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FCC PART 90 EMI MEASUREMENT AND TEST REPORT

(Report is amended from R091008-02A)

Company: 3e Technologies International
9715 Key West Ave. Suite 500
Rockville, MD 20850

Contact: Ryon Coleman

Product: CM9 PCI Transmitter Module
FCC ID: QVT-525A-3

Test Report No: R091008-02C

APPROVED BY: Nic Johnson
Test Engineer

A handwritten signature in black ink, appearing to read "Nic Johnson", written over a horizontal line.

DATE: 6 February 2009

Total Pages: 29

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1.0 Summary of test results

The equipment under test (EUT) was tested for compliance to FCC Part 90 and Part 2. Below is a summary of the test results. Complete results can be found in Section 3.

Rule	Description	Result
§ 2.1046 § 90.205	RF Output Power Peak Transmit Power Power Spectral Density	Compliant
§ 2.1049 § 90.209 § 90.210	Occupied Bandwidth	Compliant
§ 2.1053 §90.210	Emissions and emission limitations Spurious Emission	Compliant

1.1 Test procedures

ANSI/TIA-603-C-2004

1.2 Reason for amendment

All measurements from section 3.6 were re-made at the proper temperatures and results of voltage input variations were added.

Calibration dates have been updated.

Conducted spectrum plots have been added to section 3.4 to show emissions from 4.5 to 5.5Ghz for channels 40 and 80.

2.0 EUT Description

The Equipment Under Test (EUT) was an wireless network adapter PCI module capable of multi-band operation including 802.11 a, b and g. The EUT operates with 20MHz channels only.

2.1 Equipment under test

- 2.1.1 Identification: QVT-525A-3
- 2.1.2 EUT received date: 29 September 2008
- 2.1.3 EUT tested dates: (see Section 3)
- 2.1.4 Manufacturer: 3e Technologies Int.
- 2.1.5 Serial number: C13570100A11C01

2.2 Testing location

All testing was performed at the NCEE Labs Lincoln, NE facility, which is an A2LA accredited EMC test laboratory.

2.3 EUT Setup

The EUT was tested on an adapter board. The board included two transmitters, only one was active. The board was powered by 5VDC. The EUT was set to operate on the highest and lowest frequency (Channel 40 and 80) in the 4.9GHz emergency band. Only the functionality of these frequencies were tested and covered in this report.

2.4 Objective

This report is prepared on behalf of 3e Technologies Int. in accordance with Part 2 and Part 90 of the Federal Communication Commission's rules. The objective of the manufacturer is to determine compliance with FCC rules for output power, power spectral density occupied bandwidth and spurious emissions.

3.0 Test Results

3.1 Peak Transmit Power

Test: FCC §2.1046 and §90.205

Test Method: TIA-603-C, Section 3.2.1

Test Result: *Complies* Date: 20 Jan 09

Test Description

Per FCC §2.1046 and §90.205, the maximum power of the transmitter for mobile station is 33.00dBm.

Test Environment

Testing was performed at the NCEE Labs Lincoln facility. Laboratory environmental conditions varied slightly throughout the test:

Relative humidity of $40 \pm 5\%$

Temperature of $20 \pm 2^\circ$ Celsius

Test Setup

The RF output of the transceiver was connected to a power sensor through appropriate attenuators. The power was read from a power meter.

Test Results

Channel	Frequency (GHz)	Output Power dBm	Limit dBm	Result
40	4.96	20.09	33.00	PASS
80	4.98	18.19	33.00	PASS

<i>Serial #</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Description</i>	<i>Last Cal.</i>
100307	Hewlett Packard	4378	Power Meter	NA
2702A63981	Hewlett Packard	8481A	Power Sensor	1/20/09

3.2 Power Spectral Density

Test: FCC §2.1046 and §90.205

Test Method: TIA-603-C, Section 3.2.1

Test Result: *Complies* Date: 18 Dec 08

Test Description

Per FCC §2.1046 and §90.205, the maximum power spectral density of the transmitter for mobile station is 21.00dB/MHz.

Test Environment

Testing was performed at the NCEE Labs Lincoln facility. Laboratory environmental conditions varied slightly throughout the test:

Relative humidity of $40 \pm 5\%$

Temperature of $20 \pm 2^\circ$ Celsius

Test Setup

The RF output of the transceiver was connected to a spectrum analyzer through 20dB attenuators. The spectrum analyzer was used to make power spectral density measurements. The resolution bandwidth and video bandwidths were set to 1MHz, and the frequency span set to 15MHz. The plots on the following page include all correction factors from attenuation.

Test Equipment Used

<i>Serial #</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Description</i>	<i>Last Cal.</i>
100037	Rohde & Schwarz	ESIB26	EMI Test Receiver	8/19/08

Test Results

Channel	Frequency (GHz)	Peak Power Spectral Density dB/MHz	Limit dB/MHz	Result
40	4.96	18.38	21.00	PASS
80	4.98	18.82	21.00	PASS

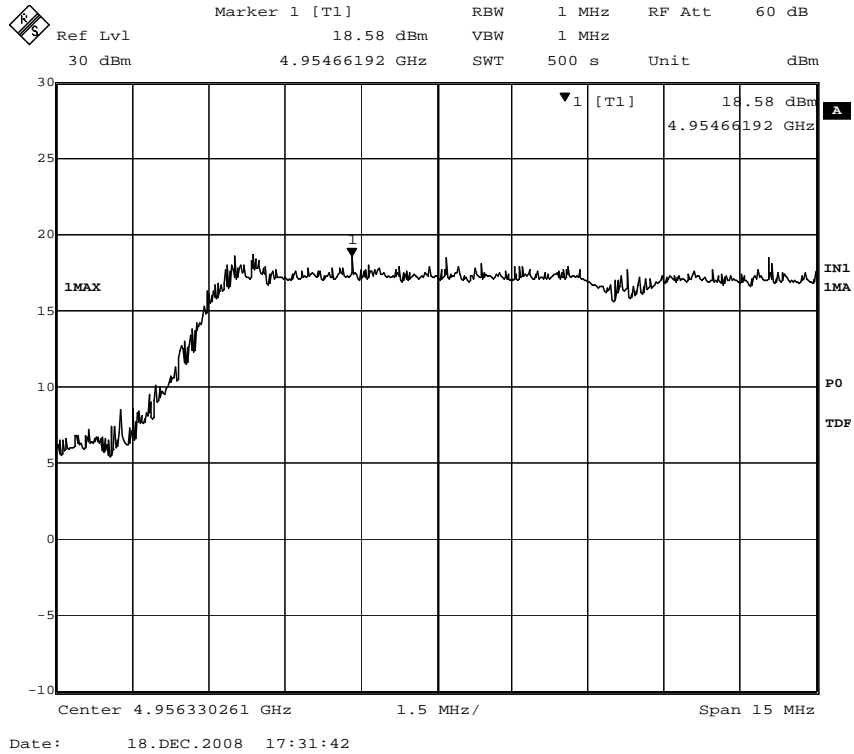


Figure 1 - Power Spectral Density, Channel 40

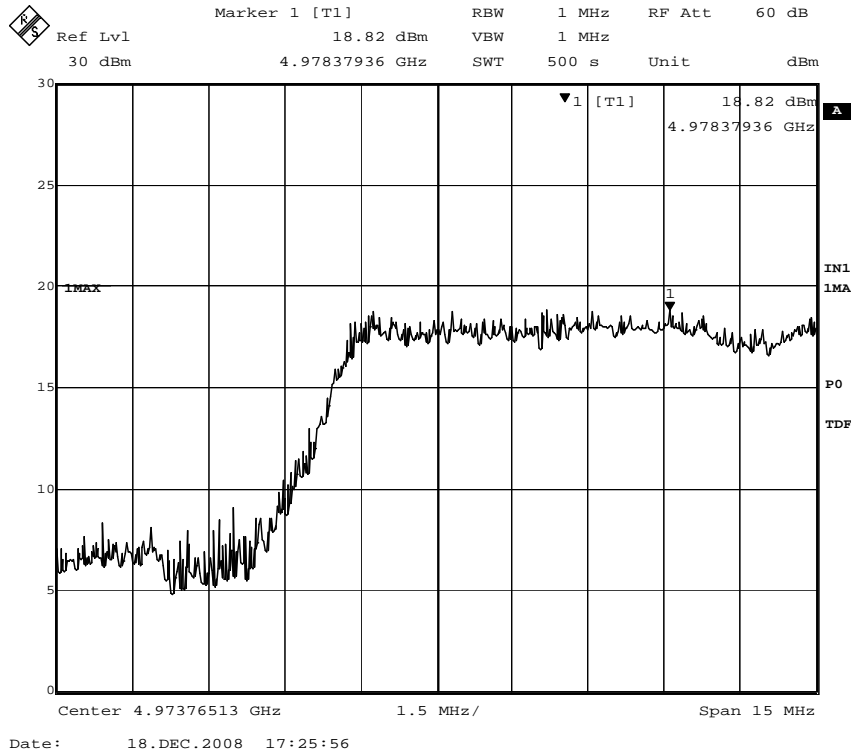


Figure 2 - Power Spectral Density, Channel 80

3.3 Occupied Bandwidth

Test: FCC §2.1049, §90.209, §90.210

Test Method: TIA-603-C, Section 3.2.11

Test Result: *Complies* Date: 18 Dec 08

Test Description

The occupied bandwidth is required to be less than the maximum authorized bandwidth of 50MHz.

Test Setup

The RF output of the transmitter was connected to the input of the receiver in spectrum analyzer mode through sufficient attenuation. The resolution bandwidth was set at 1 kHz and the bandwidth was measured 20dB below from the peak emission.

Test Environment

Testing was performed at the NCEE Labs Lincoln facility. Laboratory environmental conditions varied slightly throughout the test:

Relative humidity of $40 \pm 5\%$

Temperature of $20 \pm 2^\circ$ Celsius

Test Equipment Used

<i>Serial #</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Description</i>	<i>Last Cal.</i>
100037	Rohde & Schwarz	ESIB26	EMI Test Receiver	8/19/08

Test Results

Channel	Frequency (GHz)	Emission Bandwidth (MHz)	Max Limit (MHz)	Result
40	4.96	35.67	50.00	PASS
80	4.98	41.24	50.00	PASS

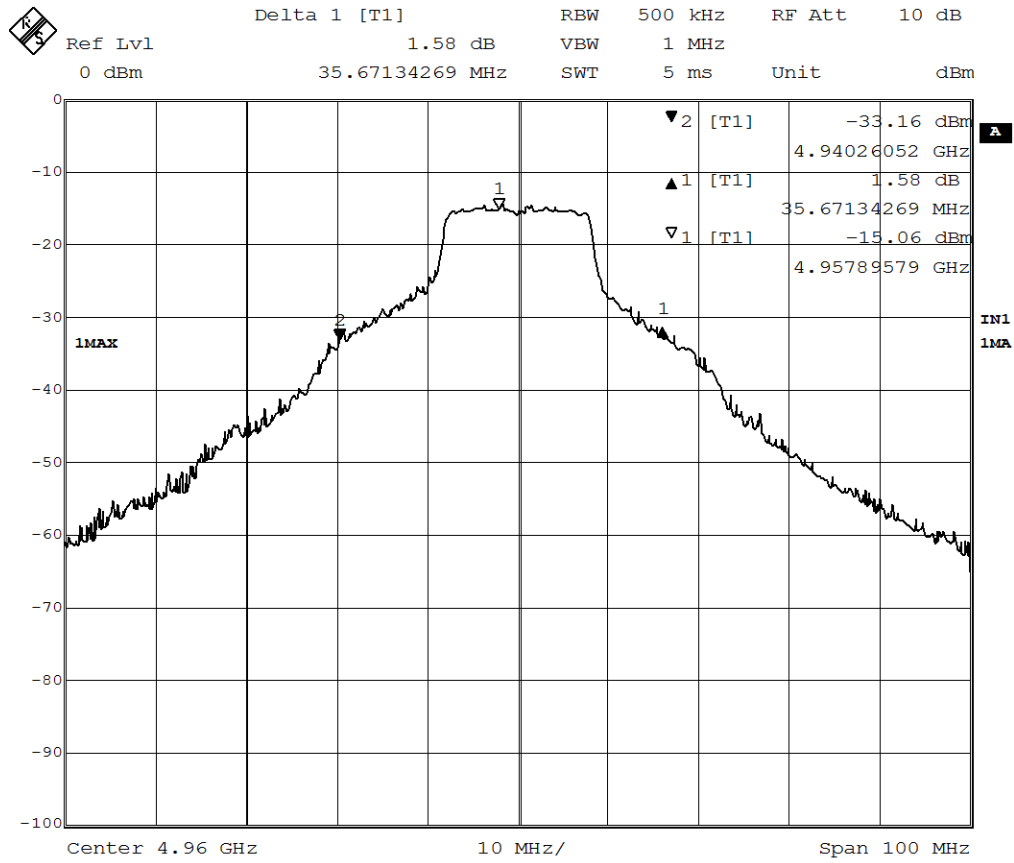


Figure 3 - Occupied Bandwidth, Channel 40

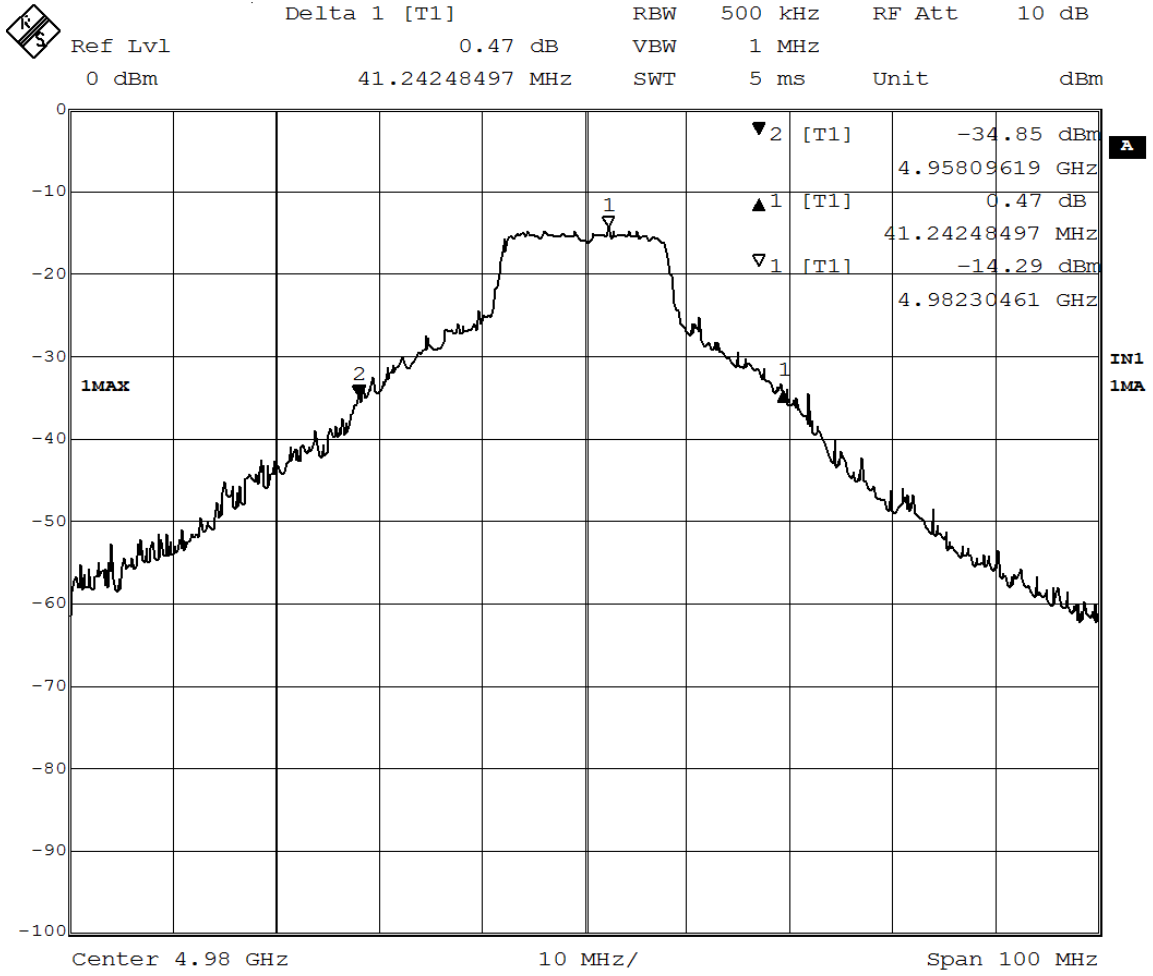


Figure 4 - Occupied Bandwidth, Channel 80

3.4 Emissions and Emissions Limitations to §90.210

Test: FCC §2.1051 and §90.210

Test Method: TIA-603-C, Section 3.2.11, 3.2.13

Result: *Complies* Date: 18 Dec 08

Test Description

On any frequency removed from the center of the assigned channel by more than 250 percent at least: $43 + 10 \log (P)$ dB

Test Environment

Testing was performed at the NCEE Labs Lincoln facility. Laboratory environmental conditions varied slightly throughout the test:

Relative humidity of $40 \pm 5\%$

Temperature of $20 \pm 2^\circ$ Celsius

Test Setup

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to the 10th harmonic. The test setup can be seen in Figures 2 through 4 of appendix A.

Test Equipment Used

<i>Serial #</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Description</i>	<i>Last Cal.</i>
100037	Rohde & Schwarz	ESIB26	EMI Test Receiver	8/19/08
100307	Rohde & Schwarz	FSP40	Spectrum Analyzer	1/19/09*

*Internal self-calibration

Test Results

The spurious emissions at the antenna terminals were found to comply with FCC §2.1051 and §90.210.

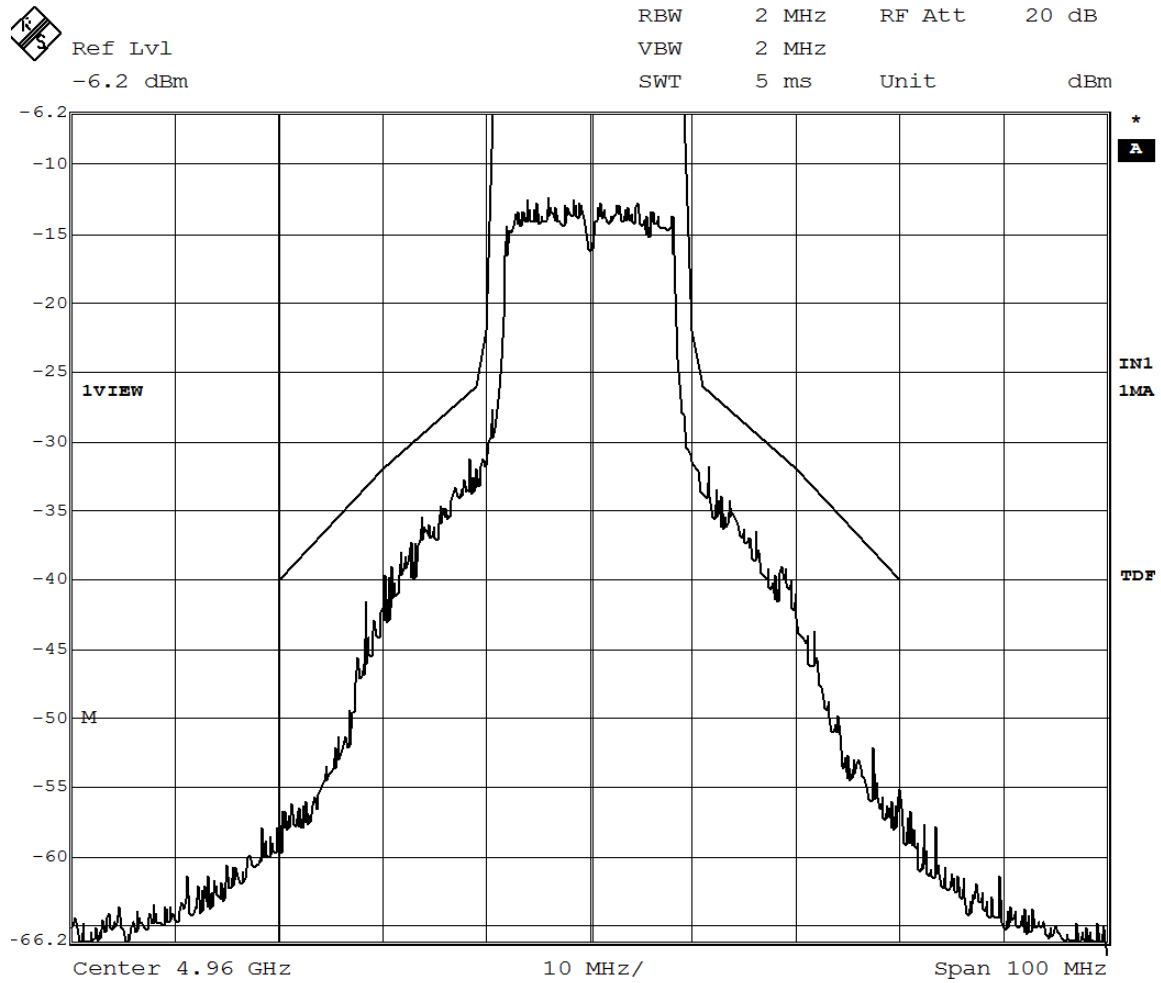


Figure 5 - Mask M, Channel 40

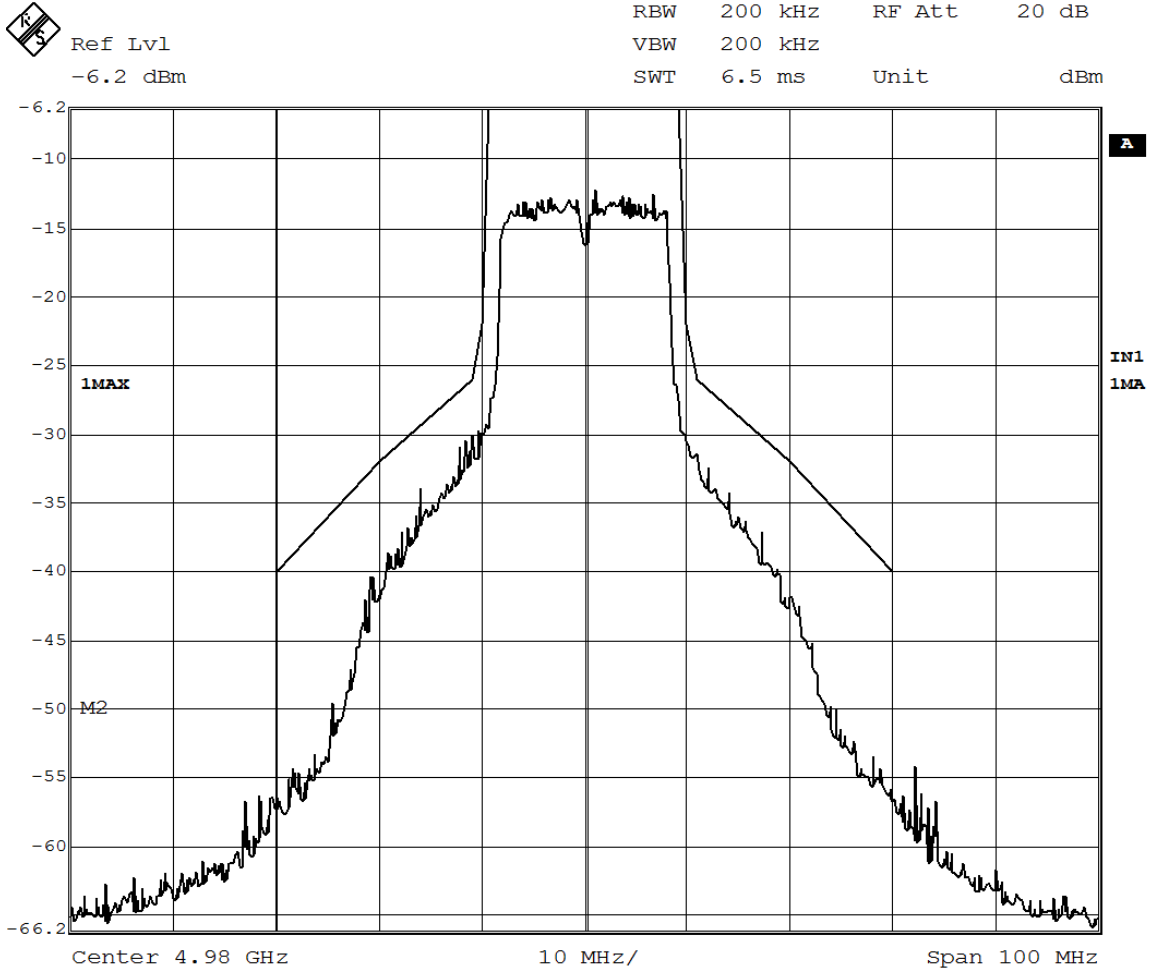


Figure 6 - Mask M, Channel 80

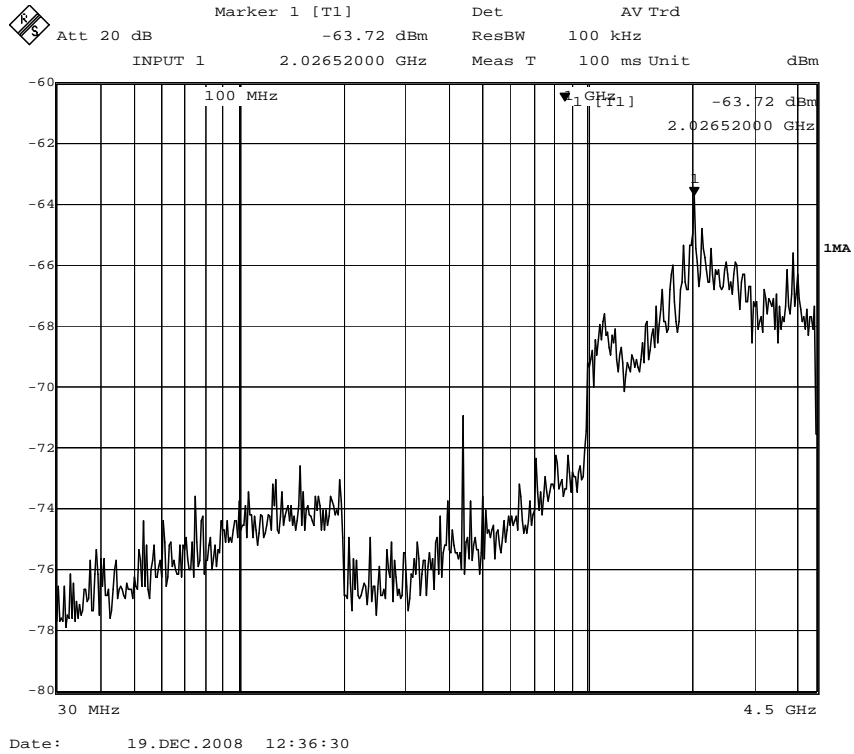


Figure 7 - Channel 40, 30MHz – 4.5GHz

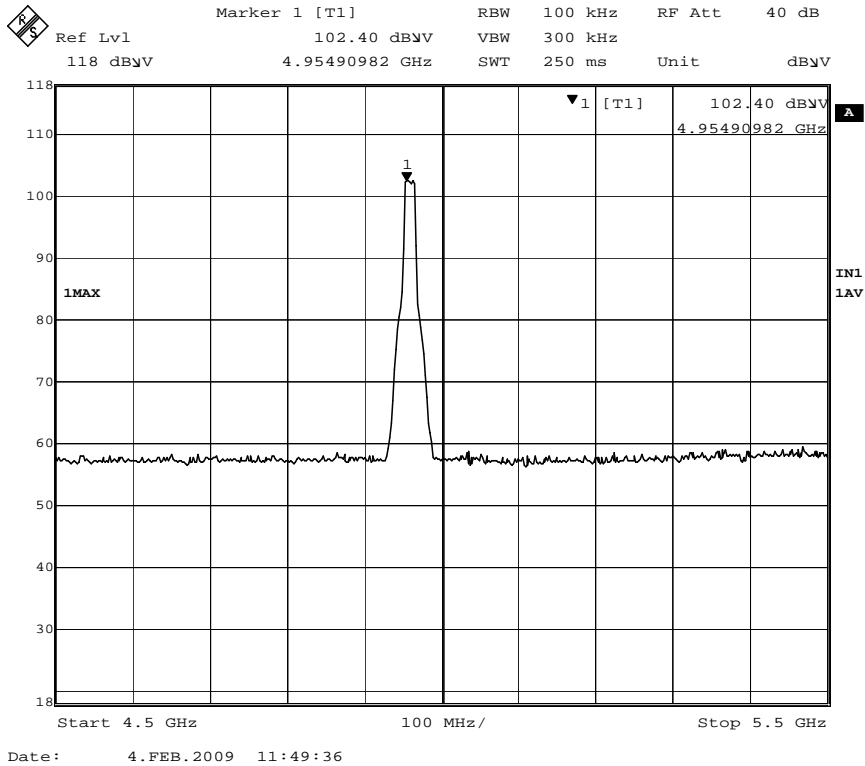


Figure 8 - Channel 40, 4.5- 5.5GHz

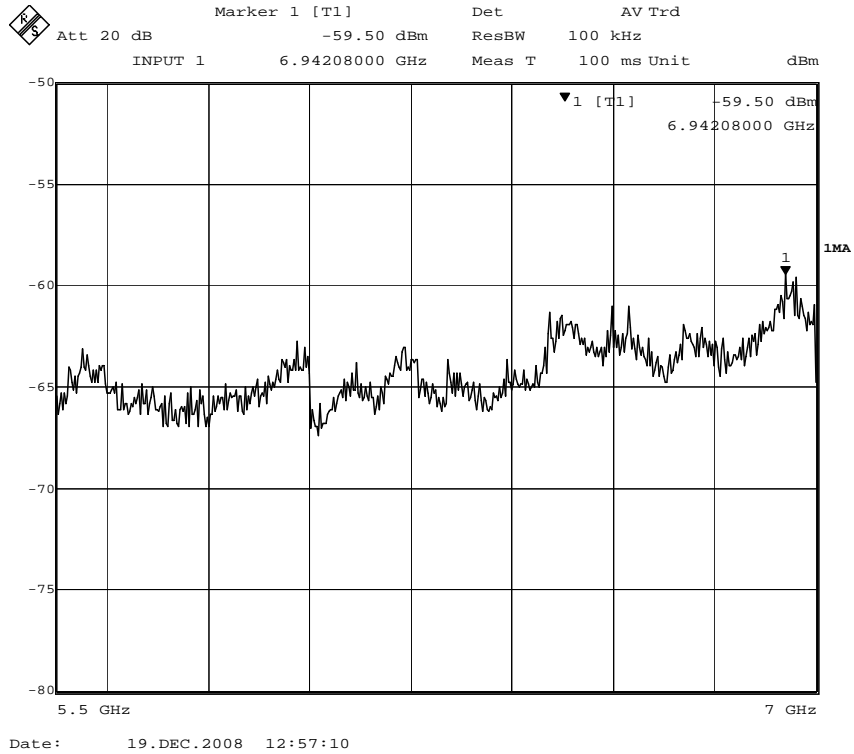


Figure 9 - Channel 40, 5.5GHz - 7GHz

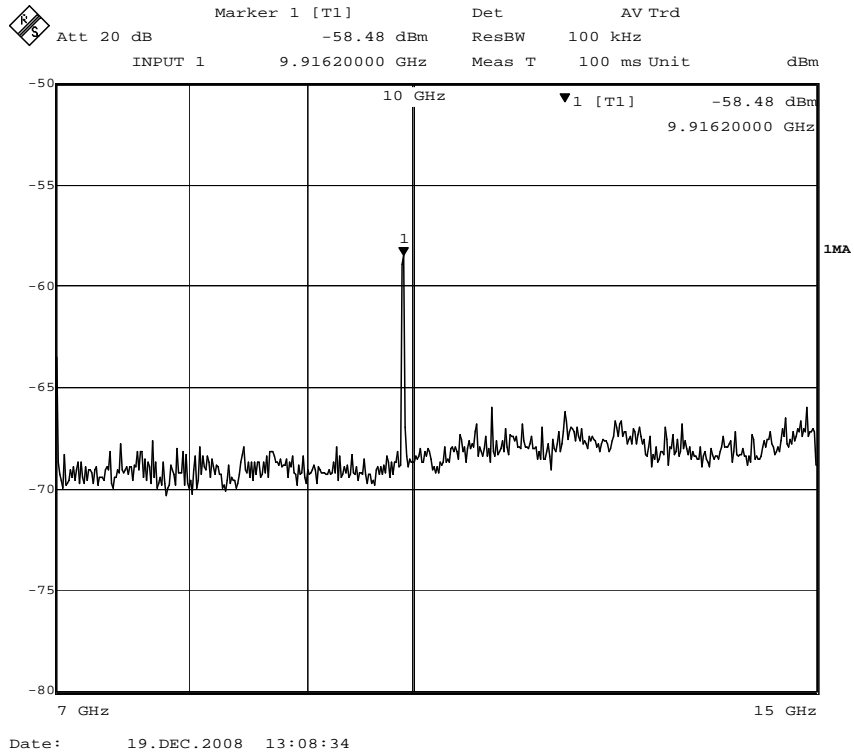


Figure 10 - Channel 40, 7GHz - 15GHz

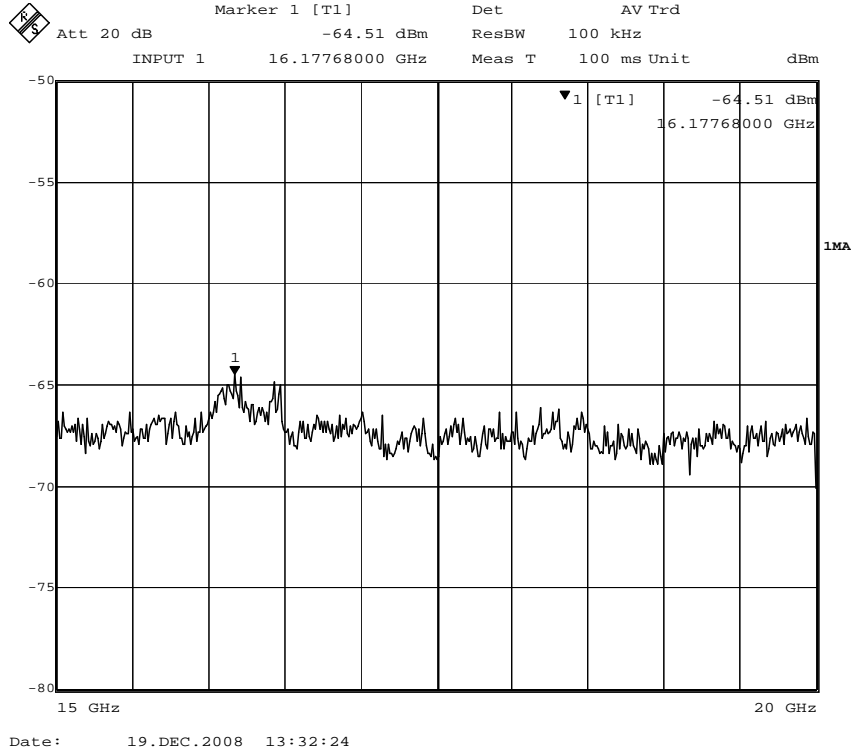


Figure 11 - Channel 40, 15GHz - 20GHz

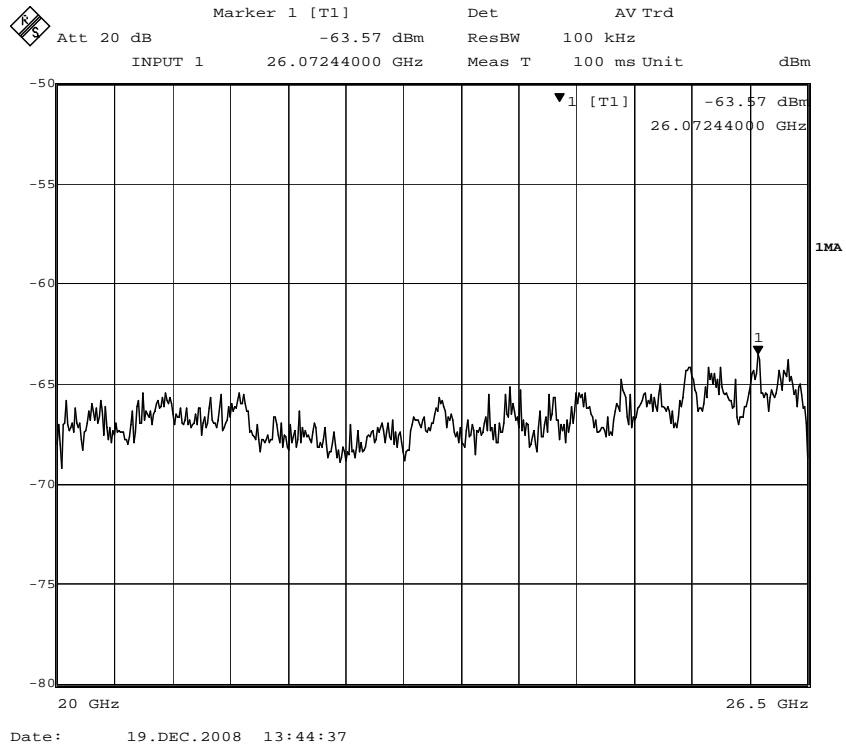
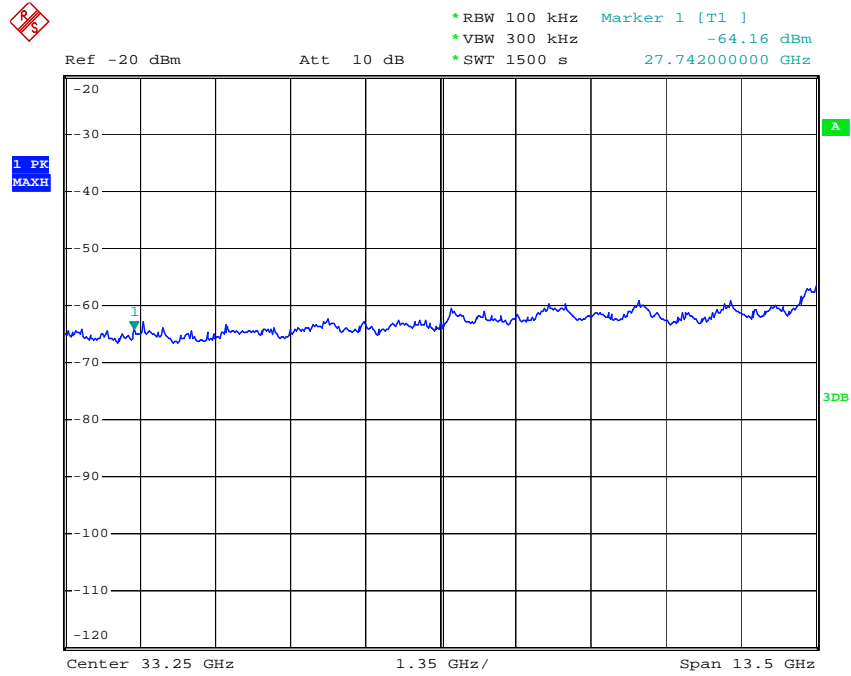
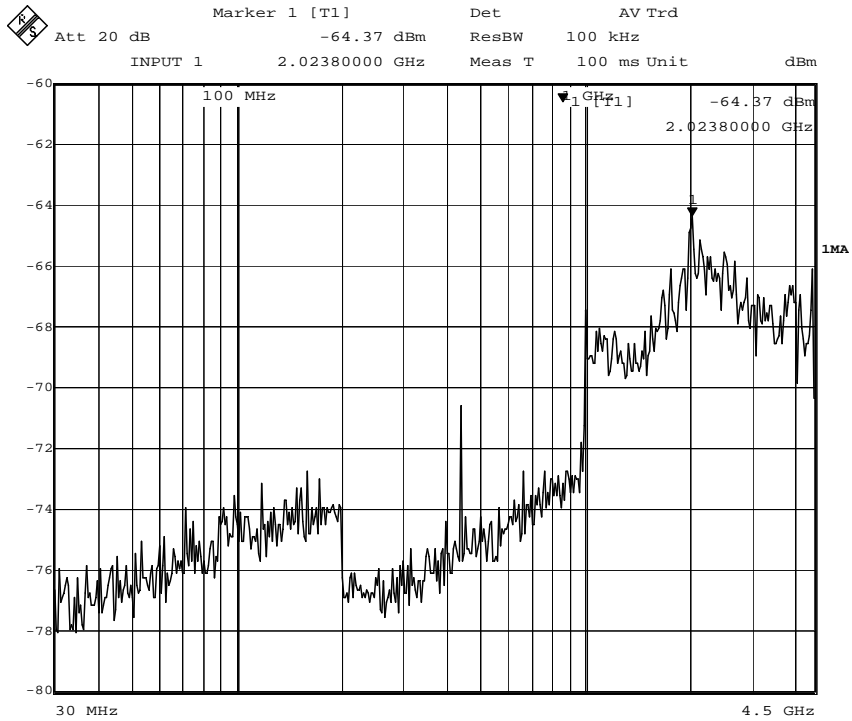


Figure 12 - Channel 40, 20-26.5GHz



Date: 19.JAN.2009 20:36:51

Figure 13 - Channel 40, 26.5-40GHz



Date: 19.DEC.2008 12:46:15

Figure 14 - Channel 80, 30MHz - 4.5GHz

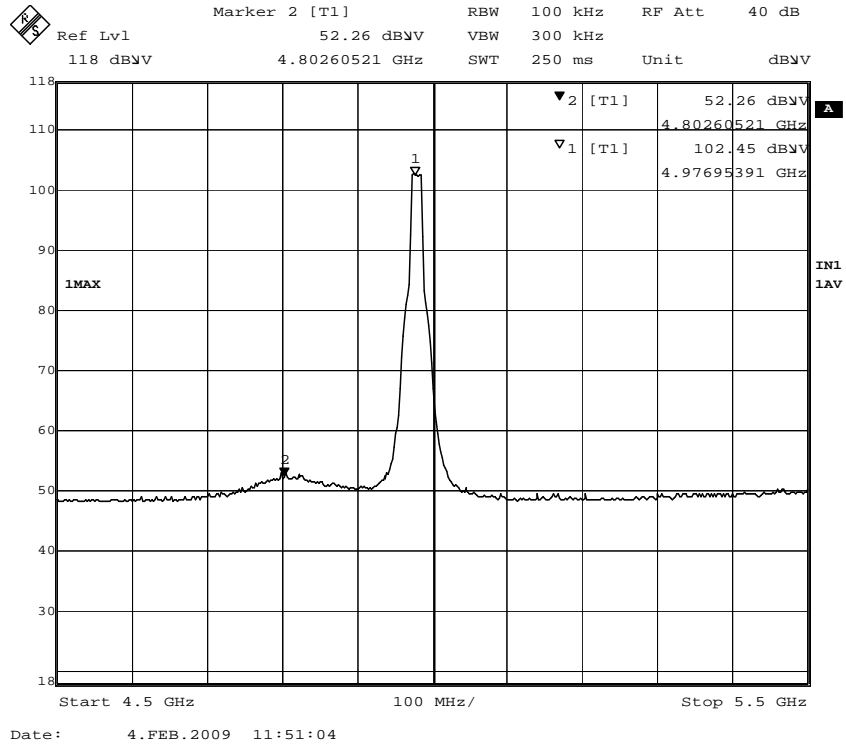


Figure 15 - Channel 80, 4.5 - 5.5GHz

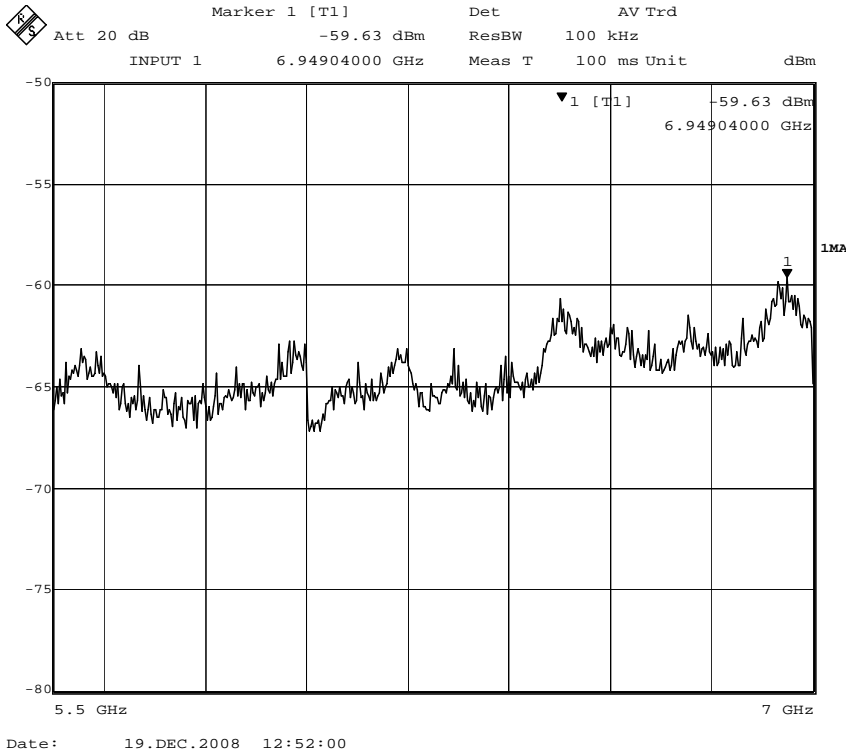


Figure 16 - Channel 80, 5.5GHz - 7GHz

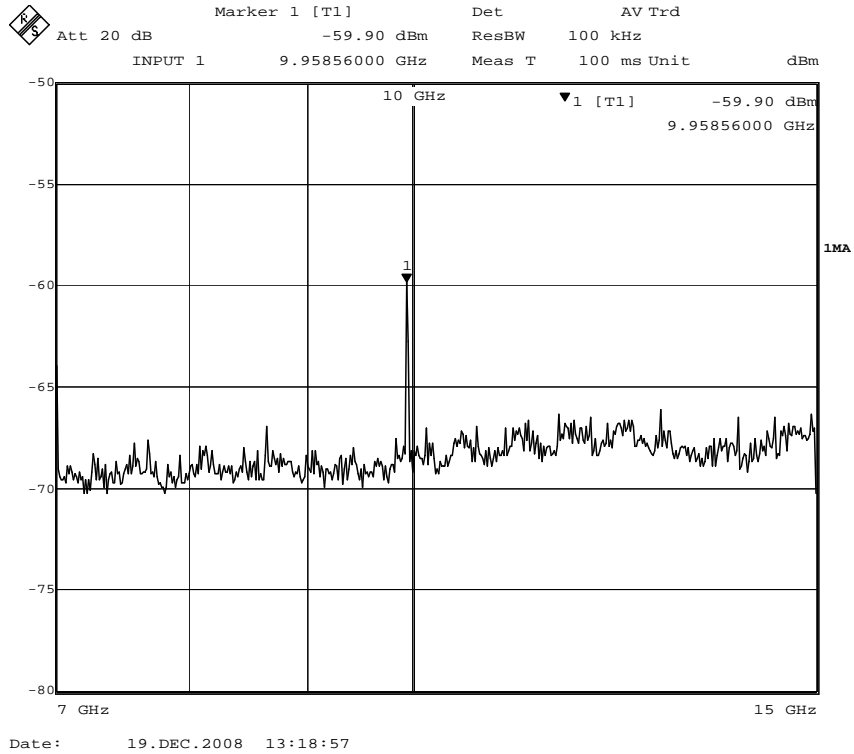


Figure 17 - Channel 80, 7GHz - 15GHz

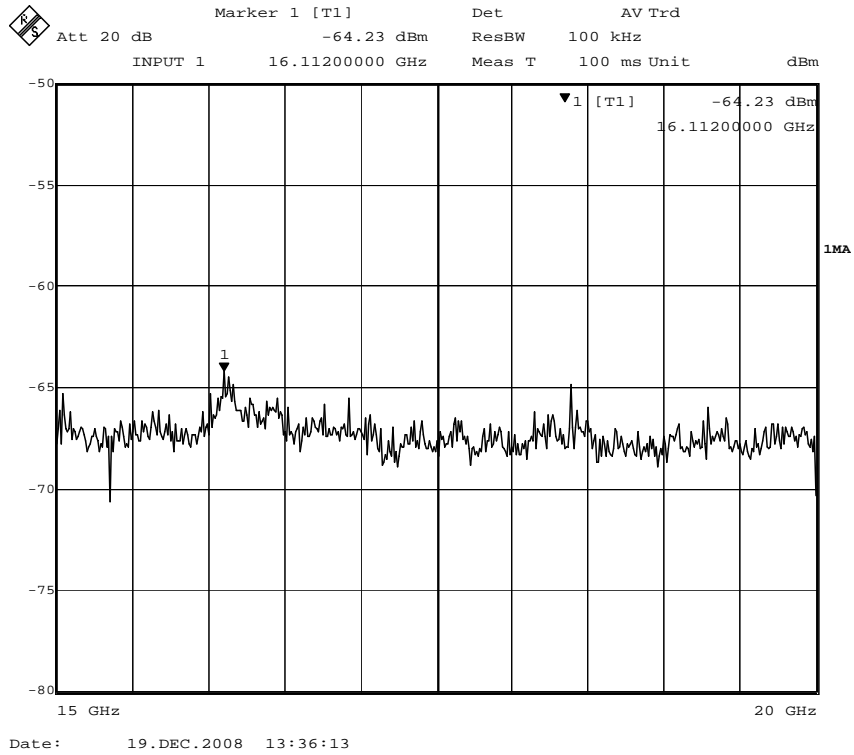


Figure 18 - Channel 80, 15GHz - 20GHz

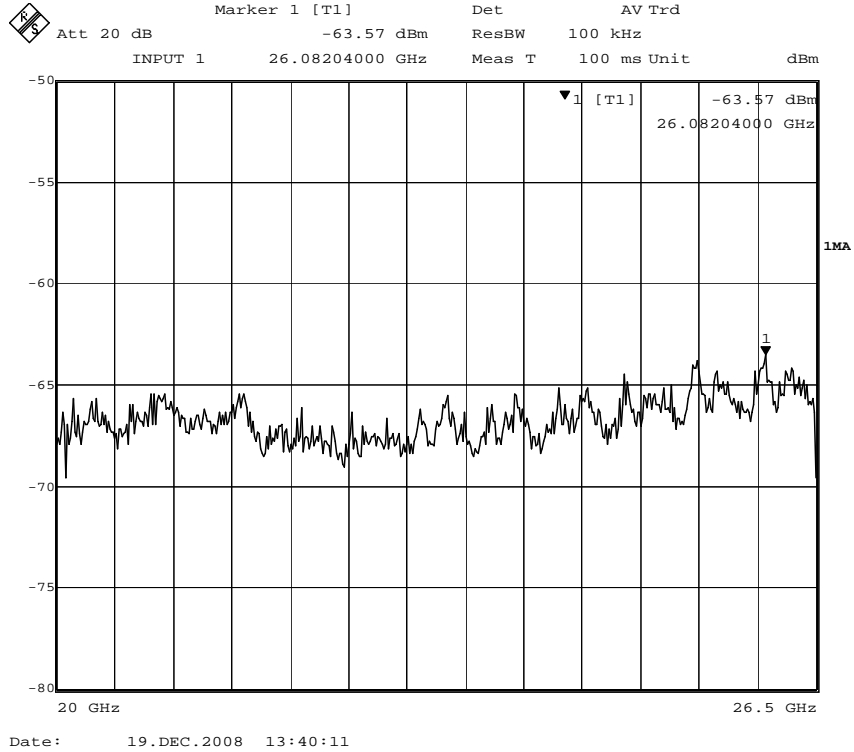
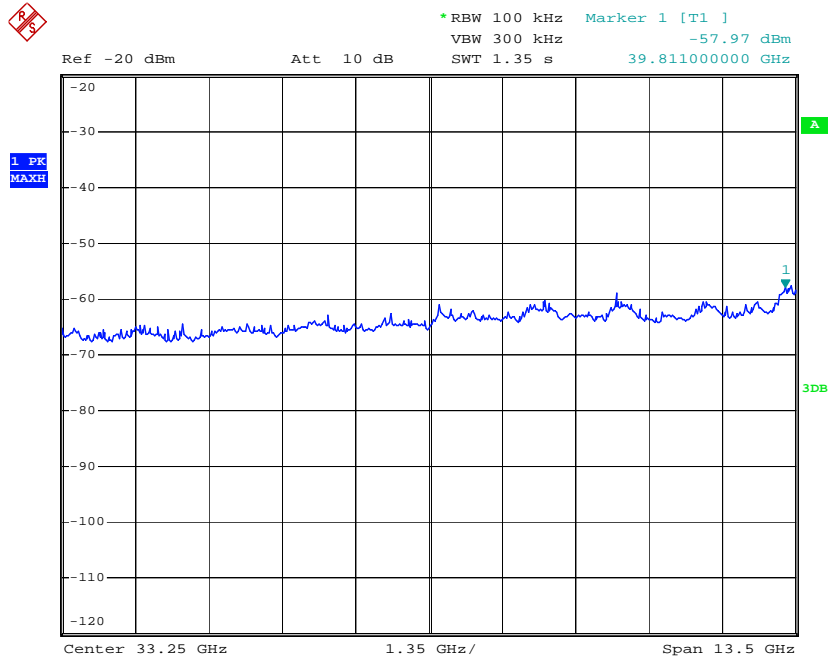


Figure 19 - Channel 80, 20GHz - 26.5GHz



Date: 19.JAN.2009 20:43:09

Figure 20 - Channel 80, 26.5-40GHz

3.5 Spurious Emission

Test: FCC §2.1053 and §90.210

Test Method: TIA-603-C, Section 3.2.12

Result: *Complies* Date: 18 Dec 08

Test Description

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis. The frequency range up to tenth harmonic of the fundamental frequency was investigated.

The EUT was then removed and the replaced with a substitution antenna of the same model as the receiving antenna.. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution. Spurious emissions in dB = 10 log (TXpwr in Watts/0.001) which is the absolute level.

*Note:*All frequencies above 18GHz were at least 6dB below the limit. No substitution method measurements were made above 18Ghz.

Test Environment

Testing was performed at the NCEE Labs Lincoln facility in the 10m semi-anechoic chamber. Laboratory environmental conditions varied slightly throughout the test:

- Relative humidity of 40 ± 5%
- Temperature of 20 ± 2° Celsius

Test Setup

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

Test Equipment Used

<i>Serial #</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Description</i>	<i>Last Cal</i>
100477	Rohde & Schwarz	SML03	Signal Generator 3.3GH	11/7/06
100037	Rohde & Schwarz	ESIB26	EMI Test Receiver	8/19/08
100007	Rohde & Schwarz	ESIB7	EMI Test Receiver	6/9/08
100307	Rohde & Schwarz	FSP40	Spectrum Analyzer	1/19/09*
1647	EMCO	3141B	Bicon Antenna	2/8/08
1654	EMCO	3141B	Bicon Antenna	2/8/08
6415	EMCO	3115	DRG Horn	2/5/08
6416	EMCO	3115	DRG Horn	2/5/08
2576	EMCO	3116	DRG Horn	6/6/08
405	Rohde & Schwarz	EMS0K1	Software v.1.20	N/A

*internal self calibration

Test Results
See following table

Radiated Spurious Emission, Substitution Method Measurements

Frequency	Pre-scan Level	Antenna Height	Angle	Pol.	Signal Generator Level	Transmit Antenna Factor	Transmit Cable loss	Level	Limit	Margin
MHz	dBm	cm	deg.		dBm	dB	dB	dBm	dBm	
Channel 40										
39.48	-72.69	104.0	302	VERT	-31.0	8.6	0.6	-40.2	-21.46	18.74
9920.00	-65.02	108.0	332	HOR	20.1	37.8	13.4	-31.1	-21.46	9.64
14880.00	-58.62	115.0	312	HOR	11.65	40.3	17.6	-46.25	-21.46	24.79
Channel 80										
39.48	-71.42	101.0	336	VERT	-32.5	8.6	0.6	-41.7	-21.46	20.24
9960.00	-61.40	120.0	298	HOR	19.8	37.8	13.4	-31.4	-26.46	4.94
14940.00	-59.21	140.0	355	HOR	12.09	40.3	17.6	-45.8	-12.46	33.35

3.6 Carrier Frequency Stability

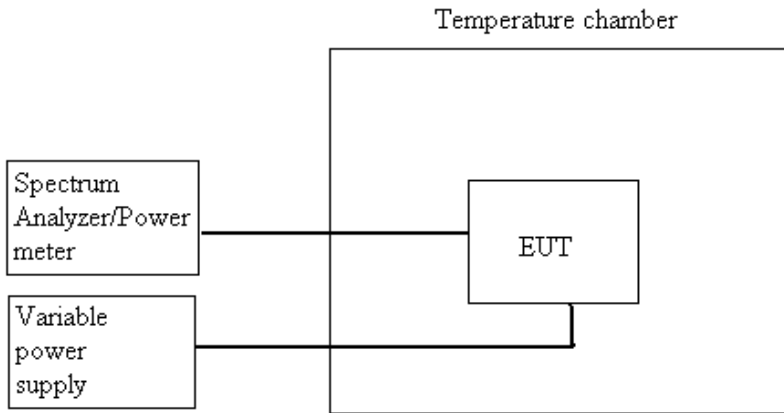
Test: FCC §90.213

Test Method: TIA-603-C, Section 3.2.2

Result: *Complies* Date: 6 Feb 09

Tested per TIA-60-C:2004. Conducted power was measured on a spectrum analyzer with resolution bandwidth and video bandwidth set to 100KHz. The center frequency was found by measuring the frequency of the signal 10dB below the peak on the high and low end of the signal. The frequency half way in between these frequencies was recorded as the center frequency. The EUT support board is supplied by 5VDC. This input voltage was varied by (+/-)15% for each temperature setting.

Test Setup:



Test Procedure:

Channel 40 nominal: 4960.000MHz
 Channel 80 nominal: 4980.000MHz

Allowed deviation: 0.494MHz
 Channel 40: 4959.510 – 4960.494MHz
 Channel 80: 4979.510 – 4960.494MHz

See the standard for test procedures.

Test Equipment Used

<u>Serial #</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Description</u>	<u>Last Cal.</u>
100037	Rohde & Schwarz	ESIB26	EMI Test Receiver	8/19/08
31373	Thermotron	SE-1000L	Temp chamber	11/12/2007

Test Results:

Ambient temperature: 22degC

Relative Humidity: 45%

Test conditions		Frequency (MHz)	
		Channel 40	Channel 80
Temperature	Input Voltage (VDC)	Frequency (MHz)	Frequency (MHz)
-30°C	5.00	1960.13	1980.01
-30°C	5.25	1960.08	1980.23
-30°C	4.75	1960.12	1980.05
-20°C	5.00	1960.15	1980.06
-20°C	5.25	1960.26	1980.30
-20°C	4.75	1960.04	1979.89
-10°C	5.00	1960.23	1980.02
-10°C	5.25	1960.31	1980.08
-10°C	4.75	1960.12	1980.11
0°C	5.00	1960.01	1980.21
0°C	5.25	1960.18	1979.95
0°C	4.75	1959.87	1980.24
10°C	5.00	1960.10	1980.02
10°C	5.25	1960.00	1980.09
10°C	4.75	1960.30	1980.20
20°C	5.00	1959.99	1979.98
20°C	5.25	1960.04	1980.13
20°C	4.75	1960.19	1980.30
30°C	5.00	1960.21	1980.14
30°C	4.75	1960.04	1980.08
30°C	5.25	1960.03	1980.05
40°C	5.00	1959.95	1980.23
40°C	5.25	1960.12	1980.12
40°C	4.75	1960.30	1980.29
50°C	5.00	1960.05	1979.23
50°C	5.25	1960.07	1980.01
50°C	4.75	1960.27	1980.07

Appendix A: Test Photos

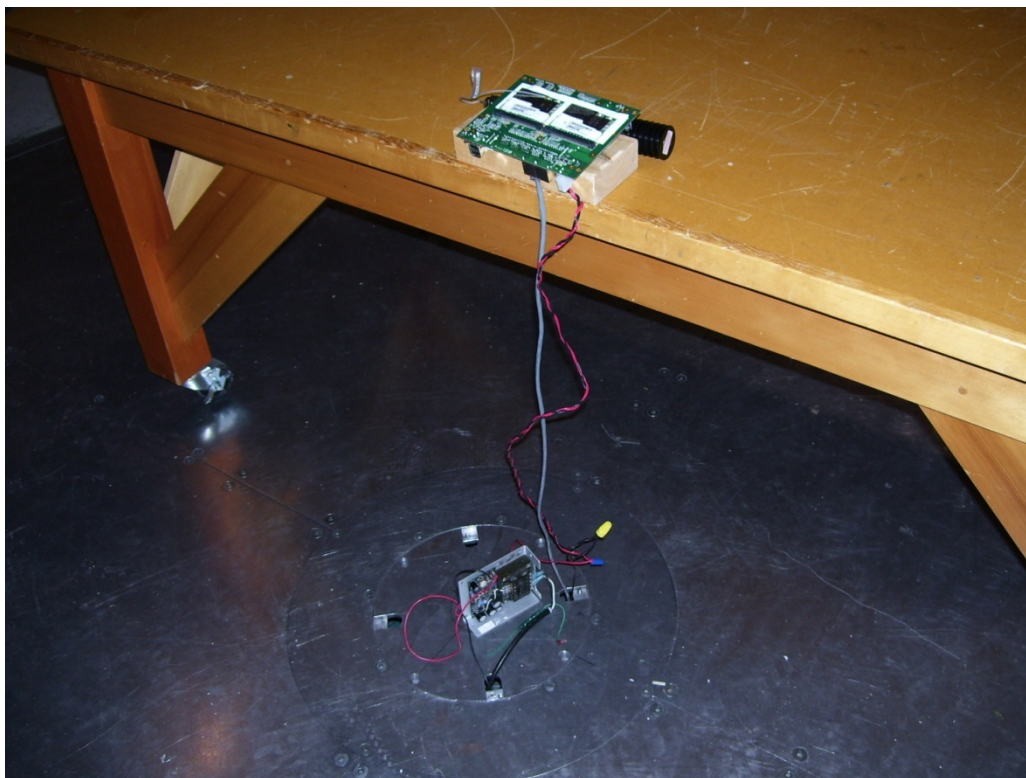


Figure 21 - EUT Test Setup

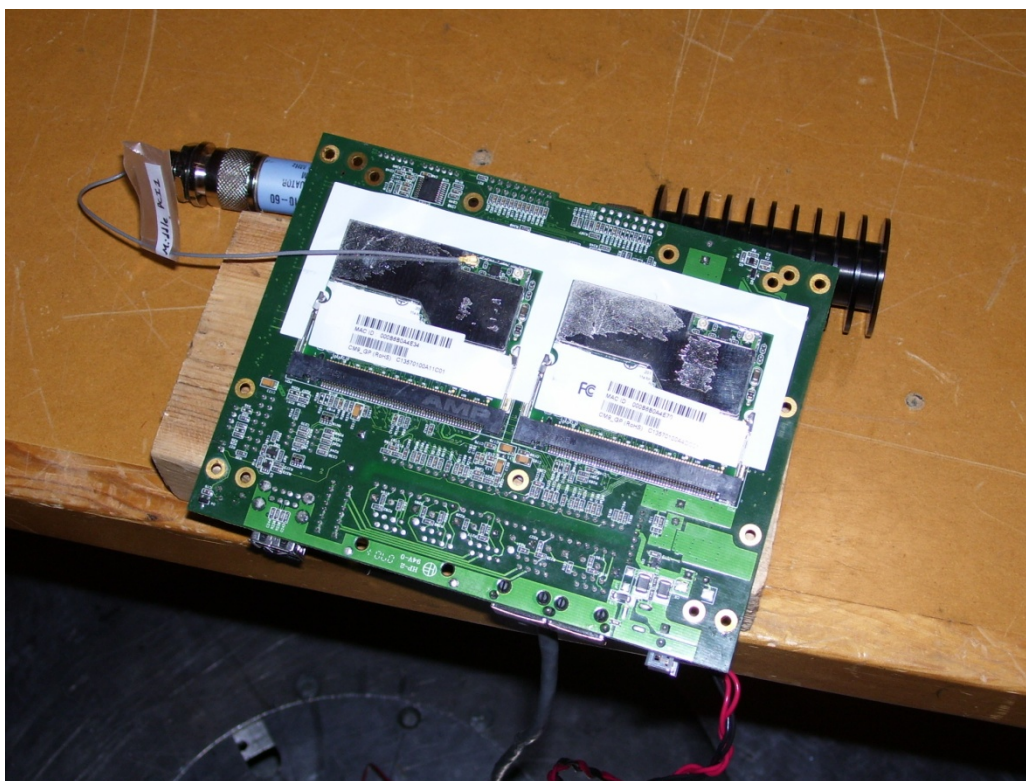


Figure 22 - EUT Test Setup

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