



# Wireless Transceiver Test Report



FCC id: A94311822

IC: 3232A-311822

Certificate # 1514.1

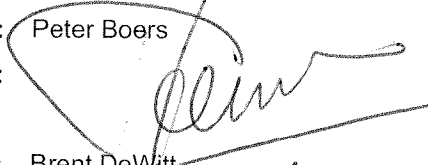
**Report number:** EMC.311822.10.11.1

**Prepared for:** Bose Corporation  
DCE - EMC  
1 New York Ave, Framingham MA 01701


**Product Tested:** Bose Modular transmitter model 311822

**Standards:** FCC part 15.B, FCC 15.C (15.249)  
RSS210 issue 7 (June 2007),  
ICES-003 issue 4, CAN/CSA-CIE/IEC CISPR22:02

**Report prepared by:** Peter Boers

**Signature:** 

**Report reviewed by:** Brent DeWitt

**Signature:** 

**Report issue date:** January 11 ,2010

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## 1 Report Summary

**1.1 Product** Bose IR and RF remote control module  
Model 311822

**1.2 Client** Bose Corporation  
1 New York Ave, Framingham MA 01701

**1.3 Applicable Standards** FCC part 15.B  
FCC 15.C (15.249), ANSI C63.10 (2009)  
RSS210 issue 7 (June 2007),  
ICES-003 issue 4, CAN/CSA-CIE/IEC CISPR22:02

Test Results: Pass  Fail

**1.4 Test Laboratory** Bose DCE laboratories  
1 New York Ave  
Framingham, MA 01701.  
IC registration : 3232A  
FCC site registration under A2LA cert. #1514

This report relates only to the items tested.

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## 2 Product description

The Bose IR and RF remote control module is a Modular RF device in the context of FCC rules. It provides remote control capabilities for several types of Bose products. It has power and data interfaces and provides internal voltage control to the RF circuitry. The RF part communicates in the 2.4 GHz ISM band with a peak RF power of approximately 1 mW.

## 3. Applicable standards, requirements and tests

RSS gen	RSS 210	ICES-003 CSA-CISPR22	FCC part	Test references.	Status/ Test reference
5.3			15.15(b)	There are no user-accessible controls in the device under test.	
			15.27	There are no special devices such as shielded cables or special connectors required for compliance to the applicable standards.	
			15.203	The device uses a unique connector in line to the permanently attached antenna.	
	2.2		15.205	The device does not operate in either the US or Canadian restricted bands.	
7.2.2		5.1	15.207	Conducted emissions	Complies, See section 6.1
		6	15.109	Radiated emissions, unintentional device	Complies, see section 6.2
	A2.9 (a)		15.249 (a)	Transmitter field strength	Complies, see section 6.3
	A2.9 (a)		15.249 (a)	Transmitter harmonics	Complies, see section 6.4
				Occupied Bandwidth	for reference only see Section 6.5
6(b)	2.3		15.111	Receiver conducted spurious emissions	Not required for permanently attached antenna's
	2.2		15.249 (b) 15.209	Transmitter spurious (unwanted) emissions	Complies See section 6.6

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## 4 Environmental Conditions

All testing is performed under the following conditions, unless otherwise defined in the detail test report section.

Temperature:  $22 \pm 4$  °C

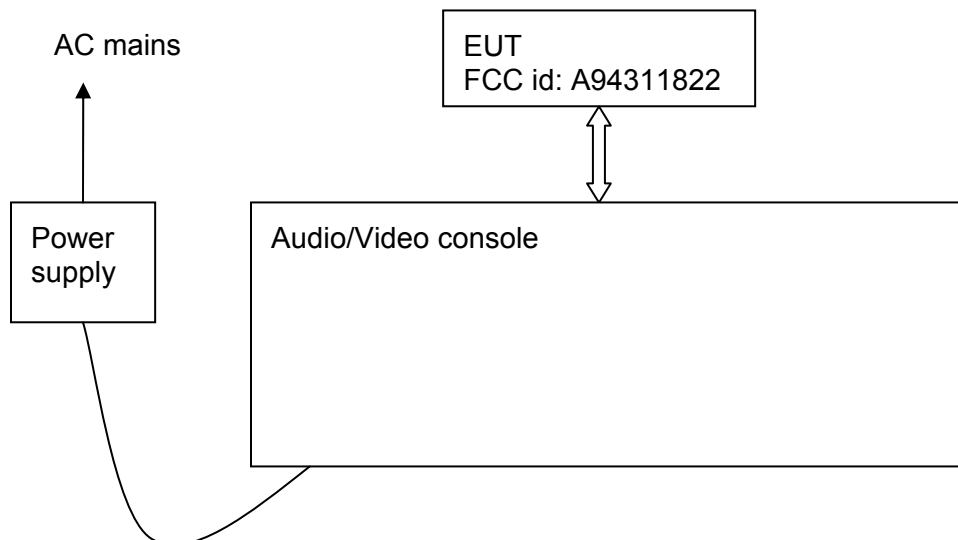
Humidity: 30 – 60 % RH

## 5 EUT configuration.

The EUT is a Modular Transmitter under FCC rules and consists of a small PC board containing the RF and IR remote control functions and communications capability for the remote control of several home entertainment devices. The RF link protocol is specific to Bose Corporation's handheld RF remotes; the IR functions can be programmed to address a multitude of devices. Only the RF attributes of the module are addressed in this test report

The EUT needs to be placed in specific test modes in order to be able to test its attributes as specified by FCC rules and ANSI C63.10.

The EUT is power by a Bose Lifestyle console (host equipment), which provides the power and data interfaces. The EUT contains a single chip transceiver, which incorporates a voltage regulator and data I/O buffers as well as an integral (etched) antenna.



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## 6 Test data

### 6.1. Conducted emissions.

#### 6.1.1. Requirements

47CFR15.207

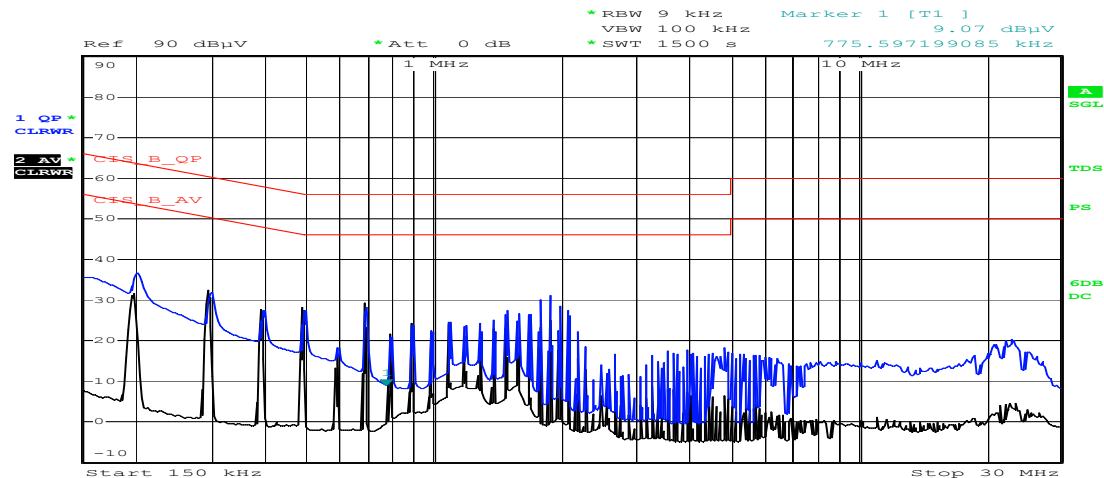
Frequency MHz	Limits dB(μV)	
	Quasi-peak	Average
0.15 - 0.5	66-56	56-46
0.5 - 1.6	56	46
1.6 - 30	60	50

#### 6.1.2. Test setup details

The conducted emissions of the sample console that provides the power and data interface to the modular transceiver were tested. The test setup is to ANSI C63.4 (2009) and ANSI C63.10 (2009). The Modular transceiver is located outside the console. The console functions only as a supply of DC power and provides the data interfaces for the purposes of this test.

#### 6.1.3. Test data

Conducted emissions (QP and Average) on the AC line side of the console power supply



Date: 11.JAN.2010 17:23:00

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# Wireless Transceiver Test Report

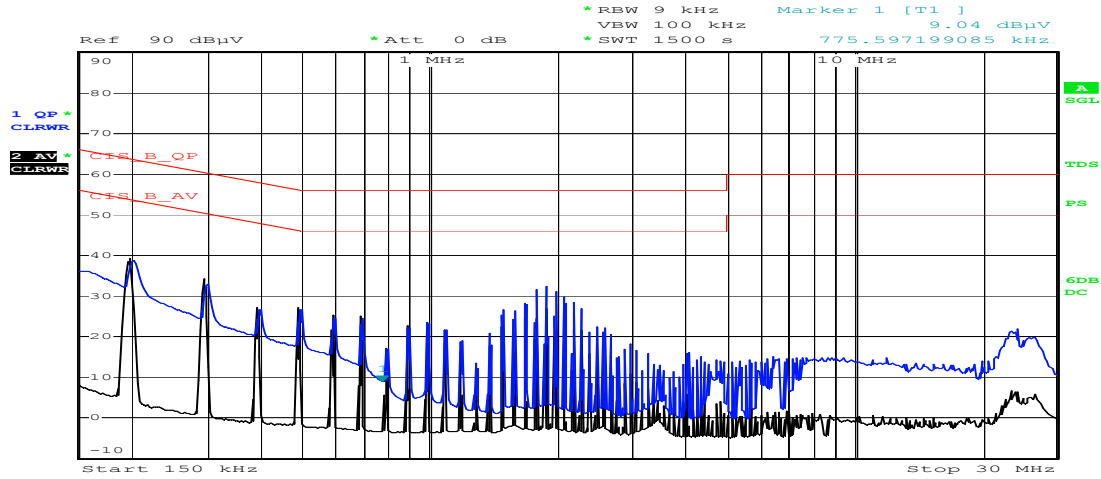


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Conducted emissions (QP and Average) on the AC neutral side of the console power supply



Date: 11.JAN.2010 18:02:00

Summary: All conducted emissions (in this mode) due to the Modular Transceiver are more than 20 dB below the class B limits.

## 6.1.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				Last	due date
LISN	EMCO	3810/2	TN600	2/26/2009	2/26/2010
Receiver	Rohde & Schwarz	ESCI	TN1420	6/2/2009	6/2/2010
Transient Limiter	HP	11947A	TN57	11/24/2009	11/24/2011

## 6.1.5. Test information

<b>Date of test:</b>	Jan 11, 2010	<b>EUT serial:</b>	NA
<b>Test Location:</b>	Henry room	<b>Test result:</b>	Pass
<b>Tested by:</b>	Peter Boers		

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## 6.2. Radiated emissions 30 MHz – 1 GHz

### 6.2.1. Requirements

FCC rules part 15.109 (g), CAN-CSA-CISPR22 section 6 class B\*

Frequency	Limit in dB $\mu$ V/m @3m
MHz	Quasi-peak
30 – 230	40
230 - 1000	47

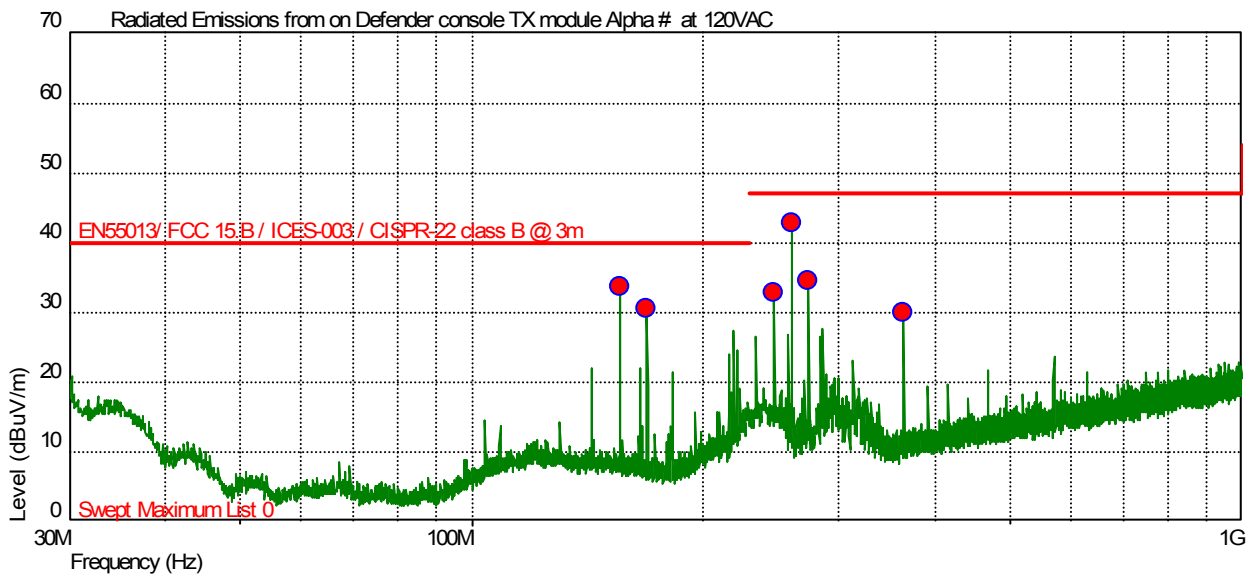
\* The 10 meter limits as defined in CAN-CSA-CISPR22 have been scaled to 3 meters using the 1/d formula

### 6.2.2. Test setup details

The EUT is placed in the center of an 80 cm high non-conductive turntable and programmed to constantly transmit. The EUT is scanned in both H and V polarizations, the turntable is rotated over 360 degrees and the antenna height is varied from 1 to 4 meters at a distance of 3 meters in order to find the maximum emissions in the pre-scan. After the maximum emissions are determined in this mode, each point within 6 dB from the limit is manually re-measured with the receiver in quasi-peak mode.

### 6.2.3. Test data

Pre-scan data with peak detector. Antenna factors, pre-amp gain and cable losses are included in the measurement results by the measurement software.



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The 6 highest emissions relative to the limit line:

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
156.0	33.6	40	-6.4	Unintentional emission from support equipment
168.95	30.5	40	-9.5	Unintentional emission from support equipment
246.95	33.0	47	-14	Unintentional emission from support equipment
259.95	42.7	47	-4.3	Unintentional emission from support equipment
259.95	39.8	47	-7.2	QP value
272.95	34.5	47	-12.5	Unintentional emission from support equipment
363.95	30.0	47	-17	Unintentional emission from support equipment

## 6.2.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Antenna	Sunol Sciences	JB6	TN1541	8/6/2009	8/6/2010
Pre-Amp	Rohde & Schwarz	TS-PR8	TN1669	3/5/2009	3/5/2010
Receiver	Rohde & Schwarz	ESU40	TN1663	7/29/2009	7/29/2010
8 GHz cable set	-	-	TN1445	5/19/2009	5/19/2010

## 6.2.5. Test information

<b>Date of test:</b>	12/9/2009	<b>EUT serial:</b>	NA
<b>Test Location:</b>	Maxwell House	<b>Test result:</b>	Pass
<b>Tested by:</b>	Peter Boers		

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## 6.3. Output Field Strength

### 6.3.1. Requirements.

FCC 15.249 (a), RSS-210 section A2.9(a):

The maximum field strength in the frequency range of 2400 – 2483.5 MHz shall be 50mV/m (94dB $\mu$ V/m) with an average detector @ 3 meters distance. There is an implied peak limit 20 dB above the average limit

### 6.3.2. Test setup details.

The EUT is placed on a 80 cm non-conductive table according to ANSI C63.10.

It is operated in an artificial test mode simulating continual key presses at a 100 ms interval.

The EUT is tested in 3 orthogonal planes to measure the highest output field strength.

### 6.3.3. Test data.

EUT orientation	Position in frequency band	Maximum field strength (dB $\mu$ V/m @ 3m)		Antenna	Table	Limit (dB $\mu$ V/m @ 3m)		Margin (dB)
		Av	Pk			Av	Pk	
Normal	Low	92.3	104.4	H - 135	325	94	114	-1.7
	Mid	93.0	105.3	H - 129	316	94	114	-1.0
	High	92.9	105.3	H - 128	318	94	114	-1.1
Sideways	Low	88.5	100.7	H - 124	317	94	114	-5.5
	Mid	89.2	101.4	H - 120	305	94	114	-4.8
	High	87.8	100.3	H - 119	307	94	114	-6.2
Upright	Low	86	98.2	H - 133	318	94	114	-8.0
	Mid	85.6	97.7	H - 132	317	94	114	-8.4
	High	85.5	97.6	H - 129	313	94	114	-8.5

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## 6.3.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Antenna	Sunol Sciences	JB6	TN1541	8/6/2009	8/6/2010
Receiver	Rohde & Schwarz	ESU40	TN1663	7/29/2009	7/29/2010
8 GHz cable set	-	-	TN1445	5/19/2009	5/19/2010

## 6.3.5. Test information

<b>Date of test:</b>	1/08/2010	<b>EUT serial:</b>	NA
<b>Test Location:</b>	Maxwell	<b>Test result:</b>	Pass
<b>Tested by:</b>	Peter Boers		

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## 6.4. Harmonics

### 6.4.1. Requirements.

FCC 15.249 (a), RSS-210 section A2.9(a):

The maximum field strength in the frequency range of 2400 – 2483.5 MHz shall be 500 microV/m (54dBμV/m) with an average detector @ 3 meters distance. There is an implied peak limit 20 dB above the average limit

### 6.4.2. Test setup details.

The EUT is placed in the center of a 80 cm non-conductive table according to ANSI C63.10  
The EUT position of the highest (worst case) output field strength determined previously is used to measure the harmonics.

### 6.4.3. Test data.

Carrier [MHz]	Measured Level [dBμV/m]						Limit [dBμV/m]		Margin dB	Notes
	2401.67		2441.067		2482.021		av	pk		
Harmonic order	av	pk	av	pk	av	pk	av	pk		
2 <sup>nd</sup>	45	56.6	40.4	53.1	38.9	50.4	54	74	-9.0	Low: table @ 336, H pol 100 Mid: table @ 332, H pol 100 High: table @292, Hpol 100
3 <sup>rd</sup>	30.7	45.4	26.3	40.1	-	-	54	74	-23.3	Low: table@ 336, H pol 120 Mid: table @ 334, V pol 116 Noise floor = 25.5
4 <sup>th</sup>	-	-	-	-	-	-	54	74		Noise floor = 33.8
5 <sup>th</sup>	-	-	-	-	-	-	54	74		Noise floor = 36.8
6 <sup>th</sup>	-	-	-	-	-	-	54	74		Noise floor = 40.9
7 <sup>th</sup>	-	-	-	-	-	-	54	74		Noise floor = 43.7
8 <sup>th</sup>	-	-	-	-	-	-	54	74		* Noise floor = 37
9 <sup>th</sup>	-	-	-	-	-	-	54	74		* Noise floor = 38.5
10 <sup>th</sup>	-	-	-	-	-	-	54	74		* Noise floor = 40

\* measurements are made at 1 meter distance above 18 GHz

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## 6.4.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Receiver	Rohde & Schwarz	ESU40	TN1663	7/29/2009	7/29/2010
Antenna 4 – 8G	AR	AT4003	TN727	11/24/2008	11/24/2011
8 GHz pre-amp	Rohde & Schwarz	TS-PR8	TN1669	3/5/2009	3/5/2010
8 GHz cable set	-	-	TN1445	5/19/2009	5/19/2010
Antenna 8 – 18G	AR	AT4004	TN728	11/24/2008	11/24/2011
Antenna cable 18GHz	Rohde & Schwarz	HFE160D	TN1692	3/5/2009	3/5/2010
20 GHz Pre-amp	MITEQ	AFS4-00102000-30-10P-4	TN1672	4/27/2009	4/27/2010
Antenna 18 – 26.5G	ETS	3160-09	TN1307	2/18/2008	2/18/2010
40 GHz pre-amp	MITEQ	JS4018004000-30-8P-A1	TN1757	Verify before use	
40 GHz cable	-	-	TN1277	Verify before use	

## 6.4.5. Test information

<b>Date of test:</b>	Jan 10, 2010	<b>EUT serial:</b>	NA
<b>Test Location:</b>	Maxwell	<b>Test result:</b>	Pass
<b>Tested by:</b>	Peter Boers		

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## 6.5. Occupied Bandwidth

### 6.5.1. Requirements

The 99% Bandwidth to be measured in the low, mid and high channels.

### 6.5.2. Test setup details

The EUT is connected via the build-in switch/connector to a spectrum analyzer. The Spectrum Analyzer's build-in function to measure the 99% occupied bandwidth is used.

The conducted output power in the low, middle and high end of the band is also measured for reference in other tests.

### 6.5.3. Test data

	Low	Middle	High
Actual frequency (MHz)	2401.683	2441.122	2482.004
Output power (dBm)	1.75	1.61	1.48
99% Occupied bandwidth (kHz)	813	768	795

### 6.5.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Receiver	Rohde & Schwarz	ESIB40	TN1560	3/3/2009	3/3/2010
TS7 adapter cable	SMK	-	TN1808	Verify before use	

### 6.5.5. Test information

<b>Date of test:</b>	12-19-2009 & 1/10/2010	<b>EUT serial:</b>	NA
<b>Test Location:</b>	TX test bench	<b>Test result:</b>	NA
<b>Tested by:</b>	Peter Boers		

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## 6.6. Radiated spurious emissions

### 6.6.1. Requirements

FCC 15.249(d) & RSS210 : Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209 or RSS210 Table 2, whichever is the lesser attenuation.

### 6.6.2. Test setup details

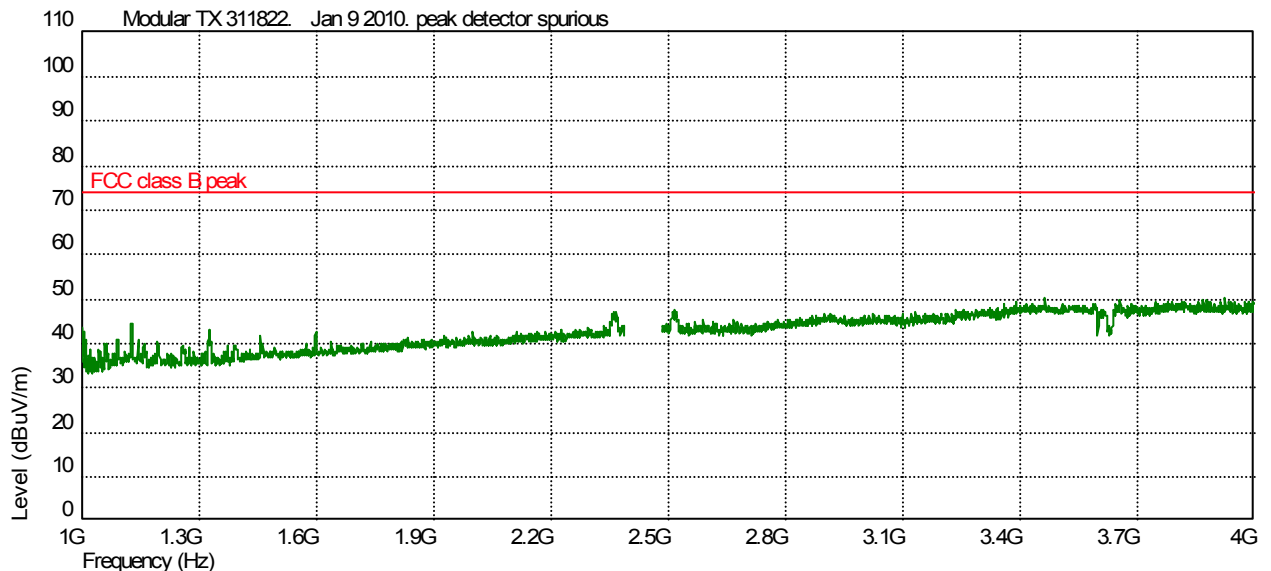
The EUT was placed in a simulated repeated key press mode and placed in a typical user position on a 80 cm non-conducted table according to ANSI C63.4. The EUT was scanned in the frequency range of 1 – 25 GHz (covering the 10<sup>th</sup> harmonic of the transmit frequency) in both Horizontal and vertical polarizations of the measurement antenna.

Measurements below 1 GHz are covered in section 1. The applied limit is FCC 15.209 and RSS210 table 2.

### 6.6.3. Test data

#### 1-4 GHz

Peak detector, omitting the 2.4 GHz Band



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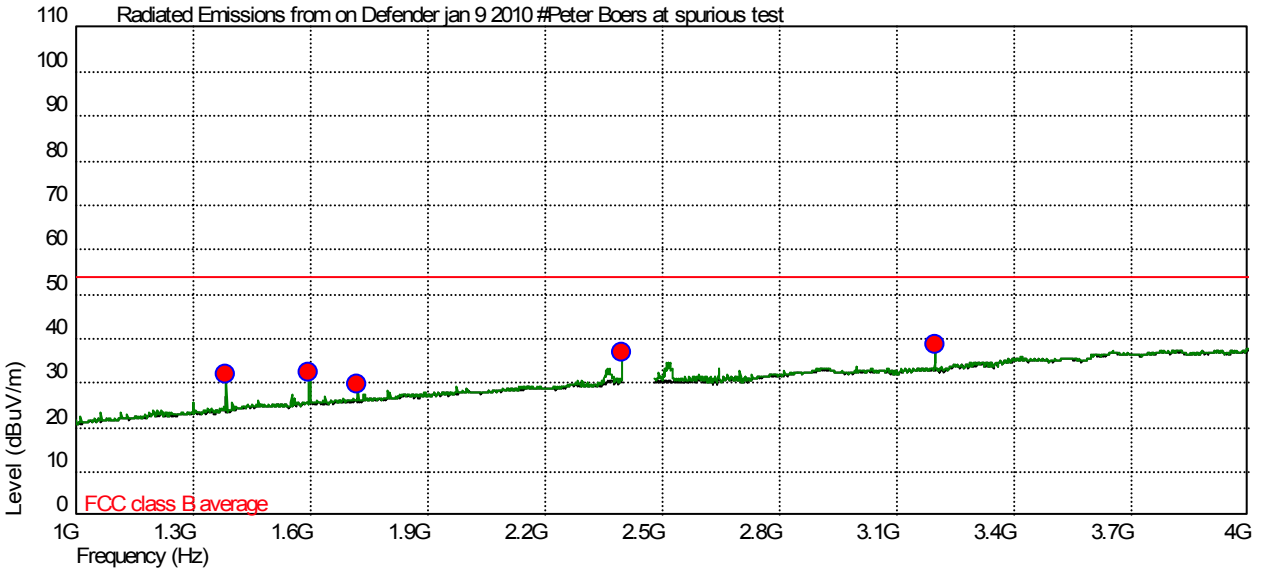


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Average detector, omitting the 2.4 GHz band



Frequency (MHz)	Level (dBuV/m)	Antenna Height (m)	Polar	Table Angle (Deg)	Limit (dBuV/m)	Margin (dB)	Comment
1386.0	32.0	1	V	120	54	-22	Unintentional emission from support equipment
1599.5	32.5	1	V	60	54	-21.5	
1721.5	29.7	1	V	160	54	-24.3	Unintentional emission from support equipment
2399.5	36.9	1	V	220	54	-17.1	Lower Band edge
3199.5	38.6	1	V	350	54	-15.4	

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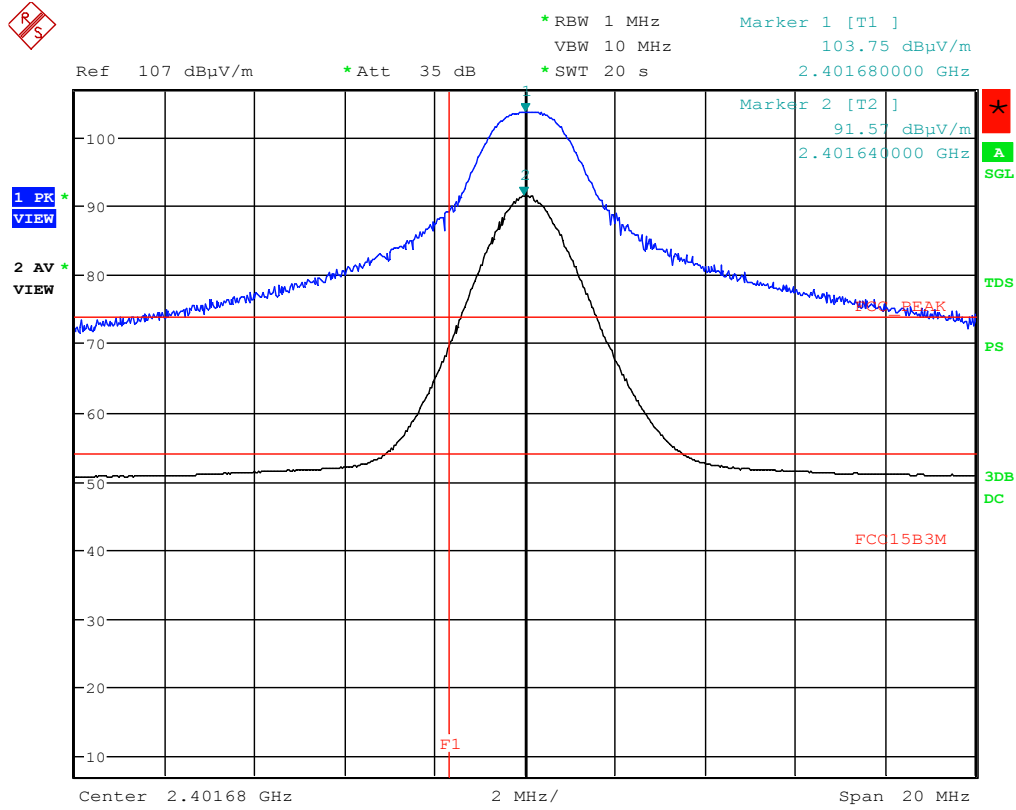


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Lower band edge measurement, marker-delta method. F1 is the band edge  
1 MHz rbw data: maximum peak = 103.75 , maximum average = 91.57



Date: 10.JAN.2010 12:02:02

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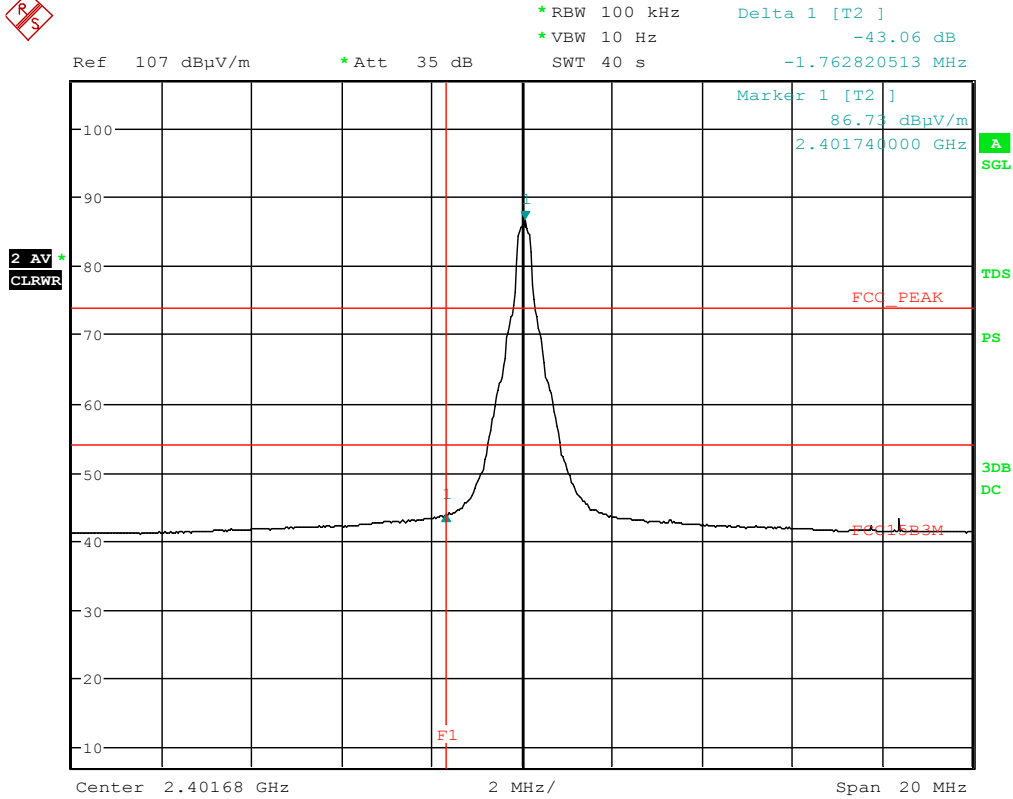


FCC id: A94311822

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100 kHz rbw average, delta = 43.06 dB



Date: 10.JAN.2010 12:05:24

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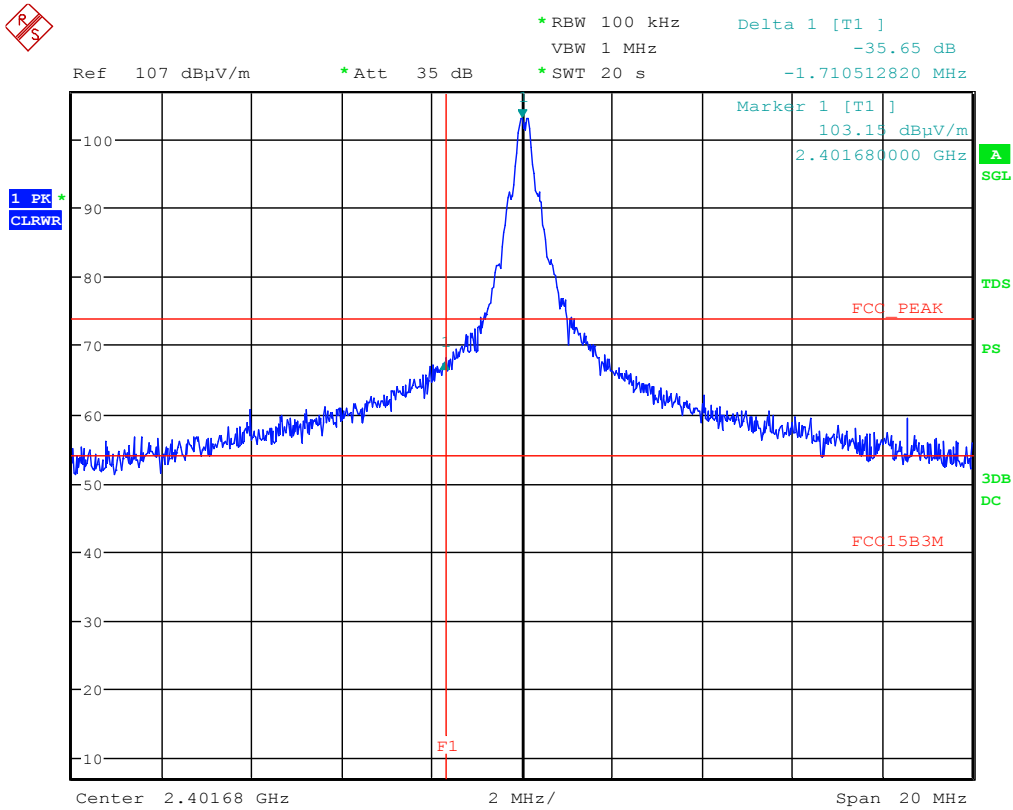


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100 kHz peak delta = 35.65 dB. F1 is the lower band edge



Date: 10.JAN.2010 12:03:33

Band edge calculation:

Average value @ band edge: 91.57 – 43.06 = 48.51 dBμV/m. Limit is 54

Peak value @ band edge: 103.75 – 35.65 = 68.1 dBμV/m. Limit is 74

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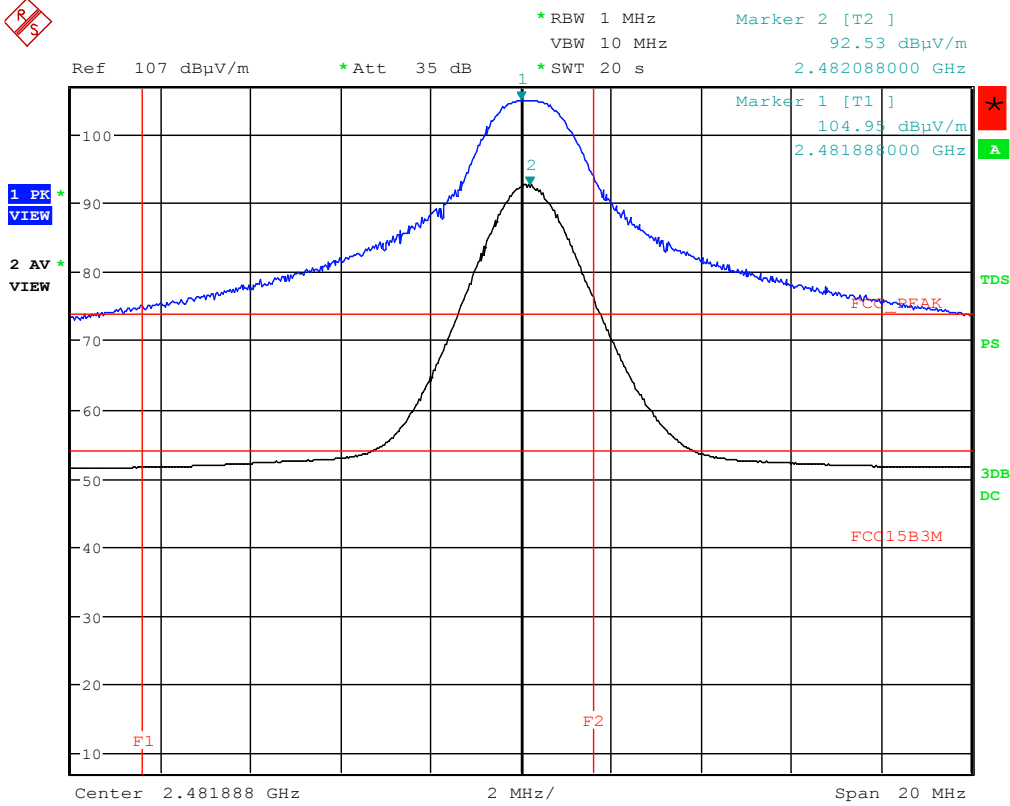
IC: 3232A-311822

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Upper band edge measurement, marker delta method

Output high channel (246 or F6), average = 92.53 , peak = 104.95

F2 is the upper band edge



Date: 10.JAN.2010 11:43:34

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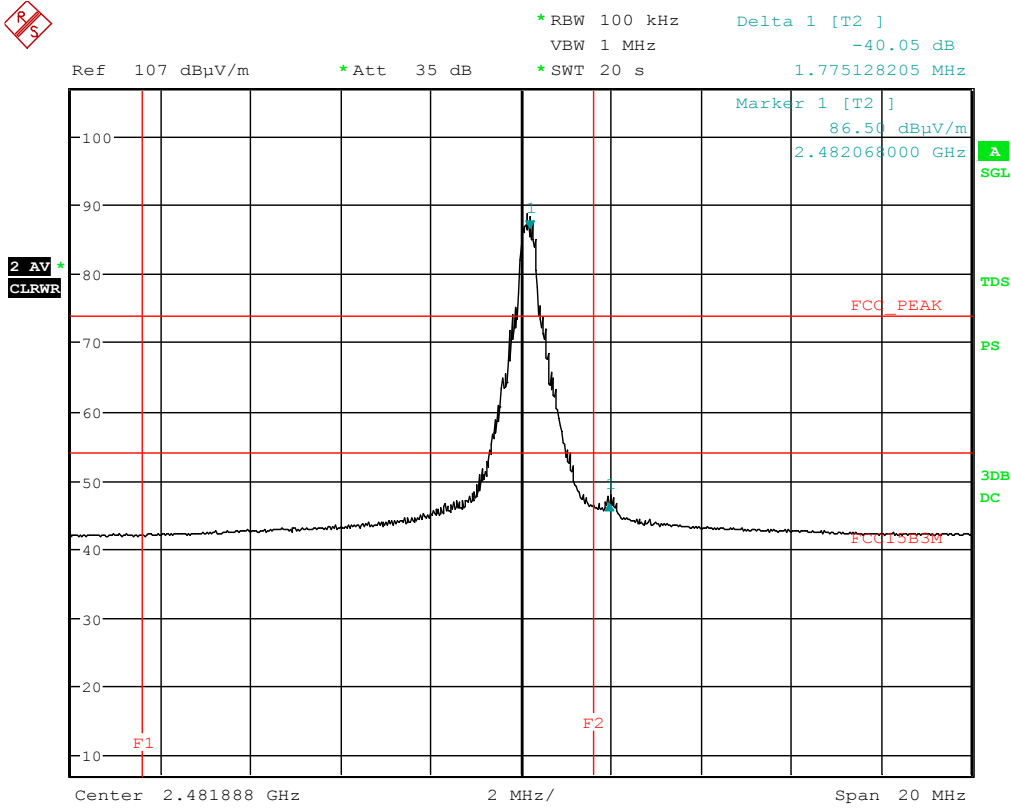


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IC: 3232A-311822

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100 kHz rbw, average detector, delta = 40.05 dB



Date: 10.JAN.2010 11:49:36

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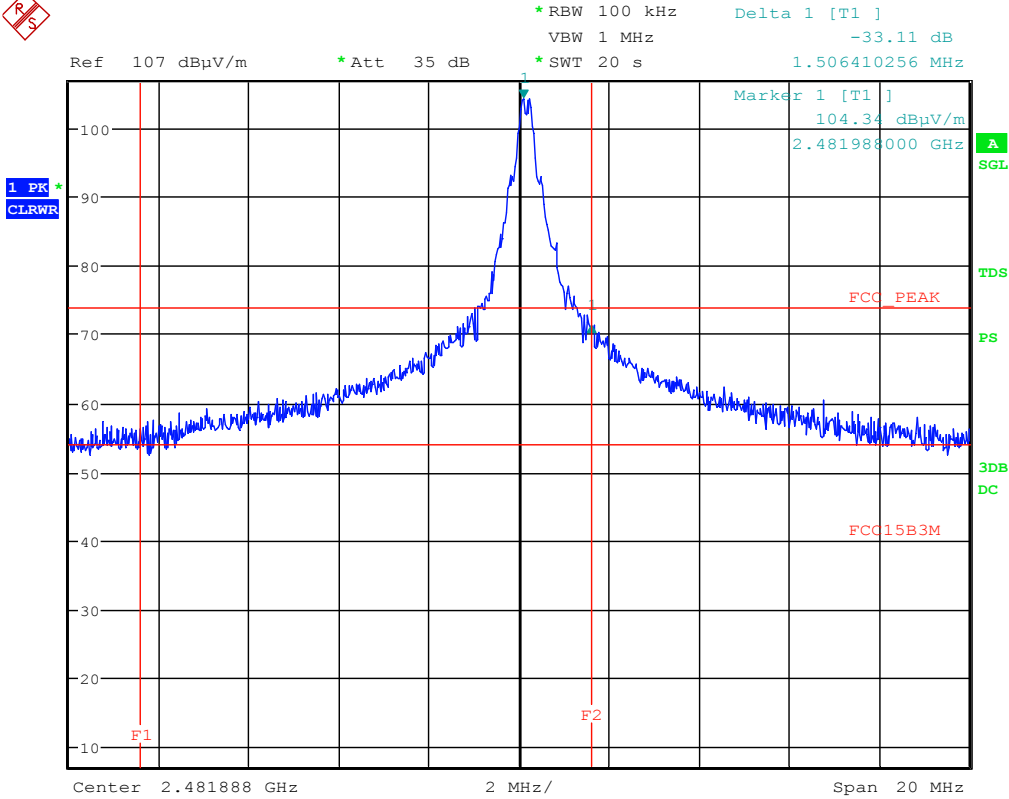


FCC id: A94311822

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100kHz rbw, peak, delta = 33.11 dB



Date: 10.JAN.2010 11:51:23

Band edge calculation:

Average value @ band edge  $92 - 40.05 = 51.95$  dBµV/m. Limit is 54

Peak value @ band edge:  $104.95 - 33.11 = 71.84$  dBµV/m. Limit is 74

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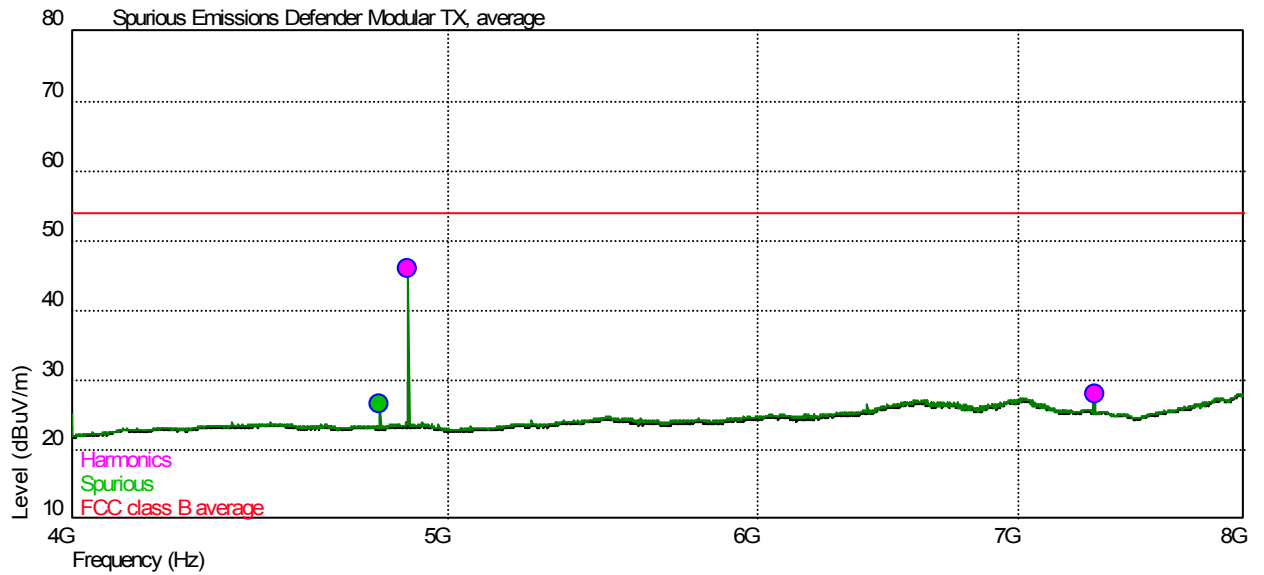
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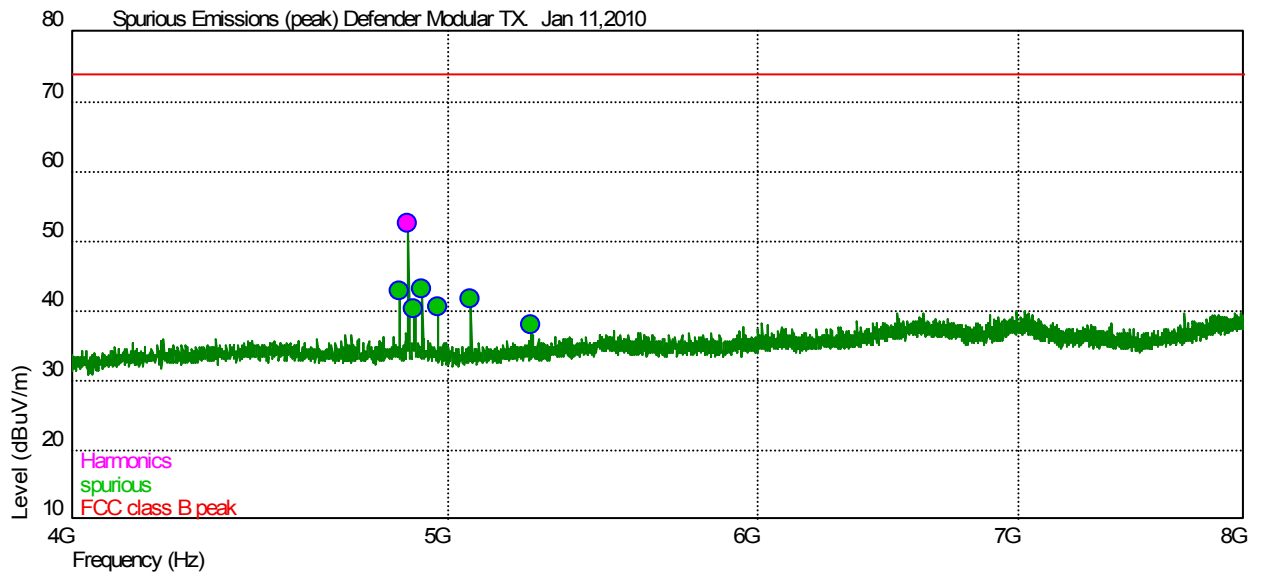
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## 4-8 GHz

Average detector



peak detector



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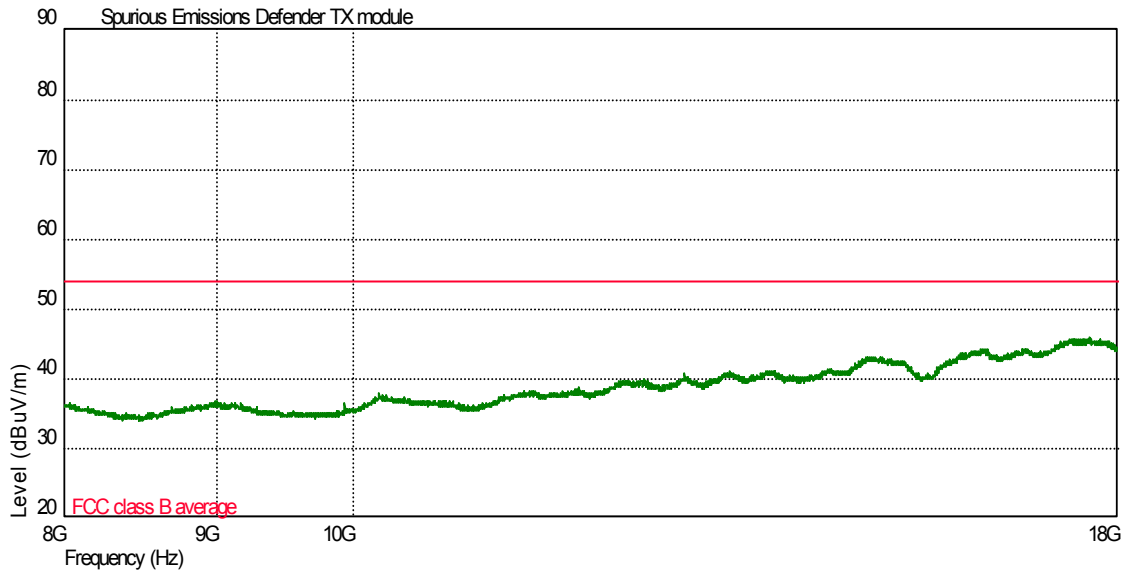
FCC id: A94311822

IC: 3232A-311822

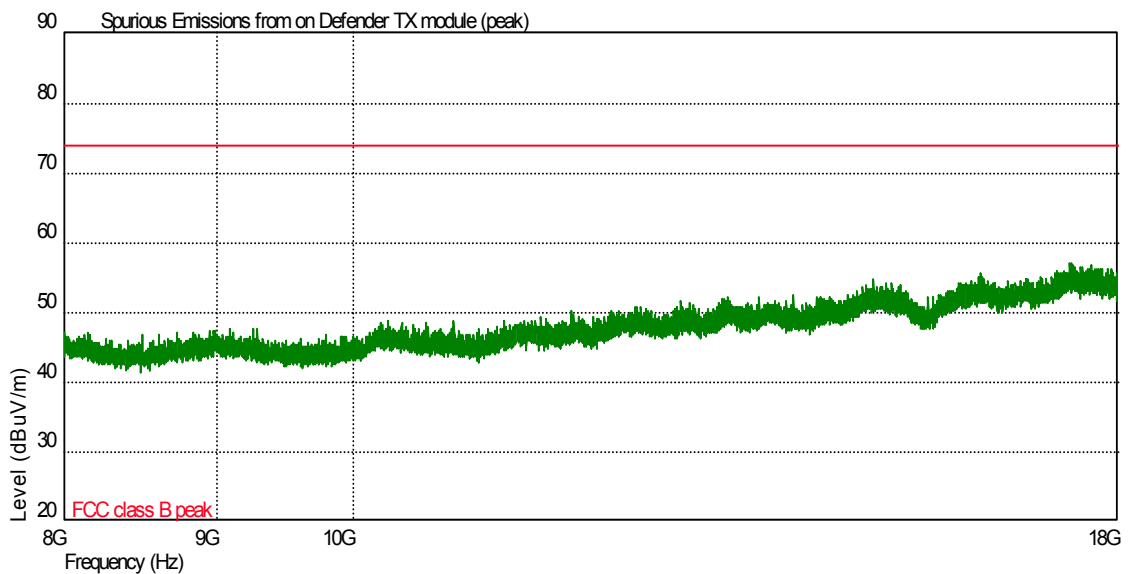
Certificate # 1514.1

## 8-18 GHz

Average detector



Peak detector



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# Wireless Transceiver Test Report



FCC id: A94311822

IC: 3232A-311822

Certificate # 1514.1

## 18-25 GHz.

The units were manually scanned at close distances. No emissions above the instrumentation noise floor were found. The instrumentation noise floor is > 10dB below the limit

### 6.6.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Receiver	Rohde & Schwarz	ESU40	TN1663	7/29/2009	7/29/2010
Antenna 4 – 8G	AR	AT4003	TN727	11/24/2008	11/24/2011
8 GHz pre-amp	Rohde & Schwarz	TS-PR8	TN1669	3/5/2009	3/5/2010
8 GHz cable set	-	-	TN1445	5/19/2009	5/19/2010
Antenna 8 – 18G	AR	AT4004	TN728	11/24/2008	11/24/2011
Antenna cable 18GHz	Rohde & Schwarz	HFE160D	TN1692	3/5/2009	3/5/2010
20 GHz Pre-amp	MITEQ	AFS4-00102000-30-10P-4	TN1672	4/27/2009	4/27/2010
Antenna 18 – 26.5G	ETS	3160-09	TN1307	2/18/2008	2/18/2010
40 GHz pre-amp	MITEQ	JS4018004000-30-8P-A1	TN1757	Verify before use	
40 GHz cable	-	-	TN1277	Verify before use	

### 6.6.5. Test information

<b>Date of test:</b>	Jan 11, 2010	<b>EUT serial:</b>	NA
<b>Test Location:</b>	Maxwell	<b>Test result:</b>	pass
<b>Tested by:</b>	Peter Boers		

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