TRANZEO
EMC LABS INC

EMC Test Report

FCC ID: QRF-FM58JD24UY

IC: 5181A-FM58JD24UY

TR-WMX 5.8 GHz PICO Base Station

Tranzeo Wireless Technologies Inc.

Testing body:	Tranzeo EMC Labs Inc. 19473 Fraser Way, Pitt Meadows, BC, Canada V3Y 2V4
Client:	Tranzeo Wireless Technologies Inc. 19473 Fraser Way, Pitt Meadows, BC, Canada V3Y 2V4

The test results indicated in this report refer exclusively to the equipment under test specified below. It is not permitted to transfer the results to other systems or configurations.

Order number: 102

Type of test: Testing of electromagnetic disturbances characteristics

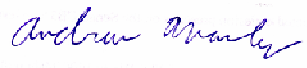
Date the EUT was received: October 05th, 2010

Date of test: October 05th, 2010 to October 12th, 2010

Report No.: 052611.1

Pitt Meadows, 26 May, 2011

EMC Manager: Andrew Marles



EMC Engineer: Andrei Moldavanov

Revision History

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1.0 General Information

1.1 EUT Description

Product Name	WiMax Base Station
Company Name	Tranzeo Wireless Technologies Inc
Model No.	TR-WMX-24_5.8-pBS
Frequency Range	5725-5850 MHz
Rated RF Output Power	Adjustable, 20 dBm MAX
Channel Bandwidth	10 MHz
Frequency Resolution	5 MHz
Transmit Rate	22 Mbps maximum
Type of Modulation	OFDM
Antenna Type	External
Product Software Revision	TR6-WMX-0.2.5.bin
Test Software	Mikrotik test software; RS EMC32 software
Operator Channel Selection	By software
Power Adapter	Model: Powertron PA1024-3DU
	Input: 100-240V 50-60Hz, 0.6A
	Output: 24V 1.1A 20W

Product sample tested:

Manufacturer	Model No.	Serial No.
Tranzeo Wireless	TR-WMX-24_5.8-pBS	TR-WMX-24_5.8-pBS-ENG001

As an IEEE 802.16 compliant wireless system, this device includes a 5.8 GHz receive function as well as 5.8 GHz digital modulation transmit function. There are no user serviceable parts inside the unit. It is factory sealed in a one-time use manner and inaccessible to the end user.

The TR-WMX-24_5.8-pBS product operates at 5.8 GHz and is fitted with a standard Type N antenna connector.

The tests were performed on a production sample model to demonstrate compliance with FCC Parts 15.

Frequencies tested in report:

Frequency (MHz)		Range (MHz)
Low	5730	5725-5850
Middle	5800	5725-5850
High	5845	5725-5850

1.2 Operational Description

The device is a WiMax Base Station designed specifically for wireless networks. The device has an IEEE 802.16 radio and a standard type N antenna connector. The transceiver operates in the frequency band 5725-5850 MHz. The device transmits digital network data and is mounted in fixed point-to-multi point installations.

The type of RF modulation is OFDM used at 5.8 GHz band. The device can transmit data at a real-world data rate of approximately 22 Mbps. The device's standard compliance ensures that it can communicate with a corresponding WiMax CPE.

The firmware used with the device prevents the use of channels outside the specified frequency bands.

The product is used exclusively in a professionally installed, wireless network environment.

1.3 Standards Applied

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

FCC Part 15, Subparts B and C
Industry Canada RSS-210 Issue 8
Industry Canada RSS-Gen Issue 3

All tests have been performed in accordance with the above test standards.

1.4 EUT Testing Configuration

The model TR-WMX-24_5.8-pBS was tested with the highest gain antenna of each type. Data is presented for the worst case configuration only.

All radiated emissions testing was performed in a semi-anechoic chamber. This device was tested as a tabletop device. The EUT was mounted to a custom non-metallic stand to best represent a typical user installation. The EUT was wirelessly connected to a CPE to imitate a real world situation. Both the CPE and the EUT were also connected to a host PCs so that they could be cycled through the various test modes and channels.

The EUT was tested in the following modes:

Standby/Receive mode: In this mode the EUT searches for and exchanges acknowledgments with client devices.

Data transfer mode: In this mode the EUT is exercised with commercially available bandwidth test software. A link is established between two PCs through the unit and the client device and data is transmitted at the highest possible rate.

1.5 Auxillary Equipment

The following auxiliary equipment and cables were used for performing the tests:

Manufacturer	Model	Description	S/N
Soyo	PW-930S	Laptop PC	6188
Tranzeo	POE-1	DC injection unit	n/a

The TR-WMX-24_5.8-pBS unit was tested with the antennas listed.

5.8 GHz Antennas model	Description
TDJ-5800SPL9	30 dBi Grid Antenna
TR-5X-Ant-24	24 dBi Panel Antenna
TR-58V-60-17	17 dBi Vertical Sector Antenna
TR-HTQ-5.8-12	12 dBi Vertical Omni Antenna

1.6 EUT Modifications

No modifications were necessary for this unit to comply with FCC Part 15, Industry Canada RSS-210 Issue 8, and Industry Canada RSS-Gen Issue 3.

Overview of Test Results

Standard	Test Type	Criteria	Result
FCC 15.207:	AC Conducted	A	PASS
FCC 15.247(b)	Peak power output	A	PASS
FCC 15.247(a)	Occupied Bandwidth	A	PASS
FCC 15.247(e)	Power Spectral Density	A	PASS
FCC 15.209, 247(b,d)	Radiated spurious emissions	A	PASS
FCC 15.209, 247(b,d)	Band Edge	A	PASS

Performance Criterion A: The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed as defined in the relevant equipment standard and in the technical specification published by the manufacturer.

Performance Criterion B: The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed, as defined in the relevant

equipment standard and in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.

Performance Criterion C: Temporary degradation or loss of function or performance is allowed during the test, provided the function is self-recoverable, or can be restored at the end of the test by the operation of the controls, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.

1.7 Test Facilities

Tranzeo EMC Labs
19473 Fraser Way
Pitt Meadows, BC V3Y 2V4
Canada

Phone: (604) 460-6002
Fax: (604) 460-6005

FCC registration number: 960532
Industry Canada Number: 5238A

1.8 Test Equipment

Manufacturer	Model	Description	Serial No.	Cal Due Date
ETS-Lindgren	2165	Turntable	00043883	N/R
ETS-Lindgren	2175	Mast Motor	00077487	N/R
ETS-Lindgren	1030	Semi-Anechoic Chamber	S2014X7LH	N/A
Sunol Sciences	JB3	Antenna	A042004	02-Jun-2012
Sunol Sciences	DRH-118	Antenna	A052804	02-Jun-2012
Com-Power	LI-115	LISN	241037	30-Jan-2012
Rohde & Schwarz	FSP40	Spectrum Analyzer	100184	24-Aug-2012
Rohde & Schwarz	NRP	Power Meter	100055	02-Aug-2012
Rohde & Schwarz	ESU40	EMI Receiver	100011	29-Mar-2012
Rohde & Schwarz	SMR40	Signal Generator	100404	05-Dec-2012
A.H. Systems, Inc.	SAS-562B	18” Loop Antenna	252	02-Feb-2012

Test System Details

The following auxiliary equipment and cables were used for performing the tests:

Manufacturer	Model	Description	S/N
Compaq	Presario 2100	Laptop PC	F3261CYQ
Tranzeo	POE-1	DC injection unit	n/a

1.9 Test Results

The EUT complies with FCC Part 15, Subparts B and C, as well as Industry Canada RSS-210 Issue 8 and Industry Canada RSS-Gen Issue 3.

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2.0 Conducted Emissions

2.1 Test Standard

Test Requirement: ANSI C63.4-2003 Clause 7.1; FCC Part 15, Subpart C, 15.207a; IC RSS-Gen Issue 3, Section 7.2

Test Method: ANSI C63.4-2003 Clause 7.2

a) Except as shown in Paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

2.2 Test Limits

Frequency (MHz)	Maximum Level (dBuV) Quasi-Peak	Maximum Level (dBuV) Average
0.15-0.50	66-56 (Log Delta)	56-46 (Log Delta)
0.50-5.00	56	46
5.00-30.0	60	50

2.3 Method of measurements

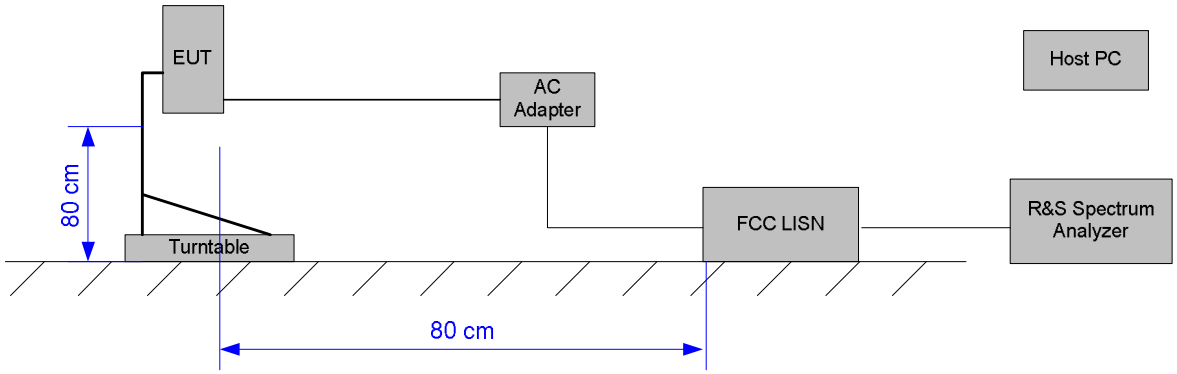
All test conditions and measurement procedures were performed in accordance with ANSI 63.4-2003 “AC powerline conducted emission measurements”; FCC Part 15, Subpart C, 15.207a

2.4 Test Setup

The EUT was exercised using bandwidth test software at the highest possible data rate. The test is performed at low (5730 MHz), middle (5800 MHz) and high channels (5845 MHz) for the 5.8 GHz frequency band. Only worst case data is shown below.

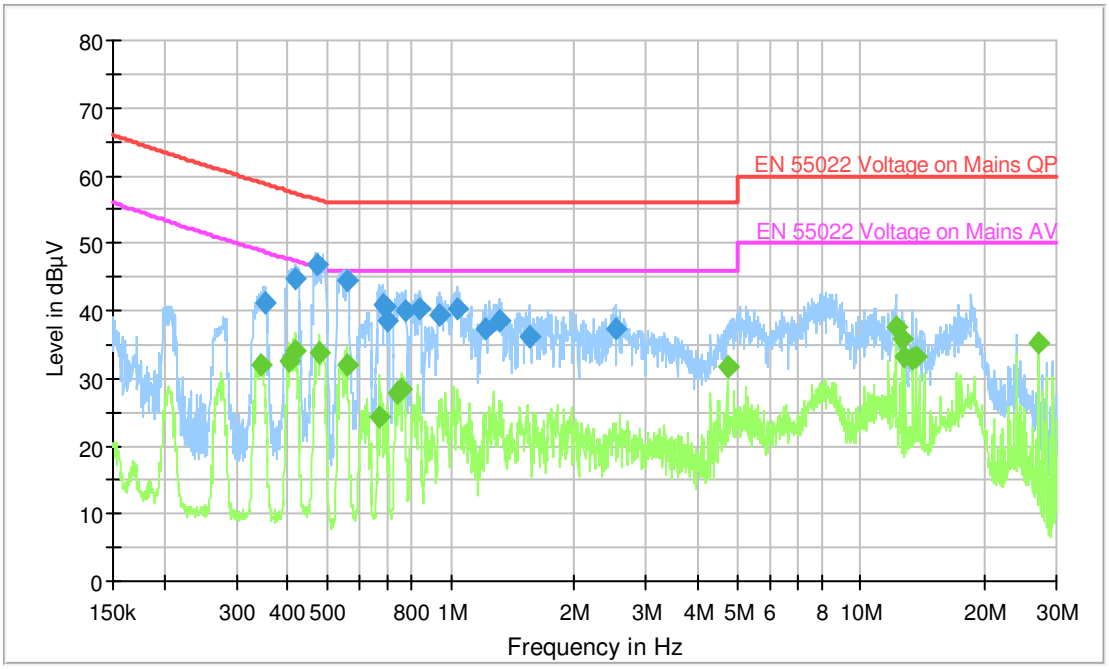
Note: For testing purposes only, to ensure worst case performance in all testing configurations, the radio is configured to transmit at the maximum possible RF power.

2.4.1 Test Setup Block Diagram



Note: The unused LISN terminal is terminated with a 50 ohms terminator.

2.5 Test Results



The blue measured curve represents the quasi-peak measurement. The green measured curve represents average values. The measured points marked with squares.

L1 line

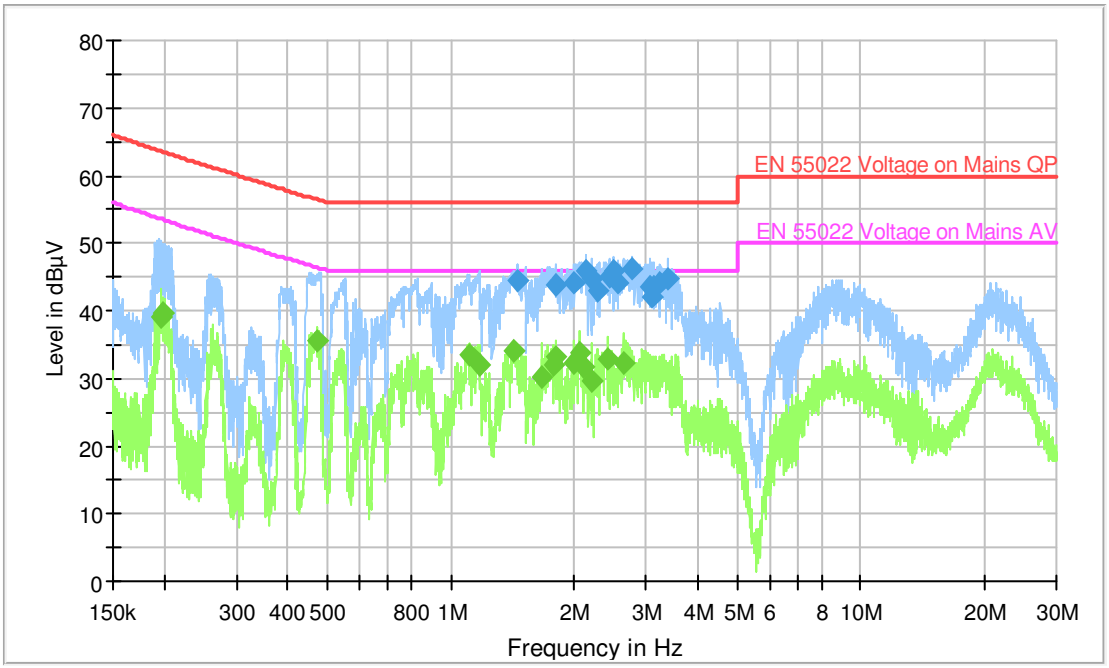
2.5.1 Test Data Quasi-Peak Detector

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.352053	41.3	1000.00	9.000	On	L1	0.0	17.4	58.7
0.417220	44.9	1000.00	9.000	On	L1	0.0	12.5	57.4
0.472241	46.7	1000.00	9.000	On	L1	0.0	9.7	56.4
0.556310	44.3	1000.00	9.000	On	L1	0.0	11.7	56.0
0.682063	40.8	1000.00	9.000	On	L1	0.0	15.2	56.0
0.690288	40.5	1000.00	9.000	On	L1	0.0	15.5	56.0
0.704219	38.6	1000.00	9.000	On	L1	0.0	17.4	56.0
0.775101	40.0	1000.00	9.000	On	L1	0.0	16.0	56.0
0.841269	40.4	1000.00	9.000	On	L1	0.0	15.6	56.0
0.935242	39.5	1000.00	9.000	On	L1	0.0	16.5	56.0
1.037638	40.3	1000.00	9.000	On	L1	0.0	15.7	56.0
1.219919	37.2	1000.00	9.000	On	L1	0.0	18.8	56.0
1.313520	38.6	1000.00	9.000	On	L1	0.0	17.4	56.0
1.550450	36.2	1000.00	9.000	On	L1	0.0	19.8	56.0
2.514469	37.4	1000.00	9.000	On	L1	-0.1	18.6	56.0

2.5.2 Test Data Average Detector

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.343027	32.0	1000.00	9.000	On	L1	0.0	16.9	48.9
0.403286	32.5	1000.00	9.000	On	L1	0.0	15.1	47.6
0.416387	34.2	1000.00	9.000	On	L1	0.0	13.2	47.4
0.479850	33.7	1000.00	9.000	On	L1	0.0	12.6	46.3
0.556310	32.0	1000.00	9.000	On	L1	0.0	14.0	46.0
0.668570	24.4	1000.00	9.000	On	L1	0.0	21.6	46.0
0.744739	28.0	1000.00	9.000	On	L1	0.0	18.0	46.0
0.759768	28.4	1000.00	9.000	On	L1	0.0	17.6	46.0
4.718225	31.6	1000.00	9.000	On	L1	-0.1	14.4	46.0
12.139783	37.7	1000.00	9.000	On	L1	-0.4	12.3	50.0
12.685301	35.7	1000.00	9.000	On	L1	-0.4	14.3	50.0
12.812663	33.1	1000.00	9.000	On	L1	-0.4	16.9	50.0
13.361695	32.9	1000.00	9.000	On	L1	-0.4	17.1	50.0
13.604138	33.3	1000.00	9.000	On	L1	-0.4	16.7	50.0
27.158306	35.1	1000.00	9.000	On	L1	-0.8	14.9	50.0

N line



Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.451714	44.6	1000.00	9.000	On	N	0.6	11.4	56.0
1.797934	44.0	1000.00	9.000	On	N	0.6	12.0	56.0
1.996880	44.0	1000.00	9.000	On	N	0.6	12.0	56.0
2.139456	46.0	1000.00	9.000	On	N	0.6	10.0	56.0
2.208990	44.7	1000.00	9.000	On	N	0.6	11.3	56.0
2.280784	42.9	1000.00	9.000	On	N	0.6	13.1	56.0
2.429020	45.0	1000.00	9.000	On	N	0.6	11.0	56.0
2.485506	46.0	1000.00	9.000	On	N	0.6	10.0	56.0
2.550944	44.0	1000.00	9.000	On	N	0.6	12.0	56.0
2.763294	46.1	1000.00	9.000	On	N	0.6	9.9	56.0
3.050709	43.5	1000.00	9.000	On	N	0.5	12.5	56.0
3.099888	42.1	1000.00	9.000	On	N	0.5	13.9	56.0
3.131027	43.4	1000.00	9.000	On	N	0.5	12.6	56.0
3.252234	44.2	1000.00	9.000	On	N	0.5	11.8	56.0
3.384892	44.8	1000.00	9.000	On	N	0.5	11.2	56.0

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.196665	39.1	1000.00	9.000	On	N	0.5	14.5	53.6
0.199635	39.6	1000.00	9.000	On	N	0.5	13.8	53.4
0.472039	35.5	1000.00	9.000	On	N	0.7	10.9	46.4
1.105040	33.3	1000.00	9.000	On	N	0.7	12.7	46.0
1.175685	31.9	1000.00	9.000	On	N	0.7	14.1	46.0
1.428683	34.2	1000.00	9.000	On	N	0.6	11.8	46.0
1.671422	30.2	1000.00	9.000	On	N	0.6	15.8	46.0
1.776499	31.9	1000.00	9.000	On	N	0.6	14.1	46.0
1.796138	33.3	1000.00	9.000	On	N	0.6	12.7	46.0

1.996880	**32.4**	**1000.00**	**9.000**	**On**	**N**	**0.6**	**13.6**	**46.0**
2.061780	**33.9**	**1000.00**	**9.000**	**On**	**N**	**0.6**	**12.1**	**46.0**
2.103410	**31.7**	**1000.00**	**9.000**	**On**	**N**	**0.6**	**14.3**	**46.0**
2.208990	**29.6**	**1000.00**	**9.000**	**On**	**N**	**0.6**	**16.4**	**46.0**
2.412085	**32.9**	**1000.00**	**9.000**	**On**	**N**	**0.6**	**13.1**	**46.0**
2.628592	**32.4**	**1000.00**	**9.000**	**On**	**N**	**0.6**	**13.6**	**46.0**

Note: All data points are corrected for insertion loss.

3.0 Peak Power Output

3.1 Test Standard

Test Requirement: FCC CFR47, Part 15, Subpart B 15.247(b); IC RSS-210 Issue 8, Section A8.4

Test Method: FCC CFR47, Part 15, Subpart B 15.247(b); "Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) KDB publication number #558074

| *(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:*

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 watt. As an alternative to a peak power measurement, compliance with the 1 watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in Paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in Paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in Paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.
(1) Fixed point-to-point operation:

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

(iii) Fixed, point-to-point operation, as used in Paragraphs (c)(4)(i) and (c)(4)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional

radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility. |

3.2 Test Limits

Maximum peak power output of the intentional radiator shall be less than 1 watt (30 dBm).

3.3 Method of measurement

All test conditions and measurement procedures were performed in accordance with FCC CFR47, Part 15, Subpart B 15.247(b)(3) and Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) KDB publication number #558074

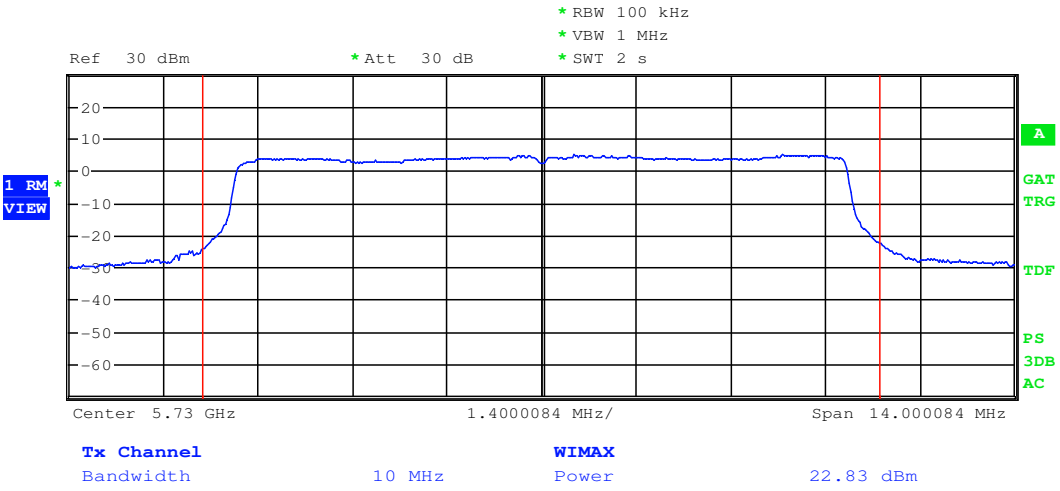
3.4 Test Setup

This test is performed conducted. The measurement equipment is connected directly to the antenna port of the EUT.

The test is performed at low (5730 MHz), middle (5800 MHz) and high channels (5845 MHz) for the 5.8 GHz frequency band. Power is measured using the channel power measurement feature of the spectrum analyzer. Only worst case data for each bandwidth is shown below

3.4.1 Test Setup Block Diagram

3.5 Test Results



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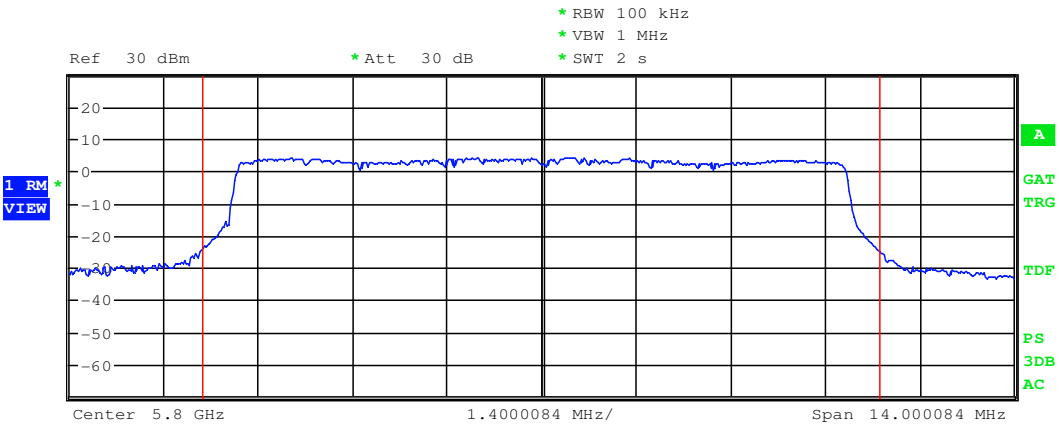
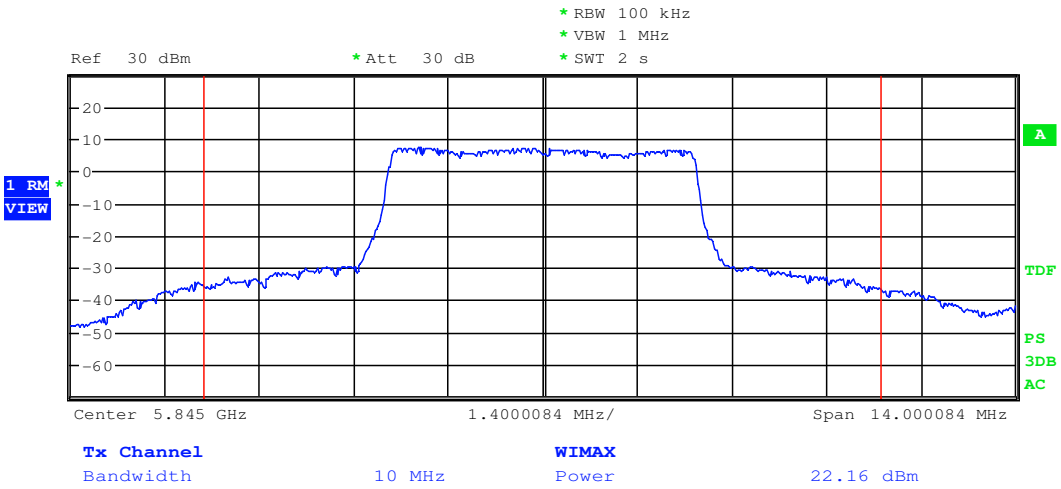


Tx Channel **WIMAX**

Bandwidth 10 MHz Power 22.09 dBm

Date: 6.OCT.2010 16:53:20



Date: 10.JUN.2011 20:00:17

Mode OFDM/ Channel BW = 10 MHz			
Frequency(MHz)	Measurement(dBm)	Limit	Result
5730	22.83	30	PASS
5800	22.09	30	PASS
5845	22.16	30	PASS

4.0 Radiated Emissions, General Requirements

4.1 Test Standard

Test Requirement: ANSI C63.4-2003 Clause 8.1; FCC CFR47, Part 15, Subpart C, 15.209 "Radiated Emission Limits, General Requirements"; IC RSS-210 Issue 8, Section 2.7

Test Method: ANSI C63.4-2003 Clause 8.3; CFR47, Part 15, Subpart C 15.247(b); "Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) KDB publication number #558074

| *(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:*

Frequency (MHz)	*Field Strength* (Microvolts/Meter)	*Measurement Distance* (Meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

*** Except as provided in Paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., Sections 15.231 and 15.241.*

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz,

110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. |

4.2 Test Limits

Frequency (MHz)	Maximum Field Strength (uV/m @ 3m)	Maximum Field Strength (dBuV/m @ 3m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-1000	500	54.0

4.3 Method of measurements

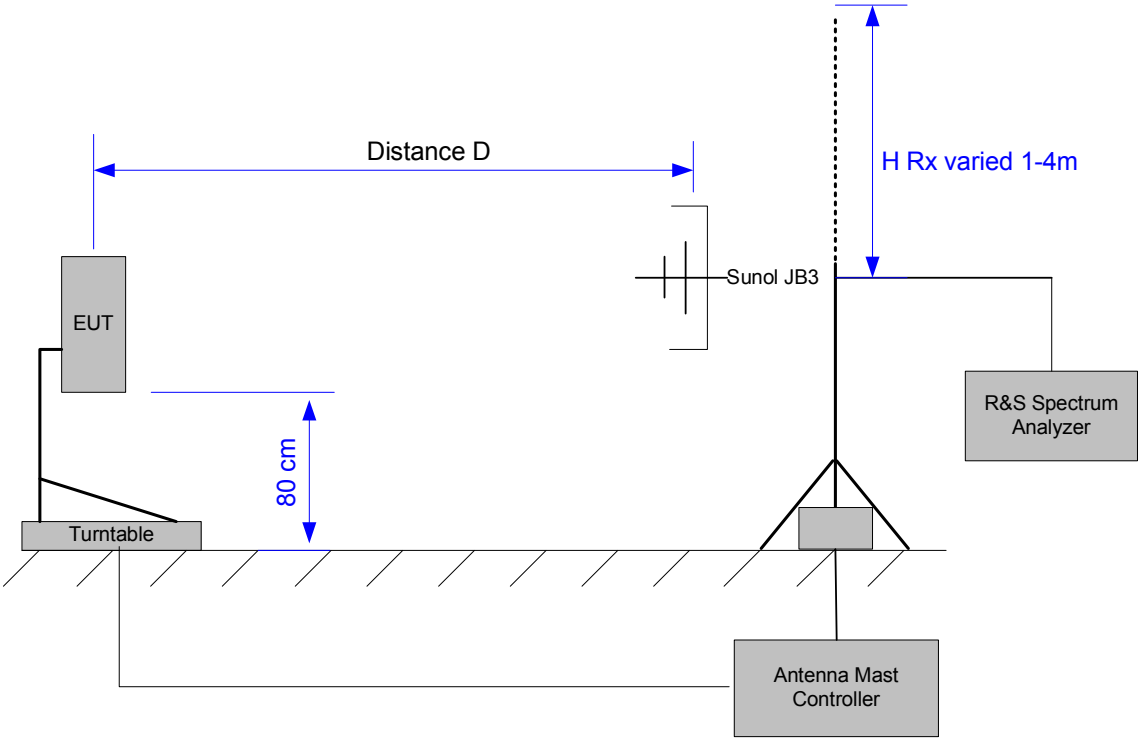
All test conditions and measurement procedures were performed in accordance with ANSI C63.4-2003 Clause 8.3; FCC CFR47, Part 15, Subpart C, 15.209.

4.4 Test Setup

The TR-WMX-24_5.8-pBS was tested with all the antennas from the list on page 8. The EUT was exercised using data transmitting mode at the highest possible transmit rate. The test is performed at low (5730 MHz), middle (5800 MHz) and high channels (5845 MHz) for the 5.8 GHz frequency band. The TR-WMX-24_5.8-pBS was connected to the external antenna via 1m of coaxial shielded cable. Only worst case data is shown below.

Note: For testing purposes and to ensure worst case performance in all testing configurations, the radio is configured to transmit at the maximum possible RF power.

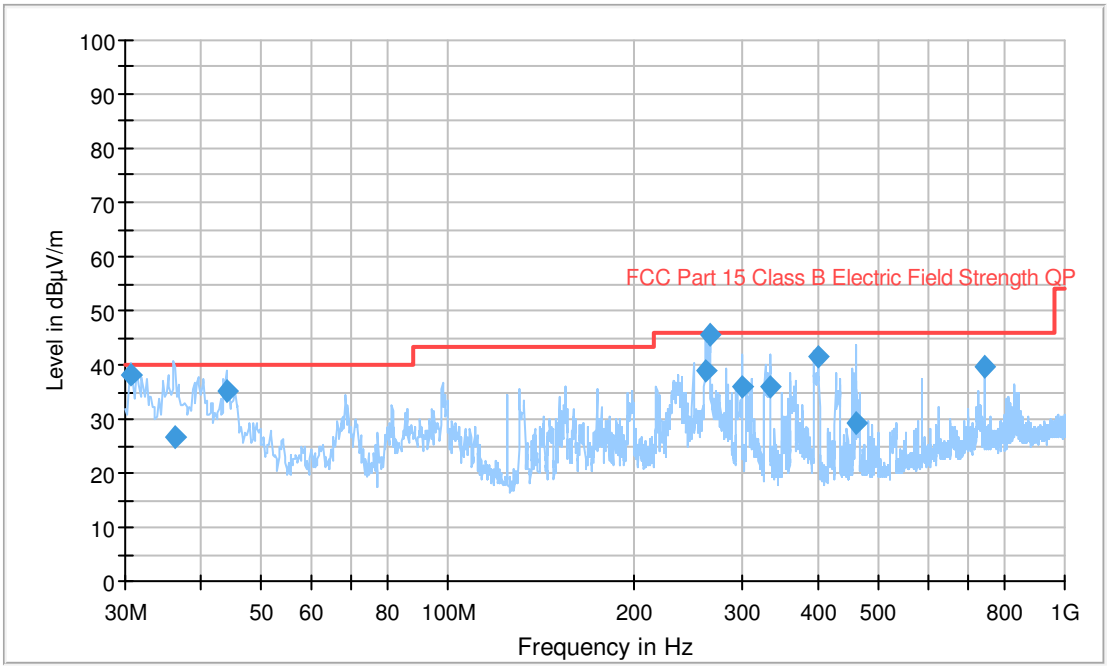
4.4.1 Test Setup Block Diagram



Note: Measurements below 1 GHz were performed with the Sunol JB3 antenna with a measurement distance of 3 m. Compliance above 1 GHz is covered in Section 5.0.

4.5 Test Results

4.5.1 30 dBi Grid antenna



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.627406	38.1	1000.00	120.000	135.0	V	274.0	20.6	1.90	40.00
36.137840	26.6	1000.00	120.000	100.0	H	258.0	17.8	13.40	40.00
43.809040	35.4	1000.00	120.000	100.0	V	113.0	11.3	4.60	40.00
261.712320	38.9	1000.00	120.000	134.0	V	30.0	14.0	7.10	46.00
266.520320	45.4	1000.00	120.000	159.0	H	0.0	14.4	0.60	46.00
299.995920	35.8	1000.00	120.000	161.0	H	203.0	14.9	10.20	46.00
332.222640	36.0	1000.00	120.000	135.0	V	30.0	15.3	10.00	46.00
399.668080	41.3	1000.00	120.000	100.0	H	30.0	17.4	4.70	46.00
459.243200	29.1	1000.00	120.000	100.0	H	72.0	18.5	16.90	46.00
739.840720	39.5	1000.00	120.000	159.0	H	272.0	22.7	6.50	46.00

Note: All data points are corrected for insertion loss.

As per Part 15.33(a), since the block diagram shows a 20.16 MHz clock frequency, we made emissions measurements starting at 20.16 MHz. The measurements were made using a calibrated Loop Antenna. They are greater than 20dB below the limit so these data are not shown in this report..

5.0 Harmonic and Spurious Emissions

5.1 Test Standard

Test Requirement: ANSI C63.4-2003 Clause 8.1; FCC CFR 47, Part 15, Subpart B 15.247d; IC RSS-210 Issue 8, A8.5
Test Method: ANSI C63.4-2003 Clause 8.3; FCC CFR 47, Part 15, Subpart C Section 15.247(d)

| *(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).* |

5.2 Test Limits

5725-5850 MHz limits:

Fundamental Limit = 30 dBm
Harmonics and Spurious Emissions = 30 dBc
Restricted Band Emissions = AVG 54 dBuV, PK 74dBuV

5.3 Method of measurements

All test conditions and measurement procedures were performed in accordance with ANSI C63.4-2003 Clause 8.3; FCC CFR47, Part 15, Subpart B 15.247d.

5.4 Test Setup – Spurious Emissions

Both radiated and conducted measurements are made on the EUT to ensure compliance with the required emission levels. Conducted scans are used to determine compliance with the 30 dBc limit for emissions outside of the operational frequency band.

In addition to conducted measurements, extensive radiated testing above 1 GHz is performed. The measurement antenna is scanned around all sides of the EUT to

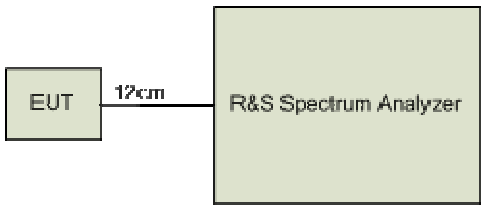
identify signals of interest. Additional measurements at an appropriate measurement distance are performed to ensure that emissions were at maximum.

The TR-WMX-24_5.8-pBS was was exercised using data transmitting mode at the highest possible transmit rate. The test is performed at low (5730 MHz), middle (5800 MHz) and high channels (5845 MHz) for the 5.8 GHz frequency band. Only worst case data is shown below.

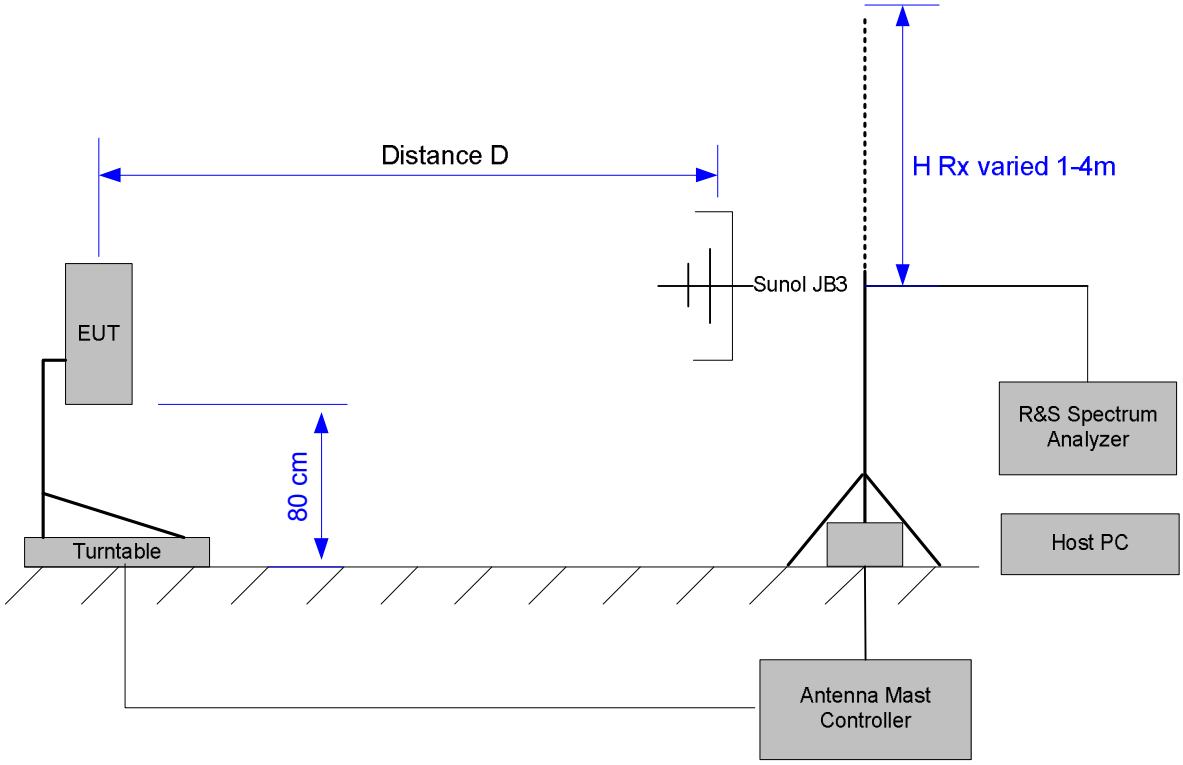
The antenna is connected to the EUT equipped with a Type N connecter via 1 m of coaxial shielded cable.

Note: For testing purposes only, to ensure worst case performance in all configurations, the radio is configured to transmit at the maximum possible RF power.

5.4.1 Test Setup Block Diagram – Conducted Measurements (Harmonics)

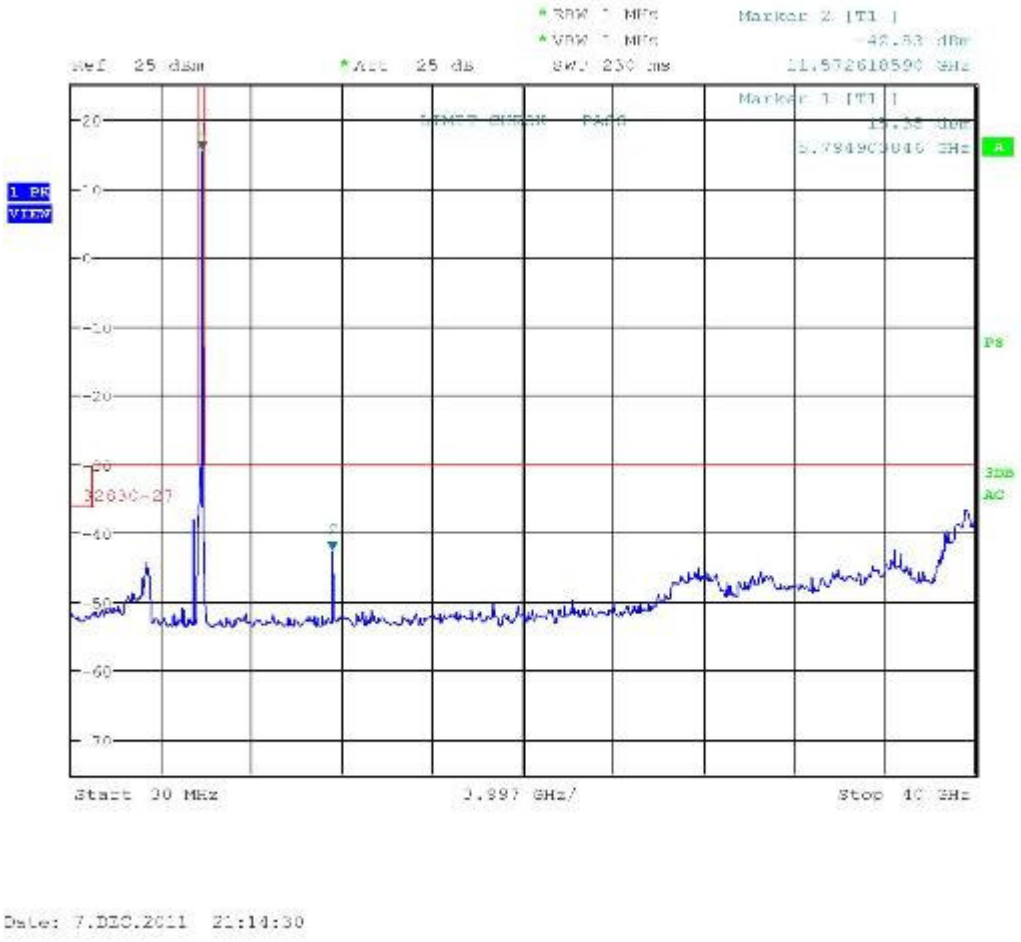


5.4.2 Test Setup Block Diagram – Radiated Measurements (Spurious)



5.5 Test Results

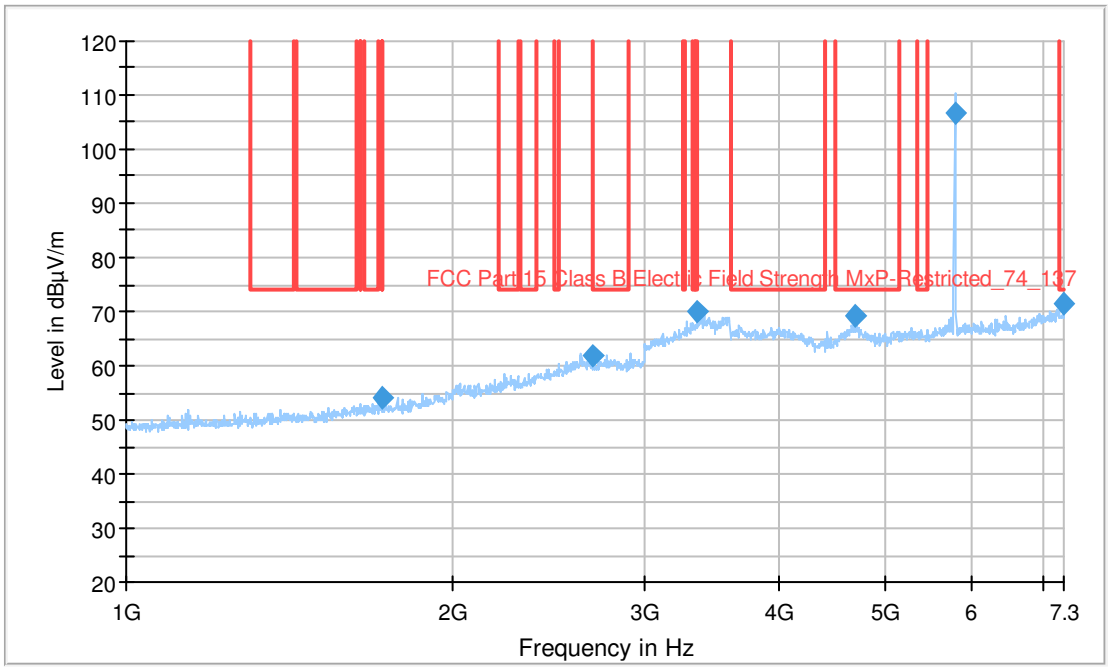
5.5.1 Test Results 15.247–Harmonics -30 dBc



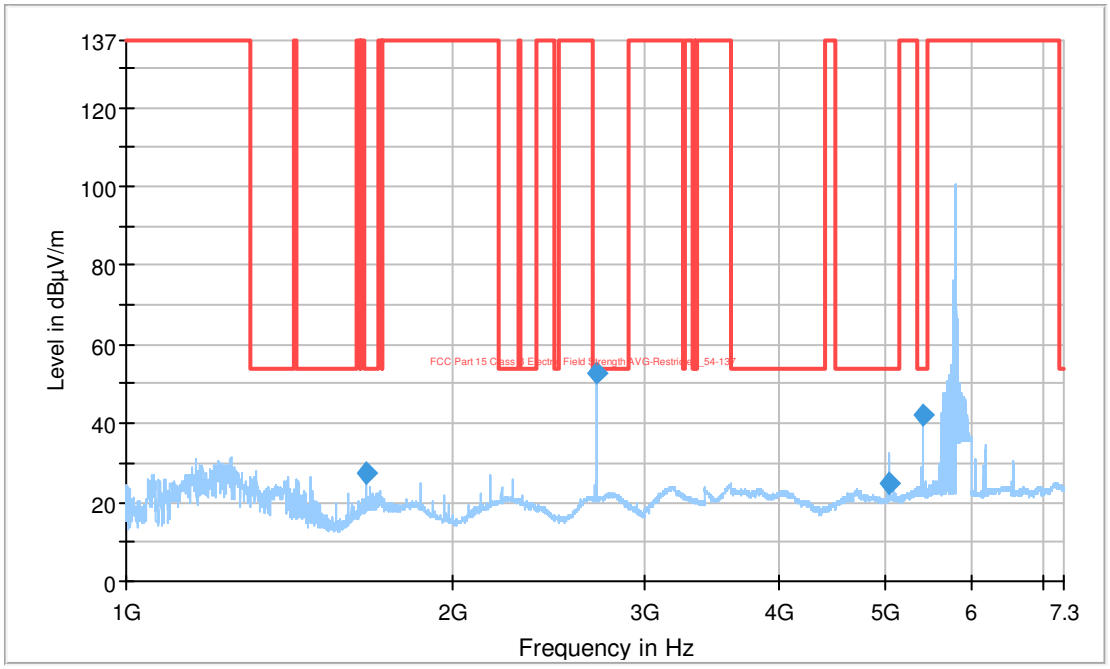
The above plot shows the worst case conducted output of the transmitter. It should be noted that the EUT is not transmitting on three channels simultaneously. All conducted harmonics are at least 30 dBc. No other emissions were detected within 30 dB of the limit.

5.5.2 Test Results 15.247– Restricted Bands (Spurious Emissions)

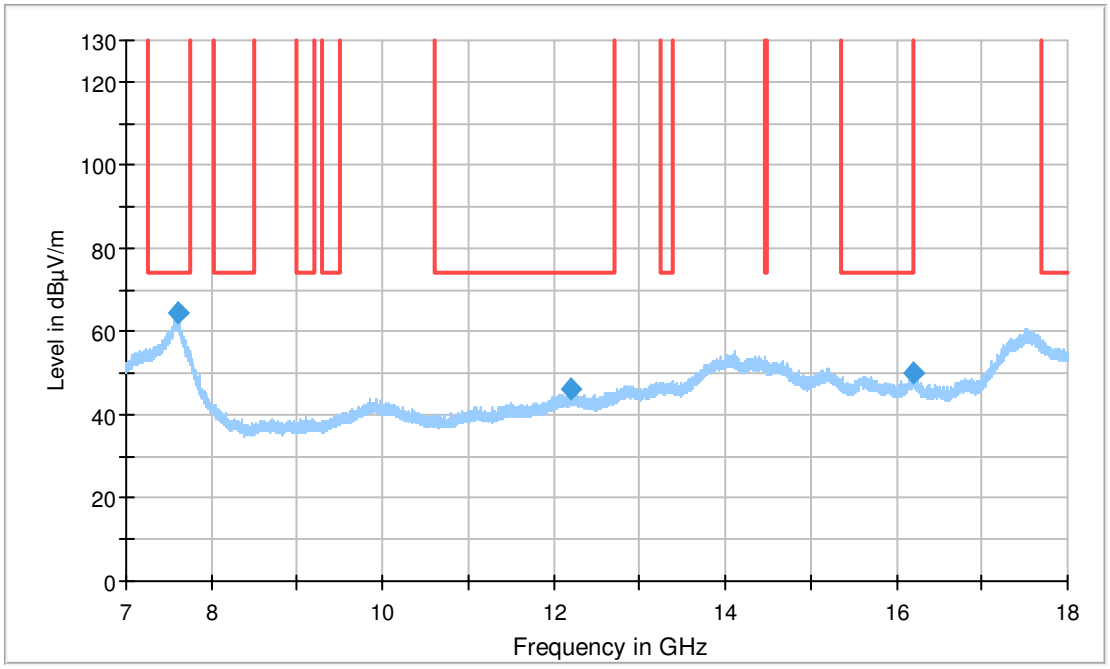
The following data was measured at a distance of 3 m. Data is presented for the worst case antenna configuration.



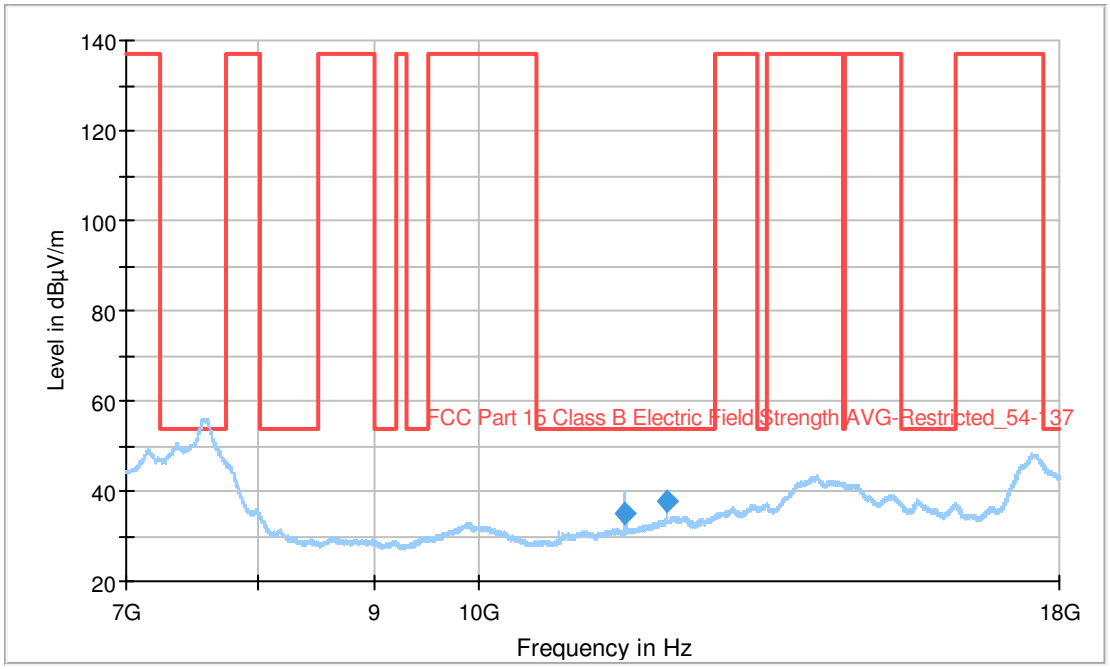
Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1718.97671	54.1	1000.000	251.0	H	55.0	28.7	19.9	74.0
2695.28602	62.0	1000.000	158.0	H	125.0	33.1	12.0	74.0
3354.80921	69.9	1000.000	255.0	H	125.0	35.1	4.1	74.0
4703.11951	69.3	1000.000	100.0	V	-58.0	39.2	4.7	74.0
5795.73084	106.5	1000.000	204.0	V	15.0	38.8	30.5	137.0
7286.38225	71.6	1000.000	205.0	V	125.0	42.0	2.4	74.0



Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1663.20000	27.3	1000.000	145.0	V	354.0	-12.0	26.7	54.0
2710.00000	52.7	1000.000	196.0	V	336.0	-7.4	1.3	54.0
5041.60000	24.8	1000.000	145.0	V	78.0	-3.5	29.2	54.0
5420.40000	42.2	1000.000	145.0	V	0.0	-2.9	11.8	54.0
1718.97671	22.7	1000.000	251.0	H	55.0	28.7	19.9	74.0
2695.28602	22.8	1000.000	158.0	H	125.0	33.1	12.0	74.0
3354.80921	20.9	1000.000	255.0	H	125.0	35.1	4.1	74.0
4703.11951	23.2	1000.000	100.0	V	-58.0	39.2	4.7	74.0
5795.73084	78	1000.000	204.0	V	15.0	38.8	30.5	137.0
7286.38225	24.1	1000.000	205.0	V	125.0	42.0	2.4	74.0



Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
7597.200000	64.6	1000.000	122.0	H	80.0	34.4	9.4	74.0
12190.40000	46.0	1000.000	155.0	H	47.0	15.1	28.0	74.0
16192.00000	50.0	1000.000	147.0	V	293.0	19.5	24.0	74.0



Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
11601.60000	35.2	1000.000	100.0	V	0.0	12.6	18.8	54.0
12101.20000	37.6	1000.000	145.0	V	0.0	14.9	16.4	54.0
7597.200000	53.3	1000.000	122.0	H	80.0	34.4	9.4	74.0

6.0 Band Edge

6.1 Test Standard

Test Requirement: FCC CFR 47, Part 15, Subpart B 15.247d; IC RSS-210 Issue 8, A8.5

Test Method: FCC CFR 47, Part 15, Subpart C 15.209a; "Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) KDB publication number #558074

| *(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).* |

6.2 Test Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). (See Section 15.205(c).)

6.3 Method of measurements

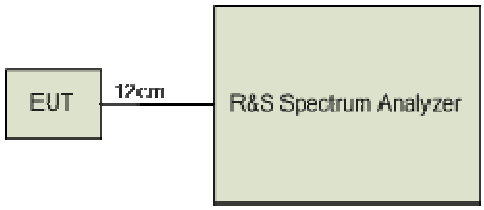
All test conditions and measurement procedures were performed in accordance with FCC CFR 47, Part 15, Subpart B 15.247d; "Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) KDB publication number #558074

6.4 Test Setup

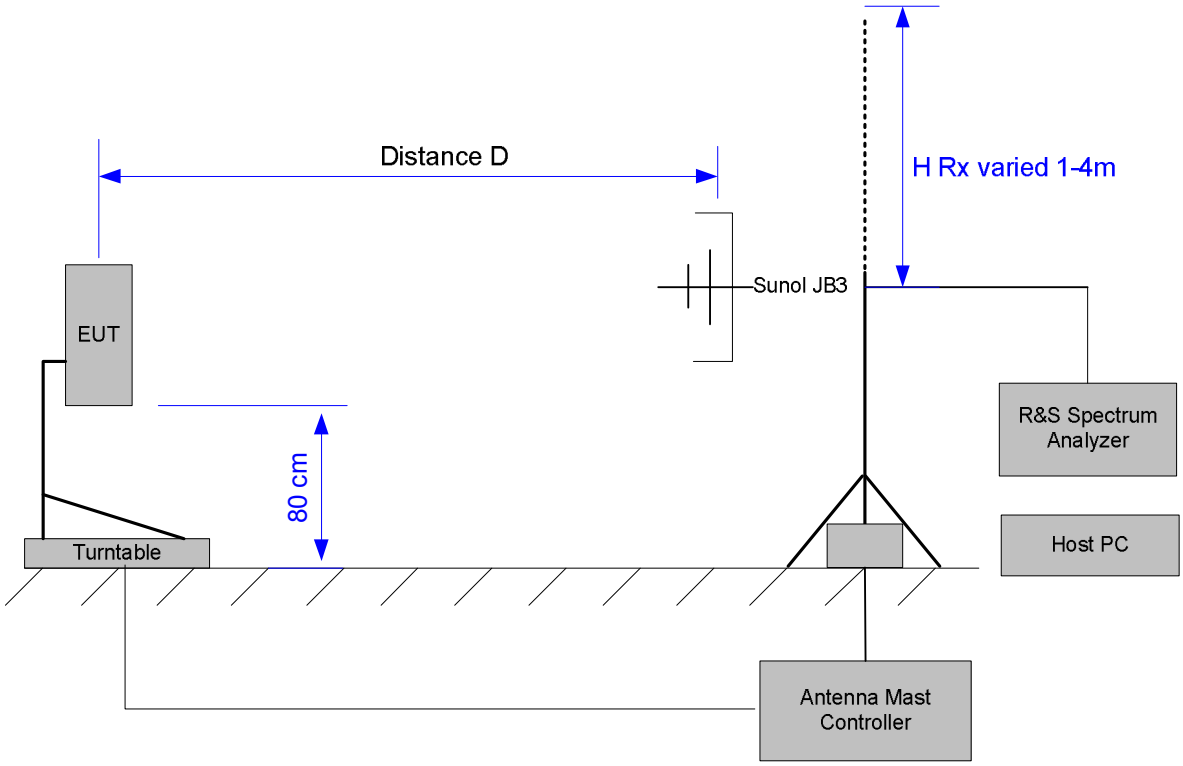
Conducted measurements are made on the EUT to ensure compliance with the required emission levels.

The test is performed at low and high channels. Compliance in the 5725-5850 MHz band is established through conducted measurements. Please note that in the following plots the EUT is not transmitting on two channels simultaneously.

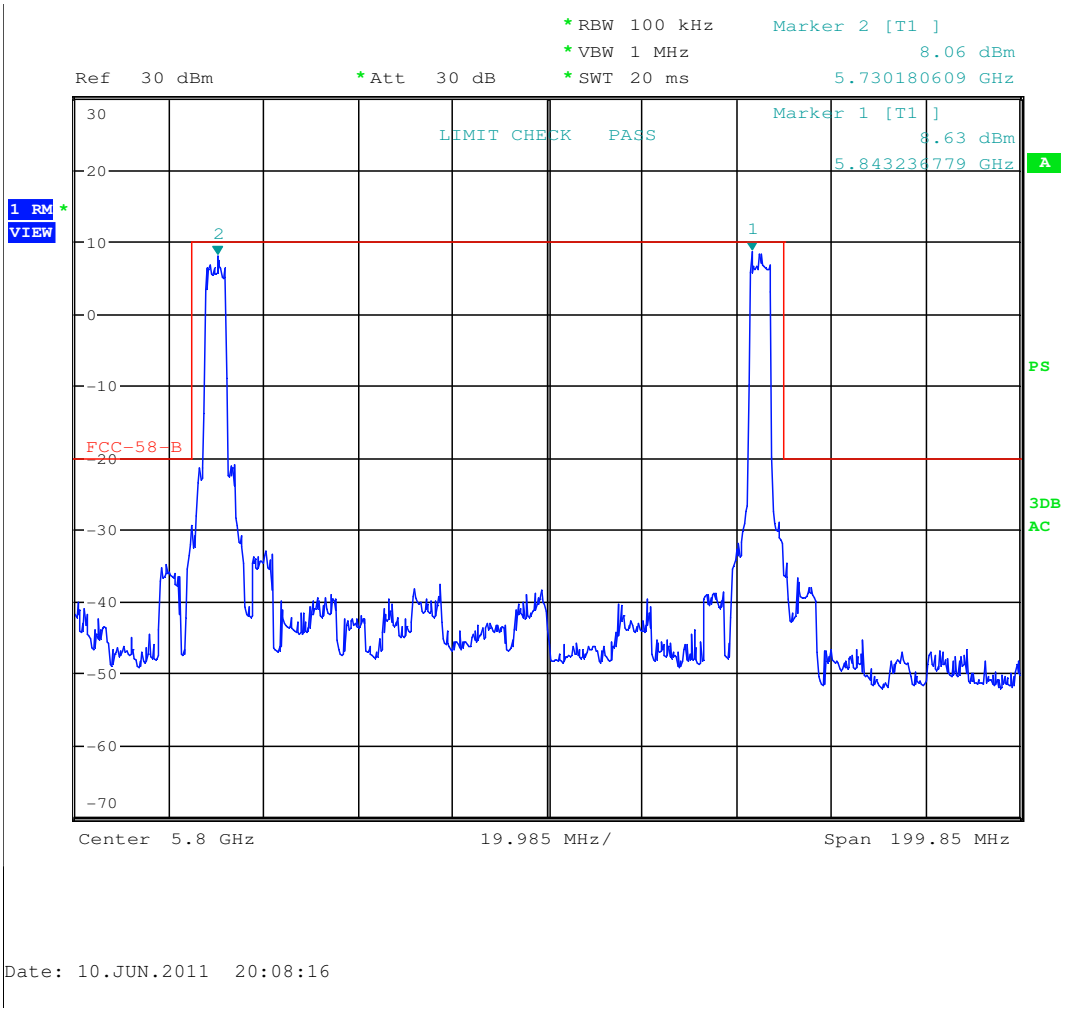
6.4.1 Test Setup Block Diagram – Conducted Measurements)



6.4.2 Test Setup Block Diagram – Radiated Measurements



6.5 Test Results, 5725-5850 MHz, Conducted Measurements



All emissions outside of the 5725-5850 MHz frequency band are attenuated by at least 30 dB.

7.0 Occupied Bandwidth

7.1 Test Standard

Test Requirement: FCC CFR47, Part 15, Subpart B 15.247a; IC RSS-210 Issue 8, Section A8.2

Test Method: FCC CFR47, Part 15, Subpart B 15.247a; "Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) KDB publication number #558074

| *(a) Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:*

(2) Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz. |

7.2 Test Limits

The minimum 6 dB bandwidth shall be at least 500 kHz.

7.3 Method of measurements

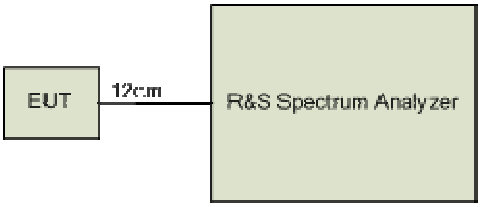
All test conditions and measurement procedures were performed in accordance with. FCC CFR47, Part 15, Subpart B 15.247a; "Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) KDB publication number #558074.

7.4 Test Setup

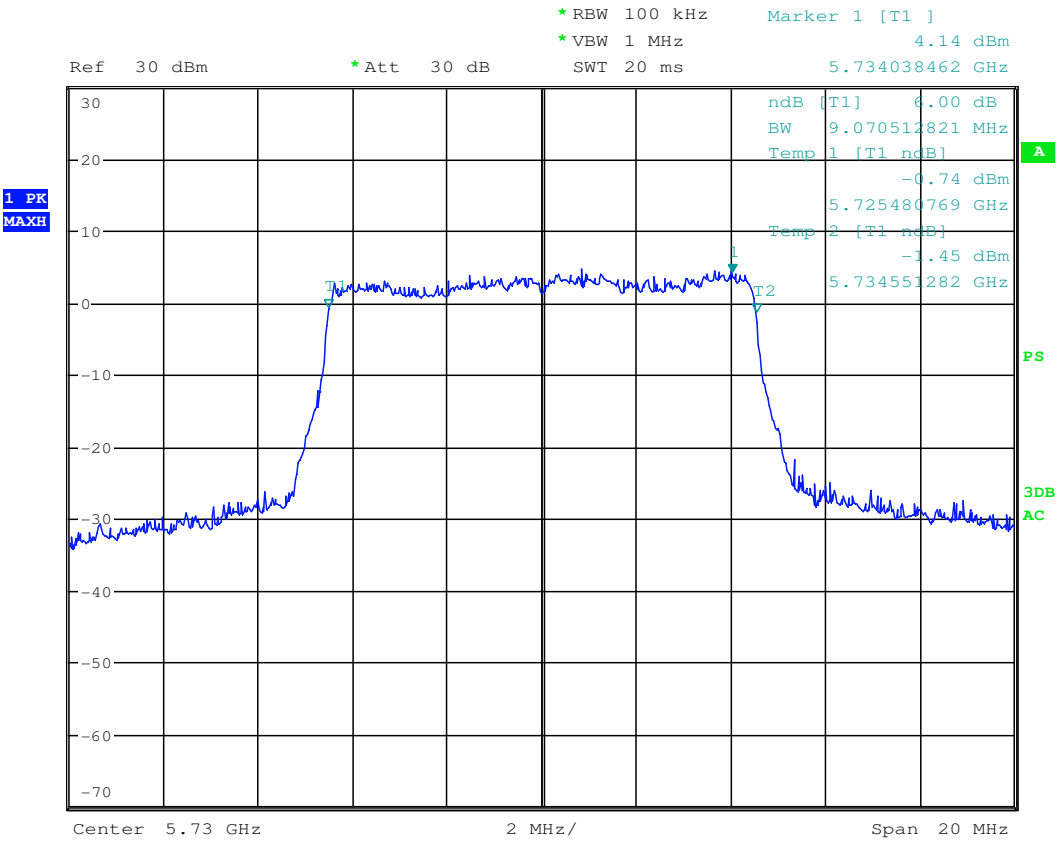
This test is performed conducted. The measurement equipment is connected directly to the antenna port of the EUT.

The test is performed at low (5730 MHz), middle (5800 MHz) and high channels (5845 MHz) for the 5.8 GHz frequency band.

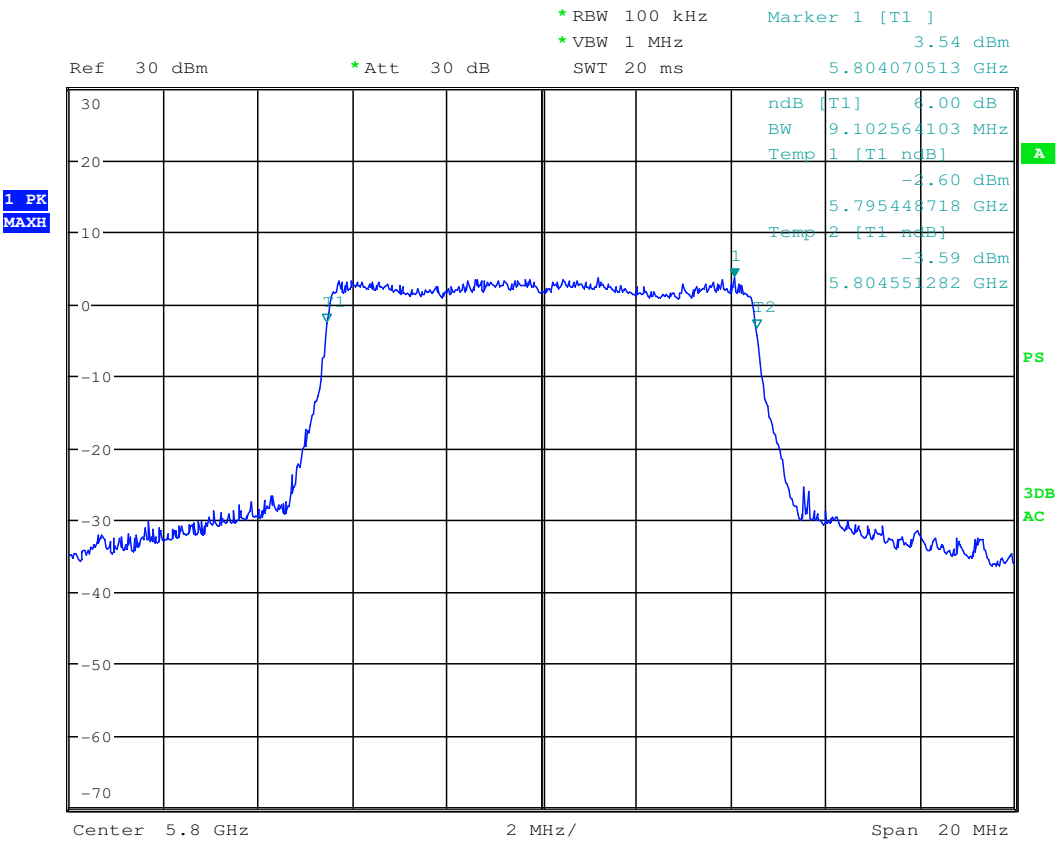
7.4.1 Test Setup Block Diagram



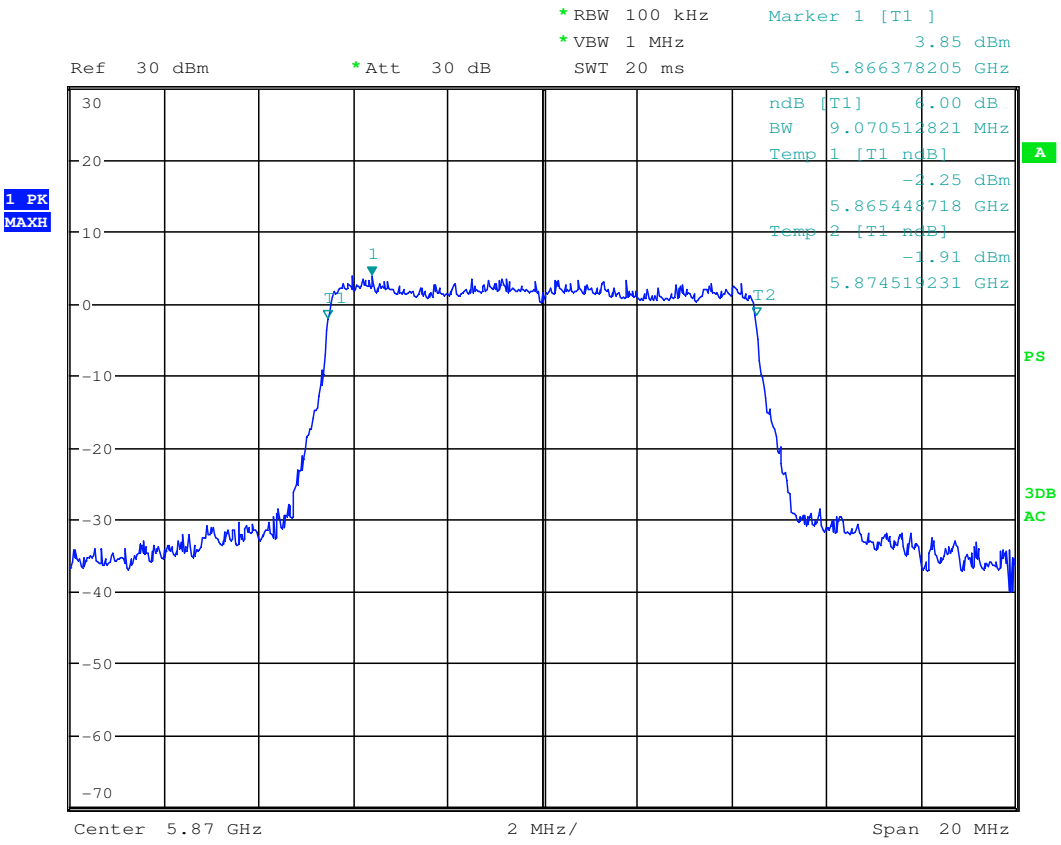
7.5 Test Results, 6 dB Occupied Bandwidth



Date: 6.OCT.2010 15:14:33



Date: 5.OCT.2010 20:58:34



7.5.4 Data Table – Occupied Bandwidth

Mode OFDM/ Channel BW = 10 MHz			
Frequency(MHz)	Occupied Bandwidth(MHz)	Limit	Result
5730	9.07	0.5	PASS
5800	9.10	0.5	PASS
5845	9.07	0.5	PASS

8.0 Power Spectral Density

8.1 Test Standard

Test Requirement: FCC CFR 47, Part 15, Subpart B 15.247e; IC RSS-210 Issue 8, Section A8.2

Test Method: FCC CFR47, Part 15, Subpart C 15.247d; "Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) KDB publication number #558074

FCC CFR 47, Part 15, Subpart B 15.247e \ IC RSS-210 Issue 8, Section A8.2

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density. |

8.2 Test Limits

The transmitted power density shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.3 Method of measurements

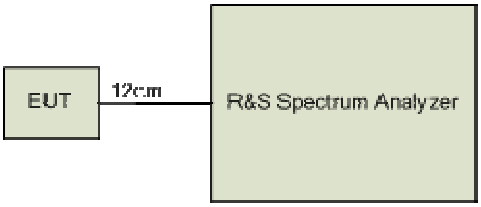
All test conditions and measurement procedures were performed in accordance with. FCC CFR47, Part 15, Subpart B 15.247e ; "Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) KDB publication number #558074.

8.4 Test Setup

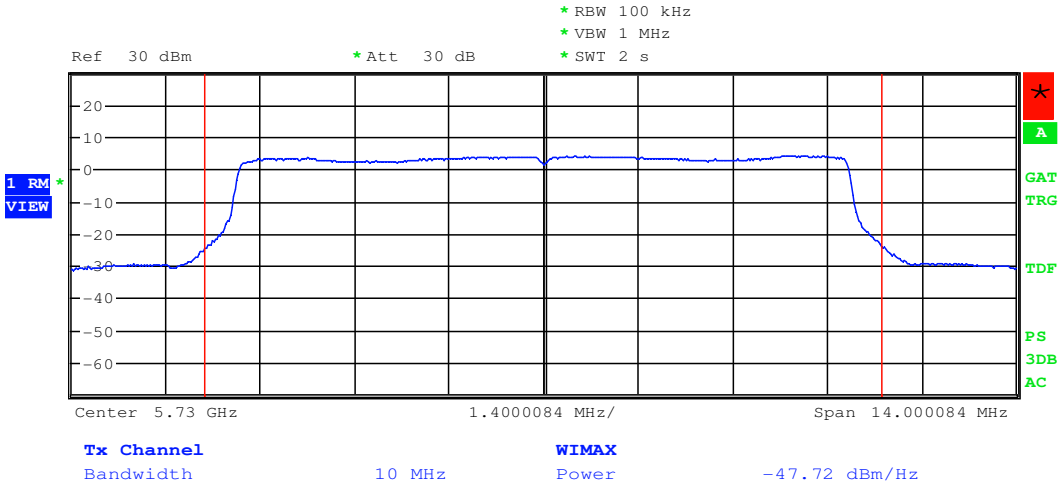
This test is performed conducted. The measurement equipment is connected directly to the antenna port of the EUT.

The test is performed at low (5730 MHz), middle (5800 MHz) and high channels (5845 MHz) for the 5.8 GHz frequency band. Only worst case data in each bandwidth is shown below.

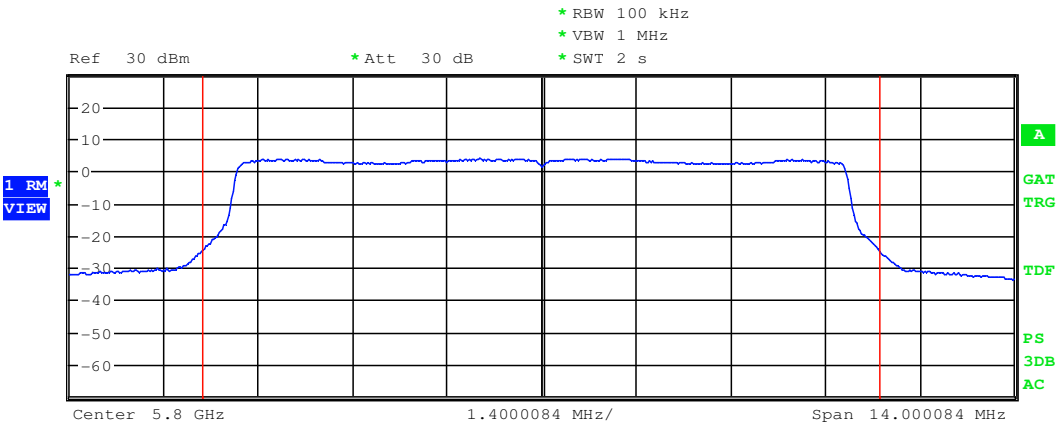
8.4.1 Test Setup Block Diagram



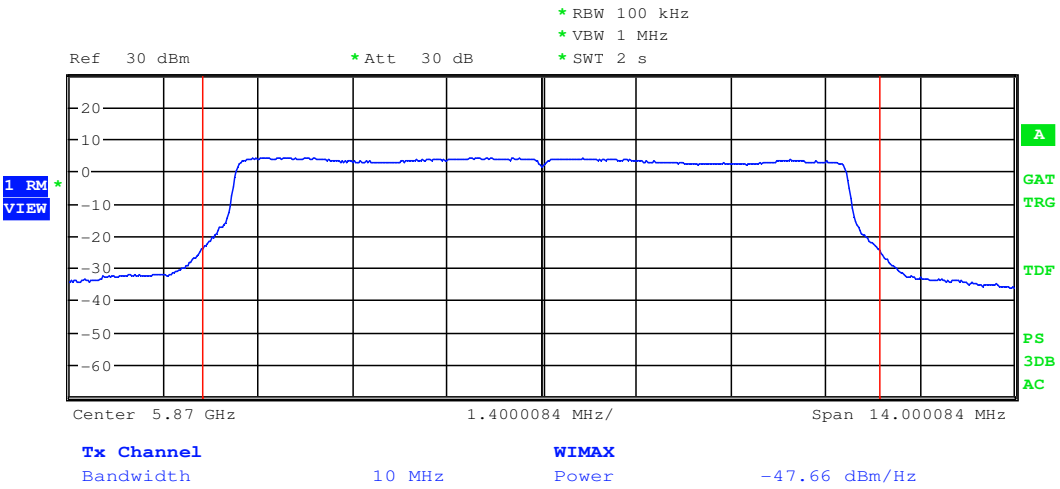
8.5 Test Results, Power Spectral Density



Date: 6.OCT.2010 19:56:33



Date: 6.OCT.2010 19:59:21



Date: 6.OCT.2010 20:01:44

8.6 Results, Data Tables

Mode OFDM/ Channel BW = 10MHz			
Frequency, MHz	PSD in 1 Hz (dBm)	PSD in 3 kHz (dBm)	Limit
5730	-47.72	-12.95	8
5800	-47.88	-13.1	8
5845	-47.66	-12.88	8

9.0 RF Exposure Evaluation

Test Requirement: FCC 1.1310; IC RSS-102 Issue 2, Section 4

FCC 1.1310 states the criteria listed in the table below shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Section 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Section 2.1093 of this chapter. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation".

Frequency Range (MHZ)	Electric Field Strength (V/m)	Magnetic Field Strength (A/M)	Power Density (mW/cm^2)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

9.1 EUT Operating Condition

The maximum antenna gain is 30 dBi at 5.8 GHz.

9.2 Method of measurements

All test conditions and measurement procedures were performed in accordance with FCC 1.1310.

9.3 RF exposure evaluation distance calculation

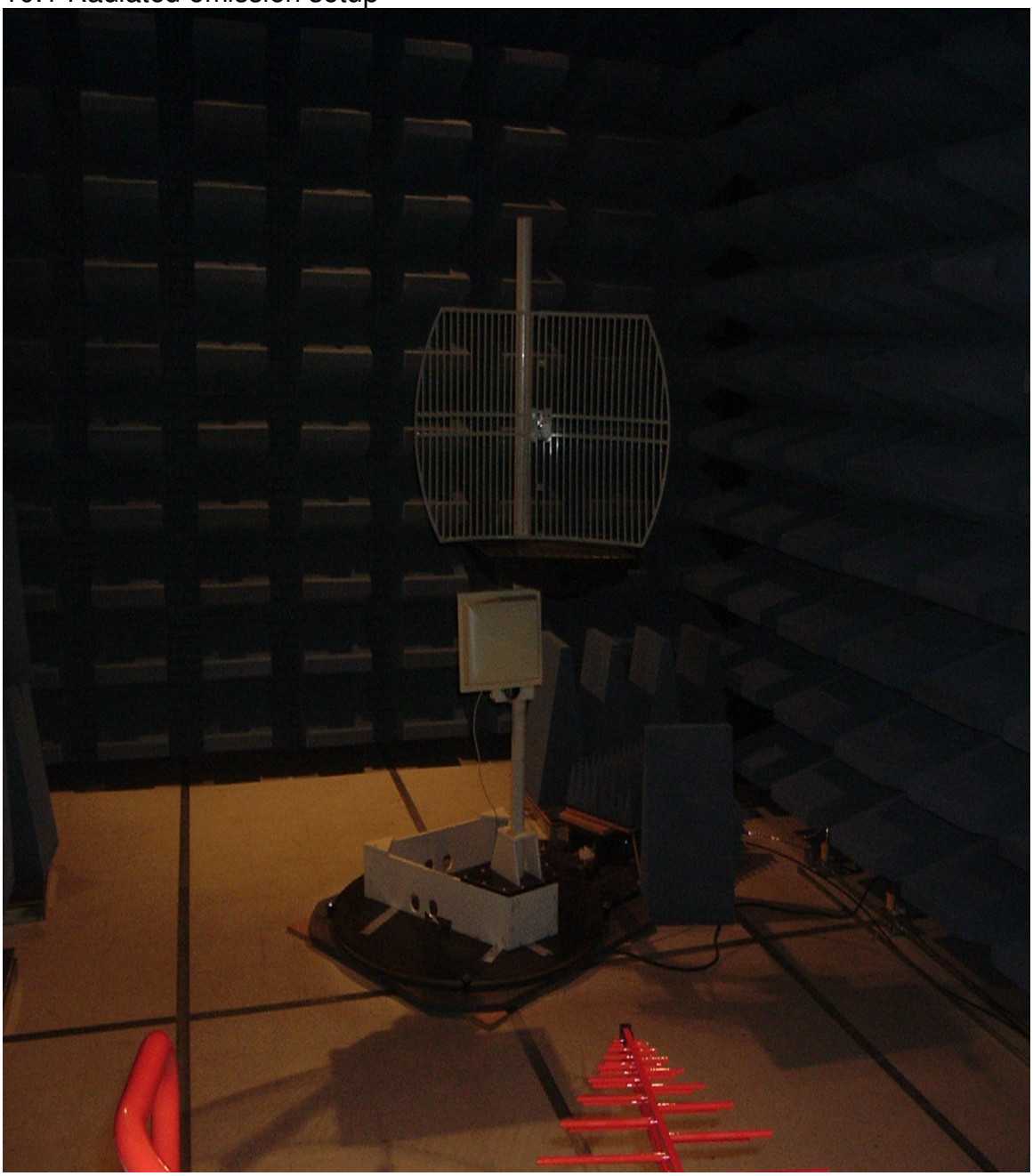
EUT with 30 dBi antenna

Mode OFDM/ Channel BW = 10 MHz			
Freq (MHz)	Output Power to Antenna (dBm)	Antenna Gain (dBi)	r (cm)
5730	22.83	30	123.6
5800	22.09	30	113.5
5845	22.24	30	115.6

As shown above, the minimum distance where the MPE limit is reached is 123.6 cm for the EUT.

10.0 Test Photos

10.1 Radiated emission setup



10.2 Conducted Emission Setup