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REDUCED BACKSCATTERING CROSS SECTION (σ°) DATA FROM THE SKYLAB S-193 RADAR ALTIMETER

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16. Abstract

This report presents backscattering cross section per unit scattering area ($\sigma°$) data reduced from measurements made by the Skylab S-193 Radar Altimeter over the ocean surface. Descriptions of the altimeter are given where applicable to the measurement process. Analytical solutions are obtained for the flat surface impulse response for the case of a nonsymmetrical antenna pattern. Formulations are developed for converting altimeter AGC outputs into values for $\sigma°$. Reduced data is presented for Missions SL-2, 3 and 4 for all modes of the altimeter where sufficient calibration existed. The problem of interpreting land scatter data is also discussed. Finally, a comprehensive error analysis of the measurement is presented and worst case random and bias errors are estimated.

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1.0 INTRODUCTION

The Skylab S-193 short pulse radar altimeter represented the first opportunity to provide very high angular resolution measurements of near normal incidence backscattering cross section per unit scattering area ($\sigma°$) over the ocean and land. The S-193 radar altimeter was operated during missions SL-2, 3 and 4 covering a time frame from 30 May, 1973, to 20 January, 1974. Backscattered power was measured for ocean surface conditions ranging from near calm to extremely rough ($H_{1/3} > 6$ meters) and over various types of land terrain. The data obtained by the S-193 radar altimeter will be useful not only for the design of future altimeters but also for the determination of the sensitivity of various radar-measurable parameters to local surface conditions.

Originally, it was intended that measurements of $\sigma°$ obtained by the S-193 altimeter would be provided investigators by the NASA Johnson Space Flight Center (JSC) as a standard data product. However, it was found that conversion of backscattered power measurements into absolute values of $\sigma°$ was not a procedure which was amenable to the standard JSC Earth Resources Experiment Package (EREP) data processing format. Therefore, this task was initiated to provide experimenters with corrected values of $\sigma°$ as obtained from the S-193 radar altimeter data.

At the time the S-193 radar altimeter was designed, there were a number of unanswered questions pertaining to the measurement of backscattering characteristics of the earth's surface. In order to provide data for answering these questions and also allow a reasonable degree of margin for error in the radar design (due to unknown target characteristics), the S-193 radar altimeter was designed to operate in a number of different configurations or modes. Mode II was the designation given to the operational configuration of the altimeter specifically implemented to measure the scattering cross section of the surface. In this mode, the nominal transmitted pulsewidth was 100 ns and the IF bandwidth was 10 MHz. However, in addition to Mode II, this particular combination of pulse width and IF bandwidth was used in the other operating modes of the altimeter since it provided the greatest probability of target acquisition and tracking. In Mode II, scattering data were obtained at nominal angles of incidence of 0°, 0.43°, 1.3°, 2.7°, 7.6° and 15.6° with respect to the normal to the mean surface. In the other modes, all 100 ns/10 MHz data were obtained at 0° (nominal) angle of incidence. Table 1.1 summarizes the various configurations of the altimeter during which time the 100 ns pulsewidth and 10 MHz IF bandwidth combination were exercised. Detailed characteristics of the altimeter will be discussed in subsequent sections of this report, however, Table 1.1 indicates the general characteristics of the system during which time cross section data were acquired. It should be noted that although the altimeter operated in other pulsewidth/bandwidth combinations, only with the 100 ns/10 MHz configuration were there sufficient calibration data to permit reduction of the backscattered power data.

The backscattered power as measured by the radar is dependent upon the surface scattering cross section per unit scattering area and a number of other parameters which are related to the characteristics of the radar system. Among these other factors are the antenna pattern, the pointing angle of the antenna boresight relative to nadir, the transmitted pulse shape and the receiver effects. In order to obtain accurate values of $\sigma°$ from the received power data, it was essential that each of the above factors be accounted for. In Section 2.0, the scattering process and the receiver characteristics are detailed, and the various correction factors are obtained. The result of this chapter is a set of curves which permit the direct conversion of basic altimeter AGC (Automatic Gain Control) data to $\sigma°$ values.

Section 3.0 presents the reduced $\sigma°$ data obtained from SL-2, 3 and 4. While the results presented in Section 3.0 are certainly the main thrust of this effort, they are not truly meaningful without some realistic error bounds on the data. Section 4.0 presents the results of an effort to obtain such error bounds. Because of limited calibration data, the error analysis phase of this effort was probably the most difficult. For example, the problem of classifying an error source as random or bias was particularly troublesome and often became an engineering judgment decision. However, in view of the fact that an "educated" estimate is far better than no estimate at all, such an error analysis was determined to be most necessary.

TABLE 1.1

S-193 Radar Altimeter Configuration During Transmission of a 100 ns Pulse and an IF Receiver Bandwidth of 10 MHz

MODE	SUB MODE	ANGLE OF INCIDENCE	WAVEFORM SAMPLES	SAMPLE SPACING	ALTIMETER TRACKING	AGC GATE WIDTH	DATA ACQUISITION TIME AND GROUND TRACK COVERED
I	0	0°	Yes	25ns	Yes	600ns	46.8s/346.9 km
	4 #	–	Yes	25ns	No	600 to 800ns	3.12s/ ---
II	0	0°	Yes	25ns	Yes	600ns	6.24s/46.3 km
	1 *	0.43° †	No	–	No	800µs	29.12s/215.8 km
	2 *	15.6 ° †	No	–	No	800µs	29.12s/215.8 km
	3 *	7.6 ° †	No	–	No	800µs	29.12s/215.8 km
	4 *	2.7 ° †	No	–	No	800µs	29.12s/215.8 km
	5 *	1.3 ° †	No	–	No	800µs	29.12s/215.8 km
	6	0°	Yes	25ns	Yes	600ns	6.24s/46.3 km
	7 #	–	Yes	25ns	No	600 to 800ns	4.16s/ ---
III	2 #	–	Yes	25ns	No	600 to 800ns	2.08s/ ---
	3	0°	Yes	25ns	Yes	600ns	13.52s/100.2 km
V	0	0°	Yes	25ns	Yes	600ns	13.52s/100.2 km
	5 #	–	Yes	25ns	No	600 to 800ns	3.12s/ ---
NADIR AUGN		ANTENNA SCANNING	No		GENERALLY NOT	800µs	VARIABLE

#Internal calibration

*NOTE: The AGC gate is positioned on the returns by the last altitude reading during tracking. This is not critical, however, because of the large width of the AGC gate.

†The antenna is offset in positive pitch angle (ahead of track, for no yaw of the spacecraft).

2.0 SYSTEM ANALYSES

Although the S-193 radar altimeter was designed to measure the backscatter cross section per unit scattering area ($\sigma°$) of the ocean surface, the task of extracting $\sigma°$ from the raw altimeter data was not simple. The difficulties were primarily due to three factors: the use of a peak averaging detector to control the AGC, a paucity of AGC calibration data, and the use of a pulsewidth and antenna beamwidth which resulted in system operation which was neither completely pulsewidth nor beamwidth limited. These three factors generated requirements for extensive computation and detailed analysis of the mean return waveform as measured by the altimeter in order to extract valid $\sigma°$ estimates from the recorded AGC data.

2.1 Extended Target Scattering

There are four measurements accomplished by the altimeter which significantly impact the computation of $\sigma°$: system point target response, altitude, AGC voltage, and instantaneous samples of 100 return waveforms per second. Using these four measurements, $\sigma°$ can be determined because we know that the mean return power as a function of delay time and as measured by the AGC is a convolution of the following system and environmental characteristics:

(a) transmitted waveform,

(b) flat surface impulse response,

(c) radar observed waveheight distribution, and

(d) radar receiver impulse response.

The convolution of (a) and (d) is proportional to the system point target response.† In the S-193 altimeter this function is recorded by the Sample and Hold (S&H) gates in the CDS (Calibration Data Step) submode. Previous computations* [2.1] have shown that for an rms waveheight of less than 2 meters (significant waveheight less than 26 feet), the error introduced by neglecting (c) in computing the peak of the mean return power is

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†Note that as we have defined it, the system point target response does not include antenna effects. The antenna effects are included in the flat surface impulse response.

*These comments only apply to the long pulse (100 ns) mode of operation for the S-193 altimeter. Waveheight roughness effects are not necessarily negligible for the 10 ns return.

less than 0.1 dB. When the rms waveheight increases to 4 meters (significant waveheight of 52 feet), the error increases to 0.35 dB. In view of the range of sea states encountered during the Skylab missions, it appears that the effects of waveheight roughness on the peak of the mean return waveforms can be neglected with negligible resultant error.

Under the above assumptions, the mean return power as a function of delay time reduces to a convolution of the system point target response (recorded in the appropriate CDS submode) with the flat surface impulse response, or

$$\overline{P}_r(\tau) = k \int_{-\infty}^{\infty} P_i(\hat{\tau})\, P_{CDS}\,(\tau-\hat{\tau})\, d\hat{\tau} \qquad (2\text{-}1)$$

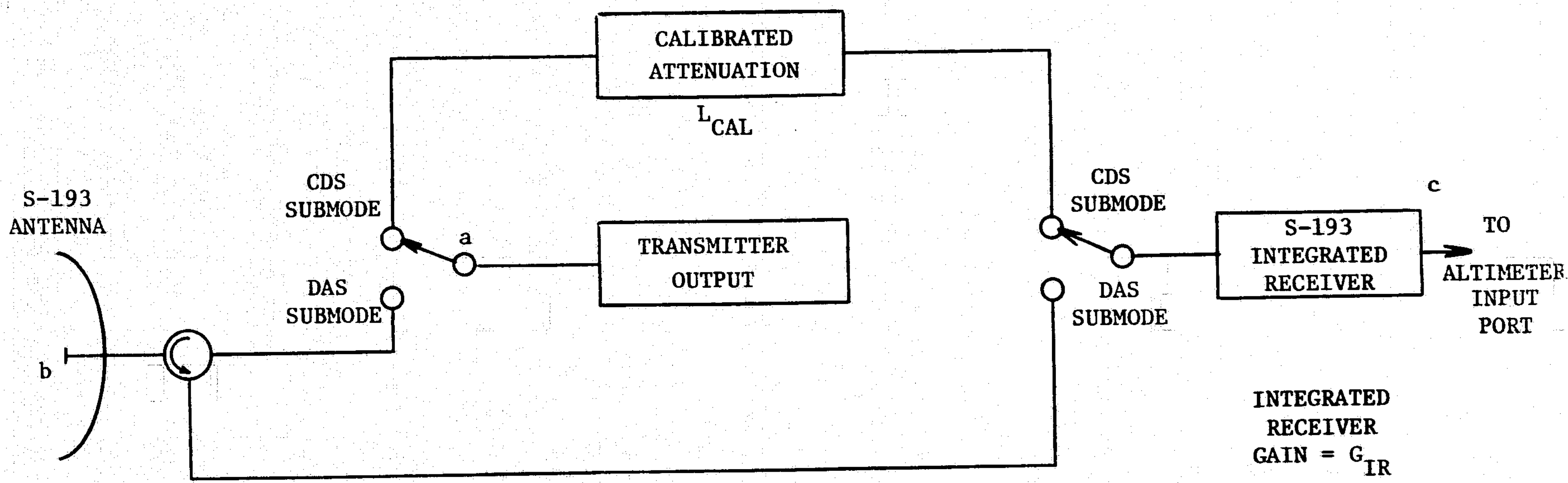
where $\overline{P}_r(\tau)$ is the mean return power, $P_i(\hat{\tau})$ is the flat-sea impulse response and $P_{CDS}(\hat{\tau})$ is the power waveform recorded in the appropriate CDS submode. The constant k is the proportionality factor between the true system point target response peak amplitude and the CDS waveform peak amplitude. To evaluate k we refer to Figure 2.1 which is a simplified block diagram of how the altimeter front-end is configured during DAS (Data Acquisition Step) and CDS submodes. <u>All losses, power levels and computed waveforms will be referred to the output of the S-193 integrated receiver (or equivalently, the altimeter input port) since it was at this point that General Electric (the S-193 contractor) obtained calibration curves of received power level versus AGC voltage [2.2].</u> The peak amplitude of the true system point target response referred to the altimeter input port is given by $\hat{P}_S$ where

$$\hat{P}_S = \frac{\hat{P}_T}{L_{DAS}} = \frac{\hat{P}_T\, G_{IR}}{L_{ab}\, L_{bc}} \quad , \qquad (2\text{-}2)$$

and $\hat{P}_T$ is the peak transmitted power and the other quantities are as defined in Figure 2.1. In a CDS submode, the peak amplitude at the altimeter input port is $\hat{P}_{CDS}$, where

$$\hat{P}_{CDS} = \frac{\hat{P}_T}{L_{CDS}} = \frac{\hat{P}_T\, G_{IR}}{L_{ac}\, L_{CAL}} \qquad (2\text{-}3)$$

Solving (2-2) and (2-3) for $\hat{P}_S$ in terms of $\hat{P}_{CDS}$ yields



DAS - SUBMODE SYSTEM PATH LOSSES

LOSS FROM TRANSMITTER TO ANTENNA $= L_{ab}$

LOSS FROM ANTENNA TO ALTIMETER INPUT PORT $= \dfrac{L_{bc}}{G_{IR}}$

$$L_{DAS} = \frac{L_{ab}\, L_{bc}}{G_{IR}}$$

CDS - SUBMODE SYSTEM PATH LOSSES

LOSS FROM TRANSMITTER TO ALTIMETER INPUT PORT $= \dfrac{L_{ac}\, L_{CAL}}{G_{IR}}$

$$L_{CDS} = \frac{L_{ac}\, L_{CAL}}{G_{IR}}$$

Figure 2-1. Simplified schematic representation of S-193 altimeter front-end.

$$\hat{P}_S = \left(\frac{L_{ac}\,L_{CAL}}{L_{ab}\,L_{bc}}\right)\hat{P}_{CDS} \tag{2-4}$$

and, thus,

$$k = \left(\frac{L_{ac}\,L_{CAL}}{L_{ab}\,L_{bc}}\right) \tag{2-5}$$

If we write $P_{CDS}(\tau-\hat{\tau})$ as

$$P_{CDS}(\tau-\hat{\tau}) = \hat{P}_{CDS}\, q_{CDS}(\tau-\hat{\tau})$$

where $q_{CDS}(\tau-\hat{\tau})$ is the normalized (to a maximum amplitude of unity) waveform as recorded by the S&H gates in the CDS submode*, then the mean return waveform referred to the altimeter input port is given by

$$\overline{P}_r(\tau) = \hat{P}_{CDS}\left(\frac{L_{ac}L_{CAL}}{L_{ab}L_{bc}}\right)\int_{-\infty}^{\infty} P_i(\hat{\tau})\; q_{CDS}(\tau-\hat{\tau})\, d\hat{\tau} \tag{2-6}$$

A detailed analysis is presented in Appendix A in which the flat surface impulse is obtained for the S-193 geometry and antenna pattern. If we define $F(h,\xi,\tau)$ in the following manner

$$F(h,\xi,\tau) = \frac{L_p}{\sigma^\circ(\psi_o)}\int_{-\infty}^{\infty} P_i(\hat{\tau},\xi)q_{CDS}(\tau-\hat{\tau})\, d\hat{\tau} \tag{2-7}$$

where ξ is the S-193 antenna pointing angle with respect to nadir, h is the altitude, L_p is the atmospheric path attenuation, and $\tan\psi_o = \sqrt{c\tau/h}$ then $F(h,\xi,\tau)$ is independent of surface conditions or atmospheric attenuation and is only a function of the radar system characteristics and the

*For operating modes of the altimeter for which σ° can be obtained (see Table 1.1), the post detection bandwidth of the receiver ($\sim$50 MHz) is large compared to the IF bandwidth (10 MHz, two-sided). Furthermore, since square-law detection is used, the post detection voltage waveform recorded by the S&H gates is a direct measure of the IF demodulated power waveform.

geometry. Substitution of (2-7) in (2-6) yields the following expression for the average return power;

$$\overline{P}_r(\tau) = \hat{P}_{CDS}\left(\frac{L_{ac}L_{CAL}}{L_{ab}L_{bc}}\right)F(h,\xi,\tau)\ \frac{\sigma^\circ(\psi_o)}{L_p} \tag{2-8}$$

The calibration curves for converting the AGC output to received power were in terms of the <u>peak of the mean</u> return power. Thus, if we define $\hat{F}(h,\xi,\tau_p)$ as

$$\hat{F}(h,\xi,\tau_p) = \underset{\tau}{\mathrm{Max}}\left\{F(h,\xi,\tau)\right\}$$

where τ_p is the time at which the maximum occurs, the peak of the mean return power is given by

$$\hat{P}(\tau_p) = \hat{P}_{CDS}\left(\frac{L_{ac}L_{CAL}}{L_{ab}L_{bc}}\right)\hat{F}(h,\xi,\tau_p)\ \frac{\sigma^\circ(\hat{\psi}_o)}{L_p} \tag{2-9}$$

where $\hat{\psi}_o = \sqrt{c\tau_p/h}$. Equation (2-9) relates the measurable quantity $\hat{\overline{P}}(\tau_p)$ to the radar system parameters, the scattering surface and the path attenuation. It therefore contains the basic scattering process model.

Equation (2-7) defines $\hat{F}(h,\xi,\tau_p)$ in terms of the normalized system point target response and the flat surface impulse response. The system point target response is directly measured by the S&H gates in any of the internal calibration (CDS) submodes listed in Table 1.1. Furthermore, this is a measurement which is performed in flight and, hence, any changes in the radar system will be reflected in this measurement. Inspection of in-flight recorded data showed no significant departures of the system point target response from preflight calibration. Figure 2.2 shows a typical system point target response* (unnormalized) for the 100 ns/10 MHz receiver configuration. In this figure we also show a Gaussian function whose parameters have been adjusted to provide a "best-fit" to the measured data.

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*Since the receiver employs a square-law detector and a wideband video amplifier, the S&H input voltage is a direct measure of the IF (demodulated) power waveform.

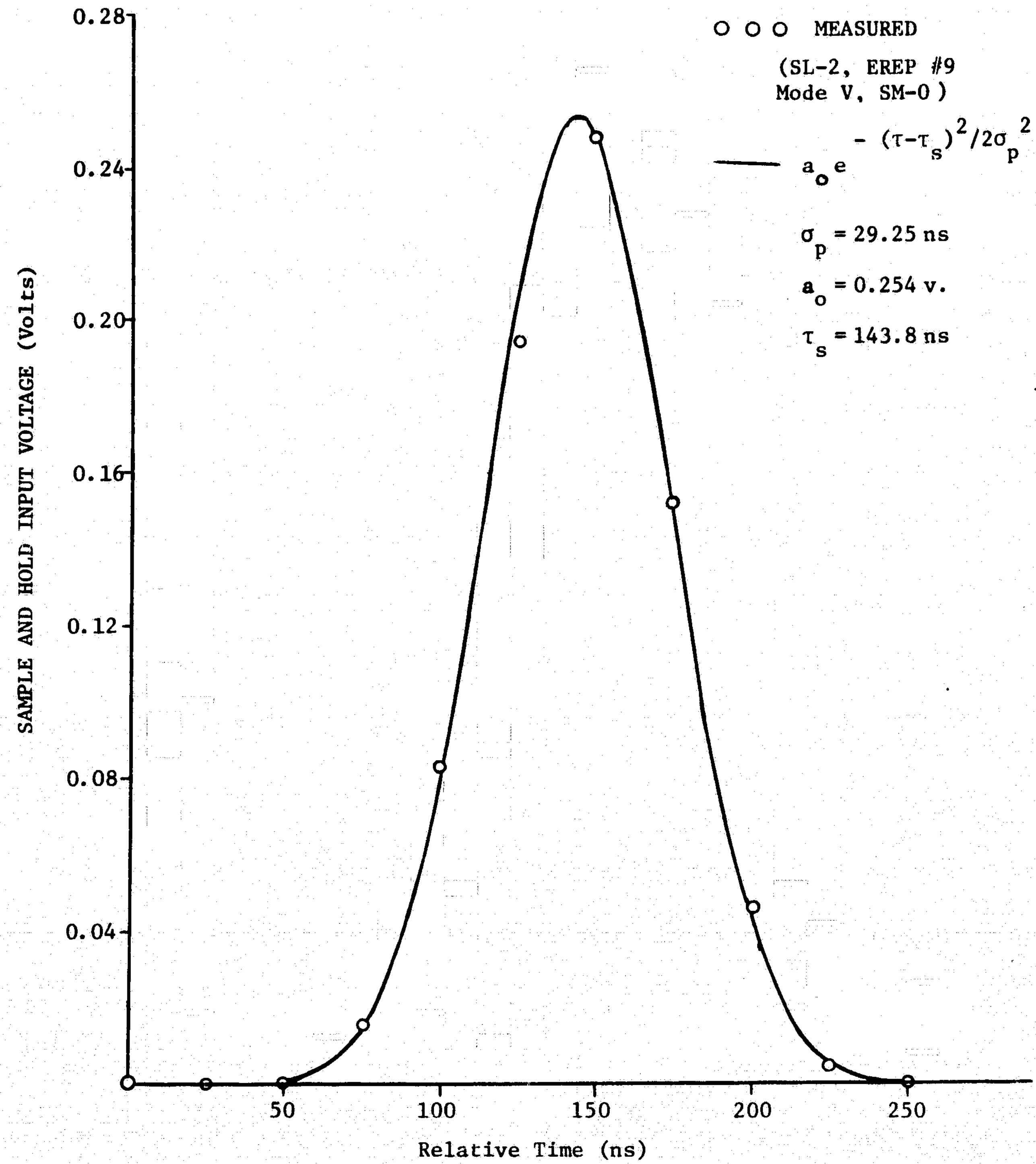

Figure 2-2. Typical 100 ns/10 MHz system point target response and Gaussian fit.

Since the Gaussian function appeared to fit the data very well, it was used to approximate the point target impulse response. That is, we take

$$q_{CDS}(\tau) = e^{-(\tau-\tau_s)^2/2\sigma_p^2} \qquad (2\text{-}10)$$

where from Figure 2.2, $\sigma_p = 29.25$ ns. The time shift τ_s should be such that when (2-10) is convolved with the surface impulse response there is no appreciable return before $\tau = 0$ (corresponding to a total two-way delay time equal to 2h/c). For the purposes of these calculations, we take $\tau_s = 2\sqrt{2}\,\sigma_p$.

The flat surface impulse response for the Skylab geometry is obtained in Appendix A. For a pointing error* of less than about a beamwidth, the flat surface impulse response is given by the following expression,

$$P_i(\tau,\xi) \approx \frac{G_o^2\lambda^2\sigma^\circ(\psi_o)c}{4(4\pi)^2h^3L_p}\, e^{-\frac{4}{\gamma}\left[\sin^2\xi + \delta\cos\xi\tan^2\xi_p\right]}$$

$$\cdot\, e^{-\frac{4c}{\gamma h}\tau(\cos 2\xi + \delta\cos\xi)} \sum_{m=o}^{5} \frac{\Gamma(m+1/2)\bar{c}_n}{\sqrt{\pi}\,(\beta/2)^m\,\Gamma(m+1)}\, I_{2m}(\beta)u(\tau) ,$$

where the various quantities are defined in Appendix A. Of particular note, however, is the fact that the impulse response depends upon the angles ξ and ξ_p. More explicitly, if ξ_p is the angular error in pitch and ξ_r is the error in roll (pitch and roll refer to the spacecraft coordinate system), then the total angular error is given by

$$\tan^2\xi = \tan^2\xi_p + \tan^2\xi_r$$

---

*The pointing error is defined as the angular difference between the line from the altimeter to the sub-nadir point and the boresight axis of the altimeter antenna. The terms pointing error and pointing angle are used interchangeably.

Even though ξ is fixed, as ξ_p and ξ_r vary, the impulse response will change. This is a direct result of the nonsymmetrical pattern of the S-193 antenna and the resulting change in effective illuminated area as ξ_p and ξ_r vary.

Substituting the above expression for $P_i(\tau,\xi)$ and $q_{CDS}(\tau)$ in equation (2-7) and finding the maximum of the resultant integral will give $\hat{F}$ as a function of altitude and pitch (ξ_p) and roll (ξ_r) angular pointing errors. Table 2.1 lists the important radar parameters for the three Skylab missions. Of particular note is the different antenna gain and pattern for the SL-4 mission due to damage to the reflector feed system. Appendices B and C present the meaning of the factors γ and δ in terms of the measured antenna patterns. Figure 2.3 shows how $\hat{F}$ depends upon the pitch and roll angular errors. The dashed curve was obtained by setting $\xi_r = 0°$ and varying ξ_p out to the limit of validity of the above expression for the flat surface impulse response. Similarly, the solid curve was obtained by setting $\xi_p = 0°$ and varying ξ_r. The case of $\xi_r = 0°$ and ξ_p variable corresponds to scanning the antenna in the plane of the narrow beamwidth of the antenna or the along track direction (for no yaw). Similarly $\xi_p = 0°$ and ξ_r variable corresponds to the antenna scanning in the plane of the broad beamwidth or the cross track direction (for no yaw). Of particular note in Figure 2.3 is the fact that although less power is initially returned from a scan in the narrow-beam direction than the broadbeam direction, eventually the two curves cross and the situation is reversed. This is a result of the two-dimensional nature of the antenna pattern, i.e. consideration must be given to the antenna pattern in the plane orthogonal to the direction of scan. Figure 2.4 presents similar results for the SL-4 mission. Apart from the reduced return due to the antenna gain reduction, we see that the dashed and solid curves are closer together due to less asymmetry in the pattern.

Figures 2.3 and 2.4 represent a particular combination of (ξ_p, ξ_r), namely, either $\xi_p = 0°$ or $\xi_r = 0°$. However, due to the uncertainty in determining ξ_p and ξ_r, these curves will be sufficient for estimating the error bounds on reduced values of $\sigma°$. When ξ_r exceeded the limits given in Figures 2.3 and 2.4 (1.35° for SL-2&3, 1.1° for SL-4), it was not possible to convert AGC data to $\sigma°$ values because ξ_r could not be determined from the average return waveform data (See Appendix D). Thus, it was not necessary to compute $\hat{F}$ for ξ_r exceeding these values. The case of ξ_p greater than the limits shown in

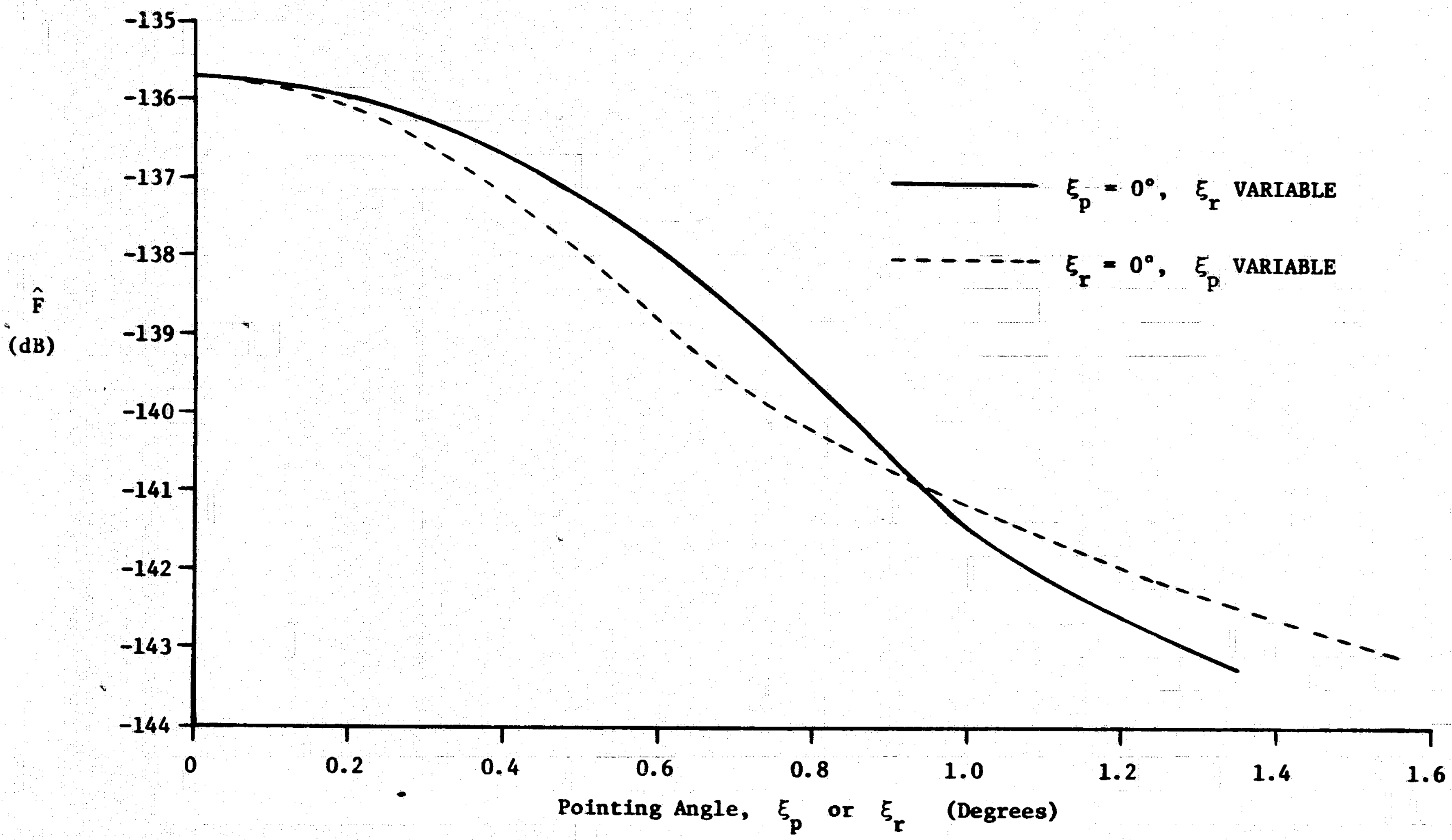

Figure 2-3. $\hat{F}$ as a function of $(0°, \xi_r)$ and $(\xi_p, 0°)$ For SKYLAB Missions SL-2 and SL-3

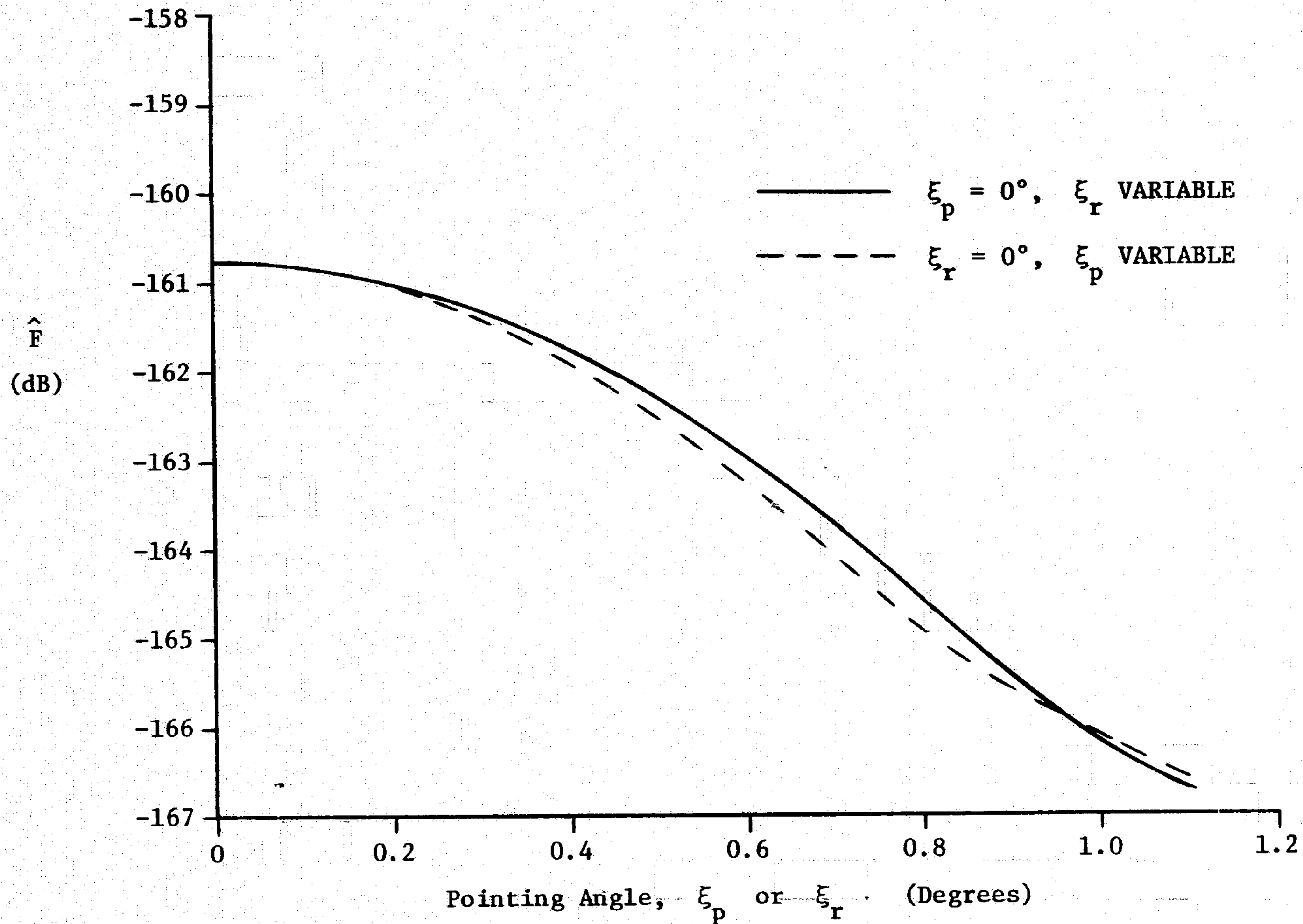

Figure 2-4. $\hat{F}$ as a function of $(0°,\xi_r)$ and $(\xi_p,0°)$ for SKYLAB Mission SL-4.

Figure 2.3 for the SL-2 and 3 missions was, however, of great importance since it corresponded to the acquisition of off-nadir data in Mode II (see Table 1.1). For $\xi_p \gtrsim 1.3°$ during mission SL-2 and 3, it is shown in Appendix A that $\hat{F}$ may be determined from the following expression (for $\xi_r = 0$);

$$\hat{F} \approx \frac{G_o^2 \lambda^2 c}{2\sqrt{2}\ (4\pi)^3 h^3} \quad \frac{\sqrt{\pi\gamma}}{\sin\xi_p \left[2(1+\delta) - \delta(1+\sec\xi_p) + 2(1+\delta)\tan^2\xi_p\right]^{1/2}}$$

$$\cdot \int_{-\infty}^{\infty} q_{CDS}(\tau)\, d\tau \qquad ,$$

or using (2-10)

$$\hat{F} = \frac{G_o^2 \lambda^2 \pi c \sigma_p}{2(4\pi)^3 h^3} \quad \frac{\sqrt{\gamma}}{\sin\xi_p \left[2(1+\delta) - \delta(1+\sec\xi_p) + 2(1+\delta)\tan^2\xi_p\right]^{1/2}} \quad . \qquad (2\text{-}11)$$

The variation of $\hat{F}$ with ξ_p as computed from (2-11) and using the SL-2 and 3 radar parameters from Table 2.1 is shown in Figure 2.5. It was not necessary to perform the computation for SL-4 since the antenna was not scanned during this mission.

Equation (2-9) along with the graphs showing the dependence of $\hat{F}$ on the pitch and roll pointing errors basically describe the scattering model. That is, equation (2-9) gives the peak of the mean return power in terms of the scattering surface, the path attenuation, the antenna pattern, the geometry, and the losses in the front-end of the receiver. It now remains to determine how the receiver and the AGC in particular responded to the peak of the mean return.

2.2 Receiver Effects and the Use of Calibration Data

Although the calibration curves for relating the AGC output to the back-scattered power are in terms of the peak of the mean return power, the AGC system in the S-193 altimeter receiver did not measure the peak of the mean power directly. Instead the system measured the largest peak in a single return and then averaged over a number of returns to form the average-of-the peak power. The AGC voltage was then derived from this mean-of-the-peak

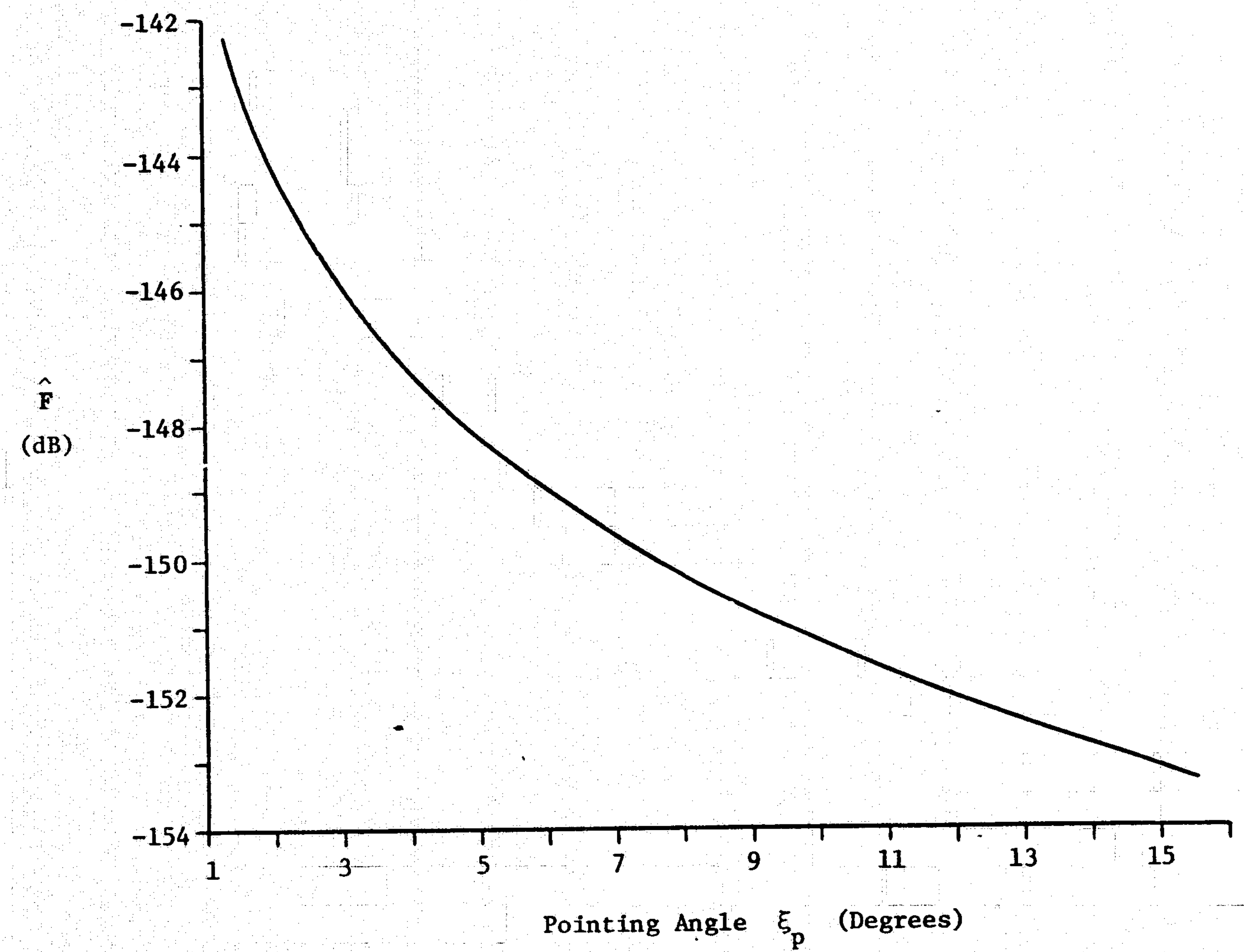

Figure 2-5. $\hat{F}$ as a function of ξ_p ($\xi_r = 0°$) for SKYLAB Missions SL-2 and SL-3 with $\xi_p \geq 1.3°$.

TABLE 2.1

Summary Of S-193 Radar Altimeter Parameters For Missions SL-2, 3 and 4

	Missions SL-2 and SL-3	Mission SL-4
Antenna Gain (G_o)	41.3 dB	28.7 dB
Radar Wavelength (λ)	0.02158 m	0.02158 m
Speed of Light (c)	3×10^8 m/sec	3×10^8 m/sec
Altitude (h)	435.5 km	435.5 km
Antenna Pattern Taper Parameter (γ)	7×10^{-4}	7×10^{-4}
Antenna Pattern Asymmetry Factor (δ)	0.75	0.18
Point Target One Sigma Width (σ_p)	29.25 ns	29.25 ns

power. The AGC calibration curves for the altimeter [2.2] should have avoided the process of converting from mean of the peak power to peak of the mean power since they presented AGC voltage in terms of peak-of-the-mean power directly. This would have been the case if the mean return waveforms obtained from the S&H data during in-flight operation of the altimeter were exactly the same as the waveforms used to obtain the AGC calibration curves. However, the relation between the peak-of-the-mean power and the mean-of-peak power is a complicated function of the statistics of the return waveform (including the mean and variance), the IF and video portions of the receiver, and the AGC system. Thus, when the mean return waveforms as measured in-flight were different from the waveforms used to obtain the AGC calibration curves, the calibration curves could not be used to directly obtain the peak-of-the-mean return power. In order to get the peak-of-the-mean return power from AGC measurements when the mean return waveform was different from that used to obtain the AGC calibration curve, we had to deal with the "r-factor".

The r-factor as originally defined [2.3] is the ratio of the peak of the mean return power (P_{POM}) to the mean of the peak return power (P_{MOP}), i.e.

$$r = \frac{P_{POM}}{P_{MOP}} \tag{2-12}$$

We first will demonstrate how the r-factor may be obtained from the AGC calibration curves and upon what other characteristics it depends. Figure 2.6 symbolically illustrates the type of AGC curves that are available from Reference 2.2. The curve in 4(a) was obtained using a deterministic ("clean") waveform of shape "A" and at a temperature T_o, while curve 4(b) was obtained using a random ("noisy") input waveform (whose mean or average shape is the same as "A") and at the same temperature, T_o. For curve 4(b), the peak of the mean return power is a function of V_{AGC}, T_o and the mean waveform "A", i.e.

$$P_{POM_n} = f(V_{AGC}, T_o, \text{"A"}) \quad . \tag{2-13}$$

For curve 4(a), the peak of the mean return power is a different function of V_{AGC}, T_o and the waveform "A", i.e.

$$P_{POM_c} = \tilde{f}(V_{AGC}, T_o, \text{"A"}) \tag{2-14}$$

However, since (2-14) is for a deterministic input signal the peak of the mean power and the mean of the peak power are the same, i.e.

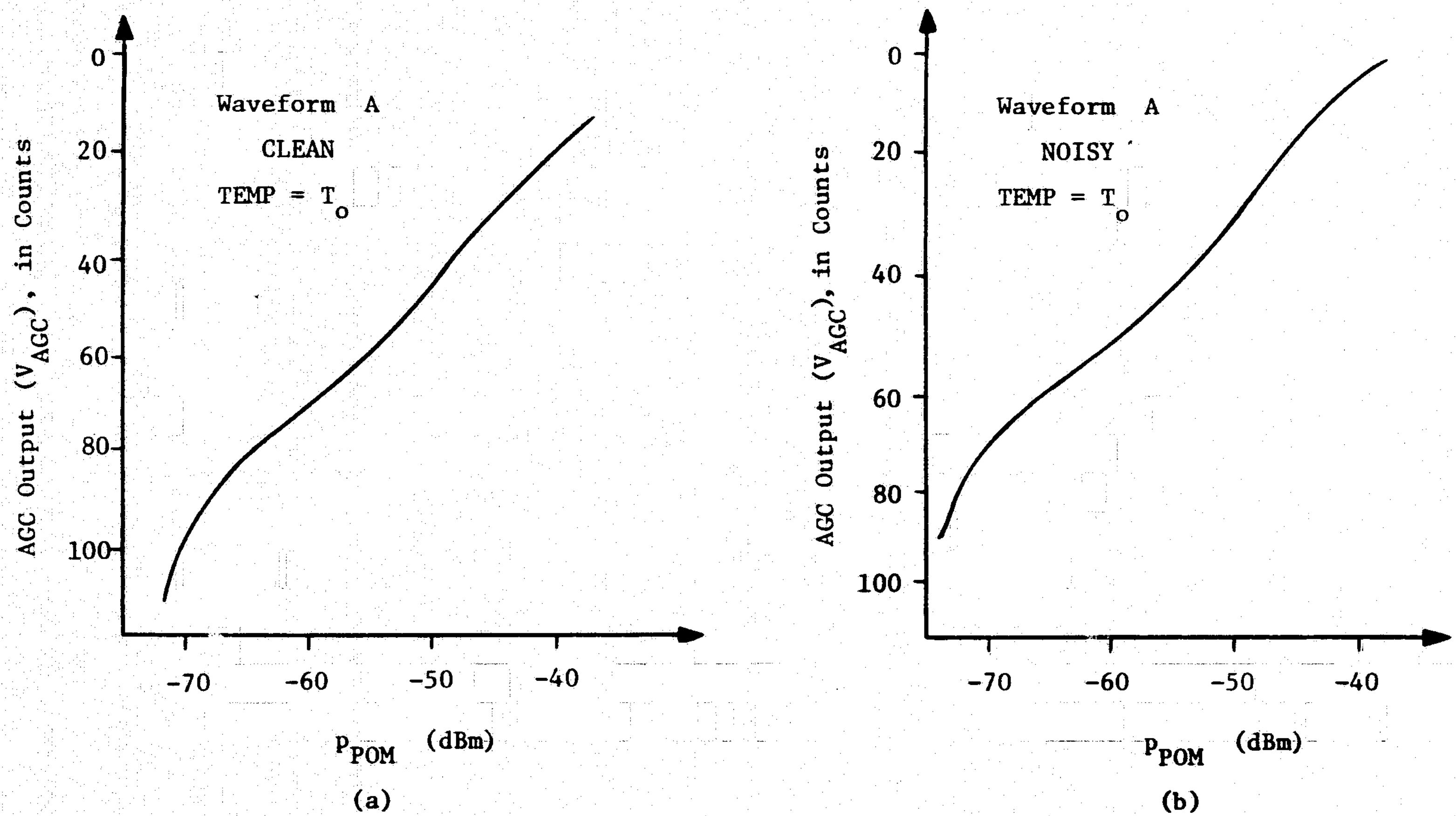

Figure 2-6. Typical AGC calibration curves relating the AGC output (in telemetry counts) to the peak-of-the-mean return power. (Note that the terminology "NOISY" and "CLUTTER" are synonymous.)

$$P_{MOP_c} = P_{POM_c} \qquad ,$$

and since the mean of the peak is unchanged in the two cases* i.e., $P_{MOP_{clean}} = P_{MOP_{noisy}}$,

$$r = \frac{P_{POM_n}}{P_{MOP_n}} = \frac{f(V_{AGC}, T_o, \text{"A"})}{\tilde{f}(V_{AGC}, T_o, \text{"A"})}$$

or in dB

$$r(dB) = f(V_{AGC}, T_o, \text{"A"})_{(dBm)} - \tilde{f}(V_{AGC}, T_o, \text{"A"})_{(dBm)} \qquad (2\text{-}15)$$

Thus, if we plot the curves shown in Figures 4(a) and (b) on the same graph, the r-factor for waveform "A" and temperature T_o is, for a fixed value of V_{AGC}, equal to the horizontal spacing between the two curves (see Figure 2.7).

Table 2.2 is a summary of the AGC calibration curves that were available from [2.2] and which were applicable to the r-factor determination problem. If we attempt to determine the r-factors for the waveforms in Table 2.2 we encounter a problem in that there are no "clean" curves for the 0.4, 1.0, 4, 14 and 25 μs rectangular waveforms. However, for the case of a deterministic (clean) input pulse the AGC calibration curves should be independent of the pulse shape. To check this, the triangular "clean" and the 100 ns rectangular "clean" calibration curves were plotted on the same graph. It was found that there was essentially no difference, i.e. the curves overlapped, for near equal receiver temperatures. Thus, for the 0.4 through 25 μs rectangular waveforms, the 100 ns "clean" data was used to obtain the "clean" curves required (as shown in Figure 2.7) to determine the r-factor.

Another problem encountered during the attempt to obtain the r-factors from the AGC calibration curves was that the actual operating temperature of the altimeter receiver in flight was very near to 0°C. Therefore, it was necessary to interpolate the curves summarized in Table 2.2 to -10°C,

*This implies that V_{AGC} is the same in both clean and noisy cases.

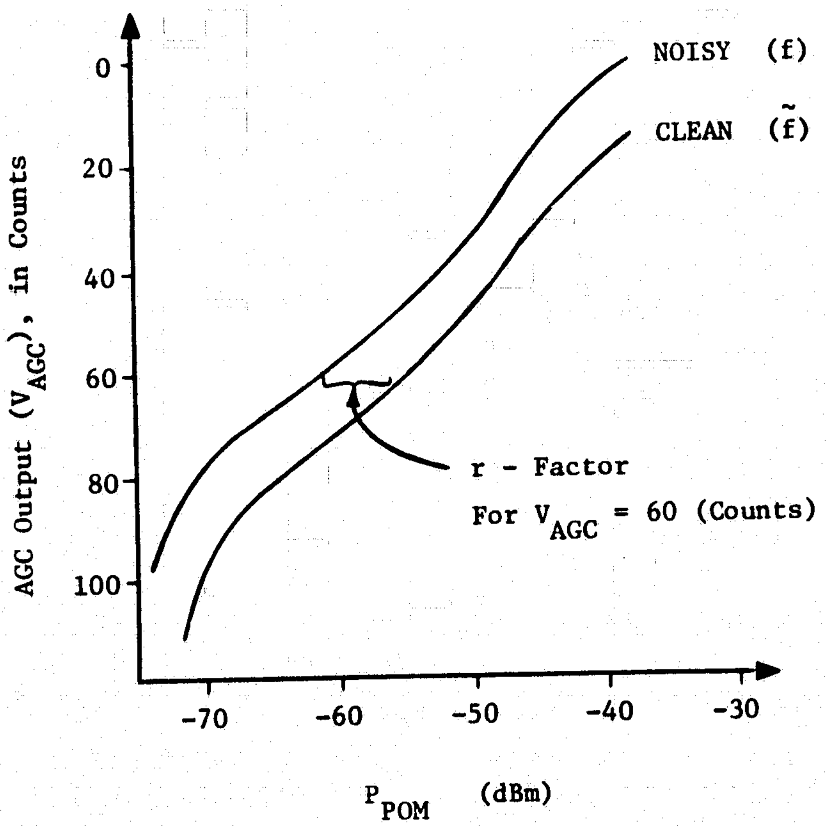

Figure 2-7. Graph showing that the r-Factor is the (dB) separation between the "CLEAN" and "NOISY" AGC calibration curves.

TABLE 2.2

Summary of Applicable Calibration Data Available From [2.2] (10 MHz Bandwidth)

MEAN WAVEFORM	CORRESPONDING POINTING ANGLE	CLEAN/NOISY	AGC GATE LENGTH	RECEIVER TEMPERATURES	Ref. 2.2 CURVE NUMBER
TRIANGULAR (100ns/500ns)	0°	NOISY	600 ns	-11,-2,+33,+52°C	1(a)
RECTANGULAR (0.4μs)	0.5°	NOISY	800 μs	-4 , +36 , +54°C	9(c)
RECTANGULAR (1μs)	1.5°	NOISY	800 μs	-4 , +36 , +54°C	9(b)
RECTANGULAR (4μs)	3°	NOISY	800 μs	-4 , +35 , +54°C	9(a)
RECTANGULAR (14μs)	8°	NOISY	800 μs	-7 , +33 , +53°C	8(b)
RECTANGULAR (25μs)	15.6°	NOISY	800 μs	-5 , +33 , +54°C	8(a)
TRIANGULAR (100ns/500ns)	0°	CLEAN	600 ns	-11,-2,+33,+52°C	2(a)
RECTANGULAR (100ns)	CDS	CLEAN	600 ns	-15,-5,+33,+59°C	7

Note: When Tracking the AGC gate width is 600ns; when not tracking the gate width is 800μs; when in CDS the gate width is 600 to 800ns.

0°C, +10°C; this was done using Lagrange interpolation. After accomplishing the temperature interpolation of the AGC calibration curves, the r-factors were then computed according to the scheme shown in Figure 2.7. Tables 2.3, 2.4 and 2.5 show the r-factors obtained from the AGC calibration curves for -10°C, 0°C and +10°C receiver temperature and as a function of mean pulse shape and AGC readings. The variation of r-factor with AGC reading is most likely due to system nonlinearities and repeatability problems [2.2].

The next question to answer is as follows; how do we use the AGC calibration curves to determine the peak of the mean return power when the mean waveforms are not the same as used in obtaining the calibration curves? Let

$$\left.\begin{array}{r} P_{POM_{CAL}} \\ r_{CAL} \\ P_{MOP_{CAL}} \end{array}\right\} = \begin{array}{l}\text{Peak of the mean return power, r-factor} \\ \text{and mean of the peak return power as } \underline{\text{determined}} \\ \underline{\text{from the AGC calibration curves}}. \end{array}$$

and

$$\left.\begin{array}{r} P_{POM_{DATA}} \\ r_{DATA} \\ P_{MOP_{DATA}} \end{array}\right\} = \begin{array}{l}\text{Peak-of-the-mean return power, r-factor and} \\ \text{mean-of-the-peak return power } \underline{\text{corresponding}} \\ \underline{\text{to the actual data recorded in flight}}. \end{array}$$

From the definition of the r-factor we know that

$$P_{POM_{CAL}} = r_{CAL}\, P_{MOP_{CAL}} \quad ,$$

and

$$P_{POM_{DATA}} = r_{DATA}\, P_{MOP_{DATA}} \quad .$$

For equal mean of the peak return power in both cases, i.e. $P_{MOP_{CAL}} = P_{MOP_{DATA}}$, we then have

$$P_{POM_{DATA}} = \frac{r_{DATA}}{r_{CAL}}\, P_{POM_{CAL}} \tag{2-16}$$

TABLE 2.3

r-Factors Computed From AGC Calibration Curves in [2.2] Interpolated To -10°C Receiver Temperature.

PULSE SHAPE	V_{AGC} (in COUNTS) 45	50	55	60	65	70	75	80	85	90	
TRIANGULAR (100ns/500ns)	-2.1	-2.5	-1.7	-0.9	-0.3	-0.2	-1.1	-0.9	-0.9		
0.4μs RECT.	-3.9	-3.8	-3.3	-3.4	-3.0	-2.7	-2.6	-2.6	-3.0		
1.0μs RECT.	-5.0	-5.7	-6.0	-4.7	-3.7	-4.2	-4.2	-4.9	-6.6		r_{CAL} (in dB)
4.0μs RECT.	-7.0	-7.7	-6.9	-5.1	-5.0	-5.4	-6.3	-7.3			
14.0μs RECT.	-7.9	-7.9	-6.8	-6.1	-6.1	-6.7	-7.1	-7.6			
25μs RECT.	-8.0	-9.1	-8.6	-7.9	-7.1	-7.3	-7.9	-9.0			

TABLE 2.4

r-Factors Computed From AGC Calibration Curves in [2.2] Interpolated to 0°C. Receiver Temperature

MEAN PULSE SHAPE	V_{AGC} (in COUNTS)										
	45	50	55	60	65	70	75	80	85	90	
TRIANGULAR (100ns/500ns)	-2.4	-1.5	-2.0	-2.6	-1.7	-1.3	-0.7	-0.4	-0.1	-1.0	r_{CAL} (in dB)
0.4 μs RECT.	-6.1	-5.6	-4.8	-5.9	-4.7	-4.7	-4.3	-3.4	-3.1		
1.0 μs. RECT.	-7.3	-7.3	-6.8	-7.0	-6.7	-6.7	-5.8	-5.6	-5.8		
4.0 μs. RECT.	-9.6	-9.3	-7.8	-8.2	-7.4	-8.0	-7.9	-8.0			
14 μs. RECT.	-10.4	-9.6	-8.2	-9.1	-8.9	-9.3	-8.8	-8.1			
25 μs. RECT.	-10.7	-10.8	-10.1	-10.3	-8.9	-9.0	-9.1	-9.1			

TABLE 2.5

r-Factors Computed From AGC Calibration Curves
in [2.2] Interpolated to +10°C. Receiver Temperature

PULSE SHAPE	V_{AGC} (in COUNTS)									
	45	50	55	60	65	70	75	80	85	90
TRIANGULAR (100ns/500ns)	-1.6	-0.5	-1.5	-2.2	-1.7	-1.2	-1.0	-0.9	-0.8	-2.2
0.4 μs RECT.	-5.4	-4.8	-4.2	-5.2	-4.2	-4.2	-4.2	-3.7	-3.5	
1.0 μs RECT.	-6.7	-6.4	-5.8	-6.3	-7.2	-6.4	-6.2	-5.8	-5.7	
4.0 μs RECT.	-9.1	-8.3	-6.9	-8.1	-8.3	-8.0	-7.8	-8.0		
14 μs RECT.	-9.8	-8.8	-7.6	-8.8	-9.2	-9.3	-8.6	-8.1		
25 μs RECT.	-9.9	-10.0	-9.5	-9.6	-8.5	-8.4	-8.5	-8.8		

r_{CAL} (in dB)

Equation (2-16) provides a means for using the AGC calibration curves to obtain the peak of the mean return power even though the waveforms used to determine the calibration curves are different from the data waveforms. The price we pay for this convenience is that we must also know the r-factor for the waveforms which were measured in-flight. Unfortunately, as we have seen in Tables 2.3 through 2.5, the r-factor is not only dependent on the waveform but also on the altimeter receiver hardware and, therefore, theoretical values of the r-factor inadequately describe the system.

From a previous study [2.4], we have the results of a computer analysis of r-factor in which the receiver was modeled based on known system design characteristics. No system nonlinearities (apart from the square law detector) or temperature dependency were incorporated in the receiver model and the r-factor was determined by taking the ratio of the computed peak of the mean return power to the computed mean of the peak power. The results of this study for both the expected in-flight waveforms and the waveforms used to determine the calibration curves are shown in Table 2.6.

Comparing the computed triangular or rectangular waveform r-factors (r_{sim_c}) in Table 2.6 with corresponding r-factors obtained from the calibration curves (r_{CAL}, in Tables 2.3, 2.4 and 2.5, we now have a means for determining how the altimeter receiver affects the theoretical r-factor. That is, if we plot r_{sim_c} versus r_{CAL} such as in Figures 2.8, 2.9 and 2.10 with the AGC output (in counts) as a parameter and for 0°C receiver temperature, we can determine the system r-factor for any other rectangular pulse length (greater than 0.4 μs but less than 14 μs) and a receiver temperature of 0°C. This could be accomplished by first computing r_{sim_c} as discussed in [2.4] (or with more error, interpolating between the data points given in Table 2.6) and then finding the value of r_{CAL} from Figures 2.8, 2.9 or 2.10 as a function of AGC output. This value (or values) of r_{CAL} <u>is the system r-factor for the new pulse length and it could be substituted in (2-16) for</u> r_{DATA}. Then we could use the AGC calibration curve from [2.2] along with (2-16) to determine the peak of the mean return power as a function of AGC reading at 0°C. It is important to note that the value of r_{CAL} in the denominator of (2-16) depends upon which calibration curve is used to measure $P_{POM_{CAL}}$. For example, assume that the average waveform as recorded by the altimeter S&H gates is a 10 μs rectangular waveform and the average AGC word is 65 counts. To determine r_{DATA}, we would first compute r_{sim_c} or interpolate between the

TABLE 2.6

Summary of Computed r-Factors From [2.4]

EXPECTED POINTING ANGLE	WAVEFORM USED TO OBTAIN CALIB. CURVES	CALCULATED r-FACTOR (r_{sim_c})†	WAVEFORM EXPECTED IN-FLIGHT	CALCULATED r-FACTOR (r_{sim_d})††
0°	TRIANGULAR (100ns/500ns)	-1.78 dB	*	-1.26 dB
0.5°	0.4 μs RECT.	-2.88 dB	*	-1.65 dB
1.5°	1.0 μs RECT.	-3.91 dB	*	-3.4 dB
3.0°	4 μs RECT.	-5.17 dB	*	-4.06 dB
8.0°	14 μs RECT.	-5.99 dB	*	-4.82 dB
15.6°	25 μs RECT.	**	**	**

*The expected in-flight waveforms were computed from (2-8) using a Gaussian approximation to the shape of the CDS waveform. See Reference 2.4 for the exact shape of the waveforms used.

**Not Calculated.

†r_{sim_c} = r-factor from the computer simulation using the waveforms used to obtain the AGC calibration curves.

††r_{sim_d} = r-factor from the computer simulation using the (computed) expected in-flight waveforms.

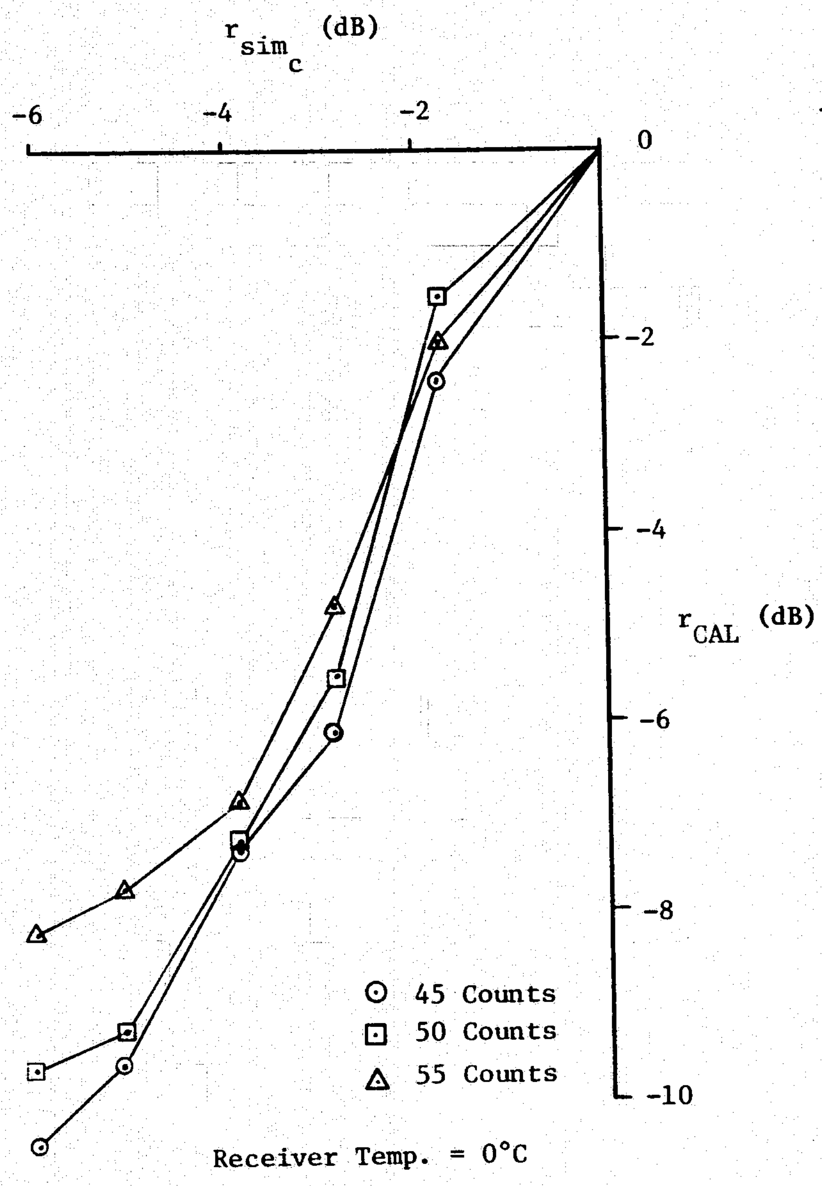

Figure 2-8. Simulated versus measured r-factor for an AGC output of 45, 50, and 55 counts.

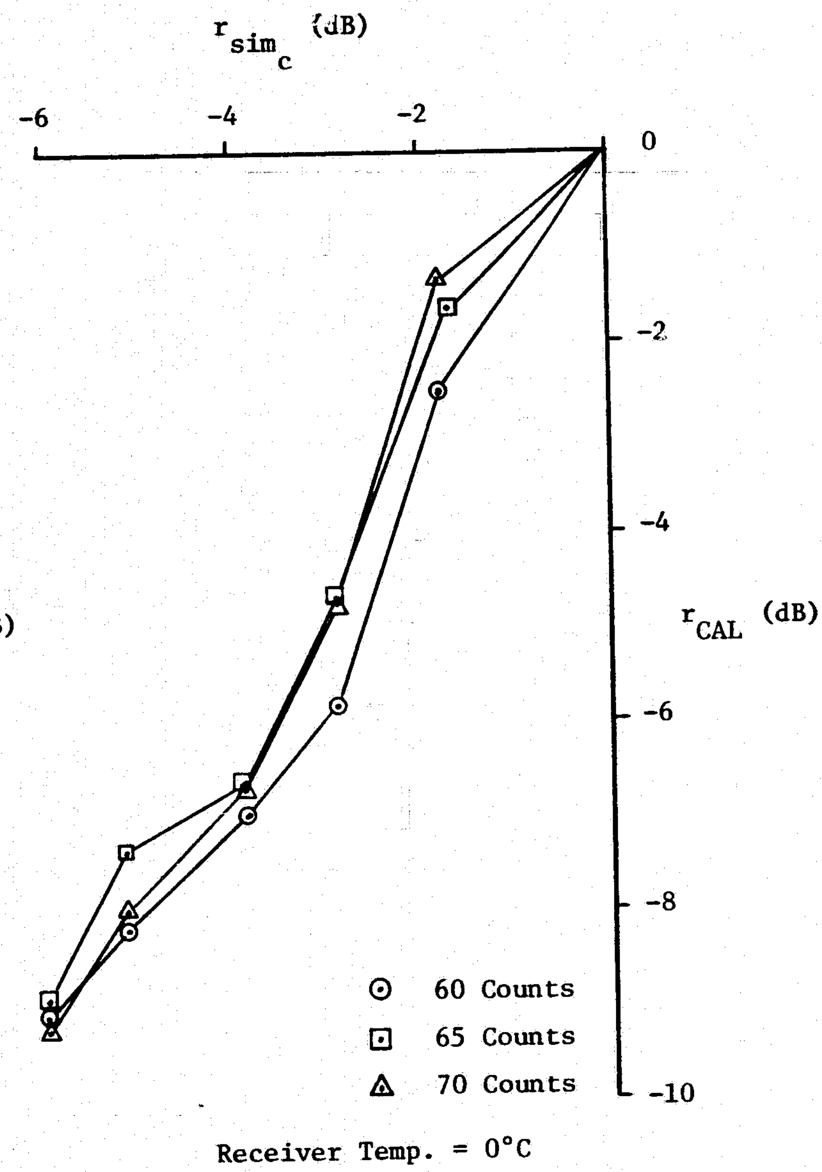

Figure 2-9. Simulated versus measured r-factor for an AGC output of 60, 65, and 70 counts.

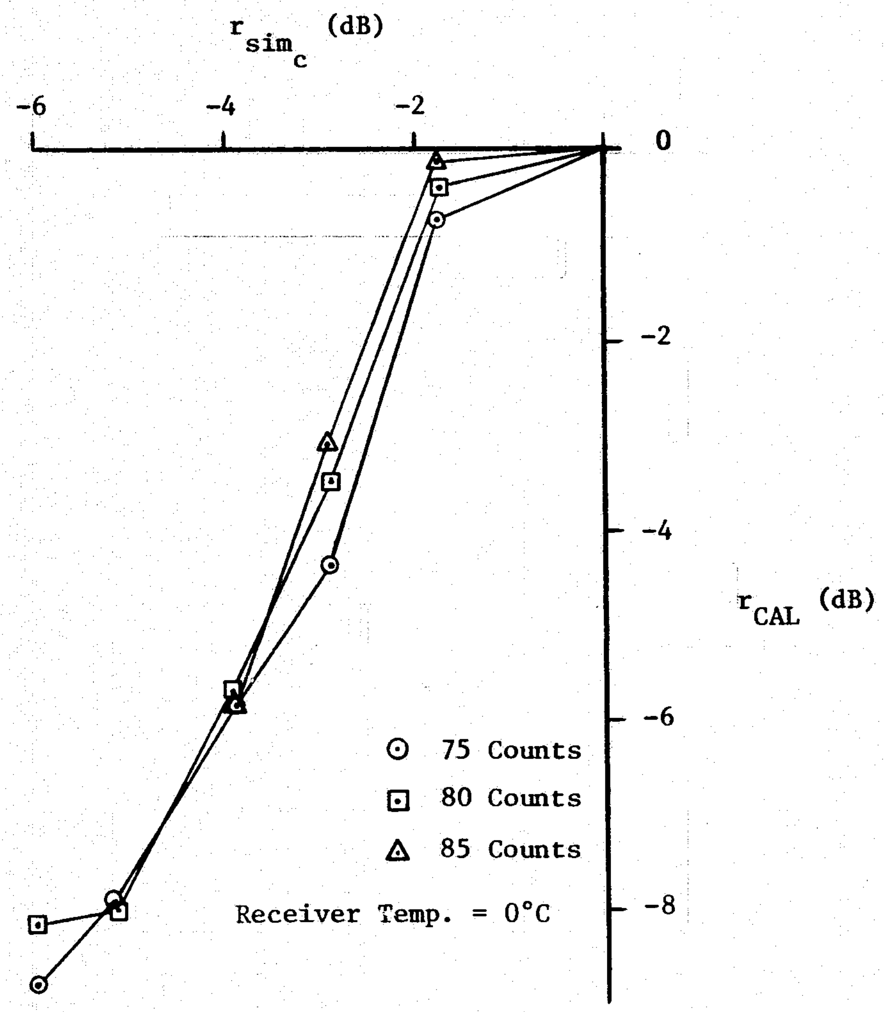

Figure 2-10. Simulated versus measured r-factor for an AGC output of 75, 80, and 85 counts.

4 and 14 μs values given in Table 2.6. Having obtained a value for r_{sim_c} we then go to Figure 2.9 to determine r_{DATA} from the vertical axis. With equation (2.6), we can use either (from Table 2.2) calibration curve 9(a) (to convert 65 counts to $P_{POM_{CAL}}$) along with $r_{CAL} = -7.4$ dB or curve 8(b) along with $r_{CAL} = -8.9$ dB to determine $P_{POM_{DATA}}$. Actually, the ratio r_{DATA}/r_{CAL} can be determined directly from the appropriate curve in Figures 2.8, 2.9 or 2.10.

While this procedure is perfectly straightforward for rectangular or triangular waveforms, the problem of waveforms which are not rectangular (or triangular), as is the case with the in-flight data, remains. In order to address this problem, it is necessary to assume that the curves in Figures 2.8, 2.9 and 2.10 are independent of input mean waveform. That is, the relationship between the ideal r-factor for the system (r_{sim_c}) and the actual measured r-factor (r_{CAL}) does not depend on the character of the input waveform. In other words, if we computed a value of r_{sim_c} for a certain rectangular input waveform and measured the corresponding r_{CAL} and then changed the <u>shape</u> of the input waveform but held r_{sim_c} constant, the resultant measured value of r_{CAL} would not change. This assumption should not be greatly in error because we are not dealing with drastic changes in input waveforms. Furthermore, we would expect the assumption to be most valid when dealing with near-nadir ($\xi \leq 0.6°$) returns, because the triangular calibration waveform is a very good approximation to the shape of the expected mean returns. Under this assumption, we may relabel the horizontal axes in Figures 2.8, 2.9 and 2.10 as r_{sim_d} (computed r-factor for expected return waveform) and the vertical axes as r_{DATA} (resultant r-factor for the system with r_{sim_d} as input).

If we let ρ be given by

$$\rho = \frac{r_{DATA}}{r_{CAL}}$$

then by using the results in Table 2.6 to obtain r_{sim_d} as a function of pointing angle (ξ), Figures 2.8, 2.9 and 2.10 to obtain r_{DATA} as a function of ξ (and AGC output), and Table 2.4 for r_{CAL}, we can construct a table for ρ as a function of pointing angle and AGC word. Such a set of tables (2.7 thru 2.10) are shown on the following pages for a receiver temperature of -10°C, 0°C and +10°C. It should be noted that these tables also specify which AGC calibration curve is to be used to obtain $P_{POM_{CAL}}$. This is necessary because in order to compute ρ, we must know r_{CAL} which depends upon the AGC calibration curve that is used (see Tables 2.3, 2.4 and 2.5).

The above written discussion of how the ρ-factor is obtained is, at best, most difficult because it involves using a very limited calibration data base to extract very general results. The reader should, however, understand that the ρ-factor is a correction to the calibration data which represents the fact that the AGC system is waveform (and not just amplitude) dependent. Since the actual received waveforms are different from the waveforms used to calibrate the AGC system, such a correction must be made. The entire correction process arises because of the use of a peak averaging AGC system.

From equation (2-16), we know how the in-flight peak of the average return power (corresponding to the expected in-flight waveform) is related to the peak of the average return power as obtained from the calibration curves, i.e.

$$P_{POM_{DATA}} = \rho \; POM_{CAL} \tag{2-17}$$

Substituting $P_{POM_{DATA}}$ in equation (2-9) for $\hat{\bar{P}}_r(\tau_p)$ and solving for $\sigma°(\hat{\psi}_o)/L_p$ we obtain

$$\frac{\sigma°(\hat{\psi}_o)}{L_p} = \frac{P_{POM_{CAL}}}{\hat{P}_{CDS}} \; \frac{\rho}{\hat{F}(h,\xi,\tau_p)} \; \frac{L_{ab}L_{bc}}{L_{ac}L_{CAL}} \tag{2-18}$$

where $\hat{P}_{CDS}$ is the peak power measured in the appropriate (100 ns/10 MHz) internal calibration submode. $\hat{P}_{CDS}$ is obtained from the AGC data through the use of curve 7 of Reference 2.2 (100 ns, 10 MHz, clean, rectangular pulse shape).

From Reference [2.2], $L_{ab}L_{bc} \simeq 1.73$ dB and loss L_{ac} was estimated to be 0.13 dB; thus

TABLE 2.7

TABULATION OF CORRECTION FACTORS AS A FUNCTION OF AGC OUTPUT AND POINTING ANGLE FOR EXPECTED MEAN RETURN WAVEFORMS AND A RECEIVER TEMPERATURE OF -10°C.

GE CALIBRATION (1) CURVE TO BE USED TO OBTAIN $P_{POM_{CAL}}$	POINTING ANGLE IN DEGREES	V_{AGC} (in COUNTS)								
		45	50	55	60	65	70	75	80	ρ (in dB)
100ns/500ns	0	0.6	0.7	0.5	0.3	0	0	0.3	0.2	
TRIANGULAR	0.25	0.4	0.5	0.4	0.2	0	0	0.3	0.1	
[Curve 1(a)]	0.5	0.1	0.1	0.1	0.1	0	0	0.1	0	
	0.75	-0.4	-0.3	-0.3	-0.5	-0.6	-0.6	-0.3	-0.4	
	1.0	-1.0	-0.7	-0.9	-1.4	-1.5	-1.5	-0.9	-1.0	
	1.25	-1.7	-1.2	-1.6	-2.5	-2.6	-2.6	-1.5	-1.7	
	1.0	1.9	2.5	3.4	2.4	1.9	2.3	2.2	3.0	
1 μs	1.25	1.2	2.0	2.7	1.3	0.8	1.4	1.6	2.3	
RECTANGULAR	1.5	0.6	1.0	1.3	0.6	0.4	0.7	0.8	1.1	
[Curve 9(b)]	1.75	0.3	0.5	0.6	0.3	0.2	0.3	0.4	0.6	
	2.0	0.2	0.3	0.4	0.2	0.1	0.2	0.3	0.3	
	2.0	2.2	2.3	1.3	0.6	1.4	1.4	2.4	2.7	
4 μs	2.5	2.0	1.9	0.8	0.4	1.3	1.1	2.2	2.4	
RECTANGULAR	3.0	1.8	1.7	0.8	0.3	1.1	1.0	1.9	2.1	
[Curve 9(a)]	4.0	1.5	1.4	0.6	0.2	0.9	0.8	1.6	1.7	
	5.0	1.2	1.2	0.5	0.2	0.8	0.7	1.3	1.4	
	6.0	1.8	1.0	0.3	1.1	1.7	1.8	1.8	1.4	
14 μs	7.0	1.6	0.8	0.2	1.1	1.6	1.7	1.6	1.1	
RECTANGULAR	8.0	1.4	0.7	0.1	1.1	1.5	1.6	1.4	0.9	
[Curve 8(b)]										

(1) Calibration curves must be interpolated to -10°C receiver temperature

TABLE 2.8

TABULATION OF CORRECTION FACTORS AS A FUNCTION OF AGC OUTPUT AND POINTING ANGLE FOR EXPECTED MEAN RETURN WAVEFORMS AND A RECEIVER TEMPERATURE OF 0°C.

GE CALIBRATION CURVE TO BE USED TO OBTAIN $P_{POM_{CAL}}$ (1)	POINTING ANGLE IN DEGREES	V_{AGC} (in COUNTS) 45	50	55	60	65	70	75	80	
100ns/500ns TRIANGULAR [Curve 1(a)]	0	0.7	0.4	0.6	0.8	0.5	0.4	0.2	0.1	ρ (in dB)
	0.25	0.5	0.2	0.4	0.6	0.3	0.3	0.1	0.1	
	0.5	0.1	0	0.1	0.3	0.1	0.1	0	0	
	0.75	-0.8	-1.0	-0.7	-0.5	-0.7	-0.7	-0.8	-0.7	
	1.0	-2.2	-2.4	-1.4	-1.8	-1.7	-2.0	-2.1	-1.8	
	1.25	-3.7	-4.1	-2.9	-3.3	-3.0	-3.5	-3.7	-3.1	
1 μs RECTANGULAR [Curve 9(b)]	1.0	2.7	3.4	3.2	2.6	3.3	3.4	3.0	3.4	
	1.25	1.2	1.7	1.9	1.1	2.0	1.9	1.4	2.1	
	1.5	0.5	0.8	0.9	0.5	1.0	0.9	0.7	1.0	
	1.75	0.3	0.5	0.5	0.3	0.5	0.4	0.4	0.6	
	2.0	0.2	0.3	0.3	0.2	0.4	0.3	0.2	0.4	
4 μs RECTANGULAR [Curve 9(a)]	2.0	2.5	2.3	1.3	1.4	1.1	1.6	2.3	2.8	
	2.5	2.3	2.0	1.0	1.2	0.7	1.3	2.1	2.3	
	3.0	2.0	1.8	0.8	1.0	0.6	1.1	1.8	2.1	
	4.0	1.7	1.5	0.7	0.9	0.5	0.9	1.5	1.7	
	5.0	1.4	1.2	0.6	0.7	0.4	0.7	1.3	1.5	
14 μs RECTANGULAR [Curve 8(b)]	6.0	1.8	1.2	0.9	1.4	1.8	1.8	1.8	1.2	
	7.0	1.7	1.1	0.8	1.3	1.8	1.7	1.7	1.0	
	8.0	1.4	0.9	0.7	1.2	1.7	1.6	1.5	0.8	

(1) Calibration curves must be interpolated to 0°C receiver temperature.

TABLE 2.9

TABULATION OF CORRECTION FACTORS AS A FUNCTION OF AGC OUTPUT AND POINTING ANGLE FOR EXPECTED MEAN RETURN WAVEFORMS AND A RECEIVER TEMPERATURE OF +10°C.

GE CALIBRATION CURVE TO BE USED TO OBTAIN $P_{POM_{CAL}}$ (1)	POINTING ANGLE IN DEGREES	V_{AGC} (in COUNTS) 45	50	55	60	65	70	75	80
100ns/500ns TRIANGULAR [Curve 1(a)]	0	0.5	0.2	0.5	0.7	0.5	0.3	0.3	0.3
	0.25	0.3	0.1	0.3	0.5	0.3	0.2	0.2	0.2
	0.5	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1
	0.75	-0.8	-0.8	-0.5	-0.6	-0.5	-0.6	-0.5	-0.4
	1.0	-2.2	-2.4	-1.6	-1.6	-1.4	-1.7	-1.7	-1.5
	1.25	-2.9	-3.3	-2.1	-2.9	-2.5	-3.0	-3.1	-2.8
1 μs RECTANGULAR [Curve 9(b)]	1.0	2.9	3.5	2.7	2.5	4.1	3.5	3.5	3.4
	1.25	2.2	2.6	2.2	1.2	3.0	2.0	2.1	2.1
	1.5	1.3	1.6	1.5	0.6	1.5	1.1	1.0	1.1
	1.75	0.6	0.8	0.7	0.3	0.7	0.6	0.6	0.6
	2.0	0.3	0.5	0.4	0.2	0.5	0.4	0.3	0.4
4 μs RECTANGULAR [Curve 9(a)]	2.0	2.7	2.4	1.5	2.0	1.6	2.0	1.9	2.6
	2.5	2.4	2.0	1.0	1.8	1.1	1.6	1.6	2.2
	3.0	2.1	1.7	0.9	1.6	1.0	1.4	1.4	2.0
	4.0	1.7	1.4	0.8	1.3	0.8	1.2	1.1	1.6
	5.0	1.4	1.2	0.6	1.1	0.6	1.0	0.9	1.4
14 μs RECTANGULAR [Curve 8(b)]	6.0	1.8	1.4	1.2	1.5	1.4	2.0	1.5	1.1
	7.0	1.5	1.2	1.1	1.4	1.3	1.9	1.3	0.9
	8.0	1.3	1.1	1.0	1.2	1.2	1.7	1.2	0.7

ρ (in dB)

(1) Calibration curves must be interpolated to +10°C receiver temperature.

TABLE 2.10

TABULATION OF CORRECTION FACTORS AS A FUNCTION OF AGC OUTPUT AND RECEIVER TEMPERATURE FOR A POINTING ANGLE OF 15.6°.

GE CALIBRATION (1) CURVE TO BE USED TO OBTAIN $P_{POM_{CAL}}$	RECEIVER TEMPERATURE (°C)	V_{AGC} (in COUNTS)			
		75	80	85	
25 µs	-10	1.7	-3.8	-6.8	ρ (in dB)
RECTANGULAR	0	6.5	1.2	-4.0	
[Curve 8(a)]	+10	10.4	5.0	0.7	

(1) Calibration must be interpolated to the appropriate receiver temperature.

$$\frac{L_{ab}L_{bc}}{L_{ac}} \approx 1.6 \text{ dB} \quad .$$

In Mode II, submode 7 is the only internal calibration submode for which the pulsewidth is 100 ns and the IF bandwidth is 10 MHz; thus, $\hat{P}_{CDS}$ should be obtained from this submode. In Mode II, submode 7, the value of L_{CAL} is 118.5 + 10.8 dB or 129.3 dB. Therefore, for Mode II data, we obtain $\hat{P}_{CDS}$ from submode 7 and:

$$\frac{L_{ab}L_{bc}}{L_{ac}L_{CAL}} \simeq -127.7 \text{ dB} \qquad \text{(Mode II only)} \tag{2-19}$$

Of course, we are not restricted to Mode II for determining $\sigma°$; however, in all other modes for which we have 100 ns/10 MHz data acquisition and internal calibration submodes, $L_{CAL} = 118.5$ dB, thus:

$$\frac{L_{ab}L_{bc}}{L_{ac}L_{CAL}} \simeq -116.9 \text{ dB} \qquad \left\{ \begin{array}{l} \text{Other 100 ns,} \\ \text{10 MHz Modes} \end{array} \right. \tag{2-20}$$

2.3 AGC to $\sigma°$ Conversion Curves

Equation (2-18) represents the basic relation between $\sigma°$ and the AGC output. The conversion process is explained in the following. From the S&H recording of the mean or average return waveform (normalized by the AGC) we obtain a "best estimate" of the pointing angle, ξ. From the AGC, we determine the AGC output in telemetry counts. The pointing angle and receiver temperature define which calibration curve we use to convert the AGC output to $P_{POM_{CAL}}$ in dBm. Using Tables 2.7 through 2.10, we determine the correction factor ρ. Using the curves in Figures 2.3 and 2.4, we obtain the appropriate value of $\hat{F}$. Depending upon the mode of the altimeter, we use either (2-19) or (2-20) for the attenuation correction factor. All factors in equation (2-18) are therefore known except $\hat{P}_{CDS}$, and this is found from the appropriate internal calibration submode and curve 7 of Reference 2.2.

The above paragraph clearly shows that apart from $\hat{P}_{CDS}$, we can parametrically express $\sigma°/L_p$ as a function of pointing angle, receiver temperature, and AGC output. Such a set of curves are given in Figures 2.11 through

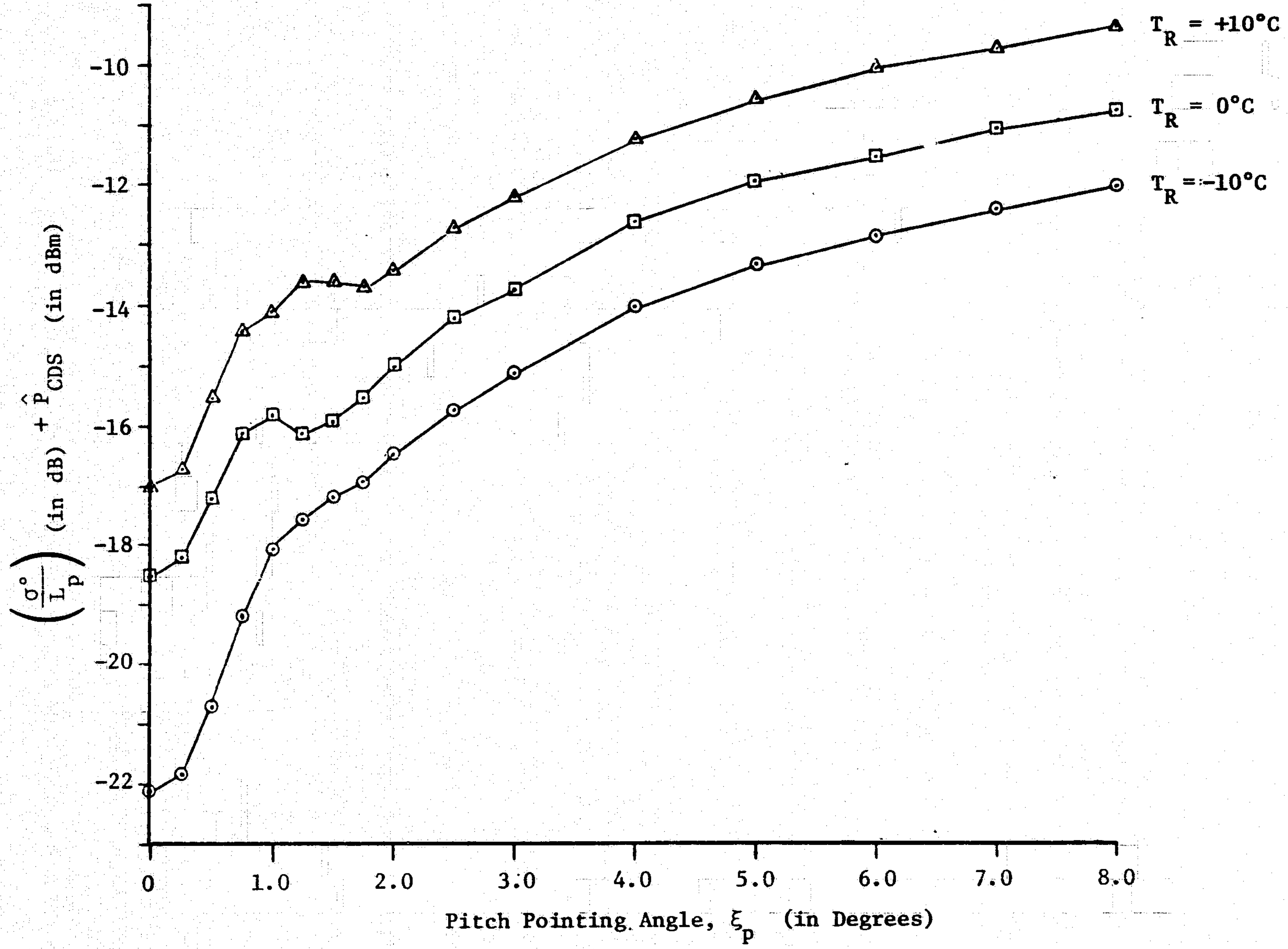

Figure 2-11. $\left(\frac{\sigma°}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and pointing angle for an AGC output of 45 counts.

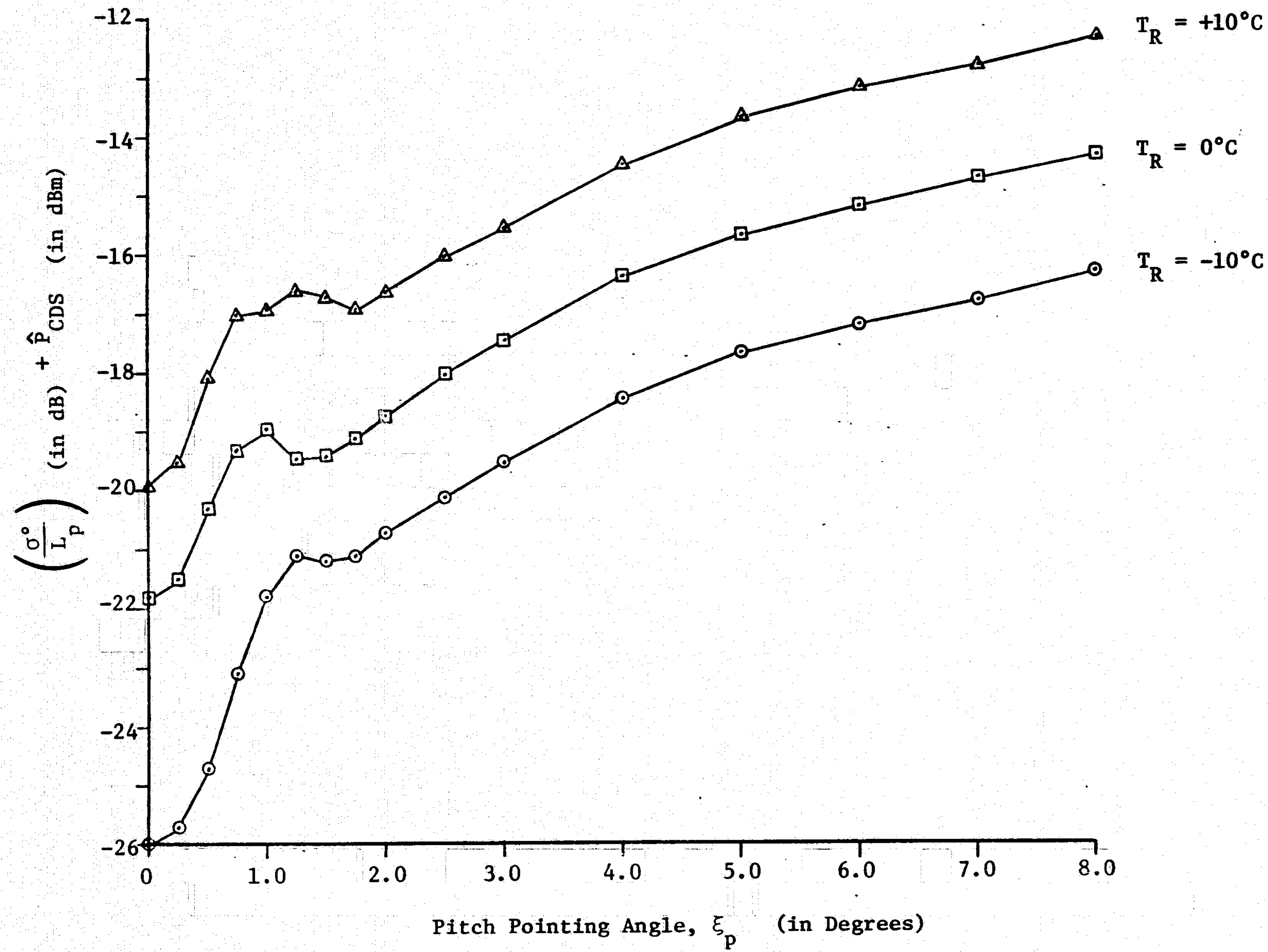

Figure 2-12. $\left(\frac{\sigma^\circ}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and pointing angle for an AGC output of 50 counts.

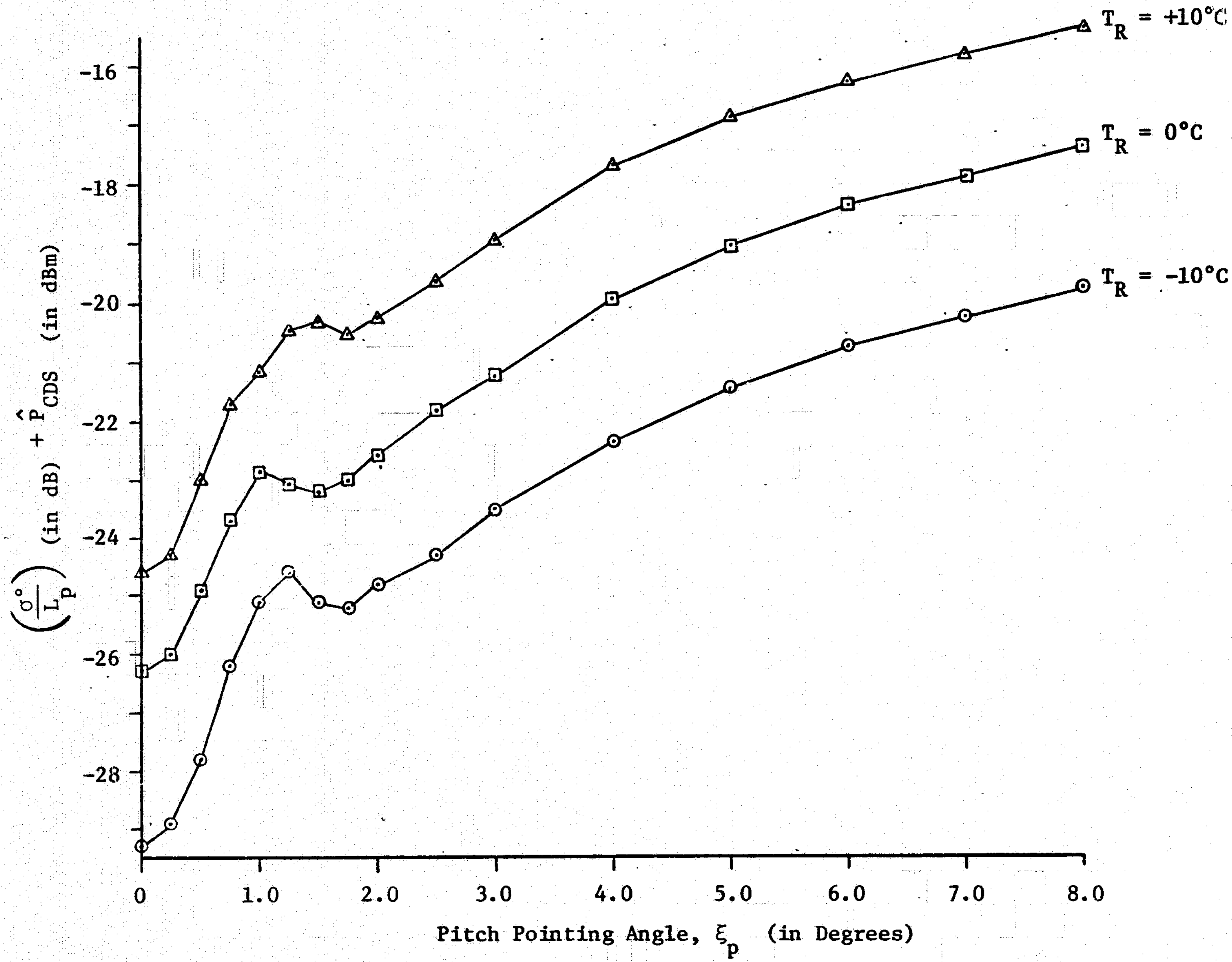

Figure 2-13. $\left(\frac{\sigma^\circ}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and pointing angle for an AGC output of 55 counts.

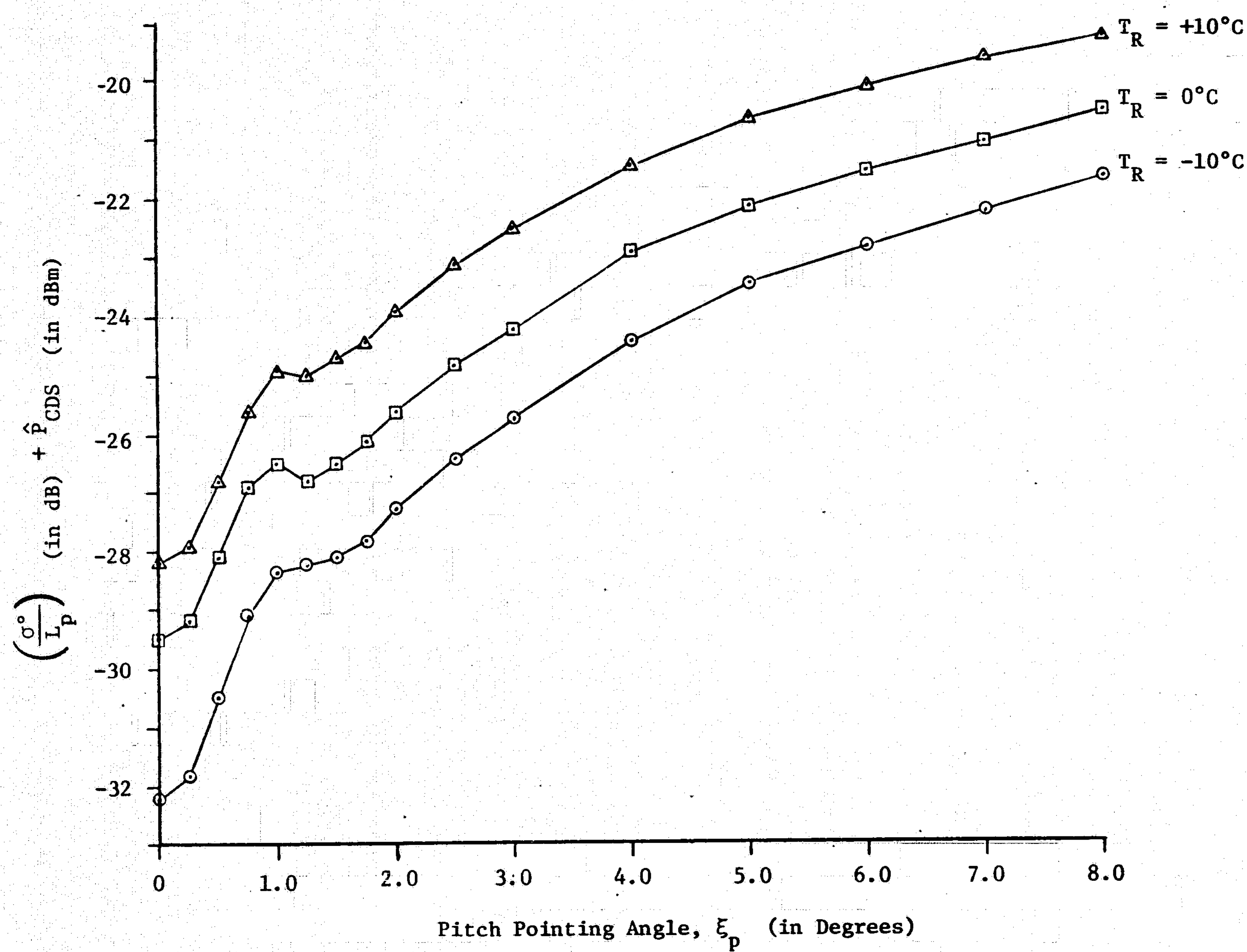

Figure 2-14. $\left(\frac{\sigma^\circ}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and pointing angle for an AGC output of 60 counts.

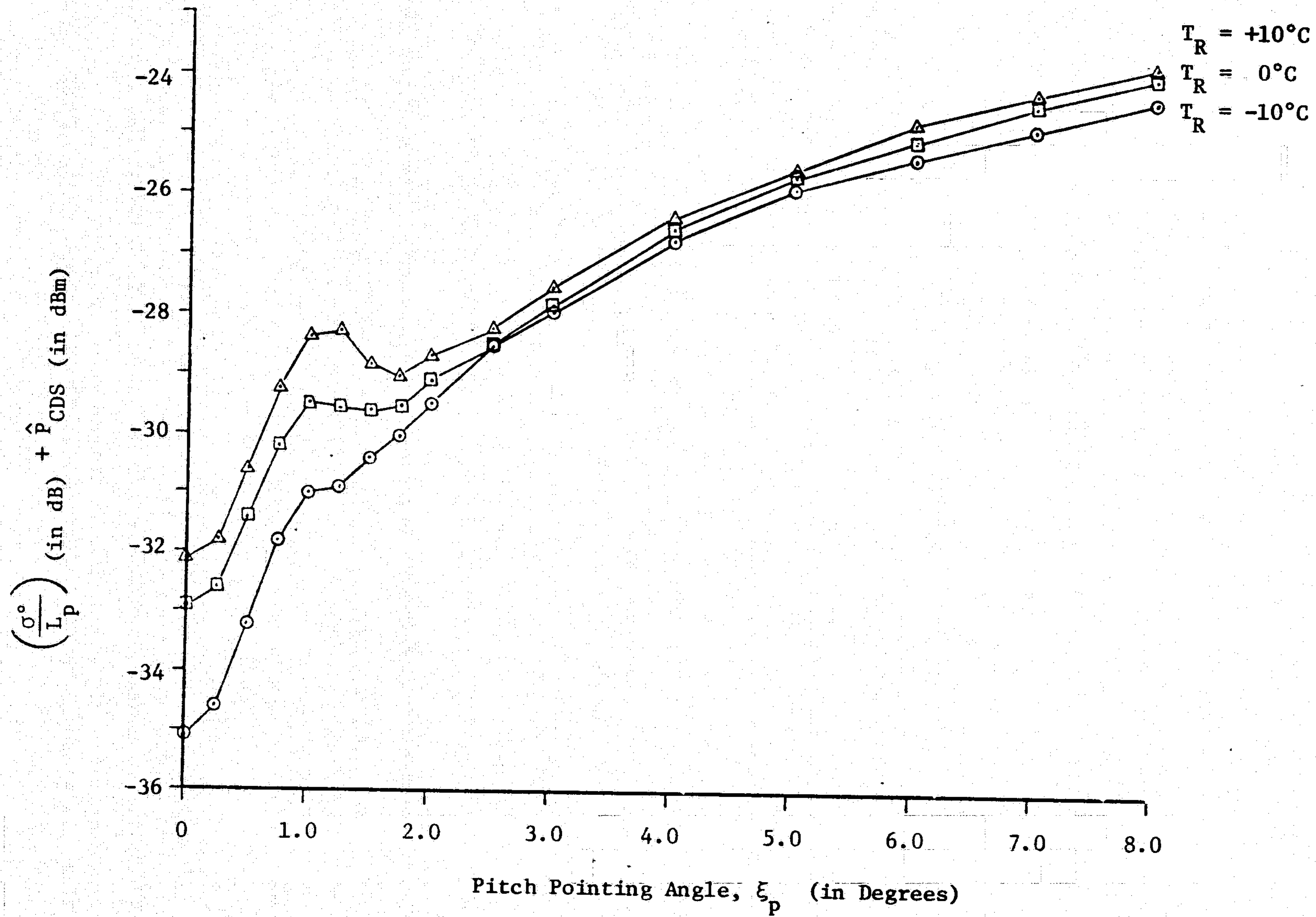

Figure 2-15. $\left(\frac{\sigma°}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and pointing angle for an AGC output of 65 counts.

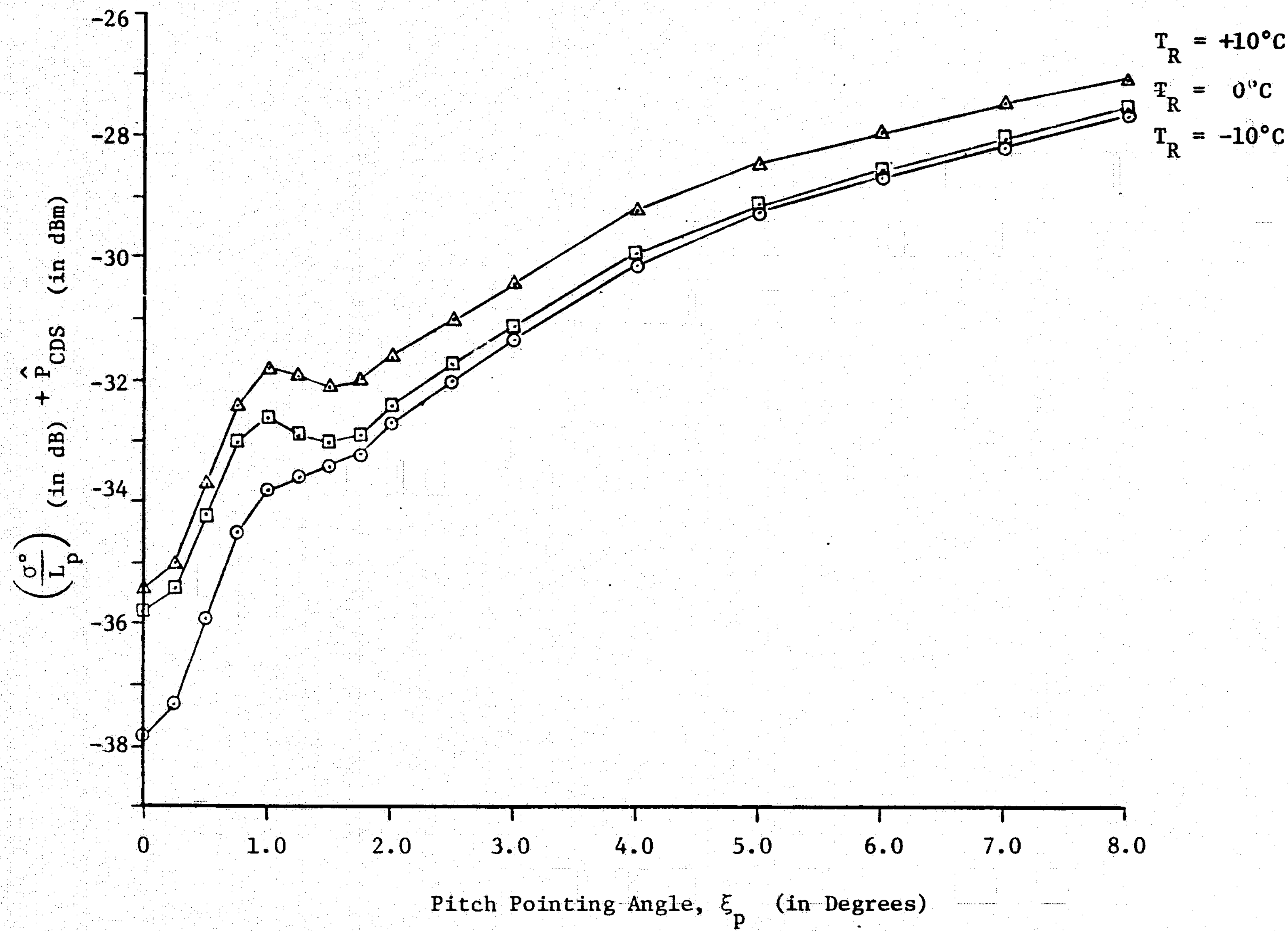

Figure 2-16. $\left(\frac{\sigma^\circ}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and pointing angle for an AGC output of 70 counts.

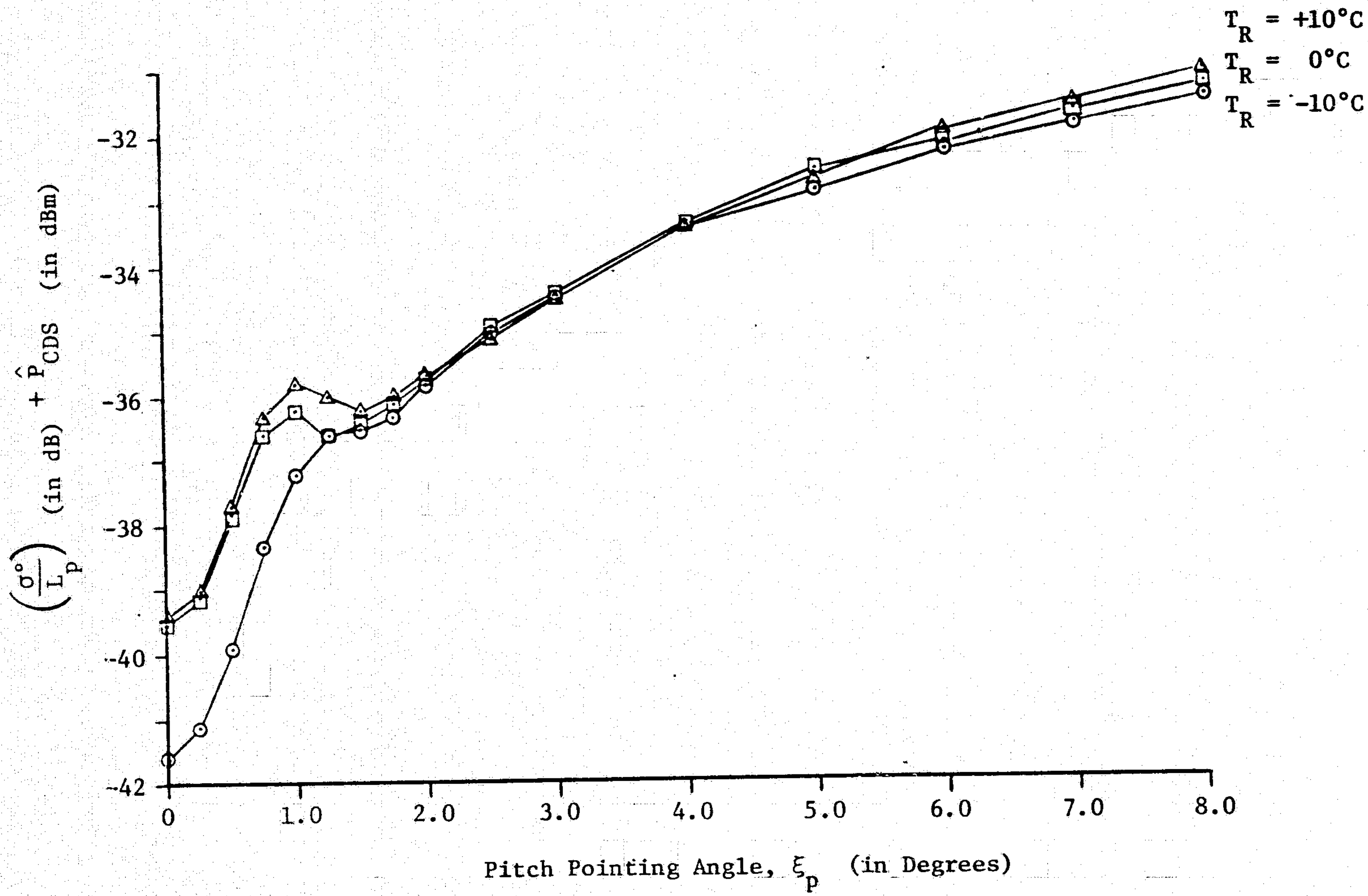

Figure 2-17. $\left(\frac{\sigma^\circ}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and pointing angle for an AGC output of 75 counts.

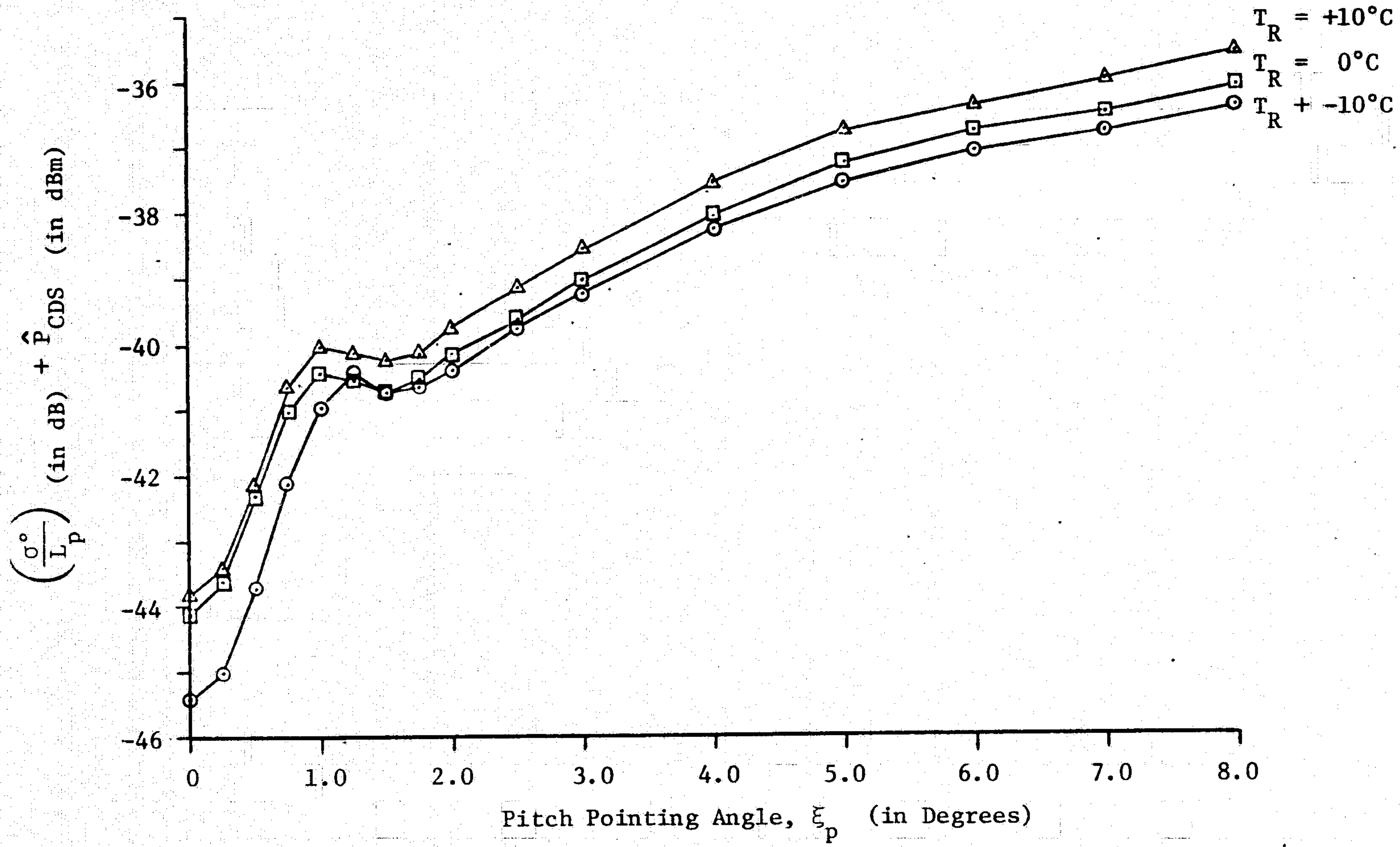

Figure 2-18. $\left(\frac{\sigma^\circ}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and pointing angle for an AGC output of 80 counts.

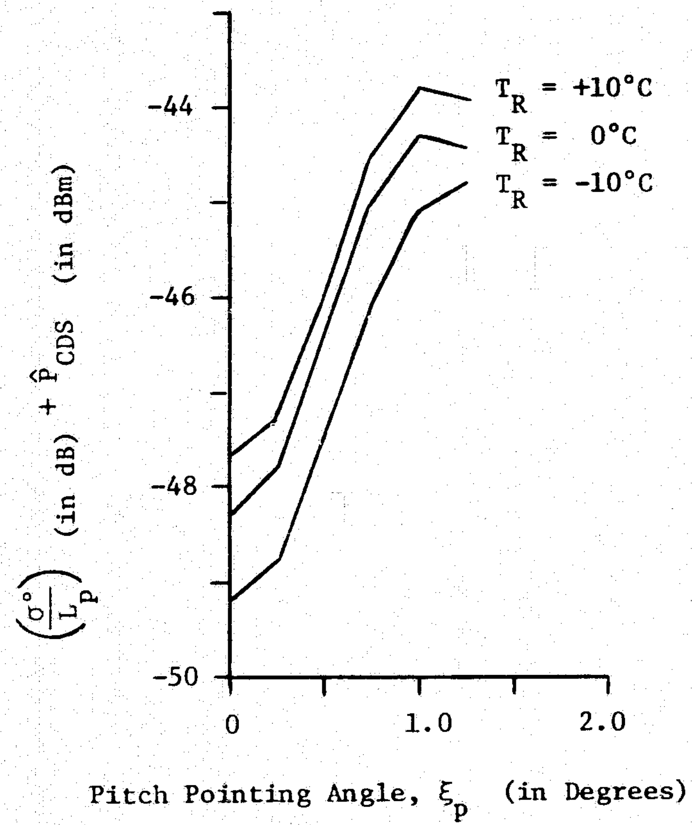

Figure 2-19. $\left(\frac{\sigma°}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and pointing angle for an AGC output of 85 counts.

2.19. Each figure is a plot of $\sigma°/L_p + \hat{P}_{CDS}$ (with $\sigma°/L_p$ in dB and $\hat{P}_{CDS}$ in dBm) versus pointing angle ξ for a specific AGC output in counts and for three receiver temperatures (-10°C, 0°C, +10°C). For a given set of AGC, temperature and pointing angle measurements, we must perform a double interpolation. The data presented in this report was interpolated first in temperature using Lagrange interpolation and then in AGC using linear interpolation. This scheme was chosen based upon an inspection of the behavior of the calibration data. Figure 2.20 is somewhat different from the other curves because for this large a pointing angle, the right hand side of equation (2-18) is relatively independent of ξ. Thus, if the curves in Figure 2.20 had been plotted as those in Figures 2.11 through 2.19, they would have essentially been straight horizontal lines. The curves were obtained using a value of -116.9 dB for the attenuation constant $L_{ab}L_{bc}/L_{ac}L_{CAL}$ (see equation (2-20)). Thus, the curves are applicable for all 100 ns/10 MHz altimeter submodes except Mode II. To obtain values of $\sigma°/L_p$ for Mode II, it is only necessary to add 10.8 dB to the value of $\sigma°/L_p$ obtained from the curves. This accounts for the difference in L_{CAL} between all other 100 ns/ 10 MHz internal calibration submodes and submode 7 of Mode II.

Unfortunately, the curves in Figures 2.11 through 2.20 are subject to another correction which (for good reason) was not included in the calculations. The correction is a result of the fact that all of the AGC calibration curves were obtained at the input to the altimeter port (see Figure 2.1). The curves would be perfectly valid except that the S-193 RF preamplifier (called the S-193 integrated receiver) adds noise to altimeter port which, because of the peak averaging detector, results in a higher value for the peak input signal power (at the altimeter port) than is actually present. Adding to the problem is the fact that only very limited data was acquired on this effect prior to launch. This data was reduced and is presented in Figure 2.21. In this figure we plot the correction to be added to $\sigma°$ as a function of AGC counts for two particular test waveforms and a receiver temperature of +31° C. About the only thing that can be said about this data is that it represents a form of bound on the degree of correction resulting from this effect. That is the 100 ns/500 ns triangular waveform approximates a very near-nadir return while the 25 μs return approximates a 15.6° angle of incidence return. A correction for this effect was used in reducing the $\sigma°$ data, however, it certainly cannot be considered as accurate. As a consequence, this effect must be included in the error analysis.

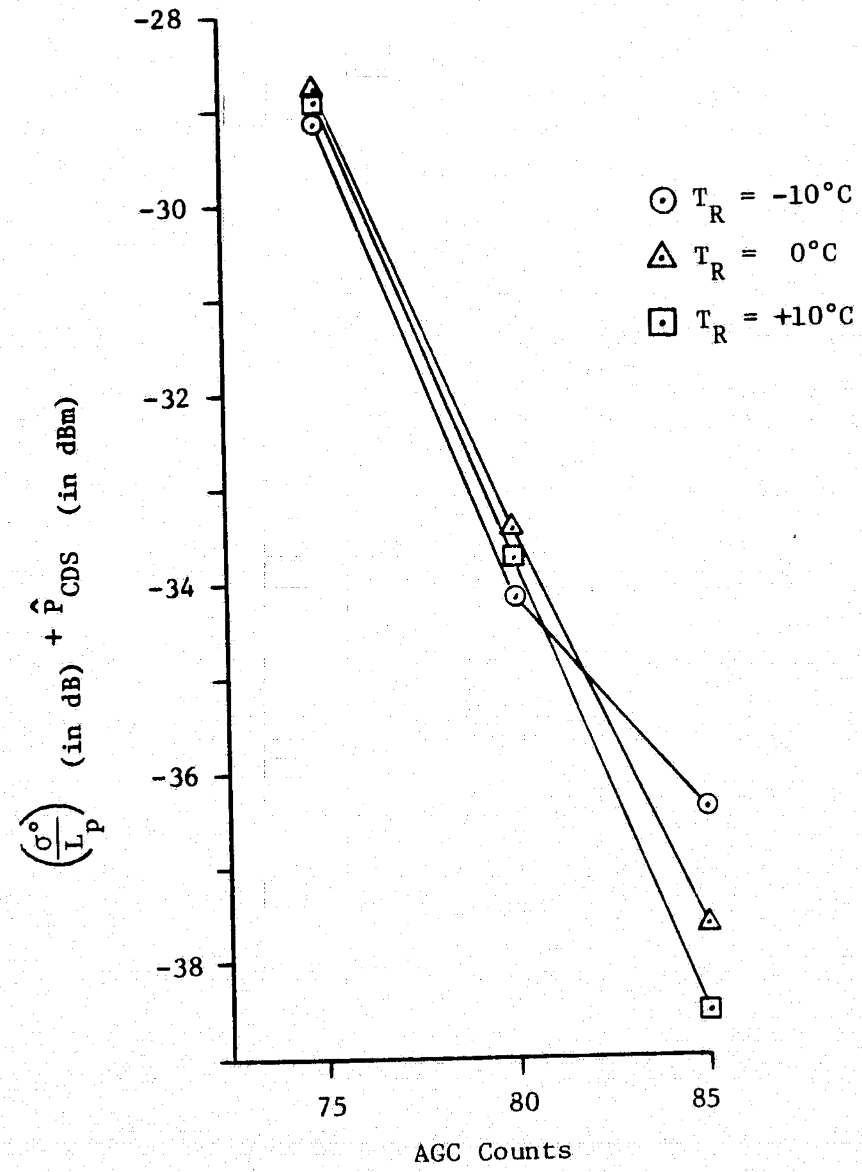

Figure 2-20. $\left(\frac{\sigma^\circ}{L_p}\right)$ as a function of $\hat{P}_{CDS}$, receiver temperature, and AGC output for a pointing angle of 15.6°.

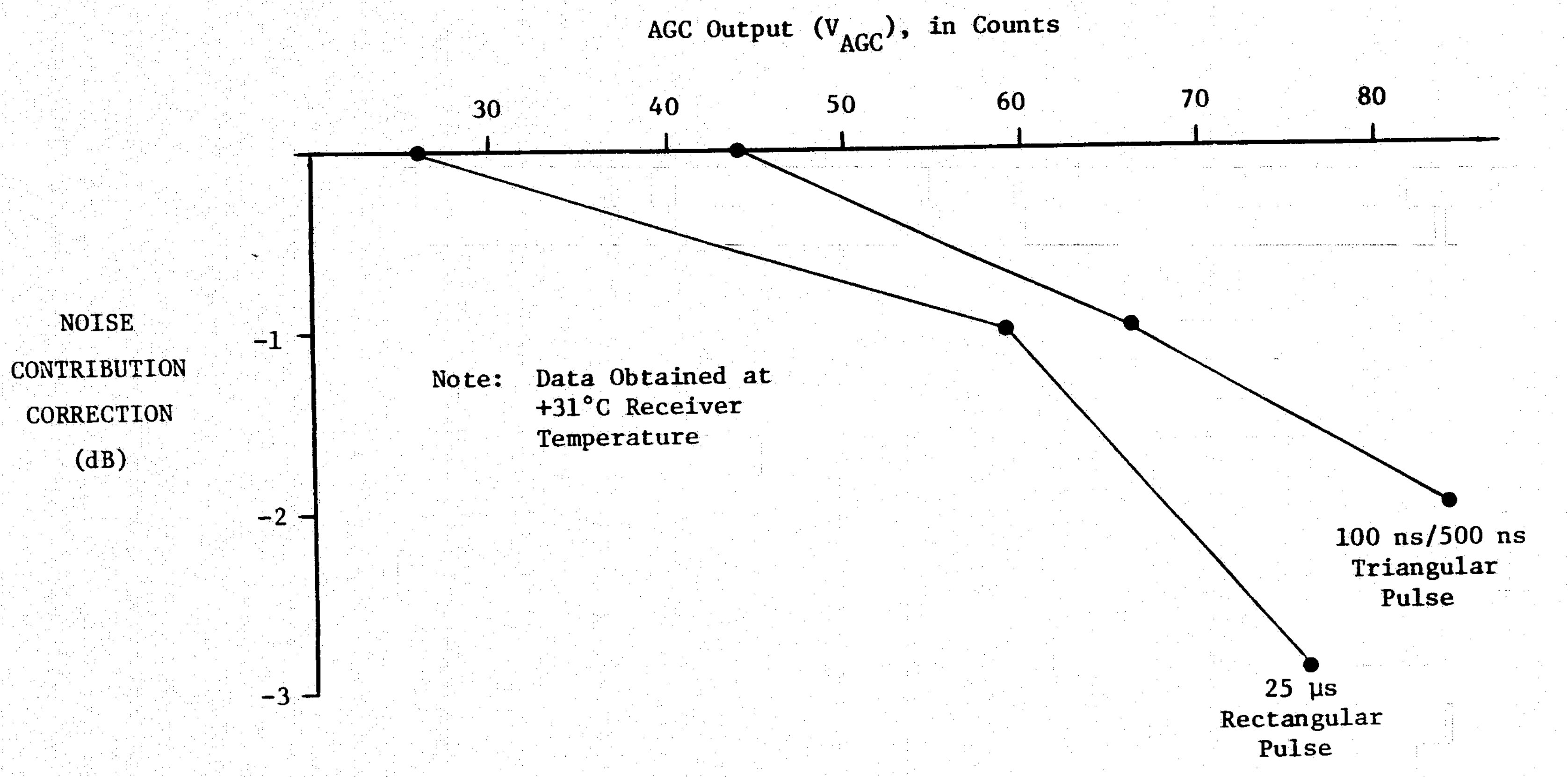

Figure 2-21. $\frac{\sigma^\circ}{L_p}$ correction factor due to noise contribution of S-193 integrated receiver. The 100/500 ns triangular pulse simulates a near-nadir return while the 25 μs rectangular pulse simulates a return at 15.6°.

The curves in Figures 2.11 through 2.20 were generated for a pointing angle in the pitch direction, i.e. $\xi = \xi_p$. However, with only a slight modification, they can also be used for a pointing angle in the roll direction ($\xi = \xi_r$). The only factor in equation (2-18) which would be altered, if we desire to change to $\xi = \xi_r$, is the $\hat{F}$ factor. That is, as shown in Appendix D, from the measured waveform we can determine a value of (ξ_{po}, $\xi_r = 0°$) and ($\xi_p = 0°$, ξ_{ro}) which both result in a theoretical waveform which matches the measured one. If we choose ($\xi_{po}, \xi_r = 0°$) as the "best fit", the reduction curves can be used directly, if we choose ($\xi_p = 0°, \xi_{ro}$), the curves must be modified. Since the waveform is the same for both cases, ρ does not change. However, the $\hat{F}$ for (ξ_{po}, $\xi_r = 0°$) and ($\xi_p = 0°$, $\xi_r = 0$) are not necessarily equal. To correct for this, we first add $\hat{F}(\xi_{po})$ to the value of ($\sigma°/L_p$) we obtain from the curves in Figures 2.11 through 2.20. We then subtract $\hat{F}(\xi_{ro})$ from the resulting quantity. That is,

$$\left(\frac{\sigma°}{L_p}\right)_{\left(0°,\xi_{ro}\right)} = \left(\frac{\sigma°}{L_p}\right)_{\left(\xi_{po},0°\right)} + \hat{F}\left(\xi_{po}\right) - \hat{F}\left(\xi_{ro}\right) \tag{2-21}$$

It should be noted that this correction follows directly from equation (2-18). The values of $\hat{F}(\xi_{po})$ and $\hat{F}(\xi_{ro})$ may be obtained from Figures 2.3 and 2.4.

2.4 Land Scatter

The S-193 radar altimeter was designed primarily as a remote sensor of ocean surface features. However, because of the instrument's versatility, it was also possible to acquire scattering data from land surfaces. Unfortunately, the reduction and interpretation of land scatter data obtained by the radar altimeter is not as easy or straightforward as the case for ocean scatter data.

Inherent in the convolutional model for extended target scattering is the assumption of homogeneous roughness statistics for the scattering surface. It is assumed that the true mean surface height does not significantly depart from the assumed mean surface (in the model) within a time set by the radar averaging period. Furthermore, we assume that over the radar averaging period the mean squared surface height is a statistically stationary quantity. Both of the assumptions imply that over a radar averaging period and over the corresponding surface area "sampled" by the radar, the surface may be described by a set of statistical parameters, i.e. mean height and mean squared height, which are constant over the "sampled" area.

Even over the ocean surface we know that this condition is not always satisfied. In fact, it is a particularly nasty problem when attempting to determine the roughness of the ocean surface from the increased slope of the leading edge of the average return waveform. However, the question that must be answered is: how much change in surface statistics can be tolerated before our ability to interpret the data is degraded? The data that we require for obtaining $\sigma°$ are the average return waveform and the AGC output. It can be shown [2.5] that the slope of the leading edge of the average return waveform is proportional to σ_c where

$$\sigma_c = \sqrt{\sigma_p^2 + (2\sigma_z/c)^2}$$

and σ_p is 29.25 ns for the 100 ns pulsewidth, and σ_z is the rms height of the mean flat surface and c is the speed of light. If we assume that a change in σ_c from σ_p to 1.2 σ_p results in a significant change in the slope of leading edge of the average return, this would require a change in σ_z of 2.9 meters. In terms of the more physically interpretable quantity, $H_{1/3}$, the change would be 11.6 meters or 38.0 feet. Since this degree of change in $H_{1/3}$ is seldom encountered over the ocean surface, we see that statistical homogeniety of the mean squared height of the ocean surface is no problem in the case of the 100 ns radar pulsewidth. That is, the roughness of the ocean surface will seldom, if ever, change enough over a radar averaging period (say, less than twenty seconds) to result in a change in the mean return waveform <u>during</u> the averaging interval for the 100 ns pulsewidth transmission.

The output data rate of the S-193 radar altimeter AGC is four samples per 1.04 seconds. Reference [2.2] shows that the time constant of the AGC is between 0.25 and 0.5 seconds depending upon whether the signal is increasing or decreasing in magnitude. Since the ground speed of Skylab was roughly 7.4 km/sec, we get an independent sample of the return power every 3.7 km or less. This degree of resolution is certainly acceptable for open-ocean measurements of $\sigma°$. That is, we would not expect the ocean surface to change significantly over such a small distance.

The previous paragraphs have attempted to show that the lack of ocean surface statistical homogeniety is not a problem with regard to reducing and interpreting $\sigma°$ data. However, for land scattering we have an entirely different situation. First of all, we would like to have the surface statistically homogeneous over at least 15.4 km in order to form a 200 sample mean return. With limited exceptions, this is a rather large distance to assume that the land surface is homogeneous. Even more disturbing is the fact that over this 15.4 km, there may be significant changes in the surface roughness. If we cannot get at least a 200 sample mean return, then we cannot estimate the pointing and we do not know what value of ρ (the waveform dependent AGC calibration correction) to use.

In addition to the problem of surface statistical homogeniety, there is the very complex problem of determining the type of scattering, i.e. random, large body or specular [2.6]. The data reduction established in this report for obtaining $\sigma°$ from the AGC data is only applicable to the case of a random scattering process. In fact, $\sigma°$ only has meaning <u>if</u> the scattering is random. During the course of this study, it was found that a great majority of the land scatter data was of such a nature as to make a quick determination of the primary scattering mechanism almost impossible [2.7]. That is, to pinpoint the dominant type of scattering mechanism would require a careful examination of pulse-by-pulse waveforms and histograms of the waveform samples. Since such an effort was not within the present scope of work, it could not be accomplished within the time frame allocated to this study.

The two problems of target statistical homogeniety and type of scattering presented significant difficulties in analyzing land scatter data. Therefore, rather than blindly reduce the land scatter data using the techniques developed here (which are only applicable to a random homogeneous scattering surface), it was decided to set aside the land scatter data and not include it as a part of this report. It is anticipated that an in-depth study of the land scatter data can be accomplished in the near future.

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2.6 Moore, R. K and C. S. Williams, Jr., "Radar Terrain Return at Near-Vertical Incidence," Proc. of the IRE, Vol 45, pp. 228-238, February, 1957.

2.7 McGoogan, J. T., L. S. Miller, G. S. Brown and G. S. Hayne, "The S-193 Radar Altimeter Experiment," Proc. of the IEEE, Vol 62, page 802, June, 1974.

3.0 REDUCED CROSS SECTION DATA

This section presents the primary goal of our effort: the conversion of AGC data from the S-193 radar altimeter to $\sigma°$ values. Included in the results are data from all three Skylab missions during which the altimeter was operated. Data resulting from Modes I, II, III and V were reduced. The criteria established for deciding which data were to be reduced were as follows:

(1) the radar transmitted a 100 ns pulse and the IF of the receiver was set to 10 MHz (two-sided) bandwidth;

(2) an estimate of the altimeter antenna pointing angle with respect to nadir must have been available from the average return waveform as measured by the S&H gates*;

(3) only ocean surface or ocean-land interface scattering was considered.

These criteria were not arbitrarily established, but were based upon the availability of calibration data and applicability of the algorithms developed in this study.

The actual data reduction phase of this effort was complicated by the fact that the processed tapes provided by NASA-JSC contained AGC data which had been erroneously converted from counts to peak of the average return power (in dBm). Due to the errors contained in the conversion of the data from counts to power, the JSC reduced data could not be used. The only available data which gave the AGC in counts were computer print-outs made by the Martin-Marietta Corporation at the Kennedy Space Center (KSC) for the purpose of "quick-look" data evaluation. These print-outs contained no frame-by-frame time; thus, it was necessary to do a Mode-by-Mode and frame-by-frame cross match with the JSC processed data to establish the proper timing of the data. This, of course, was a very laborious and time consuming operation especially since it was done by hand. Particularly confusing was the fact that many incomplete Modes had been deleted from the JSC output. It is felt, however, that the data has been accurately time tagged and identified.

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*It was not necessary to satisfy this criterion for the submodes of Mode II where the antenna was stepped off-nadir because the pitch gimbal readouts indicated the pointing angle.

In the following paragraphs, we define the nomenclature used in the data summary tables and explain the organization of the tables.

MISSION: The particular Skylab flight during which the data was acquired (SL-2, SL-3 or SL-4).

PASS: The Earth Resources Experimentation Package (EREP) designation given to the particular orbit in which the data was acquired.

MODE: Operating Mode of the altimeter.

(__of__): The order of this Mode relative to the total number of times the same Mode was exercised during the particular PASS.

SUBMODE: Operating submode of the altimeter.

FIRST FRAME START TIME (JSC/GMT): The GMT (Day of year, hour, min., sec.) time at the beginning of the first frame of data in the data tables.

$\xi_p = $ __; $\xi_r = 0°$; Estimated pointing angle assuming 0° pointing angle in roll.

$\xi_p = 0°$; $\xi_r = $ ___; Estimated pointing angle assuming 0° pointing angle in pitch.

$\psi = $ ________; The angle at which the average return power peaks ($\tan\psi = \sqrt{c\tau_p/h}$ for $\xi_{p,r} \lesssim 1.5°$, $\psi = \xi_p$ for $\xi_p \gtrsim 1.5°$).

FRAME NO.; Altimeter nomenclature designating a data group contained within a 1.04 second time window.

$\sigma°(\psi)$; $(\xi_p, 0°)$ The reduced value of $\sigma°/L_p$ at an angle ψ, assuming that the antenna is pointed off-nadir by ξ_p in pitch and 0° in roll.

$\sigma°(\psi)$; $(0°, \xi_r)$ The reduced value of $\sigma°/L_p$ at an angle ψ, assuming that the antenna is pointed off-nadir by 0° in pitch and ξ_r in roll.

The first entry in the table will not in general be Frame Number 1, because it was necessary to delete the first few Frames to eliminate transient effects due to bandwidth changes, pulsewidth changes and antenna repositioning. The data rate for the $\sigma°$ values is four samples per Frame or four samples per 1.04 seconds. The designation "SSM" stands for sub-submode and indicates a change in the position of the S&H gates on the waveform. It has no relevance to the $\sigma°$ computation and is used purely as a timing indicator.

When there is a change in the SSM, the GMT start time of the first Frame of the new SSM is given. It should be noted that the values of $\sigma°$ listed in the tables are actually values for $\sigma°/L_p$ since no correction for atmospheric loss was attempted.

Since the S-193 antenna pattern was not symmetrical around the boresight axis, we could not determine the pointing angle to the statistical accuracy of the waveform estimation technique (See Appendix D). That is, we could only bound the pointing error to an ellipse in which $2\xi_p$ is the length of the minor axis and $2\xi_r$ is the length of the major axis. However, if we first compute $\sigma°$ assuming a pointing of $(\xi_p, 0°)$ and then perform the same computation assuming a pointing of $(0°, \xi_r)$, the difference between the two computed values is the maximum error due to pointing direction uncertainty. Thus, the two columns labeled

$$\begin{array}{cc} \sigma°(\psi) & \sigma°(\psi) \\ (\xi_p, 0°) & (0°, \xi_r) \end{array} ,$$

represent the bounds on $\sigma°$ as a result of pointing direction uncertainty. That is, apart from the random and other bias errors in the measurement, the true value of $\sigma°$ will be between the two values listed in the tables.

3.1 MISSION SL-2 σ°/L_p DATA TABLES

MISSION SL-2 PASS 4 MODE I (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 155:17:11:11.335

ESTIMATED POINTING BOUNDS

$\xi_p = 0°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = 0°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	12.7	12.7
	11.2	11.2
	11.9	11.9
	11.9	11.9
7	12.6	12.6
	11.7	11.7
	12.6	12.6
	12.6	12.6
8	11.9	11.9
	11.9	11.9
	11.9	11.9
	11.9	11.9
9	12.7	12.7
	11.9	11.9
	11.2	11.2
	11.2	11.2
10	11.7	11.7
	11.7	11.7
	11.7	11.7
	11.7	11.7
11	11.9	11.9
	11.2	11.2
	11.9	11.9
	11.9	11.9
12	11.7	11.7

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
12	10.9	10.9
	11.7	11.7
	12.6	12.6
13	11.7	11.7
	12.6	12.6
	11.7	11.7
	10.9	10.9
14	12.6	12.6
	12.6	12.6
	10.9	10.9
	11.7	11.7
15	11.7	11.7
	11.7	11.7
	11.9	11.9
	11.9	11.9
16	11.7	11.7
	11.7	11.7
	11.7	11.7
	10.9	10.9
17	11.7	11.7
	12.6	12.6
	11.7	11.7
	11.7	11.7
18	10.9	10.9
	11.7	11.7

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
18	12.6	12.6
	10.9	10.9
19	11.7	11.7
	11.7	11.7
	11.7	11.7
	11.7	11.7
20	10.9	10.9
	10.9	10.9
	12.6	12.6
	11.7	11.7
SSM-1	(155:17:11:26.935)	
1	10.9	10.9
	10.9	10.9
	10.9	10.9
	10.9	10.9
2	10.9	10.9
	10.9	10.9
	10.9	10.9
	11.7	11.7
3	10.9	10.9
	10.9	10.9
	11.7	11.7
	11.9	11.9
4	10.9	10.9
	11.7	11.7

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 4 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________________

ESTIMATED POINTING BOUNDS

$\xi_p = 0°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = 0°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
4(Cont'd.)	11.7	11.7	11	11.3	11.3		12.1	12.1
	10.9	10.9		12.8	12.8		12.1	12.1
5	10.9	10.9		11.3	11.3		12.1	12.1
	11.7	11.7		12.1	12.1	3	12.1	12.1
	11.7	11.7	12	12.1	12.1		12.1	12.1
	11.7	11.7		11.3	11.3		11.3	11.3
6	11.7	11.7		10.6	10.6		11.3	11.3
	10.9	10.9		11.3	11.3	4	11.3	11.3
	10.9	10.9	13	12.1	12.1		11.3	11.3
	11.9	11.9		12.1	12.1		11.3	11.3
7	11.7	11.7		11.3	11.3		12.1	12.1
	10.9	10.9		11.3	11.3	5	10.6	10.6
	11.7	11.7	14	11.3	11.3		12.1	12.1
	10.9	10.9		11.3	11.3		10.6	10.6
8	10.9	10.9		12.1	12.1		11.3	11.3
	11.7	11.7		12.1	12.1	6	12.1	12.1
	10.9	10.9	15	12.8	12.8		11.3	11.3
	11.7	11.7		12.1	12.1		12.1	12.1
9	10.9	10.9		11.3	11.3		10.6	10.6
	10.9	10.9		12.1	12.1	7	11.3	11.3
	10.1	10.1	SSM-2 (155:17:11:42.535)				11.3	11.3
	10.9	10.9	1	11.3	11.3		11.3	11.3
10	11.3	11.3		12.8	12.8		12.1	12.1
	10.6	10.6		11.3	11.3	8	10.6	10.6
	12.1	12.1		11.3	11.3		12.1	12.1
	12.1	12.1	2	12.1	12.1		12.1	12.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 4 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________________

ESTIMATED POINTING BOUNDS

$\xi_p = 0°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = 0°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
8(Cont'd.)	11.3	11.3		11.8	11.8			
9	10.6	10.6		11.8	11.8			
	11.3	11.3		11.1	11.1			
	12.1	12.1						
	12.1	12.1						
10	12.1	12.1						
	12.1	12.1						
	10.6	10.6						
	12.1	12.1						
11	11.8	11.8						
	11.8	11.8						
	11.8	11.8						
	11.1	11.1						
12	11.8	11.8						
	12.5	12.5						
	12.5	12.5						
	11.1	11.1						
13	11.8	11.8						
	12.5	12.5						
	11.1	11.1						
	11.8	11.8						
14	11.8	11.8						
	11.8	11.8						
	11.1	11.1						
	11.8	11.8						
15	11.1	11.1						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 4 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 155:17:15:18.879

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.2°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.3°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0			4	12.4	12.6		12.4	12.6
4	13.1	13.3		11.5	11.7		11.5	11.7
	12.4	12.6		12.4	12.6		11.5	11.7
	11.5	11.7		11.5	11.7			
	13.1	13.3	5	11.5	11.7			
5	11.5	11.7		13.1	13.3			
	12.4	12.6		13.1	13.3			
	12.4	12.6		12.4	12.6			
	11.5	11.7	SSM-2 (155:17:15:27.198)					
6	12.4	12.6	1	12.4	12.6			
	11.5	11.7		12.4	12.6			
	12.4	12.6		12.4	12.6			
	12.4	12.6		13.1	13.3			
SSM-1 (155:17:15:21.998)			2	13.1	13.3			
1	12.4	12.6		12.4	12.6			
	12.4	12.6		11.5	11.7			
	13.1	13.3		12.4	12.6			
	11.5	11.7	3	12.4	12.6			
2	13.1	13.3		12.4	12.6			
	11.5	11.7		12.4	12.6			
	11.5	11.7		12.4	12.6			
	12.4	12.6	4	12.4	12.6			
3	12.4	12.6		12.4	12.6			
	11.5	11.7		12.4	12.6			
	11.5	11.7		12.4	12.6			
	11.5	11.7	5	12.4	12.6			

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 6 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 159:15:15:33.480

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.7°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	12.7	13.5
	12.7	13.5
	12.7	13.5
	12.7	13.5
5	12.7	13.5
	12.7	13.5
	12.7	13.5
	12.9	13.7
6	13.6	14.4
	13.6	14.4
	12.7	13.5
	12.7	13.5
SSM-1 (159:15:15:36.600)		
1	13.6	14.4
	12.7	13.5
	11.8	12.6
	12.7	13.5
2	12.7	13.5
	12.7	13.5
	13.6	14.4
	12.7	13.5
3	13.6	14.4
	13.6	14.4
	12.7	13.5
	13.6	14.4
4	12.7	13.5
	13.6	14.4
	11.8	12.6
	12.7	13.5
5	12.7	13.5
	11.8	12.6
	12.7	13.5
	12.7	13.5
SSM-2 (159:15:15:41.800)		
1	12.7	13.5
	12.7	13.5
	12.7	13.5
	12.7	13.5
2	12.7	13.5
	12.7	13.5
	12.7	13.5
	12.7	13.5
3	12.7	13.5
	11.8	12.6
	11.8	12.6
	12.7	13.5
4	12.7	13.5
	12.7	13.5
	12.7	13.5
	12.7	13.5
5	12.7	13.5
	12.7	13.5
	11.8	12.6
	11.8	12.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 8 MODE III (1 of 1) SUBMODE 3

FIRST FRAME START TIME (JSC/GMT) 161:15:25:12.515

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	12.3	12.4
	12.3	12.4
	13.1	13.2
	13.8	13.9
5	12.3	12.4
	13.1	13.2
	13.1	13.2
	13.1	13.2
6	13.8	13.9
	12.3	12.4
	13.1	13.2
	13.1	13.2
SSM-1 (161:15:25:15.635)		
1	13.8	13.9
	13.1	13.2
	13.1	13.2
	13.1	13.2
2	13.8	13.9
	12.3	12.4
	13.1	13.2
	13.1	13.2
3	13.8	13.9
	12.3	12.4
	13.8	13.9
	13.1	13.2
4	13.8	13.9
	13.8	13.9
	14.5	14.6
	13.8	13.9
5	12.3	12.4
	13.8	13.9
	12.3	12.4
	12.3	12.4
SSM-2 (161:15:25:20.835)		
1	13.8	13.9
	13.1	13.2
	13.1	13.2
	13.1	13.2
2	13.1	13.2
	13.8	13.9
	12.3	12.4
	13.1	13.2
3	13.8	13.9
	12.3	12.4
	13.1	13.2
	13.1	13.2
4	11.5	11.6
	13.1	13.2
	12.3	12.4
	13.1	13.2
5	13.1	13.2
	13.1	13.2
	13.1	13.2
	13.1	13.2

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 162:13:01:38.222

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	12.6	13.0
	12.6	13.0
	13.3	13.7
	12.6	13.0
5	13.3	13.7
	14.0	14.4
	12.6	13.0
	13.3	13.7
6	13.3	13.7
	14.0	14.4
	12.6	13.0
	13.3	13.7
SSM-1 (162:13:01:41.342)		
1	13.3	13.7
	13.3	13.7
	12.6	13.0
	11.8	12.2
2	12.6	13.0
	12.6	13.0
	13.3	13.7
	13.3	13.7
3	13.3	13.7
	12.6	13.0
	13.3	13.7
	13.3	13.7
4	11.8	12.2
	13.3	13.7
	12.6	13.0
	13.3	13.7
5	12.6	13.0
	13.3	13.7
	11.8	12.2
	12.6	13.0
SSM-2 (162:13:01:40.542)		
1	13.3	13.7
	12.6	13.0
	11.8	12.2
	13.3	13.7
2	12.6	13.0
	11.8	12.2
	12.6	13.0
	13.3	13.7
3	13.3	13.7
	14.0	14.4
	12.6	13.0
	13.3	13.7
4	12.6	13.0
	12.6	13.0
	12.6	13.0
	13.3	13.7
5	14.0	14.4
	14.0	14.4
	13.3	13.7
	14.0	14.4

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 162:13:05:19.432

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.2°$; $\xi_r = \pm 0.58°$

$\psi = 0.56°$

FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)
SSM-0					
5	15.9				
	15.9				
	15.0				
	15.0				
6	16.6				
	15.0				
	15.9				
	15.0				
SSM-1	(162:13:05:21.512)				
1	15.9				
	15.0				
	15.0				
	15.9				
2	15.0				
	15.0				
	15.0				
	15.9				
SSM-2	(162:13:05:23.592)				
1	14.1				
	14.1				
	14.1				
	14.1				
2	15.0				
	15.0				
	15.0				
	15.0				

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 1

FIRST FRAME START TIME (JSC/GMT) 162:13:05:27.752

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = \pm 0.58°$

$\psi = 0.59°$

FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$
SSM-0			14.5		13.8
3	14.5		14.5	16	13.8
	14.5		14.5		13.8
	15.1	10	14.5		13.8
	13.8		14.5		13.2
4	14.5		13.8	17	13.8
	14.5		14.5		14.5
	15.1	11	14.5		13.8
	14.5		13.8		13.8
5	15.1		13.8	18	13.8
	15.1		13.8		14.5
	14.5	12	14.5		13.8
	14.5		14.5		13.8
6	13.8		13.8	19	13.8
	14.5		14.5		13.8
	13.8	13	13.8		13.8
	14.5		14.5		13.8
7	14.5		14.5	20	13.8
	13.8		13.8		13.8
	14.5	14	13.8		13.8
	14.5		13.8		13.8
8	13.8		13.2	21	13.8
	14.5		13.2		14.5
	14.5	15	13.8		13.8
	14.5		13.8		13.8
9	13.8		13.8	22	13.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 1 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = \pm 0.58°$

$\psi = 0.59°$

FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$
22(Cont'd.)	13.8		13.8		
	13.8	29	14.5		
	13.8		13.8		
23	13.8		13.8		
	13.8		13.8		
	14.5	30	13.8		
	13.8		13.2		
24	14.5		14.5		
	13.8		13.8		
	14.5				
	14.5				
25	13.8				
	13.8				
	13.8				
	13.8				
26	13.8				
	13.8				
	13.8				
	13.8				
27	14.5				
	13.8				
	13.8				
	13.8				
28	14.5				
	14.5				
	13.8				

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 2

FIRST FRAME START TIME (JSC/GMT) 162:13:05:58.952

ESTIMATED POINTING BOUNDS

$\xi_p = +15.5°$; $\xi_r = \pm 0.58°$

$\psi = 15.5°$

FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)
3	-5.8		-4.8	16	-3.9
	-5.8		-3.9		-4.8
	-5.8	10	-3.9		-3.9
	-4.8		-3.9		-4.8
4	-4.8		-4.8	17	-3.9
	-4.8		-3.9		-4.9
	-4.8	11	-4.8		-4.9
	-5.8		-4.8		-3.9
5	-4.8		-3.9	18	-4.9
	-4.8		-3.9		-4.9
	-4.8	12	-3.9		-3.9
	-4.8		-3.9		-3.9
6	-4.8		-4.8	19	-3.9
	-4.8		-3.9		-3.9
	-4.8	13	-3.9		-3.9
	-4.8		-3.9		-3.9
7	-4.8		-3.9	20	-4.9
	-4.8		-3.9		-3.9
	-4.8	14	-4.8		-3.9
	-4.8		-3.9		-3.9
8	-4.8		-3.9	21	-4.9
	-4.8		-3.9		-3.9
	-4.8	15	-3.9		-3.9
	-4.8		-4.8		-3.9
9	-4.8		-4.8	22	-3.9
	-4.8		-3.9		-3.9

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 2 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 15.5°$; $\xi_r = \pm 0.58°$

$\psi = 15.5°$

FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)
22(Cont'd.)	-3.9	29	-3.9		
	-3.9		-3.9		
23	-3.9		-3.9		
	-4.9		-3.9		
	-3.9	30	-3.9		
	-3.9		-3.9		
24	-3.9		-4.9		
	-3.9		-3.9		
	-3.9				
	-3.9				
25	-3.9				
	-3.9				
	-3.9				
	-3.9				
26	-3.9				
	-3.9				
	-3.9				
	-3.9				
27	-3.9				
	-3.9				
	-3.9				
	-3.9				
28	-3.9				
	-3.9				
	-3.9				
	-3.9				

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 3

FIRST FRAME START TIME (JSC/GMT) 162:13:06:32.232

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 7.6°$; $\xi_r = \pm 0.58°$

$\psi = 7.6°$

FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$
5	6.4		6.4		6.4
	7.1	12	6.4		6.4
	7.1		7.1	19	7.1
	6.4		6.4		6.4
6	6.4		6.4		6.4
	7.1	13	6.4		6.4
	6.4		6.4	20	6.4
	6.4		6.4		6.4
7	6.4		6.4		6.4
	6.4	14	6.4		6.4
	6.4		6.4	21	7.1
	7.1		6.4		6.4
8	6.4		6.4		6.4
	7.1	15	6.4		6.4
	5.7		6.4	22	6.4
	6.4		6.4		6.4
9	6.4		6.4		6.4
	6.4	16	6.4		6.4
	6.4		6.4	23	6.4
	6.4		6.4		6.4
10	7.1		5.7		6.4
	7.1	17	6.4		6.4
	5.7		6.4	24	6.4
	6.4		6.4		7.1
11	6.4		6.4		7.1
	7.1	18	6.4		6.4
	5.7		6.4	25	6.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 3 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________________

ESTIMATED POINTING BOUNDS

$\xi_p = +7.6°$; $\xi_r = \pm 0.58°$

$\psi = 7.6°$

FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$
25(Cont'd.)	6.6				
	6.6				
	6.6				
26	6.6				
	6.6				
	6.6				
	7.3				
27	6.6				
	6.6				
	6.6				
	6.6				
28	5.7				
	6.6				
	6.6				
	6.6				
29	6.6				
	6.6				
	6.6				
	6.6				
30	6.6				
	6.6				
	6.6				
	6.6				

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 4

FIRST FRAME START TIME (JSC/GMT) 162:13:07:2.392

ESTIMATED POINTING BOUNDS

** $\xi_p = +3.25°$; $\xi_r = 0°$

ψ = 3.2°

†† $\xi_p = +2.6°$; $\xi_r = \pm 0.9°$

FRAME NO.	** σ°(ψ)	†† σ°(ψ)	FRAME NO.	** σ°(ψ)	†† σ°(ψ)	FRAME NO.	** σ°(ψ)	†† σ°(ψ)
4	13.1	12.7		13.1	12.7	17	11.9	11.4
	13.1	12.7		13.1	12.7		12.5	12.0
	13.1	12.7	11	12.5	12.0		12.5	12.0
	13.1	12.7		12.5	12.0		12.5	12.0
5	12.5	12.0		13.1	12.7	18	13.1	12.7
	12.5	12.0		12.5	12.0		11.9	11.4
	13.1	12.7	12	12.5	12.0		11.5	11.0
	12.5	12.0		13.1	12.7		11.9	11.4
6	12.5	12.0		12.5	12.0	19	12.5	12.0
	13.1	12.7		12.5	12.0		11.9	11.4
	12.5	12.0	13	12.5	12.0		12.5	12.0
	12.5	12.0		12.5	12.0		11.9	11.4
7	13.1	12.7		13.1	12.7	20	11.9	11.4
	13.1	12.7		12.5	12.0		12.5	12.0
	12.5	12.0	14	12.5	12.0		11.9	11.4
	13.1	12.7		13.1	12.7		11.9	11.4
8	12.5	12.0		12.5	12.0	21	11.9	11.4
	12.5	12.0		12.5	12.0		11.9	11.4
	12.5	12.0	15	12.5	12.0		11.9	11.4
	12.5	12.0		12.5	12.0		12.5	12.0
9	12.5	12.0		13.1	12.7	22	11.9	11.4
	13.1	12.7		13.1	12.7		11.9	11.4
	12.5	12.0	16	13.1	12.7		11.9	11.4
	12.5	12.0		12.5	12.0		11.9	11.4
10	12.5	12.0		12.5	12.0	23	11.9	11.4
	13.1	12.7		12.5	12.0		11.9	11.4

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 4 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ______________

ESTIMATED POINTING BOUNDS

** $\xi_p = +3.25°$; $\xi_r = 0°$

$\psi = 3.2°$

†† $\xi_p = +2.6°$; $\xi_r = +0.9°$

FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$	FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$	FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$
23(Cont'd.)	11.9	11.4	30	11.9	11.4			
	12.5	12.0		11.9	11.4			
24	11.9	11.4		11.9	11.4			
	11.9	11.4		11.9	11.4			
	11.9	11.4						
	12.5	12.0						
25	11.9	11.4						
	11.9	11.4						
	12.5	12.0						
	12.5	12.0						
26	11.9	11.4						
	11.9	11.4						
	11.9	11.4						
	11.9	11.4						
27	12.5	12.0						
	11.9	11.4						
	11.9	11.4						
	11.9	11.4						
28	12.5	12.0						
	12.5	12.0						
	11.9	11.4						
	11.9	11.4						
29	12.5	12.0						
	11.9	11.4						
	11.9	11.4						
	11.9	11.4						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 5

FIRST FRAME START TIME (JSC/GMT) 162:13:07:33.591

ESTIMATED POINTING BOUNDS

** $\xi_p = \underline{+1.92°}$; $\xi_r = 0°$

ψ = 1.9° or 1.4°

†† $\xi_p = +1.27°$; $\xi_r = \underline{\pm 0.9°}$

FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$	FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$	FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$
4	12.2	11.8		12.4	12.0	17	12.4	12.0
	12.2	11.8		12.4	12.0		12.4	12.0
	12.2	11.8	11	11.8	11.4		11.8	11.4
	12.2	11.8		12.4	12.0		12.4	12.0
5	11.6	11.2		12.4	12.0	18	11.8	11.4
	12.2	11.8		12.4	12.0		11.8	11.4
	12.2	11.8	12	11.8	11.4		12.4	12.0
	12.2	11.8		11.8	11.4		11.8	11.4
6	12.2	11.8		11.8	11.4	19	11.8	11.4
	12.2	11.8		11.8	11.4		12.4	12.0
	12.2	11.8	13	11.8	11.4		11.8	11.4
	12.2	11.8		11.8	11.4		12.4	12.0
7	12.2	11.8		11.8	11.4	20	12.4	12.0
	11.6	11.2		11.8	11.4		12.4	12.0
	12.8	12.4	14	12.4	12.0		12.4	12.0
	12.8	12.4		12.4	12.0		11.8	11.4
8	11.6	11.2		11.8	11.4	21	12.4	12.0
	12.2	11.8		11.8	11.4		11.8	11.4
	12.2	11.8	15	12.4	12.0		12.4	12.0
	12.2	11.8		12.4	12.0		11.8	11.4
9	12.4	12.0		12.4	12.0	22	12.4	12.0
	12.4	12.0		11.8	11.4		12.4	12.0
	12.4	12.0	16	11.8	11.4		11.8	11.4
	12.4	12.0		11.8	11.4		11.8	11.4
10	12.4	12.0		11.8	11.4	23	12.4	12.0
	11.8	11.4		12.4	12.0		12.4	12.0

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 5 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

** $\xi_p = +1.92°$; $\xi_r = 0°$

$\psi = 1.9°$ or $1.4°$

†† $\xi_p = +1.27°$; $\xi_r = \pm 0.9°$

FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$	FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$	FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$
23(Cont'd.)	11.8	11.4	30	11.8	11.4			
	11.8	11.4		11.8	11.4			
24	11.8	11.4		11.8	11.4			
	12.4	12.0		11.8	11.4			
	12.4	12.0						
	11.8	11.4						
25	11.8	11.4						
	11.8	11.4						
	12.4	12.0						
	11.8	11.4						
26	12.4	12.0						
	12.4	12.0						
	11.8	11.4						
	11.8	11.4						
27	11.8	11.4						
	11.8	11.4						
	11.8	11.4						
	11.8	11.4						
28	11.8	11.4						
	11.8	11.4						
	11.8	11.4						
	11.8	11.4						
29	11.2	10.8						
	11.8	11.4						
	11.8	11.4						
	12.4	12.0						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 9 MODE II (2 of 2) SUBMODE 6

FIRST FRAME START TIME (JSC/GMT) 162:13:08:02.711

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.62°$

$\xi_p = 0°$; $\xi_r = \pm 0.9°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_F, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0								
2	12.2	13.6						
	12.2	13.6						
	13.2	14.5						
	12.2	13.6						
3	13.2	14.5						
	12.2	13.6						
	12.2	13.6						
	13.2	14.5						
SSM-1 (162:13:08:04.791)								
1	12.2	13.6						
	12.2	13.6						
	13.2	14.5						
	12.2	13.6						
2	13.2	14.5						
	13.2	14.5						
	13.2	14.5						
	12.2	13.6						
SSM-2 (162:13:08:06.872)								
1	13.2	14.5						
	13.2	14.5						
	12.2	13.6						
	13.2	14.5						
2	12.2	13.6						
	11.6	12.9						
	12.2	13.6						
	12.2	13.6						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-2 PASS 11 MODE V (2 of 3) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 164:14:50:09.827

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.7°$; $\xi_r = 0°$

$\psi = 0.71°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$
SSM-0	
4	16.4
	17.7
	16.4
	16.4
5	15.7
	16.4
	16.4
	16.4
6	15.7
	15.0
	15.0
	14.4
SSM-1 (164:14:50:12.947)	
1	15.0
	15.0
	15.0
	15.0
2	14.4
	14.4
	15.0
	14.4
3	14.4
	14.4
	14.4
	14.4
4	15.0
	14.4
	14.4
	14.4
5	14.4
	13.5
	14.4
	14.4
SSM-2 (164:14:50:18.147)	
1	13.5
	14.4
	13.5
	15.0
2	15.0
	14.4
	14.4
	15.0
3	15.0
	14.4
	14.4
	14.4
4	14.4
	15.0
	14.4
	14.4
5	15.0
	15.0
	15.0
	14.4

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

3.2 MISSION SL-3 $\sigma°/L_p$ DATA TABLES

MISSION SL-3 PASS 12 MODE I (3 of 3) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 215:18:12:32.573

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.85°$; $\xi_r = 0°$

$\psi = 0.9°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$
SSM-0			13.6		12.7
6	13.6		13.6	19	13.6
	14.4		12.7		13.6
	13.6	13	12.7		13.6
	13.6		13.6		13.6
7	13.6		12.7	20	13.6
	14.4		13.6		12.7
	14.4	14	14.4		12.7
	13.6		13.6		12.7
8	14.4		12.7	SSM-1	(215:18:12:48.173)
	14.4		12.7	1	12.7
	15.2	15	12.7		13.6
	14.4		13.6		12.7
9	14.4		12.7		13.6
	13.6		13.6	2	13.6
	14.4	16	13.6		12.7
	14.4		12.7		13.6
10	13.6		12.7		11.9
	13.6		12.7	3	12.7
	13.6	17	12.7		13.6
	13.6		12.7		12.7
11	13.6		13.6		13.6
	13.6		13.6	4	13.6
	13.6	18	13.6		12.7
	12.7		12.7		12.7
12	13.6		13.6		12.7

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 12 MODE I (3 of 3) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.85°$; $\xi_r = 0°$

ψ = 0.9°

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$
5	12.7		11.9		12.7
	12.7		12.7	3	12.7
	12.7	12	12.7		12.7
	12.7		12.7		13.6
6	12.7		11.9		12.7
	12.7		12.7	4	12.7
	11.9	13	11.9		11.9
	13.6		11.9		12.7
7	12.7		12.7		12.7
	12.7		13.6	5	11.9
	12.7	14	12.7		11.9
	12.7		12.7		12.7
8	12.7		11.9		12.7
	13.6		12.7	6	12.7
	12.7	15	11.9		12.7
	12.7		11.9		11.9
9	11.9		12.7		12.7
	12.7		12.7	7	11.9
	12.7	SSM-2 (215:18:13:03.772)			12.7
	13.6	1	12.7		12.7
10	11.9		12.7		11.1
	12.7		11.9	8	12.1
	12.7		12.7		12.1
	12.7	2	11.9		11.3
11	12.7		12.7		13.0
	12.7		12.7	9	13.0

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 12 MODE I (3 of 3) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.85°$; $\xi_r = 0°$

$\psi = 0.9°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$
9(Cont'd.)	12.1				
	13.0				
	13.0				
10	13.0				
	12.1				
	13.0				
	13.0				
11	13.0				
	13.0				
	12.1				
	12.1				
12	12.1				
	11.3				
	12.1				
	12.1				
13	12.1				
	12.1				
	13.0				
	12.1				
14	11.3				
	12.1				
	11.3				
	12.1				
15	12.1				
	12.1				
	11.3				
	12.1				

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE III (1 of 1) SUBMODE 3

FIRST FRAME START TIME (JSC/GMT) 221:13:51:12.893

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.9°$; $\xi_r = 0°$

$\psi = 0.95°$

$\xi_p = 0°$; $\xi_r = \pm 1.2°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	11.8	13.7
	11.8	13.7
	11.0	12.9
	11.8	13.7
5	11.8	13.7
	10.3	12.2
	11.8	13.7
	11.0	12.9
6	11.0	12.9
	11.8	13.7
	11.0	12.9
	11.0	12.9
SSM-1 (221:13:51:16.012)		
1	11.0	12.9
	11.8	13.7
	12.6	14.5
	11.0	12.9
2	11.8	13.7
	10.3	12.2
	11.0	12.9
	11.0	12.9
3	11.0	12.9
	11.8	13.7
	11.0	12.9
	11.8	13.7
4	10.3	12.2
	11.0	12.9
	11.8	13.7
	11.8	13.7
5	11.0	12.9
	11.8	13.7
	11.0	12.9
	11.0	12.9
SSM-2 (221:13:51:21.212)		
1	11.0	12.9
	11.0	12.9
	11.0	12.9
	11.0	12.9
2	11.8	13.7
	11.0	12.9
	10.3	12.2
	11.0	12.9
3	11.0	12.9
	12.6	14.5
	11.0	12.9
	11.8	13.7
4	11.0	12.9
	11.0	12.9
	11.0	12.9
	11.8	13.7
5	11.8	13.7
	11.8	13.7
	11.0	12.9
	11.0	12.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 221:13:54:49.919

ESTIMATED POINTING BOUNDS

$\xi_p = -0.31°$; $\xi_r = \pm 0.91°$

$\psi = 0.55°$

FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)
SSM-0					
5	11.0				
	10.3				
	11.0				
	11.8				
6	11.8				
	11.0				
	11.0				
	11.0				
SSM-1 (221:13:54:52.000)					
1	10.3				
	11.0				
	11.8				
	11.0				
2	11.0				
	11.8				
	11.8				
	11.8				
SSM-2 (221:13:54:54.079)					
1	11.8				
	11.0				
	11.0				
	10.3				
2	11.8				
	11.8				
	11.0				
	11.0				

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 1

FIRST FRAME START TIME (JSC/GMT) 221:13:54:58.239

ESTIMATED POINTING BOUNDS

$\xi_p = +0.31°$; $\xi_r = \pm 0.91°$

$\psi = 0.55°$

FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$
3	11.9		10.5	16	10.5
	11.2		10.5		11.2
	11.2	10	11.2		11.2
	11.2		11.2		10.5
4	11.2		10.5	17	11.2
	11.2		10.5		11.2
	11.9	11	11.2		11.2
	11.2		11.2		11.2
5	11.2		11.2	18	10.5
	11.2		10.5		11.2
	11.2	12	11.2		11.2
	11.2		11.2		11.9
6	11.2		11.2	19	11.2
	11.2		11.2		11.2
	11.2	13	11.2		11.2
	11.2		11.2		11.2
7	11.2		11.2	20	11.2
	11.2		11.2		11.2
	10.5	14	11.2		11.2
	10.5		11.2		11.2
8	10.5		11.2	21	10.5
	9.7		11.2		11.2
	9.7	15	11.2		11.2
	9.7		10.5		11.2
9	9.7		11.2	22	11.2
	9.7		11.2		11.2

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 1 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)__________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.31°$; $\xi_r = \pm 0.91°$

$\psi = 0.55°$

FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$
22(Cont'd.)	11.2	29	11.2		
	11.9		11.9		
23	11.2		11.9		
	11.2		11.9		
	11.2	30	11.2		
	11.2		11.2		
24	11.2		11.2		
	10.5		11.9		
	10.5				
	11.2				
25	11.2				
	10.5				
	11.2				
	11.2				
26	11.2				
	11.2				
	10.5				
	11.2				
27	11.9				
	10.5				
	11.2				
	11.9				
28	11.2				
	11.2				
	11.2				
	11.9				

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 2

FIRST FRAME START TIME (JSC/GMT) 221:13:55:29.439

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 15.5°$; $\xi_r = \pm 0.91°$

$\psi = 15.5°$

FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$
3	-6.2		-5.2	16	-4.2
	-6.2		-4.2		-4.2
	-6.2	10	-5.2		-5.2
	-6.2		-4.2		-5.2
4	-6.2		-5.2	17	-5.2
	-5.2		-4.2		-5.2
	-5.2	11	-5.2		-5.2
	-5.2		-4.2		-5.2
5	-5.2		-5.2	18	-4.2
	-5.2		-5.2		-4.2
	-5.2	12	-5.2		-5.2
	-5.2		-4.2		-5.2
6	-5.2		-4.2	19	-5.2
	-5.2		-5.2		-5.2
	-5.2	13	-4.2		-5.2
	-5.2		-5.2		-5.2
7	-4.2		-4.2	20	-5.2
	-4.2		-4.2		-5.2
	-5.2	14	-4.2		-5.2
	-5.2		-4.2		-5.2
8	-5.2		-4.2	21	-4.2
	-5.2		-4.2		-4.2
	-4.2	15	-4.2		-5.2
	-5.2		-4.2		-4.2
9	-5.2		-4.2	22	-5.2
	-5.2		-4.2		-5.2

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 2 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ________

ESTIMATED POINTING BOUNDS

$\xi_p = +15.5°$; $\xi_r = \pm 0.91°$

$\psi = 15.5°$

FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)
22(Cont'd.)	-5.2	29	-4.2		
	-4.2		-4.2		
23	-5.2		-4.2		
	-4.2		-4.2		
	-4.2	30	-5.2		
	-4.2		-5.2		
24	-4.2		-4.2		
	-4.2		-5.2		
	-5.2				
	-4.2				
25	-4.2				
	-4.2				
	-4.2				
	-4.2				
26	-5.2				
	-4.2				
	-5.2				
	-5.2				
27	-5.2				
	-5.2				
	-5.2				
	-5.2				
28	-4.2				
	-4.2				
	-5.2				
	-5.2				

SPECIAL NOTES:
1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 3

FIRST FRAME START TIME (JSC/GMT) 221:13:56:00.639

ESTIMATED POINTING BOUNDS

$\xi_p = +7.06°$; $\xi_r = \pm 0.91°$

$\psi = 7.1°$

FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$
3	5.5		4.8	16	4.1
	6.2		4.1		4.1
	5.5	10	4.1		4.1
	5.5		4.1		4.1
4	5.5		4.1	17	4.1
	5.5		4.8		4.1
	4.8	11	4.8		4.1
	4.8		4.8		4.1
5	4.8		4.8	18	4.8
	4.8		4.8		4.1
	4.8	12	4.1		4.1
	4.1		4.8		4.1
6	4.1		4.8	19	4.1
	4.1		4.8		4.1
	4.8	13	4.1		4.1
	4.8		4.1		4.1
7	4.8		4.8	20	4.1
	4.1		4.1		4.1
	4.1	14	4.8		4.1
	4.1		4.1		3.3
8	4.1		4.8	21	4.1
	4.8		4.1		4.1
	4.8	15	4.8		4.1
	4.1		4.8		4.1
9	4.8		4.1	22	4.1
	4.1		4.1		4.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 3 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 7.06°$; $\xi_r = \pm 0.91°$

$\psi = 7.1°$

FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)
22(Cont'd.)	4.1	29	3.3		
	4.1		3.3		
23	4.1		2.6		
	4.8		3.3		
	4.1	30	3.3		
	4.1		4.8		
24	4.1		4.1		
	4.1		4.8		
	4.8				
	4.1				
25	4.1				
	4.8				
	4.1				
	4.1				
26	4.8				
	4.1				
	4.8				
	4.1				
27	4.1				
	4.1				
	4.1				
	4.8				
28	4.1				
	4.8				
	4.1				
	4.1				

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 4

FIRST FRAME START TIME (JSC/GMT) 221:13:56:31.838

ESTIMATED POINTING BOUNDS

$\xi_p = \underline{+2.21°}$; $\xi_r = \underline{+}0.91°$

$\psi = \underline{2.22°}$

FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$	FRAME NO.	$\sigma°(\psi)$
3	9.7		9.7	16	10.3
	9.7		10.3		9.7
	9.7	10	9.7		10.3
	9.1		10.3		9.7
4	9.1		10.3	17	9.7
	9.1		9.7		10.3
	9.7	11	10.3		10.3
	9.1		10.3		10.3
5	8.4		9.7	18	9.7
	9.7		9.7		9.7
	9.7	12	9.7		10.3
	9.7		9.7		10.3
6	9.7		10.3	19	10.3
	9.1		9.7		10.3
	9.7	13	10.3		10.3
	9.7		10.3		10.3
7	9.7		10.3	20	9.7
	9.7		10.3		10.3
	9.7	14	10.3		9.7
	10.3		9.7		9.7
8	9.7		10.3	21	9.7
	9.7		10.3		9.7
	9.7	15	10.3		9.7
	9.7		9.7		9.7
9	10.3		10.3	22	10.3
	9.7		10.3		10.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 4 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 2.21°$; $\xi_r = \pm 0.91°$

$\psi = 2.22°$

FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)	FRAME NO.	σ°(ψ)
22(Cont'd.)	9.7	29	9.7		
	10.3		9.7		
23	9.7		9.7		
	10.3		9.7		
	9.7	30	9.7		
	10.3		9.7		
24	10.3		9.7		
	9.7		9.7		
	9.7				
	9.7				
25	10.3				
	9.7				
	9.7				
	9.7				
26	9.7				
	9.7				
	10.3				
	10.3				
27	9.7				
	9.7				
	9.7				
	10.3				
28	9.7				
	9.7				
	9.7				
	10.3				

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 5

FIRST FRAME START TIME (JSC/GMT) 221:13:57:03.039

ESTIMATED POINTING BOUNDS

** $\xi_p = +0.94°$; $\xi_r = \pm 0.9°$ $\psi = 0.94°$

†† $\xi_p = +1.56°$; $\xi_r = \pm 0.9°$ $\psi = 1.6°$

FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$	FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$	FRAME NO.	** $\sigma°(\psi)$	†† $\sigma°(\psi)$
3	10.7	11.9		11.5	12.6	16	11.5	12.6
	11.5	12.6		11.5	12.6		11.5	12.6
	11.5	12.6	10	11.5	12.6		11.5	12.6
	11.5	12.6		11.5	12.6		10.7	11.9
4	11.5	12.6		11.5	12.6	17	11.5	12.6
	11.5	12.6		10.7	11.9		11.5	12.6
	11.5	12.6	11	11.5	12.6		11.5	12.6
	10.7	11.9		11.5	12.6		11.5	12.6
5	11.5	12.6		11.5	12.6	18	11.5	12.6
	10.7	11.9		11.5	12.6		10.7	11.9
	10.7	11.9	12	10.7	11.9		11.5	12.6
	11.5	12.6		11.5	12.6		11.5	12.6
6	10.7	11.9		11.5	12.6	19	12.2	13.4
	11.5	12.6		11.5	12.6		12.2	13.4
	11.5	12.6	13	11.5	12.6		11.5	12.6
	11.5	12.6		11.5	12.6		11.5	12.6
7	11.5	12.6		11.5	12.6	20	11.5	12.6
	11.5	12.6		11.5	12.6		11.5	12.6
	10.7	11.9	14	10.7	11.9		11.5	12.6
	11.5	12.6		11.5	12.6		11.5	12.6
8	11.5	12.6		10.7	11.9	21	11.5	12.6
	11.5	12.6		11.5	12.6		11.5	12.6
	11.5	12.6	15	12.2	13.4		11.5	12.6
	11.5	12.6		11.5	12.6		11.5	12.6
9	11.5	12.6		10.7	11.9	22	12.2	13.4
	10.7	11.9		11.5	12.6		11.5	12.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 5 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

** $\xi_p = \underline{+0.94°}$; $\xi_r = \pm 0.9°$ $\psi = 0.94°$

†† $\xi_p = +1.56°$; $\xi_r = \underline{\pm 0.9°}$ $\psi = 1.6°$

FRAME NO.	** σ°(ψ)	†† σ°(ψ)	FRAME NO.	** σ°(ψ)	†† σ°(ψ)	FRAME NO.	** σ°(ψ)	†† σ°(ψ)
22(Cont'd.)	11.5	12.6	29	11.5	12.6			
	10.7	11.9		12.2	13.4			
23	11.5	12.6		11.5	12.6			
	11.5	12.6		11.5	12.6			
	11.5	12.6	30	12.2	13.4			
	11.5	12.6		11.5	12.6			
24	11.5	12.6		12.2	13.4			
	11.5	12.6		12.2	13.4			
	11.5	12.6						
	11.5	12.6						
25	11.5	12.6						
	11.5	12.6						
	12.2	13.4						
	12.2	13.4						
26	11.5	12.6						
	11.5	12.6						
	11.5	12.6						
	11.5	12.6						
27	10.7	11.9						
	11.5	12.6						
	12.2	13.4						
	11.5	12.6						
28	10.7	11.9						
	10.7	11.9						
	11.5	12.6						
	11.5	12.6						

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE II (1 of 1) SUBMODE 6

FIRST FRAME START TIME (JSC/GMT) 221:13:57:34.238

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.9°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0								
2	13.4	14.7						
	12.4	13.7						
	12.4	13.7						
	13.4	14.7						
3	12.4	13.7						
	12.4	13.7						
	12.4	13.7						
	13.4	14.7						
SSM-1	(221:13:57:36.318)							
1	12.4	13.7						
	13.4	14.7						
	12.4	13.7						
	12.4	13.7						
2	13.4	14.7						
	13.4	14.7						
	13.4	14.7						
	12.4	13.7						
SSM-2	(221:13:57:38.398)							
1	13.4	14.7						
	13.4	14.7						
	12.4	13.7						
	11.4	12.7						
2	12.4	13.7						
	11.4	12.7						
	12.4	13.7						
	12.4	13.7						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 17 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 221:13:58:29.674

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.75°$; $\xi_r = 0°$

$\psi = 0.76°$

$\xi_p = 0°$; $\xi_r = \pm 0.95°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	17.4	18.8
	18.0	19.4
	16.8	18.2
	16.8	18.2
5	18.0	19.4
	17.4	18.8
	17.4	18.8
	16.8	18.2
6	16.8	18.2
	16.8	18.2
	16.2	17.6
	16.8	18.2
SSM-1 (221:13:58:32.794)		
1	16.2	17.6
	16.2	17.6
	15.2	16.6
	16.2	17.6
2	16.8	18.2
	15.2	16.6
	16.2	17.6
	16.8	18.2
3	16.8	18.2
	15.2	16.6
	15.2	16.6
	16.2	17.6
4	16.2	17.6
	16.8	18.2
	16.8	18.2
	16.2	17.6
5	16.2	17.6
	16.2	17.6
	16.8	18.2
	16.2	17.6
SSM-2 (221:13:58:37.994)		
1	16.2	17.6
	15.2	16.6
	16.8	18.2
	16.2	17.6
2	16.2	17.6
	15.2	16.6
	16.2	17.6
	16.8	18.2
3	16.8	18.2
	16.8	18.2
	16.2	17.6
	16.8	18.2
4	16.8	18.2
	16.8	18.2
	17.4	18.8
	18.0	19.4
5	18.0	19.4
	18.0	19.4
	17.4	18.8
	17.4	18.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

C-2

MISSION SL-3 **PASS** 18 **MODE** V **(**1 **of** 1**) SUBMODE** 0

FIRST FRAME START TIME (JSC/GMT) 223:15:36:53.258

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.3^\circ$; $\xi_r = 0^\circ$

$\psi = 0.54^\circ$

$\xi_p = 0^\circ$; $\xi_r = \pm 0.4^\circ$

FRAME NO.	$\sigma^\circ(\psi)$ $(\xi_p,0^\circ)$	$\sigma^\circ(\psi)$ $(0^\circ,\xi_r)$
SSM-0		
4	15.5	15.7
	15.5	15.7
	14.8	15.0
	13.9	14.1
5	13.9	14.1
	13.9	14.1
	13.9	14.1
	13.9	14.1
6	13.9	14.1
	13.9	14.1
	13.2	13.4
	13.9	14.1
SSM-1 (223:15:36:56.378)		
1	13.2	13.4
	13.9	14.1
	13.9	14.1
	13.9	14.1
2	13.2	13.4
	13.2	13.4
	13.9	14.1
	13.2	13.4
3	13.9	14.1
	13.2	13.4
	13.2	13.4
	12.4	12.6
4	14.8	15.0
	13.2	13.4
	13.9	14.1
	13.2	13.4
5	12.4	12.6
	12.4	12.6
	12.4	12.6
	13.2	13.4
SSM-2 (223:15:37:01.578)		
1	13.2	13.4
	12.4	12.6
	11.7	11.9
	11.7	11.9
2	12.4	12.6
	11.7	11.9
	11.7	11.9
	11.7	11.9
3	11.7	11.9
	11.7	11.9
	12.4	12.6
	11.7	11.9
4	11.7	11.9
	12.4	12.6
	11.7	11.9
	11.7	11.9
5	12.4	12.6
	12.4	12.6
	11.7	11.9
	11.0	11.2

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 19 MODE I (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 224:02:35:01.652

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.9°$; $\xi_r = 0°$

$\psi = 0.95°$

$\xi_p = 0°$; $\xi_r = \pm 1.2°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				12.0	13.9		12.0	13.9
6	12.0	13.9		12.0	13.9	19	11.3	13.2
	12.7	14.6		12.0	13.9		11.3	13.2
	12.7	14.6	13	11.3	13.2		11.3	13.2
	12.0	13.9		12.0	13.9		11.3	13.2
7	12.7	14.6		12.0	13.9	20	11.3	13.2
	12.7	14.6		10.6	12.5		11.3	13.2
	13.4	15.3	14	12.7	14.6		11.3	13.2
	12.7	14.6		12.0	13.9		11.3	13.2
8	12.7	14.6		12.0	13.9	SSM-1 (224:02:35:16.212)		
	12.7	14.6		11.3	13.2	1	11.7	13.6
	12.7	14.6	15	12.0	13.9		11.7	13.6
	12.7	14.6		12.0	13.9		12.4	14.3
9	13.4	15.3		12.0	13.9		11.0	12.9
	12.0	13.9		12.0	13.9	2	11.7	13.6
	12.0	13.9	16	12.0	13.9		11.7	13.6
	12.7	14.6		12.0	13.9		12.4	14.3
10	12.7	14.6		11.3	13.2		11.7	13.6
	12.7	14.6		12.0	13.9	3	11.7	13.6
	12.7	14.6	17	11.3	13.2		11.7	13.6
	12.0	13.9		11.3	13.2		11.0	12.9
11	12.0	13.9		10.6	12.5		11.7	13.6
	12.7	14.6		11.3	13.2	4	11.7	13.6
	12.0	13.9	18	11.3	13.2		11.7	13.6
	12.7	14.6		11.3	13.2		11.0	12.9
12	11.3	13.2		12.0	13.9		11.7	13.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 19 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.9°$; $\xi_r = 0°$

$\psi = 0.95°$

$\xi_p = 0°$; $\xi_r = \pm 1.2°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5	11.7	13.6		11.0	12.9		11.7	13.6
	11.0	12.9		11.7	13.6	3	11.2	13.1
	11.7	13.6	12	11.7	13.6		11.2	13.1
	11.7	13.6		11.7	13.6		11.2	13.1
6	11.7	13.6		11.0	12.9		12.0	13.9
	11.7	13.6		11.0	12.9	4	12.0	13.9
	11.7	13.6	13	11.7	13.6		12.0	13.9
	11.0	12.9		11.0	12.9		12.0	13.9
7	11.0	12.9		11.0	12.9		12.0	13.9
	11.0	12.9		11.7	13.6	5	12.0	13.9
	11.0	12.9	14	11.7	13.6		12.7	14.6
	11.7	13.6		11.0	12.9		12.0	13.9
8	11.7	13.6		11.7	13.6		12.0	13.9
	11.7	13.6		11.7	13.6	6	11.2	13.1
	11.7	13.6	15	11.7	13.6		12.0	13.9
	11.7	13.6		11.7	13.6		11.2	13.1
9	11.0	12.9		11.0	12.9		12.0	13.9
	10.2	12.1		11.0	12.9	7	12.0	13.9
	12.4	14.3	SSM-2 (224:02:35:31.813)				12.0	13.9
	11.0	12.9	1	11.7	13.6		11.2	13.1
10	11.7	13.6		11.7	13.6		11.2	13.1
	11.0	12.9		11.0	12.9	8	12.7	14.6
	11.7	13.6		11.7	13.6		12.0	13.9
	11.7	13.6	2	11.0	12.9		11.2	13.1
11	11.7	13.6		11.7	13.6		12.0	13.9
	11.0	12.9		11.7	13.6	9	12.7	14.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 19 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.9°$; $\xi_r = 0°$

$\psi = 0.95°$

$\xi_p = 0°$; $\xi_r = \pm 1.2°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
9(Cont'd.)	12.0	13.9		12.0	13.9			
	12.0	13.9						
	12.0	13.9						
10	12.0	13.9						
	11.2	13.1						
	12.0	13.9						
	12.7	14.6						
11	11.2	13.1						
	12.0	13.9						
	11.2	13.1						
	12.0	13.9						
12	12.7	14.6						
	12.0	13.9						
	12.0	13.9						
	12.0	13.9						
13	12.0	13.9						
	11.2	13.1						
	12.0	13.9						
	12.0	13.9						
14	11.2	13.1						
	12.0	13.9						
	11.2	13.1						
	12.0	13.9						
15	12.0	13.9						
	12.0	13.9						
	12.0	13.9						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 21 MODE V (1 of 3) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 244:15:22:47.445

ESTIMATED POINTING BOUNDS

$\xi_p = 0°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = 0°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	10.5	10.5
	12.0	12.0
	11.3	11.3
	12.0	12.0
5	11.3	11.3
	12.0	12.0
	12.0	12.0
	11.3	11.3
6	10.5	10.5
	11.3	11.3
	12.0	12.0
	11.3	11.3
SSM-1 (244:15:22:50.565)		
1	11.3	11.3
	12.0	12.0
	11.3	11.3
	10.5	10.5
2	10.5	10.5
	10.5	10.5
	11.3	11.3
	11.3	11.3
3	11.3	11.3
	10.5	10.5
	11.3	11.3
	12.0	12.0
4	10.5	10.5
	10.5	10.5
	11.3	11.3
	11.3	11.3
5	11.3	11.3
	10.5	10.5
	12.0	12.0
	11.3	11.3
SSM-2 (244:15:22:55.765)		
1	10.5	10.5
	11.3	11.3
	10.5	10.5
	10.5	10.5
2	11.3	11.3
	10.5	10.5
	10.5	10.5
	10.5	10.5
3	10.5	10.5
	11.3	11.3
	9.8	9.8
	10.5	10.5
4	9.8	9.8
	11.3	11.3
	11.3	11.3
	10.5	10.5
5	11.3	11.3
	10.5	10.5
	10.5	10.5
	11.3	11.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 21 MODE V (2 of 3) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 244:15:26:38.528

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.2°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.3°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0			5	12.1	12.3			
4	12.1	12.3		12.1	12.3			
	12.1	12.3		12.1	12.3			
	12.1	12.3		12.1	12.3			
	12.1	12.3	SSM-2 (244:15:26:46.848)					
5	12.1	12.3	1	11.2	11.4			
	12.1	12.3		12.1	12.3			
	12.7	12.9		12.1	12.3			
	12.1	12.3		11.2	11.4			
SSM-1 (244:15:26:41.648)			2	12.7	12.9			
1	12.7	12.9		12.7	12.9			
	12.7	12.9		12.1	12.3			
	12.1	12.3		11.2	11.4			
	12.1	12.3	3	11.2	11.4			
2	12.7	12.9		12.7	12.9			
	12.7	12.9		12.7	12.9			
	12.7	12.9		12.7	12.9			
	12.1	12.3	4	12.1	12.3			
3	12.7	12.9		12.7	12.9			
	12.1	12.3		12.1	12.3			
	12.1	12.3		12.1	12.3			
	12.7	12.9	5	12.7	12.9			
4	12.7	12.9		12.7	12.9			
	12.1	12.3		12.7	12.9			
	12.1	12.3		12.1	12.3			
	12.1	12.3						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 21 MODE V (3 of 3), SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 244:15:30:23.443

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.3°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	14.4	14.8
	14.4	14.8
	15.7	16.1
	13.7	14.1
5	14.4	14.8
	15.1	15.5
	14.4	14.8
	14.4	14.8
6	14.4	14.8
	14.4	14.8
	13.7	14.4
	14.4	14.8
SSM-1 (244:15:30:26.562)		
1	14.4	14.8
	14.4	14.8
	13.7	14.4
	13.7	14.4
2	14.4	14.8
	13.7	14.4
	13.7	14.4
	13.7	14.4
3	13.7	14.4
	14.4	14.8
	13.7	14.4
	14.4	14.8
4	14.4	14.8
	15.1	15.5
	15.1	15.5
	15.1	15.5
5	15.7	16.1
	17.1	17.5
	17.1	17.5
	17.7	18.1
SSM-2 (244:15:30:31.762)		
1	17.1	17.5
	18.4	18.8
	16.5	16.9
	17.1	17.5
2	16.5	16.9
	15.7	16.1
	17.1	17.5
	16.5	16.9
3	15.7	16.1
	15.7	16.1
	16.5	16.9
	17.7	18.1
4	17.1	17.5
	17.1	17.5
	17.1	17.5
	16.5	16.9
5	17.1	17.5
	17.1	17.5
	15.7	16.1
	16.5	16.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (1 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 245:14:29:52.536

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
8	12.6	13.0
	13.4	13.8
	12.6	13.0
	14.2	14.6
9	13.4	13.8
	14.2	14.6
	12.6	13.0
	12.6	13.0
10	13.4	13.8
	12.6	13.0
	12.6	13.0
	11.8	12.2
11	12.6	13.0
	11.8	12.2
	11.8	12.2
	11.8	12.2
12	12.6	13.0
	11.8	12.2
	11.8	12.2
	11.8	12.2
13	12.6	13.0
	12.6	13.0
	12.6	13.0
	11.8	12.2
14	13.8	14.2
	13.0	13.4
	13.0	13.4
	12.2	12.6
15	13.0	13.4
	13.0	13.4
	13.0	13.4
	12.2	12.6
16	11.5	11.9
	11.5	11.9
	13.0	13.4
	12.2	12.6
17	12.2	12.6
	13.8	14.2
	12.2	12.6
	13.0	13.4
18	13.0	13.4
	13.0	13.4
	13.0	13.4
	12.2	12.6
19	13.0	13.4
	13.0	13.4
	11.5	11.9
	12.2	12.6
20	12.2	12.6
	13.0	13.4
	12.2	12.6
	12.2	12.6
SSM-1 (245:14:30:06.055)		
1	12.2	12.6
	13.0	13.4
	12.2	12.6
	12.2	12.6
2	13.0	13.4
	12.2	12.6
	11.5	11.9
	13.0	13.4
3	13.0	13.4
	13.0	13.4
	11.5	11.9
	12.2	12.6
4	12.2	12.6
	12.2	12.6
	13.0	13.4
	12.2	12.6
5	13.0	13.4
	12.2	12.6
	11.5	11.9
	12.2	12.6
6	11.5	11.9
	12.2	12.6
	12.2	12.6
	11.5	11.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (1 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
7	12.2	12.6		12.0	12.4		11.2	11.6
	12.2	12.6		12.0	12.4	5	12.0	12.4
	12.2	12.6	14	12.7	13.1		12.7	13.1
	11.5	11.9		13.5	13.9		12.0	12.4
8	12.2	12.6		12.7	13.1		12.7	13.1
	12.2	12.6		12.7	13.1	6	12.7	13.1
	12.2	12.6	15	12.7	13.1		12.7	13.1
	12.2	12.6		12.7	13.1		12.0	12.4
9	11.5	11.9		12.7	13.1		11.2	11.6
	11.5	11.9		12.0	12.4	7	12.7	13.1
	13.0	13.4	SSM-2 (245:14:30:21.655)				11.2	11.6
	12.2	12.6	1	12.0	12.4		12.0	12.4
10	11.5	11.9		12.7	13.1		12.0	12.4
	13.0	13.4		12.7	13.1	8	12.0	12.4
	12.2	12.6		12.7	13.1		12.0	12.4
	12.2	12.6	2	12.0	12.4		11.2	11.6
11	12.0	12.4		12.0	12.4		12.0	12.4
	12.0	12.4		12.0	12.4	9	12.0	12.4
	12.7	13.1		12.0	12.4		12.7	13.1
	12.7	13.1	3	12.0	12.4		11.2	11.6
12	12.7	13.1		12.0	12.4		12.7	13.1
	12.7	13.1		12.7	13.1	10	12.0	12.4
	12.0	12.4		12.7	13.1		12.0	12.4
	12.7	13.1	4	11.2	11.6		12.7	13.1
13	12.0	12.4		12.0	12.4		10.5	10.9
	12.0	12.4		12.7	13.1	11	12.7	13.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (1 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
11(Cont'd.)	11.2	11.6						
	12.0	12.4						
	12.0	12.4						
12	11.2	11.6						
	12.0	12.4						
	10.5	10.9						
	12.0	12.4						
13	11.2	11.6						
	11.2	11.6						
	12.0	12.4						
	12.0	12.4						
14	12.4	12.8						
	12.4	12.8						
	11.7	12.1						
	12.4	12.8						
15	10.9	11.3						
	12.4	12.8						
	11.7	12.1						
	12.4	12.8						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (2 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 245:14:33:40.798

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.2°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.3°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	12.6	12.8
	11.9	12.1
	12.6	12.8
	11.1	11.3
7	11.9	12.1
	11.1	11.3
	11.9	12.1
	13.3	13.5
8	11.9	12.1
	11.1	11.3
	11.9	12.1
	11.1	11.3
9	11.9	12.1
	11.1	11.3
	11.9	12.1
	12.6	12.8
10	11.9	12.1
	12.6	12.8
	11.1	11.3
	11.9	12.1
11	11.9	12.1
	11.9	12.1
	12.6	12.8
	11.9	12.1
12	11.9	12.1

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	11.9	12.1
	11.9	12.1
	12.6	12.8
13	11.9	12.1
	11.9	12.1
	11.9	12.1
	11.9	12.1
14	11.1	11.3
	11.1	11.3
	11.9	12.1
	11.9	12.1
15	11.9	12.1
	11.1	11.3
	11.1	11.3
	11.9	12.1
16	11.1	11.3
	12.6	12.8
	11.9	12.1
	11.1	11.3
17	11.1	11.3
	11.9	12.1
	12.6	12.8
	11.9	12.1
18	11.1	11.3
	11.9	12.1
	11.9	12.1

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	11.1	11.3
19	11.9	12.1
	11.1	11.3
	11.1	11.3
	11.9	12.1
20	11.9	12.1
	11.1	11.3
	11.1	11.3
	11.1	11.3
SSM-1	(245:14:33:56.398)	
1	11.1	11.3
	11.9	12.1
	10.2	10.4
	11.1	11.3
2	11.9	12.1
	13.3	13.5
	11.1	11.3
	11.9	12.1
3	12.6	12.8
	11.9	12.1
	11.1	11.3
	11.9	12.1
4	12.6	12.8
	11.1	11.3
	12.6	12.8
	11.9	12.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (2 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.2°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.3°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
5	11.9	12.1		11.1	11.3		11.9	12.1
	11.1	11.3		11.9	12.1	3	12.6	12.8
	11.1	11.3	12	11.1	11.3		12.6	12.8
	11.1	11.3		11.9	12.1		11.9	12.1
6	10.2	10.4		11.9	12.1		11.9	12.1
	12.6	12.8		11.9	12.1	4	12.6	12.8
	11.9	12.1	13	11.1	11.3		11.9	12.1
	11.9	12.1		12.6	12.8		11.1	11.3
7	11.9	12.1		11.9	12.1		11.1	11.3
	11.1	11.3		11.9	12.1	5	12.6	12.8
	11.1	11.3	14	11.9	12.1		12.6	12.8
	11.9	12.1		11.9	12.1		12.6	12.8
8	11.9	12.1		11.9	12.1		12.6	12.8
	11.1	11.3		11.9	12.1	6	No Data	
	11.1	11.3	15	11.1	11.3	7	No Data	
	11.9	12.1		11.1	11.3	8	12.9	13.1
9	11.9	12.1		11.9	12.1		12.3	12.5
	11.1	11.3		11.1	11.3		12.3	12.5
	11.9	12.1	SSM-2 (245:14:34:11.998)				12.9	13.1
	11.1	11.3	1	11.1	11.3	9	12.9	13.1
10	11.9	12.1		11.1	11.3		13.6	13.8
	11.1	11.3		11.9	12.1		12.3	12.5
	11.1	11.3		11.9	12.1		12.3	12.5
	11.1	11.3	2	11.9	12.1	10	12.9	13.1
11	11.1	11.3		11.9	12.1		12.3	12.5
	11.9	12.1		11.9	12.1		12.9	13.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (2 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.2°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.3°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
10(Cont'd.)	12.3	12.5						
11	12.3	12.5						
	12.9	13.1						
	12.3	12.5						
	12.3	12.5						
12	11.4	11.6						
	11.4	11.6						
	11.4	11.6						
	12.9	13.1						
13	12.3	12.5						
	12.9	13.1						
	12.3	12.5						
	12.3	12.5						
14	11.4	11.6						
	11.4	11.6						
	12.9	13.1						
	11.4	11.6						
15	12.3	12.5						
	11.4	11.6						
	11.4	11.6						
	12.9	13.1						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (3 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 245:14:37:20.801

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.15°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.2°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				13.1	13.0		12.5	12.4
6	12.5	12.4		13.1	13.0	19	11.6	11.5
	12.5	12.4		14.4	14.3		12.5	12.4
	12.5	12.4	13	13.8	13.7		13.1	13.0
	12.5	12.4		13.1	13.0		13.1	13.0
7	11.6	11.5		13.1	13.0	20	11.6	11.5
	11.6	11.5		13.8	13.7		13.1	13.0
	11.6	11.5	14	13.8	13.7		11.6	11.5
	12.5	12.4		13.8	13.7		11.6	11.5
8	11.6	11.5		13.1	13.0	SSM-1	(245:14:37:36.401)	
	11.6	11.5		13.1	13.0	1	12.5	12.4
	11.6	11.5	15	13.1	13.0		12.5	12.4
	11.6	11.5		13.8	13.7		12.5	12.4
9	11.6	11.5		13.1	13.0		13.9	13.7
	12.5	12.4		12.5	12.4	2	12.5	12.4
	12.5	12.4	16	13.1	13.0		12.5	12.4
	12.5	12.4		13.1	13.0		13.1	13.0
10	13.1	13.0		12.5	12.4		11.6	11.5
	13.1	13.0		13.1	13.0	3	13.1	13.0
	13.1	13.0	17	12.5	12.4		12.5	12.4
	14.4	14.3		12.5	12.4		10.7	10.6
11	13.1	13.0		10.7	10.6		12.5	12.4
	13.1	13.0		13.1	13.0	4	12.5	12.4
	13.1	13.0	18	12.5	12.4		12.5	12.4
	12.5	12.4		12.5	12.4		13.1	13.0
12	13.1	13.0		10.7	10.6		11.6	11.5

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (3 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.15°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.2°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
5	12.5	12.4		13.9	13.7		12.8	12.7
	11.6	11.5		13.9	13.7	3	13.1	13.0
	12.5	12.4	12	14.4	14.3		13.9	13.7
	11.6	11.5		13.1	13.0		11.6	11.5
6	12.5	12.4		13.9	13.7		13.9	13.7
	13.1	13.0		12.5	12.4	4	13.9	13.7
	12.5	12.4	13	13.9	13.7		13.1	13.0
	11.6	11.5		13.1	13.0		12.5	12.4
7	13.1	13.0		13.1	13.0		12.5	12.4
	11.6	11.5		13.1	13.0	5	12.5	12.4
	12.5	12.4	14	13.1	13.0		13.1	13.0
	12.5	12.4		13.1	13.0		12.5	12.4
8	13.1	13.0		13.1	13.0		12.5	12.4
	11.6	11.5		13.1	13.0	6	12.8	12.7
	13.1	13.0	15	13.1	13.0		13.4	13.3
	13.9	13.7		11.6	11.5		14.1	14.0
9	13.9	13.7		12.5	12.4		11.9	11.8
	12.5	12.4		13.1	13.0	7	11.9	11.8
	14.4	14.3	SSM-2	(245:14:37:52.001)			13.4	13.3
	13.9	13.7	1	12.5	12.4		12.8	12.7
10	13.9	13.7		13.9	13.7		12.8	12.7
	13.9	13.7		12.5	12.4	8	12.8	12.7
	13.1	13.0		12.5	12.4		12.8	12.7
	13.9	13.7	2	12.8	12.7		11.9	11.8
11	13.9	13.7		12.8	12.7		11.9	11.8
	13.9	13.7		12.8	12.7	9	13.4	13.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (3 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.15°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.2°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
9(Cont'd.)	12.8	12.7						
	13.4	13.3						
	11.9	11.8						
10	11.9	11.8						
	12.8	12.7						
	12.8	12.7						
	12.8	12.7						
11	12.8	12.7						
	12.8	12.7						
	12.8	12.7						
	11.9	11.8						
12	12.8	12.7						
	12.8	12.7						
	12.8	12.7						
	12.8	12.7						
13	12.8	12.7						
	11.9	11.8						
	11.9	11.8						
	12.8	12.7						
14	12.8	12.7						
	12.8	12.7						
	11.9	11.8						
	12.8	12.7						
15	11.9	11.8						
	11.9	11.8						
	12.8	12.7						
	12.8	12.7						

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (4 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 245:14:40:56.727

ESTIMATED POINTING BOUNDS

$\xi_p = 0.15°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = 0.2°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				13.2	13.2		13.8	13.8
6	13.2	13.2		13.8	13.8	19	13.2	13.2
	12.3	12.3		13.8	13.8		13.2	13.2
	13.8	13.8	13	12.3	12.3		13.2	13.2
	13.2	13.2		13.2	13.2		13.8	13.8
7	13.2	13.2		14.5	14.5	20	13.2	13.2
	13.8	13.8		13.8	13.8		13.2	13.2
	14.5	14.5	14	13.2	13.2		13.8	13.8
	13.2	13.2		13.8	13.8		12.3	12.3
8	13.8	13.8		12.3	12.3	SSM-1 (245:14:41:12.327)		
	13.2	13.2		13.8	13.8	1	12.3	12.3
	13.8	13.8	15	13.8	13.8		13.2	13.2
	13.2	13.2		12.3	12.3		14.5	14.5
9	13.8	13.8		12.3	12.3		13.2	13.2
	13.8	13.8		13.2	13.2	2	13.8	13.8
	13.8	13.8	16	13.8	13.8		13.8	13.8
	13.2	13.2		13.2	13.2		14.5	14.5
10	12.3	12.3		12.3	12.3		12.3	12.3
	13.2	13.2		13.2	13.2	3	13.8	13.8
	13.2	13.2	17	13.2	13.2		13.8	13.8
	13.8	13.8		12.3	12.3		13.8	13.8
11	12.3	12.3		13.8	13.8		13.8	13.8
	12.3	12.3		13.2	13.2	4	13.2	13.2
	12.3	12.3	18	13.2	13.2		13.2	13.2
	11.3	11.3		13.8	13.8		13.2	13.2
12	12.3	12.3		13.2	13.2		13.8	13.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (4 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \underline{0.15°}$; $\xi_r = 0°$

$\psi = \underline{0.53°}$

$\xi_p = 0°$; $\xi_r = \underline{0.2°}$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5	13.2	13.2		13.8	13.8		14.5	14.5
	13.8	13.8		14.5	14.5	3	13.8	13.8
	15.1	15.1	12	13.8	13.8		13.8	13.8
	13.8	13.8		13.8	13.8		14.5	14.5
6	13.8	13.8		13.8	13.8		13.8	13.8
	13.2	13.2		13.2	13.2	4	14.5	14.5
	13.8	13.8	13	13.8	13.8		13.8	13.8
	13.2	13.2		13.2	13.2		14.5	14.5
7	13.2	13.2		13.8	13.8		13.8	13.8
	13.8	13.8		14.5	14.5	5	13.8	13.8
	14.5	14.5	14	14.5	14.5		13.8	13.8
	13.8	13.8		14.5	14.5		13.8	13.8
8	13.8	13.8		13.8	13.8		13.8	13.8
	13.8	13.8		14.5	14.5	6	13.8	13.8
	13.8	13.8	15	13.8	13.8		13.8	13.8
	13.8	13.8		13.2	13.2		13.2	13.2
9	13.2	13.2		13.8	13.8		12.3	12.3
	13.8	13.8		14.5	14.5	7	13.8	13.8
	13.2	13.2	SSM-2 (245:14:41:32.087)				13.2	13.2
	14.5	14.5	1	13.8	13.8		13.8	13.8
10	13.8	13.8		14.5	14.5		13.2	13.2
	13.2	13.2		13.8	13.8	8	13.8	13.8
	13.8	13.8		13.8	13.8		13.8	13.8
	13.8	13.8	2	13.8	13.8		13.8	13.8
11	14.5	14.5		14.5	14.5		13.8	13.8
	14.5	14.5		13.8	13.8	9	13.2	13.2

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (4 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = 0.15^\circ$; $\xi_r = 0^\circ$

$\psi = 0.53^\circ$

$\xi_p = 0^\circ$; $\xi_r = 0.2^\circ$

FRAME NO.	$\sigma^\circ(\psi)$ $(\xi_p,0^\circ)$	$\sigma^\circ(\psi)$ $(0^\circ,\xi_r)$	FRAME NO.	$\sigma^\circ(\psi)$ $(\xi_p,0^\circ)$	$\sigma^\circ(\psi)$ $(0^\circ,\xi_r)$	FRAME NO.	$\sigma^\circ(\psi)$ $(\xi_p,0^\circ)$	$\sigma^\circ(\psi)$ $(0^\circ,\xi_r)$
9(Cont'd.)	13.8	13.8		13.2	13.2			
	13.2	13.2						
	13.2	13.2						
10	13.8	13.8						
	13.2	13.2						
	13.8	13.8						
	13.8	13.8						
11	13.2	13.2						
	13.2	13.2						
	14.5	14.5						
	13.8	13.8						
12	13.2	13.2						
	13.2	13.2						
	13.2	13.2						
	13.8	13.8						
13	13.2	13.2						
	13.8	13.8						
	13.2	13.2						
	13.8	13.8						
14	13.8	13.8						
	13.8	13.8						
	13.2	13.2						
	13.2	13.2						
15	13.2	13.2						
	13.2	13.2						
	13.2	13.2						

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (5 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 245:14:44:41.342

ESTIMATED POINTING BOUNDS

$\xi_p = 0°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = 0°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				10.8	10.8		12.9	12.9
6	12.7	12.7		13.6	13.6	19	12.9	12.9
	12.7	12.7		12.7	12.7		13.8	13.8
	11.8	11.8	13	12.7	12.7		13.8	13.8
	13.6	13.6		13.6	13.6		12.9	12.9
7	11.9	11.9		12.7	12.7	20	12.9	12.9
	12.9	12.9		12.7	12.7		12.9	12.9
	13.8	13.8	14	13.8	13.8		12.9	12.9
	12.9	12.9		12.9	12.9		12.9	12.9
8	12.9	12.9		12.9	12.9	SSM-1	(245:14:44:56.942)	
	13.8	13.8		11.9	11.9	1	12.9	12.9
	13.8	13.8	15	12.7	12.7		11.9	11.9
	12.9	12.9		12.7	12.7		12.9	12.9
9	12.7	12.7		13.6	13.6		12.9	12.9
	12.7	12.7		11.8	11.8	2	13.8	13.8
	11.8	11.8	16	12.7	12.7		12.9	12.9
	12.7	12.7		13.6	13.6		12.9	12.9
10	12.7	12.7		12.7	12.7		12.9	12.9
	13.6	13.6		14.3	14.3	3	12.9	12.9
	12.7	12.7	17	11.8	11.8		12.9	12.9
	12.7	12.7		12.7	12.7		12.9	12.9
11	13.8	13.8		12.7	12.7		12.9	12.9
	12.9	12.9		12.7	12.7	4	12.9	12.9
	12.9	12.9	18	11.9	11.9		11.9	11.9
	12.9	12.9		12.9	12.9		13.8	13.8
12	12.7	12.7		12.9	12.9		12.9	12.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (5 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = 0°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = 0°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
5	11.9	11.9		12.9	12.9		13.8	13.8
	12.9	12.9		12.9	12.9	3	12.9	12.9
	12.9	12.9	12	11.9	11.9		11.9	11.9
	11.9	11.9		12.9	12.9		12.9	12.9
6	12.9	12.9		12.9	12.9		12.9	12.9
	13.8	13.8		12.9	12.9	4	12.9	12.9
	12.9	12.9	13	13.8	13.8		13.8	13.8
	12.9	12.9		12.9	12.9		12.9	12.9
7	12.9	12.9		12.9	12.9		12.9	12.9
	12.9	12.9		13.8	13.8	5	11.9	11.9
	12.9	12.9	14	13.8	13.8		12.9	12.9
	13.8	13.8		12.9	12.9		11.9	11.9
8	13.8	13.8		11.9	11.9		12.9	12.9
	13.8	13.8		12.9	12.9	6	13.8	13.8
	12.9	12.9	15	12.9	12.9		12.9	12.9
	12.9	12.9		14.5	14.5		11.9	11.9
9	12.9	12.9		13.8	13.8		11.9	11.9
	12.9	12.9		12.9	12.9	7	12.9	12.9
	13.8	13.8	SSM-2 (245:14:45:12.542)				11.9	11.9
	12.9	12.9	1	13.8	13.8		12.9	12.9
10	12.9	12.9		12.9	12.9		12.9	12.9
	12.9	12.9		13.8	13.8	8	13.8	13.8
	11.9	11.9		12.9	12.9		12.9	12.9
	11.9	11.9	2	11.9	11.9		13.8	13.8
11	11.9	11.9		12.9	12.9		12.9	12.9
	11.9	11.9		12.9	12.9	9	13.8	13.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 22 MODE I (5 of 5) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = 0°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = 0°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
9(Cont'd.)	12.9	12.9						
	12.9	12.9						
	11.9	11.9						
10	12.9	12.9						
	12.9	12.9						
	13.8	13.8						
	12.9	12.9						
11	11.9	11.9						
	12.9	12.9						
	12.9	12.9						
	13.8	13.8						
12	12.9	12.9						
	13.8	13.8						
	13.8	13.8						
	12.9	12.9						
13	12.9	12.9						
	12.9	12.9						
	13.8	13.8						
	12.9	12.9						
14	11.9	11.9						
	12.9	12.9						
	13.8	13.8						
	13.8	13.8						
15	12.9	12.9						
	13.8	13.8						
	12.9	12.9						
	12.9	12.9						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 24 MODE III (1 of 3) SUBMODE 3

FIRST FRAME START TIME (JSC/GMT) 246:15:35:42.782

ESTIMATED POINTING BOUNDS

$\xi_p = 0.15°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = 0.2°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0			4	11.4	11.4		11.7	11.7
4	12.8	12.8		11.4	11.4		11.7	11.7
	11.4	11.4		11.1	11.1		11.4	11.4
	11.7	11.7		11.7	11.7			
	12.1	12.1	5	11.7	11.7			
5	11.4	11.4		11.7	11.7			
	11.4	11.4		11.4	11.4			
	11.7	11.7		11.4	11.4			
	11.4	11.4	SSM-2 (246:15:35:51.102)					
6	11.4	11.4	1	11.1	11.1			
	11.4	11.4		12.1	12.1			
	11.7	11.7		11.4	11.4			
	11.7	11.7		11.4	11.4			
SSM-1 (246:15:35:45.902)			2	11.7	11.7			
1	11.7	11.7		11.4	11.4			
	11.7	11.7		11.7	11.7			
	11.1	11.1		11.4	11.4			
	11.7	11.7	3	11.7	11.7			
2	11.7	11.7		11.4	11.4			
	11.7	11.7		11.4	11.4			
	11.7	11.7		12.1	12.1			
	11.4	11.4	4	11.4	11.4			
3	11.7	11.7		11.7	11.7			
	11.7	11.7		11.7	11.7			
	11.7	11.7		11.4	11.4			
	11.1	11.1	5	11.4	11.4			

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 24 MODE III (2 of 3) SUBMODE 3

FIRST FRAME START TIME (JSC/GMT) 246:15:40:07.126

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.2°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.3°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	11.4	11.6
	12.3	12.5
	12.3	12.5
	13.0	13.2
5	11.4	11.6
	13.0	13.2
	12.3	12.5
	13.0	13.2
6	12.3	12.5
	11.4	11.6
	12.3	12.5
	13.0	13.2
SSM-1 (246:15:40:10.247)		
1	12.3	12.5
	11.4	11.6
	12.3	12.5
	13.6	13.8
2	13.0	13.2
	13.0	13.2
	12.3	12.5
	13.0	13.2
3	13.0	13.2
	12.3	12.5
	12.3	12.5
	11.4	11.6
4	12.3	12.5
	12.3	12.5
	10.5	10.7
	12.3	12.5
5	11.4	11.6
	11.4	11.6
	13.0	13.2
	11.4	11.6
SSM-2 (246:15:40:15.446)		
1	11.4	11.6
	12.3	12.5
	13.0	13.2
	13.0	13.2
2	11.7	11.9
	12.6	12.8
	12.6	12.8
	11.7	11.9
3	12.3	12.5
	12.3	12.5
	11.4	11.6
	12.3	12.5
4	11.7	11.9
	11.7	11.9
	12.6	12.8
	12.6	12.8
5	13.3	13.5
	11.7	11.9
	13.3	13.5
	12.6	12.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 24 MODE III (3 of 3) SUBMODE 3

FIRST FRAME START TIME (JSC/GMT) 246:15:44:40.992

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	11.4	11.8
	11.4	11.8
	10.5	10.9
	11.4	11.8
5	11.4	11.8
	11.4	11.8
	11.4	11.8
	11.4	11.8
6	10.5	10.9
	10.5	10.9
	10.5	10.9
	11.4	11.8
SSM-1 (246:15:44:44.112)		
1	12.4	12.8
	11.4	11.8
	10.5	10.9
	12.4	12.8
2	9.5	9.9
	11.4	11.8
	11.4	11.8
	11.4	11.8
3	10.5	10.9
	11.4	11.8
	11.4	11.8
	11.4	11.8
4	10.5	10.9
	12.4	12.8
	10.5	10.9
	10.5	10.9
5	11.4	11.8
	11.4	11.8
	11.4	11.8
	11.4	11.8
SSM-2 (246:15:44:49.312)		
1	10.5	10.9
	11.4	11.8
	10.5	10.9
	11.4	11.8
2	11.4	11.8
	10.5	10.9
	11.4	11.8
	12.4	12.8
3	10.5	10.9
	10.5	10.9
	11.4	11.8
	12.4	12.8
4	10.5	10.9
	11.4	11.8
	11.4	11.8
	11.4	11.8
5	11.4	11.8
	11.4	11.8
	13.3	13.7
	12.4	12.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 25 MODE V (1 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 247:14:51:39.052

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	11.5	11.5
	10.8	10.8
	11.5	11.5
	11.5	11.5
5	11.5	11.5
	12.3	12.3
	10.8	10.8
	12.3	12.3
6	10.8	10.8
	11.5	11.5
	11.5	11.5
	11.5	11.5
SSM-1 (247:14:51:42.171)		
1	10.8	10.8
	10.8	10.8
	11.5	11.5
	11.2	11.2
2	11.5	11.5
	11.2	11.2
	10.8	10.8
	11.5	11.5
3	10.8	10.8
	11.5	11.5
	10.8	10.8
	11.5	11.5
4	10.8	10.8
	11.5	11.5
	12.3	12.3
	10.8	10.8
5	11.5	11.5
	10.8	10.8
	11.5	11.5
	11.5	11.5
SSM-2 (247:14:51:47.372)		
1	10.8	10.8
	11.5	11.5
	10.8	10.8
	10.8	10.8
2	10.8	10.8
	11.5	11.5
	11.5	11.5
	11.5	11.5
3	11.2	11.2
	11.2	11.2
	11.9	11.9
	11.9	11.9
4	11.9	11.9
	11.2	11.2
	11.9	11.9
	11.2	11.2
5	11.9	11.9
	11.2	11.2
	11.9	11.9
	11.9	11.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 25 MODE V (2 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 247:14:55:10.636

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.2°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.3°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	13.4	13.6
	13.4	13.6
	14.1	14.3
	12.7	12.9
5	13.4	13.6
	12.7	12.9
	14.1	14.3
	12.7	12.9
6	13.4	13.6
	12.7	12.9
	13.4	13.6
	15.5	15.7
SSM-1 (247:14:55:13.756)		
1	13.4	13.6
	15.5	15.7
	12.7	12.9
	13.4	13.6
2	13.4	13.6
	12.7	12.9
	12.7	12.9
	13.4	13.6
3	14.1	14.3
	15.5	15.7
	13.4	13.6
	13.4	13.6
4	13.4	13.6
	13.4	13.6
	13.4	13.6
	12.7	12.9
5	13.4	13.6
	12.7	12.9
	12.7	12.9
	12.7	12.9
SSM-2 (247:14:55:18.956)		
1	13.4	13.6
	13.4	13.6
	13.4	13.6
	13.4	13.6
2	14.1	14.3
	13.4	13.6
	12.7	12.9
	13.4	13.6
3	12.7	12.9
	13.4	13.6
	13.4	13.6
	12.7	12.9
4	12.7	12.9
	13.4	13.6
	12.7	12.9
	13.4	13.6
5	13.4	13.6
	12.7	12.9
	14.1	14.3
	12.7	12.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 27 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 249:21:19:47.866

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	12.9	13.0
	12.9	13.0
	12.9	13.0
	12.9	13.0
5	12.1	12.2
	12.9	13.0
	12.9	13.0
	13.7	13.8
6	12.1	12.2
	12.1	12.2
	12.9	13.0
	12.1	12.2
SSM-1 (249:21:19:50.987)		
1	12.9	13.0
	12.1	12.2
	12.1	12.2
	12.1	12.2
2	12.1	12.2
	12.9	13.0
	12.9	13.0
	12.1	12.2
3	11.3	11.4
	12.1	12.2
	12.1	12.2
	12.1	12.2
4	12.1	12.2
	12.9	13.0
	12.9	13.0
	12.1	12.2
5	11.8	11.9
	11.8	11.9
	11.8	11.9
	13.3	13.4
SSM-2 (249:21:19:56.186)		
1	12.9	13.0
	12.1	12.2
	12.1	12.2
	12.1	12.2
2	12.1	12.2
	11.3	11.4
	12.1	12.2
	11.3	11.4
3	13.3	13.4
	12.5	12.6
	12.5	12.6
	11.8	11.9
4	12.1	12.2
	12.1	12.2
	12.1	12.2
	12.1	12.2
5	11.8	11.9
	11.8	11.9
	12.5	12.6
	12.5	12.6

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 28 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 250:20:35:16.545

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.2°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.3°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0		
4	12.9	13.1
	11.2	11.4
	12.9	13.1
	11.2	11.4
5	11.2	11.4
	12.9	13.1
	12.9	13.1
	11.2	11.4
6	11.2	11.4
	12.9	13.1
	10.4	10.6
	11.2	11.4
SSM-1 (250:20:35:19.665)		
1	9.6	9.8
	11.2	11.4
	11.2	11.4
	10.4	10.6
2	12.9	13.1
	11.2	11.4
	12.9	13.1
	12.9	13.1
3	11.2	11.4
	11.2	11.4
	11.2	11.4
	11.2	11.4
4	11.2	11.4
	10.4	10.6
	10.4	10.6
	11.2	11.4
5	11.2	11.4
	12.9	13.1
	11.2	11.4
	11.2	11.4
SSM-2 (250:20:35:24.865)		
1	12.9	13.1
	12.9	13.1
	11.2	11.4
	12.9	13.1
2	11.2	11.4
	11.2	11.4
	10.4	10.6
	10.4	10.6
3	11.6	11.8
	11.6	11.8
	11.6	11.8
	11.6	11.8
4	12.3	12.5
	11.6	11.8
	12.3	12.5
	11.6	11.8
5	10.8	11.0
	11.6	11.8
	12.3	12.5
	11.6	11.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 39 MODE V (1 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 256:19:45:49.453

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.69°$

$\xi_p = 0°$; $\xi_r = \pm 0.9°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	13.6	15.0
	14.5	15.9
	13.6	15.0
	13.6	15.0
5	13.6	15.0
	13.6	15.0
	13.6	15.0
	14.5	15.9
6	14.5	15.9
	14.5	15.9
	13.6	15.0
	14.5	15.9
SSM-1 (256:19:45:52.573)		
1	12.8	14.2
	14.5	15.9
	14.5	15.9
	14.5	15.9
2	15.2	16.6
	14.5	15.9
	13.6	15.0
	13.6	15.0
3	14.5	15.9
	15.2	16.6
	14.5	15.9
	14.5	15.9
4	13.6	15.0
	13.6	15.0
	13.6	15.0
	14.5	15.9
5	14.5	15.9
	14.5	15.9
	15.2	16.6
	13.6	15.0
SSM-2 (256:19:45:57.773)		
1	14.5	15.9
	15.2	16.6
	14.5	15.9
	14.5	15.9
2	14.5	15.9
	14.5	15.9
	14.5	15.9
	13.6	15.0
3	15.2	16.6
	14.5	15.9
	14.5	15.9
	14.5	15.9
4	15.2	16.6
	13.6	15.0
	14.5	15.9
	14.5	15.9
5	13.6	15.0
	15.2	16.6
	14.5	15.9
	14.5	15.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-3 PASS 39 MODE V (2 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 256:19:49:27.424

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.8°$; $\xi_r = 0°$

$\psi = 0.89°$

$\xi_p = 0°$; $\xi_r = \pm 1.1°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	11.6	13.5
	11.0	12.9
	11.0	12.9
	11.0	12.9
5	11.6	13.5
	11.0	12.9
	10.3	12.2
	11.0	12.9
6	11.0	12.9
	11.0	12.9
	10.3	12.2
	11.0	12.9
SSM-1 (256:19:49:30.544)		
1	11.0	12.9
	10.3	12.2
	10.3	12.2
	11.0	12.9
2	10.3	12.2
	10.3	12.2
	10.3	12.2
	11.0	12.9
3	11.0	12.9
	11.0	12.9
	10.3	12.2
	11.0	12.9
4	11.0	12.9
	10.3	12.2
	10.3	12.2
	11.0	12.9
5	10.3	12.2
	10.3	12.2
	10.3	12.2
	10.3	12.2
SSM-2 (256:19:49:35.744)		
1	10.3	12.2
	10.3	12.2
	9.6	11.5
	10.3	12.2
2	9.6	11.5
	9.6	11.5
	8.9	10.8
	9.6	11.5
3	9.6	11.5
	9.6	11.5
	9.6	11.5
	9.6	11.5
4	9.6	11.5
	8.9	10.8
	8.9	10.8
	8.9	10.8
5	8.9	10.8
	9.6	11.5
	8.9	10.8
	9.6	11.5

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

3.3 MISSION SL-4 σ°/L_p DATA TABLES

MISSION SL-4 PASS 54 MODE I (3 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 334:16:42:46.774

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				12.2	12.4		12.2	12.4
6	13.0	13.2		11.4	11.5	19	11.4	11.5
	13.0	13.2		12.2	12.4		11.4	11.5
	12.2	12.4	13	12.2	12.4		12.2	12.4
	11.4	11.5		13.0	13.2		12.2	12.4
7	13.8	14.0		13.0	13.2	20	11.4	11.5
	13.0	13.2		12.2	12.4		12.2	12.4
	12.2	12.4	14	12.2	12.4		11.4	11.5
	12.2	12.4		12.2	12.4		12.2	12.4
8	13.0	13.2		11.4	11.5	SSM-1	(334:16:43:02.374)	
	13.0	13.2		11.4	11.5	1	13.0	13.2
	11.4	11.5	15	12.2	12.4		12.2	12.4
	11.4	11.5		11.4	11.5		12.2	12.4
9	12.2	12.4		11.4	11.5		12.2	12.4
	12.2	12.4		12.2	12.4	2	13.0	13.2
	13.0	13.2	16	11.4	11.5		11.4	11.5
	12.2	12.4		12.2	12.4		11.4	11.5
10	12.2	12.4		11.4	11.5		11.4	11.5
	11.4	11.5		12.2	12.4	3	13.0	13.2
	12.2	12.4	17	12.2	12.4		12.2	12.4
	12.2	12.4		12.2	12.4		12.2	12.4
11	13.0	13.2		11.4	11.5		13.0	13.2
	12.2	12.4		11.4	11.5	4	12.2	12.4
	11.4	11.5	18	11.4	11.5		13.0	13.2
	12.2	12.4		11.4	11.5		12.2	12.4
12	12.2	12.4		12.2	12.4		13.0	13.2

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 54 MODE I (3 of 4) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5	11.4	11.5
	13.0	13.2
	11.4	11.5
	11.4	11.5
6	12.2	12.4
	9.8	9.9
	10.6	10.8
	11.4	11.5
7	11.4	11.5
	11.4	11.5
	11.4	11.5
	11.4	11.5
8	12.3	12.5
	11.5	11.7
	12.3	12.5
	10.7	10.9
9	12.3	12.5
	11.5	11.7
	10.7	10.9
	10.7	10.9
10	12.3	12.5
	11.5	11.7
	12.3	12.5
	10.7	10.9
11	11.5	11.7
	11.5	11.7

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	11.5	11.7
	12.3	12.5
12	11.5	11.7
	12.3	12.5
	10.7	10.9
	11.5	11.7
13	10.7	10.9
	11.5	11.7
	11.5	11.7
	13.1	13.3
SSM-2 (334:16:43:19.014)		
1	12.3	12.5
	11.5	11.7
	11.5	11.7
	10.7	10.9
2	11.5	11.7
	11.5	11.7
	11.5	11.7
	11.5	11.7
3	11.5	11.7
	10.7	10.9
	10.7	10.9
	10.7	10.9
4	11.5	11.7
	11.5	11.7
	13.1	13.3

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	10.7	10.9
5	11.5	11.7
	10.7	10.9
	11.5	11.7
	11.5	11.7
6	11.5	11.7
	11.5	11.7
	11.5	11.7
	11.5	11.7
7	9.9	10.0
	11.5	11.7
	10.7	10.9
	10.7	10.9
8	10.7	10.9
	12.3	12.5
	11.5	11.7
	9.9	10.0
9	11.5	11.7
	10.7	10.9
	10.7	10.9
	10.7	10.9
10	11.5	11.7
	11.5	11.7
	11.5	11.7
	10.7	10.9
11	11.6	11.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 54 MODE I (3 of 4) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
11(Cont'd.)	12.4	12.6						
	12.4	12.6						
	12.4	12.6						
12	12.4	12.6						
	12.4	12.6						
	10.8	11.0						
	11.6	11.8						
13	11.6	11.8						
	11.6	11.8						
	11.6	11.8						
	12.4	12.6						
14	11.6	11.8						
	11.6	11.8						
	10.8	11.0						
	10.8	11.0						
15	10.8	11.0						
	11.6	11.8						
	10.0	10.1						
	11.6	11.8						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 54 MODE I (4 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 334:16:46:46.799

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.3°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.35°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				11.2	11.3		10.4	10.5
6	10.2	10.4		9.5	9.6	19	9.5	9.6
	10.2	10.4		11.2	11.3		10.4	10.5
	11.1	11.2	13	11.2	11.3		11.2	11.3
	11.1	11.2		12.0	12.1		11.2	11.3
7	11.1	11.2		12.0	12.1	20	10.4	10.5
	12.9	13.0		12.0	12.1		10.4	10.5
	11.1	11.2	14	11.2	11.3		10.4	10.5
	10.2	10.4		11.2	11.3		11.2	11.3
8	10.2	10.4		11.2	11.3	SSM-1	(334:16:47:02.399)	
	11.1	11.2		10.4	10.5	1	9.5	9.6
	11.1	11.2	15	10.4	10.5		11.2	11.3
	11.1	11.2		10.4	10.5		10.4	10.5
9	11.1	11.2		11.2	11.3		11.2	11.3
	11.1	11.2		11.2	11.3	2	11.2	11.3
	11.1	11.2	16	11.2	11.3		11.2	11.3
	11.1	11.2		11.2	11.3		10.4	10.5
10	12.0	12.1		10.4	10.5		11.2	11.3
	12.0	12.1		12.0	12.1	3	11.2	11.3
	11.2	11.3	17	11.2	11.3		11.2	11.3
	9.5	9.6		10.4	10.5		11.2	11.3
11	10.4	10.5		10.4	10.5		10.4	10.5
	11.2	11.3		10.4	10.5	4	10.4	10.5
	10.4	10.5	18	12.0	12.1		11.2	11.3
	11.2	11.3		10.4	10.5		10.4	10.5
12	11.2	11.3		11.2	11.3		12.0	12.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 54 MODE I (4 of 4) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.3°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.35°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5	11.2	11.3		9.5	9.6		10.4	10.5
	12.0	12.1		10.4	10.5	3	9.5	9.6
	9.5	9.6	12	10.4	10.5		11.2	11.3
	11.2	11.3		10.4	10.5		11.2	11.3
6	9.5	9.6		9.5	9.6		9.5	9.6
	12.0	12.1		10.4	10.5	4	10.4	10.5
	11.2	11.3	13	10.4	10.5		12.0	12.1
	11.2	11.3		11.2	11.3		10.4	10.5
7	10.4	10.5		11.2	11.3		10.4	10.5
	9.5	9.6		10.4	10.5	5	9.5	9.6
	11.2	11.3	14	11.2	11.3		11.2	11.3
	10.4	10.5		10.4	10.5		10.4	10.5
8	11.2	11.3		11.2	11.3		11.2	11.3
	11.2	11.3		9.5	9.6	6	10.4	10.5
	10.4	10.5	15	9.5	9.6		10.4	10.5
	11.2	11.3		10.4	10.5		11.2	11.3
9	10.4	10.5		10.4	10.5		10.4	10.5
	11.2	11.3		10.4	10.5	7	9.5	9.6
	10.4	10.5	SSM-2	(334:16:47:17.999)			10.4	10.5
	11.2	11.3	1	10.4	10.5		9.5	9.6
10	11.2	11.3		10.4	10.5		10.4	10.5
	10.4	10.5		11.2	11.3	8	9.5	9.6
	11.2	11.3		10.4	10.5		9.5	9.6
	11.2	11.3	2	11.2	11.3		10.4	10.5
11	11.2	11.3		11.2	11.3		10.4	10.5
	9.5	9.6		11.2	11.3	9	10.4	10.5

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 54 MODE I (4 of 4) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.3°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.35°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
9(Cont'd.)	11.2	11.3						
	11.2	11.3						
	10.4	10.5						
10	10.4	10.5						
	11.2	11.3						
	9.5	9.6						
	8.7	8.8						
11	9.5	9.6						
	9.5	9.6						
	11.2	11.3						
	10.4	10.5						
12	11.2	11.3						
	10.4	10.5						
	10.4	10.5						
	9.5	9.6						
13	10.4	10.5						
	11.2	11.3						
	10.4	10.5						
	10.4	10.5						
14	9.5	9.6						
	10.4	10.5						
	9.5	9.6						
	10.4	10.5						
15	9.5	9.6						
	10.4	10.5						
	9.5	9.6						
	10.4	10.5						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 55 MODE I (1 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 335:17:30:21.190

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	9.7	9.9
	7.3	7.5
	12.1	12.2
	13.7	13.9
7	13.7	13.9
	8.9	9.1
	7.3	7.5
	8.9	9.1
8	11.3	11.4
	19.3	19.4
	17.1	17.2
	18.5	18.7
9	21.3	21.4
	25.2	25.3
	16.2	16.4
	16.2	16.4
10	13.7	13.9
	14.6	14.7
	15.4	15.5
	13.7	13.9
11	13.7	13.9
	13.7	13.9
	13.7	13.9
	13.7	13.9
12	13.7	13.9
	13.7	13.9
	13.7	13.9
	13.7	13.9
13	13.9	14.0
	13.0	13.1
	13.0	13.1
	13.0	13.1
14	12.9	13.0
	13.7	13.9
	12.9	13.0
	12.9	13.0
15	13.7	13.9
	12.1	12.2
	12.9	13.0
	12.9	13.0
16	12.2	12.3
	12.2	12.3
	13.0	13.1
	13.0	13.1
17	12.2	12.3
	12.2	12.3
	13.9	14.0
	13.9	14.0
18	12.2	12.3
	12.2	12.3
	12.2	12.3
	13.0	13.1
19	12.2	12.3
	12.2	12.3
	12.2	12.3
	13.0	13.1
20	13.0	13.1
	12.2	12.3
	13.0	13.1
	13.0	13.1
SSM-1	(335:17:30:36.789)	
1	12.2	12.3
	13.0	13.1
	13.0	13.1
	11.4	11.5
2	13.0	13.1
	13.0	13.1
	13.0	13.1
	12.2	12.3
3	13.0	13.1
	13.0	13.1
	12.2	12.3
	12.2	12.3
4	12.2	12.3
	13.0	13.1
	12.2	12.3
	13.0	13.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 55 MODE I (1 of 2) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5	13.0	13.[illegible]
	12.2	12.3
	13.0	13.1
	12.2	12.3
6	13.0	13.1
	12.2	12.3
	13.0	13.1
	13.0	13.1
7	12.2	12.3
	12.2	12.3
	13.0	13.1
	13.0	13.1
8	13.0	13.1
	11.4	11.5
	13.0	13.1
	13.0	13.1
9	12.2	12.3
	12.2	12.3
	13.0	13.1
	13.0	13.1
10	14.2	14.3
	13.3	13.4
	14.2	14.3
	12.4	12.6
11	13.0	13.1
	13.0	13.1

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	13.0	13.1
	12.2	12.3
12	13.3	13.4
	11.6	11.8
	14.2	14.3
	13.3	13.4
13	12.4	12.6
	12.4	12.6
	12.4	12.6
	12.4	12.6
14	12.4	12.6
	12.4	12.6
	11.6	11.8
	12.4	12.6
15	13.3	13.4
	11.6	11.8
	11.6	11.8
	12.4	12.6
SSM-2 (335:17:30:52.389)		
1	11.6	11.8
	10.8	10.9
	12.4	12.6
	11.6	11.8
2	12.4	12.6
	12.4	12.6
	13.3	13.4

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	12.4	12.6
3	11.6	11.8
	11.6	11.8
	11.6	11.8
	11.6	11.8
4	11.6	11.8
	13.3	13.4
	11.6	11.8
	12.4	12.6
5	11.6	11.8
	12.4	12.6
	10.8	10.9
	11.6	11.8
6	11.6	11.8
	12.4	12.6
	12.4	12.6
	11.6	11.8
7	12.4	12.6
	10.8	10.9
	10.8	10.9
	12.4	12.6
8	10.8	10.9
	11.6	11.8
	10.8	10.9
	10.0	10.1
9	12.4	12.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 55 MODE I (1 of 2) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
9(Cont'd.)	11.6	11.8						
	11.6	11.8						
	10.8	10.9						
10	10.8	10.9						
	10.8	10.9						
	10.8	10.9						
	10.0	10.1						
11	10.0	10.1						
	11.6	11.8						
	10.8	10.9						
	10.8	10.9						
12	10.8	10.9						
	10.0	10.1						
	10.8	10.9						
	10.8	10.9						
13	9.2	9.3						
	10.0	10.1						
	11.6	11.8						
	10.8	10.9						
14	9.2	9.3						
	10.0	10.1						
	10.8	10.9						
	10.0	10.1						
15	10.9	11.1						
	10.1	10.2						
	10.1	10.2						
	10.9	11.1						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 55 MODE I (2 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 335:17:33:56.434

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	9.6	9.7
	10.4	10.5
	8.7	8.9
	9.6	9.7
7	10.4	10.5
	9.6	9.7
	10.4	10.5
	10.4	10.5
8	9.6	9.7
	10.4	10.5
	9.6	9.7
	9.6	9.7
9	9.6	9.7
	9.6	9.7
	9.6	9.7
	8.7	8.9
10	8.7	8.9
	10.4	10.5
	9.6	9.7
	10.4	10.5
11	10.4	10.5
	10.4	10.5
	10.4	10.5
	10.4	10.5
12	9.6	9.7

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	10.4	10.5
	9.6	9.7
	9.6	9.7
13	9.6	9.7
	8.7	8.9
	9.6	9.7
	9.6	9.7
14	10.4	10.5
	8.7	8.9
	10.4	10.5
	9.6	9.7
15	9.6	9.7
	9.6	9.7
	9.6	9.7
	9.6	9.7
16	10.4	10.5
	9.6	9.7
	9.6	9.7
	10.4	10.5
17	8.7	8.9
	10.4	10.5
	9.6	9.7
	10.4	10.5
18	9.6	9.7
	9.6	9.7
	10.4	10.5

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	9.6	9.7
19	9.6	9.7
	10.4	10.5
	9.6	9.7
	10.4	10.5
20	9.6	9.7
	9.6	9.7
	9.6	9.7
	9.6	9.7
SSM-1	(335:17:34:12.034)	
1	9.6	9.7
	10.4	10.5
	10.4	10.5
	11.2	11.4
2	9.6	9.7
	10.4	10.5
	8.7	8.9
	9.6	9.7
3	9.6	9.7
	8.7	8.9
	9.6	9.7
	8.7	8.9
4	9.6	9.7
	9.6	9.7
	9.6	9.7
	9.6	9.7

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 55 MODE I (2 of 2) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
5	9.6	9.7		8.7	8.9		8.8	9.0
	8.7	8.9		10.4	10.5	3	9.7	9.8
	9.6	9.7	12	9.6	9.7		9.7	9.8
	9.6	9.7		9.6	9.7		8.8	9.0
6	11.2	11.4		9.6	9.7		8.8	9.0
	8.7	8.9		8.7	8.9	4	9.7	9.8
	10.4	10.5	13	9.6	9.7		8.8	9.0
	10.4	10.5		9.6	9.7		10.5	10.6
7	10.4	10.5		9.6	9.7		10.5	10.6
	9.6	9.7		9.6	9.7	5	9.7	9.8
	9.6	9.7	14	7.9	8.0		8.8	9.0
	9.6	9.7		8.7	8.9		8.8	9.0
8	9.6	9.7		9.6	9.7		10.5	10.6
	9.6	9.7		10.4	10.5	6	8.8	9.0
	9.6	9.7	15	10.4	10.5		8.8	9.0
	9.6	9.7		10.4	10.5		8.0	8.1
9	9.6	9.7		10.4	10.5		9.7	9.8
	9.6	9.7		9.6	9.7	7	9.7	9.8
	8.7	8.9	SSM-2	(335:17:34:27.634)			8.8	9.0
	9.6	9.7	1	9.6	9.7		9.7	9.8
10	9.6	9.7		9.6	9.7		9.7	9.8
	10.4	10.5		8.7	8.9	8	8.8	9.0
	8.7	8.9		9.6	9.7		9.7	9.8
	9.6	9.7	2	9.7	9.8		9.7	9.8
11	9.6	9.7		8.8	9.0		9.7	9.7
	9.6	9.7		9.7	9.8	9	9.7	9.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 55 MODE I (2 of 2) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
9(Cont'd.)	9.7	9.8						
	8.8	9.0						
	9.7	9.8						
10	9.7	9.8						
	9.7	9.8						
	8.8	9.0						
	9.7	9.8						
11	9.7	9.8						
	10.5	10.6						
	9.7	9.8						
	9.7	9.8						
12	8.8	9.0						
	9.7	9.8						
	8.8	9.0						
	10.5	10.6						
13	8.8	9.0						
	9.7	9.8						
	8.8	9.0						
	9.7	9.8						
14	8.8	9.0						
	8.8	9.0						
	9.7	9.8						
	9.7	9.8						
15	8.8	9.0						
	8.8	9.0						
	8.8	9.0						
	9.7	9.8						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 57 MODE III (1 of 1) SUBMODE 3

FIRST FRAME START TIME (JSC/GMT) 336:18:17:12.071

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.7°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.75°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	14.4	14.5
	14.4	14.5
	13.7	13.7
	14.4	14.5
5	14.4	14.5
	14.4	14.5
	16.0	16.1
	14.4	14.5
6	14.4	14.5
	16.0	16.1
	15.2	15.3
	15.2	15.3
SSM-1 (336:18:17:15.192)		
1	15.2	15.3
	13.7	13.7
	14.4	14.5
	14.4	14.5
2	15.3	15.4
	15.3	15.4
	17.0	17.0
	15.3	15.4
3	17.0	17.0
	17.0	17.0
	17.8	17.9
	17.0	17.0
4	17.8	17.9
	17.0	17.0
	17.0	17.0
	17.0	17.0
5	17.0	17.0
	17.0	17.0
	17.0	17.0
	17.0	17.0
SSM-2 (336:18:17:20.391)		
1	17.0	17.0
	16.1	16.2
	14.5	14.6
	15.3	15.4
2	14.5	14.6
	13.8	13.8
	13.8	13.8
	14.5	14.6
3	14.5	14.6
	13.8	13.8
	13.8	13.8
	14.5	14.6
4	14.5	14.6
	13.8	13.8
	13.8	13.8
	14.5	14.6
5	13.0	13.1
	13.0	13.1
	13.8	13.8
	12.2	12.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 61 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 339:16:21:08.009

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.9°$; $\xi_r = 0°$

$\psi = 0.82°$

$\xi_p = 0°$; $\xi_r = \pm 0.95°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	17.4	17.6
	17.4	17.6
	17.4	17.6
	16.6	16.8
5	15.8	16.0
	16.6	16.8
	15.8	16.0
	16.6	16.8
6	15.8	16.0
	15.8	16.0
	15.0	15.2
	14.2	14.5
SSM-1 (339:16:21:11.130)		
1	15.0	15.2
	14.2	14.5
	14.2	14.5
	13.4	13.7
2	14.2	14.5
	13.4	13.7
	12.6	12.9
	13.4	13.7
3	12.6	12.9
	12.6	12.9
	12.6	12.9
	13.4	13.7
4	12.6	12.9
	12.6	12.9
	13.4	13.7
	12.6	12.9
5	12.6	12.9
	13.4	13.7
	11.8	12.1
	12.6	12.9
SSM-2 (339:16:21:16.329)		
1	13.4	13.7
	11.8	12.1
	11.8	12.1
	11.8	12.1
2	12.6	12.9
	12.6	12.9
	11.8	12.1
	12.6	12.9
3	12.6	12.9
	12.6	12.9
	12.6	12.9
	12.6	12.9
4	12.6	12.9
	12.6	12.9
	12.6	12.9
	11.8	12.1
5	12.6	12.9
	11.8	12.1
	13.4	13.7
	11.8	12.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 62 MODE I (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 341:14:48:08.226

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.1°$; $\xi_r = 0°$

$\psi = 1.04°$

$\xi_p = 0°$; $\xi_r = \pm 1.15°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				11.6	12.0		10.8	11.2
6	12.4	12.8		11.6	12.0	19	10.8	11.2
	15.6	16.0		12.4	12.8		10.8	11.2
	11.6	12.0	13	11.6	12.0		11.6	12.0
	11.6	12.0		11.6	12.0		10.8	11.2
7	10.8	11.2		11.6	12.0	20	10.8	11.2
	11.6	12.0		11.6	12.0		11.6	12.0
	11.6	12.0	14	11.6	12.0		*	*
	10.8	11.2		11.6	12.0		*	*
8	10.8	11.2		11.6	12.0	SSM-1 (341:14:48:23.826)		
	10.8	11.2		11.6	12.0	1	10.8	11.2
	11.6	12.0	15	10.8	11.2		11.6	12.0
	12.4	12.8		10.8	11.2		*	*
9	12.4	12.8		10.8	11.2		11.6	12.0
	11.6	12.0		10.8	11.2	2	10.8	11.2
	12.4	12.8	16	11.6	12.0		10.8	11.2
	12.4	12.8		12.4	12.8		*	*
10	11.6	12.0		11.6	12.0		11.6	12.0
	11.6	12.0		10.8	11.2	3	11.6	12.0
	10.8	11.2	17	10.8	11.2		10.8	11.2
	11.6	12.0		*	*		10.8	11.2
11	10.8	11.2		10.8	11.2		12.4	12.8
	10.8	11.2		11.6	12.0	4	10.8	11.2
	10.8	11.2	18	10.8	11.2		10.8	11.2
	10.8	11.2		*	*		10.8	11.2
12	11.6	12.0		11.6	12.0		11.6	12.0

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

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*Data below calibration range

MISSION SL-4 PASS 62 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.1°$; $\xi_r = 0°$

$\psi = 1.04°$

$\xi_p = 0°$; $\xi_r = \pm 1.15°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5	11.6	12.0
	11.6	12.0
	10.8	11.2
	*	*
6	10.8	11.2
	10.8	11.2
	10.8	11.2
	11.6	12.0
7	10.8	11.2
	11.6	12.0
	*	*
	11.6	12.0
8	10.9	11.3
	10.9	11.3
	*	*
	11.7	12.1
9	*	*
	10.9	11.3
	11.7	12.1
	10.9	11.3
10	10.9	11.3
	10.9	11.3
	10.9	11.3
	10.9	11.3
11	10.9	11.3
	10.9	11.3

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	10.9	11.3
	11.7	12.1
12	10.9	11.3
	10.9	11.3
	10.9	11.3
	*	*
13	10.9	11.3
	*	*
	*	*
	11.7	12.1
14	10.9	11.3
	10.9	11.3
	11.7	12.1
	10.9	11.3
15	10.9	11.3
	10.9	11.3
	10.9	11.3
	10.9	11.3
SSM-2 (341:14:48:39.426)		
1	10.9	11.3
	11.7	12.1
	10.9	11.3
	10.9	11.3
2	10.9	11.3
	11.7	12.1
	*	*

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	*	*
3	11.7	12.1
	10.9	11.3
	10.9	11.3
	10.9	11.3
4	10.9	11.3
	10.9	11.3
	*	*
	11.7	12.1
5	10.9	11.3
	10.9	11.3
	11.7	12.1
	*	*
6	10.9	11.3
	11.7	12.1
	*	*
	10.9	11.3
7	10.9	11.3
	10.9	11.3
	11.7	12.1
	10.9	11.3
8	*	*
	*	*
	10.9	11.3
	*	*
9	*	*

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 62 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)______________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.1°$; $\xi_r = 0°$

$\psi = 1.04°$

$\xi_p = 0°$; $\xi_r = \pm 1.15°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
9(Cont'd.)	10.9	11.3						
	10.9	11.3						
	11.7	12.1						
10	11.0	11.4						
	11.0	11.4						
	11.8	12.2						
	*	*						
11	*	*						
	11.0	11.4						
	11.0	11.4						
	11.0	11.4						
12	11.0	11.4						
	11.0	11.4						
	11.0	11.4						
	11.0	11.4						
13	11.8	12.2						
	11.0	11.4						
	11.8	12.2						
	11.8	12.2						
14	11.8	12.2						
	11.0	11.4						
	11.0	11.4						
	11.0	11.4						
15	11.0	11.4						
	11.0	11.4						
	11.0	11.4						
	11.0	11.4						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 64 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 342:02:37:07.759

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.7°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.75°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0			4	11.5	11.5		12.3	12.3
4	11.3	11.3		11.5	11.5		12.3	12.3
	10.5	10.5		11.5	11.5		12.3	12.3
	12.0	12.1		12.3	12.3			
	12.8	12.9	5	12.3	12.3			
5	10.5	10.5		11.5	11.5			
	12.0	12.1		11.5	11.5			
	12.0	12.1		11.5	11.5			
	12.0	12.1	SSM-2 (342:02:37:16.079)					
6	12.0	12.1	1	13.0	13.1			
	12.0	12.1		12.3	12.3			
	10.5	10.5		10.7	10.8			
	10.5	10.5		10.7	10.8			
SSM-1 (342:02:37:10.879)			2	12.3	12.3			
1	11.3	11.3		10.7	10.8			
	10.5	10.5		10.7	10.8			
	11.3	11.3		12.3	12.3			
	11.3	11.3	3	12.3	12.3			
2	12.0	12.1		11.5	11.5			
	11.3	11.3		11.5	11.5			
	12.0	12.1		12.3	12.3			
	11.3	11.3	4	11.5	11.5			
3	12.3	12.3		11.5	11.5			
	10.7	10.8		11.5	11.5			
	10.7	10.8		11.5	11.5			
	12.3	12.3	5	11.5	11.5			

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 **PASS** 64 **MODE** I (1 of 3) **SUBMODE** 0

FIRST FRAME START TIME (JSC/GMT) 342:02:43:11.958

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.7°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.75°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 14.7	= 14.8
	= 14.7	= 14.8
	= 15.5	= 15.6
	= 13.9	= 14.0
7	= 13.9	= 14.0
	= 13.9	= 14.0
	= 14.7	= 14.8
	= 13.1	= 13.2
8	= 14.7	= 14.8
	= 13.9	= 14.0
	= 14.7	= 14.8
	= 14.7	= 14.8
9	= 13.9	= 14.0
	= 13.9	= 14.0
	= 13.9	= 14.0
	= 13.9	= 14.0
10	= 13.9	= 14.0
	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.9	= 14.0
11	= 13.9	= 14.0
	= 13.9	= 14.0
	= 14.7	= 14.8
	= 15.5	= 15.6
12	= 13.9	= 14.0

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 14.7	= 14.8
	= 13.9	= 14.0
	= 13.1	= 13.2
13	= 14.7	= 14.8
	= 15.5	= 15.6
	= 14.7	= 14.8
	= 14.7	= 14.8
14	= 14.7	= 14.8
	= 14.7	= 14.8
	= 14.7	= 14.8
	= 15.5	= 15.6
15	= 14.7	= 14.8
	= 16.3	= 16.4
	= 16.3	= 16.4
	= 15.5	= 15.6
16	= 15.5	= 15.6
	= 15.5	= 15.6
	= 14.7	= 14.8
	= 13.9	= 14.0
17	= 14.7	= 14.8
	= 13.9	= 14.0
	= 13.9	= 14.0
	= 13.9	= 14.0
18	= 13.3	= 13.3
	= 14.8	= 14.9
	= 14.0	= 14.1

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 13.3	= 13.3
19	= 13.3	= 13.3
	= 14.8	= 14.9
	= 14.0	= 14.1
	= 14.0	= 14.1
20	= 13.3	= 13.3
	= 14.8	= 14.9
	= 14.0	= 14.1
	= 14.8	= 14.9
SSM-1 (342:02:43:27.558)		
1	= 15.6	= 15.7
	= 15.6	= 15.7
	= 15.6	= 15.7
	= 14.8	= 14.9
2	= 13.3	= 13.3
	= 12.5	= 12.6
	= 13.3	= 13.3
	= 14.0	= 14.1
3	= 14.0	= 14.1
	= 13.3	= 13.3
	= 13.3	= 13.3
	= 13.3	= 13.3
4	= 13.3	= 13.3
	= 13.3	= 13.3
	= 13.3	= 13.3
	= 13.3	= 13.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 64 MODE I (1 of 3) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.7°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.75°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5	= 13.3	= 13.3		= 13.3	= 13.3		= 14.9	= 15.0
	= 13.3	= 13.3		= 14.0	= 14.1	3	= 14.9	= 15.0
	= 14.0	= 14.1	12	= 14.8	= 14.9		= 14.9	= 15.0
	= 12.5	= 12.6		= 15.6	= 15.7		= 15.7	= 15.8
6	= 14.0	= 14.1		= 14.0	= 14.1		= 14.9	= 15.0
	= 14.0	= 14.1		= 13.3	= 13.3	4	= 16.6	= 16.6
	= 13.3	= 13.3	13	= 14.8	= 14.9		= 15.7	= 15.8
	= 14.8	= 14.9		= 13.3	= 13.3		= 15.7	= 15.8
7	= 13.3	= 13.3		= 14.0	= 14.1		= 15.7	= 15.8
	= 13.3	= 13.3		= 14.8	= 14.9	5	= 16.6	= 16.6
	= 13.3	= 13.3	14	= 13.3	= 13.3		= 16.6	= 16.6
	= 12.5	= 12.6		= 13.3	= 13.3		= 16.6	= 16.6
8	= 13.3	= 13.3		= 14.0	= 14.1		= 16.6	= 16.6
	= 13.3	= 13.3		= 14.0	= 14.1	6	= 17.4	= 17.5
	= 13.3	= 13.3	15	= 14.8	= 14.9		= 17.4	= 17.5
	= 13.3	= 13.3		= 14.0	= 14.1		= 17.4	= 17.5
9	= 14.0	= 14.1		= 14.0	= 14.1		= 17.4	= 17.5
	= 14.0	= 14.1		= 14.0	= 14.1	7	= 18.3	= 18.4
	= 13.3	= 13.3	SSM-2 (342:02:43:43.158)				= 18.3	= 18.4
	= 14.0	= 14.1	1	= 14.1	= 14.2		= 18.3	= 18.4
10	= 13.3	= 13.3		= 15.7	= 15.8		= 18.3	= 18.4
	= 14.0	= 14.1		= 14.1	= 14.2	8	= 18.3	= 18.4
	= 14.0	= 14.1		= 14.1	= 14.2		= 18.3	= 18.4
	= 14.0	= 14.1	2	= 14.9	= 15.0		= 18.3	= 18.4
11	= 14.0	= 14.1		= 14.1	= 14.2		= 18.3	= 18.4
	= 13.3	= 13.3		= 14.9	= 15.0	9	= 19.2	= 19.2

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 64 MODE I (1 of 3) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.7°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.75°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
9 (Cont'd.)	20.8	= 20.8						
	= 21.5	= 21.6						
	= 23.7	= 23.8						
10	= 24.2	= 24.3						
	= 25.3	= 25.4						
	= 25.8	= 25.9						
	= 25.8	= 25.9						
11	= 26.4	= 26.4						
	= 25.3	= 25.4						
	= 23.7	= 23.8						
	= 22.2	= 22.3						
12	= 21.5	= 21.6						
	= 20.8	= 20.8						
	= 18.3	= 18.4						
	= 19.2	= 19.2						
13	= 20.8	= 20.8						
	= 16.6	= 16.6						
	= 14.9	= 15.0						
	= 22.2	= 22.3						
14	= 23.7	= 23.8						
	*	*						
	*	*						
	= 13.4	= 13.4						
15	= 9.46	= 9.53						
	= 11.7	= 11.8						
	= 12.6	= 12.7						
	= 12.6	= 12.7						

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 64 MODE I (2 of 3) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 342:02:46:54.588

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.6°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.65°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 10.9	= 11.0
	= 10.1	= 10.2
	= 9.29	= 9.39
	= 10.1	= 10.2
7	= 10.9	= 11.0
	= 10.1	= 10.2
	= 10.9	= 11.0
	= 10.9	= 11.0
8	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.1	= 10.2
	= 10.1	= 10.2
9	= 10.1	= 10.2
	= 12.4	= 12.5
	= 13.2	= 13.3
	= 14.0	= 14.1
10	= 12.4	= 12.5
	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.9	= 11.0
11	= 12.4	= 12.5
	= 11.7	= 11.8
	= 12.4	= 12.5
	= 14.0	= 14.1
12	= 14.0	= 14.1
	= 14.8	= 14.9

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 14.8	= 14.9
	= 14.0	= 14.1
13	= 13.2	= 13.3
	= 11.7	= 11.8
	= 13.2	= 13.3
	= 14.0	= 14.1
14	= 12.4	= 12.5
	= 10.1	= 10.2
	= 8.50	= 8.60
	= 8.50	= 8.60
15	= 10.1	= 10.2
	= 11.7	= 11.8
	= 12.4	= 12.5
	= 11.7	= 11.8
16	= 11.7	= 11.8
	= 10.9	= 11.0
	= 8.50	= 8.60
	= 8.50	= 8.60
17	= 9.29	= 9.39
	= 9.29	= 9.39
	= 10.1	= 10.2
	= 10.1	= 10.2
18	= 9.29	= 9.39
	= 10.1	= 10.2
	= 9.29	= 9.39
	= 9.29	= 9.39
19	= 8.50	= 8.60

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 9.29	= 9.39
	= 9.29	= 9.39
	= 10.1	= 10.2
20	= 9.29	= 9.39
	*	*
	*	*
	*	*
SSM-1	(342:02:47:10.188)	
1	*	*
	*	*
	*	*
	*	*
2	*	*
	= 10.9	= 11.0
	= 8.50	= 8.60
	*	*
3	= 8.50	= 8.60
	= 8.50	= 8.60
	= 8.50	= 8.60
	= 8.50	= 8.60
4	= 8.50	= 8.60
	= 8.50	= 8.60
	= 9.29	= 9.39
	= 10.1	= 10.2
5	= 11.7	= 11.8
	= 12.4	= 12.5
	= 14.0	= 14.1
	= 13.2	= 13.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

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*Data below calibration range.

MISSION SL-4 **PASS** 64 **MODE** I (2 **of** 3) **SUBMODE** 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.6°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.65°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
6	= 13.2	= 13.3
	= 13.2	= 13.3
	= 11.7	= 11.8
	= 12.4	= 12.5
7	= 10.9	= 11.0
	= 8.50	= 8.60
	= 10.1	= 10.2
	= 9.29	= 9.39
8	= 10.1	= 10.2
	= 10.9	= 11.0
	= 10.1	= 10.2
	= 9.29	= 9.39
9	= 9.29	= 9.39
	= 8.50	= 8.60
	= 8.50	= 8.60
	= 8.50	= 8.60
10	= 9.29	= 9.39
	= 9.29	= 9.39
	= 9.29	= 9.39
	= 8.50	= 8.60
11	= 8.50	= 8.60
	= 8.50	= 8.60
	= 8.50	= 8.60
	= 9.29	= 9.39
12	= 8.50	= 8.60
	= 8.50	= 8.60
	*	*
	*	*

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
13	= 8.50	= 8.60
	= 8.50	= 8.60
	= 9.29	= 9.39
	= 9.29	= 9.39
14	= 8.50	= 8.60
	= 8.50	= 8.60
	= 10.1	= 10.2
	= 9.29	= 9.39
15	= 9.29	= 9.39
	= 10.9	= 11.0
	= 9.29	= 9.39
	*	*
SSM-2 (342:02:47:25.788)		
1	= 9.29	= 9.39
	= 10.1	= 10.2
	= 9.29	= 9.39
	= 8.50	= 8.60
2	= 8.50	= 8.60
	= 8.50	= 8.60
	*	*
	= 8.50	= 8.60
3	*	*
	*	*
	*	*
	= 9.29	= 9.39
4	= 8.50	= 8.60

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 8.50	= 8.60
	= 8.50	= 8.60
	= 9.29	= 9.39
5	= 8.50	= 8.60
	*	*
	= 9.29	= 9.39
	= 9.29	= 9.39
6	= 9.29	= 9.39
	= 9.29	= 9.39
	= 9.29	= 9.39
	= 9.29	= 9.39
7	= 8.50	= 8.60
	= 8.50	= 8.60
	= 8.50	= 8.60
	*	*
8	= 9.29	= 9.39
	= 9.29	= 9.39
	= 10.1	= 10.2
	= 9.29	= 9.39
9	= 10.1	= 10.2
	= 10.1	= 10.2
	= 8.50	= 8.60
	*	*
10	= 9.29	= 9.39
	= 8.50	= 8.60
	= 8.50	= 8.60
	= 8.50	= 8.60

SPECIAL NOTES:

1. $\sigma°$ **Values In dB. Not Corrected For Atmospheric Loss.**
2. **Elapsed Time Of One Frame = 1.04 secs.**
3. ψ **Corresponds To Angle At Which Return Power Peaks.**

---

*Data below calibration range.

MISSION SL-4 PASS 64 MODE I (2 of 3) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.6°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.65°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-2 (Cont'd.)								
11	= 8.57	= 8.67						
	= 8.57	= 8.67						
	= 8.57	= 8.67						
	= 8.57	= 8.67						
12	= 8.57	= 8.67						
	= 9.36	= 9.46						
	= 8.57	= 8.67						
	*	*						
13	*	*						
	*	*						
	*	*						
	*	*						
14	= 8.57	= 8.67						
	*	*						
	= 8.57	= 8.67						
	= 8.57	= 8.67						
15	= 10.2	= 10.3						
	= 15.3	= 15.4						
	= 8.57	= 8.67						
	= 9.36	= 9.46						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

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*Data below calibration range.

MISSION SL-4 PASS 65 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 349:00:01:0.319

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-Ø		
4	= 12.5	= 12.6
	= 12.5	= 12.6
	= 11.8	= 11.9
	= 14.1	= 14.2
5	= 12.5	= 12.6
	= 14.1	= 14.2
	= 14.1	= 14.2
	= 14.1	= 14.2
6	= 14.1	= 14.2
	= 14.1	= 14.2
	= 14.1	= 14.2
	= 14.1	= 14.2
SSM-1 (349:00:01:03.438)		
1	= 14.1	= 14.2
	= 13.3	= 13.4
	= 14.1	= 14.2
	= 14.1	= 14.2
2	= 13.3	= 13.4
	= 13.3	= 13.4
	= 14.1	= 14.2
	= 14.1	= 14.2
3	= 15.8	= 15.9
	= 15.8	= 15.9
	= 16.6	= 16.7
	= 16.6	= 16.7
4	= 15.8	= 15.9
	= 15.8	= 15.9
	= 15.Ø	= 15.1
	= 14.2	= 14.3
5	= 15.Ø	= 15.1
	= 13.4	= 13.5
	= 15.Ø	= 15.1
	= 14.2	= 14.3
SSM-2 (349:00:01:08.638)		
1	= 14.2	= 14.3
	= 13.4	= 13.5
	= 14.2	= 14.3
	= 14.2	= 14.3
2	= 13.4	= 13.5
	= 13.4	= 13.5
	= 13.4	= 13.5
	= 13.4	= 13.5
3	= 13.4	= 13.5
	= 13.4	= 13.5
	= 13.4	= 13.5
	= 14.2	= 14.3
4	= 14.2	= 14.3
	= 13.4	= 13.5
	= 13.4	= 13.5
	= 13.4	= 13.5
5	= 12.6	= 12.7
	= 13.4	= 13.5
	= 13.4	= 13.5
	= 12.6	= 12.7

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 67 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 352:02:0:17.698

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-Ø		
4	= 8.8Ø	= 8.91
	= 8.8Ø	= 8.91
	= 8.8Ø	= 8.91
	= 9.61	= 9.72
5	= 8.8Ø	= 8.91
	= 9.61	= 9.72
	= 9.61	= 9.72
	= 9.61	= 9.72
6	= 9.61	= 9.72
	= 9.61	= 9.72
	= 8.8Ø	= 8.91
	= 9.61	= 9.72
SSM-1 (352:02:0:20.818)		
1	= 9.61	= 9.72
	= 9.61	= 9.72
	= 8.8Ø	= 8.91
	= 1Ø.4	= 1Ø.5
2	= 9.61	= 9.72
	= 1Ø.4	= 1Ø.5
	= 1Ø.4	= 1Ø.5
	= 8.ØØ	= 8.11
3	= 8.8Ø	= 8.91
	= 8.8Ø	= 8.91
	= 9.61	= 9.72
	= 1Ø.4	= 1Ø.5
4	= 9.61	= 9.72
	= 8.8Ø	= 8.91
	= 8.8Ø	= 8.91
	= 1Ø.4	= 1Ø.5
5	= 9.61	= 9.72
	= 11.2	= 11.3
	= 9.61	= 9.72
	= 8.8Ø	= 8.91
SSM-2 (352:02:0:26.018)		
1	= 1Ø.4	= 1Ø.5
	= 9.61	= 9.72
	= 1Ø.4	= 1Ø.5
	= 8.8Ø	= 8.91
2	= 8.8Ø	= 8.91
	= 9.61	= 9.72
	= 11.2	= 11.3
	= 9.61	= 9.72
3	= 11.2	= 11.3
	= 8.8Ø	= 8.91
	= 1Ø.4	= 1Ø.5
	= 1Ø.4	= 1Ø.5
4	= 1Ø.5	= 1Ø.6
	= 9.7Ø	= 9.81
	= 1Ø.5	= 1Ø.6
	= 8.89	= 9.ØØ
5	= 8.89	= 9.ØØ
	= 9.7Ø	= 9.81
	= 11.2	= 11.3
	= 9.7Ø	= 9.81

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 67 MODE II (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 352:02:17:17.985

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.6°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.65°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0								
5	12.4	12.5						
	12.4	12.5						
	12.4	12.5						
	13.1	13.2						
6	11.6	11.7						
	11.6	11.7						
	11.6	11.7						
	12.4	12.5						
SSM-1	(352:02:17:20.064)							
1	12.4	12.5						
	12.4	12.5						
	12.4	12.5						
	12.4	12.5						
2	12.4	12.5						
	12.4	12.5						
	12.4	12.5						
	11.6	11.7						
SSM-2	(352:02:17:22.144)							
1	11.6	11.7						
	11.6	11.7						
	11.6	11.7						
	12.4	12.5						
2	11.6	11.7						
	13.1	13.2						
	11.6	11.7						
	12.4	12.5						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 67 MODE II (1 of 1) SUBMODE 6

FIRST FRAME START TIME (JSC/GMT) 352:02:20:01.264

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.6°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.65°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0								
2	13.7	13.8						
	13.0	13.1						
	13.0	13.1						
	12.2	12.3						
3	12.2	12.3						
	13.0	13.1						
	12.2	12.3						
	12.2	12.3						
SSM-1 (352:02:20:03.344)								
1	13.8	13.9						
	13.8	13.9						
	12.3	12.4						
	13.0	13.1						
2	12.3	12.4						
	12.3	12.4						
	11.5	11.6						
	12.3	12.4						
SSM-2 (352:02:20:05.424)								
1	12.3	12.4						
	11.5	11.6						
	12.3	12.4						
	13.8	13.9						
2	12.3	12.4						
	13.0	13.1						
	12.3	12.4						
	13.0	13.1						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 68 MODE I (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 352:11:33:17.228)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-Ø		
6	= 8.14	= 8.25
	= 8.14	= 8.25
	= 8.14	= 8.25
	= 8.14	= 8.25
7	= 8.14	= 8.25
	= 8.14	= 8.25
	*	*
	= 8.14	= 8.25
8	= 8.87	= 8.98
	= 8.14	= 8.25
	= 8.14	= 8.25
	= 8.14	= 8.25
9	*	*
	= 8.87	= 8.98
	= 8.14	= 8.25
	= 8.14	= 8.25
1Ø	= 9.16	= 9.27
	= 8.48	= 8.59
	= 8.48	= 8.59
	= 8.48	= 8.59
11	= 8.48	= 8.59
	*	*
	= 8.48	= 8.59
	*	*
12	= 8.48	= 8.59
	= 9.16	= 9.27
	= 9.16	= 9.27
	= 8.48	= 8.59
13	= 8.48	= 8.59
	= 8.48	= 8.59
	= 9.16	= 9.27
	= 8.48	= 8.59
14	= 9.16	= 9.27
	= 8.48	= 8.59
	= 8.48	= 8.59
	= 9.85	= 9.96
15	= 8.48	= 8.59
	= 9.16	= 9.27
	= 9.16	= 9.27
	= 9.16	= 9.27
16	= 9.16	= 9.27
	= 9.85	= 9.96
	= 8.48	= 8.59
	= 9.85	= 9.96
17	= 9.16	= 9.27
	= 9.16	= 9.27
	= 8.48	= 8.59
	= 9.16	= 9.27
18	= 9.85	= 9.96
	= 9.16	= 9.27
	= 8.48	= 8.59
	= 9.85	= 9.96
19	= 8.48	= 8.59
	= 9.85	= 9.96
	= 8.48	= 8.59
	= 9.16	= 9.27
2Ø	*	*
	= 8.48	= 8.59
	= 9.85	= 9.96
	= 9.16	= 9.27
SSM-1 (352:11:33:32.828)		
1	= 9.85	= 9.96
	= 9.16	= 9.27
	= 9.16	= 9.27
	= 8.48	= 8.59
2	= 9.16	= 9.27
	= 8.48	= 8.59
	= 9.85	= 9.96
	= 9.16	= 9.27
3	= 9.16	= 9.27
	= 8.48	= 8.59
	= 9.16	= 9.27
	= 9.16	= 9.27
4	= 9.16	= 9.27
	= 9.16	= 9.27
	= 8.48	= 8.59
	= 8.48	= 8.59
5	= 9.16	= 9.27
	= 8.48	= 8.59
	= 8.48	= 8.59

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 68 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	8.48	= 8.59
6	= 8.48	= 8.59
	= 8.48	= 8.59
	= 8.48	= 8.59
	= 9.16	= 9.27
7	= 8.66	= 8.77
	= 9.33	= 9.44
	= 9.99	= 10.1
	= 9.99	= 10.1
8	= 9.99	= 10.1
	= 8.66	= 8.77
	= 9.33	= 9.44
	= 9.33	= 9.44
9	= 8.66	= 8.77
	= 9.33	= 9.44
	= 8.66	= 8.77
	= 8.66	= 8.77
10	= 9.33	= 9.44
	= 9.33	= 9.44
	= 9.33	= 9.44
	= 9.33	= 9.44
11	= 9.33	= 9.44
	= 8.66	= 8.77
	= 8.66	= 8.77
	= 9.33	= 9.44
12	= 8.66	= 8.77
	= 9.99	= 10.1
	= 9.33	= 9.44

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 9.33	= 9.44
13	= 9.33	= 9.44
	= 8.66	= 8.77
	= 9.33	= 9.44
	= 9.99	= 10.1
14	= 9.33	= 9.44
	= 9.33	= 9.44
	= 9.33	= 9.44
	= 8.66	= 8.77
15	= 9.33	= 9.44
	= 9.33	= 9.44
	= 9.33	= 9.44
	= 9.99	= 10.1
SSM-2 (352:11:33:48.428)		
1	= 9.33	= 9.44
	= 9.99	= 10.1
	= 9.33	= 9.44
	= 9.33	= 9.44
2	= 8.66	= 8.77
	= 9.99	= 10.1
	= 8.66	= 8.77
	= 9.99	= 10.1
3	= 9.99	= 10.1
	= 9.99	= 10.1
	= 9.99	= 10.1
	= 8.66	= 8.77
4	= 9.33	= 9.44

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 9.33	= 9.44
	= 9.33	= 9.44
	= 9.33	= 9.44
5	= 8.66	= 8.77
	= 9.33	= 9.44
	= 9.33	= 9.44
	= 9.33	= 9.44
6	= 9.99	= 10.1
	= 8.66	= 8.77
	= 9.33	= 9.44
	= 9.99	= 10.1
7	= 9.33	= 9.44
	= 8.66	= 8.77
	= 9.33	= 9.44
	= 9.99	= 10.1
8	= 9.33	= 9.44
	= 9.99	= 10.1
	= 9.33	= 9.44
	= 9.33	= 9.44
9	= 9.99	= 10.1
	= 9.99	= 10.1
	= 9.33	= 9.44
	= 8.66	= 8.77
10	= 9.33	= 9.44
	= 9.33	= 9.44
	= 8.66	= 8.77
	= 9.33	= 9.44

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 68 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ______

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
11	= 9.99	= 10.1						
	= 9.33	= 9.44						
	= 9.99	= 10.1						
	= 9.33	= 9.44						
12	= 8.66	= 8.77						
	= 9.33	= 9.44						
	= 11.3	= 11.4						
	= 9.99	= 10.1						
13	= 9.99	= 10.1						
	= 9.99	= 10.1						
	= 9.33	= 9.44						
	= 9.33	= 9.44						
14	= 8.66	= 8.77						
	= 9.33	= 9.44						
	= 9.99	= 10.1						
	= 9.99	= 10.1						
15	= 9.33	= 9.44						
	= 9.99	= 10.1						
	= 9.33	= 9.44						
	= 9.99	= 10.1						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 68 MODE V (1 of 3) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 352:11:44:53.412

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.7°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.75°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 14.7	= 14.8
	= 14.7	= 14.8
	= 15.5	= 15.6
	= 14.7	= 14.8
5	= 14.7	= 14.8
	= 13.9	= 14.0
	= 14.7	= 14.8
	= 13.9	= 14.0
6	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.9	= 14.0
	= 13.9	= 14.0
SSM-1 (352:11:44:56.532)		
1	= 13.1	= 13.2
	= 14.7	= 14.8
	= 13.9	= 14.0
	= 13.1	= 13.2
2	= 13.9	= 14.0
	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.1	= 13.2
3	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.9	= 14.0
	= 13.9	= 14.0
4	= 13.9	= 14.0
	= 13.9	= 14.0
	= 13.9	= 14.0
	= 13.1	= 13.2
5	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.9	= 14.0
	= 13.9	= 14.0
SSM-2 (352:11:45:1.732)		
1	= 13.1	= 13.2
	= 13.9	= 14.0
	= 13.9	= 14.0
	= 13.1	= 13.2
2	= 13.9	= 14.0
	= 13.1	= 13.2
	= 13.9	= 14.0
	= 14.7	= 14.8
3	= 13.9	= 14.0
	= 13.1	= 13.2
	= 13.9	= 14.0
	= 13.1	= 13.2
4	= 13.9	= 14.0
	= 13.9	= 14.0
	= 13.1	= 13.2
	= 13.9	= 14.0
5	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.9	= 14.0
	= 13.9	= 14.0

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 68 MODE V (2 of 3) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 352:11:48:14.783

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.7°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 14.5	= 14.6
	= 13.7	= 13.8
	= 13.7	= 13.8
	= 13.7	= 13.8
5	= 13.0	= 13.0
	= 13.7	= 13.8
	= 14.5	= 14.6
	= 13.7	= 13.8
6	= 13.7	= 13.8
	= 13.7	= 13.8
	= 13.7	= 13.8
	= 13.7	= 13.8
SSM-1 (352:11:48:17.903)		
1	= 13.0	= 13.0
	= 13.7	= 13.8
	= 13.0	= 13.0
	= 13.7	= 13.8
2	= 13.7	= 13.8
	= 13.0	= 13.0
	= 13.7	= 13.8
	= 13.0	= 13.0
3	= 13.0	= 13.0
	= 13.0	= 13.0
	= 13.0	= 13.0
	= 13.0	= 13.0
4	= 13.0	= 13.0
	= 13.7	= 13.8
	= 12.2	= 12.2
	= 13.0	= 13.0
5	= 13.0	= 13.0
	= 13.0	= 13.0
	= 11.4	= 11.5
	= 12.2	= 12.2
SSM-2 (352:11:48:23.103)		
1	= 12.2	= 12.2
	= 13.0	= 13.0
	= 13.0	= 13.0
	= 13.0	= 13.0
2	= 13.0	= 13.0
	= 12.2	= 12.2
	= 12.2	= 12.2
	= 12.2	= 12.2
3	= 13.0	= 13.0
	= 13.0	= 13.0
	= 13.0	= 13.0
	= 13.0	= 13.0
4	= 12.2	= 12.2
	= 12.2	= 12.2
	= 12.2	= 12.2
	= 13.0	= 13.0
5	= 13.0	= 13.0
	= 11.4	= 11.5
	= 12.2	= 12.2
	= 12.2	= 12.2

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 68 MODE V (3 of 3) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 352:11:51:13.852

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.9°$; $\xi_r = 0°$

$\psi = 0.82°$

$\xi_p = 0°$; $\xi_r = \pm 0.95°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 15.7	= 16.0
	= 15.0	= 15.2
	= 15.0	= 15.2
	= 14.2	= 14.4
5	= 15.0	= 15.2
	= 15.7	= 16.0
	= 15.7	= 16.0
	= 15.0	= 15.2
6	= 14.2	= 14.4
	= 14.2	= 14.4
	= 15.7	= 16.0
	= 15.0	= 15.2
SSM-1 (352:11:51:16.972)		
1	= 15.0	= 15.2
	= 15.0	= 15.2
	= 15.0	= 15.2
	= 14.2	= 14.4
2	= 15.0	= 15.2
	= 15.0	= 15.2
	= 14.2	= 14.4
	= 15.7	= 16.0
3	= 15.0	= 15.2
	= 14.2	= 14.4
	= 15.0	= 15.2
	= 15.0	= 15.2
4	= 14.2	= 14.4

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 15.0	= 15.2
	= 15.7	= 16.0
	= 15.7	= 16.0
5	= 15.0	= 15.2
	= 15.7	= 16.0
	= 15.7	= 16.0
	= 15.7	= 16.0
SSM-2 (352:11:51:22.172)		
1	= 15.0	= 15.2
	= 15.0	= 15.2
	= 15.0	= 15.2
	= 15.0	= 15.2
2	= 14.2	= 14.4
	= 15.0	= 15.2
	= 15.7	= 16.0
	= 15.0	= 15.2
3	= 15.7	= 16.0
	= 15.0	= 15.2
	= 15.7	= 16.0
	= 15.0	= 15.2
4	= 15.7	= 16.0
	= 15.0	= 15.2
	= 15.0	= 15.2
	= 15.0	= 15.2
5	= 15.0	= 15.2
	= 14.2	= 14.4
	= 12.6	= 12.9

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 13.4	= 13.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 71 MODE I (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 001:13:17:46.872

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.6°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.65°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 11.3	= 11.4
	= 11.3	= 11.4
	= 10.5	= 10.6
	= 11.3	= 11.4
7	= 11.3	= 11.4
	= 11.3	= 11.4
	= 11.3	= 11.4
	= 12.0	= 12.1
8	= 11.3	= 11.4
	= 11.3	= 11.4
	= 12.0	= 12.1
	= 12.0	= 12.1
9	= 11.3	= 11.4
	= 12.8	= 12.9
	= 11.3	= 11.4
	= 10.5	= 10.6
10	= 11.3	= 11.4
	= 11.3	= 11.4
	= 12.0	= 12.1
	= 11.3	= 11.4
11	= 10.6	= 10.7
	= 11.3	= 11.4
	= 12.1	= 12.2
	= 11.3	= 11.4
12	= 11.3	= 11.4
	= 12.1	= 12.2
	= 11.3	= 11.4
	= 11.3	= 11.4
13	= 12.1	= 12.2
	= 11.3	= 11.4
	= 11.3	= 11.4
	= 10.6	= 10.7
14	= 10.6	= 10.7
	= 11.3	= 11.4
	= 12.1	= 12.2
	= 9.79	= 9.89
15	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 12.1	= 12.2
16	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 11.3	= 11.4
17	= 10.6	= 10.7
	= 9.79	= 9.89
	= 12.1	= 12.2
	= 9.79	= 9.89
18	= 9.03	= 9.13
	= 11.3	= 11.4
	= 9.79	= 9.89
	= 11.3	= 11.4
19	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
20	= 11.3	= 11.4
	= 11.3	= 11.4
	= 11.3	= 11.4
	= 9.79	= 9.89
SSM-1(001:13:18:2.472)		
1	= 10.6	= 10.7
	= 11.3	= 11.4
	= 11.3	= 11.4
	= 10.6	= 10.7
2	= 10.6	= 10.7
	= 9.76	= 9.89
	= 10.6	= 10.7
	= 9.79	= 9.89
3	= 11.3	= 11.4
	= 11.3	= 11.4
	= 10.6	= 10.7
	= 9.79	= 9.89
4	= 10.6	= 10.7
	= 10.6	= 10.7
	= 9.79	= 9.89
	= 9.79	= 9.89
5	= 11.3	= 11.4
	= 10.6	= 10.7
	= 11.3	= 11.4

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 71 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ______________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.6°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.65°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	11.3	= 11.4
6	= 11.3	= 11.4
	= 11.3	= 11.4
	= 10.6	= 10.7
	= 10.6	= 10.7
7	= 10.6	= 10.7
	= 10.6	= 10.7
	= 11.3	= 11.4
	= 11.3	= 11.4
8	= 10.8	= 10.9
	= 11.5	= 11.6
	= 11.5	= 11.6
	= 10.8	= 10.9
9	= 11.5	= 11.6
	= 10.8	= 10.9
	= 11.5	= 11.6
	= 12.3	= 12.4
10	= 10.8	= 10.9
	= 10.8	= 10.9
	= 10.8	= 10.9
	= 11.5	= 11.6
11	= 11.5	= 11.6
	= 10.8	= 10.9
	= 10.8	= 10.9
	= 11.5	= 11.6
12	= 10.8	= 10.9
	= 10.8	= 10.9

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 11.5	= 11.6
	= 10.8	= 10.9
13	= 12.3	= 12.4
	= 11.5	= 11.6
	= 11.5	= 11.6
	= 10.8	= 10.9
14	= 10.8	= 10.9
	= 10.8	= 10.9
	= 10.8	= 10.9
	= 11.5	= 11.6
15	= 10.8	= 10.9
	= 10.8	= 10.9
	= 11.5	= 11.6
	= 11.5	= 11.6
SSM-2 (001:13:18:18.072)		
1	= 10.8	= 10.9
	= 11.5	= 11.6
	= 10.8	= 10.9
	= 11.5	= 11.6
2	= 10.0	= 10.1
	= 10.0	= 10.1
	= 10.8	= 10.9
	= 10.8	= 10.9
3	= 10.8	= 10.9
	= 10.8	= 10.9
	= 10.0	= 10.1
	= 10.8	= 10.9

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	= 10.8	= 10.9
	= 11.5	= 11.6
	= 10.8	= 10.9
	= 10.8	= 10.9
5	= 11.5	= 11.6
	= 11.5	= 11.6
	= 11.5	= 11.6
	= 10.8	= 10.9
6	= 10.0	= 10.1
	= 10.8	= 10.9
	= 10.0	= 10.1
	= 10.8	= 10.9
7	= 11.5	= 11.6
	= 10.0	= 10.1
	= 10.8	= 10.9
	= 10.0	= 10.1
8	= 10.0	= 10.1
	= 10.8	= 10.9
	= 10.0	= 10.1
	= 11.5	= 11.6
9	= 10.8	= 10.9
	= 11.5	= 11.6
	= 11.5	= 11.6
	= 10.8	= 10.9
10	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.9	= 11.0

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 71 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.6°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.65°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	10.9	= 11.0						
11	= 10.9	= 11.0						
	= 10.9	= 11.0						
	= 10.1	= 10.2						
	= 11.7	= 11.8						
12	= 10.1	= 10.2						
	= 10.9	= 11.0						
	= 10.1	= 10.2						
	= 10.9	= 11.0						
13	= 10.9	= 11.0						
	= 10.9	= 11.0						
	= 10.9	= 11.0						
	= 11.7	= 11.8						
14	= 10.9	= 11.0						
	= 10.9	= 11.0						
	= 10.9	= 11.0						
	= 10.9	= 11.0						
15	= 10.9	= 11.0						
	= 10.9	= 11.0						
	= 10.9	= 11.0						
	= 10.9	= 11.0						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 71 MODE V (1 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 001:13:21:30.883

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				= 12.1	= 12.2		= 11.2	= 11.4
4	= 11.2	= 11.4		= 12.1	= 12.2			
	= 11.2	= 11.4		= 11.2	= 11.4			
	= 12.1	= 12.2	5	= 12.1	= 12.2			
	= 11.2	= 11.4		= 11.2	= 11.4			
5	= 12.1	= 12.2		= 11.2	= 11.4			
	= 11.2	= 11.4		= 11.2	= 11.4			
	= 10.4	= 10.5	SSM-2 (001:13:21:39.203)					
	= 10.4	= 10.5	1	= 11.2	= 11.4			
6	= 10.4	= 10.5		= 11.2	= 11.4			
	= 10.4	= 10.5		= 12.1	= 12.2			
	= 11.2	= 11.4		= 10.4	= 10.5			
	= 11.2	= 11.4	2	= 11.2	= 11.4			
SSM-1 (001:13:21:34.002)				= 12.1	= 12.2			
1	= 11.2	= 11.4		= 11.2	= 11.4			
	= 11.2	= 11.4		= 11.2	= 11.4			
	= 11.2	= 11.4	3	= 12.1	= 12.2			
	= 11.2	= 11.4		= 11.2	= 11.4			
2	= 12.1	= 12.2		= 10.4	= 10.5			
	= 12.1	= 12.2		= 11.2	= 11.4			
	= 11.2	= 11.4	4	= 12.1	= 12.2			
	= 11.2	= 11.4		= 11.2	= 11.4			
3	= 12.1	= 12.2		= 11.2	= 11.4			
	= 12.1	= 12.2		= 12.1	= 12.2			
	= 12.1	= 12.2	5	= 12.1	= 12.2			
	= 11.2	= 11.4		= 10.4	= 10.5			
4	= 11.2	= 11.4		= 11.2	= 11.4			

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 71 MODE V (2 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 001:13:25:18.925

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0		
4	= 11.1	= 11.2
	= 10.3	= 10.4
	= 9.41	= 9.54
	= 9.41	= 9.54
5	= 10.3	= 10.4
	= 11.1	= 11.2
	= 10.3	= 10.4
	= 9.41	= 9.54
6	= 10.3	= 10.4
	= 10.3	= 10.4
	= 9.41	= 9.54
	= 10.3	= 10.4
SSM-1 (001:13:25:22.045)		
1	= 9.41	= 9.54
	= 10.3	= 10.4
	= 10.3	= 10.4
	= 10.3	= 10.4
2	= 9.41	= 9.54
	= 9.41	= 9.54
	= 9.41	= 9.54
	= 9.41	= 9.54
3	= 8.58	= 8.71
	= 9.41	= 9.54
	= 10.3	= 10.4
	= 9.41	= 9.54
4	= 10.3	= 10.4
	= 9.41	= 9.54
	= 10.3	= 10.4
	= 9.41	= 9.54
5	= 9.41	= 9.54
	= 10.3	= 10.4
	= 9.41	= 9.54
	= 9.41	= 9.54
SSM-2 (001:13:25:27.245)		
1	= 10.3	= 10.4
	= 8.58	= 8.71
	= 8.58	= 8.71
	= 9.41	= 9.54
2	= 10.3	= 10.4
	= 8.58	= 8.71
	= 8.58	= 8.71
	= 11.1	= 11.2
3	= 9.41	= 9.54
	= 10.3	= 10.4
	= 9.41	= 9.54
	= 10.3	= 10.4
4	= 10.3	= 10.4
	= 9.41	= 9.54
	= 10.3	= 10.4
	= 9.41	= 9.54
5	= 9.41	= 9.54
	= 9.41	= 9.54
	= 9.41	= 9.54
	= 9.41	= 9.54

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 71 MODE V (3 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 001:13:29:0.393

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.3°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.35°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 11.5	= 11.6
5	= 9.77	= 9.89
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
6	= 10.6	= 10.7
	= 9.77	= 9.89
	= 10.6	= 10.7
	= 10.6	= 10.7
SSM-1 (001:13:29:3.513)		
1	= 9.77	= 9.89
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 11.5	= 11.6
2	= 9.77	= 9.89
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
3	= 9.77	= 9.89
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 9.77	= 9.89
4	= 11.5	= 11.6
	= 9.77	= 9.89
	= 10.6	= 10.7
	= 10.6	= 10.7
5	= 10.6	= 10.7
	= 11.5	= 11.6
	= 10.6	= 10.7
	= 9.77	= 9.89
SSM-2 (001:13:29:8.713)		
1	= 8.93	= 9.05
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
2	= 10.6	= 10.7
	= 9.77	= 9.89
	= 11.5	= 11.6
	= 11.5	= 11.6
3	= 9.77	= 9.89
	= 10.6	= 10.7
	= 11.5	= 11.6
	= 9.77	= 9.89
4	= 11.5	= 11.6
	= 9.77	= 9.89
	= 9.77	= 9.89
	= 10.6	= 10.7
5	= 11.5	= 11.6
	= 10.6	= 10.7
	= 11.5	= 11.6
	= 10.6	= 10.7

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 71 MODE V (4 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 001:13:32:38.738

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.3°$; $\xi_r = 0°$

$\psi = 0.53°$

$\xi_p = 0°$; $\xi_r = \pm 0.35°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-Ø		
4	= 12.Ø	= 12.1
	= 12.Ø	= 12.1
	= 12.Ø	= 12.1
	= 12.8	= 12.9
5	= 11.1	= 11.3
	= 12.Ø	= 12.1
	= 11.1	= 11.3
	= 11.1	= 11.3
6	= 11.1	= 11.3
	= 1Ø.3	= 1Ø.4
	= 11.1	= 11.3
	= 12.Ø	= 12.1
SSM-1 (001:13:32:41.858)		
1	= 11.1	= 11.3
	= 11.1	= 11.3
	= 11.1	= 11.3
	= 11.1	= 11.3
2	= 12.Ø	= 12.1
	= 11.1	= 11.3
	= 11.1	= 11.3
	= 11.1	= 11.3
3	= 11.1	= 11.3
	= 11.1	= 11.3
	= 12.8	= 12.9
	= 11.1	= 11.3
4	= 11.1	= 11.3
	= 12.8	= 12.9
	= 12.Ø	= 12.1
	= 11.1	= 11.3
5	= 12.Ø	= 12.1
	= 11.1	= 11.3
	= 11.1	= 11.3
	= 12.Ø	= 12.1
SSM-2 (001:13:32:47.058)		
1	= 11.1	= 11.3
	= 11.1	= 11.3
	= 11.1	= 11.3
	= 11.1	= 11.3
2	= 1Ø.3	= 1Ø.4
	= 12.Ø	= 12.1
	= 11.1	= 11.3
	= 12.Ø	= 12.1
3	= 1Ø.3	= 1Ø.4
	= 11.1	= 11.3
	= 9.45	= 9.57
	= 11.1	= 11.3
4	= 11.1	= 11.3
	= 11.1	= 11.3
	= 11.1	= 11.3
	= 11.1	= 11.3
5	= 11.1	= 11.3
	= 1Ø.3	= 1Ø.4
	= 11.1	= 11.3
	= 11.1	= 11.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 74 MODE V (3 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 006:18:08:58.405

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 10.4	= 10.5
	*	*
	= 7.15	= 7.26
	= 7.15	= 7.26
5	= 7.15	= 7.26
	*	*
	= 7.15	= 7.26
	= 7.96	= 8.07
6	*	*
	*	*
	*	*
	*	*
SSM-1 (006:18:09:1.525)		
1	*	*
	= 7.15	= 7.26
	*	*
	*	*
2	= 7.15	= 7.26
	= 7.15	= 7.26
	*	*
	*	*
3	*	*
	*	*
	*	*
	*	*
4	*	*

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	*	*
	= 7.15	= 7.26
	*	*
5	*	*
	*	*
	*	*
	= 7.23	= 7.34
SSM-2 (006:18:09:6.725)		
1	*	*
	*	*
	*	*
	*	*
2	= 7.23	= 7.34
	*	*
	*	*
	= 7.23	= 7.34
3	= 7.23	= 7.34
	*	*
	*	*
	*	*
4	= 7.23	= 7.34
	*	*
	= 7.23	= 7.34
	*	*
5	= 7.23	= 7.34
	*	*
	= 7.23	= 7.34

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	*	*

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 74 MODE V (4 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 006:18:11:23.673

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.7°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 8.57	= 8.65
	= 8.57	= 8.65
	= 9.36	= 9.44
	= 8.57	= 8.65
5	= 8.65	= 8.73
	*	*
	*	*
	= 8.65	= 8.73
6	*	*
	*	*
	*	*
	*	*
SSM-1 (006:18:11:26.793)		
1	= 8.65	= 8.73
	= 8.65	= 8.73
	= 8.65	= 8.73
	= 8.65	= 8.73
2	*	*
	= 8.65	= 8.73
	= 8.65	= 8.73
	= 8.65	= 8.73
3	= 8.65	= 8.73
	= 8.65	= 8.73
	= 8.65	= 8.73
	*	*
4	= 8.65	= 8.73
	= 8.65	= 8.73
	= 8.65	= 8.73
	*	*
5	= 8.65	= 8.73
	= 8.65	= 8.73
	*	*
	= 8.65	= 8.73
SSM-2 (006:18:11:31.993)		
1	= 8.65	= 8.73
	*	*
	*	*
	*	*
2	= 8.65	= 8.73
	*	*
	*	*
	*	*
3	*	*
	*	*
	*	*
	*	*
4	*	*
	*	*
	*	*
	= 8.65	= 8.73
5	*	*
	*	*
	*	*
	*	*

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 74 MODE V (5 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 006:18:13:54.399

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.85°$; $\xi_r = 0°$

$\psi = 0.71°$

$\xi_p = 0°$; $\xi_r = \pm 0.9°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 10.6	= 10.8
	= 11.4	= 11.5
	= 10.6	= 10.8
	= 11.4	= 11.5
5	= 11.4	= 11.5
	= 11.4	= 11.5
	= 10.6	= 10.8
	= 11.4	= 11.5
6	= 11.4	= 11.5
	= 11.4	= 11.5
	= 10.6	= 10.8
	= 9.80	= 9.99
SSM-1 (006:18:13:57.519)		
1	= 11.4	= 11.5
	= 10.6	= 10.8
	= 11.4	= 11.5
	= 12.1	= 12.3
2	= 10.6	= 10.8
	= 11.4	= 11.5
	= 10.6	= 10.8
	= 10.6	= 10.8
3	= 10.6	= 10.8
	= 9.80	= 9.99
	= 9.80	= 9.99
	= 10.6	= 10.8
4	= 9.80	= 9.99
	= 10.6	= 10.8
	= 9.80	= 9.99
	= 10.6	= 10.8
5	= 10.6	= 10.8
	= 9.80	= 9.99
	= 10.6	= 10.8
	= 10.6	= 10.8
SSM-2 (006:18:14:02.719)		
1	= 10.6	= 10.8
	= 11.4	= 11.5
	= 10.6	= 10.8
	= 10.6	= 10.8
2	= 10.6	= 10.8
	= 9.80	= 9.99
	= 12.1	= 12.3
	= 10.6	= 10.8
3	= 10.6	= 10.8
	= 10.6	= 10.8
	= 10.6	= 10.8
	= 11.4	= 11.5
4	= 10.6	= 10.8
	= 10.6	= 10.8
	= 10.6	= 10.8
	= 9.80	= 9.99
5	= 11.4	= 11.5
	= 11.4	= 11.5
	= 11.4	= 11.5
	= 11.4	= 11.5

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 76 MODE I (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 007:17:13:47.106

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.9°$; $\xi_r = 0°$

$\psi = 0.85°$

$\xi_p = 0°$; $\xi_r = \pm 0.95°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				= 14.7	= 15.0		= 17.1	= 17.4
6	= 17.0	= 17.2		= 13.9	= 14.2		= 17.1	= 17.4
	= 17.0	= 17.2	13	= 13.9	= 14.2		= 17.1	= 17.4
	= 16.2	= 16.4		= 14.7	= 15.0	20	= 17.1	= 17.4
	= 16.2	= 16.4		= 14.7	= 15.0		= 17.1	= 17.4
7	= 16.2	= 16.4		= 15.5	= 15.8		= 17.1	= 17.4
	= 16.2	= 16.4	14	= 14.7	= 15.0		= 17.1	= 17.4
	= 16.2	= 16.4		= 14.7	= 15.0	SSM-1 (007:17:14:02.706)		
	= 15.4	= 15.6		= 15.5	= 15.8	1	= 17.9	= 18.2
8	= 15.4	= 15.6		= 15.5	= 15.8		= 17.1	= 17.4
	= 15.4	= 15.6	15	= 16.3	= 16.6		= 17.1	= 17.4
	= 13.8	= 14.0		= 15.5	= 15.8		= 17.1	= 17.4
	= 15.4	= 15.6		= 15.5	= 15.8	2	= 16.3	= 16.6
9	= 14.6	= 14.8		= 16.3	= 16.6		= 17.9	= 18.2
	= 16.2	= 16.4	16	= 15.5	= 15.8		= 17.1	= 17.4
	= 16.2	= 16.4		= 16.3	= 16.6		= 17.1	= 17.4
	= 15.4	= 15.6		= 15.5	= 15.8	3	= 17.1	= 17.4
10	= 15.5	= 15.8		= 17.9	= 18.2		= 16.3	= 16.6
	= 15.5	= 15.8	17	= 17.1	= 17.4		= 17.1	= 17.4
	= 16.3	= 16.6		= 17.1	= 17.4		= 17.1	= 17.4
	= 16.3	= 16.6		= 16.3	= 16.6	4	= 16.3	= 16.6
11	= 15.5	= 15.8		= 17.1	= 17.4		= 16.3	= 16.6
	= 15.5	= 15.8	18	= 16.3	= 16.6		= 16.3	= 16.6
	= 15.5	= 15.8		= 16.3	= 16.6		= 17.1	= 17.4
	= 15.5	= 15.8		= 16.3	= 16.6	5	= 17.1	= 17.4
12	= 14.7	= 15.0		= 17.1	= 17.4		= 16.3	= 16.6
	= 14.7	= 15.0	19	= 17.1	= 17.4		= 15.5	= 15.8

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 76 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.9°$; $\xi_r = 0°$

$\psi = 0.85°$

$\xi_p = 0°$; $\xi_r = \pm 0.95°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	16.3	= 16.6
6	= 16.3	= 16.6
	= 16.3	= 16.6
	= 17.1	= 17.4
	= 16.3	= 16.6
7	= 16.4	= 16.6
	= 16.4	= 16.6
	= 16.4	= 16.6
	= 16.4	= 16.6
8	= 15.6	= 15.9
	= 15.6	= 15.9
	= 16.4	= 16.6
	= 16.4	= 16.6
9	= 17.2	= 17.4
	= 17.2	= 17.4
	= 15.6	= 15.9
	= 15.6	= 15.9
10	= 15.6	= 15.9
	= 16.4	= 16.6
	= 17.2	= 17.4
	= 15.6	= 15.9
11	= 15.6	= 15.9
	= 16.4	= 16.6
	= 16.4	= 16.6
	= 16.4	= 16.6
12	= 16.4	= 16.6
	= 16.4	= 16.6
	= 16.4	= 16.6
	= 15.6	= 15.9
13	= 16.4	= 16.6
	= 17.2	= 17.4
	= 16.4	= 16.6
	= 17.2	= 17.4
14	= 17.2	= 17.4
	= 17.2	= 17.4
	= 18.0	= 18.2
	= 18.0	= 18.2
15	= 18.8	= 19.0
	= 18.8	= 19.0
	= 19.6	= 19.9
	= 18.0	= 18.2
SSM-2 (007:17:14:18.306)		
1	= 19.6	= 19.9
	= 18.8	= 19.0
	= 18.8	= 19.0
	= 19.6	= 19.9
2	= 19.6	= 19.9
	= 18.8	= 19.0
	= 18.0	= 18.2
	= 18.8	= 19.0
3	= 18.0	= 18.2
	= 18.0	= 18.2
	= 18.0	= 18.2
	= 18.0	= 18.2
4	= 18.0	= 18.2
	= 18.0	= 18.2
	= 19.6	= 19.9
	= 19.6	= 19.9
5	= 18.0	= 18.2
	= 19.6	= 19.9
	= 18.0	= 18.2
	= 18.0	= 18.2
6	= 18.8	= 19.0
	= 18.8	= 19.0
	= 18.0	= 18.2
	= 19.6	= 19.9
7	= 18.8	= 19.0
	= 18.8	= 19.0
	= 18.8	= 19.0
	= 18.8	= 19.0
8	= 18.8	= 19.0
	= 19.6	= 19.9
	= 19.6	= 19.9
	= 19.6	= 19.9
9	= 19.6	= 19.9
	= 19.6	= 19.9
	= 20.4	= 20.7
	= 19.6	= 19.9
10	= 21.1	= 21.4
	= 21.1	= 21.4
	= 21.8	= 22.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 76 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.9°$; $\xi_r = 0°$

$\psi = 0.85°$

$\xi_p = 0°$; $\xi_r = \pm 0.95°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
10(Cont'd.)	21.8	= 22.1						
11	= 22.5	= 22.8						
	= 22.5	= 22.8						
	= 21.8	= 22.1						
	= 21.1	= 21.4						
12	= 21.8	= 22.1						
	= 21.8	= 22.1						
	= 21.8	= 22.1						
	= 21.1	= 21.4						
13	= 21.8	= 22.1						
	= 21.1	= 21.4						
	= 21.1	= 21.4						
	= 21.1	= 21.4						
14	= 21.1	= 21.4						
	= 21.1	= 21.4						
	= 21.1	= 21.4						
	= 21.8	= 22.1						
15	= 22.5	= 22.8						
	= 23.9	= 24.2						
	= 24.5	= 24.8						
	= 25.1	= 25.3						

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 76 MODE V (1 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 007:17:17:21.981

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.0°$; $\xi_r = 0°$

$\psi = 0.95°$

$\xi_p = 0°$; $\xi_r = \pm 1.05°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				= 10.4	= 10.7		= 10.4	= 10.7
4	= 11.2	= 11.5		*	*			
	= 10.4	= 10.7		= 11.2	= 11.5			
	= 11.2	= 11.5	5	= 10.4	= 10.7			
	= 10.4	= 10.7		= 11.2	= 11.5			
5	= 10.4	= 10.7		= 10.4	= 10.7			
	= 11.2	= 11.5		= 10.4	= 10.7			
	= 11.2	= 11.5	SSM-2 (007:17:17:30.3[illegible]1)					
	= 11.2	= 11.5	1	= 11.2	= 11.5			
6	= 11.2	= 11.5		*	*			
	= 10.4	= 10.7		= 11.2	= 11.5			
	= 11.2	= 11.5		= 10.4	= 10.7			
	= 12.0	= 12.3	2	= 11.2	= 11.5			
SSM-1 (007:17:17:25.101)				= 11.2	= 11.5			
1	= 11.2	= 11.5		= 10.4	= 10.7			
	= 10.4	= 10.7		= 10.4	- 10.7			
	= 11.2	= 11.5	3	= 10.4	= 10.7			
	= 10.4	= 10.7		*	*			
2	= 10.4	= 10.7		= 10.4	= 10.7			
	= 11.2	= 11.5		= 10.4	= 10.7			
	= 10.4	= 10.7	4	= 10.4	= 10.7			
	= 10.4	= 10.7		= 10.4	= 10.7			
3	= 11.2	= 11.5		= 10.4	= 10.7			
	= 10.4	= 10.7		= 10.4	= 10.7			
	= 11.2	= 11.5	5	= 10.4	= 10.7			
	= 10.4	= 10.7		= 10.4	= 10.7			
4	= 11.2	= 11.5		= 10.4	= 10.7			

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 76 MODE V (2 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 007:17:18:41.026

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.0°$; $\xi_r = 0°$

$\psi = 0.98°$

$\xi_p = 0°$; $\xi_r = \pm 1.05°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 12.0	= 12.3
	= 12.0	= 12.3
	= 11.2	= 11.5
	= 11.2	= 11.5
5	= 12.0	= 12.3
	= 12.0	= 12.3
	= 11.2	= 11.5
	= 11.2	= 11.5
6	= 11.2	= 11.5
	= 12.0	= 12.3
	= 11.2	= 11.5
	= 12.0	= 12.3
SSM-1 (007:17:18:44.146)		
1	= 11.2	= 11.5
	= 11.2	= 11.5
	= 11.2	= 11.5
	= 11.2	= 11.5
2	= 11.2	= 11.5
	= 11.2	= 11.5
	= 12.0	= 12.3
	= 10.4	= 10.7
3	= 11.2	= 11.5
	= 12.0	= 12.3
	= 11.2	= 11.5
	= 11.2	= 11.5
4	= 11.2	= 11.5

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 11.2	= 11.5
	= 12.0	= 12.3
	= 12.7	= 13.1
5	= 11.2	= 11.5
	= 11.2	= 11.5
	= 11.2	= 11.5
	= 12.0	= 12.3
SSM-2 (007:17:18:49.346)		
1	= 12.0	= 12.3
	= 11.2	= 11.5
	= 12.0	= 12.3
	= 12.0	= 12.3
2	= 11.2	= 11.5
	= 12.7	= 13.1
	= 11.2	= 11.5
	= 12.0	= 12.3
3	= 12.0	= 12.3
	= 12.0	= 12.3
	= 12.0	= 12.3
	= 12.0	= 12.3
4	= 12.0	= 12.3
	= 12.0	= 12.3
	= 12.0	= 12.3
	= 12.7	= 13.1
5	= 12.0	= 12.3
	= 12.0	= 12.3
	= 11.2	= 11.5

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 11.2	= 11.5

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 76 MODE V (3 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 007:17:24:40.861

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.0°$; $\xi_r = 0°$

$\psi = 0.98°$

$\xi_p = 0°$; $\xi_r = \pm 1.05°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				= 9.23	= 9.55		*	*
4	= 9.23	= 9.55		= 9.23	= 9.55			
	= 10.8	= 11.1		= 9.23	= 9.55			
	= 9.23	= 9.55	5	*	*			
	= 9.23	= 9.55		= 9.23	= 9.55			
5	= 9.23	= 9.55		*	*			
	= 9.23	= 9.55		= 9.23	= 9.55			
	= 9.23	= 9.55	SSM-2 (007:17:24:49.181)					
	= 9.23	= 9.55	1	*	*			
6	= 9.23	= 9.55		= 9.23	= 9.55			
	= 9.23	= 9.55		*	*			
	= 10.0	= 10.3		*	*			
	= 9.23	= 9.55	2	*	*			
SSM-1 (007:17:24:43.981)				*	*			
1	= 9.23	= 9.55		= 9.23	= 9.55			
	= 9.23	= 9.55		= 9.23	= 9.55			
	= 9.23	= 9.55	3	= 9.23	= 9.55			
	= 9.23	= 9.55		= 9.23	= 9.55			
2	= 9.23	= 9.55		*	*			
	= 9.23	= 9.55		= 9.23	= 9.55			
	= 9.23	= 9.55	4	= 10.1	= 10.4			
	*	*		= 9.31	= 9.63			
3	= 10.0	= 10.3		*	*			
	= 9.23	= 9.55		= 9.31	= 9.63			
	*	*	5	*	*			
	= 9.23	= 9.55		*	*			
4	= 9.23	= 9.55		= 9.31	= 9.63			

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 78 MODE V (2 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 008:16:44:28.542

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 10.3	= 10.4
	= 9.61	= 9.72
	= 10.3	= 10.4
	= 10.3	= 10.4
5	= 9.61	= 9.72
	= 10.9	= 11.0
	= 10.3	= 10.4
	= 11.5	= 11.6
6	= 10.3	= 10.4
	= 10.3	= 10.4
	= 10.3	= 10.4
	= 10.3	= 10.4
SSM-1 (008:16:44:31.662)		
1	= 10.9	= 11.0
	= 10.3	= 10.4
	= 10.9	= 11.0
	= 10.3	= 10.4
2	= 11.5	= 11.6
	= 9.61	= 9.72
	= 10.3	= 10.4
	= 10.3	= 10.4
3	= 10.9	= 11.0
	= 10.3	= 10.4
	= 10.9	= 11.0
	= 10.3	= 10.4
4	= 10.9	= 11.0
	= 10.3	= 10.4
	= 10.9	= 11.0
	= 10.9	= 11.0
5	= 10.3	= 10.4
	= 9.61	= 9.72
	= 10.3	= 10.4
	= 9.61	= 9.72
SSM-2 (008:16:44:36.862)		
1	= 10.3	= 10.4
	= 9.61	= 9.72
	= 9.61	= 9.72
	= 10.3	= 10.4
2	= 10.3	= 10.4
	= 9.61	= 9.72
	= 10.3	= 10.4
	= 10.3	= 10.4
3	= 10.3	= 10.4
	= 10.3	= 10.4
	= 10.3	= 10.4
	= 10.3	= 10.4
4	= 10.3	= 10.4
	= 10.9	= 11.0
	= 10.3	= 10.4
	= 10.9	= 11.0
5	= 10.9	= 11.0
	= 10.9	= 11.0
	= 9.61	= 9.72
	= 10.9	= 11.0

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 79 MODE V (1 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 009:15:45:56.355

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

ψ = 0.56°

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 11.5	= 11.6
	= 11.5	= 11.6
	= 11.5	= 11.6
	= 9.84	= 9.97
5	= 9.84	= 9.97
	= 11.5	= 11.6
	= 10.7	= 10.8
	= 9.84	= 9.97
6	= 11.5	= 11.6
	= 10.7	= 10.8
	= 9.84	= 9.97
	= 11.5	= 11.6
SSM-1 (009:15:45:59.476)		
1	= 10.7	= 10.8
	= 10.7	= 10.8
	= 10.7	= 10.8
	= 10.7	= 10.8
2	= 10.7	= 10.8
	= 10.7	= 10.8
	= 11.5	= 11.6
	= 9.84	= 9.97
3	= 10.7	= 10.8
	= 9.01	= 9.14
	= 9.84	= 9.97
	= 11.5	= 11.6
4	= 10.7	= 10.8
	= 9.84	= 9.97
	= 9.84	= 9.97
	= 9.84	= 9.97
5	= 9.01	= 9.14
	= 10.7	= 10.8
	= 9.84	= 9.97
	= 9.01	= 9.14
SSM-2 (009:15:46:04.676)		
1	= 11.5	= 11.6
	= 11.5	= 11.6
	= 12.3	= 12.5
	= 11.5	= 11.6
2	= 10.7	= 10.8
	= 11.5	= 11.6
	= 9.84	= 9.97
	= 10.7	= 10.8
3	= 10.7	= 10.8
	= 9.84	= 9.97
	= 9.01	= 9.14
	= 10.7	= 10.8
4	= 10.7	= 10.8
	= 11.5	= 11.6
	= 9.84	= 9.97
	= 10.7	= 10.8
5	= 10.7	= 10.8
	= 10.7	= 10.8
	= 10.7	= 10.8
	= 11.5	= 11.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 79 MODE V (2 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 009:15:49:46.026

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.3°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.35°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6
5	= 11.7	= 11.8
	= 12.5	= 12.6
	= 11.7	= 11.8
	= 11.7	= 11.8
6	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6
SSM-1 (009:15:49:49.146)		
1	= 12.5	= 12.6
	= 10.8	= 10.9
	= 11.7	= 11.8
	= 11.7	= 11.8
2	= 10.8	= 10.9
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 10.8	= 10.9
3	= 9.99	= 10.1
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 9.99	= 10.1
4	= 11.7	= 11.8
	= 10.8	= 10.9
	= 9.99	= 10.1
	= 10.8	= 10.9
5	= 11.7	= 11.8
	= 10.8	= 10.9
	= 10.8	= 10.9
	= 10.8	= 10.9
SSM-2 (009:15:49:54.346)		
1	= 10.8	= 10.9
	= 11.7	= 11.8
	= 10.8	= 10.9
	= 11.7	= 11.8
2	= 11.7	= 11.8
	= 11.7	= 11.8
	= 10.8	= 10.9
	= 11.7	= 11.8
3	= 10.8	= 10.9
	= 12.5	= 12.6
	= 9.99	= 10.1
	= 11.7	= 11.8
4	= 10.8	= 10.9
	= 10.8	= 10.9
	= 12.5	= 12.6
	= 11.7	= 11.8
5	= 10.8	= 10.9
	= 10.8	= 10.9
	= 10.8	= 10.9
	= 11.7	= 11.8

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 79 MODE V (3 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 009:15:52:51.055

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 9.70	= 9.83
	= 10.5	= 10.7
	= 11.4	= 11.5
	= 10.5	= 10.7
5	= 11.4	= 11.5
	= 12.2	= 12.4
	= 12.2	= 12.4
	= 10.5	= 10.7
6	= 11.4	= 11.5
	= 12.2	= 12.4
	= 10.5	= 10.7
	= 11.4	= 11.5
SSM-1 (009:15:52:54.175)		
1	= 11.4	= 11.5
	= 11.4	= 11.5
	= 9.70	= 9.83
	= 10.5	= 10.7
2	= 10.5	= 10.7
	= 10.5	= 10.7
	= 11.4	= 11.5
	= 11.4	= 11.5
3	= 11.4	= 11.5
	= 9.70	= 9.83
	= 12.2	= 12.4
	= 12.2	= 12.4
4	= 10.5	= 10.7
	= 11.4	= 11.5
	= 11.4	= 11.5
	= 10.5	= 10.7
5	= 11.4	= 11.5
	= 11.4	= 11.5
	= 10.5	= 10.7
	= 10.5	= 10.7
SSM-2 (009:15:52:59.375)		
1	= 9.70	= 9.83
	= 10.5	= 10.7
	= 10.5	= 10.7
	= 9.70	= 9.83
2	= 9.70	= 9.83
	= 10.5	= 10.7
	= 10.5	= 10.7
	= 10.5	= 10.7
3	= 10.5	= 10.7
	= 10.5	= 10.7
	= 10.5	= 10.7
	= 9.70	= 9.83
4	= 10.5	= 10.7
	= 10.5	= 10.7
	= 10.5	= 10.7
	= 10.5	= 10.7

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 79 MODE V (4 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 009:16:00:44.472

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0		
4	= 7.80	= 7.93
	= 7.80	= 7.93
	= 8.63	= 8.76
	= 8.63	= 8.76
5	= 8.63	= 8.76
	= 7.80	= 7.93
	= 9.45	= 9.58
	= 9.45	= 9.58
6	= 6.98	= 7.11
	= 8.63	= 8.76
	= 7.80	= 7.93
	= 7.80	= 7.93
SSM-1(009:16:00:47.592)		
1	= 7.80	= 7.93
	= 7.80	= 7.93
	= 8.63	= 8.76
	= 6.98	= 7.11
2	= 6.98	= 7.11
	= 7.80	= 7.93
	= 7.80	= 7.93
	= 8.63	= 8.76
3	= 8.63	= 8.76
	= 7.80	= 7.93
	= 8.63	= 8.76
	= 7.80	= 7.93
4	= 7.80	= 7.93
	= 9.45	= 9.58
	= 8.63	= 8.76
	= 7.80	= 7.93
5	= 6.98	= 7.11
	= 7.80	= 7.93
	= 8.63	= 8.76
	= 7.80	= 7.93
SSM-2 (009:16:00:52.792)		
1	= 7.89	= 8.02
	= 7.07	= 7.20
	= 8.72	= 8.85
	= 7.89	= 8.02
2	= 7.89	= 8.02
	= 9.55	= 9.68
	= 8.72	= 8.85
	= 8.72	= 8.85
3	= 8.72	= 8.85
	= 7.89	= 8.02
	= 8.72	= 8.85
	= 7.89	= 8.02
4	= 9.55	= 9.68
	= 7.89	= 8.02
	= 7.89	= 8.02
	= 7.07	= 7.20
5	= 7.89	= 8.02
	= 7.89	= 8.02
	= 7.89	= 8.02
	= 7.89	= 8.02

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 81 MODE III(1 of 1) SUBMODE 3

FIRST FRAME START TIME (JSC/GMT) 011:17:29:11.419

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.75°$; $\xi_r = 0°$

$\psi = 0.6°$

$\xi_p = 0°$; $\xi_r = \pm 0.8°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 9.71	= 9.78
	*	*
	= 8.91	= 8.98
	= 9.71	= 9.78
5	= 9.71	= 9.78
	= 10.5	= 10.6
	= 9.71	= 9.78
	= 9.71	= 9.78
6	= 9.71	= 9.78
	= 8.91	= 8.98
	= 10.5	= 10.6
	= 9.71	= 9.78
SSM-1 (011:17:29:14.539)		
1	= 9.71	= 9.78
	= 8.91	= 8.98
	= 8.91	= 8.98
	= 8.91	= 8.98
2	= 9.71	= 9.78
	= 8.91	= 8.98
	= 9.71	= 9.78
	= 8.91	= 8.98
3	= 8.91	= 8.98
	= 8.91	= 8.98
	= 9.71	= 9.78
	*	*
4	= 8.91	= 8.98
	= 8.91	= 8.98
	= 9.71	= 9.78
	= 8.91	= 8.98
5	= 8.91	= 8.98
	= 9.71	= 9.78
	= 9.71	= 9.78
	= 8.91	= 8.98
SSM-2 (011:17:29:19.739)		
1	= 8.91	= 8.98
	= 8.91	= 8.98
	= 9.71	= 9.78
	= 8.91	= 8.98
2	*	*
	= 8.91	= 8.98
	= 8.91	= 8.98
	= 8.91	= 8.98
3	= 9.71	= 9.78
	= 8.91	= 8.98
	= 9.71	= 9.78
	= 9.71	= 9.78
4	= 8.91	= 8.98
	= 8.91	= 8.98
	= 8.91	= 8.98
	= 9.71	= 9.78
5	= 9.71	= 9.78
	= 9.71	= 9.78
	*	*
	= 9.71	= 9.78

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 82 MODE V (1 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 012:17:00:31.351

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.6°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.65°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 16.2	= 16.3
	= 14.6	= 14.7
	= 15.4	= 15.5
	= 13.8	= 13.9
5	= 13.0	= 13.1
	= 13.0	= 13.1
	= 13.8	= 13.9
	= 16.2	= 16.3
6	= 14.6	= 14.7
	= 14.6	= 14.7
	= 15.4	= 15.5
	= 14.6	= 14.7
SSM-1 (012:17:00:34.471)		
1	= 15.4	= 15.5
	= 17.0	= 17.1
	= 15.4	= 15.5
	= 16.2	= 16.3
2	= 16.2	= 16.3
	= 16.2	= 16.3
	= 16.2	= 16.3
	= 16.2	= 16.3
3	= 17.0	= 17.1
	= 17.0	= 17.1
	= 17.0	= 17.1
	= 16.2	= 16.3
4	= 15.4	= 15.5
	= 16.2	= 16.3
	= 15.4	= 15.5
	= 13.0	= 13.1
5	= 13.0	= 13.1
	= 11.5	= 11.6
	= 10.7	= 10.8
	= 9.98	= 10.1
SSM-2 (012:17:00:39.671)		
1	= 9.21	= 9.31
	= 9.21	= 9.31
	= 9.98	= 10.1
	= 9.98	= 10.1
2	= 9.22	= 9.32
	= 9.99	= 10.1
	= 9.22	= 9.32
	= 9.22	= 9.32
3	= 9.22	= 9.32
	= 9.22	= 9.32
	= 9.99	= 10.1
	= 9.99	= 10.1
4	= 11.6	= 11.7
	= 10.8	= 10.9
	= 9.99	= 10.1
	= 10.8	= 10.9
5	= 10.8	= 10.9
	= 10.8	= 10.9
	= 9.99	= 10.1
	= 9.22	= 9.32

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 83 MODE V (1 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 014:15:34:38.880

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				= 9.43	= 9.54		= 10.2	= 10.3
4	= 9.43	= 9.54		= 10.2	= 10.3			
	= 9.43	= 9.54		= 9.43	= 9.54			
	= 8.70	= 8.81	5	= 10.2	= 10.3			
	= 10.2	= 10.3		= 8.70	= 8.81			
5	= 10.2	= 10.3		= 8.70	= 8.81			
	= 8.70	= 8.81		= 10.2	= 10.3			
	= 9.43	= 9.54	SSM-2 (014:15:34:47.201)					
	= 10.2	= 10.3	1	= 8.70	= 8.81			
6	= 10.2	= 10.3		= 9.43	= 9.54			
	= 9.43	= 9.54		= 10.2	= 10.3			
	= 8.70	= 8.81		= 8.70	= 8.81			
	= 8.70	= 8.81	2	= 9.43	= 9.54			
SSM-1 (014:15:34:42.000)				= 9.43	= 9.54			
1	= 8.70	= 8.81		= 10.2	= 10.3			
	= 9.43	= 9.54		= 9.43	= 9.54			
	= 10.2	= 10.3	3	= 8.70	= 8.81			
	= 10.2	= 10.3		= 9.43	= 9.54			
2	= 10.2	= 10.3		= 8.70	= 8.81			
	= 9.43	= 9.54		= 9.43	= 9.54			
	= 9.43	= 9.54	4	= 9.43	= 9.54			
	= 9.43	= 9.54		= 8.70	= 8.81			
3	= 9.43	= 9.54		= 8.70	= 8.81			
	= 9.43	= 9.54		= 10.2	= 10.3			
	= 9.43	= 9.54	5	= 9.47	= 9.58			
	= 9.43	= 9.54		= 9.47	= 9.58			
4	= 9.43	= 9.54		= 8.74	= 8.85			

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 83 MODE V (2 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 014:15:36:18.248

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-Ø		
4	= 8.46	= 8.57
	= 9.13	= 9.24
	= 8.46	= 8.57
	= 8.46	= 8.57
5	= 8.46	= 8.57
	= 8.46	= 8.57
	= 8.46	= 8.57
	= 8.46	= 8.57
6	= 8.46	= 8.57
	= 8.46	= 8.57
	= 8.46	= 8.57
	*	*
SSM-1 (014:15:36:21.368)		
1	= 8.46	= 8.57
	*	*
	= 8.46	= 8.57
	= 8.46	= 8.57
2	= 8.46	= 8.57
	*	*
	= 9.13	= 9.24
	= 9.13	= 9.24
3	= 9.13	= 9.24
	= 8.46	= 8.57
	= 8.46	= 8.57
	= 9.13	= 9.24
4	= 8.46	= 8.57
	*	*
	= 8.46	= 8.57
	= 8.46	= 8.57
5	= 8.46	= 8.57
	*	*
	= 8.46	= 8.57
	= 8.46	= 8.57
SSM-2 (014:15:36:26.568)		
1	= 8.46	= 8.57
	*	*
	*	*
	= 8.46	= 8.57
2	= 9.13	= 9.24
	= 8.46	= 8.57
	= 8.46	= 8.57
	= 8.46	= 8.57
3	*	*
	= 8.46	= 8.57
	= 9.13	= 9.24
	= 8.46	= 8.57
4	= 8.62	= 8.73
	= 8.62	= 8.73
	= 8.62	= 8.73
	= 8.62	= 8.73
5	*	*
	*	*
	*	*
	= 8.62	= 8.73

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 83 MODE V (3 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 014:15:38:26.133

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0		
4	= 7.68	= 7.79
	*	*
	= 7.68	= 7.79
	= 7.68	= 7.79
5	= 7.68	= 7.79
	*	*
	= 7.68	= 7.79
	*	*
6	*	*
	*	*
	= 7.68	= 7.79
	*	*
SSM-1 (014:15:38:29.253)		
1	*	*
	*	*
	= 7.68	= 7.79
	= 7.68	= 7.79
2	*	*
	*	*
	*	*
	= 7.68	= 7.79
3	*	*
	= 7.68	= 7.79
	= 7.68	= 7.79
	*	*
4	*	*

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
	= 7.68	= 7.79
	= 7.68	= 7.79
	= 8.49	= 8.60
5	*	*
	= 8.49	= 8.60
	= 7.68	= 7.79
	= 7.68	= 7.79
SSM-2 (014:15:38:34.453)		
1	= 7.68	= 7.79
	*	*
	*	*
	*	*
2	= 7.68	= 7.79
	= 7.68	= 7.79
	*	*
	= 7.68	= 7.79
3	= 8.49	= 8.60
	= 7.68	= 7.79
	= 7.68	= 7.79
	*	*
4	= 7.68	= 7.79
	= 7.68	= 7.79
	*	*
	= 8.49	= 8.60
5	= 7.68	= 7.79
	= 7.68	= 7.79
	= 7.68	= 7.79

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
	*	*

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 83 MODE V (4 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 014:15:41:23.270

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				= 7.94	= 8.05		= 8.83	= 8.94
4	= 8.75	= 8.86		= 8.75	= 8.86			
	= 7.94	= 8.05		= 9.57	= 9.68			
	= 7.94	= 8.05	5	= 8.75	= 8.86			
	= 8.75	= 8.86		= 8.75	= 8.86			
5	= 8.75	= 8.86		= 7.94	= 8.05			
	= 8.75	= 8.86		= 10.4	= 10.5			
	= 8.75	= 8.86	SSM-2 (014:15:41:31.590)					
	= 7.94	= 8.05	1	= 8.75	= 8.86			
6	= 8.75	= 8.86		= 8.75	= 8.86			
	= 9.57	= 9.68		= 8.75	= 8.86			
	= 9.57	= 9.68		= 7.94	= 8.05			
	= 7.94	= 8.05	2	= 7.94	= 8.05			
SSM-1 (014:15:41:26.390)				= 9.57	= 9.68			
1	= 7.94	= 8.05		= 8.75	= 8.86			
	= 7.94	= 8.05		= 8.75	= 8.86			
	= 9.57	= 9.68	3	= 7.94	= 8.05			
	*	*		= 7.94	= 8.05			
2	= 7.94	= 8.05		= 8.75	= 8.86			
	= 7.94	= 8.05		= 8.75	= 8.86			
	= 9.57	= 9.68	4	= 8.75	= 8.86			
	= 8.75	= 8.86		= 8.75	= 8.86			
3	= 8.75	= 8.86		= 7.94	= 8.05			
	= 8.75	= 8.86		= 8.75	= 8.86			
	= 9.57	= 9.68	5	= 8.83	= 8.94			
	= 8.75	= 8.86		= 8.01	= 8.12			
4	= 8.75	= 8.86		= 8.83	= 8.94			

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 83 MODE I (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 014:16:56:0.994

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.0°$; $\xi_r = 0°$

$\psi = 0.95°$

$\xi_p = 0°$; $\xi_r = \pm 1.05°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				= 11.4	= 11.8		= 11.4	= 11.8
6	= 13.0	= 13.4		= 10.6	= 11.0		= 12.2	= 12.6
	= 12.2	= 12.6	13	= 13.0	= 13.4		= 11.4	= 11.8
	= 12.2	= 12.6		= 12.2	= 12.6	20	= 11.4	= 11.8
	= 11.4	= 11.8		= 11.4	= 11.8		= 11.4	= 11.8
7	= 12.2	= 12.6		= 11.4	= 11.8		= 12.2	= 12.6
	= 11.4	= 11.8	14	= 11.4	= 11.8		= 10.6	= 11.0
	= 12.2	= 12.6		= 12.2	= 12.6	SSM-1 (014:16:56:16.594)		
	= 10.6	= 11.0		= 11.4	= 11.8	1	= 11.4	= 11.8
8	= 11.4	= 11.8		= 12.2	= 12.6		= 11.4	= 11.8
	= 11.4	= 11.8	15	= 11.4	= 11.8		= 11.4	= 11.8
	= 11.4	= 11.8		= 12.2	= 12.6		= 11.4	= 11.8
	= 13.0	= 13.4		= 11.4	= 11.8	2	= 12.2	= 12.6
9	= 11.4	= 11.8		= 11.4	= 11.8		= 12.2	= 12.6
	= 11.4	= 11.8	16	= 11.4	= 11.8		= 11.4	= 11.8
	= 11.4	= 11.8		= 11.4	= 11.8		= 11.4	= 11.8
	= 10.6	= 11.0		= 11.4	= 11.8	3	= 11.4	= 11.8
10	= 11.4	= 11.8		= 10.6	= 11.0		= 10.6	= 11.0
	= 11.4	= 11.8	17	= 11.4	= 11.8		= 10.6	= 11.0
	= 11.4	= 11.8		= 11.4	= 11.8		= 10.6	= 11.0
	= 11.4	= 11.8		= 12.2	= 12.6	4	= 12.2	= 12.6
11	= 12.2	= 12.6		= 11.4	= 11.8		= 11.4	= 11.8
	= 12.2	= 12.6	18	= 12.2	= 12.6		= 10.6	= 11.0
	= 12.2	= 12.6		= 12.2	= 12.6		= 12.2	= 12.6
	= 11.4	= 11.8		= 11.4	= 11.8	5	= 11.4	= 11.8
12	= 11.4	= 11.8		= 11.4	= 11.8		= 12.2	= 12.6
	= 12.2	= 12.6	19	= 11.4	= 11.8		= 11.4	= 11.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 83 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.0°$; $\xi_r = 0°$

$\psi = 0.95°$

$\xi_p = 0°$; $\xi_r = \pm 1.05°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	11.4	= 11.8
6	= 11.4	= 11.8
	= 11.4	= 11.8
	= 12.2	= 12.6
	= 12.2	= 12.6
7	= 12.2	= 12.6
	= 12.2	= 12.6
	= 11.4	= 11.8
	= 11.4	= 11.8
8	= 11.4	= 11.8
	= 12.2	= 12.6
	= 12.2	= 12.6
	= 11.4	= 11.8
9	= 11.4	= 11.8
	= 11.4	= 11.8
	= 11.4	= 11.8
	= 11.4	= 11.8
10	= 11.4	= 11.8
	= 11.4	= 11.8
	= 12.2	= 12.6
	= 11.4	= 11.8
11	= 11.4	= 11.8
	= 12.2	= 12.6
	= 12.2	= 12.6
	= 10.6	= 11.0
12	= 11.4	= 11.8
	= 10.6	= 11.0

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 12.2	= 12.6
	= 11.4	= 11.8
13	= 11.4	= 11.8
	= 11.4	= 11.8
	= 11.4	= 11.8
	= 11.4	= 11.8
14	= 12.3	= 12.6
	= 11.5	= 11.8
	= 11.5	= 11.8
	= 11.5	= 11.8
15	= 10.6	= 11.0
	= 12.2	= 12.6
	= 11.4	= 11.8
	= 11.4	= 11.8
SSM-2 (014:16:56:32.194)		
1	= 10.7	= 11.1
	= 10.7	= 11.1
	= 11.5	= 11.8
	= 11.5	= 11.8
2	= 11.5	= 11.8
	= 12.3	= 12.6
	= 11.5	= 11.8
	= 11.5	= 11.8
3	= 11.5	= 11.8
	= 12.3	= 12.6
	= 10.7	= 11.1
	= 11.5	= 11.8

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	= 10.7	= 11.1
	= 11.5	= 11.8
	= 11.5	= 11.8
	= 11.5	= 11.8
5	= 11.5	= 11.8
	= 11.5	= 11.8
	= 12.3	= 12.6
	= 11.5	= 11.8
6	= 11.5	= 11.8
	= 11.5	= 11.8
	= 11.5	= 11.8
	= 11.5	= 11.8
7	= 11.5	= 11.8
	= 11.5	= 11.8
	= 12.3	= 12.6
	= 12.3	= 12.6
8	= 11.5	= 11.8
	= 11.5	= 11.8
	= 12.3	= 12.6
	= 11.5	= 11.8
9	= 12.3	= 12.6
	= 11.5	= 11.8
	= 11.5	= 11.8
	= 12.3	= 12.6
10	= 11.5	= 11.8
	= 11.5	= 11.8
	= 11.5	= 11.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 83 MODE I (1 of 1) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.0°$; $\xi_r = 0°$

$\psi = 0.95°$

$\xi_p = 0°$; $\xi_r = \pm 1.05°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	11.5	= 11.8						
11	= 11.5	= 11.8						
	= 11.5	= 11.8						
	= 11.5	= 11.8						
	= 11.5	= 11.8						
12	= 11.5	= 11.8						
	= 12.3	= 12.6						
	= 11.5	= 11.8						
	= 11.5	= 11.8						
13	= 12.3	= 12.6						
	= 12.3	= 12.6						
	= 10.7	= 11.1						
	= 11.5	= 11.8						
14	= 11.5	= 11.8						
	= 10.7	= 11.1						
	= 10.7	= 11.1						
	= 11.5	= 11.8						
15	= 11.5	= 11.8						
	= 11.5	= 11.8						
	= 11.5	= 11.8						
	= 10.7	= 11.1						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 85 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 018:20:48:35.403

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				= 11.5	= 11.6		= 10.7	= 10.8
4	= 11.5	= 11.6		= 10.7	= 10.8			
	= 11.5	= 11.6		= 10.7	= 10.8			
	= 11.5	= 11.6	5	= 13.1	= 13.2			
	= 11.5	= 11.6		= 11.5	= 11.6			
5	= 11.5	= 11.6		= 11.5	= 11.6			
	= 12.3	= 12.5		= 11.5	= 11.6			
	= 11.5	= 11.6	SSM-2 (018:20:48:43.724)					
	= 11.5	= 11.6	1	= 12.3	= 12.5			
6	= 11.5	= 11.6		= 11.5	= 11.6			
	= 12.3	= 12.5		= 12.3	= 12.5			
	= 11.5	= 11.6		= 11.5	= 11.6			
	= 11.5	= 11.6	2	= 11.5	= 11.6			
SSM-1 (018:20:48:38.523)				= 11.5	= 11.6			
1	= 10.7	= 10.8		= 10.7	= 10.8			
	= 10.7	= 10.8		= 12.3	= 12.5			
	= 11.5	= 11.6	3	= 11.5	= 11.6			
	= 10.7	= 10.8		= 11.5	= 11.6			
2	= 10.7	= 10.8		= 10.7	= 10.8			
	= 11.5	= 11.6		= 11.5	= 11.6			
	= 11.5	= 11.6	4	= 10.7	= 10.8			
	= 10.7	= 10.8		= 11.5	= 11.6			
3	= 11.5	= 11.6		= 10.7	= 10.8			
	= 10.7	= 10.8		= 9.90	= 10.0			
	= 11.5	= 11.6	5	= 10.7	= 10.8			
	= 11.5	= 11.6		= 10.7	= 10.8			
4	= 11.5	= 11.6		= 11.5	= 11.6			

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

C-3

MISSION SL-4 PASS 86 MODE V (1 of 1) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 020:19:18:14.935

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 11.8	= 11.9
	= 12.6	= 12.7
	= 13.3	= 13.4
	= 13.3	= 13.4
5	= 13.3	= 13.4
	= 13.3	= 13.4
	= 11.8	= 11.9
	= 14.1	= 14.2
6	= 14.1	= 14.2
	= 14.1	= 14.2
	= 14.1	= 14.2
	= 14.9	= 15.0
SSM-1 (020:19:18:18.055)		
1	= 14.9	= 15.0
	= 14.9	= 15.0
	= 14.9	= 15.0
	= 14.9	= 15.0
2	= 14.9	= 15.0
	= 14.9	= 15.0
	= 14.9	= 15.0
	= 14.9	= 15.0
3	= 14.1	= 14.2
	= 14.9	= 15.0
	= 14.9	= 15.0
	= 14.9	= 15.0
4	= 14.1	= 14.2
	= 15.8	= 15.9
	= 14.1	= 14.2
	= 15.8	= 15.9
5	= 14.9	= 15.0
	= 13.3	= 13.4
	= 14.1	= 14.2
	= 14.9	= 15.0
SSM-2 (020:19:18:23.255)		
1	= 13.3	= 13.4
	= 13.3	= 13.4
	= 14.1	= 14.2
†	= 14.1	= 14.2
5	= 11.8	= 11.9
	= 11.8	= 11.9
	= 11.8	= 11.9
	= 11.8	= 11.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

†Frames 2,3,4, missing from SSM-2.

MISSION SL-4 PASS 88 MODE V (4 of 4) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 022:19:33:0.485

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.0°$; $\xi_r = 0°$

$\psi = 0.97°$

$\xi_p = 0°$; $\xi_r = \pm 1.05°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 10.5	= 10.8
	= 10.5	= 10.8
	= 9.70	= 10.0
	= 10.5	= 10.8
5	= 10.5	= 10.8
	= 10.5	= 10.8
	= 11.3	= 11.6
	= 10.5	= 10.8
6	= 11.3	= 11.6
	= 10.5	= 10.8
	= 9.70	= 10.0
	= 9.70	= 10.0
SSM-1 (022:19:33:3.605)		
1	= 9.70	= 10.0
	= 9.70	= 10.0
	= 9.70	= 10.0
	= 10.5	= 10.8
2	= 9.70	= 10.0
	= 10.5	= 10.8
	= 10.5	= 10.8
	= 10.5	= 10.8
3	= 9.70	= 10.0
	= 9.70	= 10.0
	= 11.3	= 11.6
	= 11.3	= 11.6
4	= 10.5	= 10.8
	= 10.5	= 10.8
	= 11.3	= 11.6
	= 10.5	= 10.8
5	= 10.5	= 10.8
	= 9.70	= 10.0
	= 11.3	= 11.6
	= 10.5	= 10.8
SSM-2 (022:19:33:8.805)		
1	= 11.3	= 11.6
	= 11.3	= 11.6
	= 10.5	= 10.8
	= 9.70	= 10.0
2	= 10.5	= 10.8
	= 12.1	= 12.4
	= 11.3	= 11.6
	= 10.5	= 10.8
3	= 11.3	= 11.6
	= 12.1	= 12.4
	= 11.3	= 11.6
	= 12.1	= 12.4
4	= 11.3	= 11.6
	= 11.3	= 11.6
	= 11.3	= 11.6
	= 12.1	= 12.4
5	= 12.1	= 12.4
	= 11.3	= 11.6
	= 11.3	= 11.6
	= 10.5	= 10.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 90 MODE V (2 of 5) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 025:17:22:35.486

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.0°$; $\xi_r = 0°$

$\psi = 0.94°$

$\xi_p = 0°$; $\xi_r = \pm 1.05°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 10.5	= 10.8
	= 10.5	= 10.8
	= 10.5	= 10.8
	= 11.2	= 11.6
5	= 11.2	= 11.6
	= 10.5	= 10.8
	= 11.2	= 11.6
	= 11.2	= 11.6
6	= 11.2	= 11.6
	= 9.80	= 10.0
	= 12.0	= 12.3
	= 11.2	= 11.6
SSM-1 (025:17:22:38.606)		
1	= 11.2	= 11.6
	= 11.2	= 11.6
	= 10.5	= 10.8
	= 11.2	= 11.6
2	= 11.2	= 11.6
	= 10.5	= 10.8
	= 10.5	= 10.8
	= 11.2	= 11.6
3	= 10.5	= 10.8
	= 10.5	= 10.8
	= 11.2	= 11.6
	= 12.0	= 12.3
4	= 10.5	= 10.8
	= 11.2	= 11.6
	= 12.0	= 12.3
	= 10.5	= 10.8
5	= 10.5	= 10.8
	= 10.5	= 10.8
	= 10.5	= 10.8
	= 9.80	= 10.0
SSM-2 (025:17:22:43.806)		
1	= 11.2	= 11.6
	= 11.2	= 11.6
	= 11.2	= 11.6
	= 11.2	= 11.6
†		

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

†Missing frames 2-5, SSM-2, from KSC data.

MISSION SL-4 PASS 91 MODE V (1 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 026:19:53:47.478

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.1°$; $\xi_r = 0°$

$\psi = 1.05°$

$\xi_p = 0°$; $\xi_r = \pm 1.15°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 12.5	= 12.9
	= 13.2	= 13.6
	= 13.2	= 13.6
	= 13.2	= 13.6
5	= 12.5	= 12.9
	= 13.2	= 13.6
	= 11.7	= 12.1
	= 11.7	= 12.1
6	= 12.5	= 12.9
	= 11.8	= 12.2
	= 11.8	= 12.2
	= 11.0	= 11.4
SSM-1 (026:19:53:50.597)		
1	= 10.9	= 11.3
	= 11.7	= 12.1
	= 11.7	= 12.1
	= 11.7	= 12.1
2	= 11.8	= 12.2
	= 11.0	= 11.4
	= 10.2	= 10.6
	= 11.0	= 11.4
3	= 10.2	= 10.6
	= 11.0	= 11.4
	= 11.0	= 11.4
	= 11.0	= 11.4
4	= 10.2	= 10.6
	= 11.0	= 11.4
	= 11.8	= 12.2
	= 11.0	= 11.4
5	= 11.0	= 11.4
	= 11.8	= 12.2
	= 10.2	= 10.6
	= 10.2	= 10.6
SSM-2 (026:19:53:55.797)		
1	= 10.9	= 11.3
	= 10.2	= 10.6
	= 9.40	= 9.79
	= 9.40	= 9.79
2	= 9.48	= 9.87
	= 10.2	= 10.6
	= 10.2	= 10.6
	= 10.2	= 10.6
3	= 11.0	= 11.4
	= 11.0	= 11.4
	= 11.0	= 11.4
	= 9.48	= 9.87
4	= 11.8	= 12.2
	= 11.0	= 11.4
	= 11.0	= 11.4
	= 9.48	= 9.87
5	= 10.2	= 10.6
	= 10.2	= 10.6
	= 10.9	= 11.3
	= 11.7	= 12.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 91 MODE V (2 of 2) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 026:19:56:11.696

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 1.0°$; $\xi_r = 0°$

$\psi = 0.97°$

$\xi_p = 0°$; $\xi_r = \pm 1.05°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
5	= 10.9	= 11.2
	= 11.7	= 12.0
	= 10.1	= 10.4
	= 10.9	= 11.2
6	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
SSM-1 (026:19:56:14.815)		
1	= 10.1	= 10.4
	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
2	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
3	= 10.1	= 10.4
	= 11.7	= 12.0
	= 10.1	= 10.4
	= 10.9	= 11.2
4	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
5	= 10.1	= 10.4
	= 11.7	= 12.0
	= 11.7	= 12.0
	= 11.7	= 12.0
SSM-2 (026:19:56:20.015)		
1	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.1	= 10.4
2	= 11.7	= 12.0
	= 10.9	= 11.2
	= 10.1	= 10.4
	= 10.1	= 10.4
3	= 11.7	= 12.0
	= 10.1	= 10.4
	= 10.9	= 11.2
	= 10.9	= 11.2
4	= 10.1	= 10.4
	= 11.7	= 12.0
	= 10.9	= 11.2
	= 10.9	= 11.2
5	= 10.9	= 11.2
	= 10.9	= 11.2
	= 10.1	= 10.4
	= 11.7	= 12.0

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (2 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:14:55:24.019

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				= 11.0	= 11.1		= 12.1	= 12.2
6	= 11.8	= 11.9		= 11.0	= 11.1		= 11.3	= 11.4
	= 11.8	= 11.9	13	= 12.1	= 12.2		= 10.5	= 10.6
	= 11.0	= 11.1		= 11.3	= 11.4	20	= 11.3	= 11.4
	= 11.8	= 11.9		= 12.1	= 12.2		= 11.3	= 11.4
7	= 11.0	= 11.1		= 11.3	= 11.4		= 11.3	= 11.4
	= 11.8	= 11.9	14	= 11.3	= 11.4		= 11.3	= 11.4
	= 11.0	= 11.1		= 10.5	= 10.6	SSM-1 (031:14:55:39.619)		
	= 11.8	= 11.9		= 12.1	= 12.2	1	= 11.3	= 11.4
8	= 11.8	= 11.9		= 11.3	= 11.4		= 10.5	= 10.6
	= 12.6	= 12.7	15	= 11.3	= 11.4		= 10.5	= 10.6
	= 11.8	= 11.9		= 11.3	= 11.4		= 12.1	= 12.2
	= 11.8	= 11.9		= 12.1	= 12.2	2	= 12.1	= 12.2
9	= 11.0	= 11.1		= 11.3	= 11.4		= 11.3	= 11.4
	= 11.8	= 11.9	16	= 10.5	= 10.6		= 9.69	= 9.80
	= 11.8	= 11.9		= 11.3	= 11.4		= 10.5	= 10.6
	= 11.0	= 11.1		= 11.3	= 11.4	3	= 11.3	= 11.4
10	= 9.46	= 9.57		= 11.3	= 11.4		= 10.5	= 10.6
	= 12.6	= 12.7	17	= 11.3	= 11.4		= 11.3	= 11.4
	= 11.0	= 11.1		= 11.3	= 11.4		= 10.5	= 10.6
	= 10.3	= 10.4		= 12.1	= 12.2	4	= 10.5	= 10.6
11	= 11.0	= 11.1		= 11.3	= 11.4		= 10.5	= 10.6
	= 11.0	= 11.1	18	= 11.3	= 11.4		= 11.3	= 11.4
	= 11.8	= 11.9		= 10.5	= 10.6		= 11.3	= 11.4
	= 11.0	= 11.1		= 11.3	= 11.4	5	= 10.5	= 10.6
12	= 11.8	= 11.9		= 11.3	= 11.4		= 10.5	= 10.6
	= 11.0	= 11.1	19	= 11.3	= 11.4		= 11.3	= 11.4

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (2 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	10.5	= 10.6		= 11.4	= 11.5	4	= 11.4	= 11.5
6	= 12.1	= 12.2		= 11.4	= 11.5		= 10.6	= 10.7
	= 10.5	= 10.6	13	= 11.4	= 11.5		= 11.4	= 11.5
	= 11.3	= 11.4		= 11.4	= 11.5		= 11.4	= 11.5
	= 10.5	= 10.6		= 12.2	= 12.3	5	= 11.4	= 11.5
7	= 11.3	= 11.4		= 10.6	= 10.7		= 11.4	= 11.5
	= 11.3	= 11.4	14	= 11.4	= 11.5		= 12.2	= 12.3
	= 11.3	= 11.4		= 11.4	= 11.5		= 10.6	= 10.7
	= 11.3	= 11.4		= 11.4	= 11.5	6	= 10.6	= 10.7
8	= 11.3	= 11.4		= 10.6	= 10.7		= 11.4	= 11.5
	= 10.5	= 10.6	15	= 10.6	= 10.7		= 11.4	= 11.5
	= 10.5	= 10.6		= 10.6	= 10.7		= 10.6	= 10.7
	= 12.1	= 12.2		= 11.4	= 11.5	7	= 12.2	= 12.3
9	= 10.5	= 10.6		= 12.2	= 12.3		= 9.79	= 9.90
	= 11.3	= 11.4	SSM-2 (031:14:55:55.219)				= 11.4	= 11.5
	= 11.3	= 11.4	1	= 10.6	= 10.7		= 10.6	= 10.7
	= 12.1	= 12.2		= 11.4	= 11.5	8	= 11.4	= 11.5
10	= 12.1	= 12.2		= 11.4	= 11.5		= 11.4	= 11.5
	= 11.3	= 11.4		= 11.4	= 11.5		= 11.4	= 11.5
	= 11.3	= 11.4	2	= 11.4	= 11.5		= 11.4	= 11.5
	= 11.3	= 11.4		= 11.4	= 11.5	9	= 11.4	= 11.5
11	= 11.3	= 11.4		= 11.4	= 11.5		= 11.4	= 11.5
	= 10.5	= 10.6		= 12.2	= 12.3		= 10.6	= 10.7
	= 11.3	= 11.4	3	= 10.6	= 10.7		= 10.6	= 10.7
	= 10.5	= 10.6		= 10.6	= 10.7	10	= 12.2	= 12.3
12	= 12.2	= 12.3		= 11.4	= 11.5		= 10.6	= 10.7
	= 10.6	= 10.7		= 12.2	= 12.3		= 11.4	= 11.5

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (2 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	10.6	= 10.7						
11	= 10.6	= 10.7						
	= 11.4	= 11.5						
	= 10.6	= 10.7						
	= 11.4	= 11.5						
12	= 10.6	= 10.7						
	= 10.6	= 10.7						
	= 11.4	= 11.5						
	= 10.6	= 10.7						
13	= 11.4	= 11.5						
	= 11.4	= 11.5						
	= 11.4	= 11.5						
	= 11.4	= 11.5						
14	= 11.4	= 11.5						
	= 12.2	= 12.3						
	= 11.4	= 11.5						
	= 10.6	= 10.7						
15	= 11.4	= 11.5						
	= 11.4	= 11.5						
	= 11.4	= 11.5						
	= 10.6	= 10.7						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (3 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:00:25.840

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.6°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				= 14.1	= 14.2		= 15.1	= 15.2
6	= 14.1	= 14.2		= 12.4	= 12.5		= 14.2	= 14.3
	= 13.2	= 13.4	13	= 13.2	= 13.4		= 15.1	= 15.2
	= 13.2	= 13.4		= 14.1	= 14.2	20	= 15.9	= 16.1
	= 11.6	= 11.7		= 13.2	= 13.4		= 16.8	= 16.9
7	= 12.4	= 12.5		= 14.1	= 14.2		= 16.8	= 16.9
	= 13.2	= 13.4	14	= 13.2	= 13.4		= 17.7	= 17.8
	= 12.4	= 12.5		= 13.2	= 13.4	SSM-1 (031:15:00:41.440		
	= 12.4	= 12.5		= 12.4	= 12.5	1	= 17.7	= 17.8
8	= 13.2	= 13.4		= 14.1	= 14.2		= 16.8	= 16.9
	= 12.4	= 12.5	15	= 14.1	= 14.2		= 16.8	= 16.9
	= 14.1	= 14.2		= 13.2	= 13.4		= 16.8	= 16.9
	= 12.4	= 12.5		= 14.1	= 14.2	2	= 15.9	= 16.1
9	= 13.2	= 13.4		= 13.2	= 13.4		= 15.9	= 16.1
	= 13.2	= 13.4	16	= 13.2	= 13.4		= 14.2	= 14.3
	= 13.2	= 13.4		= 14.1	= 14.2		= 13.3	= 13.5
	= 14.1	= 14.2		= 14.1	= 14.2	3	= 14.2	= 14.3
10	= 12.4	= 12.5		= 14.1	= 14.2		= 13.3	= 13.5
	= 13.2	= 13.4	17	= 15.1	= 15.2		= 14.2	= 14.3
	= 13.2	= 13.4		= 13.3	= 13.5		= 14.2	= 14.3
	= 14.1	= 14.2		= 15.1	= 15.2	4	= 14.2	= 14.3
11	= 13.2	= 13.4		= 15.9	= 16.1		= 13.3	= 13.5
	= 14.9	= 15.1	18	= 14.2	= 14.3		= 14.2	= 14.3
	= 14.1	= 14.2		= 15.9	= 16.1		= 14.2	= 14.3
	= 13.2	= 13.4		= 15.1	= 15.2	5	= 13.3	= 13.5
12	= 13.2	= 13.4		= 15.1	= 15.2		= 12.5	= 12.6
	= 14.1	= 14.2	19	= 15.1	= 15.2		= 12.5	= 12.6

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (3 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)__________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.6°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	12.5	= 12.6
6	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6
7	= 12.5	= 12.6
	= 13.3	= 13.5
	= 13.3	= 13.5
	= 13.3	= 13.5
8	= 12.5	= 12.6
	= 13.3	= 13.5
	= 13.3	= 13.5
	= 13.3	= 13.5
9	= 11.7	= 11.8
	= 13.3	= 13.5
	= 13.3	= 13.5
	= 14.2	= 14.3
10	= 12.5	= 12.6
	= 14.2	= 14.3
	= 13.3	= 13.5
	= 13.3	= 13.5
11	= 13.3	= 13.5
	= 14.2	= 14.3
	= 13.3	= 13.5
	= 14.2	= 14.3
12	= 12.5	= 12.6
	= 15.1	= 15.2
	= 15.1	= 15.2
	= 14.2	= 14.3
13	= 15.1	= 15.2
	= 14.2	= 14.3
	= 15.1	= 15.2
	= 14.2	= 14.3
14	= 14.2	= 14.3
	= 14.2	= 14.3
	= 12.5	= 12.6
	= 12.5	= 12.6
15	= 12.5	= 12.6
	= 12.5	= 12.6
	= 13.3	= 13.5
	= 13.3	= 13.5
SSM-2 (031:15:00:57.040)		
1	= 12.5	= 12.6
	= 13.3	= 13.5
	= 12.5	= 12.6
	= 12.5	= 12.6
2	= 12.5	= 12.6
	= 13.3	= 13.5
	= 11.7	= 11.8
	= 11.7	= 11.8
3	= 13.3	= 13.5
	= 13.3	= 13.5
	= 13.3	= 13.5
	= 12.5	= 12.6
4	= 13.3	= 13.5
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 13.3	= 13.5
5	= 12.5	= 12.6
	= 13.3	= 13.5
	= 13.3	= 13.5
	= 12.5	= 12.6
6	= 14.2	= 14.3
	= 13.3	= 13.5
	= 12.5	= 12.6
	= 14.2	= 14.3
7	= 13.3	= 13.5
	= 12.5	= 12.6
	= 14.2	= 14.3
	= 13.3	= 13.5
8	= 13.5	= 13.6
	= 12.6	= 12.7
	= 14.3	= 14.4
	= 14.3	= 14.4
9	= 13.5	= 13.6
	= 14.3	= 14.4
	= 13.5	= 13.6
	= 12.6	= 12.7
10	= 13.5	= 13.6
	= 13.5	= 13.6
	= 13.5	= 13.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (3 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.6°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	13.5	= 13.6						
11	= 12.6	= 12.7						
	= 14.3	= 14.4						
	= 12.6	= 12.7						
	= 13.5	= 13.6						
12	= 12.6	= 12.7						
	= 12.6	= 12.7						
	= 13.5	= 13.6						
	= 12.6	= 12.7						
13	= 12.6	= 12.7						
	= 13.5	= 13.6						
	= 12.6	= 12.7						
	= 13.5	= 13.6						
14	= 12.6	= 12.7						
	= 14.3	= 14.4						
	= 13.5	= 13.6						
	= 12.6	= 12.7						
15	= 12.6	= 12.7						
	= 13.5	= 13.6						
	= 11.8	= 11.9						
	= 12.6	= 12.7						

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (4 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:04:19.241

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 10.2	= 10.3
	= 11.0	= 11.1
	= 11.8	= 11.9
	= 11.0	= 11.1
7	= 11.0	= 11.1
	= 11.8	= 11.9
	= 11.0	= 11.1
	= 11.0	= 11.1
8	= 11.0	= 11.1
	= 11.8	= 11.9
	= 11.0	= 11.1
	= 10.2	= 10.3
9	= 11.0	= 11.1
	= 12.6	= 12.8
	= 11.0	= 11.1
	= 11.8	= 11.9
10	= 10.2	= 10.3
	= 11.0	= 11.1
	= 11.0	= 11.1
	= 10.2	= 10.3
11	= 11.0	= 11.1
	= 10.2	= 10.3
	= 9.32	= 9.44
	= 11.0	= 11.1
12	= 11.0	= 11.1
	= 10.2	= 10.3

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 11.0	= 11.1
	= 10.2	= 10.3
13	= 10.2	= 10.3
	= 11.0	= 11.1
	= 11.0	= 11.1
	= 10.2	= 10.3
14	= 10.2	= 10.3
	= 11.0	= 11.1
	= 11.0	= 11.1
	= 11.0	= 11.1
15	= 11.8	= 11.9
	= 10.2	= 10.3
	= 11.8	= 11.9
	= 11.8	= 11.9
16	= 10.2	= 10.3
	= 11.8	= 11.9
	= 11.0	= 11.1
	= 10.2	= 10.3
17	= 10.2	= 10.3
	= 11.0	= 11.1
	= 11.0	= 11.1
	= 11.0	= 11.1
18	= 10.2	= 10.3
	= 10.2	= 10.3
	= 11.1	= 11.2
	= 11.1	= 11.2
19	= 10.2	= 10.3

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 11.1	= 11.2
	= 10.2	= 10.3
	= 11.1	= 11.2
20	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 10.2	= 10.3
SSM-1 (031:15:04:34.841)		
1	= 10.2	= 10.3
	= 10.2	= 10.3
	= 8.56	= 8.68
	= 10.2	= 10.3
2	= 11.1	= 11.2
	= 10.2	= 10.3
	= 11.1	= 11.2
	= 10.2	= 10.3
3	= 10.2	= 10.3
	= 10.2	= 10.3
	= 11.1	= 11.2
	= 11.1	= 11.2
4	= 10.2	= 10.3
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2
5	= 11.1	= 11.2
	= 11.9	= 12.0
	= 10.2	= 10.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (4 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	11.1	= 11.2
6	= 10.2	= 10.3
	= 11.1	= 11.2
	= 10.2	= 10.3
	= 11.1	= 11.2
7	= 11.9	= 12.0
	= 11.9	= 12.0
	= 11.1	= 11.2
	= 10.2	= 10.3
8	= 10.2	= 10.3
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.9	= 12.0
9	= 9.39	= 9.51
	= 10.2	= 10.3
	= 11.1	= 11.2
	= 10.2	= 10.3
10	= 11.9	= 12.0
	= 11.1	= 11.2
	= 9.39	= 9.51
	= 10.2	= 10.3
11	= 10.2	= 10.3
	= 10.2	= 10.3
	= 11.1	= 11.2
	= 10.2	= 10.3
12	= 10.2	= 10.3
	= 11.1	= 11.2

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 11.1	= 11.2
	= 9.39	= 9.51
13	= 11.1	= 11.2
	= 11.1	= 11.2
	= 9.39	= 9.51
	= 10.2	= 10.3
14	= 9.39	= 9.51
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 10.2	= 10.3
15	= 10.2	= 10.3
	= 10.2	= 10.3
	= 10.2	= 10.3
	= 10.2	= 10.3
SSM-2 (031:15:04:50.441)		
1	= 10.2	= 10.3
	= 10.2	= 10.3
	= 10.2	= 10.3
	= 10.2	= 10.3
2	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 10.2	= 10.3
3	= 11.1	= 11.2
	= 9.39	= 9.51
	= 11.1	= 11.2
	= 11.1	= 11.2

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	= 10.2	= 10.3
	= 11.1	= 11.2
	= 10.2	= 10.3
	= 10.2	= 10.3
5	= 10.2	= 10.3
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 10.2	= 10.3
6	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 10.2	= 10.3
7	= 9.39	= 9.51
	= 10.2	= 10.3
	= 10.2	= 10.3
	= 9.39	= 9.51
8	= 10.2	= 10.3
	= 9.39	= 9.51
	= 10.2	= 10.3
	= 10.2	= 10.3
9	= 10.2	= 10.3
	= 9.39	= 9.51
	= 10.2	= 10.3
	= 10.2	= 10.3
10	= 9.39	= 9.51
	= 10.2	= 10.3
	= 10.2	= 10.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (4 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10 (Cont'd.)	9.39	= 9.51						
11	= 10.2	= 10.3						
	= 10.2	= 10.3						
	= 10.2	= 10.3						
	= 9.39	= 9.51						
12	= 9.39	= 9.51						
	= 10.2	= 10.3						
	= 10.2	= 10.3						
	= 10.2	= 10.3						
13	= 9.39	= 9.51						
	= 11.1	= 11.2						
	= 10.2	= 10.3						
	= 10.2	= 10.3						
14	= 10.2	= 10.3						
	= 10.2	= 10.3						
	= 11.1	= 11.2						
	= 10.2	= 10.3						
15	= 10.3	= 10.4						
	= 9.46	= 9.58						
	= 9.46	= 9.58						
	= 9.46	= 9.58						

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (5 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:08:06.155

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 8.52	= 8.65
	= 9.38	= 9.51
	= 9.38	= 9.51
	= 8.52	= 8.65
7	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
8	= 9.38	= 9.51
	= 8.52	= 8.65
	= 8.52	= 8.65
	= 9.38	= 9.51
9	= 9.44	= 9.57
	= 9.44	= 9.57
	= 9.44	= 9.57
	= 8.59	= 8.72
10	= 8.52	= 8.65
	= 7.67	= 7.80
	= 8.52	= 8.65
	= 9.38	= 9.51
11	= 8.52	= 8.65
	= 8.52	= 8.65
	= 7.67	= 7.80
	= 8.52	= 8.65
12	= 7.67	= 7.80
	= 10.2	= 10.4
	= 8.52	= 8.65
	= 8.52	= 8.65
13	= 8.52	= 8.65
	= 8.52	= 8.65
	= 9.38	= 9.51
	= 9.38	= 9.51
14	= 10.3	= 10.4
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
15	= 7.73	= 7.86
	= 9.44	= 9.57
	= 8.59	= 8.72
	= 8.59	= 8.72
16	= 8.59	= 8.72
	= 7.73	= 7.86
	= 7.73	= 7.86
	= 8.59	= 8.72
17	= 7.73	= 7.86
	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 8.72
18	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
19	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
20	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
SSM-1 (031:15:08:21.754)		
1	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
2	= 8.59	= 8.72
	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 8.72
3	= 9.44	= 9.57
	= 6.88	= 7.01
	= 8.59	= 8.72
	= 8.59	= 8.72
4	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
5	= 8.59	= 8.72
	= 8.59	= 8.72
	= 9.44	= 9.57

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (5 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	8.59	= 8.72
6	= 8.59	= 8.72
	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 8.72
7	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
8	= 8.59	= 8.72
	= 9.44	= 9.57
	= 10.3	= 10.4
	= 8.59	= 8.72
9	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
10	= 7.73	= 7.86
	= 7.73	= 7.86
	= 8.59	= 8.72
	= 9.44	= 9.57
11	= 8.59	= 8.72
	= 7.73	= 7.86
	= 7.73	= 7.86
	= 8.59	= 8.72
12	= 8.59	= 8.72
	= 8.59	= 8.72

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 7.73	= 7.86
	= 8.59	= 8.72
13	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 3.72
	= 7.73	= 7.86
14	= 7.73	= 7.86
	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 8.72
15	= 8.59	= 8.72
	= 7.73	= 7.86
	= 8.59	= 8.72
	= 7.73	= 7.86
SSM-2 (031:15:08:37.355)		
1	= 7.73	= 7.86
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
2	= 7.73	= 7.86
	= 8.59	= 8.72
	= 7.73	= 7.86
	= 7.73	= 7.86
3	= 8.59	= 8.72
	= 6.88	= 7.01
	= 8.59	= 8.72
	= 7.73	= 7.86

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	= 7.73	= 7.86
	= 7.73	= 7.86
	= 9.44	= 9.57
	= 8.59	= 8.72
5	= 8.59	= 8.72
	= 7.73	= 7.86
	= 7.73	= 7.86
	= 8.59	= 8.72
6	= 9.44	= 9.57
	= 9.44	= 9.57
	= 8.59	= 8.72
	= 9.44	= 9.57
7	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
	= 8.59	= 8.72
8	= 8.59	= 8.72
	= 8.59	= 8.72
	= 7.73	= 7.86
	= 9.44	= 9.57
9	= 8.59	= 8.72
	= 9.44	= 9.57
	= 8.59	= 8.72
	= 8.59	= 8.72
10	= 8.59	= 8.72
	= 7.73	= 7.86
	= 9.44	= 9.57

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (5 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.54°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	7.73	= 7.86						
11	= 8.59	= 8.72						
	= 9.44	= 9.57						
	= 9.44	= 9.57						
	= 9.44	= 9.57						
12	= 9.44	= 9.57						
	= 8.59	= 8.72						
	= 8.59	= 8.72						
	= 9.44	= 9.57						
13	= 7.73	= 7.86						
	= 8.59	= 8.72						
	= 9.44	= 9.57						
	= 9.44	= 9.57						
14	= 8.59	= 8.72						
	= 8.59	= 8.72						
	= 8.59	= 8.72						
	= 8.59	= 6.72						
15	= 7.73	= 7.86						
	= 8.59	= 8.72						
	= 8.59	= 8.72						
	= 8.59	= 8.72						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (6 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:11:55.292

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 9.13	= 9.26
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 8.28	= 8.41
7	= 9.13	= 9.26
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 9.13	= 9.26
8	= 8.28	= 8.41
	= 9.13	= 9.26
	= 8.28	= 8.41
	= 8.28	= 8.41
9	= 7.43	= 7.56
	= 9.13	= 9.26
	= 8.28	= 8.41
	= 9.13	= 9.26
10	= 8.28	= 8.41
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 8.28	= 8.41
11	= 7.43	= 7.56
	= 8.28	= 8.41
	= 9.13	= 9.26
	= 8.28	= 8.41
12	= 7.43	= 7.56
	= 8.28	= 8.41
	= 7.43	= 7.56
	= 8.28	= 8.41
13	= 8.28	= 8.41
	= 7.43	= 7.56
	= 7.43	= 7.56
	*	*
14	= 7.43	= 7.56
	= 7.43	= 7.56
	= 8.28	= 8.41
	= 8.28	= 8.41
15	= 8.28	= 8.41
	= 7.43	= 7.56
	= 8.28	= 8.41
	= 7.43	= 7.56
16	= 8.28	= 8.41
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 8.28	= 8.41
17	= 7.43	= 7.56
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 8.28	= 8.41
18	= 7.43	= 7.56
	= 9.13	= 9.26
	= 8.28	= 8.41
	= 7.43	= 7.56
19	= 8.28	= 8.41
	= 8.28	= 8.41
	= 9.13	= 9.26
	= 8.28	= 8.41
20	= 8.28	= 8.41
	= 8.28	= 8.41
	= 9.13	= 9.26
	= 8.28	= 8.41
SSM-1 (031:15:12:10.891)		
1	= 9.13	= 9.26
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 7.43	= 7.56
2	= 9.13	= 9.26
	= 8.28	= 8.41
	= 7.43	= 7.56
	= 9.13	= 9.26
3	= 7.43	= 7.56
	= 9.13	= 9.26
	= 8.28	= 8.41
	= 9.13	= 9.26
4	= 7.43	= 7.56
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 9.13	= 9.26
5	= 7.43	= 7.56
	= 8.28	= 8.41
	= 9.13	= 9.26

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 97 MODE I (6 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	8.28	= 8.41
6	= 9.13	= 9.26
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 7.43	= 7.56
7	= 8.28	= 8.41
	= 7.43	= 7.56
	= 9.13	= 9.26
	= 8.28	= 8.41
8	= 8.28	= 8.41
	= 8.28	= 8.41
	= 9.13	= 9.26
	= 8.28	= 8.41
9	= 9.13	= 9.26
	= 8.28	= 8.41
	= 9.13	= 9.26
	= 7.43	= 7.56
10	= 8.28	= 8.41
	= 9.13	= 9.26
	= 9.13	= 9.26
	= 8.28	= 8.41
11	= 8.28	= 8.41
	= 8.28	= 8.41
	= 7.43	= 7.56
	= 7.43	= 7.56
12	= 9.13	= 9.26
	= 8.28	= 8.41

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 8.28	= 8.41
	= 8.28	= 8.41
13	= 7.43	= 7.56
	= 9.13	= 9.26
	= 8.28	= 8.41
	= 8.28	= 8.41
14	= 7.43	= 7.56
	= 9.13	= 9.26
	*	*
	= 9.13	= 9.26
15	= 9.13	= 9.26
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 8.28	= 8.41
SSM-2 (031:15:12:26.491)		
1	= 8.28	= 8.41
	= 7.43	= 7.56
	= 8.28	= 8.41
	= 7.43	= 7.56
2	= 9.44	= 9.57
	= 9.13	= 9.26
	= 7.43	= 7.56
	= 7.43	= 7.56
3	= 9.13	= 9.26
	= 7.43	= 7.56
	= 8.28	= 8.41
	= 8.28	= 8.41

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	= 9.13	= 9.26
	= 7.43	= 7.56
	= 8.28	= 8.41
	= 7.43	= 7.56
5	= 8.28	= 8.41
	= 8.28	= 8.41
	= 7.43	= 7.56
	= 8.28	= 8.41
6	= 8.28	= 8.41
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 9.13	= 9.26
7	= 8.28	= 8.41
	= 8.28	= 8.41
	= 8.28	= 8.41
	= 7.43	= 7.56
8	*	*
	= 7.43	= 7.56
	= 7.43	= 7.56
	= 8.28	= 8.41
9	= 7.43	= 7.56
	= 7.43	= 7.56
	= 8.28	= 8.41
	= 8.28	= 8.41
10	= 7.43	= 7.56
	= 8.28	= 8.41
	= 7.43	= 7.56

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

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*Data below calibration range.

MISSION SL-4 PASS 97 MODE I (6 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	8.28	= 8.41						
11	= 9.13	= 9.26						
	= 9.13	= 9.26						
	= 8.28	= 8.41						
	= 9.13	= 9.26						
12	= 9.13	= 9.26						
	= 8.28	= 8.41						
	= 8.28	= 8.41						
	= 8.28	= 8.41						
13	= 7.43	= 7.56						
	= 8.28	= 8.41						
	= 7.43	= 7.56						
	= 7.43	= 7.56						
14	= 8.28	= 8.41						
	= 8.28	= 8.41						
	= 8.28	= 8.41						
	= 8.28	= 8.41						
15	= 9.13	= 9.26						
	= 8.28	= 8.41						
	= 8.28	= 8.41						
	= 8.28	= 8.41						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (7 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:15:41.281

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
7	= 10.6	= 10.7
	= 9.77	= 9.90
	= 11.4	= 11.6
	= 11.4	= 11.6
8	= 9.77	= 9.90
	= 11.4	= 11.6
	= 10.6	= 10.7
	= 10.6	= 10.7
9	= 10.6	= 10.7
	= 11.4	= 11.6
	= 10.6	= 10.7
	= 10.6	= 10.7
10	= 11.4	= 11.6
	= 11.4	= 11.6
	= 10.6	= 10.7
	= 11.4	= 11.6
11	= 10.6	= 10.7
	= 10.6	= 10.7
	= 11.4	= 11.6
	= 8.94	= 9.07
12	= 10.6	= 10.7
	= 10.6	= 10.7
	= 9.77	= 9.90
	= 10.6	= 10.7
13	= 10.6	= 10.7
	= 10.6	= 10.7
	= 9.77	= 9.90
	= 10.6	= 10.7
14	= 11.4	= 11.6
	= 11.4	= 11.6
	= 10.6	= 10.7
	= 10.6	= 10.7
15	= 10.6	= 10.7
	= 10.6	= 10.7
	= 11.4	= 11.6
	= 10.6	= 10.7
16	= 11.4	= 11.6
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 11.4	= 11.6
17	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 9.77	= 9.90
18	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
19	= 10.6	= 10.7
	= 10.6	= 10.7
	= 9.77	= 9.90
	= 11.4	= 11.6
20	= 11.4	= 11.6
	= 11.4	= 11.6
	= 10.6	= 10.7
	= 10.6	= 10.7
SSM-1 (031:15:15:56.882)		
1	= 10.6	= 10.7
	= 9.77	= 9.90
	= 10.6	= 10.7
	= 11.4	= 11.6
2	= 10.6	= 10.7
	= 9.77	= 9.90
	= 10.6	= 10.7
	= 10.6	= 10.7
3	= 9.77	= 9.90
	= 11.4	= 11.6
	= 10.6	= 10.7
	= 9.77	= 9.90
4	= 9.77	= 9.90
	= 9.77	= 9.90
	= 11.4	= 11.6
	= 9.77	= 9.90
5	= 9.77	= 9.90
	= 10.6	= 10.7
	= 11.4	= 11.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (7 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	9.77	= 9.90
6	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
	= 9.77	= 9.90
7	= 10.6	= 10.7
	= 9.77	= 9.90
	= 11.4	= 11.6
	= 9.77	= 9.90
8	= 10.6	= 10.7
	= 9.77	= 9.90
	= 10.6	= 10.7
	= 9.77	= 9.90
9	= 11.4	= 11.6
	= 10.6	= 10.7
	= 9.77	= 9.90
	= 10.6	= 10.7
10	= 11.4	= 11.6
	= 9.77	= 9.90
	= 10.6	= 10.7
	= 8.94	= 9.07
11	= 10.6	= 10.7
	= 9.77	= 9.90
	= 11.4	= 11.6
	= 10.6	= 10.7
12	= 9.77	= 9.90
	= 11.4	= 11.6
	= 10.6	= 10.7
	= 9.77	= 9.90
13	= 10.6	= 10.7
	= 9.77	= 9.90
	= 11.4	= 11.6
	= 8.94	= 9.07
14	= 11.4	= 11.6
	= 9.77	= 9.90
	= 9.77	= 9.90
	= 10.6	= 10.7
15	= 9.77	= 9.90
	= 9.77	= 9.90
	= 10.6	= 10.7
	= 10.6	= 10.7
SSM-2 (031:15:16:12.481)		
1	= 9.77	= 9.90
	= 9.77	= 9.90
	= 10.6	= 10.7
	= 10.6	= 10.7
2	= 10.6	= 10.7
	= 9.77	= 9.90
	= 9.77	= 9.90
	= 9.77	= 9.90
3	= 9.77	= 9.90
	= 9.77	= 9.90
	= 9.77	= 9.90
	= 9.77	= 9.90
4	= 9.77	= 9.90
	= 8.94	= 9.07
	= 10.6	= 10.7
	= 10.6	= 10.7
5	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
	= 10.6	= 10.7
6	= 10.6	= 10.7
	= 10.6	= 10.7
	= 9.77	= 9.90
	= 10.6	= 10.7
7	= 9.82	= 9.95
	= 9.82	= 9.95
	= 10.7	= 10.8
	= 9.82	= 9.95
8	= 9.82	= 9.95
	= 9.82	= 9.95
	= 9.82	= 9.95
	= 9.82	= 9.95
9	= 9.82	= 9.95
	= 9.82	= 9.95
	= 9.82	= 9.95
	= 8.99	= 9.12
10	= 8.99	= 9.12
	= 9.82	= 9.95
	= 10.7	= 10.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (7 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	8.99	= 9.12						
11	= 10.7	= 10.8						
	= 10.7	= 10.8						
	= 9.82	= 9.95						
	= 9.82	= 9.95						
12	= 9.82	= 9.95						
	= 10.7	= 10.8						
	= 9.82	= 9.95						
	= 10.7	= 10.8						
13	= 9.82	= 9.95						
	= 11.5	= 11.6						
	= 10.7	= 10.8						
	= 8.99	= 9.12						
14	= 9.82	= 9.95						
	= 8.99	= 9.12						
	= 9.82	= 9.95						
	= 9.82	= 9.95						
15	= 9.82	= 9.95						
	= 9.82	= 9.95						
	= 10.7	= 10.8						
	= 9.82	= 9.95						

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (8 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:22:06.44

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.56$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				= 8.83	= 8.95		= 9.65	= 9.77
6	= 8.83	= 8.95		= 9.65	= 9.77		= 9.65	= 9.77
	= 8.83	= 8.95	13	= 9.65	= 9.77		= 10.5	= 10.6
	= 8.83	= 8.95		= 8.01	= 8.13	20	= 9.65	= 9.77
	= 9.65	= 9.77		= 9.65	= 9.77		= 8.01	= 8.13
7	= 8.83	= 8.95		= 8.01	= 8.13		= 8.01	= 8.13
	= 9.65	= 9.77	14	= 9.65	= 9.77		= 8.01	= 8.13
	= 8.83	= 8.95		= 9.65	= 9.77	SSM-1 (031:15:22:22.044)		
	= 8.83	= 8.95		= 9.65	= 9.77	1	= 8.83	= 8.95
8	= 8.83	= 8.95		= 9.65	= 9.77		= 10.5	= 10.6
	= 8.83	= 8.95	15	= 9.65	= 9.77		= 8.83	= 8.95
	= 8.83	= 8.95		= 8.01	= 8.13		= 8.83	= 8.95
	= 9.65	= 9.77		= 9.65	= 9.77	2	= 8.83	= 8.95
9	= 10.5	= 10.6		= 8.01	= 8.13		= 8.83	= 8.95
	= 8.83	= 8.95	16	= 8.01	= 8.13		= 8.01	= 8.13
	= 9.65	= 9.77		= 9.65	= 9.77		= 8.83	= 8.95
	= 9.65	= 9.77		= 10.5	= 10.6	3	= 8.83	= 8.95
10	= 9.65	= 9.77		= 9.65	= 9.77		= 8.83	= 8.95
	= 8.83	= 8.95	17	= 9.65	= 9.77		= 8.83	= 8.95
	= 9.65	= 9.77		= 9.65	= 9.77		= 9.65	= 9.77
	= 8.83	= 8.95		= 9.65	= 9.77	4	= 8.01	= 8.13
11	= 8.83	= 8.95		= 8.01	= 8.13		= 8.83	= 8.95
	= 10.5	= 10.6	18	= 8.01	= 8.13		= 8.83	= 8.95
	= 8.83	= 8.95		= 9.65	= 9.77		= 8.83	= 8.95
	= 9.65	= 9.77		= 8.01	= 8.13	5	= 8.83	= 8.95
12	= 9.65	= 9.77		= 10.5	= 10.6		= 9.65	= 9.77
	= 9.65	= 9.77	19	= 9.65	= 9.77		= 8.83	= 8.95

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (8 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	8.83	= 8.95
6	= 8.83	= 8.95
	= 8.83	= 8.95
	= 10.5	= 10.6
	= 8.83	= 8.95
7	= 9.65	= 9.77
	= 9.65	= 9.77
	= 8.83	= 8.95
	= 9.65	= 9.77
8	= 9.65	= 9.77
	= 9.65	= 9.77
	= 8.83	= 8.95
	= 8.83	= 8.95
9	= 9.65	= 9.77
	= 8.01	= 8.13
	= 9.65	= 9.77
	= 8.83	= 8.95
10	= 8.83	= 8.95
	= 8.83	= 8.95
	= 9.65	= 9.77
	= 9.65	= 9.77
11	= 9.65	= 9.77
	= 8.83	= 8.95
	= 8.83	= 8.95
	= 8.83	= 8.95
12	= 8.83	= 8.95
	= 8.01	= 8.13

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 8.83	= 8.95
	= 9.65	= 9.77
13	= 8.83	= 8.95
	= 9.65	= 9.77
	= 9.65	= 9.77
	= 8.83	= 8.95
14	= 9.65	= 9.77
	= 9.65	= 9.77
	= 8.83	= 8.95
	= 8.83	= 8.95
15	= 8.83	= 8.95
	= 8.83	= 8.95
	= 9.65	= 9.77
	= 9.65	= 9.77
SSM-2 (031:15:22:37.644)		
1	= 8.83	= 8.95
	= 8.01	= 8.13
	= 8.83	= 8.95
	= 8.83	= 8.95
2	= 10.5	= 10.6
	= 10.5	= 10.6
	= 9.65	= 9.77
	= 10.5	= 10.6
3	= 9.65	= 9.77
	= 9.65	= 9.77
	= 9.65	= 9.77
	= 9.65	= 9.77

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	= 9.65	= 9.77
	= 8.83	= 8.95
	= 9.65	= 9.77
	= 10.5	= 10.6
5	= 8.83	= 8.95
	= 8.83	= 8.95
	= 9.65	= 9.77
	= 8.83	= 8.95
6	= 9.65	= 9.77
	= 8.83	= 8.95
	= 8.83	= 8.95
	= 8.83	= 8.95
7	= 9.65	= 9.77
	= 8.01	= 8.13
	= 9.65	= 9.77
	= 10.5	= 10.6
8	= 9.65	= 9.77
	= 10.5	= 10.6
	= 9.65	= 9.77
	= 9.65	= 9.77
9	= 8.83	= 8.95
	= 10.5	= 10.6
	= 10.5	= 10.6
	= 8.83	= 8.95
10	= 9.65	= 9.77
	= 9.65	= 9.77
	= 9.65	= 9.77

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (8 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
10(Cont'd.)	8.83	= 8.95						
11	= 8.83	= 8.95						
	= 9.65	= 9.77						
	= 10.5	= 10.6						
	= 9.65	= 9.77						
12	= 9.65	= 9.77						
	= 9.65	= 9.77						
	= 10.5	= 10.6						
	= 9.65	= 9.77						
13	= 9.65	= 9.77						
	= 9.65	= 9.77						
	= 8.83	= 8.95						
	= 10.5	= 10.6						
14	= 9.65	= 9.77						
	= 9.65	= 9.77						
	= 9.65	= 9.77						
	= 10.5	= 10.6						
15	= 10.5	= 10.6						
	= 9.65	= 9.77						
	= 9.65	= 9.77						
	= 10.5	= 10.6						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (9 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:25:51.096

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 9.43	= 9.56
	= 9.43	= 9.56
	= 9.43	= 9.56
	= 10.3	= 10.4
7	= 10.3	= 10.4
	= 10.3	= 10.4
	= 10.3	= 10.4
	= 9.43	= 9.56
8	= 9.43	= 9.56
	= 8.61	= 8.74
	= 10.3	= 10.4
	= 9.43	= 9.56
9	= 9.43	= 9.56
	= 9.43	= 9.56
	= 9.43	= 9.56
	= 8.61	= 8.74
10	= 11.1	= 11.2
	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
11	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
12	= 9.43	= 9.56
	= 9.43	= 9.56

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 9.43	= 9.56
	= 9.43	= 9.56
13	= 10.3	= 10.4
	= 9.43	= 9.56
	= 8.61	= 8.74
	= 8.61	= 8.74
14	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
15	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
	= 9.43	= 9.56
16	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
	= 9.43	= 9.56
17	= 9.43	= 9.56
	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
18	= 9.43	= 9.56
	= 10.3	= 10.4
	= 8.61	= 8.74
	= 9.43	= 9.56
19	= 8.61	= 8.74

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
20	= 8.61	= 8.74
	= 7.78	= 7.91
	= 8.61	= 8.74
	= 8.61	= 8.74
SSM-1 (031:15:26:06.696)		
1	= 9.43	= 9.56
	= 9.43	= 9.56
	= 10.3	= 10.4
	= 9.43	= 9.56
2	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
	= 9.43	= 9.56
3	= 9.43	= 9.56
	= 9.43	= 9.56
	= 8.61	= 8.74
	= 8.61	= 8.74
4	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 10.3	= 10.4
5	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (9 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ______________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
5(Cont'd.)	9.43	= 9.56
6	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
	= 10.3	= 10.4
7	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
8	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
9	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
10	= 10.3	= 10.4
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
11	= 9.43	= 9.56
	= 9.43	= 9.56
	= 9.43	= 9,56
	= 9.43	= 9.56
12	= 9.43	= 9.56
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
13	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
14	= 9.43	= 9.56
	= 9.43	= 9.56
	= 8.61	= 8.74
	= 8.61	= 8.74
15	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
SSM-2 (031:15:26:22.296)		
1	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
	= 9.43	= 9.56
2	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
3	= 8.61	= 8.74
	= 8.61	= 8.74
	= 9.43	= 9.56
	= 8.61	= 8.74
4	= 9.43	= 9.56
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
5	= 10.3	= 10.4
	= 9.43	= 9.56
	= 9.43	= 9.56
	= 9.43	= 9.56
6	= 8.61	= 8.74
	= 9.43	= 9.56
	= 9.43	= 9.56
	= 8.61	= 8.74
7	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
8	= 8.61	= 8.74
	= 8.61	= 8.74
	= 7.78	= 7.91
	= 9.43	= 9.56
9	= 9.43	= 9.56
	= 8.61	= 8.74
	= 8.61	= 8.74
	= 8.61	= 8.74
10	= 9.43	= 9.56
	= 10.3	= 10.4
	= 9.43	= 9.56

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (9 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.35°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.4°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10 (Cont'd.)	8.61	= 8.74						
11	= 8.61	= 8.74						
	= 8.61	= 8.74						
	= 7.78	= 7.91						
	= 8.61	= 8.74						
12	= 9.43	= 9.56						
	= 8.61	= 8.74						
	= 9.43	= 9.56						
	= 9.43	= 9.56						
13	= 9.43	= 9.56						
	= 8.61	= 8.74						
	= 7.78	= 7.91						
	= 8.61	= 8.74						
14	= 8.61	= 8.74						
	= 7.78	= 7.91						
	= 8.61	= 8.74						
	= 8.61	= 8.74						
15	= 8.61	= 8.74						
	= 8.61	= 8.74						
	= 9.43	= 9.56						
	= 8.61	= 8.74						

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (10 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:29:35.063

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
# SSM-0		
6	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.9	= 14.0
	= 13.1	= 13.2
7	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.1	= 13.2
8	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.1	= 13.2
9	= 13.9	= 14.0
	= 12.2	= 12.4
	= 13.1	= 13.2
	= 13.1	= 13.2
10	= 13.1	= 13.2
	= 13.1	= 13.2
	= 13.1	= 13.2
	= 12.2	= 12.4
11	= 12.2	= 12.4
	= 13.1	= 13.2
	= 13.1	= 13.2
	= 10.6	= 10.8
12	= 13.1	= 13.2
	= 11.4	= 11.6

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 13.1	= 13.2
	= 11.4	= 11.6
13	= 12.2	= 12.4
	= 12.2	= 12.4
	= 13.1	= 13.2
	= 11.4	= 11.6
14	= 10.6	= 10.8
	= 13.1	= 13.2
	= 11.4	= 11.6
	= 12.2	= 12.4
15	= 12.2	= 12.4
	= 13.1	= 13.2
	= 12.2	= 12.4
	= 12.2	= 12.4
16	= 12.2	= 12.4
	= 12.2	= 12.4
	= 12.2	= 12.4
	= 13.1	= 13.2
17	= 12.2	= 12.4
	= 13.1	= 13.2
	= 12.2	= 12.4
	= 12.2	= 12.4
18	= 11.4	= 11.6
	= 13.1	= 13.2
	= 11.4	= 11.6
	= 12.2	= 12.4
19	= 12.2	= 12.4

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 13.1	= 13.2
	= 11.4	= 11.6
	= 10.6	= 10.8
20	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
	= 12.2	= 12.4
SSM-1 (031:15:29:50.663)		
1	= 11.4	= 11.6
	= 13.1	= 13.2
	= 12.2	= 12.4
	= 11.4	= 11.6
2	= 12.2	= 12.4
	= 11.4	= 11.6
	= 12.2	= 12.4
	= 11.4	= 11.6
3	= 12.2	= 12.4
	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
4	= 11.4	= 11.6
	= 13.1	= 13.2
	= 12.2	= 12.4
	= 13.1	= 13.2
5	= 12.2	= 12.4
	= 12.2	= 12.4
	= 12.2	= 12.4

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

DATA FOR AGC READINGS IN SSM-0 OBTAINED FROM KSC PRINT-OUT.

MISSION SL-4 PASS 97 MODE I (10 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
5(Cont'd.)	11.4	= 11.6
6	= 12.2	= 12.4
	= 12.2	= 12.4
	= 11.4	= 11.6
	= 12.2	= 12.4
7	= 12.2	= 12.4
	= 11.4	= 11.6
	= 12.2	= 12.4
	= 13.1	= 13.2
8	= 12.2	= 12.4
	= 12.2	= 12.4
	= 12.2	= 12.4
	= 12.2	= 12.4
9	= 13.1	= 13.2
	= 12.2	= 12.4
	= 12.2	= 12.4
	= 12.2	= 12.4
10	= 11.4	= 11.6
	= 13.1	= 13.2
	= 12.2	= 12.4
	= 12.2	= 12.4
11	= 10.6	= 10.8
	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
12	= 12.2	= 12.4
	= 12.2	= 12.4

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
	= 11.4	= 11.6
	= 12.2	= 12.4
13	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
14	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
15	= 11.4	= 11.6
	= 12.2	= 12.4
	= 12.2	= 12.4
	= 11.4	= 11.6
SSM-2 (031:15:30:06.263)		
1	= 12.2	= 12.4
	= 12.2	= 12.4
	= 11.4	= 11.6
	= 12.2	= 12.4
2	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
	= 11.4	= 11.6
3	= 11.4	= 11.6
	= 12.2	= 12.4
	= 11.4	= 11.6
	= 12.2	= 12.4

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
4	= 11.4	= 11.6
	= 10.6	= 10.8
	= 12.2	= 12.4
	= 11.4	= 11.6
5	= 11.4	= 11.6
	= 12.2	= 12.4
	= 11.4	= 11.6
	= 11.4	= 11.6
6	= 11.4	= 11.6
	= 12.2	= 12.4
	= 12.2	= 12.4
	= 11.4	= 11.6
7	= 12.2	= 12.4
	= 12.2	= 12.4
	= 12.2	= 12.4
	= 11.4	= 11.6
8	= 11.4	= 11.6
	= 12.2	= 12.4
	= 11.4	= 11.6
	= 12.2	= 12.4
9	= 12.2	= 12.4
	= 12.2	= 12.4
	= 11.4	= 11.6
	= 11.4	= 11.6
10	= 12.2	= 12.4
	= 12.2	= 12.4
	= 13.1	= 13.2

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (10 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	11.4	= 11.6						
11	= 11.4	= 11.6						
	= 12.2	= 12.4						
	= 11.4	= 11.6						
	= 11.4	= 11.6						
12	= 11.4	= 11.6						
	= 11.4	= 11.6						
	= 11.4	= 11.6						
	= 12.2	= 12.4						
13	= 12.2	= 12.4						
	= 13.1	= 13.2						
	= 11.4	= 11.6						
	= 11.4	= 11.6						
14	= 12.2	= 12.4						
	= 12.2	= 12.4						
	= 11.4	= 11.6						
	= 11.4	= 11.6						
15	= 12.2	= 12.4						
	= 12.2	= 12.4						
	= 11.4	= 11.6						
	= 10.6	= 10.8						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (11 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:33:21.195

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 14.1	= 14.2
	= 13.3	= 13.4
	= 13.3	= 13.4
	= 12.5	= 12.6
7	= 12.5	= 12.6
	= 10.9	= 11.0
	= 12.5	= 12.6
	= 10.9	= 11.0
8	= 12.5	= 12.6
	= 14.1	= 14.2
	= 15.7	= 15.8
	= 16.5	= 16.7
9	= 16.5	= 16.7
	= 16.5	= 16.7
	= 17.4	= 17.6
	= 17.4	= 17.6
10	= 16.5	= 16.7
	= 17.4	= 17.6
	= 16.5	= 16.7
	= 16.5	= 16.7
11	= 19.2	= 19.3
	= 20.9	= 21.0
	= 20.9	= 21.0
	= 21.7	= 21.8
12	= 20.1	= 20.2
	= 20.1	= 20.2

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 19.2	= 19.3
	= 18.3	= 18.4
13	= 17.4	= 17.6
	= 17.4	= 17.6
	= 14.9	= 15.0
	= 14.1	= 14.2
14	= 14.1	= 14.2
	= 15.7	= 15.8
	= 14.9	= 15.0
	= 14.1	= 14.2
15	= 12.5	= 12.6
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
16	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
17	= 12.5	= 12.6
	= 14.1	= 14.2
	= 12.5	= 12.6
	= 13.3	= 13.4
18	= 11.7	= 11.8
	= 11.7	= 11.8
	= 13.3	= 13.4
	= 12.5	= 12.6
19	= 13.3	= 13.4

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 12.5	= 12.6
	= 11.7	= 11.8
	= 12.5	= 12.6
20	= 13.3	= 13.4
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 11.7	= 11.8
SSM-1 (031:15:33:36.794)		
1	= 13.3	= 13.4
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.5	= 12.6
2	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 13.3	= 13.4
3	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 13.3	= 13.4
4	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
5	= 10.9	= 11.0
	= 11.7	= 11.8
	= 10.9	= 11.0

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (11 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	10.9	= 11.0
6	= 10.9	= 11.0
	= 10.9	= 11.0
	= 12.5	= 12.6
	= 11.7	= 11.8
7	= 12.5	= 12.6
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
8	= 12.5	= 12.6
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 11.7	= 11.8
9	= 12.5	= 12.6
	= 13.3	= 13.4
	= 13.3	= 13.4
	= 13.3	= 13.4
10	= 12.5	= 12.6
	= 12.5	= 12.6
	= 13.3	= 13.4
	= 14.1	= 14.2
11	= 12.5	= 12.6
	= 13.3	= 13.4
	= 14.1	= 14.2
	= 13.3	= 13.4
12	= 13.3	= 13.4
	= 13.3	= 13.4
	= 13.3	= 13.4
	= 12.5	= 12.6
13	= 13.3	= 13.4
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
14	= 12.5	= 12.6
	= 13.3	= 13.4
	= 14.1	= 14.2
	= 12.5	= 12.6
15	= 13.3	= 13.4
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 13.3	= 13.4
SSM-2 (031:15:33:52.394)		
1	= 12.5	= 12.6
	= 14.1	= 14.2
	= 13.3	= 13.4
	= 13.3	= 13.4
2	= 13.3	= 13.4
	= 14.1	= 14.2
	= 13.3	= 13.4
	= 13.3	= 13.4
3	= 13.3	= 13.4
	= 13.3	= 13.4
	= 14.1	= 14.2
	= 14.1	= 14.2
4	= 13.3	= 13.4
	= 13.3	= 13.4
	= 13.3	= 13.4
	= 14.1	= 14.2
5	= 13.3	= 13.4
	= 13.3	= 13.4
	= 13.3	= 13.4
	= 13.3	= 13.4
6	= 13.3	= 13.4
	= 12.5	= 12.6
	= 13.3	= 13.4
	= 14.1	= 14.2
7	= 13.3	= 13.4
	= 13.3	= 13.4
	= 14.1	= 14.2
	= 13.3	= 13.4
8	= 13.3	= 13.4
	= 13.3	= 13.4
	= 13.3	= 13.4
	= 14.1	= 14.2
9	= 13.3	= 13.4
	= 14.1	= 14.2
	= 14.1	= 14.2
	= 14.9	= 15.0
10	= 14.1	= 14.2
	= 12.5	= 12.6
	= 13.3	= 13.4

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (11 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT) ____________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.4°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.45°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
10(Cont'd.)	13.3	= 13.4						
11	= 13.3	= 13.4						
	= 13.3	= 13.4						
	= 13.3	= 13.4						
	= 12.5	= 12.6						
12	= 13.3	= 13.4						
	= 13.3	= 13.4						
	= 13.3	= 13.4						
	= 12.5	= 12.6						
13	= 13.3	= 13.4						
	= 13.3	= 13.4						
	= 13.3	= 13.4						
	= 13.3	= 13.4						
14	= 13.3	= 13.4						
	= 13.3	= 13.4						
	= 13.3	= 13.4						
	= 13.3	= 13.4						
15	= 11.7	= 11.8						
	= 11.7	= 11.8						
	= 12.5	= 12.6						
	= 13.3	= 13.4						

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (12 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:37:11.092

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				= 14.0	= 14.1		= 12.4	= 12.6
6	= 13.2	= 13.3		= 14.8	= 14.9		= 12.4	= 12.6
	= 13.2	= 13.3	13	= 14.0	= 14.1		= 12.4	= 12.6
	= 13.2	= 13.3		= 14.8	= 14.9	20	= 13.2	= 13.3
	= 14.0	= 14.1		= 14.0	= 14.1		= 12.4	= 12.6
7	= 13.2	= 13.3		= 14.8	= 14.9		= 13.2	= 13.3
	= 13.2	= 13.3	14	= 14.8	= 14.9		= 13.2	= 13.3
	= 13.2	= 13.3		= 14.8	= 14.9	SSM-1 (031:15:37:26.692)		
	= 14.0	= 14.1		= 14.8	= 14.9	1	= 13.2	= 13.3
8	= 13.2	= 13.3		= 14.8	= 14.9		= 13.2	= 13.3
	= 14.0	= 14.1	15	= 14.0	= 14.1		= 12.4	= 12.6
	= 13.2	= 13.3		= 13.2	= 13.3		= 14.0	= 14.1
	= 14.8	= 14.9		= 13.2	= 13.3	2	= 13.2	= 13.3
9	= 14.8	= 14.9		= 14.0	= 14.1		= 14.0	= 14.1
	= 14.8	= 14.9	16	= 14.0	= 14.1		= 13.2	= 13.3
	= 14.0	= 14.1		= 14.0	= 14.1		= 13.2	= 13.3
	= 14.0	= 14.1		= 14.8	= 14.9	3	= 13.2	= 13.3
10	= 14.0	= 14.1		= 13.2	= 13.3		= 12.4	= 12.6
	= 14.8	= 14.9	17	= 13.2	= 13.3		= 13.2	= 13.3
	= 13.2	= 13.3		= 14.0	= 14.1		= 13.2	= 13.3
	= 14.8	= 14.9		= 14.0	= 14.1	4	= 13.2	= 13.3
11	= 14.0	= 14.1		= 13.2	= 13.3		= 14.0	= 14.1
	= 15.6	= 15.7	18	= 13.2	= 13.3		= 13.2	= 13.3
	= 14.0	= 14.1		= 14.0	= 14.1		= 13.2	= 13.3
	= 15.6	= 15.7		= 14.0	= 14.1	5	= 14.0	= 14.1
12	= 14.8	= 14.9		= 13.2	= 13.3		= 14.0	= 14.1
	= 14.8	= 14.9	19	= 13.2	= 13.3		= 12.4	= 12.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (12 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	14.0	= 14.1
6	= 14.0	= 14.1
	= 13.2	= 13.3
	= 12.4	= 12.6
	= 12.4	= 12.6
7	= 12.4	= 12.6
	= 12.4	= 12.6
	= 13.2	= 13.3
	= 13.2	= 13.3
8	= 11.7	= 11.8
	= 12.4	= 12.6
	= 12.4	= 12.6
	= 11.7	= 11.8
9	= 13.2	= 13.3
	= 12.4	= 12.6
	= 12.4	= 12.6
	= 11.7	= 11.8
10	= 11.7	= 11.8
	= 12.4	= 12.6
	= 13.2	= 13.3
	= 12.4	= 12.6
11	= 12.4	= 12.6
	= 12.4	= 12.6
	= 11.7	= 11.8
	= 11.7	= 11.8
12	= 12.4	= 12.6
	= 13.2	= 13.3
	= 11.7	= 11.8
	= 12.4	= 12.6
13	= 11.7	= 11.8
	= 12.4	= 12.6
	= 12.4	= 12.6
	= 12.4	= 12.6
14	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.4	= 12.6
15	= 12.4	= 12.6
	= 12.4	= 12.6
	= 13.2	= 13.3
	= 11.7	= 11.8
SSM-2 (031:15:37:42.293)		
1	= 12.4	= 12.6
	= 12.4	= 12.6
	= 12.4	= 12.6
	= 13.2	= 13.3
2	= 12.4	= 12.6
	= 13.2	= 13.3
	= 11.7	= 11.8
	= 11.7	= 11.8
3	= 11.7	= 11.8
	= 12.4	= 12.6
	= 12.4	= 12.6
	= 12.4	= 12.6
4	= 12.4	= 12.6
	= 12.4	= 12.6
	= 13.2	= 13.3
	= 11.7	= 11.8
5	= 12.4	= 12.6
	= 11.7	= 11.8
	= 13.2	= 13.3
	= 12.4	= 12.6
6	= 13.2	= 13.3
	= 12.4	= 12.6
	= 12.4	= 12.6
	= 11.7	= 11.8
7	= 12.4	= 12.6
	= 12.4	= 12.6
	= 11.7	= 11.8
	= 13.2	= 13.3
8	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.4	= 12.6
	= 12.4	= 12.6
9	= 13.2	= 13.3
	= 12.4	= 12.6
	= 11.7	= 11.8
	= 12.4	= 12.6
10	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (12 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.55°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
10(Cont'd.)	13.2	= 13.3						
11	= 12.4	= 12.6						
	= 12.4	= 12.6						
	= 11.7	= 11.8						
	= 13.2	= 13.3						
12	= 11.7	= 11.8						
	= 11.7	= 11.8						
	= 12.4	= 12.6						
	= 12.4	= 12.6						
13	= 11.7	= 11.8						
	= 12.4	= 12.6						
	= 11.7	= 11.8						
	= 12.4	= 12.6						
14	= 12.4	= 12.6						
	= 11.7	= 11.8						
	= 11.7	= 11.8						
	= 11.7	= 11.8						
15	= 11.7	= 11.8						
	= 10.9	= 11.0						
	= 12.4	= 12.6						
	= 12.4	= 12.6						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (13 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:40:57.956

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0				= 11.1	= 11.2		= 11.1	= 11.2
6	= 11.8	= 12.0		= 11.1	= 11.2		= 10.3	= 10.4
	= 11.8	= 12.0	13	= 11.1	= 11.2		= 11.8	= 12.0
	= 11.8	= 12.0		= 11.8	= 12.0	20	= 11.1	= 11.2
	= 11.1	= 11.2		= 11.8	= 12.0		= 11.8	= 12.0
7	= 11.1	= 11.2		= 11.8	= 12.0		= 11.8	= 12.0
	= 11.1	= 11.2	14	= 10.3	= 10.4		= 11.8	= 12.0
	= 11.1	= 11.2		= 11.8	= 12.0	SSM-1 (031:15:41:13.557)		
	= 11.8	= 12.0		= 11.1	= 11.2	1	= 11.8	= 12.0
8	= 11.8	= 12.0		= 11.8	= 12.0		= 11.8	= 12.0
	= 11.1	= 11.2	15	= 11.1	= 11.2		= 11.8	= 12.0
	= 11.8	= 12.0		= 11.1	= 11.2		= 11.8	= 12.0
	= 10.3	= 10.4		= 11.1	= 11.2	2	= 11.8	= 12.0
9	= 11.8	= 12.0		= 11.1	= 11.2		= 11.1	= 11.2
	= 11.1	= 11.2	16	= 11.8	= 12.0		= 11.1	= 11.2
	= 11.8	= 12.0		= 11.1	= 11.2		= 11.8	= 12.0
	= 11.8	= 12.0		= 11.1	= 11.2	3	= 11.1	= 11.2
10	= 11.1	= 11.2		= 11.8	= 12.0		= 11.8	= 12.0
	= 11.8	= 12.0	17	= 11.1	= 11.2		= 11.1	= 11.2
	= 11.1	= 11.2		= 11.1	= 11.2		= 12.6	= 12.7
	= 12.6	= 12.7		= 11.8	= 12.0	4	= 11.8	= 12.0
11	= 10.3	= 10.4		= 11.1	= 11.2		= 11.1	= 11.2
	= 11.8	= 12.0	18	= 11.8	= 12.0		= 11.1	= 11.2
	= 11.8	= 12.0		= 12.6	= 12.7		= 11.8	= 12.0
	= 11.8	= 12.0		= 11.1	= 11.2	5	= 11.8	= 12.0
12	= 11.1	= 11.2		= 11.8	= 12.0		= 11.8	= 12.0
	= 11.8	= 12.0	19	= 11.1	= 11.2		= 11.1	= 11.2

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (13 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \underline{\pm 0.45°}$; $\xi_r = 0°$

$\psi = \underline{0.56°}$

$\xi_p = 0°$; $\xi_r = \underline{\pm 0.5°}$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	11.8	= 12.0
6	= 11.8	= 12.0
	= 11.8	= 12.0
	= 11.1	= 11.2
	= 12.6	= 12.7
7	= 11.1	= 11.2
	= 11.9	= 12.0
	= 11.1	= 11.2
	= 11.1	= 11.2
8	= 12.6	= 12.7
	= 11.8	= 12.0
	= 12.6	= 12.7
	= 11.8	= 12.0
9	= 12.6	= 12.7
	= 10.3	= 10.4
	= 11.8	= 12.0
	= 11.8	= 12.0
10	= 11.1	= 11.2
	= 12.6	= 12.7
	= 11.1	= 11.2
	= 11.1	= 11.2
11	= 11.8	= 12.0
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.8	= 12.0
12	= 11.1	= 11.2
	= 11.8	= 12.0

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 11.8	= 12.0
	= 11.1	= 11.2
13	= 11.8	= 12.0
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.8	= 12.0
14	= 11.8	= 12.0
	= 11.1	= 11.2
	= 11.8	= 12.0
	= 11.1	= 11.2
15	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2
SSM-2 (031:15:41:29.157)		
1	= 11.8	= 12.0
	= 11.8	= 12.0
	= 11.8	= 12.0
	= 10.3	= 10.4
2	= 11.1	= 11.2
	= 11.8	= 12.0
	= 11.1	= 11.2
	= 11.8	= 12.0
3	= 11.8	= 12.0
	= 10.3	= 10.4
	= 11.1	= 11.2
	= 11.1	= 11.2

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	= 11.8	= 12.0
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2
5	= 12.6	= 12.7
	= 11.8	= 12.0
	= 11.8	= 12.0
	= 11.8	= 12.0
6	= 11.1	= 11.2
	= 12.6	= 12.7
	= 11.1	= 11.2
	= 11.8	= 12.0
7	= 10.3	= 10.4
	= 11.9	= 12.0
	= 11.1	= 11.2
	= 11.1	= 11.2
8	= 11.1	= 11.2
	= 11.8	= 12.0
	= 11.1	= 11.2
	= 11.1	= 11.2
9	= 11.1	= 11.2
	= 11.9	= 12.0
	= 11.1	= 11.2
	= 10.3	= 10.4
10	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (13 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.45°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.5°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	11.1	= 11.2						
11	= 11.8	= 12.0						
	= 11.8	= 12.0						
	= 11.1	= 11.2						
	= 10.3	= 10.4						
12	= 10.3	= 10.4						
	= 11.1	= 11.2						
	= 11.1	= 11.2						
	= 10.3	= 10.4						
13	= 11.9	= 12.0						
	= 11.1	= 11.2						
	= 11.1	= 11.2						
	= 11.9	= 12.0						
14	= 12.7	= 12.8						
	= 11.1	= 11.2						
	= 12.7	= 12.8						
	= 11.1	= 11.2						
15	= 10.3	= 10.4						
	= 11.9	= 12.0						
	= 11.9	= 12.0						
	= 10.3	= 10.4						

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (14 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:44:41.245

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 13.7	= 13.9
	= 13.7	= 13.9
	= 13.0	= 13.1
	= 13.0	= 13.1
7	= 13.7	= 13.9
	= 13.7	= 13.9
	= 13.0	= 13.1
	= 13.0	= 13.1
8	= 13.7	= 13.9
	= 13.0	= 13.1
	= 13.7	= 13.9
	= 13.0	= 13.1
9	= 13.8	= 13.9
	= 12.3	= 12.4
	= 13.1	= 13.2
	= 13.1	= 13.2
10	= 12.2	= 12.3
	= 13.0	= 13.1
	= 13.0	= 13.1
	= 12.2	= 12.3
11	= 13.7	= 13.9
	= 13.0	= 13.1
	= 13.0	= 13.1
	= 13.0	= 13.1
12	= 13.0	= 13.1
	= 13.0	= 13.1

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 13.0	= 13.1
	= 14.5	= 14.6
13	= 13.0	= 13.1
	= 13.0	= 13.1
	= 13.0	= 13.1
	= 12.2	= 12.3
14	= 13.7	= 13.9
	= 11.4	= 11.5
	= 12.2	= 12.3
	= 13.0	= 13.1
15	= 13.0	= 13.1
	= 11.4	= 11.5
	= 13.0	= 13.1
	= 13.0	= 13.1
16	= 12.2	= 12.3
	= 13.7	= 13.9
	= 12.2	= 12.3
	= 12.2	= 12.3
17	= 13.0	= 13.1
	= 13.7	= 13.9
	= 13.0	= 13.1
	= 12.2	= 12.3
18	= 12.2	= 12.3
	= 12.2	= 12.3
	= 13.0	= 13.1
	= 13.0	= 13.1
19	= 11.4	= 11.5

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 12.2	= 12.3
	= 12.2	= 12.3
	= 12.2	= 12.3
20	= 12.2	= 12.3
	= 12.2	= 12.3
	= 13.0	= 13.1
	= 12.2	= 12.3
SSM-1 (031:15:44:56.845)		
1	= 13.0	= 13.1
	= 12.2	= 12.3
	= 12.2	= 12.3
	= 13.0	= 13.1
2	= 13.0	= 13.1
	= 12.2	= 12.3
	= 13.7	= 13.9
	= 13.0	= 13.1
3	= 12.2	= 12.3
	= 13.0	= 13.1
	= 13.0	= 13.1
	= 12.2	= 12.3
4	= 12.2	= 12.3
	= 13.0	= 13.1
	= 13.7	= 13.9
	= 13.0	= 13.1
5	= 13.7	= 13.9
	= 13.0	= 13.1
	= 13.0	= 13.1

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame ≑ 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (14 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
5(Cont'd.)	12.2	= 12.3		= 12.3	= 12.4	4	= 12.3	= 12.4
6	= 12.2	= 12.3		= 13.1	= 13.2		= 13.1	= 13.2
	= 12.2	= 12.3	13	= 11.5	= 11.6		= 12.3	= 12.4
	= 13.0	= 13.1		= 13.1	= 13.2		= 13.1	= 13.2
	= 12.2	= 12.3		= 13.1	= 13.2	5	= 12.3	= 12.4
7	= 13.0	= 13.1		= 12.3	= 12.4		= 11.5	= 11.6
	= 13.0	= 13.1	14	= 11.5	= 11.6		= 11.5	= 11.6
	= 12.2	= 12.3		= 12.3	= 12.4		= 12.3	= 12.4
	= 13.7	= 13.9		= 13.1	= 13.2	6	= 12.3	= 12.4
8	= 13.0	= 13.1		= 13.1	= 13.2		= 12.3	= 12.4
	= 12.2	= 12.3	15	= 12.3	= 12.4		= 13.1	= 13.2
	= 12.2	= 12.3		= 11.5	= 11.6		= 13.1	= 13.2
	= 13.0	= 13.1		= 11.5	= 11.6	7	= 11.5	= 11.6
9	= 12.2	= 12.3		= 12.3	= 12.4		= 13.1	= 13.2
	= 13.0	= 13.1	SSM-2 (031:15:45:12.445)				= 12.3	= 12.4
	= 11.4	= 11.5	1	= 12.3	= 12.4		= 12.3	= 12.4
	= 12.2	= 12.3		= 12.3	= 12.4	8	= 12.3	= 12.4
10	= 12.2	= 12.3		= 11.5	= 11.6		= 12.3	= 12.4
	= 13.0	= 13.1		= 12.3	= 12.4		= 13.1	= 13.2
	= 13.0	= 13.1	2	= 12.3	= 12.4		= 12.3	= 12.4
	= 13.7	= 13.9		= 13.1	= 13.2	9	= 13.1	= 13.2
11	= 13.1	= 13.2		= 11.5	= 11.6		= 12.3	= 12.4
	= 12.3	= 12.4		= 12.3	= 12.4		= 13.1	= 13.2
	= 12.3	= 12.4	3	= 13.0	= 13.1		= 12.3	= 12.4
	= 13.1	= 13.2		= 11.4	= 11.5	10	= 13.1	= 13.2
12	= 12.3	= 12.4		= 12.2	= 12.3		= 12.3	= 12.4
	= 13.8	= 13.9		= 12.2	= 12.3		= 13.8	= 13.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (14 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	13.1	= 13.2						
11	= 11.5	= 11.6						
	= 13.1	= 13.2						
	= 11.5	= 11.6						
	= 11.5	= 11.6						
12	= 13.1	= 13.2						
	= 12.3	= 12.4						
	= 12.3	= 12.4						
	= 12.3	= 12.4						
13	= 12.3	= 12.4						
	= 13.1	= 13.2						
	= 12.3	= 12.4						
	= 12.3	= 12.4						
14	= 13.1	= 13.2						
	= 12.3	= 12.4						
	= 13.8	= 13.9						
	= 13.1	= 13.2						
15	= 12.3	= 12.4						
	= 13.1	= 13.2						
	= 13.1	= 13.2						
	= 13.8	= 13.9						

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (15 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:48:30.319

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 10.9	= 11.0
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 10.9	= 11.0
7	= 11.7	= 11.8
	= 11.7	= 11.8
	= 10.9	= 11.0
	= 11.7	= 11.8
8	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.4	= 12.5
	= 11.7	= 11.8
9	= 11.7	= 11.8
	= 11.7	= 11.8
	= 10.9	= 11.0
	= 10.9	= 11.0
10	= 11.7	= 11.8
	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.9	= 11.0
11	= 10.9	= 11.0
	= 10.9	= 11.0
	= 11.7	= 11.8
	= 11.7	= 11.8
12	= 10.9	= 11.0
	= 11.7	= 11.8

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 10.1	= 10.2
	= 10.1	= 10.2
13	= 10.9	= 11.0
	= 10.9	= 11.0
	= 11.7	= 11.8
	= 10.9	= 11.0
14	= 10.9	= 11.0
	= 10.1	= 10.2
	= 10.9	= 11.0
	= 10.1	= 10.2
15	= 10.9	= 11.0
	= 10.1	= 10.2
	= 10.9	= 11.0
	= 10.1	= 10.2
16	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.1	= 10.2
	= 10.9	= 11.0
17	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.1	= 10.2
18	= 10.1	= 10.2
	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.9	= 11.0
19	= 10.9	= 11.0

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.9	= 11.0
20	= 10.9	= 11.0
	= 10.1	= 10.2
	= 10.1	= 10.2
	= 10.1	= 10.2
SSM-1 (031:15:48:45.919)		
1	= 10.1	= 10.2
	= 10.1	= 10.2
	= 10.9	= 11.0
	= 10.1	= 10.2
2	= 10.1	= 10.2
	= 10.1	= 10.2
	= 10.1	= 10.2
	= 10.9	= 11.0
3	*	*
	= 10.1	= 10.2
	= 10.9	= 11.0
	= 10.1	= 10.2
4	= 10.9	= 11.0
	= 10.1	= 10.2
	= 10.1	= 10.2
	= 10.1	= 10.2
5	= 10.1	= 10.2
	*	*
	= 10.9	= 11.0

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 97 MODE I (15 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	10.9	= 11.0
6	= 10.1	= 10.2
	= 10.1	= 10.2
	= 10.9	= 11.0
	= 10.1	= 10.2
7	= 10.1	= 10.2
	*	*
	= 10.1	= 10.2
	= 10.9	= 11.0
8	= 10.9	= 11.0
	= 10.9	= 11.0
	= 10.9	= 11.0
	*	*
9	= 10.1	= 10.2
	*	*
	*	*
	*	*
10	*	*
	= 10.1	= 10.2
	*	*
	= 10.1	= 10.2
11	= 10.1	= 10.2
	*	*
	*	*
	= 10.1	= 10.2
12	*	*
	*	*

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 10.1	= 10.2
	*	*
13	= 10.1	= 10.2
	*	*
	= 10.1	= 10.2
	= 10.1	= 10.2
14	*	*
	= 10.1	= 10.2
	*	*
	*	*
15	= 10.1	= 10.2
	= 10.1	= 10.2
	*	*
	= 10.1	= 10.2
SSM-2	(031:15:49:1.519)	
1	*	*
	= 10.1	= 10.2
	*	*
	*	*
2	*	*
	*	*
	= 10.1	= 10.2
	*	*
3	*	*
	*	*
	*	*
	= 10.1	= 10.2

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	*	*
	*	*
	= 10.1	= 10.2
	= 10.1	= 10.2
5	*	*
	= 10.1	= 10.2
	= 10.1	= 10.2
	*	*
6	*	*
	*	*
	*	*
	*	*
7	*	*
	*	*
	= 10.1	= 10.2
	= 10.1	= 10.2
8	*	*
	= 10.1	= 10.2
	*	*
	*	*
9	*	*
	= 10.1	= 10.2
	*	*
	= 10.1	= 10.2
10	*	*
	*	*
	*	*

SPECIAL NOTES:

1. σ° Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 97 MODE I (15 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.5°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.55°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	*	*						
11	=10.1	= 10.2						
	*	*						
	*	*						
	*	*						
12	*	*						
	*	*						
	*	*						
	*	*						
13	*	*						
	*	*						
	*	*						
	*	*						
14	*	*						
	*	*						
	*	*						
	*	*						
15	*	*						
	*	*						
	*	*						
	*	*						

SPECIAL NOTES:
1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 97 MODE V (1 of 3) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:15:56:28.004

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.55°$; $\xi_r = 0°$

$\psi = 0.56°$

$\xi_p = 0°$; $\xi_r = \pm 0.6°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
4	*	*
	*	*
	= 11.1	= 11.2
	= 11.1	= 11.2
5	*	*
	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2
6	*	*
	*	*
	= 11.1	= 11.2
	*	*
SSM-1 (031:15:56:31.124)		
1	= 11.1	= 11.2
	= 11.1	= 11.2
	*	*
	*	*
2	= 11.1	= 11.2
	*	*
	= 11.1	= 11.2
	*	*
3	= 11.9	= 12.0
	*	*
	*	*
	= 11.1	= 11.2
4	= 11.1	= 11.2
	= 11.1	= 11.2
	= 11.1	= 11.2

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	*	*
5	= 11.1	= 11.2
	= 11.9	= 12.0
	*	*
	*	*
SSM-2 (031:15:56:36.324)		
1	*	*
	*	*
	*	*
	*	*
2	*	*
	= 11.1	= 11.2
	= 11.1	= 11.2
	*	*
3	*	*
	*	*
	= 11.1	= 11.2
	= 11.1	= 11.2
4	*	*
	*	*
	*	*
	*	*
5	*	*
	*	*
	= 11.1	= 11.2
	*	*

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 97 MODE I (23 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:16:16:24.878

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.7°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
SSM-0				= 13.2	= 13.3		= 14.0	= 14.1
6	= 13.2	= 13.3		= 12.5	= 12.6		= 13.2	= 13.3
	= 14.0	= 14.1	13	= 12.5	= 12.6		= 14.0	= 14.1
	= 14.0	= 14.1		= 13.2	= 13.3	20	= 14.0	= 14.1
	= 12.5	= 12.6		= 12.5	= 12.6		= 14.8	= 14.9
7	= 11.7	= 11.8		= 12.5	= 12.6		= 14.0	= 14.1
	= 14.0	= 14.1	14	= 13.2	= 13.3		= 14.8	= 14.9
	= 13.2	= 13.3		= 13.2	= 13.3	SSM-1 (031:16:16:40.478)		
	= 12.5	= 12.6		= 13.2	= 13.3	1	= 14.8	= 14.9
8	= 12.5	= 12.6		= 13.2	= 13.3		= 14.0	= 14.1
	= 12.5	= 12.6	15	= 12.5	= 12.6		= 14.8	= 14.9
	= 12.5	= 12.6		= 14.0	= 14.1		= 14.8	= 14.9
	= 12.5	= 12.6		= 14.8	= 14.9	2	= 14.8	= 14.9
9	= 13.2	= 13.3		= 14.8	= 14.9		= 14.8	= 14.9
	= 12.5	= 12.6	16	= 14.8	= 14.9		= 15.5	= 15.6
	= 12.5	= 12.6		= 13.2	= 13.3		= 15.5	= 15.6
	= 13.2	= 13.3		= 13.2	= 13.3	3	= 16.3	= 16.4
10	= 12.5	= 12.6		= 14.8	= 14.9		= 15.5	= 15.6
	= 13.2	= 13.3	17	= 14.0	= 14.1		= 15.5	= 15.6
	= 13.2	= 13.3		= 14.0	= 14.1		= 14.8	= 14.9
	= 13.2	= 13.3		= 13.2	= 13.3	4	= 14.8	= 14.9
11	= 12.5	= 12.6		= 13.2	= 13.3		= 15.5	= 15.6
	= 14.0	= 14.1	18	= 13.2	= 13.3		= 14.0	= 14.1
	= 14.0	= 14.1		= 12.5	= 12.6		= 14.8	= 14.9
	= 11.7	= 11.8		= 12.5	= 12.6	5	= 15.5	= 15.6
12	= 11.7	= 11.8		= 12.5	= 12.6		= 14.8	= 14.9
	= 14.0	= 14.1	19	= 14.0	= 14.1		= 14.8	= 14.9

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

MISSION SL-4 PASS 97 MODE I (23 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)____________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.7°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	14.8	= 14.9
6	= 14.8	= 14.9
	= 14.8	= 14.9
	= 14.8	= 14.9
	= 14.8	= 14.9
7	= 14.8	= 14.9
	= 14.0	= 14.1
	= 14.0	= 14.1
	= 14.8	= 14.9
8	= 14.8	= 14.9
	= 14.8	= 14.9
	= 14.0	= 14.1
	= 14.8	= 14.9
9	= 15.5	= 15.6
	= 15.5	= 15.6
	= 14.8	= 14.9
	= 14.8	= 14.9
10	= 16.3	= 16.4
	= 16.3	= 16.4
	= 16.3	= 16.4
	= 16.3	= 16.4
11	= 17.1	= 17.2
	= 16.3	= 16.4
	= 16.3	= 16.4
	= 15.5	= 15.6
12	= 15.5	= 15.6
	= 14.8	= 14.9

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 14.8	= 14.9
	= 14.8	= 14.9
13	= 16.3	= 16.4
	= 15.5	= 15.6
	= 14.8	= 14.9
	= 14.0	= 14.1
14	= 14.8	= 14.9
	= 14.0	= 14.1
	= 14.8	= 14.9
	= 14.8	= 14.9
15	= 14.0	= 14.1
	= 15.5	= 15.6
	= 14.0	= 14.1
	= 14.8	= 14.9
SSM-2 (031:16:16:56.078)		
1	= 15.5	= 15.6
	= 14.8	= 14.9
	= 14.8	= 14.9
	= 13.2	= 13.3
2	= 13.2	= 13.3
	= 13.2	= 13.3
	= 12.5	= 12.6
	= 12.5	= 12.6
3	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 11.7	= 11.8

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	= 12.5	= 12.6
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
5	= 12.5	= 12.6
	= 12.5	= 12.6
	= 11.7	= 11.8
	= 11.7	= 11.8
6	= 11.7	= 11.8
	= 12.5	= 12.6
	= 11.7	= 11.8
	= 11.7	= 11.8
7	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 11.7	= 11.8
8	= 11.7	= 11.8
	*	*
	= 12.5	= 12.6
	= 11.7	= 11.8
9	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
10	= 11.7	= 11.8
	*	*
	= 12.5	= 12.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

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*Data below calibration range.

MISSION SL-4 PASS 97 MODE I (23 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.58°$

$\xi_p = 0°$; $\xi_r = \pm 0.7°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
10(Cont'd.)	11.7	= 11.8						
11	= 12.5	= 12.6						
	= 12.5	= 12.6						
	= 11.7 *	= 11.8 *						
12	= 12.5	= 12.6						
	= 11.7	= 11.8						
	= 12.5	= 12.6						
	= 11.7	= 11.8						
13	= 12.5 *	= 12.6 *						
	= 11.7	= 11.8						
	= 12.5	= 12.6						
14	= 11.7	= 11.8						
	= 11.7	= 11.8						
	= 11.7 *	= 11.8 *						
15	= 11.7 *	= 11.8 *						
	= 11.7	= 11.8						
	= 11.7	= 11.8						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 97 MODE I (24 of 24) SUBMODE 0

FIRST FRAME START TIME (JSC/GMT) 031:16:18:0.074

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.7°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
SSM-0		
6	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
7	*	*
	= 11.7	= 11.8
	*	*
	= 11.7	= 11.8
8	*	*
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
9	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 11.7	= 11.8
10	= 11.7	= 11.8
	= 12.5	= 12.6
	*	*
	= 11.7	= 11.8
11	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 11.7	= 11.8
12	= 12.5	= 12.6
	= 11.7	= 11.8
	*	*
	= 11.7	= 11.8
13	*	*
	*	*
	*	*
	*	*
14	= 11.7	= 11.8
	= 12.5	= 12.6
	= 11.7	= 11.8
	= 11.7	= 11.8
15	= 12.5	= 12.6
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
16	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
17	= 11.7	= 11.8
	= 11.7	= 11.8
	*	*
	= 11.7	= 11.8
18	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
19	= 11.7	= 11.8
	= 12.5	= 12.6
	= 11.7	= 11.8
	*	*
20	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
SSM-1 (031:16:18:15.674)		
1	= 12.5	= 12.6
	= 11.7	= 11.8
	*	*
	= 11.7	= 11.8
2	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
3	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.5	= 12.6
4	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
5	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 97 MODE I (24 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.7°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
5(Cont'd.)	11.7	= 11.8
6	= 12.5	= 12.6
	= 11.7	= 11.8
	*	*
	= 11.7	= 11.8
7	*	*
	*	*
	= 12.5	= 12.6
	= 12.5	= 12.6
8	*	*
	*	*
	*	*
	*	*
9	*	*
	*	*
	*	*
	*	*
10	*	*
	*	*
	*	*
	*	*
11	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.5	= 12.6
12	*	*
	= 11.7	= 11.8

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
	= 11.7	= 11.8
	= 12.5	= 12.6
13	= 12.5	= 12.6
	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
14	= 12.5	= 12.6
	= 12.5	= 12.6
	*	*
	= 11.7	= 11.8
15	= 12.5	= 12.6
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
SSM-2 (031:16:18:31.273)		
1	= 11.7	= 11.8
	= 11.7	= 11.8
	= 11.7	= 11.8
	= 12.5	= 12.6
2	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 11.7	= 11.8
3	= 12.5	= 12.6
	= 12.5	= 12.6
	= 11.7	= 11.8
	= 11.7	= 11.8

FRAME NO.	$\sigma°(\psi)$ $(\xi_p, 0°)$	$\sigma°(\psi)$ $(0°, \xi_r)$
4	= 12.5	= 12.6
	= 13.2	= 13.3
	= 11.7	= 11.8
	= 12.5	= 12.6
5	= 12.5	= 12.6
	= 12.5	= 12.6
	= 11.7	= 11.8
	= 11.7	= 11.8
6	= 11.7	= 11.8
	= 12.5	= 12.6
	= 11.7	= 11.8
	= 12.5	= 12.6
7	= 11.7	= 11.8
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 11.7	= 11.8
8	= 12.5	= 12.6
	= 12.5	= 12.6
	= 12.5	= 12.6
	= 13.2	= 13.3
9	= 12.5	= 12.6
	= 13.2	= 13.3
	= 11.7	= 11.8
	= 12.5	= 12.6
10	= 12.5	= 12.6
	= 13.2	= 13.3
	= 13.2	= 13.3

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

*Data below calibration range.

MISSION SL-4 PASS 97 MODE I (24 of 24) SUBMODE 0 (Cont'd.)

FIRST FRAME START TIME (JSC/GMT)________________

ESTIMATED POINTING BOUNDS

$\xi_p = \pm 0.65°$; $\xi_r = 0°$

$\psi = 0.57°$

$\xi_p = 0°$; $\xi_r = \pm 0.7°$

FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$	FRAME NO.	$\sigma°(\psi)$ $(\xi_p,0°)$	$\sigma°(\psi)$ $(0°,\xi_r)$
10(Cont'd.)	12.5	= 12.6						
11	= 14.0	= 14.1						
	= 14.0	= 14.1						
	= 14.8	= 14.9						
	= 15.5	= 15.6						
12	= 14.8	= 14.9						
	= 17.1	= 17.2						
	= 15.5	= 15.6						
	= 15.5	= 15.6						
13	= 16.3	= 16.4						
	= 16.3	= 16.4						
	= 16.3	= 16.4						
	= 16.3	= 16.4						
14	= 16.3	= 16.4						
	= 16.3	= 16.4						
	= 16.3	= 16.4						
	= 16.3	= 16.4						
15	= 16.3	= 16.4						
	= 15.5	= 15.6						
	= 15.5	= 15.6						
	= 14.0	= 14.1						

SPECIAL NOTES:

1. $\sigma°$ Values In dB. Not Corrected For Atmospheric Loss.
2. Elapsed Time Of One Frame = 1.04 secs.
3. ψ Corresponds To Angle At Which Return Power Peaks.

4.0 ERROR ANALYSIS

As noted in Section 1 of this report, probably the most difficult phase of this study was the development of a meaningful error analysis. The difficulty stems primarily from the lack of an in-depth calibration to include such factors as calibration repeatability, system aging effects and component stability. As is normal, however, such tests are easier stated than performed, and, given time and budget constraints, usually fall by the wayside. Hence, the task becomes one of using "best engineering judgment" to estimate the various error sources in the system.

Our primary source of data for this study has been Reference 2.2 of Section 2 and informal discussions with Dr. E. L. Hofmeister and Mr. T. Godbey of the General Electric Company, Utica, New York, to whom the author is greatly indebted. Both sources provided a great deal of information relative to this phase of the study; however, in the final analysis it was the author's decision as to the magnitude of the errors. The reader is therefore warned that this section is the result of the author's assessment of the error sources for which he accepts full responsibility.

The basic relationship used to determine $(\sigma°/L_p)$ was equation (2-18), i.e.

$$\frac{\sigma°(\psi)}{L_p} = \frac{P_{POM_{CAL}}\ \rho\ L_{ab}\ L_{bc}}{\hat{P}_{CDS}\ \hat{F}\ L_{ac}\ L_{CAL}\ R_n} \tag{4-1}$$

where we have now explicitly included the factor R_n to account for noise contributions due to the S-193 integrated receiver. The question that has to be answered now is how to determine the type of error associated with each of the terms in (4-1). That is, are the errors short term random, long term random, bias or a combination of these classes of errors? To answer these questions, we first list the sources of error for each of the factors in (4-1) as follows.

(a) $P_{POM_{CAL}}$: statistical fluctuation of the return, A/D quantization error, calibration curve changes with time, repeatibility, temperature interpolation

(b) ρ : calibration curve changes, repeatability, temperature interpolation, signal-to-noise ratio dependence

(c) $L_{ab}L_{bc}$: changes in the thermal environment, vibration of the altimeter during launch

(d) $\hat{P}_{CDS}\ L_{ac}\ L_{CAL}$: A/D quantization, calibration curve changes, repeatibility, temperature interpolation

(e) $\hat{F}$: Changes in antenna gain, altitude deviation from 435.5 km, statistical uncertainty in estimating the pointing angle, changes in the shape of the point target response, changes in the radar wavelength

(f) R_n : Inadequate calibration, changes in the noise figure of the S-193 integrated receiver, changes in available calibration curves.

Of particular importance in assessing the types of errors is the fact that by computing $\sigma°/L_p$ from the ratio of $P_{POM_{CAL}}$ to $\hat{P}_{CDS}$, we eliminate any errors due to long term drift in the transmitter and receiver of the S-193 radar altimeter. That is, since the data acquisition and internal calibration signals traverse common portions of the radar transmitter and receiver (see Figure 2.1), any changes which occur over the time extent of <u>both</u> data acquisition and internal calibration (in the common portions of the radar) will divide out. This statement, of course, is true only to the extent that the radar is a linear system, i.e. superposition applies. With this observation in mind, we can catagorize the type of residual error in each of the above quantities as follows;

(a) $P_{POM_{CAL}}$: Dominant short term random error and small long term random error

(b) ρ : Long term random error

(c) $L_{ab}L_{bc}$: Dominant short term random error and small bias error

(d) $P_{CDS}\ L_{ac}\ L_{CAL}$: Dominant long term error with small bias error

(e) $\hat{F}$: (SL-2,3) Dominant short term random error and small long term random error. (SL-4) Dominant bias error and smaller short term random error

(f) R_n : Dominant bias error and small short term random error.

The particular terminology used in the above description is explained as follows.

By short term random error we mean that a stationary error statistic could be constructed using the data from one submode and the results would be valid for the entire mission. Long term random error means that data from an entire mission would be required to construct a stationary error statistic. Bias errors are those errors resulting from an inadequate measurement; they change very slowly over the life of the mission. Of particular note in the above classification is the change in $\hat{F}$ as a function of mission. This is due to the change in antenna gain and pattern during SL-4.

Let b_1, b_2, b_3 and b_4 be defined as follows;

$$b_1 = \frac{L_{ab}\, L_{bc} \text{ (estimated value)}}{L_{ab}\, L_{bc} \text{ (true value)}}$$

$$b_2 = \frac{\hat{P}_{CDS}\, L_{ac}\, L_{CAL} \text{ (estimated value)}}{\hat{P}_{CDS}\, L_{ac}\, L_{CAL} \text{ (true value)}}$$

$$b_3 = \frac{\hat{F} \text{ (estimated value)}}{\hat{F} \text{ (true value)}}$$

$$b_4 = \frac{R_n \text{ (estimated value)}}{R_n \text{ (true value)}}$$

where the "estimated value" differs from the "true value" by the bias. Assuming that all other quantities on the right hand side of (4-1) contain no bias, we have

$$\frac{(\sigma^\circ/L_p \text{, estimated value})}{(\sigma^\circ/L_p \text{, true value})} = \frac{b_1}{b_2\, b_3\, b_4} \tag{4-2}$$

In dB, the relative bias error is given by

$$\varepsilon_t = \varepsilon_1 - \varepsilon_2 - \varepsilon_3 - \varepsilon_4$$

where $\varepsilon_i = 10 \log_{10}(b_i)$, $i = 1,2,3,4$. The worst case relative bias error occurs when the sign of the ε_i are such that

$$\varepsilon_t = |\varepsilon_1| + |\varepsilon_2| + |\varepsilon_3| + |\varepsilon_4| \tag{4-3}$$

Equation (4-3) will be used to determine the worst case relative bias error. It should be noted that this bias error is <u>in addition</u> to the bounds on $(\sigma°/L_p)$ given in the data tables of Section 3 which are due entirely to the uncertainty in <u>direction</u> of the pointing. A summary of our estimates of worst case bias errors is given in Table 4.1 for SL-2 and SL-3 missions and in Table 4.2 for SL-4. Of particular note in these tables is the increase in bias error in $\hat{F}$ during SL-4 due to the antenna damage.

We determine the per unit or percentage standard deviation of the random error in $\sigma°/L_p$ by taking the square root of the sum of the squares of the per unit standard deviation of the errors of the terms on the right hand side of (4-1). This rss approach to random error analysis, while not particularly elegant, is considered to be sufficient given the accuracy of the individual error terms. That is, if δ_t is the per unit standard deviation of the error in $\sigma°/L_p$, then

$$\delta_t = \left[\sum_{i=1}^{6} \delta_i^2\right]^{1/2} \tag{4-4}$$

where

$$\delta_1 = \text{Std Dev } (L_{ab}\, L_{bc}) \Big/ \overline{L_{ab}\, L_{bc}}$$

$$\delta_2 = \text{Std Dev } (\hat{P}_{CDS}\, L_{ac}\, L_{CAL}) \Big/ \overline{\hat{P}_{CDS}\, L_{ac}\, L_{CAL}}$$

$$\delta_3 = \text{Std Dev } (\hat{F}) / \overline{\hat{F}}$$

$$\delta_4 = \text{Std Dev } (R_n) / \overline{R_n}$$

$$\delta_5 = \text{Std Dev } (P_{POM_{CAL}}) / \overline{P_{POM_{CAL}}}$$

$$\delta_6 = \text{Std Dev } (\rho) / \overline{\rho}$$

The assignment of values to the δ_i is, for the most part, based on judgment. However, in some cases it is possible to be more specific. For example,

TABLE 4.1

Worst Case Relative Bias Error Estimates For Missions SL-2 and SL-3 As A Function Of Pointing Angle.

	$\xi_p=0°$	$\xi_p=0.5°$	$\xi_p=1.5°$	$\xi_p=3°$	$\xi_p=7.6°$	$\xi_p=15.6°$
ε_1 ($L_{ab}L_{bc}$)	0.2 dB	0.2 dB	0.2 dB	0.2 dB	0.2 dB	0.2 dB
ε_2 ($\hat{P}_{CDS}L_{ac}L_{CAL}$)	0.2 dB	0.2 dB	0.2 dB	0.2 dB	0.2 dB	0.2 dB
ε_3 ($\hat{F}$)	0.1 dB	0.1 dB	0.1 dB	0.1 dB	0.1 dB	0.1 dB
ε_4 (R_n)	0.2 dB	0.2 dB	0.5 dB	0.9 dB	1.5 dB	3.0 dB
ε_t* ($\sigma°/L_p$)	0.7 dB	0.7 dB	1.0 dB	1.4 dB	2.0 dB	3.5 dB

*ε_t = Magnitude of the worst case estimate of the relative bias in the measurement of ($\sigma°/L_p$). Note that this error is in addition to the bounds given in Section 3 which are due to pointing direction uncertainty.

TABLE 4.2

Worst Case Relative Bias Error Estimates For Mission SL-4 As A Function Of Pointing Angle.

	$\xi_p = 0°$	$\xi_p=0.5°$	$\xi_p=0.8°$
ε_1 ($L_{ab}L_{bc}$)	0.2 dB	0.2 dB	0.2 dB
ε_2 ($\hat{P}_{CDS}L_{ac}L_{CAL}$)	0.2 dB	0.2 dB	0.2 dB
ε_3 ($\hat{F}$)	2.0 dB	2.0 dB	2.0 dB
ε_4 (R_n)	1.5 dB	1.8 dB	2.5 dB
ε_t* ($\sigma°/L_p$)	3.9 dB	4.2 dB	4.9 dB

*ε_t = Magnitude of the worst case estimate of the relative bias in the measurement of ($\sigma°/L_p$). Note that this error is in addition to the bounds given in Section 3 which are due to pointing direction uncertainty.

the per unit standard deviation of the measurement error in $\hat{P}_{CDS}\ L_{ac}\ L_{CAL}$ was found to be about 2.2%*. However, it could not be determined how much of this error was constant over the time interval during which $\hat{P}_{POM_{CAL}}$ was also measured. Such errors would be due primarily to changes in the radar system which was common to both measurements; thus, when ratioing the two measurements, the common errors would cancel even though they might be long term random. Based upon the short term stability of the measurement of $\hat{P}_{CDS} L_{ac}\ L_{CAL}$, it was determined that roughly 1.1% error should be attributed to $\hat{P}_{CDS}\ L_{ac}\ L_{CAL}$ for SL-2, 3 and 4. The per unit standard deviation δ_5 is the root sum square of: (1) the error d_1 due to the statistical fluctuation of the return signal, (2) the error d_2 due to the telemetry quantization process, and (3) the error d_3 due to repeatability and interpolation. On a one second basis, $d_1 = 1/\sqrt{256} = 6.25\%$ because of the exponential statistics of the return power. Based upon the observed quantization error in the data and the level of return signal, the following list shows d_2 as a function of pointing angle for a one second averaging time;

SL-2 and 3		SL-4	
ξ_p	d_2	ξ	d_2
0 °	3.3%	0 °	2.2%
0.5°	3.3%	0.5°	1.8%
1.5°	3.3%	0.8°	0.6%
3.0°	2.5%		
7.6°	1.6%		
15.6°	0.4%		

The value of d_3 was determined by judgment.

The random error in $\hat{F}$ may be considered to be primarily due to the $\pm 0.1°$ accuracy of the waveform derived pointing angle estimates. With this angular accuracy and the curves of $\hat{F}$ vs. ξ_p in Figures 2.3 through 2.5, estimates of δ_3 may be obtained.

Tables 4.3 and 4.4 present our worst case estimates of the one second per unit standard deviation of the random errors for Missions SL-2 and SL-3 and Mission SL-4, respectively. The bottom row in these tables shows the resultant error due to a (one second) one-sigma deviation from the mean.

*Based on 24 samples from SL-2 and 3 and 54 samples from SL-4.

TABLE 4.3

Worst Case Estimate Of The One Second Per Unit Standard Deviation Of The Random Error For Missions SL-2 And 3 As A Function Of Pointing Error

	$\xi_p=0°$	$\xi_p=0.5°$	$\xi_p=1.5°$	$\xi_p=3°$	$\xi_p=7.6°$	$\xi_p=15.6°$
δ_1 $(L_{ab}L_{bc})$	1%	1%	1%	1%	1%	1%
δ_2 $(\hat{P}_{CDS}L_{ac}L_{CAL})$	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
δ_3 $(\hat{F})$	2.3%	17.5%	7.2%	3.9%	2.3%	0.5%
δ_4 (R_n)	1%	1%	2%	3%	5%	8%
δ_5 $(P_{POM_{CAL}})$	7.1%	7.1%	7.1%	6.9%	7.1%	8%
δ_6 (ρ)	1%	1%	1%	1.5%	3%	5%
δ_7 $(\sigma°/L_p)$	7.7%	19%	10.5%	8.7%	9.6%	15.4%
1σ ERROR in dB	0.3 dB	0.8dB	0.4 dB	0.4 dB	0.4 dB	0.6dB

TABLE 4.4

Worst Case Estimate of the One Second Per Unit Standard Deviation Of The Random Error For Mission SL-4 As A Function of Pointing Error.

	$\xi_p = 0°$	$\xi_p = 0.5°$	$\xi_p = 0.8°$
δ_1 $(L_{ac} L_{bc})$	1%	1%	1%
δ_2 $(\hat{P}_{CDS} L_{ac} L_{CAL})$	1.1%	1.1%	1.1%
δ_3 $(\hat{F})$	1.2%	17.5%	23%
δ_4 (R_n)	2%	4%	7%
δ_5 $(P_{POM_{CAL}})$	6.8%	7.1%	7.8%
δ_6 (ρ)	1.4%	2.8%	4.7%
δ_t $(\sigma°/L_p)$	7.5%	19.6%	25.8%
1σ ERROR in dB	0.3 dB	0.8 dB	1.0 dB

It should be pointed out that an increase in averaging time will only reduce δ_1 since all the other error sources are long term errors or are determined by a process which is not dependent upon AGC (such as the pointing error in $\hat{F}$). Furthermore, increasing the averaging time may be limited by surface homogeniety. We emphasize the fact that both the bias estimates presented in Tables 4.1 and 4.2 and the one second random errors presented in Tables 4.3 and 4.4 are in addition to the error bounds presented in the data tables of Section 3 resulting from pointing direction uncertainty.

The results of this section clearly show that the accuracy of data from the SL-2 and SL-3 missions is significantly greater than that from SL-4. This is due to the reduced antenna gain during SL-4. All factors considered, however, we see that the accuracy of the data is extremely good. This is primarily a result of the ratioing technique used to determine received power which eliminates the need for detailed data on receiver long term drift.

APPENDIX A. NEAR NORMAL INCIDENCE FLAT SURFACE IMPULSE RESPONSE FOR A NONSYMMETRICAL ANTENNA PATTERN

It is well known from radar astronomy [A1] that the average return power as a function of delay time and doppler frequency is a double convolution of the radar system ambiguity function and the scattering function. When the doppler extent of the scattering function ($=4V/\lambda$, V = along-track velocity of the radar and λ = wavelength of the radar) is small compared to the doppler spread of the ambiguity function ($\approx 2/T$, where T is the reciprocal of the transmitted pulse length), the double convolution reduces to a single convolution of the autocorrelation function* of the transmitted pulse with the surface impulse response. Since the autocorrelation function of the transmitted pulse is equivalent to the system point target response, equation (2-1) in Section 2.1 results.

For the Skylab altitude ($h = 435.5$ km, nominal), the curvature of the earth's surface may be neglected. The flat surface impulse response, $P_i(\tau)$, is given by the following formula [A2]:

$$P_i(\tau,\xi) = \frac{G_o^2\,\lambda^2}{L_p(4\pi)^3} \int_{\substack{\text{SCATTERING}\\ \text{SURFACE}}} \frac{\delta(\tau + \frac{2h}{c} - \frac{2r}{c})\; g^2(\theta,\omega)\;\sigma^\circ(\psi)}{r^4}\, dA \qquad \text{(A-1)}$$

where

c = Speed of light

$\tau = t - \frac{2h}{c}$, two-way time delay relative to the time required to travel to the mean surface and back,

L_p = Two-way path loss over and above free-space loss,

G_o = Boresight power gain of the transmitting/receiving antenna,

λ = rf-wavelength,

$\delta(\tau + \frac{2h}{c} - \frac{2r}{c})$ = Delta function,

$g(\theta,\omega)$ = Antenna power pattern normalized to a maximum amplitude of unity,

*This assumes that the receiver is a "matched filter".

r = Distance from the antenna to the incremental area dA on the scattering surface,

$\sigma^\circ(\psi)$ = Backscattering cross-section of the sea surface per unit area of scattering surface.

When the antenna pattern is only a function of the polar angle θ, (A-1) has been previously evaluated [A3]. However, as shown in Appendices B and C, the Skylab antenna pattern is a function of both the polar angle θ and the azimuthal angle ω. For this case, the analysis becomes much more complex, however, a closed-form approximation to the right hand side of (A-1) may still be obtained.

The geometry of the situation is shown in Figure A1. For no yaw, the x and y axes correspond to the along-track and cross-track directions, respectively, of the altimeter's motion. The altimeter is at an altitude h above the mean flat surface ($z = 0$). The boresight of the altimeter's antenna is cocked at an angle ξ with respect to the $-z$ axis (the subsatellite or nadir axis). The projection of the boresight axis upon the $y = 0$ plane is at an angle ξ_p with respect to the $-z$ axis and the projection upon the $x = 0$ plane is at an angle ξ_r with respect to the $-z$ axis (ξ_p and ξ_r are the pitch and roll angles relative to the spacecraft coordinate system). The projection of the boresight axis on the $z = 0$ plane forms an angle α with respect to the x axis. The element of scattering area dA in the $z = 0$ plane is at an angle θ with respect to the antenna boresight axis, an angle ϕ with respect to the x axis, and at a distance ρ from the intersection of the z axis and the $z = 0$ plane. The azimuthal angle coordinate ω of the antenna pattern is measured with respect to a line which is a translation of the x axis.

A very good analytical approximation to the Skylab antenna patterns is given by (see Appendices B and C)

$$g^2(\theta,\omega) = e^{-\frac{4}{\gamma}\left[1 + \delta\cos^2\omega\right]\sin^2\theta} \qquad \text{(A-2)}$$

The element of area dA is taken to be equal to $\rho d\rho d\phi$. Thus, in order to accomplish the integration in (A-1), we must determine ω and θ in terms of ρ and ϕ. The angle α is related to ξ_p and ξ_r by

$$\tan\alpha = \tan\xi_r / \tan\xi_p \quad ,$$

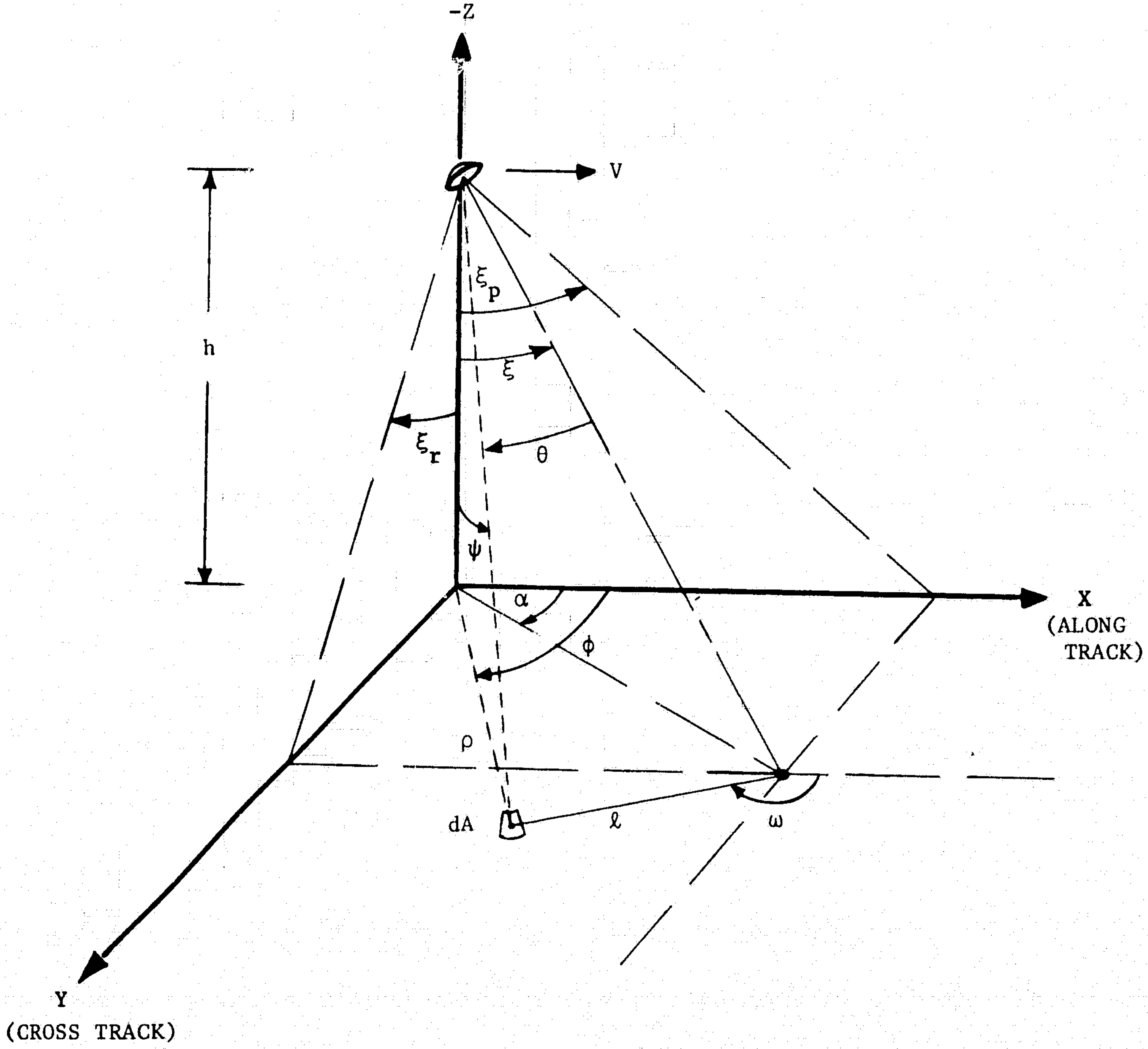


Figure A1. Geometry for determining the flat surface impulse response.

while ξ_r and ξ_p are dependent upon ξ in the following manner;

$$\tan^2\xi = \tan^2\xi_r + \tan^2\xi_p \quad . \tag{A-3}$$

The distance ℓ, from dA to the intersection point of the antenna axis and the $z = 0$ plane, is given by the law of cosines as follows;

$$\ell^2 = \rho^2 + h^2\tan^2\xi - 2\rho h \tan\xi \cos(\phi-\alpha) \tag{A-4}$$

Using the triangle formed by the antenna axis, ℓ, and the line from the antenna to dA, we also find that

$$\ell^2 = h^2\sec^2\xi + h^2 + \rho^2 - 2h\sec\xi\sqrt{h^2+\rho^2}\,\cos\theta \tag{A-5}$$

Solving (A-4) and (A-5) for $\cos\theta$ yields

$$\cos\theta = \frac{\cos\xi + (\rho/h)\sin\xi\cos(\alpha-\phi)}{\sqrt{1+(\rho/h)^2}} \tag{A-6}$$

Equation (A-5) may be rewritten in the following form;

$$\ell^2 = 2h^2\sec\xi\sqrt{1+(\rho/h)^2}\left\{\frac{\sec^2\xi+1+(\rho/h)^2}{2\sec\xi\sqrt{1+(\rho/h)^2}} - \cos\theta\right\} \tag{A-7}$$

Since $\rho << h$ and ξ is small (2° or less),

$$\ell^2 \approx 2h^2\sec\xi\sqrt{1+(\rho/h)^2}\left[1-\cos\theta\right] \quad . \tag{A-8}$$

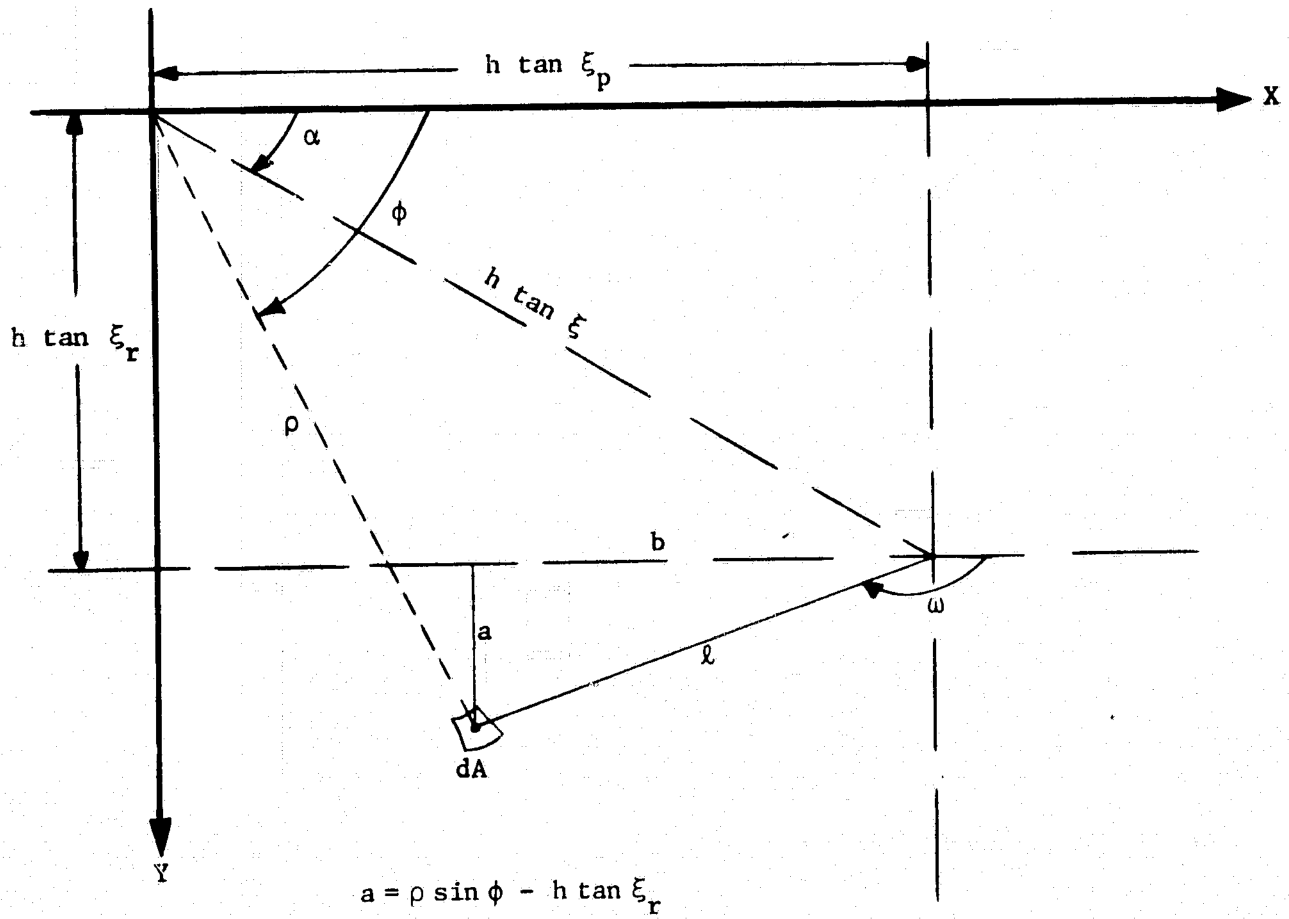
Using the equalities established in Figure A2, we find that

$$\ell\cos\omega = \rho\cos\phi - h\tan\xi_p \quad ,$$

and substituting from (A-8) there results

$$\cos^2\omega \approx \frac{\rho^2\cos^2\phi - 2h\rho\tan\xi_p\cos\phi + h^2\tan^2\xi_p}{2h^2\sec\xi\sqrt{1+(\rho/h)^2}\left[1-\cos\phi\right]} \tag{A-9}$$

Equations (A-6) and (A-9) form the basic equalities necessary to couch the exponent in (A-2) in terms of ρ and ϕ.



$a = \rho \sin\phi - h \tan \xi_r$

$b = h \tan \xi_p - \rho \cos\phi$

Figure A2. Geometry from Figure A1 for evaluating ω as a function of ρ and ϕ.

The exponent in (A-2) may be rewritten as

$$-\frac{4}{\gamma}\left[1+\delta\cos^2\omega\right]\sin^2\theta = -\frac{4}{\gamma}\sin^2 - \frac{4\delta}{\gamma}\cos^2\omega(1-\cos\theta)(1+\cos\theta) \quad .$$

Substituting from (A-6) and (A-9), we find that

$$-\frac{4}{\gamma}\left(1+\delta\cos^2\omega\right)\sin^2\theta = -\frac{4}{\gamma}\left\{1-\left[\frac{\cos^2\xi+\varepsilon\sin2\xi\cos(\alpha-\phi)+\varepsilon^2\sin^2\xi\cos^2(\alpha-\phi)}{1+\varepsilon^2}\right]\right.$$
$$\left.+\delta\left[\frac{\varepsilon^2\cos^2\phi-2\varepsilon\tan\xi_p\cos\phi+\tan^2\xi_p}{2\sec\xi\sqrt{1+\varepsilon^2}}\right]\left(1+\frac{\cos\xi+\varepsilon\sin\xi\cos(\alpha-\phi)}{\sqrt{1+\varepsilon^2}}\right)\right\}$$
(A-10)

where $\varepsilon = \rho/h$. Using the identity $\cos^2(\alpha-\phi) = 1-\sin^2(\alpha-\phi)$, we find that

$$\frac{\varepsilon^2\sin^2\xi}{1+\varepsilon^2}\cos^2(\alpha-\phi) = \frac{\varepsilon^2\sin^2\xi}{1+\varepsilon^2} - \frac{\varepsilon^2\sin^2\xi}{1+\varepsilon^2}\sin^2(\alpha-\phi) \quad .$$

From a previous analysis of the symmetrical antenna pattern case [A3], we know that the last term in the above expression has very little effect on the resultant ϕ-integration; thus,

$$\frac{\varepsilon^2\sin^2\xi}{1+\varepsilon^2}\cos^2(\alpha-\phi) \approx \frac{\varepsilon^2\sin^2\xi}{1+\varepsilon^2} \quad .$$

Also, since $|\varepsilon\sin\xi\cos(\alpha-\phi)| << \cos\xi$ and $\cos\xi \approx 1$,

$$\frac{\cos\xi+\varepsilon\sin\xi\cos(\alpha-\phi)}{\sqrt{1+\varepsilon^2}} \approx 1 \quad .$$

Substituting the above simplifications in equation (A-10) yields

$$-\frac{4}{\gamma}\left(1+\delta\cos^2\omega\right)\sin^2\theta \approx -\frac{4}{\gamma}\left\{1-\left[\frac{\cos^2\xi+\varepsilon\sin2\xi\cos(\alpha-\phi)+\varepsilon^2\sin^2\xi}{1+\varepsilon^2}\right]\right.$$
$$\left.+\delta\left[\frac{\varepsilon^2\cos^2\phi-2\varepsilon\tan\xi_p\cos\phi+\tan^2\xi_p}{\sec\xi\sqrt{1+\varepsilon^2}}\right]\right\} \qquad \text{(A-11)}$$

Under the assumption that $\sigma°$ is independent of ϕ, $g^2(\theta,\omega)$ is the only factor in (A-1) which depends on ϕ. Thus, the evaluation of (A-1) depends upon the integrability of (A-1) with the exponent of $g^2(\theta,\omega)$ given by (A-11). Inspection of (A-11) clearly indicates that the difficulty in accomplishing the integration arises due to the appearance of the term $\cos(\alpha-\phi)$ in addition to the trigonometric terms having only ϕ as their argument. Thus, it is obvious that some form of series approximation must be made. Since there are a number of choices, the guidelines for choosing the appropriate approximation should be; (1) simplicity, (2) generality and (3) validity for as large a value of ξ as possible. A number of approximations were tried, however the following appears to most satisfy the above three conditions. Since

$$\cos(\alpha - \phi) = \cos\alpha\cos\phi + \sin\alpha\sin\phi$$

and

$$\cos^2\phi = 1 - \sin^2\phi \quad ,$$

equation (A-11) can be rewritten in the following form:

$$-\frac{4}{\gamma}\left(1+\delta\cos^2\omega\right)\sin^2\theta = -\frac{4}{\gamma}\left\{-\frac{\delta\varepsilon^2\sin^2\phi}{\sec\xi\sqrt{1+\varepsilon^2}} - \frac{\varepsilon\sin 2\xi\sin\alpha\sin\phi}{(1+\varepsilon^2)}\right.$$

$$+1-\left[\frac{\cos^2\xi+\varepsilon^2\sin^2\xi - \delta\tan^2\xi_p\cos\xi\sqrt{1+\varepsilon^2} - \delta\varepsilon^2\cos\xi\sqrt{1+\varepsilon^2}}{1+\varepsilon^2}\right]$$

$$\left.-\left[\frac{\varepsilon\sin 2\xi\cos\alpha + 2\delta\varepsilon\sqrt{1+\varepsilon^2}\cos\xi\tan\xi_p}{1+\varepsilon^2}\right]\cos\phi\right\} \qquad \text{(A-12)}$$

Let

$$a = \frac{4\delta\varepsilon^2\cos\xi}{\gamma\sqrt{1+\varepsilon^2}} \qquad b = \frac{4\varepsilon\sin 2\xi\sin\alpha}{\gamma\sqrt{1+\varepsilon^2}} \qquad \text{(A-12a)}$$

and

$$d = -\frac{4}{\gamma}\left\{1 - \left[\frac{\cos^2\xi + \varepsilon^2\sin^2\xi - \delta\tan^2\xi_p\cos\xi\sqrt{1+\varepsilon^2} - \delta\varepsilon^2\cos\xi\sqrt{1+\varepsilon^2}}{1+\varepsilon^2}\right]\right\}$$

and

$$\beta = \frac{4}{\gamma}\left[\frac{\varepsilon\sin 2\xi\cos\alpha + 2\delta\varepsilon\sqrt{1+\varepsilon^2}\cos\xi\tan\xi_p}{1+\varepsilon^2}\right]. \tag{A-12b}$$

Using these notational changes,

$$g^2(\phi,\omega) = e^{d + \beta\cos\phi + a\sin^2\phi + b\sin\phi}$$

Expanding the exponential of the last two terms yields

$$e^{a\sin^2\phi + b\sin\phi} = \sum_{m=o}^{\infty}\frac{1}{m!}\left(a\sin^2\phi + b\sin\phi\right)^m ,$$

thus

$$\int_o^{2\pi} g^2(\theta,\omega)\,d\phi = e^d\sum_{m=o}^{\infty}\frac{1}{m!}\int_o^{2\pi} e^{\beta\cos\phi}\left(a\sin^2\phi + b\sin\phi\right)^m . \tag{A-13}$$

Equation (A-13) can be considerably simplified. First, it should be noted that all odd powers of $\sin\phi$ will integrate to zero due to the asymmetrical nature of the integrand. Also, since the sign of the terms of the series do not oscillate, a rough approximation to the error resulting from a finite truncation of the series may be obtained by comparing the m=0 term and the m=M term , where M is the upper limit of the summation. For the time being, let the summation be truncated at M=10. The implications of this choice upon the accuracy will be discussed later in this Appendix.

Thus, after truncating the summation in (A-13) at M=10 and retaining only $\sin^n\phi$ terms with $n \leq 10$, we find that the integral reduces to

$$\int_0^{2\pi} g^2(\theta,\omega)d\phi \simeq 2\pi \sum_{m=o}^{5} \frac{\Gamma(m+1/2)}{\sqrt{\pi}\,(\beta/2)^m \Gamma(m+1)}\ \bar{c}_m\, I_{2m}(\beta) \qquad \text{(A-14)}$$

where, in terms of the a and b coefficients defined in equation (A-12a),

$$\bar{c}_o = 1$$

$$\bar{c}_1 = a + b^2/2$$

$$\bar{c}_2 = a^2 + ab^2 + b^4/12$$

$$\bar{c}_3 = a^3 + \frac{3a^2b^2}{2} + \frac{ab^4}{4} + \frac{b^6}{120}$$

$$\bar{c}_4 = a^4 + 2a^3b^2 + \frac{a^2b^4}{2} + \frac{ab^6}{30} + \frac{b^8}{1680}$$

$$\bar{c}_5 = a^5 + \frac{5a^4b^2}{2} + \frac{5a^3b^4}{6} + \frac{a^2b^6}{12} + \frac{b^8a}{336} + \frac{b^{10}}{30{,}240} \qquad ,$$

and the I_{2m} are the modified Bessel functions. Because of the δ-function in equation (A-1), the ρ-integration ($dA = \rho d\rho d\phi$) is trivial. Using the fact that $\varepsilon << 1$, we find that the flat sea impulse response is given by the following;

$$P_i(\tau,\xi) \simeq \frac{G_o^2\lambda^2\sigma^\circ(\psi_o)c}{4(4\pi)^2h^3L_p}\, e^{-\frac{4}{\gamma}\left[\sin^2\xi + \delta\cos\xi\tan^2\xi_p\right]}$$

$$\cdot\, e^{-\frac{4c}{\gamma h}\tau(\cos 2\xi + \delta\cos\xi)} \cdot \sum_{m=o}^{5} \frac{\Gamma(m+1/2)\,\bar{c}_n}{\sqrt{\pi}\,(\beta/2)^m\Gamma(m+1)}\, I_{2m}(\beta)u(\tau) \qquad \text{(A-15)}$$

where a, b and β simplify to the following form;

$$a = \frac{4c\delta\tau}{\gamma h}\cos\xi$$

$$b = \frac{4\sin 2\xi \sin\alpha}{\gamma}\sqrt{\frac{c\tau}{h}}$$

$$\beta = \frac{4}{\gamma}\left[\sin 2\xi \cos\alpha + 2\delta \cos\xi \tan \xi_p\right]\sqrt{\frac{c\tau}{h}} \quad ,$$

and

$$\psi_o = \tan^{-1}\left(\sqrt{c\tau/h}\right) \quad ,$$

and $u(\tau)$ is the unit step, i.e.

$$u(\tau) = \begin{cases} 0 & \tau < 0 \\ 1 & \tau > 0 \end{cases}$$

Since the terms in the series in equation (A-15) do not change sign, it is possible to estimate the range of validity of the approximate expression by comparing the first and last terms of the series. When $\alpha = 0$, $b = 0$ and it can be shown that the ratio of the last to first term in the series is given by

$$\left(\frac{1}{1+8}\right)^5 \cdot \frac{I_{10}(\beta)}{I_0(\beta)} \quad .$$

For $\alpha = \pi/2$, no such simple expression is possible, and a parameter variation must be accomplished. For the ratio of the last to first term in the series less than or equal to 0.02 and over the reasonable range of interest on τ, the upper bounds on ξ are given in Table A1. The values of ξ in table A1 represent very conservative estimates of the range of validity of (A-15) and are presented here merely as guidelines.

TABLE A1

Conservative Bounds on the Range of Validity of Equation (A-15)

	$\gamma = 7\text{x}10^{-4}$ $\delta = 0.75$ (SL-2 & 3)	$\gamma = 7\text{x}10^{-4}$ $\delta = 0.18$ (SL-4)
$\alpha = 0$	$\xi \leq 1.6°$	$\xi \leq 1.5°$
$\alpha = \pi/2$	$\leq 1.35°$	$\xi \leq 1.6°$

Finally, in regard to equation (A-15), we note that as $\xi \to 0$, all terms in the series go to zero except the m=o term since for $m \neq o$

$$\lim_{\beta \to o} \frac{I_{2m}(\beta)}{\beta^m} = \frac{1}{2^{2m}\,\Gamma(2m+1)} \quad \beta^m = 0 \qquad .$$

When the angle ξ exceeds about a beamwidth*, the five term series in (A-15) is no longer valid. However, for this condition ($\xi >$ beamwidth) an alternate approach may be used. When ξ is large relative to a beamwidth, the flat surface impulse response spreads out in time. Thus, since the time expanse of $P_{CDS}(\tau)$ is small, the integral in equation (2-6) of Section 2.1 reduces to

$$\overline{P}_r(\tau) \approx \hat{P}_{CDS}\left(\frac{L_{ac}L_{CAL}}{L_{ab}L_{bc}}\right) P_{\hat{I}}(\tau) \int_0^\infty P_{CDS}(\hat{\tau})\,d\hat{\tau} \quad , \qquad \text{(A-16)}$$

for τ sufficiently greater than zero. For $\xi >$ beamwidth, we are primarily interested in the peak of $\overline{P}_r(\tau)$ since this is the quantity that enters our computation of $\sigma^\circ(\psi_o)$. However, from (A-16), we see that the peak of $\overline{P}_r(\tau)$ is directly determined by the peak of the flat surface impulse response. Thus, for $\xi >$ beamwidth, we need only to determine the peak of the flat surface impulse response.

For the Skylab data, where ξ exceeded a beamwidth and the data could be reduced**, the situation was generally represented by a pointing angle offset in the pitch or along-track direction. Thus, for all practical purposes $\alpha \approx 0$. Under this condition, the normalized antenna gain squared reduces to the following;

$$g^2(\theta,\omega) \approx e^{\tilde{a} + \tilde{b}\cos\phi + \tilde{c}\sin^2\phi} \qquad \text{(A-17)}$$

where

---

*For the purposes of this discussion, the term beamwidth may be taken to mean the smallest principal plane beamwidth for a nonsymmetrical antenna pattern.

**The data could only be reduced when the pointing angles could either be obtained from the waveform data or could be determined from the pitch and roll gimbals such as in Mode II.

$$\tilde{a} = \frac{4(1+\delta)}{\gamma}\left[-1 + \frac{\cos^2\xi}{(1+\varepsilon^2)} + \frac{\varepsilon^2\sin^2\xi}{(1+\varepsilon^2)}\right]$$

$$\tilde{b} = \frac{4(1+\delta)}{\gamma}\left[\frac{\varepsilon\sin 2\xi}{(1+\varepsilon^2)}\right]$$

$$\tilde{c} = \frac{2\delta\varepsilon^2}{\gamma\sqrt{1+\varepsilon^2}}\left[\cos\xi + \frac{\cos^2\xi}{\sqrt{1+\varepsilon^2}}\right] - \frac{4(1+\delta)}{\gamma}\;\frac{\varepsilon^2}{(1+\varepsilon^2)}\sin^2\xi \qquad .$$

As ξ becomes large relative to a beamwidth, the coefficient $\tilde{b}$ becomes large due to its dependence upon $\sin 2\xi$ and the exponent peaks about $\phi = 0$. Thus, we can apply the techniques of asymptotic approximation [A4], i.e.

$$\lim_{x\to\infty} \int_{\phi_1}^{\phi_2} f(\phi)\, e^{xq(\phi)}\, d\phi = f(\phi_o)\sqrt{\frac{-2\pi}{q''(\phi_o)}} \quad , \qquad \text{(A-18)}$$

where ϕ_o is the point at which $q(\phi)$ is maximum and ϕ_o is contained in (ϕ_1,ϕ_2). With

$$q(\phi) = \tilde{b}\cos\phi + \tilde{c}\sin^2\phi \quad ,$$

we have

$$q'(\phi) = -\tilde{b}\sin\phi + 2\tilde{c}\sin\phi\cos\phi$$

which is zero when $\phi = 0$. Provided $\tilde{b}/2\tilde{c} > 1$, this is the point at which $q(\phi)$ is maximum. Thus,

$$\int_{o}^{2\pi} g^2(\theta,\omega)\, d\phi \simeq e^{\tilde{a}+\tilde{b}}\sqrt{\frac{2\pi}{\tilde{b}-2\tilde{c}}} \qquad \text{(A-19)}$$

Substituting (A-19) in (A-1), performing the ρ-integration, and noting that the time τ_p at which the peak in $P_i(\tau,\xi)$ occurs is given by

$$\tan\xi = \sqrt{c\tau_p/h} \quad ,$$

we find that the peak of the flat surface impulse response is given by the following;

$$\hat{P}_i(\tau_p) = \frac{G_o^2 \lambda^2 c\sigma^\circ(\psi_o)}{2\sqrt{2}\,(4\pi)^3 h^3 L_p} \; \frac{\sqrt{\pi\gamma}}{\sin\xi\left[2(1+\delta) - \delta(1+\sec\xi) + 2(1+\delta)\tan^2\xi\right]^{1/2}} \quad \text{(A-20)}$$

where $\psi_o = \xi$. The range of validity of (A-20) may be conservatively estimated from the requirement that $\tilde{b}(\tau_p) \geq 10$. Since $\varepsilon \approx \sqrt{c\tau_p/h}$, we find that

$$\sin^2\xi \geq \frac{10\gamma}{8(1+\delta)} \quad . \qquad \text{(A-21)}$$

For the SL-2 and SL-3 missions $\delta = 0.75$ and the range of validity for (A-20) is $\xi \geq 1.3°$. For SL-4, $\delta = 0.18$ and we must satisfy $\xi \geq 1.56°$.

The purpose of this Appendix has been to develop appropriate expressions for the flat surface impulse response for the case of a nonsymmetric antenna pattern. Subject to the restrictions given in Table A-1, equation (A-15) is an accurate numerical approximation for the flat surface impulse response as a function of two-way delay time and pointing angle. For pointing angles larger than the bounds given in Table A-1, it is only necessary that we know the behavior of the peak of the flat surface impulse response. Equation (A-20) provides the desired expression subject to the condition given in (A-21).

REFERENCES

A1. Evans, J. and T. Hagfors, Radar Astronomy, McGraw-Hill Company, New York, Chapter 1, 1964.

A2. Moore, R. K. & C. S. Williams, Jr., "Radar Terrain Return at Near-Vertical Incidence," Proc. of IRE, Vol. 45, pp. 228-238, February, 1957.

A3. Miller, L. S., G. S. Brown & G. S. Hayne, "Engineering Studies Related To Geodetic and Oceanographic Remote Sensing Using Short Pulse Techniques," NASA-CR-137466, pp. 2-33 to 2-52, 1973.

A4. Evgrafov, M. A., Asymptotic Estimates and Entire Functions, Gordon and Breach, New York, pp. 20-23, 1961.

APPENDIX B. JSC MEASURED ANTENNA PATTERNS FOR MISSIONS SL-2 AND SL-3

During the course of establishing his data processing for the S-193 Radiometer, Dr. J. P. Hollinger of the Naval Research Laboratory determined that the S-193 antenna patterns as measured by the General Electric Company were in error. In order to provide a measure of the true S-193 antenna patterns, the protoflight unit antenna was reworked to closely approximate the flight unit antenna. Patterns were measured on this reworked antenna at JSC by NASA and contractor personnel. Reference B1 provides a detailed description of the measurement techniques.

The geometry of the measurement set-up referenced to the spacecraft coordinate system is shown in Figure B1. For no yaw, i.e. no rotation of the antenna about the z axis, the $\omega = 0, \pi$ pattern cut corresponds to the antenna pattern in along-track direction (roll angle $= 0°$, pitch angle variable). For $\omega = \pi/2$, $3\pi/2$ the measurement corresponds to the antenna pattern in the cross-track direction (pitch angle $= 0°$, roll angle variable).

The measured characteristics of the mainbeam are shown in Figures B2 through B6 at increments of 22.5° in ω. The data presented in these figures has been shifted in θ to eliminate boresight alignment errors. Also, the patterns are only shown out to about the -10 dB point since this is the portion of the mainbeam that is important to the altimeter. In terms of the S-193 polarization nomenclature, the patterns correspond to vertical transmit and vertical receive. The patterns are only shown from $\omega = 0$ to $\omega = \pi/2$ since there was, essentially, mirror image symmetry about the $x = 0$ axis.

Of particular significance in the data is the nonsymmetrical behavior of the patterns as a function of ω. In order to avoid some rather tedious two dimensional integrations using tabular data, a functional form was sought to fit the data in Figures B2 through B6. The logic of the choice for a functional fit is given in the following. One means of achieving an asymmetrical antenna pattern is to use different effective aperture lengths in the $x = 0$ and $y = 0$ planes. A radiating aperture which produces this effect is the rectangular uniformly illuminated aperture. The power pattern for such an aperture [B2] is proportional to $g(\theta,\omega)$ where

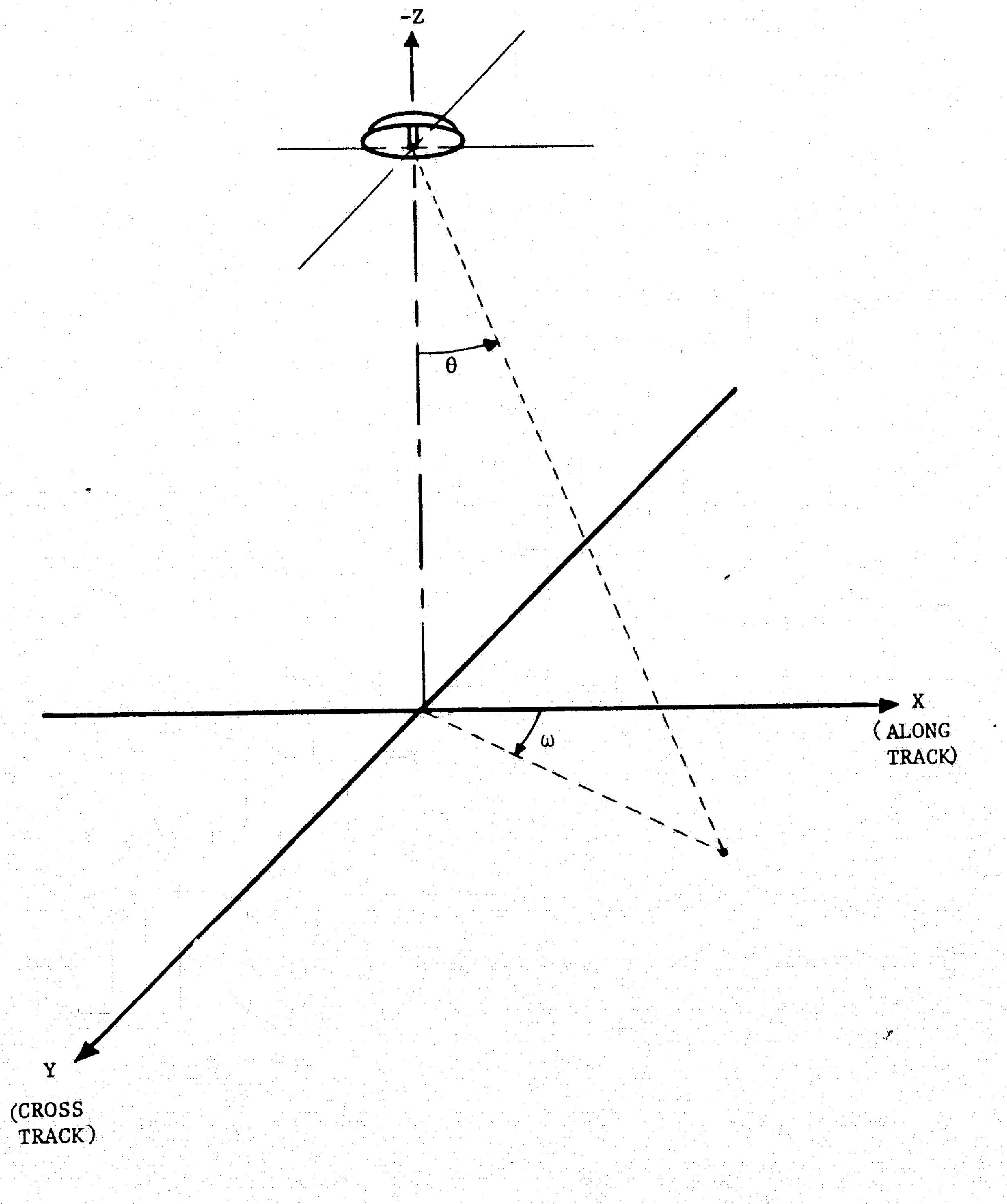


Figure B1. Coordinate system for the antenna pattern measurements, referenced to the spacecraft (θ = Polar Angle, ω = Azimuthal Angle)

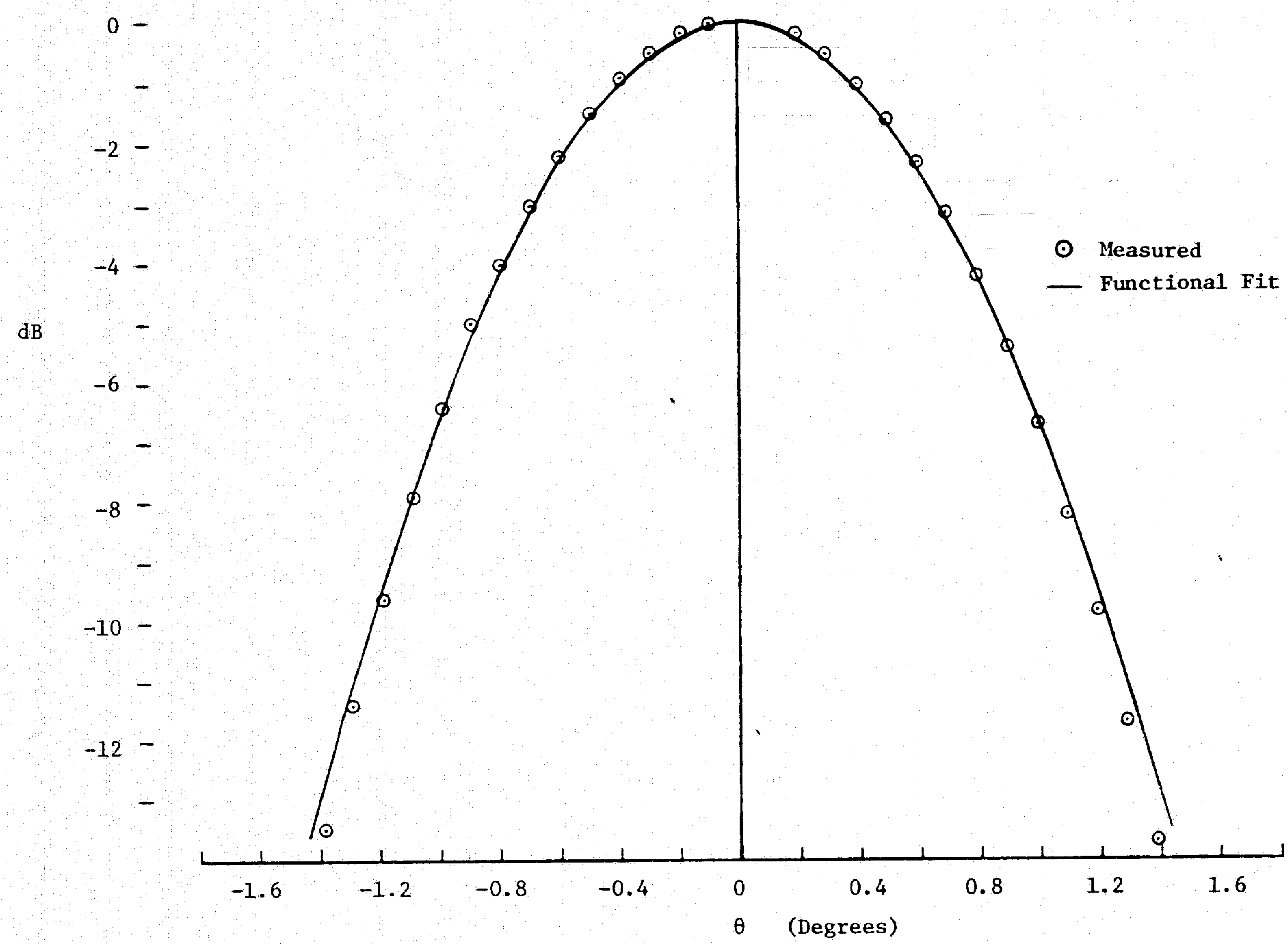


Figure B2. Measured and fitted antenna pattern for $\omega = 0°$ ($\gamma = 7 \times 10^{-4}$, $\delta = 0.75$)

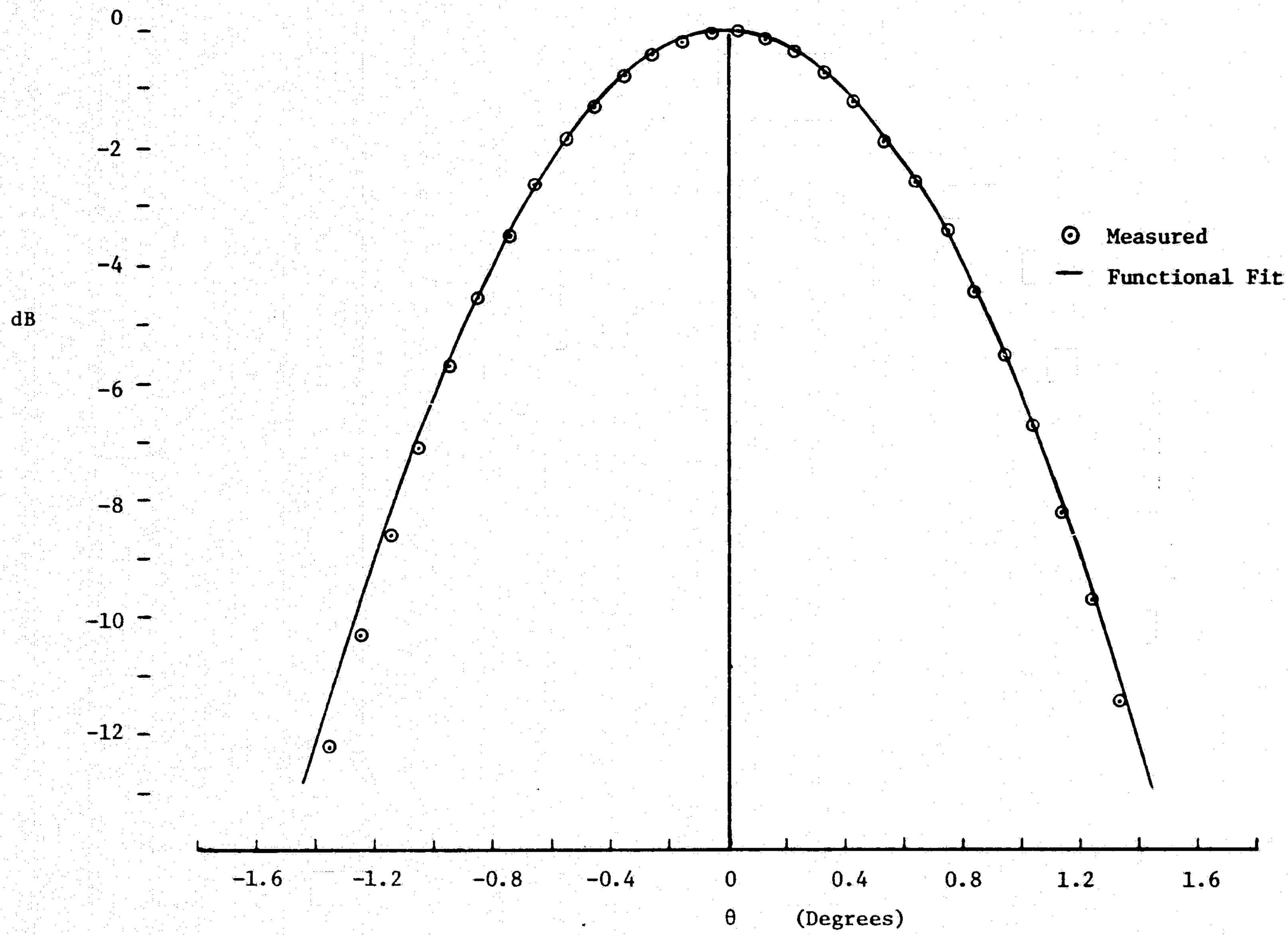


Figure B3. Measured and fitted antenna pattern for $\omega = 22.5°$ ($\gamma = 7\text{x}10^{-4}$, $\delta = 0.75$)

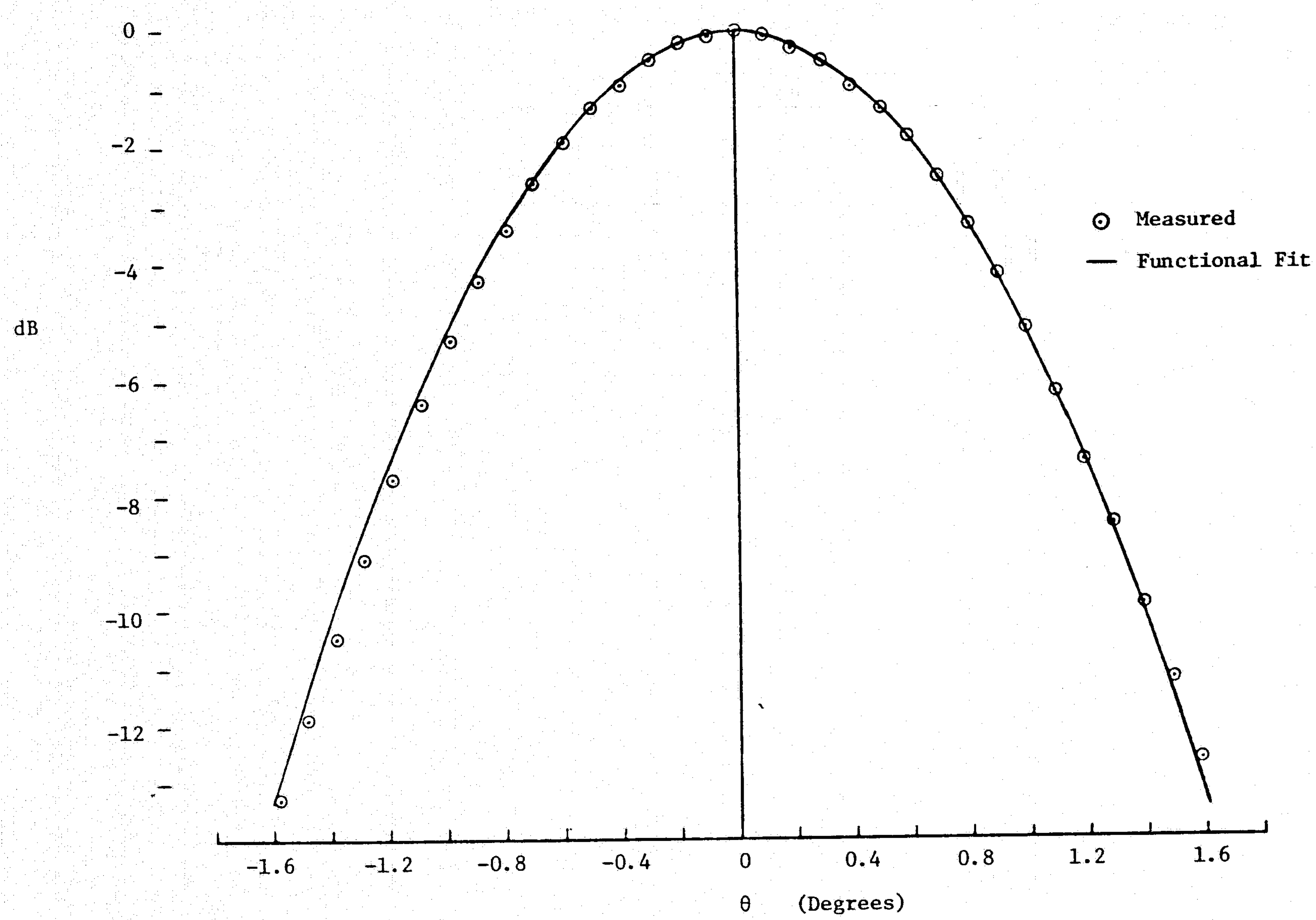


Figure B4. Measured and fitted antenna pattern for
$\omega = 45°$ ($\gamma = 7x10^{-4}$, $\delta = 0.75$)

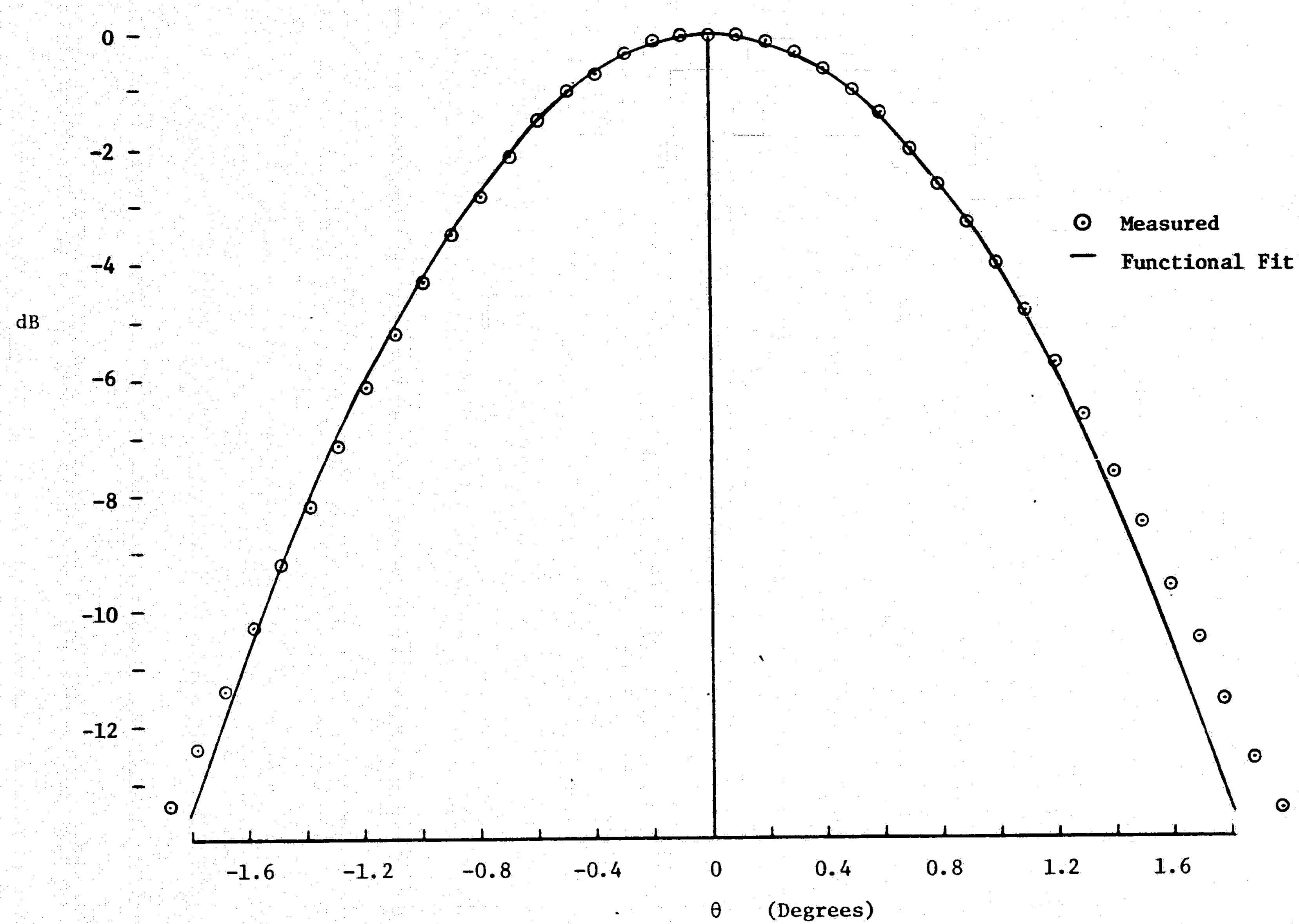


Figure B5. Measured and fitted antenna pattern for $\omega = 67.5°$ ($\gamma = 7 \times 10^{-4}$, $\delta = 0.75$)

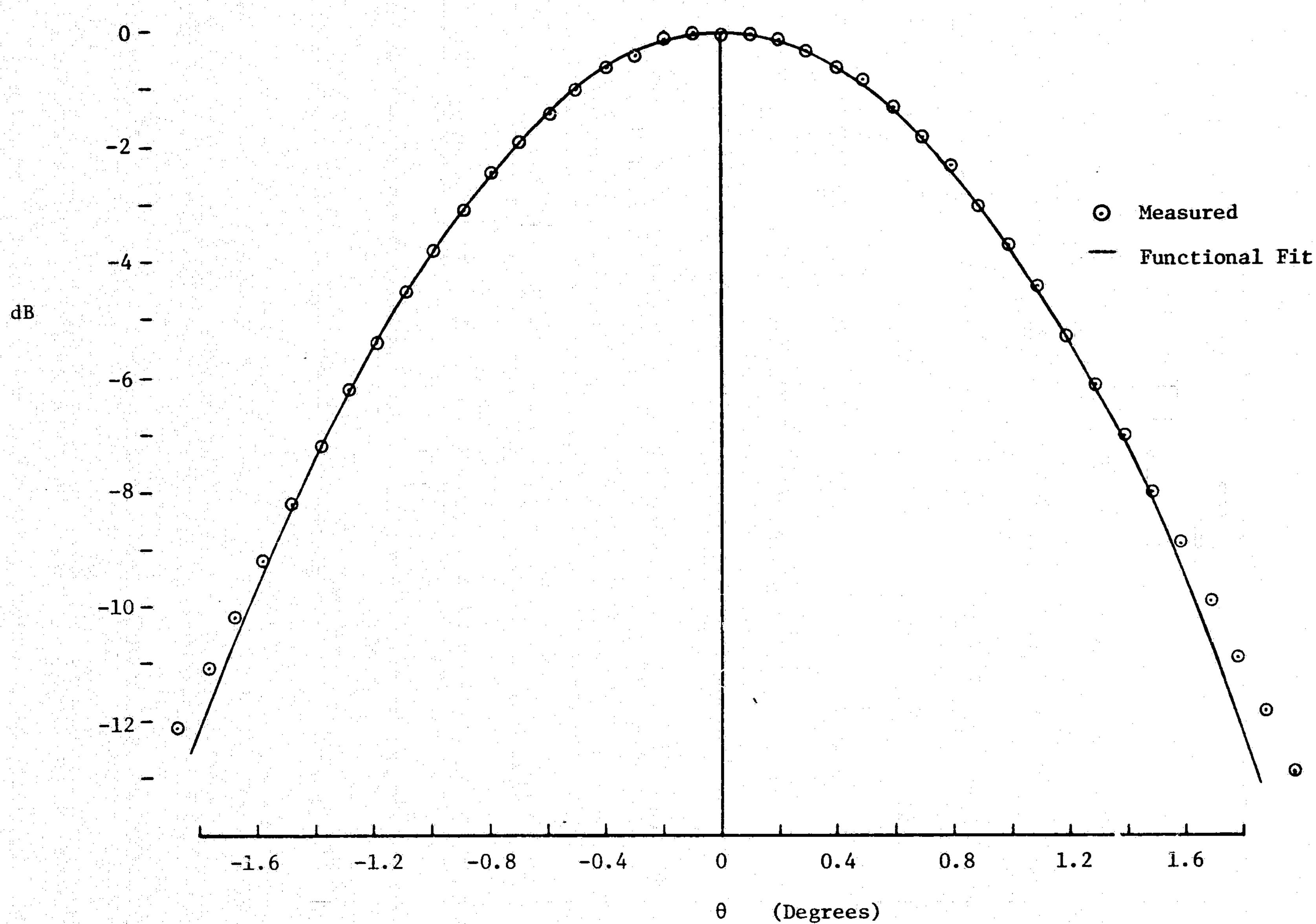


Figure B6. Measured and fitted antenna pattern for $\omega = 90°$ ($\gamma = 7\times10^{-4}$, $\delta = 0.75$)

$$g(\theta,\omega) = \frac{\sin^2(b \sin\theta \cos\omega)}{(b \sin\theta \cos\omega)^2} \cdot \frac{\sin^2(c \sin\theta \sin\omega)}{(c \sin\theta \sin\omega)} \quad .$$

In the mainbeam region of the pattern, a good approximation to the above expression is a Gaussian, i.e.

$$g(\theta,\omega) \approx e^{- b^2 \sin^2\theta \cos^2\omega - c^2 \sin^2\theta \sin^2\omega} \tag{B-1}$$

Equation (B-1) may be simplified to the following form

$$g(\theta,\omega) = e^{- c^2 \left[1 + \frac{\left[b^2 - c^2\right]}{c^2} \cos^2\omega\right] \sin^2\theta} \tag{B-2}$$

Thus, based upon the development given above, the following functional form was selected to fit the measured antenna pattern;

$$g(\theta,\omega) = e^{- \frac{2}{\gamma} (1 + \delta \cos^2\omega) \sin^2\theta} \tag{B-3}$$

We note from equation (B-3) that the parameter δ is a direct measure of the asymmetry in the pattern. That is, the larger δ the larger the asymmetry in the pattern. As shown in Figures B2 through B6, an excellent fit to the data is provided by equation (B-3) with $\delta = 0.75$ and $\gamma = 7 \times 10^{-4}$.

The antenna measurements on the modified protoflight antenna indicated that the boresight gain originally measured by the General Electric Company was valid. Thus, for the SL-2 and SL-3 missions, the boresight antenna gain was taken to be 41.3 dB.

REFERENCES

B1. Lindberg, A. C., "Skylab S-193 Radiometer/Scatterometer/Altimeter Sensor Antenna Testing Results," Lockheed Electronics Company, Inc., Houston, Texas, Job Order No. 16-604, NASA Contract NAS9-12200, September, 1974.

B2. Silver, S. (Editor), Microwave Antenna Theory and Design, Dover Publications, New York, page 180, 1965.

APPENDIX C. JSC MEASURED ANTENNA PATTERNS FOR MISSION SL-4

Toward the end of the SL-3 mission there was a malfunction in the servo system used to position the S-193 antenna and the antenna moved in pitch and roll to an angle of about 50 degrees with respect to nadir. Since it was not possible to reposition the antenna from inside the spacecraft, the astronauts (at the start of SL-4) exited the spacecraft and proceeded to pin the antenna to a nadir-pointing position. Some time after this instance, it was determined that the gain of the S-193 antenna had decreased significantly. Analysis of photos of the S-193 antenna indicated that the splash plate on the feed for the reflector had been broken off. This change in the reflector feed resulted in a change in the gain and patterns of the antenna during the entire SL-4 mission.

During testing of the protoflight unit antenna at JSC, a similar breakage of the feed occurred [C1]. Although, it could not be exactly established that the damage to the protoflight antenna was the same as that experienced by the flight antenna, there was strong evidence that the two breaks were very similar. Measurements were made on the protoflight antenna with the damaged feed at JSC. In view of the fact that these measurements represented the only quantitative data which approximated the SL-4 situation, we have used these data for interpreting the SL-4 data.

Measured mainbeam patterns for the damaged protoflight antenna are shown in Figures C1 through C5. In the S-193 nomenclature, these patterns were taken with vertical transmit and receive polarization. The form of the functional fit is the same as was used for the SL-2 and 3 patterns, i.e.

$$g(\theta,\omega) = e^{-\frac{2}{\gamma}(1 + \delta \cos^2\omega) \sin^2\theta}$$

with $\gamma = 7x10^{-4}$ but $\delta = 0.18$. Rather surprisingly, we note that the shape of the mainbeam is not appreciably different from the SL-2 and SL-3 patterns except near the -10 dB level. In fact, the asymmetry in the mainbeam is actually less for the damaged feed patterns.

Gain measurements on the damaged protoflight antenna [C1] yielded a boresight gain of about 28 dB which would result in a one-way loss in gain of 13.3 dB, relative to the SL-2 & 3 antenna gain. An attempt was made in

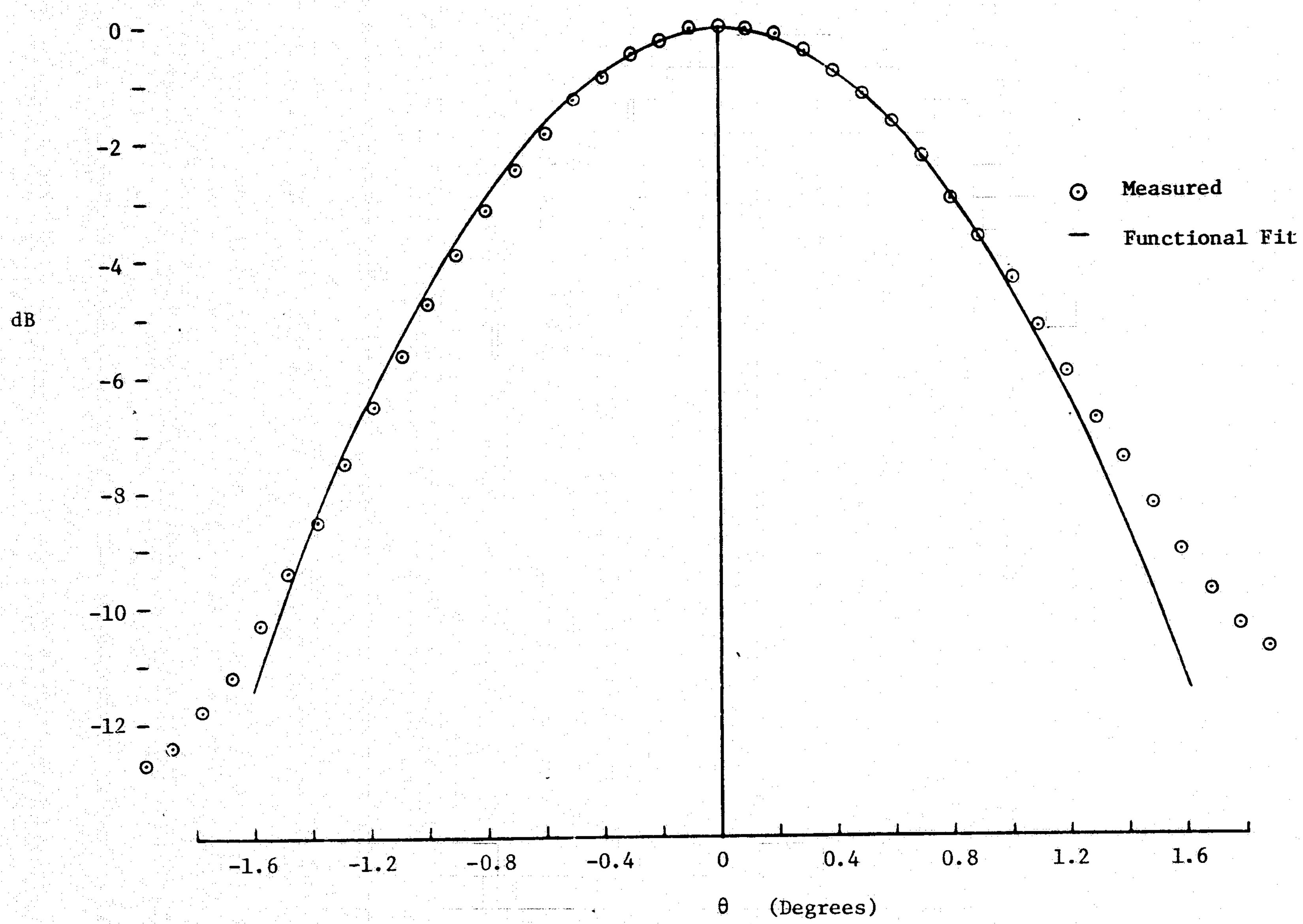


Figure C1. Measured and fitted antenna pattern for $\omega = 0°$ ($\gamma = 7x10^{-4}$, $\delta = 0.18$)

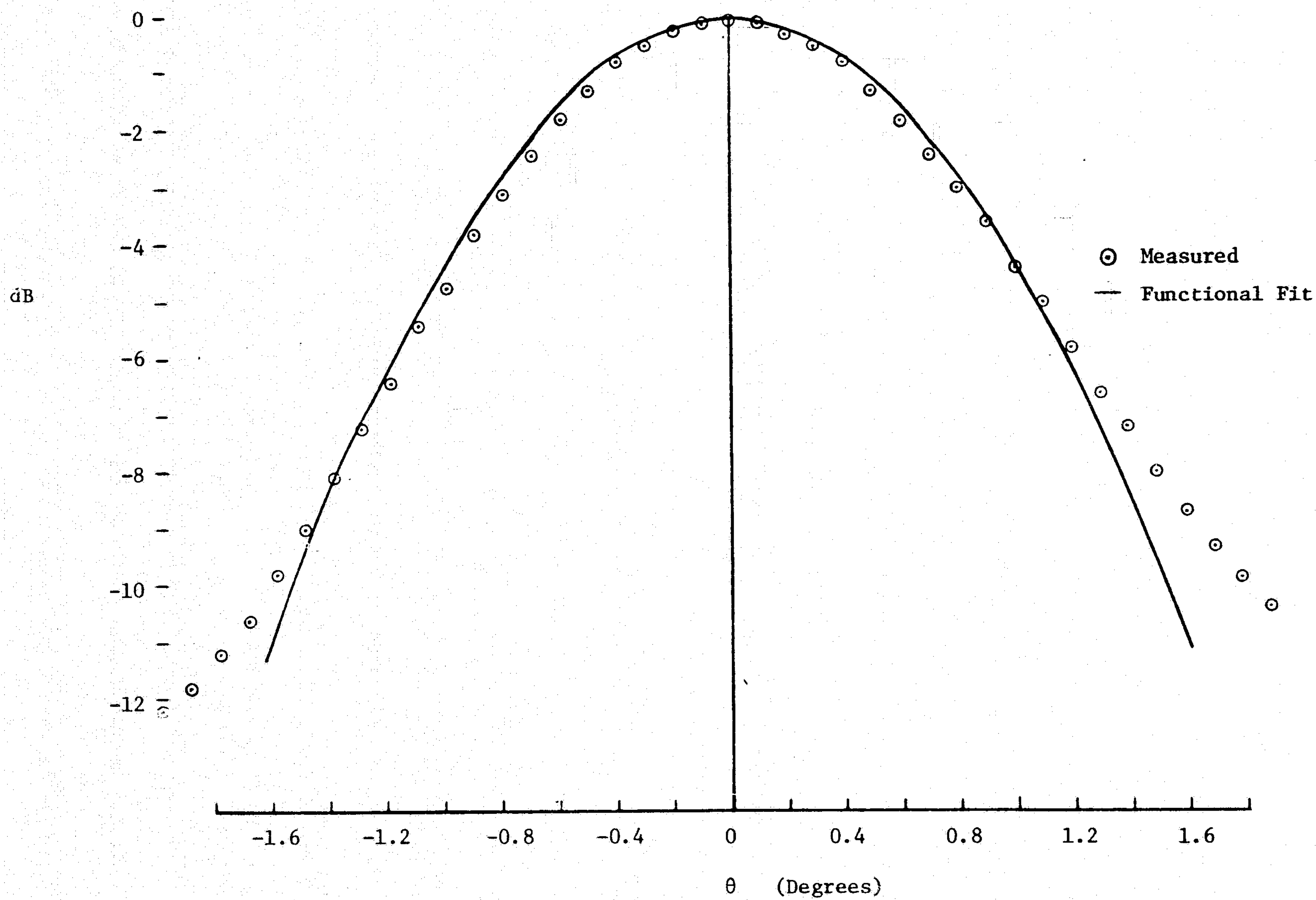


Figure C2. Measured and fitted antenna pattern for $\omega = 22.5°$ ($\gamma = 7 \times 10^{-4}$, δ = 0.1[illegible])

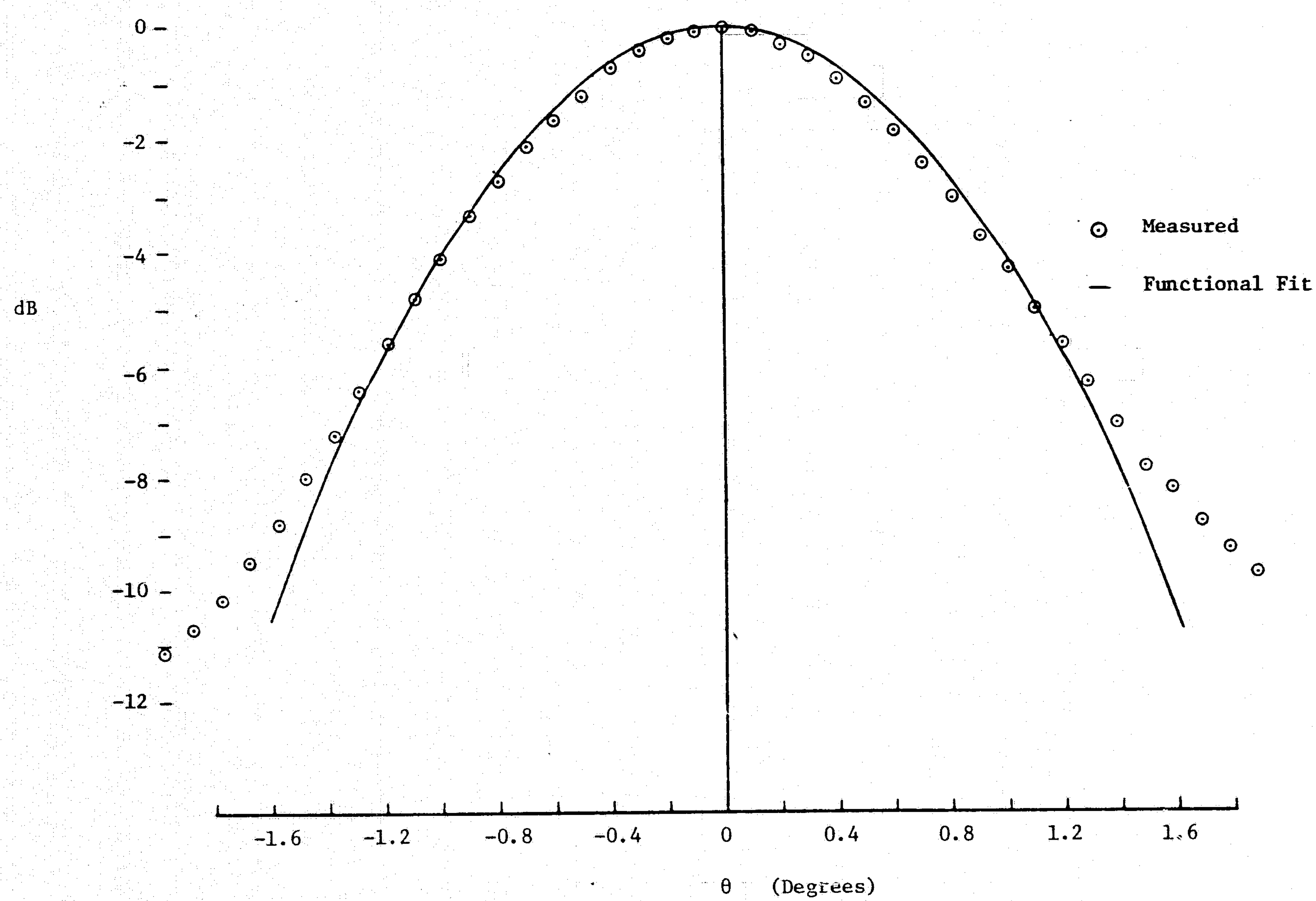


Figure C3. Measured and fitted antenna pattern for $\omega = 45°$ ($\gamma = 7 \times 10^{-4}$, $\delta = 0.18$)

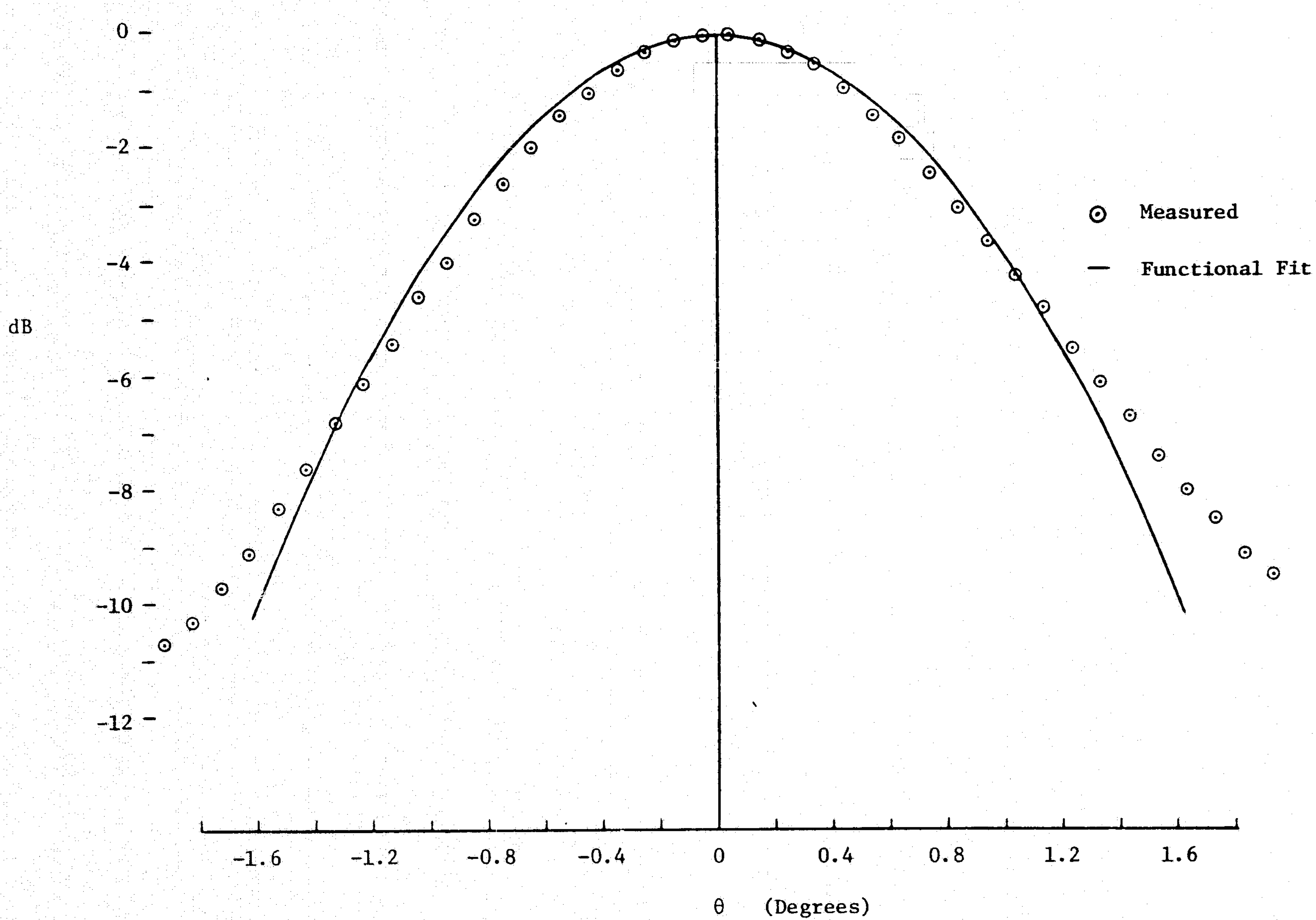


Figure C4. Measured and fitted antenna pattern for $\omega = 67.5°(\gamma = 7 \times 10^{-4}, \delta = 0.18)$

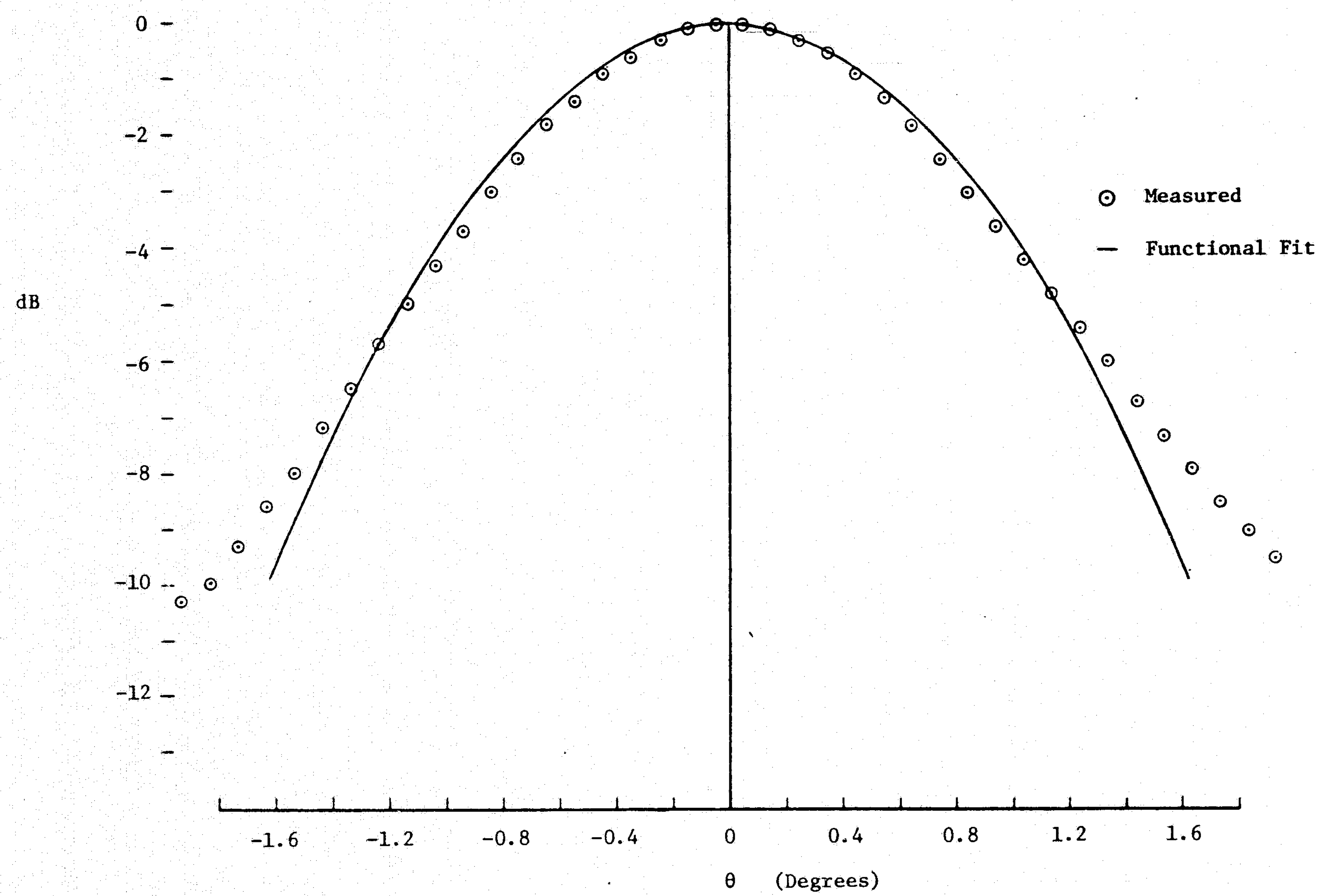


Figure C5. Measured and fitted antenna pattern for $\omega = 90°$ ($\gamma = 7x10^{-4}$, $\delta = 0.18$)

this study to verify the gain loss of 13.3 dB. A number of altimeter passes were made in the vicinity of the Puerto Rican Trench during all three missions. Under similar surface conditions, SL-2 and SL-3 reduced data yielded a value for σ° at a one-half degree angle of incidence equal to about 12.1 dB. For nearly similar surface conditions and angle of incidence during SL-4, it was found that a one-way gain loss of 12.6 dB would result in $\sigma^\circ = 12.1$ dB. Thus, we concluded that the measurements of the damaged protoflight antenna made at JSC accurately reflect the behavior of the damaged (SL-4) S-193 flight unit antenna.

REFERENCES

C1. Lindberg, A. C., "Skylab S-193 Radiometer/Scatterometer/Altimeter Sensor Antenna Testing Results," Lockheed Electronics Company, Inc., Houston, Texas, Job Order No. 16-604, NASA Contract No. NAS9-12200, September, 1974.

APPENDIX D. A SUMMARY OF WAVEFORM DETERMINED ANTENNA POINTING ANGLES

For the S-193 long pulse mode, the average return power as a function of delay time is determined by the convolution of the flat surface impulse response with the system point target response. A typical return for the 100 ns/10 MHz altimeter configuration is shown in Figure D1. There are two distinct regions or time zones in the return which may be identified. The first of these is the so-called rise time region. When the altimeter antenna is pointed off the subnadir point by an angle which is less than about half an antenna beamwidth, the rise time region of the return is determined primarily by the integral of the system point target response. The trailing edge region of the return is, however, determined by the antenna pattern and the pointing angle. For the S-193 altimeter, the trailing edge of the return is, in fact, a very sensitive function of the pointing angle. That is, as the pointing angle increases, the "droop" rate of the average return <u>decreases</u> such as shown in Figure D1 ($\xi_1 > \xi_o$). Since one of the measurements accomplished by the S-193 altimeter is the shape of the normalized average return power, there exists the possibility of estimating the pointing angle of the antenna from these waveform measurements.

If the antenna pattern were perfectly symmetrical in the azimuthal angular coordinate, an estimate of pointing angle would mean that the point of intersection of the boresight axis of the antenna with the mean flat surface is constrained to a <u>circle</u> centered on the subnadir point. However, when the antenna pattern is not symmetrical, the circle becomes an <u>ellipse</u>. This is due to the fact that the effective illuminated area on the surface is a function of whether the antenna is pointed in the direction of the narrow beamwidth or the wide beamwidth. That is, for an offset in the narrowbeam direction, there would be a distinct elongation of the illuminated area whereas an offset in the broadbeam direction would produce little change in the nadir illuminated area. Thus, for a nonsymmetrical antenna pattern, we can use the waveform data to estimate an ellipse of pointing uncertainty.

The geometry of the altimeter relative to the spacecraft coordinate system is shown in Figure D2. For an angular error ξ_p in pitch and ξ_r in roll, the total pointing angle error with respect to nadir is given by

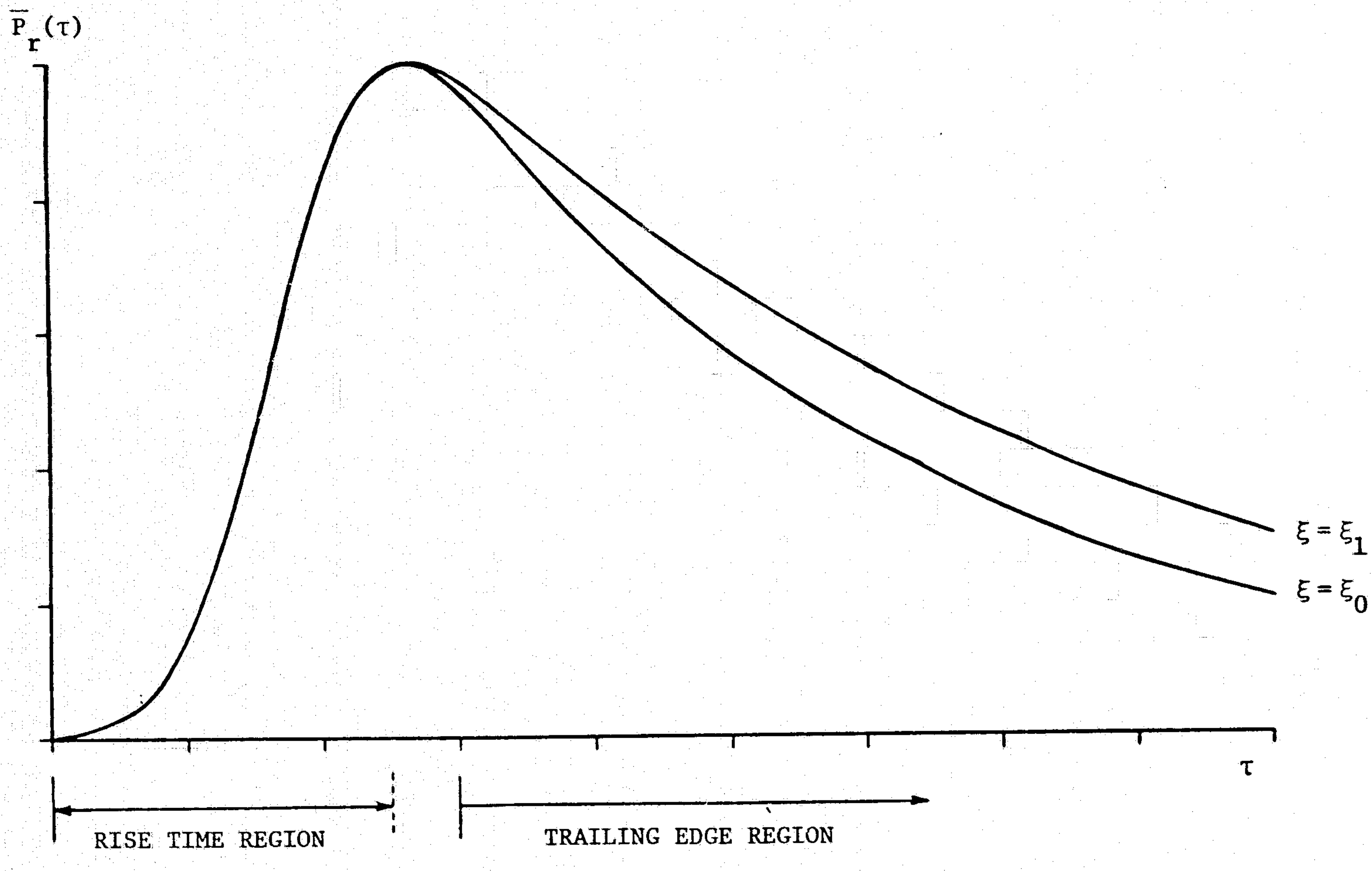
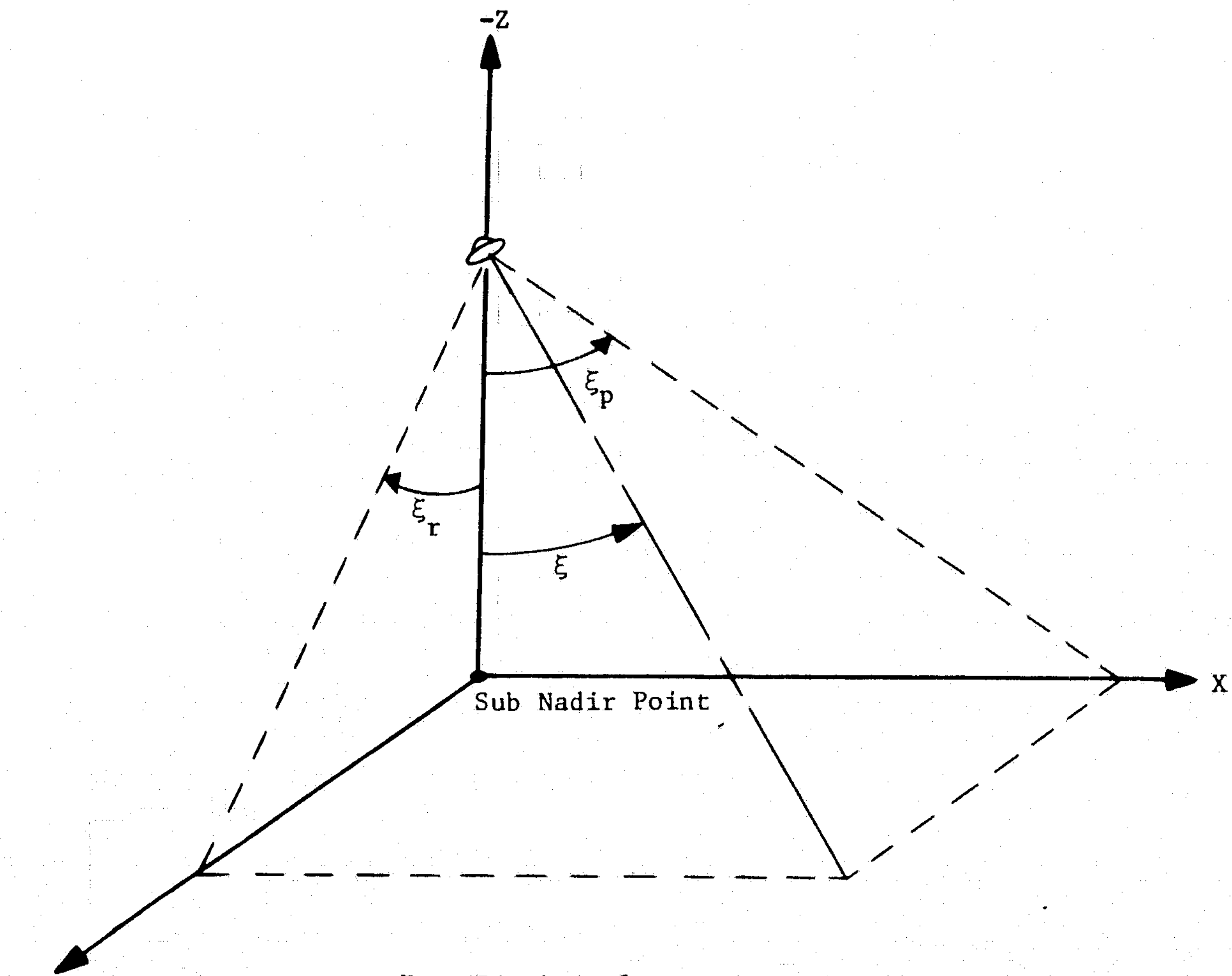


Figure D1. Typical shape of the average return power as a function of delay time for the S-193 100 ns/10 MHz configuration



ξ_p = Pitch Angle

ξ_r = Roll Angle

$$\tan^2\xi = \tan^2\xi_p + \tan^2\xi_r$$

Figure D2. Pointing geometry of the S-193 altimeter relative to the spacecraft coordinate system. Note that for no yaw, the X-axis corresponds to the along track direction while the Y-axis corresponds to the cross track direction.

$$\tan^2\xi = \tan^2\xi_p + \tan^2\xi_r \quad .$$

When there is no rotation of the antenna about the z axis, i. e. no yaw, the x axis corresponds to the along-track direction while the y axis corresponds to the cross-track direction.

The procedure for determining the ellipse of uncertainty is described as follows. The pointing error in the roll coordinate is first assumed to be zero ($\xi_r = 0$). The average return power is computed as a function of the pointing angle error in pitch direction (ξ_p) using the flat surface impulse derived in Appendix A. By curve fitting these results with the measured waveform data, we determine the "best fit" value of pointing error in the pitch coordinate, i.e. $\pm\xi_{po}$. By setting $\xi_p = 0$ and determining the "best-fit" roll coordinate ($\pm\xi_{ro}$), we generate four points of the ellipse, i.e. ($\pm\xi_{po}$, 0°) and (0°, $\pm\xi_{ro}$). Thus, any point (ξ_p,ξ_r) on the ellipse defined by

$$\frac{\xi_p^2}{\xi_{ro}^2} + \frac{\xi_r^2}{\xi_{po}^2} = 1 \qquad \text{(D-1)}$$

is a valid estimate of the true pointing error to within the statistical error inherent in the "curve-fitting" process. Without other <u>a priori</u> information, it is not possible to further reduce the ellipse of uncertainty.

Since the asymmetry in the S-193 antenna patterns was not great, the difference between ξ_{po} and ξ_{ro} was not large. However, the peak of the average return power for a pointing error in the (ξ_p,0°) direction may be significantly different from the peak of the average return power for a pointing error in the (0°,ξ_r) direction. That is, the peak of the average return power is dependent upon the <u>direction</u> of the pointing error because of the asymmetry in the S-193 antenna pattern. The angle estimation process outlined above only determines the extremes of the pointing direction, i.e. (ξ_p,0°) and (0°,ξ_p). Fortunately, however, these directional extremes also correspond to the maximum and minimum value of the peak of the mean return power on the ellipse of uncertainty. Thus, given an estimate of (ξ_p,0°) and (0°,ξ_r), we can determine the <u>maximum</u> variation in the peak of the mean return power due to pointing direction uncertainty. Since the peak of the mean return power directly affects our ability to extract $\sigma°$ from the AGC data, we can produce bounds on reduced measurements of $\sigma°$ due to pointing direction uncertainty.

Tables D1, D2 and D3 present pointing angle estimates as derived from the average return waveform recorded by the altimeter. Based upon an analysis of the estimation process, it was determined that the one-sigma error in pointing angle was on the order of 0.1° or less. Unless marked with an asterisk (*), all angle estimates are $(\pm\xi_p, 0°)$ and $(0°, \pm\xi_r)$ and the $\pm$ signs have not been explicitly shown in the Tables.

TABLE D1

Pointing Angle Estimates For Mission SL-2

EREP PASS NO.	MODE	SUB MODE	ESTIMATED POINTING ANGLES $(\xi_p, 0°)$	$(0°, \xi_r)$	COMMENTS
1	NAL				No Confirmation Of Gimbal Data
	I	0			Mixed Sea-Land Scatter
		1			Land Scatter
	II				Not Enough Waveform Data
2	I				Spacecraft Roll Rate Too Large
	II				Land Scatter
3	II				Land Scatter
4	I	0	(0°,0°)	(0°,0°)	
		1	(0.15°,0°)	(0°,0.2°)	
		2	(.53°,0°)*	---	Antenna Moved In + Pitch Direction
	V	0	(.2°,0°)	(0°,0.3°)	
6	II				Land Scatter
	NAL				No Pitch Gimbal Readout
	V	0	(0.5°,0°)	(0°,0.7°)	
		1			PC Network Malfunction
		2			
7	I				Angles Too Large to $\xi_p > 0.95°$
	V				Accurately Estimate $\xi_r > 1.2°$
	III				From Waveform Data
8	I				Land Scatter
	III	3	(0.35°,0°)	(0°,0.5°)	
9	II				Land Scatter
	V	0	(0.35°,0°)	(0°,0.5°)	
		1			PC Network Malfunction
		2			
	II	0	(0.2°, ±0.58°)*		Based On Waveform & AGC Data
		6	(0.65°,0°)	(0°,0.9°)	
	III	3	(0.7°,0°)	(0°,1.0°)	
	III	3	$\xi_p > 0.95°$	$\xi_r > 1.2°$	
10	II				Land Scatter
	II				Land Scatter
	II				Land Scatter
	I	0			Land Scatter
		1	(0.55°,0°)	(0°,0.75°)	
		2			Manual Termination Too Soon
	I	0			Land Scatter
		1			Land Scatter
		2			Land Scatter
	V	0			Land Scatter
		1			Land Scatter

C-4

TABLE D1 (Cont'd.)

EREP PASS NO.	MODE	SUB MODE	ESTIMATED POINTING ANGLES $(\xi_p, 0°)$	$(0°, \xi_r)$	COMMENTS
		2			Land Scatter
11	I				Land Scatter
	II				Land Scatter
	V				Land Scatter
	V	0	(0.7°,0°)	---	No Good Fit For ξ_p=0°
	III				Land Scatter
	V				Land Scatter

TABLE D2

Pointing Angle Estimates For Mission SL-3

EREP PASS NO.	MODE	SUB MODE	ESTIMATED POINTING ANGLES $(\xi_p,0°)$	$(0°,\xi_r)$	COMMENTS
12	NAL				Meaningless Pitch Gimbal Readout
	I				Land Scatter
	I	0			Land Scatter
		1	(0.6°,0°)	(0°,0.8°)	Gulf Of Mexico
		2	$\xi_p>0.95°$	$\xi_r>1.2°$	Gulf of Mexico
	I	0	(0.85°,0°)	---	No Good Fit For $\xi_p=0°$
		1			Land Scatter
		2			Land Scatter
	I				No Data On JSC Tape
14	I				Land Scatter
	I	0			Land Scatter
		1	(0.6°,0°)	(0°,0.85°)	
		2	(0.85°,0°)	(0°,1.2°)	
17	I	0			Land Scatter
		1	$\xi_p>0.95°$	$\xi_r>1.2°$	
		2	$\xi_p>0.95°$	$\xi_r>1.2°$	
	III	3	(0.9°,0°)	(0°,1.2°)	
	II	0	(-0.31°, ±0.91°)*		Based On AGC And Waveform Data
		6	(0.65°,0°)	(0°,0.9°)	
	V	0	(0.75°,0°)	(0°,0.95°)	
		2			TBD
18	I				Land Scatter
	V	0	(0.3°,0°)	(0°,0.4°)	
		2			TBD
19	I	0	(0.9°,0°)	(0°,1.2°)	
		1	(0.85°,0°)	(0°,1.1°)	
		2			Angle Too Large To Estimate
	V	0			Land Scatter
		2			
20	I	0			Partial Land Scatter
		1	(0.5°,0°)	(0°,0.7°)	
		2			Partial Land Scatter
21	V	0	(0°,0°)	(0°,0°)	
		1			PC Malfunction
		2			TBD
	V	0	(0.2°,0°)	(0°,0.3°)	
		1			PC Malfunction
		2			TBD
	V	0	(0.3°,0°)	(0°,0.45°)	
		1			PC Malfunction

TABLE D2 (Cont'd.)

EREP PASS NO.	MODE	SUB MODE	ESTIMATED POINTING ANGLES $(\xi_p,0°)$	$(0°,\xi_r)$	COMMENTS
		2			TBD
	II				Land Scatter
22	I	0	(0.35°,0°)	(0°,0.5°)	
		1			TBD
		2	(0.4°,0°)	(0°,0.6°)	
	I	0	(0.2°,0°)	(0°,0.3°)	
		1			TBD
		2	(0.35°,o°)	(0°,0.5°)	
	I	0	(0.15°,0°)	(0°,0.2°)	
		1			TBD
		2	(0.4°,0°)	(0°,0.6°)	
	I	0	(0.15°,0°)	(0°,0.2°)	
		1			TBD
		2	(0.5°,0°)	(0°,0.7°)	
	I	0	(0°,0°)	(0°,0°)	
		1			TBD
		2	(0.6°,0°)	---	No Good Fit For $\xi_p=0°$
	II	0			Land Scatter
		6			Anomolous Ocean Scatter (Med. Sea)
24	III	3	(0.15°,0°)	(0°,0.2°)	
	III	3	(0.2°,0°)	(0°,0.3°)	
	III	3	(0.4°,0°)	(0°,0.55°)	
25	V	0	(0°,0°)	(0°,0°)	
		1			PC Malfunction
		2			TBD
	V	0	(0,2°,0°)	(0°,0.3°)	
		1			PC Malfunction
		2			TBD
27	V	0	(0.4°,0°)	(0°,0.5°)	
		1			PC Malfunction
		2			TBD
	I				Land Scatter
	V	0	(0.2°,0°)	(0°.0.3°)	
		1			PC Malfunction
		2			TBD
	I				Land Scatter
29	NAL				Meaningless Pitch Gimbal Read Out
	NAL				Meaningless Pitch Gimbal Read Out
	I				Land Scatter

TABLE D2 (Cont'd.)

EREP PASS NO.	MODE	SUB MODE	ESTIMATED POINTING ANGLES $(\xi_p, 0°)$	$(0°, \xi_r)$	COMMENTS
30	NAL				No Data On JSC Tapes
	II				
31	II				No Data On JSC Tapes
32	V	0			Angle Too Large To Estimate
		1			PC Malfunction
		2			Too Large To Estimate
	V	0			Too Large To Estimate
		1			PC Malfunction
		2			Too Large To Estimate
	V				Land Scatter
34	I				Land Scatter
35	V	0			Too Large To Estimate
		1			PC Malfunction
		2			Too Large To Estimate
	V	0			No Waveform Date On JSC Tapes
		1			
		2			
	I	0			
		1			
		2			
36	V	0			Attitude Changing During DAS
		1			PC Malfunction
		2			TBD
	V	0			Incomplete Waveform Data
		1			PC Malfunction
		2			TBD
	V	0			Too Large To Estimate
		1			PC Malfunction
		2			TBD
	II	0			Too Large To Estimate
		6			Incomplete Waveform Data
	I	0			Mixed Ocean/Land Scatter
		1			Mixed Ocean/Land Scatter
		2			Too Large To Estiamte
	V	0			Too Large To Estimate
		1			PC Malfunction
		2			Too Large To Estimate
37	V	0			Too Large To Estimate
		1			PC Malfunction
		2			Too Large To Estimate

TABLE D2 (Cont'd.)

EREP PASS NO.	MODE	SUB MODE	ESTIMATED POINTING ANGLES $(\xi_p, 0°)$	$(0°, \xi_r)$	COMMENTS
	I	0			Too Large To Estimate
		1			Sea/Land Scatter Mixed
		2			Land Scatter
38	I				Land Scatter
	V	0			Sea/Land Scatter Mixed
		1			PC Malfunction
		2			Too Large To Estimate
	V	0			Too Large To Estimate
		1			PC Malfunction
		2			Too Large To Estimate
39	NAL				Incorrect Pitch Gimbal Readout
	I				Land Scatter
	V	0	(0.65°,0°)	(0°,0.9°)	
		1			PC Started To Work 1/2 Way Thru
		2			TBD
	V	0	(0.8°,0°)	(0°,1.1°)	
		1			TBD
		2			TBD
40	III				Too Large To Estimate
	I				Land Scatter
	I				Land Scatter
	V				Data Not On JSC Tapes
	NO	OTHER	WAVEFORM	DATA ON	JSC TAPES

TABLE D3

Pointing Angle Estimates For Mission SL-4

EREP PASS NO.	MODE	SUB MODE	ESTIMATED POINTING ANGLES $(\xi_p,0°)$	$(0°,\xi_r)$	COMMENTS
54	I	0			Incomplete Submode
	I	0			Incomplete Submode
	I	0	(0.4°,0°)	(0°,0.45°)	
	I	0	(0.3°,0°)	(0°,0.35°)	
55	I	0	(0.35°,0°)	(0°,0.4°)	
	I	0	(0.4°,0°)	(0°,0.45°)	
56	I				Not On JSC Tape
	V				Not On JSC Tape
57	III	3	(0.7°,0°)	(0°,0.75°)	
	I	0			Incomplete Submode
	I	0			Incomplete Submode
	V	0			Incomplete Submode
	V	0	(0.5°,0°)	(0°,0.55°)	
58	I	0			Not On JSC Tape
	II				
	I				
61	I	0			Incomplete Submode
	III	3	$\xi_p > 1.1°$	$\xi_r > 1.15°$	
	V	0	(0.9°,0°)	(0°,0.95°)	
62	I	0	(1.1°,0°)	(0°,1.15°)	
	V	0			Incomplete Submode
64	V	0	(0.7°,0°)	(0°,0.75°)	
	I	0	(0.7°,0°)	(0°,0.75°)	
	I	0	(0.6°,0°)	(0°,0.65°)	
65	V	0	(0.5°,0°)	(0°,0.55°)	
67	V	0	(0.5°,0°)	(0°,0.55°)	
	II	0	(0.6°,0°)	(0°,0.65°)	
	II	6	(0.6°,0°)	(0°,0.65°)	
68	I	0	(0.55°,0°)	(0°,0.6°)	
	V	0	(0.7°,0°)	(0°,0.75°)	
	V	0	(0.65°,0°)	(0°,0.7°)	Listed As Only One Mode V In NASA-WFC Altimetry Report
	V	0	(0.9°,0°)	(0°,0.95°)	
71	I	0	(0.6°,0°)	(0°,0.65°)	
	V	0	(0.4°,0°)	(0°,0.45°)	
	V	0	(0.4°,0°)	(0°,0.45°)	
	V	0	(0.3°,0°)	(0°,0.35°)	
	V	0	(0.3°,0°)	(0°,0.35°)	
74	III	3			Incomplete Submode
	V	0			Incomplete Submode
	V	0			Incomplete Submode

TABLE D3 (Cont'd.)

EREP PASS NO.	MODE	SUB MODE	ESTIMATED POINTING ANGLES $(\xi_p, 0°)$	$(0°, \xi_r)$	COMMENTS
	V	0	(0.5°,0°)	(0°,0.55°)	
	V	0	(0.65°,0°)	(0°,0.7°)	
	V	0	(0.85°,0°)	(0°,0.9°)	
76	I	0	(0.9°,0°)	(0°,0.95°)	
	V	0	(1.0°,0°)	(0°,1.05°)	
	V	0	(1.0°,0°)	(0°,1.05°)	
	V	0	(1.0°,0°)	(0°,1.05°)	
	V	0			Data Not On JSC Tape
	V	0			Data Not On JSC Tape
78	I	0	(0.3°,0°)	(0°,0.35°)	
	V	0	(0.5°,0°)	(0°,0.55°)	
	V	0	(0.55°,0°)	(0°,0.60°)	
79	III	3			Data Not On JSC Tape
	V	0	(0.4°,0°)	(0°,0.45°)	
	V	0	(0.3°,0°)	(0°,0.35°)	
	V	0	(0.4°,0°)	(0°,0.45°)	
	V	0	(0.4°,0°)	(0°,0.45°)	
81	III	3	(0.75°,0°)	(0°,0.8°)	
	I	0			Data Not On JSC Tape
82	III	3			Data Not On JSC Tape
	III	3			Data Not On JSC Tape
	V	0	(0.6°,0°)	(0°,0.65°)	
	V	0			Data Not On JSC Tape
	V	0			Data Not On JSC Tape
	V	0			Data Not On JSC Tape
	III	3			Data Not On JSC Tape
	III	3			Data Not On JSC Tape
83	V	0	(0.55°,0°)	(0°,0.6°)	
	V	0	(0.55°,0°)	(0°,0.6°)	
	V	0	(0.5°,0°)	(0°,0.55°)	
	V	0			Incomplete Submode On Tape
	V	0	(0.5°,0°)	(0°,0.55°)	
	I	0	(1.0°,0°)	(0°,1.05°)	Not In NASA-WFC Altimetry Report
85	I	0			Incomplete Submode On Tape
	I	0			Incomplete Submode On Tape
	V	0	(0.5°,0°)	(0°,0.55°)	
86	V	0	(0.55°,0°)	(0°,0.6°)	Not In NASA-WFC Altimetry Report
87	I	0	(0.7°,0°)	(0°,0.75°)	
88	V	0			Data Not On Tape
	V	0			Data Not On Tape

TABLE D3 (Cont'd.)

EREP PASS NO.	MODE	SUB MODE	ESTIMATES POINTING ANGLES $(\xi_p, 0°)$	$(0°, \xi_r°)$	COMMENTS
	V	0			Land Scatter
	V	0	(1.0°,0°)	(0°,1.05°)	
89	I	0			Data Not On JSC Tapes (Data Shows One Less Mode I Than In NASA-WFC Altimetry Report)
	I	0			
	I	0			
	I	0			
	I	0			
	I	0	(0.8°,0°)	(0°,0.85°)	
	V	0	(0.85°,0°)	(0°,0.90°)	
90	I	0			Data Not On JSC Tape
	I	0			
	III	3			
	V	0	(1.0°,0°)	(0°,1.05°)	
	V	0	(1.0°,0°)	(0°,1.05°)	
	V	0			Data Not On JSC Tape
	V	0			
	V	0			
91	III	3			Data Not On JSC Tape
	III	3			
	V	0	(1.1°,0°)	(0°,1.15°)	
	V	0	(1.0°,0°)	(0°,1.05°)	Not In NASA-WFC Altimetry Report
92	V	0			Data Not On JSC Tapes
	V	0			
	V	0			
	V	0			
	V	0			
	V	0			
	V	0			Incomplete Submode
	V	0			Data Not On JSC Tapes
	III	3			
	V	0			Incomplete Submode
93	V	0	(0.5°,0°)	(0°,0.55°)	These Modes Are Not Shown In
	V	0	(0.5°,0°)	(0°,0.55°)	The NASA-WFC Altimetry Report
94					Data Not On JSC Tapes
95					
96					
97	I	0	(0.5°,0°)	(0°,0.55°)	
	I	0	(0.4°,0°)	(0°,0.45°)	
	I	0	(0.45°,0°)	(0°,0.5°)	
	I	0	(0.35°,0°)	(0°,0.40°)	

TABLE D3 (Cont'd.)

EREP PASS NO.	MODE	SUB MODE	ESTIMATED POINTING ANGLES $(\xi_p, 0°)$	ESTIMATED POINTING ANGLES $(0°, \xi_r°)$	COMMENTS
	I	0	(0.35°,0°)	(0°,0.4°)	
	I	0	(0.4°,0°)	(0°,0.45°)	
	I	0	(0.45°,0°)	(0°,0.5°)	
	I	0	(0.35°,0°)	(0°,0.4°)	
	I	0	(0.4°,0°)	(0°,0.45°)	
	I	0	(0.4°,0°)	(0°,0.45°)	
	I	0	(0.45°,0°)	(0°,0.5°)	
	I	0	(0.45°,0°)	(0°,0.5°)	
	I	0	(0.55°,0°)	(0°,0.6°)	
	I	0	(0.5°,0°)	(0°,0.55°)	
	I	0	(0.5°,0°)	(0°,0.55°)	
	V	0	(0.55°,0°)	(0°,0.6°)	
	V	0	(0.55°,0°)	(0°,0.6°)	
	V	0	(0.55°,0°)	(0°,0.6°)	
	I	0			Incomplete Submode
	I	0			
	I	0			Data Not On JSC Tapes
	I	0			
	V	0			Incomplete Submode
	I	0	(0.65°,0°)	(0°,0.7°)	
	I	0			Data Not On Tape
	I	0	(0.65°,0°)	(0°,0.7°)	
	I	0	(0.65°,0°)	(0°,0.7°)	
98					Data Not On JSC Tape