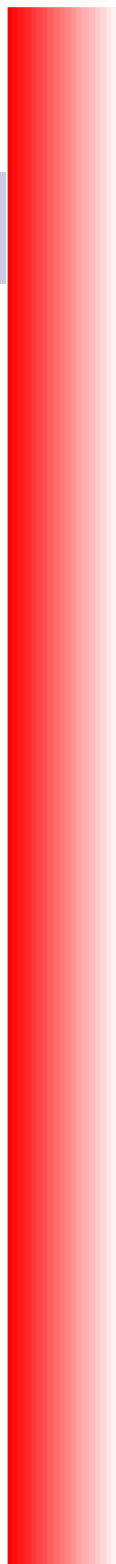
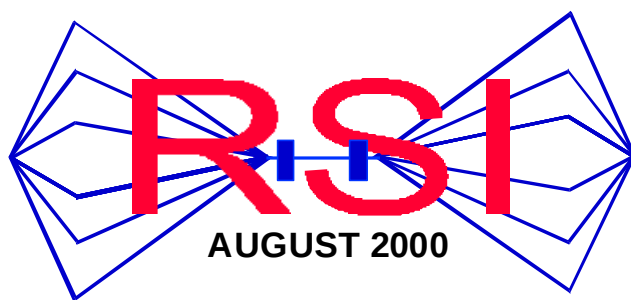


RUBICOM SYSTEMS, INC.



**FCC INTENTIONAL RADIATOR
TEST REPORT
FOR THE
P-COM
POINT TO MULTIPOINT
24GHz REMOTE OUTDOOR UNIT**



Rubicom Systems, Inc.
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THIS REPORT SHALL NOT BE REPRODUCED
EXCEPT IN FULL WITHOUT THE WRITTEN
APPROVAL OF THE TESTING LABORATORY

**FCC INTENTIONAL RADIATOR
TEST REPORT
FOR THE
P-COM
POINT TO MULTIPOINT
24GHz REMOTE OUTDOOR UNIT
S/N: 24RH3A300012**

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Date Completed: August 11, 2000

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
	ABSTRACT	3
1.0	INTRODUCTION.....	4
1.1	Propose	4
1.2	Requirements.....	4
1.3	Unit Under Test Description.....	5
1.4	Modifications	5
1.5	Summary of Results.....	5
2.0	APPLICABLE DOCUMENTS.....	6
3.0	TEST SITE DESCRIPTION.....	7
3.1	Environmental Conditions.....	7
4.0	TEST INSTRUMENTATION.....	8
5.0	TEST SAMPLE SETUP AND CONFIGURATIONS.....	9
6.0	PROCEDURES AND RESULTS	11
6.1	General.....	11
6.1.1	Occupied Bandwidth (101.109).....	11
6.1.2	Transmitter Power Limitations	22
6.1.3	Radiated Emissions, Part 15 and Part 101.....	24
6.1.3.1	<u>Radiated 15.209(a)/101.111).....</u>	<u>27</u>
	Data Sheets 6.1.1-1 - 6.1.1-9.....	13 - 21
	Data Sheets 6.1.3.1-1 - 6.1.3.1-52	31 - 82

ABSTRACT

This report presents test results of the emanations found emitting from the P-COM Point to Multipoint 24GHz 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 F78160. The results of this test effort indicate compliance of the P-COM Point to Multipoint 24GHz Remote Outdoor Unit to FCC, Title 47 requirements.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to show continued compliance of the P-COM Point to Multipoint 24GHz 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 24.25GHz to 25.25GHz. 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 24.25GHz to 25.25GHz common carrier fixed point to multipoint microwave service terminal.

Bandwidth 101.109 (40MHz 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 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 Remote Subsystem consists of an Indoor Unit (IDU) and an Outdoor Unit (ODU). A total system can have up to 24 remote subsystems to provide 360° coverage. The product under test in this report is the Remote ODU. The ODU receives data at a 40mbps rate from the IDU along with the DC power to the ODU. Up/down conversion of the 24GHz plus amplification is performed in 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 24GHz 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 APPLCIABLE 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

The 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.

3.1 Environmental Conditions

This test effort was performed between July 2000 and August 2000.

Typical conditions in the laboratory during this testing were:

Temperature: 78°

Barometer: 29.75 in.

Humidity: 50%

The meter site conditions are typically:

Temperature: 85°

Barometer: 29.55 in

Humidity: 75%

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	8498B	03/07/01
1	Bi-Log Antenna	Chase	CLB6111B	07/17/01
1	Standard Gain Horn	Flann Microwave	23240-20	NCR
1	Ridge Guide Horn	A.H. Systems	SAS-200/571	04/25/01
1	Standard Gain Horn	NARDA	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	Power Meter	Hewlett Packard	437B	07/21/01
1	Sensor	Hewlett Packard	8487A	07/31/01
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: 1163	1 ea. PTM PTM 24GHz High 3 s/n: 24RH3A300012	LMR-400, 50 ohms Communication Cable

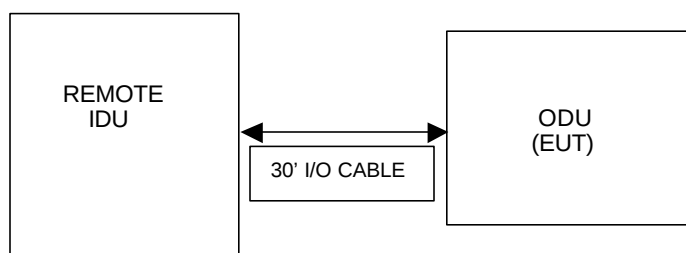




PHOTO 1

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. Power line conduction was performed on the AC power to the IDU. Since the lowest frequency in the OD is the 40mbit data input from the Remote IDU, the radiated measurements were started at 30MHz. 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)

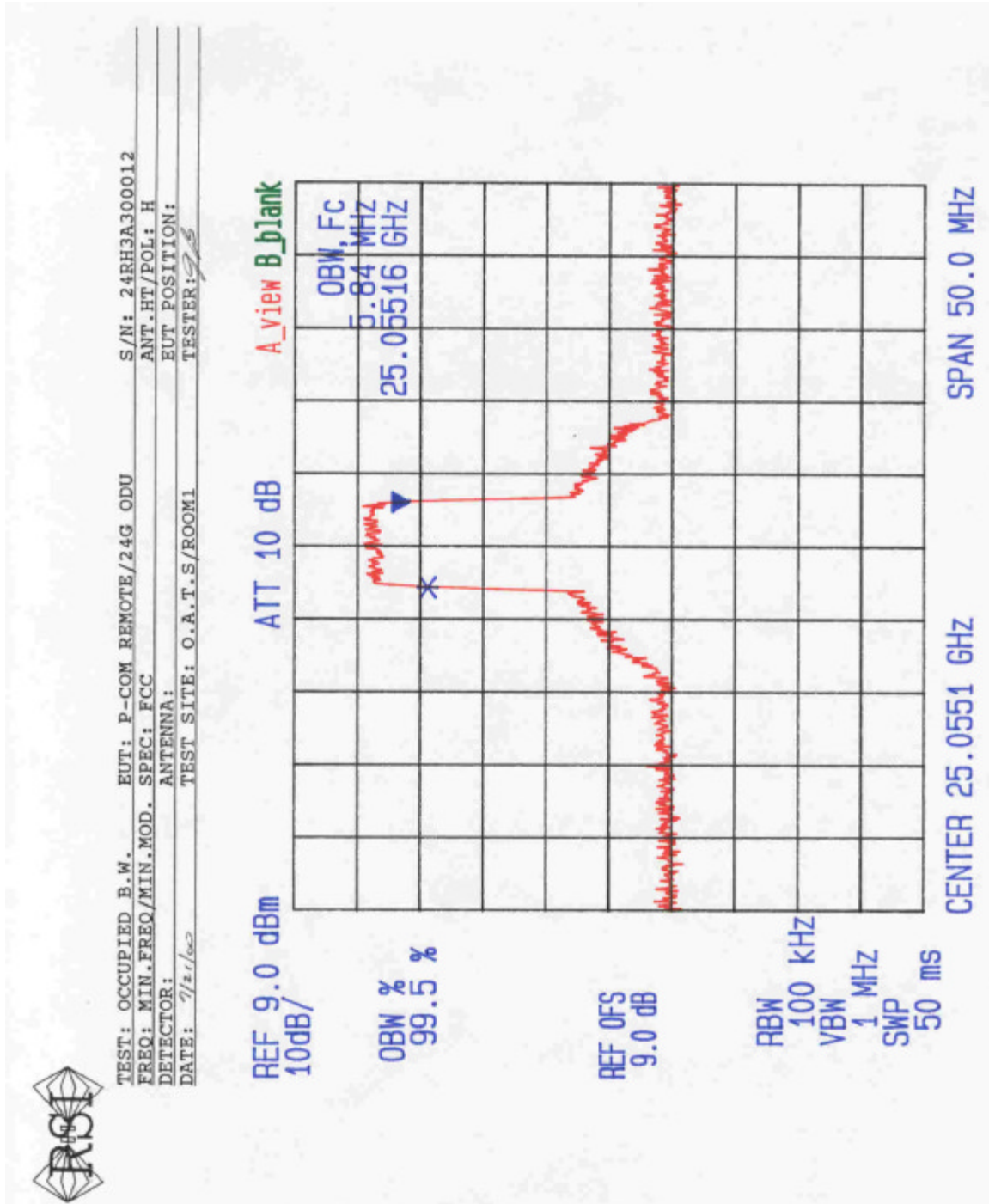
Bandwidth requirements applicable to the 24.25GHz to 25.25GHz range is 40MHz maximum. Table 6.1.1-1 presents the 99.5% bandwidth measurements at the minimum, mid and maximum transmit frequencies with the minimum, mid and maximum modulation rates. Data Sheets 6.1.1-1 through 6.1.1-9 are included for reference.

RESULT: The maximum bandwidth measured was 5.90MHz. The unit complies with the <40MHz requirement.

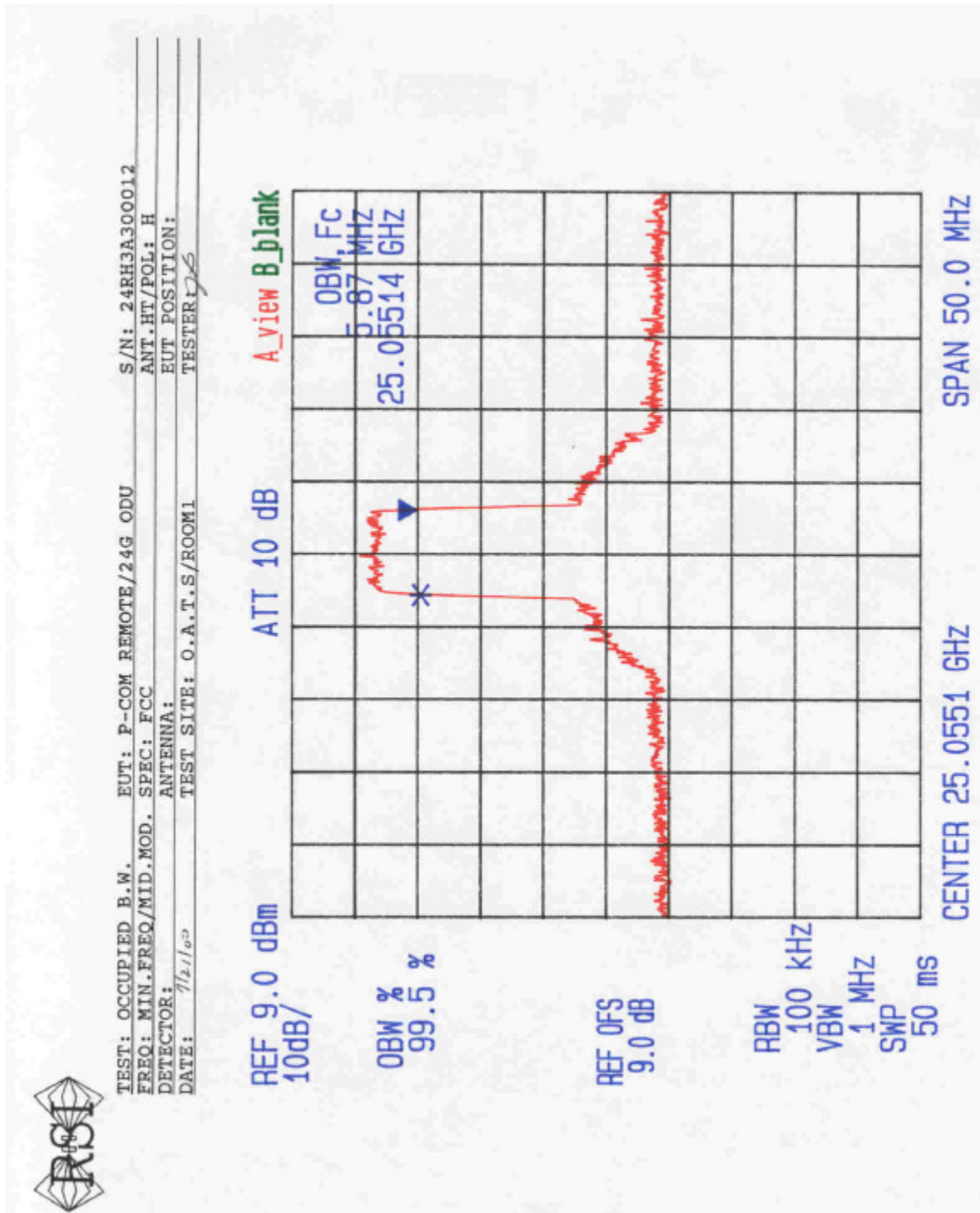
EUT: ODU 24GHz High 3 ODU	S/N: 24RH3A300012
MIN TX FREQ : 25.055GHz	MODULATION MIN: 5.84MHz MID: 5.87MHz MAX: 5.90MHz
MID TX FREQ: 25.145GHz	MODULATION MIN: 5.88MHz MID: 5.84MHz MAX: 5.86MHz
MAX TX FREQ: 25.245GHz	MODULATION MIN: 5.87MHz MID: 5.84MHz MAX: 5.86MHz
REQUIREMENT: <40MHz	

TABULATED BANDWIDTHS

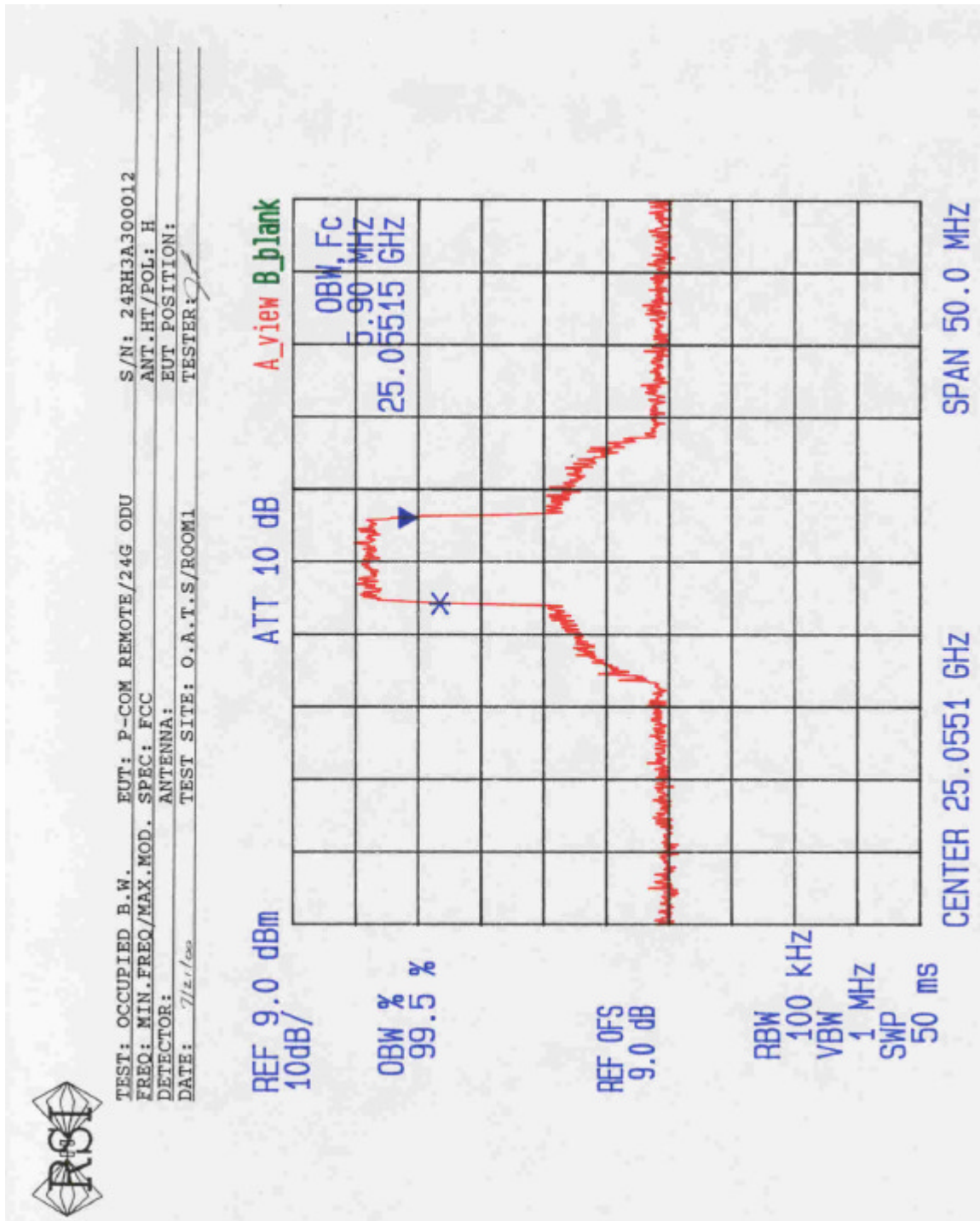
TABLE 6.1.1-1



DATA SHEET 6.1.1-1



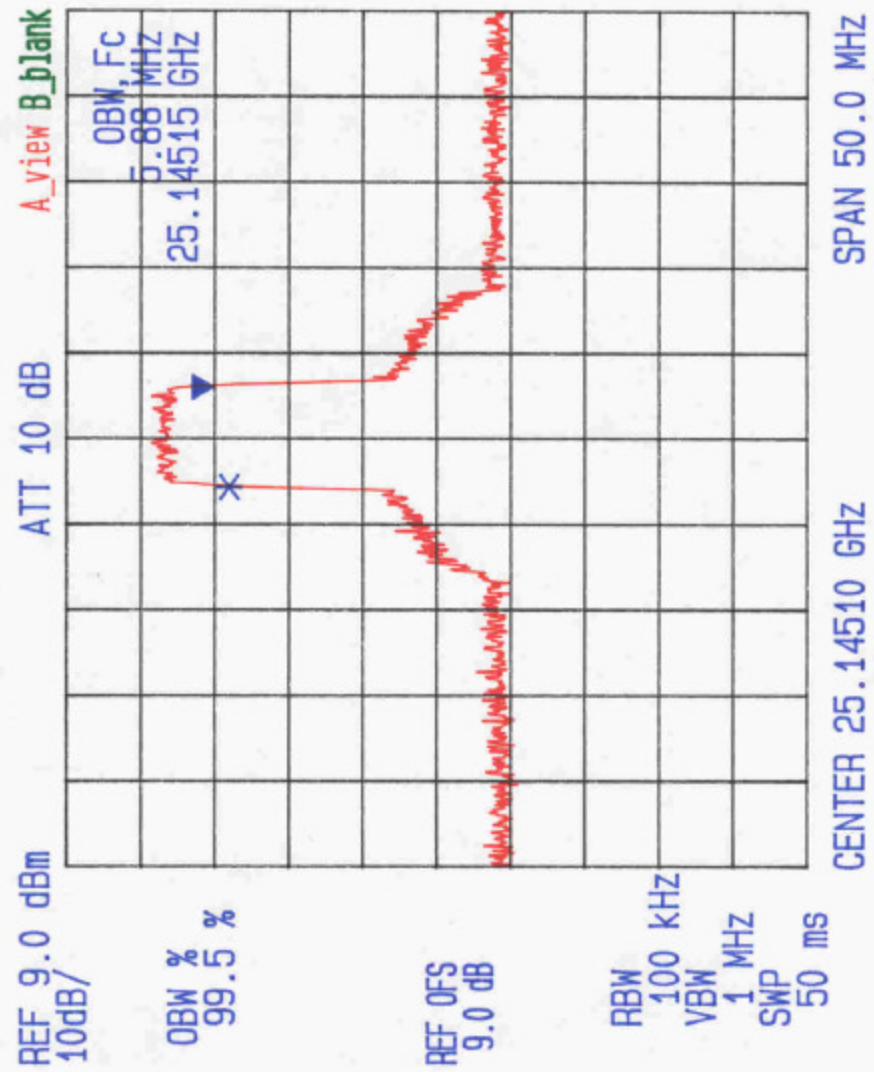
DATA SHEET 6.1.1-2



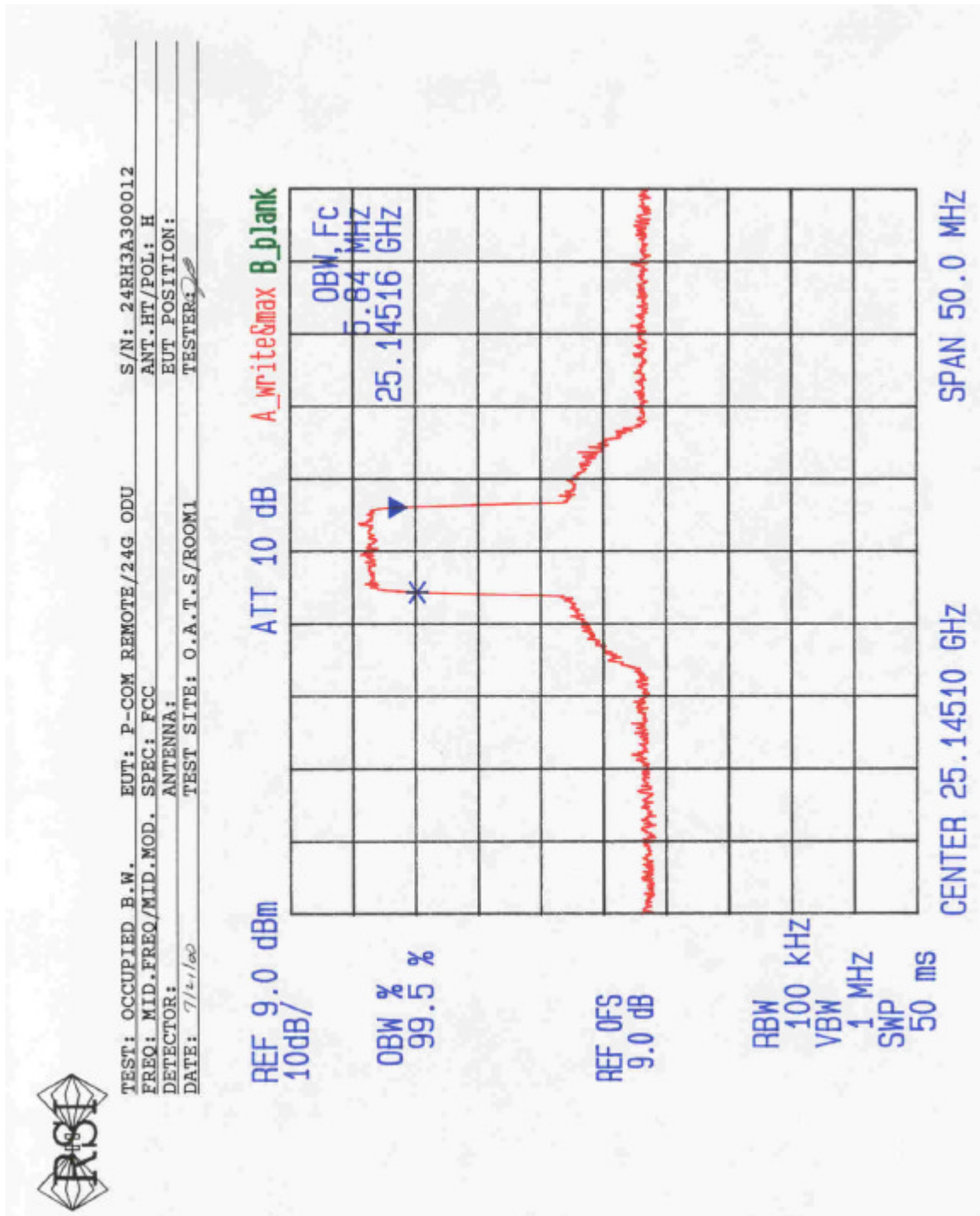
DATA SHEET 6.1.1-3



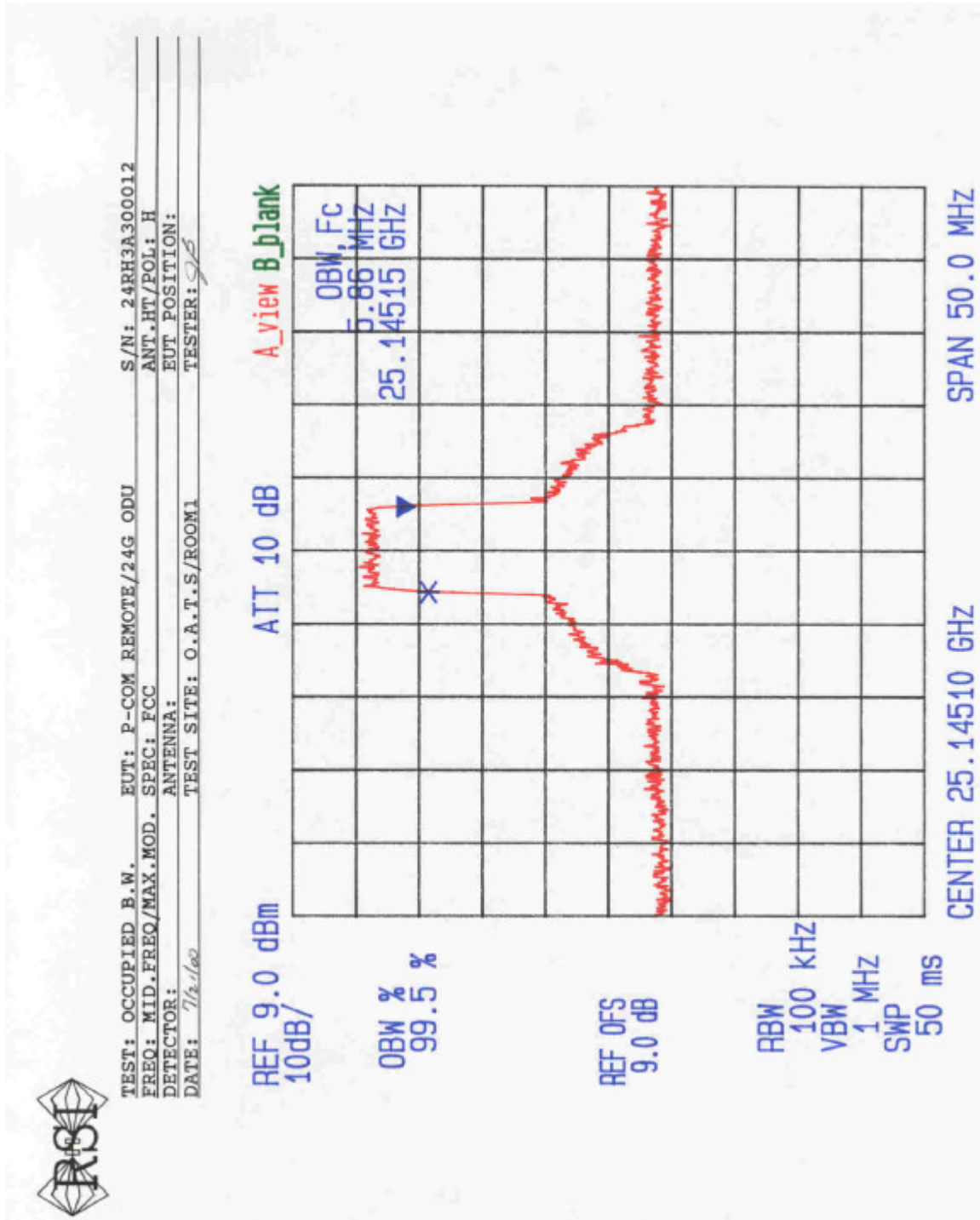
TEST: OCCUPIED B.W. EUT: P-COM REMOTE/24G ODU S/N: 24RH3A300012
 FREQ: MID.FREQ/MIN.MOD. SPEC: FCC ANT.HT/POL: H
 DETECTOR: ANTENNA: EUT POSITION:
 DATE: 7/21/00 TEST SITE: O.A.T.S./ROOM1 TESTER: JS



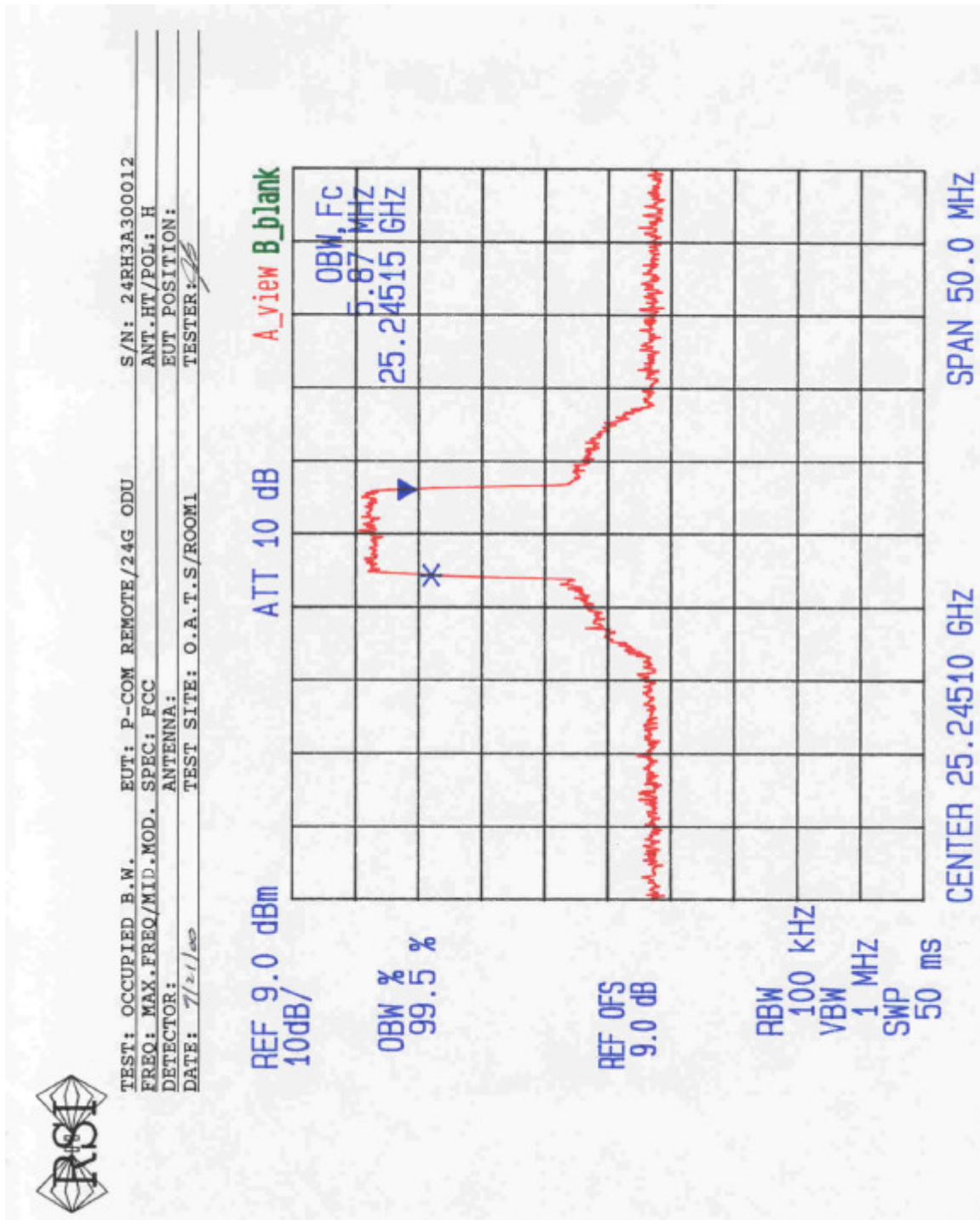
DATA SHEET 6.1.1-4



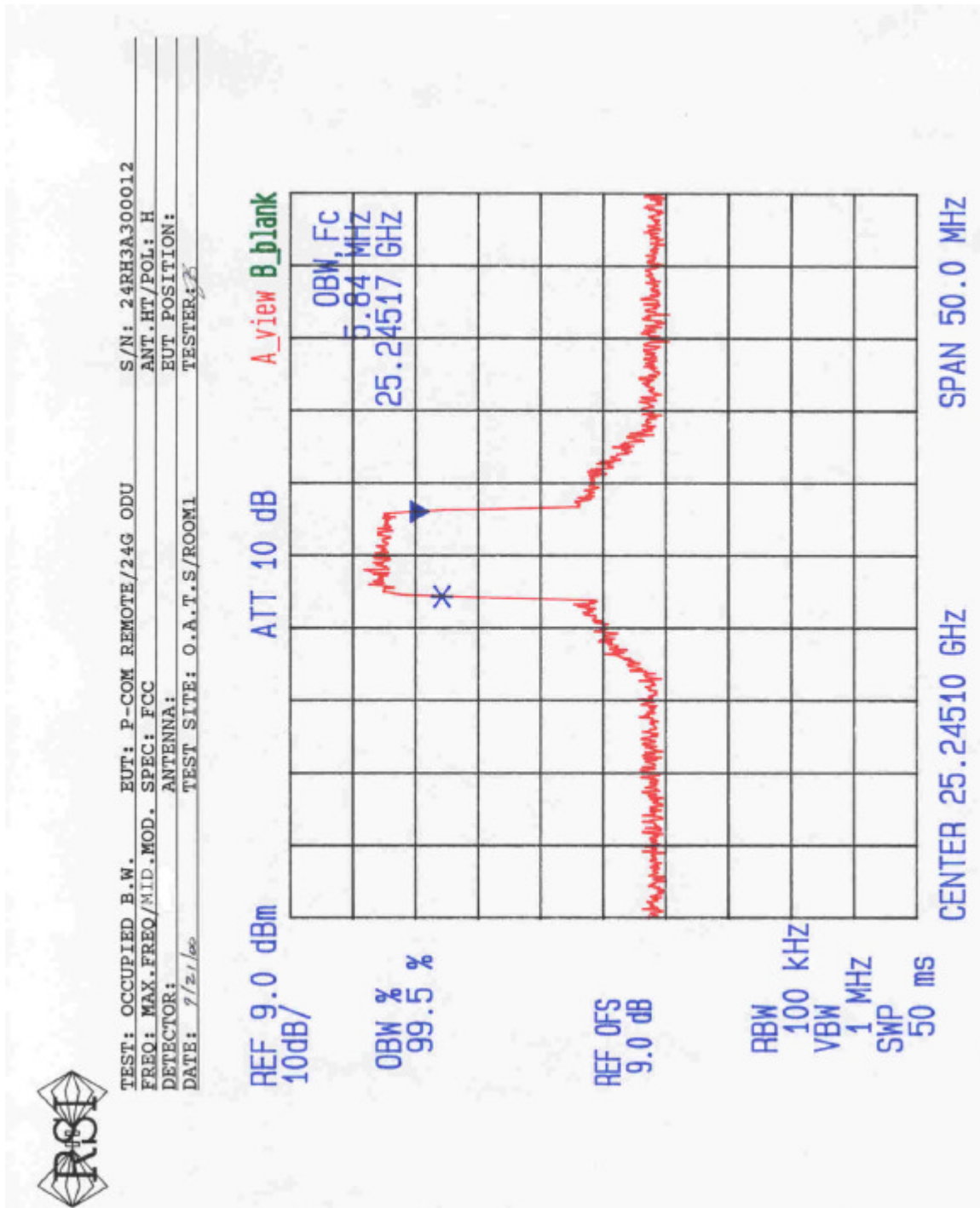
DATA SHEET 6.1.1-5



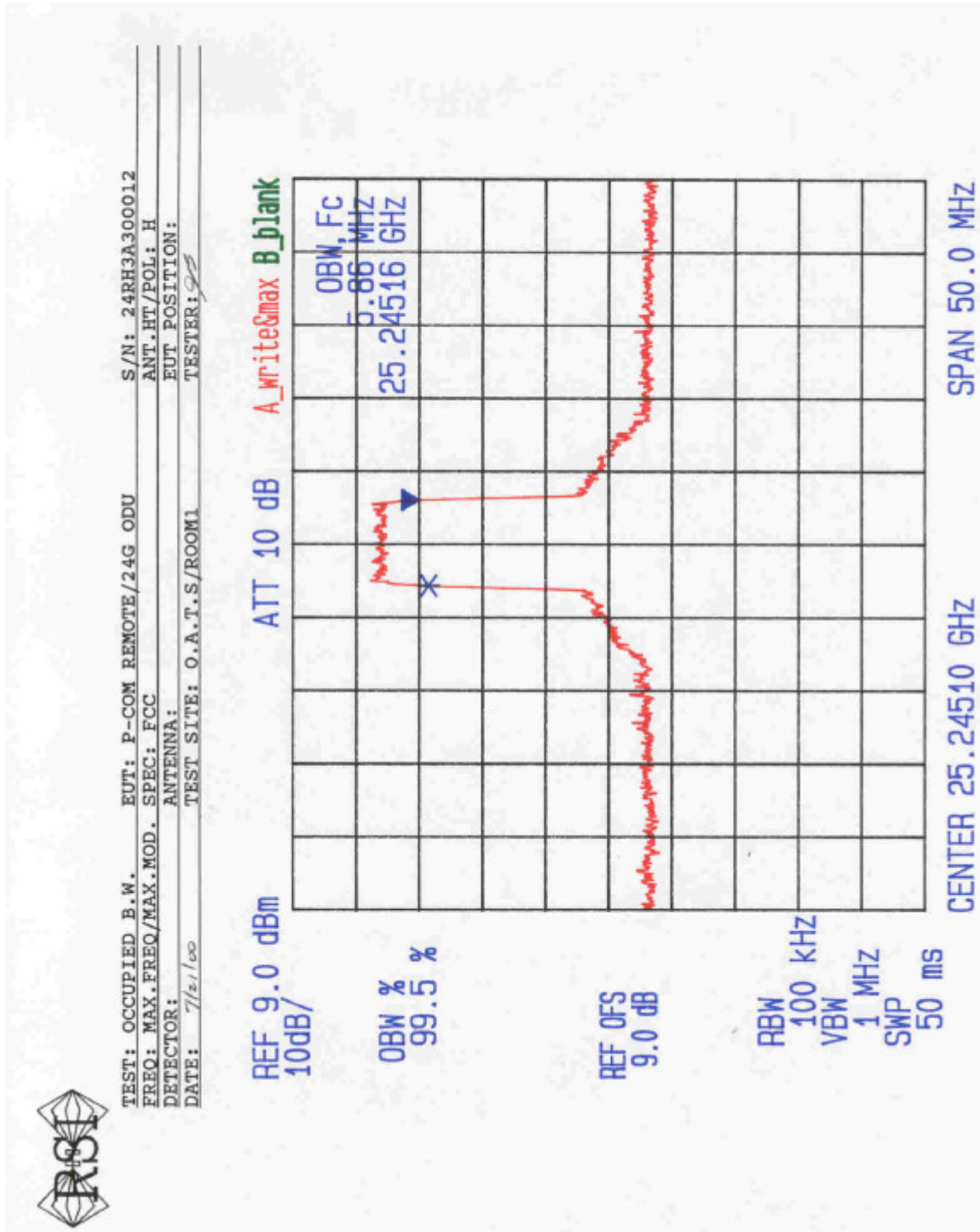
DATA SHEET 6.1.1-6



DATA SHEET 6.1.1-7



DATA SHEET 6.1.1-8



DATA SHEET 6.1.1-9

6.1.2 Transmitter Power Limitations

Power measurements were made at the input to the antenna. Measurements were made using a Hewlett Packard Model 437B 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 = 25.05GHz, Mid = 25.145GHz, Max = 25.245GHz

Frequency	Modulation	Measured Power DBW	Antenna Gain	ERIP dBW	Reference 55dBW
Min	Min	-8.3	35.5	27.2	-27.8
	Mid	-9.8	35.5	25.7	-29.3
	Max	-10.6	35.5	24.9	-30.1
Mid	Min	-8.2	36.5	28.3	-26.7
	Mid	-9.6	36.5	26.0	-29.0
	Max	-10.4	36.5	26.1	-28.9
Max	Min	-8.1	37.0	28.9	-26.1
	Mid	-9.5	37.0	27.5	-27.5
	Max	-10.3	37.0	26.7	-28.3

TABLE 6.1.2-1

6.1.3 Radiated Emissions, Part 15 and Part 101

This paragraph presents the radiated emissions for the 24GHz Remote Outdoor Unit tested to the requirements of Part 15.207 and 15.209 and the transmitter requirements to Part 101.111. Figure 6.1.3-1 presents the mixer setups used to cover the 100GHz range.

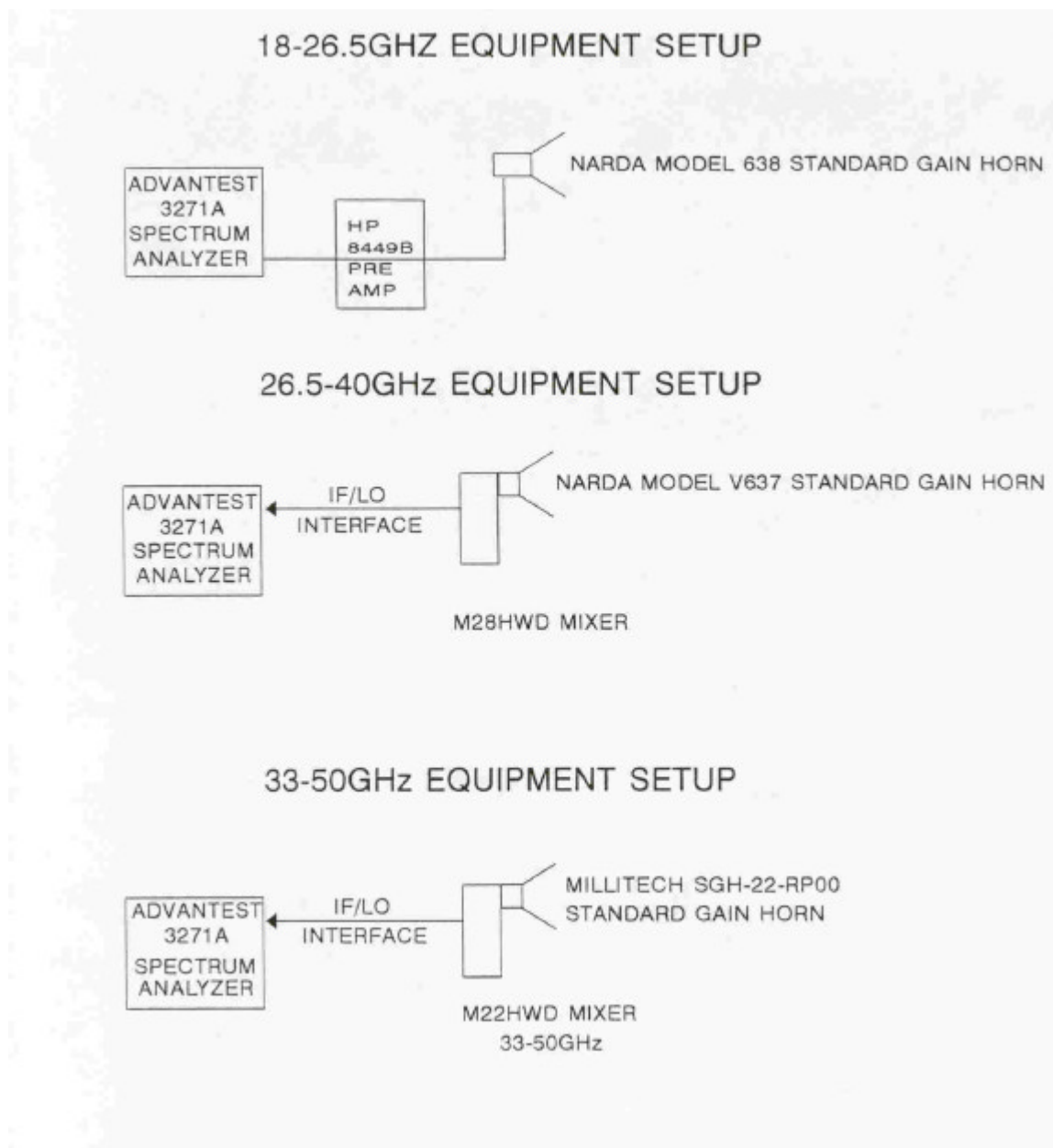


FIGURE 6.1.3-1