KTL Test Report:	9L0766RUS2
Applicant:	Proxim Inc. 401 Edgewater Drive, Suite 530 Wakefield, MA 01880
Equipment Under Test:	Stratum MP
FCC ID:	IMK-STMP-10-1
In Accordance With:	FCC Part 15, Subpart C, 15.247 Direct Sequence Spread Spectrum Transmitters
Tested By:	KTL Dallas Inc. 802 N. Kealy Lewisville, Texas 75057-3136
Authorized By:	 Tom Tidwell, RF Group Manager
Date:	May 31, 2000
Total Number of Pages:	50

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Proxim

Model No.: Stratum MP

Serial No.: Sample No. 10

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 for Direct Sequence Spread Spectrum devices. Radiated tests were conducted is accordance with ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".

NVLAP LAB CODE: 100426-0

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
Powerline Conducted Emissions	15.207(a)	48 dBµV	47.75 dBuV Peak	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	500 kHz	19 MHz	Complies
Maximum Peak Power Output	15.247(b)(1)	1 Watt @ antenna	14.5 mW (1.83 W EIRP)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	-20 dBc/100kHz	-40 dBc	Complies
Spurious Emissions (Restricted Bands)	15.247(c)	Table 15.209(a)	45 dBuV/m (Peak)	Complies
Peak Power Spectral Density	15.247(d)	+8 dBm/3kHz	-10 dBm	Complies
Processing Gain	15.247(e)	10 dB	> 10 dB	Complies

Footnotes: None

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

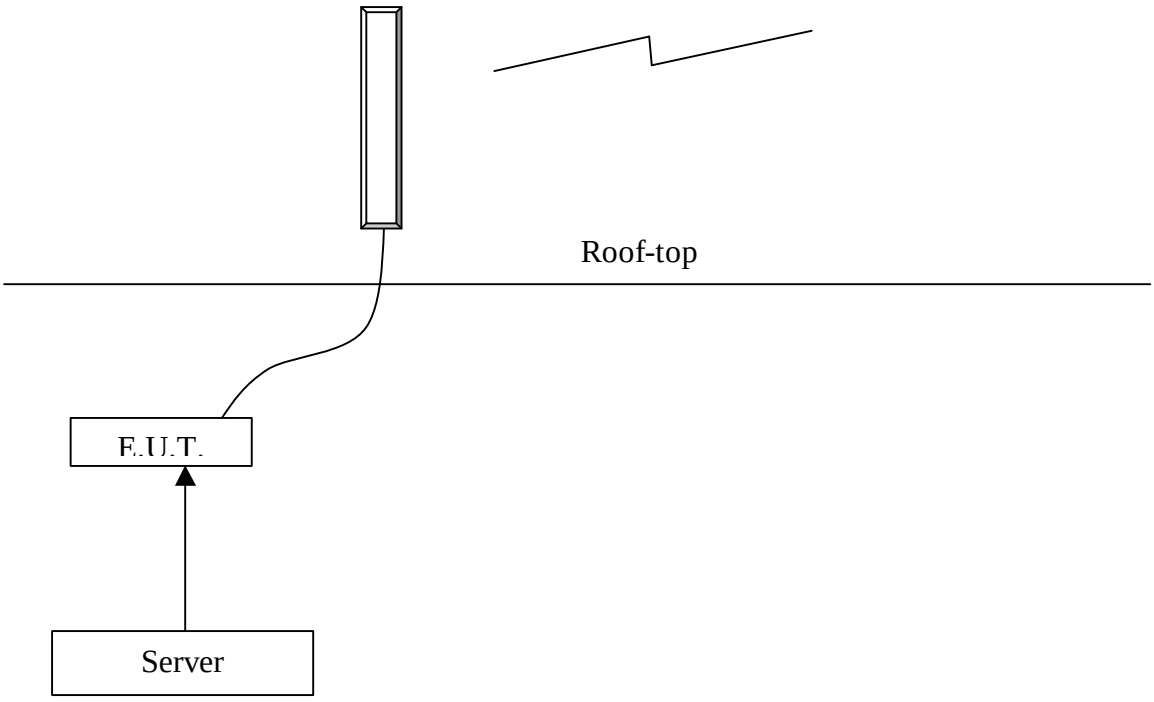
Frequency Band:	☐ 902 – 928 MHz ☒ 2400 – 2483.5 MHz ☐ 5725 – 5850 MHz
Channel Spacing:	2417MHz - 2457MHz
Emissions Designator:	24M0G7W
User Frequency Adjustment:	Software controlled

Description of Operation

The E.U.T. is a wireless ethernet bridge. The following antenna configurations are possible:

Dipole antenna	0 dBi	Mounted directly to rf output port
Omni-directional antenna (monopole)	5.1 dBi	Roof-top mount
Omni-directional antenna (monopole)	9 dBi	Roof-top mount
Flat panel antenna	8.5 dBi	Roof-top mount
Flat panel antenna	12 dBi	Roof-top mount
Dish antenna (parabolic)	21 dBi	Roof-top mount

System Diagram



Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: Kevin Rose	DATE: May 15 2000

Test Results: Complies.

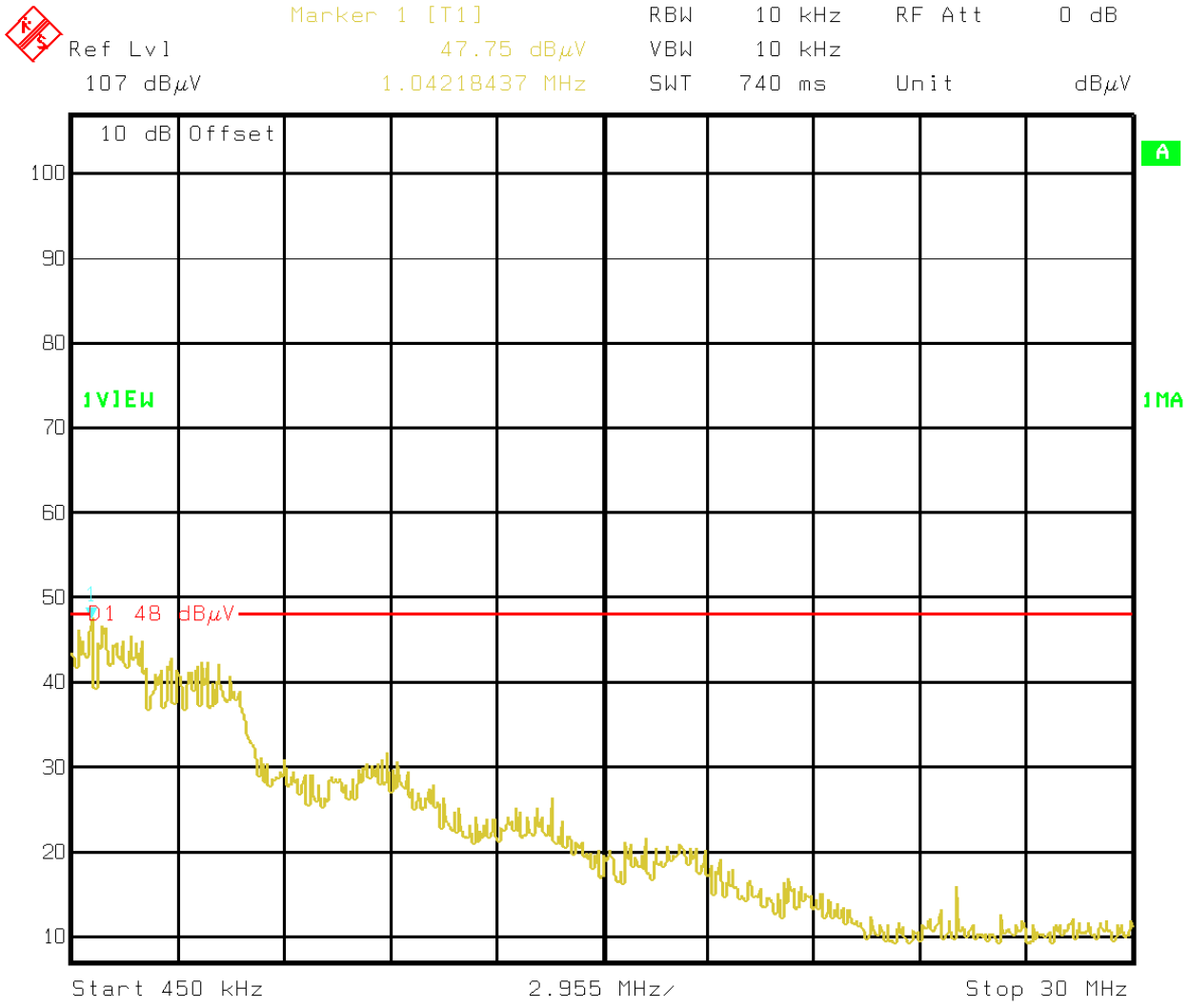
Measurement Data: See attached plots.

Equipment Used: 1036, 1043, 1188

Temperature: 20 °C

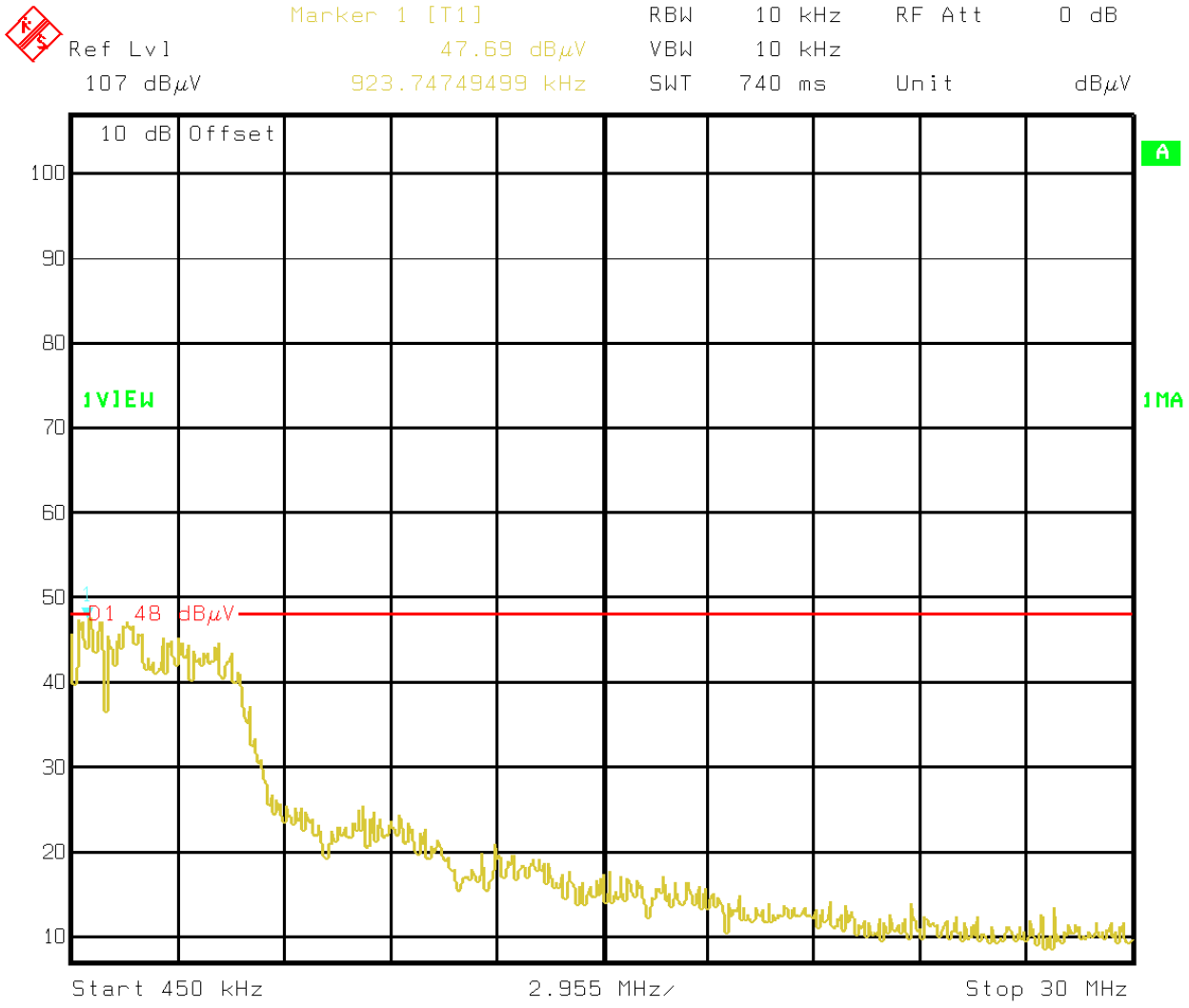
Relative Humidity: 43 %

Powerline Conducted Emissions Plots



Title: fcc neutral
Comment A: fcc neutral
Date: 16.MAY.2000 9:12:37

Powerline Conducted Emissions Plots



Title: fcc phase
Comment A: fcc phase
Date: 16.MAY.2000 9:10:39

Section 4. Minimum 6 dB Bandwidth

NAME OF TEST: Minimum 6 dB Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: Kevin Rose	DATE: 5/11/00

Test Results: Complies.

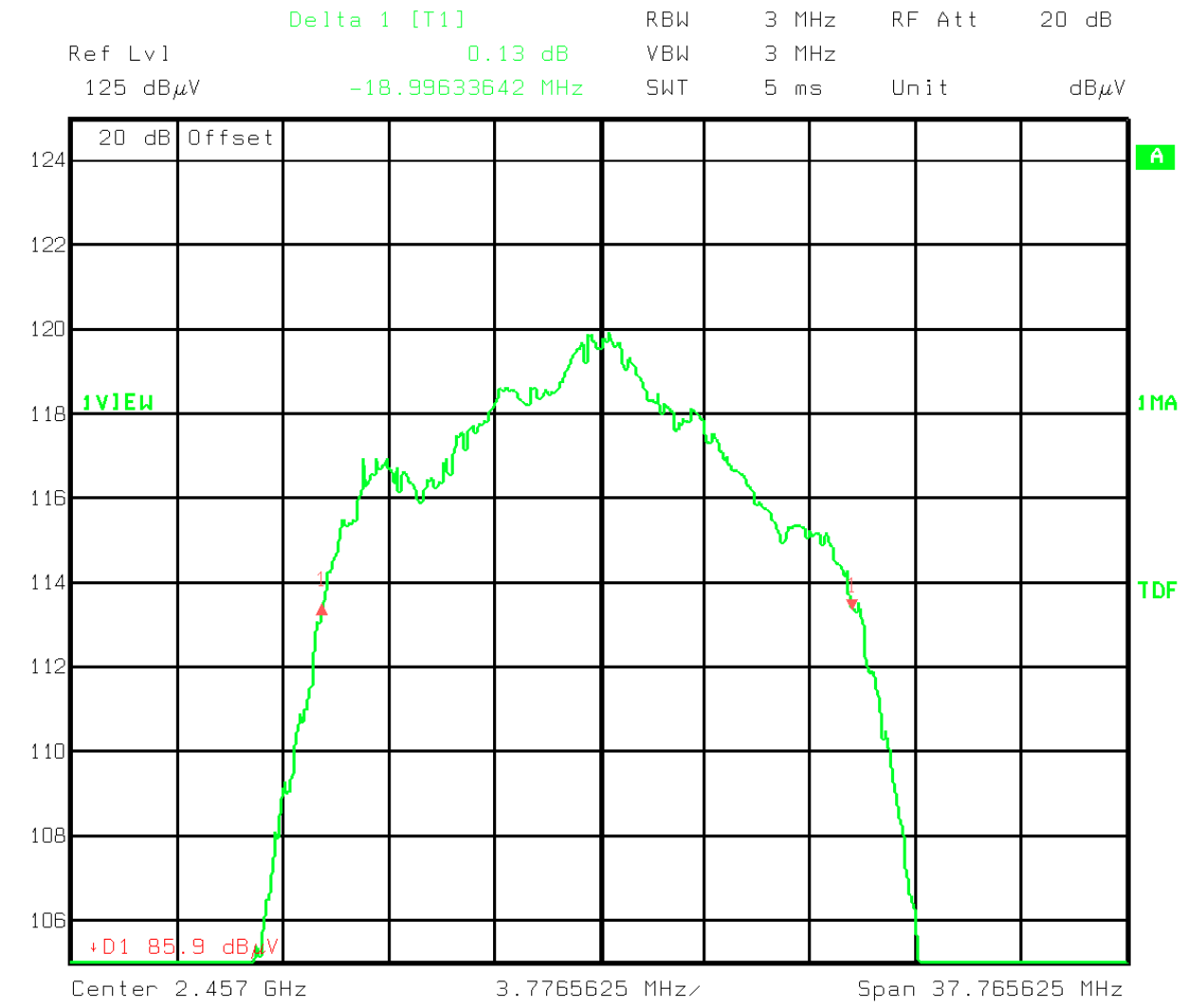
Measurement Data: See 6 dB BW plot
Measured 6 dB bandwidth: 19 MHz

Equipment Used: 1036, 1043

Temperature: 21 °C

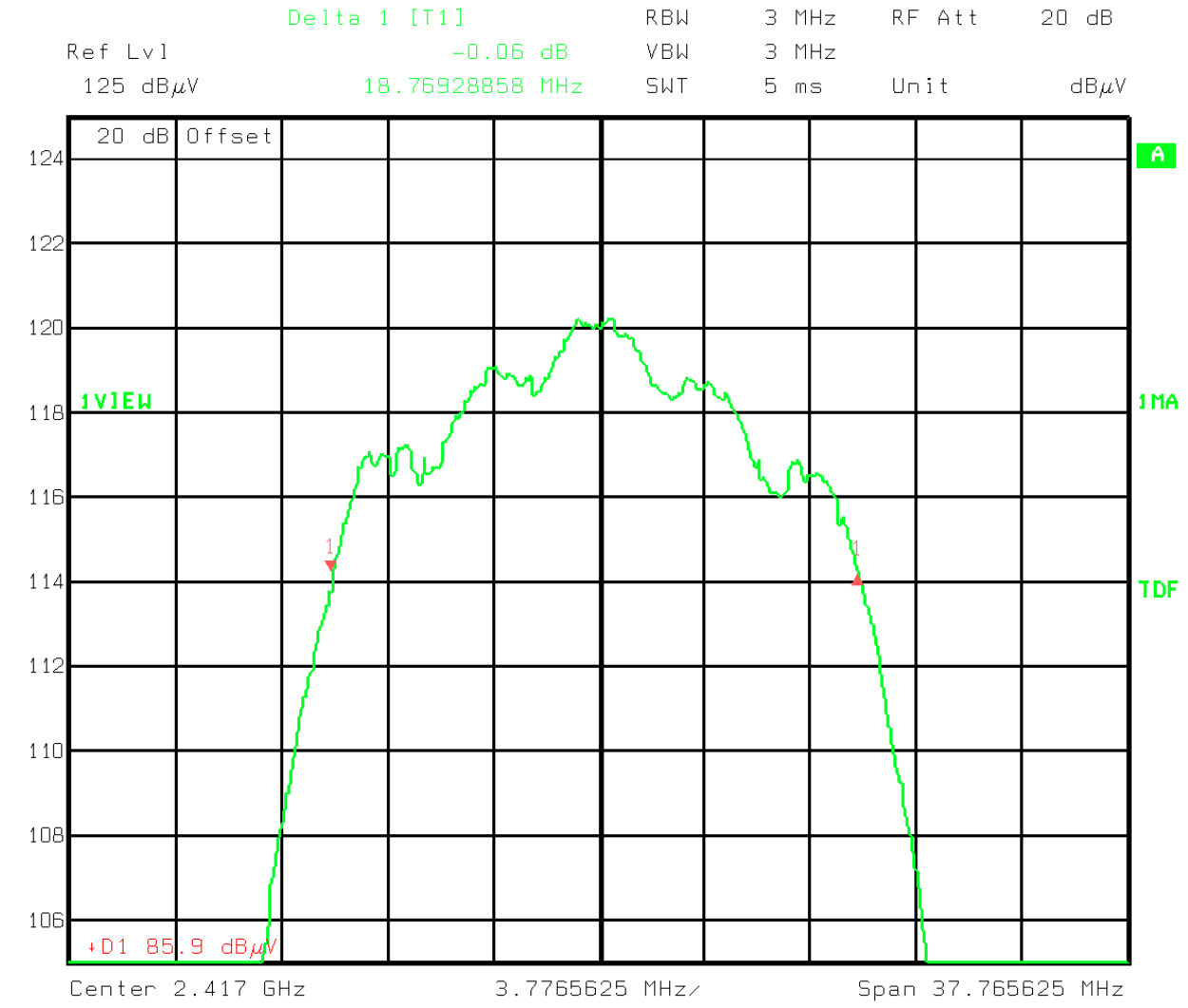
Relative Humidity: 42 %

6db bandwidth



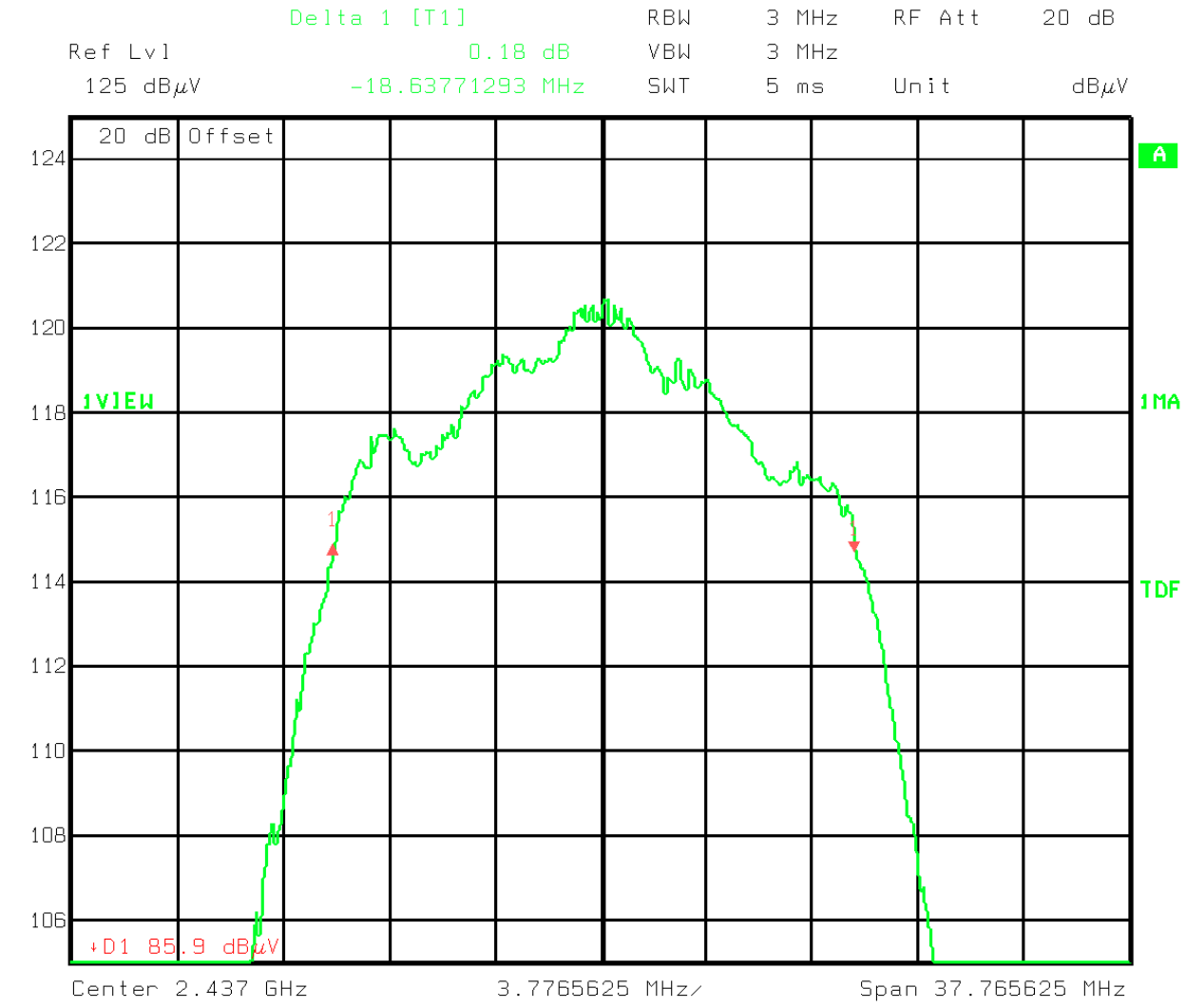
Title: 6db high
Comment A: proxim
Date: 11.MAY.2000 14:03:27

6db bandwidth



Title: 6db lower bw
Comment A: proxim
Date: 11.MAY.2000 13:58:19

6db bandwidth



Title: 6db mid
Comment A: proxim
Date: 11.MAY.2000 14:01:20

Section 5. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power PARA. NO.: 15.247(b)(1)

TESTED BY: Kevin Rose DATE: 5/23/00

RF Power Output (Conducted)

Job No.: 9L0766R Date: 5/11/00
Specification: CFR 47, Part 15 Temperature(°F): 72
Tested By: Kevin Rose Relative Humidity(%) 50
E.U.T.: Wireless Bridge
Configuration: Main RF Port
Sample Number: 10
RBW: #N/A
Detector: Peak VBW: #N/A

Test Equipment Used

Power Meter:	406	Directional Coupler:	#N/A
Power Sensor:	1021	Cable #1:	1043
Load:	#N/A	Cable #2:	#N/A
Spectrum Analyzer:	#N/A	Cable #3:	#N/A
Attenuator #1	1065	Cable #4:	#N/A
Attenuator #2:	#N/A	Cable #5:	#N/A
Attenuator #3:	#N/A	Cable #6:	#N/A
Attenuator #4:	#N/A		

Additional equipment used:
Measurement Uncertainty: +/- .7 dB

Antenna Model and Type	Measured Power(watts)			Antenna Gain (dBi)	EIRP (watts)		
	RF Channel Low	RF Channel Mid	RF Channel High		RF Channel Low	RF Channel Mid	RF Channel High
Dipole	0.0145	0.0145	0.0141	0	0.01450	0.01450	0.01410
S2403B Omni	0.0145	0.0145	0.0141	5.1	0.04692	0.04692	0.04563
7014-05 Omni	0.0145	0.0145	0.0141	9	0.11518	0.11518	0.11200
1900.0043 Flat Panel	0.0145	0.0145	0.0141	8.5	0.10265	0.10265	0.09982
505026AX Flat Panel	0.0145	0.0145	0.0141	12	0.22981	0.22981	0.22347
PT2421 Dish	0.0145	0.0145	0.0141	21	1.82544	1.82544	1.77508

EIRP is derived from the relation: $10^{[(10 \log(P) + G) / 10]}$

where: P = Power at antenna terminal(W) and G = EUT antenna gain(dBi)

Section 6. RF Exposure

NAME OF TEST: RF Exposure	PARA. NO.: 15.247(b)(4)

The E.U.T. operates with a variety of roof-mount antennas as described in the description of operation. The only antenna that is not roof-mount is the 0 dBi dipole “rubber ducky” antenna. The maximum measured peak output power in this configuration is 14.5 mW e.i.r.p. This is well below the levels expected to present an rf exposure risk.

The roof-top antennas are professionally installed and have unique connectors (reverse TNC).

Section 7. Spurious Emissions (conducted)

NAME OF TEST: Spurious Emissions (conducted)	PARA. NO.: 15.247(c)
TESTED BY: Kevin Rose	DATE: 5/11/00

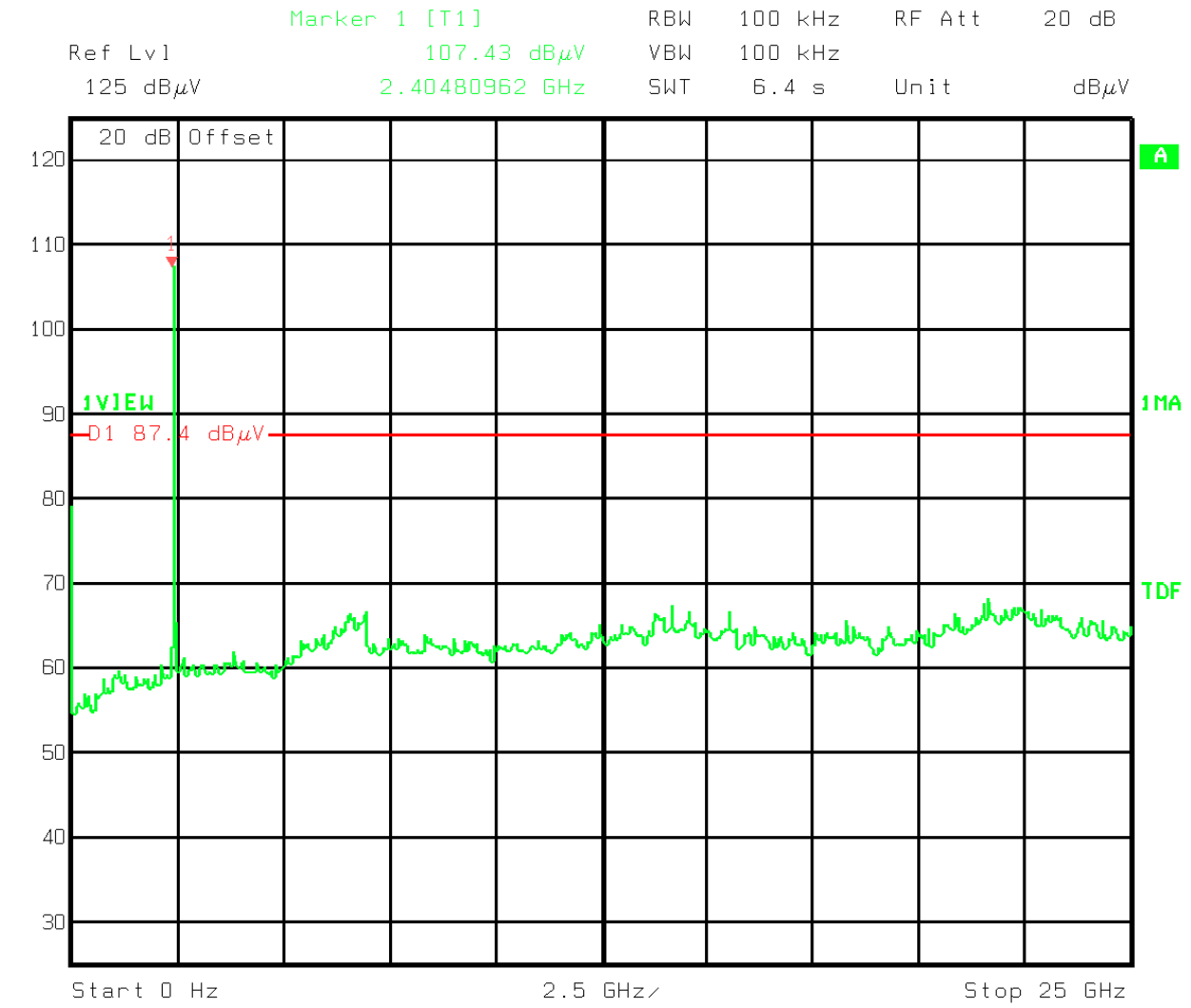
Test Results: Complies. The worst-case spurious emission is more than 40 dB below the peak carrier level.

Measurement Data: See attached plots.

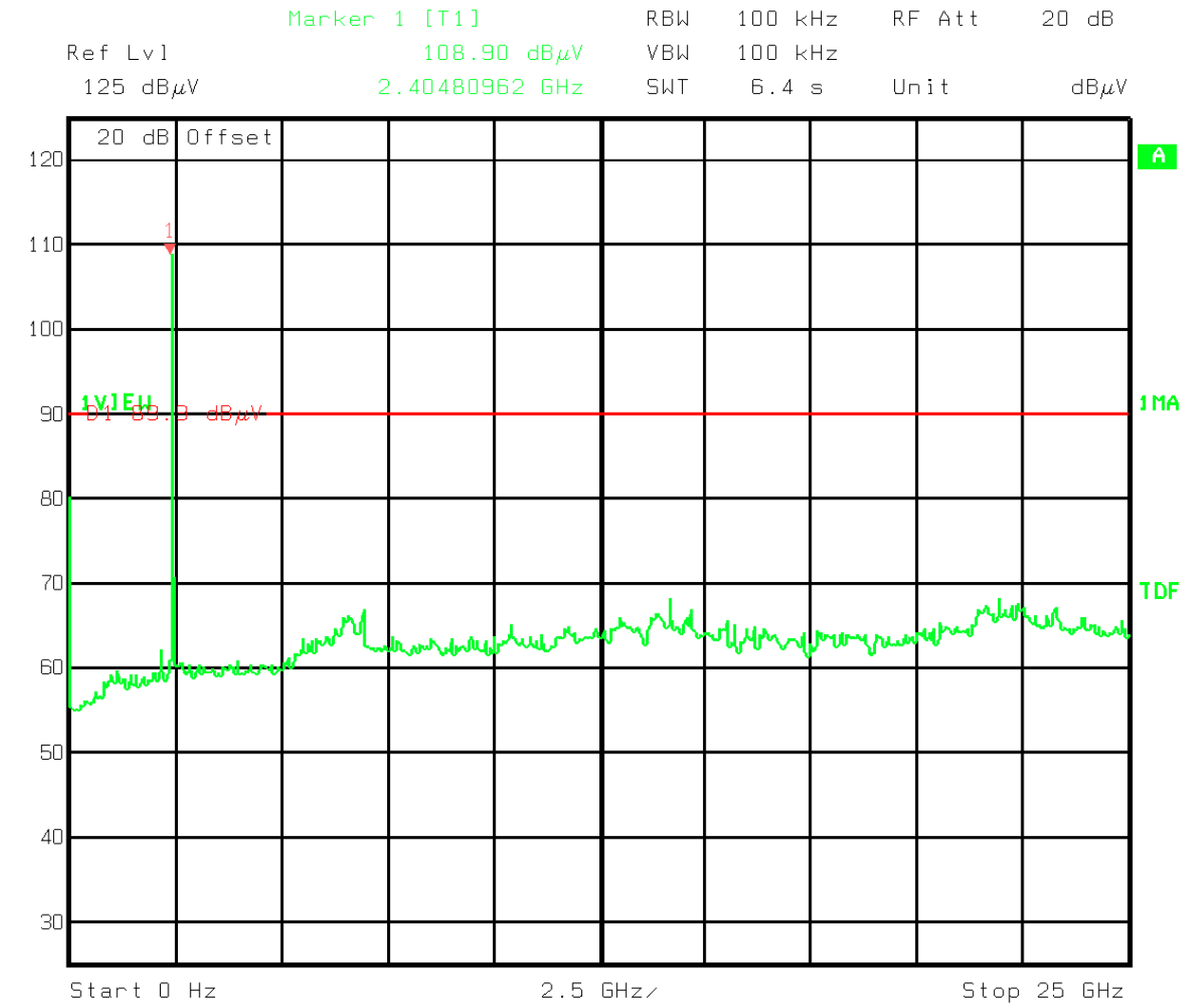
Equipment Used: 1036, 1043

Temperature: 21 °C

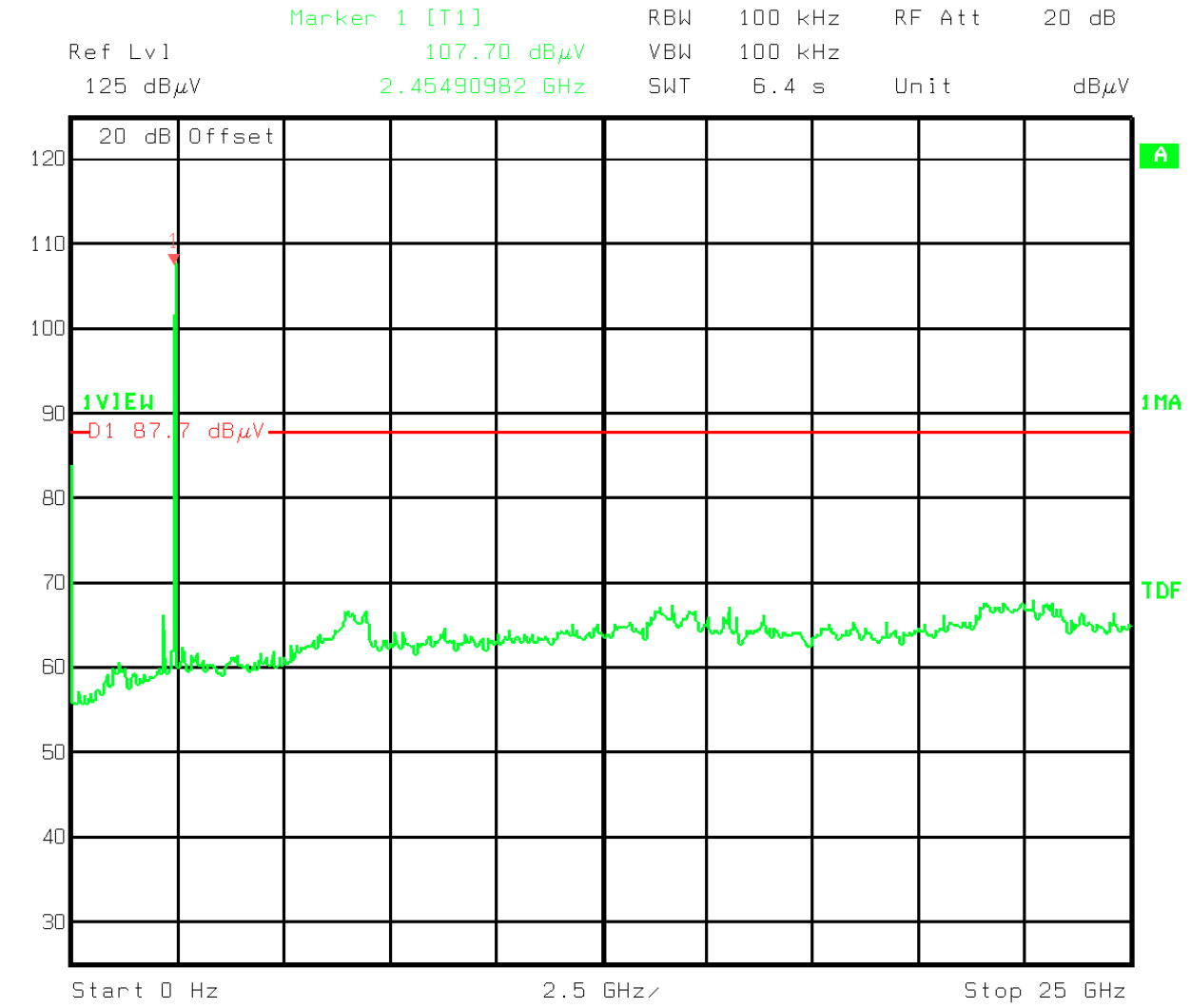
Relative Humidity: 43 %



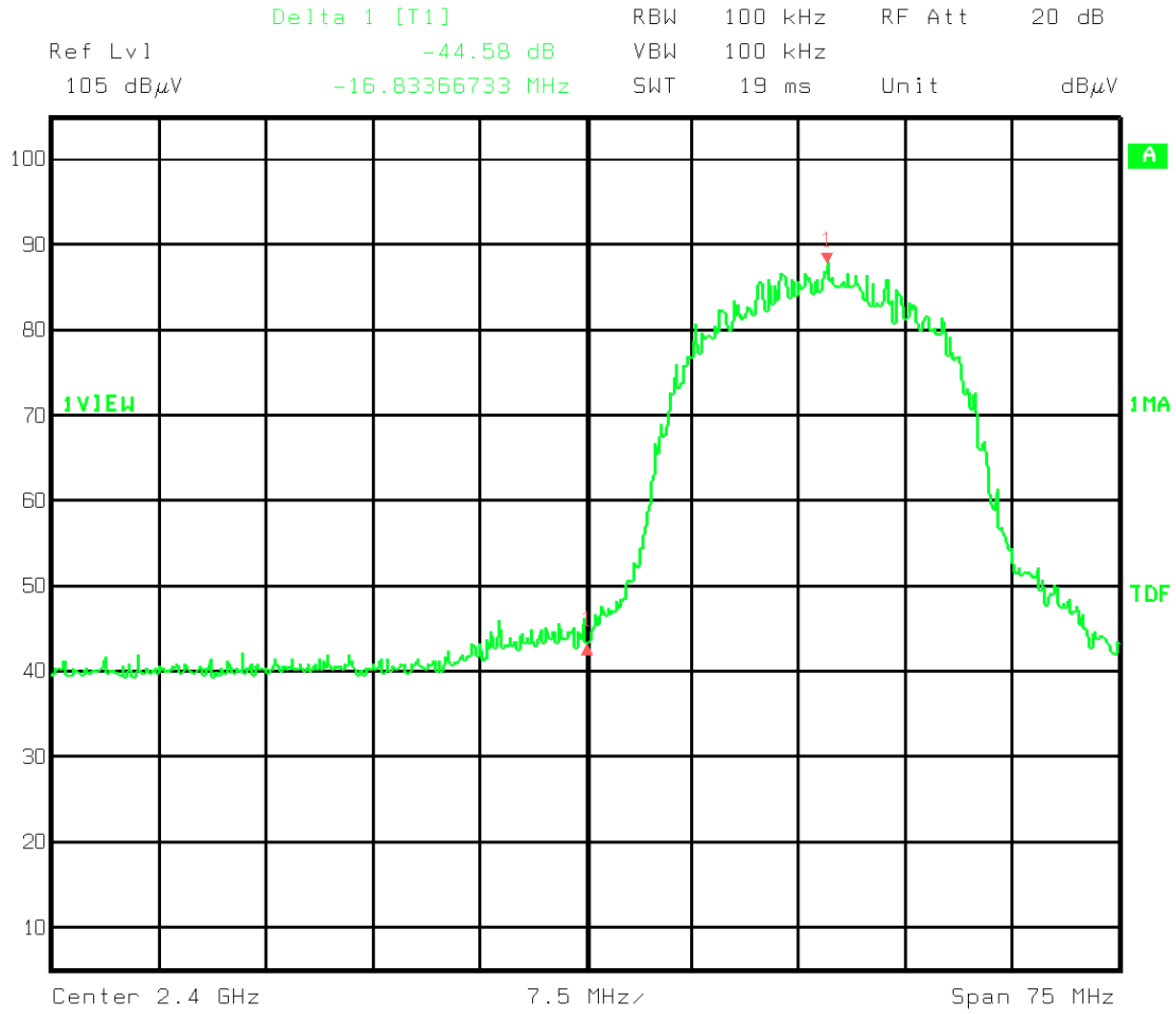
Title: tx spurious low aux
Comment A: proxim
Date: 11.MAY.2000 14:14:00



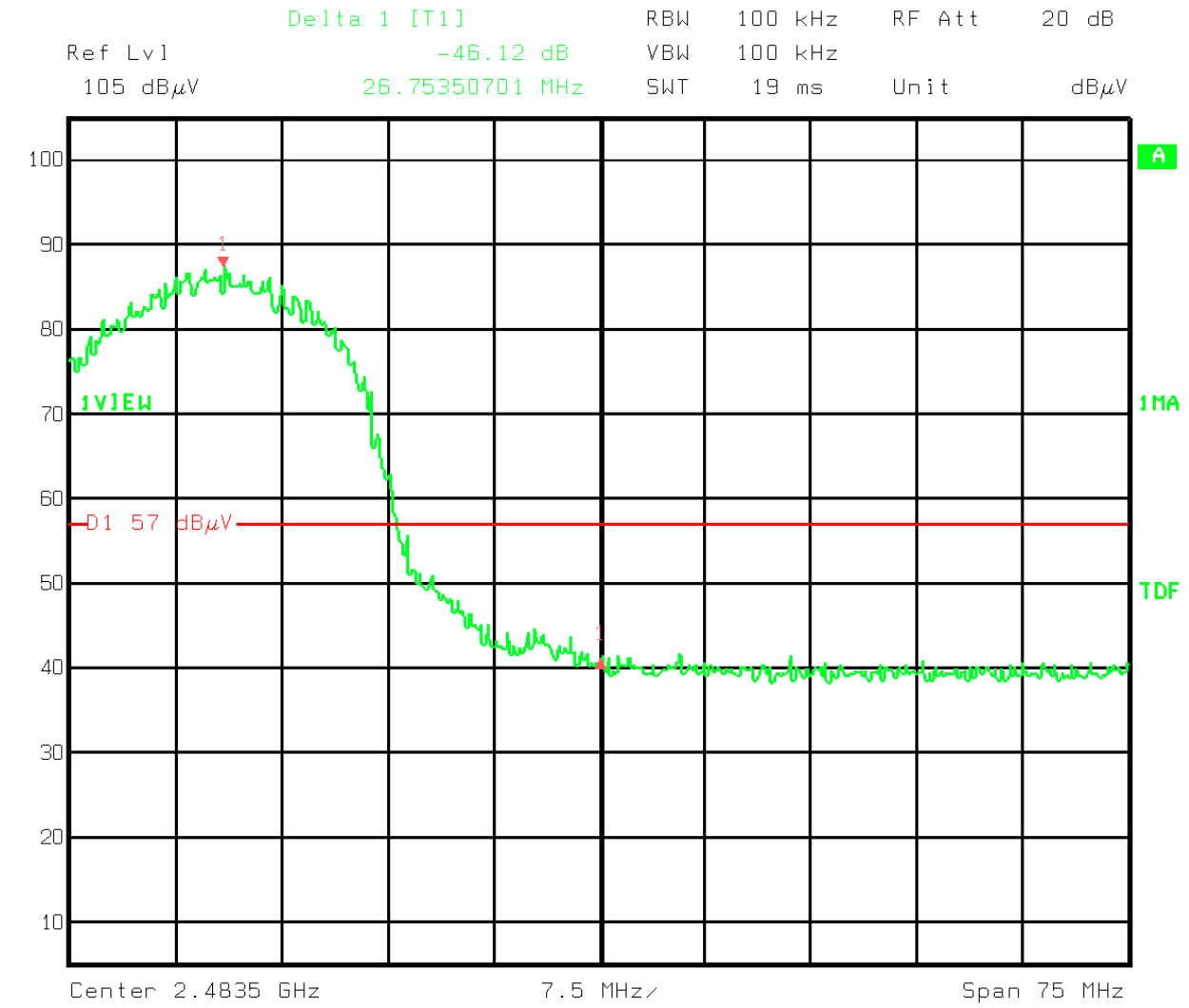
Title: tx spurious mid aux
Comment A: proxim
Date: 11.MAY.2000 14:12:15



Title: tx spurious upper aux
Comment A: proxim
Date: 11.MAY.2000 14:16:23



Title: lower band edge
Comment A: proxim
Date: 11.MAY.2000 14:39:41



Title: upper band edge
Comment A: proxim
Date: 11.MAY.2000 14:35:08

Section 8. Spurious Emissions (radiated)

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (c)
TESTED BY: Kevin Rose	DATE: 5/15/00

Test Results: Complies.

Measurement Data: See attached table.

Duty Cycle Calculation:

Duty Cycle correction factor(dB) = 20 log (rf_{ON} in ms/100ms)

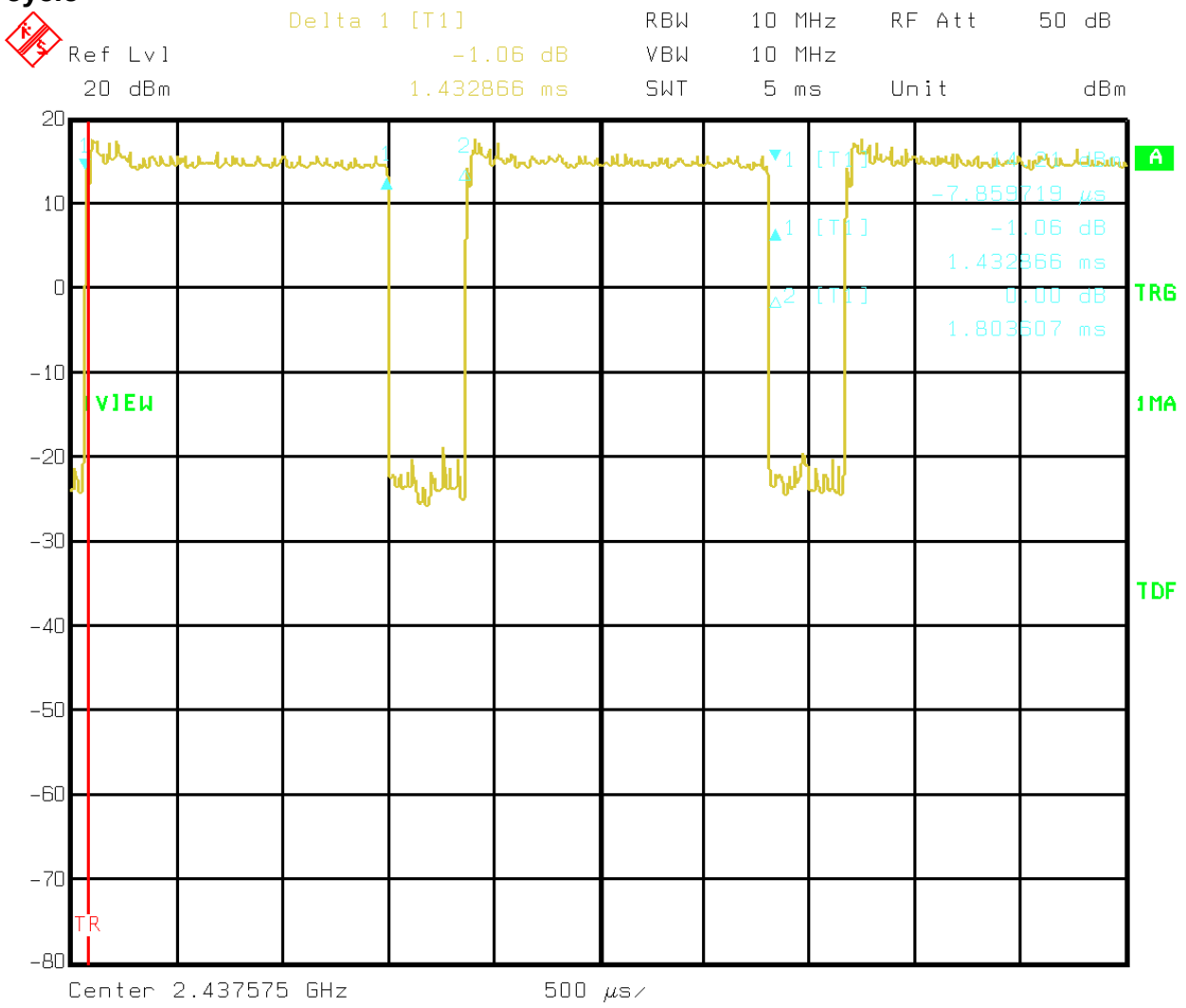
6 pulses in 10 ms.
60 pulses in 100 ms
1.304 ms on time pulses
.363 ms off time pulses

78.24 ms on time over 100ms=.78.24 log 20= -2.1 db correction factor

Temperature: 21 °C

Relative Humidity: 43 %

Duty cycle



Title: Transmit Duty Cycle 7.2.1, step 1
Date: 16.MAY.2000 11:06:24

Spurious Emissions (Radiated)

Radiated Emissions
FCC

Complete X
Preliminary

Page 1 of 1

Client: Proxim W.O.#: 9L0766R Date: May 12 2000

EUT: Stratum MP Sample# 10 Specification: CFR47,Part 15.247

Tech: Kevin rose Test #: APSE-1 Lab: AC3 Photo ID: 9L0766 APSE-1

Equipment Used: CF47 CF44 CF41 CF43 G2016 G2200 Antenna Distance: 3m

Configuration: Transmitting into 12 dB Gain Flat Panel Antenna

IF Bandwidth: 1Mhz Video Bandwidth 1Mhz Detector: Peak X Quasi Peak

Ambient Temperature: 21 C EUT Power: X 115 V.A.C. X 60 Hz X 1 Phase
Relative Humidity: 54 % 230 V.A.C. 50 Hz 3 Phase
Atmospheric Pressure: 999 mbar Other

Freq. (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV) FCC	Pol.	Comments:
2.4172								Fundamental
4.8344	48	30	7	30	43	54	V	Low Chanel
7.2516	45.3	34.2	8.6	34.2	41.9	54	V	Low Chanel
9.6688	46.3	33.9	11.5	33.2	46.5	54	V	Low Chanel
12.0853	45.8	33	12.5	33.5	45.8	54	V	Low Chanel
2.4172								Fundamental
4.8344	45.2	30	7	30	40.2	54	H	Low Chanel
7.2516	44.3	34.2	8.6	34.2	40.9	54	H	Low Chanel
9.6688	46.5	33.9	11.5	33.2	46.7	54	H	Low Chanel
12.0853	45.2	33	12.5	33.5	45.2	54	H	Low Chanel
2.436								Fundamental
4.873	45.6	30	7	30	40.6	54	H	Mid Channel
7.3095	44.7	34.2	8.6	34.2	41.3	54	H	Mid Channel
9.746	45.3	33.9	11.5	33.2	45.5	54	H	Mid Channel
12.182	45.2	33	12.5	33.5	45.2	54	H	Mid Channel
2.436								Fundamental
4.873	45.7	30	7	30	40.7	54	V	Mid Channel
7.3095	44.5	34.2	8.6	34.2	41.1	54	V	Mid Channel
9.746	45.5	33.9	11.5	33.2	45.7	54	V	Mid Channel
12.182	46.2	33	12.5	33.5	46.2	54	V	Mid Channel
2.4565								Fundamental
4.913	45.3	30	7	30	40.3	54	V	High Channel
7.3695	46	34.2	8.6	34.2	42.6	54	V	High Channel
9.826	46.3	33.9	11.5	33.2	46.5	54	V	High Channel
12.2825	45.8	33	12.5	33.5	45.8	54	V	High Channel
2.4565								Fundamental
4.913	44.7	30	7	30	39.7	54	H	High Channel
7.3695	45.3	34.2	8.6	34.2	41.9	54	H	High Channel
9.826	46.3	33.9	11.5	33.2	46.5	54	H	High Channel
12.2825	44.8	33	12.5	33.5	44.8	54	H	High Channel

Spurious Emissions (Radiated)

Radiated Emissions
FCC

Complete X
Preliminary

Page 1 of 1

Client: Proxim W.O.#: 9L0766R Date: 5/12/00

EUT: Stratum MP Sample# 10 Specification: CFR47, Part 15.247

Tech: Kevin Rose Test #: APSE-2 Lab: AC3 Photo ID: 9L0766 APSE-2

Equipment Used: CF47 CF44 CF41 CF43 G2016 G2200 Antenna Distance: 3m

CoNFiguration: Transmitting @ Mid Channel into 21 dB Gain Dish Antenna

IF Bandwidth: 1Mhz Video Bandwidth 1Mhz Detector: X Peak Quasi Peak

Ambient Temperature: 21 C EUT Power: X 115 V.A.C. X 60 Hz X 1 Phase
Relative Humidity: 54 % 230 V.A.C. 50 Hz 3 Phase
Atmospheric Pressure: 999 mbar Other

Freq. (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV) FCC	Pol.	Comments:
2.4357								Fundamental
4.8714	47.2	30	7	30	42.2	54	H	NF
7.3071	45.5	34.2	8.6	34.2	42.1	54	H	NF
9.7428	46.5	33.9	11.5	33.2	46.7	54	H	NF
12.18	46.5	33	12.5	33.5	46.5	54	H	NF
2.4357								Fundamental
4.8664	48	30	7	30	55	54	V	
4.865	35.8	30	7	30	42.8	54	V	Video BW dropped to 10 Hz
7.307	45.2	34.2	8.6	34.2	41.8	54	V	NF
9.7211	45.5	33.9	11.5	33.2	45.7	54	V	NF
12.1568	46.3	33	12.5	33.5	46.3	54	V	NF

Spurious Emissions (Radiated)

Radiated Emissions
FCC

Complete X
Preliminary

Page 1 of 1

Client: Proxim W.O.#: 9L0766R Date: may 12 2000

EUT: Stratum MP Sample# 10 Specification:

Tech: Kevin Rose Test #: APSE-3 Lab: AC3 Photo ID: 9L0766F APSE-3

Equipment Used: CF47 CF44 CF41 CF43 G2016 G2200 Antenna Distance: 3m

Configuration: Transmitting into 9 dB Omni-directional Antenna

IF Bandwidth: 1 MHz Video Bandwidth: 1 MHz Detector: X Peak Quasi Peak

Ambient Temperature: 21 C EUT Power: X 115 V.A.C. X 60 Hz X 1 Phase
Relative Humidity: 51 % 230 V.A.C. 50 Hz 3 Phase
Atmospheric Pressure: 999 mbar Other

Freq. (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV) FCC	Pol.	Comments:	
2.4554								Fundamental	Upper Channel
4.9108	44.7	30	7	30	39.7	54	H	Noise Floor	Upper Channel
7.366	46	34.2	8.6	34.2	42.6	54	H	Noise Floor	Upper Channel
9.8216	46.2	33.9	11.5	33.2	46.4	54	H	Noise Floor	Upper Channel
12.277	45.7	33	12.5	33.5	45.7	54	H	Noise Floor	Upper Channel
2.4554								Fundamental	Upper Channel
4.9108	45.2	30	7	30	40.2	54	V	Noise Floor	Upper Channel
7.366	44.7	34.2	8.6	34.2	41.3	54	V	Noise Floor	Upper Channel
9.8216	46.5	33.9	11.5	33.2	46.7	54	V	Noise Floor	Upper Channel
12.277	45	33	12.5	33.5	45	54	V	Noise Floor	Upper Channel
2.4368								Fundamental	Mid Channel
4.8922	45.7	30	7	30	40.7	54	V	Noise Floor	Mid Channel
7.3476	45.5	34.2	8.6	34.2	42.1	54	V	Noise Floor	Mid Channel
9.803	46.3	33.9	11.5	33.2	46.5	54	V	Noise Floor	Mid Channel
12.258	45.8	33	12.5	33.5	45.8	54	V	Noise Floor	Mid Channel
2.4368								Fundamental	Mid Channel
4.8922	44.8	30	7	30	39.8	54	H	Noise Floor	Mid Channel
7.3476	45.7	34.2	8.6	34.2	42.3	54	H	Noise Floor	Mid Channel
9.803	46.3	33.9	11.5	33.2	46.5	54	H	Noise Floor	Mid Channel
12.258	45.7	33	12.5	33.5	45.7	54	H	Noise Floor	Mid Channel
2.417								Fundamental	Lower Channel
4.8344	44.8	30	7	30	39.8	54	H	Noise Floor	Lower Channel
7.2516	45.2	34.2	8.6	34.2	41.8	54	H	Noise Floor	Lower Channel
9.668	45.3	33.9	11.5	33.2	45.5	54	H	Noise Floor	Lower Channel
12.086	45.8	33	12.5	33.5	45.8	54	H	Noise Floor	Lower Channel
2.417								Fundamental	Lower Channel
4.8344	45.8	30	7	30	40.8	54	V	Noise Floor	Lower Channel
7.2516	45	34.2	8.6	34.2	41.6	54	V	Noise Floor	Lower Channel
9.668	45.2	33.9	11.5	33.2	45.4	54	V	Noise Floor	Lower Channel
12.086	44.8	33	12.5	33.5	44.8	54	V	Noise Floor	Lower Channel

Spurious Emissions (Radiated)

Radiated Emissions
FCC

Complete X
Preliminary

Page 1 of 1

Client: Proxim W.O.#: 9L0766R Date: May 12 2000

EUT: Stratum MP Sample #: 10 Specification: CFR47, Part 15.247

Tech: Kevin Rose Test #: APSE-4 Lab: AC3 Photo ID: 9L0766F APSE-4

Equipment Used: cf47 cf44 cf41 cf43 g2016 g2200 Antenna Distance: 3m

Configuration: Transmitting into dipole antenna

IF Bandwidth: 1 MHz Video Bandwidth: 1 MHz Detector: X Peak Quasi Peak

Ambient Temperature: 21 C EUT Power: X 115 V.A.C. X 60 Hz X 1 Phase
Relative Humidity: 51 % 230 V.A.C. 50 Hz 3 Phase
Atmospheric Pressure: 999 mbar Other

Freq. (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV) FCC	Pol.	Comments:	
2.4357							V	Fundamental	Mid Channel
4.8714	49	30	7	30	56	54	V		Mid Channel
4.8714	38	30	7	30	45	54	V	VBW reduced to 10 Hz	Mid Channel
7.307	46	34.2	8.6	34.2	42.6	54	V	Noise Floor	Mid Channel
9.7428	46.3	33.9	11.5	33.2	46.5	54	V	Noise Floor	Mid Channel
12.1785	45.3	33	12.5	33.5	45.3	54	V	Noise Floor	Mid Channel
2.4357								Fundamental	Mid Channel
4.8714	45.5	30	7	30	40.5	54	H	Noise Floor	Mid Channel
7.307	44.5	34.2	8.6	34.2	41.1	54	H	Noise Floor	Mid Channel
9.7428	46	33.9	11.5	33.2	46.2	54	H	Noise Floor	Mid Channel
12.1785	45.5	33	12.5	33.5	45.5	54	H	Noise Floor	Mid Channel
2.4177								Fundamental	Lower Channel
4.8354	44.7	30	7	30	39.7	54	H	Noise Floor	Lower Channel
7.2531	44.8	34.2	8.6	34.2	41.4	54	H	Noise Floor	Lower Channel
9.67	45.5	33.9	11.5	33.2	45.7	54	H	Noise Floor	Lower Channel
12.0885	44.8	33	12.5	33.5	44.8	54	H	Noise Floor	Lower Channel
2.4177								Fundamental	Lower Channel
4.8334	49.5	30	7	30	56.5	54	V		Lower Channel
4.8334	37.3	30	7	30	44.3	54	V	VBW reduced to 10 Hz	Lower Channel
7.253	44.67	34.2	8.6	34.2	41.27	54	V	Noise Floor	Lower Channel
9.6708	45.2	33.9	11.5	33.2	45.4	54	V	Noise Floor	Lower Channel
12.0885	45	33	12.5	33.5	45	54	V	Noise Floor	Lower Channel
2.456								Fundamental	Upper Channel
4.9108	45.2	30	7	30	40.2	54	V	Noise Floor	Upper Channel
7.366	46	34.2	8.6	34.2	42.6	54	V	Noise Floor	Upper Channel
9.8216	45.5	33.9	11.5	33.2	45.7	54	V	Noise Floor	Upper Channel
12.277	45.3	33	12.5	33.5	45.3	54	V	Noise Floor	Upper Channel
2.4554								Fundamental	Upper Channel
4.9108	46.3	30	7	30	41.3	54	H	Noise Floor	Upper Channel
7.3662	46.8	34.2	8.6	34.2	43.4	54	H	Noise Floor	Upper Channel
9.8216	45.3	33.9	11.5	33.2	45.5	54	H	Noise Floor	Upper Channel
12.277	45	33	12.5	33.5	45	54	H	Noise Floor	Upper Channel

Radiated Photographs (Worst Case Configuration)

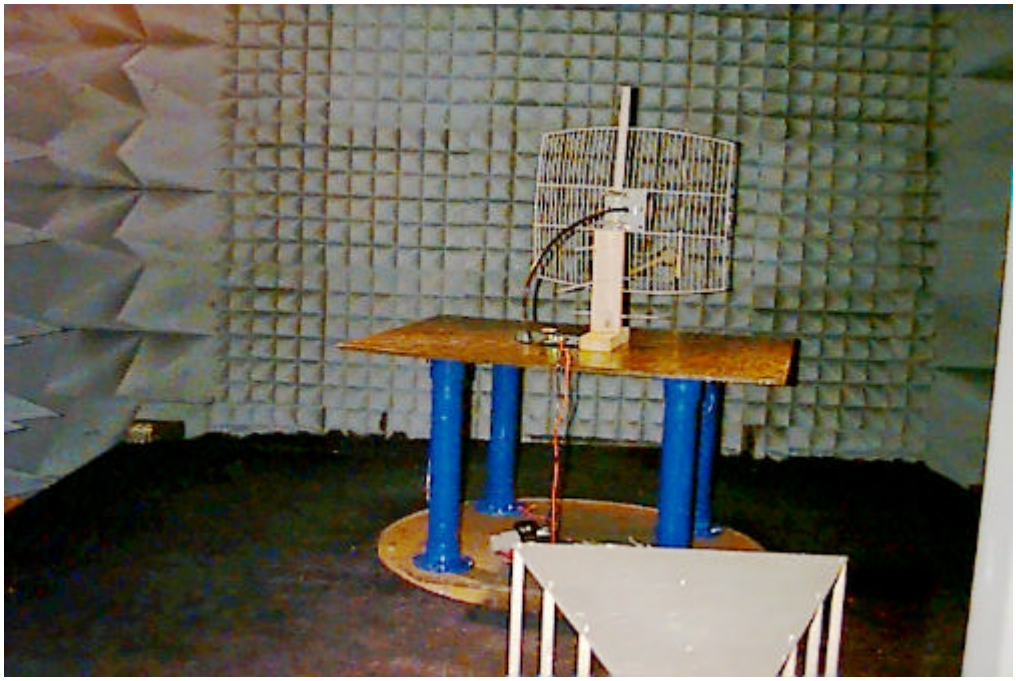
Flat panel antenna-Front

Flat panel antenna-Rear

Radiated Photographs – Continued

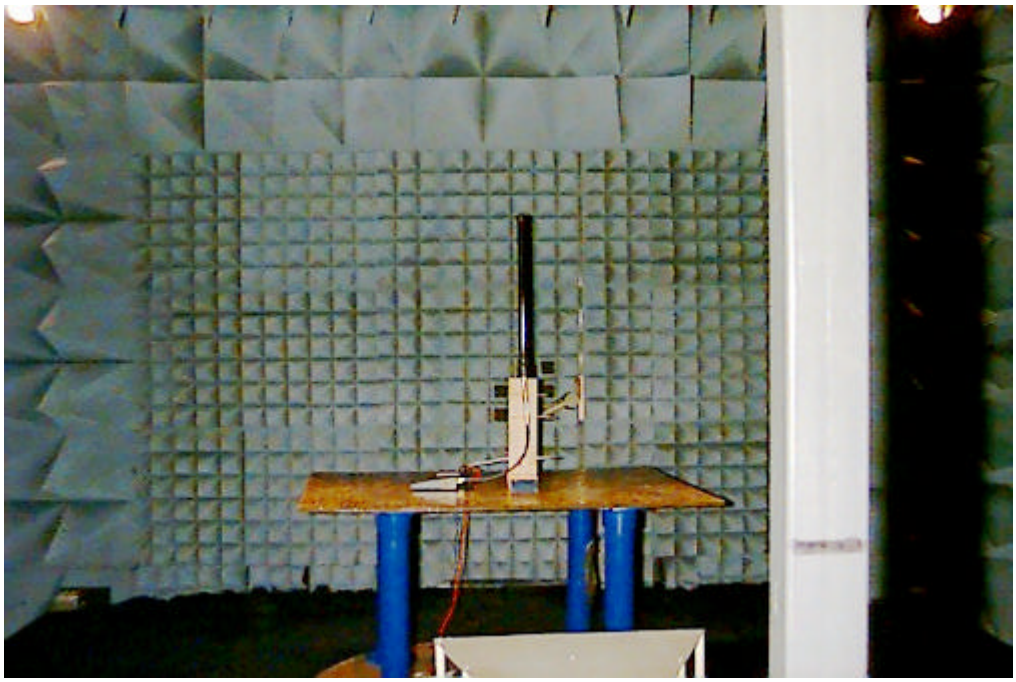
Parabolic Dish Antenna – Front

Parabolic Dish Antenna –Rear

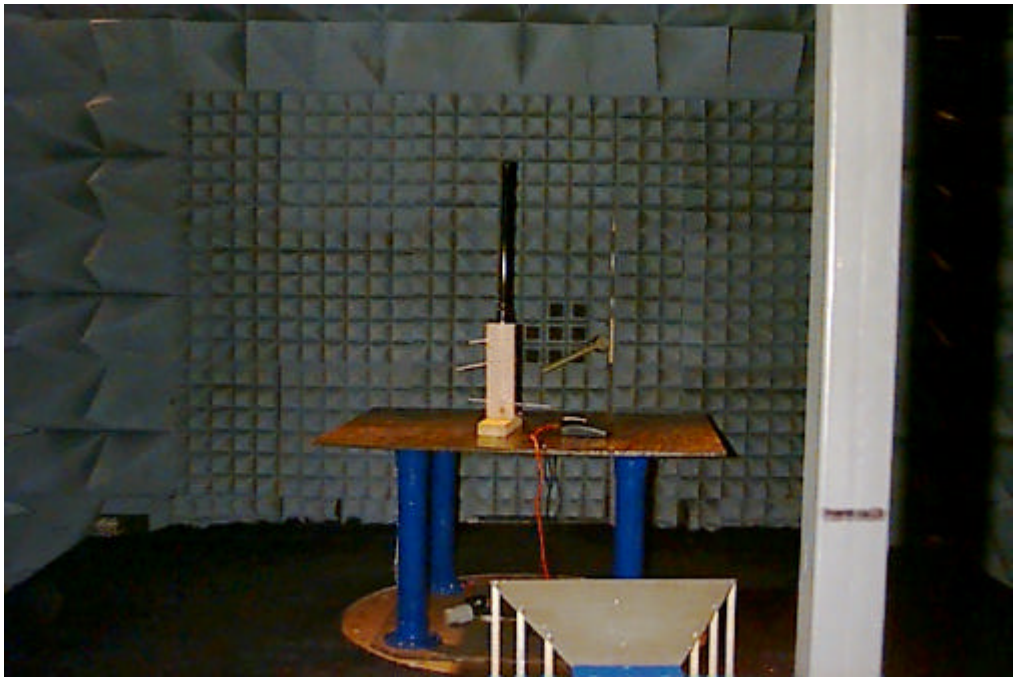


Radiated Photographs – Continued

Omni-directional Antenna – Front



Omni-directional Antenna –Rear



Radiated Photographs – Continued

Dipole Antenna – Front

Dipole Antenna –Rear

Section 9. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(d)
TESTED BY: Kevin Rose	DATE: 5/11/00

Test Results: Complies.

Measurement Data: See attached plots.

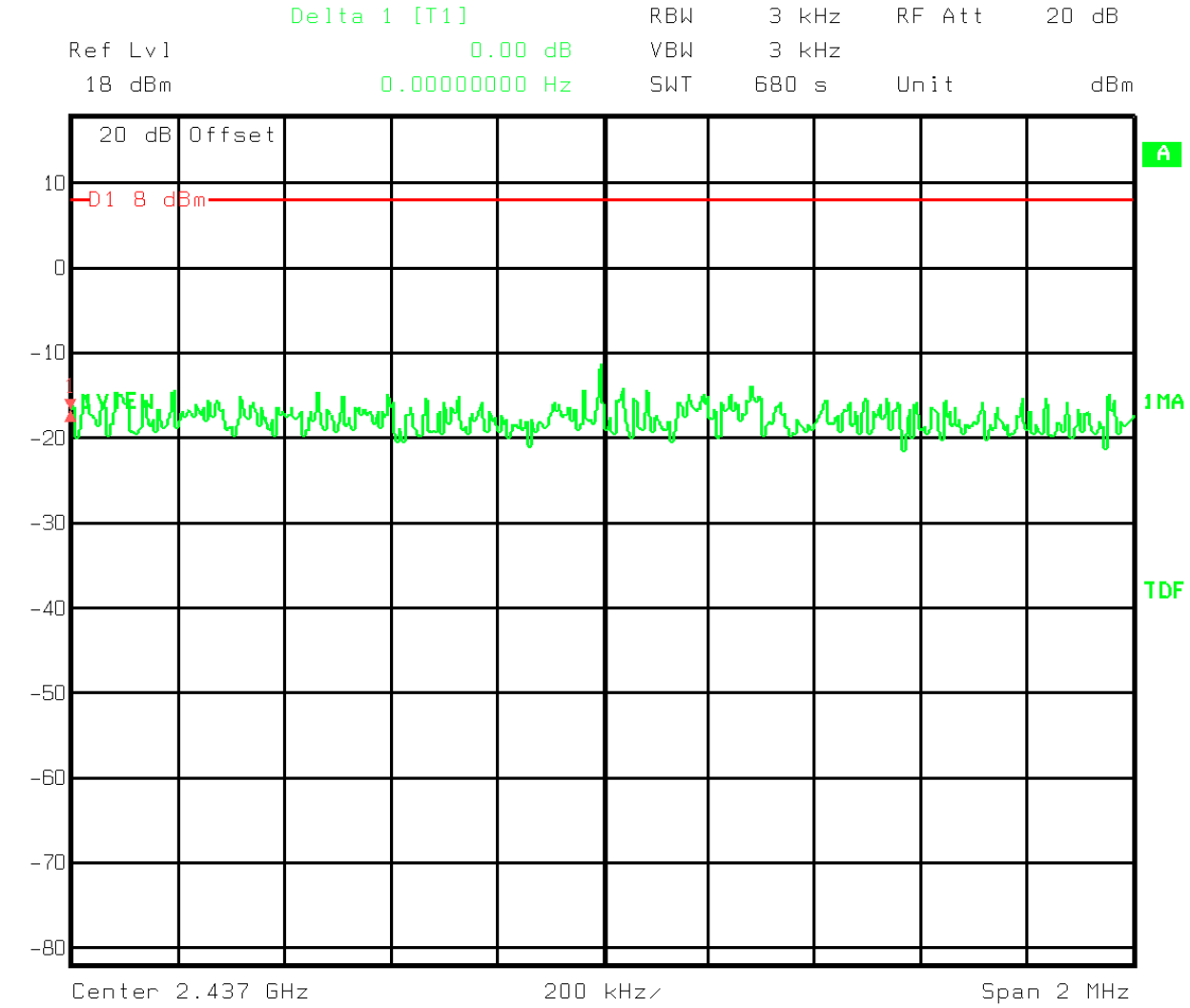
Equipment Used: 1036, 1043

Measurement Uncertainty: +/- 0.7 dB

Temperature: 22 °C

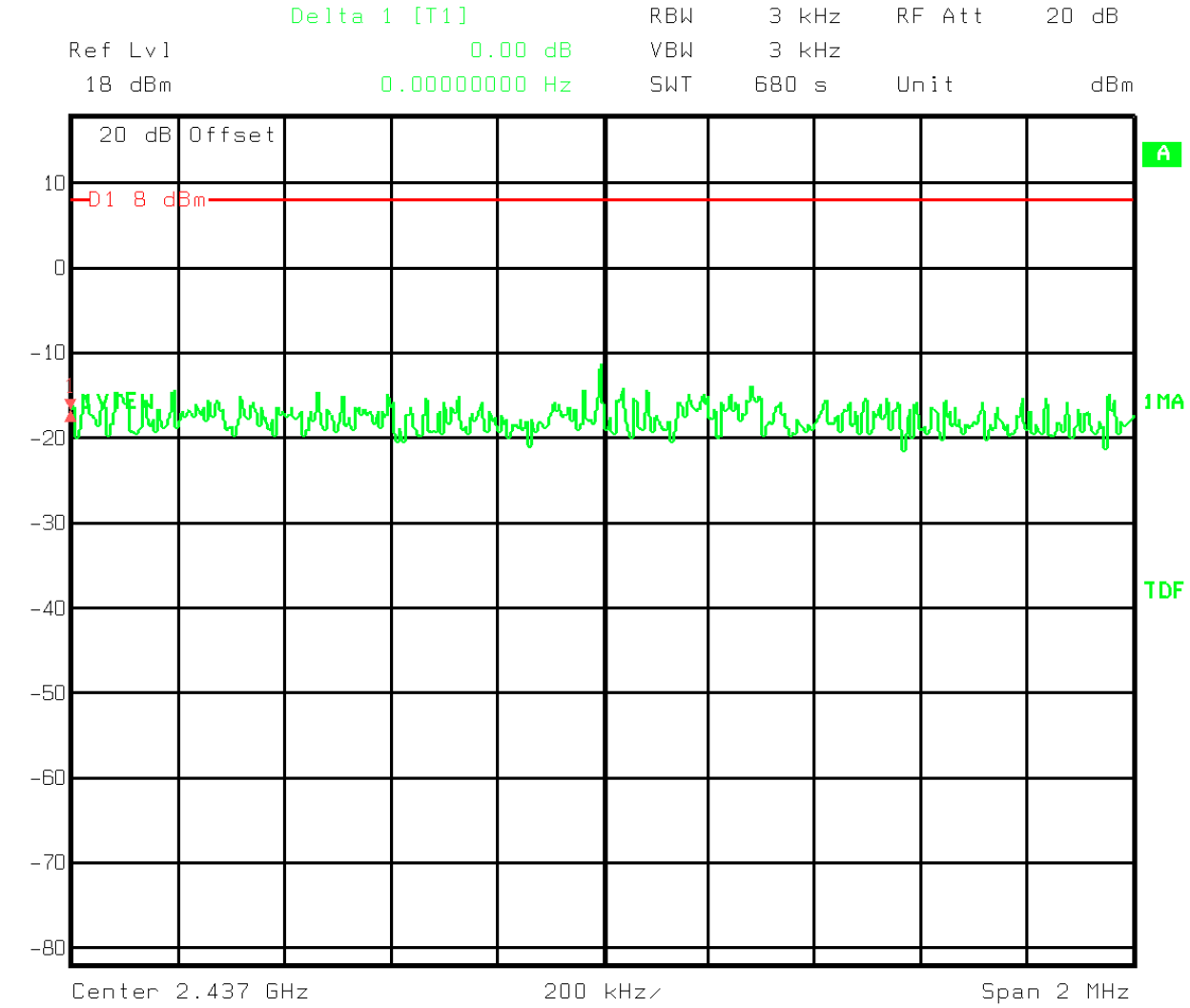
Relative Humidity: 50 %

Peak Power Spectral Density – Plots



Title: spec. power den.upper
Comment A: proxim
Date: 11.MAY.2000 15:23:39

Peak Power Spectral Density – Plots



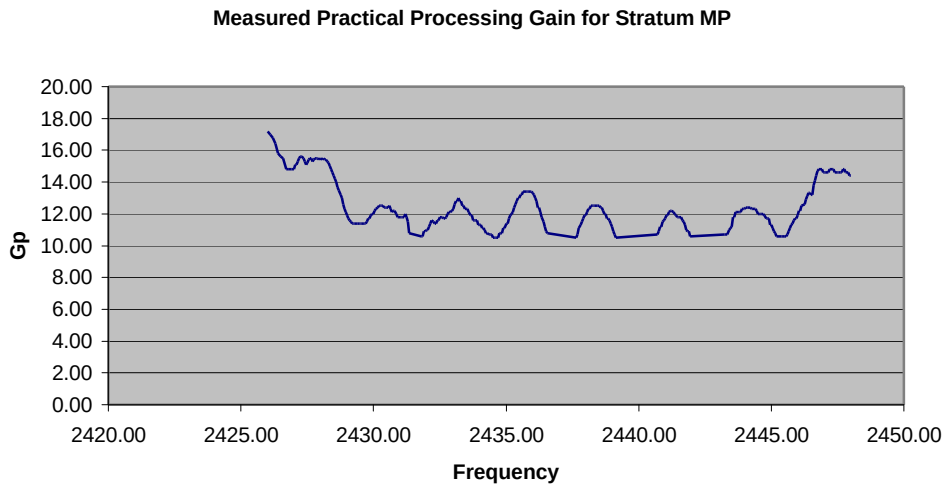
Title: spec. power den.upper
Comment A: proxim
Date: 11.MAY.2000 15:23:39

Section 10. Minimum Processing Gain

NAME OF TEST: Minimum Processing Gain	PARA. NO.: 15.247(e)
TESTED BY: Manufacturer	

Test Results: Complies. The processing gain of the system exceeds 10 dB across the entire passband of the system.

Measurement Data: A separate test report has been provided for processing gain. The specific test method and conditions are recorded in that report.



Equipment Used: See separate test report

Section 11. Test Equipment List

The listing below indicates the test equipment utilized for the test(s).

KTL ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	01/25/99
1479	Bi Conical Antenna 20-330 MHz	A. H. Systems SAS-200/540	496	10/19/99
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	06/14/99
791	PREAMP, 25dB	ICC LNA25	398	08/27/99
1188	LISN	EMCO 3825/2	1214	01/00/00
1331	CABLE, 8.5m	KTL RG223	N/A	08/06/99
674	LIMITER	HP 11947A	3107A02200	06/17/99
1066	CABLE, 4M	STORM PR90-010-144	N/A	10/15/99
1067	Blue cable 4m	Storm 99-10-002	0	01/00/00
993	Horn antenna	A.H. Systems SAS-200/571	0	Not Req
1016	AMPLIFIER	HEWLETT PACKARD 8449A	2749A00159	06/11/99
1021	Power sensor	Hewlett Packard A (50 ohm, 0.3 uw-100m)	2349A45632	02/17/00
1065	ATTENUATOR	NARDA 776B-10	NONE	09/30/99
1043	Flexible cable 1m	Astrolab Inc. 32027-2-29094K-1M	0	01/00/00
406	POWER METER	HP 436A	2512A22082	02/17/00

Calibration interval on all items is typically 12 months from the calibration date shown. Where relevant, measuring equipment is subjected to in-service checks between testing. Should any measurement equipment be utilized beyond its scheduled

calibration date, the measuring equipment is subjected to in-service checks prior to use. KTL shall notify clients promptly, in writing, of identification of defective measuring equipment that casts doubt on the validity of results given in this report.

LEGEND:

CNR CALIBRATION NOT REQUIRED
N/A NOT APPLICABLE
CBU CALIBRATED BEFORE USE

ANNEX A - TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)

Minimum Standard: The R.F. that is conducted back onto the AC power line on any frequency within the band 0.45 to 30 MHz shall not exceed 250µV (48 dBµV) across 50 ohms.

NAME OF TEST: Minimum 6 dB bandwidth	PARA. NO.: 15.247(a)(2)

Minimum Standard: The minimum 6 dB bandwidth shall be at least 500 kHz

NAME OF TEST: Maximum Peak Output Power	PARA. NO.: 15.247(b)(1)

Minimum Standard: The maximum peak output power shall not exceed 1 watt.

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Direct Measurement Method For Detachable Antennas:
If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Calculation Of EIRP For Integral Antenna:
If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts
E = the maximum measured field strength in V/m
R = the measurement range (3 meters)
G = the numeric gain of the transmit antenna in relation to an isotropic radiator

The RBW of the spectrum analyzer shall be set to a value greater than the measured 6 dB occupied bandwidth of the E.U.T.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: RF Exposure	PARA. NO.: 15.247(b)(4)

Minimum Standard: Systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines stipulated in 1.1307(b)(1) of CFR 47.

NAME OF TEST: Spurious Emissions(conducted) PARA. NO.: 15.247(c)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (mV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM IS SEARCHED TO THE 10th HARMONIC OF THE HIGHEST FREQUENCY GENERATED IN THE EUT.

Method Of Measurement:

30 MHz - 10th harmonic plot
RBW: 100 kHz
VBW: 300 kHz
Sweep: Auto
Display line: -20 dBc

Lower Band Edge
RBW: At least 1% of span/div.
VBW: >RBW
Span: As necessary to display any spurious at band edge.
Sweep: Auto
Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz
Marker: Peak of fundamental emission
Marker Δ: Peak of highest spurious level below center frequency.

Upper Band Edge
RBW: At least 1% of span/div.
VBW: >RBW
Span: As necessary to display any spurious at band edge.
Sweep: Auto
Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz
Marker: Peak of fundamental emission
Marker Δ: Peak of highest spurious level above center frequency.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Radiated Spurious Emissions	PARA. NO.: 15.247(c)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (mV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Transmitter Power Density	PARA. NO.: 15.247(d)

Minimum Standard: The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

Method Of Measurement: The spectrum analyzer is set as follows:

RBW: 3 kHz
VBW: >3 kHz
Span: => measured 6 dB bandwidth
Sweep: Span(kHz)/3 (i.e. for a span of 1.5 MHz the sweep rate is 1500/3 = 500 sec.
LOG dB/div.: 2 dB

Note: For devices with spectrum line spacing =< 3 kHz, the RBW of the analyzer is reduced until the spectral lines are resolved. The measurement data is normalized to 3 kHz by summing the power of all the individual spectral lines within a 3 kHz band in linear power units.

For Devices With Integral Antenna:

For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent isotropic radiated power using the same method as described for Peak Power output.

Number of channels tested:

Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

NAME OF TEST: Processing Gain	PARA. NO.: 15.247(e)

Minimum Standard: The processing gain shall be at least 10 dB.

Method Of Measurement: The CW jamming margin method was used to determine the processing gain. A CW signal generator is stepped across the passband of the receiver in 50 kHz increments. At each point the signal generator level required to obtain the recommended bit error rate is recorded. The jammer to signal ratio (J/S) is then calculated. The worst 20% of the J/S points is discarded. The lowest remaining J/S ratio is used to calculate the processing gain.

Calculation Of Processing Gain:

The processing gain was determined by measuring the jamming margin of the E.U.T. and using the following formula:

Jamming Margin = G_p - $(S/N)_{out}$ - L_{sys}

For a receiver using non-coherent detection the value $(S/N)_{out}$ is calculated using the formula:

$P_e = (1/2)EXP\{-E/2N_o\}$ where P_e is the probability of error (minimum Bit Error Rate required for proper operation).

E/N_o is $(S/N)_{out}$
for example, for a bit error rate of 10^{-4} a S/N ratio of 12.3 dB is required.

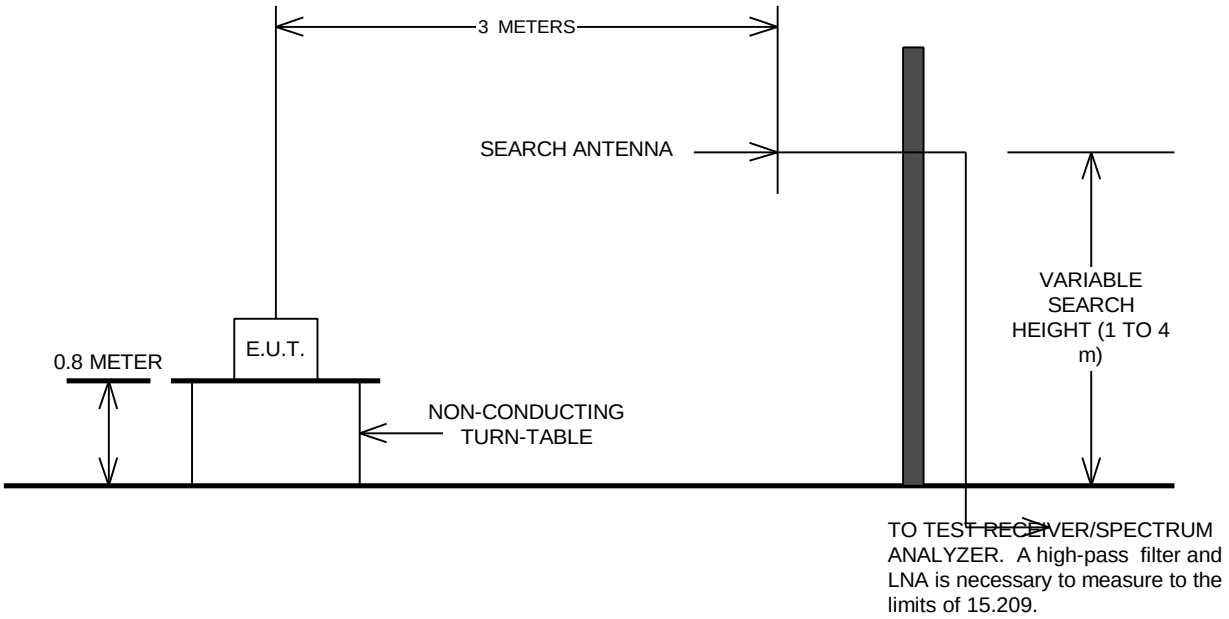
$L_{sys\ (system\ losses)}$ is assumed to be 2 dB.

Therefore $G_p = Mj + (S/N)_{out} + L_{sys}$

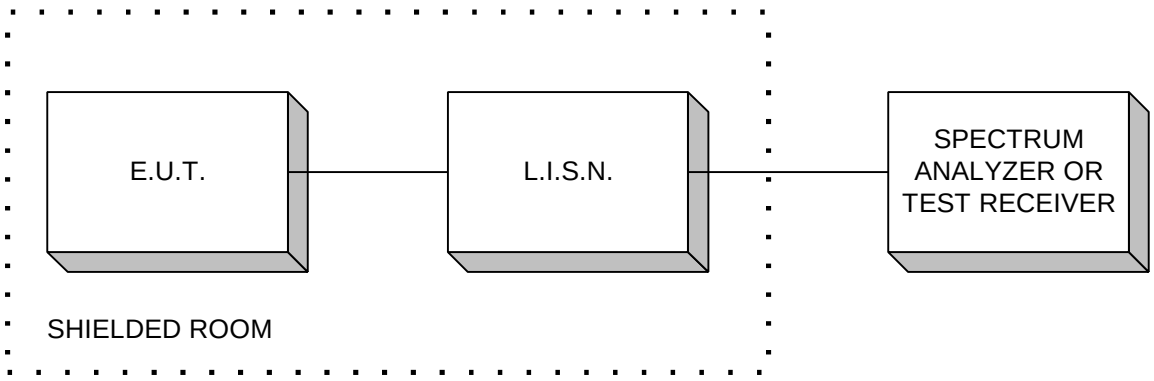
Measurement performed at a channel in the center of the operating band of the EUT.

ANNEX B - TEST DIAGRAMS

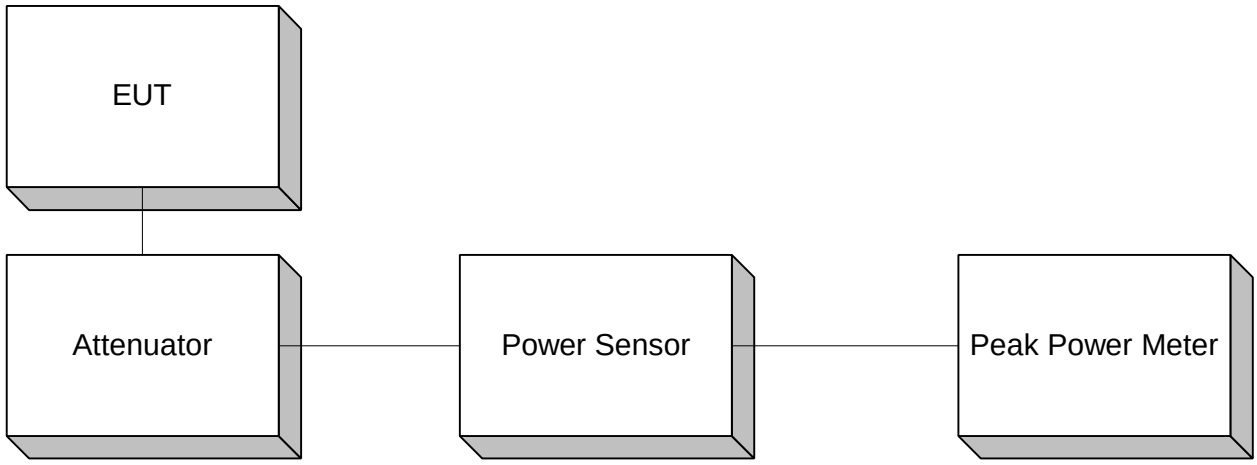
Test Site For Radiated Emissions



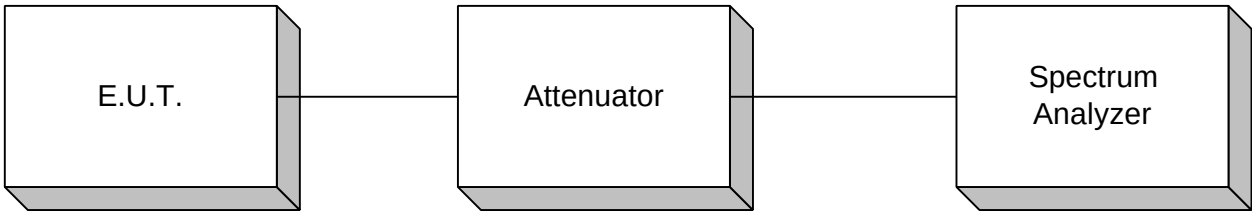
Conducted Emissions



Peak Power At Antenna Terminals



Minimum 6 dB Bandwidth
Peak Power Spectral Density
Spurious Emissions (conducted)



Processing Gain

SEE SEPARATE REPORT FOR SETUP DIAGRAM