JA-1666-3

RUBICOM SYSTEMS, INC.

FCC INTENTIONAL RADIATOR

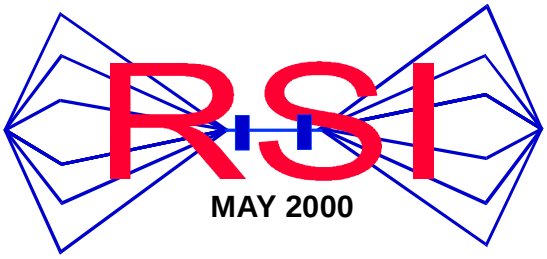
TEST REPORT

FOR THE

P-COM

POINT TO MULTIPOINT

28GHz REMOTE OUTDOOR UNIT



MAY 2000

Rubicom Systems, Inc.
284 West Drive, Suite B
Melbourne, FL 32904

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JA-1666-2

FCC INTENTIONAL RADIATOR
TEST REPORT
FOR THE
P-COM
POINT TO MULTIPOINT
28GHz SECTOR OUTDOOR UNIT

Prepared by: Joseph G. Barbee 5/18/00
Joseph G. Barbee

Tested by: Joseph G. Barbee 5/18/00
Joseph G. Barbee

Performed by:
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Performed for:
P-COM
1801 Penn Street
Melbourne, Florida 32901

Date Completed: May 10, 2000

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ABSTRACT

This report presents test results of the emanations found emitting from the P-Com Point to Multipoint 28GHz Remote Outdoor Unit and the comparison of these emissions to the requirements of FCC, Title 47, Part 101 Fixed Point to Multipoint Microwave Service as required for a Digital Electronics Message Service. In accordance with Part 15.33(a)(2) radiated measurements were extended to 100GHz. The indoor unit (IDU) was tested to Part 15 requirements in a separate submission.

This testing was performed at Rubicom Systems, Inc. (RSI). The testing was performed for P-Com under purchase order F68979. The results of this test effort indicates compliance of the P-Com Point to Multipoint 28GHz Remote Outdoor Unit to FCC, Title 47 requirements.

1.0 INTRODUCTION

1.1 Propose

The purpose of this report is to show continued compliance of the P-COM Point to Multipoint 28GHz Remote Outdoor Unit (ODU) to the requirements of CFR 47, Part 101 Subpart C for Fixed Point to Multipoint Microwave Service and Part 15.209(a) and 15.205 for the general emission limits. The band of operation is 27.5GHz to 31.225GHz. The ODU test was performed in a semi-anechoic chamber at a distance of 1 meter and .33 meters above 18GHz. Emissions below 18GHz were performed on a 3 meter O.A.T.S. Distances are noted on the data plots.

1.2 Requirements

This report is to provide results of testing to CFR 47, Part 101 Subpart C (specifically 101.109, 101.111(2)(ii) and 101.113) for a 27.5GHz to 28.35GHz common carrier fixed point to multipoint microwave service terminal.

Bandwidth 101.109 (850MHz Max)

Emission Limitation 101.111(2)(ii)(iii)

Transmitter Power Limitation 100.113 (+55dBw EIRP)

Signals outside the intended band must be attenuated by 56dB at 250% of bandwidth, and 33dB of attenuation below the measured transmit level (150dBμV/m) for harmonics and spurious signals above the transmitter frequency.

Signals appearing in the restricted bands must meet the requirements of 15.209. The lowest signal generated in the ODU is the 200MHz data from the Remote Indoor Unit.

1.3 Unit Under Test Description

The Point to Multipoint (PMP) Sector Subsystem consists of an Indoor Unit (IDU) and an Outdoor Unit (ODU) A total system can have up to 24 sector subsystems to provide 360↓↑ coverage. The product under test in this report is the Remote ODU. The ODU receives data at a 40mbit/s rate from the IDU along with the DC power to the ODU. This test covers the ODU only.

The two units are connected using 30 ft. of LMR 400 communications cable (50 ohms).

The Subsystem was configured as shown in Paragraph 5.0.

1.4 Modifications

The ODU required the following modifications:

ODU Chassis •Gasket material added around ODU dome.
Instrument Specialists Part # 8864-010-80

1.5 Summary of Results

Paragraph 6.0 of this document presents the results of the tabulated levels detected during testing of the Point to Multipoint 28GHz Remote Outdoor Unit. There were no failures after the modification was installed. The modification is noted in Paragraph 1.4. Both the applicable paragraphs of Part 15 and Part 101 are within the limits determined in this report.

2.0 APPLICABLE DOCUMENTS

The following documents form a part of this report to the extent expressed herein:

FCC Code of Federal Regulations Title 47, Part 15 and 101

ANSI C63.4-1992

FCC Characteristics of open Field Test Sites Bulletin OET 55, October 1989

3.0 TEST SITE DESCRIPTION

This testing was performed at Rubicom Systems, Inc. 3 meter test site and in a semi-anechoic chamber above 18GHz. The description of the measurement facility was found to be compliant with the requirements of section 2.948 of the FCC Rules. A copy of the compliance letter is attached to this report as Appendix A.

3.1 Environmental Conditions

This test effort was performed between May 2, 2000 through May 9, 2000. Typical conditions in the laboratory during this testing were:

Temperature: **78↓↑**

Barometer: **29.75 in.**

Humidity: **50%**

4.0 TEST INSTRUMENTATION

The following test equipment was used to perform this testing.

Qty.	Description	Manufacturer	Model No.	Cal Due Date
1	Coax Attenuator	Hewlett Packard	8494B	03/07/01
1	Bilog Antenna	Chase	CLB6111B	07/10/00
1	Standard Gain Horn	Flann	23240-20	NCR
1	Ridge Guide Horn	Electro Metrics	RGA-180	01/15/00
1	Standard Gain Horn	NARDA	Model 638	NCR
1	Standard Gain Horn	NARDA	V637	NCR
1	Standard Gain Horn	Millitech	SGH-22-PR000	NCR
1	Standard Gain Horn	Flann Microwave	27240-20	NCR
1	Spectrum Analyzer	Advantest	R3271	02/01/01
1	Harmonic Mixer	OML	WR22	09/02/00
1	Harmonic Mixer	OML	WR15	09/03/00
1	Harmonic Mixer	OML	WR10	09/03/00
1	Waveguide Adapter	OMNI	WR28-SMA	NCR
1	Standard Gain Horn	Custom Microwave	H06R	NCR
1	Meter	Hewlett Packard	436A	05/28/00
1	Sensor	Hewlett Packard	8487A	05/28/00
1	Antenna Adapter	Hill Manufacturing	1781702	NCR
1	WG to Coaxial Adapter	Hewlett Packard	P281A	NCR

5.0 TEST SAMPLE SETUP AND CONFIGURATIONS

The unit was placed on a nonconductive table on the 3 meter OATS. The unit was powered from 120 VAC 60Hz filtered power. Measurements from 200MHz-18GHz were performed on the 3 meter site at 3 meter distance.

During radiated emissions above 18GHz the unit was placed on a table inside a test chamber (semi-anechoic) and rotated for maximum level at a 1 meter or .3 meter distance.

Photo 1 shows the typical radiated test setup on the OATS.

The configuration of the IDU and ODU were as listed below:

Indoor Unit	Outdoor Unit	30 Ft. I/O Cable
Remote ATM Indoor Unit S/N: 213	1 ea. PTM PTM 28GHz High 3 S/N: 28RH3A300002	LMR-400, 50 ohm Communication Cable

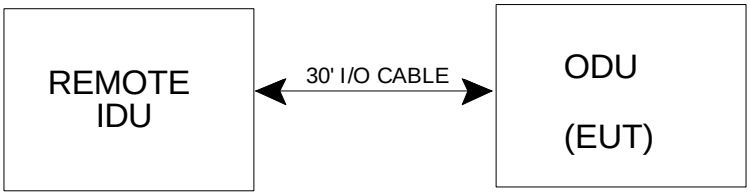


Photo1.tif (996x1358x2 tiff)

JA-1666-2

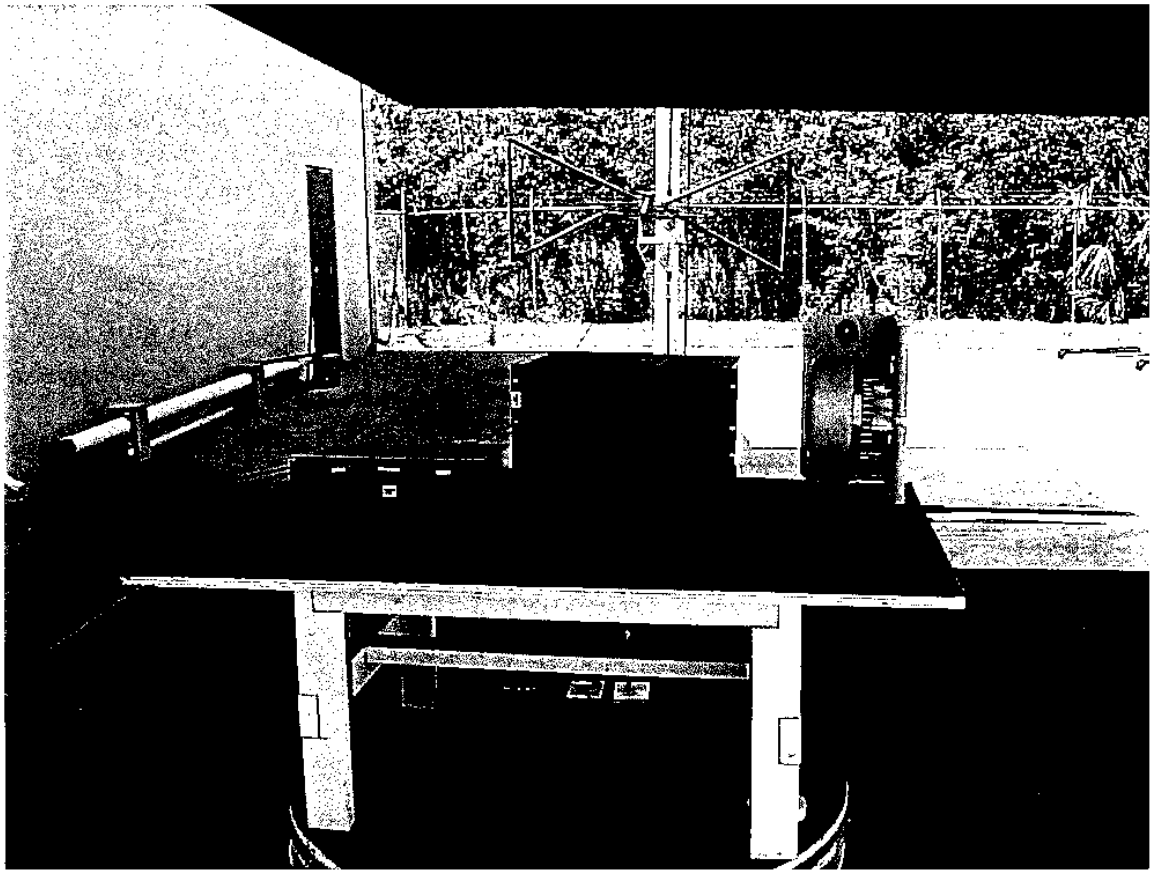


PHOTO 1

6.0 PROCEDURES AND RESULTS

6.1 General

The ODU was tested for radiated emissions on the 3 meter test site up to 18GHz. Above 18GHz the unit was tested inside a semi-anechoic chamber where the high frequency radiated measurements were completed to 100GHz. Power and bandwidth measurements were also performed in the chamber.

The ODU was not tested for power line conduction since it is powered by DC voltage from the IDU. Since the lowest frequency in the ODU is the 40mbit data input from the Remote IDU, the radiated measurements were started at 200MHz. The ODU was tested to Part 101 and the general requirements of 15.209. The following paragraphs present the test results and procedures for the testing.

6.1.1 Occupied Bandwidth (101.109)

Bandwidth requirements applicable to the 27.5GHz to 31.225GHz range is 850MHz maximum. Table 6.1.1-1 presents the 99.5% bandwidth measurements at the minimum , mid and maximum transmit frequencies with the minimum, mid and maximum modulation rates. Data Sheets 6.1.1-1 through 6.1.1-9 are included for reference.

RESULT: The maximum bandwidth measured was 13.36MHz. The unit complies with the <850MHz requirement.

EUT ODU/28GHz High 3 ODU S/N 28RH3A300002

MIN TX FREQ. 27.925 GHz MODULATION MIN 10.0 MHZ

MID 9.93 MHZ

MAX 8.07 MHZ

MID TX FREQ. 28.025 GHz MODULATION MIN 10.5 MHZ

MID 13.36 MHZ

MAX 9.21 MHZ

MAX TX FREQ. 28.135 GHz MODULATION MIN 8.5 MHZ

MID 8.36 MHZ

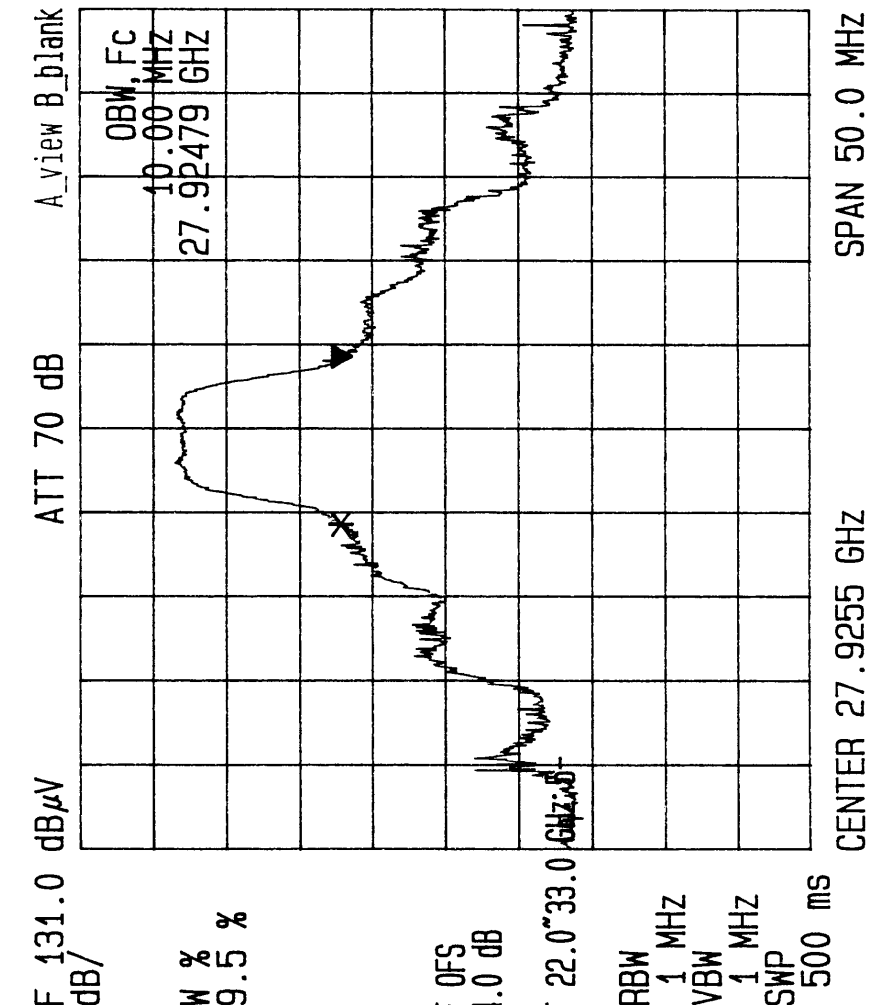
MAX 7.57 MHZ

REQUIREMENT: <850MHz

TABULATED BANDWIDTHS

TABLE 6.1.1-1

TEST: OCCUPIED B.W. EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 27.925 GHz SPEC: FCC ANT.HT/POL:
MODULATION: MIN. LINE UNDER TEST: CHANNEL 1 EUT POSITION:
DATE: 5-8-00 TEST SITE: ROOM 3 TESTER:

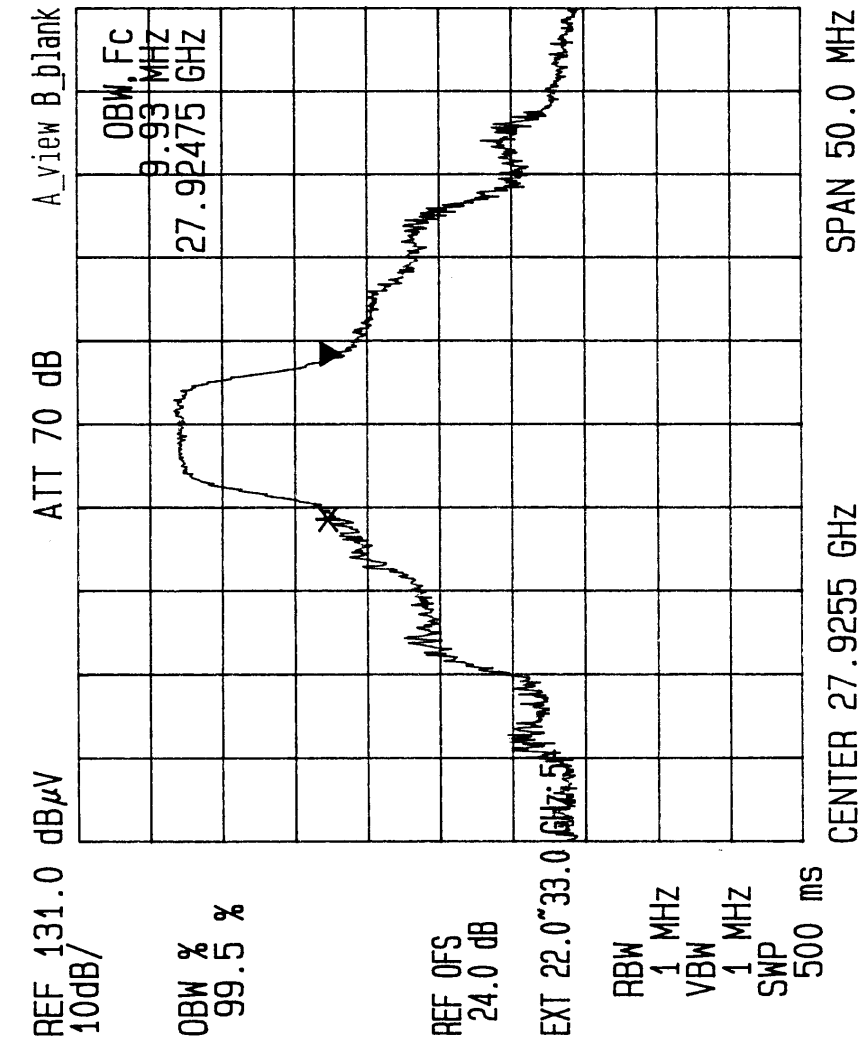


DATA SHEET 6.1.1-1

12.tif (2430x3030x2 tiff)

JA-1666-3

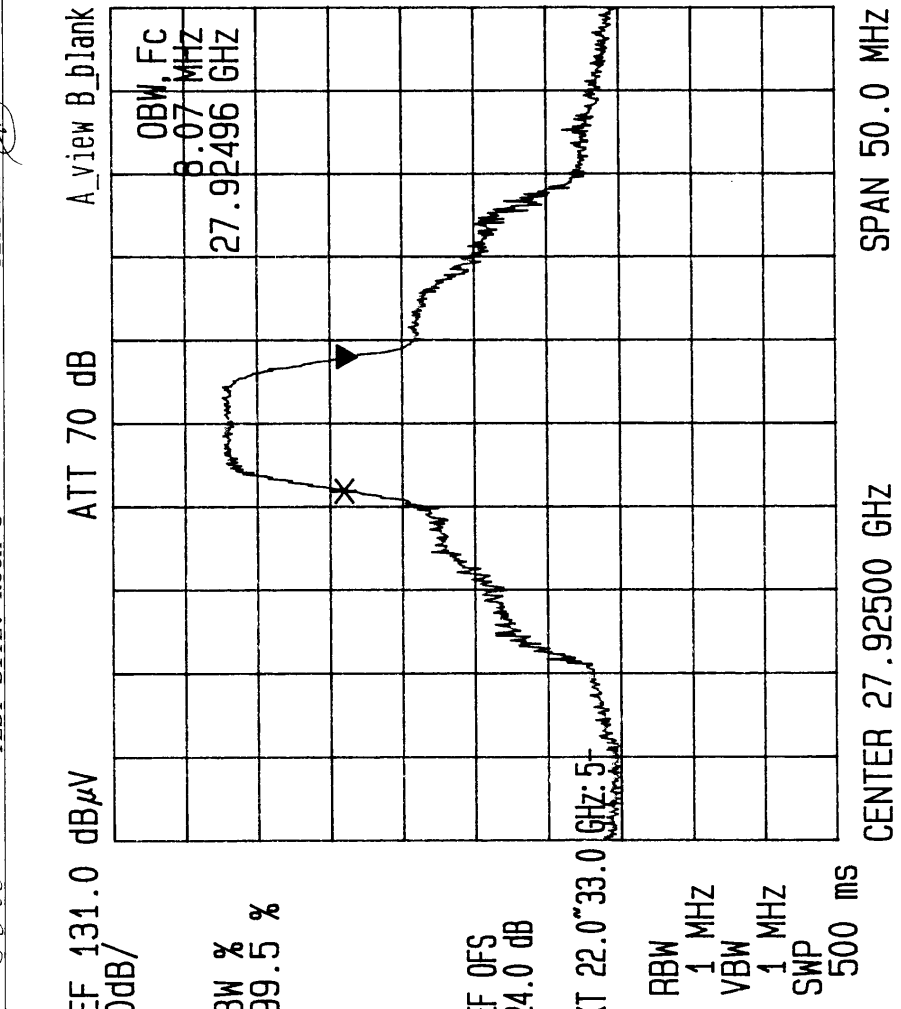
TEST: OCCUPIED B.W. EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 27.925 GHz SPEC: FCC ANT.HT/POL: H
MODULATION: MID. LINE UNDER TEST: CHANNEL 1 EUT POSITION:
DATE: 5-8-00 TEST SITE: ROOM 3 TESTER:

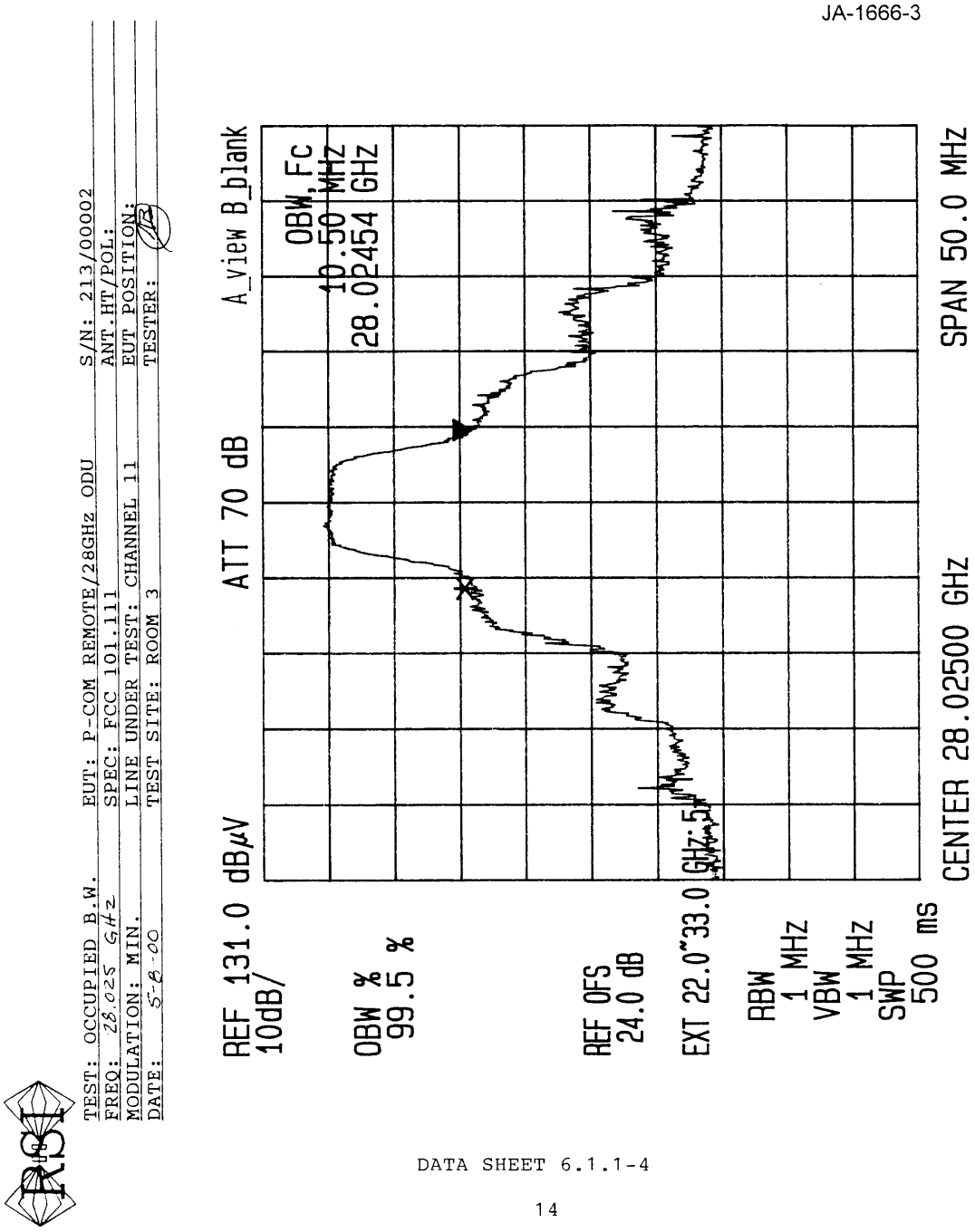


DATA SHEET 6.1.1-2

13.tif (2430x3030x2 tiff)

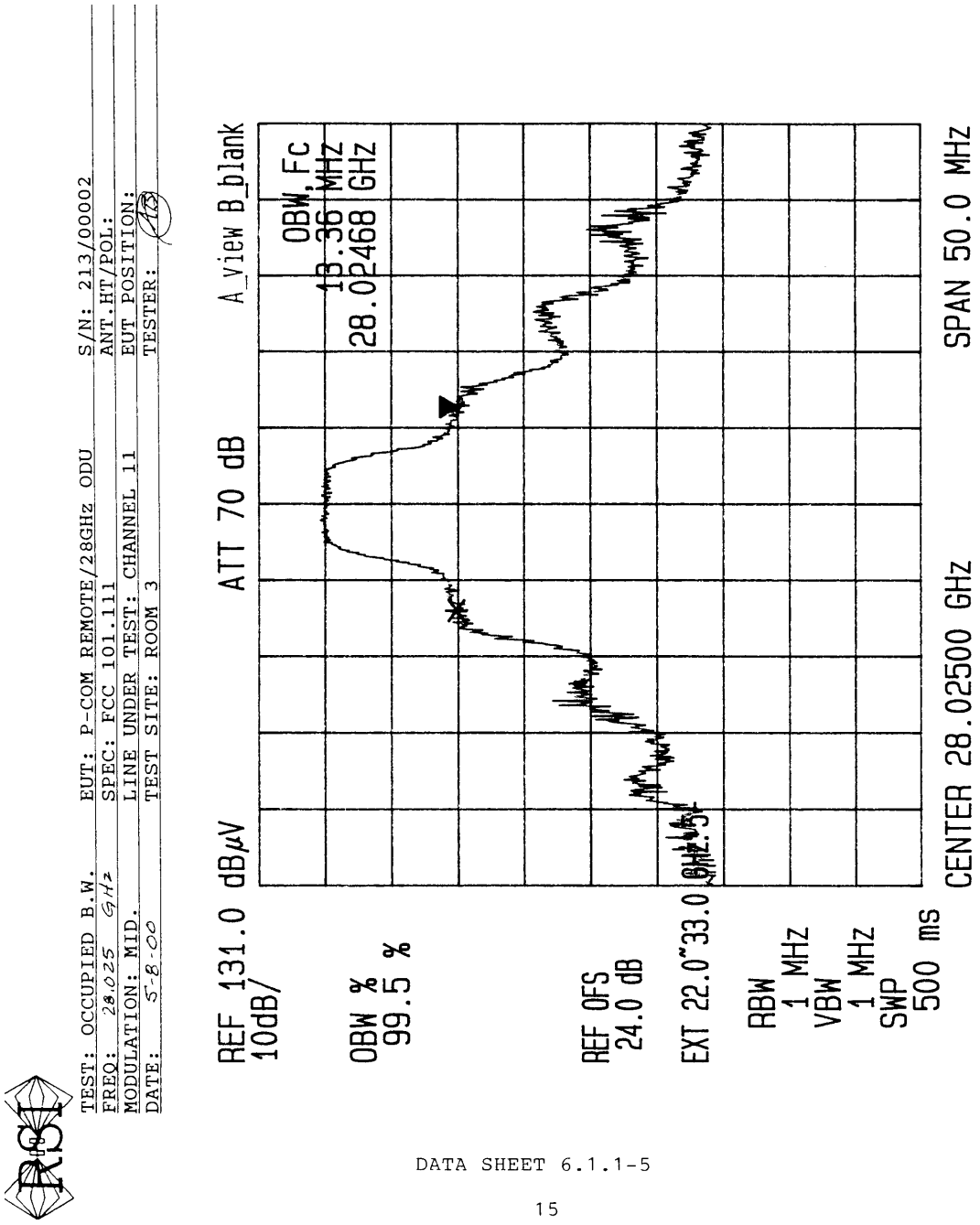
TEST: OCCUPIED B.W. EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 27.925 GHz SPEC: FCC ANT.HT/POL:
MODULATION: MAX. LINE UNDER TEST: CHANNEL 1 EUT POSITION:
DATE: 5-8-00 TEST SITE: ROOM 3 TESTER:




TEST: OCCUPIED B.W. EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 28.025 GHz SPEC: FCC 101.111 ANT.HT/POL:
MODULATION: MIN. LINE UNDER TEST: CHANNEL 11 EUT POSITION:
DATE: 5-8-00 TEST SITE: ROOM 3 TESTER:
REF 131.0 dBµV
10dB/
ATT 70 dB
A_view B_blank
OBW,Fc
10.50 MHz
28.02454 GHz
OBW %
99.5 %
REF OFS
24.0 dB
EXT 22.0~33.0 GHz
RBW
1 MHz
VBW
1 MHz
SWP
500 ms
CENTER 28.02500 GHz
SPAN 50.0 MHz

15.tif (2430x3030x2 tiff)

JA-1666-3

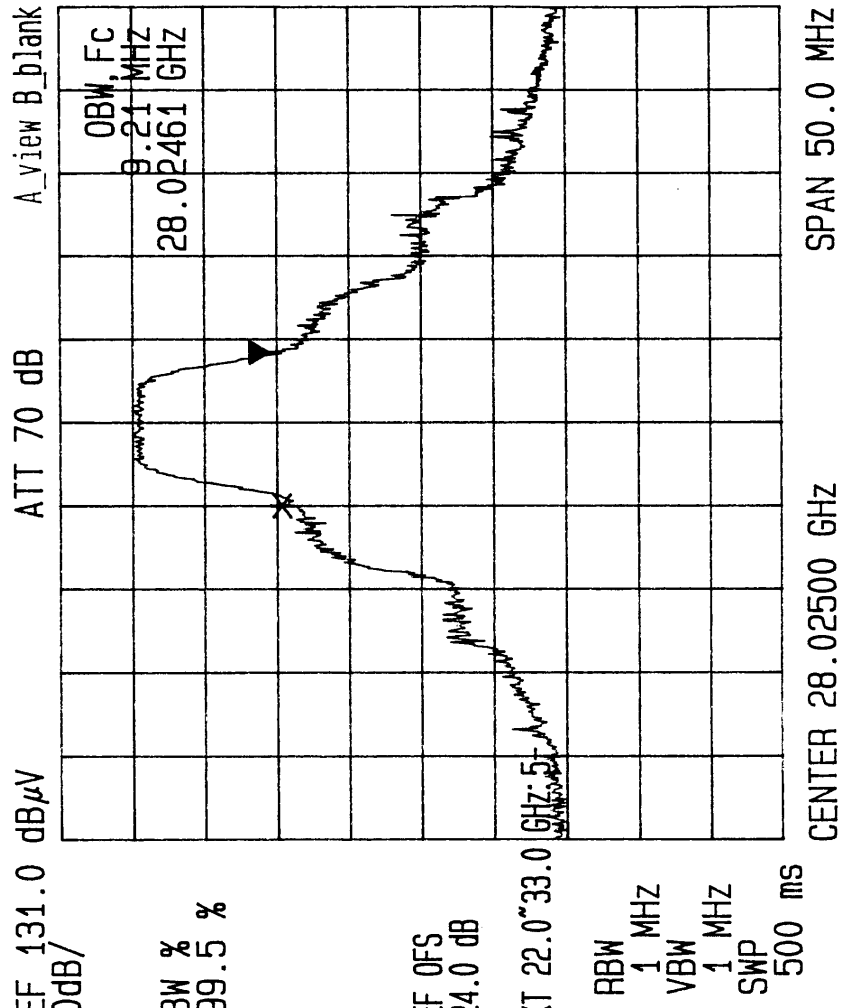


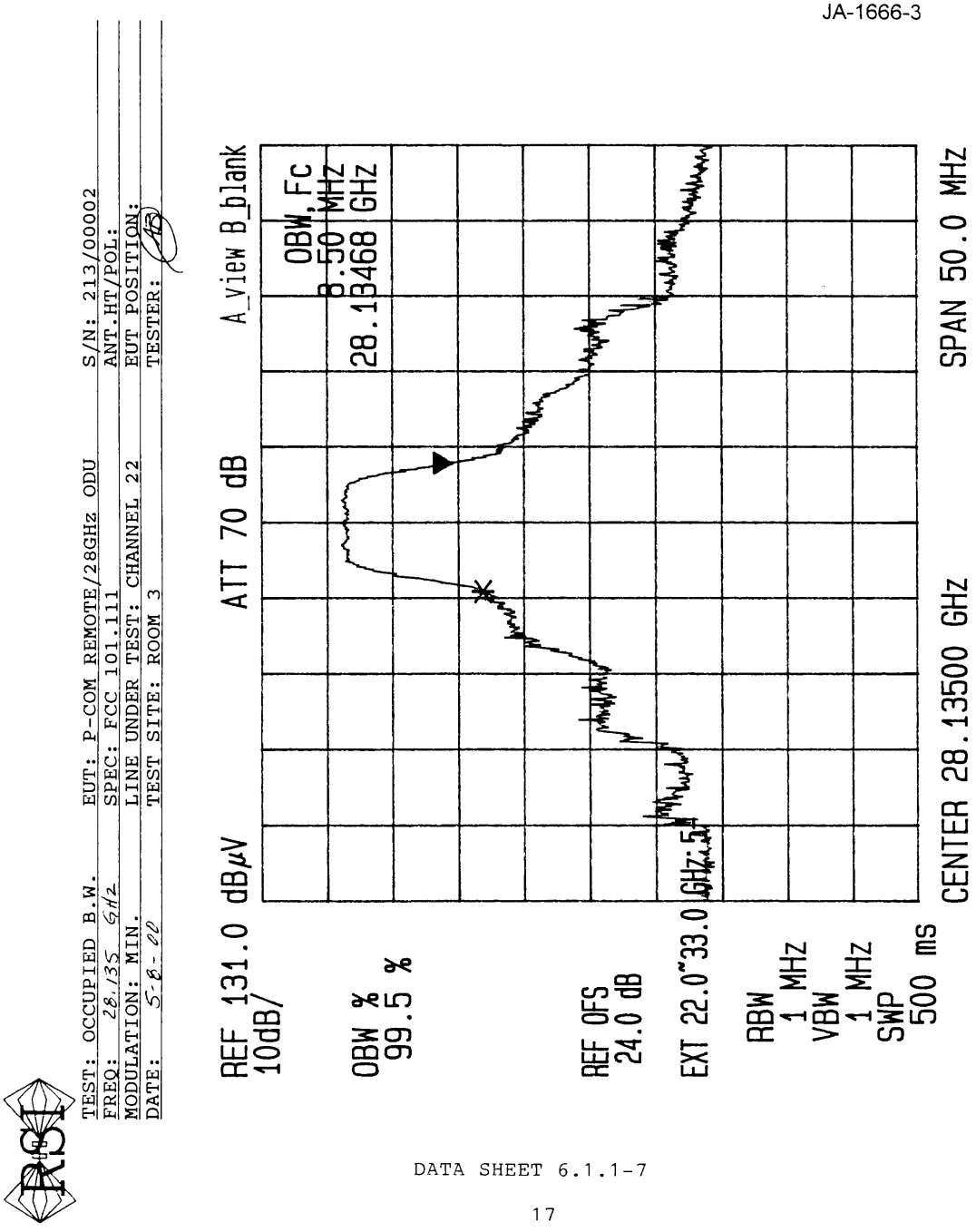
DATA SHEET 6.1.1-5

16.tif (2430x3030x2 tiff)

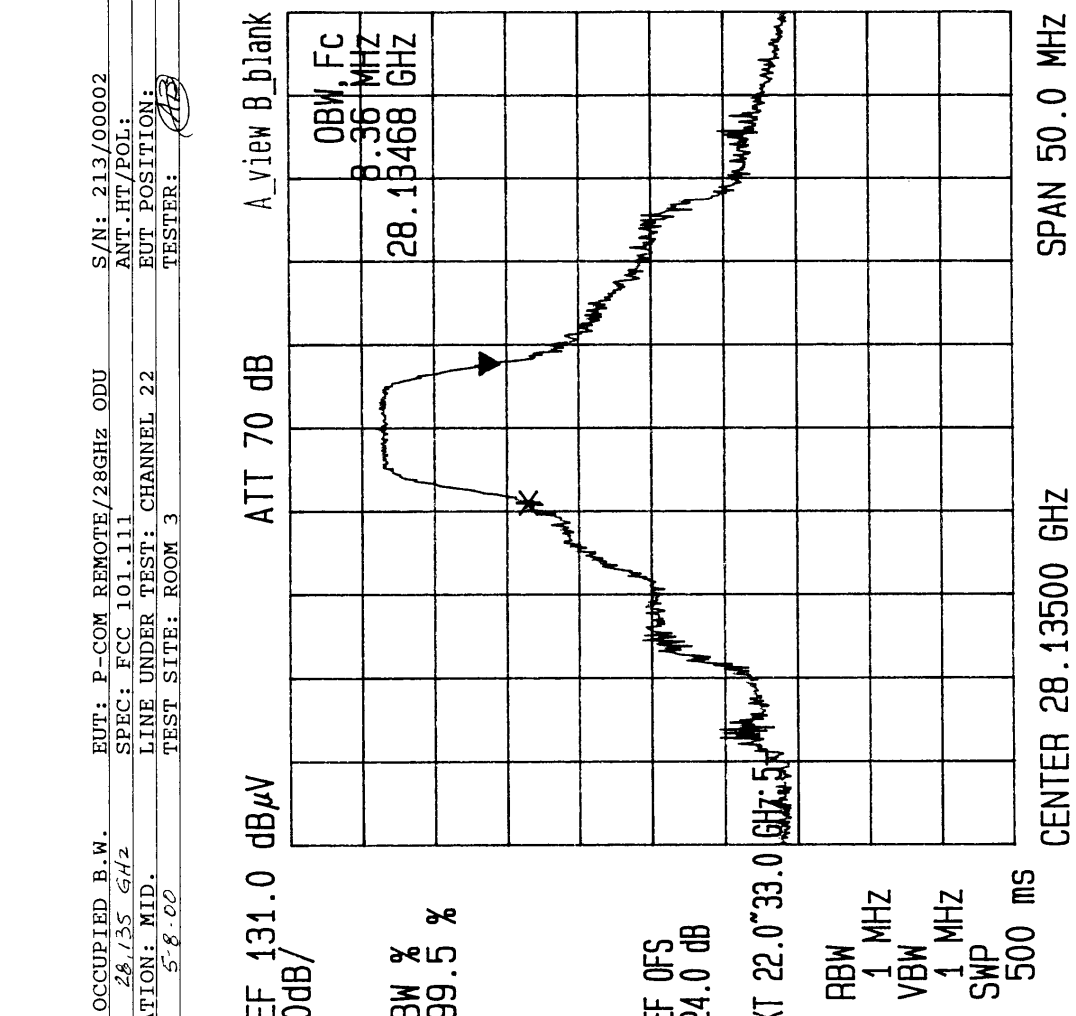
JA-1666-3

TEST: OCCUPIED B.W. EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 28.025 GHz SPEC: FCC 101.111 ANT.HT/POL:
MODULATION: MAX. LINE UNDER TEST: CHANNEL 11 EUT POSITION:
DATE: 5-8-00 TEST SITE: ROOM 3 TESTER:



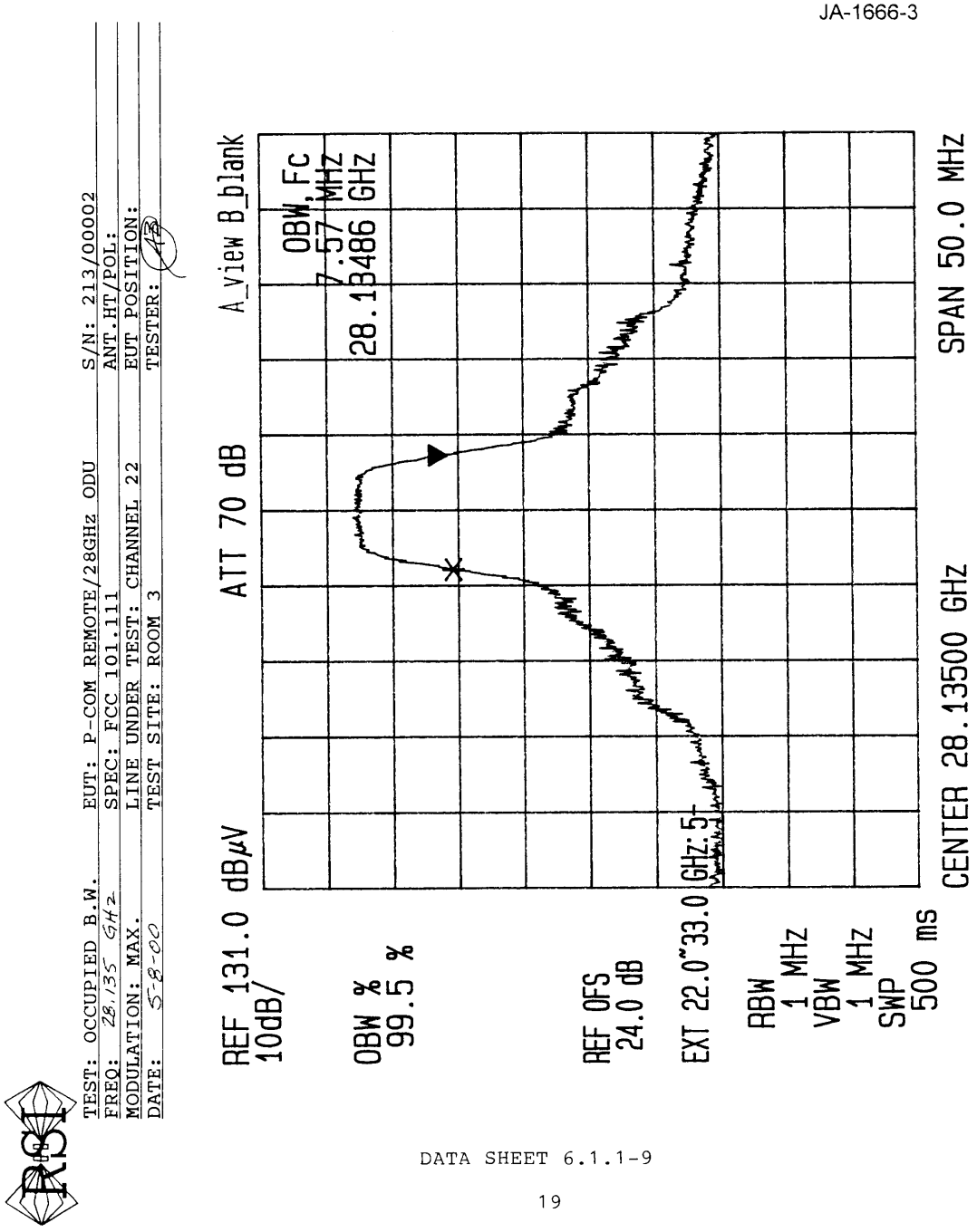

TEST: OCCUPIED B.W. EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 28.135 GHz SPEC: FCC 101.111 ANT.HT/POL:
MODULATION: MIN. LINE UNDER TEST: CHANNEL 22 EUT POSITION:
DATE: 5-8-02 TEST SITE: ROOM 3 TESTER:
REF 131.0 dBµV
10dB/
ATT 70 dB
A_view B_blank
OBW,Fc
8.50 MHz
28.13468 GHz
OBW %
99.5 %
REF OFS
24.0 dB
EXT 22.0~33.0 GHz
RBW
1 MHz
VBW
1 MHz
SWP
500 ms
CENTER 28.13500 GHz
SPAN 50.0 MHz

TEST: OCCUPIED B.W. EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 28.135 GHz SPEC: FCC 101.111 ANT.HT/POL:
MODULATION: MID. LINE UNDER TEST: CHANNEL 22 EUT POSITION:
DATE: 5-8-00 TEST SITE: ROOM 3 TESTER:



19.tif (2430x3030x2 tiff)

JA-1666-3



6.1.2 Transmitter Power Limitations

Power measurements were made at the input to the antenna. Measurements were made using a Hewlett Packard Model 436A power meter with a Model 8487A power sensor. An antenna adapter for conversion to 2.9mm connector by Hill Mfg. (Model 1781702) was used for the power measurement.

Antenna gain (dBi) was added to the measurements in dBw to obtain the EIRP.

Table 6.1.2-1 presents the tabulated results.

Results: The output was compliant to the required 55dBw by greater than 54dB.

Power Output Measurement

Frequencies: Min = 27.925GHz, Mid = 28.025GHz, Max = 28.135GHz

Freq.	Modulation	Measured Power dBw	Ant. Gain	ERIP dBw	Ref. 55dBw
Min	Min	-9.7	36	26.3	-28.7
	Mid	-10.4	36	25.6	-29.4
	Max	-12.2	36	23.8	-31.2
Mid	Min	-9.5	36	26.5	-28.5
	Mid	-10.6	36	25.4	-29.6
	Max	-12.6	36	23.4	-31.6
Max	Min	-10.3	36	25.7	-29.3
	Mid	-10.5	36	25.5	-29.5
	Max	-12.4	36	23.6	-31.4

Table 6.1.2-1

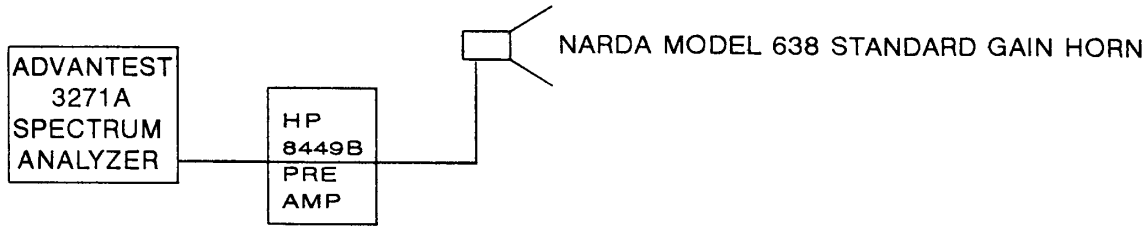
6.1.3 Radiated Emissions, Part 15 and Part 101

This paragraph presents the radiated emissions for the 28GHz Remote Outdoor Unit tested to the requirements of part 15.207 and 209, and the transmitter requirements to Part 101.111. Figure 6.1.3-1 presents the mixer setups used to cover the 100GHz range.

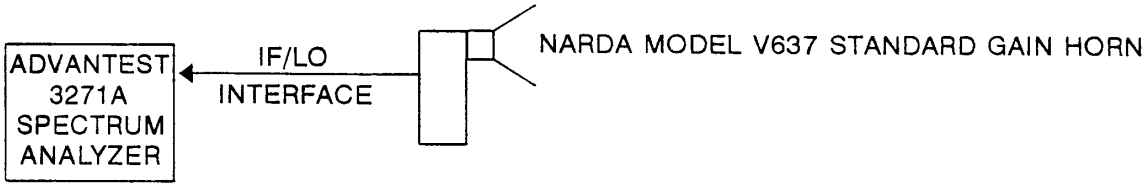
23.tif (2088x2824x2 tiff)

18-26.5GHZ EQUIPMENT SETUP

JA-1666-3

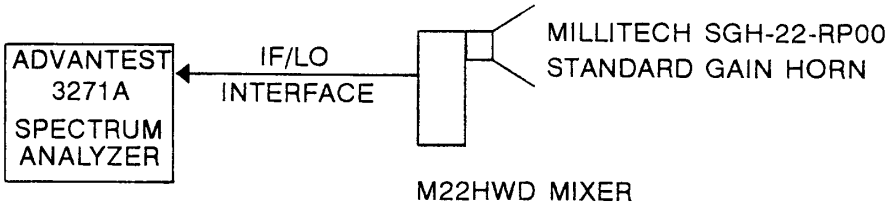


26.5-40GHz EQUIPMENT SETUP



M28HWD MIXER

33-50GHz EQUIPMENT SETUP



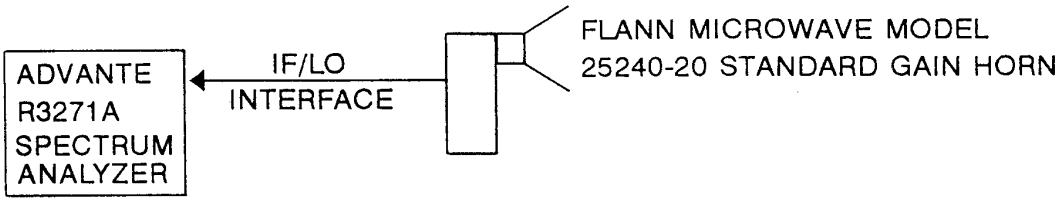
M22HWD MIXER
33-50GHz

FIGURE 6.1.3-1

24.tif (1952x2728x2 tiff)

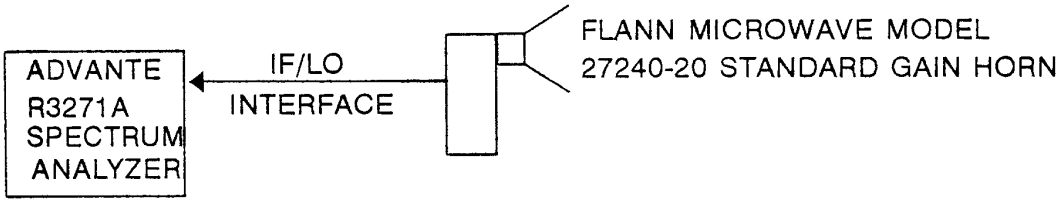
50-75GHz EQUIPMENT SETUP

JA-1666-3



M15HWD MIXER

75-110GHz EQUIPMENT SETUP



M10HWD MIXER

FIGURE 6.1.3-1 CONT.

6.1.3.1 Radiated 15.209(a)/101.111)

Radiated measurements were performed starting at 200MHz and extended out to 100GHz to include the requirements for covering the 28GHz transmitter harmonics and spurious emissions. Quasi-peak detection was used from 200MHz to 1GHz. From 1GHz to 40GHz, both peak and average measurements were performed. Above 40GHz the peak measurements at 1MHz bandwidth were measured. The harmonics were measured at the mid TX frequency. A scan at mid frequency was performed to 100GHz for spurious content. Both vertical and horizontal polarization is included in the data. Photo 6.1.3.1-1 shows the test site with the unit in place inside the enclosure.

Table 6.1.3.1-1 is a tabulated list of the signals detected including the transmitter frequency and harmonics.

Results - The system does not have signals that appear above the requirement of Part 15 or Part 101 as tested in this report. In areas where the sensitivity was lacking several techniques were used such as moving in closer or narrowing the bandwidths.

RSI is confident that the methods used show the unit compliant.

The MASK requirement of 101.111(2)(ii) is shown in Data Sheets 6.1.3.1-1 through 6.1.3.1-9. The maximum attenuation requirement of 56dB at the 250% points is applicable.

Outside the 250% bandwidth the limit was established at 33dB attenuation required below transmitter. The measurements were made using the radiated technique. The transmitter output for this application is approximately 50dB below the allowed 55dBw EIRP.

Plotted data for the quasi peak and peak scans over the entire 200MHz-100GHz range are presented on Data Sheets 6.1.3.1-10 through 6.1.3.1-25.

Average data plots to 40GHz are presented on Data Sheets 6.1.3.1-26 through 6.1.3.1-45.

Ambient data for the 200MHz-100GHz range for this test effort is on file at Rubicom Systems, Inc. under JA-1666 should it be needed.

Photo2.tif (1002x1154x2 tiff)

JA-1666-2

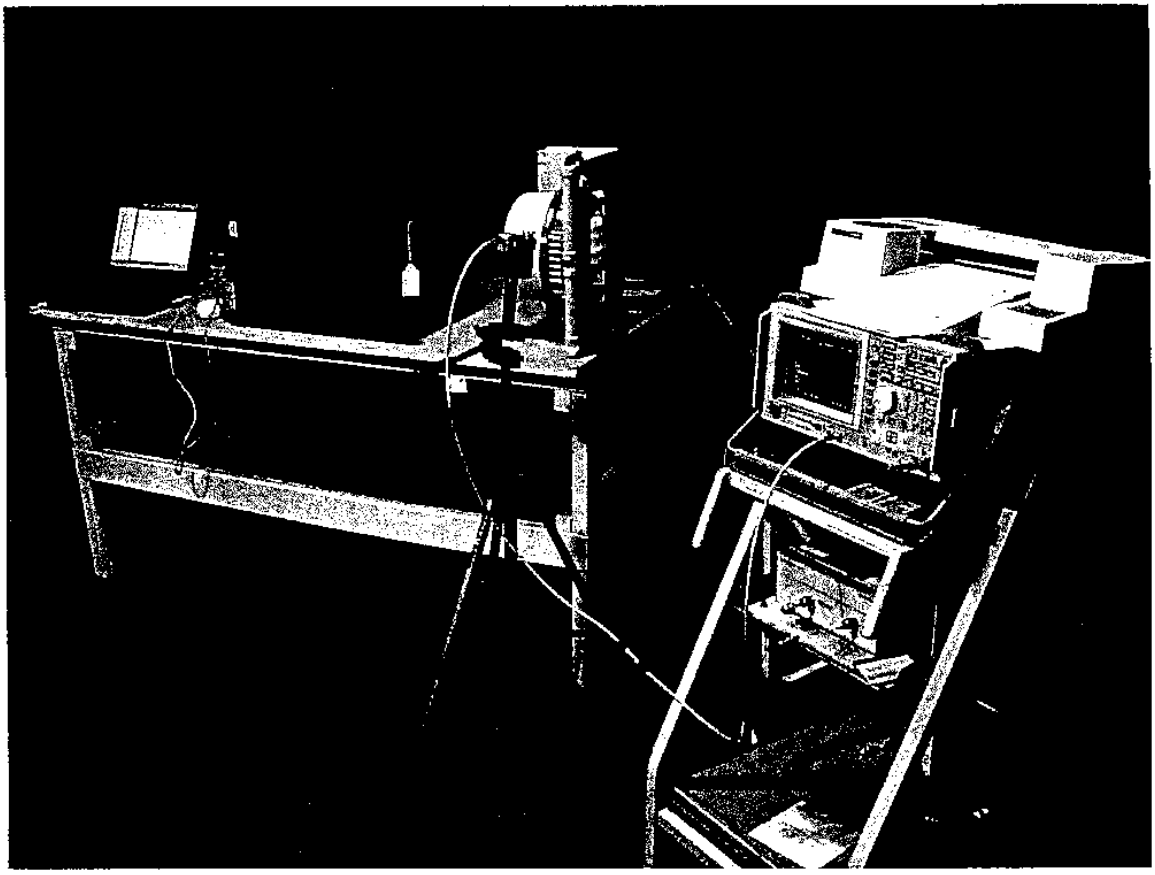


PHOTO 6.1.3.1-1

FCC RADIATED EMISSIONS TABULATED RESULTS

EUT MODEL: P-COM 28GHz REMOTE OUTDOOR UNIT

S/N: 28RH3A300002 DATE: 05/04/00 TESTER: JB

FREQUENCY (GHZ)	ANTENNA POL.	MEASURED (dBμV/m)	Q.P. LIMIT (dBμV/m @ 3 METERS)	MARGIN (dB)
27.6GHz	H	150	N/A	N/A
27.6GHz	V	140	N/A	N/A
55.2GHz	H	<100	117	<-17
55.2GHz	V	<100	117	<-17
82.8GHz	H	<115	117	<-2*
82.8GHz	V	<115	117	<-2*

* NO SIGNALS DETECTED AT HARMONIC FREQUENCIES

TABLE 6.1.3.1-1

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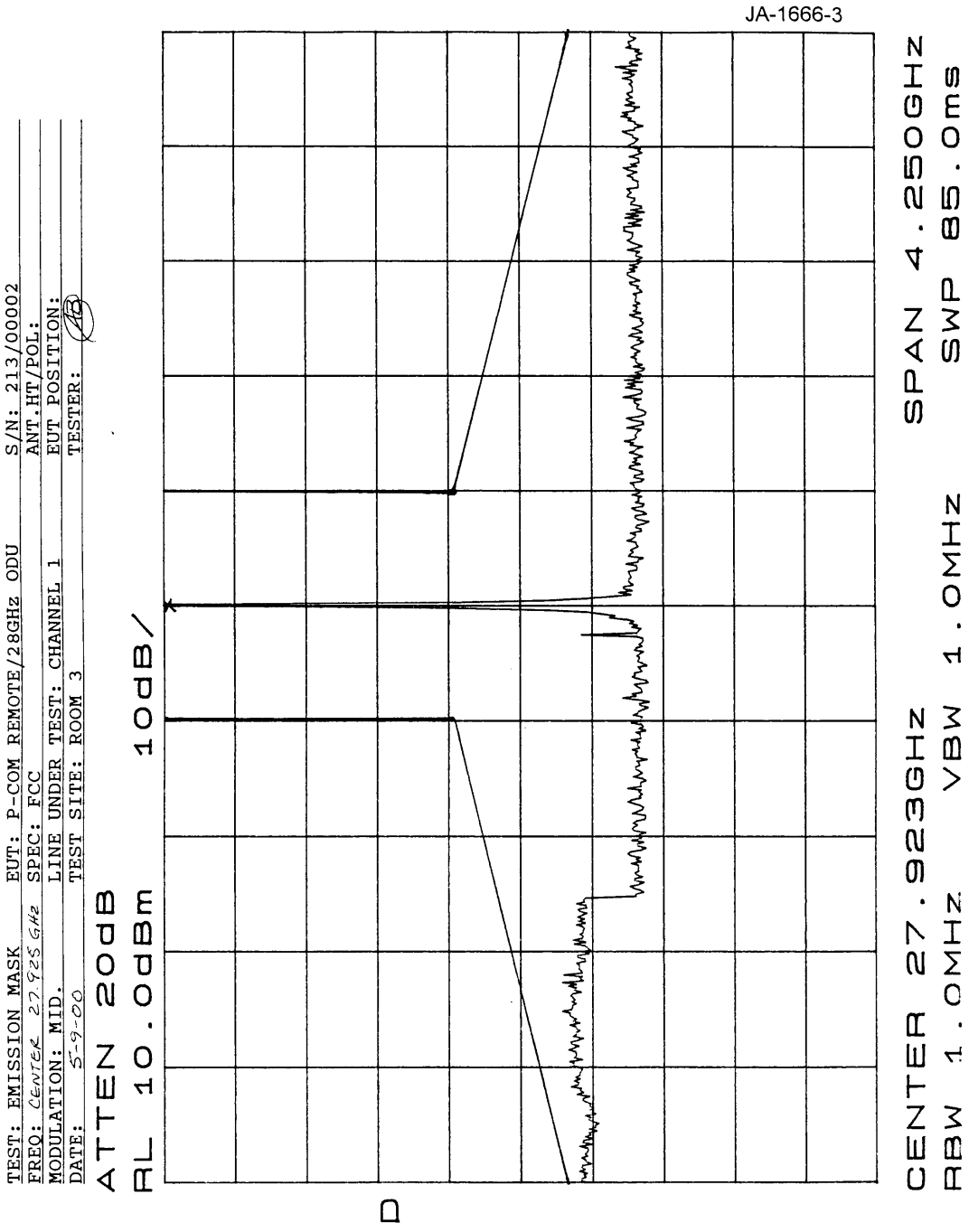

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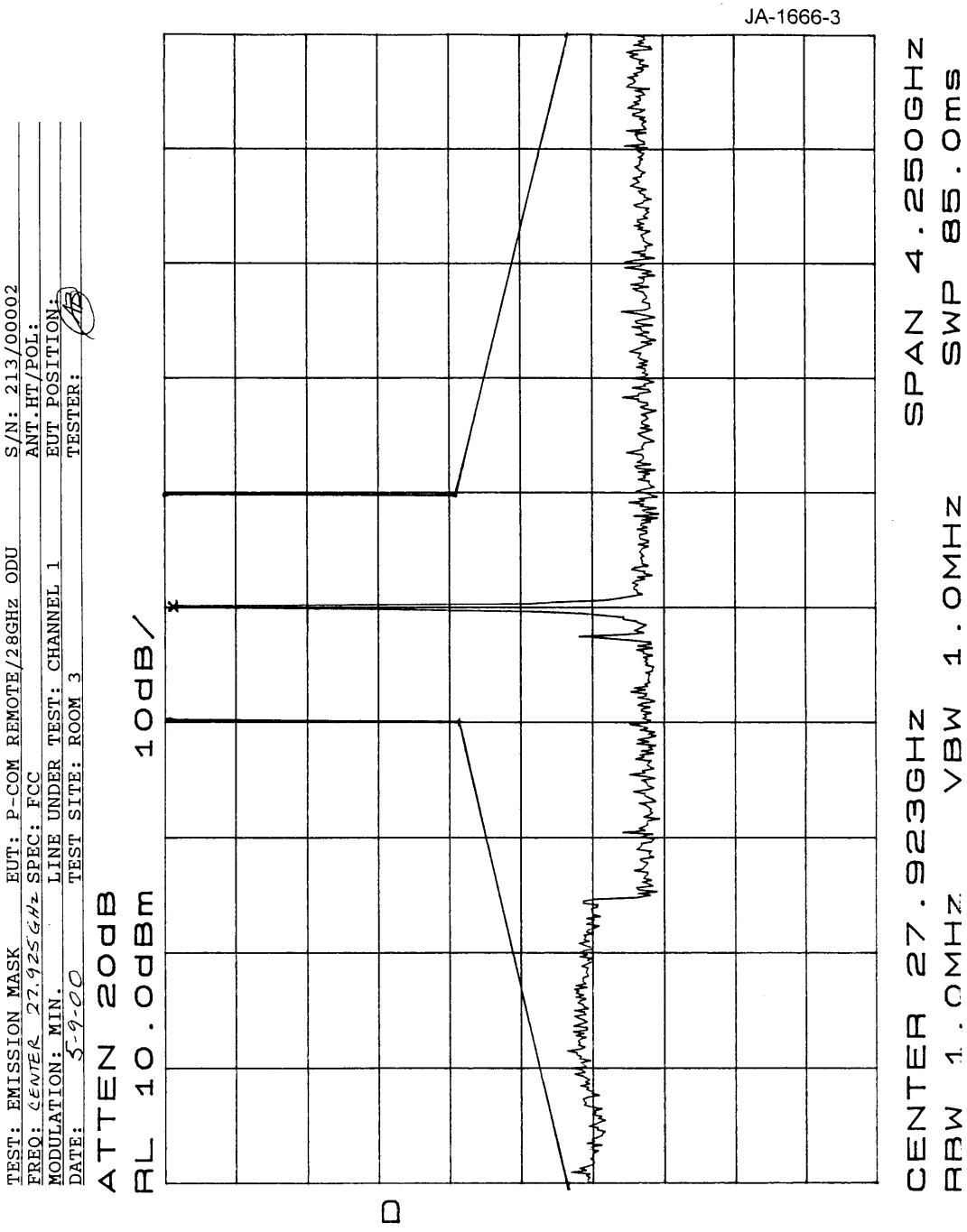
DATA SHEET 6.1.3.1-1

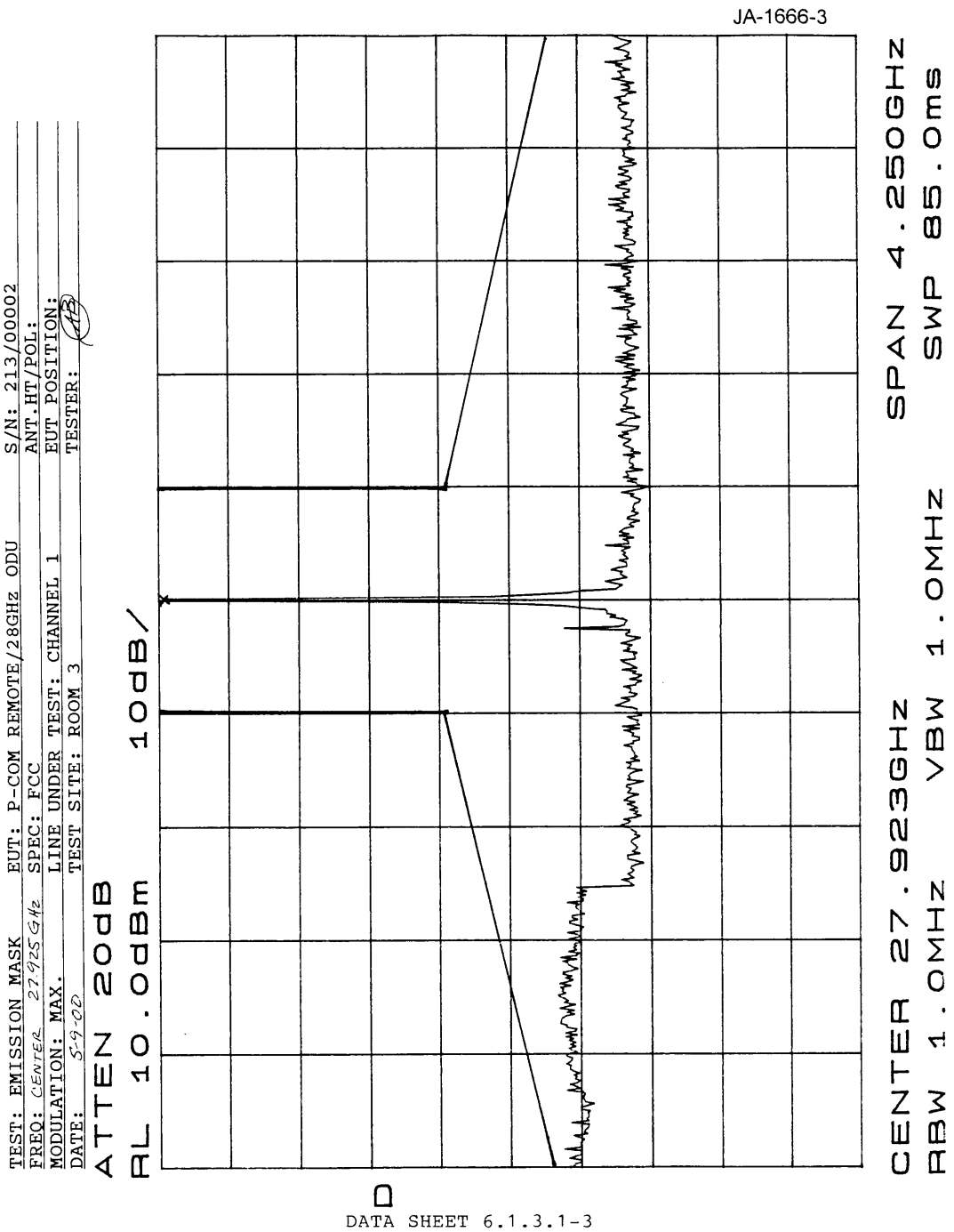
30.tif (2496x3267x2 tiff)



DATA SHEET 6.1.3.1-2

31.tif (2496x3267x2 tiff)

JA-1666-3

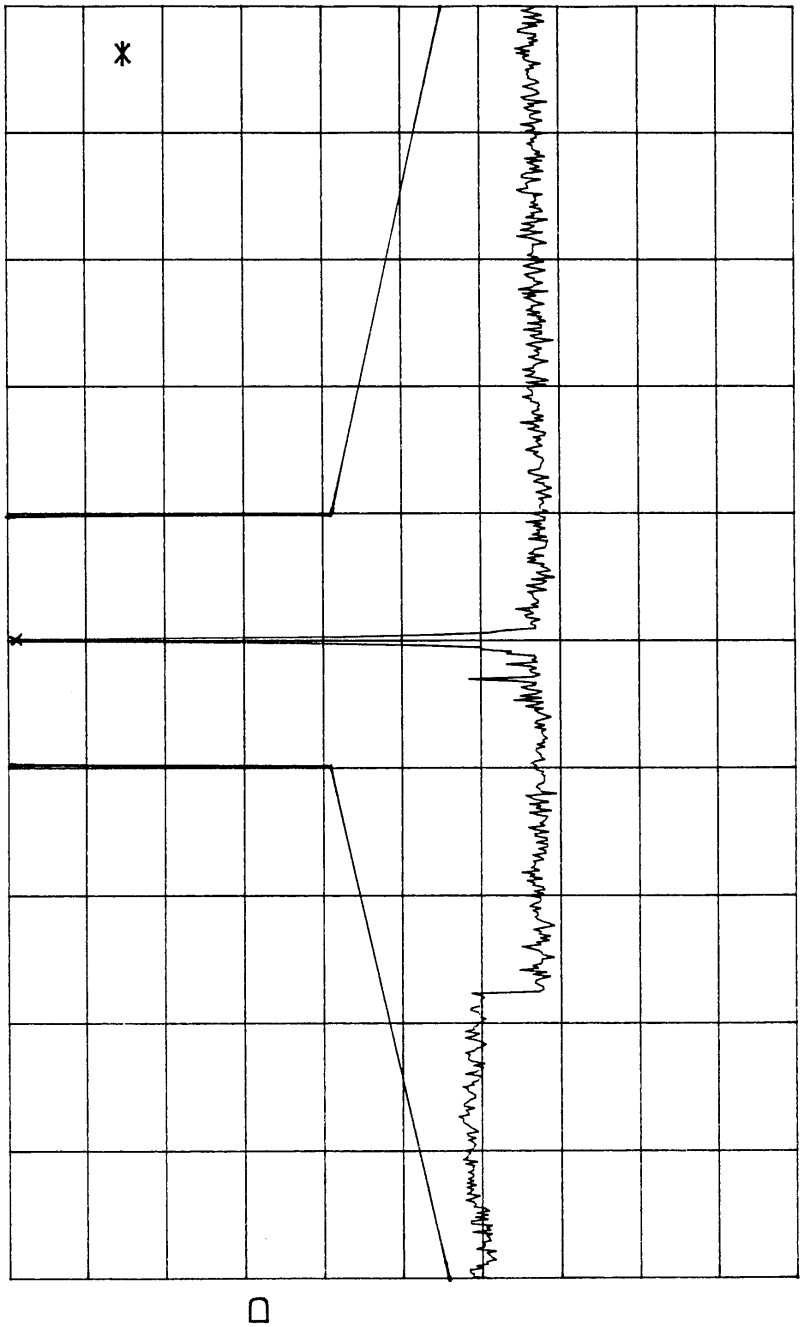


DATA SHEET 6.1.3.1-3

32.tif (2496x3267x2 tiff)

JA-1666-3

TEST: EMISSION MASK EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: Center 28.025 GHz SPEC: FCC 101.111 ANT.HT/POL:
MODULATION: MID. LINE UNDER TEST: CHANNEL 11 EUT POSITION:
DATE: 5-5-00 TEST SITE: ROOM 3 TESTER: AB



DATA SHEET 6.1.3.1-4

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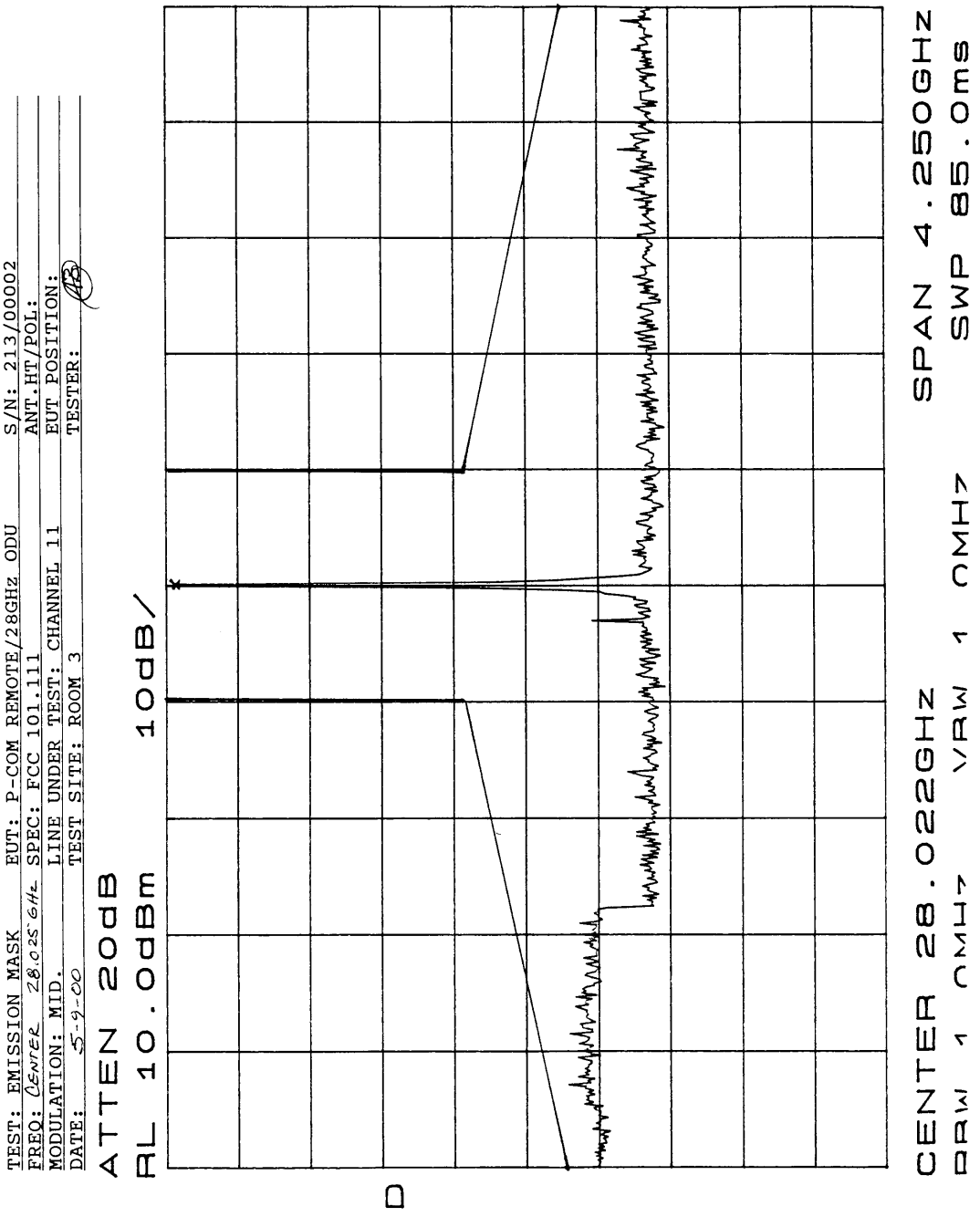
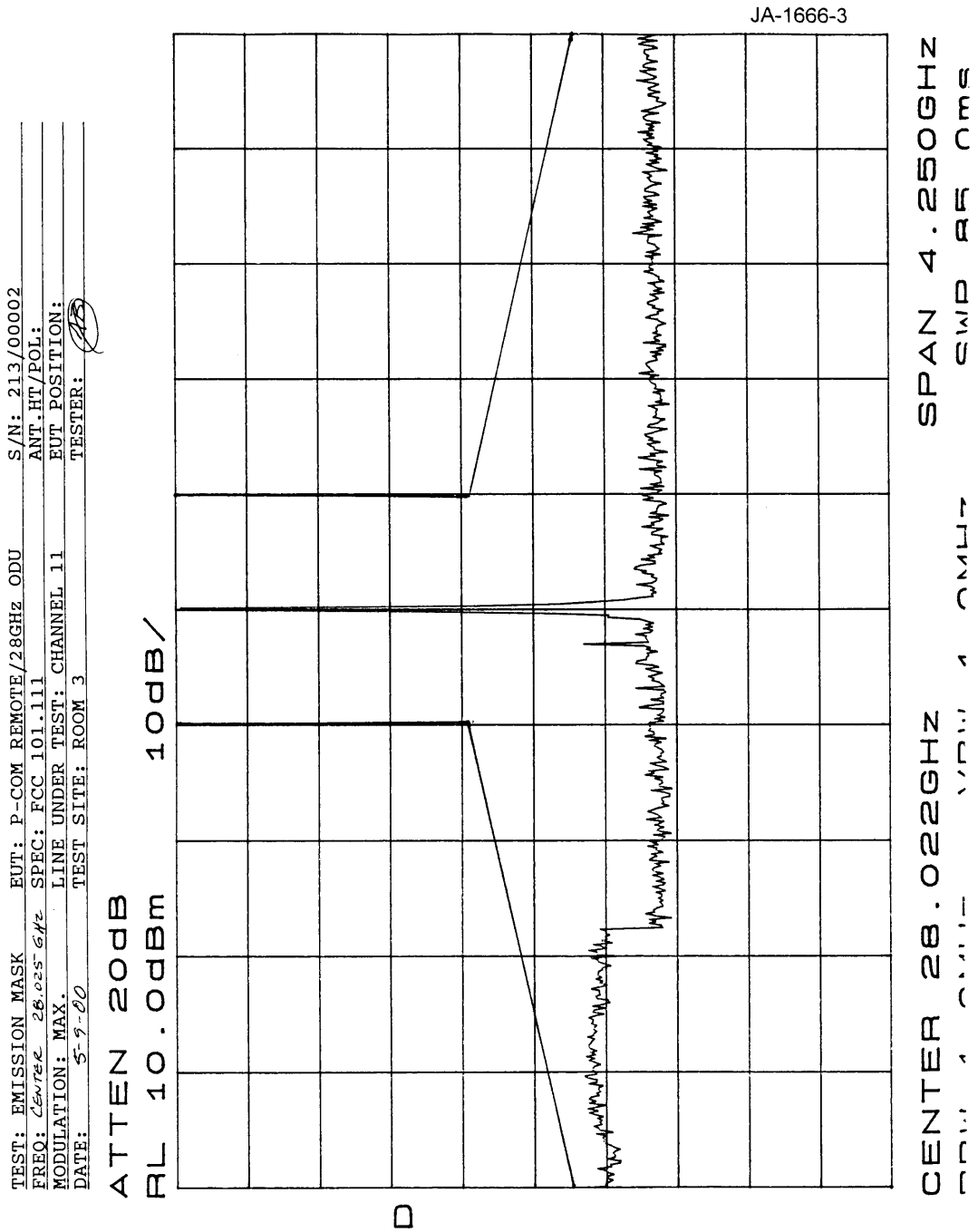
JA-1666-3



DATA SHEET 6.1.3.1-5

34.tif (2496x3267x2 tiff)

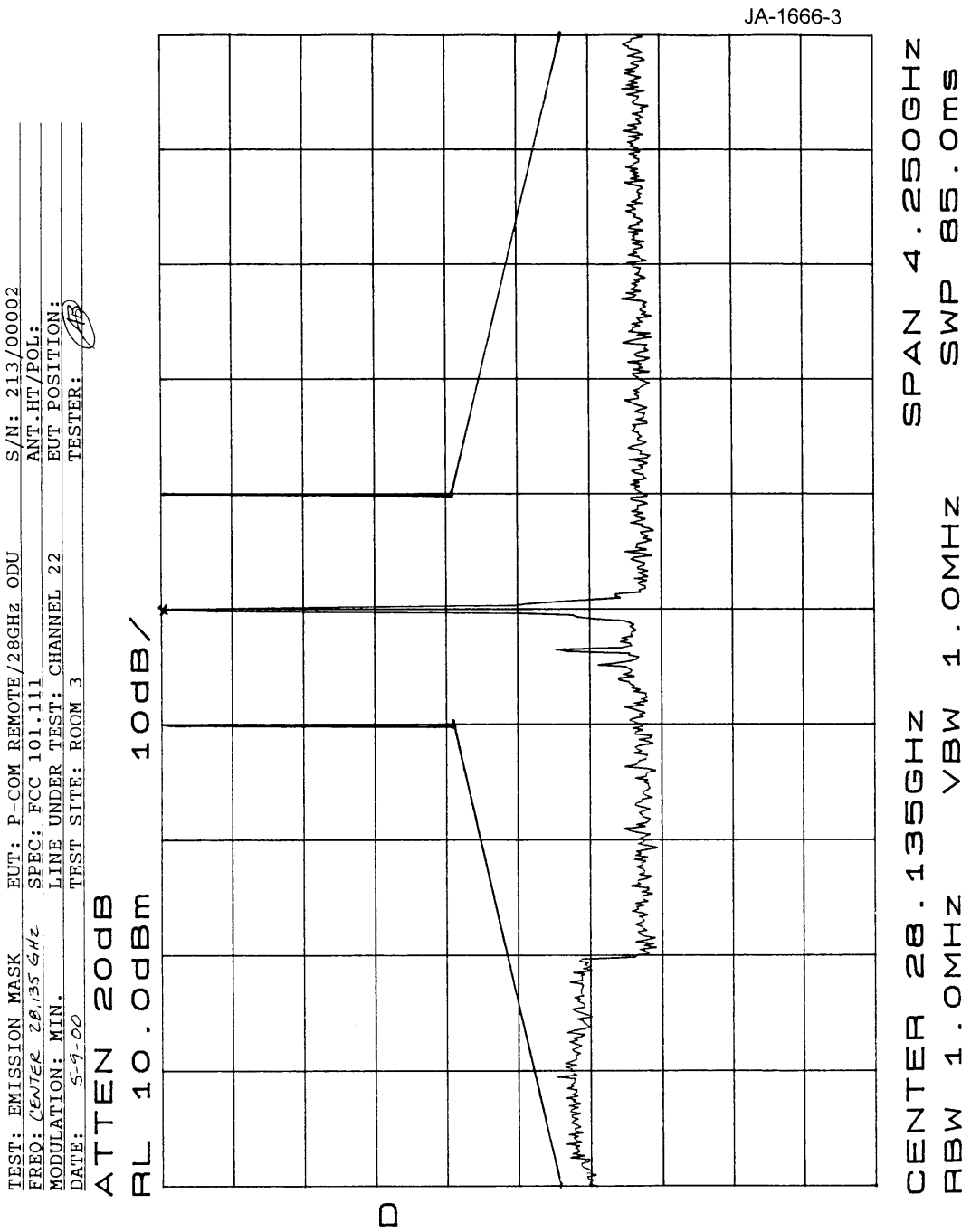
JA-1666-3



DATA SHEET 6.1.3.1-6

35.tif (2496x3267x2 tiff)

JA-1666-3

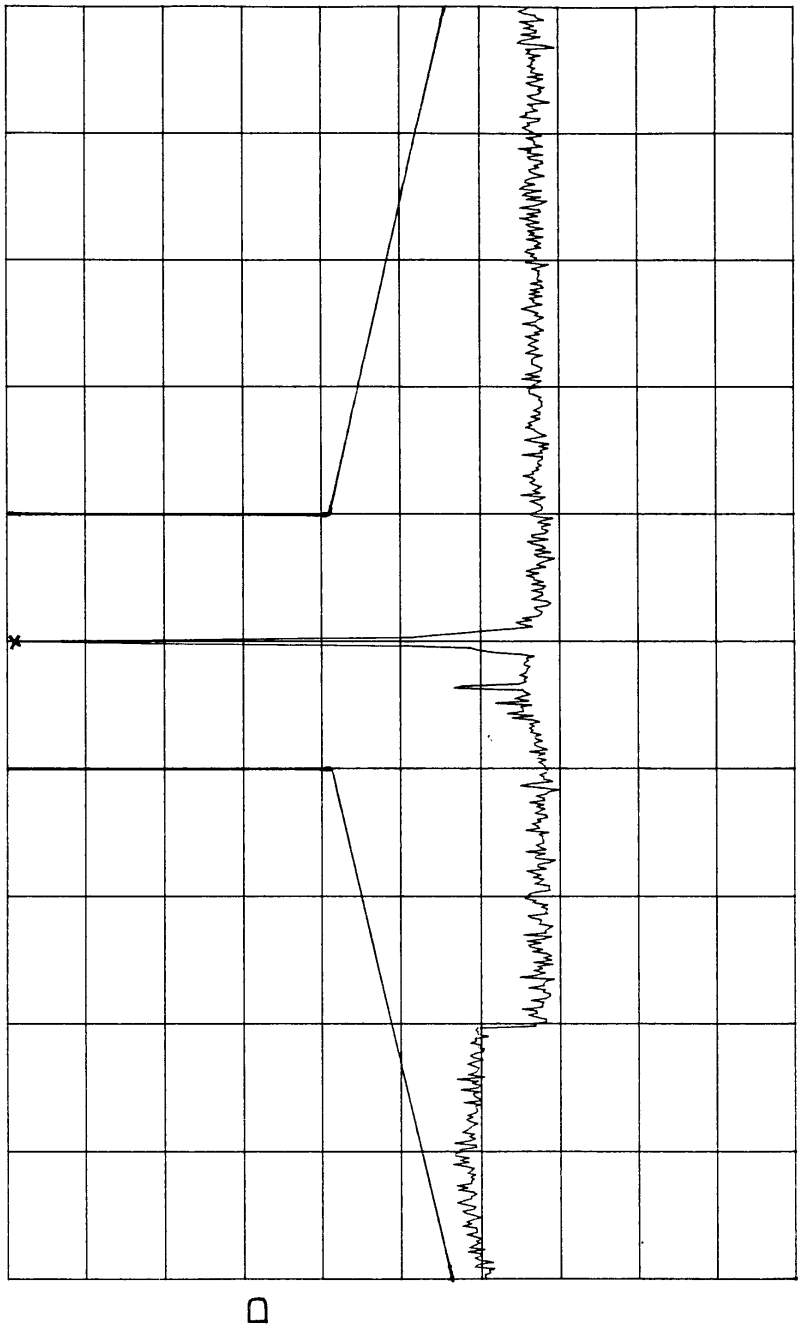


DATA SHEET 6.1.3.1-7

36.tif (2496x3267x2 tiff)

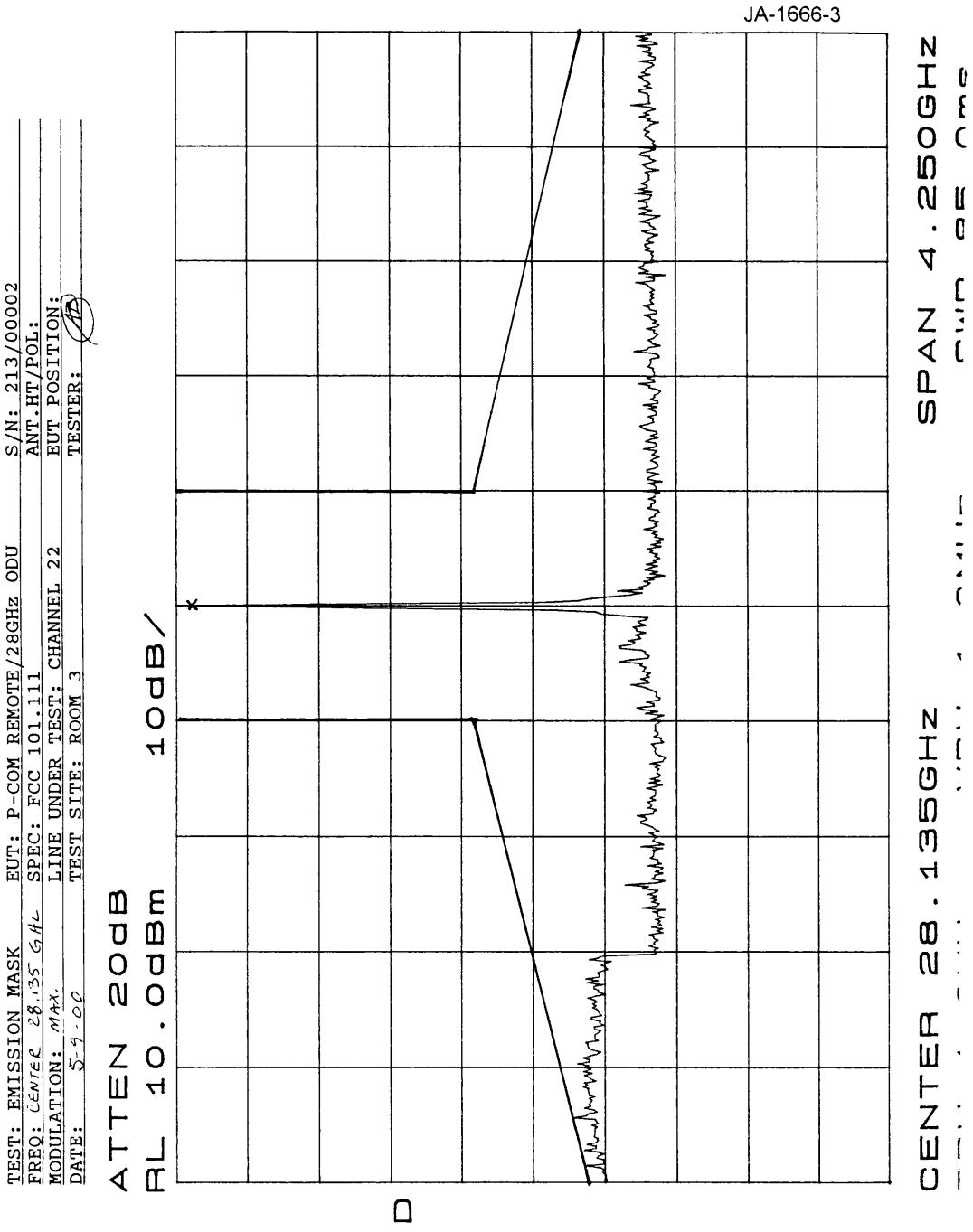
JA-1666-3

TEST: EMISSION MASK EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: CENTER 28.135 GHz SPEC: FCC 101.111 ANT.HT/POL:
MODULATION: MID. LINE UNDER TEST: CHANNEL 22 EUT POSITION:
DATE: 5-9-00 TEST SITE: ROOM 3 TESTER:



DATA SHEET 6.1.3.1-8

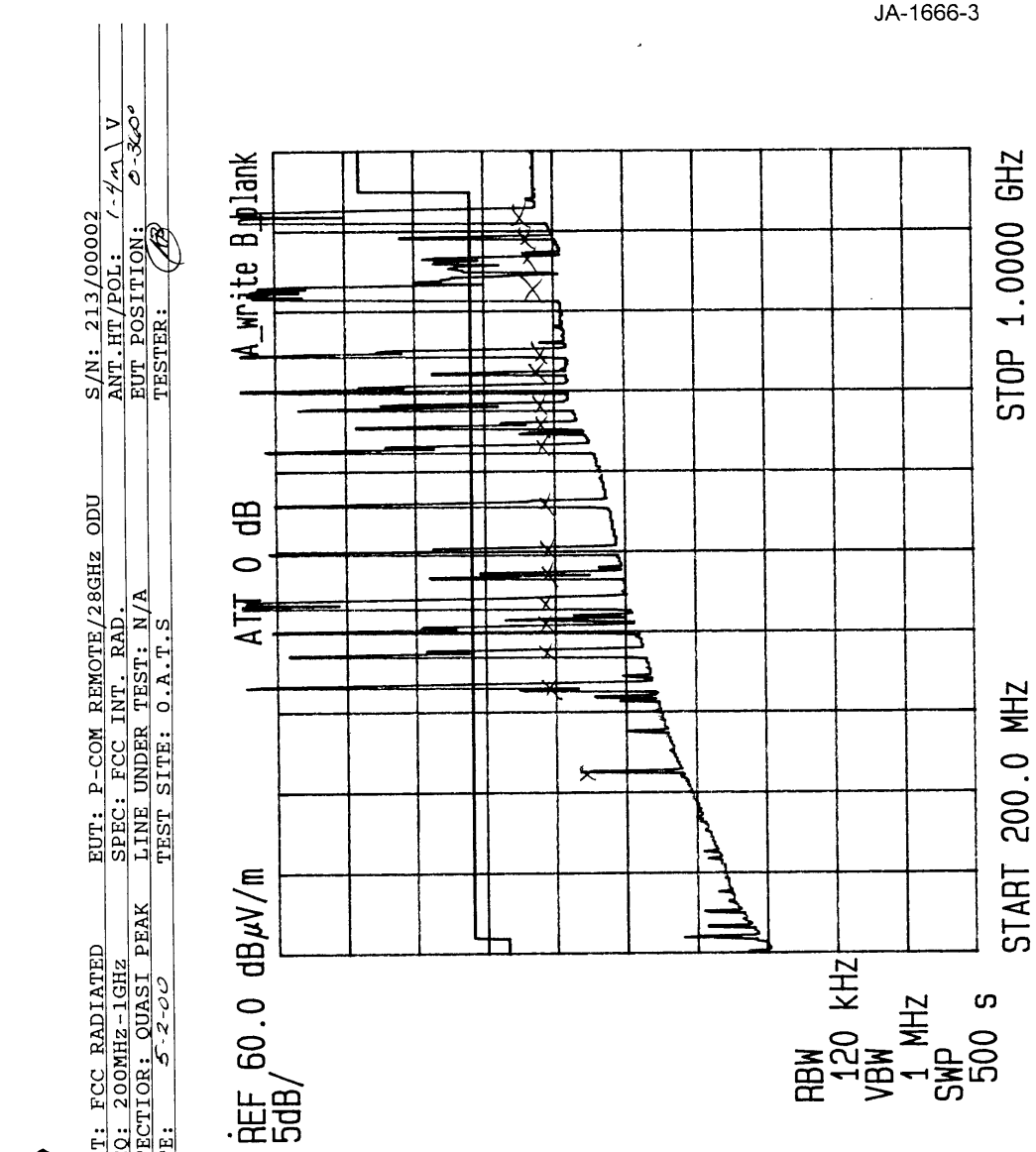
37.tif (2496x3267x2 tiff)



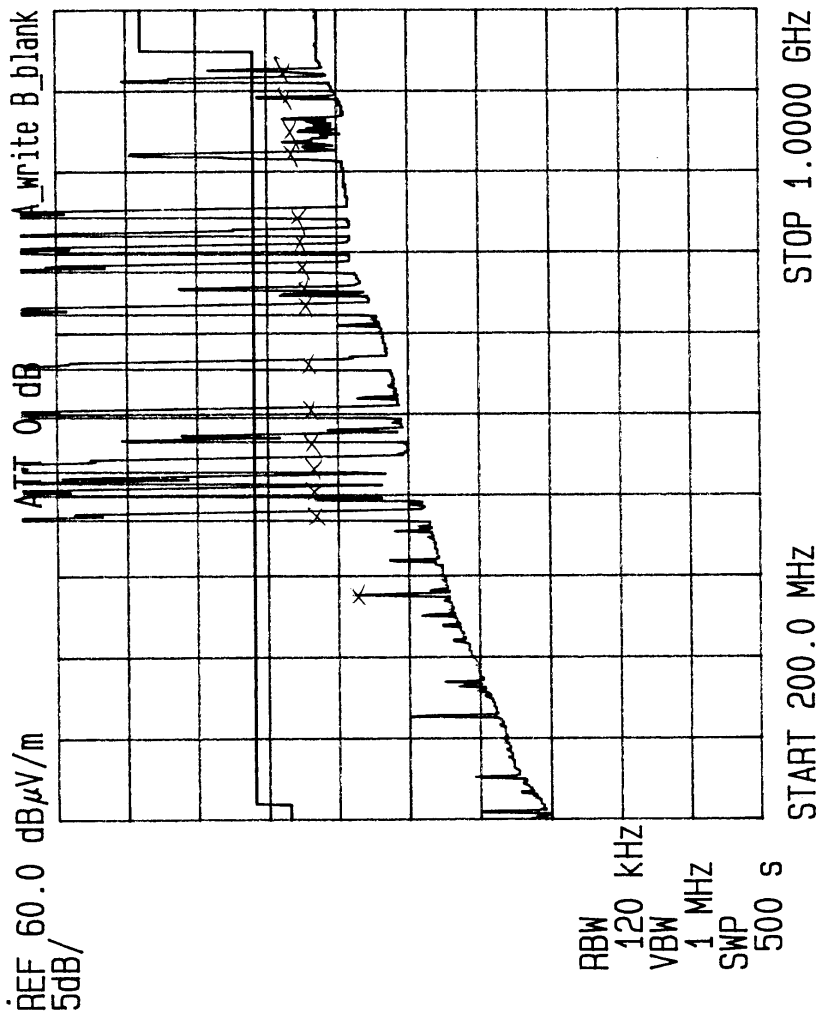
DATA SHEET 6.1.3.1-9

38.tif (2496x3267x2 tiff)

JA-1666-3

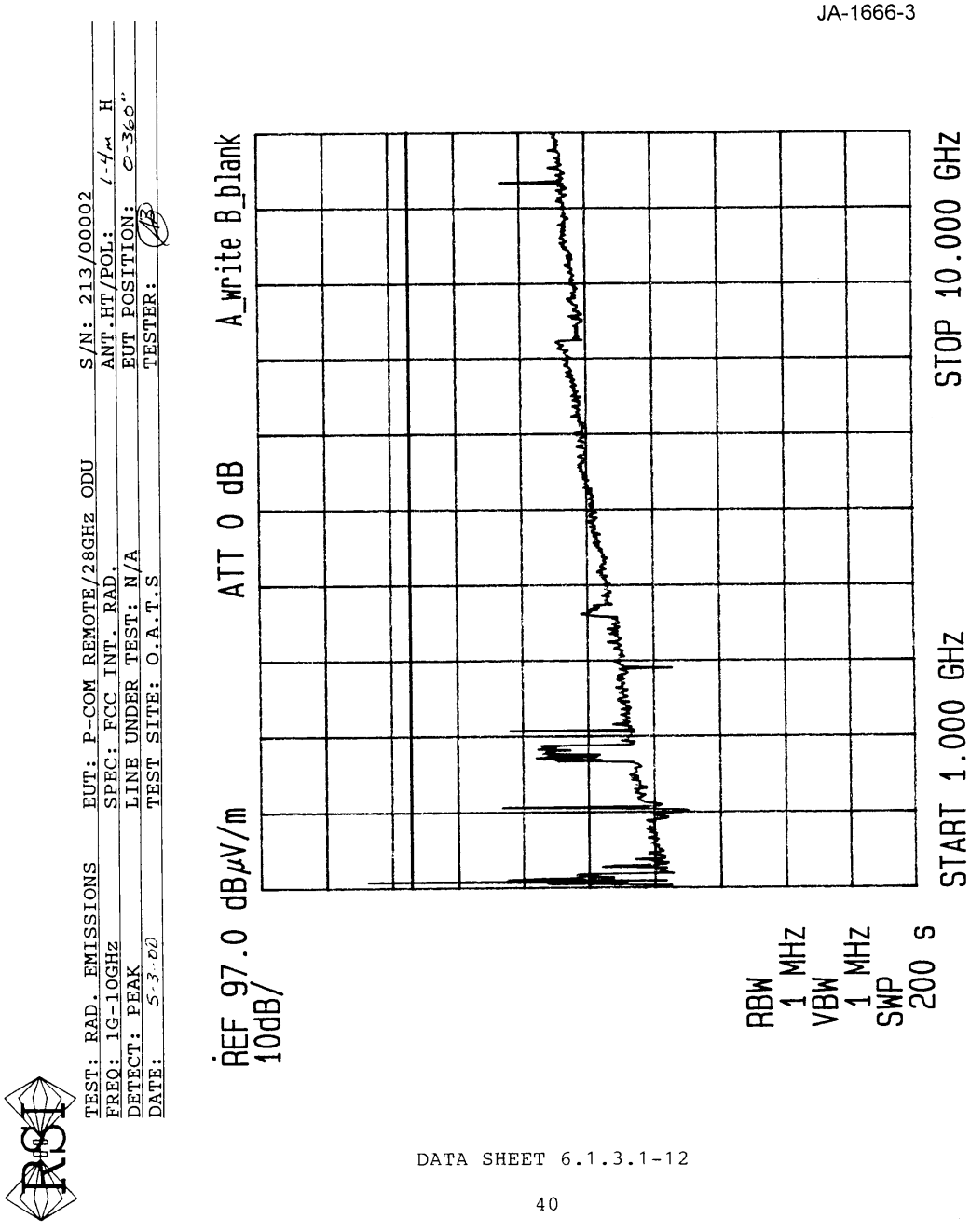


TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 200MHz-1GHz SPEC: FCC INT. RAD. ANT.HT/POL: 1-4m | H
DETECTOR: QUASI PEAK LINE UNDER TEST: N/A EUT POSITION: 0-360°
DATE: 5-3-00 TEST SITE: O.A.T.S TESTER:



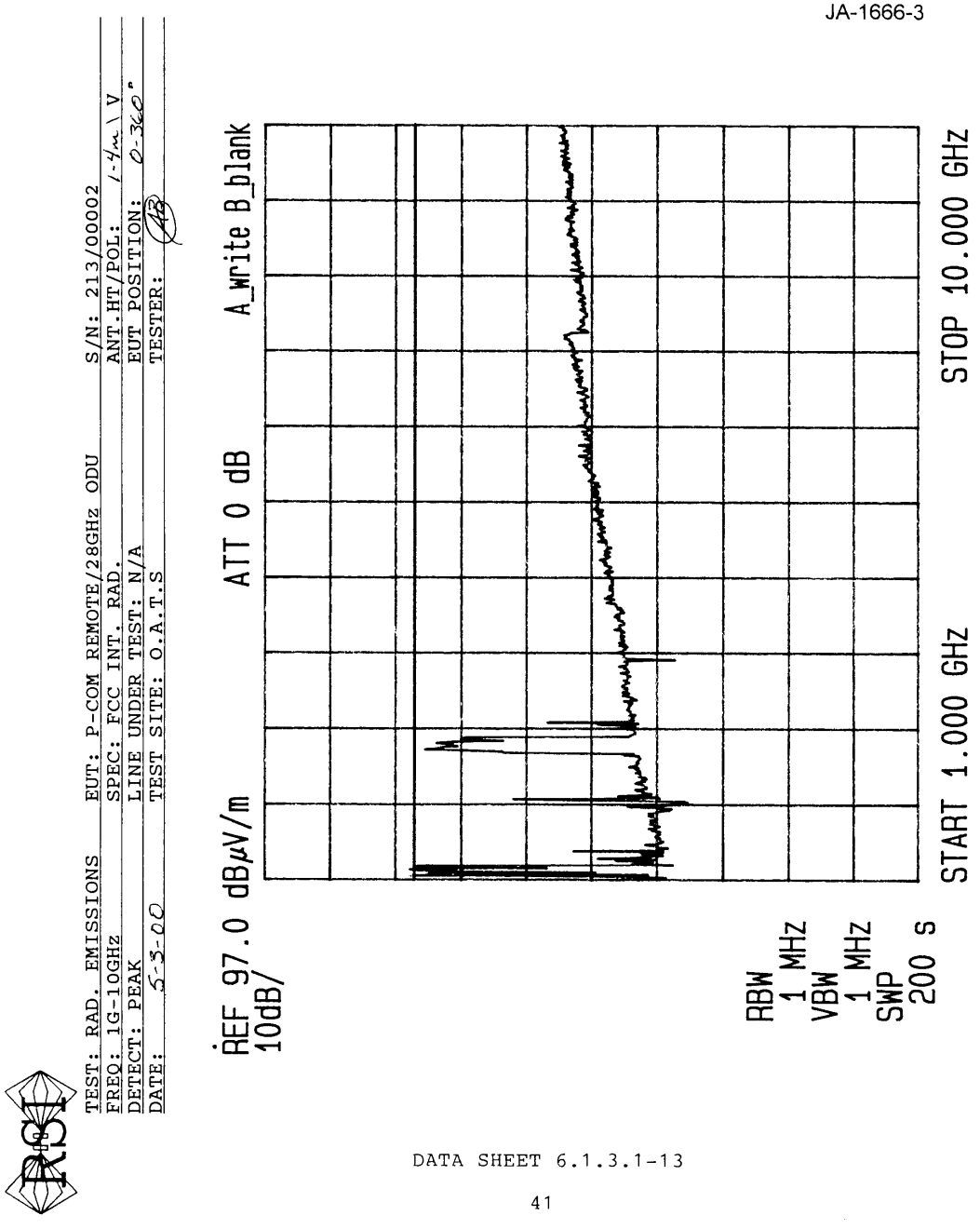
40.tif (2496x3267x2 tiff)

JA-1666-3

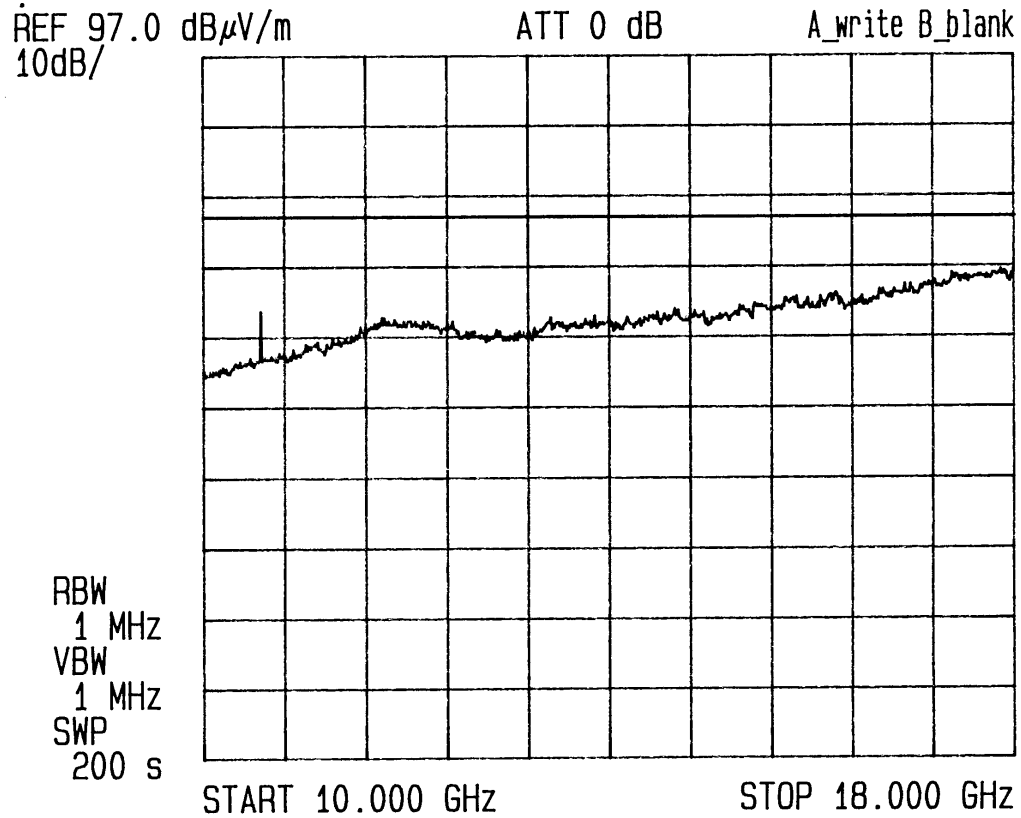


41.tif (2496x3267x2 tiff)

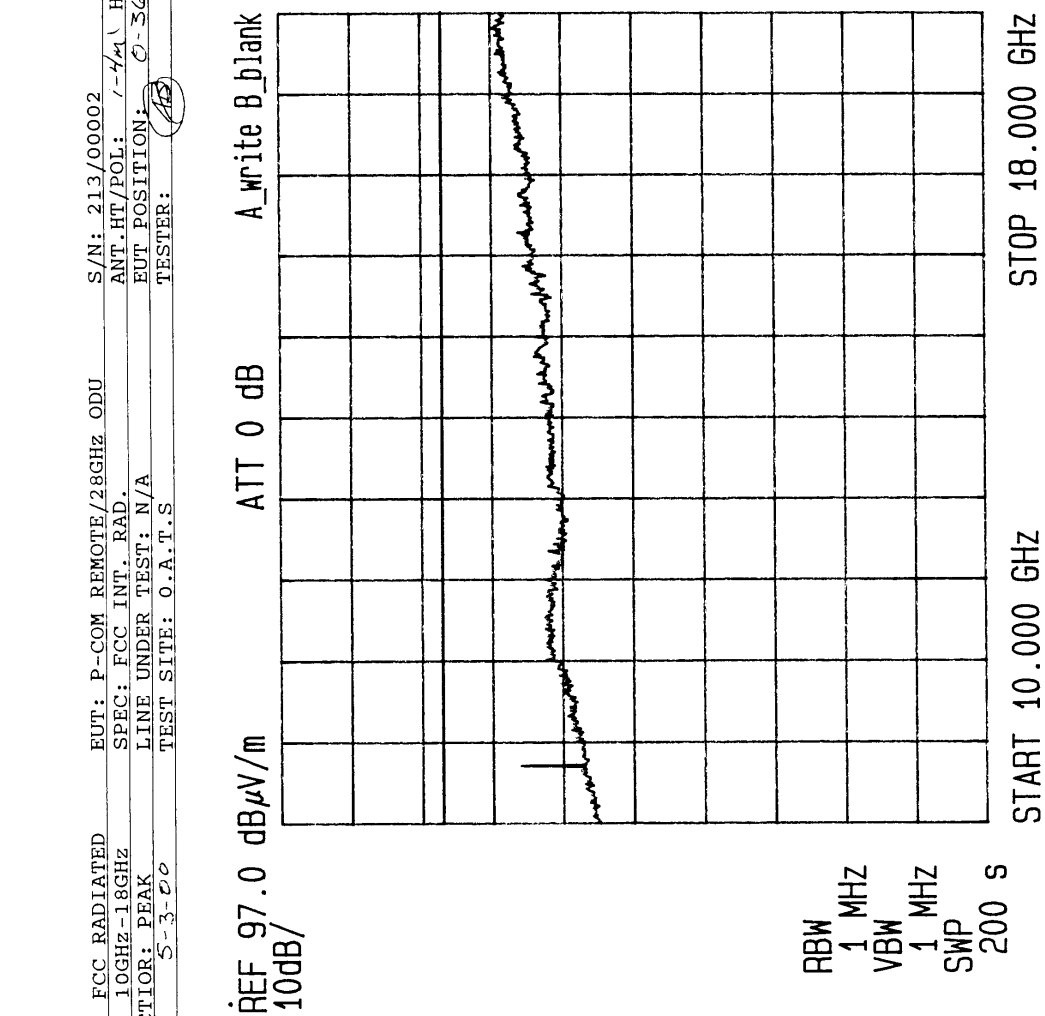
JA-1666-3



TEST: FCC RADIATED	EUT: P-COM REMOTE/28GHz ODU	S/N: 213/00002
FREQ: 10GHz-18GHz	SPEC: FCC INT. RAD.	ANT.HT/POL: 1-4m \ V
DETECTIOR: PEAK	LINE UNDER TEST: N/A	EUT POSITION: 0-360°
DATE: 5-3-00	TEST SITE: O.A.T.S	TESTER: AB

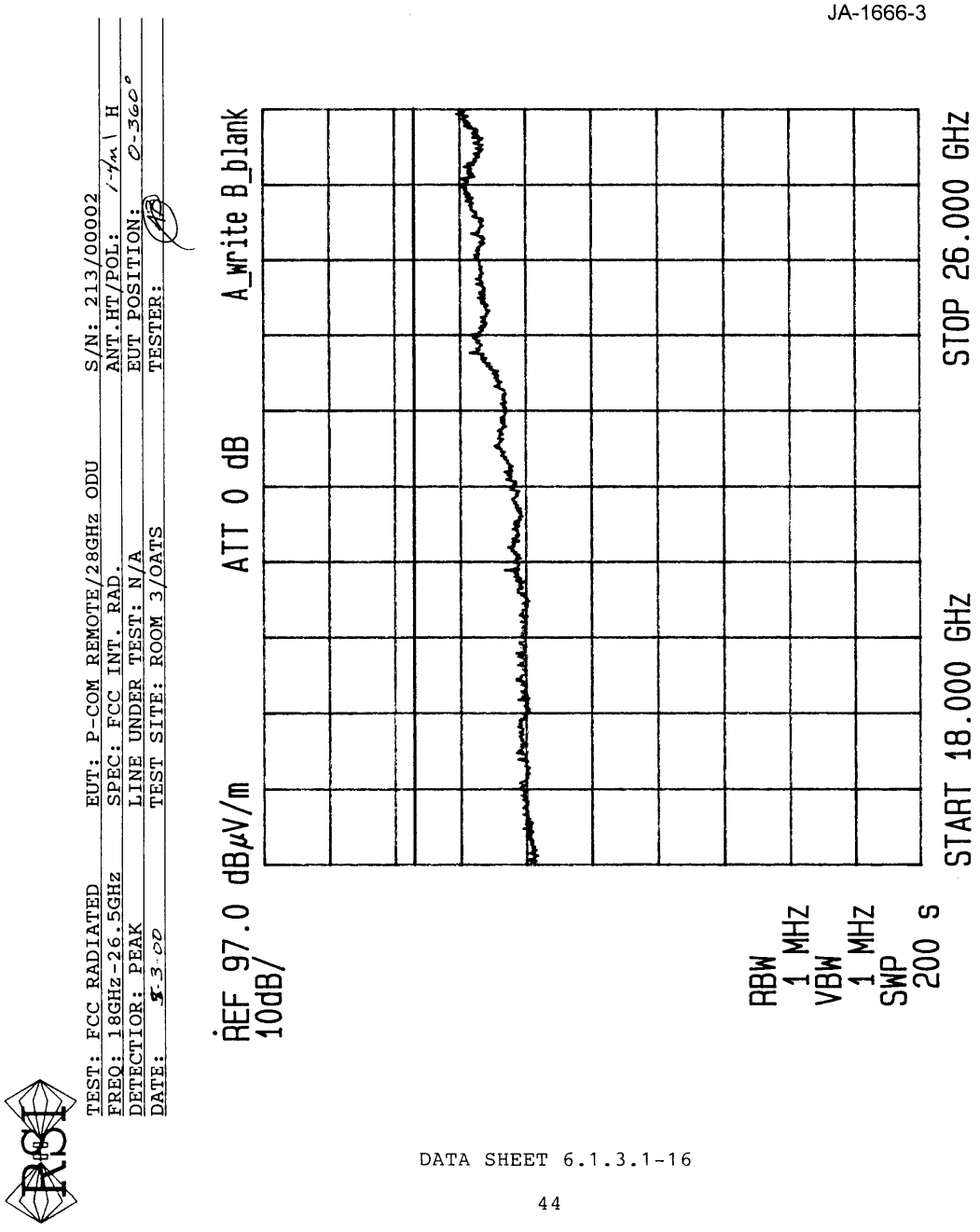


TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 10GHz-18GHz SPEC: FCC INT. RAD. ANT.HT/POL: 1-4m / H
DETECTIOR: PEAK LINE UNDER TEST: N/A EUT POSITION: 0-360°
DATE: 5-3-00 TEST SITE: O.A.T.S TESTER: AB



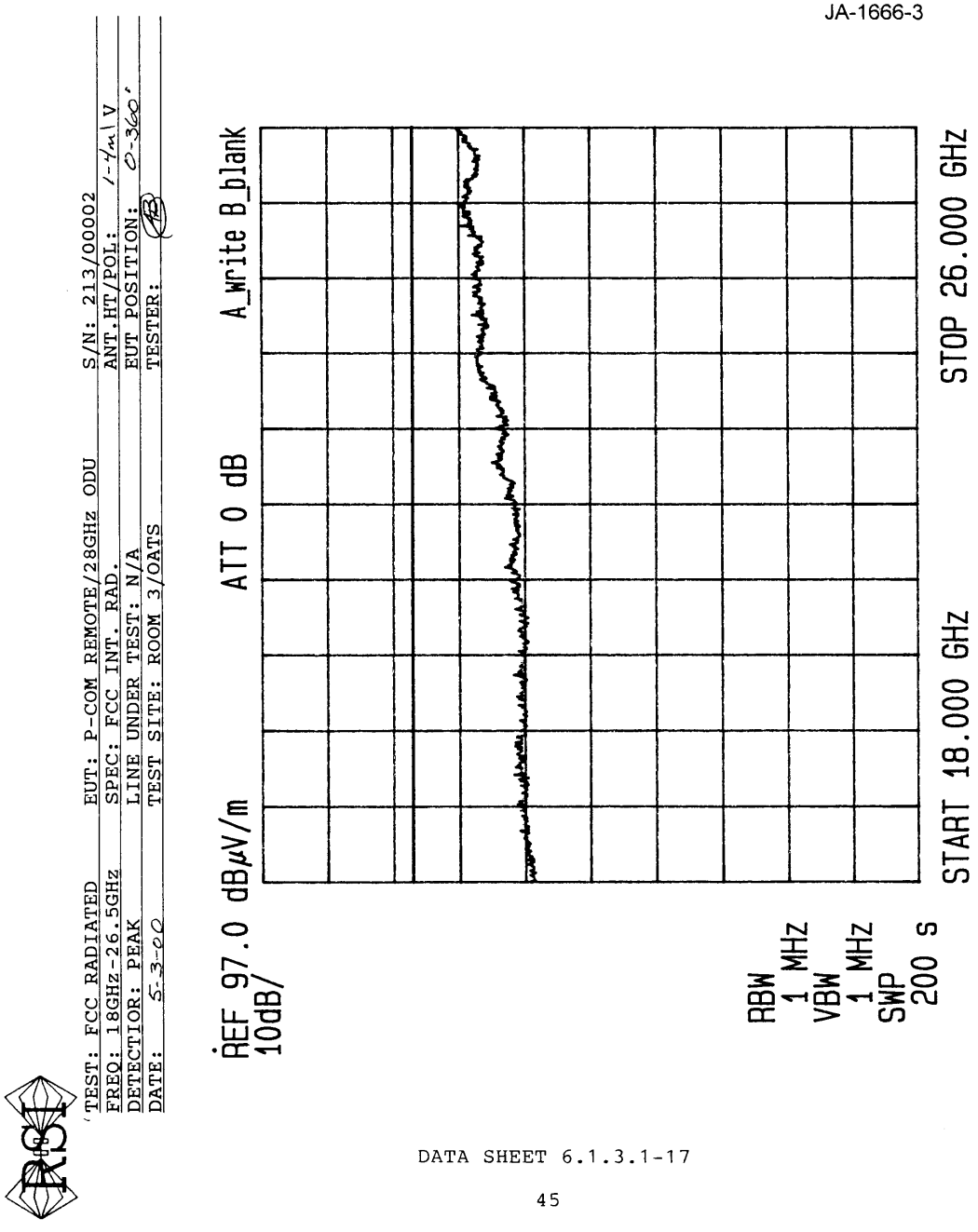
44.tif (2496x3267x2 tiff)

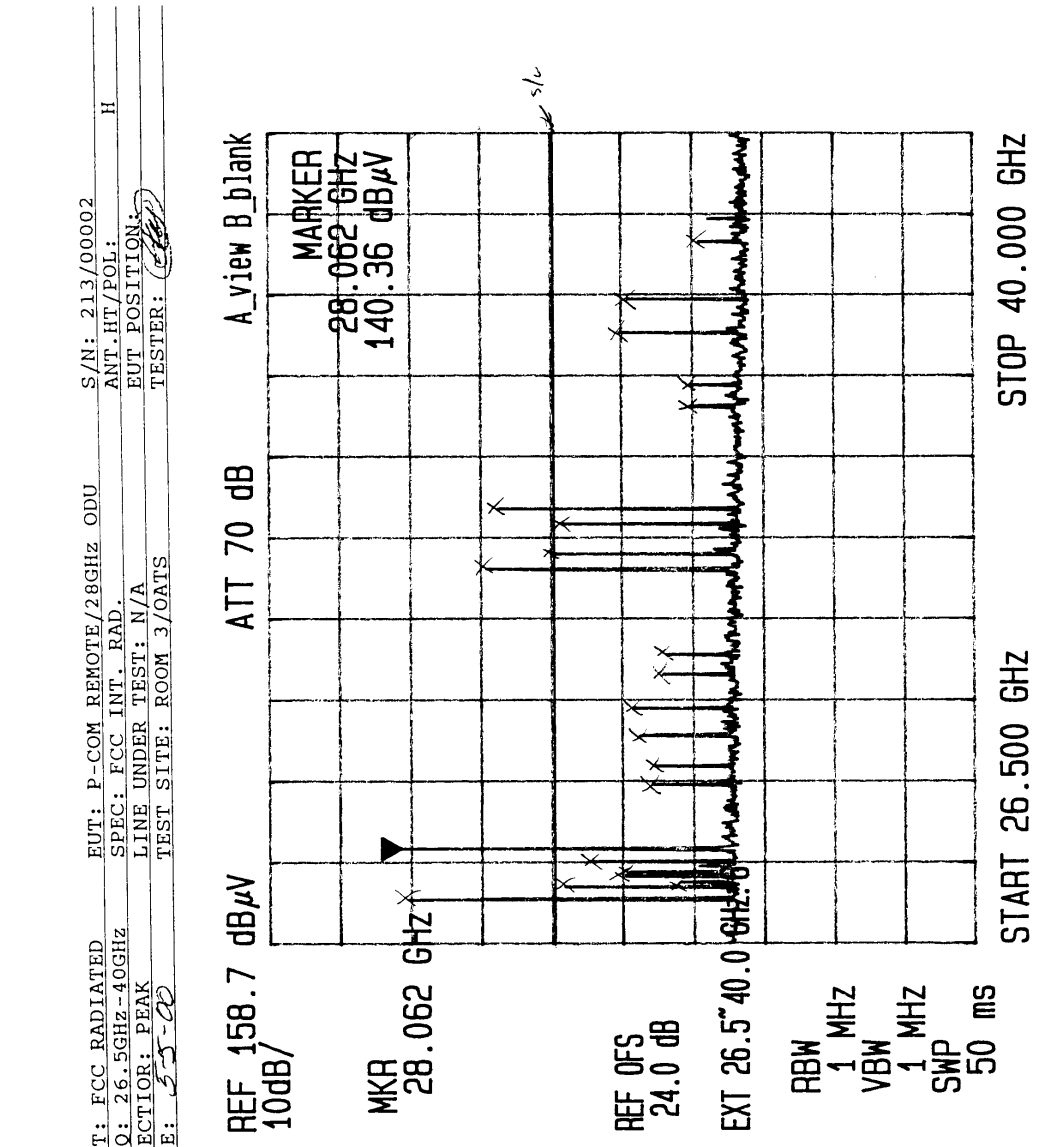
JA-1666-3



45.tif (2496x3267x2 tiff)

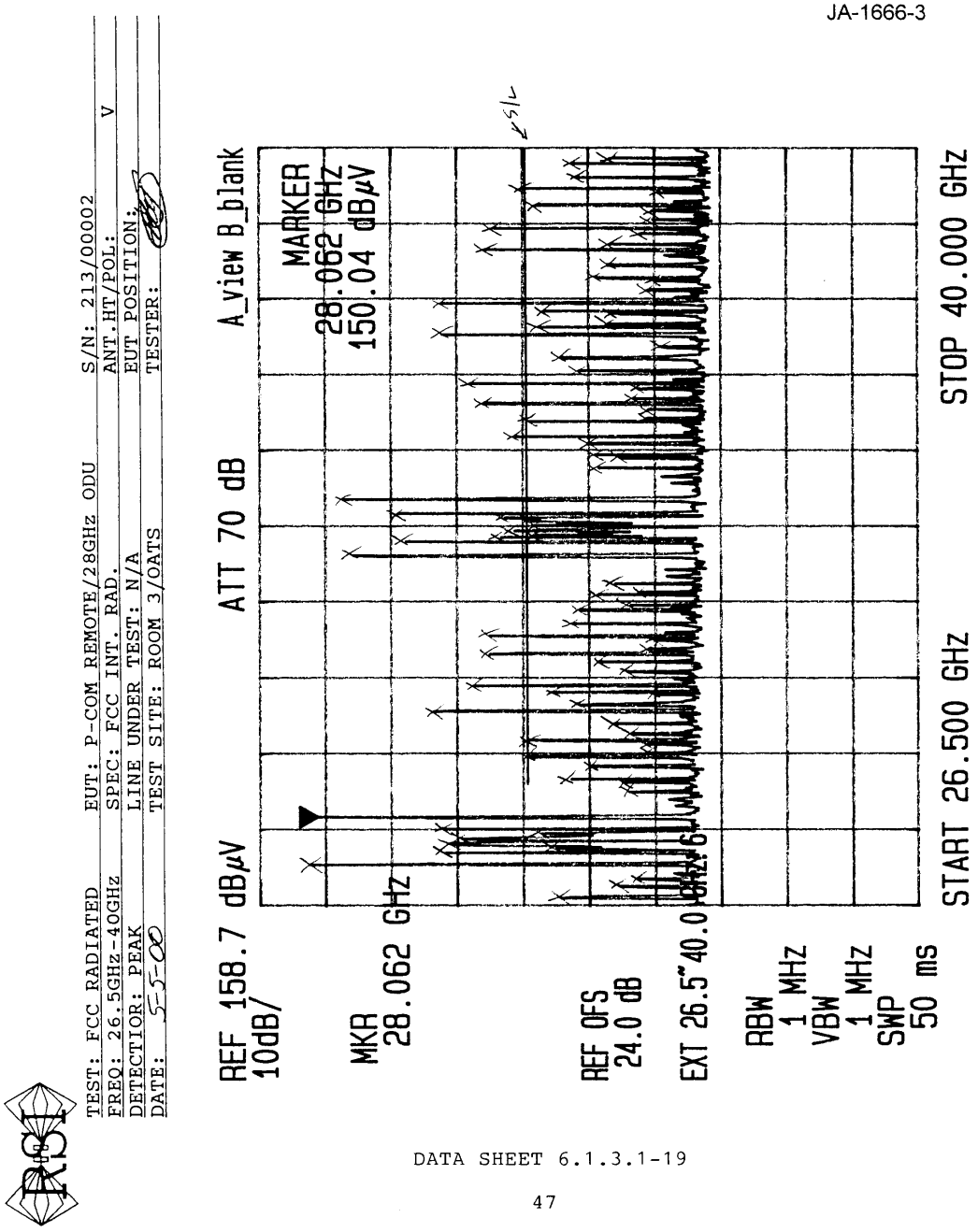
JA-1666-3




TEST: FCC RADIATED
EUT: P-COM REMOTE/28GHz ODU
S/N: 213/00002
FREQ: 26.5GHz-40GHz
SPEC: FCC INT. RAD.
ANT.HT/POL: H
DETECTION: PEAK
LINE UNDER TEST: N/A
EUT POSITION:
DATE: 5-5-00
TEST SITE: ROOM 3/OATS
TESTER:
REF 158.7 dBµV
10dB/
ATT 70 dB
A_view B_blank
MARKER
28.062 GHz
140.36 dBµV
MKR
28.062 GHz
REF OFS
24.0 dB
EXT 26.5"40.0 GHz
RBW
1 MHz
VBW
1 MHz
SWP
50 ms
START 26.500 GHz
STOP 40.000 GHz

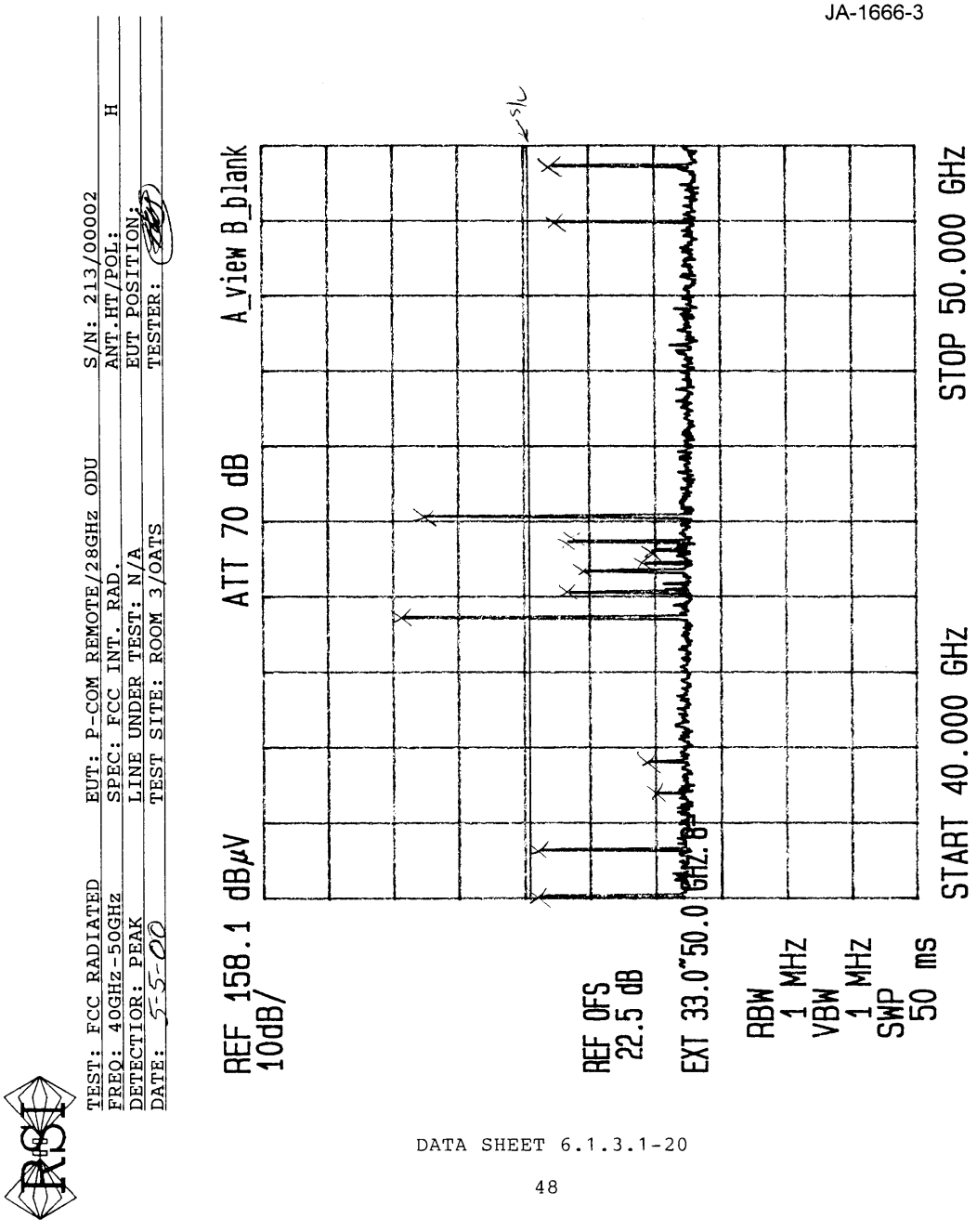
47.tif (2496x3267x2 tiff)

JA-1666-3

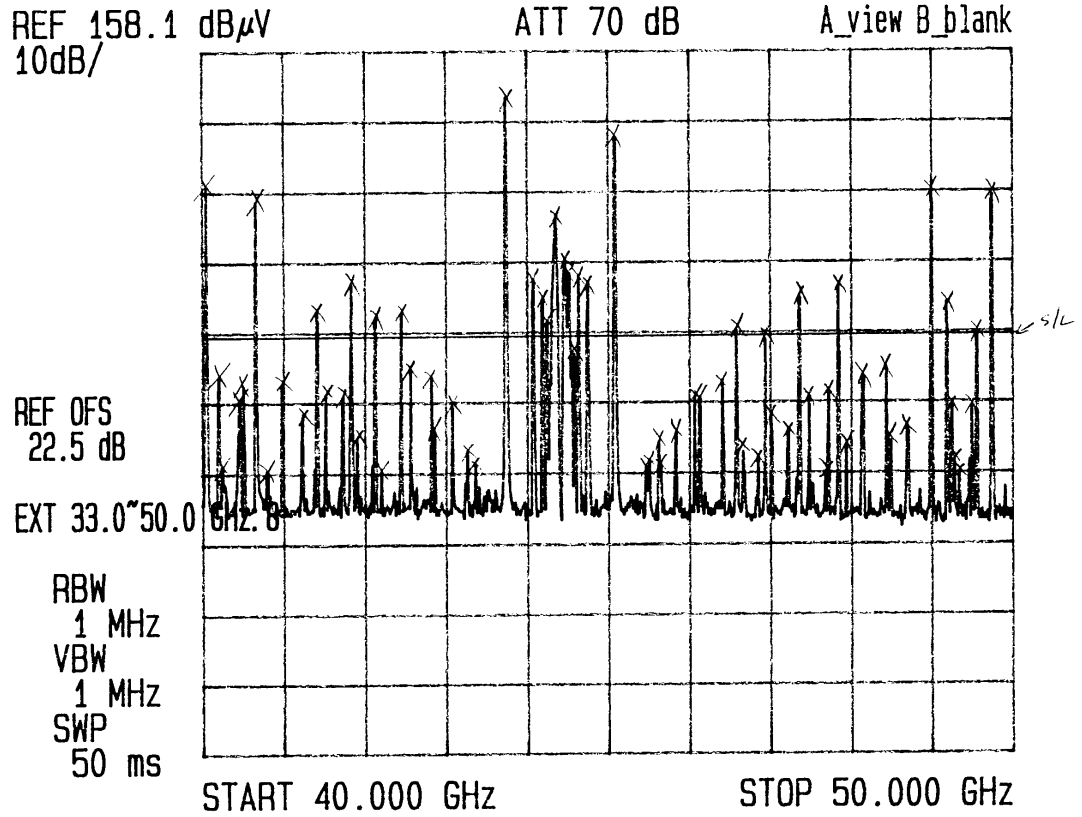


48.tif (2496x3267x2 tiff)

JA-1666-3

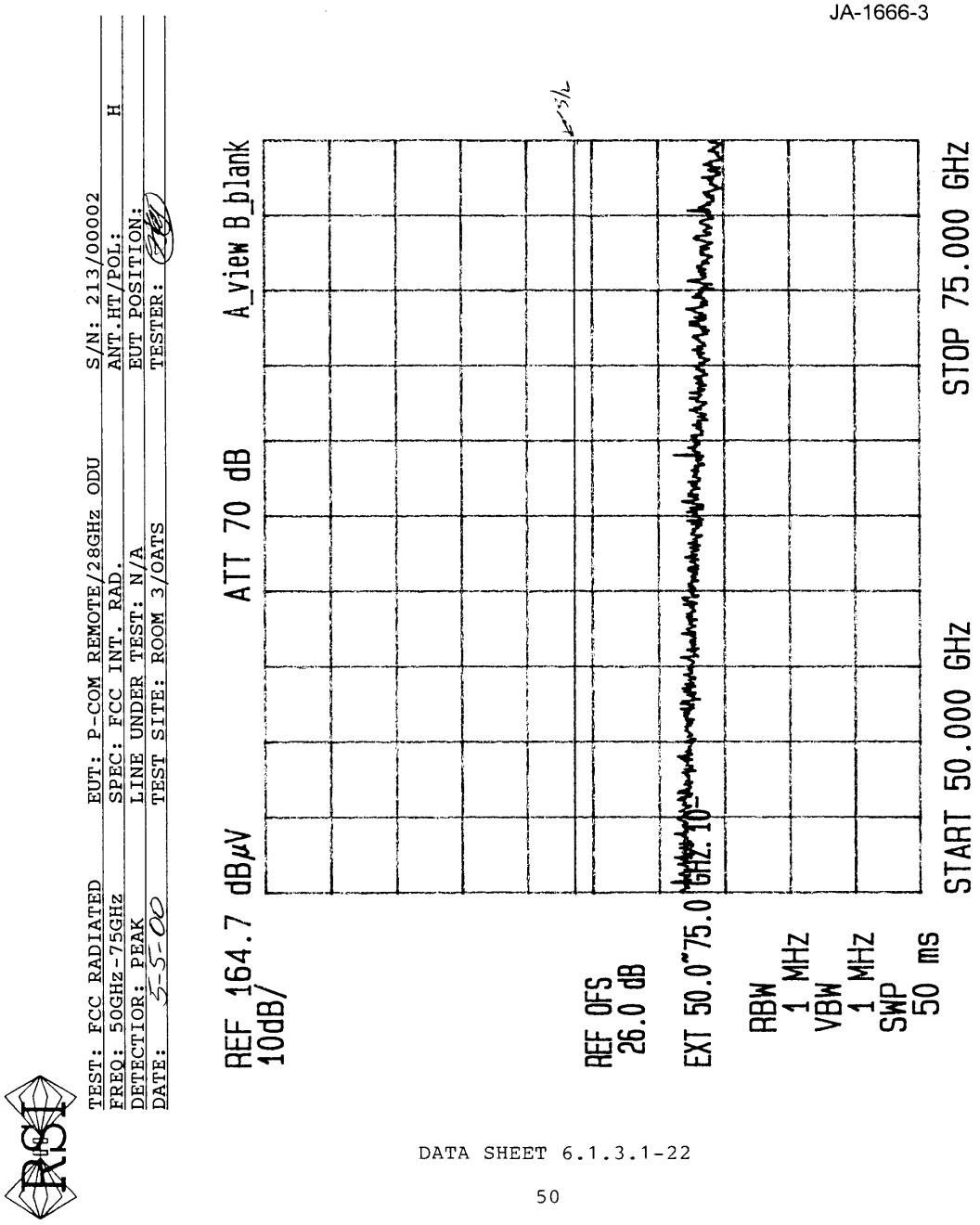


TEST: FCC RADIATED	EUT: P-COM REMOTE/28GHz ODU	S/N: 213/00002
FREQ: 40GHz-50GHz	SPEC: FCC INT. RAD.	ANT.HT/POL: V
DETECTION: PEAK	LINE UNDER TEST: N/A	EUT POSITION:
DATE: 5-5-00	TEST SITE: ROOM 3/OATS	TESTER:

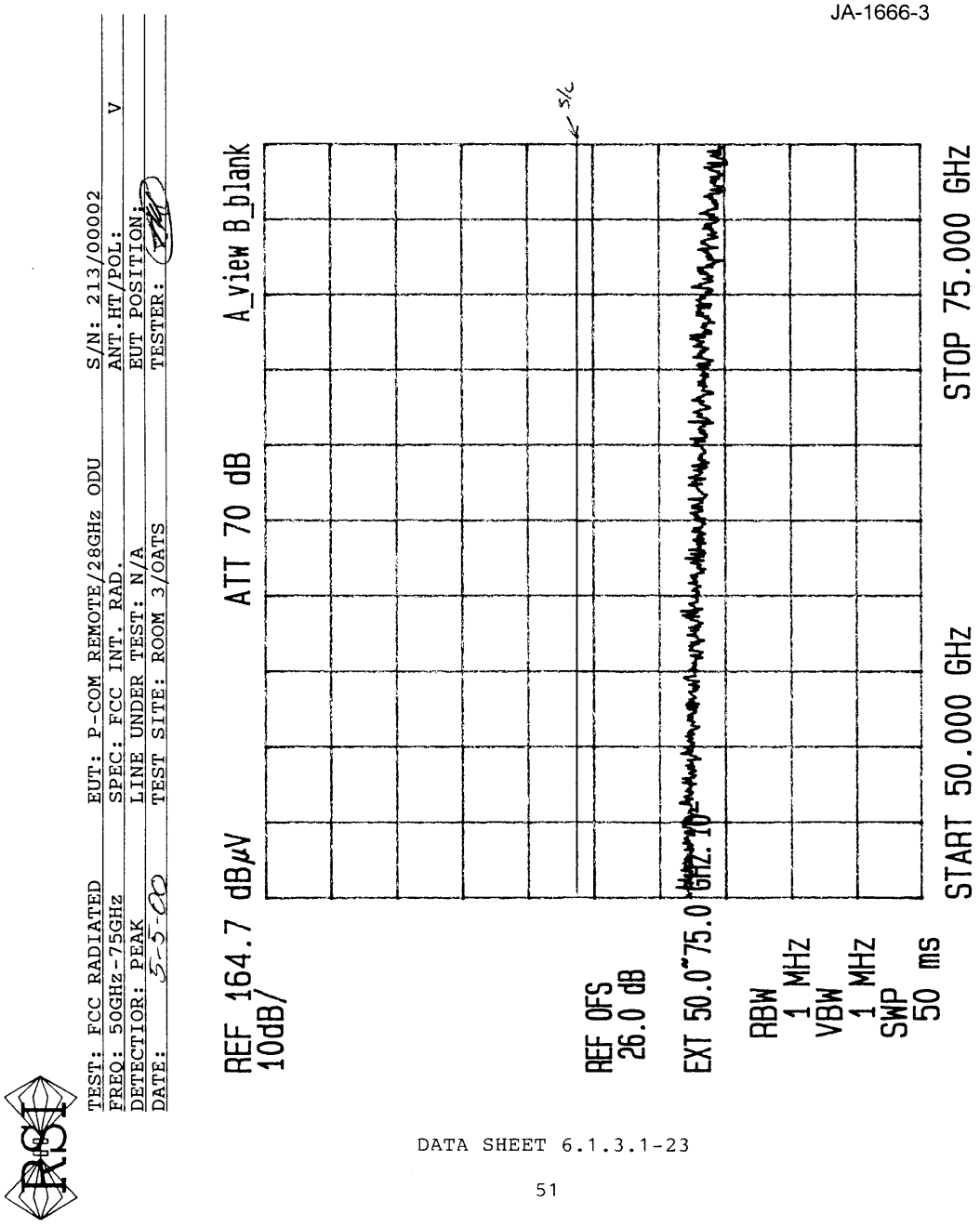


50.tif (2496x3267x2 tiff)

JA-1666-3



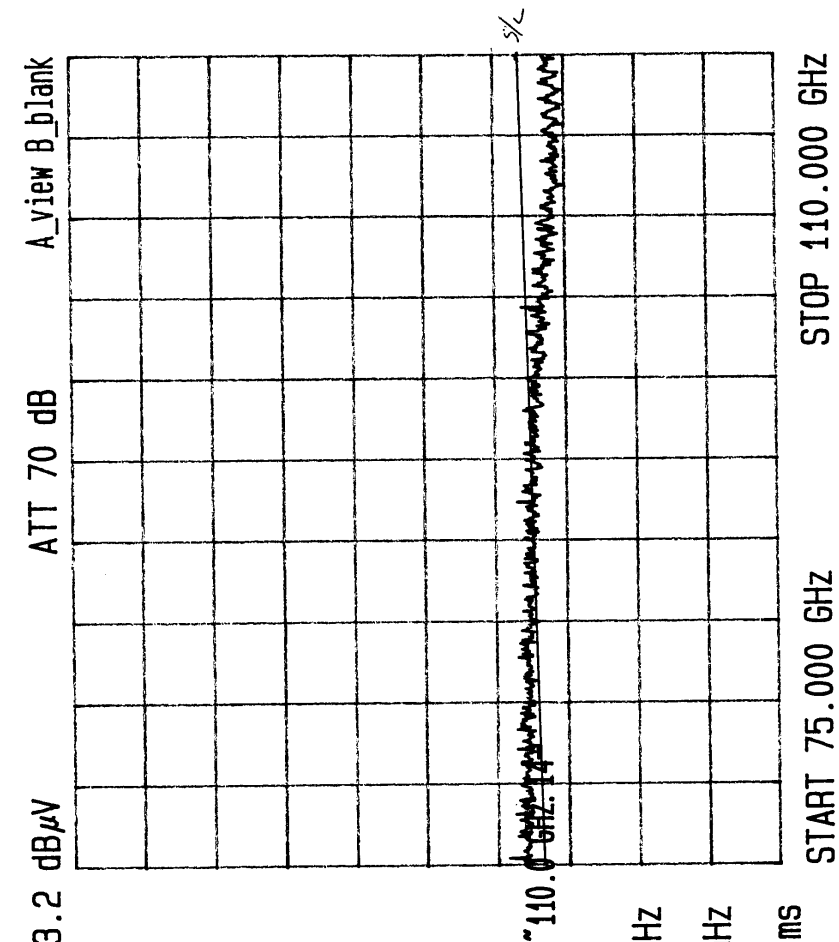
JA-1666-3


TEST: FCC RADIATED
EUT: P-COM REMOTE/28GHz ODU
S/N: 213/00002
FREQ: 50GHz-75GHz
SPEC: FCC INT. RAD.
ANT.HT/POL: V
DETECTION: PEAK
LINE UNDER TEST: N/A
EUT POSITION:
DATE: 5-5-00
TEST SITE: ROOM 3/OATS
TESTER:
REF 164.7 dBµV
10dB/
ATT 70 dB
A_view B_blank
s/c
REF OFS
26.0 dB
EXT 50.0"75.0 GHz
RBW
1 MHz
VBW
1 MHz
SWP
50 ms
START 50.000 GHz
STOP 75.000 GHz

52.tif (2496x3267x2 tiff)

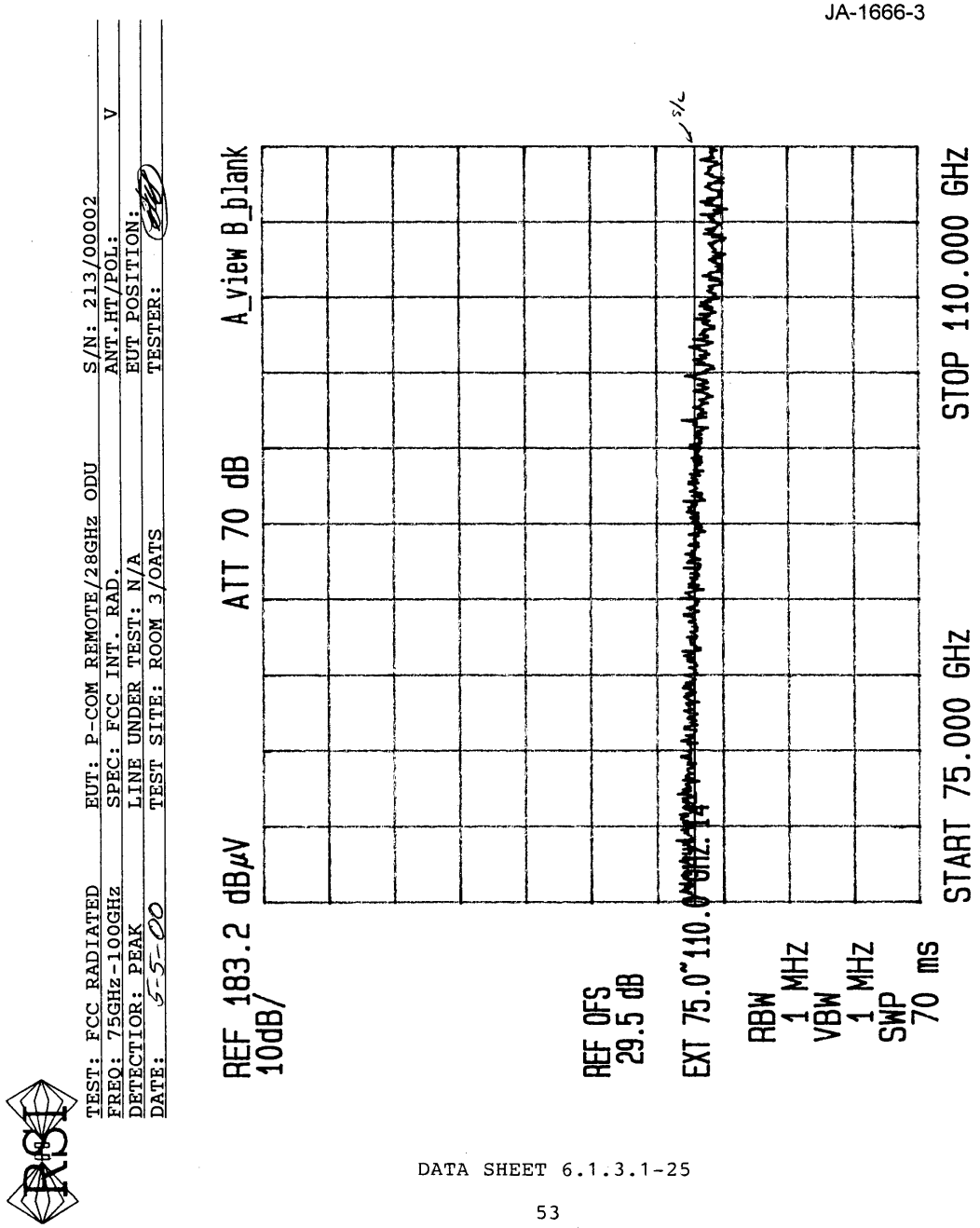
JA-1666-3

TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 75GHz-100GHz SPEC: FCC INT. RAD. ANT.HT/POL: H
DETECTION: PEAK LINE UNDER TEST: N/A EUT POSITION:
DATE: 5-5-00 TEST SITE: ROOM 3/OATS TESTER:



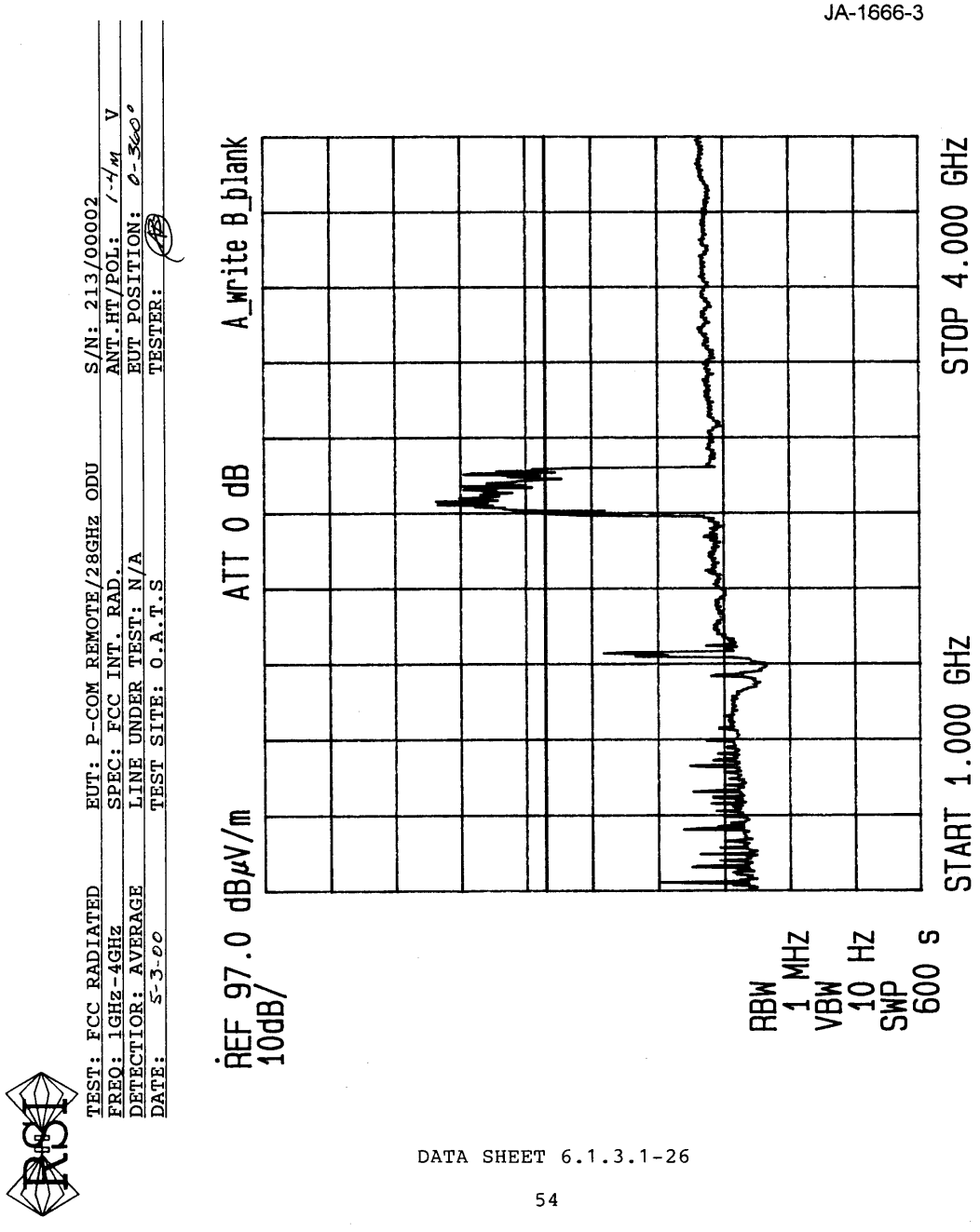
53.tif (2496x3267x2 tiff)

JA-1666-3



54.tif (2496x3267x2 tiff)

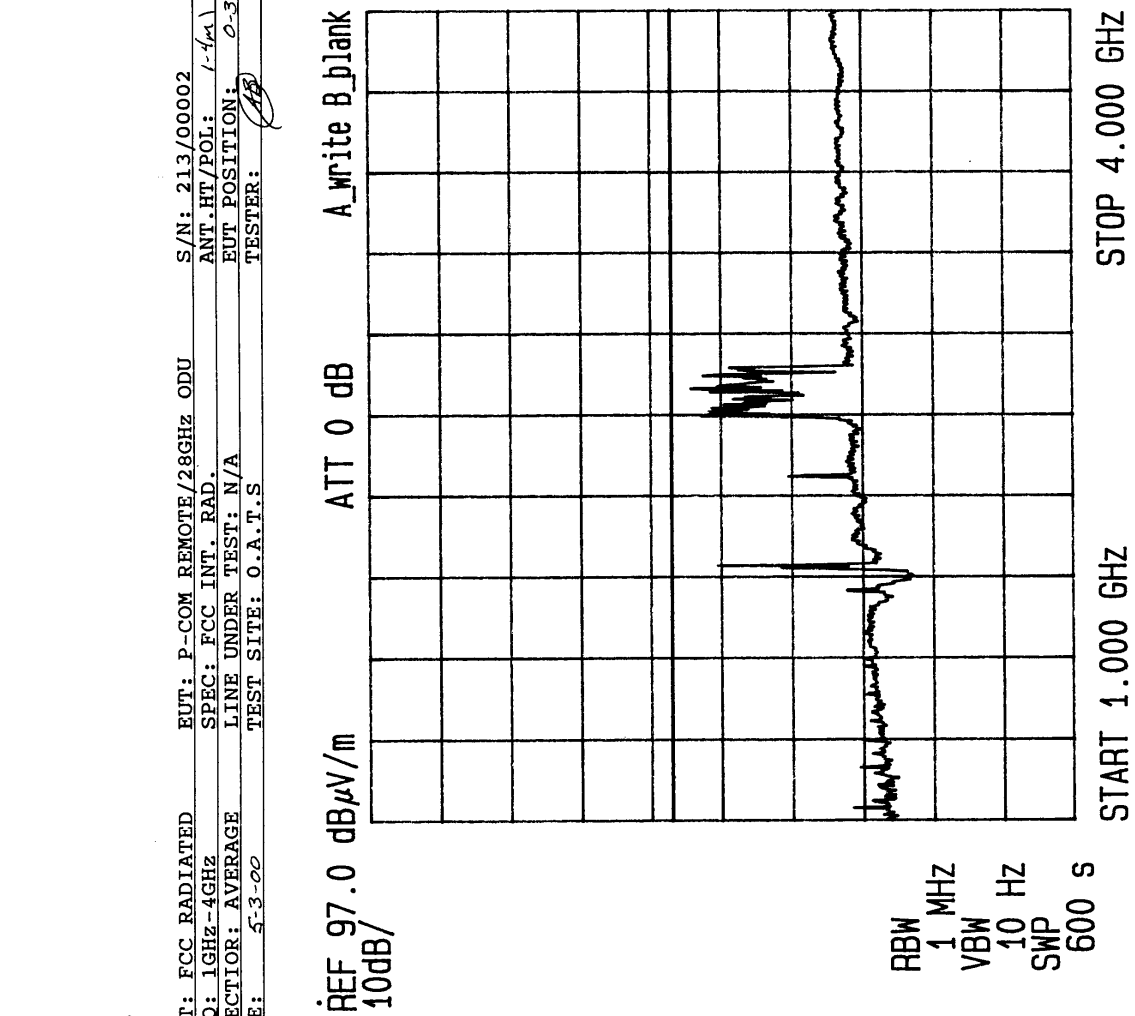
JA-1666-3



55.tif (2496x3267x2 tiff)

JA-1666-3

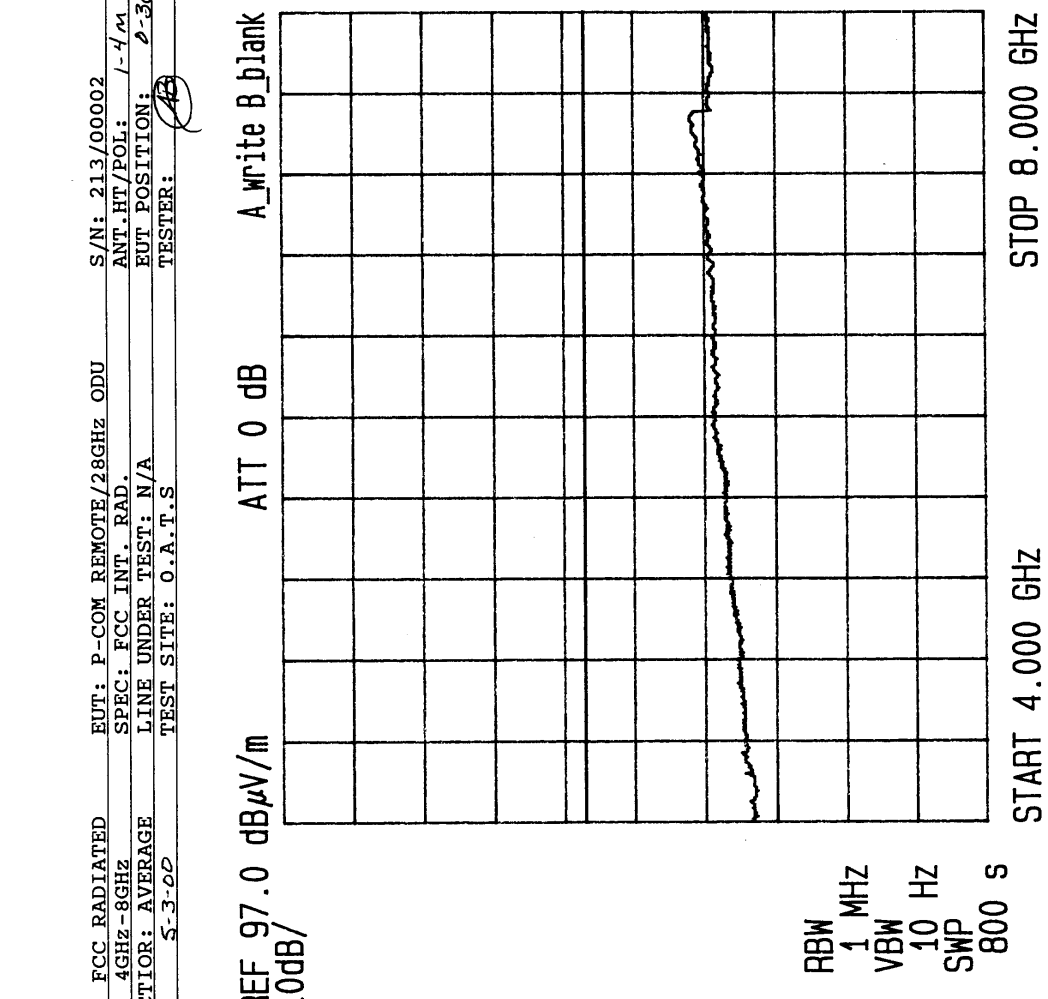
TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 1GHz-4GHz SPEC: FCC INT. RAD. ANT.HT/POL: 1-4m \ H
DETECTIOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION: 0-360°
DATE: 5-3-00 TEST SITE: O.A.T.S TESTER:



56.tif (2496x3267x2 tiff)

JA-1666-3

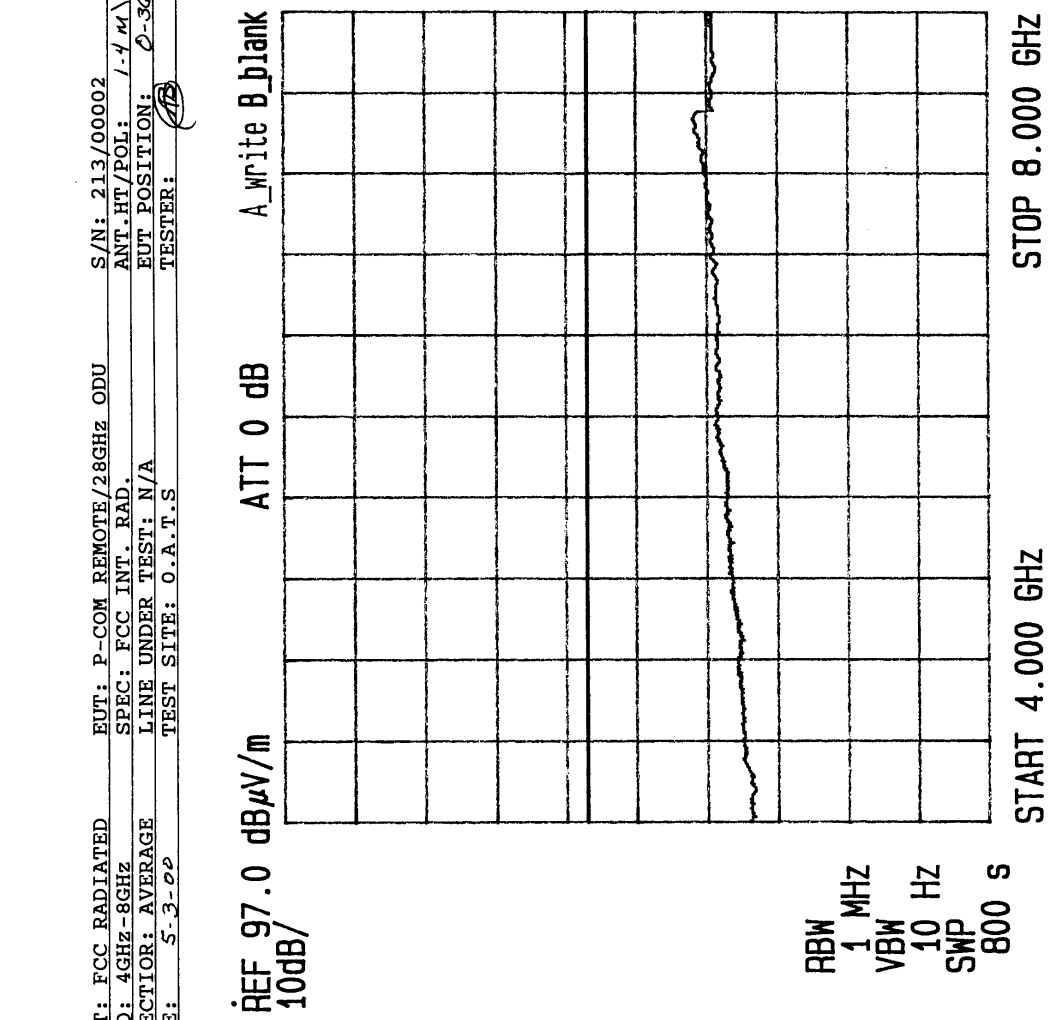
TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 4GHz-8GHz SPEC: FCC INT. RAD. ANT.HT/POL: 1-4m H
DETECTIOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION: 0-360°
DATE: 5-3-00 TEST SITE: O.A.T.S TESTER: AB

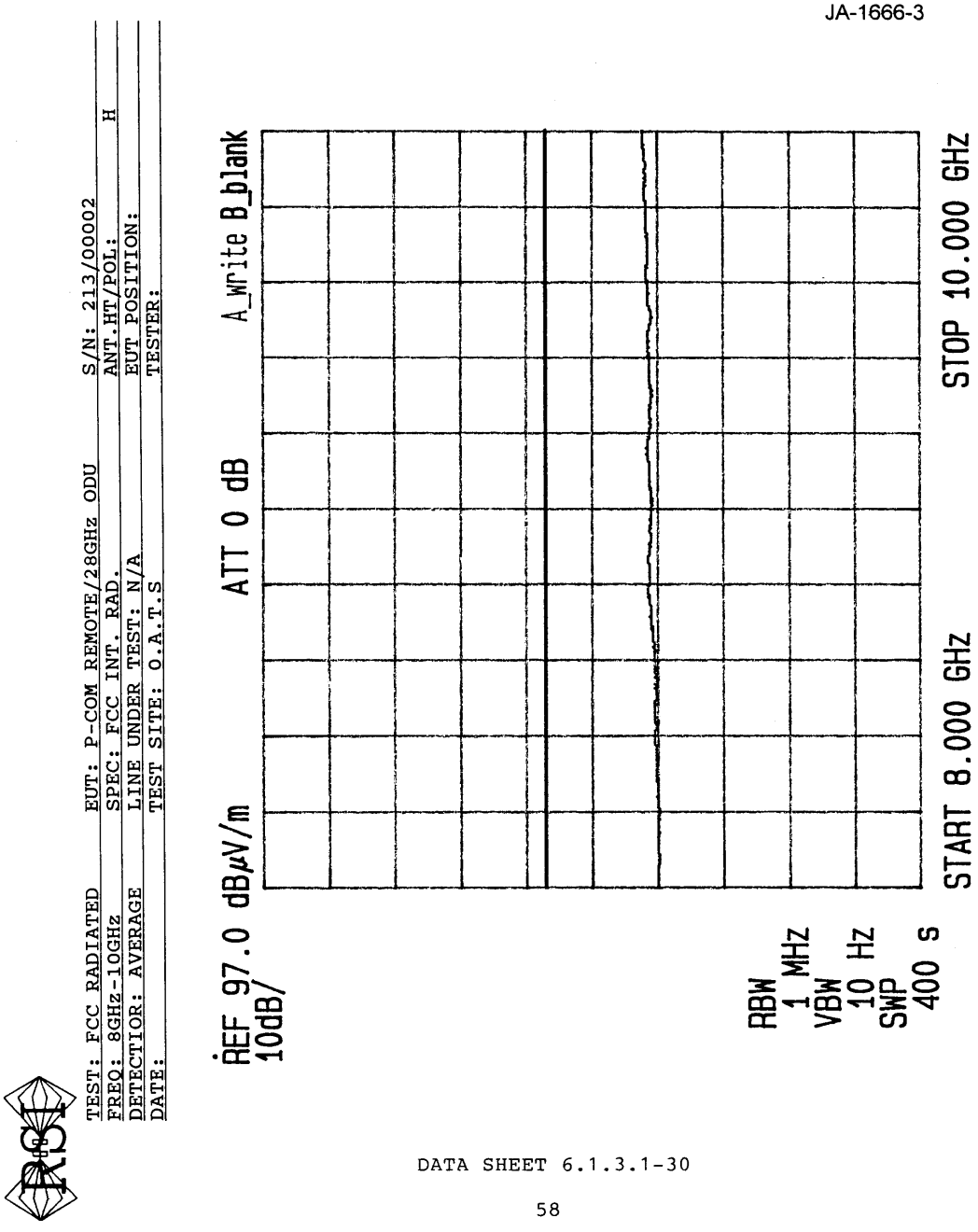


57.tif (2496x3267x2 tiff)

JA-1666-3

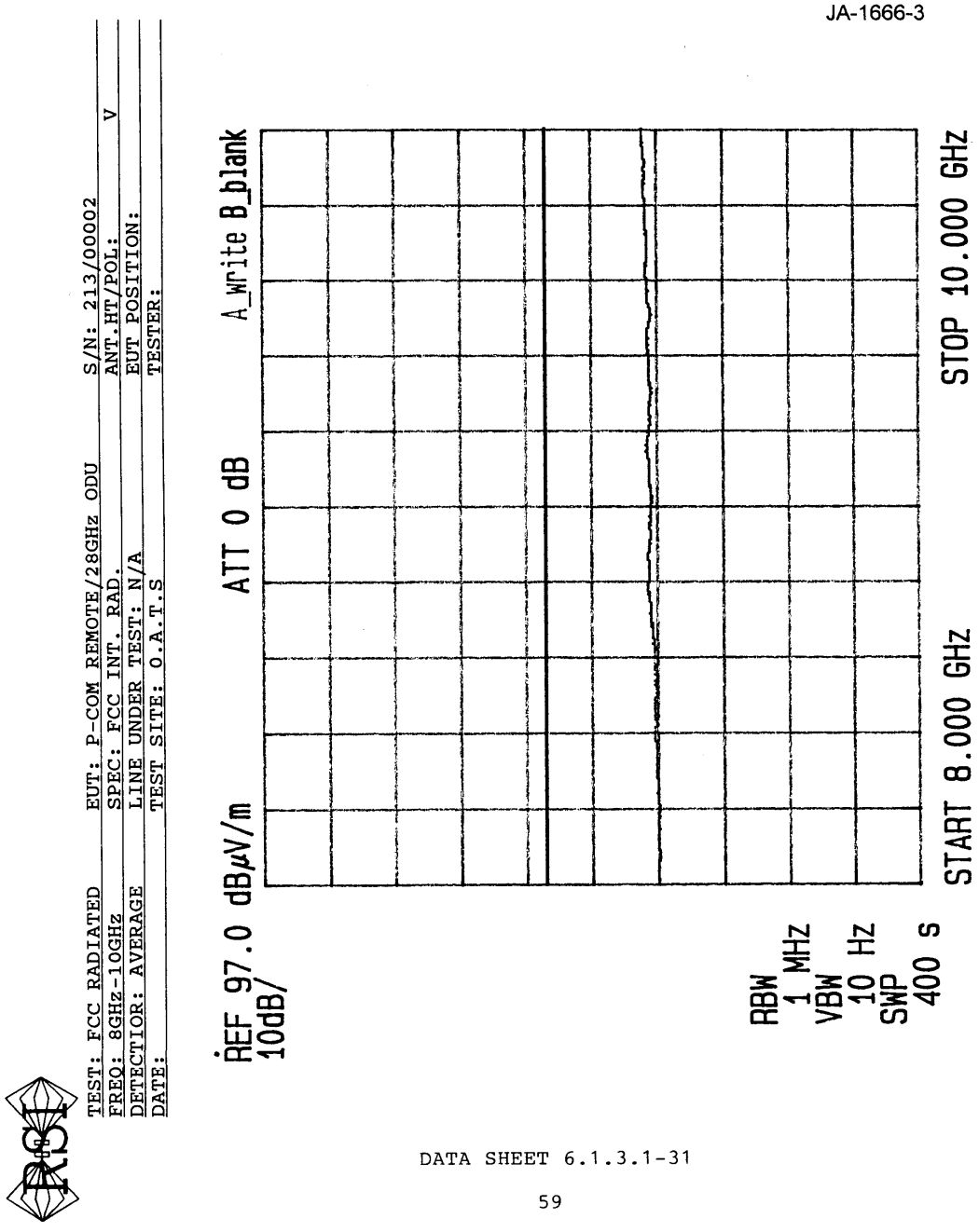
TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 4GHz-8GHz SPEC: FCC INT. RAD. ANT.HT/POL: 1-4 m\V
DETECTIOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION: 0-360°
DATE: 5-3-00 TEST SITE: O.A.T.S TESTER:




TEST: FCC RADIATED
EUT: P-COM REMOTE/28GHz ODU
S/N: 213/00002
FREQ: 8GHz-10GHz
SPEC: FCC INT. RAD.
ANT.HT/POL: H
DETECTION: AVERAGE
LINE UNDER TEST: N/A
EUT POSITION:
DATE:
TEST SITE: O.A.T.S
TESTER:
REF 97.0 dBµV/m
10dB/
ATT 0 dB
A_write B_blank
RBW 1 MHz
VBW 10 Hz
SWP 400 s
START 8.000 GHz
STOP 10.000 GHz

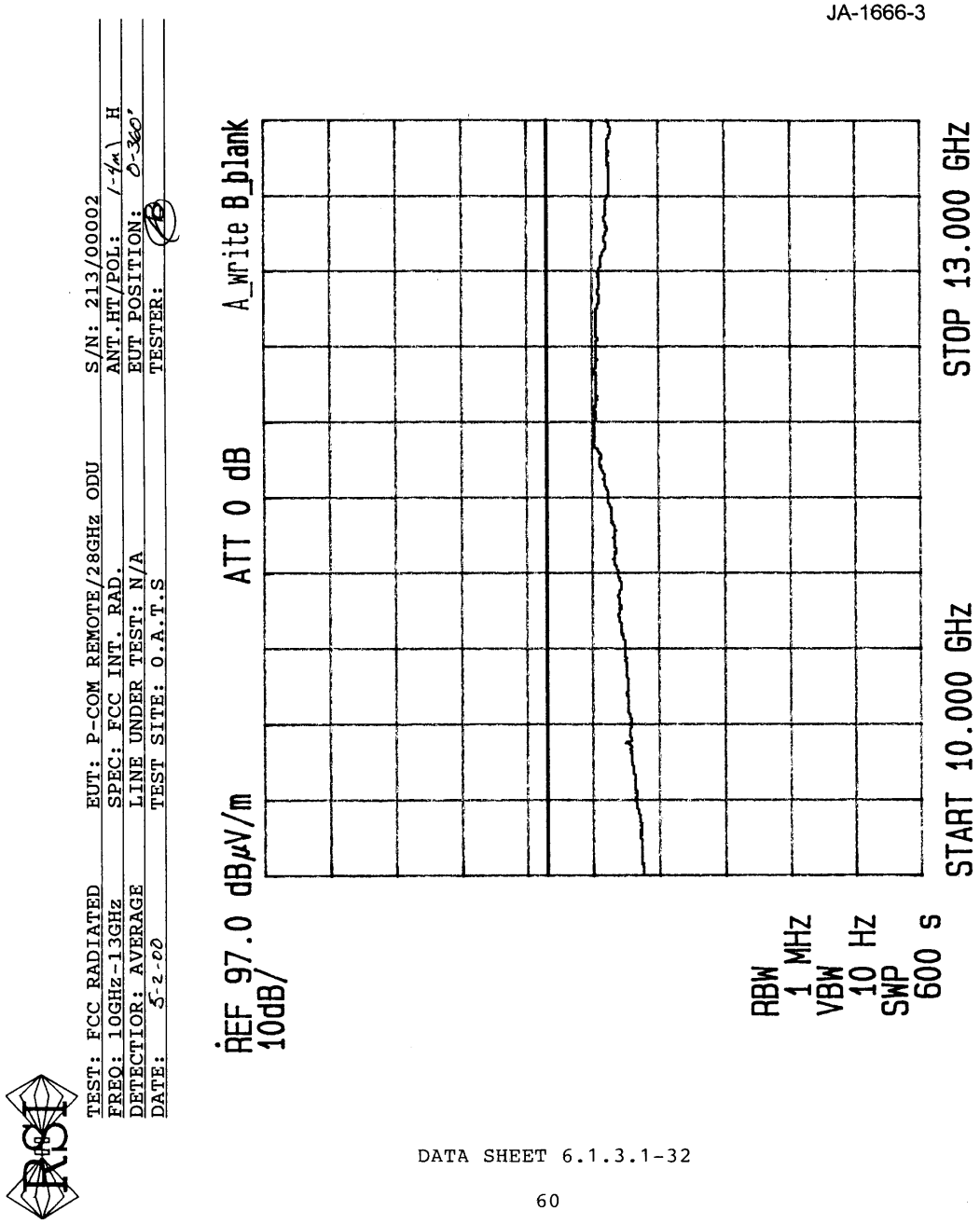
59.tif (2496x3267x2 tiff)

JA-1666-3



60.tif (2496x3267x2 tiff)

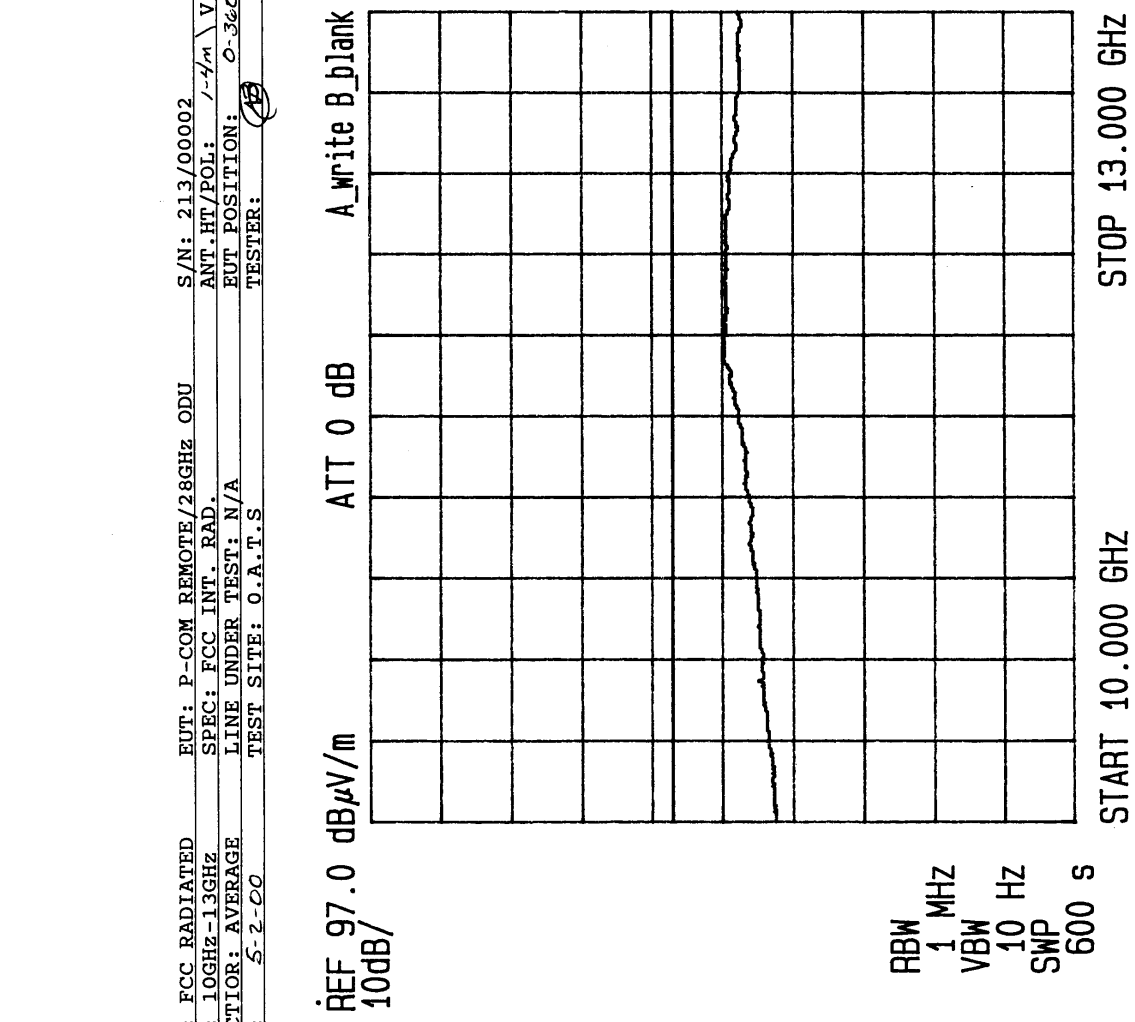
JA-1666-3



61.tif (2496x3267x2 tiff)

JA-1666-3

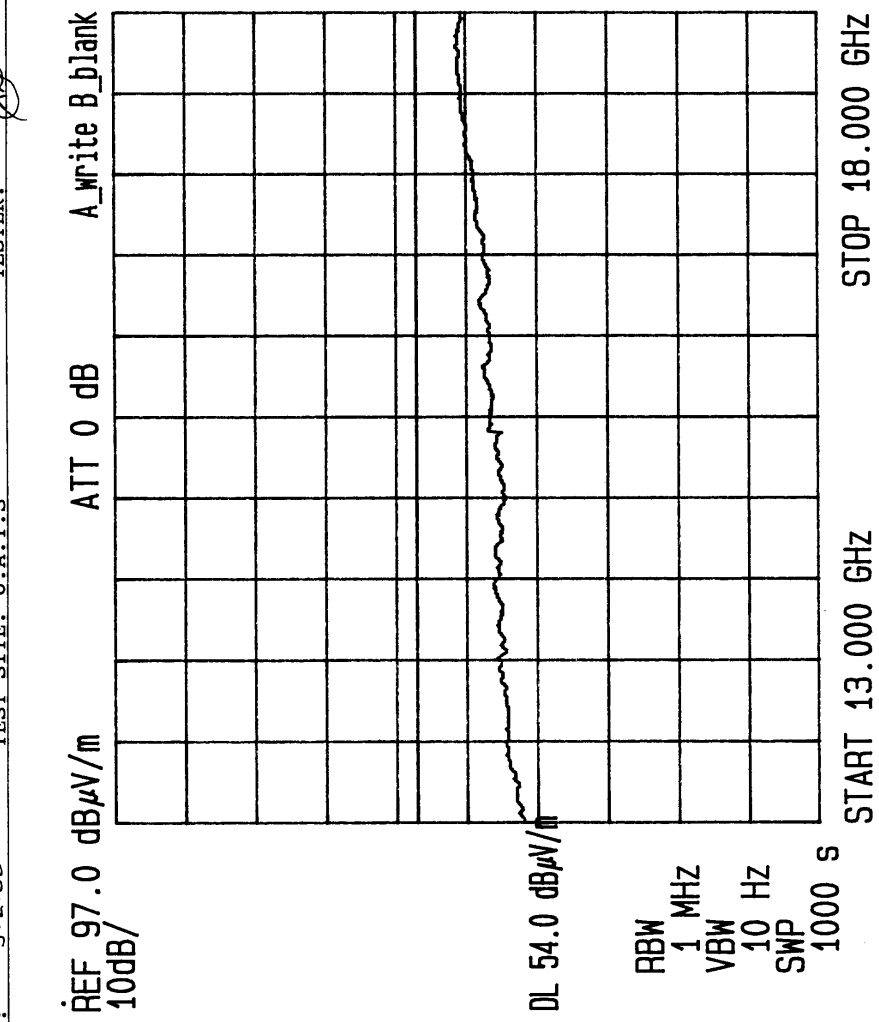
TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 10GHz-13GHz SPEC: FCC INT. RAD. ANT.HT/POL: 1-4m \ V
DETECTIOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION: 0-360°
DATE: 5-2-00 TEST SITE: O.A.T.S TESTER:



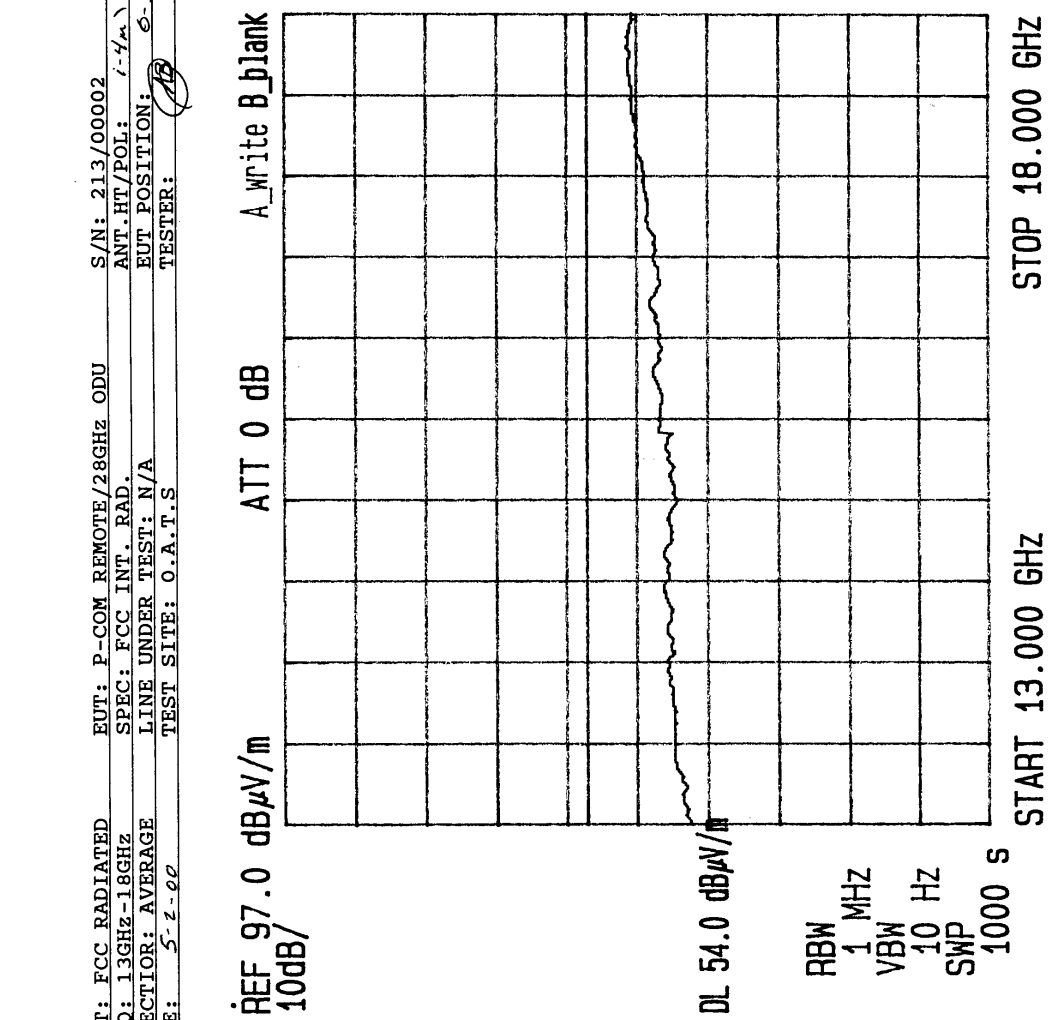
62.tif (2496x3267x2 tiff)

JA-1666-3

TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 13GHz-18GHz SPEC: FCC INT. RAD. ANT.HT/POL: 1-4m \ H
DETECTION: AVERAGE LINE UNDER TEST: N/A EUT POSITION: 0-360°
DATE: 5-2-00 TEST SITE: O.A.T.S TESTER:

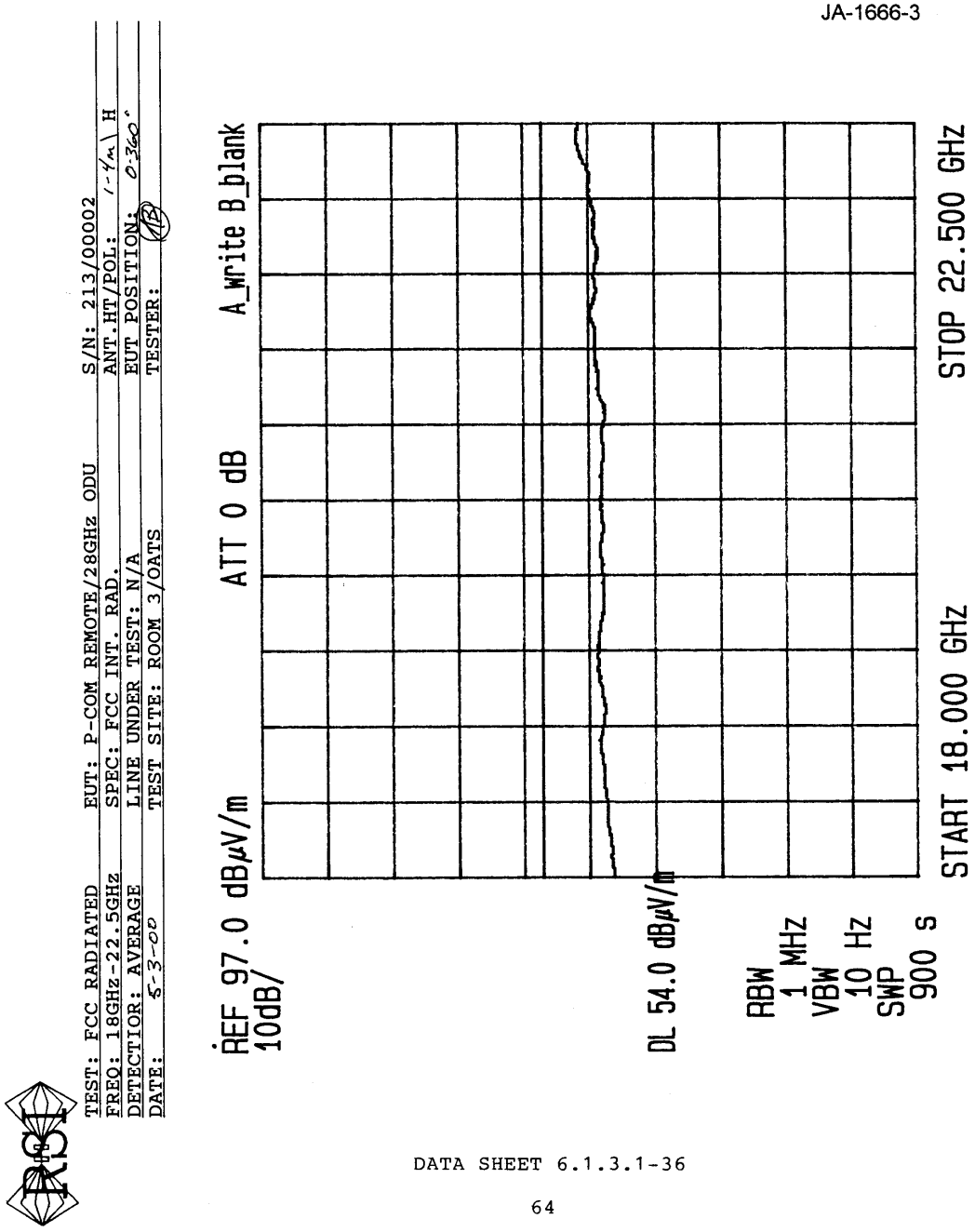


TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 13GHz-18GHz SPEC: FCC INT. RAD. ANT.HT/POL: 1-4m \ V
DETECTION: AVERAGE LINE UNDER TEST: N/A EUT POSITION: 0-360°
DATE: 5-2-00 TEST SITE: O.A.T.S TESTER:



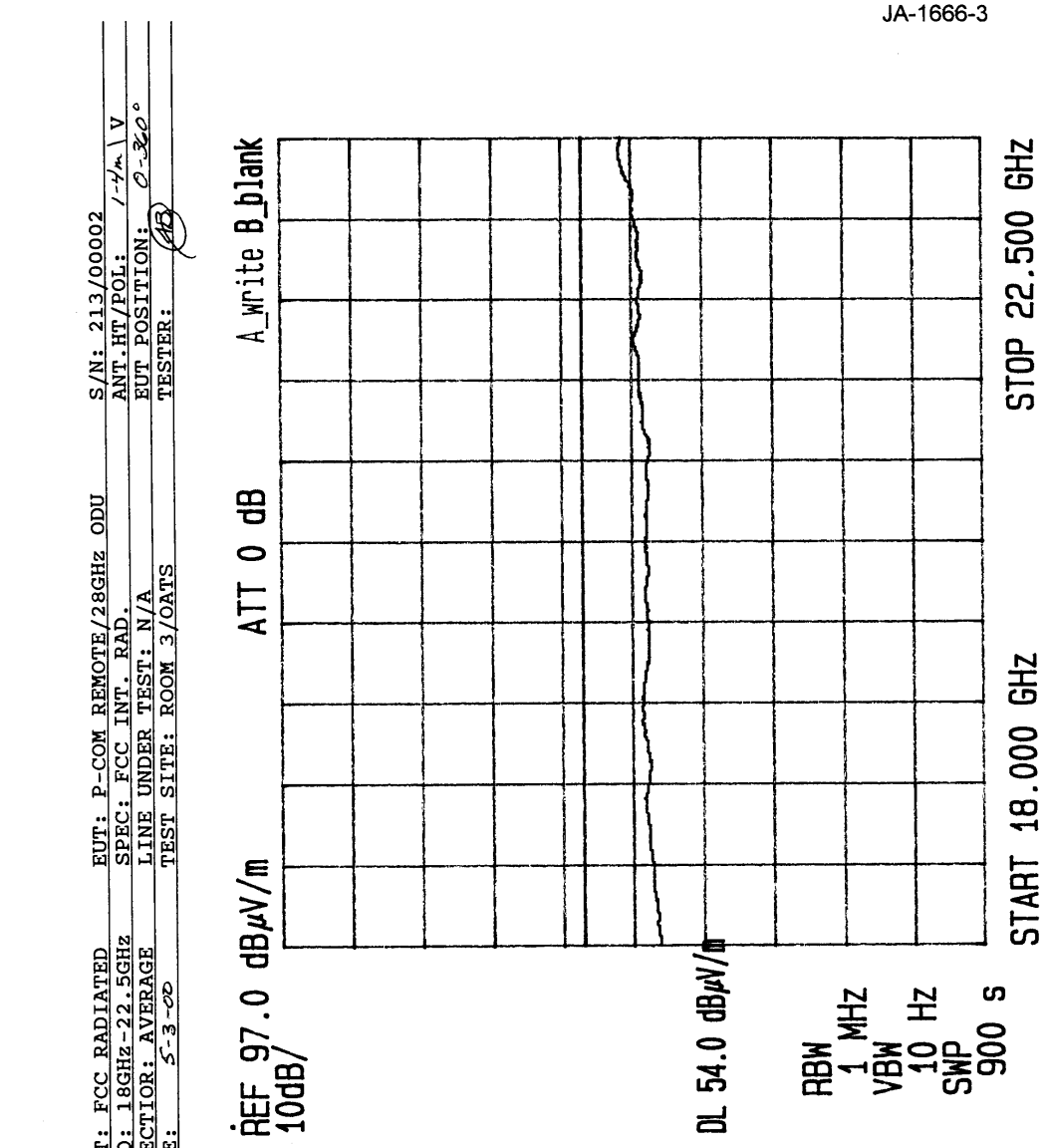
64.tif (2496x3267x2 tiff)

JA-1666-3



65.tif (2496x3267x2 tiff)

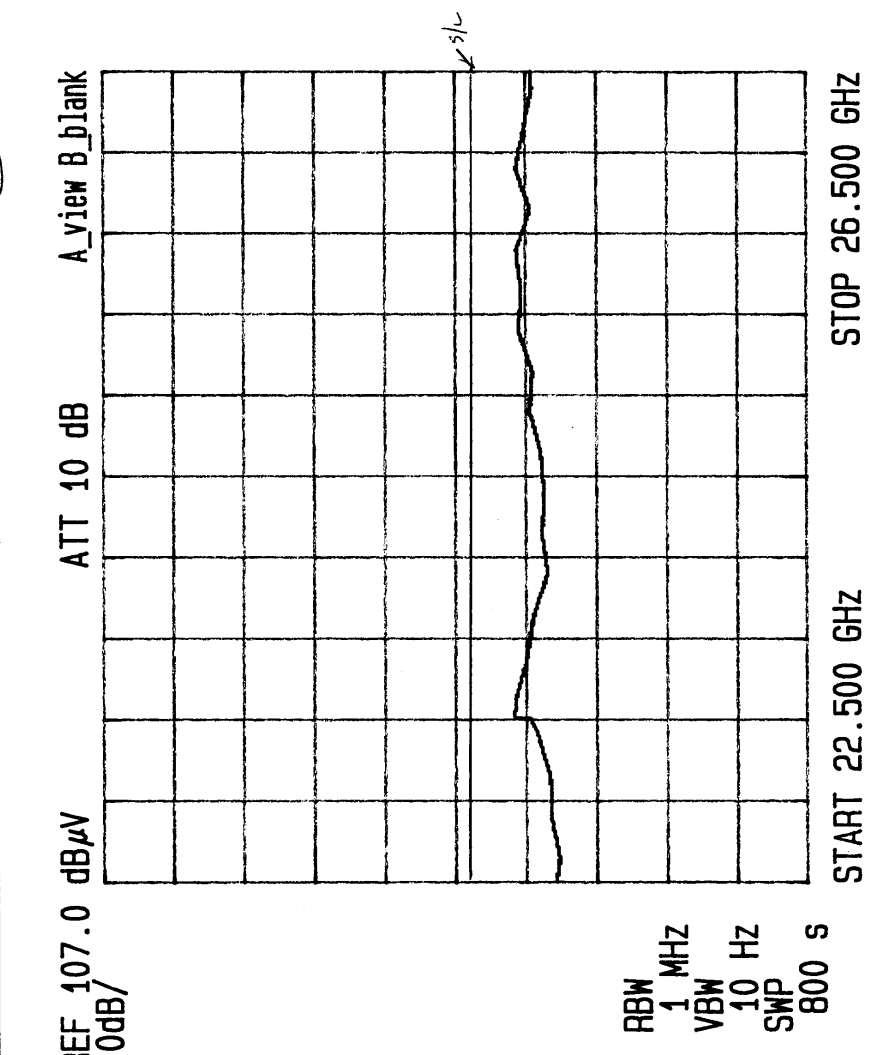
JA-1666-3



66.tif (2496x3267x2 tiff)

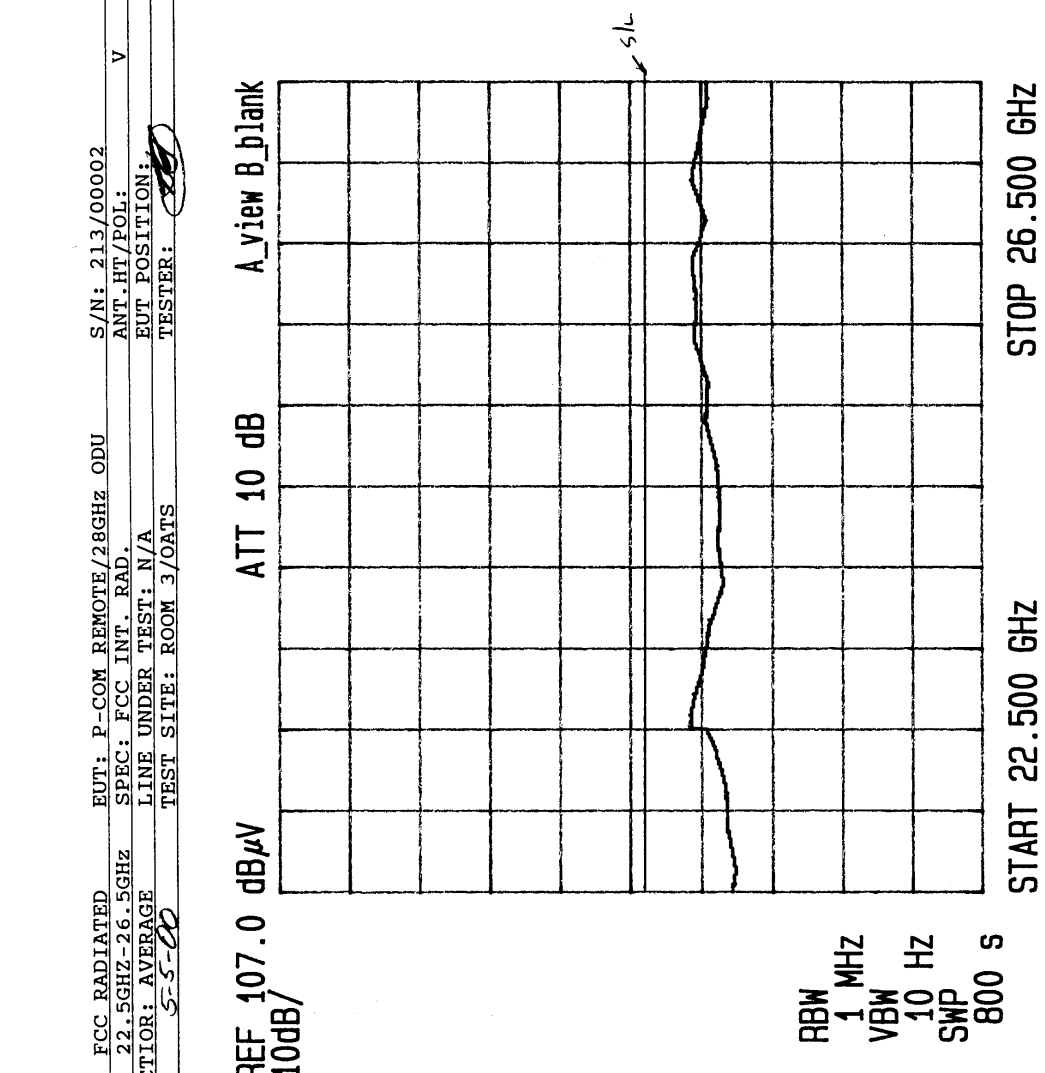
JA-1666-3

TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 22.5GHZ-26.5GHz SPEC: FCC INT. RAD. ANT.HT/POL: H
DETECTIOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION:
DATE: 5-5-00 TEST SITE: ROOM 3/OATS TESTER:



JA-1666-3

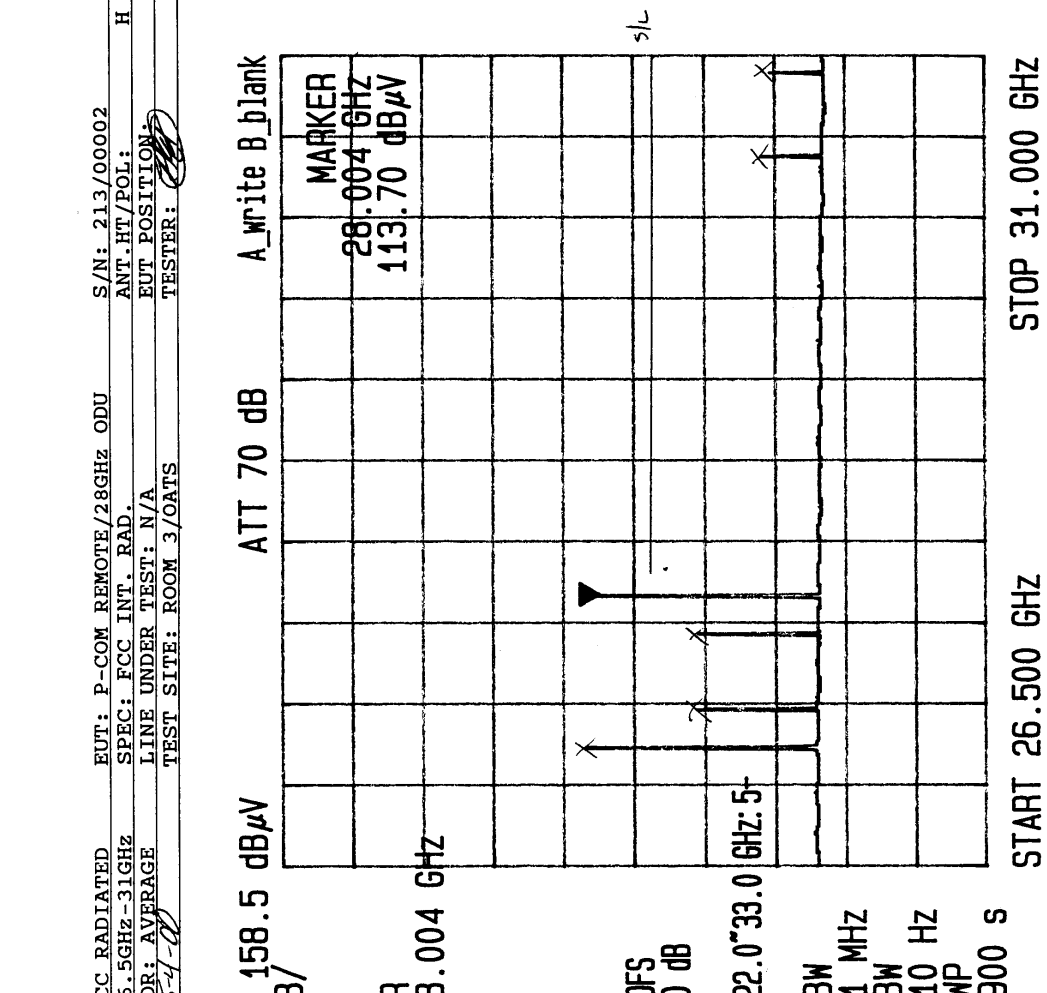
TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 22.5GHZ-26.5GHz SPEC: FCC INT. RAD. ANT.HT/POL: V
DETECTION: AVERAGE LINE UNDER TEST: N/A EUT POSITION:
DATE: 5-5-00 TEST SITE: ROOM 3/OATS TESTER:



68.tif (2496x3267x2 tiff)

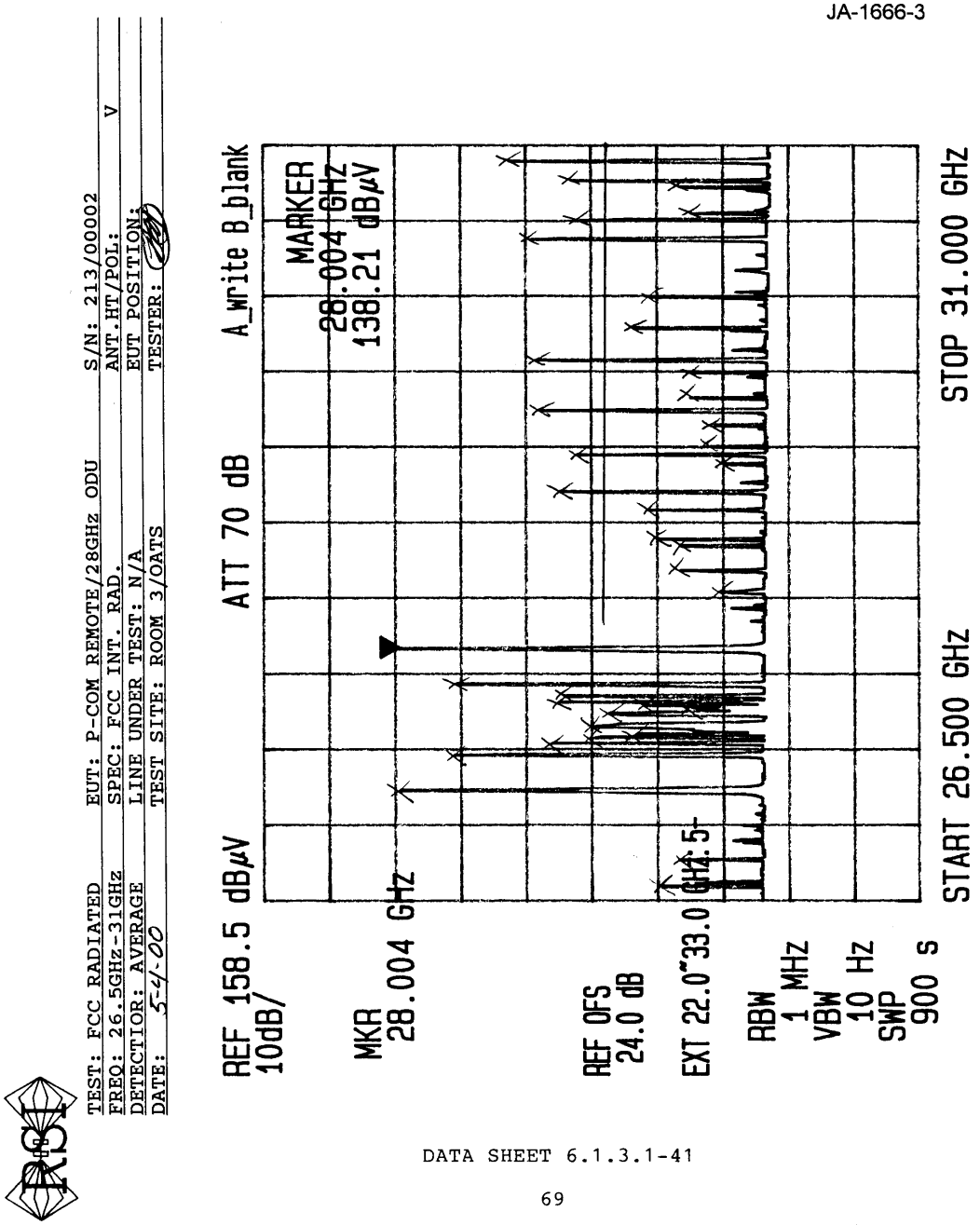
JA-1666-3

TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 26.5GHz-31GHz SPEC: FCC INT. RAD. ANT.HT/POL: H
DETECTION: AVERAGE LINE UNDER TEST: N/A EUT POSITION:
DATE: 5-4-00 TEST SITE: ROOM 3/OATS TESTER:



69.tif (2496x3267x2 tiff)

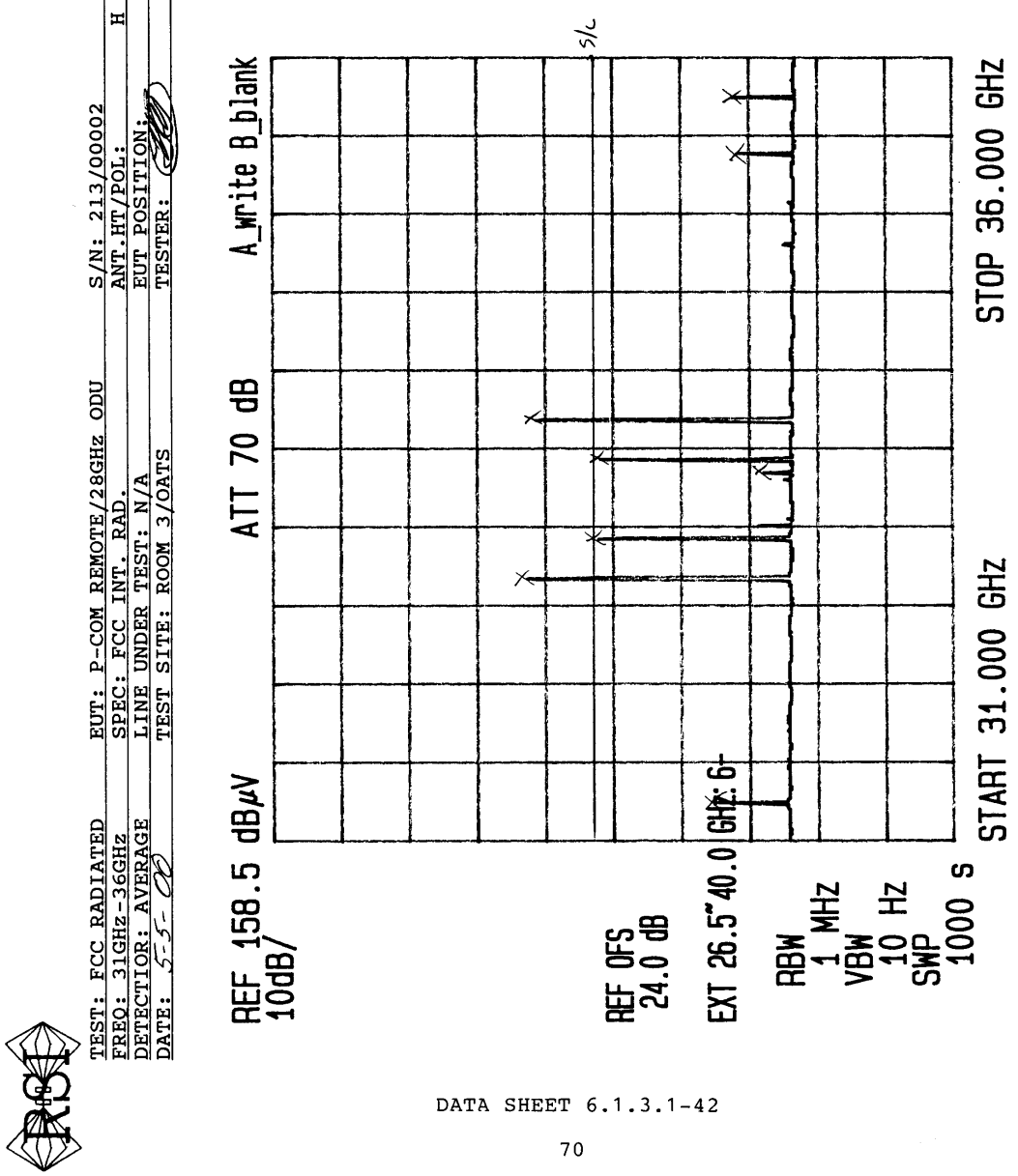
JA-1666-3



70.tif (2496x3267x2 tiff)

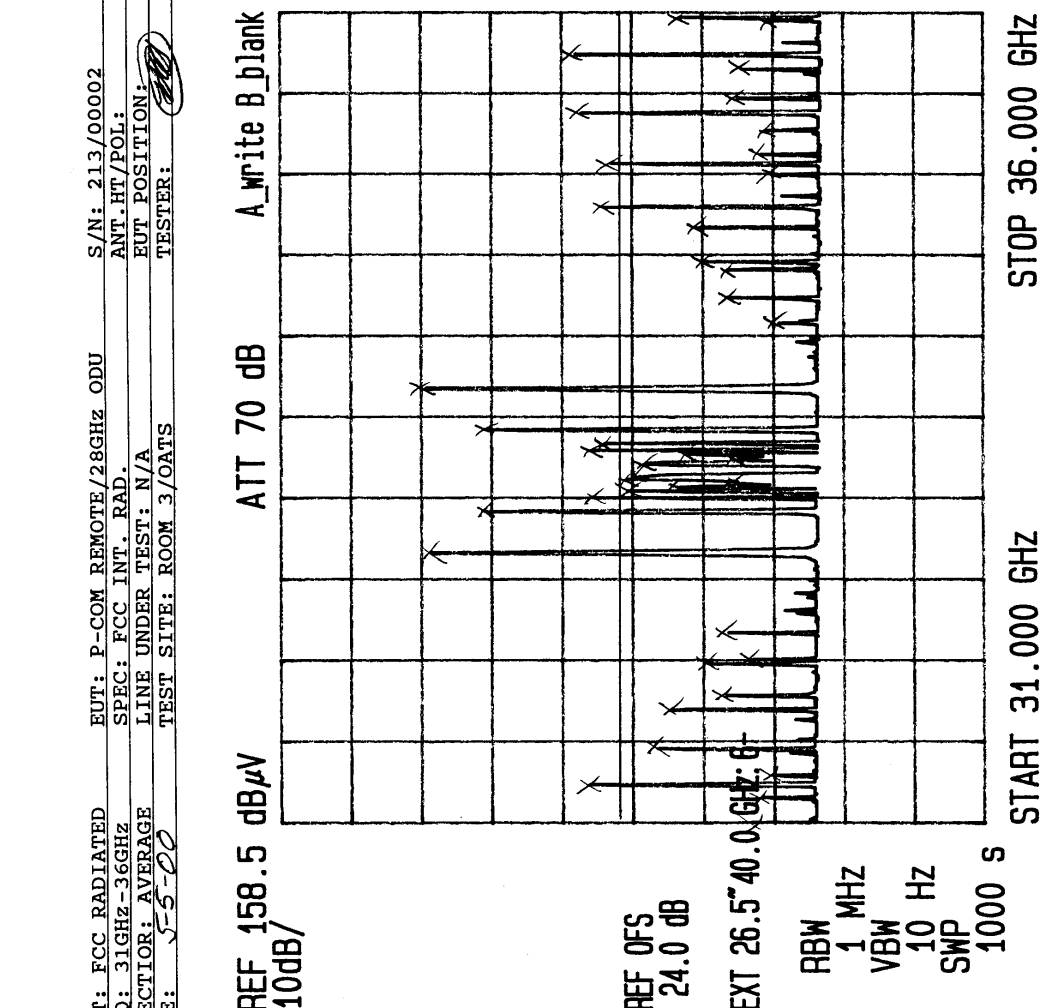
JA-1666-3

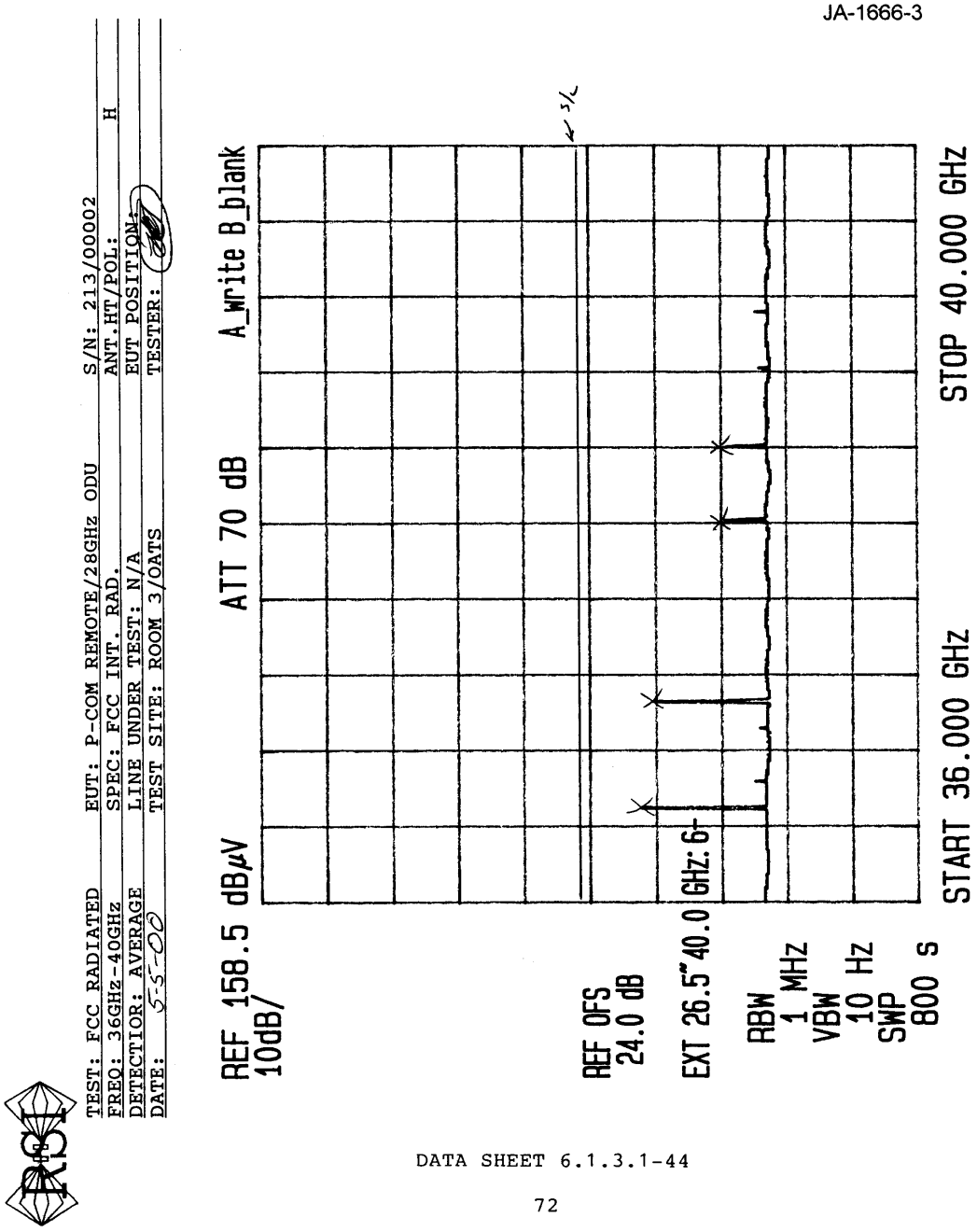
TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 31GHz-36GHz SPEC: FCC INT. RAD. ANT.HT/POL: H
DETECTOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION:
DATE: 5-5-00 TEST SITE: ROOM 3/OATS TESTER:

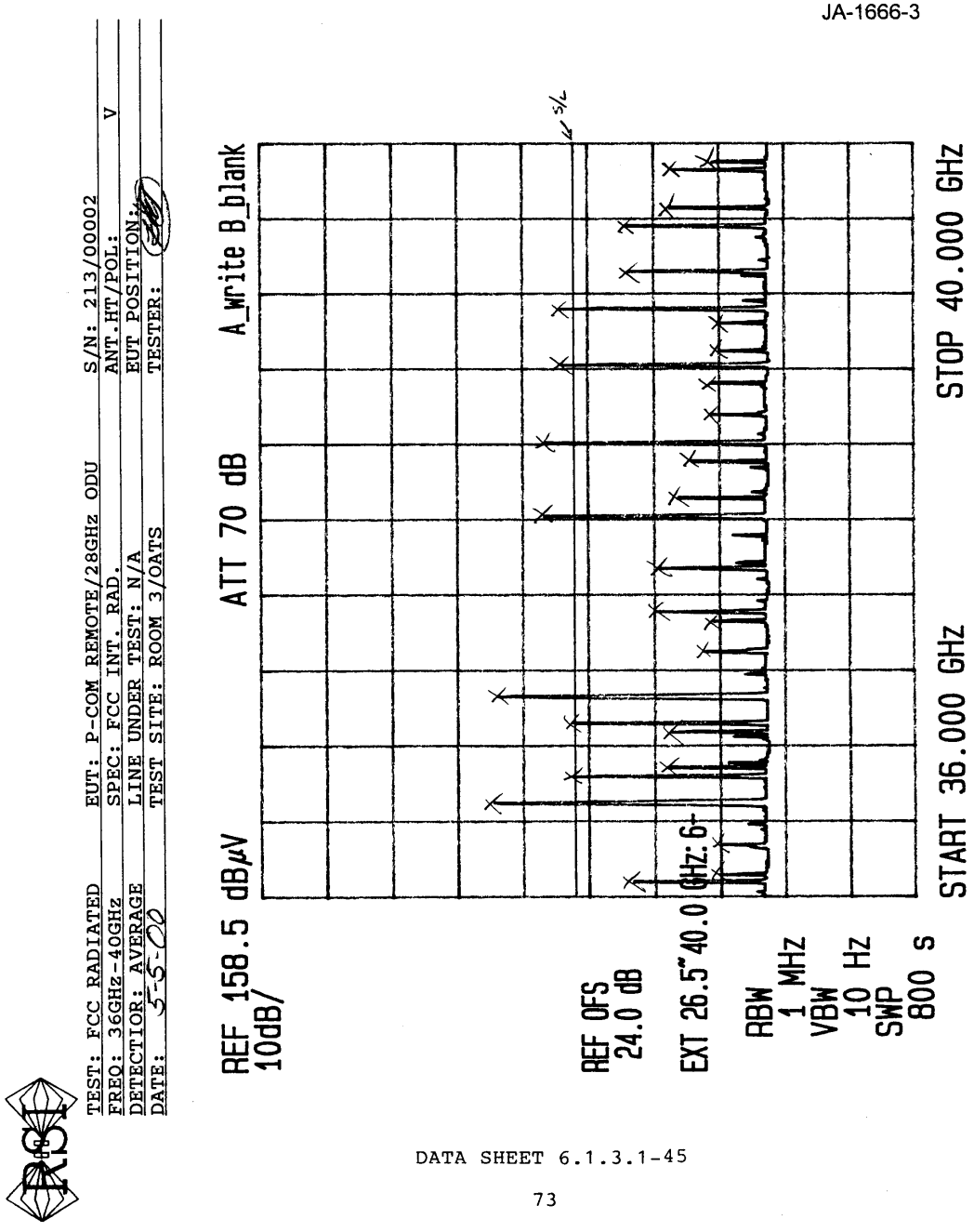


JA-1666-3

TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 31GHz-36GHz SPEC: FCC INT. RAD. ANT.HT/POL: V
DETECTION: AVERAGE LINE UNDER TEST: N/A EUT POSITION:
DATE: 5-5-00 TEST SITE: ROOM 3/OATS TESTER:




TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 36GHz-40GHz SPEC: FCC INT. RAD. ANT.HT/POL: H
DETECTIOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION:
DATE: 5-5-00 TEST SITE: ROOM 3/OATS TESTER:
REF 158.5 dBµV
10dB/
ATT 70 dB
A_write B_blank
REF OFS
24.0 dB
EXT 26.5"40.0 GHz: 6
RBW
1 MHz
VBW
10 Hz
SWP
800 s
START 36.000 GHz
STOP 40.000 GHz


TEST: FCC RADIATED EUT: P-COM REMOTE/28GHz ODU S/N: 213/00002
FREQ: 36GHz-40GHz SPEC: FCC INT. RAD. ANT.HT/POL: V
DETECTOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION:
DATE: 5-5-00 TEST SITE: ROOM 3/OATS TESTER:
REF 158.5 dBµV
10dB/
ATT 70 dB
A_write B_blank
REF OFS
24.0 dB
EXT 26.5"40.0 GHz: 6-
RBW
1 MHz
VBW
10 Hz
SWP
800 s
START 36.000 GHz
STOP 40.000 GHz

APPENDIX A

Appendix A.tif (1993x2001x2 tiff)

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD. 21046

December 16, 1999

Registration Number: 90911

Rubicom Systems, Inc.
284 West Drive, Suite B
Melbourne, FL 32904

Attention: Joseph Barbee

Re: Measurement facility located at Melbourne
3 meter site
Date of Listing: December 16, 1999

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that this filing must be updated for any changes made to the facility, and at least every three years from the date of listing the data on file must be certified as current.

If requested, the above mentioned facility has been added to our list of those who perform these measurement services for the public on a fee basis. An up-to-date list of such public test facilities is available on the Internet on the FCC Website at WWW.FCC.GOV, E-Filing, OET Equipment Authorization Electronic Filing.

Sincerely,

Thomas W Phillips
Electronics Engineer