Report 11292
21 October 1998

Integrated Advanced Microwave Sounding Unit-A (AMSU-A)

Performance Verification Report

METSAT AMSU-A2 Antenna Drive Subsystem

P/N 1331200-2, S/N 106

Contract No. NAS 5-32314
CDRL 208

Submitted to:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Submitted by:

Aerojet
1100 West Hollyvale Street
Azusa, California 91702

Report 11292
Date 21 October 1998

AMSU-A VERIFICATION TEST REPORT

TEST ITEM:	METSAT AMSU- A2 ANTENNA DRIVE SUBSYSTEM PART OF P/N: 1331200-2 SERIAL NUMBER: 106
LEVEL OF ASSEMBLY:	SUBASSEMBLY AND COMPLETE INSTRUMENT ASSEMBLY
TYPE HARDWARE:	FLIGHT
VERIFICATION: PROCEDURE NO.	AE-26002/2D
TEST DATE:	
ASSEMBLIES:	START DATE: 17 June 1998
SUBSYSTEM:	START DATE: 09 Sept 1998

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ITEM

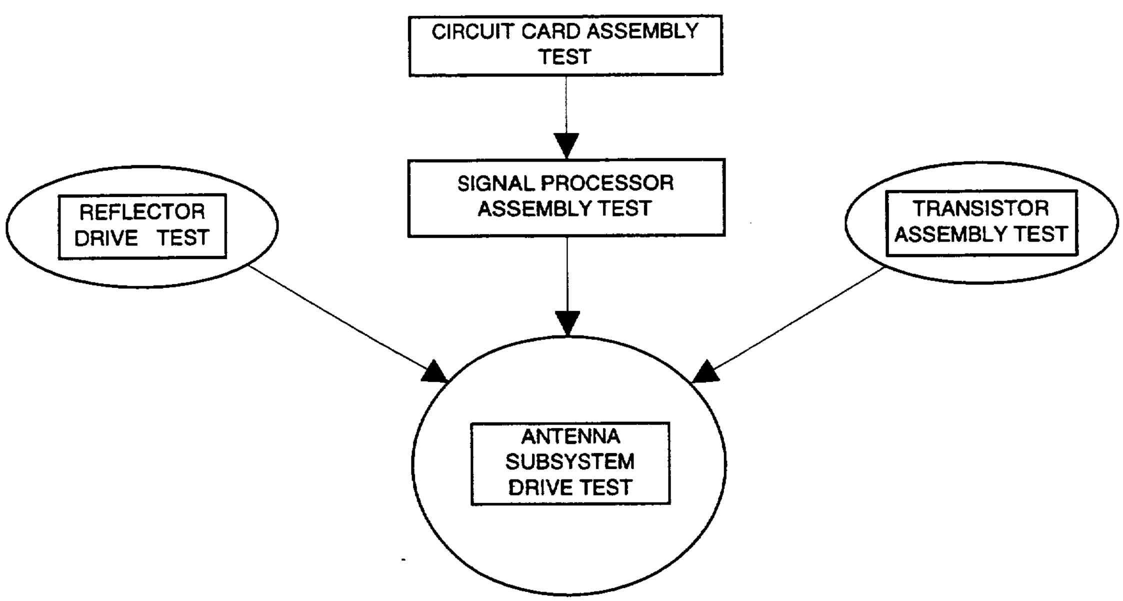
1.0 INTRODUCTION

An antenna drive subsystem test was performed on the METSAT AMSU-A2 S/N 106 instrument. The objective of the test was to demonstrate compliance with applicable paragraphs of AMSU-A specifications S-480-80. Tests were conducted at both the subassembly and instrument level.

2.0 SUMMARY

The antenna drive subsystem of the METSAT AMSU-A2 S/N 106, P/N 1331200-2, completed acceptance testing per AES Test Procedure AE-26002/2D. The test included: Scan Motion and Jitter, Pulse Load Bus Peak Current and Rise Time, Resolver Reading and Position Error, Gain/ Phase Margin, and Operational Gain Margin.

The drive motor and electronic circuitry were also tested at the component level. The drive motor test includes: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The electronic circuitry was tested at the Circuit Card Assembly (CCA) level of production; each test exercised all circuit functions. The transistor assembly was tested during the W3 cable assembly (1356946-1) test. Refer to Figure 1 for test flow.



Antenna Subsystem and Subsystem Component Test Flow
Figure 1.

The antenna drive subsystem satisfactorily passed all of the performance requirements. There were no failures in any of the antenna drive components during subsystem testing.

The results of the subsystem and component level testing are discussed in more detail in the following sections:

3.0 TEST CONFIGURATION

The ***Reflector/ Compensator Drive Motor Tests*** confirm the operability of the motor under test. The test configuration includes, the motor, motor shaft, bearings, and a supporting housing.

The ***Circuit Card Assembly (CCA) Tests*** confirm the operability of each CCA. Each test includes the CCA under test, electronic test fixtures, and the necessary loads.

A segment of the ***Signal Processor Tests*** ensures the scan drive electronics are functioning properly prior to it's assembly into the instrument. The test configuration includes:

- Timing and Control CCA
- Scan Control Interface CCA
- Relay Driver and Current Monitor CCA
- Interface Converter CCA
- Resolver Data Isolator CCA
- R/D Converter CCA
- Motor Driver CCA
- Test fixture and cabling to simulate the spacecraft bus interface
- Test fixture and cabling to interrogate and analyze positional data
- Test motor and inertia wheel

The ***Transistor Assembly Test*** verifies the correct wiring of the transistor assembly and associated cabling. Test configuration includes the CKT 1000 (continuity and Hi-Pot tester), and test fixtures.

The Antenna Drive Subsystem Tests:

- Are configured with the same motor control CCA's used in the signal processor test, interconnecting wiring, the power transistor assembly, and the drive assembly with reflector.
- The antenna drive subsystem components were all installed in the instrument when the subsystem test was performed.
- DC power for the motor control circuit cards was provided by a DC/DC converter simulator P/N: 1359322-1. The simulator operates on 120VAC facility supplied power. The power for the reflector motor drive circuits however was provided directly by the STE 28V Bus power supply.

4.0 TEST SETUP

The antenna drive subsystem tests are performed during system integration. During system integration testing, the instrument is proven electrically safe via ground isolation, and power distribution checks. Next, the communication link is exercised to ensure commands are received and interpreted correctly. The Antenna Drive Subsystem Test is then performed.

5.0 TEST RESULTS

The Antenna Drive Subsystem components designated for use in the METSAT AMSU-A2 S/N 106 instrument are shown in Table 1. During preliminary testing of these components (in preparation for the antenna drive subsystem test), several component failures occurred. The component failures and system related dispositions are listed below:

- *Reflector Drive Motor* - During Starting Torque Test, the shaft would not rotate. Excessive bonding material, used during motor assembly, was the cause of the failure; the excess flowed onto the motor shaft. The motor shaft was cleaned and re-test with no additional anomalies detected. The manufacturing assembly instruction was altered to clarify the assembly process precluding the probability of similar failure recurrence.
- *R-D Converter/ Oscillator (CCA)* - This CCA failed during board level testing. The failure was attributed to component designation U1; the Resolver to Digital converter. The component was replaced and subsequent testing revealed no additional anomalies.

CCA	S/N
Resolver Data Isolator Assembly	F27
Interface Converter Assembly	F30
Scan Motor Driver Assembly	F01
Compensator Driver Assembly	F11
R/D Converter/ Oscillator Assembly	F10

OTHER	S/N
Reflector Drive Motor	F04
Compensator Drive Motor	F07
Signal Processor	F02
Transistor Assembly (W3 cable)	N/A

TABLE 1
METSAT AMSU-A2 S/N 106 Antenna Subsystem Component S/N Designations

All other components designated for use in the METSAT AMSU-A2 S/N 106 instrument (pertaining to the scan drive circuitry) passed on the first time through component testing.

5.1 ANTENNA AND COMPENSATOR DRIVE ASSEMBLY

The tests performed on these units are: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The Motor Commutation and Resolver Operation tests are performed both pre and post-vibration.

<u>Starting Torque</u>
The starting torque test is performed on the rotating segment of the drive assembly to verify the torque associated with bearing friction. Reflector drive motor (F04) failed the starting torque test; excessive bonding material was found on the motor shaft. Once cleaned, the motor passed the starting torque test at ambient temperature as well as at the colder plateaus. The compensator drive motor (F07) passed the starting torque test at ambient temperature as well as at the colder plateaus.

<u>Motor Commutation Test</u>
This test is performed to determine the commutation characteristics of the motor under test. The reflector drive motor (F04) passed the motor commutation test both pre- and post-vibration tests without incident. The compensator drive motor (F07) failed the current limit requirement at the +4°C and -10°C plateau. Relief from the specification requirement was requested for and granted by the customer via FRB.

<u>Resolver Operation/ No-Load Speed Test</u>
This test is performed to verify resolver operation as well as speed characteristics and back electromotive force of the motor. Both the reflector drive motor (F04) and the

compensator drive motor (F07) passed the resolver operation/ no-load speed test both pre- and post-vibration tests without incident.

Random Vibration

Vibration testing was successfully completed; both motors passed the vibration requirements without incident. Both the reflector drive motor (F04) and the compensator drive motor (F07) passed the pre- and post-vibration electronic tests as well as the post-vibration visual inspection without incident.

5.2 CIRCUIT CARD ASSEMBLIES

Test procedures were prepared for each motor control circuit card; document revision status is controlled by reference in the shop order. The cards were individually tested to the procedures and results were recorded on data sheets found in Appendix A. The following list indexes the CCA Test Data Sheets:

- *Appendix A1 ....Resolver Data Isolator Assembly*
- *Appendix A2 .... Interface Converter Assembly*
- *Appendix A3 .... Motor Driver Assembly*
- *Appendix A4 ....R/D Converter/ Oscillator Assembly*

With the exception of the Resolver Data Isolator Assembly, all circuit card assemblies passed testing the first time through. The Resolver Data Isolator Assembly failed due to a faulty U1 component. Once replaced, this assembly passed all subsequent electrical tests. The assembly build shop orders contain the part number and accept tag record of the test and select resistors.

5.3 SIGNAL PROCESSOR

For the first time, the entire antenna drive motor electronics is mated together. The test instrumentation commands and interrogates the electronics during this segment of testing. The instrumentation sends position commands to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The test motor (instrumentation) responds to the drive signal and feeds back positional data via resolver outputs. The instrumentation then interrogates the Resolver Data Isolator CCA for position data. A comparison is made in the instrumentation between the position command sent and the actual position received. The pass/ fail indication is presented to the operator for test data sheet recording.

The signal processor assembly (F02) passed all scan drive tests.

5.4 TRANSISTOR ASSEMBLY

All transistor assemblies are tested along with their respective W3 cable. The cable is continuity, then hi-pot tested prior to attaching the transistor circuitry. Each transistor pair is exercised validating the turn on voltage, current drawn, and cable wiring as well.

The transistor assembly destined for AMSU-A2 S/N 106 integration passed all electrical tests first time through.

5.5 ANTENNA SUBSYSTEM DRIVE TESTS

The antenna drive motor electronics mate with the instrument microprocessor for the first time during this segment of testing. The microprocessor sends position commands from the memory CCA to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The Reflector Drive Motor responds to the drive signals and feeds back positional data via the resolver outputs. The microprocessor then interrogates the Resolver Data Isolator CCA for position data.. The microprocessor in turn communicates with the spacecraft interface.

During segments of this test, positional data is monitored via a potentiometer attached to the shaft of the reflector drive assembly. This provides scan characteristic information in regard to overshoot, jitter, and beam position transition timing.

The remaining paragraphs in this section discuss tests that ensures the instrument complies with specific operating parameters. Prior to conducting these tests there is a series of preliminary checks that are run to select component values that customize the operating parameters of the instrument. These checks perform the following functions:

- Program "on board" memory with Beam Position Pointing Angles
- Adjust for peak Motor Current Limits
- Observe Preliminary Scan Dynamics
- Identify Mechanical Resonant Frequencies

Beam Position Pointing Angles are calculated from Nadir pointing direction which is determined on the antenna range. The instrument's EPROMs (EPROMs for testing; PROMs for final configuration) are programmed to reflect the position commands. The initial programming may require fine tuning; fine tuning is determined during the remaining segments of the test procedure.

Motor Current Limits were adjusted, via selecting "test and select" resistors, to comply with the specification requirement; less than 2 amp peak current.

Preliminary Scan Dynamics looked good; transition times, overshoot and jitter were all acceptable at the sampled pointing directions (5).

The ***Mechanical Resonant Frequencies*** were identified; notch filters were calculated and installed to compensate for these resonant frequencies.

5.5.1 SCAN MOTION AND JITTER

In this test, the antenna position was measured in a series of five 8-sec full scans. The measurement was made with a 1-turn test potentiometer temporarily affixed to the rear end of the motor shaft. A Dynamic Signal Analyzer (DSA) was connected to the pot wiper to record the antenna position data. Five scans were captured and stored on the AMSU-A2 Test Data File disc. One representative waveform is presented in Appendix B1.

Each 3.33 degrees scene step was expanded and checked for a 42 msec max step time, and the 158 msec integration period. Expanded waveforms were plotted and are presented in Appendix B2 thru B30. All of the scene steps meet the step response requirement for transition time, overshoot, and jitter.

Slew periods to the cold and warm calibration stations were measured and met requirements. A time of 0.21 sec is allocated for the 35.0 degree slew to cold cal, and 0.40 sec for the 96.67 degree slew to warm cal. Calibration station jitter was less than the $\pm$ 5 % maximum permitted. Expanded waveforms were plotted and are presented in Appendix B31 thru B34. The waveforms are also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix B35

5.5.2 PULSE LOAD BUS PEAK CURRENT AND RISE TIME

The Pulse Load pulse load bus peak current and the rate of change of current were measured. The peak current must be less than 2A at any beam position along the scan. Peak current along the scan is 1.90A. The current rate of change while transitioning from one beam position to the next (including the transition to the cold calibration and warm calibration targets) should be greater than 70 microseconds. A random 3.33° step was selected; the transition to the next step was 1.95 ms. The transition to the warm cal position start and stop was significantly longer than the required 70 ms; 2.4 and 3.5 ms respectively.

The peak bus current was measured across the entire scan and met the requirement. The full scan waveform was plotted and is presented in Appendix C1. The waveform is also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix C2

5.5.3 RESOLVER READING AND POSITION ERROR

The 14-bit command position word is stored in the "on-board" memory and is read to the motor drive circuitry under microprocessor program control. The microprocessor also reads the resolver output at each of the thirty scene stations, and at the cold and warm calibration positions. The readings are made at the start of integration (LOOK 1), and halfway into the integration period (LOOK 2). The resolver data is sent to the spacecraft interface for subsequent transmission to the STE.

The purpose of this portion of the test is to demonstrate that the antenna is meeting beam pointing requirements.

If the antenna is out of the pointing tolerance of > ± 10 counts at LOOK 1 or > ± 5 counts at LOOK 2 , the EPROM is reprogrammed to bring the pointing direction to within the prescribe tolerances. A copy of the STE computer print out showing the pointing direction is shown in Figure 2.

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
1	6715	6717	6717	-2	-2
2	6563	6568	6566	-5	-3
3	6411	6416	6413	-5	-2
4	6260	6267	6264	-7	-4
5	6108	6114	6112	-6	-4
6	5956	5963	5959	-7	-3
7	5805	5811	5808	-6	-3
8	5653	5660	5656	-7	-3
9	5501	5508	5504	-7	-3
10	5350	5357	5353	-7	-3
11	5198	5206	5201	-8	-3
12	5046	5053	5049	-7	-3
13	4895	4901	4898	-6	-3
14	4743	4748	4746	-5	-3
15	4591	4596	4593	-5	-2
16	4440	4447	4444	-7	-4

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
17	4288	4292	4291	-4	-3
18	4136	4141	4138	-5	-2
19	3985	3989	3987	-4	-2
20	3833	3837	3835	-4	-2
21	3681	3685	3682	-4	-1
22	3530	3534	3532	-4	-2
23	3378	3380	3380	-2	-2
24	3226	3228	3227	-2	-1
25	3075	3077	3077	-2	-2
26	2923	2925	2925	-2	-2
27	2771	2773	2772	-2	-1
28	2620	2622	2620	-2	0
29	2468	2470	2469	-2	-1
30	2316	2318	2316	-2	0
CC 1	723	725	725	-2	-2
WC	12708	12710	12709	-2	-1

* Difference between Command and Actual

Figure 2. Beam Position Pointing Directions and Error Calculation

5.5.4 GAIN/PHASE MARGIN

A gain/phase margin test was performed on the antenna drive subsystem. The test was performed by obtaining a Bode plot of the control loop and measuring the gain at 180° phase differential and the phase margin at the 0db crossover point.

The Dynamic Signal Analyzer (DSA) was used to make the measurement operating in the swept sine mode. Three separate Bode plots were made on the antenna and the gain and phase margins were determined from each plot. The gain margin measured was 13.98 db (average of three) and the phase margin measured was 67.55 degrees (average of three). These margins exceed the specification requirements of 12 db and 25 degrees and therefore are acceptable. The three Bode waveforms were plotted and are presented in Appendix D1 thru D3. The waveforms are also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix D4.

5.5.5 OPERATIONAL GAIN MARGIN

An operational gain margin test was performed on the instrument three times. This test consists of increasing the gain of the control loop until oscillation occurs. The gain increase and frequency of oscillation are measured. An increase in gain greater than 9 db is required; the frequency of oscillation is an observation.

A 50K pot was connected in series with the R58 feedback resistor on amplifier AR8. The resistance of the test pot was slowly added to the feedback resistor while observing the reflector for oscillations.

The reflector begins to produce an audible sound as gain is increased. The following added resistance values are calculated to have the following gain margins:

Resistance (K ohms)	Gain
52.11	9.11
52.42	9.14
51.82	9.07

There were no mechanical resonance frequencies below 300 Hz detected on the shaft and reflector. The power spectrum waveform was plotted and is presented in Appendix E1. The waveform is also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix E2.

6.0 CONCLUSION

Based on the test results, it can be concluded that the METSAT AMSU-A2 S/N 106 antenna drive subsystem meets the AMSU-A specification requirements.

7.0 TEST DATA

Test data for the AMSU-A2 S/N 106 obtained in the antenna drive subsystem test is attached. Data sheet number and type of test is shown in the following Appendix Index.

APPENDIX INDEX

TEST DATA SHEET B-6 (Sheet 1 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Date: 2/14/97
S/N: E-21
1334972-1

6.6.7.1 Supply Voltages

Supply*	Measured Value (V)	Limits (Vdc)	Pass/Fail
+5 V (I)	~~5.~~ 5.00	± 0.25	P
+5 V (U)	5.00	± 0.25	P

6.6.7.2 Supply Currents

Steps 1 and 2:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	53.22	100 max	P
+5 V (U)	332.05	400 max	P

Steps 3 and 4:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	83.33	150 max	P
+5 V (U)	11.14	30 max	P

* I = Isolated, U = Unisolated

6.6.7.3 Resolver Data

Bit No.	Pass/Fail
API 0 - AP Bit 0	P
API 1 - AP Bit 1	P
API 2 - AP Bit 2	P
API 3 - AP Bit 3	P
API 4 - AP Bit 4	P
API 5 - AP Bit 5	P
API 6 - AP Bit 6	P
API 7 - AP Bit 7	P
API 8 - AP Bit 8	P
API 9 - AP Bit 9	P
API 10 - AP Bit 10	P
API 11 - AP Bit 11	P
API 12 - AP Bit 12	P
API 13 - AP Bit 13	P

6.6.7.4 Converter Busy Pulse

Converter Busy Pulse	Measured Value (μsec)	Limits (μsec)	Pass/Fail
15.0	14.8	± 3.0	P

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TEST DATA SHEET B-6 (Sheet 2 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Comments: NONE

Conducted by: Dennis Lee — Test Engineer — 4/14/97 Date

Verified by: Judie Harvey — Quality Control Inspector — 4/14/97 Date

Approved by: [signature] — DCMC — 4/16/97 Date

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TEST DATA SHEET B-13 (Sheet 1 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

Date: 8/11/97
CCA S/N: F30
1331697-1

6.13.7.1 Supply Voltages

Supply	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
+5V (U)	4.99V	+5V± 0.05	P
+15V (I)	15.00V	+15V± 0.15	P
-15V (I)	−14.97V	-15V± 0.15	P
+5V (I)	4.99V	+5V± 0.05	P

6.13.7.2 Supply Currents

Step 1 (CP and API Low):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	85.77	70 - 110	P
+5V (I)	3.33	1.5 - 5.5	P
+15V (I)	17.69	15 - 23	P
-15V (I)	20.39	18 - 26	P

Step 2 (CP and API High):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	56.30	40 - 70	P
+5V (I)	23.75	18 - 30	P
+15V (I)	17.69	15 - 23	P
-15V (I)	20.41	18 - 26	P

6.13.7.3 Amplifier Offsets

Amplifier	Measured Value (mV)	Limits (mV)	Pass/Fail
AR1	− 0.012	0.0 ±0.15	P
AR2	− 1.05	0.0 ±2.0	P

TEST DATA SHEET B-13 (Sheet 2 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.4 Subtraction and D-A Conversion

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±0.00015
±0.00060
±0.00030

Step 1:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output* Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	0.000002	P
00000000000001	00000000000000	-0.00061	-0.000596	P
00000000000010	00000000000000	-0.00122	-0.001232	P
00000000000011	00000000000000	-0.00184	-0.001864	P
00000000000100	00000000000000	-0.00245	-0.002502	P
00000000001000	00000000000000	-0.00490 *	-0.005028	P
00000000010000	00000000000000	-0.00979 *	-0.010087	P
00000000100000	00000000000000	-0.01958 *	-0.020201	P
00000001000000	00000000000000	-0.03917 *	-0.040430	P
00000010000000	00000000000000	-0.07834 *	-0.080876	P
00000100000000	00000000000000	-0.15667 *	-0.16177	P
00001000000000	00000000000000	-0.31334 *	-0.32357	P
00010000000000	00000000000000	-0.62669 *	-0.64729	P
00100000000000	00000000000000	-1.25338 *	-1.2947	P
01000000000000	00000000000000	-2.50675 *	-2.5893	P
10000000000000	00000000000000	-5.01350 *	-5.1786	P

* Tolerance on output voltage is ± 10%

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±0.00015
±0.00060
±0.00030

Step 2:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output* Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	-0.00002	P
00000000000000	00000000000001	0.00061	0.000602	P
00000000000000	00000000000010	0.00122	0.001234	P
00000000000000	00000000000011	0.00184	0.001856	P
00000000000000	00000000000100	0.00245	0.002496	P
00000000000000	00000000001000	0.00490 *	0.005032	P
00000000000000	00000000010000	0.00979 *	0.010123	P
00000000000000	00000000100000	0.01958 *	0.020234	P
00000000000000	00000001000000	0.03917 *	0.040458	P
00000000000000	00000010000000	0.07834 *	0.080919	P
00000000000000	00000100000000	0.15667 *	0.16187	P
00000000000000	00001000000000	0.31334 *	0.32376	P
00000000000000	00010000000000	0.62669 *	0.64748	P
00000000000000	00100000000000	1.25338 *	1.2945	P
00000000000000	01000000000000	2.50675 *	2.5892	P
00000000000000	10000000000000	-5.01350 *	-5.1786	P

* Tolerance on output voltage is ± 10%

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19 Jun 97

TEST DATA SHEET B-13 (Sheet 3 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.5 Strobe Function

Step 1: Strobe Low

	Pass/Fail
No E11 Change with Input CP Changes	P

Step 2: Strobe High

	Pass/Fail
E11 Change with Input CP Changes	P

6.13.7.6 Amplifier Gain

	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
E11	.32377	-	P
E10	3.5617	-	P
E10 Voltage / E11 Voltage	11.0	10.7 - 11.3	P

6.13.7.7 Ground Isolation

	Measured Value (MΩ)	Limits (MΩ)	Pass/Fail
Pin 91 to Pin 7 DC Resistance	ABOVE 100MΩ	>20	P

Comments:
NONE

Conducted by: [signature] Test Engineer — Date: 8/11/97

Verified by: [signature] 7A 190 Quality Control Inspector — Date: OCT 10 '97

Approved by: [signature] DCMC — Date: 10/14/97

A2c

TEST DATA SHEET B-4 (Sheet 1 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

S/N: FØ1
Date: 4/17/97
1331694 -4

6.4.3.2 Input Signal Offset

Step No.	Test Results	Limits
4	1.13 mV	0.0 ±1 mVdc
6	1.54 mV	0.0 ±1 mVdc
8	1.61 mV	0.0 ±1 mVdc

Step No.	Test Resistor	Resistance Measured
13	E7-E8 (R25)	3.16k
	E9-E10 (R52)	4.67k
	E11-E12 (R33)	3.40k
	E13-E14 (R53)	5.85k
	E15-E16 (R42)	2.80k
	E17-E18 (R54)	4.65k

Step No.	Resistors	Selected Trim Resistors
14	R25	RNC55J3161FS
	R52	RNC55J4751FS
	R33	RNC55J3401FS
	R53	RNC55J6041FS
	R42	RNC55J28Ø1FS
	R54	RNC55J4751FS

Step No.	E Point	Test Results	Limits	Pass/Fail
19	E19	-0.11mV	0.0 ±1 mVdc	P
	E20	-0.06mV	0.0 ±1 mVdc	P
	E21	-0.10mV	0.0 ±1 mVdc	P

6.4.3.3 Motor Driver Operation

Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
2	5.01V	+5V±0.05Vdc	P
	52.3mA	70mAdc max	P
	15.07V DLum	+15V±0.15Vdc	P
	1.5mA	3.0mAdc max	P
	-14.98V	-15V±0.15Vdc	P
	18.8mA	25mAdc max	P
	28.03V	+28V±0.5Vdc	P
	5.1mA	8mAdc max	P
3	2.94mV	400mVdc max	P
4	42.9mA	50mAdc max	P
5	[illegible]	50mAdc max	P

REFLECTOR MOTOR

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TEST DATA SHEET B-4 (Sheet 2 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

Counter Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
3	274 mV	400mVdc max	P
4	36.3 mA	50mAdc max	P
5	40.0 mA	50mAdc max	P

6.4.3.4 Current Limit Test

Step No.	Test Results	Limits	Pass/Fail
2	460 mA	350-500mAdc	P

Comments: NONE

Conducted by: Dennis Lee — Test Engineer — Date 4/17/97

Verified by: [signature] (7A 269) — Quality Control Inspector — Date 04/28/97

Approved by: [signature] — DCMC — Date 4/29/97

REFLECTOR MOTOR

A3b

TEST DATA SHEET B-4 (Sheet 1 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

S/N: F11
Date: 4/21/97

6.4.3.2 Input Signal Offset

Step No.	Test Results	Limits
4	1.26 mV	0.0 ±1 mVdc
6	0.87 mV	0.0 ±1 mVdc
8	1.52 mV	0.0 ±1 mVdc

Step No.	Test Resistor	Resistance Measured
13	E7-E8 (R25)	3.40 K
	E9-E10 (R52)	5.33K
	E11-E12 (R33)	3.40 K
	E13-E14 (R53)	4.51K
	E15-E16 (R42)	3.40 K
	E17-E18 (R54)	5.91 K

Step No.	Resistors	Selected Trim Resistors
14	R25	RNC55J3401FS
	R52	RNC55J5231FS
	R33	RNC55J3401FS
	R53	RNC55J4531FS
	R42	RNC55J3401FS
	R54	RNC55J6041FS

Step No.	E Point	Test Results	Limits	Pass/Fail
19	E19	0.09 mV	0.0 ±1 mVdc	P
	E20	0.02 mV	0.0 ±1 mVdc	P
	E21	- 0.07 mV	0.0 ±1 mVdc	P

6.4.3.3 Motor Driver Operation

Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
2	+ 5.00V	+5V±0.05Vdc	P
	52.6mA	70mAdc max	P
	+15.07V	+15V±0.15Vdc	P
	1.5mA	3.0mAdc max	P
	-14.98V	-15V±0.15Vdc	P
	18.7mA	25mAdc max	P
	28.03V	+28V±0.5Vdc	P
	5.6mA	8mAdc max	P
3	279 mV	400mVdc max	P
4	42.4mA	50mAdc max	P
5	47.3 mA	50mAdc max	P

COMPENSATING MOTOR

A3c

TEST DATA SHEET B-4 (Sheet 2 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

Counter Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
3	271mV	400mVdc max	P
4	36.3mA	50mAdc max	P
5	40.0mA	50mAdc max	P

6.4.3.4 Current Limit Test

Step No.	Test Results	Limits	Pass/Fail
2	438mA	350-500mAdc	P

Comments: NONE

Conducted by: [signature] 4/21/97
Test Engineer Date

Verified by: [signature] (IA 269) 04/28/97
Quality Control Inspector Date

Approved by: [signature] 4/29/97
DCMC Date

COMPENSATING MOTOR

A3d

TEST DATA SHEET B-5 (Sheet 1 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

Date 11/18/97
CCA S/N F10
1337739-2

6.5.7.1 UUT Pre-Test

Step 2:

Supply Currents (Without UUT)

Supply (Vdc)	(Baseline) Measured Value (mA) (Without UUT)	Limits (mA)	Pass/Fail
+15	0.06	0-1	P
-15	-0.27	-1 - 0	P
+5	0.06	0-1	P

Supply Voltages (Without UUT)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.02	± 0.50	P
-15V (I)	-15.02	± 0.50	P
+5V (I)	5.03	±0.25	P

Step 6:

Supply Currents (UUT Installed)

Supply (Vdc)	Measured Value (mA) (UUT Installed)	Difference (mA) (Measured - Baseline)	Limits (mA)	Pass/Fail
+15	33.18	33.12	20-40	P
-15	-41.53	-41.26	-30 - -50	P
+5	53.63	53.57	30-70	P

6.5.7.2 Supply Voltages (UUT Installed)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.01	± 0.50	P
-15V (I)	-14.97	± 0.50	P
+5V (I)	5.02	±0.25	P

6.5.7.3 Oscillator Frequency, Duty Cycle, and Output Voltage

Parameter	Measured Value	Limits	Pass/Fail
Frequency	1620	1550-1650 Hz	P
Duty Cycle	51.3 %	45-55 %	P
Output Voltage	8.03V	7.6-8.4 Vrms	P

A4a

TEST DATA SHEET B-5 (Sheet 2 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.4 R-D Converter Operation

Step 1:

Bit Number/ Test Fixture Label	CW Pass/Fail	CCW Pass/Fail
API 0/1	P	P
API 1/2		
API 2/3		
API 3/4		
API 4/5		
API 5/6		
API 6/7		
API 7/8		
API 8/9		
API 9/10		
API 10/11		
API 11/12		
API 12/13		
API 13/14		
Converter Busy	P	P

Step 2:

RS (E10)	Measured Value (Vdc)	Calculated Value (Vdc) * CCA -1 Assy	Calculated Value (Vdc) * CCA -2 Assy	Pass/Fail
CW Rotation**	1.57	(+) N/A	(+) 1.79	P
CCW Rotation**	-1.76	(-) N/A	(-) 1.79	P

* Signal level function of test and calibration gain resistors. Record calculated value and measured value. Measured value shall be within ±~~10~~ 20 percent of calculated value. The equation is as follows:

R20 = 59K
R17 = 5.11K
Dlm 11/13/97

228 wm funmel 3-26-97

$$V = \pm 0.155\left(\frac{R20}{R17}\right) \pm \cancel{10}\ 20\%$$

228 wm funmel 8-26-97

6.5.7.5 Amplifier Gain

PES-RS	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
PES = +0.300 Vdc	1.18	1.00 to1.30	P
PES = -0.300 Vdc	1.07	1.00 to 1.30	P

6.5.7.6 Direction Control Signal

DIR CNTRL	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
CW Rotation	5.00	4.5 to 5.5	P
CCW Rotation	0.13	0.0 to 0.4	P

A46

TEST DATA SHEET B-5 (Sheet 3 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.7 Notch Filter Frequency Response

Frequency	Measured Value (Hz)	Calculated Value (Hz) * CCA -1 Assy	Calculated Value (Hz) * CCA -2 Assy	Pass/Fail
AR3 Notch	N/A	N/A	N/A	N/A
AR4 Notch	↓	↓	↓	↓
AR5 Notch				

* Notch frequencies shall be within ±3 percent of values determined by test and calibration resistors. Record calculated and measured values.

Comments: NONE

Conducted by: [signature] Test Engineer Date 11/18/97

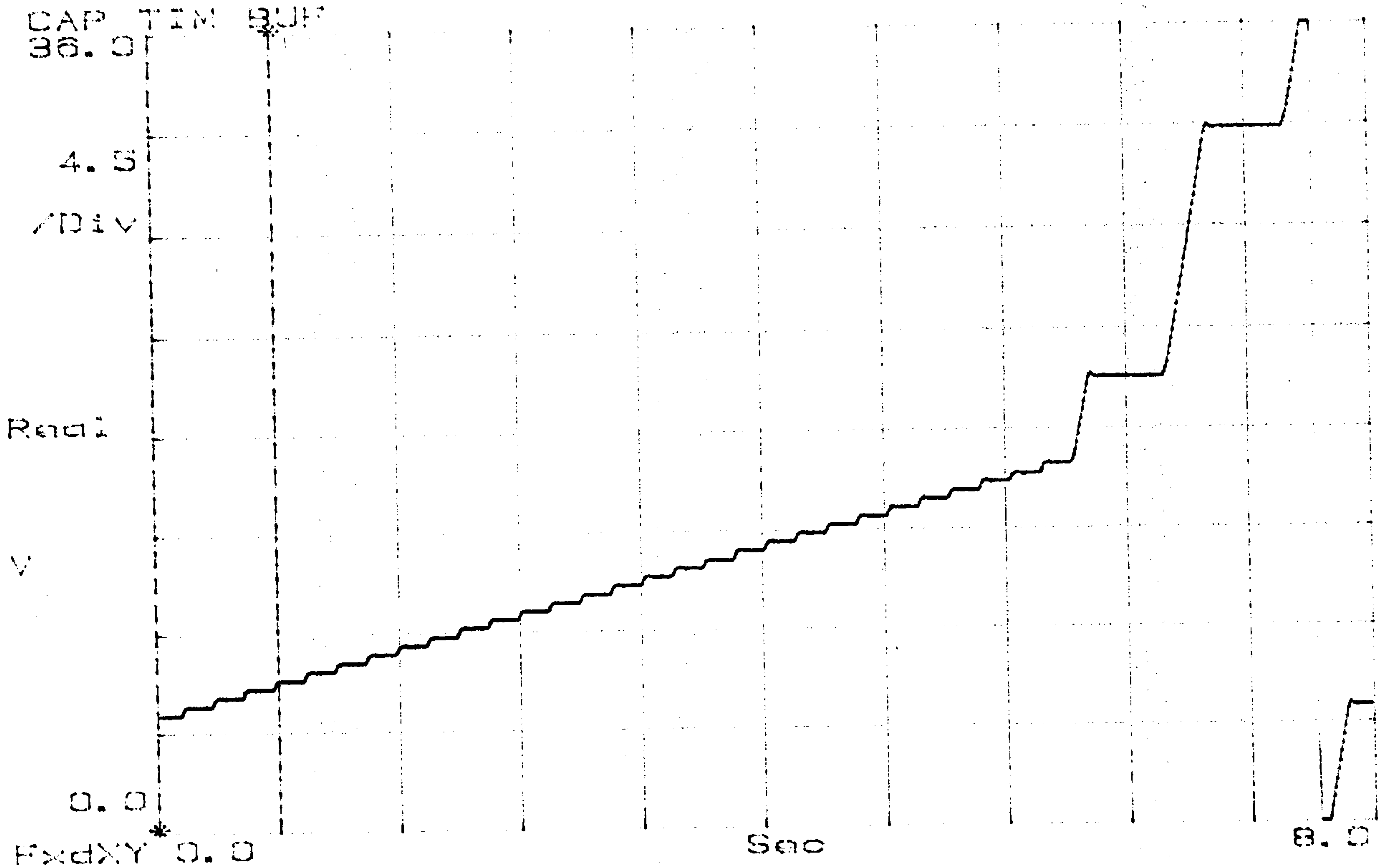
Verified by: 7A 268 Quality Control Inspector Date NOV 19 '97

Approved by: DCMC Date 11-19-97

A4c

SCAN MOTION and JITTER TEST

STEP : Full Scan



S/O: 335166
AE-26002/2D para. 3.4.5.5

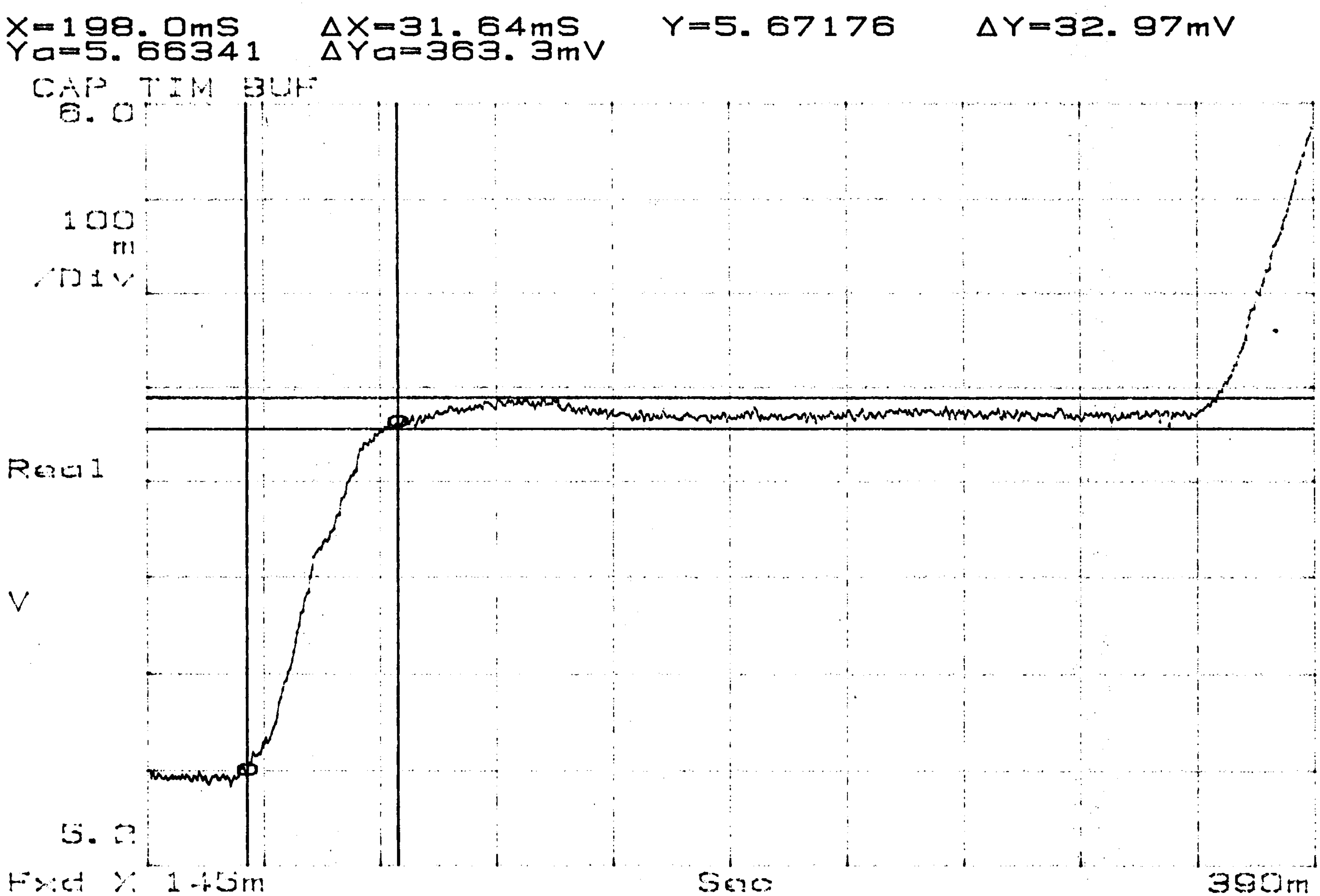
B1

METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

TEST ENGINEER:
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 1-2



S/O: 335166
AE-26002/2D para. 3.4.5.5

B2

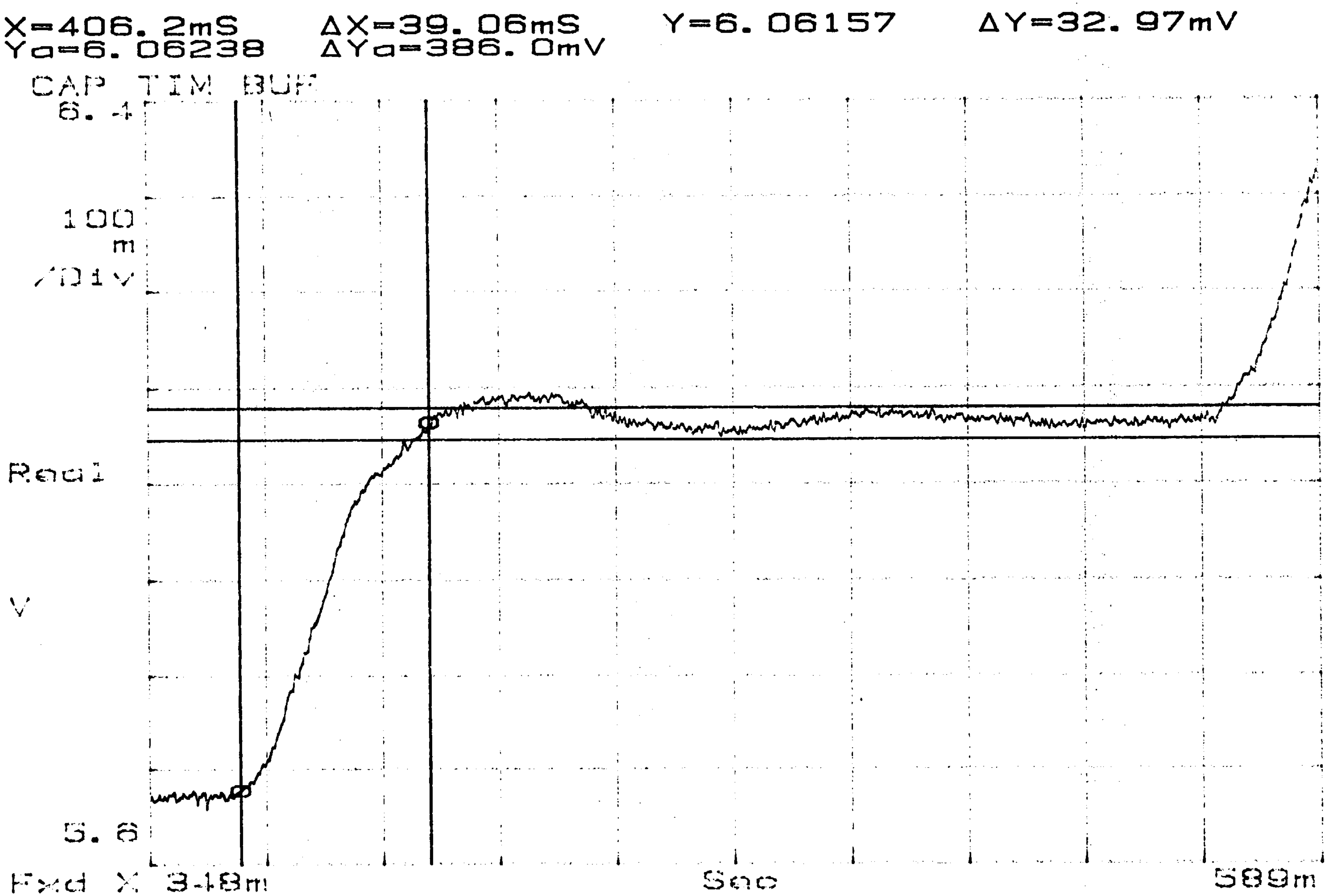
METSAT AMSU-A2
P/N: 1331200-2-IT

(7A)

TEST ENGINEER:

SCAN MOTION and JITTER TEST

STEP : 2-3



S/O: 335166
AE-26002/2D para. 3.4.5.5

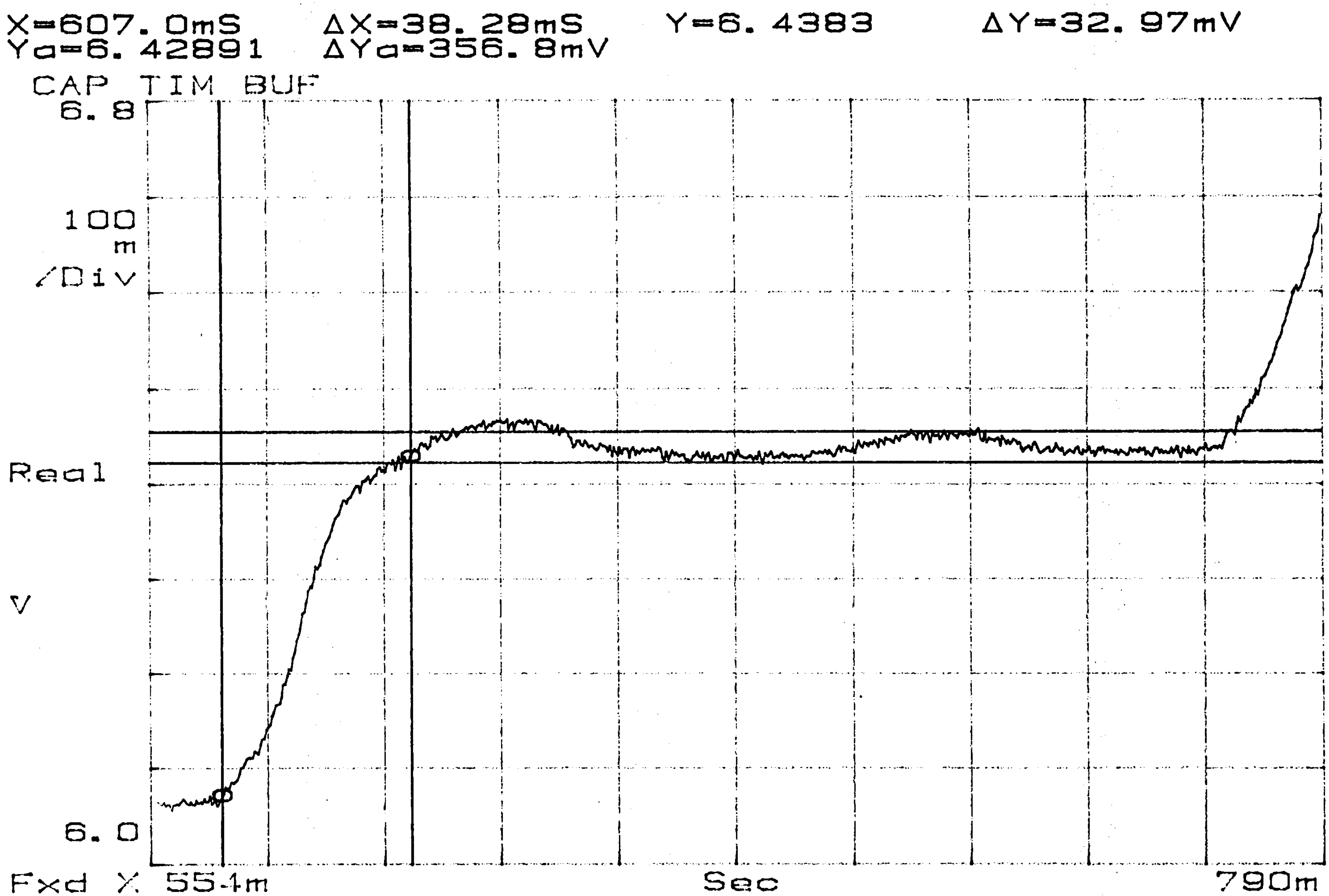
B3

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER: [signature]

SCAN MOTION and JITTER TEST

STEP : 3-4



S/O: 335166
AE-26002/2D para. 3.4.5.5

B4

METSAT AMSU-A2
P/N: 1331200-2-IT

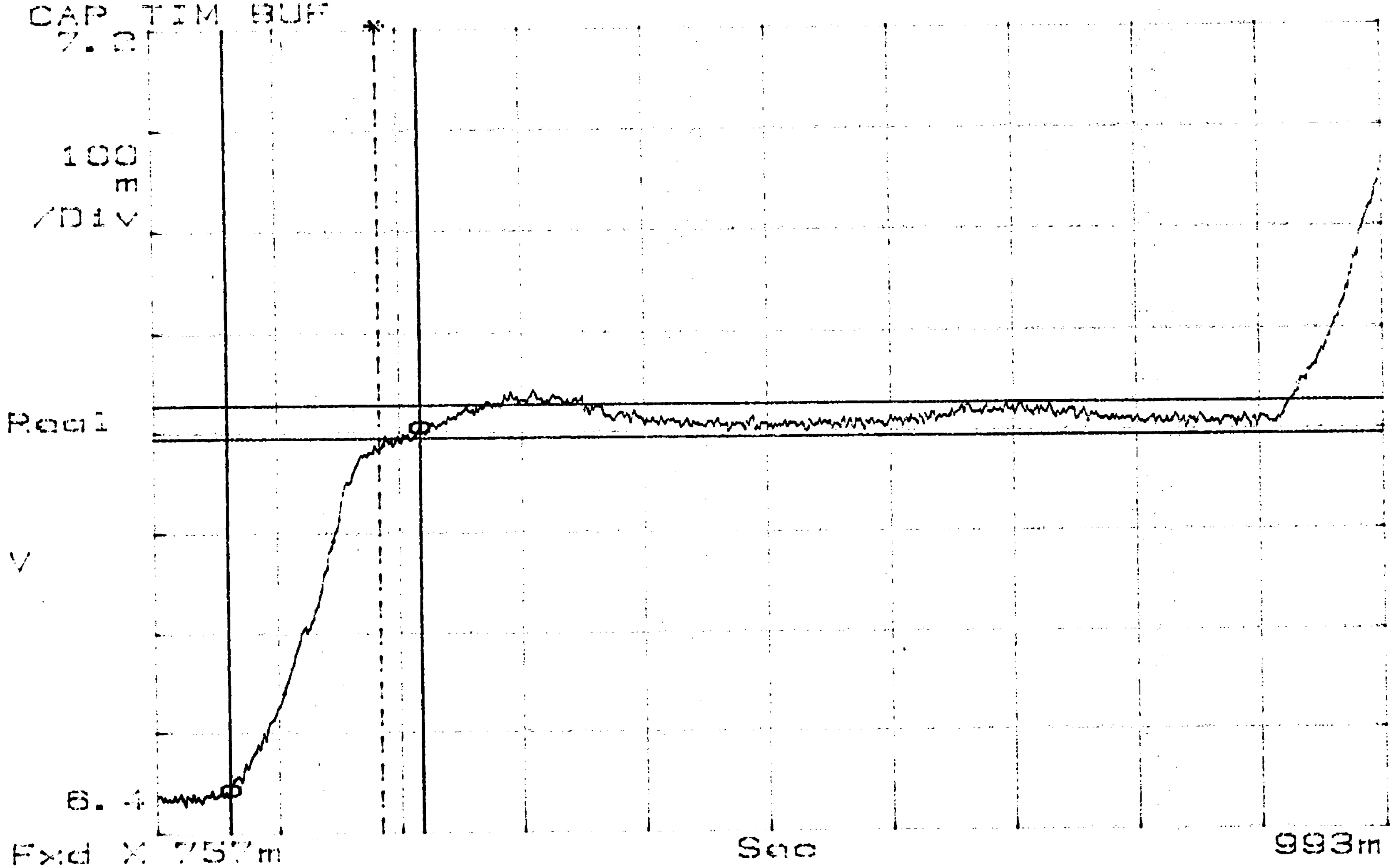
7A

TEST ENGINEER:

SCAN MOTION ... TER TEST

STEP : 4-5

X=770.7mS ΔX=37.11mS Y=6.8097 ΔY=32.97mV
Ya=6.44188 ΔYa=361.7mV



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP FS5

B5

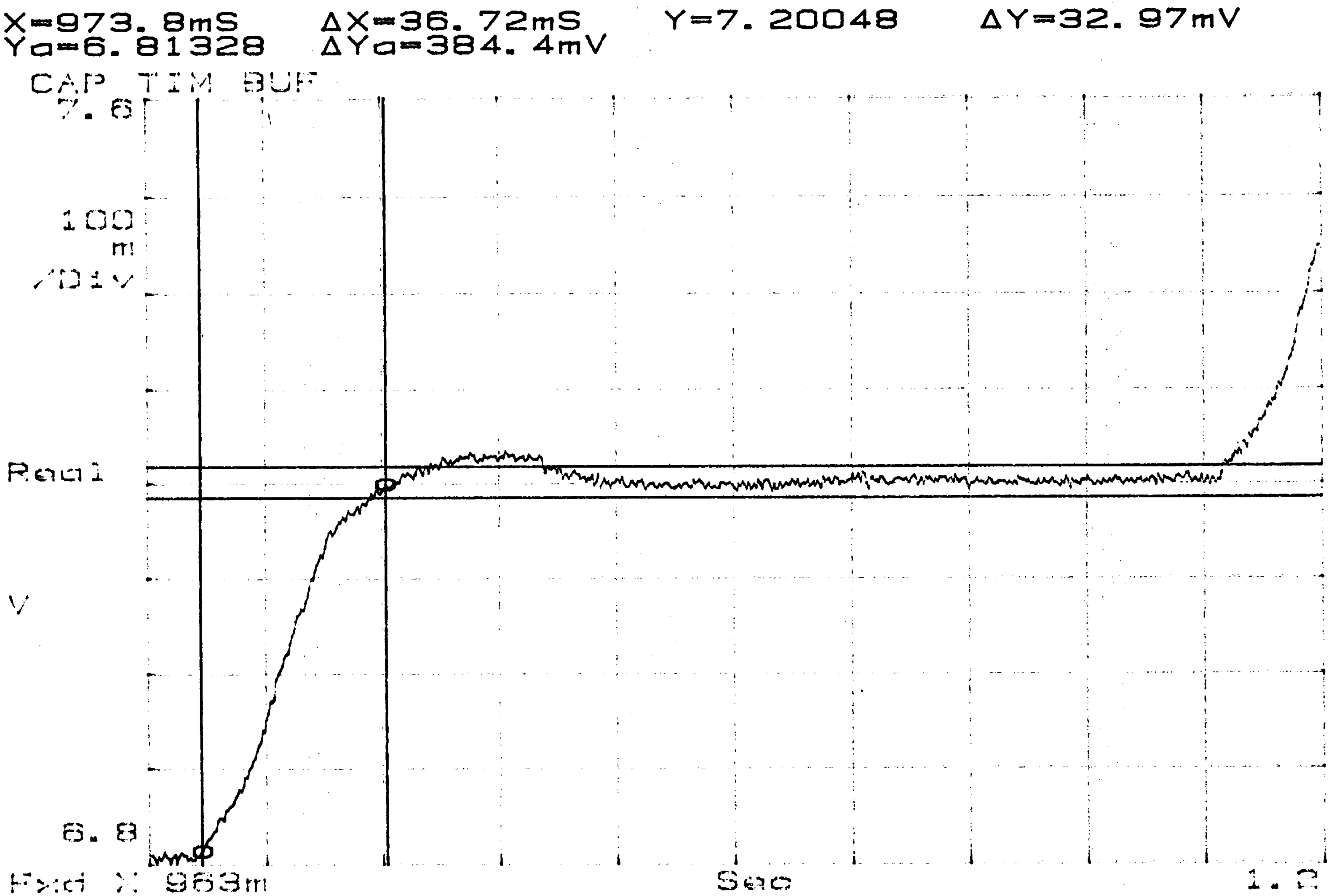
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

7A
260

TEST ENGINEER:
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 5-6



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP FS5

B6

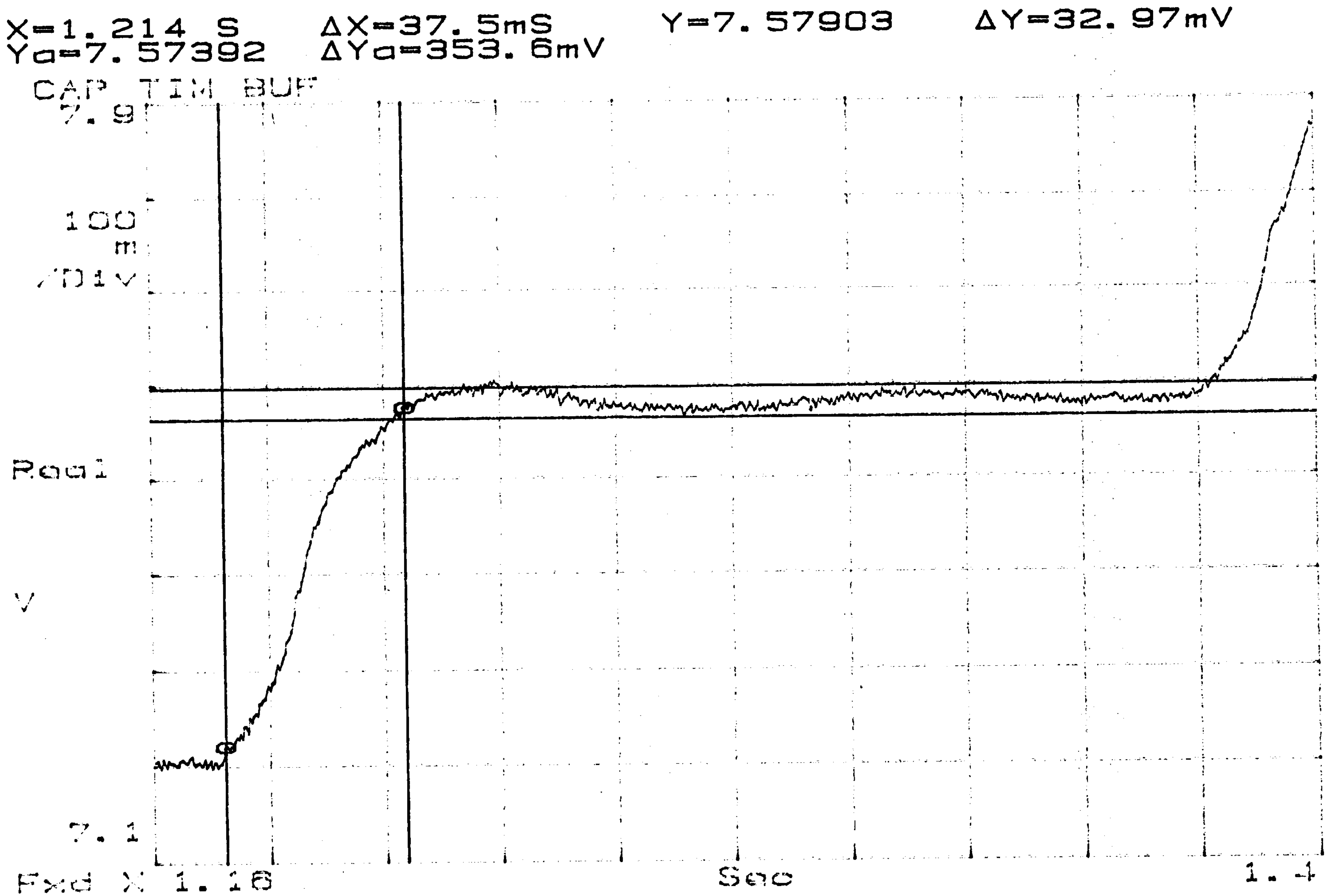
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

7A

TEST ENGINEER:
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP: 6-7



S/O: 335166
AE-26002/2D para. 3.4.5.5

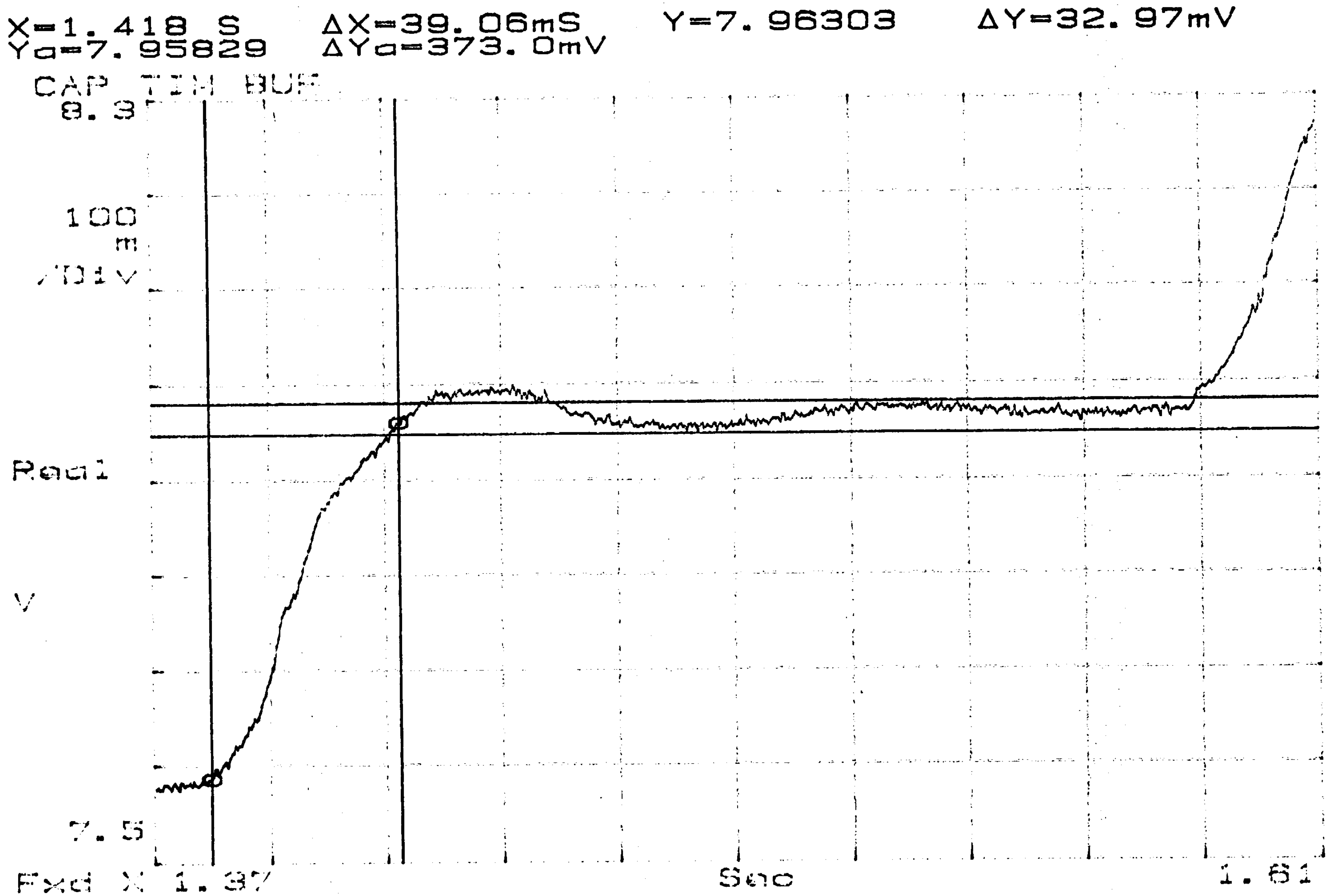
B7

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER:

SCAN ... ...N and JITTER TEST

STEP : 7-8



S/O: 335166
AE-26002/2D para. 3.4.5.5

B8

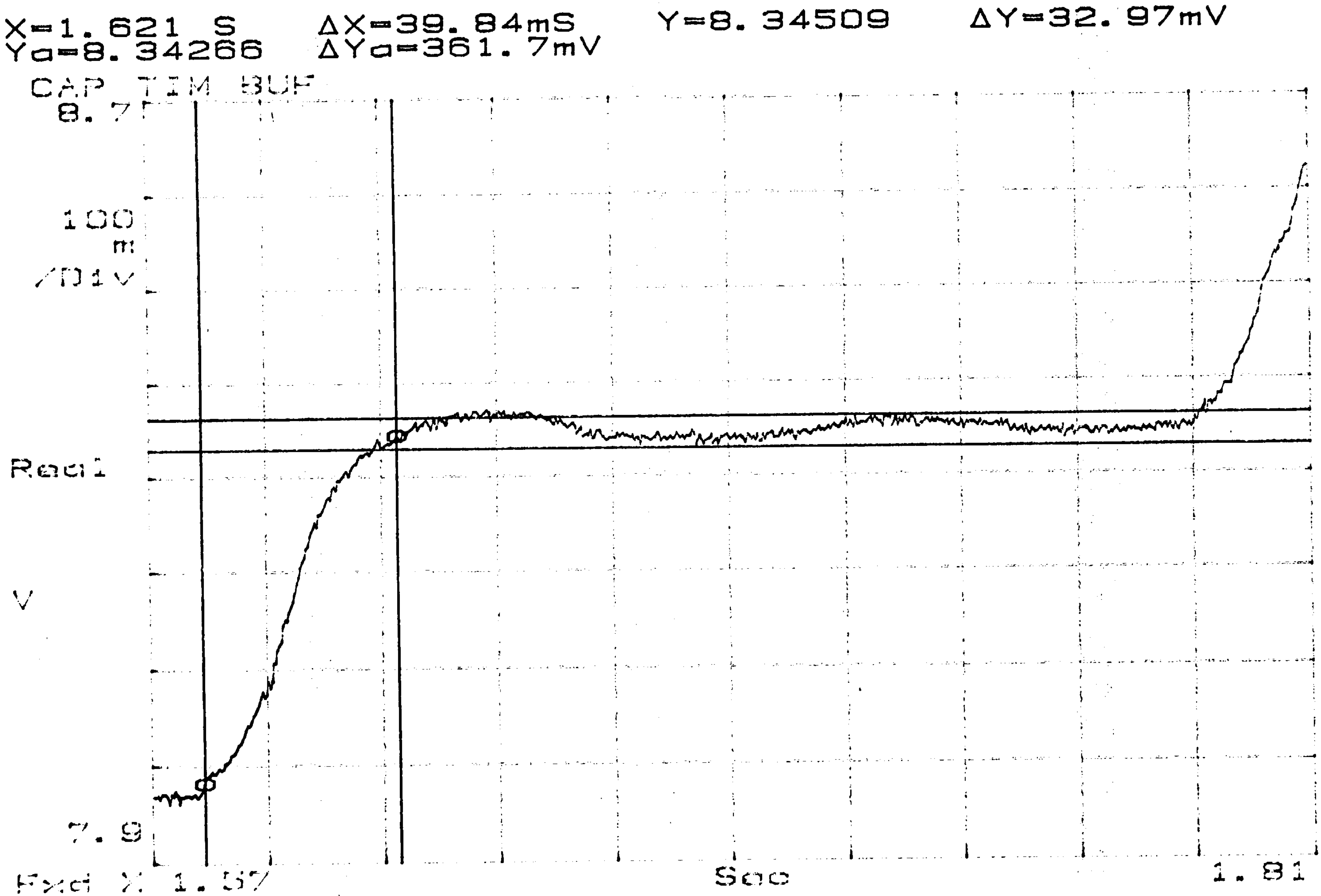
METSAT AMSU-A2
P/N: 1331200-2-IT

(7A)

TEST ENGINEER: [signature]

SCAN MOTIO... and JITTER TEST

STEP : 8-9



S/O: 335166
AE-26002/2D para. 3.4.5.5

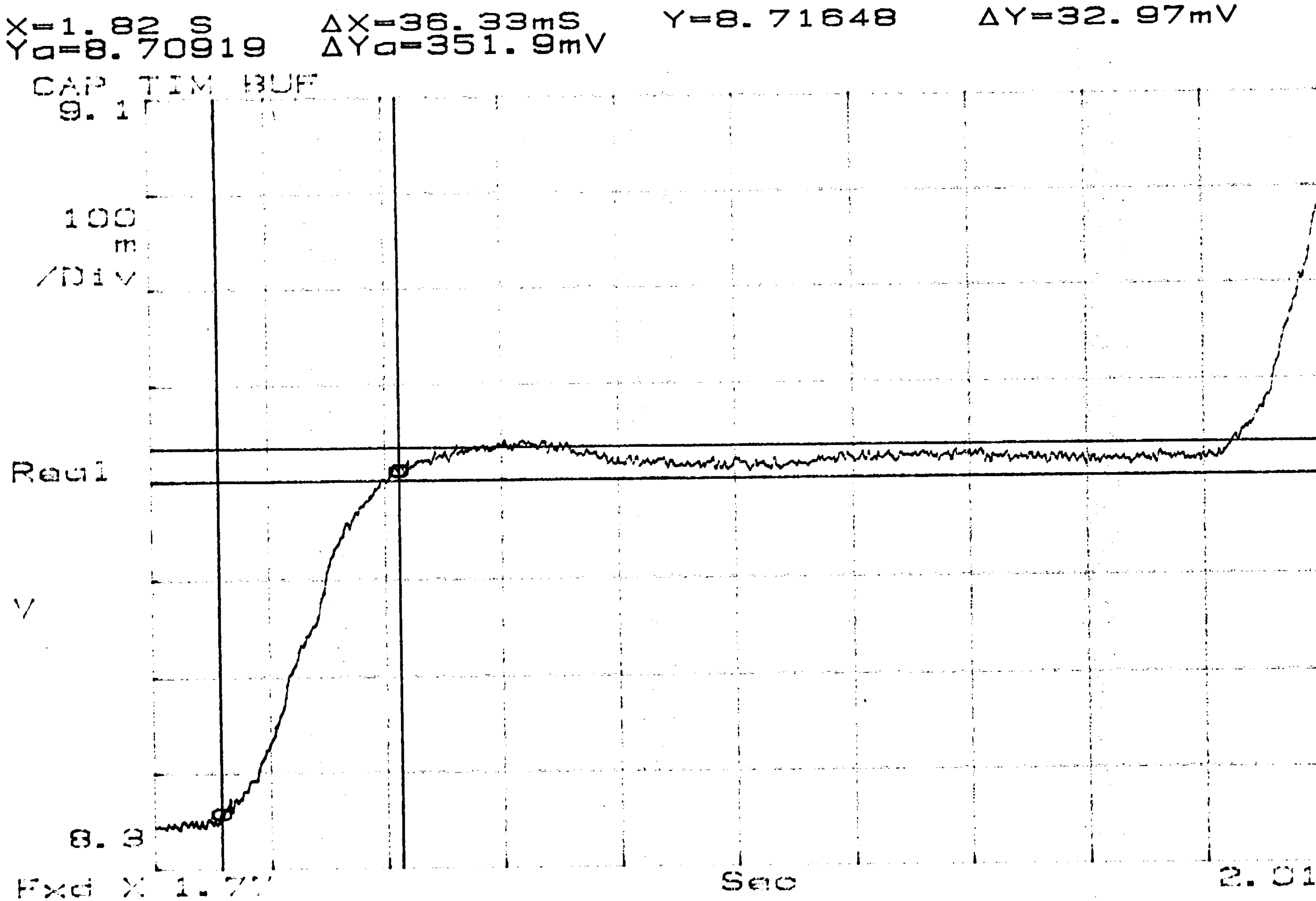
B9

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER: [signature]

SCAN MOTION and JITTER TEST

STEP : 9-10



S/O: 335166
AE-26002/2D para. 3.4.5.5

B10

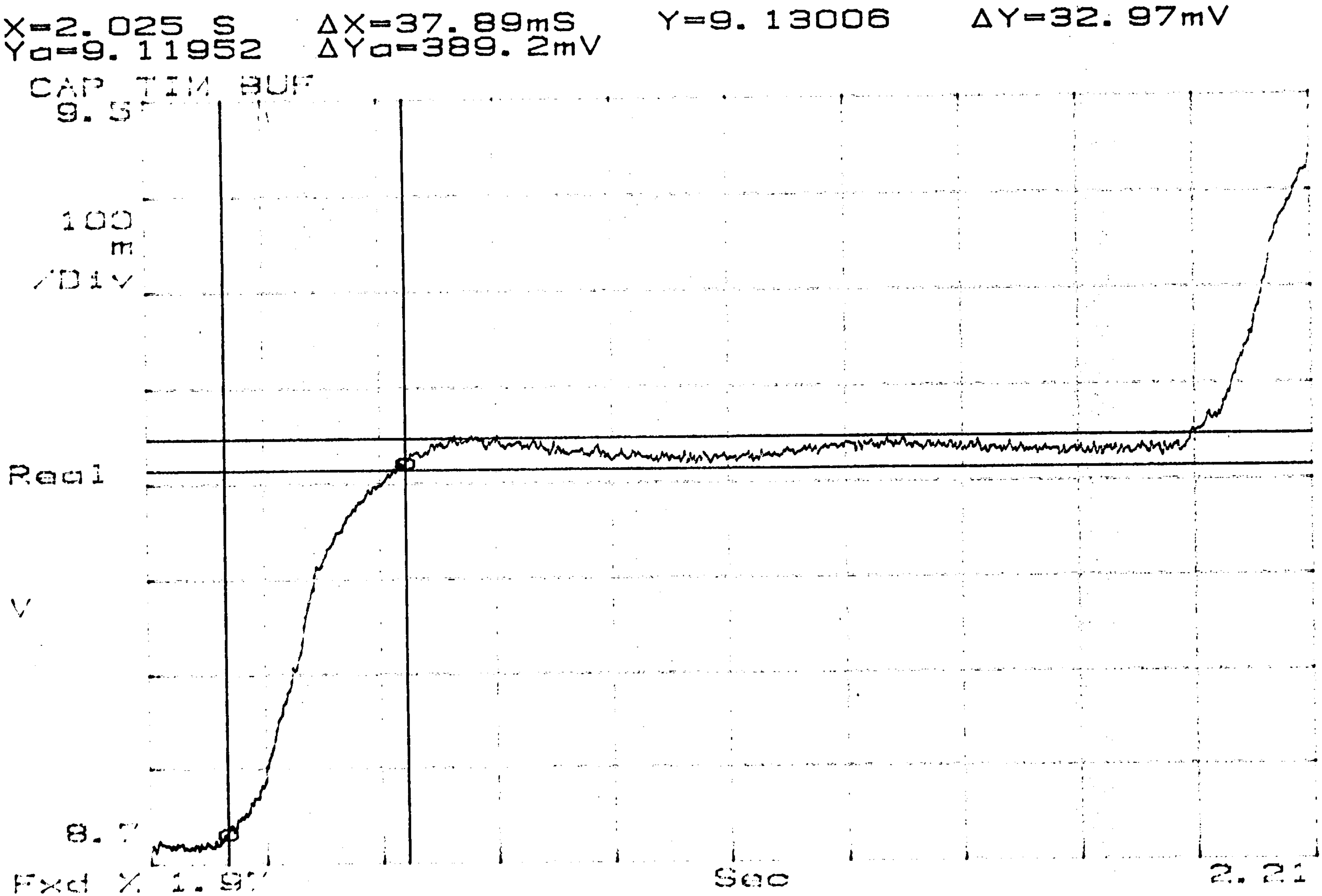
METSAT AMSU-A2
P/N: 1331200-2-IT

7A

TEST ENGINEER:

SCAN MOTION and JITTER TEST

STEP : 10-11



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP_FS5

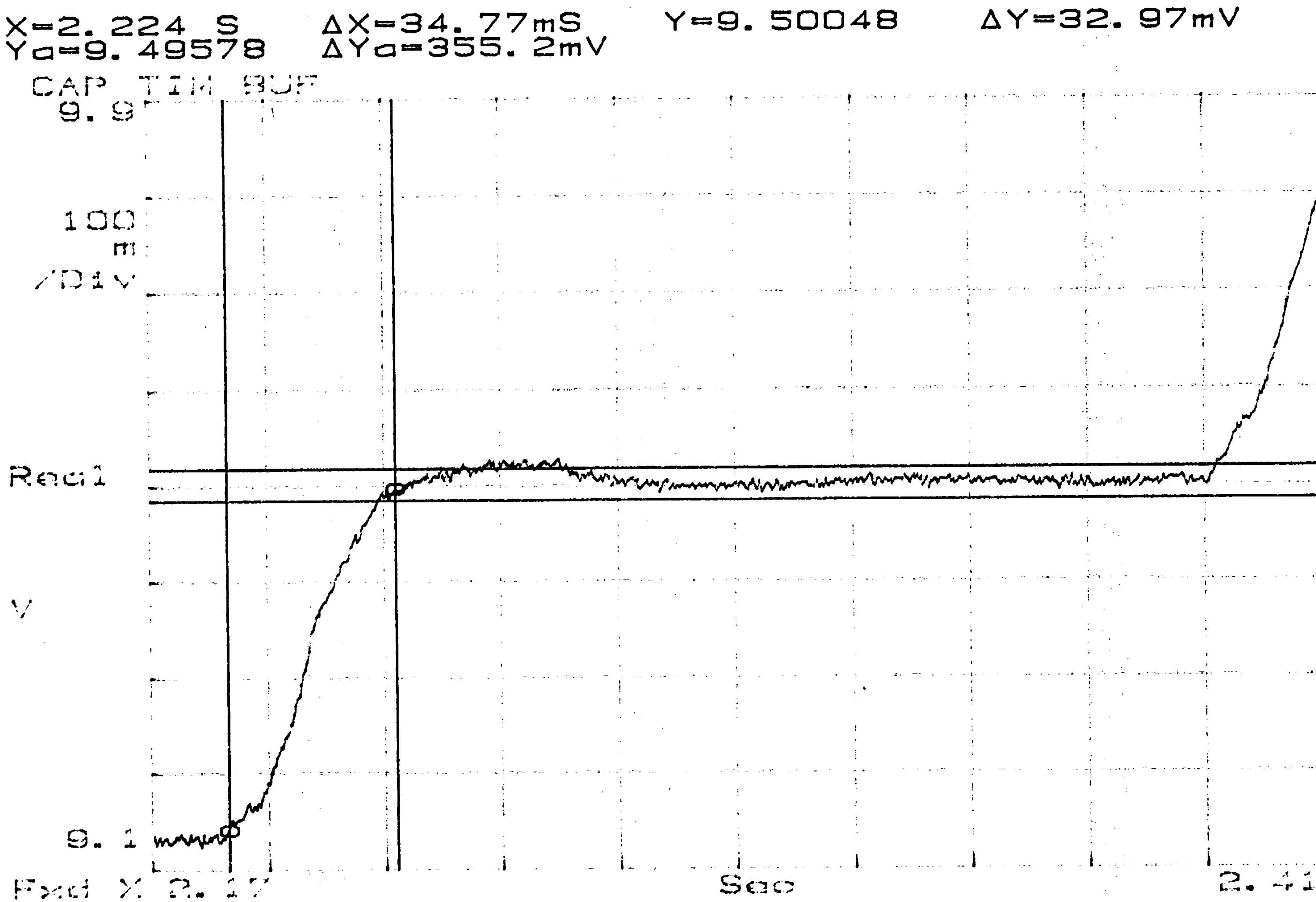
B11

METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

7A

TEST ENGINEER: [signature]
DATE : 27 June 1998

SCAN MOTI... and JITTER TEST STEP : 11-12



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP FS5

B12

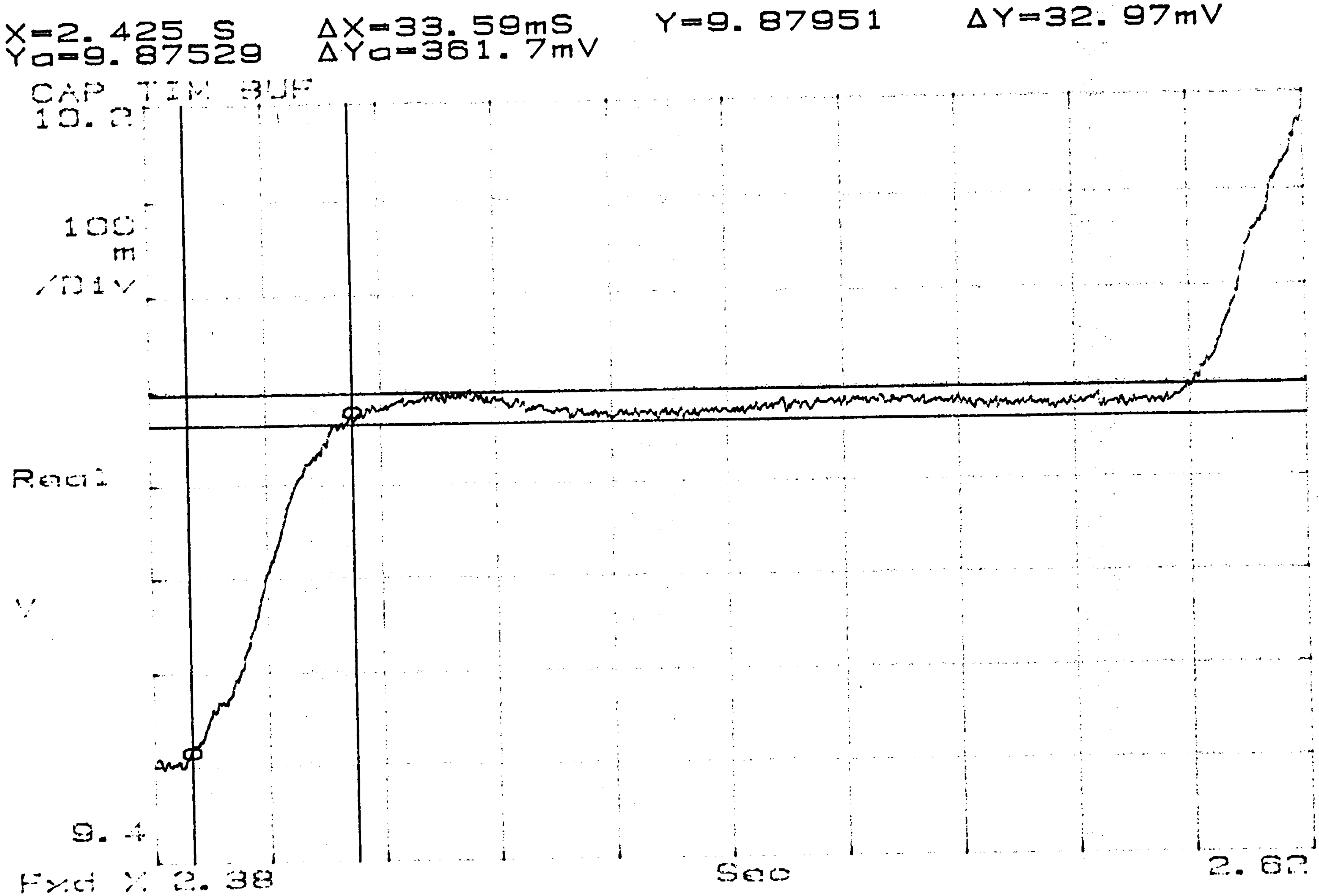
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

7A

TEST ENGINEER:
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 12-13



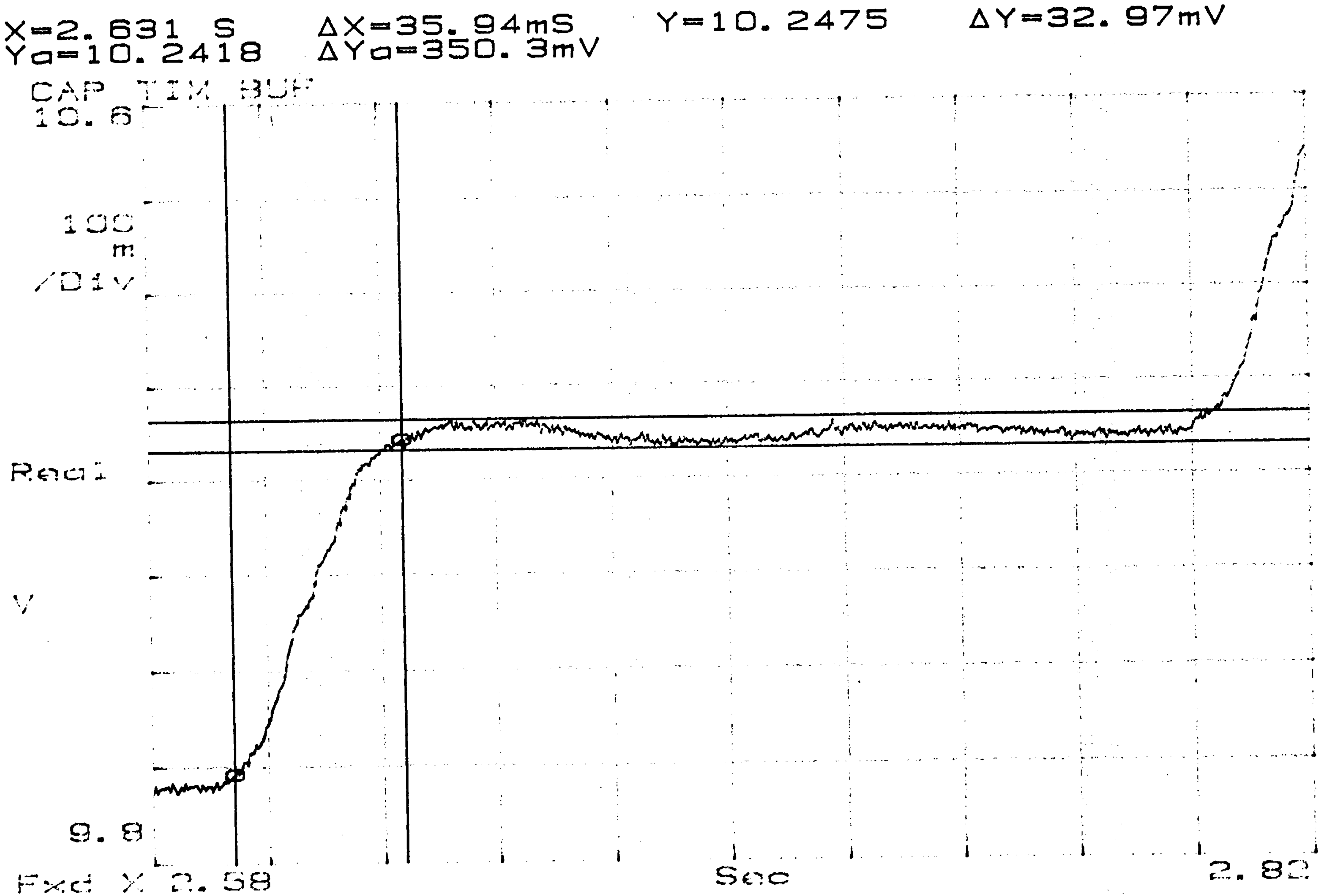
S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: ZAP_FS5

B13

METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

TEST ENGINEER:
DATE: 27 June 1999

SCAN MOT... ...ND JITTER TEST STEP : 13-14



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP FS5

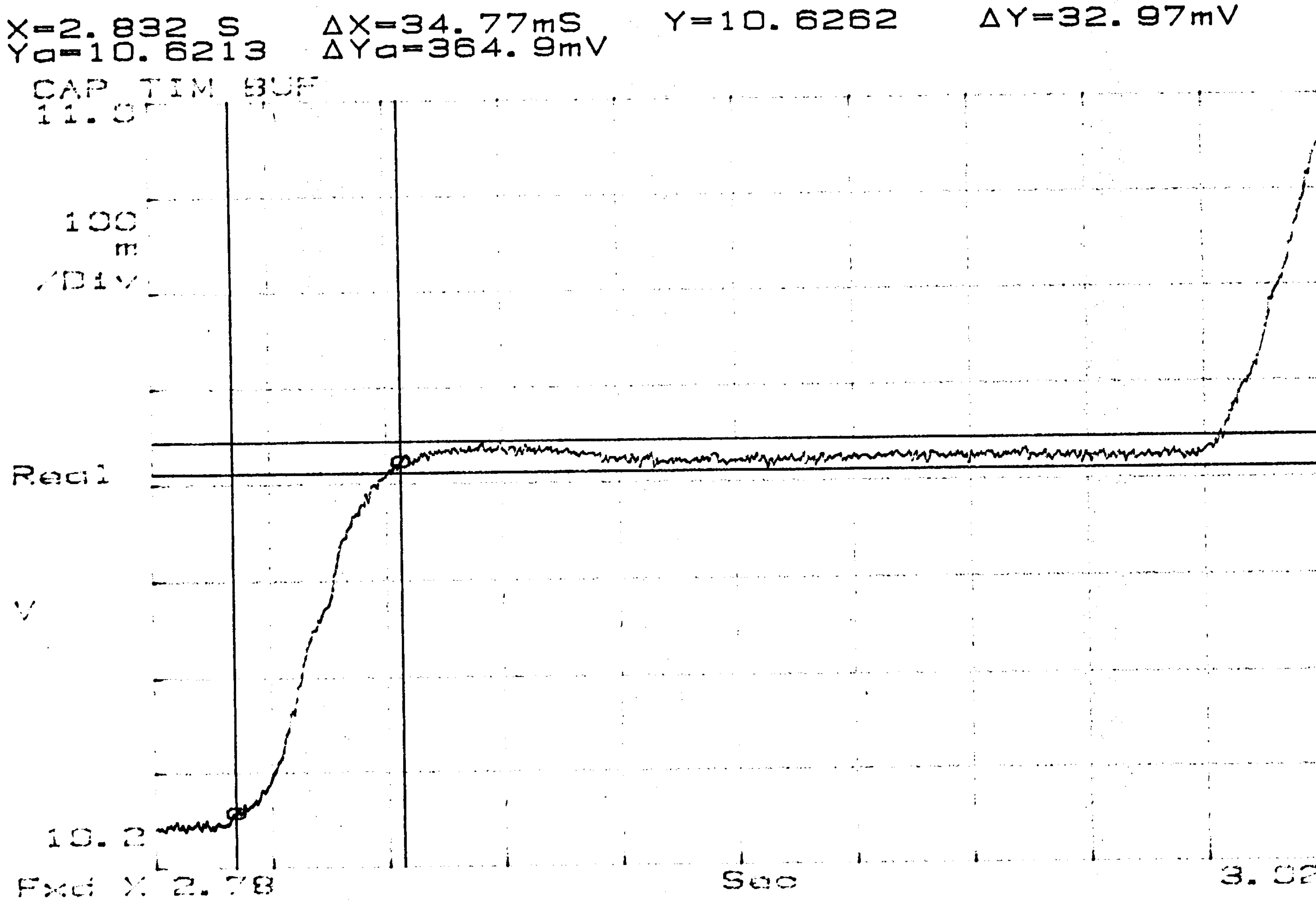
B14

METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

TEST ENGINEER: [signature]
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 14-15



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP_FS5

B15

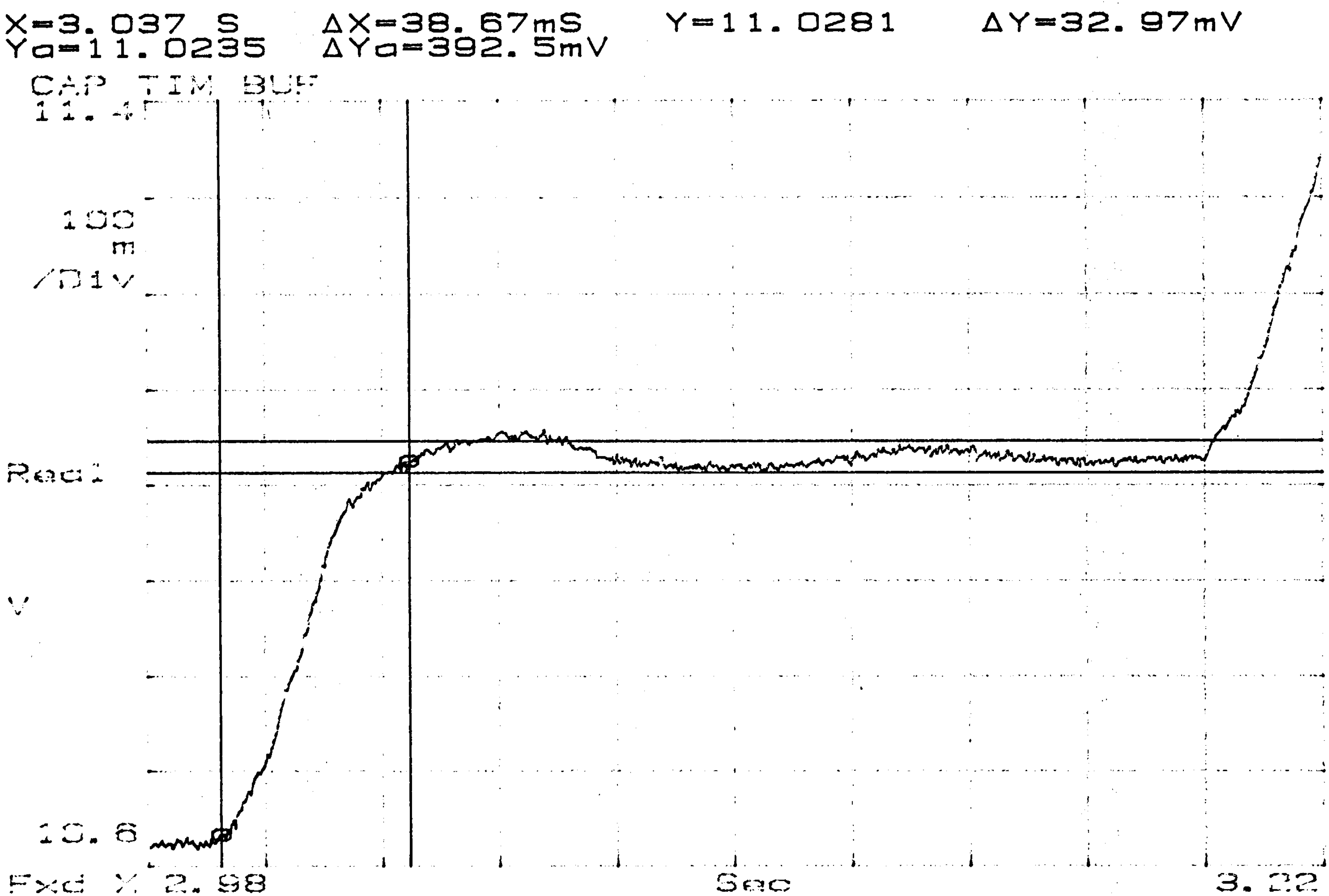
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

7A

TEST ENGINEER: [signature]
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 15-16



S/O: 335166
AE-26002/2D para. 3.4.5.5

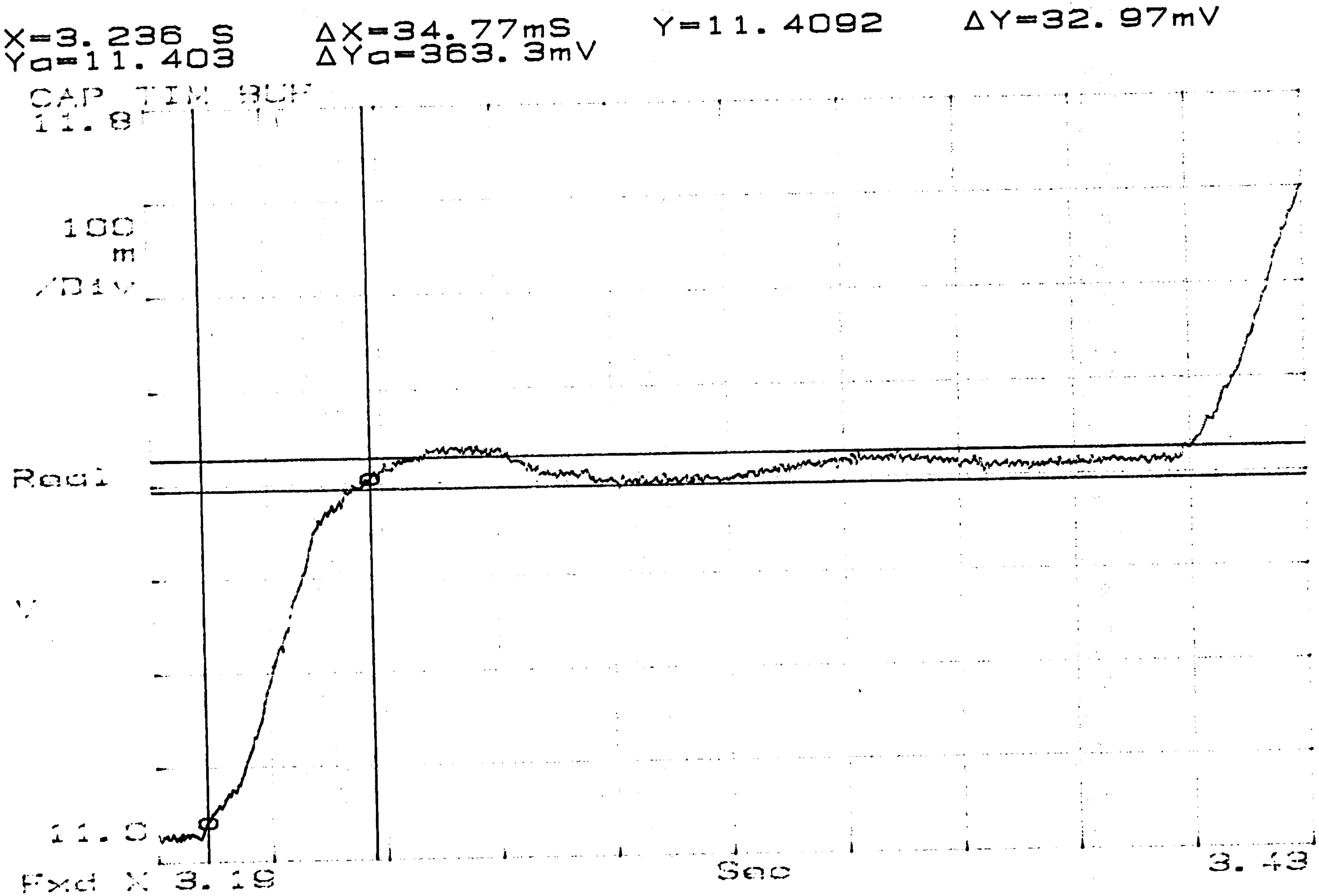
B16

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER: [signature]

SCAN MOTION and JITTER TEST

STEP : 16-17



S/O: 335166
AE-26002/2D para. 3.4.5.5

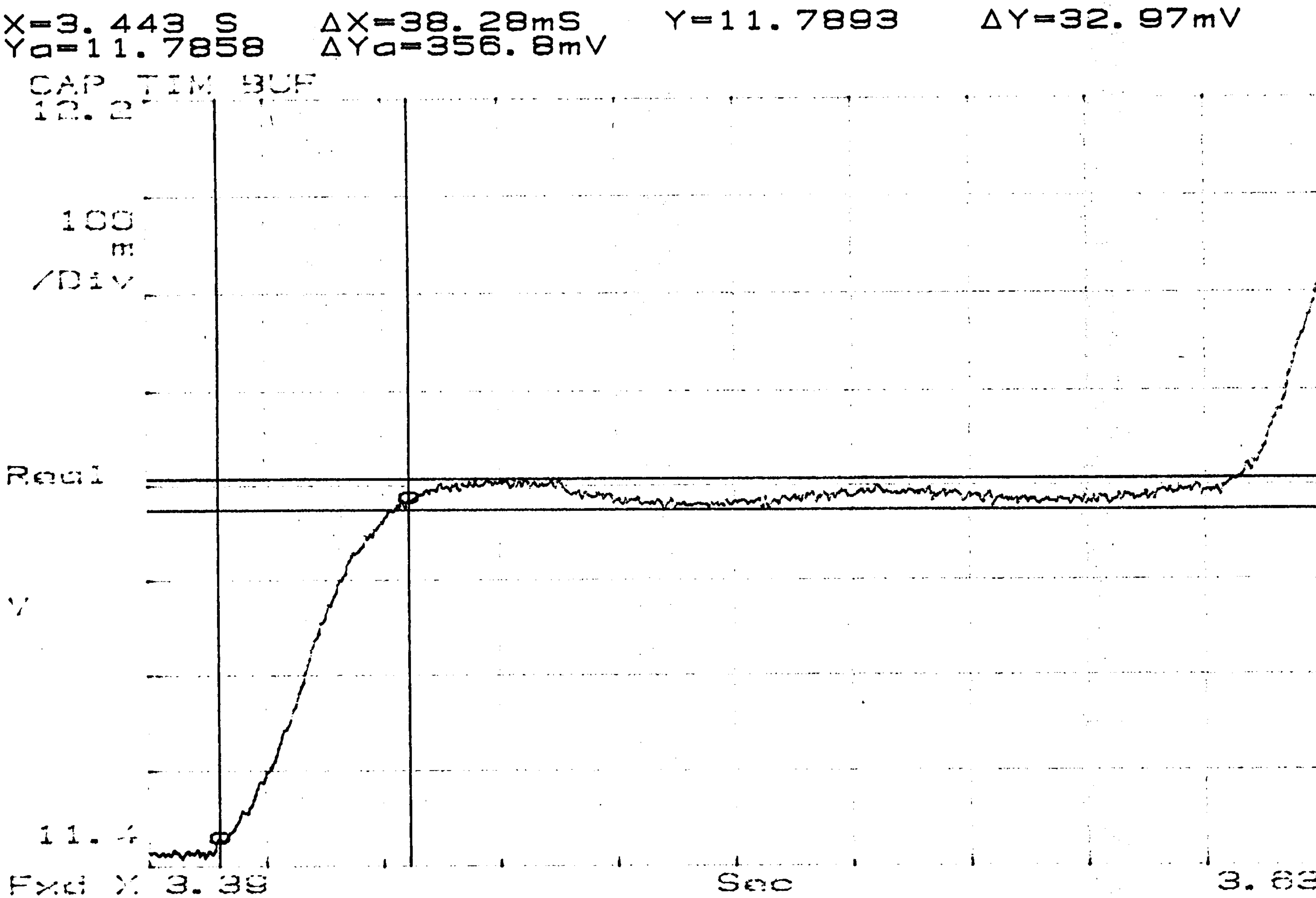
B17

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER:

SCAN MOTION and JITTER TEST

STEP : 17-18



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP_FS5

B18

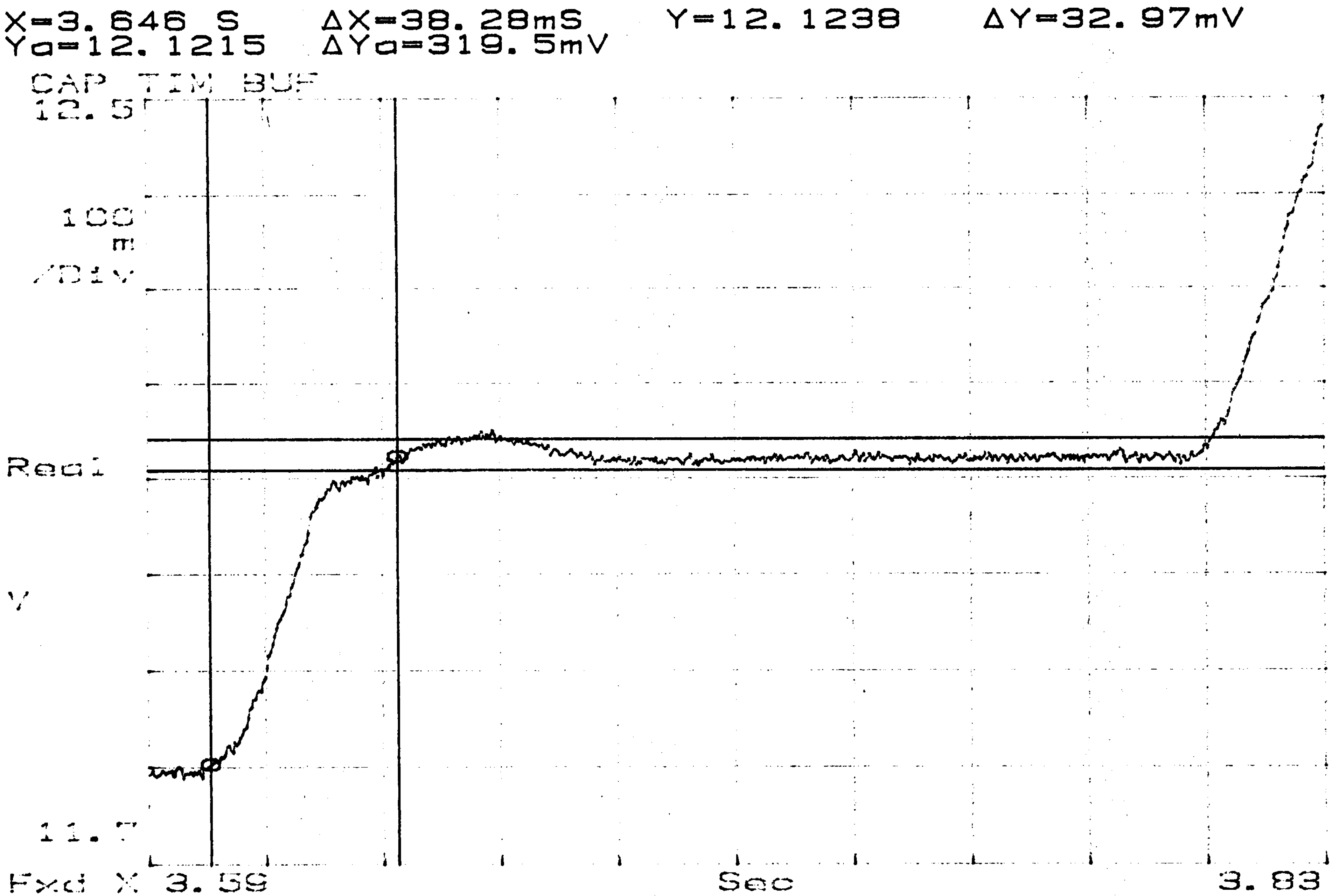
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

7A 268

TEST ENGINEER:
DATE: 27 June 1999

SCAN MOTION and JITTER TEST

STEP : 18-19



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP_FS5

B19

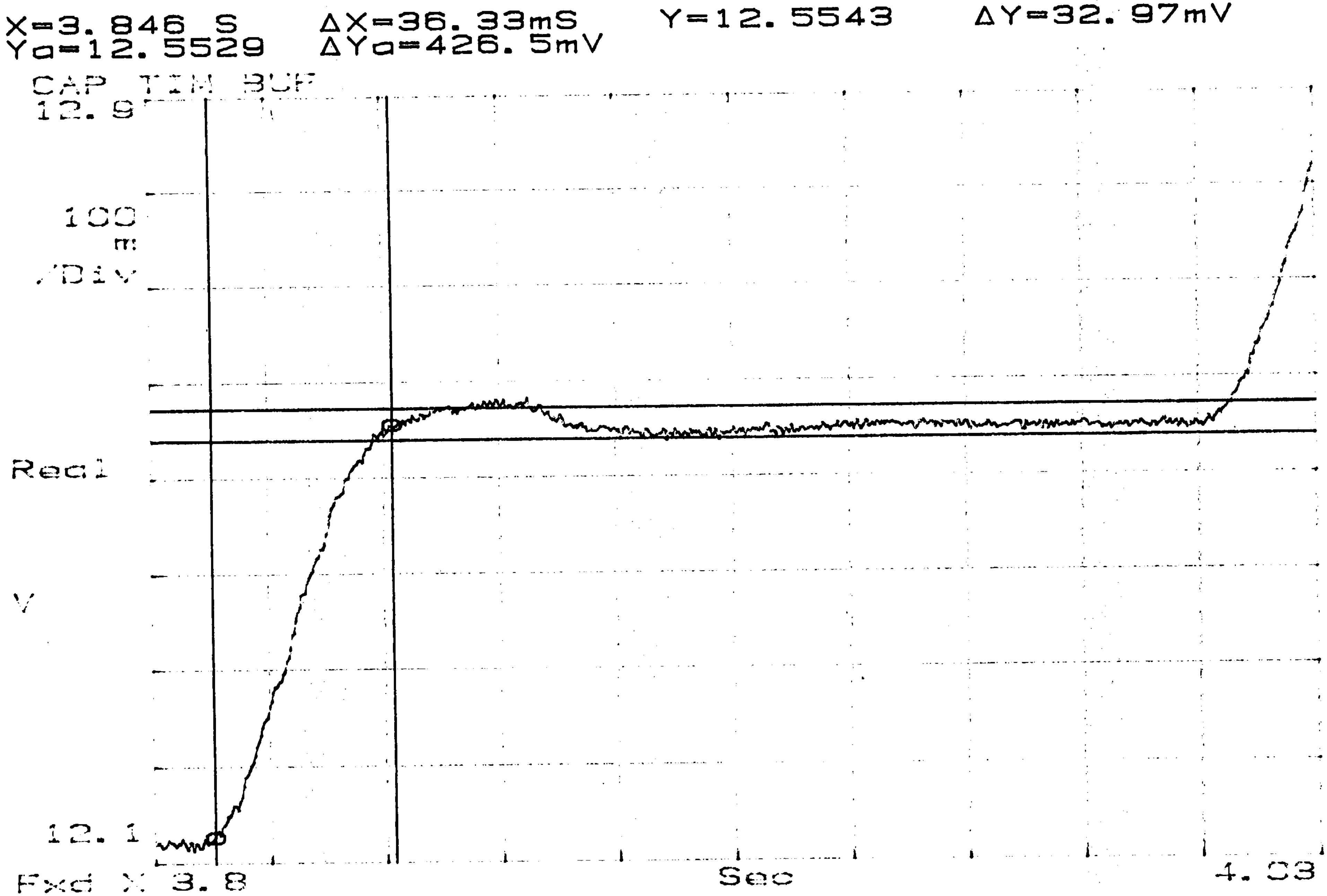
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

7A 260

TEST ENGINEER:
DATE : 27 June 199_

SCAN MOTION and JITTER TEST

STEP : 19-20



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP_FS5

B20

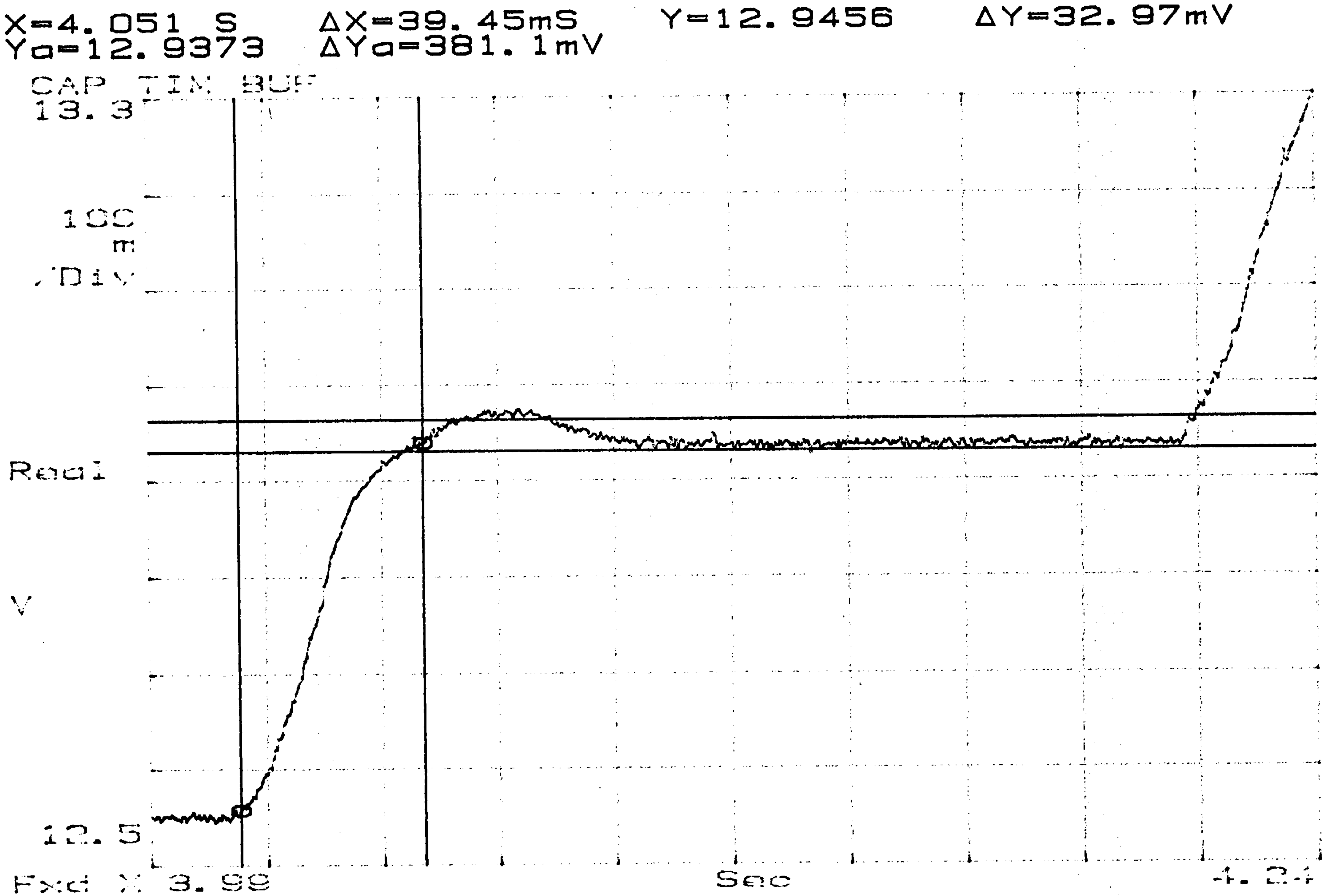
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

Quality · 7A 268

TEST ENGINEER:
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 20-21



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP_FS5

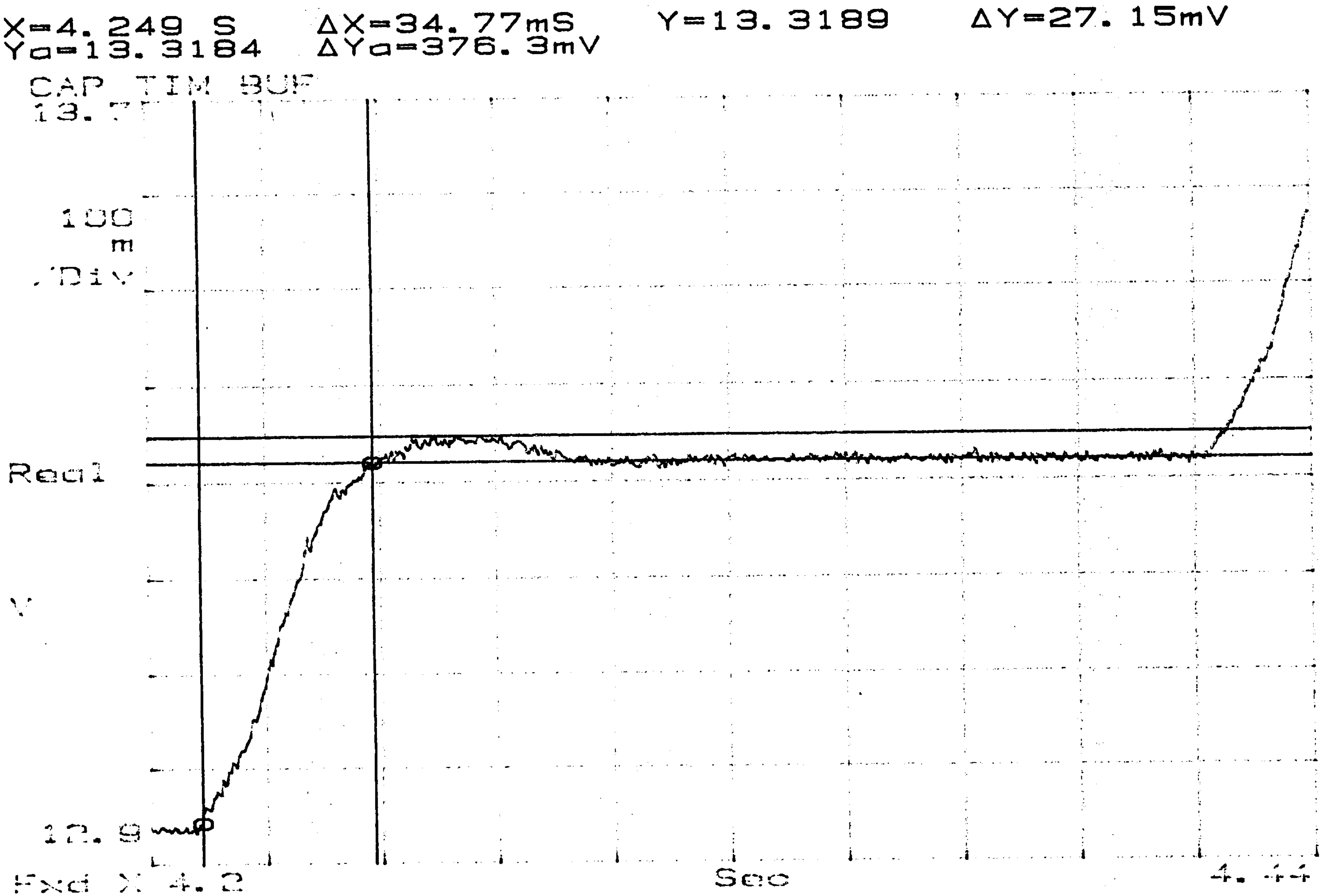
B21

METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

TEST ENGINEER:
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 21-22



S/O: 335166
AE-26002/2D para. 3.4.5.5

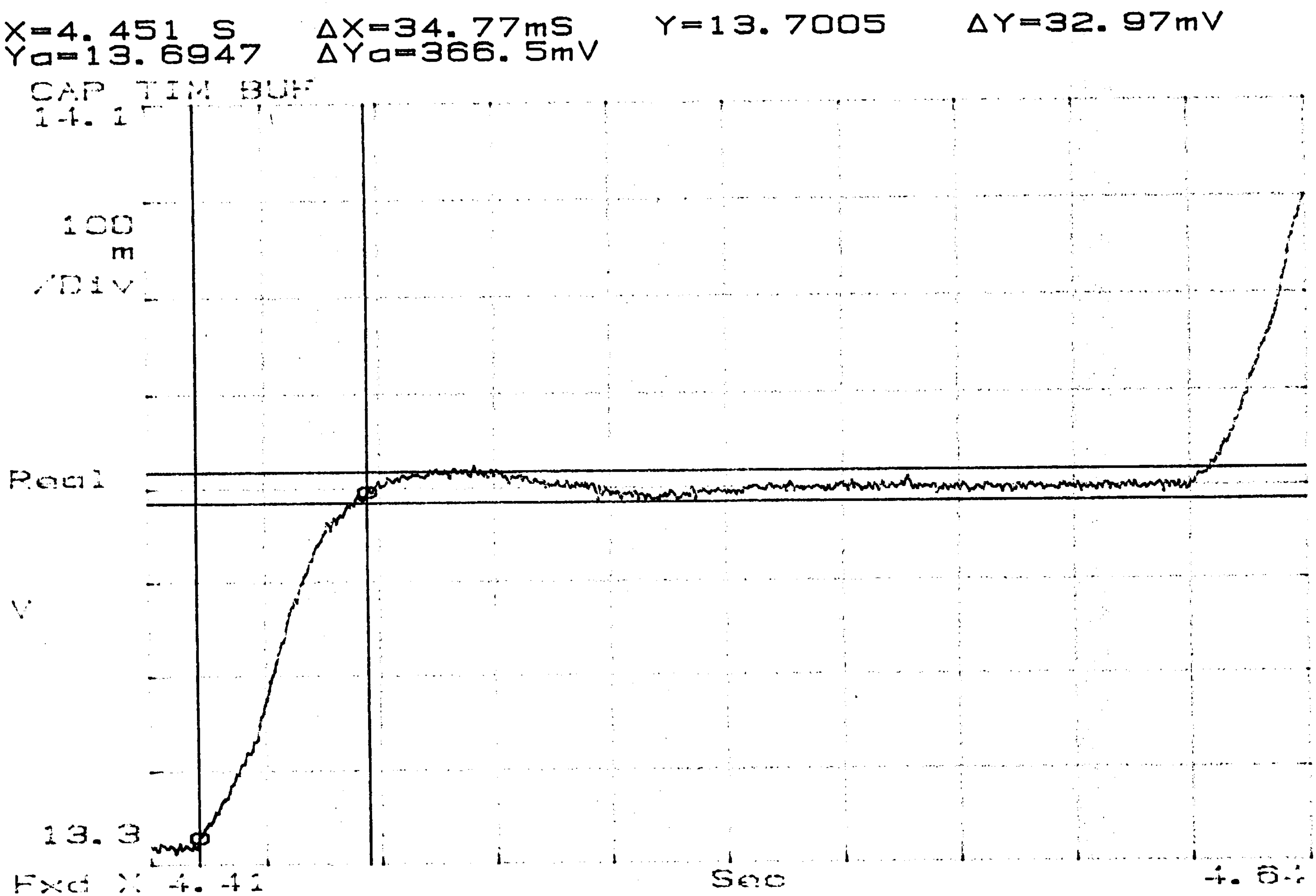
B22

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER:

SCAN MO... and JITTER TEST

STEP : 22-23



S/O: 335166
AE-26002/2D para. 3.4.5.5

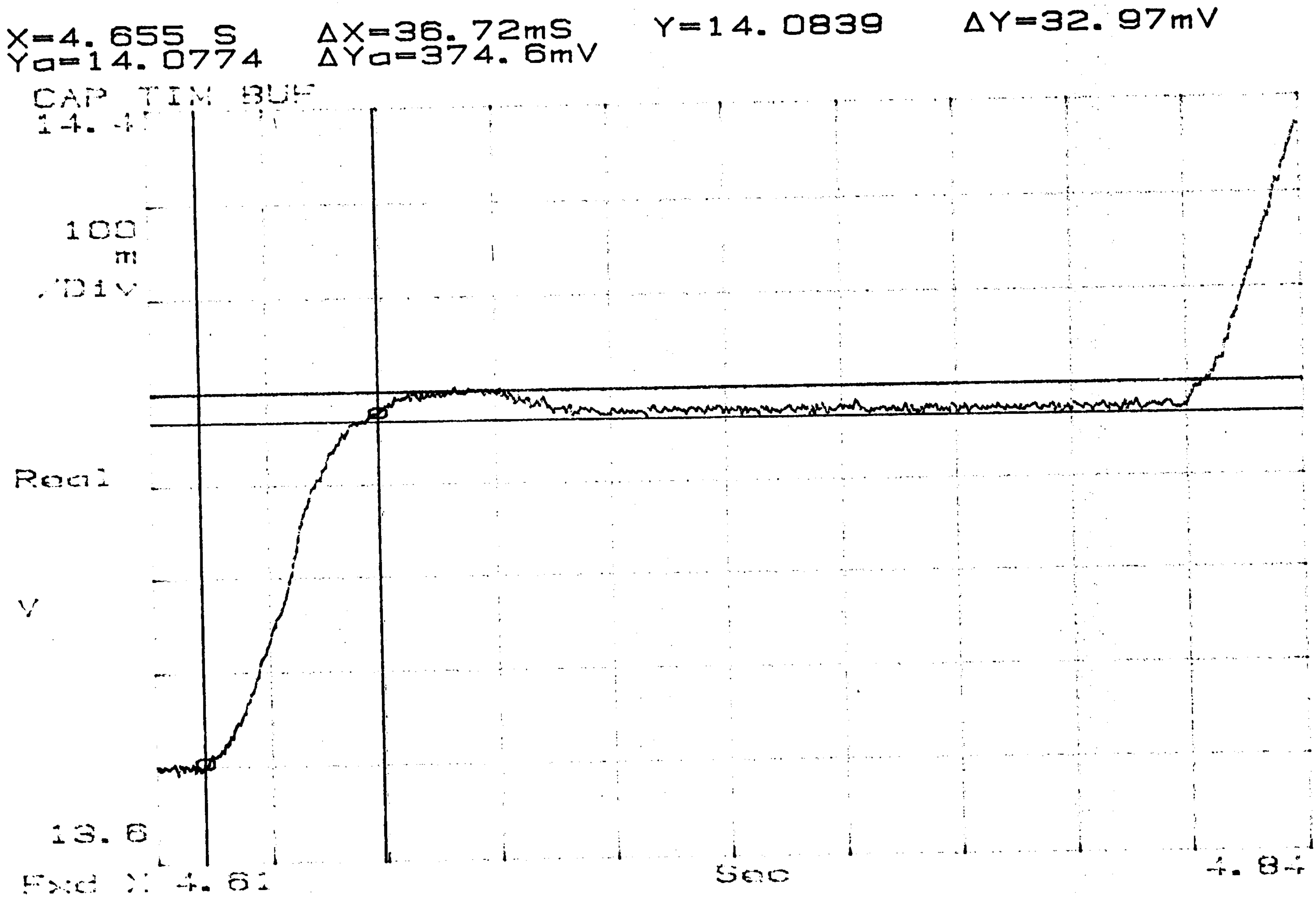
B23

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER:

SCAN MOTION and JITTER TEST

STEP : 23-24



S/O: 335166
AE-26002/2D para. 3.4.5.5

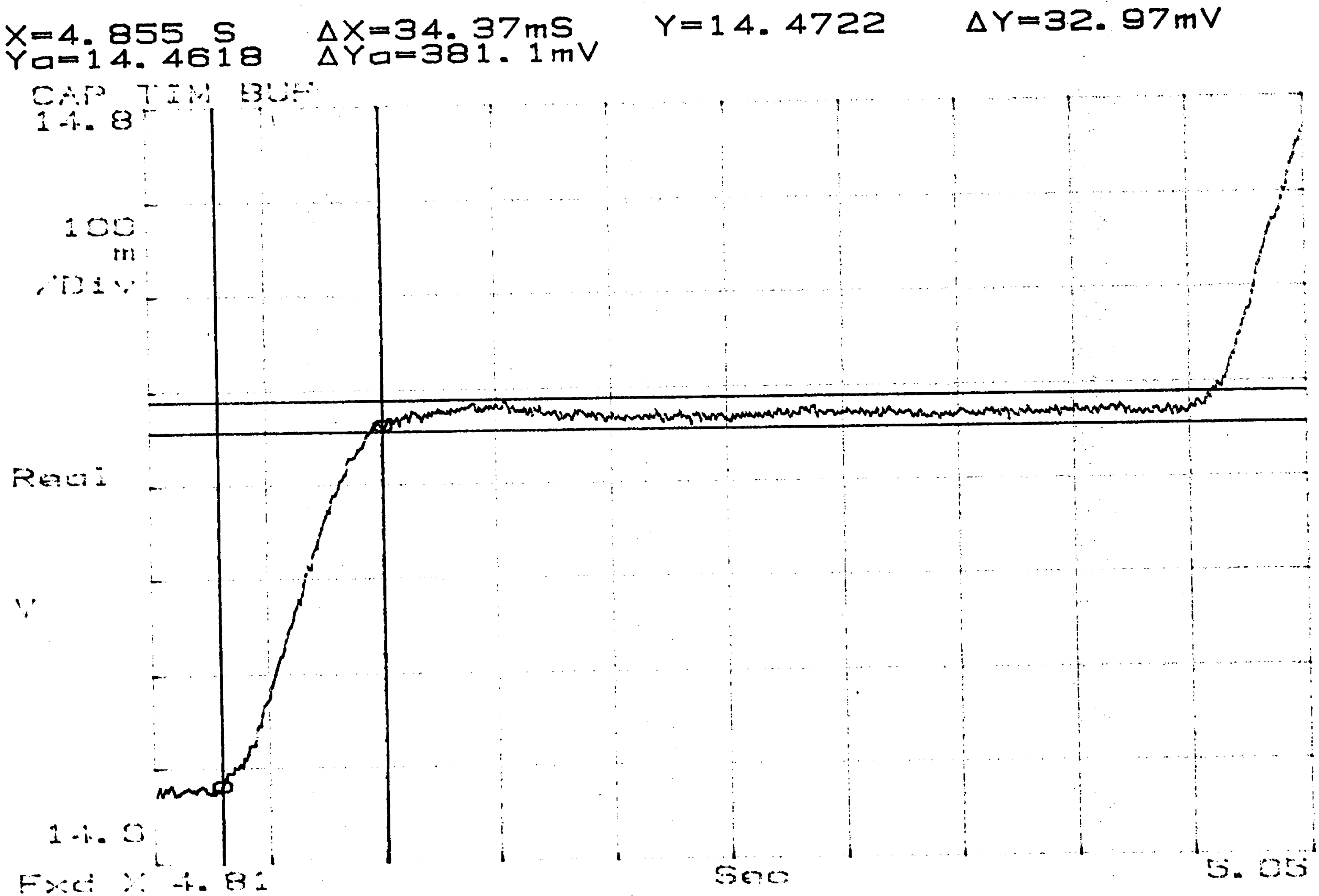
B24

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER:

SCAN MOTION and JITTER TEST

STEP : 24.25



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP_ES5

B25

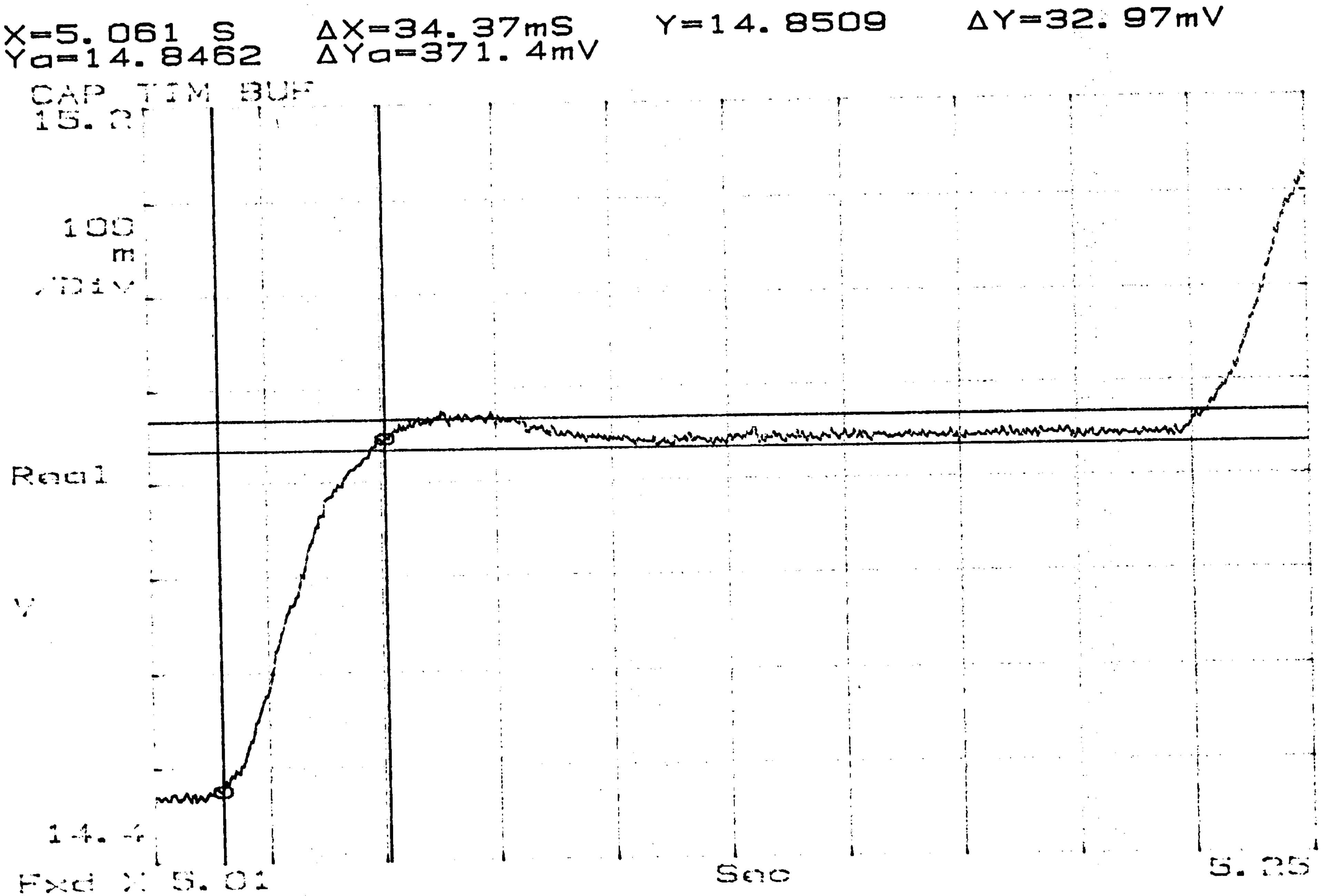
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

TEST ENGINEER:

DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 25-26



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP FS5

B26

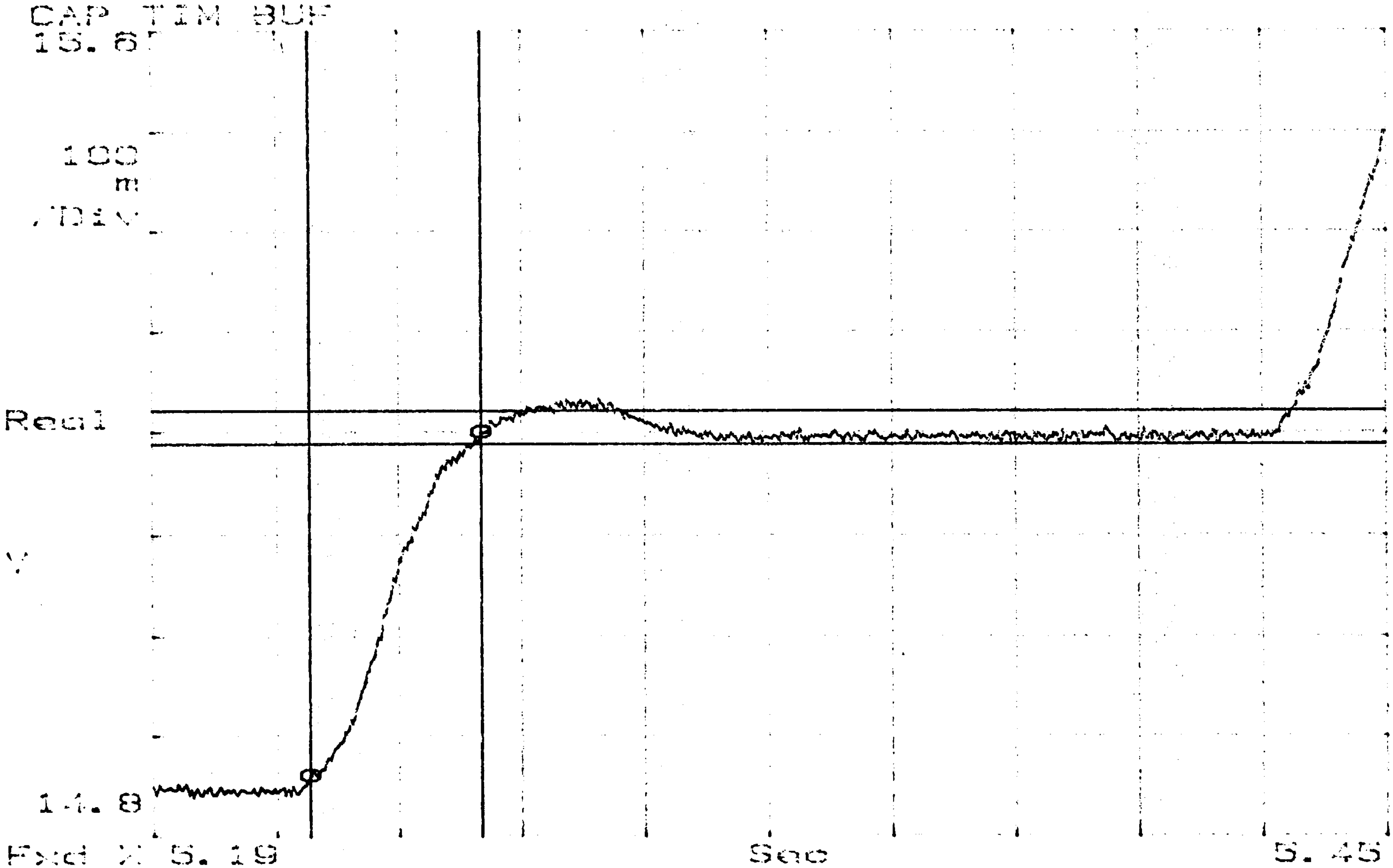
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

7A 268

TEST ENGINEER:
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 26-27



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP FS5

B27

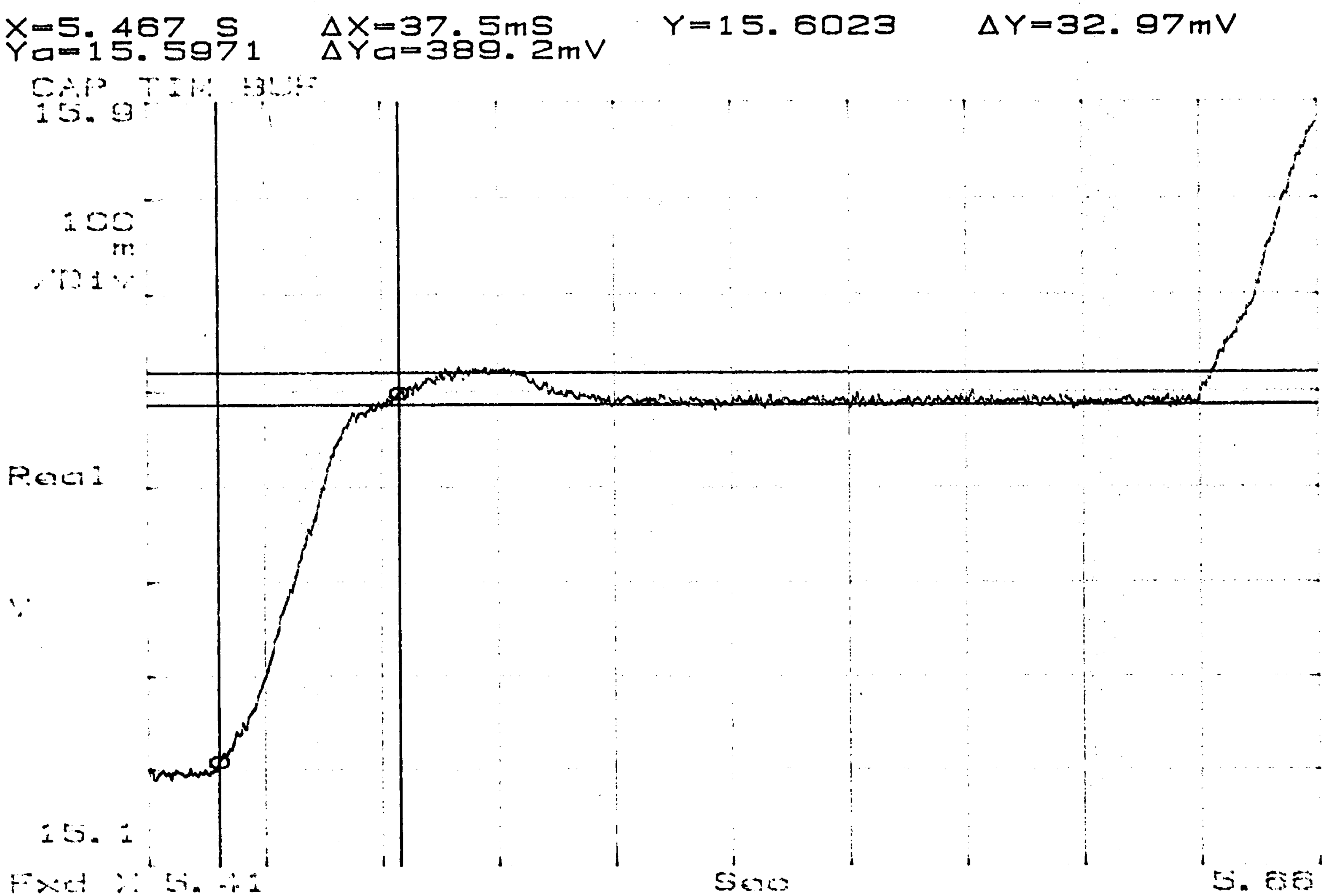
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

Quality 7A 268

TEST ENGINEER: [signature]
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 27-28



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP FS5

B28

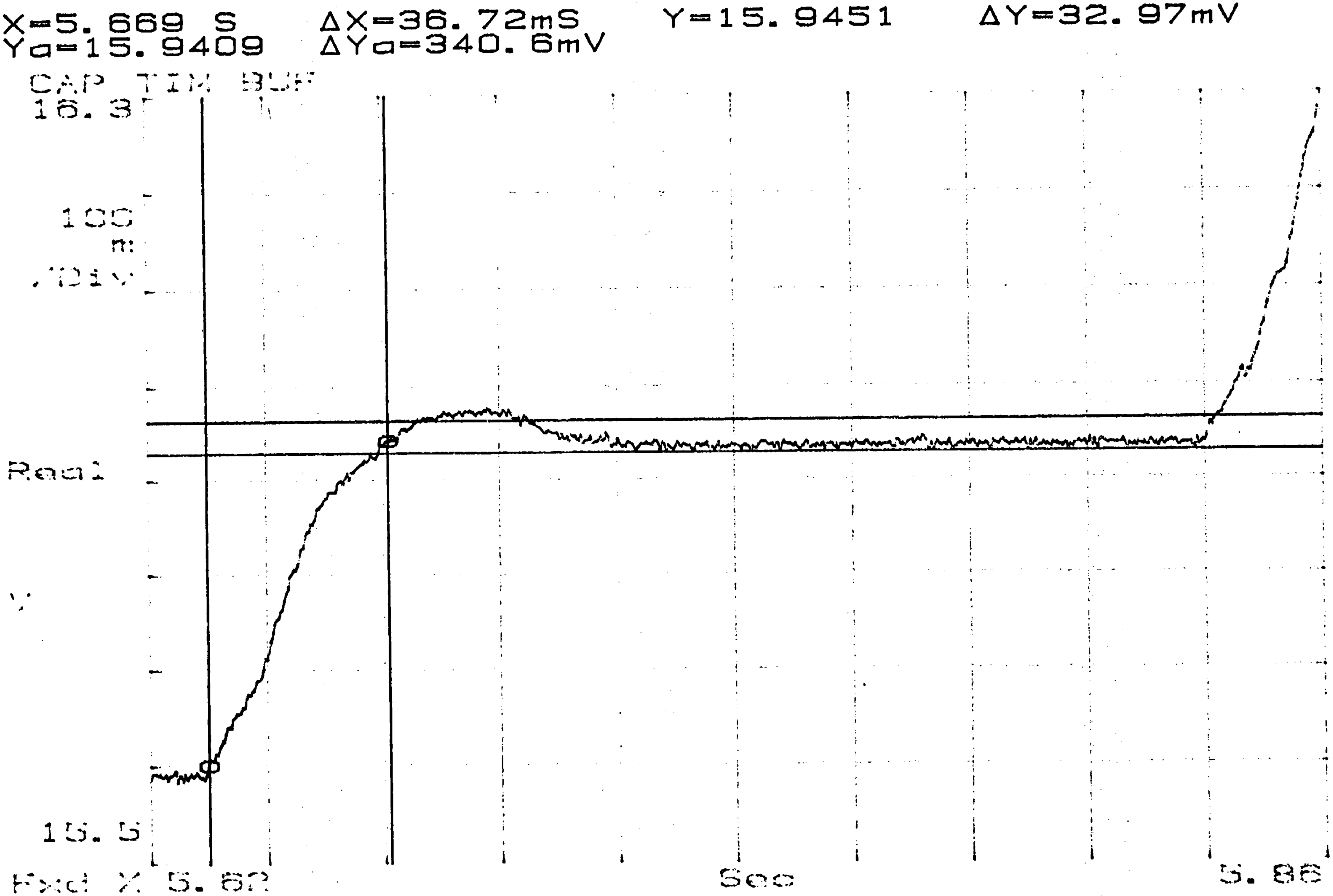
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

7A 268

TEST ENGINEER:
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : 28-29



S/O: 335166
AE-26002/2D para. 3.4.5.5

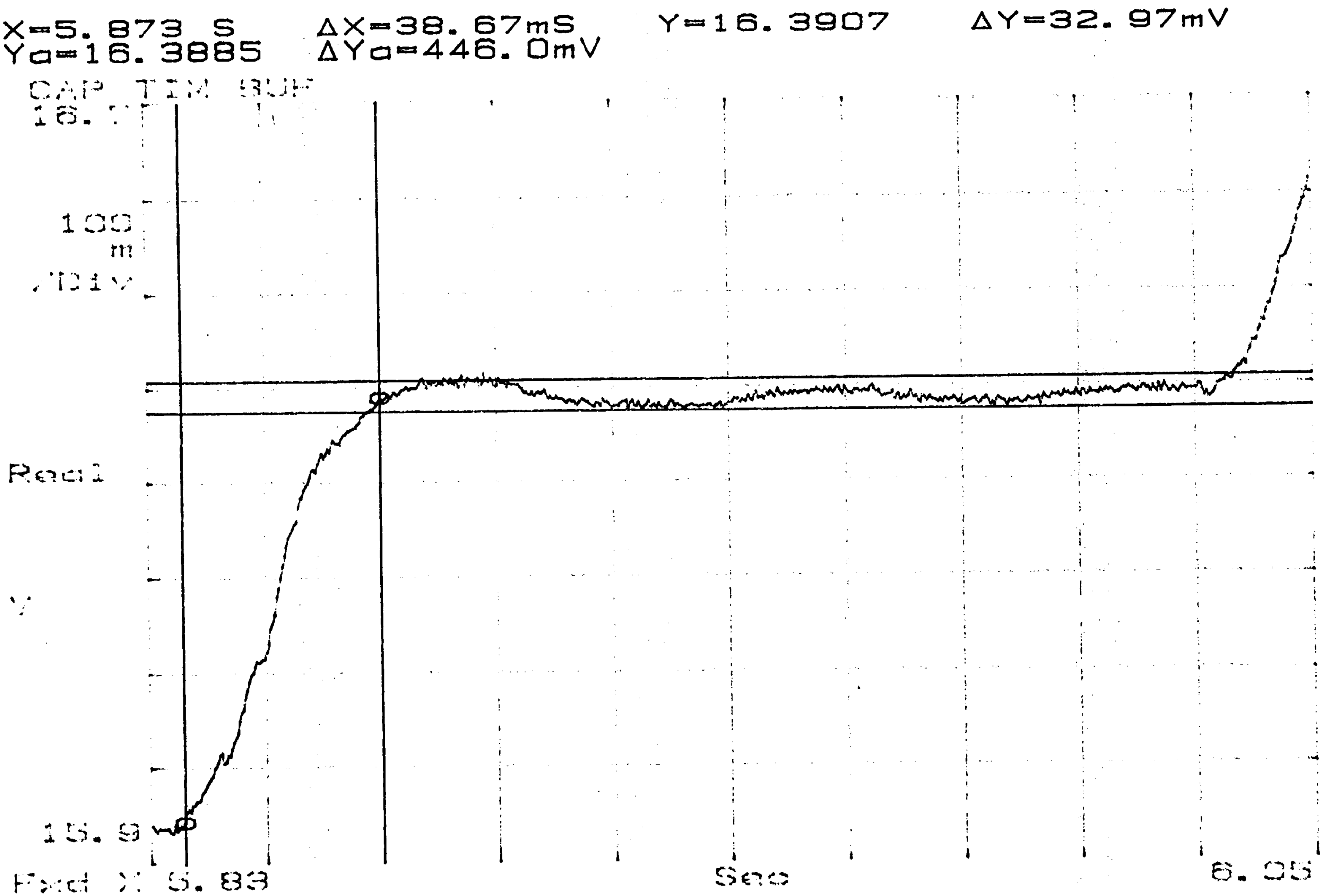
B29

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER:

SCAN MOTION and JITTER TEST

STEP : 29-30



S/O: 335166
AE-26002/2D para. 3.4.5.5

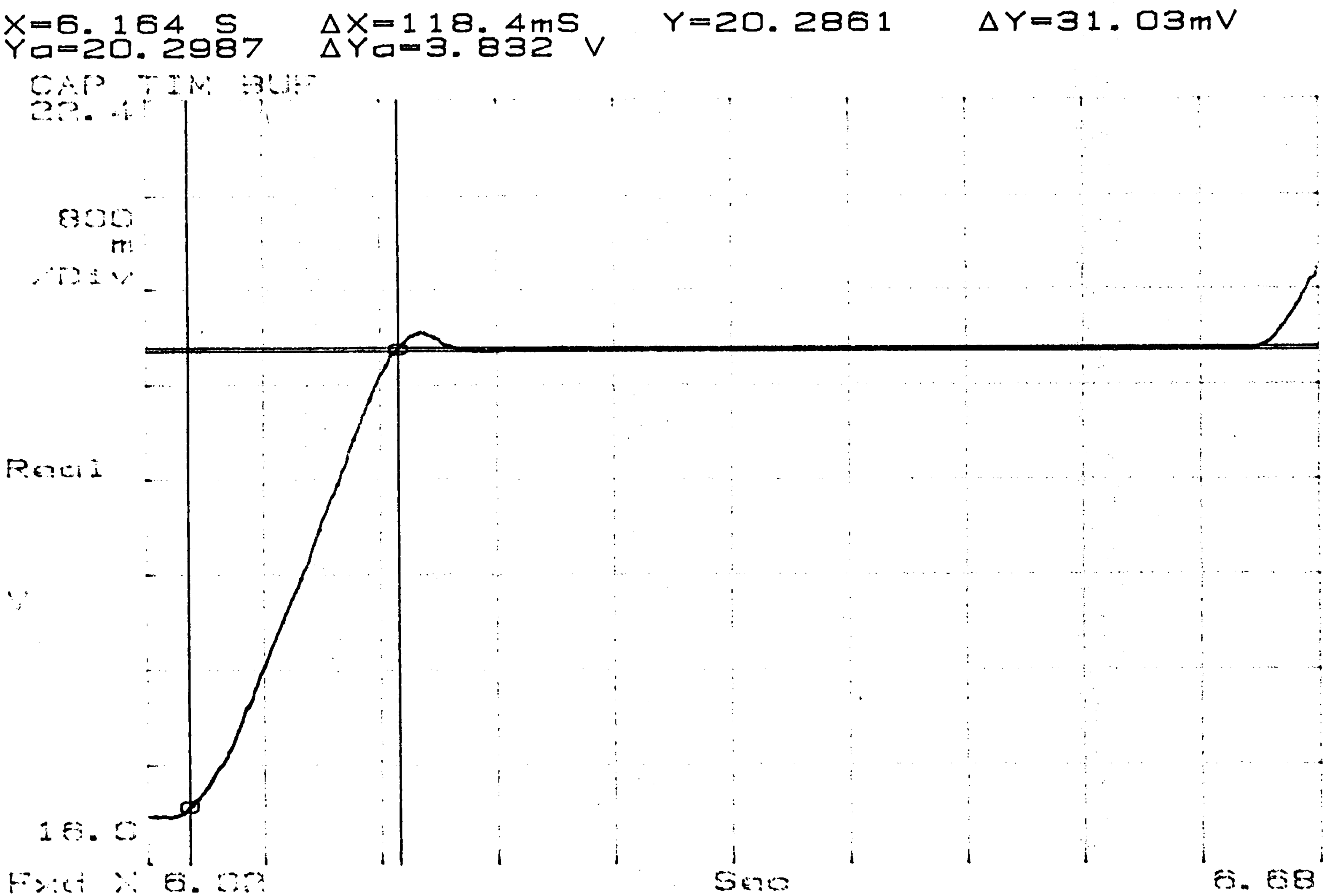
B30

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER:

SCAN MOTION and JITTER TEST

STEP : 30-COLD



S/O: 335166
AE-26002/2D para. 3.4.5.5

B31

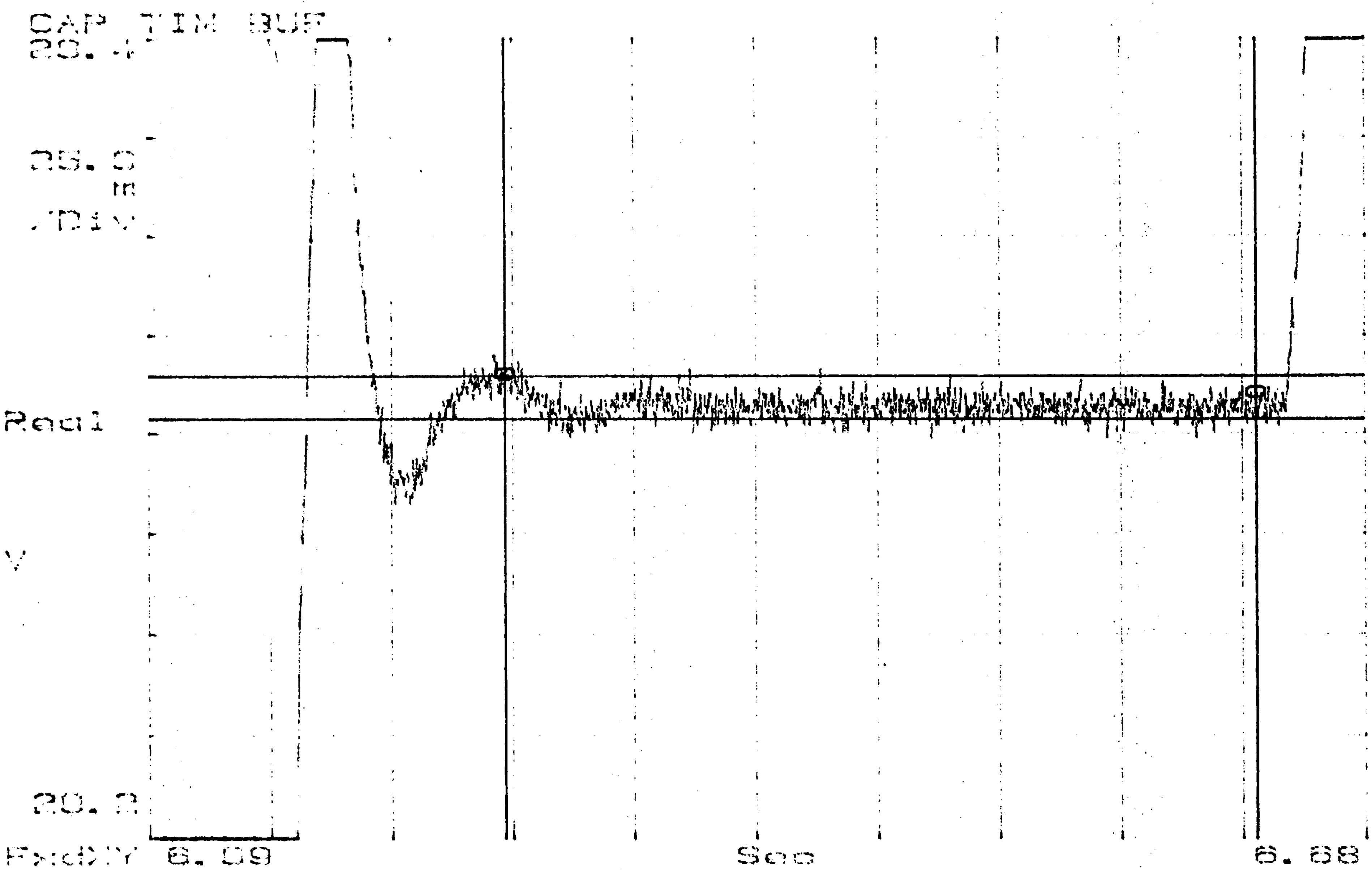
METSAT AMSU-A2
P/N: 1331200-2-IT

7A TEST ENGINEER:

SCAN MOTION and JITTER TEST

STEP : COLD CAL JITTER

X=6.631 S   ΔX=370.3mS   Y=20.3145   ΔY=11.15mV
Ya=20.3101   ΔYa=4.868mV



S/O: 335166
AE-26002/2D para. 3.4.5.5

B32

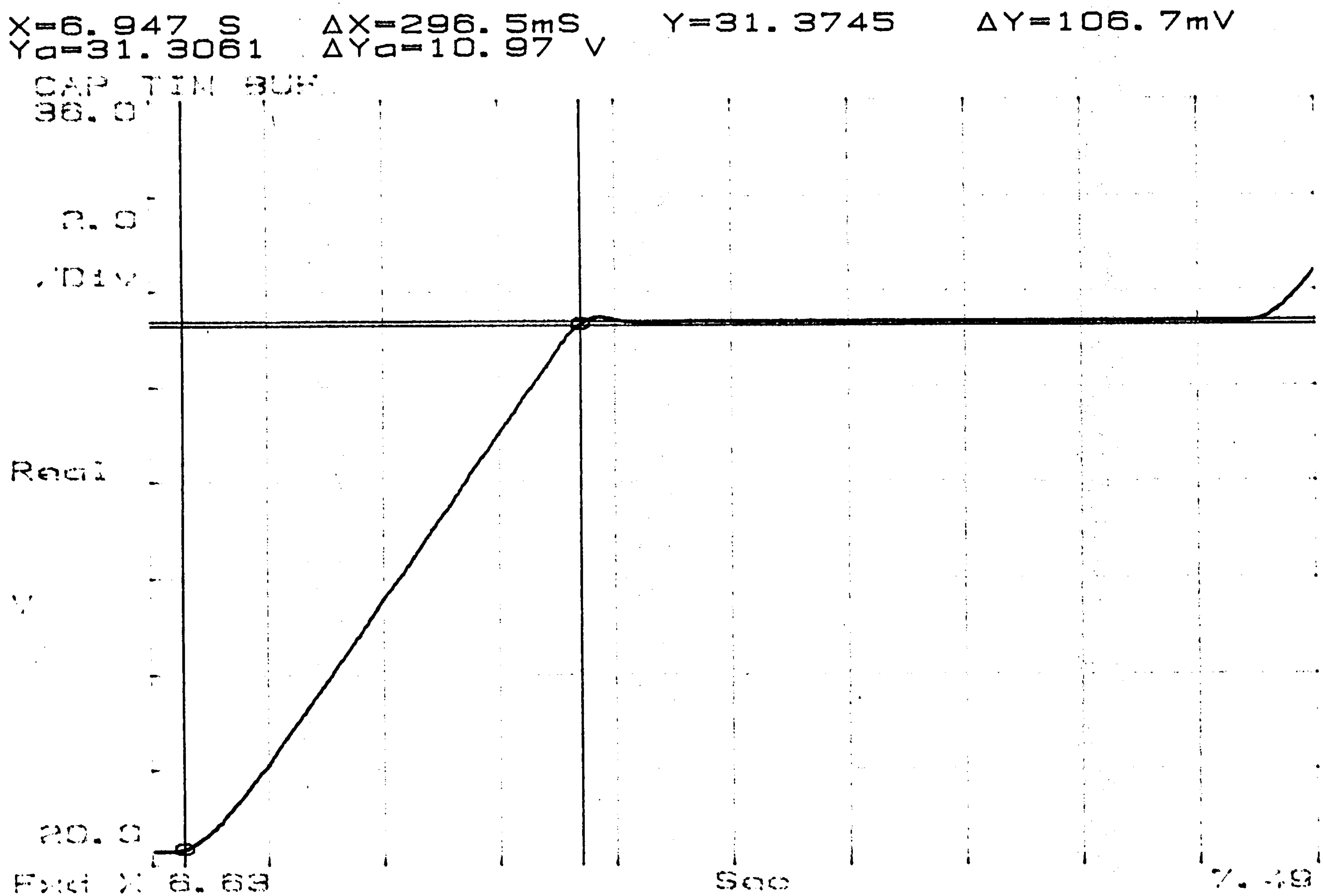
METSAT AMSU-A2
P/N: 1331200-2-IT

7A 268

TEST ENGINEER: [signature]

SCAN MOTION and JITTER TEST

STEP : COLD – WARM – SLEW



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE ZAP FS

B33

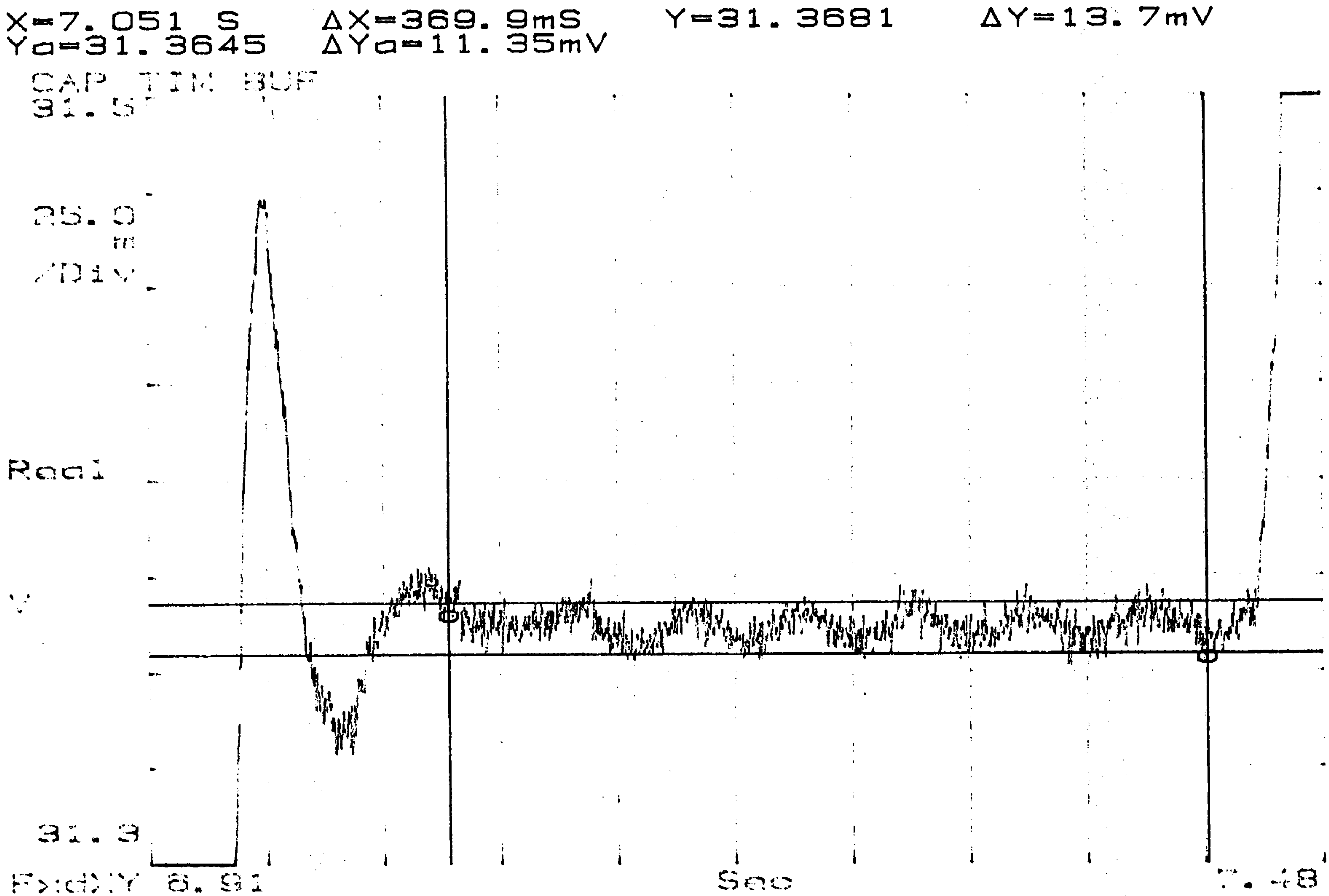
METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

Quality 7A 288

TEST ENGINEER: [signature]
DATE : 27 June 1998

SCAN MOTION and JITTER TEST

STEP : WARM CAL JITTER



S/O: 335166
AE-26002/2D para. 3.4.5.5
FILE: 7AP FS5

B34

METSAT AMSU-A2
P/N: 1331200-2-IT
S/N: 106

Quality: 7A 200

TEST ENGINEER:
DATE : 27 June 1998

TEST DATA SHEET 7 (SHEET 1 OF 4)
3.4.5.5: Scan Motion and Jitter Test

Test Setup Verified: Ray Hufberg
Signature

Shop Order No. 335166

NDO = NO DISCERNIBLE OVERSHOOT

Step No.	Description	Requirement	Test Result	Pass/Fail
7	--	Stepping Slewing <8 sec period per Figure 25	7.8 SEC	PASS
9	Scene 1-2 3.33° step	<42 msec rise time per Figure 26	31.6 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.4% NDO	
10	Scene 2-3 3.33° step	<42 msec rise time per Figure 26	39.1 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.8% .7%	
11	Scene 3-4 3.33° step	<42 msec rise time per Figure 26	38.3 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 3.7% .9%	
12	Scene 4-5 3.33° step	<42 msec rise time per Figure 26	37.1 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.4% NDO	
13	Scene 5-6 3.33° step	<42 msec rise time per Figure 26	36.7 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.3% NDO	
14	Scene 6-7 3.33° step	<42 msec rise time per Figure 26	37.5 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.5% NDO	
15	Scene 7-8 3.33° step	<42 msec rise time per Figure 26	39.1 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 3.1% 1.4%	
16	Scene 8-9 3.33° step	<42 msec rise time per Figure 26	39.8 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.8% NDO	PASS

Pass = P
Fail = F

FCR NO: SHEET OF

TEST DATA SHEET 7 (SHEET 2 OF 4)
3.4.5.5: Scan Motion and Jitter Test

NDO = NO DISCERNIBLE OVERSHOOT

Step No.	Description	Requirement	Test Result	Pass/Fail
17	Scene 9-10 3.33° step	<42 msec rise time per Figure 26	36.3 ms	PASS
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.6% NDO	
18	Scene 10-11 3.33° step	<42 msec rise time per Figure 26	37.9 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.2% NDO	
19	Scene 11-12 3.33° step	<42 msec rise time per Figure 26	34.8 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.0% NDO	
20	Scene 12-13 3.33° step	<42 msec rise time per Figure 26	33.6 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.0% NDO	
21	Scene 13-14 3.33° step	<42 msec rise time per Figure 26	35.9 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.1% NDO	
22	Scene 14-15 3.33° step	<42 msec rise time per Figure 26	34.8 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± .7% NDO	
23	Scene 15-16 3.33° step	<42 msec rise time per Figure 26	38.7 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 3.0 NDO	
24	Scene 16-17 3.33° step	<42 msec rise time per Figure 26	34.8 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 3.2% 1.1%	PASS

Pass = P
Fail = F

B35b

TEST DATA SHEET 7 (SHEET 3 OF 4)
3.4.5.5: Scan Motion and Jitter Test

NDO = NO DISCERNIBLE OVERSHOOT

Step No.	Description	Requirement	Test Result	Pass/Fail
25	Scene 17-18 3.33° step	<42 msec rise time per Figure 26	38.3 ms	PASS
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.1% NDO	
26	Scene 18-19 3.33° step	<42 msec rise time per Figure 26	38.3 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±.9% NDO	
27	Scene 19-20 3.33° step	<42 msec rise time per Figure 26	36.3 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.4% NDO	
28	Scene 20-21 3.33° step	<42 msec rise time per Figure 26	39.4 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±.4% .3%	
29	Scene 21-22 3.33° step	<42 msec rise time per Figure 26	34.8 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±.7% NDO	
30	Scene 22-23 3.33° step	<42 msec rise time per Figure 26	34.8 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.5% NDO	
31	Scene 23-24 3.33° step	<42 msec rise time per Figure 26	36.7 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±.6% NDO	
32	Scene 24-25 3.33° step	<42 msec rise time per Figure 26	34.4 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±.7% NDO	PASS

Pass = P
Fail = F

B35c

SHEET ___ OF ___
ECR NO. ___

TEST DATA SHEET 7 (SHEET 4 OF 4)

7/30/98 AMSU 2 SEIT **3.4.~~4~~5.5: Scan Motion and Jitter Test**

NDO = NO DISCERNIBLE OVERSHOOT

Step No.	Description	Requirement	Test Result	Pass/Fail
33	Scene 25-26 3.33° step	<42 msec rise time per Figure 26	34.4 ms	PASS
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±.8% NDO	
34	Scene 26-27 3.33° step	<42 msec rise time per Figure 26	35.9 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±.9% .6%	
35	Scene 27-28 3.33° step	<42 msec rise time per Figure 26	37.5 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±.5% NDO	
36	Scene 28-29 3.33° step	<42 msec rise time per Figure 26	36.7 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±.6% .9%	
37	Scene 29-30 3.33° step	<42 msec rise time per Figure 26	38.7 ms	
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	±2.4% NDO	
38	Scene 30-Cold Cal 35.0° slew	<0.21 sec slew time per Figure 29	.118 SEC	
		< ±5% jitter per Figure 30	±.056°	
39	Cold Cal - Warm Cal 96.67° slew	<0.40 sec slew time per Figure 31	.296 SEC	
		< ±5% jitter per Figure 32	±.069°	PASS

Pass = P
Fail = F

Unit: METSAT AMSU-A2

Serial No.: 106

Date: 6/27/98

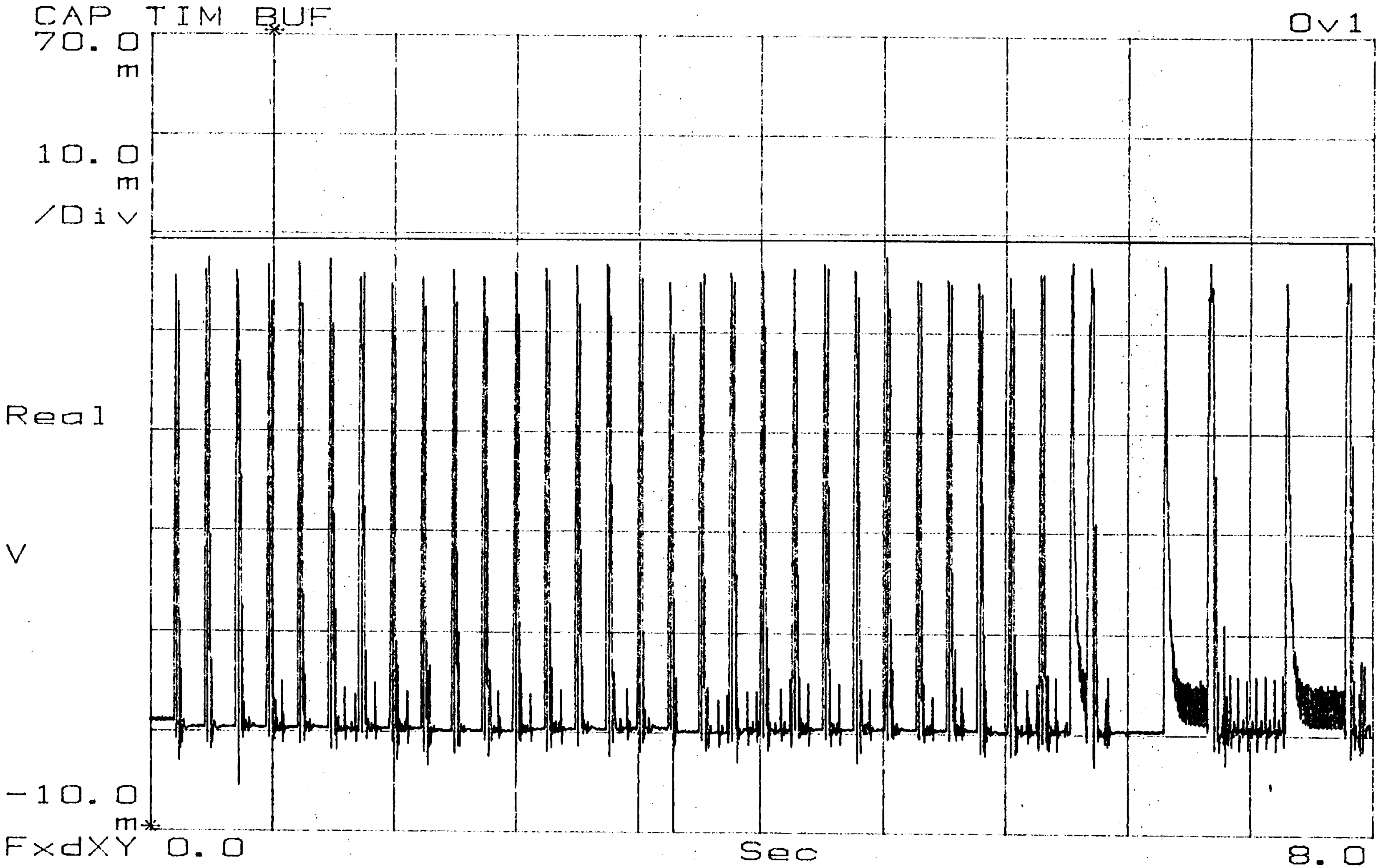
Test Engineer: [signature]

Quality Assurance: [signature]

Customer Representative: [signature] DCMC 9/21/98

B35d

Y=49.2485mV



PART NUMBER: 1331200-2-IT
UNIT: METSAT A2
S/N: 106

C1

Test Eng: [signature] 260 Date: 7-30-98 FILE NAME: 14AC_FS
Quality: ______
SHOP ORDER: 335166

TEST DATA SHEET 8
3.4.5.6: Pulse Load Bus Current

Test Setup Verified: ____________ Signature   Shop Order No. 335166

3.4.5.6: 28V Bus Peak Current and Rise Time Test

QC 227

Step No.	Requirement	Test Result	Pass/Fail
4	~~≤1~~ <2 A peak any place in the scan	1.9 A	PASS
5	> 70 μsec rise time, 3.33° step	1.95 ms	PASS
6	> 70 μsec rise time, start of WC slew	2.34 ms	Pass
6	> 70 μsec rise time, end of WC slew	3.51 ms	Pass

Pass = P
Fail = F

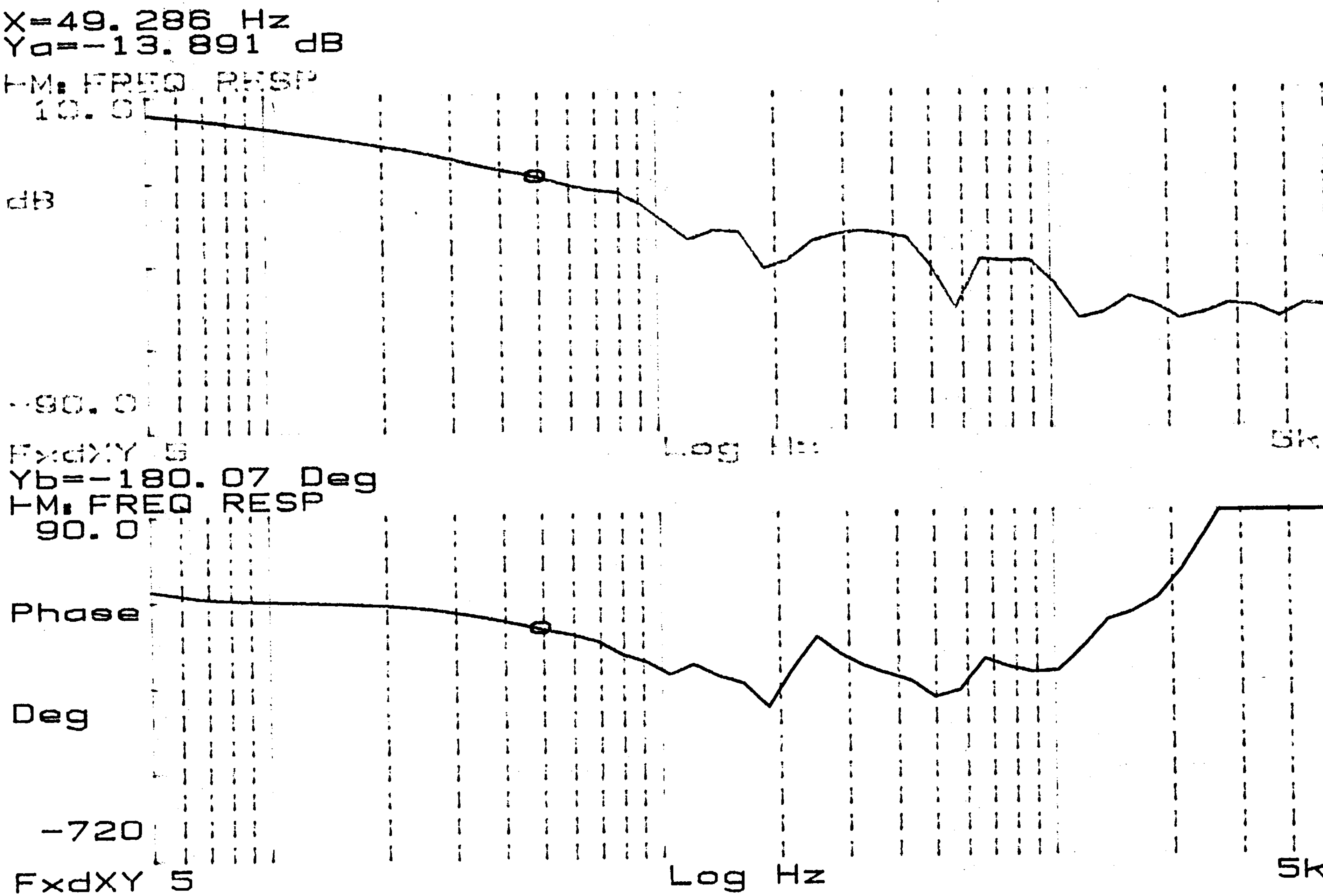
Unit: METSAT AMSU-A2
Serial No.: 106

Test Engineer: ____________
Quality Assurance: ____________
Date: 7/30/98

C2

GAIN and PHASE MARGIN TEST

FILE : 11GP_B11



S/O : 335166

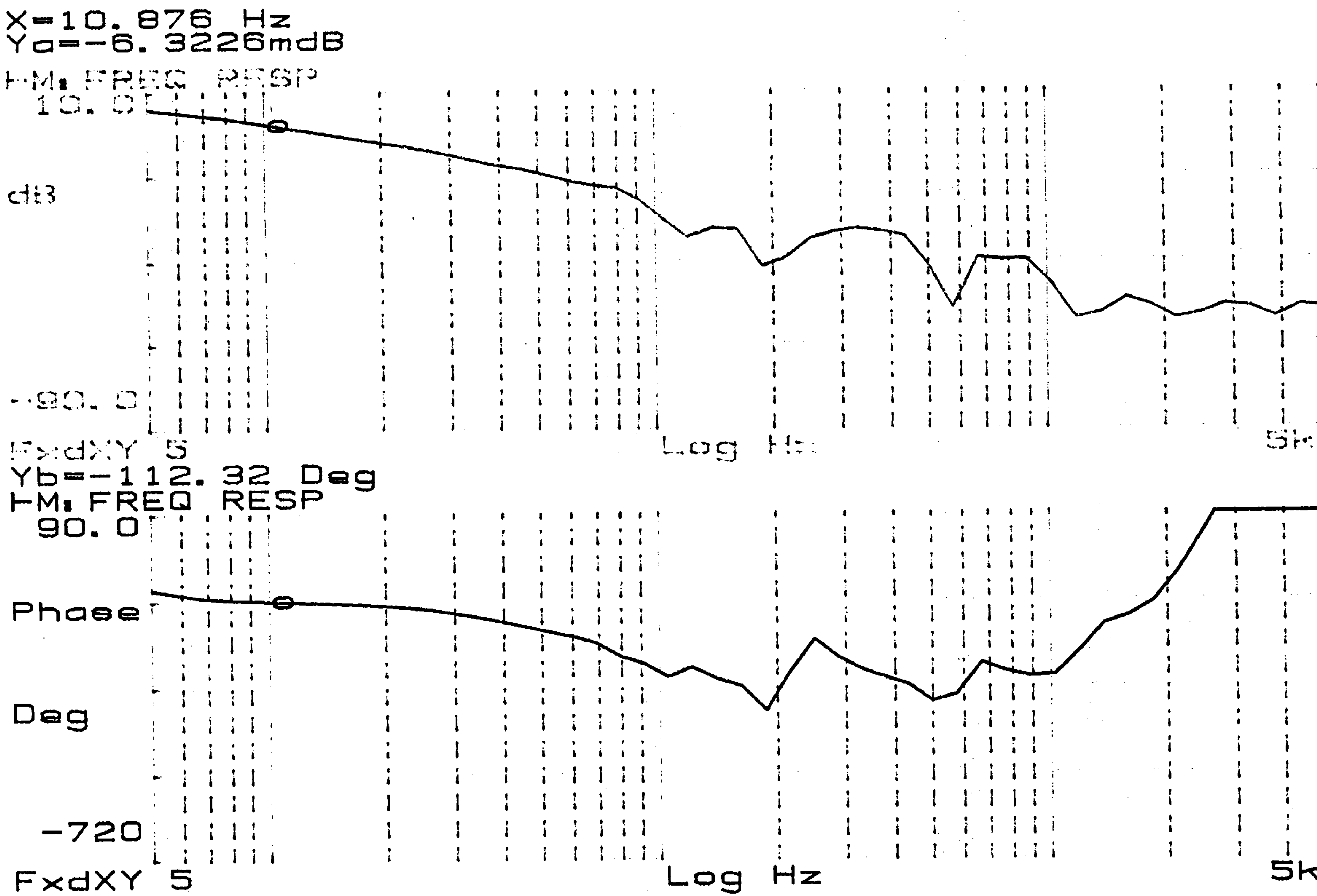
Dla

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER :

GAIN and PHASE MARGIN TEST

FILE : 11GP_B11



S/O : 335166

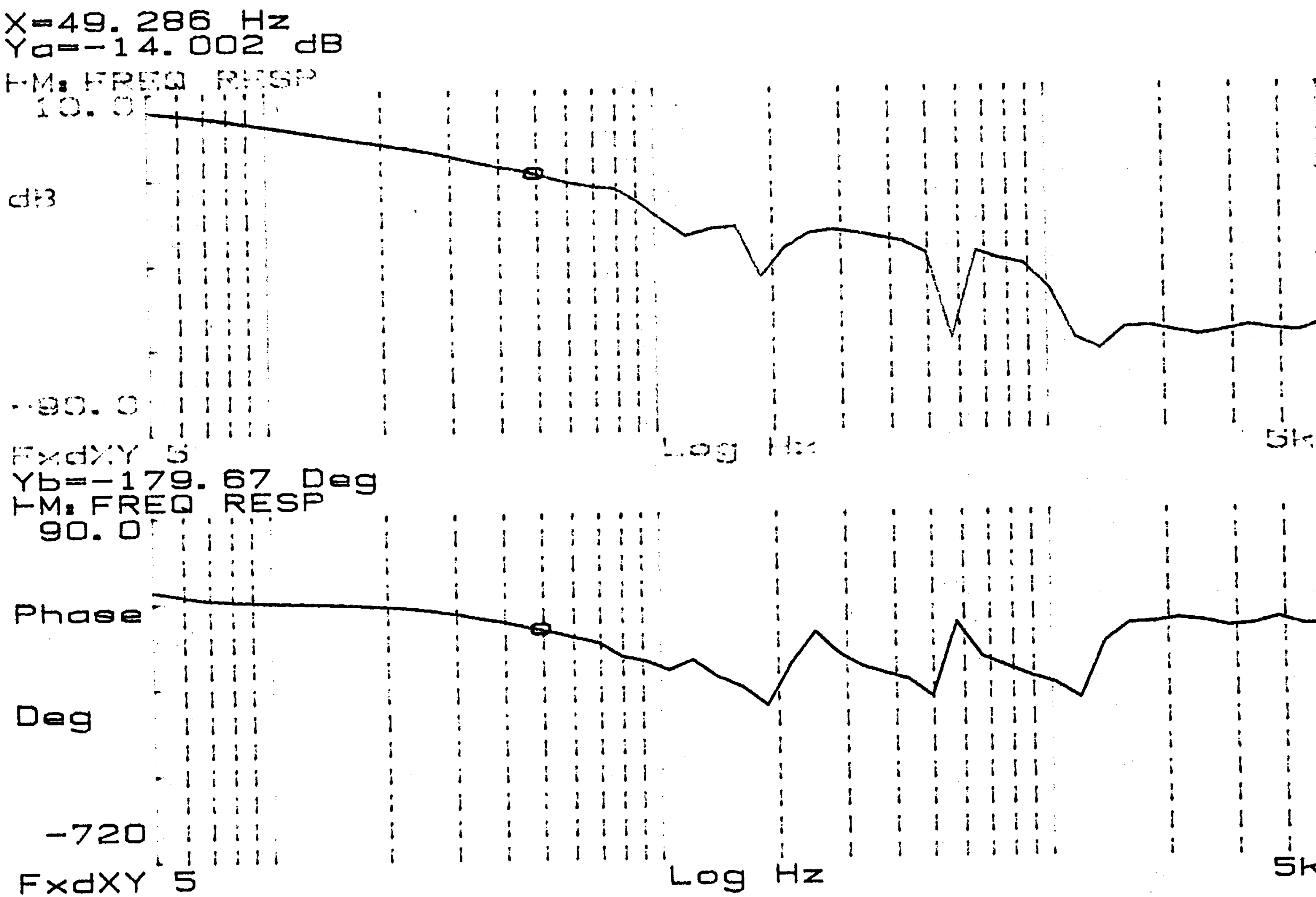
D1b

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER : [signature]

GAIN and PHASE MARGIN TEST

FILE : 12GP_B21



S/O : 335166

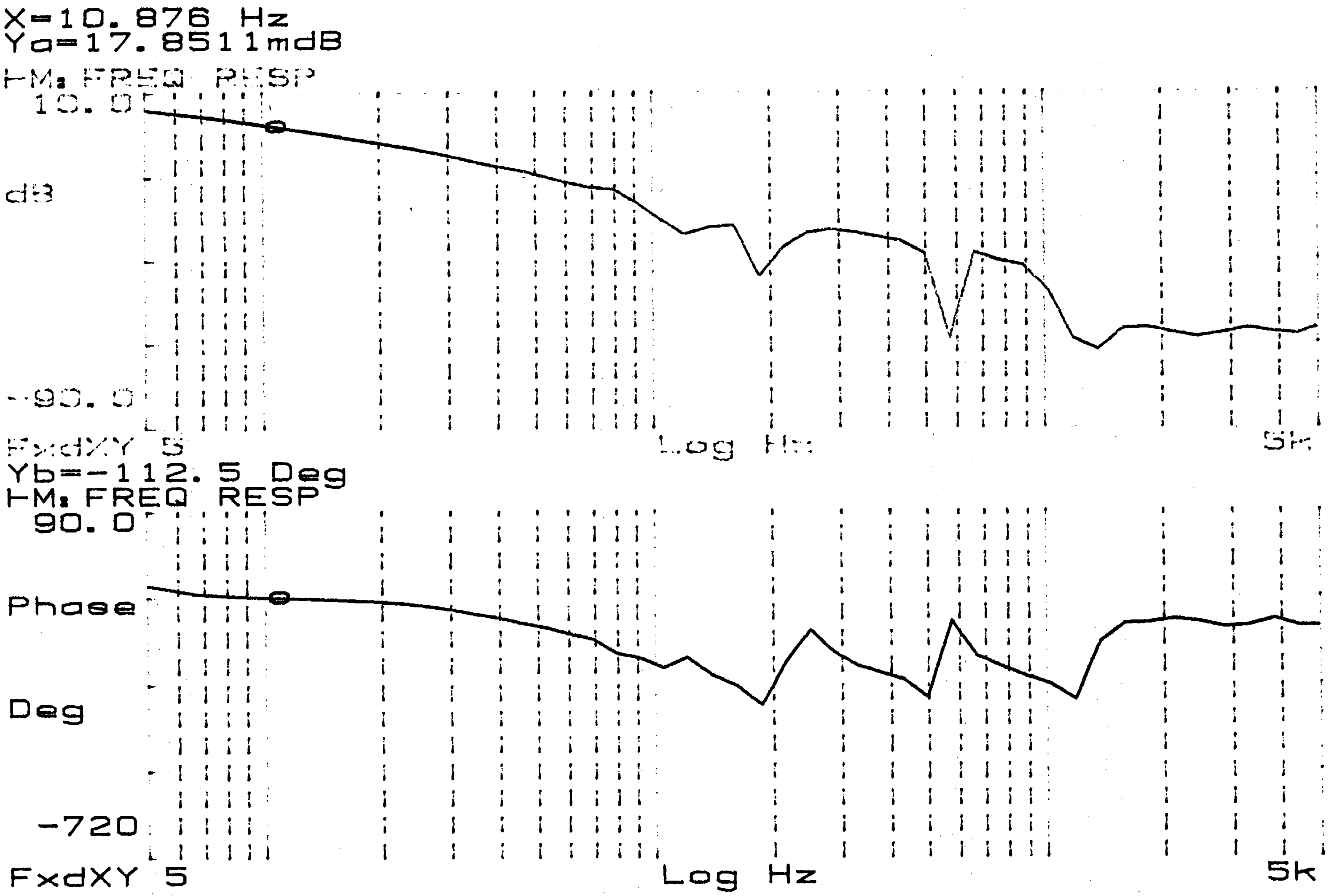
D2a

METSAT AMSU-A2
P/N: 1331200-2-IT

(7A) TEST ENGINEER: [signature]

GAIN and PHASE MARGIN TEST

FILE : 12GP_B21



D2b

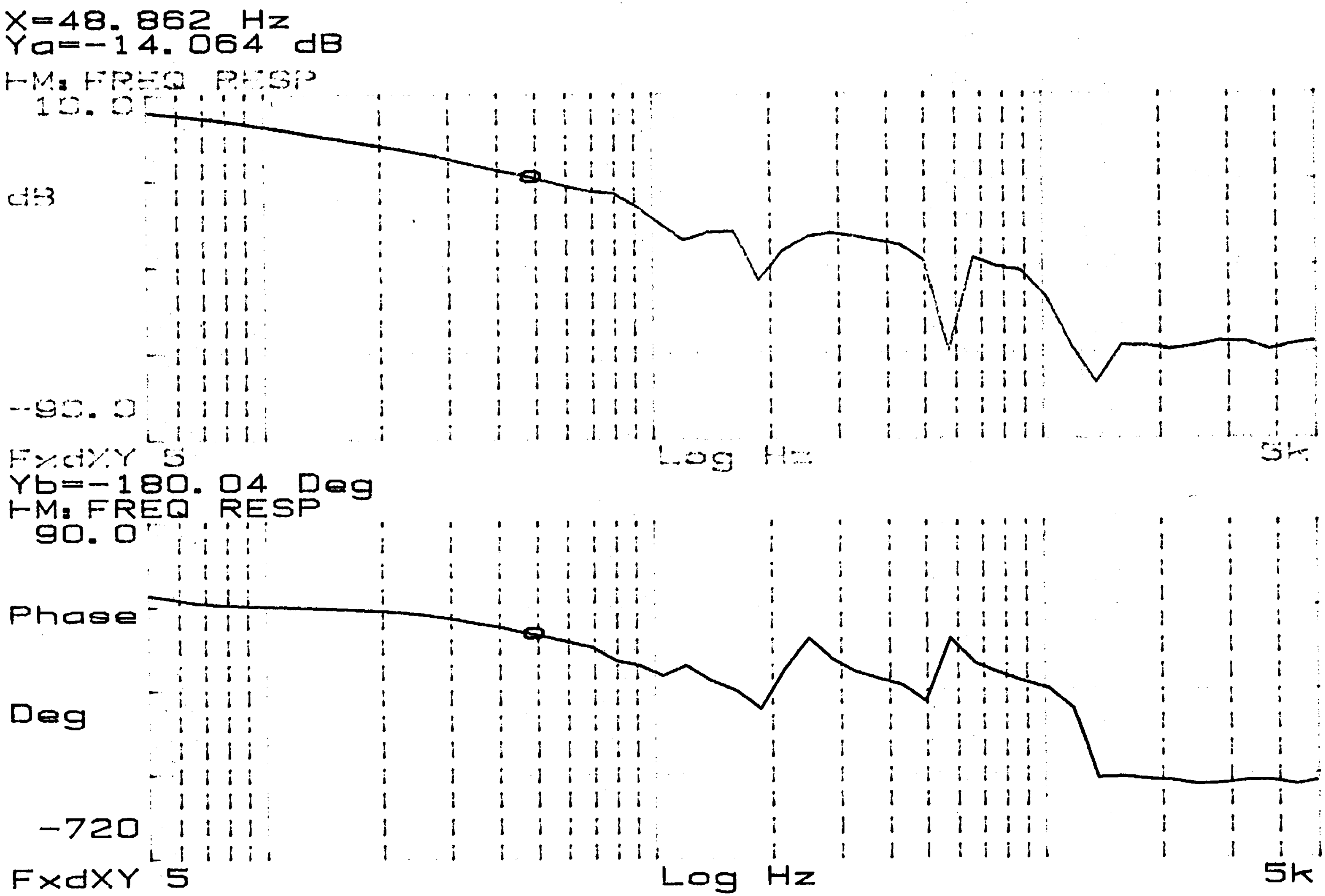
S/O : 335166

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER :

GAIN and PHASE MARGIN TEST

FILE : 12GP_B31



S/O : 335166

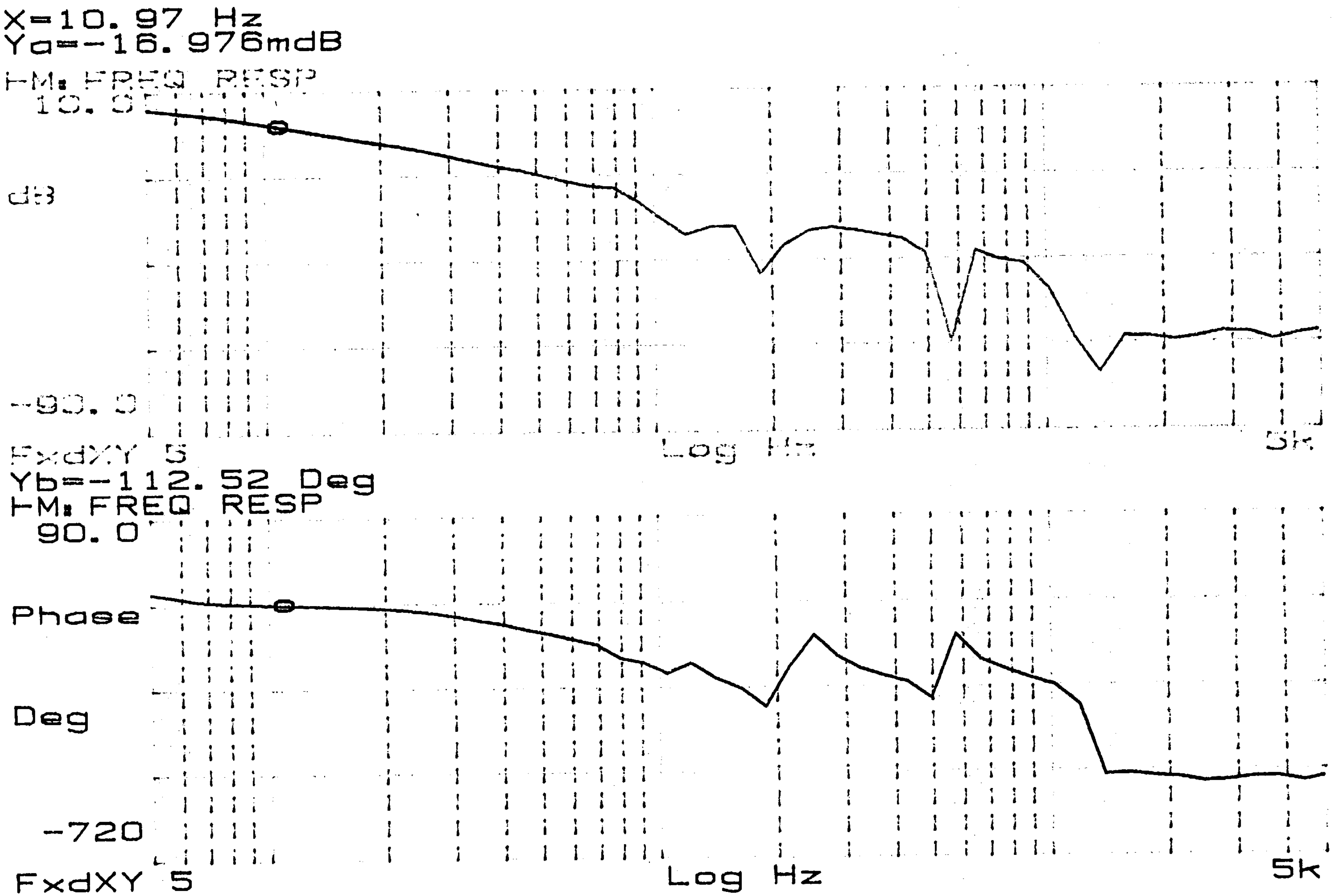
D3a

METSAT AMSU-A2
P/N: 1331200-2-IT

(74) TEST ENGINEER : [signature]

GAIN and PHASE MARGIN TEST

FILE : 12GP_B31



S/O : 335166

D3b

METSAT AMSU-A2
P/N: 1331200-2-IT

TEST ENGINEER : [signature]

SHEET ___ OF ___
ECR NO. ___

7/30/98 AMSU 2 SETT

TEST DATA SHEET 9
3.4.~~4~~.8: Gain/Phase Margin Test
5

Test Setup Verified: ____________ Shop Order No. 335166
Signature

3.4.5.8 Step 12: Gain/Phase Margin Test

Requirement	Test Result		Pass/Fail
12 dB minimum	1	−13.89 db	PASS
	2	−14.00 db	
	3	−14.06 db	
25 degrees minimum	1	67.68°	PASS
	2	67.50°	
	3	67.48°	

Pass = P
Fail = F

Unit: METSAT AMSU-A2

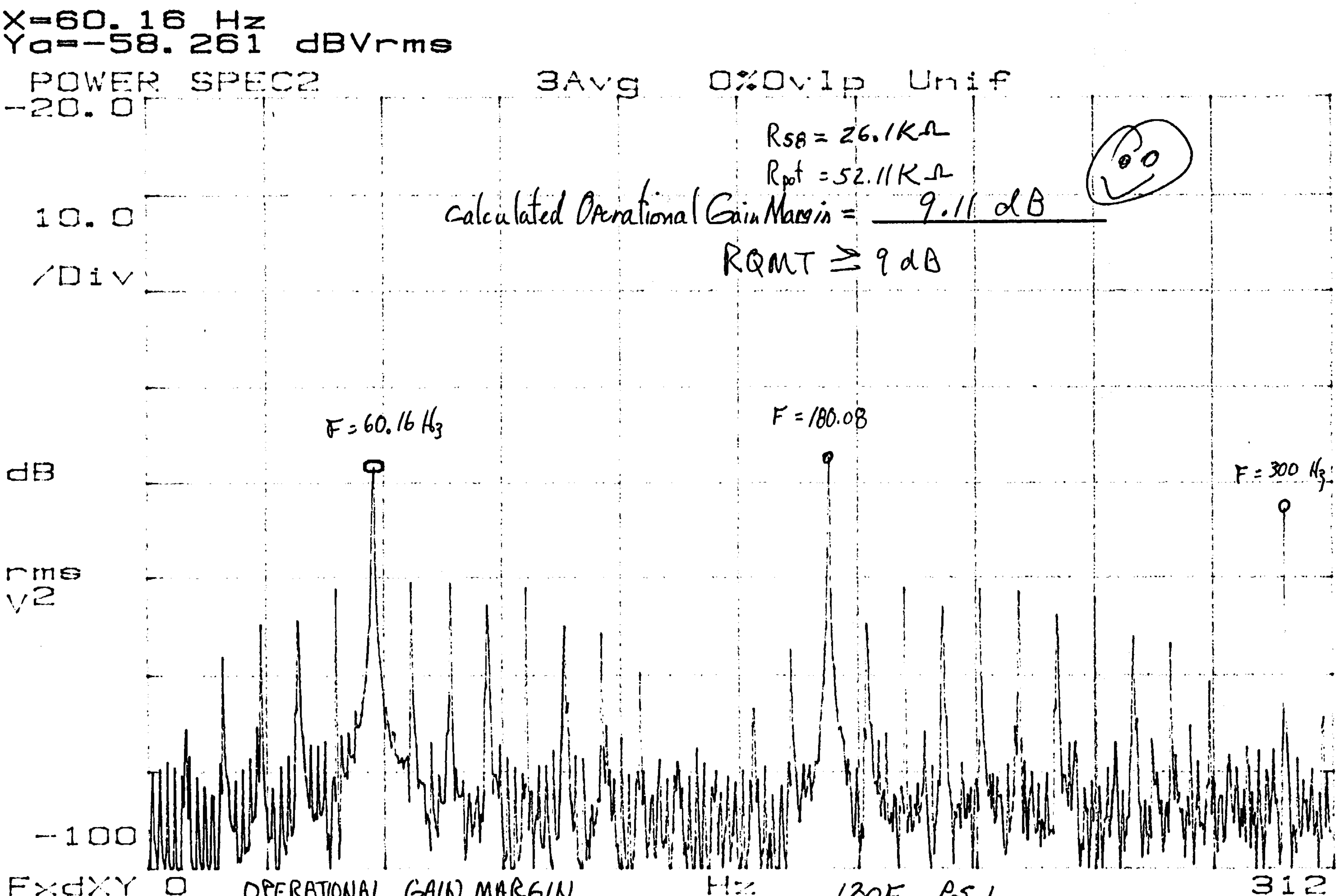
Serial No.: 106

Date: 6/27/98

Test Engineer: ____________

Quality Assurance: ____________

Customer Representative: ____________ DCMC 9/21/98



OPERATIONAL GAIN MARGIN

S/O: 335166

3.4.5.9

120F PS1

Test Eng: [signature]

Date: 6-29-98

E1

CC 250

TEST DATA SHEET 10

7/30/98 AMSU 2 REIT 3.4.~~4~~5.9: Operational Gain Margin Test

Test Setup Verified: ____________ Signature Shop Order No. 335166

3.4.5.9: Operation Gain Margin Test

Step No.	Requirement		Test Result	Pass/Fail
11	R58 Resistance (Kohms)		26.1 K	PASS
	Test Pot Resistance (Kohms)	1	52.11 K	
		2	52.42K	
		3	51.82K	
12	Oscillation Frequency (Hz)	1	60HZ, 180HZ, 300HZ	PASS
		2	60Hz, 180Hz 300Hz	
		3	60HZ, 180Hz 300HZ	
16	Gain Margin, 9 dB minimum	1	9.11db	PASS
		2	9.14db	
		3	9.07db	

Pass = P
Fail = F

Unit: METSAT AMSU-A2

Serial No.: 106

Test Engineer: ____________

Quality Assurance: 7A 268 ____________

Date: 6/29/98

E2

NASA
National Aeronautics and Space Administration

Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
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4. Title and Subtitle	5. Report Date
Integrated Advanced Microwave Sounding Unit-A (AMSU-A), Performance Verification Report	21 October 1998
	6. Performing Organization Code: ---
7. Author(s)	8. Performing Organization Report No.
T. Higgins	11292
	10. Work Unit No.: ---
9. Performing Organization Name and Address	11. Contract or Grant No.
Aerojet 1100 W. Hollyvale Azusa, CA 91702	NAS 5-32314
12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
NASA Goddard Space Flight Center Greenbelt, Maryland 20771	Final
	14. Sponsoring Agency Code: ---

15. Supplementary Notes

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16. ABSTRACT (*Maximum 200 words*)

This is the Performance Verification Report, METSAT AMSU-A2 Antenna Drive Subsystem, S/N 106, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).

17. Key Words (Suggested by Author(s))	18. Distribution Statement
EOS Microwave System	Unclassified --- Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of pages	22. Price
Unclassified	Unclassified		---

NASA FORM 1626 OCT 86

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4. TITLE AND SUBTITLE Integrated Advanced Microwave Sounding Unit-A (AMSU-A), Performance Verification Report		5. FUNDING NUMBERS NAS 5-32314	
6. AUTHOR(S) T. Higgins			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Aerojet 1100 W. Hollyvale Azusa, CA 91702		8. PERFORMING ORGANIZATION REPORT NUMBER 11292 21 October 1998	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) NASA Goddard Space Flight Center Greenbelt, Maryland 20771		10. SPONSORING/MONITORING AGENCY REPORT NUMBER ---	
11. SUPPLEMENTARY NOTES ---			
12a. DISTRIBUTION/AVAILABILITY STATEMENT ---		12b. DISTRIBUTION CODE ---	
13. ABSTRACT (*Maximum 200 words*) This is the Performance Verification Report, METSAT AMSU-A2 Antenna Drive Subsystem, S/N 106, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).			
14. SUBJECT TERMS EOS Microwave System			15. NUMBER OF PAGES
			16. PRICE CODE ---
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NSN 7540-01-280-5500

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Prescribed by ANSI Std 239-18
298-102

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G	-	Grant	TA	-	Task
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Block 16. Price Code. Enter appropriate price code (*NTIS only*).

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Block 20. Limitation of Abstract. This block must be completed to assign a limitation to the abstract. Enter either UL (unlimited) or SAR (same as report). An entry in this block is necessary if the abstract is to be limited. If blank, the abstract is assumed to be unlimited.

Standard Form 298 Back (Rev. 2-89)

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DOCUMENT APPROVAL SHEET

TITLE	DOCUMENT NO.
Performance Verification Report METSAT AMSU-A2 Antenna Drive Subsystem, S/N 106	Report 11292 21 October 1998

INPUT FROM:	DATE	CDRL:	SPECIFICATION ENGINEER:	DATE
T. Higgins		208	N/A	

CHECKED BY:	DATE	JOB NUMBER:	DATE
N/A		N/A	

APPROVED SIGNATURES		DEPT. NO.	DATE
Product Team Leader (A. Nieto)	A. Nieto	8341	10/23/98
Systems Engineer (R. Platt)	Robert H. Platt	8311	10/26/98
Design Assurance (E. Lorenz)	E. Lorenz	8331	10/26/98
Quality Assurance (R. Taylor)	RM Taylor	7831	10-26-98
Technical Director/PMO (R. Hauerwaas)	RV Hauerwaas	4001	10/26/98
Released: Configuration Management (J. Cavanaugh)	J Cavanaugh	8361	10/27/98

By my signature, I certify the above document has been reviewed by me and concurs with the technical requirements related to my area of responsibility.

(Data Center) FINAL

Please return this sheet and the reproducible master to Jim Kirk (Bldg. 1/Dept. 8631), ext. 2081.