DRAFT

REVISIONS				
ECO	REV	DESCRIPTION	DATE	APPROVED
E1215	**X1**	Initial Release	5/21/2009	

INTRODUCTION

This report contains the test data to show compliance with the sections of 47 CFR Parts 90 and 74 that were performed at GMS for the M2T1D3BX. The unit that was tested was S/N 121707-01 (102408-07). All but the Field Strength of Radiated Emissions test were performed at GMS.
The Field Strength of Radiated Emissions test was performed at Nemko USA inc. Engineering report ER0002 contains the test data for that test.

1. RF Power 2.1046

A. Part 74 (2025 – 2110 Mhz & 2450 – 2483.5 Mhz)

i. Applicable Specifications

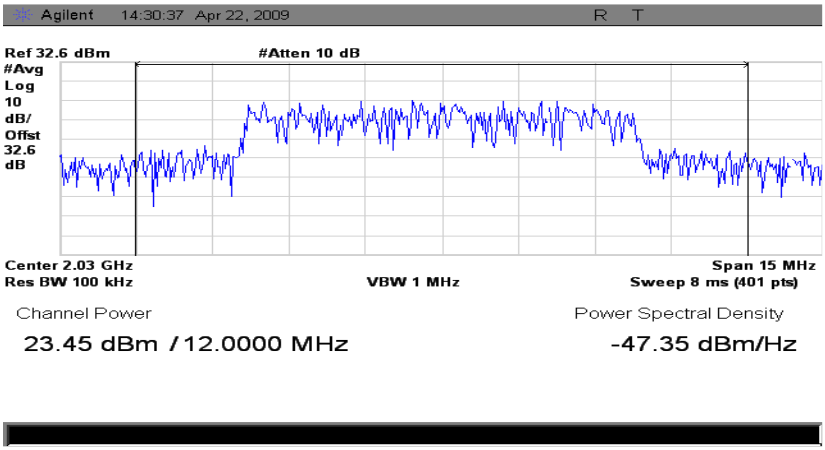
Part 74.636(a) 2,025 to 2,110 Mhz 12.0 Watts Maximum(40.8 dBm).
2,450 to 2483.5 Mhz 12.0 Watts Maximum(40.8 dBm).

ii. Measurement Frequencies

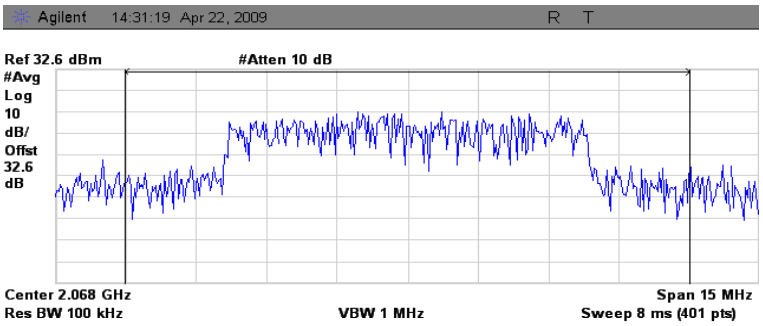
2.030 Ghz
2.068 Ghz
2.105 Ghz
2.455 Ghz
2.465 Ghz
2.475 Ghz

iii. Data

2.030 Ghz



2.068 Ghz



Channel Power

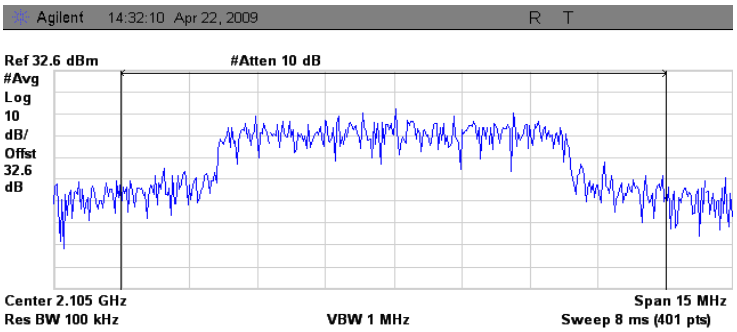
23.70 dBm / 12.0000 MHz

Power Spectral Density

-47.09 dBm/Hz

[redacted]

2.105 Ghz



Channel Power

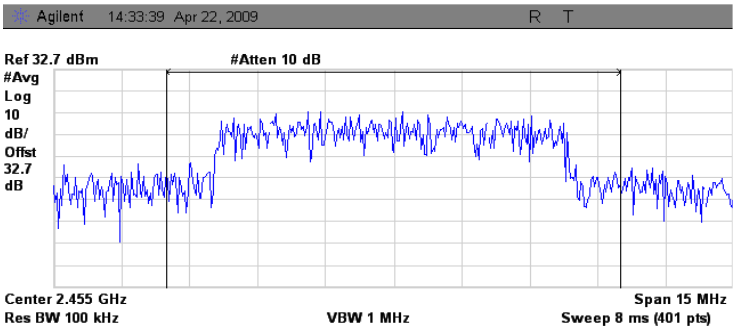
23.45 dBm / 12.0000 MHz

Power Spectral Density

-47.34 dBm/Hz

[redacted]

2.455 Ghz



Channel Power

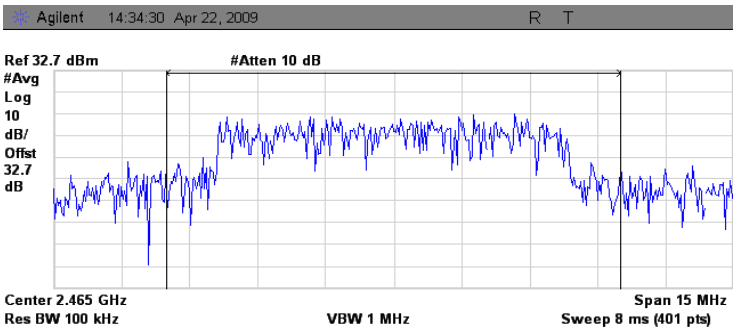
23.47 dBm / 10.0000 MHz

Power Spectral Density

-46.53 dBm/Hz

[redacted]

2.465 Ghz



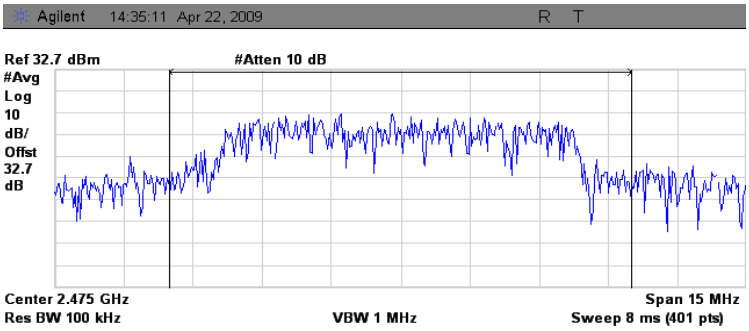
Channel Power

23.31 dBm / 10.0000 MHz

Power Spectral Density

-46.69 dBm/Hz

2.475 Ghz



Channel Power

23.31 dBm / 10.0000 MHz

Power Spectral Density

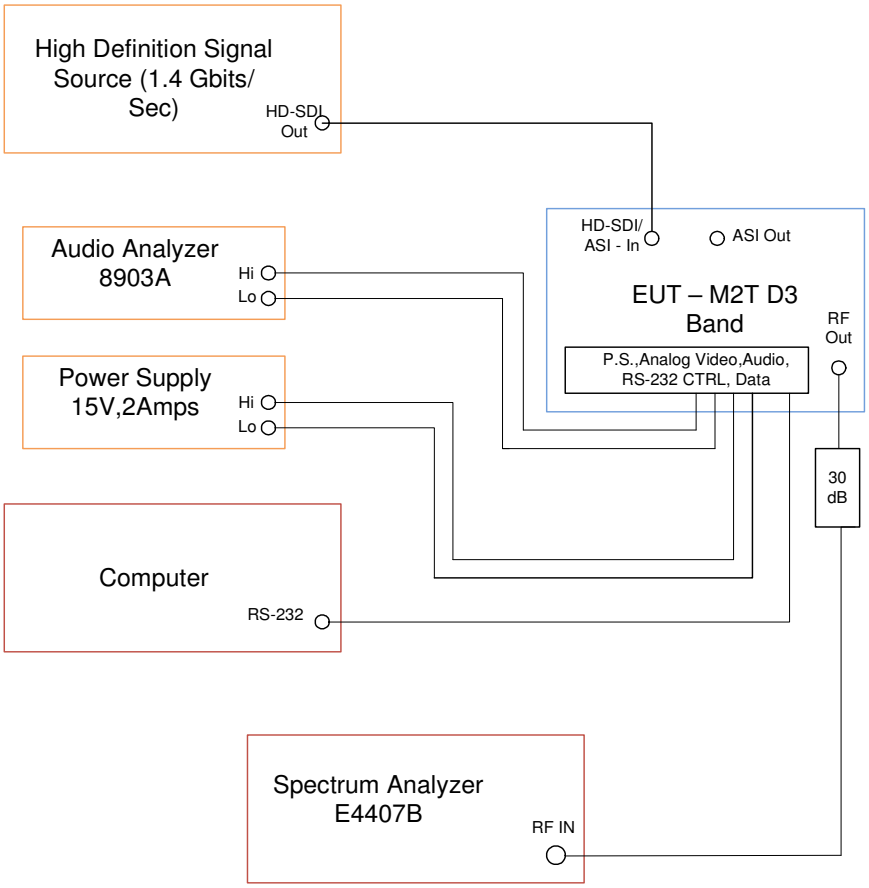
-46.69 dBm/Hz

iv. Summary

Frequency (Ghz)	RF Power Measure(dbm)	RF Power Spec.(dBm)	Comp. (Yes/No/NA)
2.03	23.45	40.8	Yes
2.068	23.7	40.8	Yes
2.105	23.45	40.8	Yes
2.455	23.47	40.8	Yes
2.465	23.31	40.8	Yes
2.475	23.31	40.8	Yes

v. Procedure

The M2T was connected to the instruments and the computer as per the figure below.
The power supply was set to 12 volts with a current limit of 3 Amps. The Transmitter was set via the GUI (see operation manual) to the settings listed below in the instrument setup figure.



M2T
Modulation: 16 QAM
FEC: ½
COFDM Carriers: 2K
COFDM BW:8K
Input Mode:SDI
Group Name: 1080i
Audio Enable: On
Audio Mute:Unmute
Audio Level:Line
Audio Gain: 50

B. Part 90 (2450 – 2483.5 Mhz)

i. Applicable Specification

Part 90.205(n) 2450–2483.5 MHz. The maximum transmitter power is 5 watts(37 dBm).

ii. Measurement Frequencies

2.455 Ghz
2.465 Ghz
2.475 Ghz

iii. Data

See data from 1 A iii.

iv. Summary

Frequency (Ghz)	RF Power Measure (dBm)	RF Power Spec. (dBm)	Comp. (Yes/No/NA)
2.455 Ghz	23.47	37 dBm	Yes
2.465 Ghz	23.31	37 dBm	Yes
2.475 Ghz	23.31	37 dBm	Yes

v. Procedure

See 1 A v.

2. Modulation Characteristics 2.1047

A. Part 74 (2025 – 2110 Mhz & 2450 – 2483.5 Mhz)

i. Applicable Specification

None.

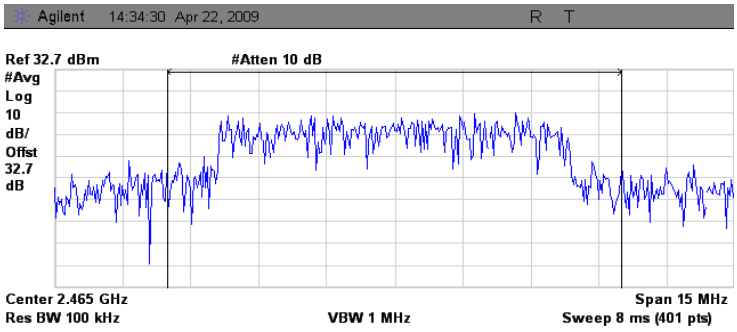
ii. Measurement Frequency

2.465 Mhz

iii. Data

The modulation is COFDM **DVB_T** 8Mhz with 2K carriers.

2.465 Ghz



iv. Summary

Not applicable.

v. Procedure

See 1 A v.

B. Part 90 (2450 – 2483.5 Mhz)

i. Applicable Specifications

Part 90.207(n) ***Other emissions. Requests for emissions other than those listed in paragraphs (c) through (e) of this section will be considered on a case-by-case basis to ensure that the requested emission will not cause more interference than other currently permitted emissions.***

Part 90.209(a) ***Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant. In those cases where § 2.202 of this chapter does not provide a formula for the computation of necessary bandwidth, the occupied bandwidth, as defined in part 2 of this chapter, may be used in lieu of the necessary bandwidth.***

ii. Measurement Frequency

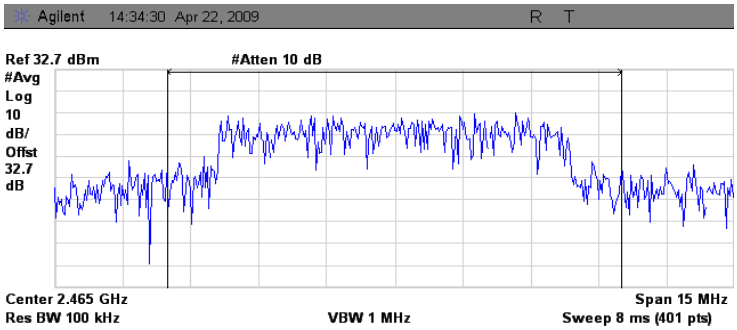
2.465 Ghz

iii. Data

1. 90.207(n)

The modulation is COFDM **DVB_T** 8Mhz with 2K carriers.

2.465 Ghz



2. 90.209(a)

The Emission Designator is **7M68D7W.**

iv. Summary

Not applicable.

v. Procedure

1. 90.207(n)

See 1 A v.

2. 90.209(a)

The Emission Designator, **7M68D7W,** is calculated as follows:

Necessary Bandwidth + Emission Class

Necessary Bandwidth:

The highest bandwidth of emissions from the M2T is with it configured in DVB-T 8 Mhz mode with 2K carriers. For DVB-T 8 Mhz with 2K carriers the necessary bandwidth is equal to (NS+16.25)*CS. Where NS is equal to the number of carriers(DVB-T 2K mode NS equals 1705) and CS is equal to the carrier spacing (DVB-T 2K, 8 Mhz the CS is equal to 1/224usec).

Bn = (1705+16.25)*(1/224usec) = 7.68 Mhz, **7M68**

Note: This formula (NS+16.25)*CS was taken from NTIA TR-84-168 Annex J

Emission Class (from Part 2.201):

2.201(c) **First Symbol—*types of modulation of the main carrier:***

2.201(c)(4) Emission in which the main carrier is amplitude and angle modulated either simultaneously or in a pre-established sequence .. D

2.201(d) **Second Symbol—*nature of signal(s) modulating the main carrier:***

2.201(d)(5) Two or more channels containing quantized or digital information 7

2.201(e) **Third Symbol—*type of information to be transmitted:*** 2

2.201(e) (8) Combination of the above ..... W

3. Occupied Bandwidth 2.1049

A. Part 74 (2025 – 2110 Mhz & 2450 – 2483.5 Mhz)

i. Applicable Specification

1. 2025 – 2110 Mhz

74.637(g) 1,990 to 2,110 ..... 18(Mhz)

2. 2450 – 2483.5 Mhz

None.

ii. Measurement Frequency

1. 2025 – 2110 Mhz

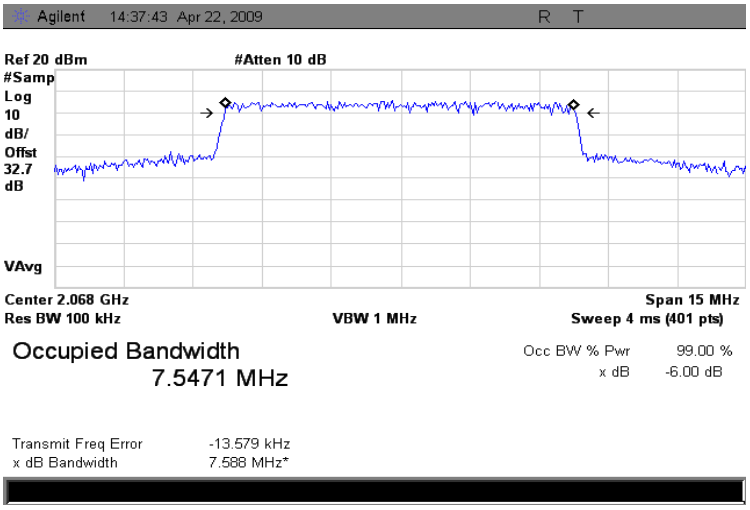
2.068 Ghz

2. 2450 – 2483.5 Mhz

None.

iii. Data

1. 2.068 Ghz



2. None

iv. Summary

1. 2025 – 2110 Mhz

Frequency (Ghz)	Occ. BW Meas. (Mhz)	Occ. BW Spec. (Mhz)	Comp. (Yes/No/NA)
2.068 Ghz	7.5471	18	Yes

2. 2450 – 2483.5 Mhz

None.

v. Procedure

See 1 A v.

B. Part 90 (2450 – 2483.5 Mhz)

i. Applicable Specification

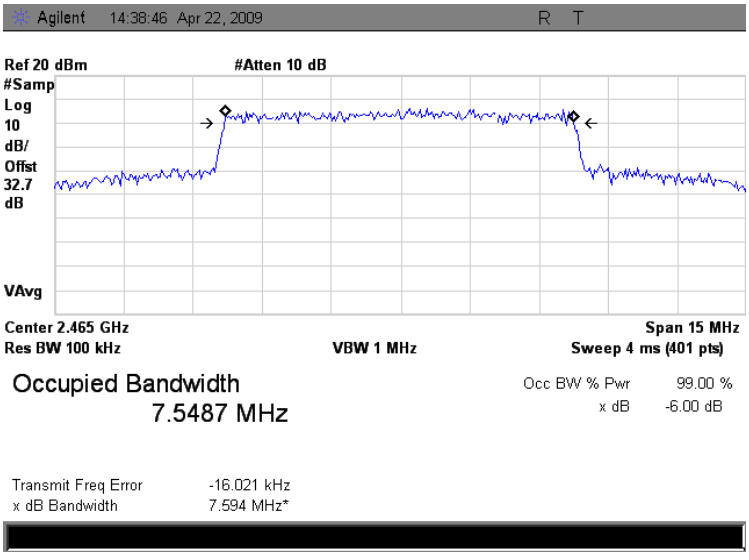
90.209(b)(5)STANDARD CHANNEL SPACING/BANDWIDTH—2450–2483.5 2. 2 Bandwidths for radiolocation stations in the 420–450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis.

ii. Measurement Frequency

2.465 Ghz

iii. Data

a. 2.465 Ghz



iv. Summary

N/A

v. Procedure

See 1 A v.

4. Spurious Emissions at Antenna Terminals 2.1051

A. Part 74 (2025 – 2110 Mhz & 2450 – 2483.5 Mhz)

i. Applicable Specification

From FCC 02-298:
For digital modulation in all TV BAS frequency bands below 15 GHz, to apply the emission mask for digital modulation in Section 101.111(a)(2)(i);

101.111 Emission limitations. (a)(2)(i) For operating frequencies below 15 GHz, in any 4 KHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 50 decibels:

A = 35 + 0.8(P -50) + 10 Log10 B.
(Attenuation greater than 80 decibels or to an absolute power of less than -13 dBm/1MHz is not required.)

where:
A = Attenuation (in decibels) below the mean output power level.
P = Percent removed from the center frequency of the transmitter bandwidth.
B = Authorized bandwidth in MHz.

74.637(a)(2)(iii) In any 4 kHz reference bandwidth (BREF), the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth:

At least 43 +10 Log10(PMEAN in watts) decibels, or 80 decibels, whichever is the lesser attenuation.

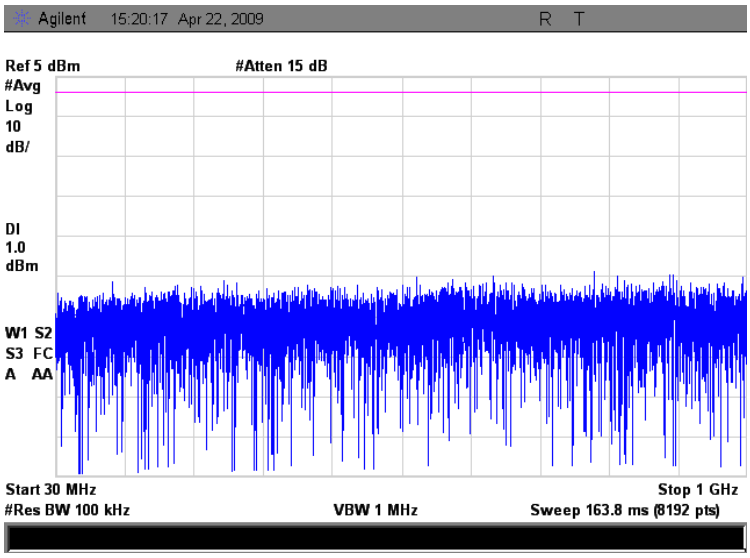
The Measurement BW is equal to 12 Mhz due to the smallest channel spacing.
The limit lines are tabulated below using a 12 Mhz BW.

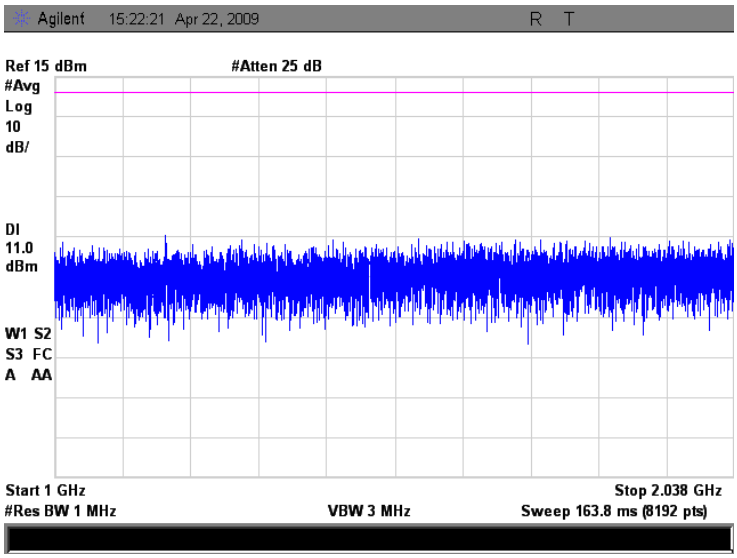
Interval Start	Interval Stop	Spec. Line	Computation	Resolution BW
30 Mhz	1000 Mhz	+1 dBm	-13 dBm/4khz	100 khz
1000 Mhz	2.038 Ghz	+11 dBm	-13 dBm/4khz	1 Mhz
2.038 Ghz	2.056 Ghz	-38.23 dBm	-13 dBm/1Mhz	3 Khz
2.056 Ghz	2.05972 Ghz	-38.23 dBm	-13 dBm/1Mhz	3 Khz
2.05972 Ghz	2.06137 Ghz	(Pwr-(35+0.8(%BW-50)+10Log(BW(Mhz)))-1.25) dBm		3 Khz
2.06137 Ghz	2.062 Ghz	(Pwr. - 50) dBm		3 Khz
2.062 Ghz	2.074 Ghz	(Pwr - 0) dBm		3 Khz
2.074 Ghz	2.07463 Ghz	(Pwr. - 50) dBm		3 Khz
2.07463 Ghz	2.08228 Ghz	(Pwr-(35+0.8(%BW-50)+10Log(BW(Mhz)))-1.25) dBm		3 Khz
2.08228 Ghz	2.080 Ghz	-38.23 dBm	-13 dBm/1Mhz	3 Khz
2.080 Ghz	2.098 Ghz	-38.23 dBm	-13 dBm/1Mhz	3 Khz
2.098 Ghz	5.000 Ghz	+11 dBm	-13 dBm/4khz	1 Mhz
5.000 Ghz	10.000 Ghz	+11 dBm	-13 dBm/4khz	1 Mhz
10.000 Ghz	15.000 Ghz	+11 dBm	-13 dBm/4khz	1 Mhz
15.000 Ghz	18.000 Ghz	+11 dBm	-13 dBm/4khz	1 Mhz
18.000 Ghz	20.98 Ghz	+11 dBm	-13 dBm/4khz	1 Mhz

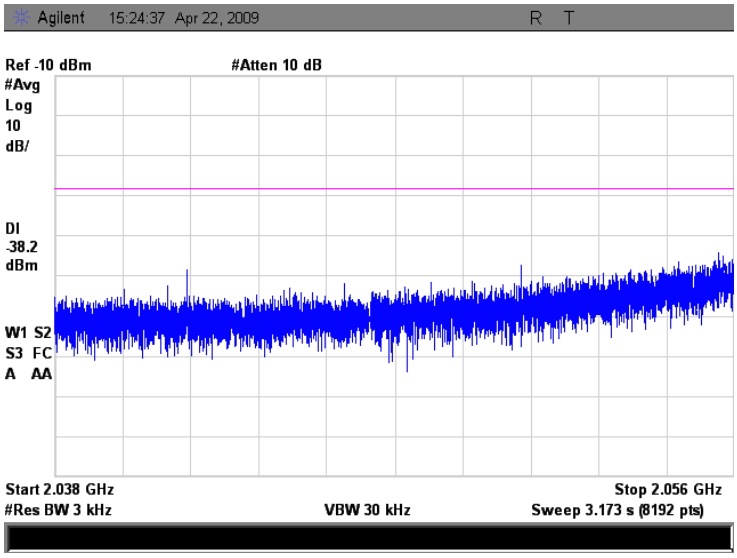
ii. Measurement Frequency

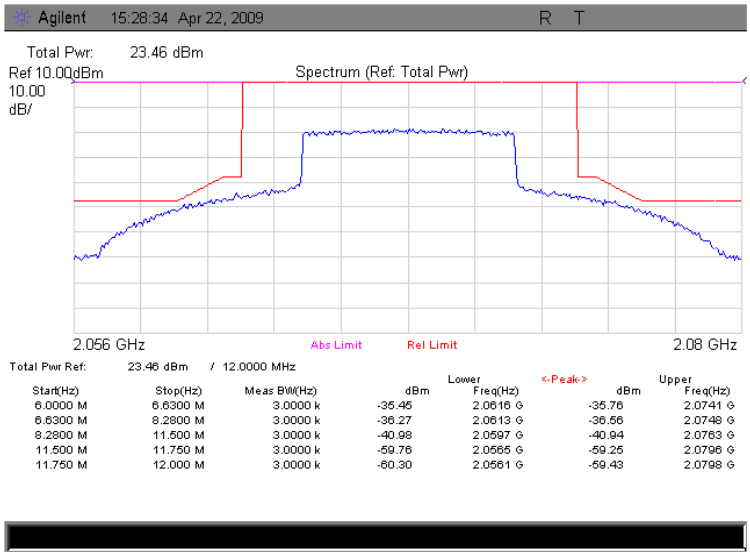
2.068 Ghz

iii. Data









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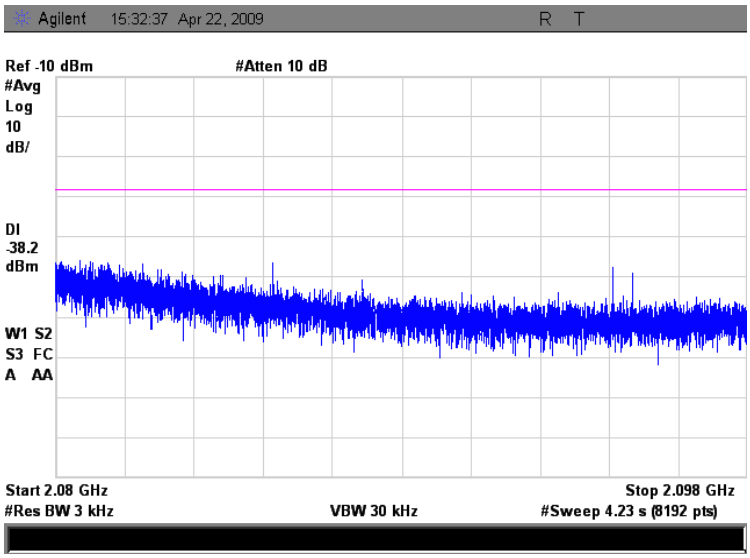

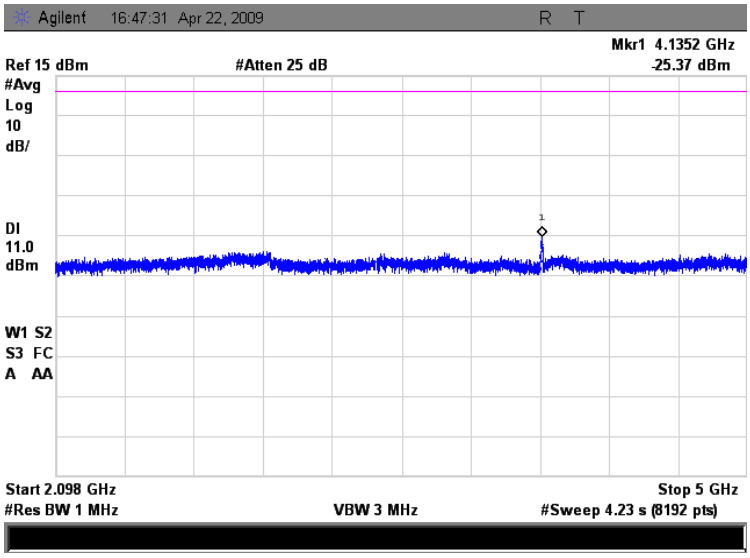

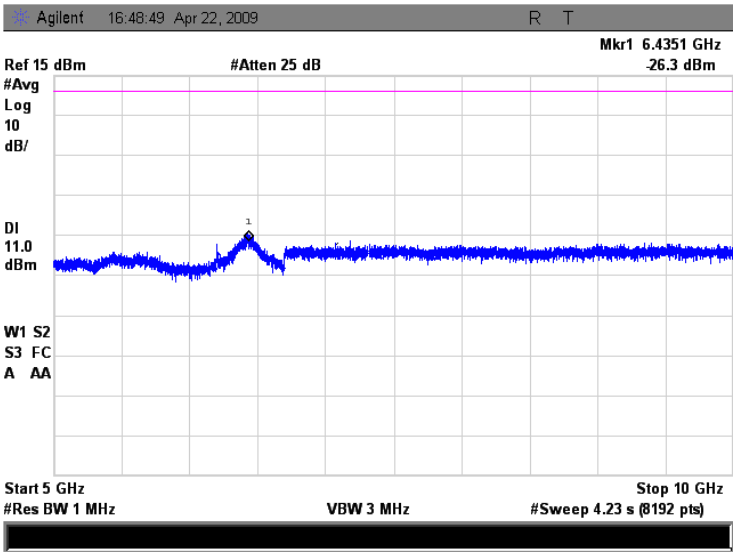

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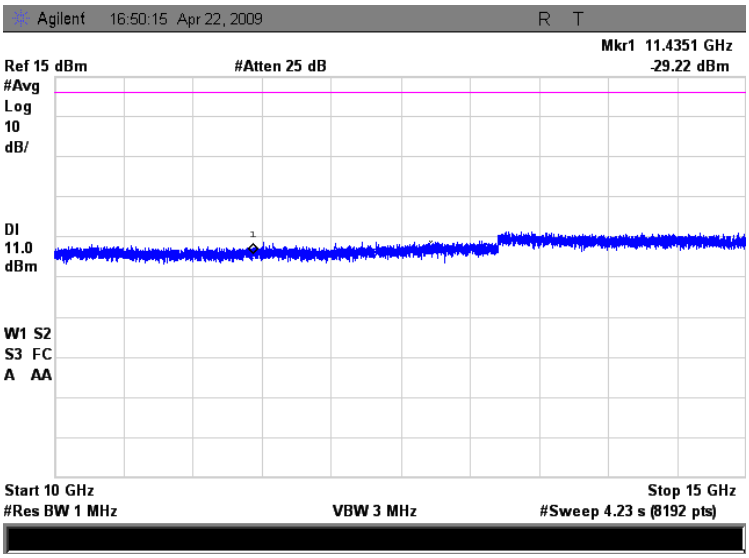
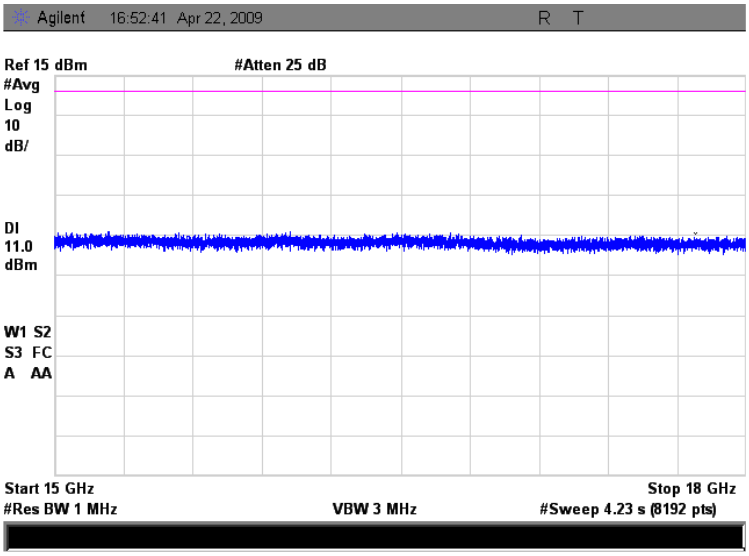
A		100-ER0001X1	X1

SCALE	1	:		SHEET	18	OF	31





iv. Summary

No Emissions were detected above the specification lines for any of the intervals tested.

v. Procedure

See 1 A v.

B. Part 90 (2450 – 2483.5 Mhz)

i. Applicable Specifications

90.210(b) Emission Mask B. For transmitters that are equipped with an audio low pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth:
At least 43 + 10 log (P) dB.

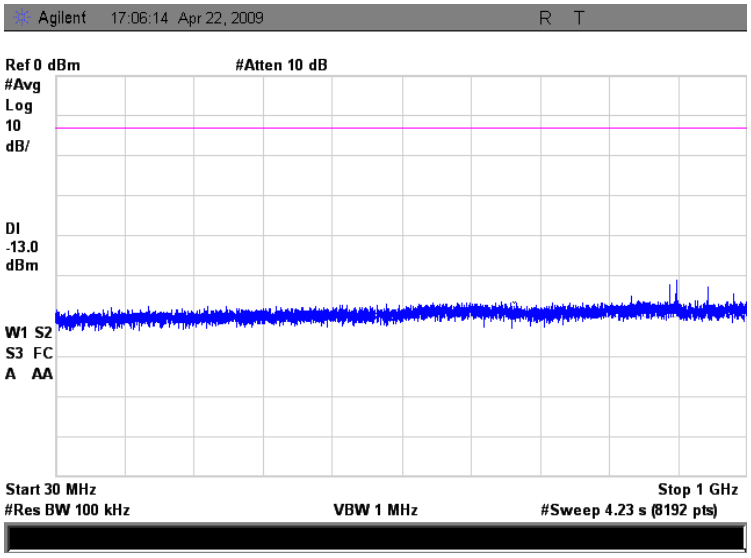
The BW is equal to 10 Mhz. The measurement frequency is 2465 Mhz.
The limit lines are tabulated below using a 10 Mhz bandwidth.

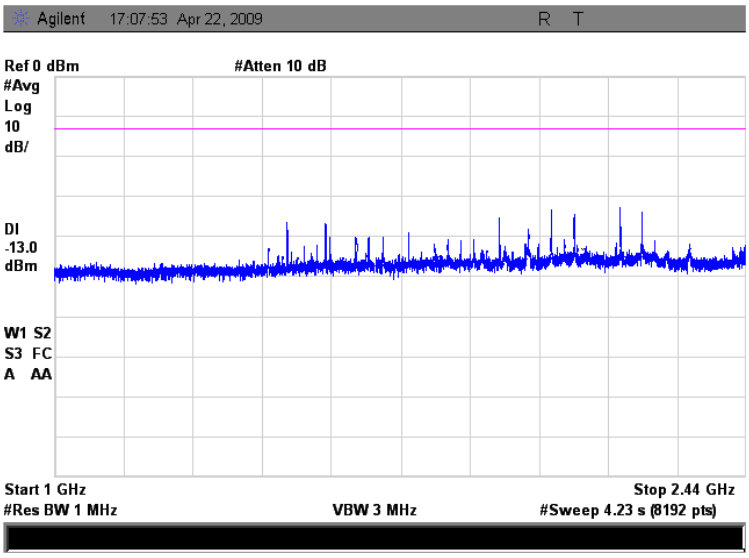
Interval Start	Interval Stop	Spec. Line	Computation	Resolution BW
30 Mhz	1000 Mhz	-13 dBm	-13 dBm	100 khz
1000 Mhz	2.440 Ghz	-13 dBm	-13 dBm	1 Mhz
2.440 Ghz	2.455 Ghz	(Pwr - 35) dBm		100 khz
2.455 Ghz	2.460 Ghz	(Pwr - 25) dBm		100 khz
2.460 Ghz	2.470 Ghz	(Pwr - 0) dBm		100 khz
2.470 Ghz	2.475 Ghz	(Pwr - 25) dBm		100 khz
2.475 Ghz	2.490 Ghz	(Pwr - 35) dBm		100 khz
2.490 Ghz	5.000 Ghz	-13 dBm	-13 dBm	1 Mhz
5.000 Ghz	10.000 Ghz	-13 dBm	-13 dBm	1 Mhz
10.000 Ghz	15.000 Ghz	-13 dBm	-13 dBm	1 Mhz
15.000 Ghz	18.000 Ghz	-13 dBm	-13 dBm	1 Mhz
18.000 Ghz	24.65 Ghz	-13 dBm	-13 dBm	1 Mhz

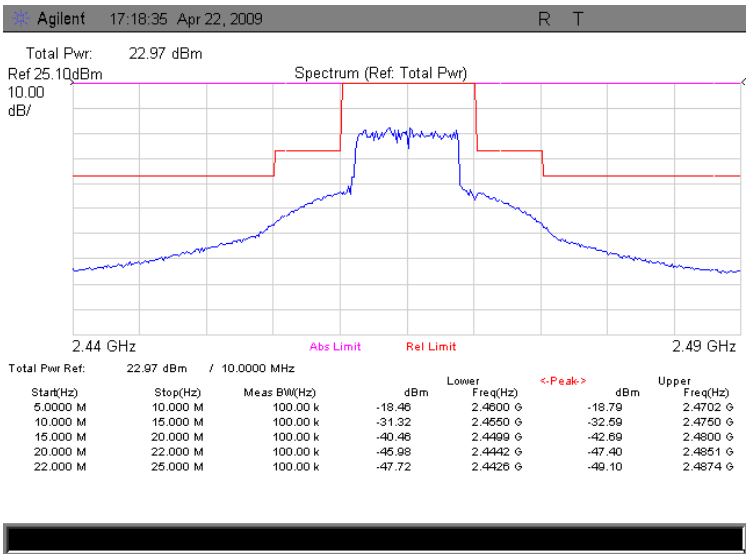
ii. Measurement Frequency

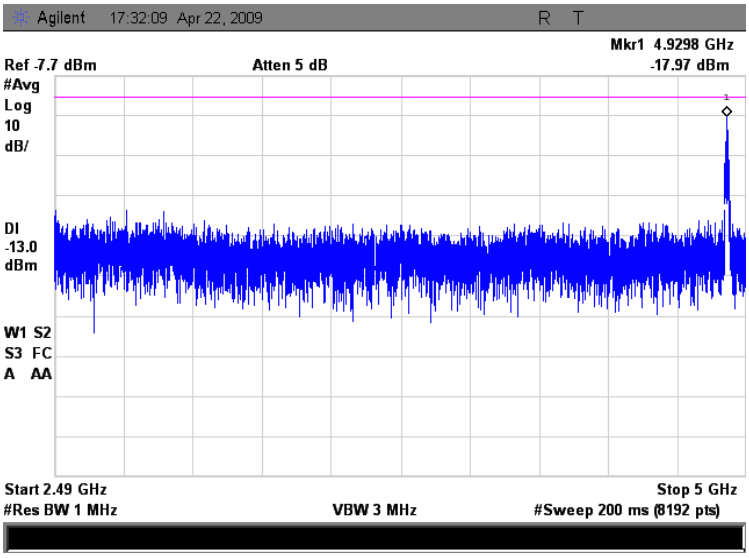
2.465 Ghz

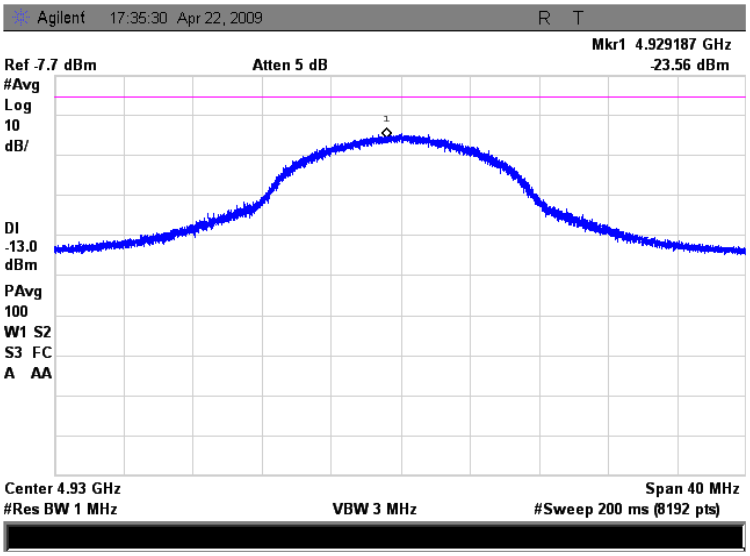
iii. Data





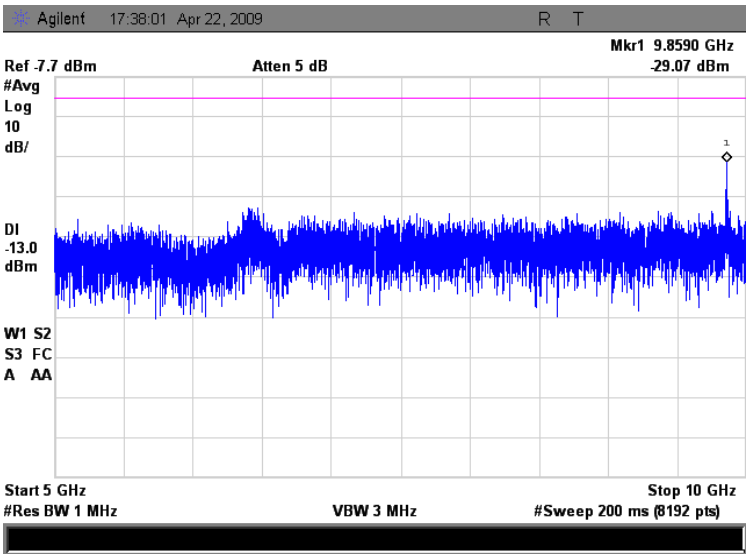


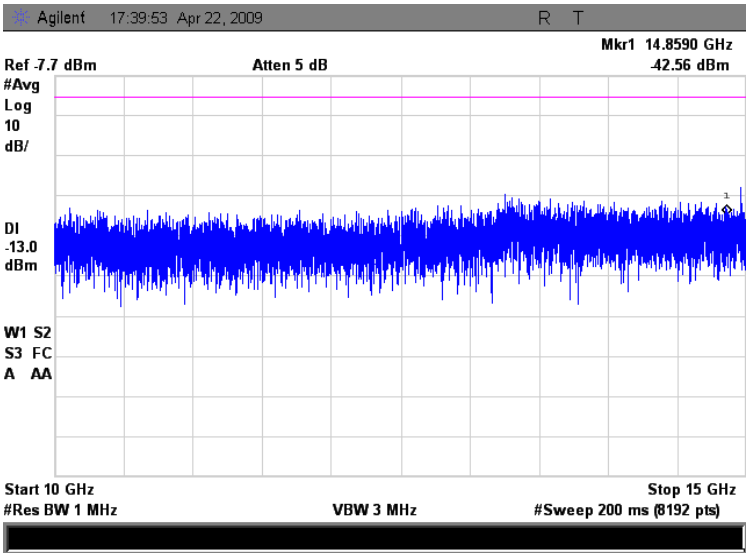


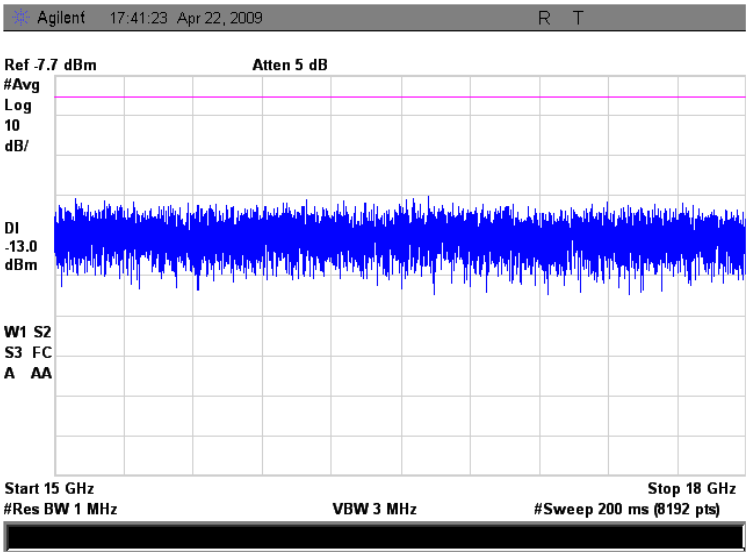


SIZE	FSCN NO	DWG NO	REV
A		100-ER0001X1	X1

SCALE	1	:		SHEET	22	OF	31







SIZE	FSCN NO	DWG NO	REV
A		100-ER0001X1	X1

SCALE	1	:		SHEET	23	OF	31

iv. Summary

No spurs were found above the specification limits for any of the intervals tested.

v. Procedure

See 1 A v.

5. Field Strength of Spurious Radiation 2.1053

A. Part 74 (2025 – 2110 Mhz & 2450 – 2483.5 Mhz)

74.637(a)(2)(iii) In any 4 kHz reference bandwidth (BREF), the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth:

At least 43 +10 Log10(PMEAN in watts) decibels, or 80 decibels, whichever is the lesser attenuation.

See ER0002 for the results of this test from Nemko.

B. Part 90 (2450 – 2483.5 Mhz)

90.210(b) Emission Mask B. For transmitters that are equipped with an audio low pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth:
At least 43 + 10 log (P) dB.

See ER0002 for the results of this from Nemko.

6. Frequency Stability 2.1055

A. Part 74 (2025 – 2110 Mhz & 2450 – 2483.5 Mhz)

i. Applicable Specifications

74.661 Frequency tolerance.(%)
2,025 to 2,110 ..... 0.005
2,450 to 2,483.5 ..... 0.001

ii. Measurement Frequency

2.465 Ghz

iii. Data

1. Over voltage

Voltage(volts)	Meas. Frequency (Hz)	|Meas. Freq - Set Freq.|(Hz)	Δ (ppm)	Δ (%)
10.2	2465000500	500	0.20	0.00002
10.4	2465000500	500	0.20	0.00002
10.6	2465000500	500	0.20	0.00002
10.8	2465000500	500	0.20	0.00002
11	2465000400	400	0.16	0.00002
11.2	2465000400	400	0.16	0.00002
11.4	2465000400	400	0.16	0.00002
11.6	2465000400	400	0.16	0.00002
11.8	2465000400	400	0.16	0.00002
12	2465000400	400	0.16	0.00002
12.2	2465000400	400	0.16	0.00002
12.4	2465000400	400	0.16	0.00002
12.6	2465000400	400	0.16	0.00002
12.8	2465000400	400	0.16	0.00002
13	2465000400	400	0.16	0.00002
13.2	2465000400	400	0.16	0.00002
13.4	2465000400	400	0.16	0.00002
13.6	2465000400	400	0.16	0.00002
13.8	2465000400	400	0.16	0.00002

2. Over Temperature

Temp(Deg. C)	Meas. Frequency (Hz)	|Meas. Freq - Set Freq.| (Hz)	Δ (ppm)	Δ (%)
-30	2464986500	13500	5.48	0.00055
-20	2464995700	4300	1.74	0.00017
-10	2465000600	600	0.24	0.00002
0	2465002500	2500	1.01	0.00010
10	2465002100	2100	0.85	0.00009
20	2465000100	100	0.04	0.00000
30	2465000400	400	0.16	0.00002
40	2465002000	2000	0.81	0.00008
50	2465007400	7400	3.00	0.00030

iv. Summary

The worst case frequency stability over voltage or temperature of .00055% was less than the most stringent of the specifications (.001%).

v. Procedure

1. Over Voltage

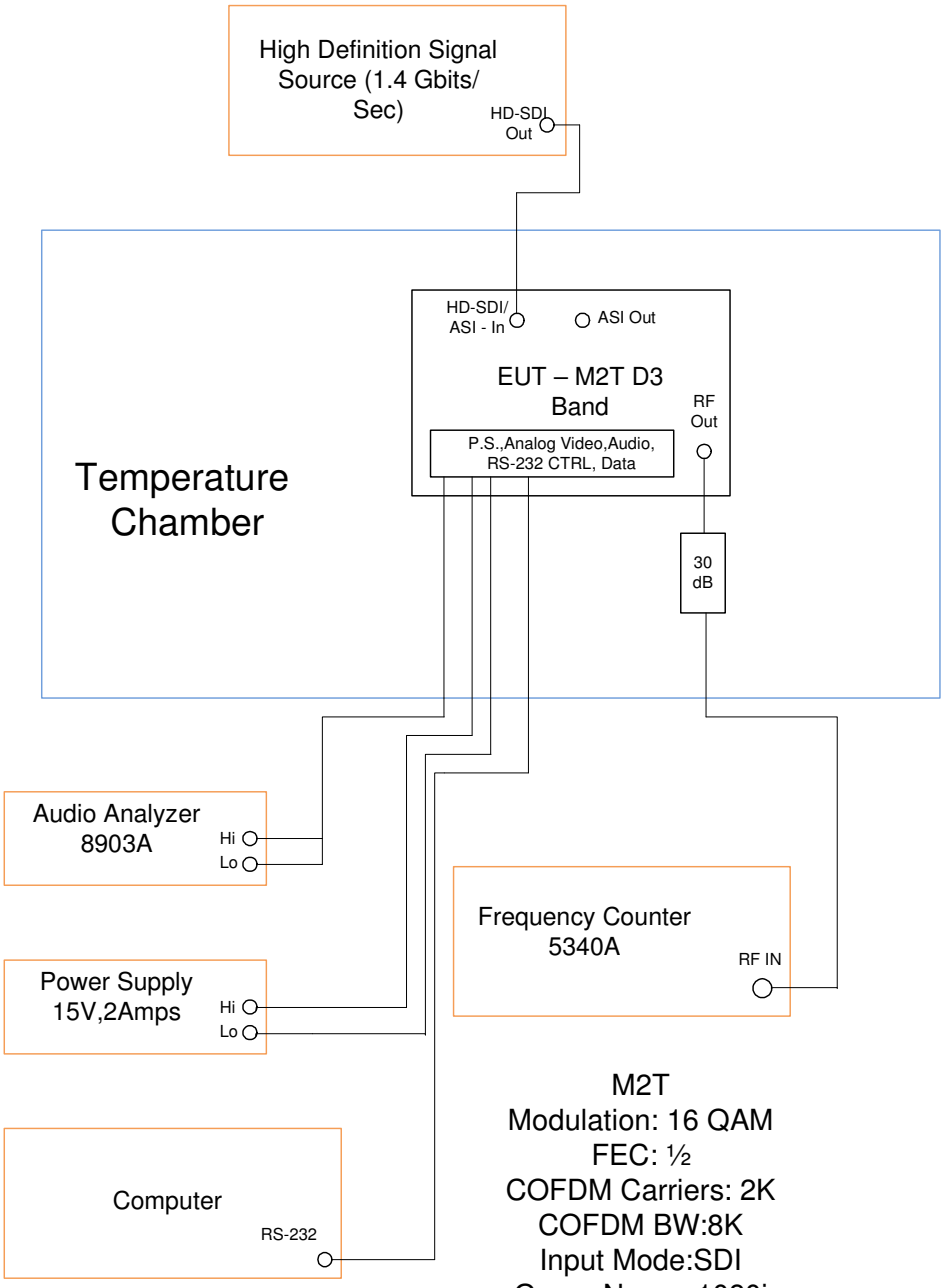
The M2T unit was attached to the test equipment as per the Figure below.
The M2T was configured at the settings listed in the figure. The Audio Analyzer was set for 0 dBm at 1 Khz. The Video frame rate was set to 30 frames/sec.. The High Definition source was set to 1080i at 30 frames/sec.

The frequency was measured from 10.2 Volts to 13.8 Volts in .2 volt increments. The frequency was measured with the modulation of the unit turned off.

2. Over Temperature

The M2T unit was attached to the test equipment as per the Figure below.
The M2T was configured at the settings listed in the figure. The Audio Analyzer was set for 0 dBm at 1 Khz. The Video frame rate was set to 30 frames/sec.. The High Definition source was set to 1080i at 30 frames/sec.

The frequency was measured from -30 degrees C to +50 degrees C. The M2T unit was allowed to settle at each temperature for at least 20 minutes before the frequency was measured. The modulation was turned on while the unit was stabilizing. The frequency was measured with the modulation turned off.



M2T
Modulation: 16 QAM
FEC: ½
COFDM Carriers: 2K
COFDM BW:8K
Input Mode:SDI
Group Name: 1080i
Audio Enable: On
Audio Mute:Unmute
Audio Level:Line
Audio Gain: 50

SIZE A	FSCN NO			DWG NO 100-ER0001X1			REV X1
SCALE	1	:		SHEET	28	OF	31

B. Part 90 (2450 – 2483.5 Mhz)

i. Applicable Specifications

90.213 Frequency stability. ***Above 2450 10 .....***

10 Except for DSRCS equipment in the 5850–5925 MHz band, frequency stability is to be specified in the station authorization. Frequency stability for DSRCS equipment in the 5850–5925 MHz band is specified in subpart M of this part.

ii. Measured Frequency

2.465 Ghz

iii. Data

See 6 A iii.

iv. Summary

Not applicable.

v. Procedure

See 6 A v.

7. General Information 2.1033

A. 2.1033 (c) (1) Name and Address of Applicant:

Global Microwave Systems, Inc.
1916 Palomar Oaks Way, Suite 100
Carlsbad, CA 92008-5523

and Manufacturer:

Same as Applicant

B. 2.1033 (c) (2) FCC ID: KPB – M2T – D3

Model Number: **M2T1D3BX**

C. 2.1033 (c) (3) Instruction Manual(s):

Please See Attached exhibits

D. 2.1033 (c) (4) Type of Emission: 7M68D7W

E. 2.1033 (c) (5) Frequency Range, Mhz: 2025 – 2110, 2450 – 2483.5 Mhz

F. 2.1033 (c) (6) Power Rating, dBm(average):

QPSK: 16 dBm to 23 dBm in 1 dB steps
16QAM: 16 dBm to 23 dBm in 1 dB steps
64 QAM: 13 dBm to 20.0 dBm in 1 dB steps

G. 2.1033 (c) (7) Maximum Power Rating, dBm:

Part 74: 40.8 dBm
Part 90: 37 dBm

H. 2.1033 (c) (8) Voltages and Currents in all elements in final stage:

U400: 5Volts, 54 mA
U401: 5Volts, 260 mA
U501: 5Volts, 54 mA

I. 2.1033 (c) (9) Tune-up Procedure

Please See Attached exhibits

J. 2.1033 (c) (10) Circuit Diagram/Circuit Description

Please See Attached exhibits

K. 2.1033 (c) (11) Label Information

Please See Attached exhibits

L. 2.1033 (c) (12) Photographs

Please See Attached exhibits

M. 2.1033 (c) (13) Digital Modulation Description

Please See ETSI EN 300 744 V1.5.1 (2004-11)

N. 2.1033 (c) (14) Test and Measurement Data

Please See sections 1 through 6.

8. Equipment List

The equipment used during the testing is tabulated below.

Equipment Type	Manufacturer	Model #	Serial Number	Cal Due Date
Spectrum Analyzer	Agilent	E4407B	SG44210654	1/15/2010
Power Meter	Hewlett Packard	436A	1629A01118	7/8/2009
Power Supply	HQ Power	PS 3003U	None	1/15/2010
Audio Analyzer	Hewlett Packard	8903B	3011A13384	1/15/2010
Frequency Counter	Hewlett Packard	5340A	1944A06729	1/15/2010
Temperature Chamber	Delta Design	5900	00-37-15	1/15/2010
20 dB Attenuator	Mini-Circuits	BW-S20W2+	N/A	N/A
12 dB Attenuator	Mini-Circuits	BW - S12W2	N/A	N/A
Power Sensor	Hewlett Packard	8481A	SG41090218	N/A
Power Sensor	Hewlett Packard	8481H	3318A18123	N/A
High Def. Sig. Gen.	Gefen	Ext-HD SDI-Gen	7180	N/A