



# Wireless Transceiver Test Report

FCC ID: A94414255 IC: 3232A-414255



Certificate # 1514.1

**Report number:** EMC.414255.296.1.2

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

**Product Tested:** Bose® Wireless Speaker

**Standards:** FCC part 15, RSS210, RSS-gen and ICES-003

**Report prepared by:** Michael Royer

**Signature:** 

November 19, 2013

**Report reviewed by:** David Sterrett

**Signature:** 

November 19, 2013

**Report issue date:** November 19, 2013

**Changes from  
previous revision:**

1. Changed Typo in 6.4.2 Occupied BW Data from 1.936 to 1.396.
2. Changed Resolution BW from 100 kHz to 30 kHz for 99% Occupied BW measurements and re-tested. Submitted new measurement data.
3. Corrected calibration dates for preamp TN1672 on page 36.
4. Updated the report number and the issue dates.

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## 1. Report Summary

1.1 Product **Bose® Wireless Speaker**

1.2 Client Bose Corporation  
The Mountain, Framingham, MA 01701

1.3 Applicable Standards **FCC part 15.B and C**  
**RSS-210 issue 8**  
**RSS-Gen issue 3**  
**ICES-003 issue 5**

Test Results: Pass  Fail

1.4 Test Laboratory Bose DCE laboratories  
1 New York Ave  
Framingham, MA01701.  
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 product is a wireless speaker for listening to music.  
A battery charger is supplied. The contacts on the bottom are for future use.

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### 3. Applicable standards, requirements and tests

FCC part 15	RSS210	RSS-Gen	Test references.	Result / Data section
15.15(b)		5.4	There are no user-accessible controls for the adjustment of any transmitter parameters in the device under test.	Complies
15.27			There are no special devices such as shielded cables or special connectors required for compliance to the applicable standards.	Complies
15.203			An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The antenna is not accessible by the user.	Complies
15.205	2.2		The device does not operate in either the US or Canadian restricted bands.	Complies
15.107 15.207		7.2.4	Conducted emissions, 150kHz–30 MHz	Complies Section 6.1
15.109 15.209			Radiated emissions, 30MHz–1GHz Spurious emissions, 30MHz–1GHz	Complies Section 6.2
15.247 (b)(1)	A8.4 (2)		Transmitter output power:	Complies Section 6.3
15.247 (a)(1)	A8.1 (b)		Hopper Occupied Bandwidth / channel spacing	Complies Section 6.4
15.247(a) (1) iii	A8.1 (d)		Time occupancy of a frequency hopper.	Complies Section 6.5
15.247(d)	A8.5	4.9	Transmitter conducted spurious emissions	Complies Section 6.6
15.247(d)		4.9	Transmitter harmonics.	Complies Section 6.7
15.247(d)		7.2.5	Transmitted radiated spurious emissions	Complies Section 6.8
		4.10, 6.2	Receiver Spurious emissions	Complies Section 6.9
OET65	Canada Health and Safety code 6		MPE calculation	Complies Section 6.10

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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 Bose® wireless speaker is powered by an internal, re-chargeable, lithium-ion battery. The battery is re-charged using the supplied AC adapter. The EUT battery was fully discharged prior to each test, so that the internal battery charging circuit would remain active through the test. During pre-compliance testing, the depleted battery mode was determined to be worst case for the EUT and for the EUT AC adapter. The pre-compliance tests also determined that the Aux input mode is the worst case. For conducted emissions, the Aux accessory was investigated in both the grounded and not grounded modes.

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## 6. Detailed Test Results

### 6.1. Conducted Emissions

#### 6.1.1. Requirements

47CFR15.207, RSS 210 section 7.2.4

Frequency	Limits dB(μV)	
MHz	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 EUT was tested in accordance with ANSI C63.4 test setup conditions in a typical user configuration to charge the battery using the supplied 17 Vdc power adapter. A 3.5 mm audio cable was connected from an audio source (cell phone) to the Aux port on the EUT.

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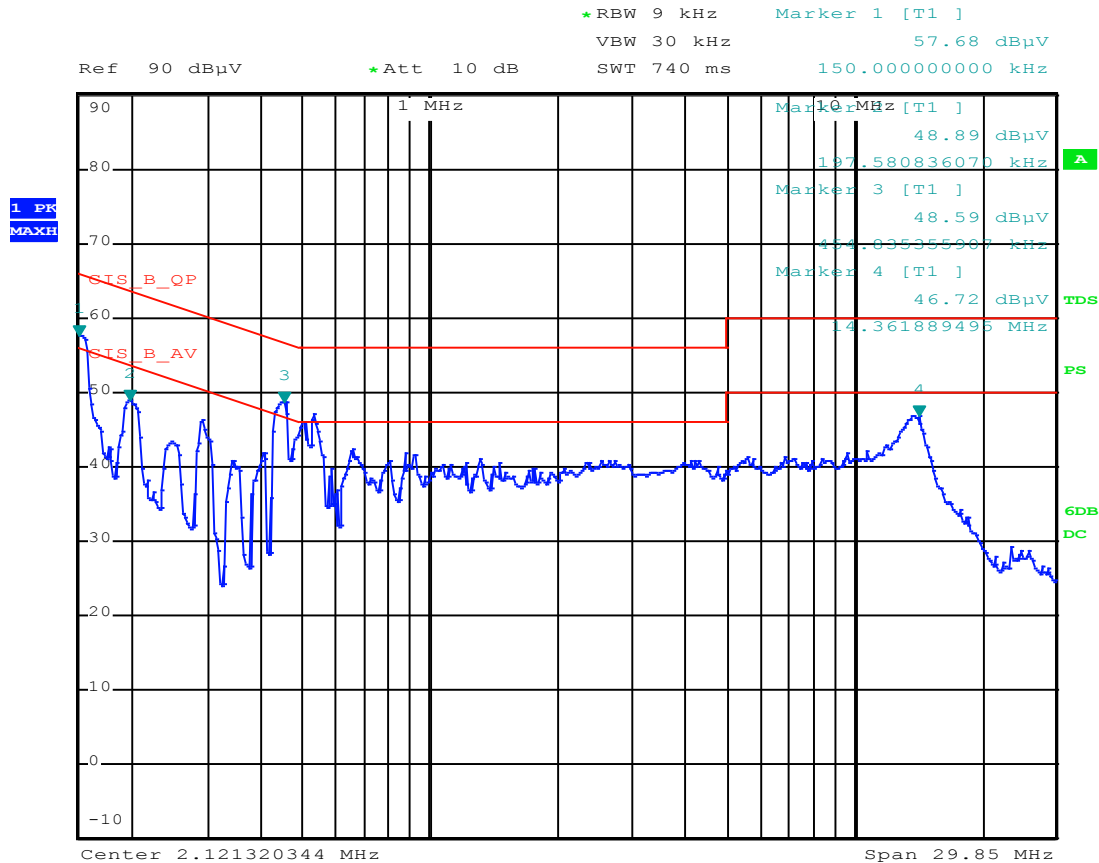
FCC ID: A94414255 IC: 3232A-414255

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## 6.1.3. Test data

AC Adapter charging EUT battery  
Playing pink noise at full volume

120 VAC 60 Hz, Line side, Max Peak Scan



Frequency MHz	MEASURED		LIMIT		MARGIN	
	dB $\mu$ V QP	dB $\mu$ V AVG	dB $\mu$ V QP	dB $\mu$ V AVG	dB QP	dB AVG
0.1500	54.80	44.40	66.0	56.0	11.2	11.6
0.1976	45.30	34.50	63.7	53.7	18.4	19.2
0.4498	47.10	40.60	56.9	46.9	9.8	6.3
0.5453	42.70	35.00	56.0	46.0	13.3	11.0
0.5872	37.20	35.30	56.0	46.0	18.8	10.7
14.3619	38.60	31.40	60.0	50.0	21.4	18.6

Worst case emission is 6.1 dB below the limit.

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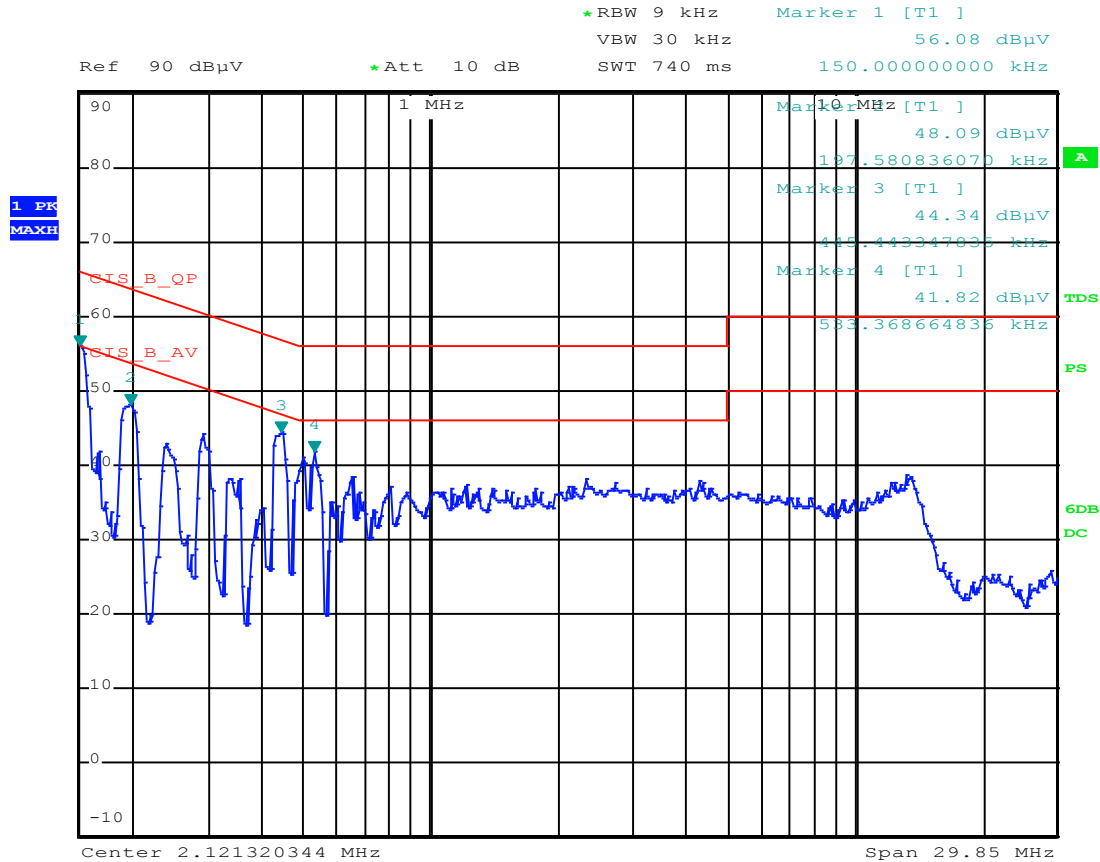
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120 VAC 60 Hz, Neutral side, Max Peak Scan



Date: 16.AUG.2013 10:23:54

Frequency MHz	MEASURED		LIMIT		MARGIN	
	dBμV QP	dBμV AVG	dBμV QP	dBμV AVG	dB QP	dB AVG
0.1500	54.20	43.80	66.0	56.0	11.8	12.2
0.1976	44.60	34.60	63.7	53.7	19.1	19.1
0.4498	47.30	40.80	56.9	46.9	9.6	6.1
0.5453	42.80	35.30	56.0	46.0	13.2	10.7
0.5872	38.00	35.00	56.0	46.0	18.0	11.0
14.3619	37.20	30.30	60.0	50.0	22.8	19.7

Worst case emission is 6.1 dB below the limit.

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## 6.1.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				Last	Due
LISN	EMCO	3810/2	TN600	3/6/2012	3/6/2014
EMI Test Receiver	Rohde & Schwarz	ESCI	TN1420	4/3/2013	4/3/2014
Transient Limiter	HP	11947A	TN57	12/6/2011	12/6/2013

## 6.1.5. Test information

<b>Date of test:</b>	8/16/13	<b>Test location :</b>	DCE lab – Henry room
<b>EUT serial:</b>	192	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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## 6.2. Radiated emissions 30 MHz – 1 GHz

### 6.2.1. Requirements

FCC rules part 15.109 (g), 15.209, ICES-003 issue 4 (2004) and CAN/CSA-CEI/IEC CISPR 22:02

Frequency	Limit in dB $\mu$ V/m @3m
MHz	Quasi-peak
30 – 230	40
230 - 1000	47
Above 1000	54

### 6.2.2. Test setup details

The EUT was placed on an 80 cm high table and configured for worst case emissions based on previous testing. Data represents the worst case operating mode with the audio stream based on pink noise. A power adapter for charging attached. The system is measured while charging the depleted EUT battery.

### 6.2.3. Test data

#### Summary:

Worst case QP margin of 5.1 dB at 87.935 MHz while charging battery.

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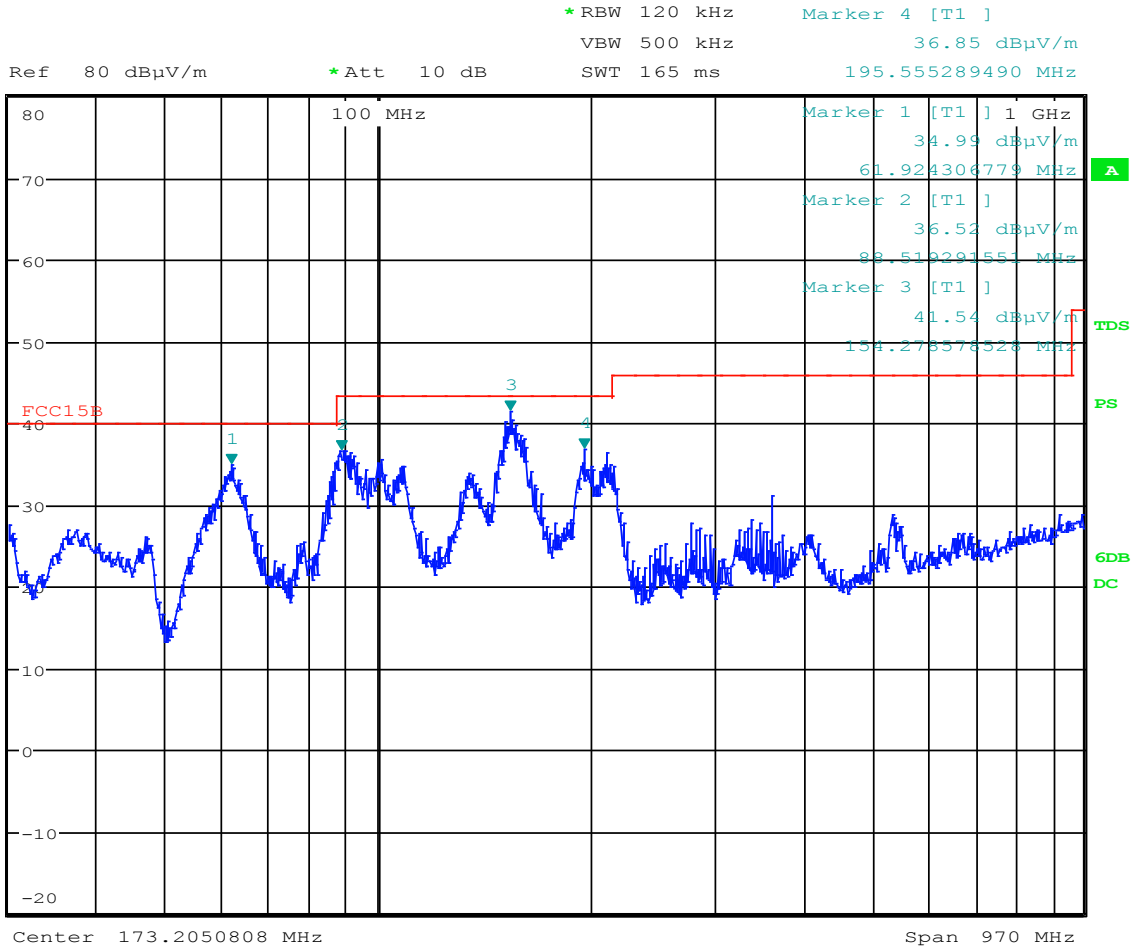
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Max-Hold Peak Pre-scan, 30MHz – 1GHz  
 Playing Pink Noise full volume using Aux input mode. Battery charging.



Emission Frequency (MHz)	Measured Amplitude (dBμV/m) QP/AVG*	Measured Amplitude (dBμV/m) Peak	FCC 15B				Table Azimuth (0° closest to ant)	Receiving Antenna	
			Limit (dBμV/m) QP/AVG*	Limit (dBμV/m) Peak	Margin (dB) QP/AVG*	Margin (dB) Peak		Pol (H/V)	Height (Meters)
61.900	29.80	35.10	40.0	N/A	10.2	N/A	118	V	1.0
89.140	35.10	38.30	43.5	N/A	8.4	N/A	40	V	1.5
87.935	34.90	38.40	40.0	N/A	5.1	N/A	65	V	1.2
195.500	32.70	39.00	43.5	N/A	10.8	N/A	166	V	1.0
154.300	35.20	43.40	43.5	N/A	8.3	N/A	40	V	1.0

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## 6.2.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				Last	Due
Antenna	Sunol Sciences	JB6	TN1541	7/24/2012	7/24/2014
EMI Test Receiver	Rohde & Schwarz	ESU40	TN1663	4/5/2013	4/5/2014
Maxwell House Radiated Emissions Cable Set	Bose Corporation	N/A	TN1445	Verify	

## 6.2.5. Test information

<b>Date of test:</b>	7/17/2013	<b>Test location :</b>	DCE - Maxwell House
<b>EUT serial:</b>	SN 210	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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## 6.3. Output power

### 6.3.1. Requirements:

FCC 15.247(a)(1) , RSS 210 A8.4 (2)

Frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W.

### 6.3.2. Test setup details:

The EUT is controlled via the USB cable with software which is used to set the test modes of the Bluetooth device. The EUT antenna is disconnected and replaced with a 1 m long piece of flexible coax cable with an SMA connector. This cable is rated to 1.05 dB of loss at 2.48 GHz. For this conducted measurement the SMA cable was connected to the spectrum analyzer input using a short calibrated flexible coax cable. The EUT is programmed to stop hopping and operate at fixed frequencies at the low, middle, and high end of the authorized frequency band.

The spectrum analyzer resolution bandwidth is set to 2 MHz (higher than the occupied bandwidth), peak detector and max hold. The maximum output power is recorded for low, mid and high band frequencies in both Basic Data Rate and Enhanced Data Rate. The maximum output power settings are different for basic rate and for Enhanced Data Rate (EDR) settings.

For basic data rate the packet type is set to 4 and packet size is set to 27.

For enhanced data rate the packet type is set to 31 and packet size is set to 1020.

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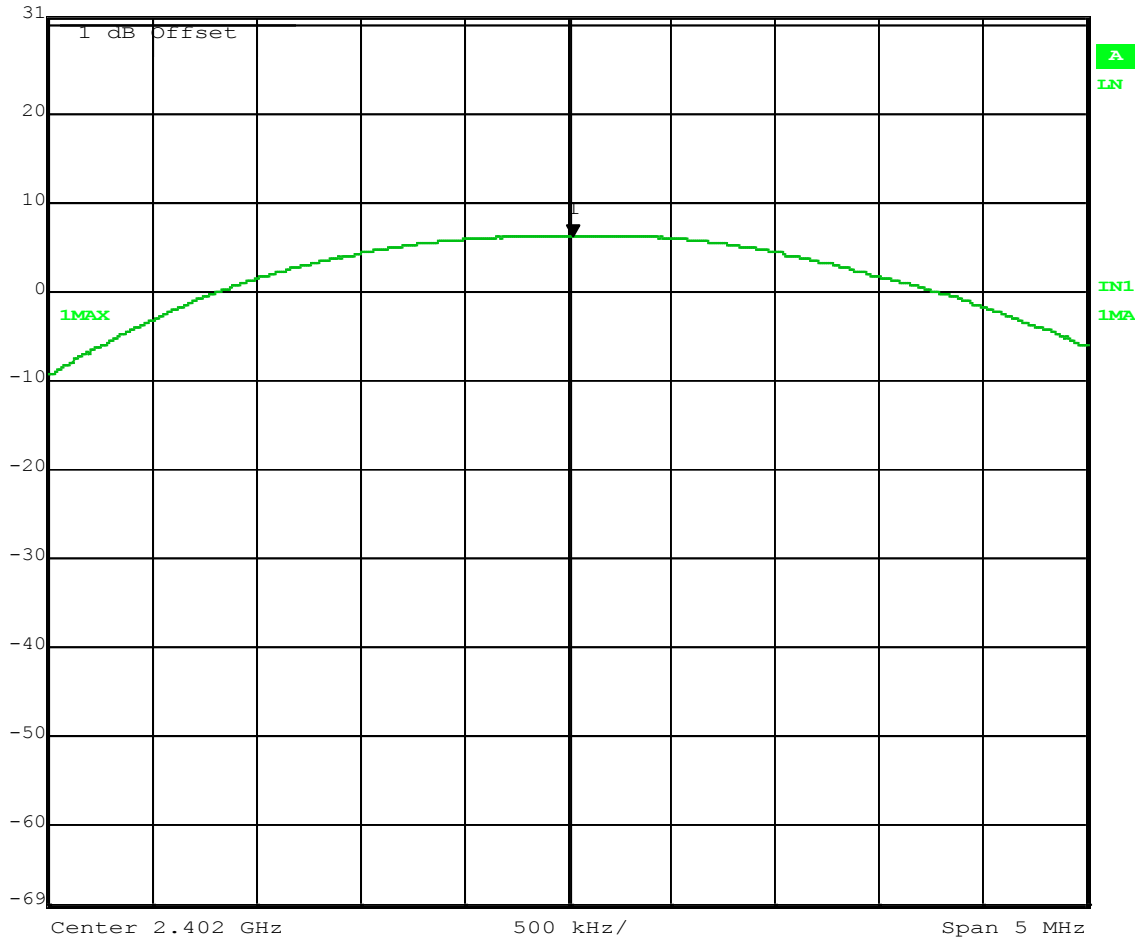
IC: 3232A-414255

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Test data: Output power



Ref Lvl	Marker 1 [T1]	RBW	2 MHz	RF Att	50 dB
31 dBm	6.19 dBm	VBW	10 MHz	Mixer	-20 dBm
	2.40202505 GHz	SWT	5 ms	Unit	dBm



Date: 22.JUL.2013 14:45:45

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**Summary:** RBW = 2 MHz, detector = peak, max power = 6.19 dBm ( 4.16 mW)

Channel	Center Frequency (MHz)	Basic Rate: DH1 (dBm)	Basic Rate: DH5 (15,339) (dBm)	EDR: 3-DH5 (31,1020) (dBm)
0	2402	6.19	6.07	4.94
30	2432	5.94	5.81	4.66
78	2480	5.56	5.44	3.98

Channel 0 measured the highest power.

### 6.3.3. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESIB40	TN1560	4/4/2013	4/4/2014
Cable	RF Coax Inc.	K316MM-42	TN1277-18	Verify	

### 6.3.4. Test information

<b>Date of test:</b>	7/22/2013	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	SN193	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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## 6.4. Occupied Bandwidth/Channel Spacing

### 6.4.1. Requirements

RSS210 section A8.1 (b)

The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopping frequency set.

FCC part 15.247(a)(1)

The hopping channel carrier frequencies are separated by at least  $2/3^{\text{rd}}$  of the 20dB bandwidth provided the output power is less than 125 mW (20.96 dBm)

### 6.4.2. Test setup details

The test setup is described in section 6.3.2.

Bandwidth summary table:  
EDR mode packet 3-DH5 (worst case modulation)

BT Channel	Center Frequency (MHz)	-20dB OBW (MHz)	99% OBW (MHz)
0	2402	1.403	0.862
39	2441	1.398	0.872
78	2480	1.398	0.878

Conclusion:  $2/3^{\text{rd}}$  of the largest OBW, =  $2/3 \times 1.403 \text{ MHz} = 935 \text{ kHz}$ , which is less than the carrier channel separation of 1 MHz. In addition, the output power is less than 125 mW. See section 6.3 for the measurement of output power.

The system RF bandwidth as defined in RSS210A8.1 (a) is:

79 channels times 0.878 MHz = 70 MHz.

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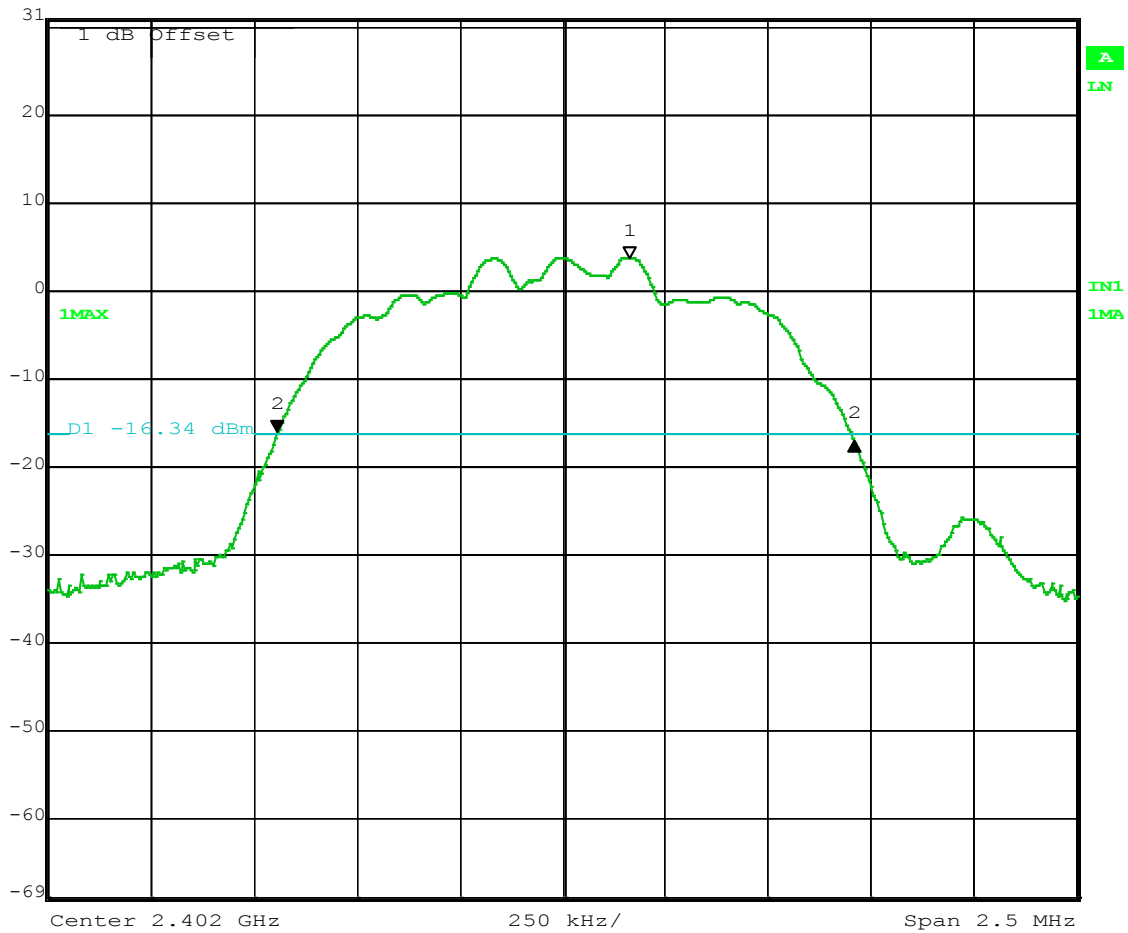
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Example spectrum analyzer plot showing how the 20 dB bandwidth is measured.

20 dB OBW = 1.403 MHz. (EDR 3-DH5)

	Delta 2 [T1]	RBW	100 kHz	RF Att	50 dB	
	Ref Lvl	-1.03 dB	VBW	100 kHz	Mixer	-20 dBm
	31 dBm	1.40280561 MHz	SWT	5 ms	Unit	dBm



Date: 22.JUL.2013 18:03:23

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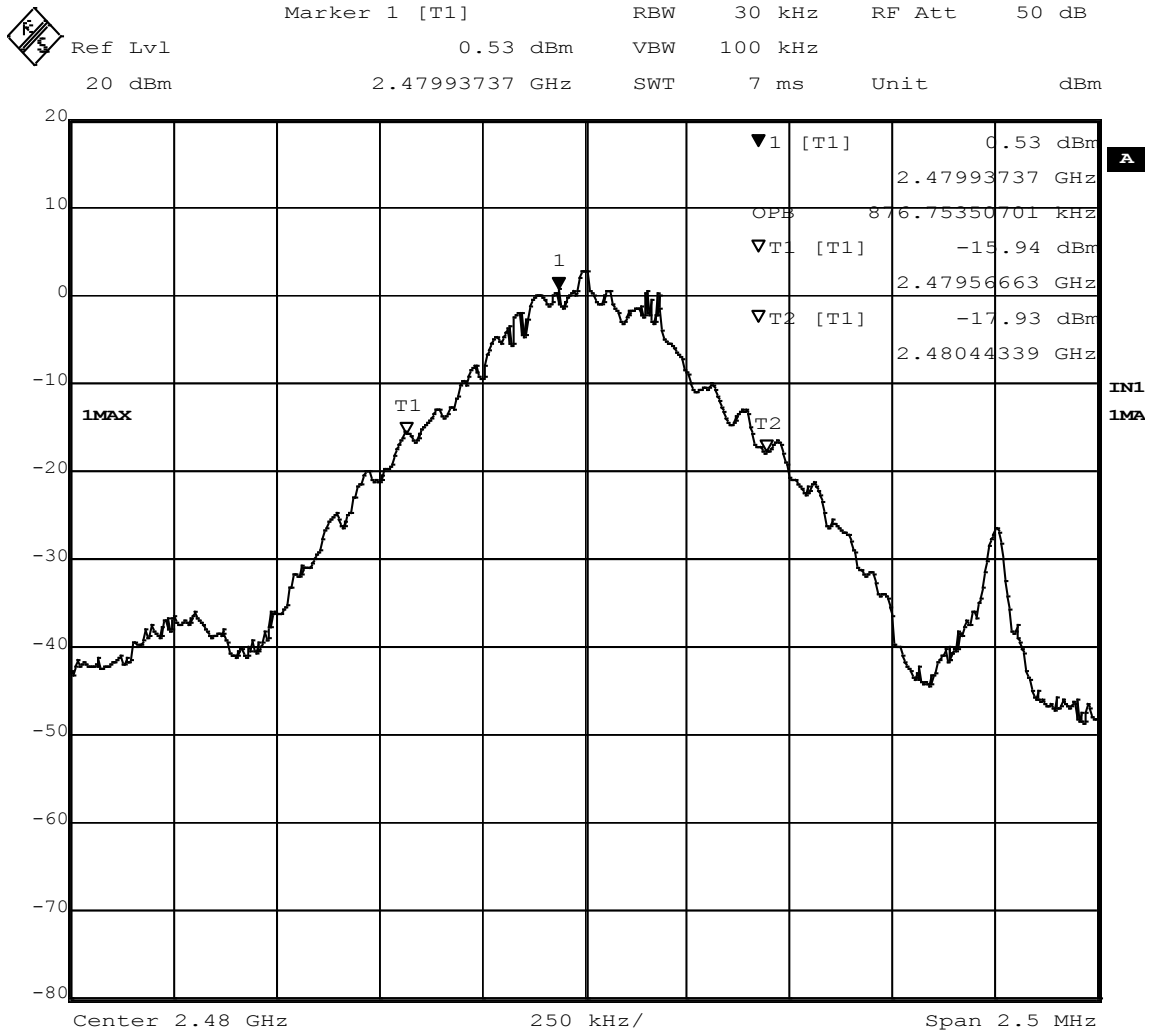


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Example spectrum analyzer plot showing how the 99% bandwidth is measured.  
Used the built in measurement on the R&S ESIB40.

99% OBW = 1.23 MHz. (EDR 3-DH5)



Date: 19.NOV.2013 14:55:17

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## Channel Spacing

79 channels between 2402 MHz and 2480 MHz = 1 MHz/channel



UNCAL

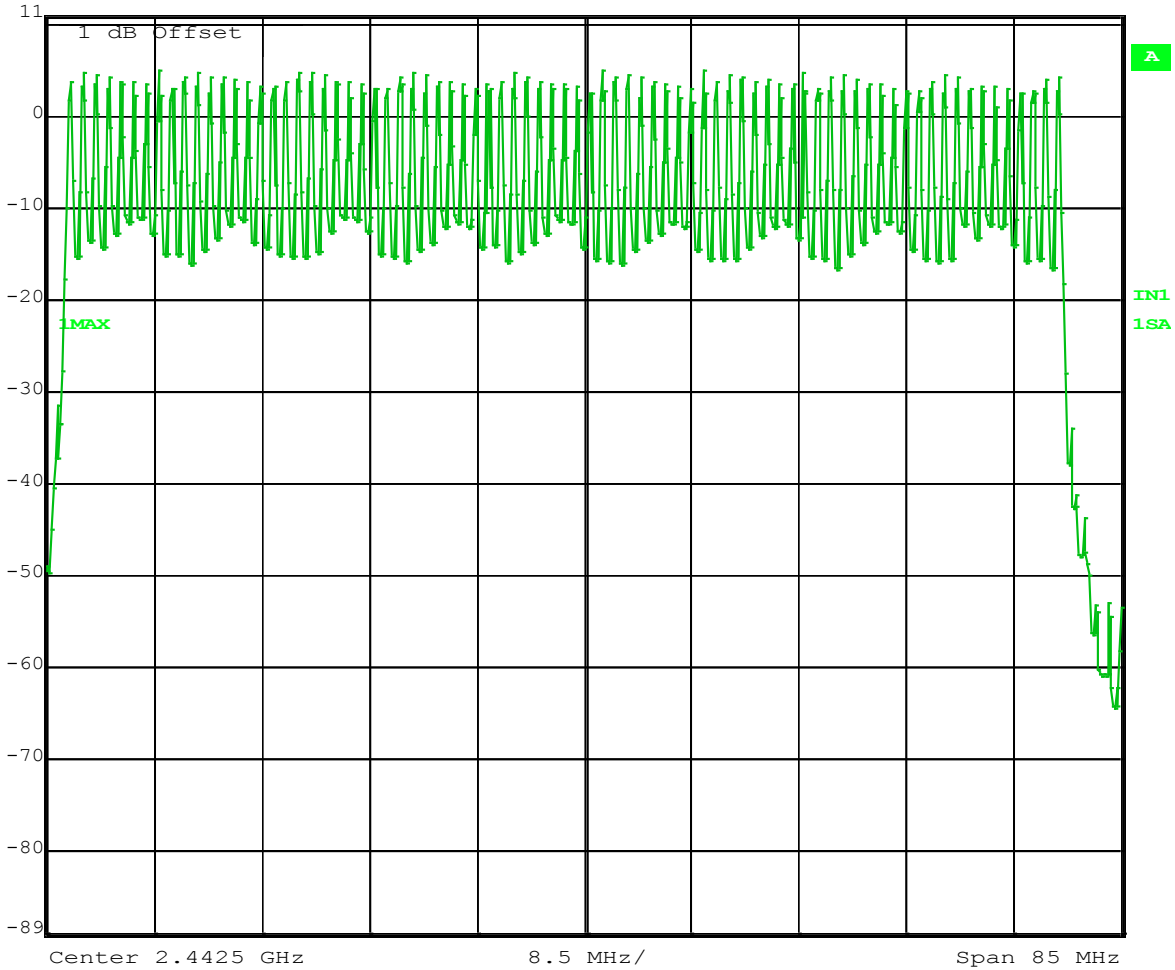
Ref Lvl

11 dBm

RBW 100 kHz RF Att 20 dB

VBW 30 kHz

SWT 20 ms Unit dBm



Date: 25.JUL.2013 17:53:12

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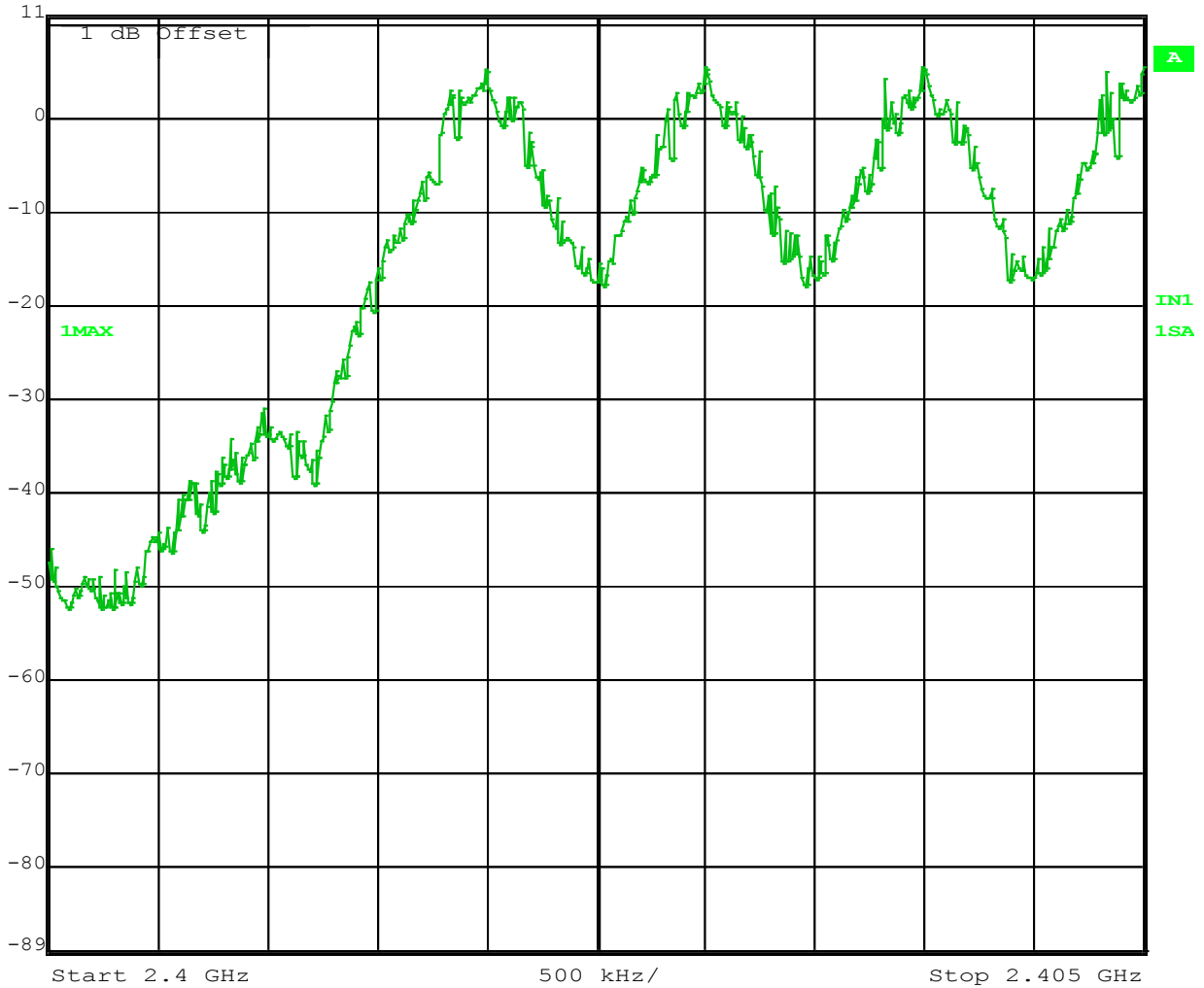
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## Low band end channel spacing detail 3-DH5



Ref Lvl  
11 dBm

RBW	100 kHz	RF Att	20 dB
VBW	30 kHz		
SWT	20 ms	Unit	dBm



Date: 25.JUL.2013 17:58:52

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# Wireless Transceiver Test Report



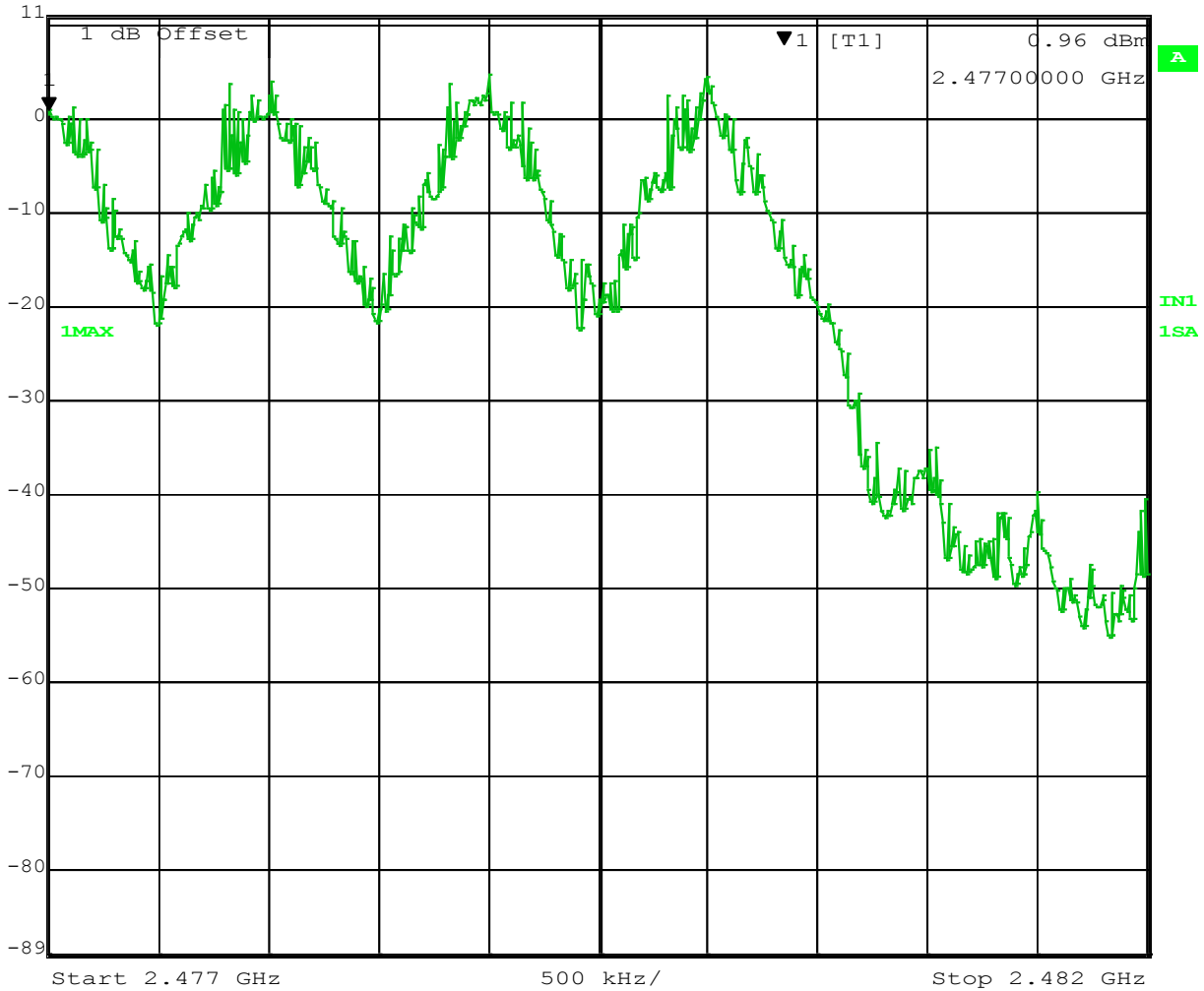
FCC ID: A94414255 IC: 3232A-414255

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## High band end channel spacing detail 3-DH5



Ref Lvl	Marker 1 [T1]	RBW	100 kHz	RF Att	20 dB
11 dBm	0.96 dBm	VBW	30 kHz		
	2.47700000 GHz	SWT	20 ms	Unit	dBm



Date: 25.JUL.2013 18:03:13

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### 6.4.3. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESIB 40	TN1560	4/4/2013	4/4/2014
Cable	RF Coax Inc.	K316MM-42	TN1277-18	Verify	

### 6.4.4. Test information

<b>Date of test:</b>	7/22/13 and 7/25/2013	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	193	<b>Test by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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## 6.5. Time of occupancy

### 6.5.1. Requirements

FCC 15.247 (a) (1) iii, RSS210 A8.1 (d)

The frequency hopping operation shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within the duration in seconds equal to the number of hopping frequencies employed multiplied by 0.4

### 6.5.2. Test setup details

The EUT is controlled via the USB cable with CSR's Blue Suite software which is used to set the test modes of the Bluetooth controller. The EUT antenna is disconnected and replaced with a 2 inch long piece of flexible semi-rigid cable with an SMA connector at the far end, this cable is rated to have less than 0.2dB of loss at 2.48GHz. For all conducted measurements the SMA cable was connected to the spectrum analyzer input using a flexible cable with one dB of loss at 2.4 GHz. The EUT is programmed to stop hopping and operated at fixed frequencies at the low, middle, and high end of the authorized frequency band.

Using zero span mode on the channel center frequency the transmit pulse width is measured for each of the following modes, DH1, DH3 & DH5 with the maximum payload size.

### 6.5.3. Test data

The Bluetooth algorithm in the controller chip BC5 does not repeat on any channel, unless all of the channels in the hopping sequence have been exhausted in turn. Knowing this, we can assume this reasonable formula for measured time of occupancy.

$$Time\ of\ occupancy = pulse\ width * pulse\ rate * Observation\ time$$

$$Observation\ time = 0.4\ s * 79\ channels = 32\ s$$

$$Pulse\ rate = \frac{1}{Period\ between\ pulses}$$

$$Time\ of\ occupancy = \frac{Pulse\ width\ (ms)}{Period\ between\ pulses\ (ms)} * 32000(ms)$$

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## Time of occupancy summary table.

Freq MHz	Modulation	Measured Pulse width $\mu$ s	Measured Period between pulses ms	Calculated occupancy time ms
2441	3-DH5	2947	296.6	317.9

The occupancy time is less than 400 ms, in the worst case mode so the device passes.

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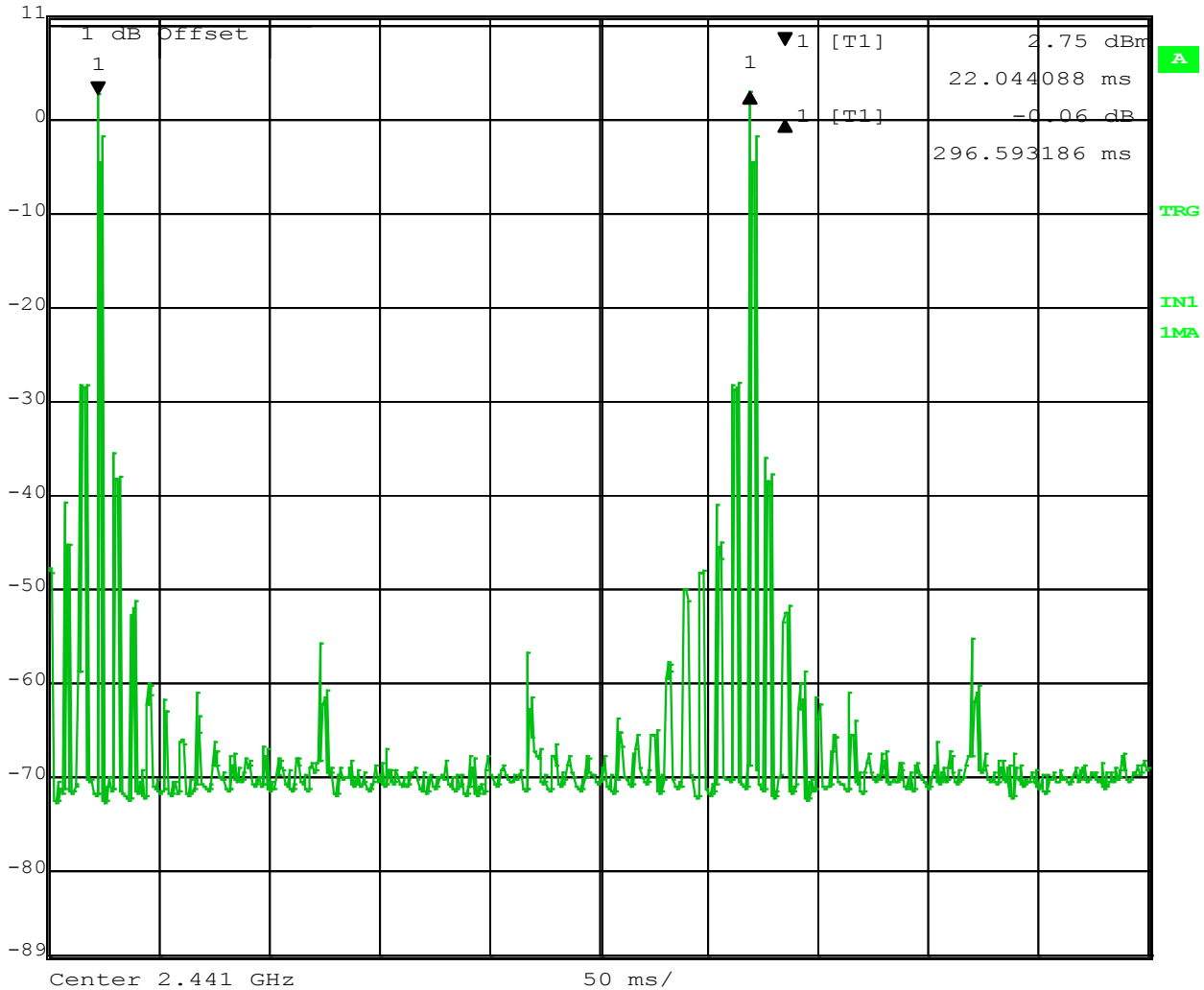
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## Example of Period between pulses Measurement



Ref Lvl	Delta 1 [T1]	RBW	100 kHz	RF Att	20 dB
11 dBm	-0.06 dB	VBW	30 kHz		
	296.593186 ms	SWT	500 ms	Unit	dBm



Date: 26.JUL.2013 10:38:06

Period is 296.6 milliseconds

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## 6.5.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESIB40	TN1560	4/4/2013	4/4/2014
Cable	RF Coax Inc.	K316MM-42	TN1277-18	8/17/2011	8/17/2013

## 6.5.5. Test information

<b>Date of test:</b>	7/23/13	<b>Test location:</b>	Transmitter Test Bench
<b>Serial number:</b>	SN 193	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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## 6.6. Spurious emissions- Conducted

### 6.6.1. Requirements

FCC part 15.247(d), RSS210 A8.5

In any 100 kHz BW, the conducted spurious emissions shall be attenuated at least 20dB below the level of the wanted signal.

### 6.6.2. Test Setup

The EUT is controlled via the USB cable with software which is used to set the test modes of the Bluetooth device. The EUT antenna is disconnected and replaced with a coax cable with an SMA connector. For this conducted measurement the short 3 inch hardline SMA cable was connected directly to the spectrum analyzer input. The EUT is programmed to hop on all available channels. The spectrum analyzer resolution bandwidth is set to 1 MHz peak detector and max hold.

### 6.6.3. Test data

**Conducted spurious:**

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

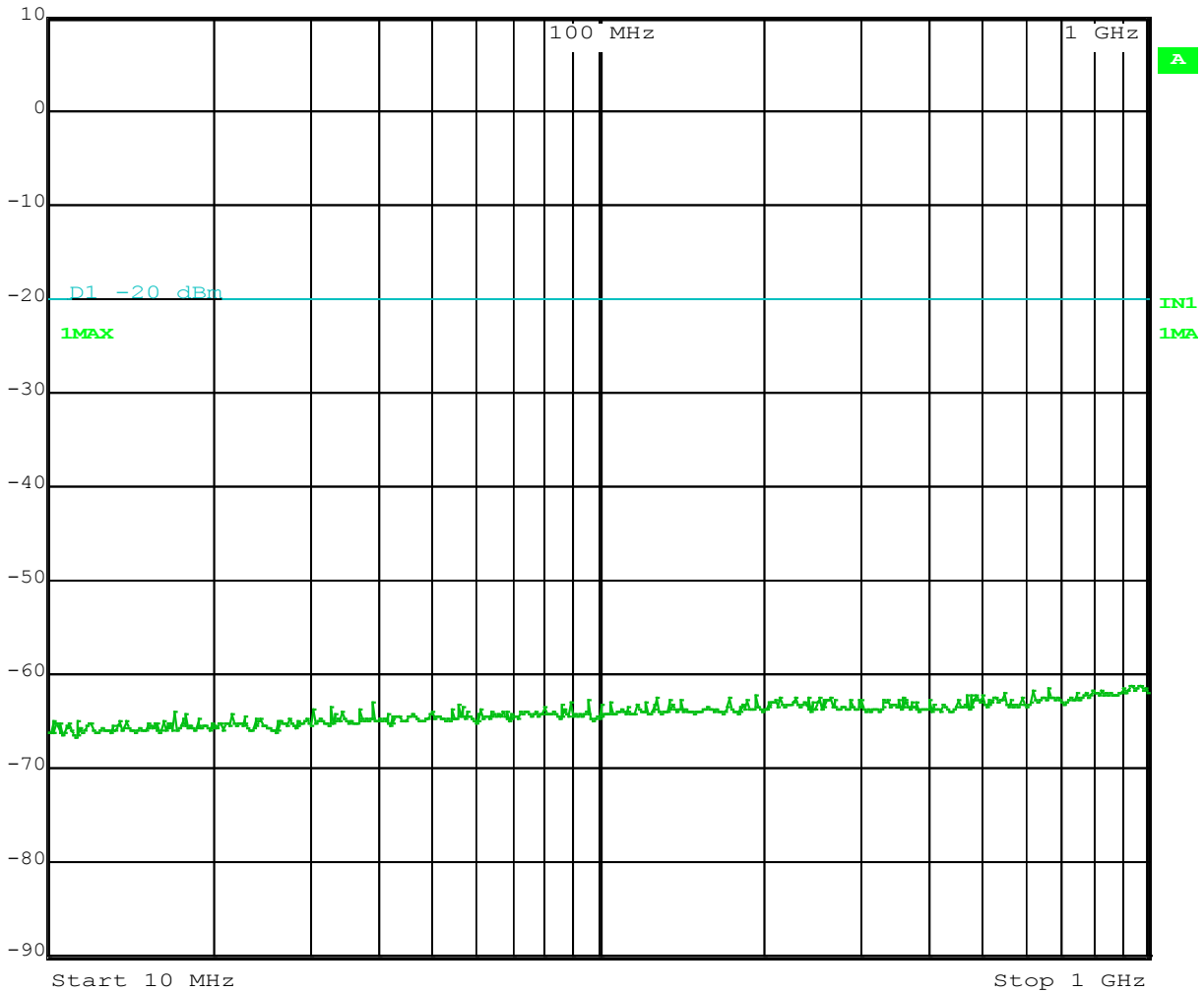
Certificate # 1514.1

DH1  
Hopping 79 channels



Ref Lvl  
10 dBm

RBW 1 MHz RF Att 20 dB  
VBW 10 MHz  
SWT 500 ms Unit dBm



Date: 26.JUL.2013 15:06:52

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

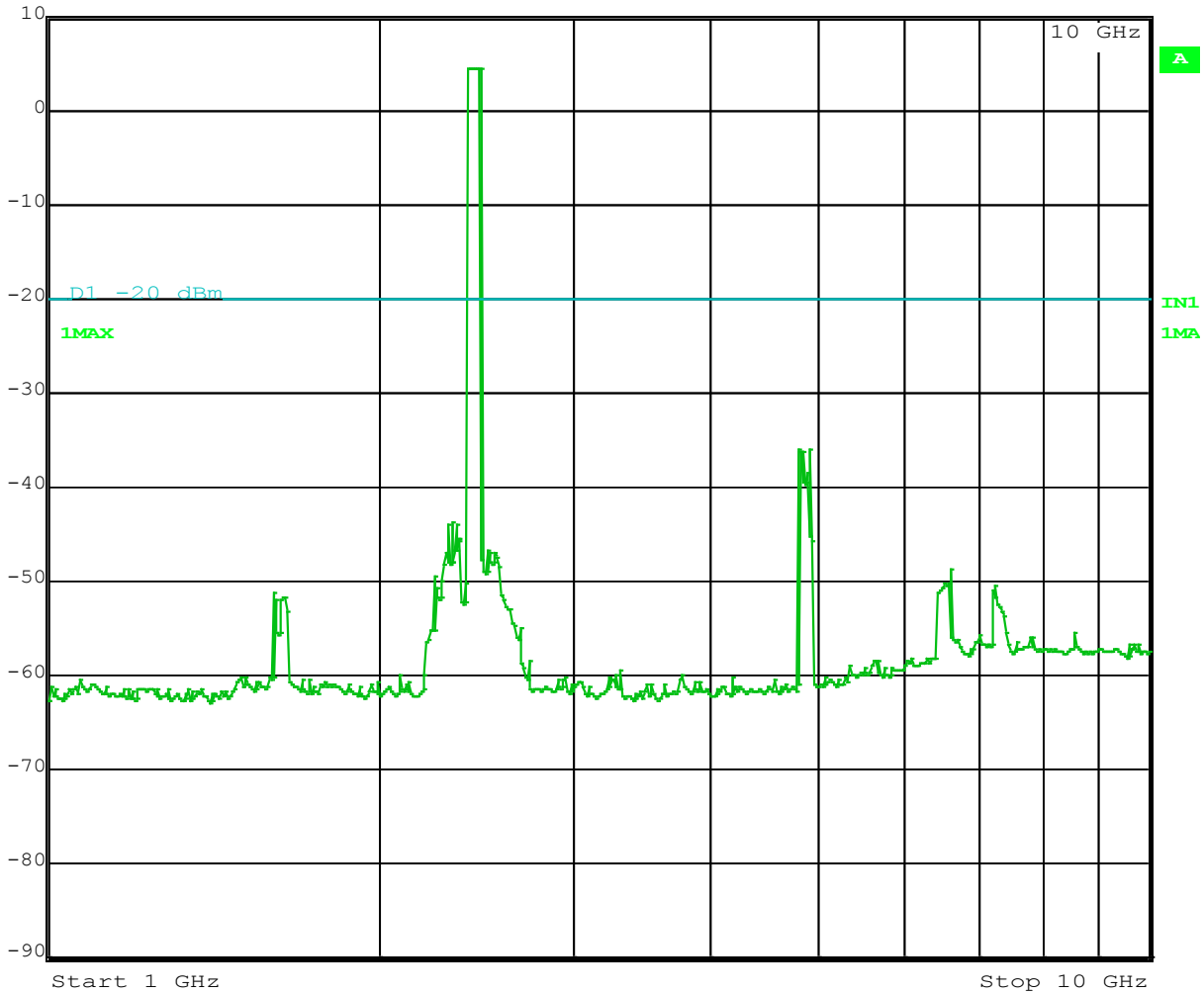
Certificate # 1514.1

DH1  
Hopping 79 channels



Ref Lvl  
10 dBm

RBW	1 MHz	RF Att	20 dB
VBW	10 MHz		
SWT	500 ms	Unit	dBm



Date: 26.JUL.2013 15:08:23

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# Wireless Transceiver Test Report

FCC ID: A94414255 IC: 3232A-414255



Certificate # 1514.1

## 6.6.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESIB40	TN1560	4/4/2013	4/4/2014

## 6.6.5. Test information

<b>Date of test:</b>	7/26/2013	<b>Test Location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	SN193	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

## 6.7. Harmonics

### 6.7.1. Requirements

FCC part 15.247(d) RSS-Gen 4.9

In any of the restricted bands defined in FCC part 15.209(a), the field strength at a distance of 3 meters shall not exceed 54dBµV/m (average) or 74dBµV/m (peak)

### 6.7.2. Test Setup

The EUT is placed in a standard ANSI C63.10 test setup. Standard antennas and gain horns with suitable pre-amps mounted directly on the horn antennas are used for the measurement of the harmonics. The EUT hopping is stopped and measurements are made in the low, mid and high end of the frequency range at the defined limit distance of 3 meters.

The EUT is rotated around the vertical axis, the antenna polarization changed from H to V and the antenna height is varied in order to find the maximum value of the harmonic emission. Account is taken of the beam width of the horn antennas to make sure the EUT remains in the main lobe of the antenna.

The DH1 mode was used.

### 6.7.3. Test data

Emission Frequency (MHz)	Measured Amplitude (dBµV/m) QP/AVG*	Measured Amplitude (dBµV/m) Peak	FCC 15B			
			Limit (dBµV/m) QP/AVG*	Limit (dBµV/m) Peak	Margin (dB) QP/AVG*	Margin (dB) Peak
4804.000	44.00	63.00	54.0	74.0	10.0	11.0
7206.000	29.00	46.00	54.0	74.0	25.0	28.0
4882.000	41.00	61.00	54.0	74.0	13.0	13.0
7323.000	26.00	40.00	54.0	74.0	28.0	34.0
4960.000	34.00	57.00	54.0	74.0	20.0	17.0
7440.000	25.00	36.00	54.0	74.0	29.0	38.0

At the 4<sup>th</sup> harmonic and above no signal was detected above the instrument noise floor as shown in the plots of spurious noise with transmitter on and hopping in sections below.

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

## 6.7.4. Test Equipment

4 to 18 GHz

Equipment Type	Manufacturer	Model	Tracking Number	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESIB40	TN1560	4/4/2013	4/4/2014
Microwave Horn Antenna 4GHz - 8GHz	Amplifier Research	AT4003	TN727	12/6/2011	12/2/2013
20 GHz Pre-amp	MITEQ	AFS4-00102000-30-10P-4	TN1672	9/20/2012	9/20/2013
Hertz Lodge 3 Meter Semi-Anechoic Chamber	Panashield Inc.		TN 1499	8/21/12	8/21/14
Cable			TN 1277-06	Verified	
Flexible cable	Florida RF Labs, Inc	NMS-290A-240.0-NMS	TN 1983	Verified	

## 6.7.5. Test information

<b>Date of test:</b>	9/4/2013	<b>Test Location:</b>	Hertz Lodge
<b>EUT serial:</b>	203	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94414255 IC: 3232A-414255



Certificate # 1514.1

## 6.8. Spurious emissions 1-25 GHz

### 6.8.1. Requirements

FCC part 15.247(d), RSS-Gen7.2.5

In any 100 kHz band width outside the frequency band in which the spread spectrum or digitally modulated radiator is operating, the radio frequency power that is produced by the intentional radiator shall be as least 20 dB below that in the 100kHz bandwidth within the band the contains the highest level of the desired power.

In any of the restricted bands defined in FCC part 15.205(a), the field strength at a distance of 3 meters shall not exceed limits shown in 15.209, 54dB $\mu$ V/m (average) or 74dB $\mu$ V/m (peak).

### 6.8.2. Test Setup

The EUT is operating normally (hopping), and measurements are made at the defined limit distance of 3 meters. Above 18GHz the measurement distance may be reduced to make sure the emissions are well below the limit.

The EUT is rotated around the vertical axis, the antenna polarization changed from H to V and the antenna height is varied from 1 to 4 meters in order to find the maximum value of the emissions. EUT was maximized in 3 orthogonal planes for radiated spurious emissions; plots shown represent worst case orientation. Account is taken of the beam width of the horn antennas to make sure the EUT remains in the main lobe of the antenna.

### 6.8.3. Test Setup

Frequency range 30MHz – 1 GHz. Passes, see section 6.2 of this report.

Note upper and lower band edge measurements are covered in section 6.8.6

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

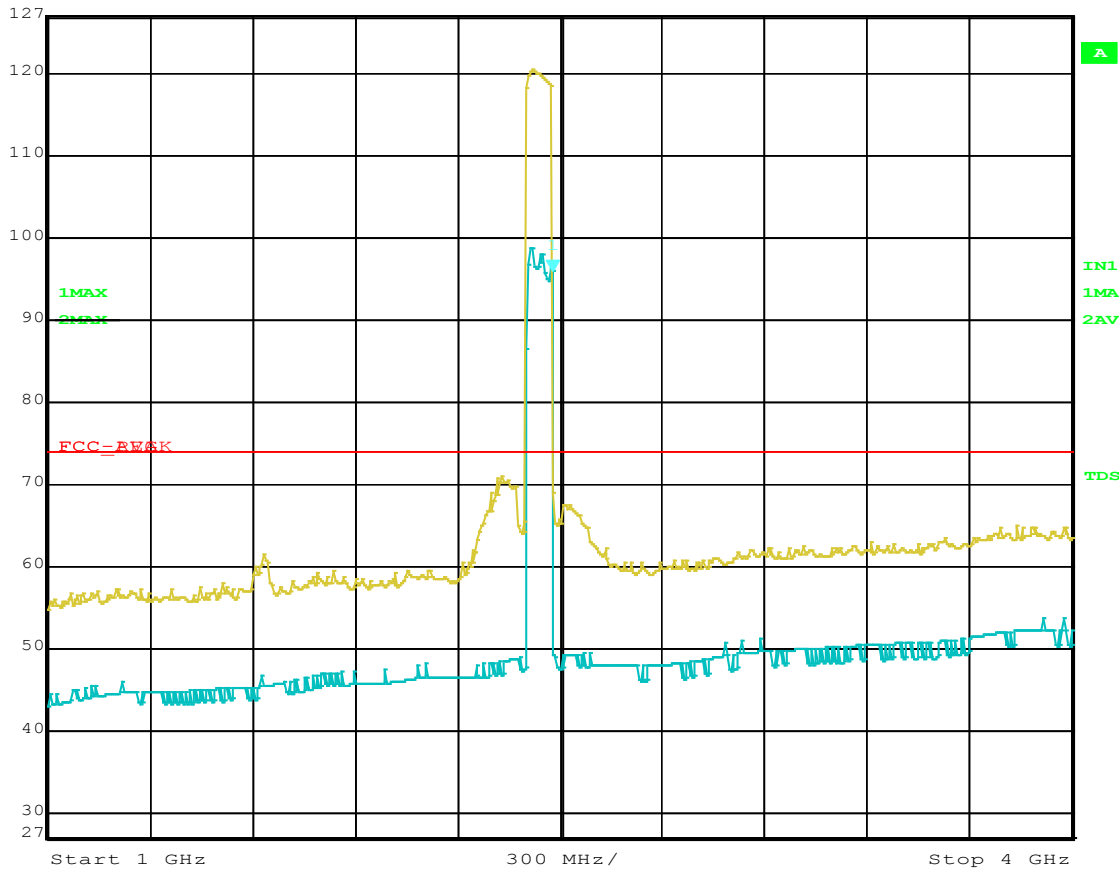
**EUT Operating Mode(s):** EUT is hopping at max TX power in DH1 mode. TX parameters were set using software.

**Test Sample S/N:** 203

### Summary of Test Results:

Max-Hold Peak Pre-scan, 1 to 4 GHz. The EUT is in DH1 transmit mode and is hopping on all channels. The carrier and harmonics seen here will be measured separately.

	Max/Ref Lvl	Marker 1 [T2]	RBW	1 MHz	RF Att	0 dB
	127 dB*	95.88 dByV/m	VBW	1 MHz		
	97 dB*	2.48100000 GHz	SWT	7.5 ms	Unit	dByV/m



Date: 16.OCT.2013 11:59:30

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# Wireless Transceiver Test Report



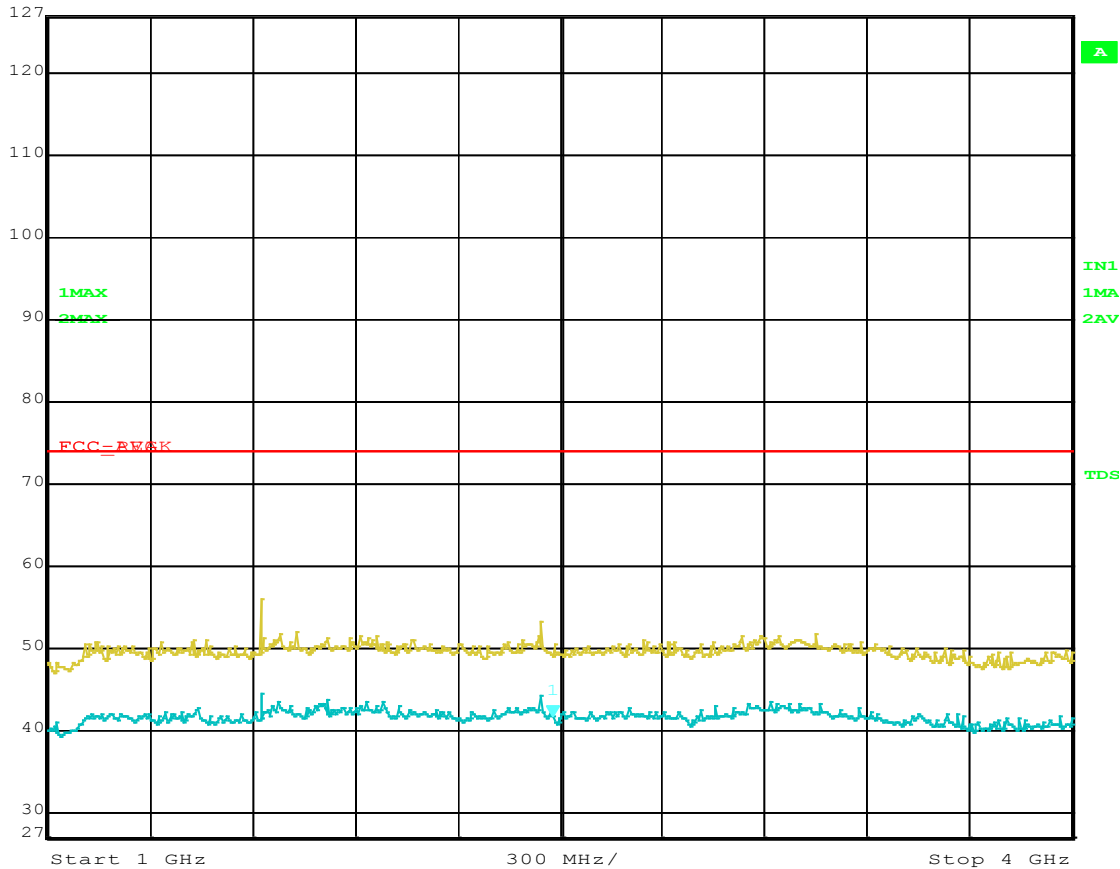
FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

## Receive mode



Max/Ref Lvl	Marker 1 [T2]	RBW	1 MHz	RF Att	0 dB
127 dB*	41.74 dByV/m	VBW	1 MHz		
97 dB*	2.48100000 GHz	SWT	7.5 ms	Unit	dByV/m



Date: 16.OCT.2013 12:13:43

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# Wireless Transceiver Test Report



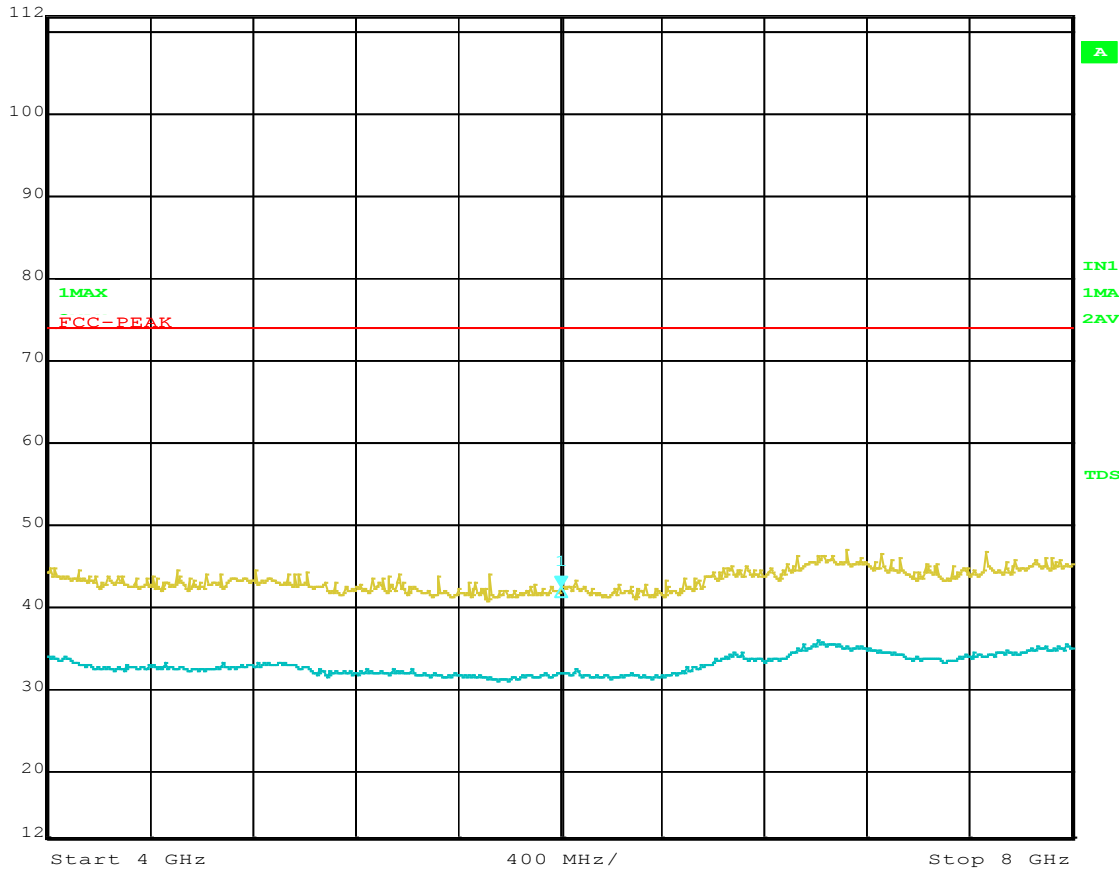
FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

Rx



Max/Ref Lvl	Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
112 dB*	42.40 dByV/m	VBW	1 MHz		
82 dB*	6.00000000 GHz	SWT	40 ms	Unit	dByV/m



Date: 16.OCT.2013 19:17:54

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# Wireless Transceiver Test Report



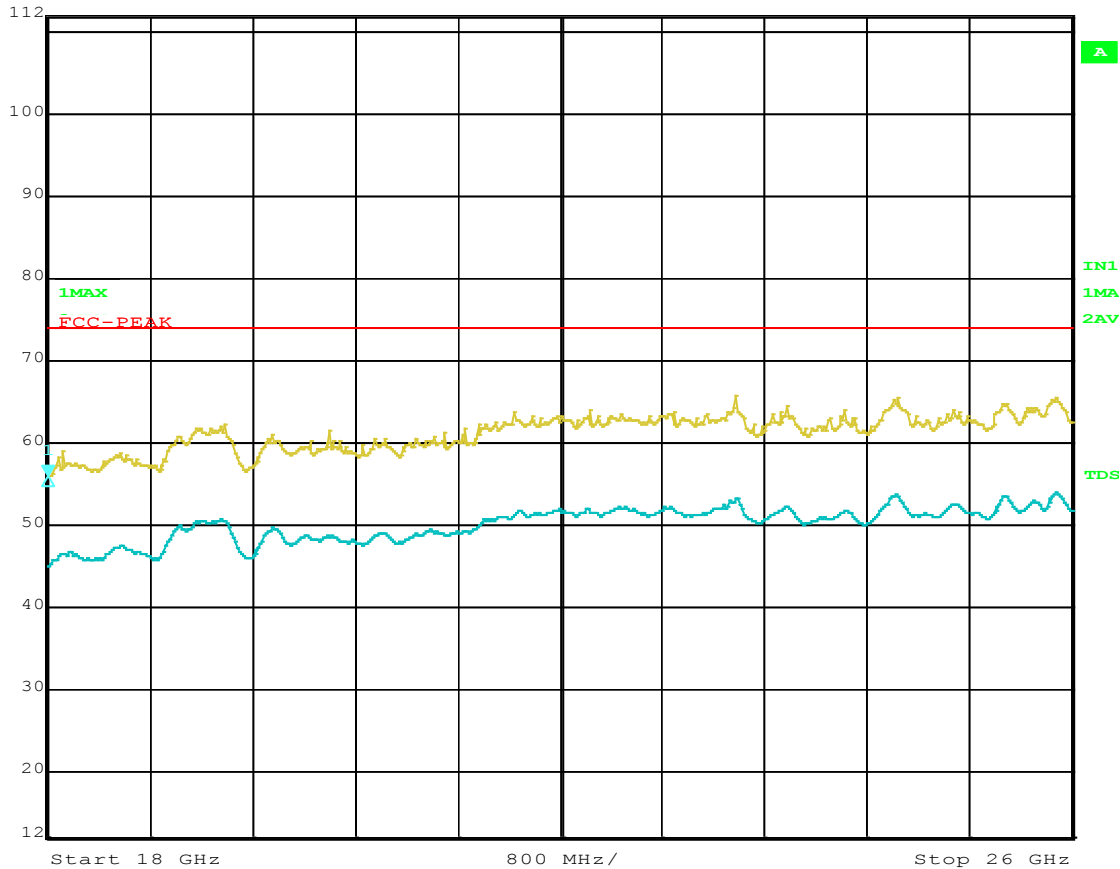
FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

## TX hopping



Max/Ref Lvl	Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
112 dB*	55.80 dByV/m	VBW	1 MHz		
82 dB*	18.00000000 GHz	SWT	80 ms	Unit	dByV/m



Date: 16.OCT.2013 18:31:53

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

## 6.8.4. Test Equipment

Equipment Type	Manufacturer	Model	Tracking Number	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESIB40	TN1560	4/4/2013	4/4/2014
Antenna 1GHz-18GHz	Emco	3115	TN478	7/12/2012	7/12/2015
Antenna 4 – 8G	AR	AT4003	TN727	12/6/2011	12/6/2014
Antenna 8 – 18G	AR	AT4004	TN728	12/1/2011	12/1/2014
20 GHz Pre-amp	MITEQ	AFS4-00102000-30-10P-4	TN1672	9/20/2012	9/20/2013
40 GHz pre-amp	MITEQ	JS4018004000-30-8P-A1	TN1757	9/18/2013	9/13/2014
Hertz Lodge 3 Meter Semi-Anechoic Chamber	Panashield Inc.		TN1499		
Cable	Florida RF Labs, Inc	NMS-290A-240.0-NMS	TN2076	Verify before use	
Cable	Florida RF Labs, Inc	NMS-290A-240.0-NMS	TN1983	Verify before use	
Cable	K316MM-42 40GHz cable	K316MM-42 40GHz cable	TN1277-18	Verify before use	
Horn Antenna 18GHz - 26.5GHz	ETS Lindgren	3160-09	TN1307	2/23/2011	2/23/2014

## 6.8.5. Test information

<b>Date of test:</b>	9/18/2013	<b>Test Location:</b>	Hertz Lodge
<b>EUT serial:</b>	SN 203	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

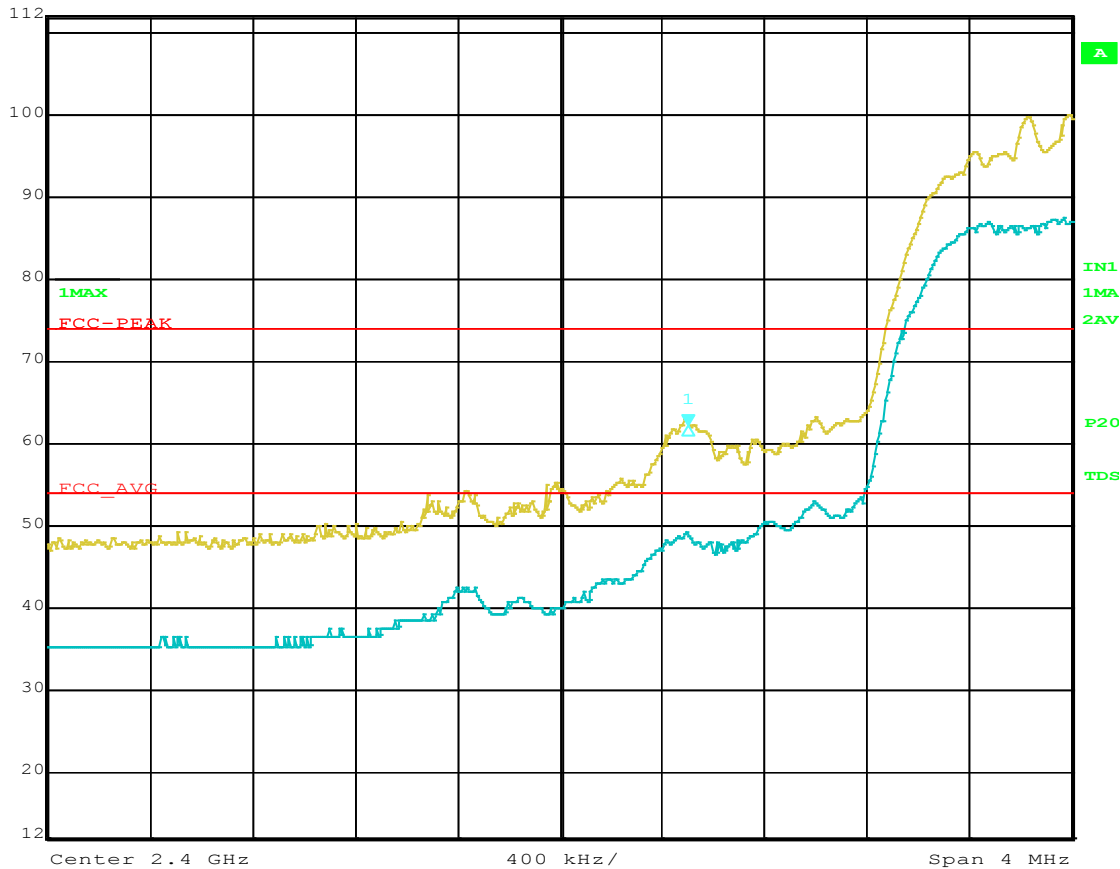
## 6.8.6. Band Edge Compliance

Restricted band edge low channel

2402 center frequency, power table =60, modulation 3-DH5

Transmitting on 2402 MHz, no hopping

	Max/Ref Lvl	Marker 1 [T1]	RBW	100 kHz	RF Att	10 dB
	112 dB*	62.11 dByV/m	VBW	1 MHz		
	82 dB*	2.40050000 GHz	SWT	1 s	Unit	dByV/m



Date: 23.OCT.2013 10:42:38

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# Wireless Transceiver Test Report

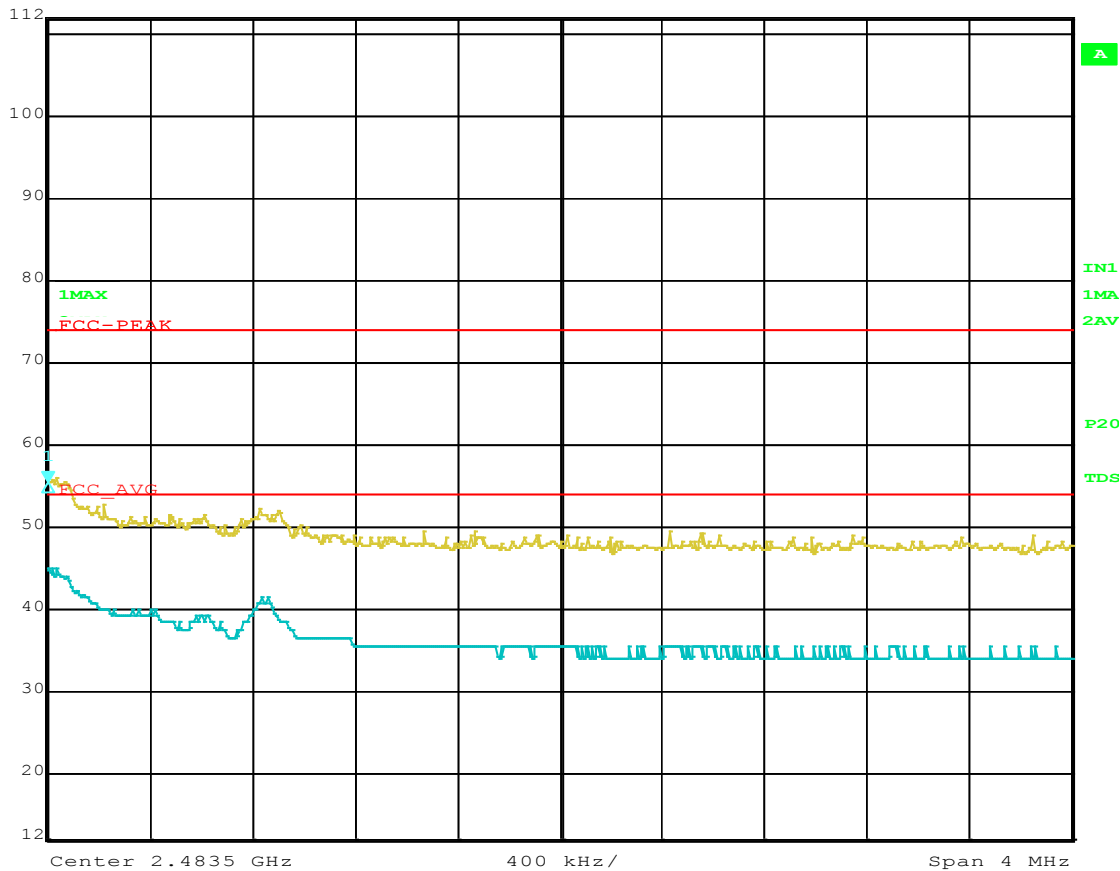


FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

Restricted band edge high channel  
2483.5 center frequency, power table =60, modulation 3-DH5  
Transmitting on 2480 MHz, no hopping

	Max/Ref Lvl	Marker 1 [T1]	RBW	100 kHz	RF Att	10 dB
	112 dB*	55.43 dB $\mu$ V/m	VBW	1 MHz		
	82 dB*	2.48150000 GHz	SWT	1 s	Unit	dB $\mu$ V/m



Date: 23.OCT.2013 10:55:32

The emissions outside of the band are below the general limit.

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

## 6.8.7. Test Equipment

Equipment Type	Manufacturer	Model	Tracking Number	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESIB40	TN1560	4/4/2013	4/4/2014
Antenna 1GHz-18GHz	Emco	3115	TN478	7/12/2012	7/12/2015
Hertz Lodge 3 Meter Semi-Anechoic Chamber	Panashield Inc.		TN1499		
Cable	Florida RF Labs, Inc	NMS-290A-240.0-NMS	TN2076	Verify before use	
Cable	Florida RF Labs, Inc	NMS-290A-240.0-NMS	TN1983	Verify before use	

## 6.8.8. Test information

<b>Date of test:</b>	10/16/2013-10/23/2013	<b>Test location :</b>	DCE – Hertz lodge
<b>EUT serial:</b>	SN 203	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94414255 IC: 3232A-414255



Certificate # 1514.1

## 6.9. Receiver spurious emissions

### 6.9.1. Requirements

RSS-Gen section 4.10

- if the antenna is detachable, a conducted measurement may be performed.

RSS-GEN section 6.2

No spurious output signals appearing at the antenna terminals shall exceed 2 nW (-57dBm) in the band 30-1000 MHz, or 5 nW (-53dBm) above 1 GHz.

### 6.9.2. Test Setup

The EUT is controlled using software which is used to set the test modes of the Bluetooth controller. The EUT antenna is disconnected and replaced with a 2 inch long piece of flexible semi-rigid cable. For this conducted measurement the SMA cable was connected directly to the spectrum analyzer input. The EUT is programmed to stop hopping and operated at fixed frequencies at the low, middle, and high end of the authorized frequency band.

A spectrum scan is made from 30 MHz to 18 GHz

(Covering the required 30MHz – 7.5 GHz range) with a 10 MHz and 1 MHz RBW

### 6.9.3. Test data

RX Frequency (MHz)	Worst case frequency (GHz)	Emission amplitude (dBm )	Margin (dB)
2402	2.40304	-56.15	3.15
2441	6.69346	-56.75	3.75
2480	6.94517	-56.43	3.43

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

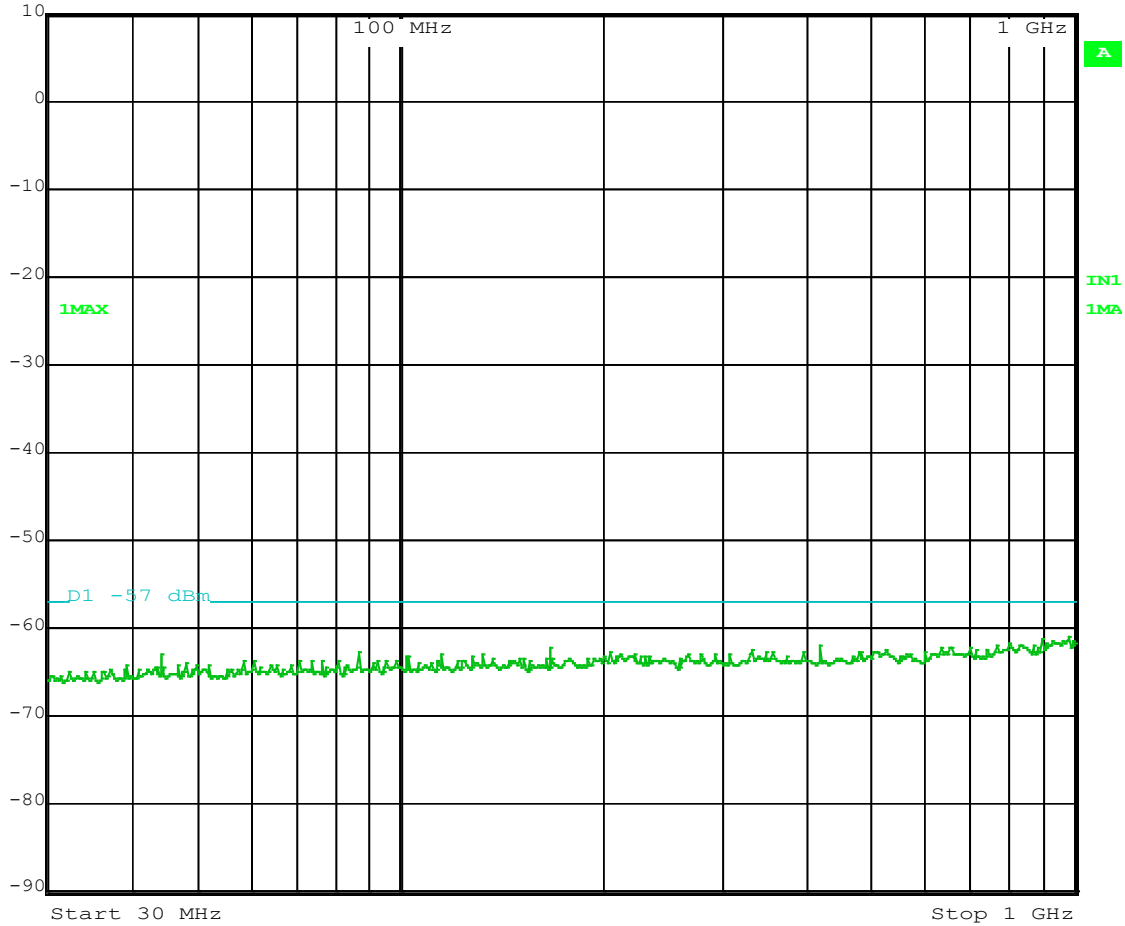
Certificate # 1514.1

Plot of emissions, made while receiving at 2402 MHz



Ref Lvl  
10 dBm

RBW 1 MHz RF Att 20 dB  
VBW 3 MHz  
SWT 500 ms Unit dBm



Date: 26.JUL.2013 14:02:18

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# Wireless Transceiver Test Report

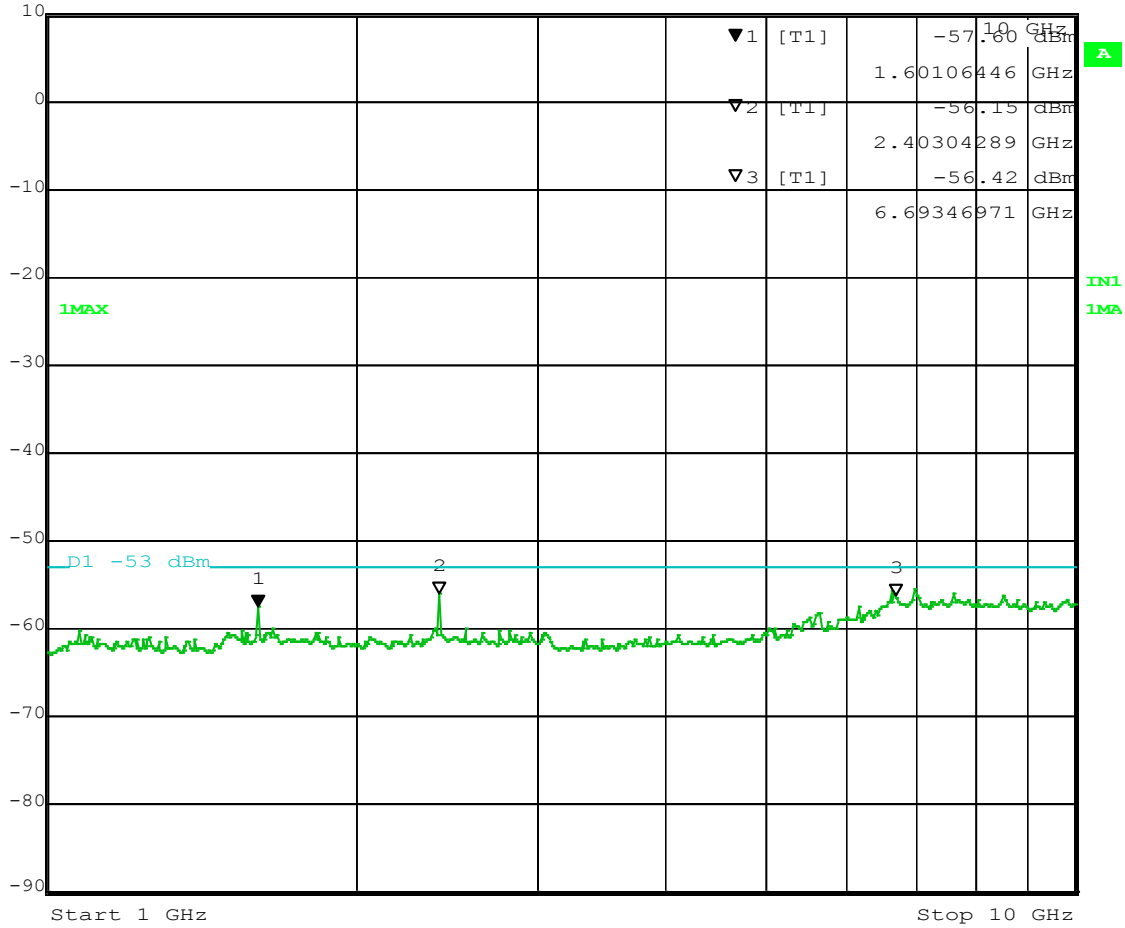


FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1



Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
 Ref Lvl -57.60 dBm VBW 3 MHz  
 10 dBm 1.60106446 GHz SWT 500 ms Unit dBm



Date: 26.JUL.2013 13:40:28

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# Wireless Transceiver Test Report



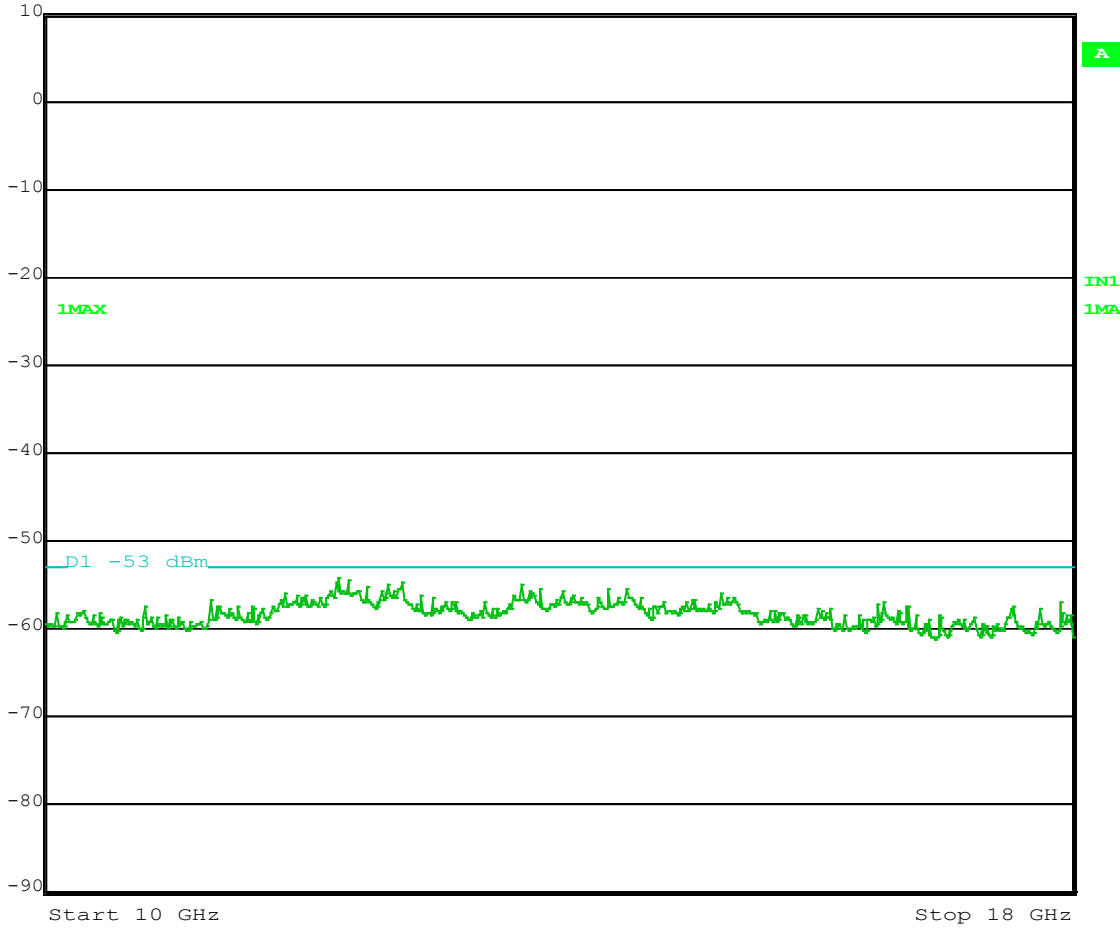
FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1



Ref Lvl  
10 dBm

RBW	1 MHz	RF Att	20 dB
VBW	3 MHz		
SWT	500 ms	Unit	dBm



Date: 26.JUL.2013 14:51:03

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

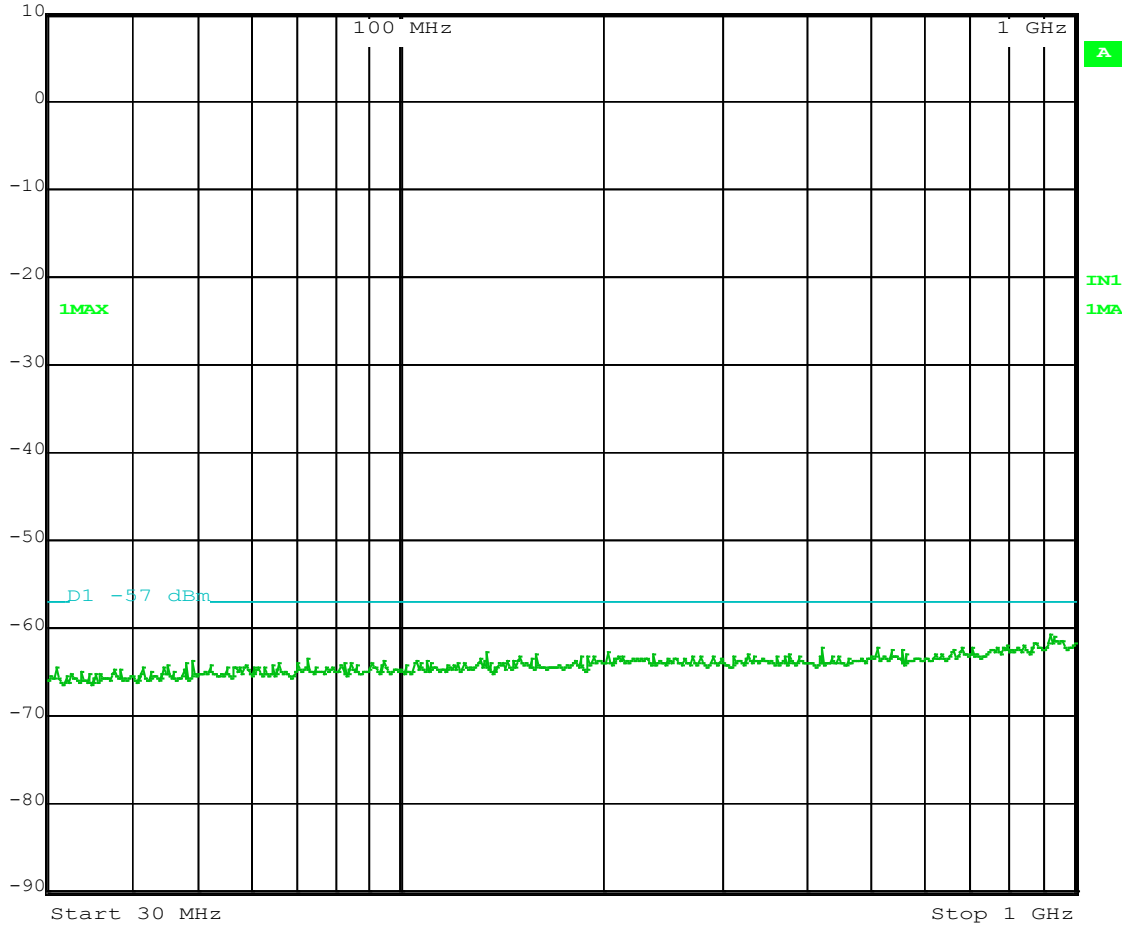
Certificate # 1514.1

Plots of emissions, made while receiving at 2441 MHz



Ref Lvl  
10 dBm

RBW 1 MHz RF Att 20 dB  
VBW 3 MHz  
SWT 500 ms Unit dBm



Date: 26.JUL.2013 14:00:51

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# Wireless Transceiver Test Report

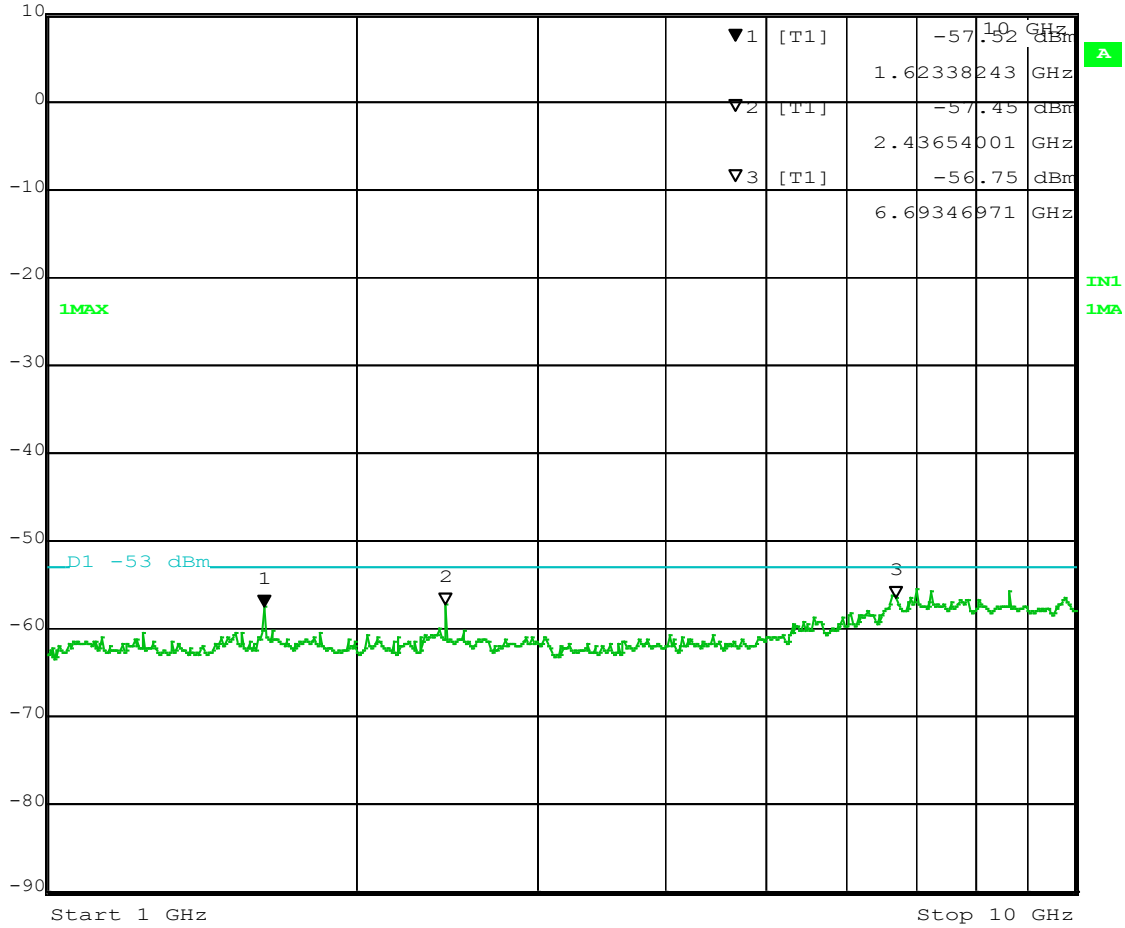


FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1



Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
 Ref Lvl -57.52 dBm VBW 3 MHz  
 10 dBm 1.62338243 GHz SWT 500 ms Unit dBm



Date: 26.JUL.2013 13:51:01

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# Wireless Transceiver Test Report



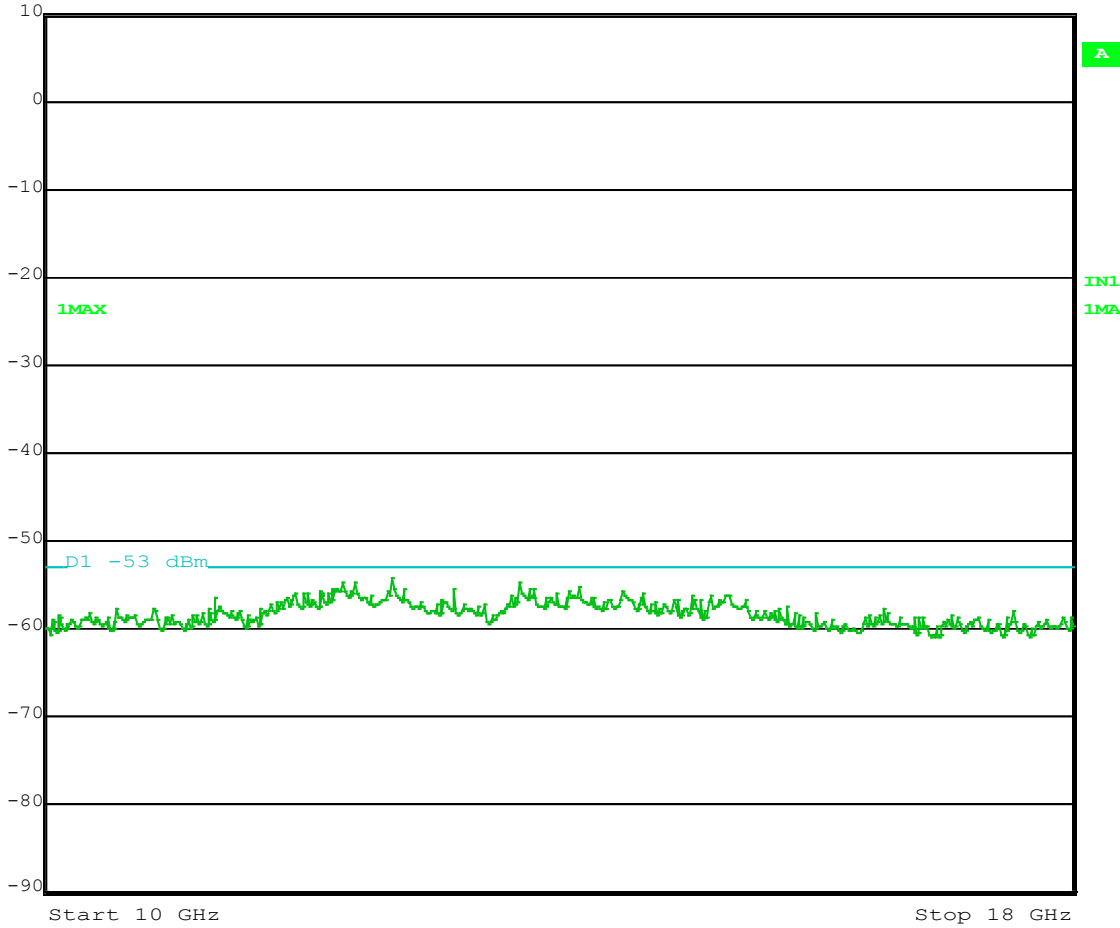
FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1



Ref Lvl  
10 dBm

RBW	1 MHz	RF Att	20 dB
VBW	3 MHz		
SWT	500 ms	Unit	dBm



Date: 26.JUL.2013 14:53:09

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# Wireless Transceiver Test Report



FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1

Plots of emissions, made while receiving at 2480 MHz

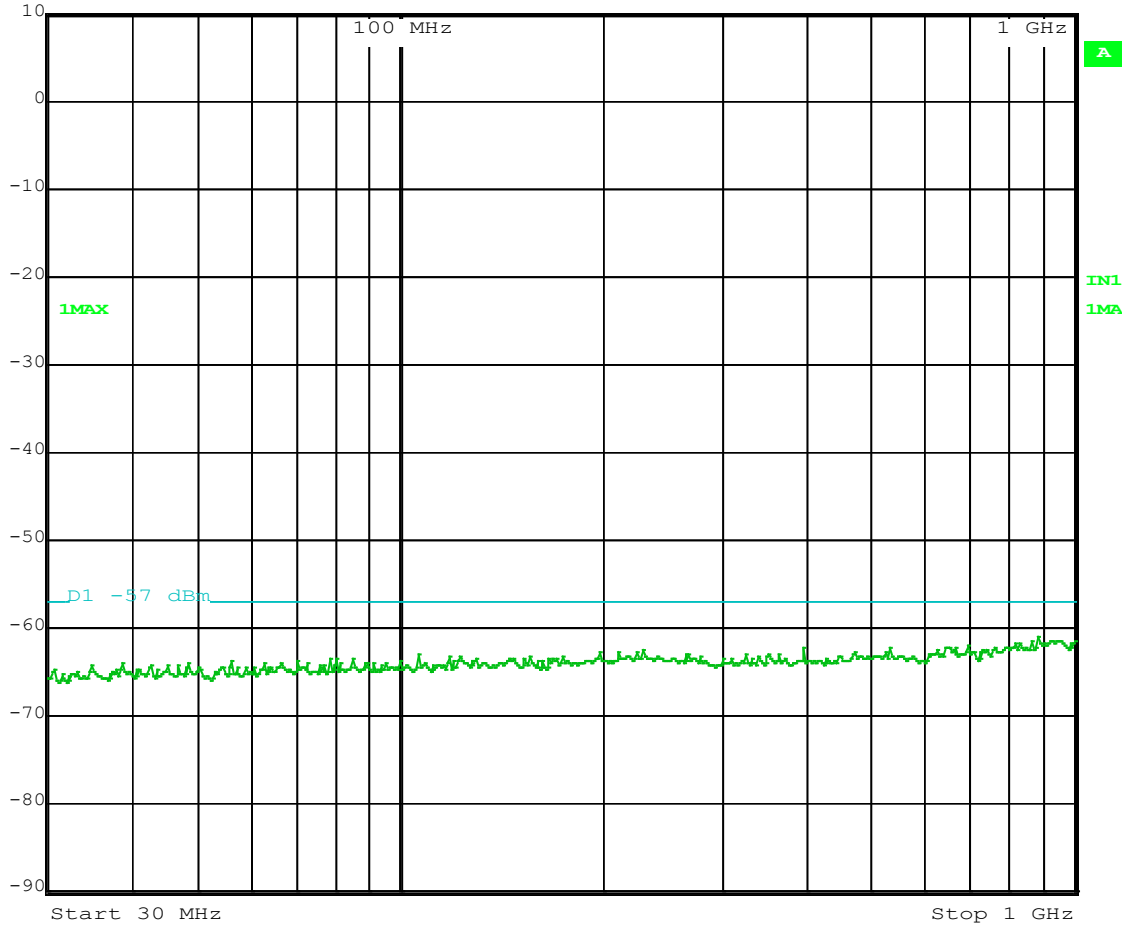


Ref Lvl  
10 dBm

RBW 1 MHz RF Att 20 dB

VBW 3 MHz

SWT 500 ms Unit dBm



Date: 26.JUL.2013 13:59:52

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# Wireless Transceiver Test Report

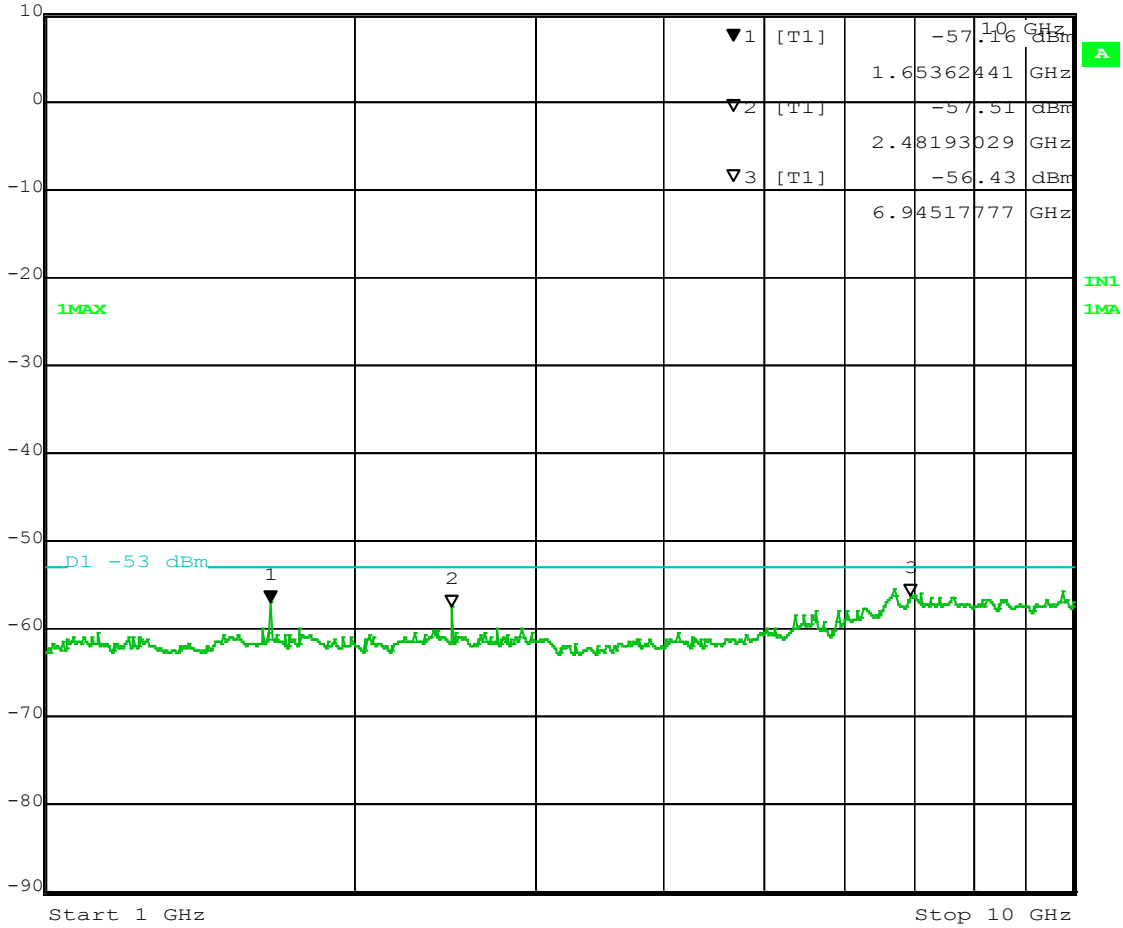


FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1



Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
 Ref Lvl -57.16 dBm VBW 3 MHz  
 10 dBm 1.65362441 GHz SWT 500 ms Unit dBm



Date: 26.JUL.2013 13:49:55

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# Wireless Transceiver Test Report



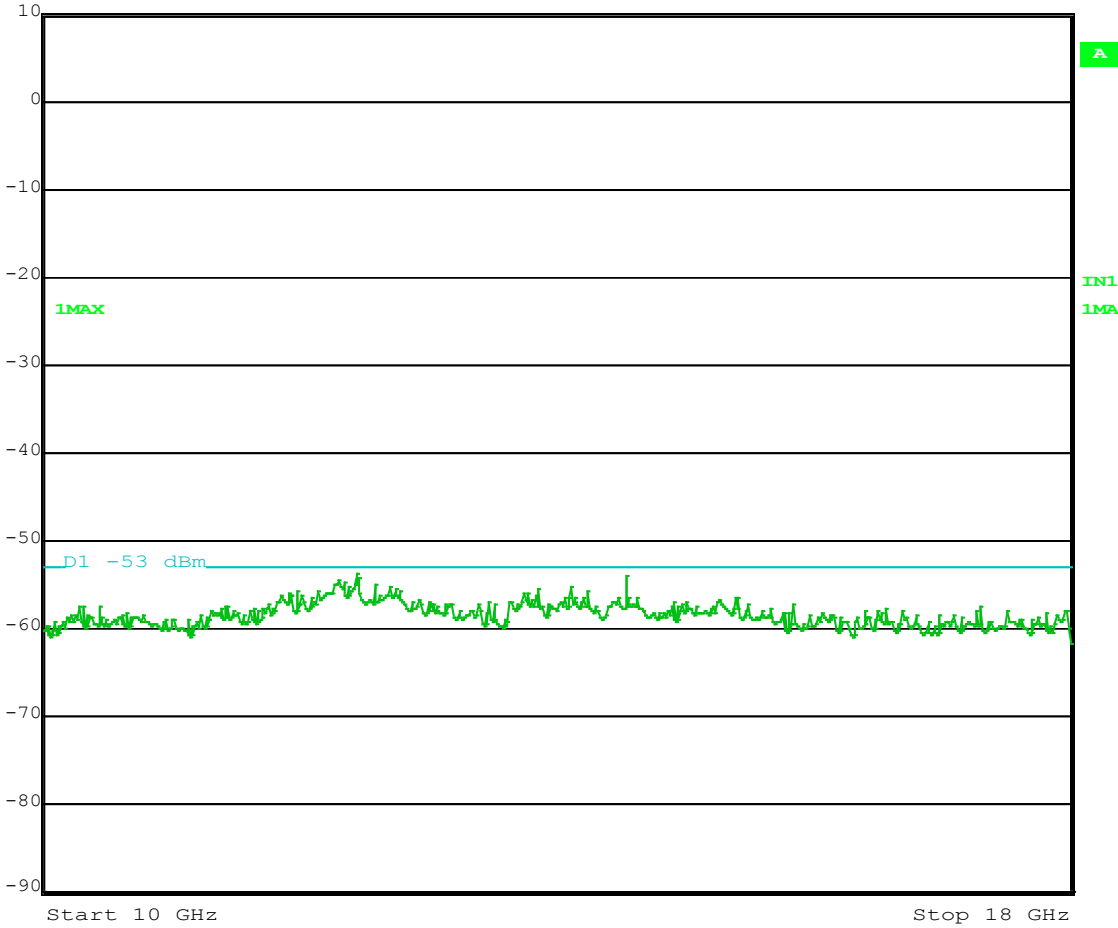
FCC ID: A94414255 IC: 3232A-414255

Certificate # 1514.1



Ref Lvl  
10 dBm

RBW	1 MHz	RF Att	20 dB
VBW	3 MHz		
SWT	500 ms	Unit	dBm



Date: 26.JUL.2013 14:57:39

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# Wireless Transceiver Test Report

FCC ID: A94414255 IC: 3232A-414255



Certificate # 1514.1

## 6.9.4. Test Equipment

Equipment Type	Manufacturer	Model	Tracking Number	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESIB40	TN1560	4/4/2013	4/4/2014

## 6.9.5. Test information

Date of test:	7/26/2013	Test location:	Transmitter Test Bench
EUT serial:	SN 203	Tested by:	M. Royer
Test Conclusion:	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94414255 IC: 3232A-414255



Certificate # 1514.1

## 6.10. SAR exemption calculation

Frequency Range: 2402-2480MHz

Based on FCC KDB 4447498 447498 D01 General RF Exposure Guidance v05

Equation 1:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] * [\sqrt{f}(\text{GHz})]$

Distance between EUT and body (head) is 10mm

Maximum conducted output power measured (dBm) = 6.19 dBm (4.16 mW) (see section 6.3 of this report)

Applying equation 1:

$(6.19/10) * [\sqrt{f}(2.402)] = 0.959 \leq 3.0$

Equation one is below the 3.0 1-g SAR exemption limit, device complies with FCC exposure limits for general population/uncontrolled exposure as a portable device without SAR evaluation.

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