


# AMENDED FCC PART 90 EMI MEASUREMENT AND TEST REPORT

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Product: DCMA-82 PCI Transmitter Module  
FCC ID: QVT-525-V21

Test Report No: R091008-02-02B

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DATE: 30 Dec 2009

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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.

<b>Rule</b>	<b>Description</b>	<b>Result</b>
§ 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 Reason for amendment.**

This report has been modified to include the following sentence in section 2.0:

“The EUT uses the same radio card and the same RF section for both the 5.7GHz and 4.9GHz band.”

Bandwidth measurements were repeated on 30 December 2009 with a video bandwidth of 1MHz.

This report includes and makes obsolete both NCEE Labs report R101309-02-02 and R101309-02-02A.

## **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, a turbo, b, g and g turbo. This functionality of the EUT is covered by NCEE Test Report R101309-02-01. This report covers only operation in the Public Safety Band from 4960MHz to 4980MHz. The EUT uses the same radio card and the same RF section for both the 5.7GHz and 4.9GHz band.

### **2.1 Equipment under test**

- 2.1.1 Identification: DCMA-82 PCI Transmitter Module,
- 2.1.2 FCC ID: QVT-525-V21
- 2.1.3 EUT received date: 10 November 2009
- 2.1.4 EUT tested dates: (see Section 3)
- 2.1.5 Manufacturer: 3e Technologies Int.
- 2.1.6 Serial number: C194918A02E8C01

### **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 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.

## Test Equipment

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE
Rohde & Schwarz Test Receiver*	ESIB26	100037	16 Sep 2009
EMCO Biconilog Antenna***	3142B	1647	8 Feb 2008
EMCO Biconilog Antenna**	3142B	1654	6 Feb 2009
EMCO Horn Antenna***	3115	6415	5 Feb 2008
EMCO Horn Antenna**	3115	6416	5 Feb 2009
Hewlett Packard Power Meter	4378	100307	20 Jan 2009
Hewlett Packard Power Sensor	8481A	2702A63981	20 Jan 2009
Rohde & Schwarz Preamp	TS-PR18	082001/003	15 Dec 2008
Agilent Variable Power Supply	E3631A	KR01128922	20 Nov 2009
Thermotron Thermal Chamber	SM-32C	13264	15 Nov 2007
OML WR28 26 to 40GHz Mixer	M28HWD	Ka91124-1	24 Nov 2009

\*Test receiver included an upgrade with an internal oscillator which was used with the mixer to make measurements from 26 – 40GHz.

\*\*Used for a receiving antenna

\*\*\*Used for a transmitting antenna

## **3.0 Test Results**

### 3.1 Peak Transmit Power

Test: FCC §2.1046 and §90.205

Test Result: *Complies* Date: 20 Nov 2009

#### 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 meter through appropriate attenuators.

#### Test Results

Channel	Frequency (GHz)	Output Power dBm	Limit dBm	Result
40	4.96	22.26	33.00	PASS
80	4.98	23.14	33.00	PASS

**3.2 Power Spectral Density**

Test: FCC §2.1046 and §90.205

Test Result: *Complies* Date: 2 Dec 2009**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 Results**

Channel	Frequency (GHz)	Peak Power Spectral Density dB/MHz	Limit dB/MHz	Result
40	4.96	19.64	21.00	PASS
80	4.98	20.11	21.00	PASS



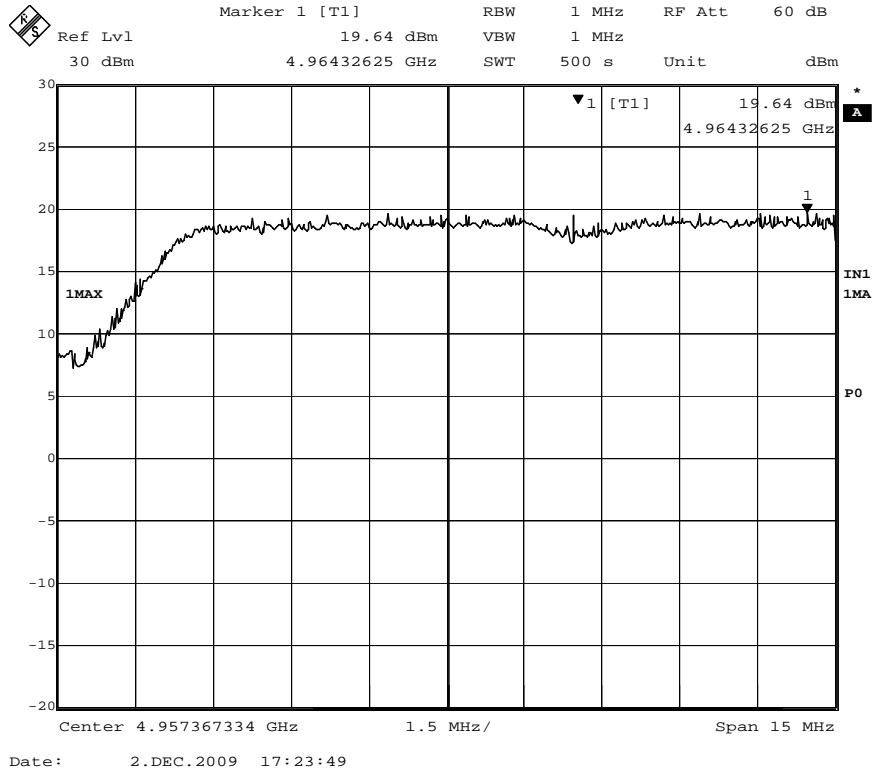


Figure 1 - Power Spectral Density, Channel 40

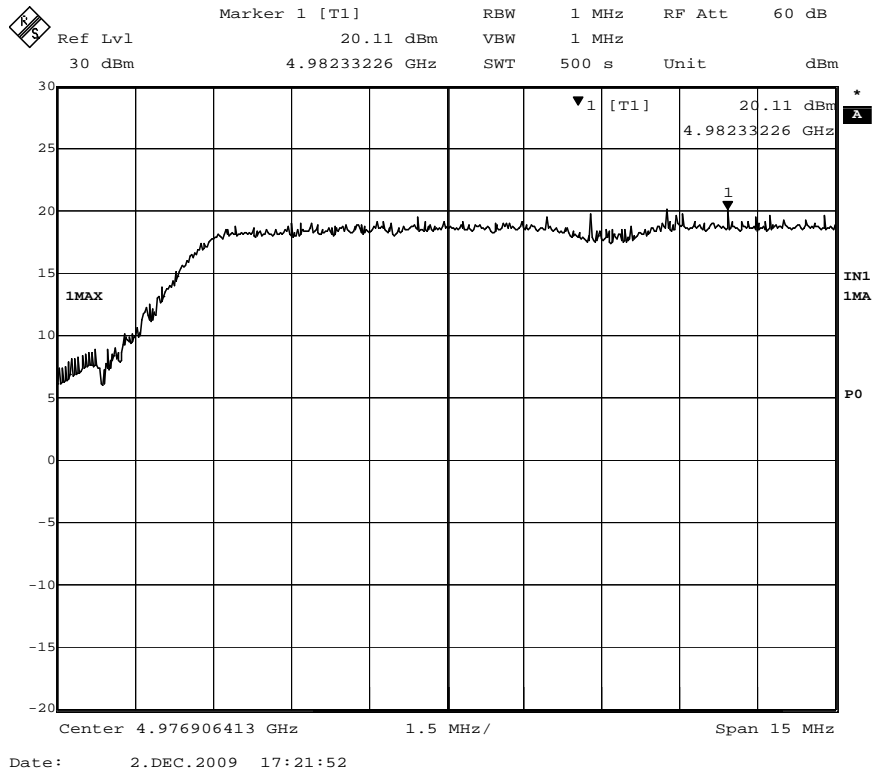


Figure 2 - Power Spectral Density, Channel 80

**3.3 Occupied Bandwidth**

Test: FCC §2.1049, §90.209, §90.210

Test Result: *Complies* Date: 30 Dec 2009**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 Results**

Channel	Frequency (GHz)	Emission Bandwidth (MHz)	Max Limit (MHz)	Result
40	4.96	30.81	50.00	PASS
80	4.98	31.46	50.00	PASS

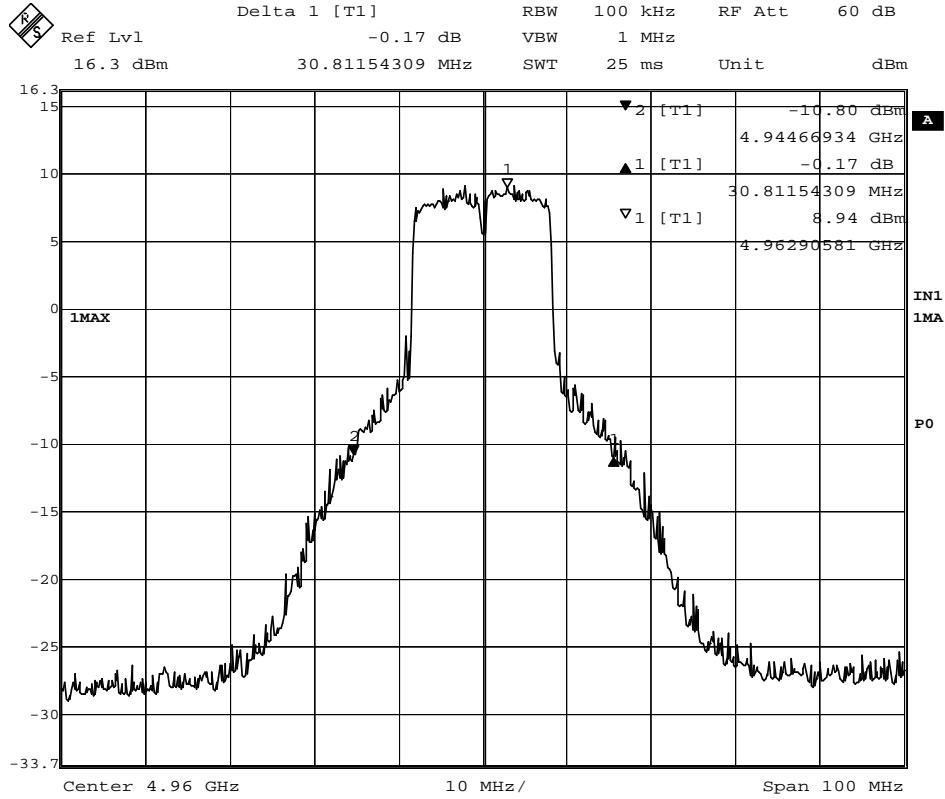


Figure 3 – Occupied Bandwidth, Channel 40

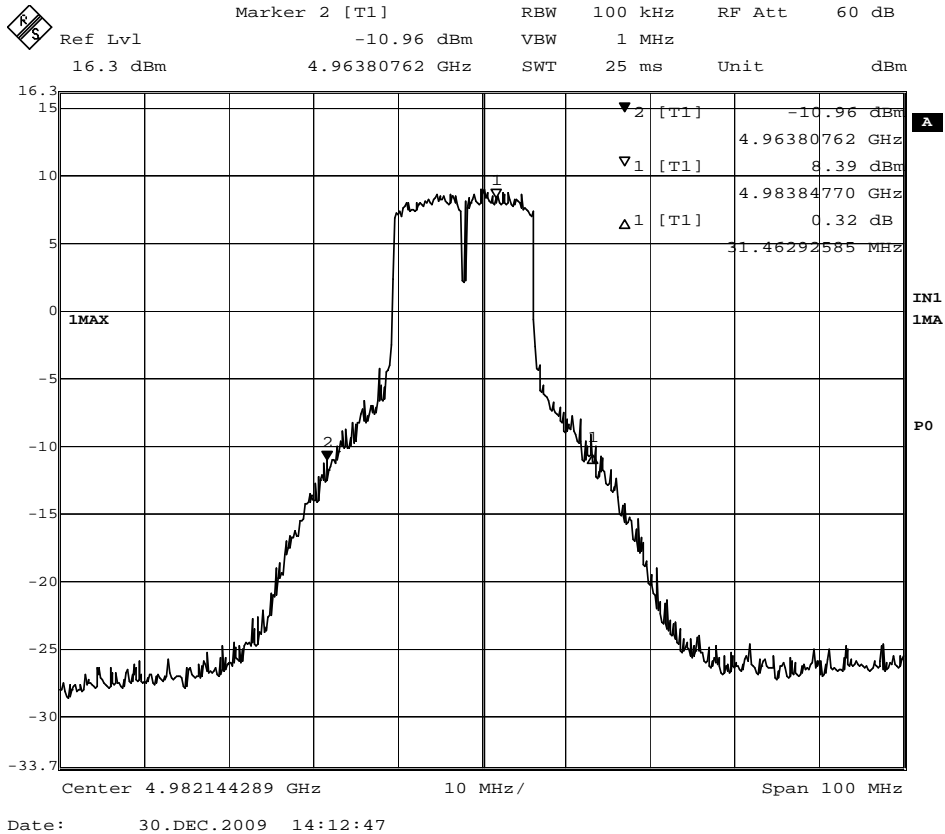


Figure 4 - Occupied Bandwidth, Channel 80

### 3.4 Emissions and emissions limitations to §90.210

Test: FCC §2.1051 and §90.210

Result: *Complies* Date: 2 Dec 2009

#### Test Description

On any frequency removed from the center of the assigned channel by more than 150 percent at least:  $53 + 10 \log (P) \text{ dB} = -34.40\text{dBm}$ . Emissions must also comply with Mask M from Part 90.210.

#### 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 300 kHz. Sufficient scans were taken to show any out of band emissions up to 40GHz. The test setup can be seen in Figures 2 through 4 of appendix A.

#### Test Results

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

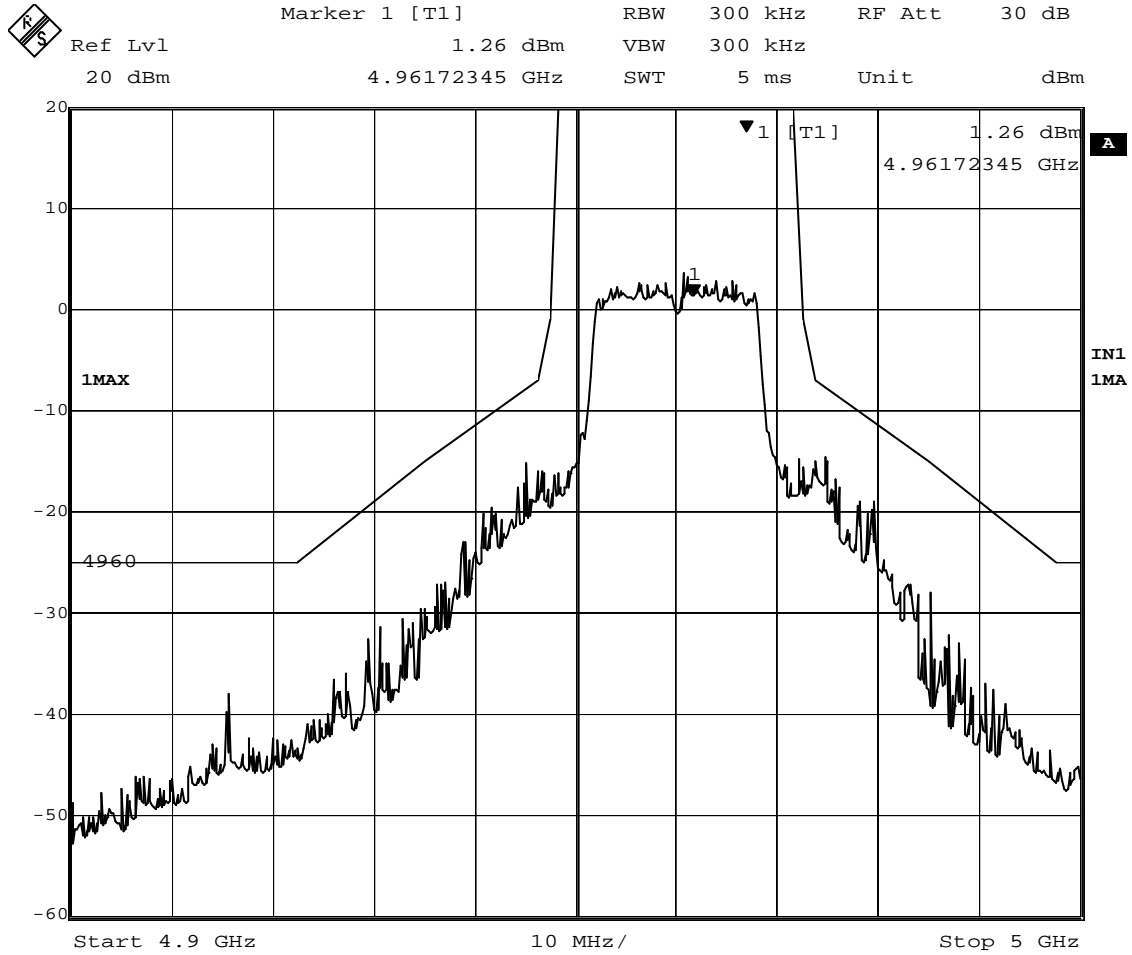
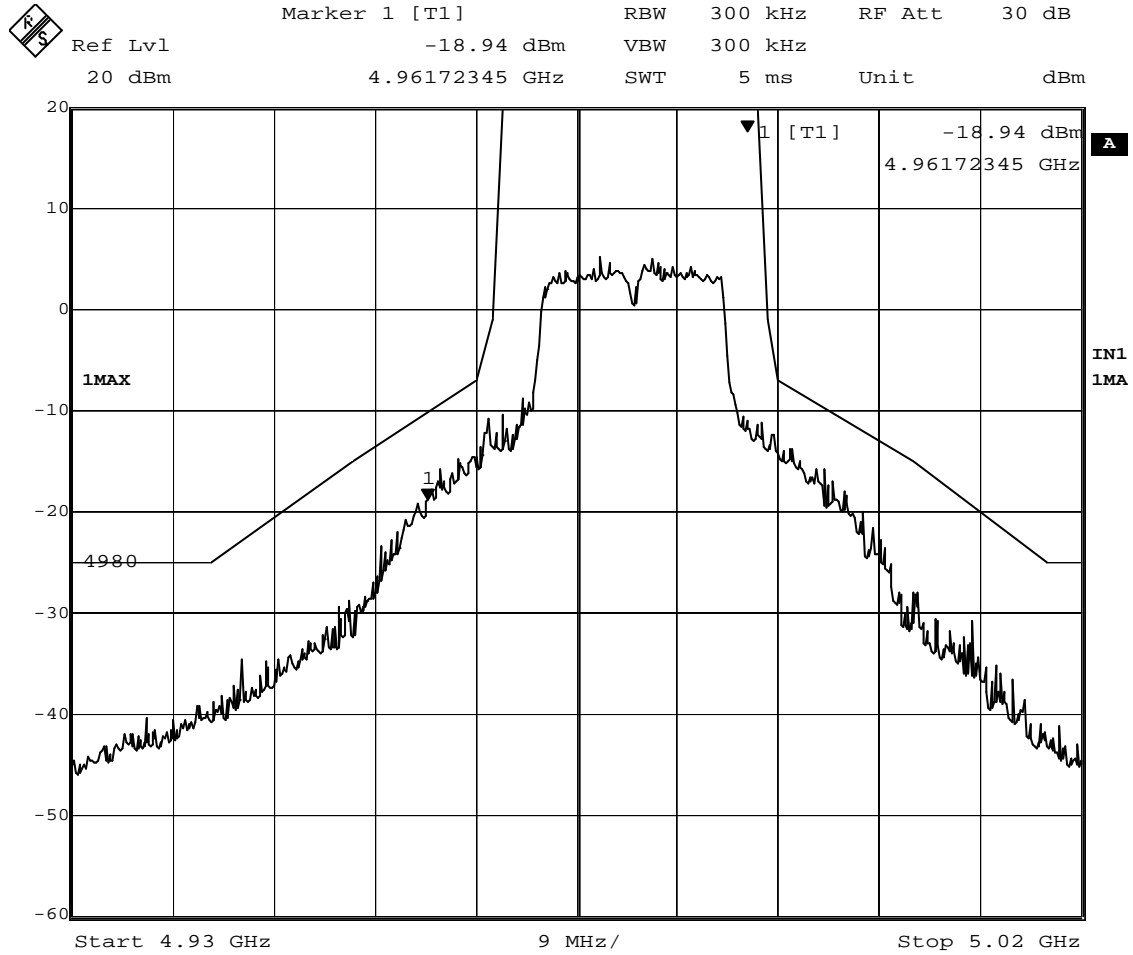


Figure 5 - Mask M, Channel 40



Date: 7.DEC.2009 17:46:15

Figure 6 - Mask M, Channel 80

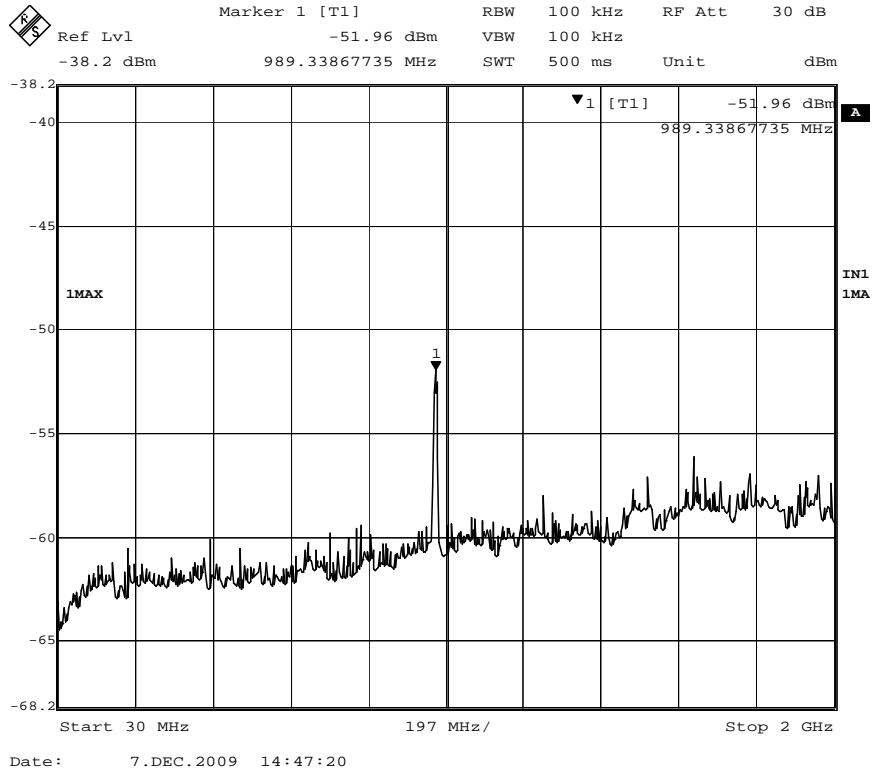


Figure 7 - Channel 40, 30MHz - 2GHz

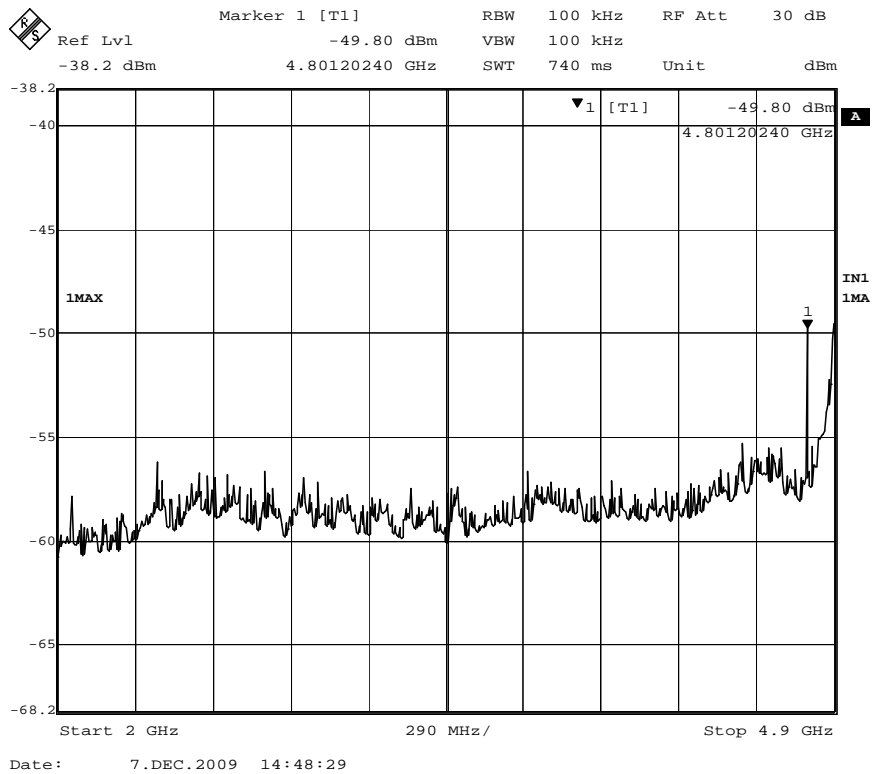


Figure 8 - Channel 40, 2.0GHz - 4.9GHz

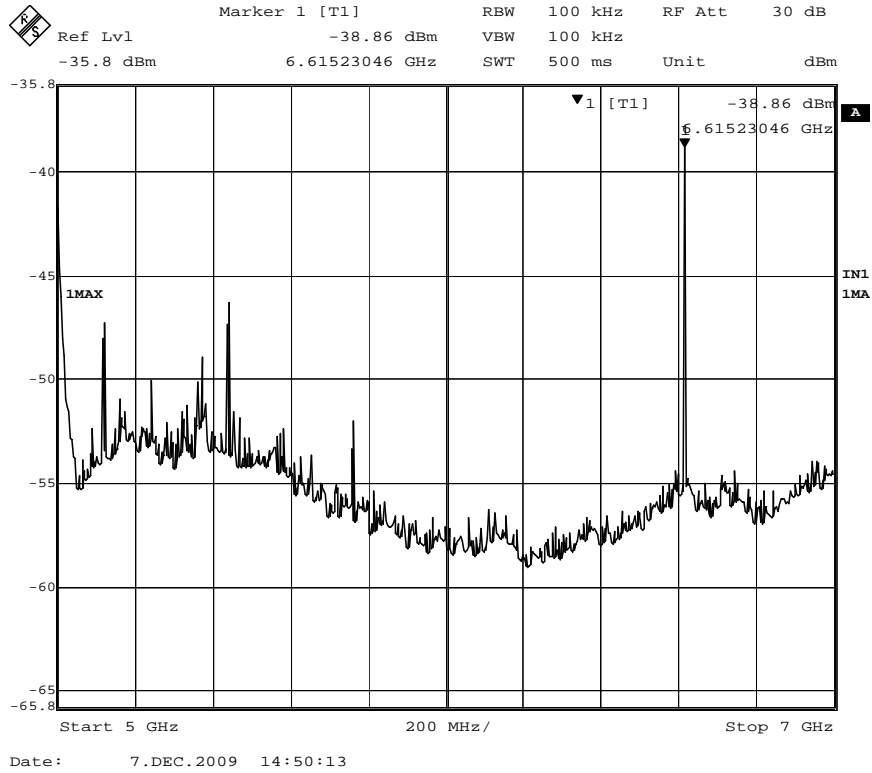


Figure 9 - Channel 40, 5GHz - 7GHz

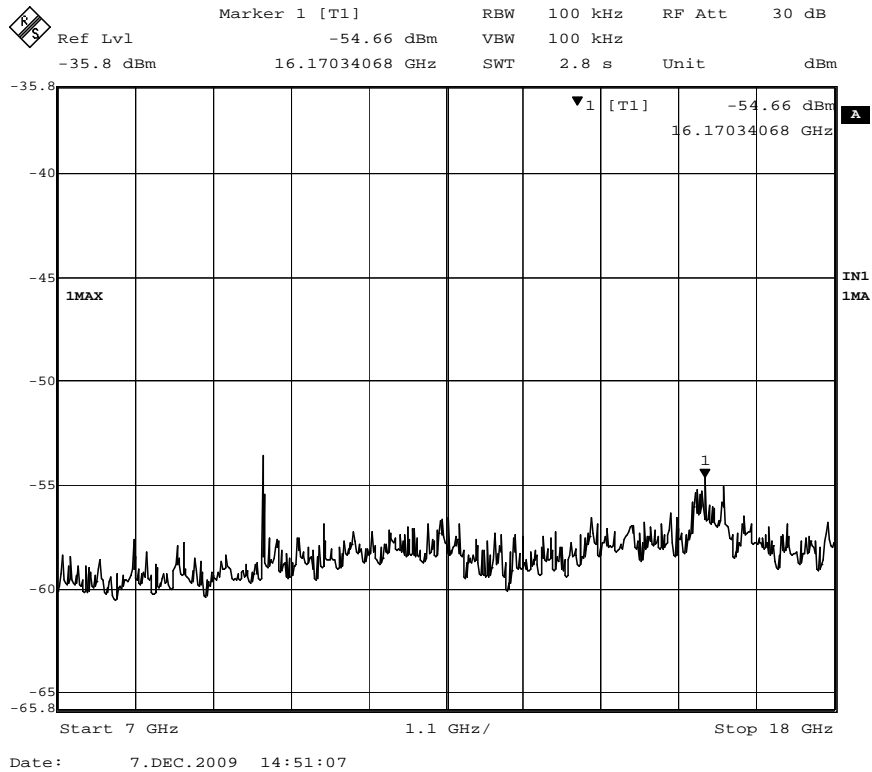


Figure 10 - Channel 40, 7GHz - 18GHz



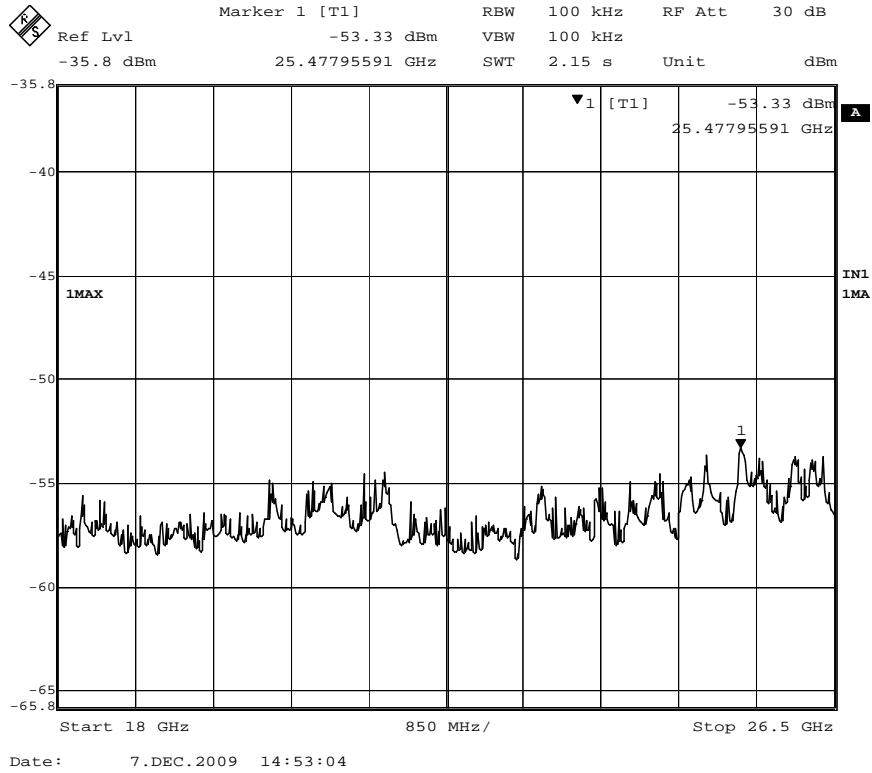


Figure 11 - Channel 40, 18GHz - 26.5GHz

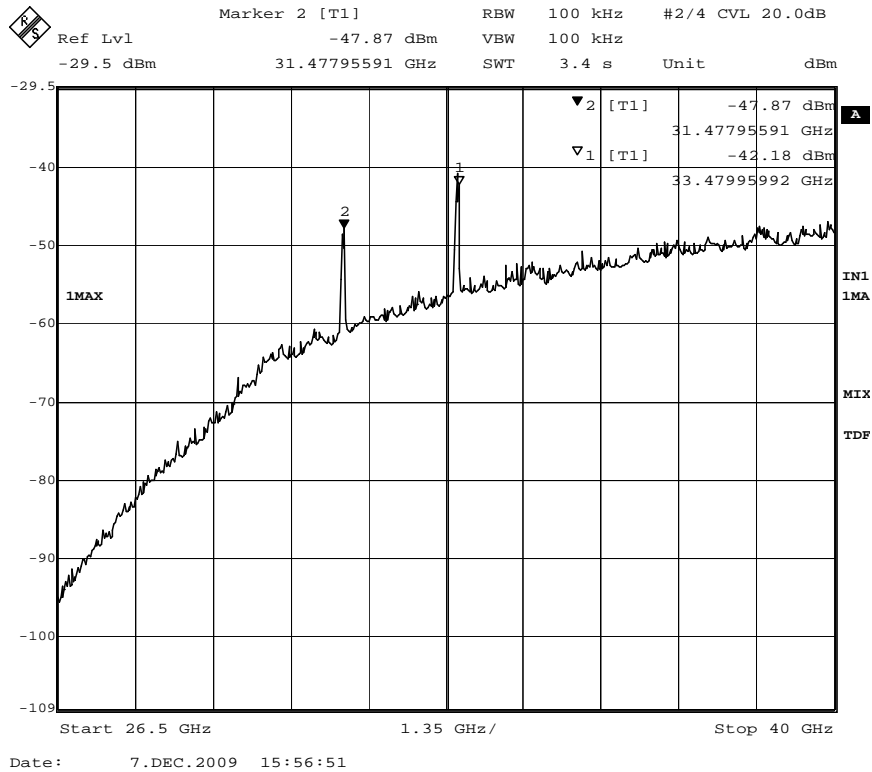


Figure 12 - Channel 40, 26.5GHz - 40GHz

\*includes correction factor from external mixer

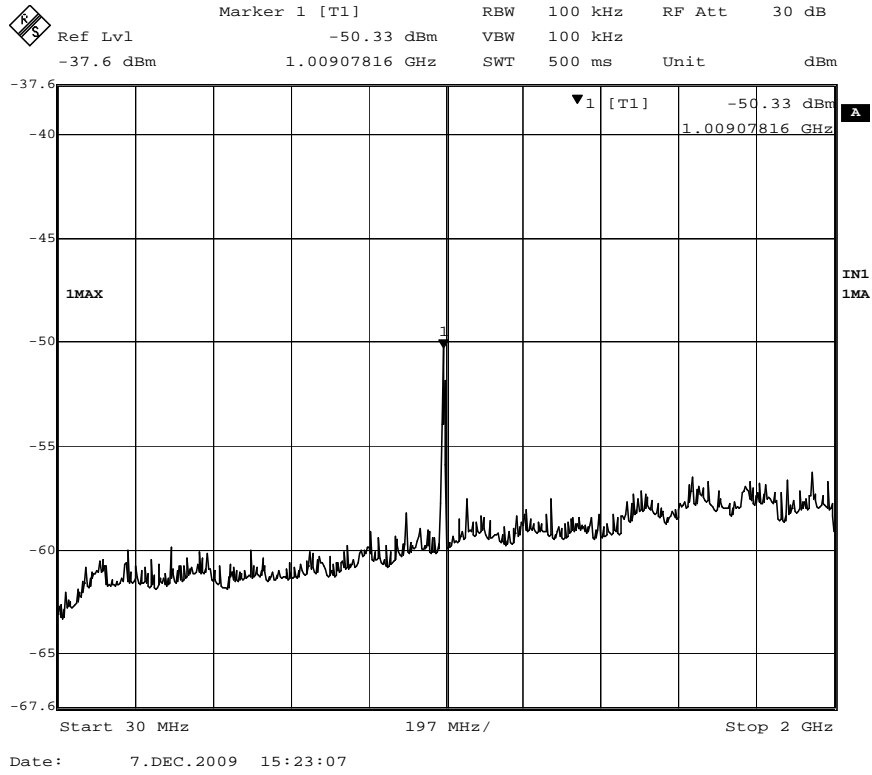


Figure 13 – Channel 80, 30MHz - 2GHz

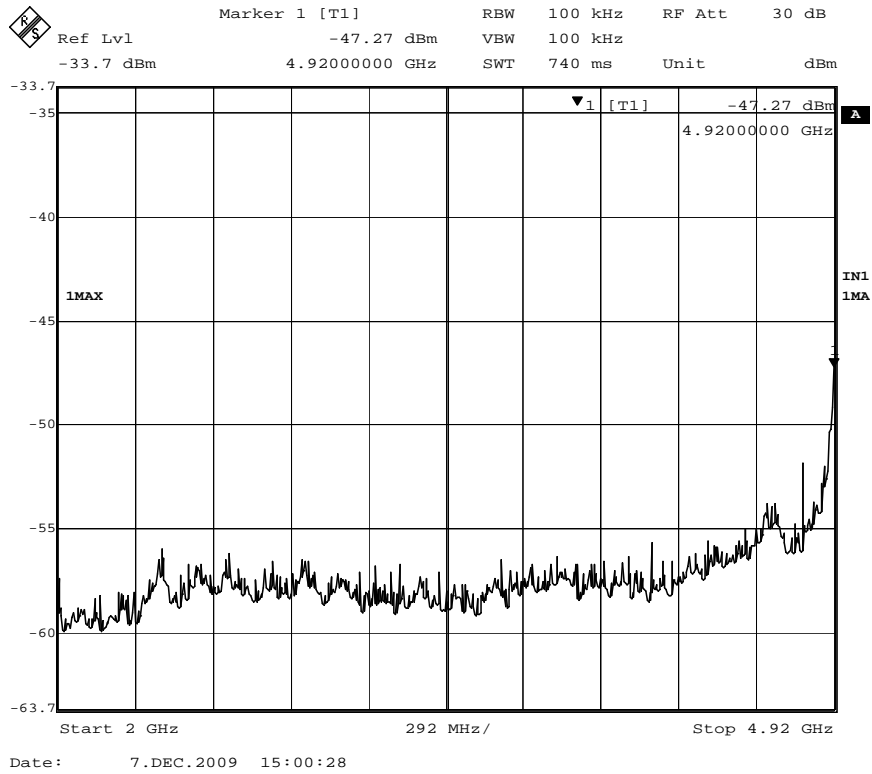


Figure 14 - Channel 80, 2GHz - 4.92GHz

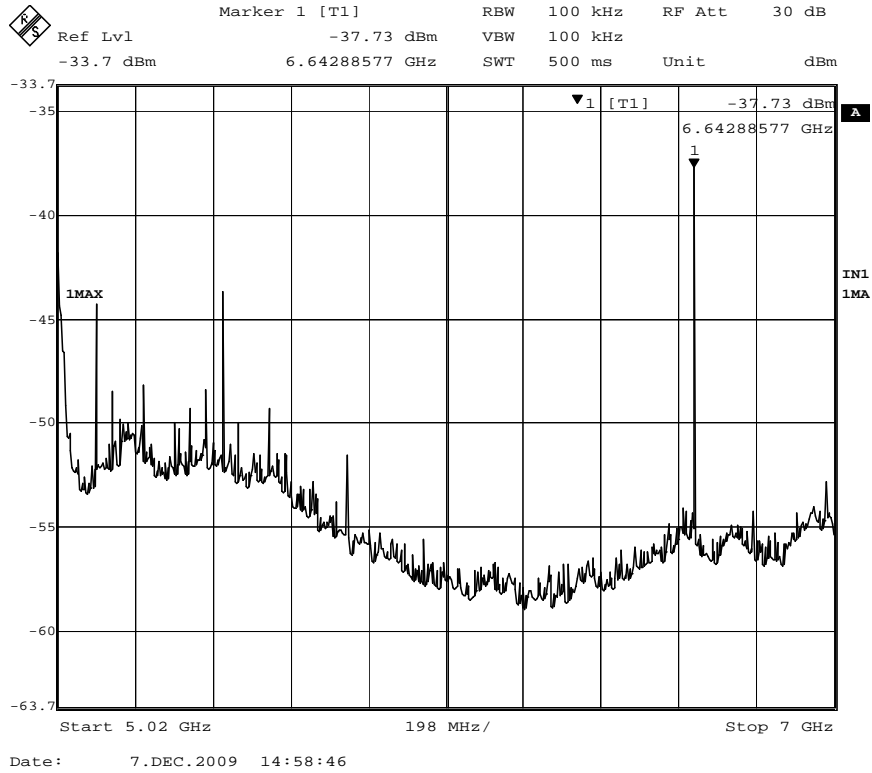


Figure 15 - Channel 80, 5.02GHz - 7GHz

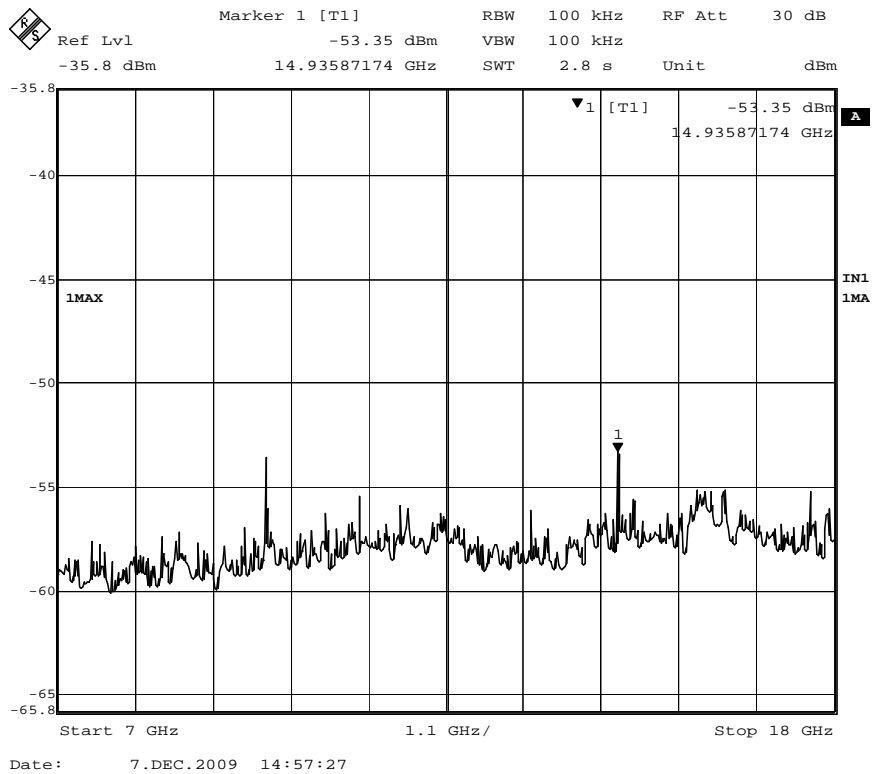


Figure 16 - Channel 80, 7GHz - 18GHz

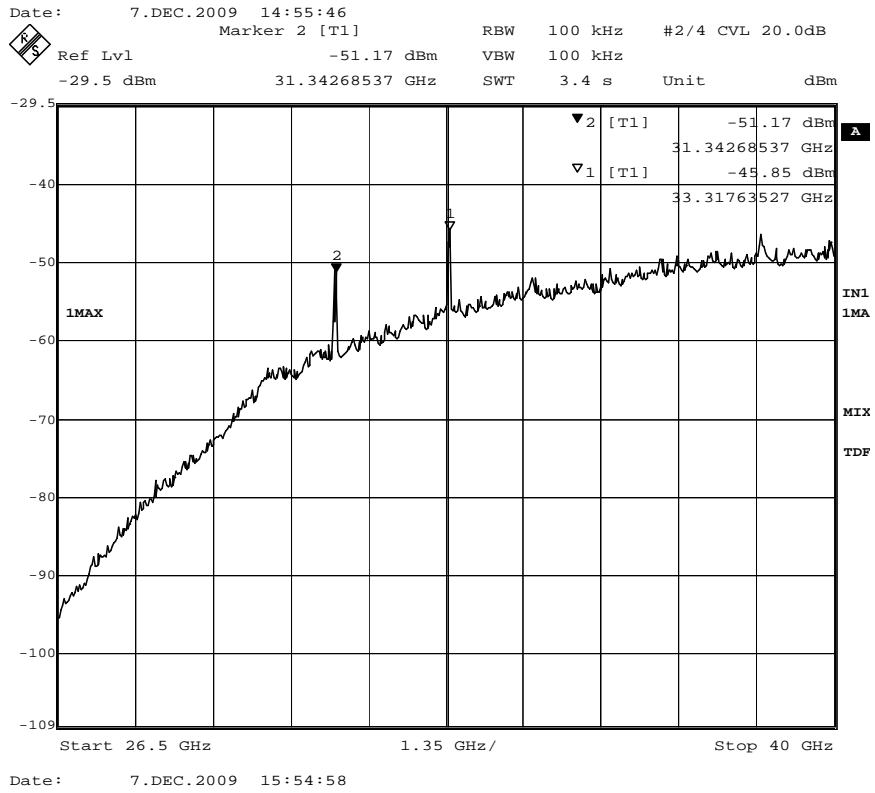
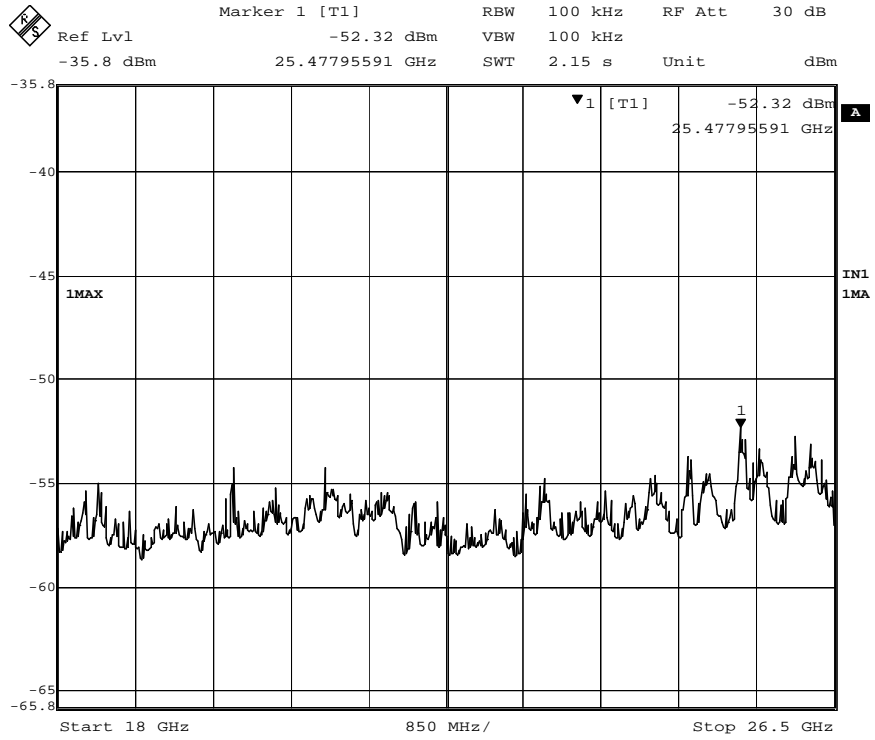


Figure 17 - Channel 80, 26.5GHz - 40GHz

\*includes correction factor from external mixer

### 3.5 Spurious Emission

Test: FCC §2.1053 and §90.210

Result: *Complies* Date: 20 Nov 2009

#### Test Description

The measurement antenna was placed at a distance of 10 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 40GHz 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.

#### 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  $40 \pm 5\%$

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

See following table

## Radiated Spurious Emission, Substitution Method Measurements

Frequency	Pre-scan Level	Antenna Height	Angle	Pol.	Signal Generator Level	Transmit Antenna Factor	Level	Limit	Margin
MHz	dBm	cm	deg.		dBm	dB	dBm	dBm	
494.98	-60.94	133	200	H	-20.59	18.50	-39.09	-13.45	25.64
527.98	-59.06	149	158	H	-20.98	19.30	-40.28	-13.45	26.83
923.98	-59.29	99	0	H	-22.1	23.90	-46.00	-13.45	32.55
1452.00	-50.61	100	5	H	0.41	25.20	-24.79	-13.45	11.34
9920.00	-41.40	99	140	V	21.56	38.10	-16.54	-13.45	3.09
Channel 80									
494.98	-47.98	163	206	H	-17.71	18.50	-36.21	-13.45	22.76
527.98	-45.62	150	157	H	-16.87	19.30	-36.17	-13.45	22.72
560.98	-43.25	150	171	H	-17.81	19.50	-37.31	-13.45	23.86
1452.00	-50.86	100	5	H	5.31	25.20	-19.89	-13.45	6.44
9960.00	-41.70	99	198	V	23.01	38.10	-15.09	-13.45	1.64

## Notes:

1. Cable factor from signal generator to transmit antenna is less than 1dB.
2. Antenna and cable factor for the receiving antenna are taken into account in the pre-scan level.
3. Limit =  $10 \log (\text{TXpwr in Watts}/0.001)$

### 3.6 Carrier Frequency Stability

Test: FCC §90.213

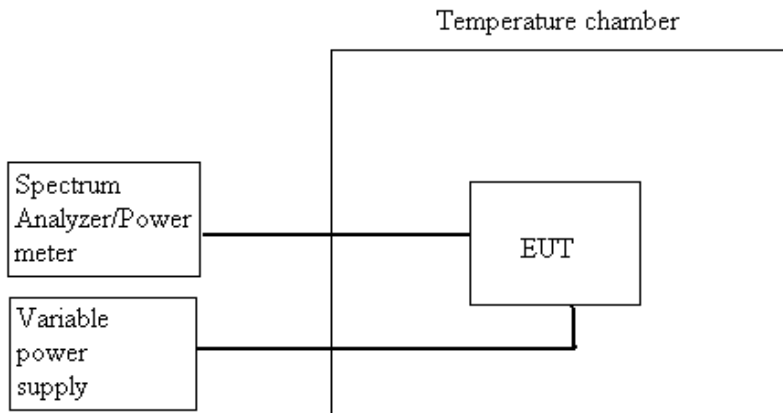
Test Method: TIA-603-C, Section 3.2.2

Result: *Complies*

Date: 20 Nov 2009

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 – 4980.494MHz

See the standard for test procedures.

## Test Results:

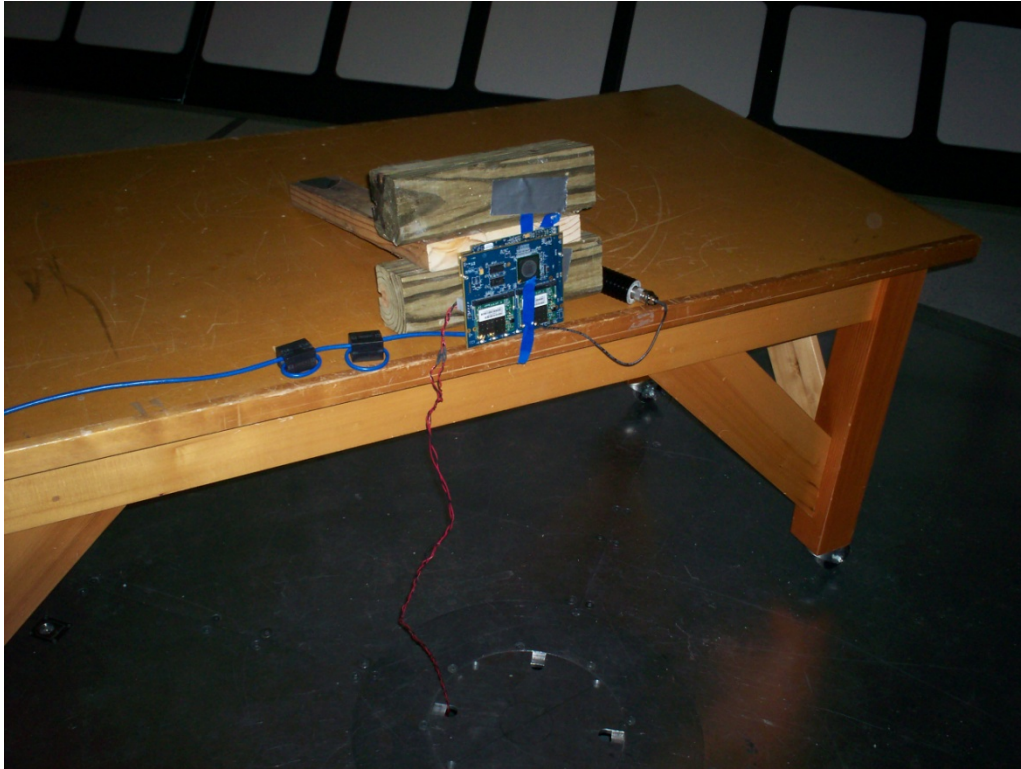
Ambient temperature: 22degC

Relative Humidity: 45%

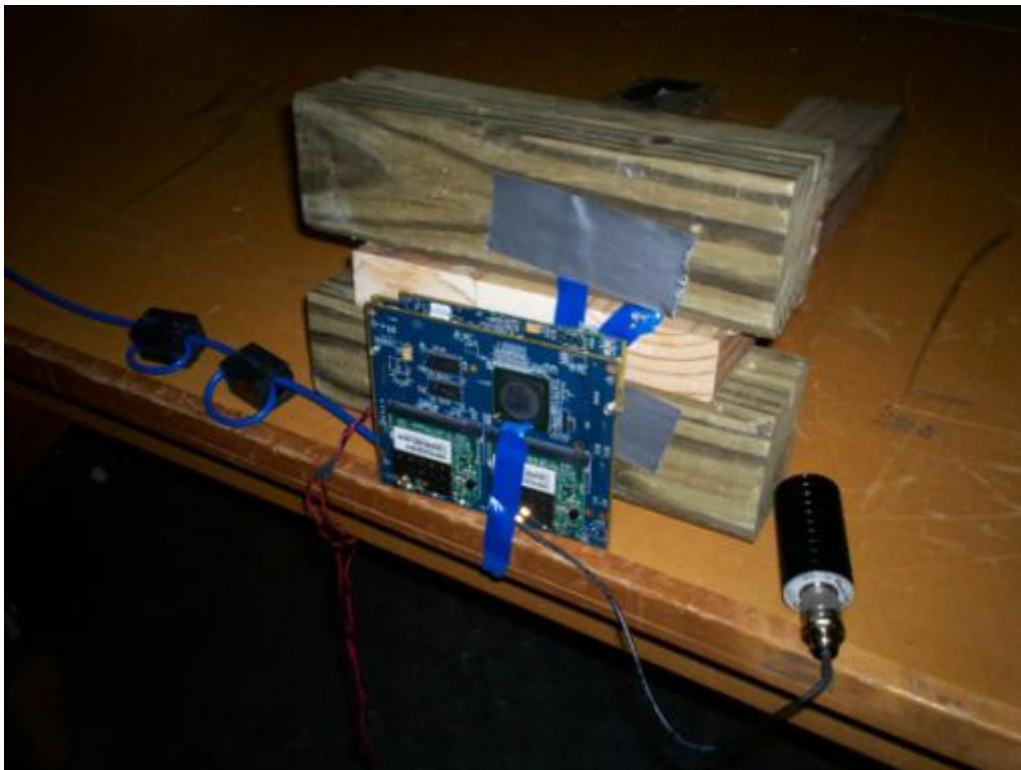
Test conditions		Frequency (MHz)	
		Channel 40	Channel 80
Temperature	Input Voltage (VDC)	Frequency (MHz)	Frequency (MHz)
-30°C	5.00	1960.14	1980.02
-30°C	5.25	1960.02	1980.03
-30°C	4.75	1960.01	1980.04
-20°C	5.00	1960.00	1980.01
-20°C	5.25	1959.11	1979.91
-20°C	4.75	1960.02	1980.01
-10°C	5.00	1960.12	1980.03
-10°C	5.25	1960.12	1980.02
-10°C	4.75	1960.89	1980.10
0°C	5.00	1959.89	1980.12
0°C	5.25	1960.10	1979.94
0°C	4.75	1960.01	1980.18
10°C	5.00	1960.09	1980.01
10°C	5.25	1960.02	1979.98
10°C	4.75	1960.03	1980.02
20°C	5.00	1960.00	1979.99
20°C	5.25	1959.87	1980.12
20°C	4.75	1960.02	1980.19
30°C	5.00	1960.02	1980.11
30°C	4.75	1960.01	1980.06
30°C	5.25	1960.03	1980.04
40°C	5.00	1959.99	1980.08
40°C	5.25	1960.00	1980.09
40°C	4.75	1960.13	1980.07
50°C	5.00	1960.50	1979.97
50°C	5.25	1960.17	1980.10
50°C	4.75	1960.10	1980.01



## **Appendix A: Test Photos**



**Figure 18 - Radiated Emissions Test Setup, with 50ohm Load on Antenna Output**



**Figure 19 - Radiated Emissions Test Setup, with 50ohm Load on Antenna Output**

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