




**Attachment to
ELECTROMAGNETIC EMISSIONS TEST REPORT**
according to FCC Part 15 subpart C, §15.247 and subpart B

for
BREEZECOM LTD.

**EQUIPMENT UNDER TEST:
DS11M system**

Approved by
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Electrical



Description of equipment under test

Test items	DS11M family
Manufacturer	BreezeCom Ltd.
Types (Models)	DS11M
Receipt date	April 2, 2000

Applicant information

Applicant's representative	Mr. David Shechter
Applicant's responsible person	Mr. Tsach Shwarts, engineering manager
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Postal code	
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Country	Israel
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Test performance

Project Number:	14002
Location	Hermon Laboratories
Test performed	April 12, 16, June 13, 2000
Purpose of test	The EUT certification in accordance with CFR 47, part 2, §2.1033
Test specification(s)	FCC Part 15, Subpart C, §15.247, §§15.205, 15.207, 15.209, 15.107, 15.109



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1 Emission measurements

1.1 Minimum bandwidth according to §15.247(a)(2)

1.1.1 General

This test was performed to prove that the EUT minimum 6 dB bandwidth is at least 500 kHz.

1.1.2 Test setup and procedure

The EUT transmitting antenna was removed and RF output was connected to the spectrum analyzer, refer to Photograph 1.1.1.

The EUT was connected to computer and the radio transmission was activated.

All the spectrum analyzer settings are shown in the plots.

The measurements were performed in normal mode of operation. The minimum bandwidth measurements were performed for carrier (channel) frequency at low and high edges and at the middle of the frequency band. Table 1.1.1 and Plots 1.1.1 to 1.1.9 demonstrate the test results of the minimum bandwidth measurements.

Table 1.1.1 Occupied bandwidth test results

Carrier frequency, MHz	Output power/antenna gain	Measured 6 BW, MHz	Minimum, kHz	Result
2412	12/24	10.33	500	Pass
2412	20/16	11.17	500	Pass
2412	24/8	9.83	500	Pass
2437	12/24	10.25	500	Pass
2437	20/16	11.50	500	Pass
2437	24/8	10.17	500	Pass
2462	12/24	10.17	500	Pass
2462	20/16	10.25	500	Pass
2462	24/8	11.00	500	Pass

Reference numbers of test equipment used

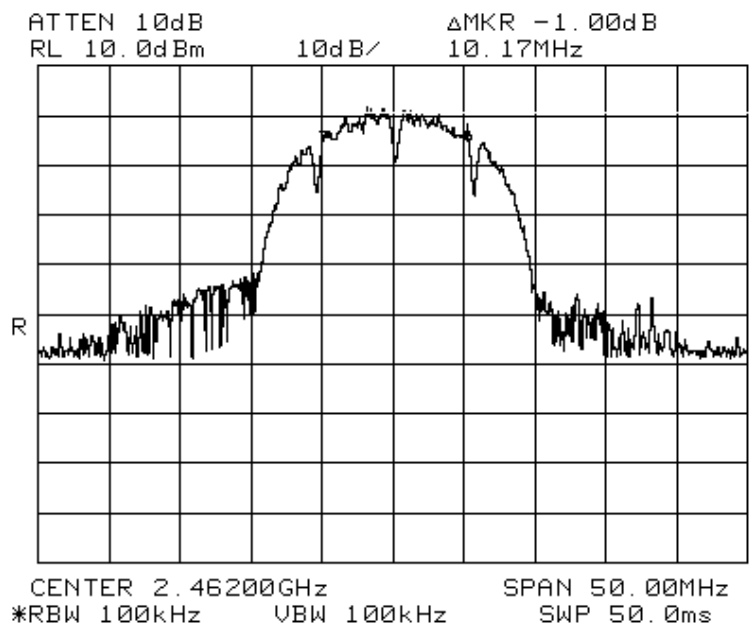
HI 0056	HL 0872	HL 3000temp
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Full description is given in Appendix A.



Plot 1.1.1

Date/Time: August 27 2000 5:46:48 PM
 Ambient Temperature: 22 Deg.C
 Relative Humidity: 49%
 Test Specification: FCC 15.247
 Detector: Peak
 Resolution Bandwidth: 100 kHz
 Notes: Channel 11, Output power=12 dBm, Antenna gain=24 dBi.

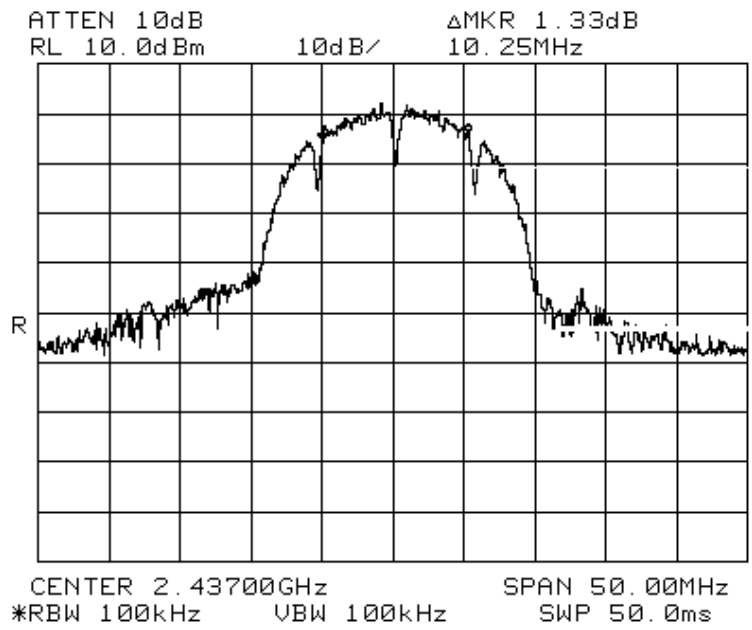


Occupied bandwidth 10.17 MHz



Plot 1.1.2

Date/Time: August 27 2000 6:03:08 PM
 Ambient: 22 Deg.C
 Temperature:
 Relative Humidity: 49%
 Test Specification: FCC 15.247
 Detector: Peak
 Resolution Bandwidth: 100 kHz
 Notes: Channel 6, Output power=12 dBm, Antenna gain=24 dBi.

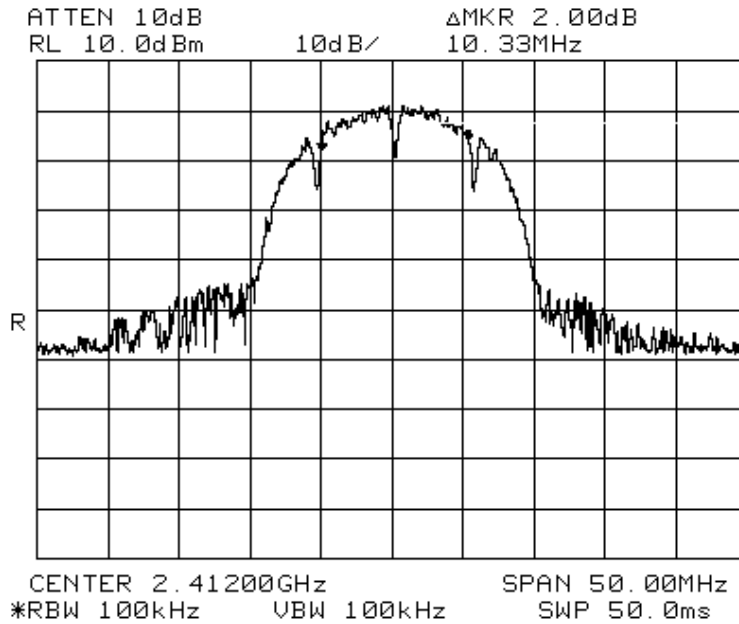


Occupied bandwidth 10.25 MHz



Plot 1.1.3

Date/Time: August 27 2000 6:07:37 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=12 dBm, Antenna gain=24 dBi.

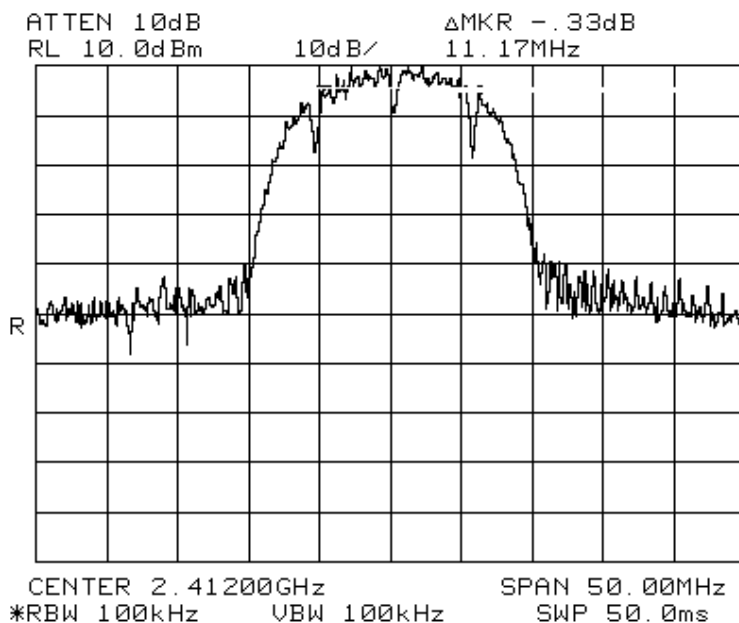


Occupied bandwidth 10.33 MHz



Plot 1.1.4

Date/Time: August 27 2000 6:11:30 PM
 Ambient 22 Deg.C
 Temperature:
 Relative Humidity: 49%
 Test Specification: FCC 15.247
 Detector: Peak
 Resolution Bandwidth: 100 kHz
 Notes: Channel 1, Output power=20 dBm, Antenna gain=16 dBi.

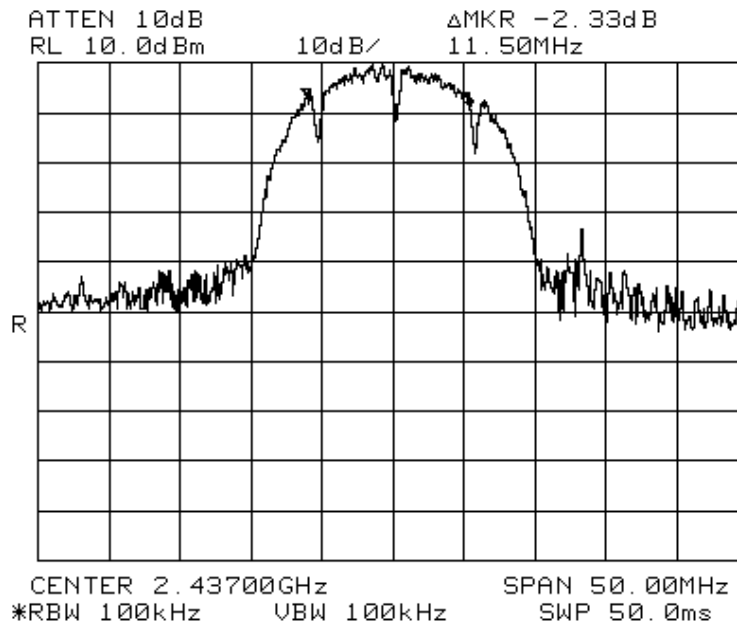


Occupied bandwidth 11.17 MHz



Plot 1.1.5

Date/Time: August 27 2000 6:19:45 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 6, Output power=20 dBm, Antenna gain=16 dBi.

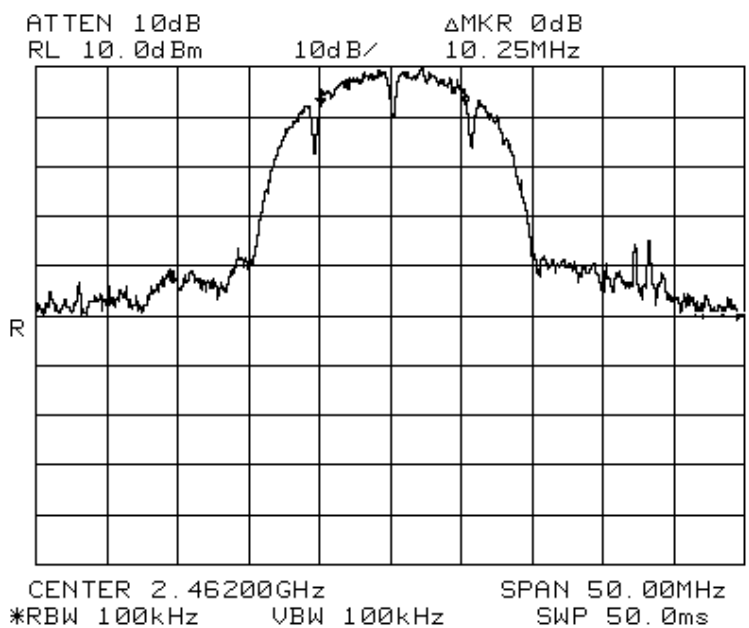


Occupied bandwidth 11.50 MHz



Plot 1.1.6

Date/Time: August 27 2000 6:21:19 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 11, Output power=20 dBm, Antenna gain=16 dBi.

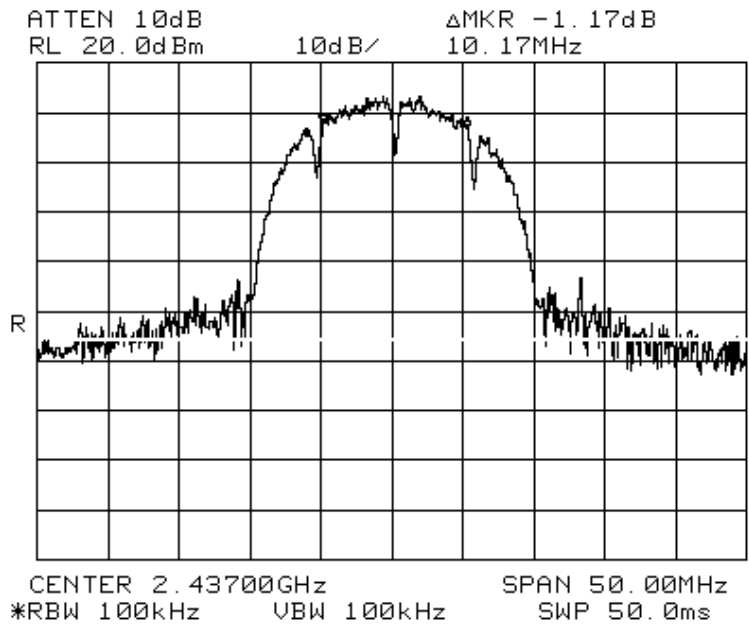


Occupied bandwidth 10.25 MHz



Plot 1.1.8

Date/Time: August 27 2000 6:31:50 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.

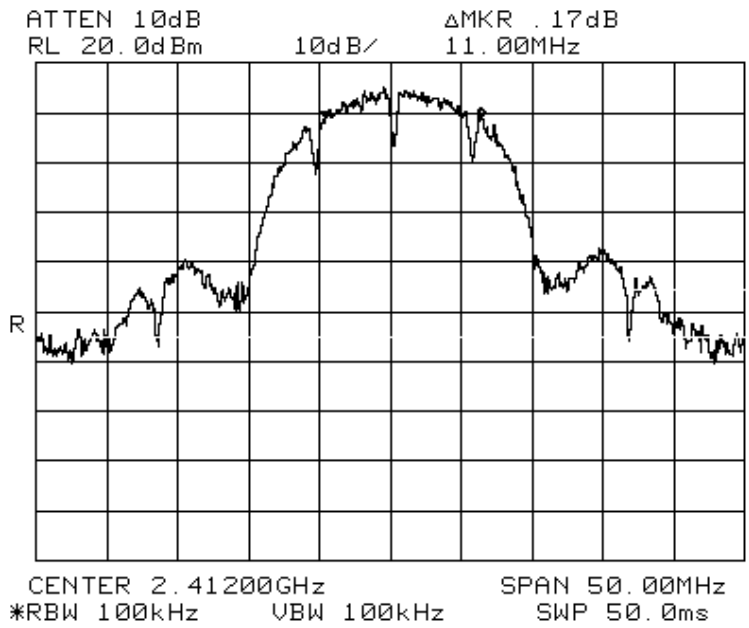


Occupied bandwidth 10.17 MHz



Plot 1.1.9

Date/Time: August 27 2000 6:31:50 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.





Photograph 1.1.1
Setup for minimum bandwidth measurements





1.2 Maximum peak output power according to § 15.247(b)

1.2.1 General

This test was performed to demonstrate that the maximum RF peak output power of the transmitter does not exceed 1 W (30 dBm) (§15.247 (b)(1)).

If the transmitting antenna gain is greater than 6 dBi, the peak output power from the intentional radiator shall be reduced below the stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The limits for different antennas are shown in Table 1.2.1.

Table 1.2.1 Limits for different antennas

Antenna gain, dBi	Calculated limit, dBm
8 (external antenna)	$30 - (8-6) = 28$
16 (integral antenna)	$30 - (16-6) = 20$
24 (external antenna)	$30 - (24-6) = 12$

1.2.2 Test procedure

The EUT transmitting antenna was removed and RF output was connected to the power meter.

The test results of the maximum peak output power measurements are shown in Table 1.2.2.

Reference numbers of test equipment used

HI 0316	HL 0460	HL 0940
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Full description is given in Appendix A.



Table 1.2.2 Maximum peak output power test results

Carrier frequency, MHz	Measured peak output power, dBm	Peak output power limit, dBm	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	Result
2412	23.85	28	8 (external)	31.85	36	Pass
2412	19.65	20	16 (integral)	35.65	36	Pass
2412	11.75	12	24 (external)	35.75	36	Pass
2437	23.36	28	8 (external)	31.36	36	Pass
2437	19.86	20	16 (integral)	35.86	36	Pass
2437	11.86	12	24 (external)	35.86	36	Pass
2462	23.66	28	8 (external)	31.66	36	Pass
2462	19.96	20	16 (integral)	35.96	36	Pass
2462	11.96	12	24 (external)	35.96	36	Pass

1.2.3 Exposure limit according to part 1, §1.1310

Limit for power density for general population/uncontrolled exposure is 1 mW/cm².

The power density P (mW/cm²) = $P_T / 4\pi r^2$, where

P_T - the transmitted power, which is equal to the transmitter output plus antenna gain.

Maximal P_T @ **antenna gain 16 dBi** is equal to 19.96 dBm + 16 dBi = 35.96 dBm = 3944.57 mW

$$1(\text{mW}/\text{cm}^2) = 3944.57 \text{ mW} / 4\pi r^2$$

The minimum allowed distance "r", where RF exposure limits may not be exceeded, is 17.72 cm.

$$r = \text{sqrt} (P_T / 4\pi) = \text{sqrt}(3944.57 / (4 \times 3.14)) = 17.72 \text{ (cm)}.$$

The same limit is obtained at **antenna gain 24 dBi** (Maximal P_T = 11.96 dBm + 24 dBi = 35.96 dBm).

At **antenna gain 8 dBi** maximal P_T is equal to 23.85 dBm + 8 dBi = 31.85 dBm and the minimum allowed distance is 11.04 cm.

The EUT is an outdoor mounted unit, therefore the public cannot be exposed to dangerous RF level.



1.3 Peak power spectral density according to § 15.247(d)

1.3.1 General

The test was performed to prove that the peak power spectral density conducted from the intentional radiator to the antenna was not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

1.3.2 Test procedure

The test setup was the same as in test 1.1.

The measurements were performed in three channels (1, 6 and 11).

Table 1.3.1 and Plots 1.3.1 to 1.3.9 demonstrate the test results of the peak power spectral density measurements.

Table 1.3.1 Peak power spectral density test results

Channel	frequency*, GHz	Antenna gain, dBi	Measured spectral density, dBm	Limit, dBm	Result
1	2.410676	8	0	8	Pass
	2.41140	16	-4.33	8	Pass
	2.41293	24	-13.5	8	Pass
6	2.43650	8	-1.17	8	Pass
	2.43880	16	-5.17	8	Pass
	2.43900	24	-12.67	8	Pass
11	2.46280	8	-0.83	8	Pass
	2.46130	16	-4.67	8	Pass
	2.45990	24	-14.00	8	Pass

* frequency inside the channel, where the maximum spectral density was found.

Reference numbers of test equipment used

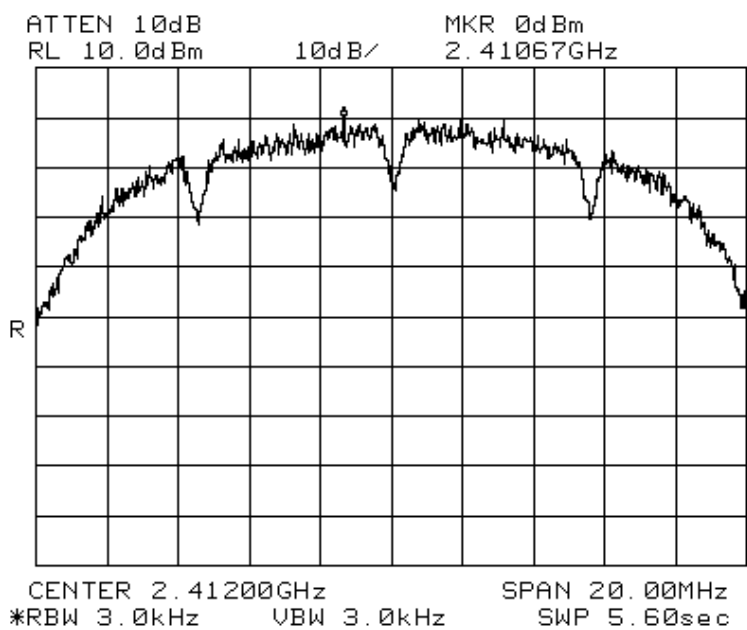
HI 0056	HL 0872	HL 3000temp
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Full description is given in Appendix A.



Plot 1.3.1

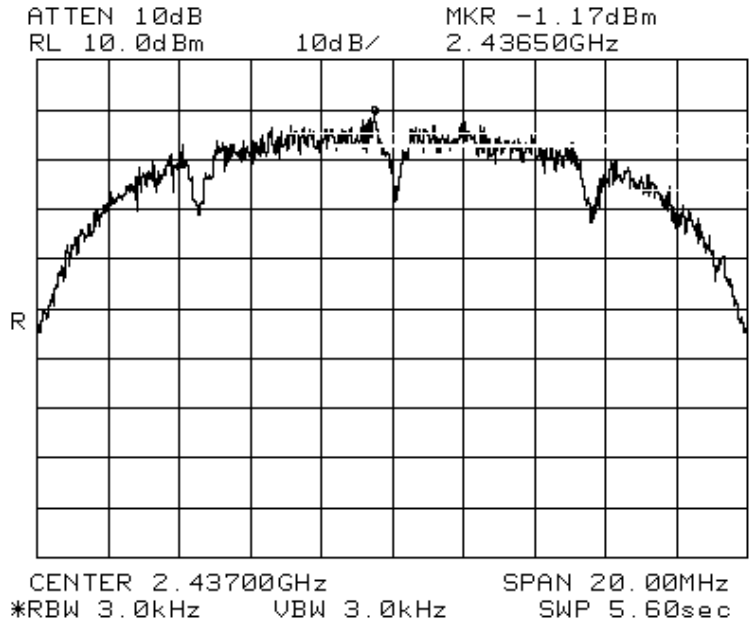
Date/Time: August 27 2000 11:29:26 AM
 Ambient 22 Deg.C
 Temperature:
 Relative Humidity: 49%
 Test Specification: FCC 15.247
 Detector: Peak
 Resolution Bandwidth: 3 kHz
 Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.





Plot 1.3.2

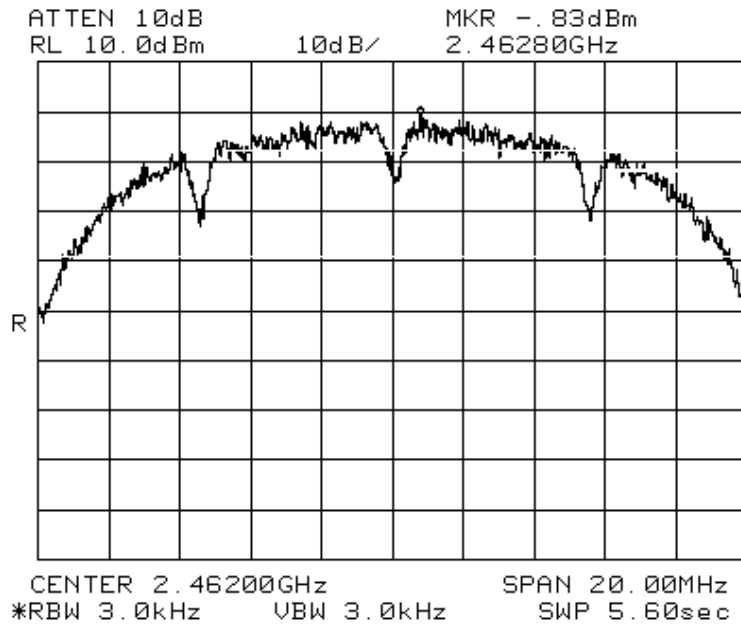
Date/Time: August 27 2000 5:13:21 PM
 Ambient 22 Deg.C
 Temperature:
 Relative Humidity: 49%
 Test Specification: FCC 15.247
 Detector: Peak
 Resolution Bandwidth: 3 kHz
 Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.





Plot 1.3.3

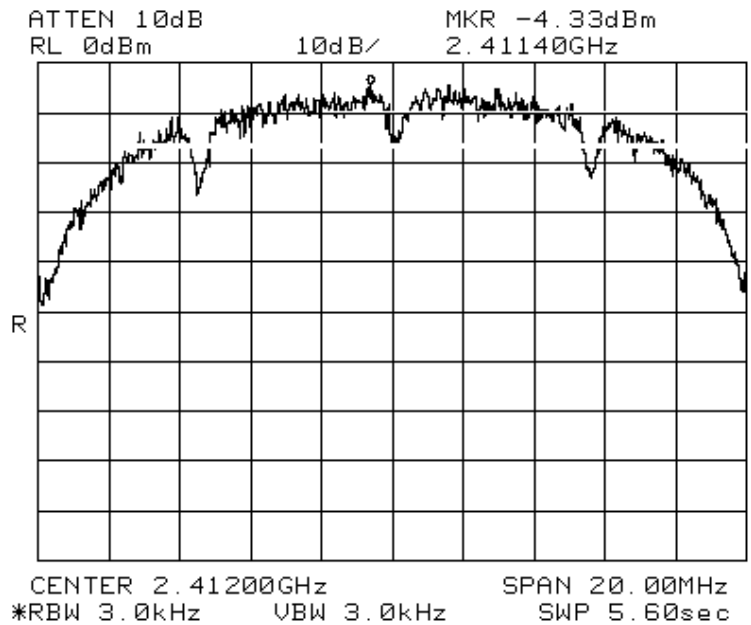
Date/Time: August 27 2000 5:17:50 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 3 kHz
Notes: Channel 11, Output power=24 dBm, Antenna gain=8 dBi.





Plot 1.3.4

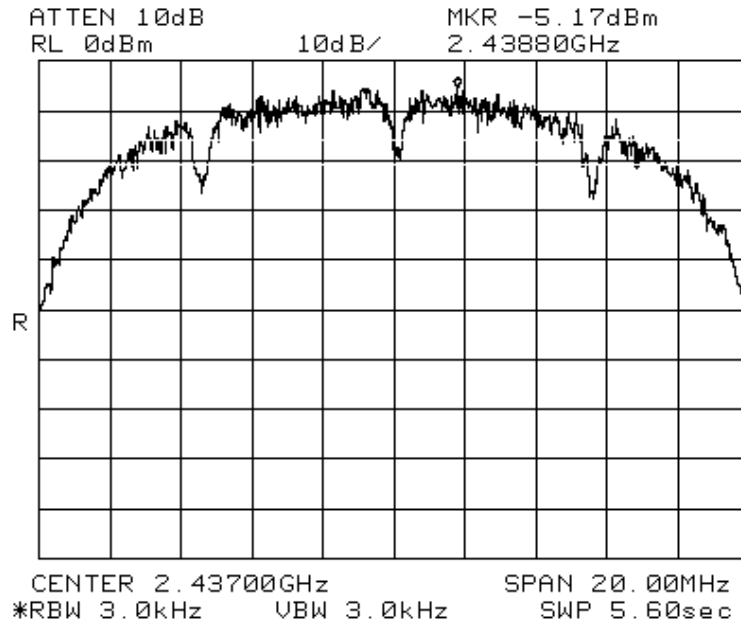
Date/Time: August 27 2000 5:26:29 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Customer: Breezecom
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 3 kHz
Notes: Channel 1, Output power=20 dBm, Antenna gain=16 dBi.





Plot 1.3.5

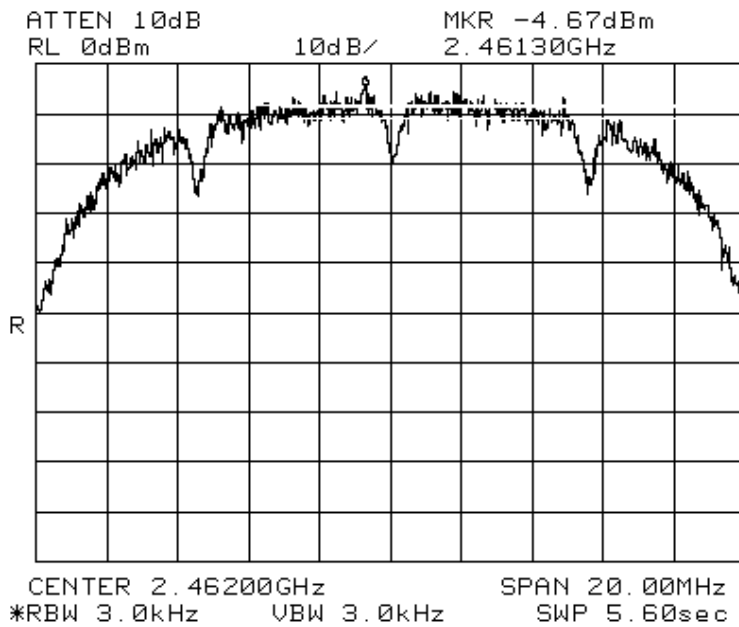
Date/Time: August 27 2000 5:29:44 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 3 kHz
Notes: Channel 6, Output power=20 dBm, Antenna gain=16 dBi.





Plot 1.3.6

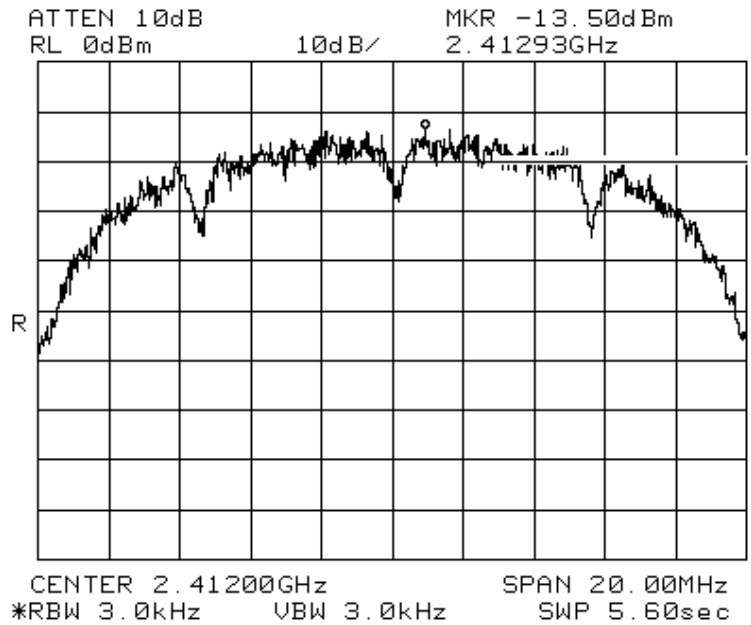
Date/Time: August 27 2000 5:37:42 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 3 kHz
Notes: Channel 11, Output power=20 dBm, Antenna gain=16 dBi.





Plot 1.3.7

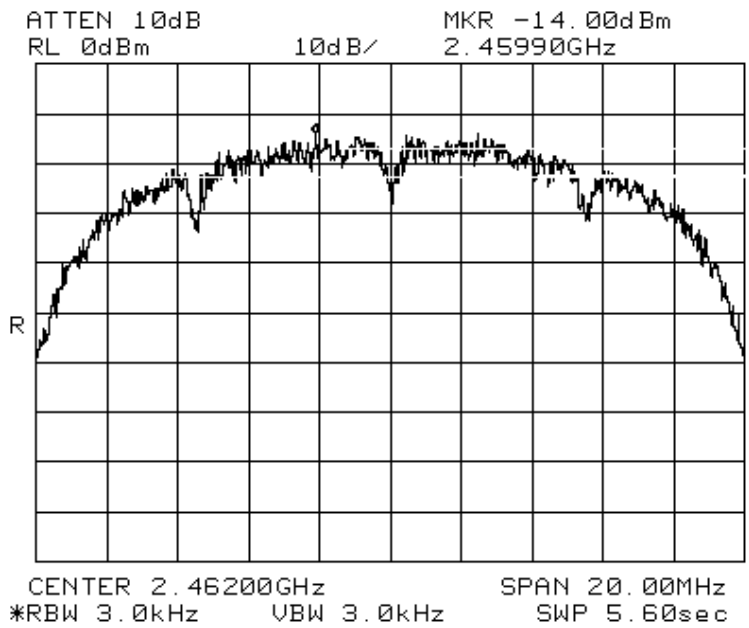
Date/Time: August 27 2000 5:39:54 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 3 kHz
Notes: Channel 1, Output power=12 dBm, Antenna gain=24 dBi.





Plot 1.3.9

Date/Time: August 27 2000 5:44:59 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 3 kHz
Notes: Channel 6, Output power=12 dBm, Antenna gain=24 dBi.





1.4 Out of band conducted emissions test according to §15.247(c)

1.4.1 General

This test was performed to prove that the EUT out-of-band emissions in any 100 kHz bandwidth outside 2400 to 2483.5 MHz are at least 20 dB below maximum power content as measured in any 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

1.4.2 Test procedure and results

The measurements were performed in frequency range 9 kHz to 25 GHz by means of spectrum analyzer connected to the transmitter operating at maximum output power in each of three channels (1, 6, 11).

All spurious emissions were found at least 20 dB below the specified limit.
No emissions were found in frequency range 13.2 GHz – 25 GHz.

The EUT met the standard requirements and successfully passed the test.

Plots 1.4.1 to 1.4.38 show conducted emission measurements in all three channels at maximum output power 24 dBm and antenna gain 8 dBi.

Reference numbers of test equipment used

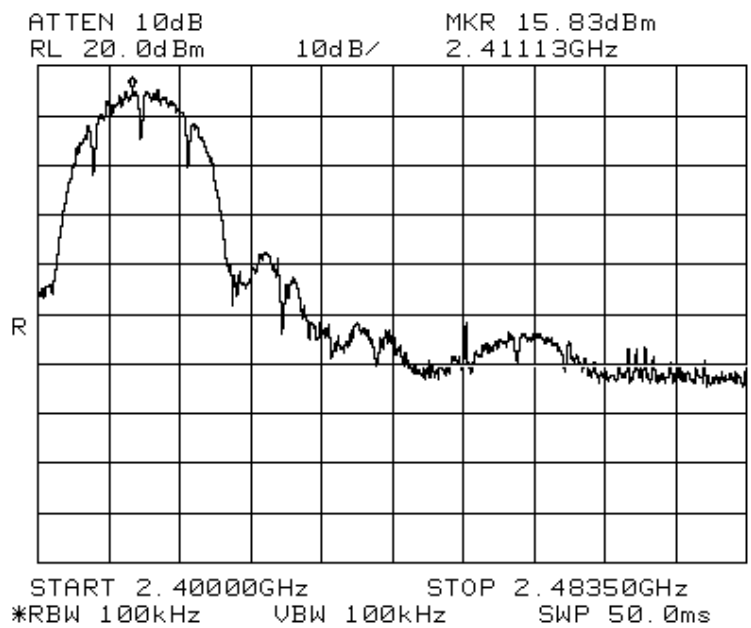
HL 0025	HL 0053	HL 0191	HL 0872	HL 3000temp
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Full description is given in Appendix A.



Plot 1.4.1
Maximum inband power content

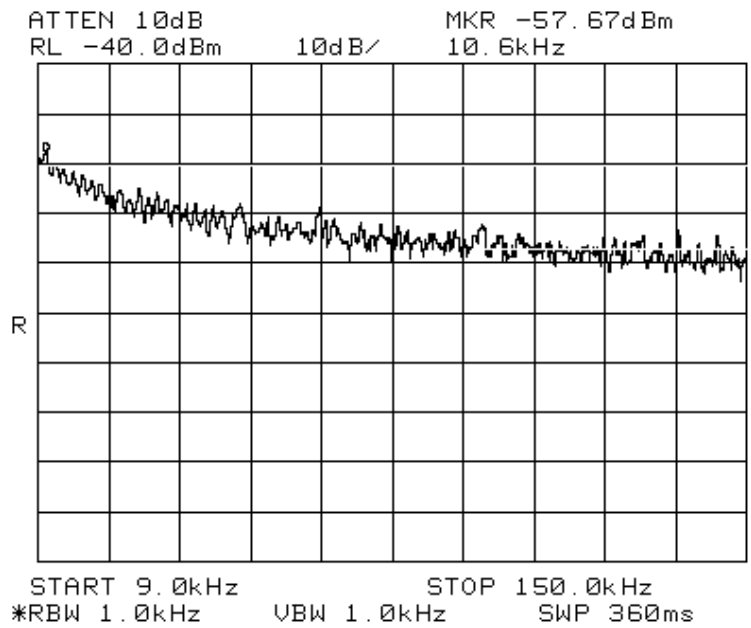
Date/Time: August 27 2000 6:39:01 PM
Ambient Temperature: 22 Deg.C
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.





Plot 1.4.2

Date/Time: August 27 2000 7:08:17 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.

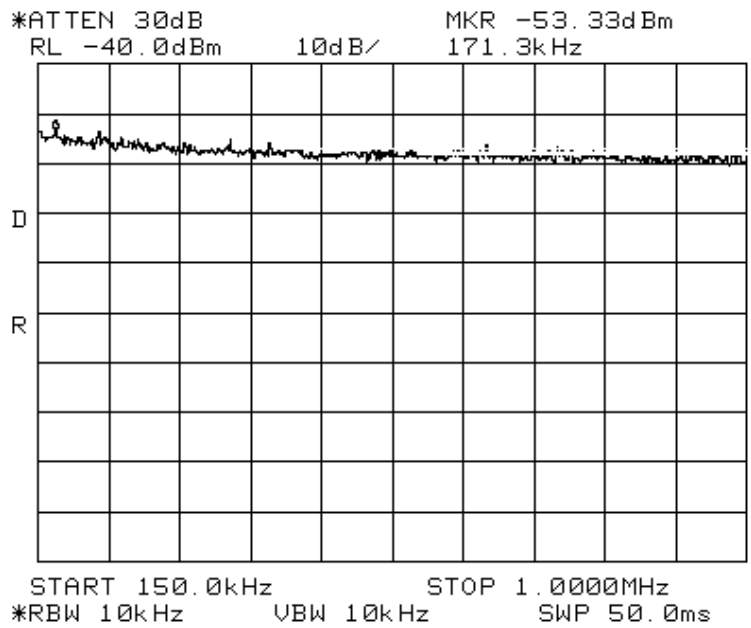


Limit= Pout.-20 dB= -4.17 dBm



Plot 1.4.3

Date/Time: August 27 2000 7:08:17 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.

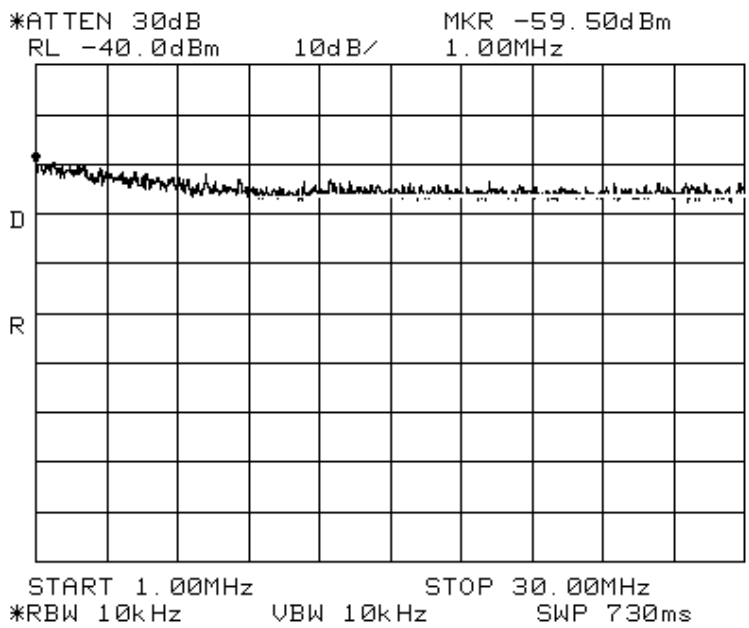


Limit= Pout.-20 dB= -4.17 dBm



Plot 1.4.4

Date/Time: August 27 2000 7:19:19 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.

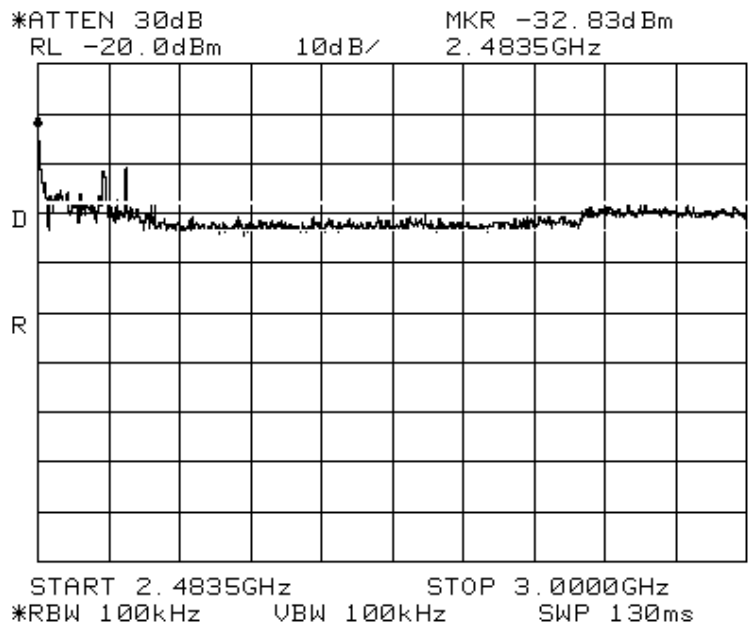


Limit= Pout.-20 dB= -4.17 dBm



Plot 1.4.8

Date/Time: August 27 2000 7:31:34 PM
Ambient Temperature: 22 Deg.C
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.

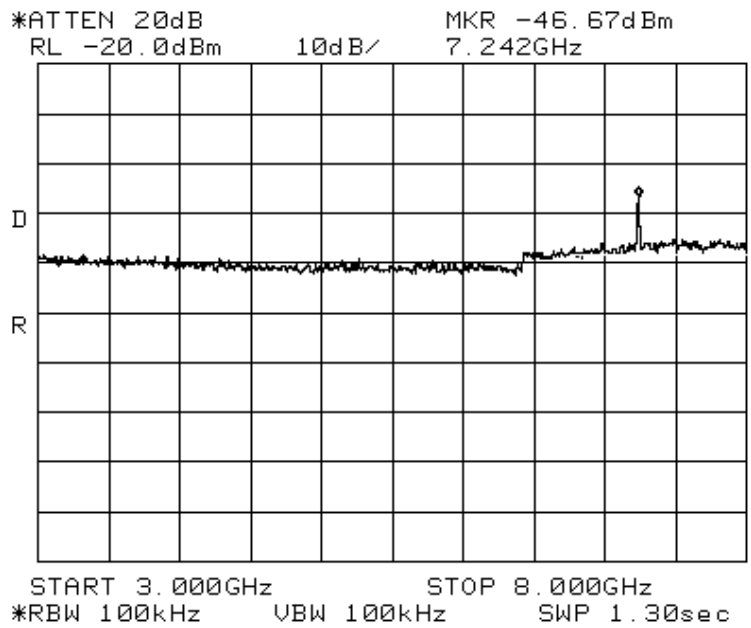


Limit= Pout.-20 dB= -4.17 dBm



Plot 1.4.9

Date/Time: August 27 2000 7:34:31 PM
Ambient Temperature: 22 Deg.C
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.

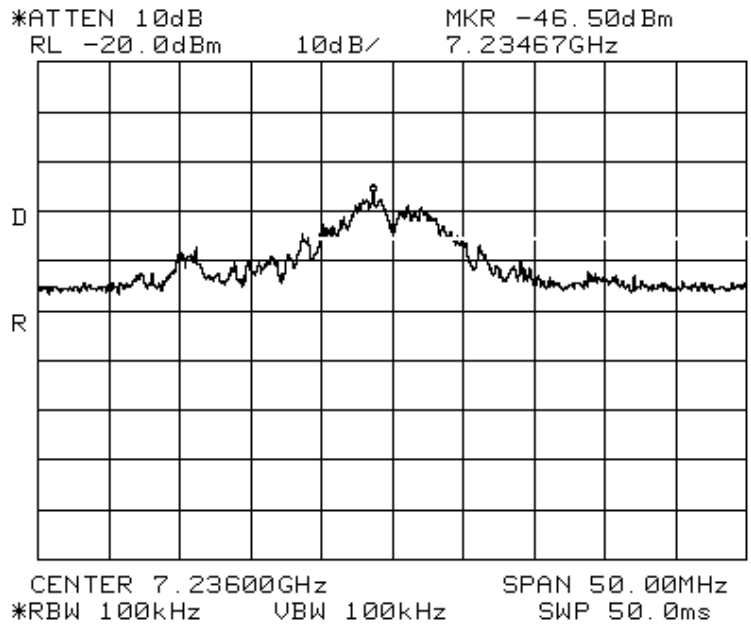


Limit= Pout.-20 dB= -4.17 dBm



Plot 1.4.10

Date/Time: August 27 2000 7:45:16 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.

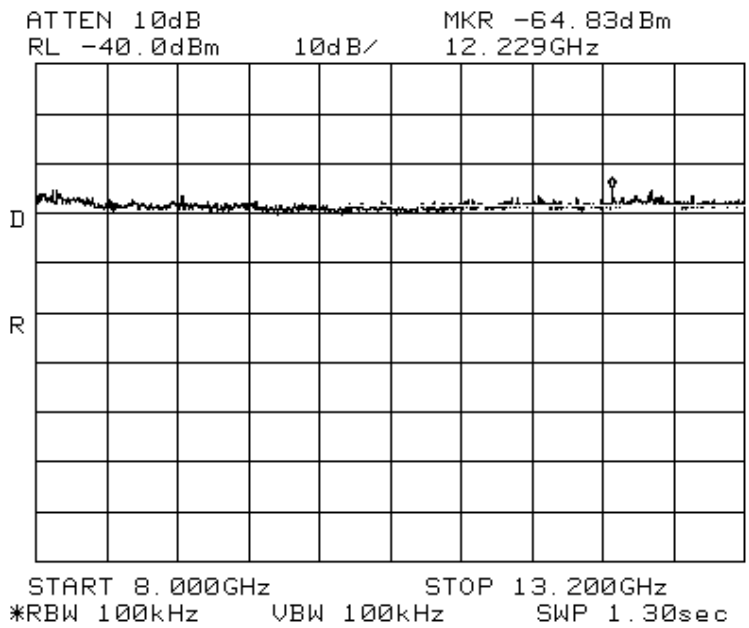


Limit= Pout.-20 dB= -4.17 dBm



Plot 1.4.12

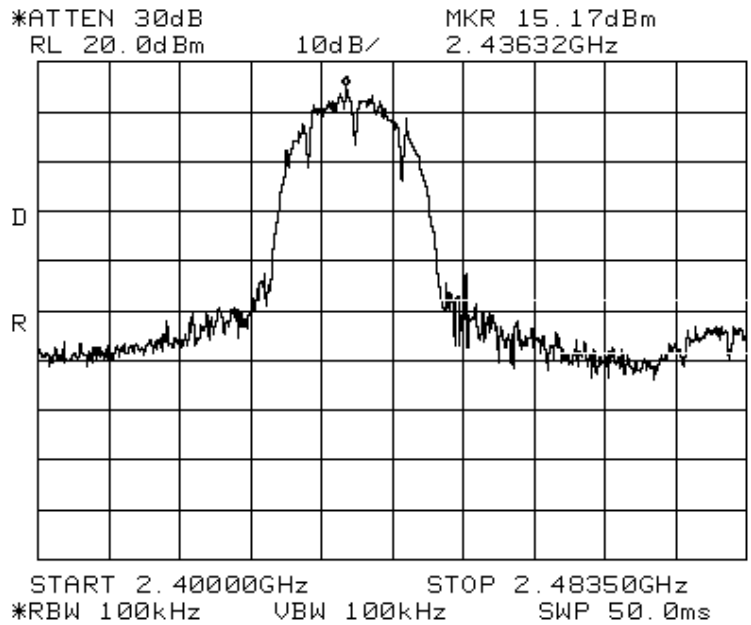
Date/Time: August 27 2000 8:05:02 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 1, Output power=24 dBm, Antenna gain=8 dBi.





Plot 1.4.13
Maximum inband power content

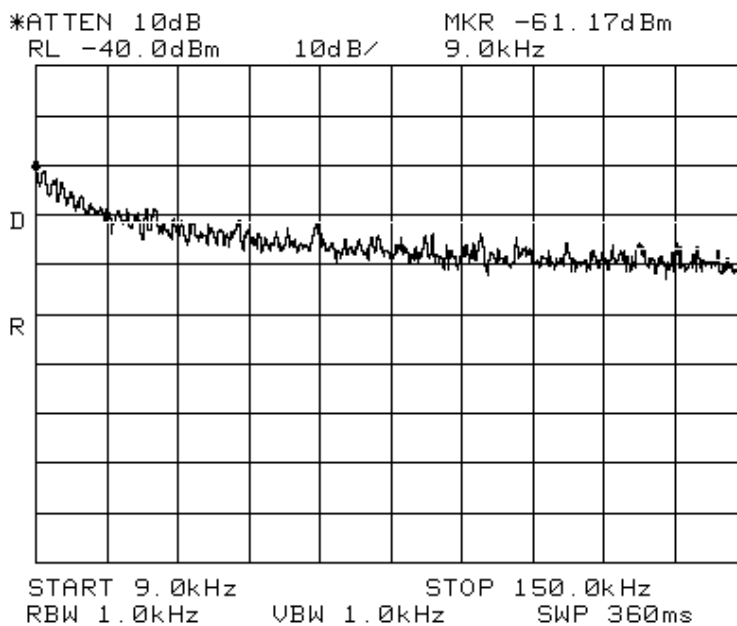
Date/Time: August 27 2000 8:06:56 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.





Plot 1.4.14

Date/Time: August 27 2000 8:15:02 PM
 Ambient 22 Deg.C
 Temperature:
 Relative Humidity: 49%
 Test Specification: FCC 15.247
 Detector: Peak
 Resolution Bandwidth: 100 kHz
 Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.

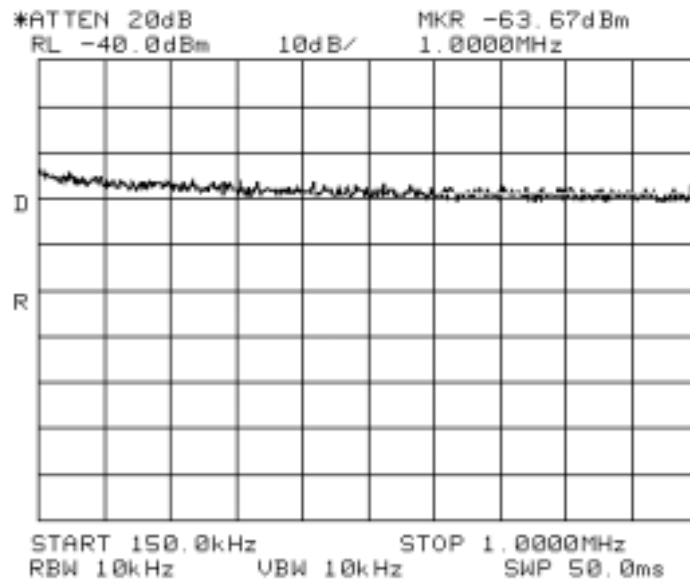


Limit= Pout.-20 dB= -4.83 dBm



Plot 1.4.15

Date/Time: August 27 2000 8:17:59 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.

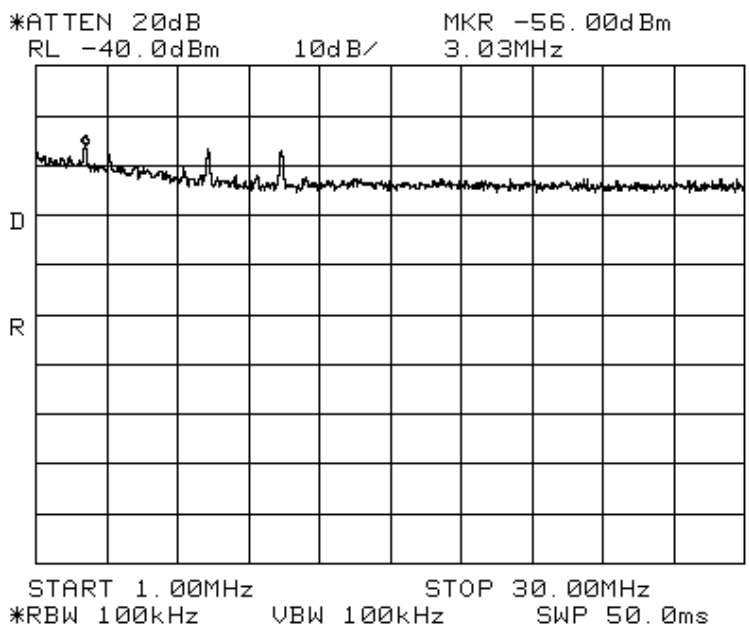


Limit= Pout.-20 dB= -4.83 dBm



Plot 1.4.16

Date/Time: August 27 2000 8:19:22 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.

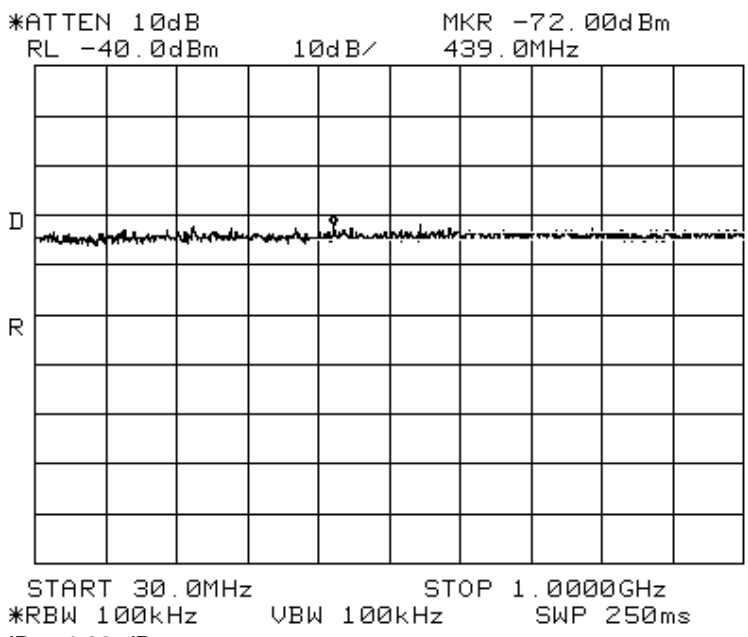


Limit= Pout.-20 dB= -4.83 dBm



Plot 1.4.17

Date/Time: August 27 2000 8:22:38 PM
Ambient 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.

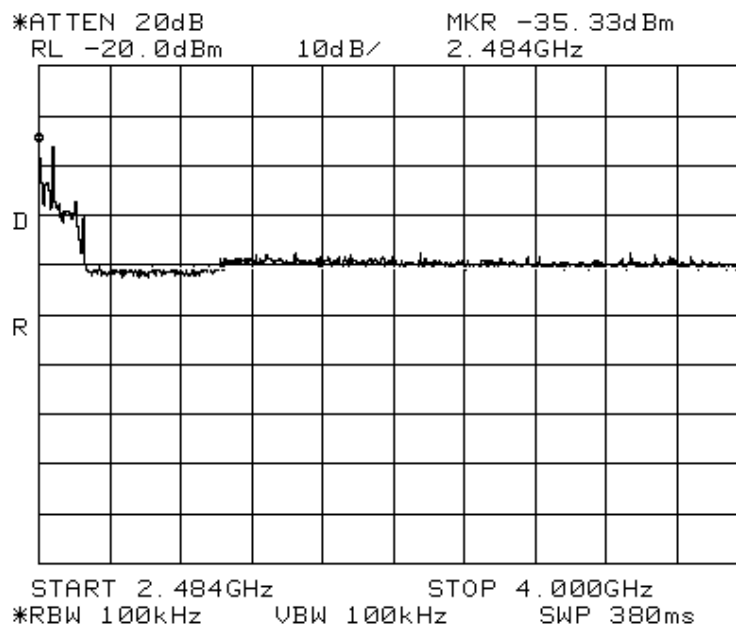


Limit= Pout.-20 dB= -4.83 dBm



Plot 1.4.20

Date/Time: August 27 2000 8:40:04 PM
Ambient Temperature: 22 Deg.C
Relative Humidity: 49%
Test Specification: FCC 15.247
EUT: DS 11M
Resolution Bandwidth: 100 kHz
Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.

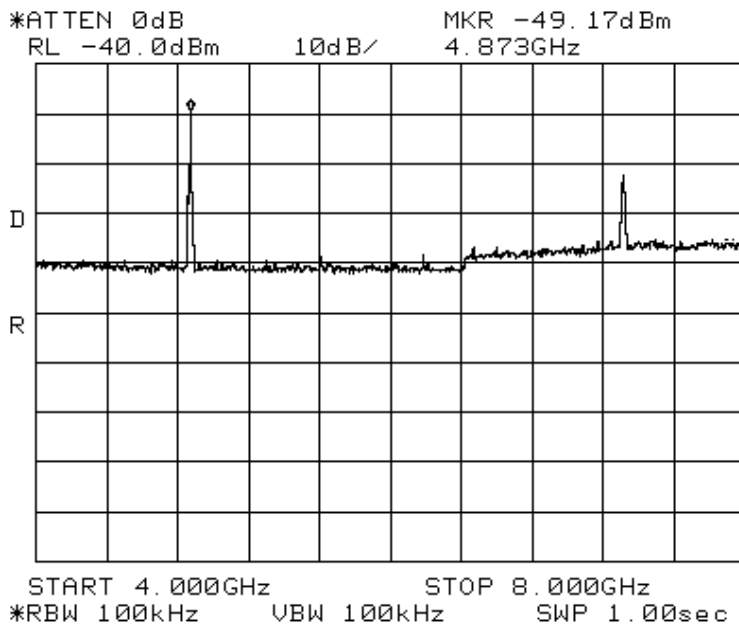


Limit= Pout.-20 dB= -4.83 dBm



Plot 1.4.21

Date/Time: August 27 2000 8:42:13 PM
 Ambient: 22 Deg.C
 Temperature:
 Relative Humidity: 49%
 Test Specification: FCC 15.247
 Detector: Peak
 Resolution Bandwidth: 100 kHz
 Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.

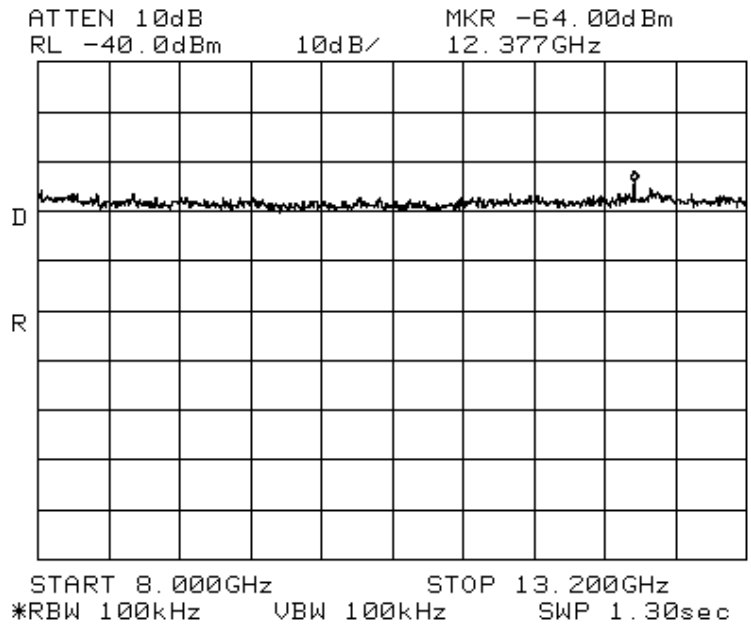


Limit= Pout.-20 dB= -4.83 dBm



Plot 1.4.24

Date/Time: August 27 2000 8:57:42 PM
Ambient Temperature: 22 Deg.C
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 6, Output power=24 dBm, Antenna gain=8 dBi.

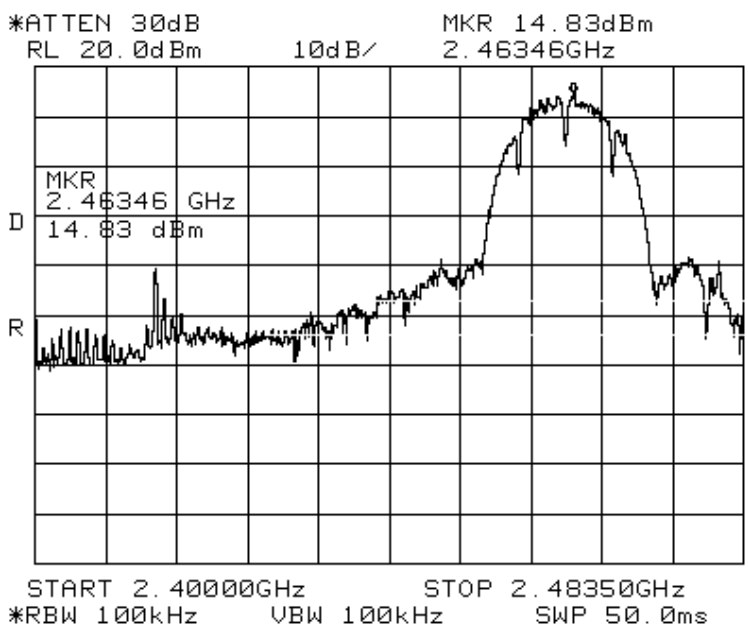


Limit= Pout.-20 dB= -4.83 dBm



Plot 1.4.26
Maximum inband power content

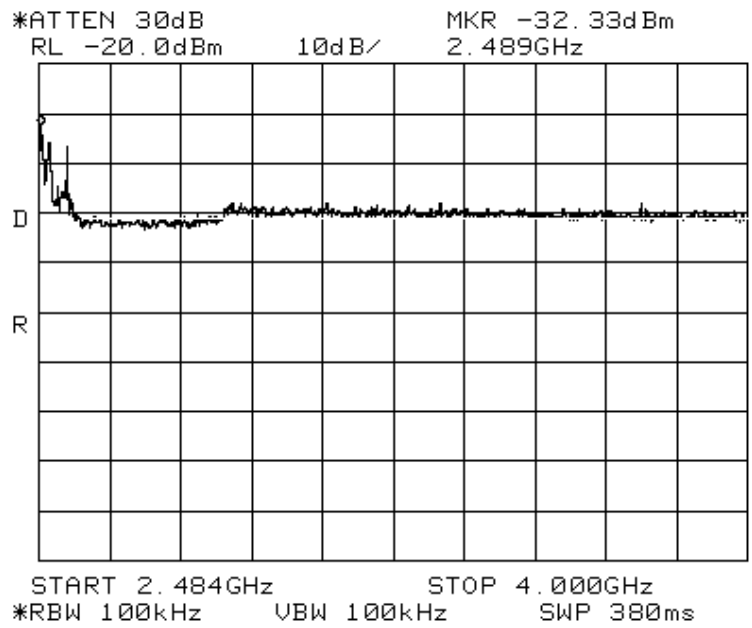
Date/Time: August 27 2000 9:03:25 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 11, Output power=24 dBm, Antenna gain=8 dBi.





Plot 1.4.27

Date/Time: August 27 2000 9:21:48 PM
Ambient Temperature: 22 Deg.C
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 11, Output power=24 dBm,
Antenna gain=8 dBi.

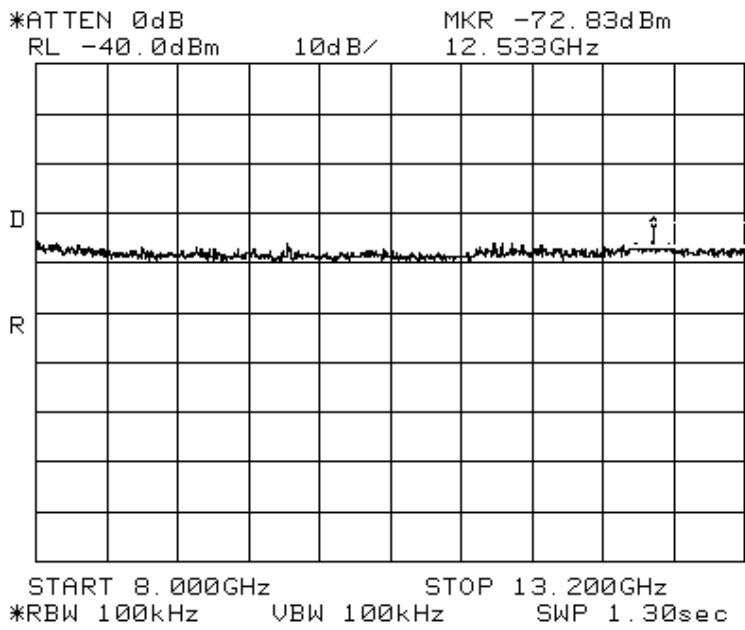


Limit= Pout.-20 dB= -5.17 dBm



Plot 1.4.31

Date/Time: August 27 2000 9:37:45 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 11, Output power=24 dBm, Antenna gain=8 dBi.

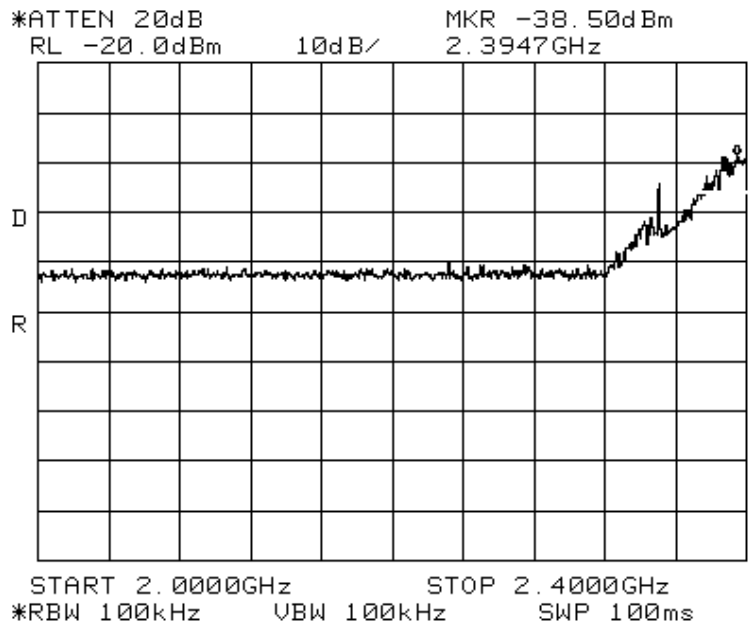


Limit= Pout.-20 dB= -5.17 dBm



Plot 1.4.33

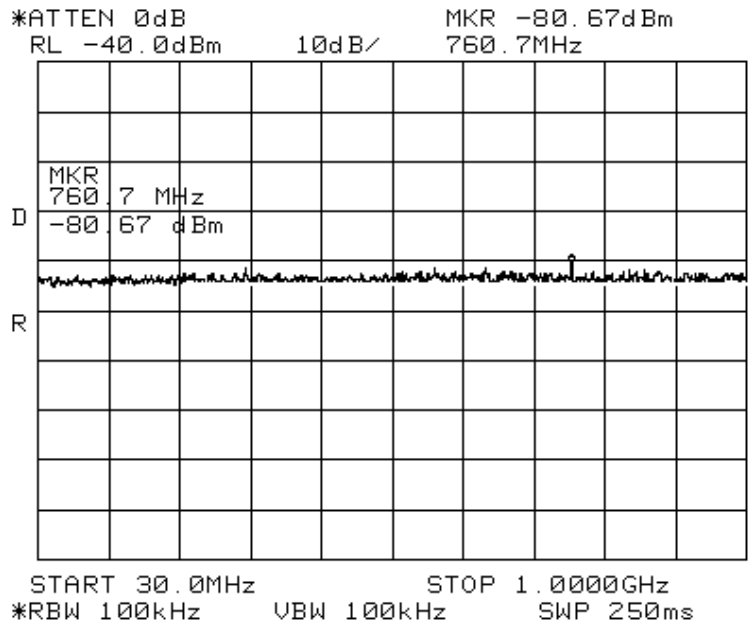
Date/Time: August 27 2000 9:45:37 PM
Ambient Temperature: 22 Deg.C
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 11, Output power=24 dBm, Antenna gain=8 dBi.





Plot 1.4.35

Date/Time: August 27 2000 9:51:32 PM
 Ambient Temperature: 22 Deg.C
 Relative Humidity: 49%
 Test Specification: FCC 15.247
 Detector: Peak
 Resolution Bandwidth: 100 kHz
 Notes: Channel 11, Output power=24 dBm, Antenna gain=8 dBi.

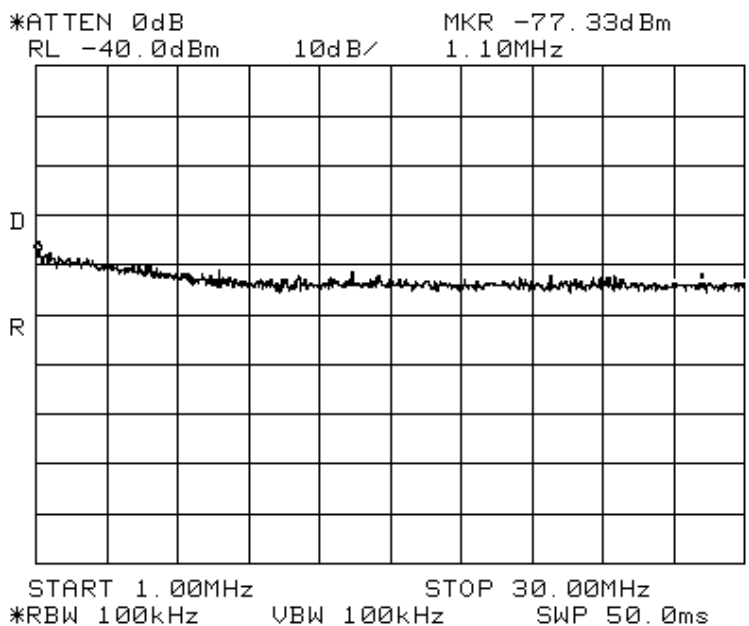


Limit= Pout.-20 dB= -5.17 dBm



Plot 1.4.36

Date/Time: August 27 2000 9:54:11 PM
Ambient: 22 Deg.C
Temperature:
Relative Humidity: 49%
Test Specification: FCC 15.247
Detector: Peak
Resolution Bandwidth: 100 kHz
Notes: Channel 11, Output power=24 dBm, Antenna gain=8 dBi.

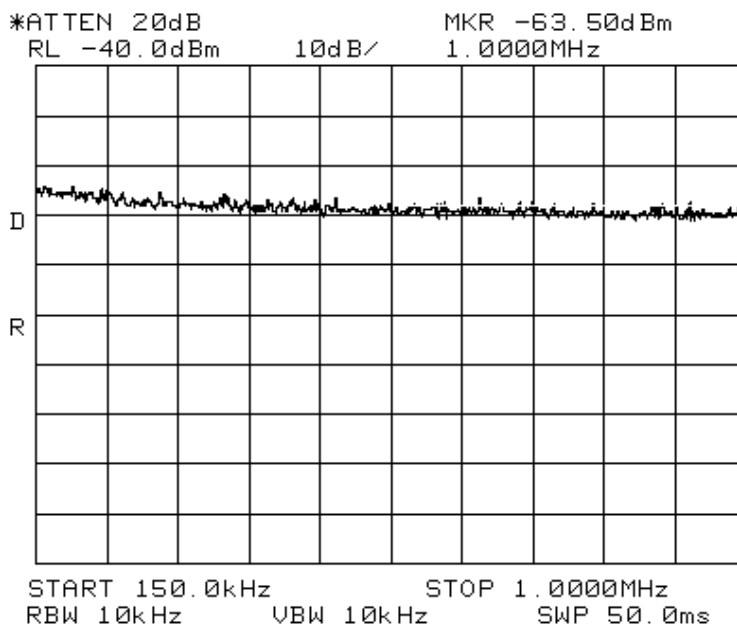


Limit= Pout.-20 dB= -5.17 dBm



Plot 1.4.37

Date/Time: August 27 2000 9:56:13 PM
 Ambient: 22 Deg.C
 Temperature:
 Relative Humidity: 49%
 Test Specification: FCC 15.247
 Detector: Peak
 Resolution Bandwidth: 100 kHz
 Notes: Channel 11, Output power=24 dBm, Antenna gain=8 dBi.



Limit= Pout.-20 dB= -5.17 dBm

**APPENDIX A – Test equipment and ancillaries used for tests**

HL Serial No.	Serial No.	Description	Manufacturer	Model No.	Due Calibr.
0025	5837	Spectrum analyzer, 10 kHz-23 GHz	Anritsu	MS-710C	8/00
0053	7538	Attenuator, 50 Ohm, 2W, 0-18 GHz, 10 dB	Hewlett Packard	8492A	2/01
0056	2627	Attenuator, 50 Ohm, 2W, 0-18 GHz, 30 dB	Hewlett Packard	8492A	2/01
0191	1206	Power meter, RF, -65 + 44 dBm, 100 kHz – 50 GHz	Hewlett Packard	435B	12/00
0316	02BK	Power meter, RF, IEEE-488, 100 kHz-100GHz, -70 to +37 dBm	Boonton	4220-01	2/01
0460	27705	Power sensor 500 kHz to 18 GHz, 50 Ohm	Boonton	51075	2/01
0872	8767	Cable coax	Amplifier Research	PFP01P01039 4	7/01
0940	8468	Attenuator, 50 Ohm, 2W, 0-12.4 GHz,	Hewlett Packard	8491A	2/01
3000temp	3804A 00716	Spectrum analyzer, 30 Hz – 13.2 GHz	Hewlett Packard	8562E	6/01