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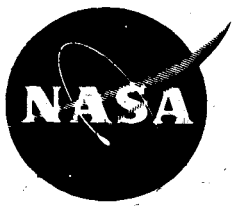
DECAMETER WAVELENGTH OBSERVATIONS OF JUPITER OCTOBER, 1966 - MARCH, 1967

J. K. ALEXANDER

OCTOBER 1967



GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

DECAMETER WAVELENGTH OBSERVATIONS OF JUPITER
OCTOBER, 1966 - MARCH, 1967

by

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ABSTRACT

Decametric observations of Jupiter obtained at Goddard Space Flight Center and Carnarvon, Australia, during the 1967 apparition are summarized and discussed. From analysis of 563 hours of observations at 16.7 MHz and 682 hours of observations at 22.2 MHz, the over-all probability of occurrence of activity was found to increase at 16.7 MHz but decrease at 22.2 MHz when compared to results from the previous apparition. There is evidence for a relative increase in the probability of occurrence of Io-controlled emission at both frequencies, however. Examination of the long term variation of the system III longitude and occurrence probability of the main emission region shows the data to be consistent with the hypothesis that there is a quasi-cylic variation in the occurrence probability statistics and apparent rotation rate although such an effect is still not fully understood. Analysis of the intensities of storms as a function of λ III suggests that activity from the Io-controlled B source is consistently more intense than activity from other regions. A catalogue of the observations is included in an appendix.

DECAMETER WAVELENGTH OBSERVATIONS OF JUPITER
OCTOBER, 1966 - MARCH, 1967

This report presents the results of observations of Jovian decametric radiation from October, 1966 to March, 1967, with the Goddard Jupiter Monitor Network - a program conducted jointly with the Department of Astronomy of the University of Texas. The observations were obtained at 16.7 and 22.2 MHz with a two-element, lobe-sweeping interferometer. Details of the instrumentation have been presented previously (Alexander, 1966). Most of the data to be discussed are from the Goddard (longitude 76° 50'W, latitude 39° 01'N) and Carnarvon (longitude 113° 43'E, latitude 24° 53'S) stations. Although some observations were obtained at the Clark Lake and Hawaii sites in early 1967, they did not produce a quantity of data sufficient to warrant detailed analysis.

Sample recordings of the Cassiopeia A radio source and of Jupiter are shown in Figure 1. The Cassiopeia record differs from the Jupiter records in that the "fringe amplitude" channels have been replaced by "sin phase" channels 90° out of phase with the "cos phase" channels at each frequency. By adding the second phase detector to the basic system to provide a sin phase output we can now digitize the two phase channels and readily compute the fringe amplitudes.

The observations available for analysis are summarized in Table 1.

Table 1

Frequency	Site	Period of Observations	Days of Observ.	Ave. hr/day	Occ. Prob.
16.7 MHz	GSFC	7.X.66-14.III.67	134	4.2	0.14
22.2 MHz	GSFC	7.X.66-14.III.67	108	3.2	0.024
22.2 MHz	Car'von	12.X.66-8.I.67	82	4.1	0.032

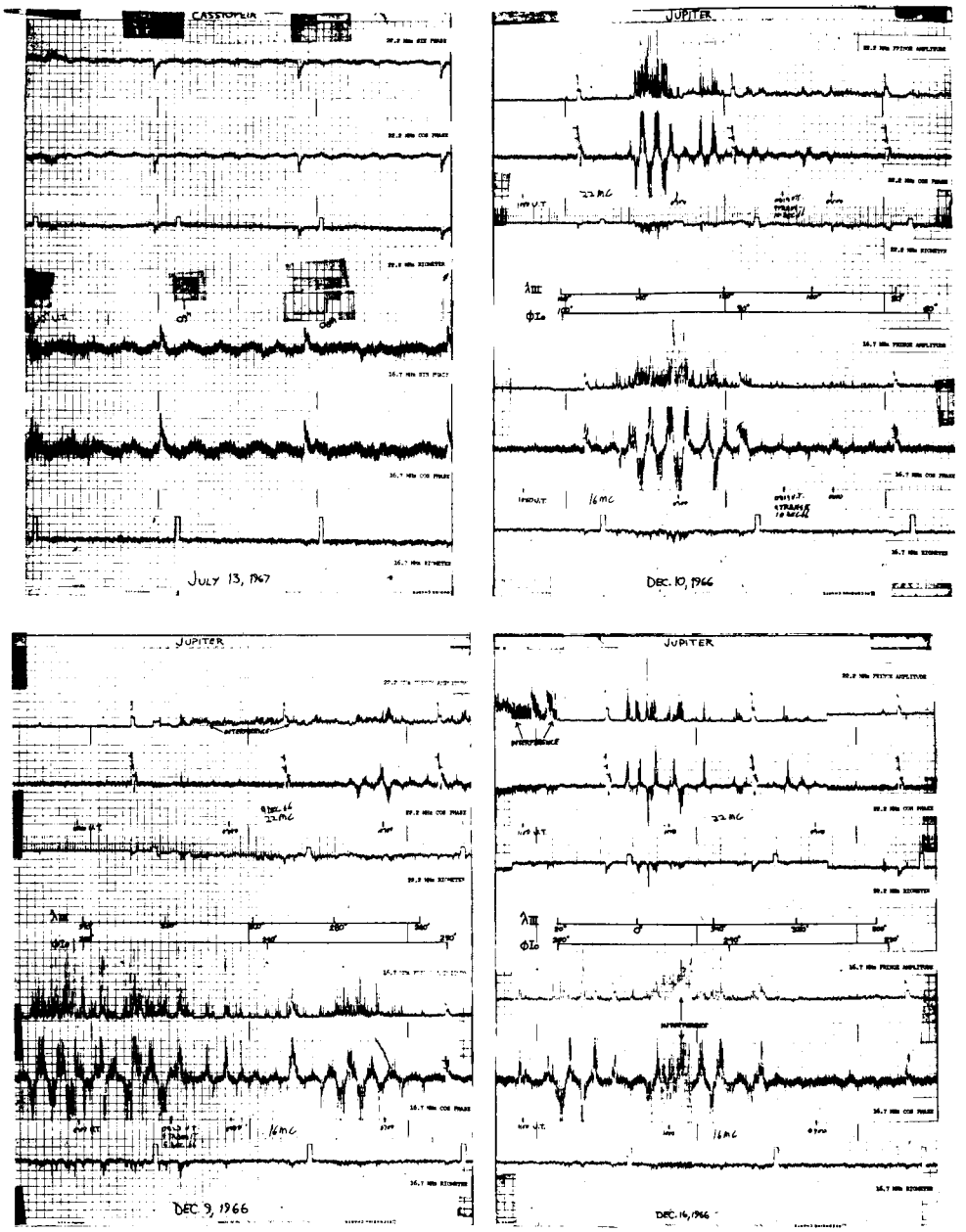

FIGURE 1. Sample recordings of emission from Cassiopia A (upper left), the Jovian B source (upper right), the Jovian A source (lower left), and the Jovian C source (lower right).

Observations were confined to times between three hours before to three hours after meridian transit. In each observing period, those portions of the data which were free from interference were sub-divided into five-minute intervals of Universal Time. Each five-minute interval was inspected for evidence of Jupiter activity and, if present, the mean and peak antenna temperatures due to Jupiter for the interval were scaled. For a signal to be identified with Jupiter, it had to be equal to or greater than three times the rms noise level of the system and had to have a clearly discernable interferometer fringe pattern of the proper period. These criteria confined the analysis to Jupiter activity with intensities greater than about 5×10^{-22} W/M^2/Hz and durations longer than about six minutes. Each event was classed as (1) possible, (2) probable, or (3) definite Jupiter activity and only events identified at confidence levels 2 or 3 were used in compiling the results to be discussed below.

The observations are plotted as a function of the system III (1957.0) central meridian longitude of Jupiter (λIII) and the departure of Io from superior geocentric conjunction (ϕIo) in Figure 2. The thin lines indicate the periods when the criteria for good observations were satisfied, and the heavy lines show the times at which Jupiter activity of ID class 2 or 3 occurred. Although there are still some combinations of λIII and ϕIo for which observations are missing, there is a notable improvement in the amount of data available at 22.2 MHz when compared to the observations of the previous year. This is partially due to improved observing conditions at the Goddard station which afforded longer observing periods and also due to the addition of the second observing site located nearly 180^o of longitude from Goddard.

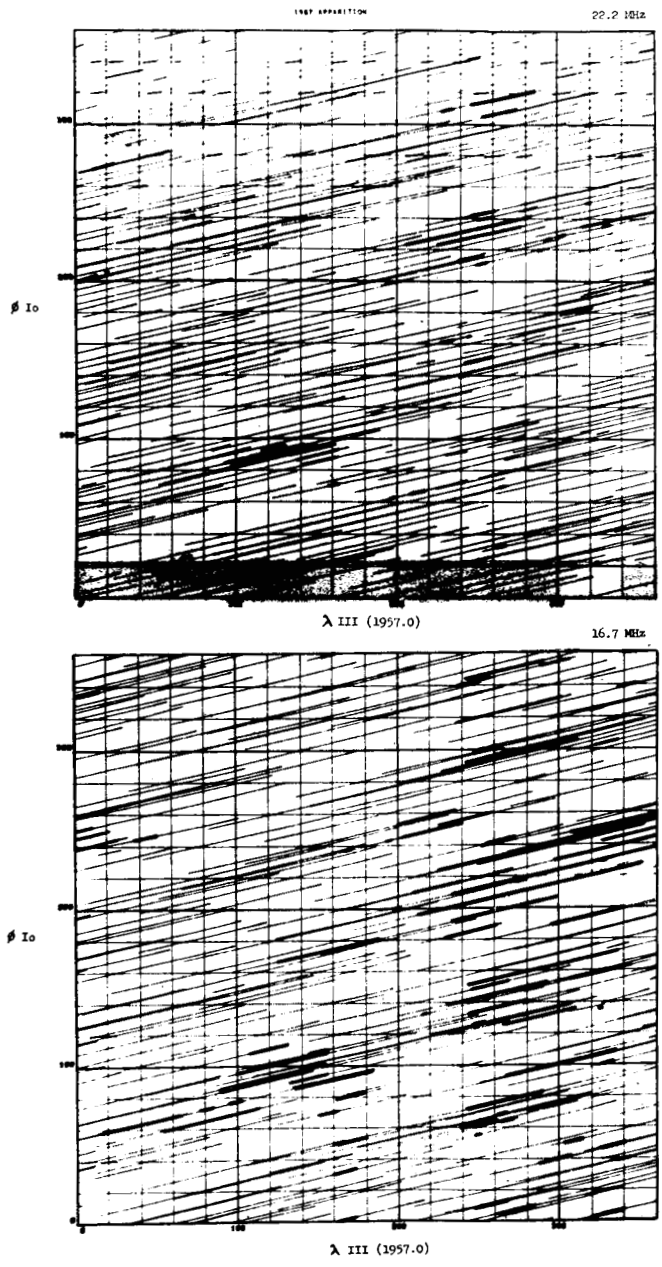

FIGURE 2. Plots of the observations available for analysis and the periods of activity as a function of the system III (1957.0) longitude of the central meridian (λIII) and the departure of Io from superior geocentric conjunction (ϕIo).

In Figure 3 we have plotted occurrence probability histograms for Jupiter activity as a function of λIII, ϕIo, and the system III (1957.0) longitude of Io (λIII Io). At 16.7 MHz the longitude of the region A occurrence probability peak appears to have decreased slightly between 1966 and 1967; at 22.2 MHz the longitude of the A region peak does not appear to have increased by more than 5^{o}. The average probability of occurrence is less than for the previous year at 22.2 MHz but substantially greater at 16.7 MHz. The increase at 16.7 MHz is partially due to the occurrence of activity for $0^{o} < \lambda III < 50^{o}$ where activity is rarely seen above ~15 MHz.

The histograms for the variation of occurrence probability versus Io phase show pronounced peaks near 90^{o} and 240^{o} which are much more evident than in the data for the previous apparition. Although the effect is due, in part, to the improved observing statistics, there also appears to have been a genuine increase in Io-controlled emission.

The third pair of plots show a maximum occurrence probability when Io is over $\lambda III \approx 205^{o}$, i.e. near the longitude of the North magnetic pole. In Gledhill's model of the Jovian magnetosphere (Gledhill, 1967) one would expect a peak in occurrence probability near λIII Io = 150^{o} and a larger, broader peak near λIII Io = 240^{o} arising from the passage of Io through a disk-shaped concentration of plasma inclined to Io's orbital plane by about 7^{o}. The λIII Io histograms are not inconsistent with that model.

One of the most interesting problems concerning the Jovian decametric radiation pertains to the long term variation of occurrence probability and apparent radio rotation rate. From observations of the λIII of the main source region from year to year, workers at Yale (Douglas and Smith, 1963) and Florida

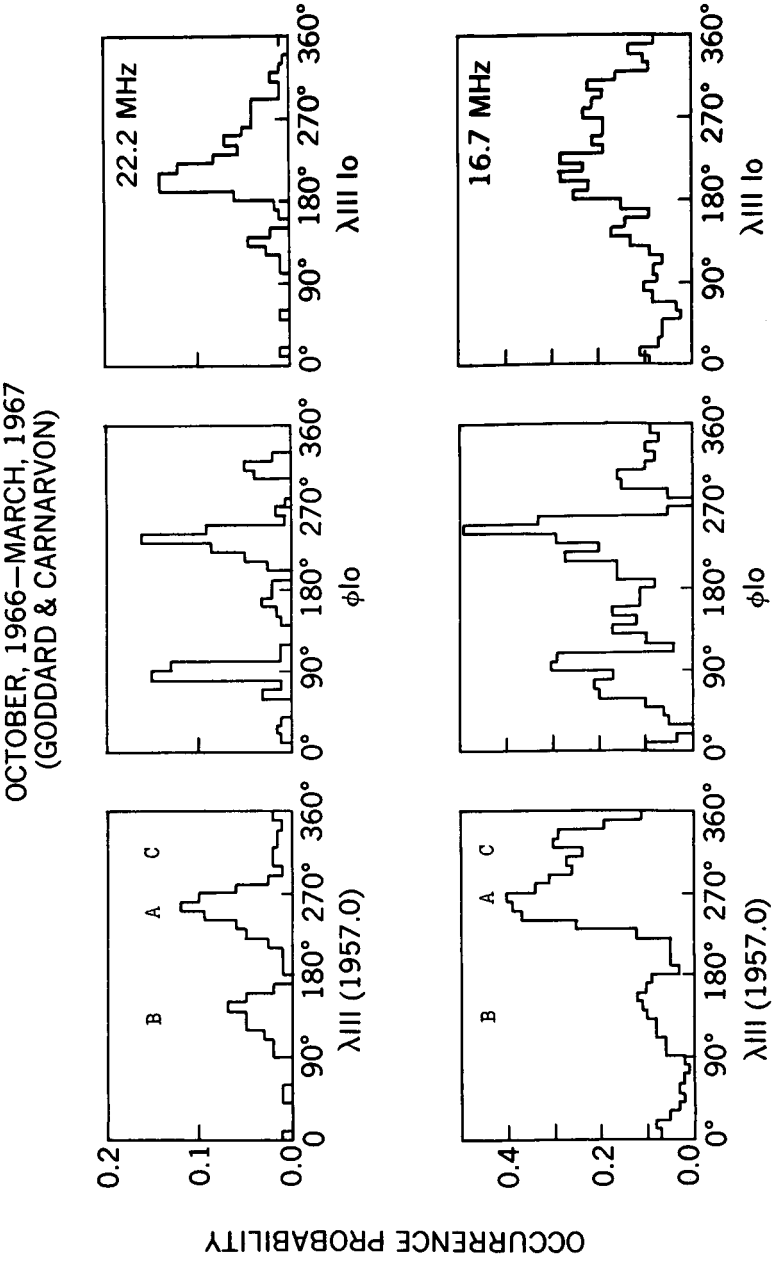

FIGURE 3. Occurrence probability histograms as a function of λIII, φIo, and λIII of Io for observations from October, 1966 through March, 1967.

(Smith, et al; 1965) found that the radio rotation period appeared to increase by about 0.8 seconds in 1961. More recently Gulkis and Carr (1966) suggested that the apparent radio rotation rate drifts cyclically with a period of 11.9 years (Jupiter's orbital period) due to beaming of the radiation. Similarly, the probability of occurrence of activity shows long term cyclic variations, and Douglas (1964) has suggested that this effect might be related to the declination of the earth as seen from Jupiter, i.e. to beaming of the radiation. In Figure 4 we have plotted the system III (1957.0) longitude of the main source peak and the peak occurrence probability of the main source region versus time for 22.2 MHz data from Yale (Douglas, 1964), Florida (Shever, 1967) and Goddard. The data on the position of the main source region are consistent with the model proposed by Gulkis and Carr. However it is not presently possible to exclude the alternate hypothesis that there was a relatively abrupt change in the rotation rate in 1961 and then a change back to the old rate in 1964. That is, the data can also be fitted with a series of three straight lines. The idea of a quasi-cyclic variation of the apparent rotation rate is physically more attractive, and indeed the occurrence probability data appear to show a strong cyclic variation having a period the order of 10-12 years. Further observations will be required to resolve this problem.

The peak antenna temperatures for each five minute interval of activity have been scaled as a part of the reduction of the analog records, and these data havebeen used to study the variation of average intensity with λIII, ϕIo, and λIII Io. The results are illustrated in Figure 5 which shows the variation of average intensity with λIII (1967.0) for the 1966-67 data from the Goddard station. The data have been smoothed by calculating three point

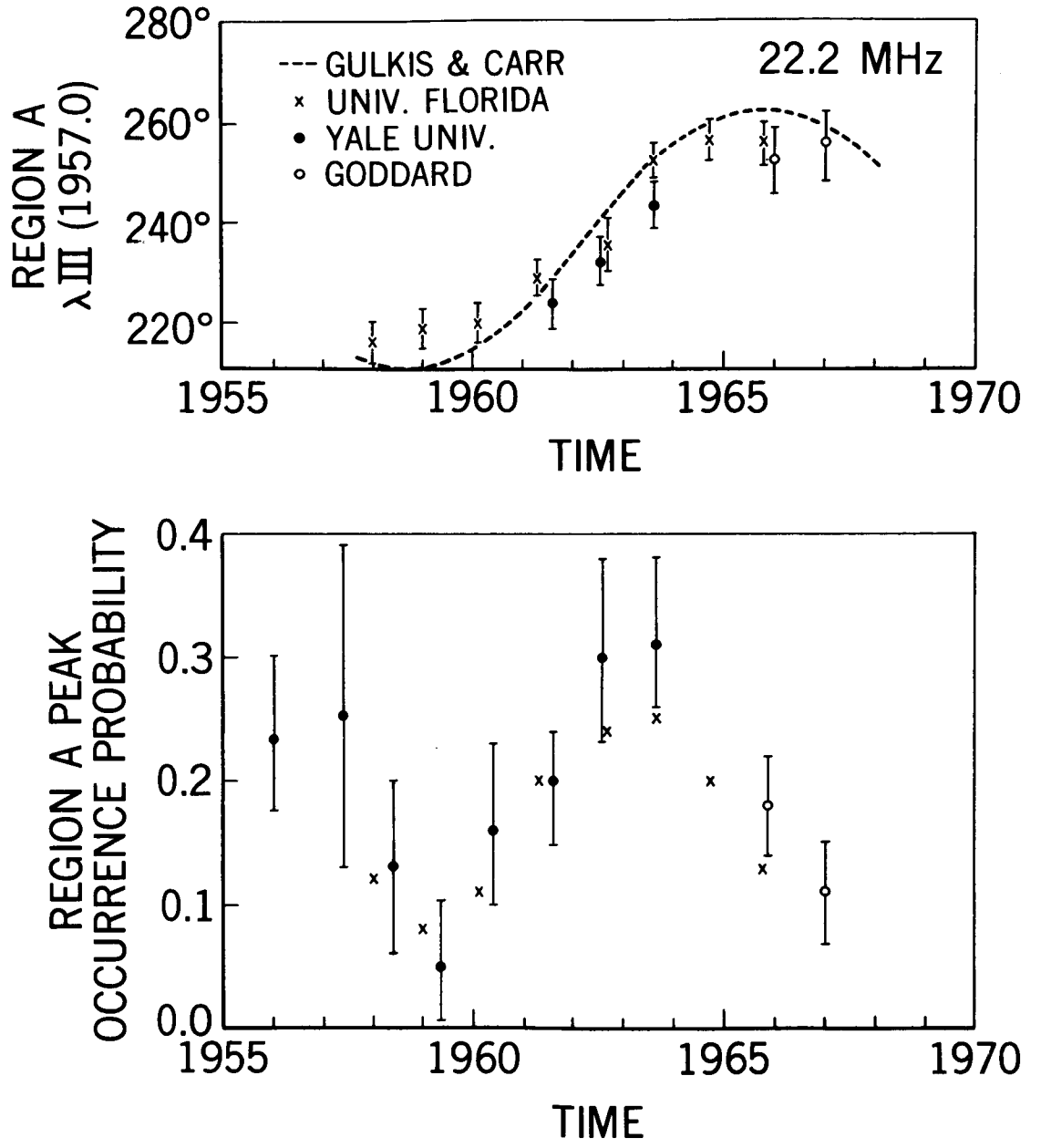

FIGURE 4. Long term variation of λIII of the region A occurrence probability peak and peak occurrence probability of the A region.

running averages. The results correspond very closely with the results of a similar analysis of the 1962 Florida data (Smith, et al., 1965) and show a peak in intensity near $\lambda III = 140^{o}$ in the center of the B source. The plots in Figure 5 must be considered with caution, however, because there is appreciable scatter in the individual points from which the averages were obtained. Although the results might change with a better statistical sample of data, the only significant trend in the present data is an indication that, when active, the Io-controlled B source is more intense than the A or C sources.

A catalogue of the observations from which the results discussed above were compiled is given in Appendix A.

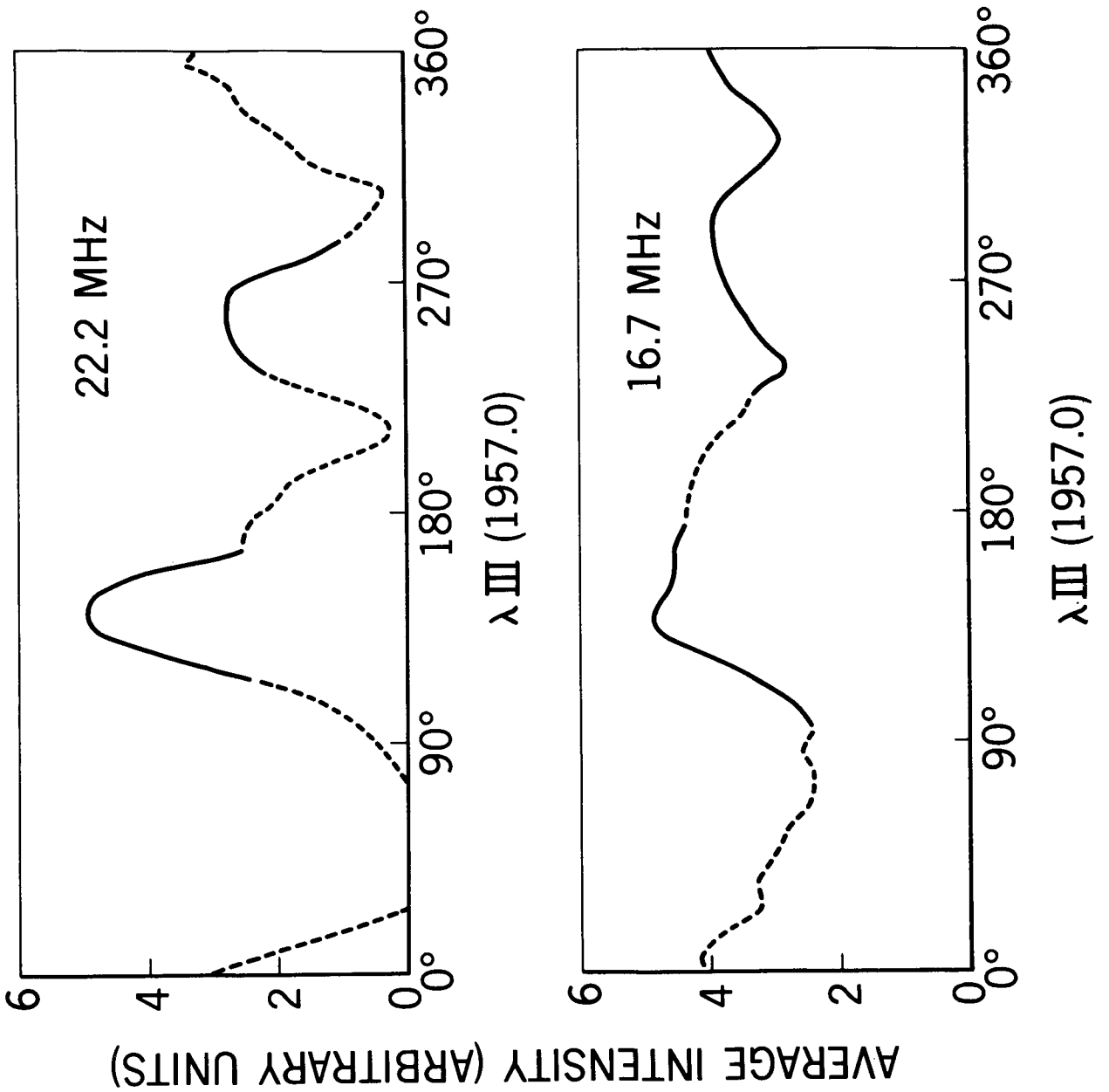

FIGURE 5. Variation of the average intensity of activity with λIII (Goddard data only). The dashed portions of the curves denote regions of marginal statistics.

ACKNOWLEDGEMENTS

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APPENDIX A

The following catalogue gives a day by day listing of the observations discussed in this report. For each day, the first column at each frequency, labelled "Observing period", gives the Universal Time of the beginning and end of the interval over which useful observations could be obtained. The second column labelled "Jupiter activity", gives the times during the observing period when Jupiter emissions at or above a level of about $5 \times 10^{-22} W/M^2/Hz$ were observed to occur. The column labelled "ID class" notes whether the activity was considered probable (2) or definite (3) Jupiter activity. "$T_a$max" is the average value of the peak antenna temperature due to Jupiter (in units of 10^3 ^oK) in each five minute interval of activity referenced to the input to the receiver. To obtain the true antenna temperature, corrections must be made for transmission line losses (about 12 db), impedance matching, etc. The station at which the observations were obtained and other remarks are given under the column labelled "Notes" as follows:

G - Goddard,
C - Carnarvon,
1 - Activity too weak for accurate T_a scaling,
2 - T_a not scaled due to possible simultaneous interference,
3 - T_a not scaled due to minor equipment problem.

October 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
7	0925-1200				G	0920-1330				G
8	0915-1140	0950-0955 1005-1015	2 2	8.3 9.2	(All 16.7 MHz dates are from Goddard)	0915-1235				
9	0915-1140					0915-1240				
10	0910-1145					0910-1230				
11	0905-1145					0905-1215				
12	0905-1125					0905-1150				
						2015-2155				C
13	0900-1115					0900-1115				G
						2015-2200				C
14	0855-1050					0855-1250				G
						2015-2205				C
						2235-2305				C
15	0855-1115					0855-1030				G
						1055-1140				G
						2005-2315				C

October 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
16	0850-1105	0935-0955	2	8.0		0000-0015				C
						0100-0115				C
						0135-0200				C
						0850-1115				G
							0945-0955	2	8.4	G
						2005-2205				C
17	0845-1125					0000-0200				C
						0845-0940				G
						1015-1125				G
						2000-2155				C
						2225-2305	2225-2235	2	3.1	C
18	0840-1115					0840-1110				G
										G
						1955-2255				C
19	0840-1125	0925-0945	3	11.8		0840-1150				G
		1005-1015	3	9.3		1955-2205				C
		1025-1115	3	11.3		2250-2305				C
20	0835-0915					0835-0915				G
	0935-1125					0935-1140				G
						1950-2230				C
21	0830-1030	0845-0920	2	5.2		0830-1030				G
						1945-2215				C

October 1966

Date	16.7 MHz Observing Period	16.7 MHz Jupiter Activity	16.7 MHz ID Class	16.7 MHz Ta Max	16.7 MHz Notes	22.2 MHz Observing Period	22.2 MHz Jupiter Activity	22.2 MHz ID Class	22.2 MHz Ta Max	22.2 MHz Notes
22						1940-2215				C
						2240-2255				C
23						1940-2255	2220-2235	2	2.3	C
							2250-2255	2	2.2	C
						2330-2340	2330-2340	2		C
24						0025-0055	0025-0055	2	2.1	C
						1935-2255				C
25	0820-1125	1045-1125	2	10.7		0820-0940				G
						1930-2210				C
26						1930-2305				C
27	0810-1105	0825-0830	2	9.4		0810-1115				G
						1925-2225				C
28						1920-2255	2250-2255	2	3.8	C
29	0805-1100	0915-1030	2	4.8		0805-1030				G
						1915-2200				C
30	0800-1130					0800-1230				G
						1915-2150				C
31	0755-1110	0945-1015	2	7.4		0755-1040	0940-0955	2	8.2	G
						1915-2200				C
						2220-2245				C

November 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
1	0750-1100					0750-1110 1905-2400				G C
2	0750-1130					0000-0100 0750-1045 1900-2400				C G C
3	0745-1200					0035-0050 0745-1040 1900-2225				C G C
4	0740-1150					0740-1040				G
5	0740-1200					0740-1125				G
6	0740-1220					0740-1210 1850-2210				G C
7	0730-1110	0940-1110	3	13.6		0730-1130 1845-2315	0940-1105 1940-1950 2010-2115	3 3 3	7.5 1.8 2.2	G C C
8	0725-1110	0740-0800	2	8.4		0725-1030 1840-2215				G C
9	0720-1150					0720-1030 1835-2205				G C

November 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
10	0720-1145					0720-1040				G
						1830-2300				C
11	0715-1130					0715-1030				G
						1830-2235				C
12	0710-1130					0710-1130				G
						1825-2205	1915-1940	3	2.0	C
						2215-2305	2215-2230	2		C, 2
13	0705-1150					0705-1155				G
14	0705-1130	1005-1105	2	7.1		0705-1040				G
						1815-2215	2105-2140	3	3.2	C
						2250-2300				C
15	0700-1150	0755-0830	3	11.6		0700-1040	0715-0725	3	7.8	G
						1815-2145				C
16	0655-1155					0655-1040				G
17	0650-1155	0900-1055	2		1	0650-1030				G
						1805-2225				C
						2310-2320				C
18	0650-1150					0650-1040				G
						1800-2155				C
						2220-2355				C
19	0645-0930					0645-1130	0955-1025	3	9.0	G

November 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
19	1000-1150	1000-1040	3	14.8		1800-2200	1850-2030	2	1.6	C
							2050-2100	2	.7	C
							2200-2205	2	.7	C
20	0645-1145					0725-1220				G
						1755-2155				C
21	0640-1105					0640-1040				G
						1750-2220				C
22	0630-0850					1755-2340				C
	1920-0930									
	1000-1100	1000-1015	2	7.9						
23	0635-1040					0630-1030				G
	1100-1125					1810-2250				C
24	0625-0845					0640-1040	0940-0945	3	3.0	G
	0935-1000	0935-0945	2	6.7		1740-2315				C
	1020-1110									
25	0620-1140	0640-0725	2	5.4		0645-1040				G
						1735-2210				C
						2245-2250				C
26	0615-0625					0620-0630				G
	0715-1125	1045-1100	2	11		0720-1140				G
						1910-2200	2045-2055	2	1.3	C
							2150-2155	2	.5	C

December 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
10	0520-1115	0750-0930	2	10.9		0620-1115	0755-0915	3	6.6	G
11	0515-1110					0640-1110				G
						1710-2225				C
12	0510-1105					0625-1040				G
						1645-2150				C
13	0505-1100					0825-1040				G
						1810	1810-1815	2	4.6	C
						1830-2215	1830-1845	2	6.0	C
14	0545-0800					0605-1035				G
	0830-1055					1615-2210				C
15	0500-1055	0850-0855	3		3	0625-0715				G
		0910-0915	3		3	0825-1040				
						1610-2035				C
						2055-2200				C
16	0455-1050	0605-0655	3		3	0810-1040	0900-0910	3	4.6	G
		0830-0850	3		3		0925-0930	2	2.9	G
		0905-1050	3		3		0945-0955	3	8.2	G
							1005-1015	2	9.9	G
						1735-2155				C
17	0450-1110	0505-0535	2		3	0625-1045	0950-1035	3	7.8	G
		0625-0750	2		3	1605-2155				C
		0810-0825	2		3					
		0840-0855	2		3					

December 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
17	0450-1110	0945-1105	3		3					
18	0445-1040					0640-1040				G
						1605-2155				C
19	0440-1035	0540-0600	2		3	0625-0915				G
		0625-0700	3		3	0945-1035				G
						1555-2150				C
20	0435-1030					0655-1030				G
						1550-2055				C
22	0430-1025	0430-0450	2		3	0630-1025				G
						1540-1805				C
						1845-2135				C
23	0425-0615					0625-1015				G
	0730-0750					1535-2130				C
	0830-1015	0830-0840	3		3					
		1000-1005	2		3					
24	0425-0635					0550-0745				G
	0710-0745					1535-1755				C
						1825-2130				C
25						1530-1815				C
						1845-2125				C

November 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
27	0650-1200	0835-0850	2	.7		0705-1205				G
		0940-1010	2	1.6		1725-2200				C
28	0610-1115					0610-1105				G
						1720-2155				C
29	0610-1140	0815-0850	2	5.2		0620-1030				G
						1745-1805				C
						1825-2255				C
30	0600-1130					0600-1040				G
						1715-2310				C

December 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
1	0555-1130	0730-0800	3	15.6		0625-1030				G
						1710-2305				C
2	0555-0630					0630-1040				G
	0655-1145					1710-2255				C
3	0550-1115	0725-0900	3	11.1		0700-1145	0945-0955	3	8.5	G
						1705-2255	2030-2130	3	1.5	C
4	0545-0750	0720-0750	2	11.0		0630-1140				G
	0815-1140	0940-0945	2	15.0		1705-2255				C
5	0540-1130					0625-1040				G
						1655-2250				C
6	0540-1130					0630-0730				G
						0815-1045				G
						1650-2245				C
7	0530-1125					0545-1030				G
						1720-1745				C
						1840-1920				C
						2025-2240				C
8	0525-0800					0620-1040				G
	0850-1120	1100-1115	3	7.0		1715-2220				C
9	0525-1120	0620-0920	3	12.4		0625-1040	0630-0710	3	4.3	G

December 1966

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
26						1525-2120				C
27						1520-2115				C
28	0400-0955	0600-0605	2	5.9		0640-0955				G
		0705-0710	2	4.8		1515-1805				C
		0745-0805	3	12.4		1825-2110				C
		0835-0935	3	12.3						
29	0400-0955					0625-0955				G
						1710-2105	1825-1955	3	3.3	C
30						1715-2055				C
31	0350-0945					0705-0945				G
						1525-2055				C

January 1967

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
1	0345-0450					0645-0940				G
	0610-0940					1515-1620				C
						1725-2055				C
2	0340-0935					0655-0935				G
						1455-1515				C
						1545-2050				C
3	0335-0500					0745-0930				G
	0535-0930					1620-2045				C
4	0330-0730	0445-0505	3	10.3		0545-0925				G
	0800-0805					1740-2040	1850-1855	2		C,3
	0825-0925						1910-1915	2		C,3
							1950-1955	2		C,3
5	0325-0455					0705-0735				G
	0545-0725					0825-0915				G
	0745-0915					1605-1725				C
						1745-2155	2020-2055	3	2.0	C
6	0635-0915					0705-0915				G
						1625-2030				C
7	0325-0915	0525-0545	3	11.1		0750-0915				G
		0605-0610	2	9.7		1540-1640				C
						1705-1720				C
						1850-2025				C

January 1967

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
8	0445-0455					0630-0910				G
	0525-0910					1445-2020				C
9	0310-0905	0625-0705	3	6.7		0705-0905				G
10	0305-0900	0425-0540	3	8.5		0825-0900				G
11	0300-0855	0355-0405	2	5.7		0440-0505	0440-0505	3	10.4	G
		0425-0545	2	8.9		0700-0855				G
12	0255-0850	0335-0515	3	7.0		0710-0850				G
		0545-0555	3	11.0						
13	0250-0845					0630-0715				G
						0745-0845				G
19	0225-0505					0625-0820				G
	0615-0820									
20	0220-0815					0635-0815				G
21	0215-0455									
	0540-0810	0610-0645	2	3.7		0620-0810				G
		0735-0805	2	8.5						
22	0210-0805	0210-0245	2	5.6		0630-0805				G
		0300-0335	2	5.8						
		0355-0420	2	5.9						

January 1967

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
22	0210-0805	0440-0445	2	8.0						
23	0205-0740					0455-0800				G
24	0200-0755	0330-0745	3	12.9		0645-0755				G
25	0155-0640	0420-0425	2	5.3		0155-0640				G
		0440-0450	2	6.0						
		0525-0600	2	5.1						
26	0155-0745	0615-0625	2	8.4		0155-0745				G
		0640-0645	2	8.6						
27	0155-0745	0330-0345	2	5.0		0155-0745				G
28	0145-0235					0200-0215				G
	0315-0740	0600-0605	2	12.0		0315-0740				G
		0645-0735	2	7.1						
29	0140-0735	0230-0415	3	11.9		0140-0735				G
30	0135-0730					0135-0730				G
31	0140-0730	0340-0345	2	20.4		0610-0725				G
		0405-0540	3	7.8						
		0615-0730	2	3.7						

February 1967

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
1	0125-0720					0125-0720				G
2	0120-0715	0455-0515	2	3.3		0120-0715				G
		0530-0555	2	6.7						
		0655-0700	2	7.3						
3	0125-0710	0155-0315	3	5.5		0125-0710				G
4	0155-0705									
5	0145-0505	0335-0345	3	10.6		0630-0705				G
		0400-0435	3	8.1						
	0530-0705									
6	0230-0700									
7	0110-0630	0155-0340	3	11.3						
		0455-0630	2	6.6						
8	0225-0645									
9	0125-0130									
	0155-0205									
	0220-0645	0445-0450	2	10.3						
		0525-0530	2	17.1						
		0540-0625	3	12.9						
10	0045-0640	0340-0355	3	10.2						
		0420-0435	2	7.4						

February 1967

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
11	0015-0635	0015-0200	2	5.6						
		0225-0240	3	3.5						
12	0035-0100									
	0135-0630	0340-0345	2	12.5						
		0355-0605	3	8.9						
13	0000-0630	0005-0310	2	5.3						
14	0055-0105									
	0130-0205									
	0235-0420									
	0455-0630	0530-0625	2	3.3						
16	0155-0615									
17	0015-0555	0330-0335	2	7.7						
18	0130-0605	0130-0245	3	10.3						
19	0155-0600	0155-0235	3	9.7		0155-0245	0155-0240	3	15.9	G
20	0230-0555	0300-0325	2	3.5						
21	0155-0555									
22	0225-0245	0225-0245	2	4.0						
	0405-0415									

February 1967

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
22	0425-0545	0435-0510	2	3.8						
23	0130-0545									
27	0215-0325 0355-0445	0215-0325	3	8.3						
28	0215-0235 0255-0305 0330-0445 0515-0525									

March 1967

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
1	0040-0520									
2	0125-0450									
3	0050-0055 0130-0450									
4	0230-0325 0415-0440									
5	0235-0315 0410-0455	0410-0440	2							
9	0230-0310 0340-0440									
13	0230-0430	0230-0240 0255-0225	2 2							
14	0250-0425					0050-0425				G
15						0150-0420				G

March 1967

	16.7 MHz					22.2 MHz				
Date	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes	Observing Period	Jupiter Activity	ID Class	Ta Max	Notes
18	2330-2400	2330-2400	3							
19	0000-0105	0000-0020 0045-0055	3 3							