



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

**Report number:** EMC.416912A.3.1

**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:** 

March 6, 2015

**Report reviewed by:** David Sterrett

**Signature:** 

March 6, 2015

**Report issue date:** March 6, 2015

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## Table of Contents

1. Report Summary.....	4
2. Product description .....	5
3. Applicable standards, requirements and tests.....	6
4. Environmental Conditions .....	7
5. EUT configuration: .....	7
6. Detailed Test Results .....	8
6.1. Conducted Emissions .....	8
6.1.1. Requirements .....	8
6.1.2. Test setup details.....	8
6.1.3. Test data.....	9
6.1.4. Test conclusion:.....	11
6.1.5. Test Equipment.....	11
6.1.6. Test information .....	11
6.2. Radiated emissions 30 MHz – 1 GHz.....	12
6.2.1. Requirements .....	12
6.2.2. Test setup details.....	12
6.2.3. Test data.....	13
6.2.4. 6.2.4. Test conclusion:.....	14
6.2.5. Test Equipment.....	15
6.2.6. Test information .....	15
6.3. Output power .....	16
6.3.1. Requirements: .....	16
6.3.2. Test setup details:.....	16
6.3.3. Output power table:.....	17
6.3.4. Test conclusion:.....	17
6.3.5. Test Equipment.....	19
6.3.6. Test information .....	19
6.4. Occupied Bandwidth/Channel Spacing .....	20
6.4.1. Requirements .....	20
6.4.2. Test setup details.....	20
6.4.3. Test conclusion:.....	20
6.4.4. Number of Channels.....	22
6.4.5. Channel separation.....	22
6.4.6. Test Conclusion: .....	23
6.4.7. Test Equipment.....	24
6.4.8. Test information .....	24

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

6.5.	Time of occupancy.....	25
6.5.1.	Requirements .....	25
6.5.2.	Test setup details.....	25
6.5.3.	Test data.....	27
6.5.4.	Test conclusion:.....	28
6.5.5.	Test Equipment.....	29
6.5.6.	Test information .....	29
6.6.	Band Edge Compliance .....	30
6.6.1.	Requirements .....	30
6.6.2.	Test Setup .....	30
6.6.3.	Test data.....	30
6.7.	Spurious emissions- Radiated .....	32
6.7.1.	Requirements .....	32
6.7.2.	Test Setup .....	32
6.7.3.	Test data.....	33
6.7.4.	Test conclusion:.....	38
6.7.5.	Test Equipment.....	39
6.7.6.	Test information .....	39
6.8.	Harmonics .....	40
6.8.1.	Requirements .....	40
6.8.2.	Test Setup .....	40
6.8.3.	Test data.....	40
6.8.4.	Test conclusion:.....	40
6.8.5.	Test Equipment.....	41
6.8.6.	Test information .....	41
6.9.	Receiver spurious emissions .....	42
6.9.1.	Requirements .....	42
6.9.2.	Test Setup .....	42
6.9.3.	Test data.....	43
6.9.4.	Test conclusion:.....	47
6.9.5.	Test Equipment.....	47
6.9.6.	Test information .....	47
6.9.7.	Conclusion:.....	47

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 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 4**  
**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.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A    IC: 3232A-416912A



Certificate # 1514.1

## 2. Product description

The product is a wireless speaker for listening to music.

A battery charger is supplied. A charging cradle is supplied in addition to the charging jack.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

### 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 radiated spurious emissions	Complies Section 6.6
15.247(d)		4.9	Transmitter harmonics.	Complies Section 6.7
		4.10, 6.2	Receiver Spurious emissions	Complies Section 6.8
OET65	Canada Health and Safety code 6		MPE calculation	Complies Section 6.9

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 4. Environmental Conditions

All testing is performed under the following conditions, unless otherwise defined in the detailed 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. For conducted emissions, the Aux accessory was investigated in both the grounded and not grounded modes. For transmitter testing, the product was tested in a typical link or in forced modes under computer control as appropriate.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 6. Detailed Test Results

### 6.1. Conducted Emissions

#### 6.1.1. Requirements

47CFR15.207, RSS 210 section 7.2.4

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 EUT was tested in accordance with ANSI C63.4 test setup conditions in a typical use. A 3.5 mm audio cable was connected from an audio source (cell phone) to the Aux port on the EUT. The measurements were pretested in all permutations of cradle powered or plug powered, radio input mode or aux input mode, and with the aux in grounded or ungrounded.

*Without written permission of laboratory, this report shall not be reproduced except in full.*





# Wireless Transceiver Test Report



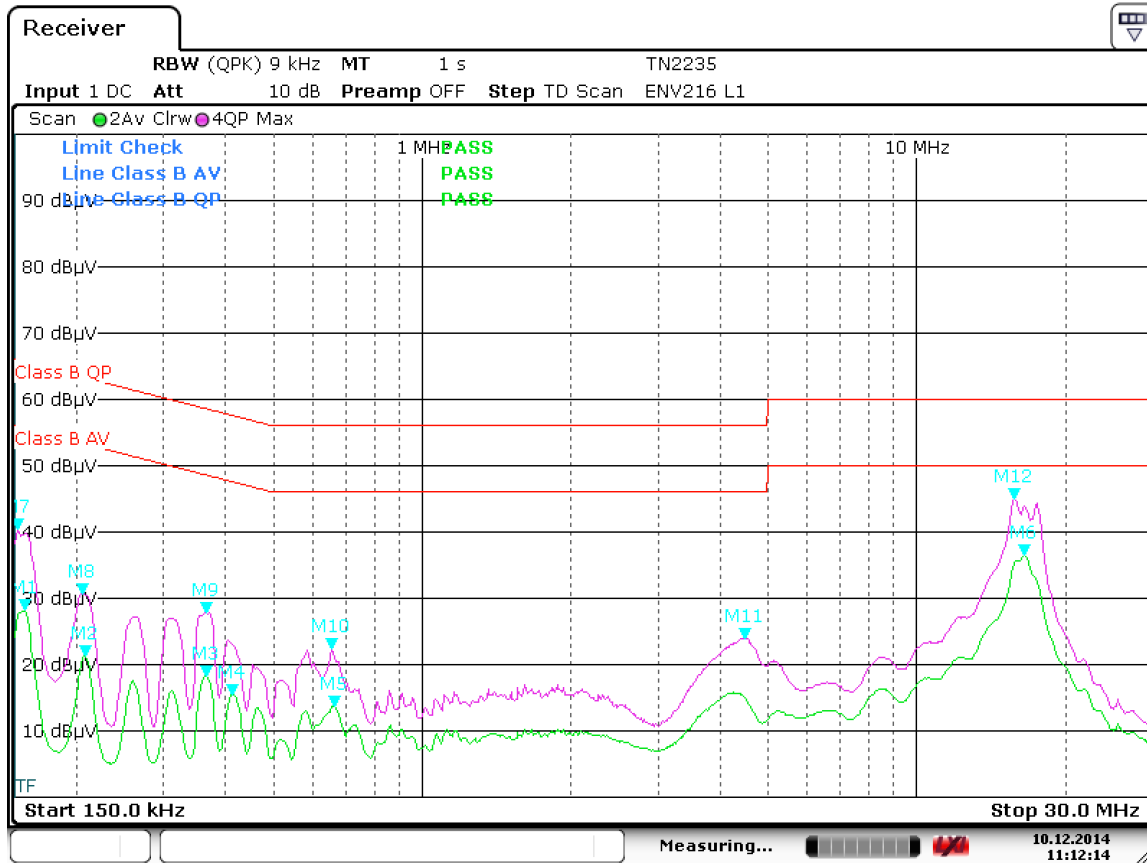
FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.1.3. Test data

AC Adapter charging EUT battery, playing pink noise at full volume.

### 6.1.3.1. 120 VAC 60 Hz, Line side, Max Peak Scan



Date: 10.DEC.2014 11:12:14

Frequency MHz	MEASURED		LIMIT		MARGIN	
	dBµV QP	dBµV AVG	dBµV QP	dBµV AVG	dB QP	dB AVG
0.157		28.3	65.6	55.6		27.3
0.209		21.4	63.3	53.3		31.9
0.366		18.3	58.6	48.6		30.3
0.413		15.5	57.6	47.6		32.1
0.663		13.7	56.0	46.0		32.3
16.546		36.4	60.0	50.0		13.6
0.152	40.5		65.9	55.9	25.4	
0.206	30.7		63.3	53.3	32.7	
0.366	27.8		58.6	48.6	30.8	
0.656	22.4		56.0	46.0	33.6	
4.499	24.0		56.0	46.0	32.0	
15.810	45.1		60.0	50.0	14.9	

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

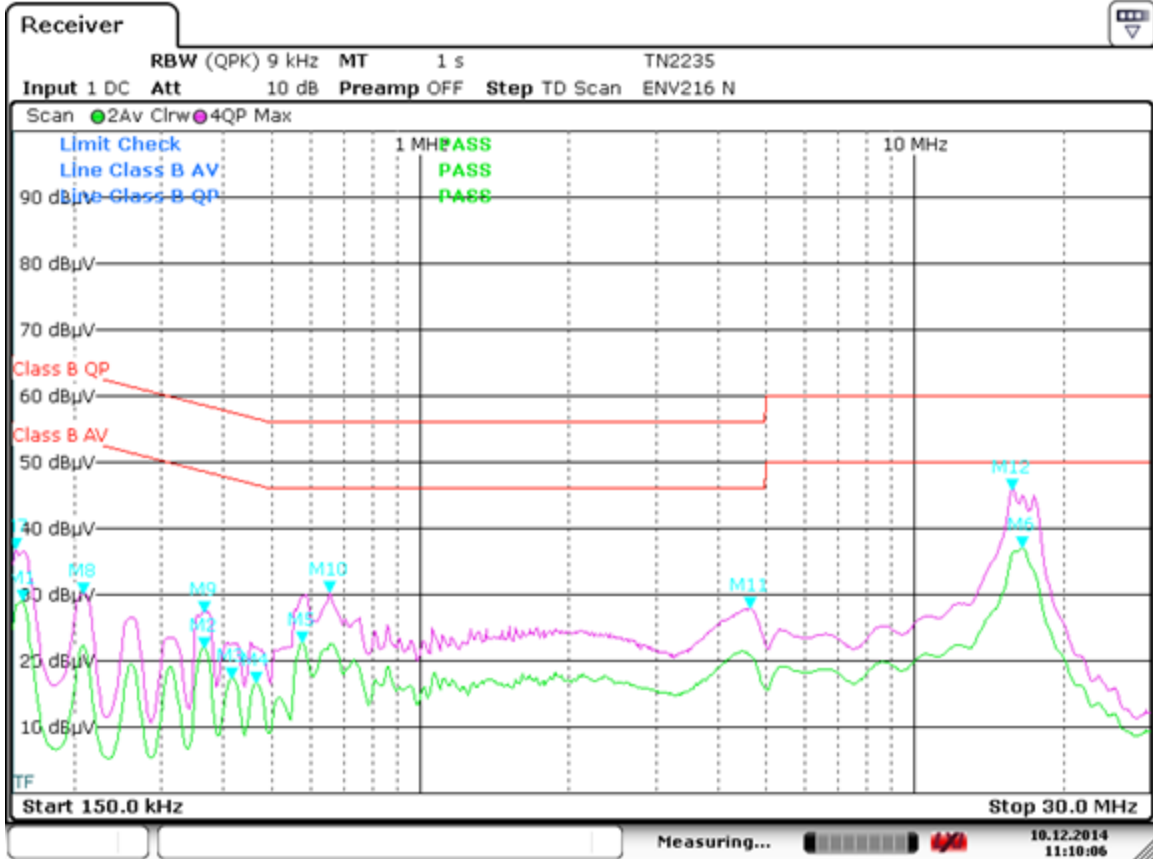


FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

AC Adapter charging EUT battery, playing pink noise at full volume.

## 6.1.3.2. 120 VAC 60 Hz, Neutral side, Max Peak Scan



Date: 10.DEC.2014 11:10:06

Frequency MHz	MEASURED		LIMIT		MARGIN	
	dBµV QP	dBµV AVG	dBµV QP	dBµV AVG	dB QP	dB AVG
0.157		29.2	65.6	55.6		26.4
0.366		21.9	58.6	48.6		26.7
0.416		17.3	57.5	47.5		30.2
0.467		16.8	56.6	46.6		29.8
0.578		22.8	56.0	46.0		23.2
16.481		37.1	60.0	50.0		12.9
0.152	36.9		65.9	55.9	29.0	
0.209	30.2		63.3	53.3	33.1	
0.366	27.4		58.6	48.6	31.1	
0.656	30.5		56.0	46.0	25.5	
4.637	27.9		56.0	46.0	28.1	
15.790	45.9		60.0	50.0	14.1	

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 6.1.4. Test conclusion:

Pass. The worst case emission is 12.9 dB below the limit, at 16.481 MHz.

## 6.1.5. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				Last	Due
LISN	Rohde & Schwarz	2-LINE V-NETWORK ENV216	TN2235	11/15/2013	11/15/2015
EMI Test Receiver	Rohde & Schwarz	ESR7	TN2247	2/3/2014	2/3/2015
Conducted Comb Generator	Com-Power	CGC-510	TN1380	1/6/2014	1/6/2015

## 6.1.6. Test information

<b>Date of test:</b>	12/10/14	<b>Test location :</b>	DCE lab – Henry room
<b>EUT serial:</b>	125	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 6.2. Radiated emissions 30 MHz – 1 GHz

### 6.2.1. Requirements

FCC rules part 15.109 (g), 15.209, ICES-003 issue 5 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 tested with and without cradle, with and without wireless with and without charging current. Data shown represents the worst case operating mode. The speaker played full volume pink noise.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.2.3. Test data

### 6.2.3.1. Horizontal Polarization



Date: 12.DEC.2014 15:43:52

FCC 15B Class B Product (Residential) @ 3 Meters									
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)
87.88	18.60	28.60	40.0	N/A	21.4	N/A	0	H	1.0
241.68	22.80	30.20	46.0	N/A	23.2	N/A	286	H	1.5
283.98	21.40	29.50	46.0	N/A	24.6	N/A	273	H	1.2
972.34	19.00	30.70	54.0	N/A	35.0	N/A	83	H	1.0

Without written permission of laboratory, this report shall not be reproduced except in full.



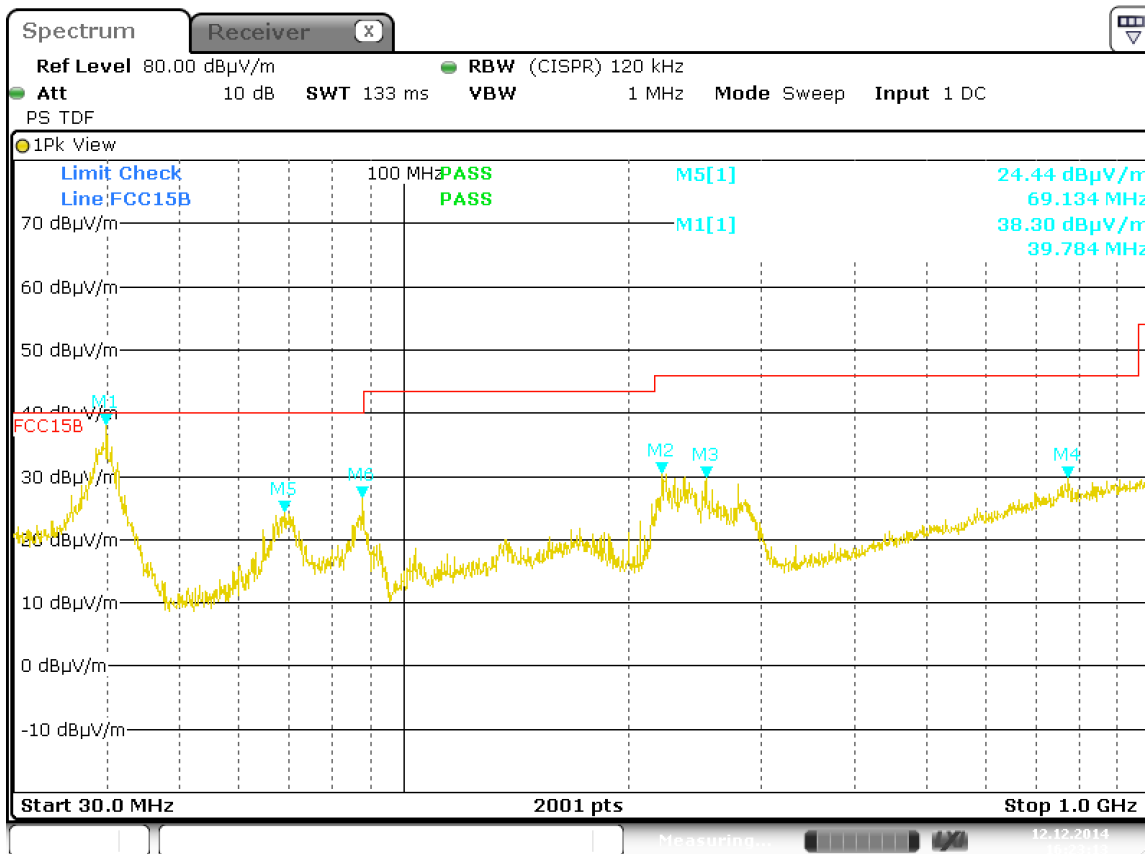
# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.2.3.2. Vertical Polarization



Date: 12.DEC.2014 16:23:13

FCC 15B Class B Product (Residential) @ 3 Meters									
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)
39.784	32.10	40.90	40.0	40.0	7.9		0	V	1.0
69.134		24.40	40.0	40.0		15.6			
87.924		26.60	40.0	40.0		13.4			
221.004		30.50	46.0	46.0		15.5			
253.837		29.90	46.0	46.0		16.1			
774.158		29.90	46.0	46.0		16.1			

## 6.2.4. 6.2.4. Test conclusion:

Pass. The worst case emission is 7.9 dB below the quasi peak limit at 39.8 MHz, using cradle, Bluetooth mode, AC power was not plugged under the table.

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.2.5. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				Last	Due
Antenna	Sunol Sciences	JB6	TN1823	7/30/2013	7/30/2015
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	

## 6.2.6. Test information

<b>Date of test:</b>	12/12/2014	<b>Test location :</b>	DCE - Maxwell House
<b>EUT serial:</b>	SN 125	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 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 software 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 0.2 m long piece of flexible coax cable with an SMA connector. This cable is measured to .75 dB of loss at 2.48 GHz. The EUT is commanded to stop hopping and operate at at the low, middle, and high end of the authorized frequency band. In addition, a display of the spectrum at every frequency was made so that the frequency of greatest strength could be determined. That strongest frequency is included also.

The spectrum analyzer resolution bandwidth is set to 10 MHz, peak detector and max hold. Basic Data Rate and Enhanced Data Rate are measured. The maximum output power settings are different for basic rate and for Enhanced Data Rate (EDR) settings.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*





# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

### 6.3.3. Output power table:

Freq MHz	Mod	Meas. dBm	Cable Loss	Result dBm
2402	DH5	6.54	0.75	7.29
2402	2-DH5	5.78	0.75	6.53
2402	3-DH5	5.9	0.75	6.65
2441	DH5	7.49	0.75	8.24
2441	2-DH5	8.07	0.75	8.82
2441	3-DH5	8.28	0.75	9.03
2480	DH5	7.43	0.75	8.18
2480	2-DH5	7.58	0.75	8.33
2480	3-DH5	7.7	0.75	8.45
2430	DH5	9.1	0.75	9.85
2430	2-DH5	9.47	0.75	10.22
2430	3-DH5	9.53	0.75	10.28

### 6.3.4. Test conclusion:

Pass. The worst case is 10.28 dBm Peak at 2430 MHz or 10.67 mW in 3-DH5 mode.

*Without written permission of laboratory, this report shall not be reproduced except in full.*



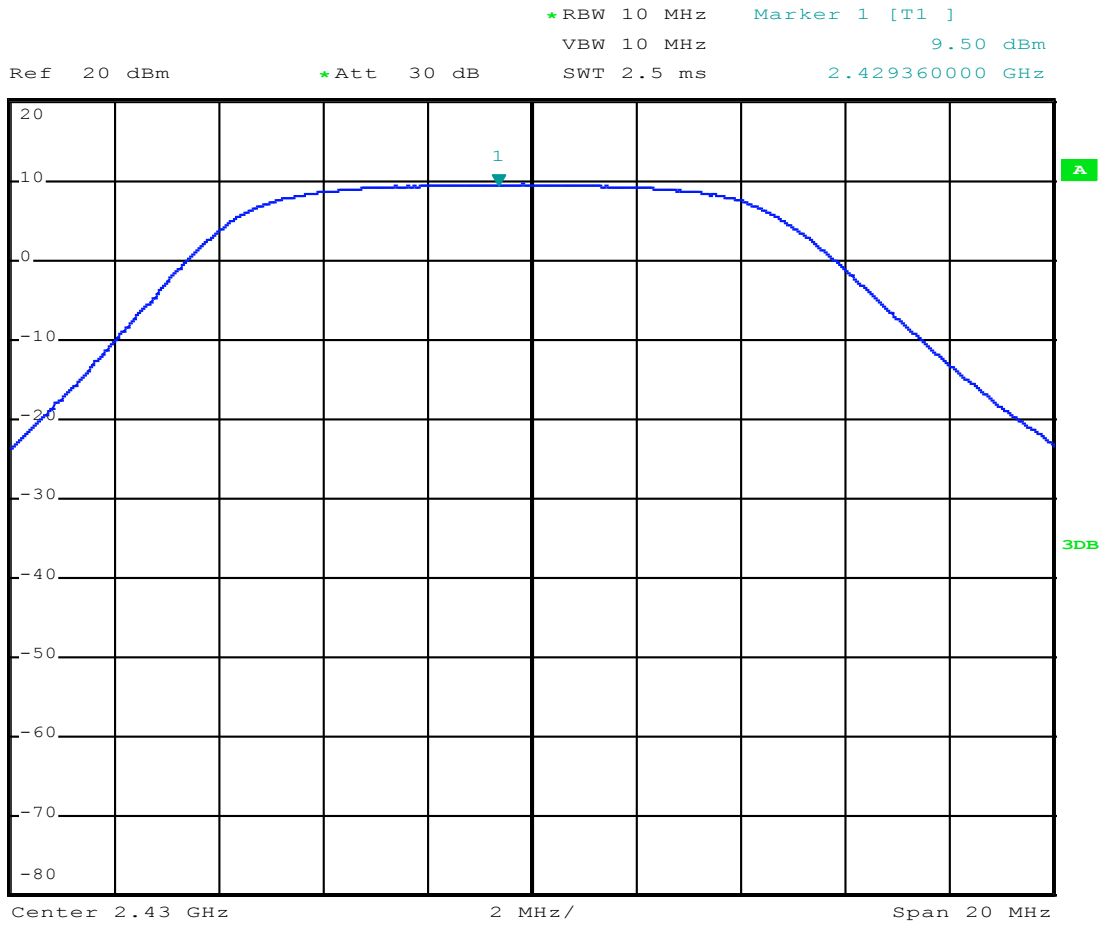
# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.3.4.1. Output power screen shot



TEST

Date: 9.JAN.2015 16:11:08

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.3.5. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
ESPI EMI Test Receiver	Rohde & Schwarz	ESPI7 / 1164.6407K07	TN1419	4/16/2014	4/16/2015
Cable	TE Connectivity	2032439-1		Verify	

## 6.3.6. Test information

<b>Date of test:</b>	1/9/2015	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	SN0000	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 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 output of the transmitter was connected directly to the spectrum analyzer using a 200mm coax with .75 dB of loss at 2.44 GHz. The hopping was stopped. Modulation was set to 3-DH5.

Bandwidth summary table:

BT Channel	Center Frequency (MHz)	-20dB OBW (MHz)
0	2402	1.4
39	2441	1.4
78	2480	1.4

### 6.4.3. Test conclusion:

Pass

$2/3^{\text{rd}}$  of the largest OBW, =  $2/3 \times 1.4 \text{ MHz} = 933 \text{ kHz}$ , which is less than the carrier channel separation of 1 MHz. In addition, the output power is 10.67 mW which is less than 125 mW.

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

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

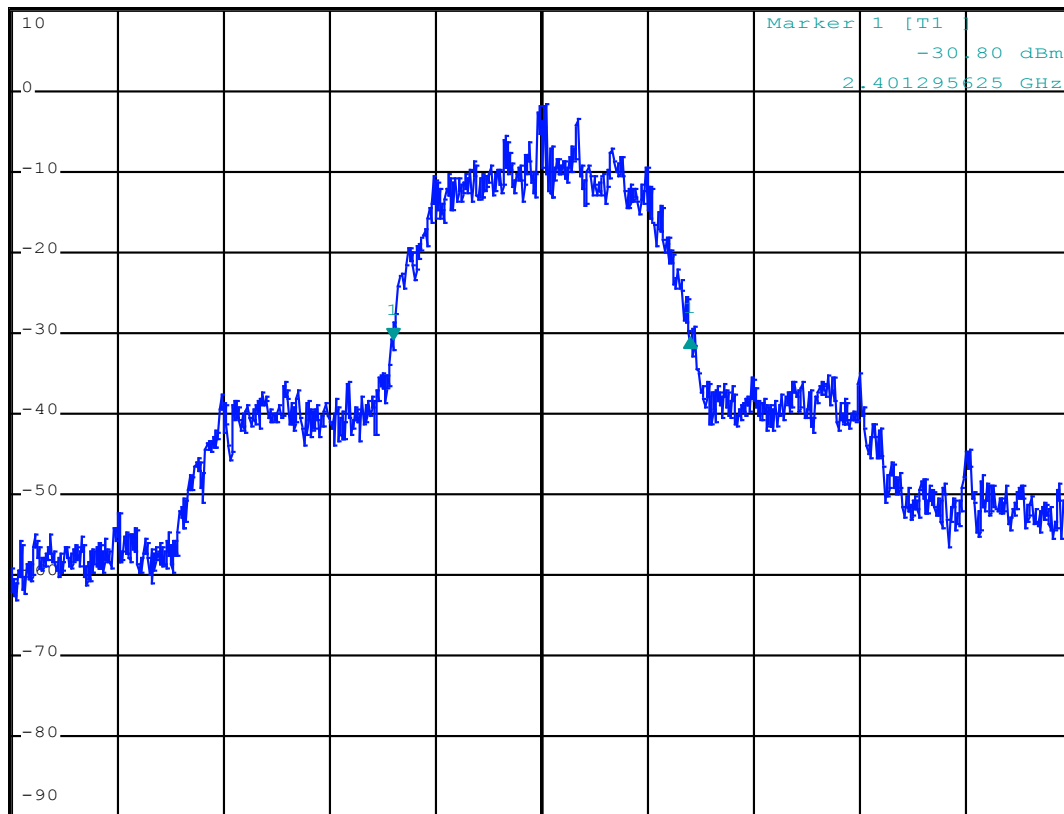


\*RBW 10 kHz Delta 1 [T1 ]  
VBW 30 kHz 0.32 dB  
SWT 50 ms 1.40000000 MHz

Ref 10 dBm

\*Att 20 dB

1. PK  
MAXH



Center 2.402 GHz

500 kHz/

Span 5 MHz

TEST

Date: 8.JAN.2015 14:51:50

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

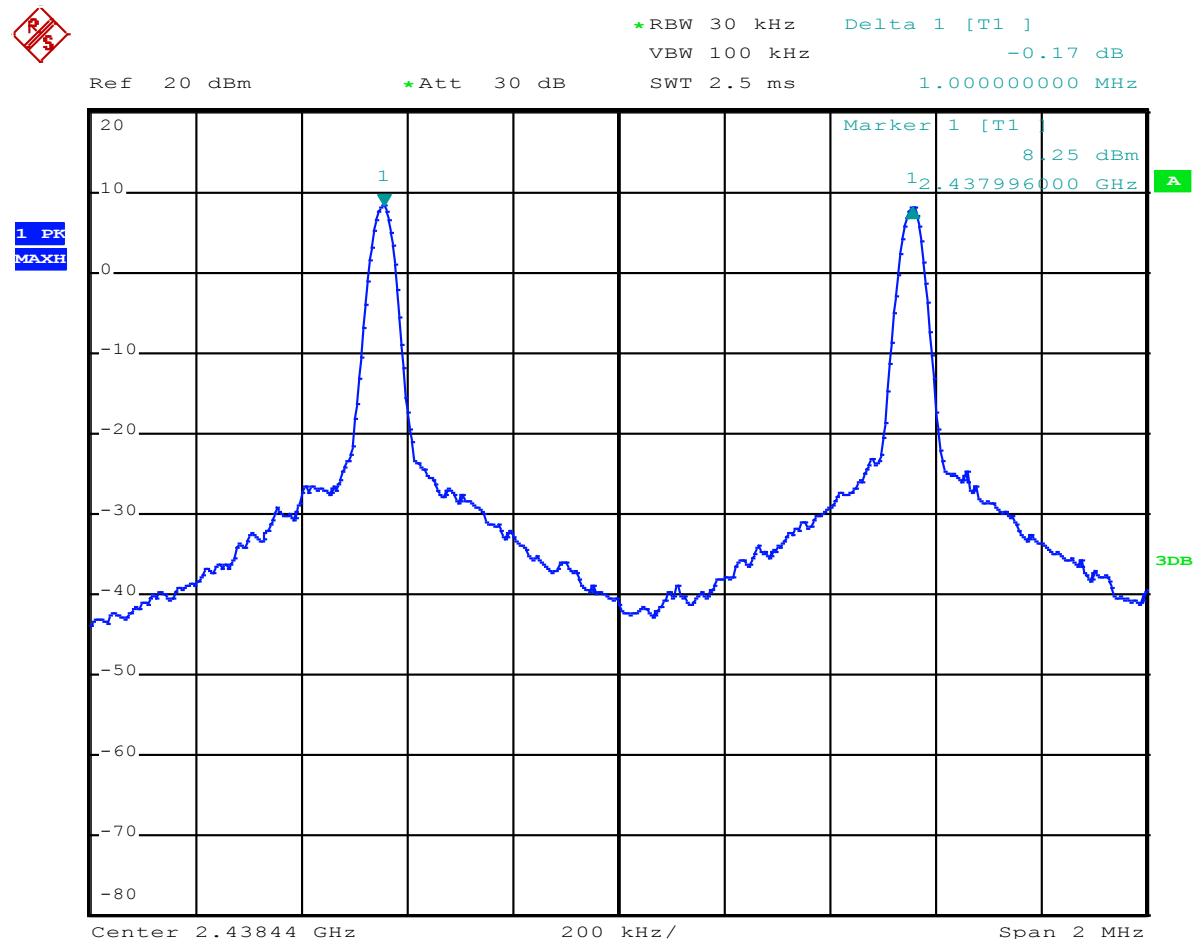
## 6.4.4. Number of Channels

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

## 6.4.5. Channel separation.

This plot was created by stopping the hop sequence with no modulation on one channel, then changing to the adjacent channel.

### 6.4.5.1. Channel Separation



TEST

Date: 9.JAN.2015 16:17:03

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

FCC ID: A94416912A    IC: 3232A-416912A



Certificate # 1514.1

#### 6.4.6. Test Conclusion:

Pass. The channel separation exceeds the minimum required.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 6.4.7. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
ESPI EMI Test Receiver	Rohde & Schwarz	ESPI7 / 1164.6407K07	TN1419	4/16/2014	4/16/2015
Cable	TE Connectivity	2032439-1		Verify	

## 6.4.8. Test information

<b>Date of test:</b>	1/9/2015	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	0000	<b>Test by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*





# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 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 was allowed to operate in its normal use mode. The RF output was connected to the spectrum analyzer using a 200mm long coax with a loss of 0.75 dB at 2.44 GHz. The EUT was paired to an audio gateway device by way of leakage. The test was made inside a shielded enclosure so that other signals would not interfere with the test.

The spectrum analyzer was set to a sweep time of 31.6 seconds (79 channels \* .4 seconds = 31.6 seconds) with a set of 30000 sweep points on the Spectrum analyzer screen. Each sweep point on the screen corresponds to a time frame of 1053 us. (31.6 seconds / 30000 points = 1053 us).

The spectrum analyzer was set to a bluetooth channel that was found to be active. The span was set to zero. The resolution bandwidth was set wide, but not so wide as to include hop events from other adjacent channels. The random hop events found on the screen are shown on the screen shot. These points are counted by downloading the data file from the analyzer into Excel. Each sweep point with an amplitude above -8 dBm is considered an active hop event and is allocated a time of 1053 us. When individual pulses are measured, they are found to be only 166 us long, which is only 10% as long as the sweep point windows that this analysis adds up. The 1053 us is considered a more rigorous test case. See the plot of an individual pulse which measures 166 us for each single pulse.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94416912A

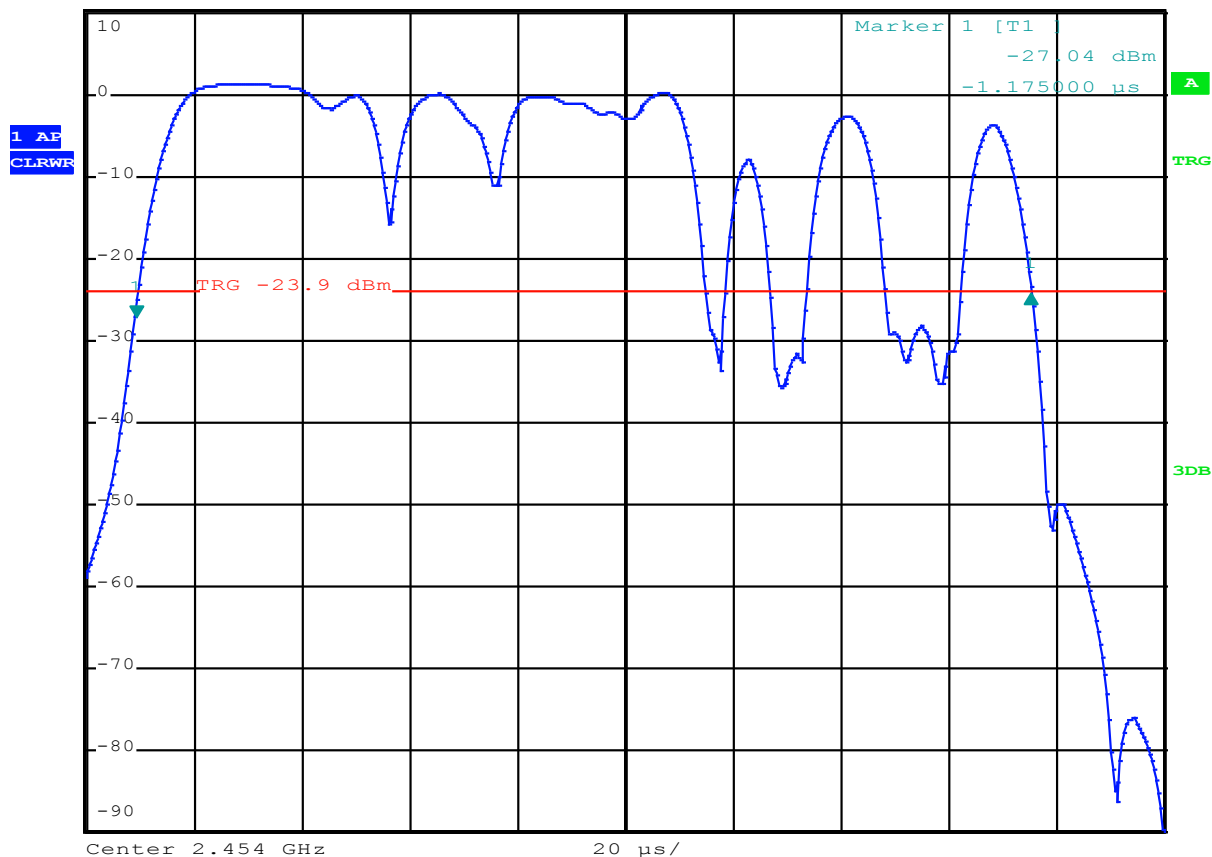
IC: 3232A-416912A

Certificate # 1514.1

## 6.5.2.1. Individual pulse plot



RBW 100 kHz    Delta 1 [T1 ]  
 VBW 300 kHz                    2.89 dB  
 Ref 10 dBm                    \*Att 20 dB                    SWT 200  $\mu$ s                    166.150000  $\mu$ s



TEST

Date: 8.JAN.2015 17:18:41

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

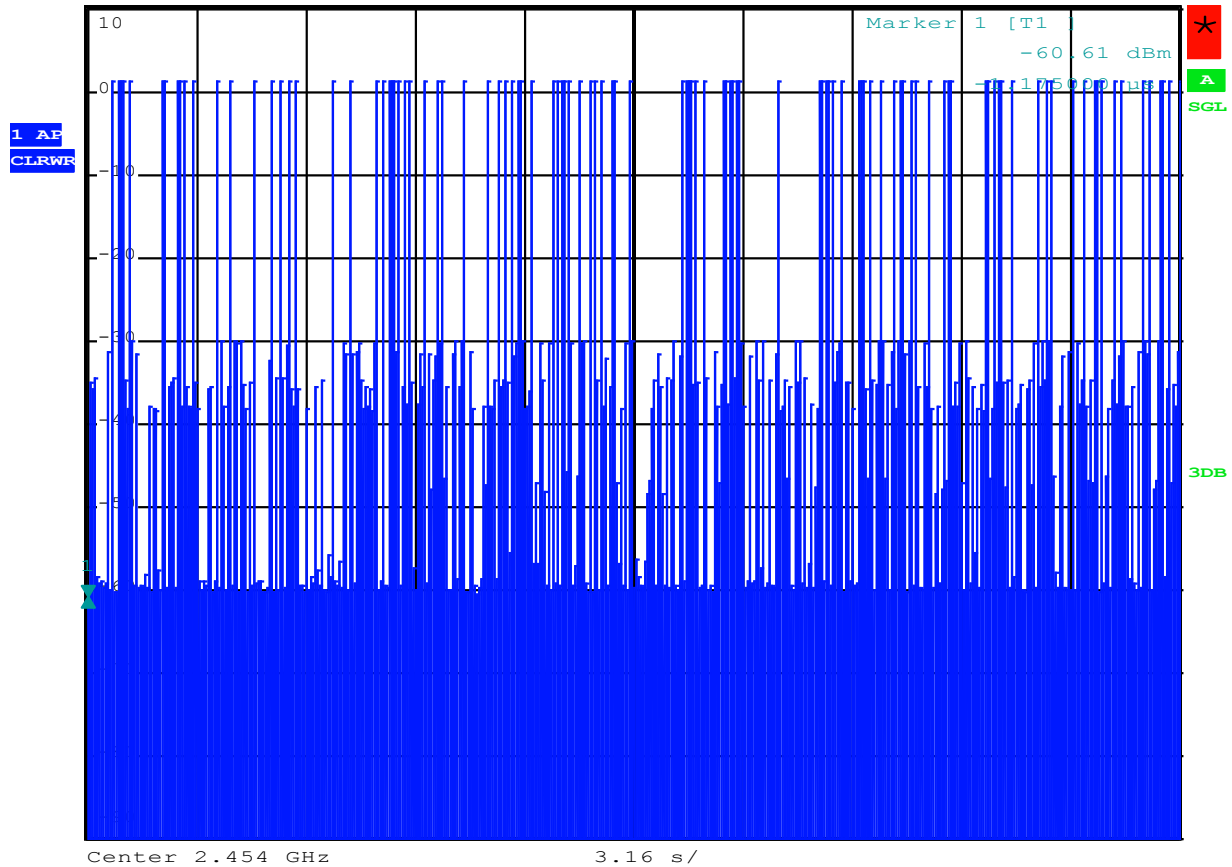
Certificate # 1514.1

## 6.5.3. Test data

### 6.5.3.1. The 31.6 second plot



RBW 100 kHz Delta 1 [T1 ]  
 VBW 300 kHz 0.00 dB  
 Ref 10 dBm \*Att 20 dB SWT 31.6 s 166.150000  $\mu$ s



TEST

Date: 8.JAN.2015 17:36:57

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

### 6.5.3.2. Example of data table

Time ms	Amplitude dBm	Time Duration us	Sum
0.00	-73.25	0	0.146413333
1.05	-73.18	0	
2.11	-73.18	0	
3.16	-73.16	0	
4.21	-73.12	0	
5.27	-72.96	0	
6.32	-67.05	0	
7.37	-72.33	0	
8.43	-8.01	1053	
9.48	-73.28	0	
10.53	-73.07	0	

Table truncated.....

### 6.5.4. Test conclusion:

Pass. The occupancy time is 0.146413 Seconds which is less than 400 ms so the device passes.

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 6.5.5. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESU40	TN1663	4/11/2014	4/11/2015
Cable	TE Connectivity	2032439-1		Verify	

## 6.5.6. Test information

<b>Date of test:</b>	1/8/2015	<b>Test location:</b>	Transmitter Test Bench
<b>Serial number:</b>	SN 0000	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.6. Band Edge Compliance

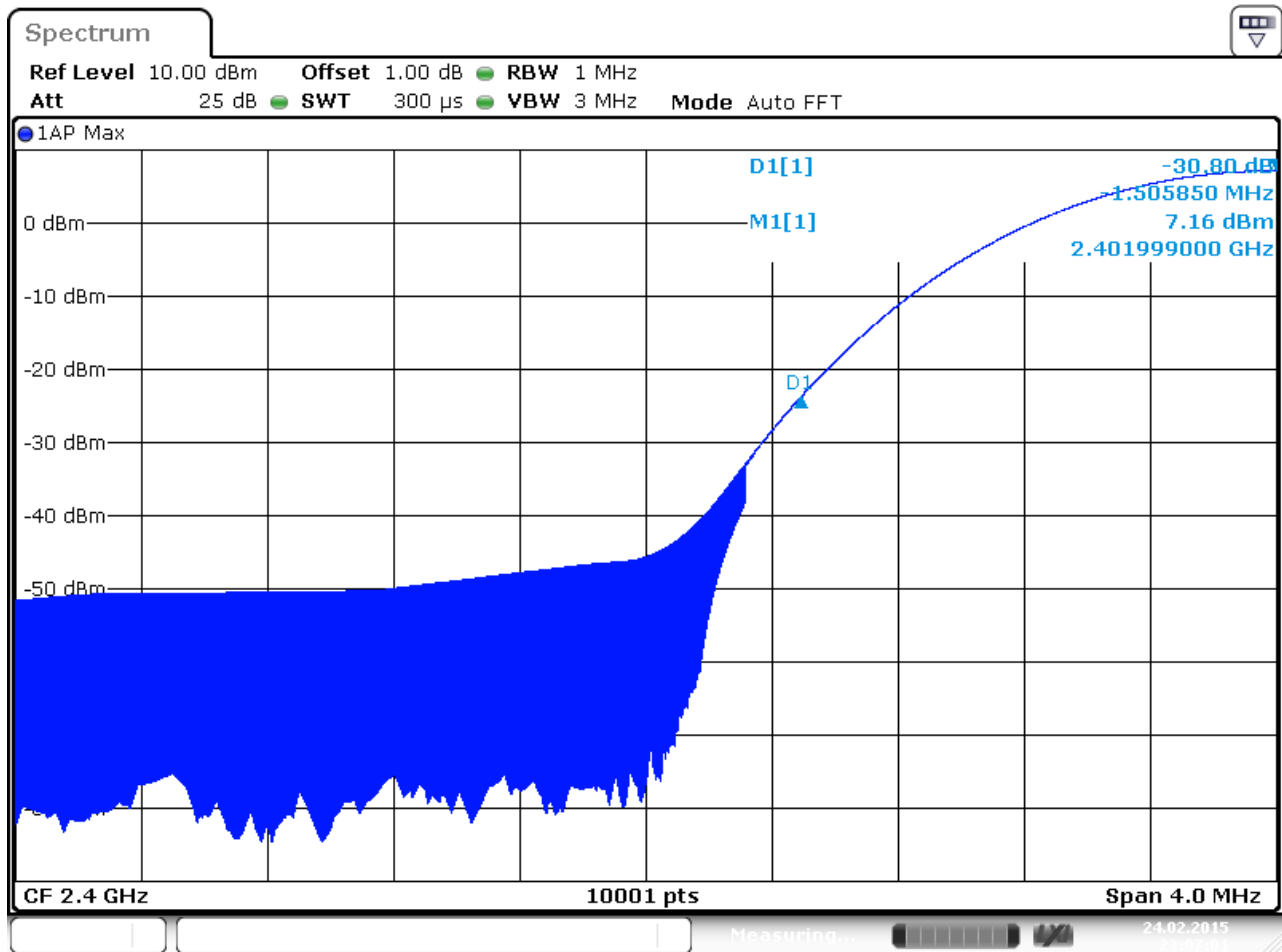
### 6.6.1. Requirements

The band edge emissions must be 30 dB down from the carrier before meeting the edge of the permitted band. If in a restricted band, emissions are also subject to the general limit.

### 6.6.2. Test Setup

The test was performed conducted using the modulation which produced the widest occupied bandwidth. The test was repeated in hopping and non-hopping modes.

### 6.6.3. Test data



Date: 24.FEB.2015 23:07:02

The 30 dB down point is at 2400.5 MHz, which is within the 2400 MHz band. The test is a pass.

*Without written permission of laboratory, this report shall not be reproduced except in full.*



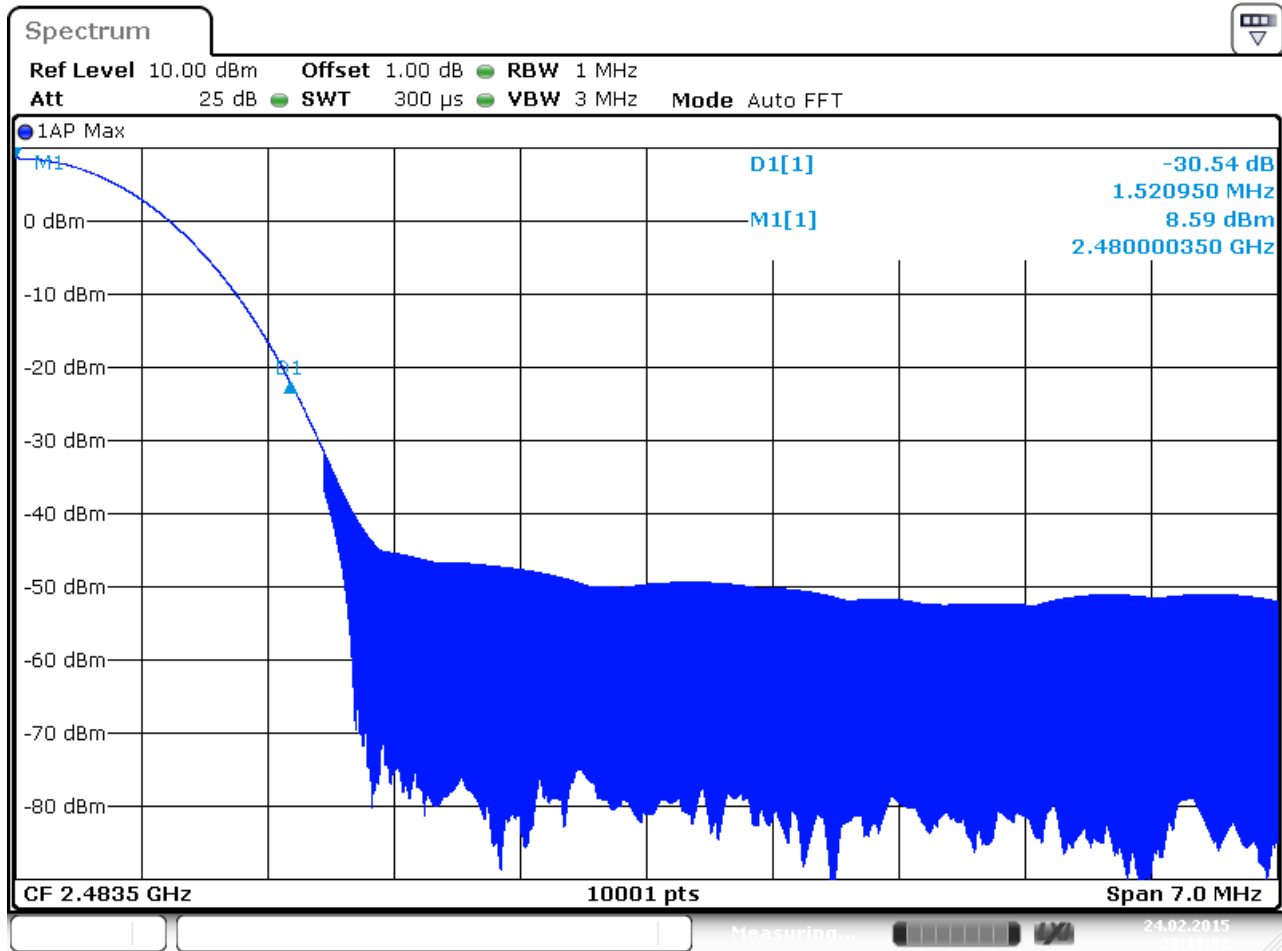
# Wireless Transceiver Test Report



FCC ID: A94416912A

IC: 3232A-416912A

Certificate # 1514.1



Date: 24.FEB.2015 23:11:02

The 30 dB down point is at 2481.5 MHz which is within the band limit of 2483.5 MHz. The result is a pass.

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 6.7. Spurious emissions- Radiated

### 6.7.1. Requirements

FCC part 15.247(d), RSS210 A8.5

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

### 6.7.2. Test Setup

The EUT is controlled via the USB cable with software which is used to stop the hopping. The EUT is placed on a turntable in a fully anechoic chamber and measured in three orthogonal positions using a bore-sighted mast and horn antenna. The spectrum analyzer resolution bandwidth is set to 1 MHz peak detector on channel 1 and average on channel 2. The sweep and turntable rates are slow. These emissions measurements were taken in horizontal and vertical polarization using a bore-sighted antenna mast and a wideband horn. A narrow 2.400-2.485 GHz notch filter, was used to block out the transmitter signal in the band 2.4 to 2.4835 GHz. The loss of this filter is compensated for in the instrument transducer factors. The remaining signals that can be seen near the band are actually out-of-band signals from the transmitter, and need to be 30 dB down from the transmitter peak when measured in average mode.

The frequency range from 18 to 25 GHz was scanned using a wand technique at a distance of 10 cm. Care was exercised to find every polarization, place, and angle possible.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*





# Wireless Transceiver Test Report

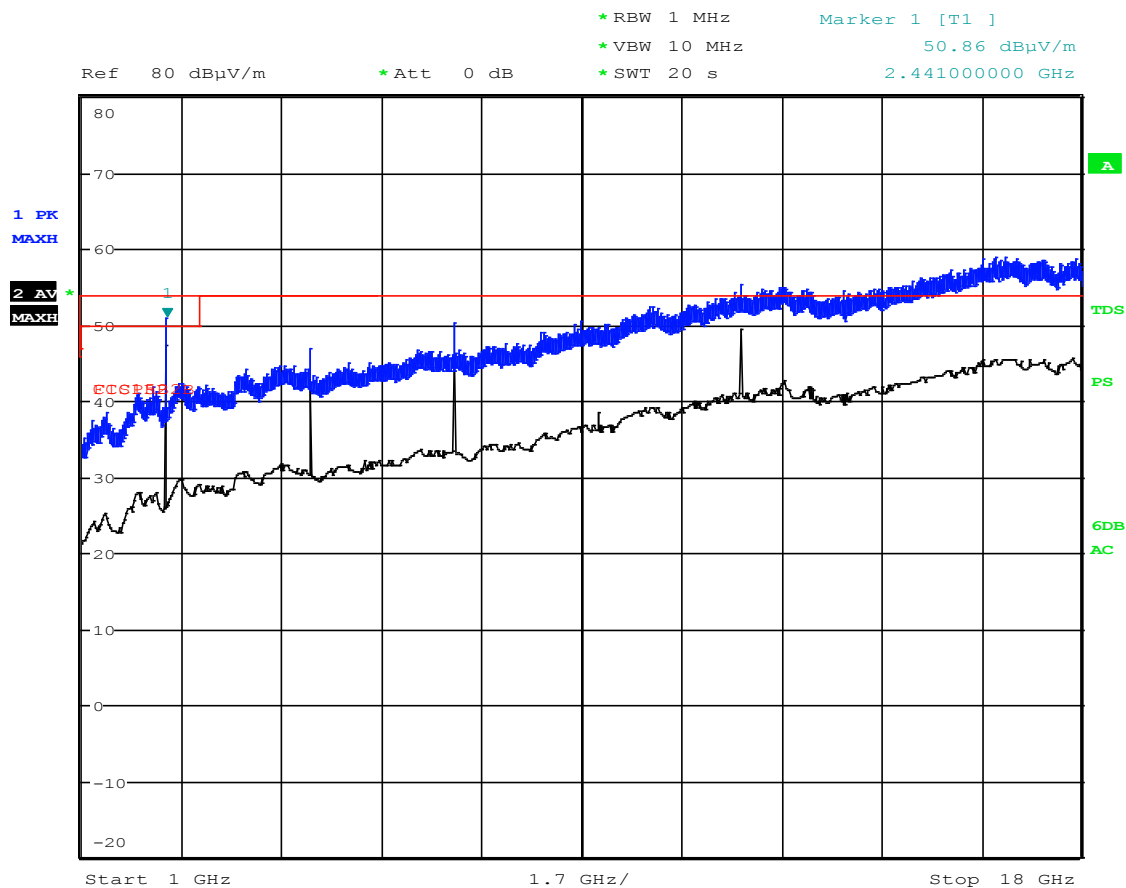


FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.7.3. Test data

### 6.7.3.1. Normal orientation.



3DH3 Pulse Width

Date: 22.DEC.2014 12:22:32

Without written permission of laboratory, this report shall not be reproduced except in full.



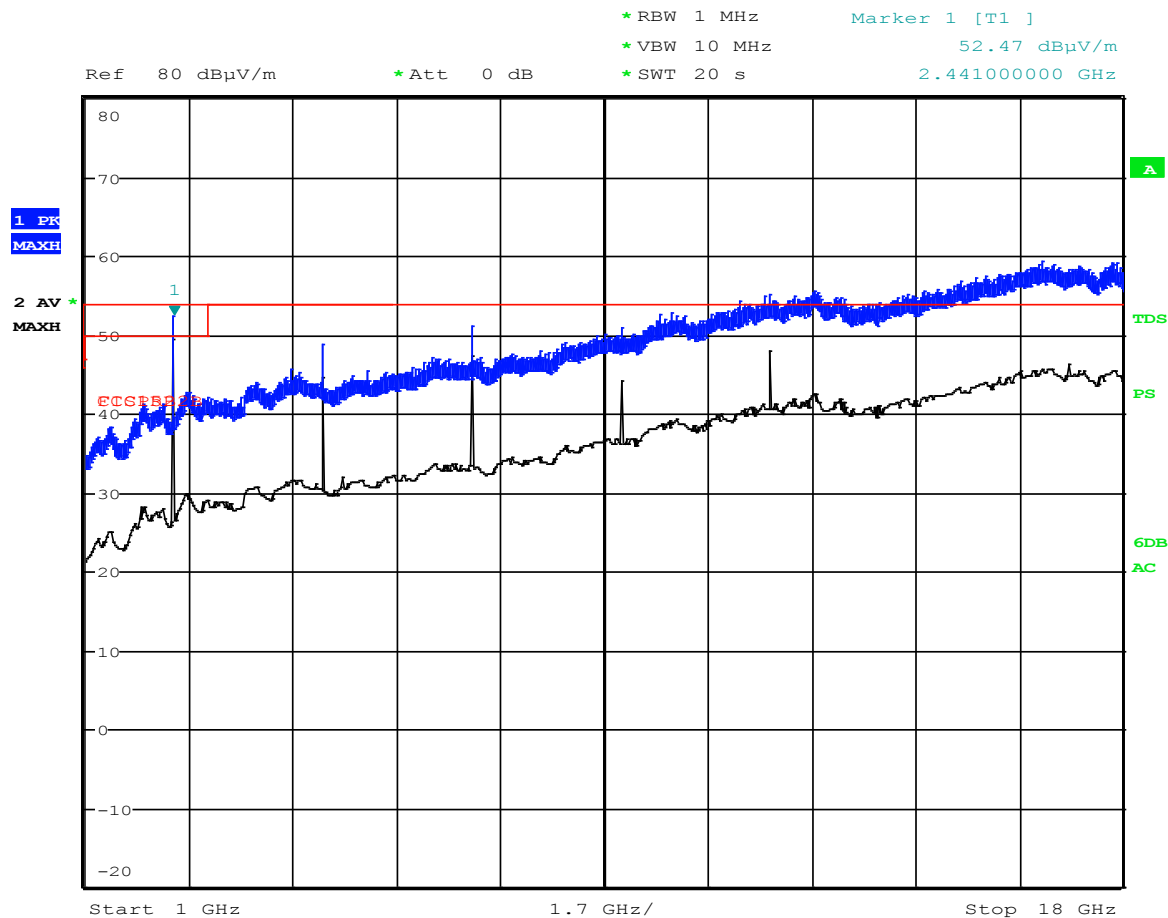
# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.7.3.2. Face up orientation



3DH3 Pulse Width

Date: 22.DEC.2014 14:53:05

Without written permission of laboratory, this report shall not be reproduced except in full.



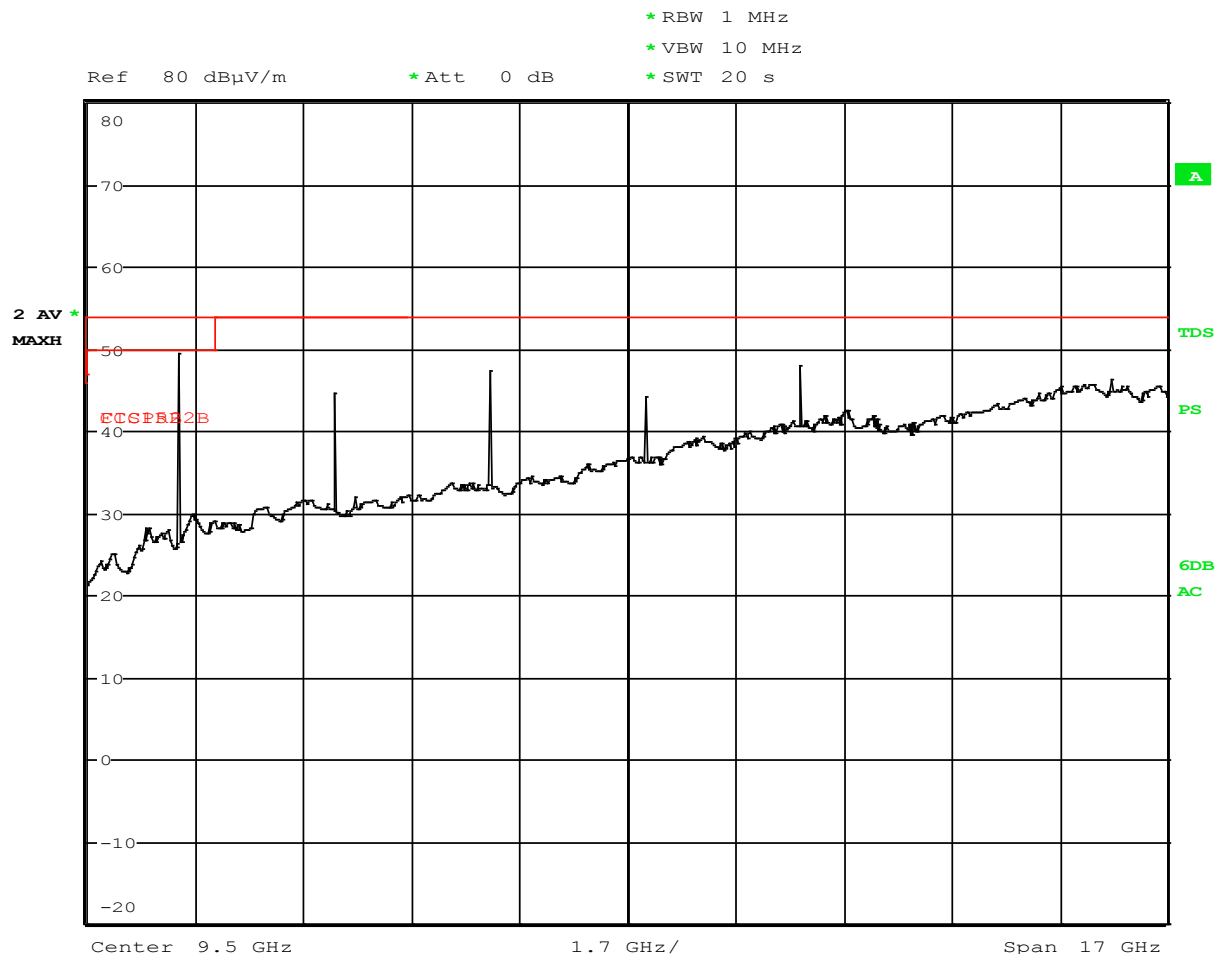
# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

### 6.7.3.3. Face up orientation Displayed with Average only



3DH3 Pulse Width

Date: 22.DEC.2014 14:54:11

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

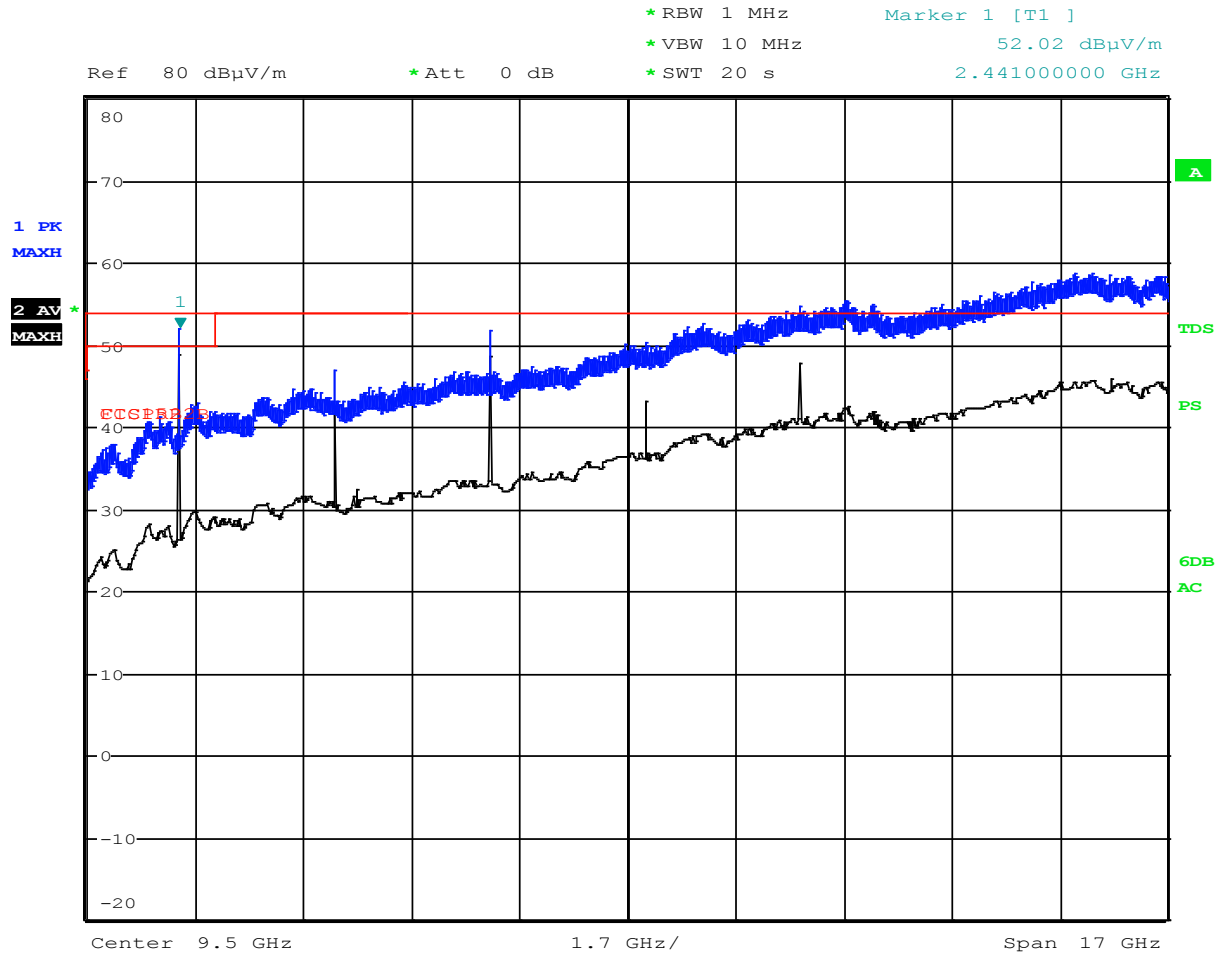


FCC ID: A94416912A

IC: 3232A-416912A

Certificate # 1514.1

## 6.7.3.4. Standing on end



3DH3 Pulse Width

Date: 22.DEC.2014 15:50:56

Without written permission of laboratory, this report shall not be reproduced except in full.



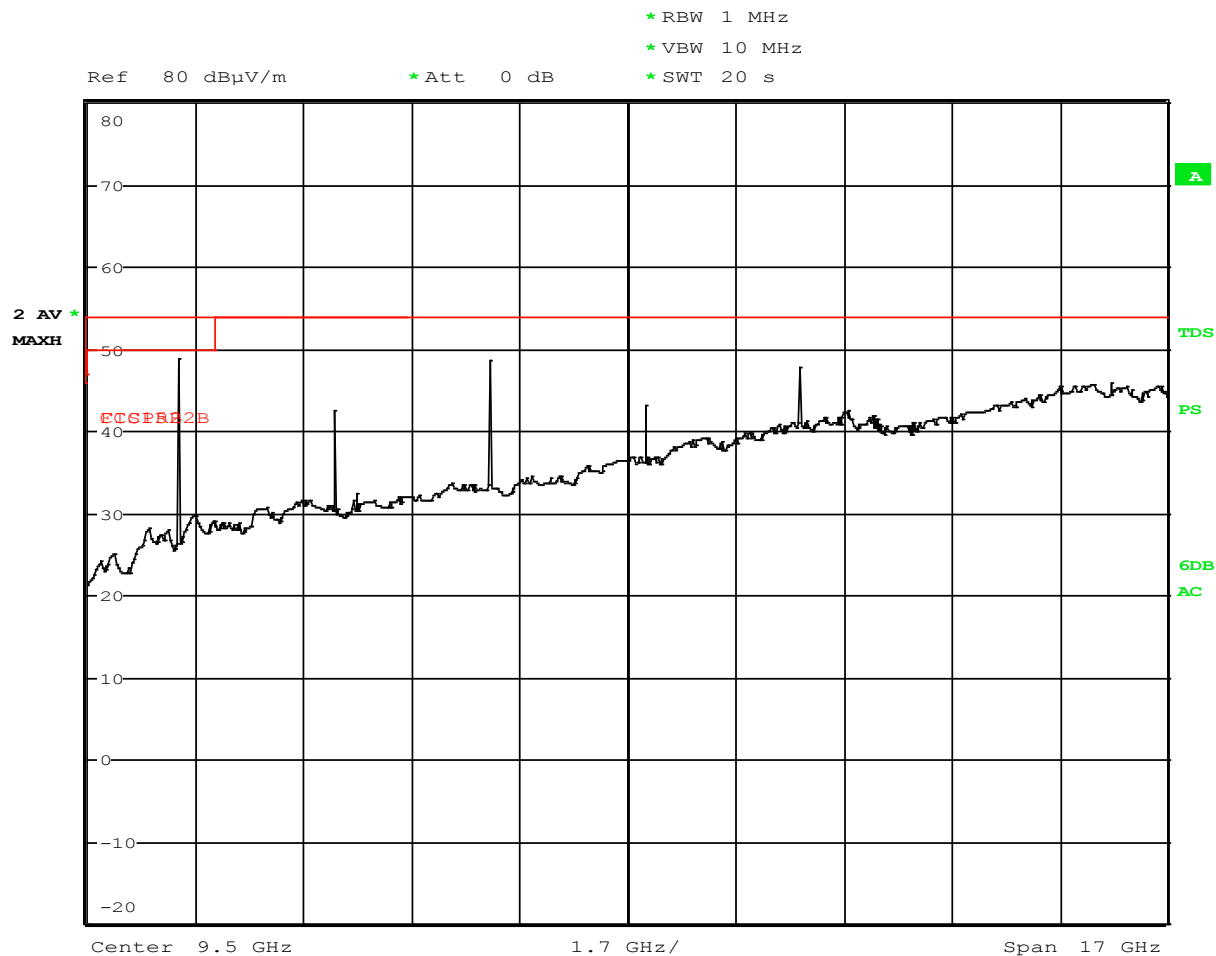
# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.7.3.5. Standing on end Average only



3DH3 Pulse Width

Date: 22.DEC.2014 15:51:51

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

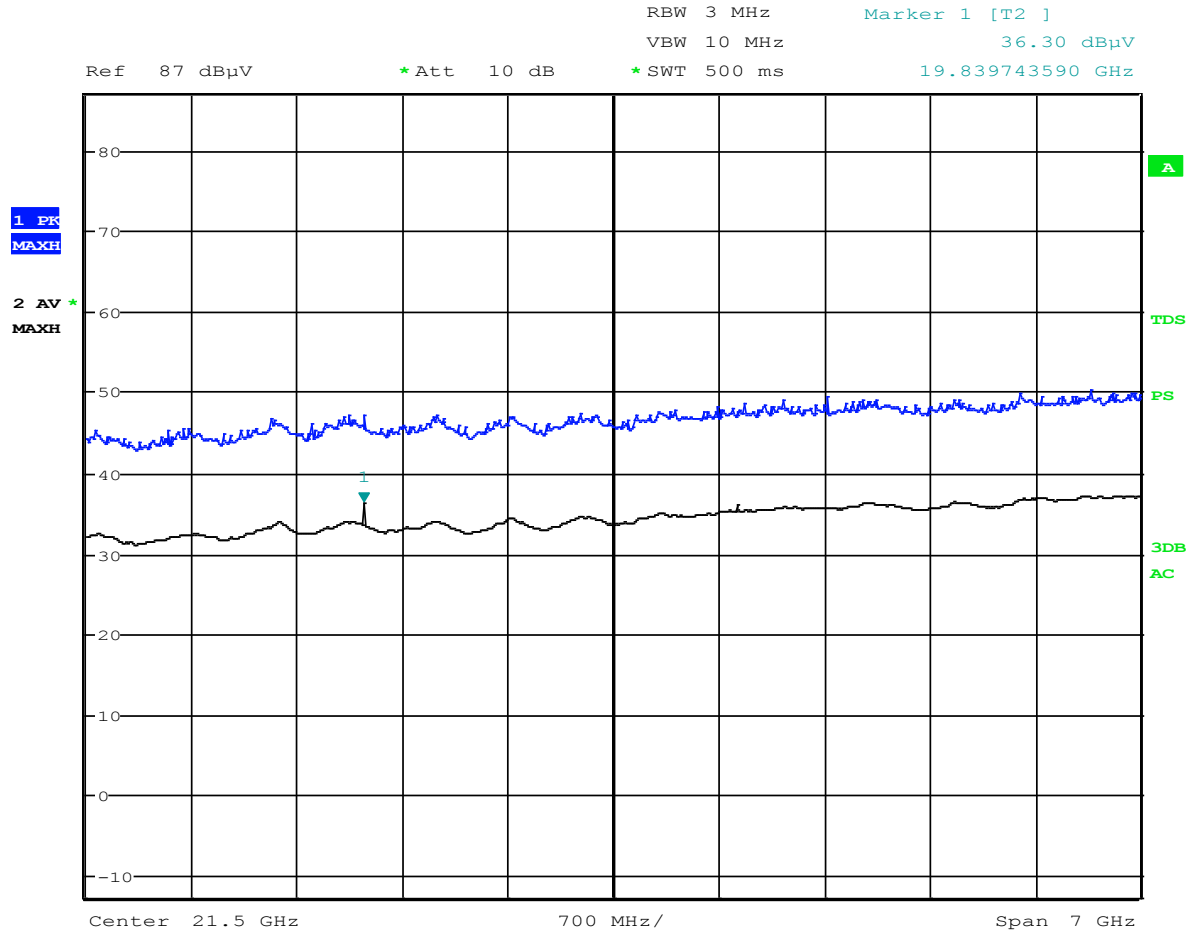


FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

### 6.7.3.6. 10 cm distance Wand technique

Average limit at 10 cm is 83.5 dBuV/m Margin is 47.2 dB



3DH3 Pulse Width

Date: 24.DEC.2014 13:17:09

### 6.7.4. Test conclusion:

Pass. The spurious emissions are more than 30 dB below the transmitter output near 2.440 GHz, and below the general limit elsewhere.

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.8. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESU40	TN1663	4/11/2014	4/11/2015
Double Ridge Waveguide Horn Antenna 1-18GHz	ETS Lindgren	3117	TN2347	10/16/2014	10/16/2015
Pre-Amp 100 MHz to 20 GHz	Miteq	AFS4-00102000-30-10P-4	TN1672	11/13/2014	11/13/2015
Horn Antenna 18GHz - 26.5GHz	Amplifier Research	AT4640	TN1596	Verify	
Pre-Amp 18GHz -40GHz	Miteq	JS4018004000-30-8P-A1	TN1757	11/13/2014	11/13/2015
25 GHz cable	Megaphase	GA08-S1S1-38	TN2372	11/6/2014	11/6/2015

## 6.9. Test information

<b>Date of test:</b>	12/22/2014	<b>Test Location:</b>	Marconi Manor
<b>EUT serial:</b>	SN125	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.10. Harmonics

### 6.10.1. Requirements

FCC part 15.247(d) RSS-Gen Issue 4, section 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)

### 6.10.2. 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 3-DH5 mode was used based on the results collected during the output power testing.

### 6.10.3. Test data

Emission Frequency (MHz)	Measured Amplitude (dBµV/m) AVG	Measured Amplitude (dBµV/m) Peak	FCC 15 General Limit				Notes / Mode
			Limit (dBµV/m) AVG	Limit (dBµV/m) Peak	Margin (dB) AVG	Margin (dB) Peak	
7323.000	48.30	51.00	54.0	74.0	5.7	23.0	on end
7323.000	50.89	53.00	54.0	74.0	3.1	21.0	on back
7323.000	49.26	52.00	54.0	74.0	4.7	22.0	upright
7206.000	46.85	50.17	54.0	74.0	7.2	23.8	upright
7206.000	50.28	52.94	54.0	74.0	3.7	21.1	on back
7206.000	46.68	49.88	54.0	74.0	7.3	24.1	on end
7440.000	48.27	51.15	54.0	74.0	5.7	22.9	upright
7440.000	46.67	50.46	54.0	74.0	7.3	23.5	on back
7440.000	49.70	52.16	54.0	74.0	4.3	21.8	on end

### 6.10.4. Test conclusion:

Pass. The worst emission is 3.1 dB below the limit at 7323 MHz. At the other harmonic frequencies, no signal was detected within 10 dB of the general limit.

*Without written permission of laboratory, this report shall not be reproduced except in full.*





# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.10.5. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESU40	TN1663	4/11/2014	4/11/2015
Double Ridge Waveguide Horn Antenna 1-18GHz	ETS Lindgren	3117	TN2347	10/16/2014	10/16/2015
Pre-Amp 100 MHz to 20 GHz	Miteq	AFS4-00102000-30-10P-4	TN1672	11/13/2014	11/13/2015
Horn Antenna 18GHz - 26.5GHz	Amplifier Research	AT4640	TN1596	Verify	
Pre-Amp 18GHz -40GHz	Miteq	JS4018004000-30-8P-A1	TN1757	11/13/2014	11/13/2015
25 GHz cable	Megaphase	GA08-S1S1-38	TN2372	11/6/2014	11/6/2015

## 6.10.6. Test information

<b>Date of test:</b>	12/23/2014	<b>Test Location:</b>	Marconi Manor
<b>EUT serial:</b>	125	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 6.11. Receiver spurious emissions

### 6.11.1. Requirements

RSS-Gen Issue 4 section 4.10

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

RSS-GEN Issue 4 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.

### 6.11.2. 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 200mm long piece of flexible 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 150 kHz – 25 GHz.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

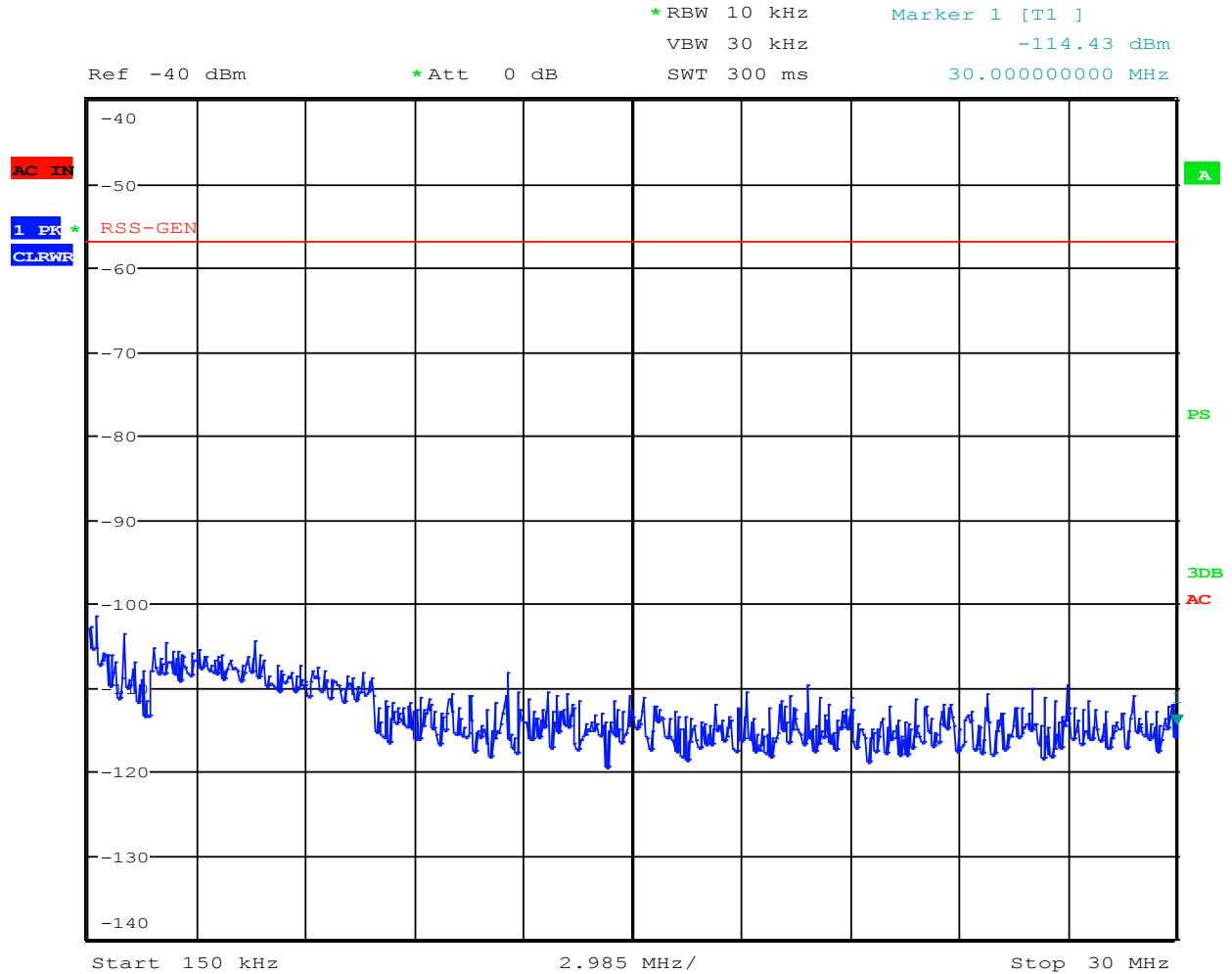


FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

### 6.11.3. Test data

### 6.12. Plot of emissions, made while receiving at 2441 MHz



T80 301893 InbandSpurs F5320 BW2 R12 P20 ANT4

Date: 9.JAN.2015 18:21:37

Without written permission of laboratory, this report shall not be reproduced except in full.



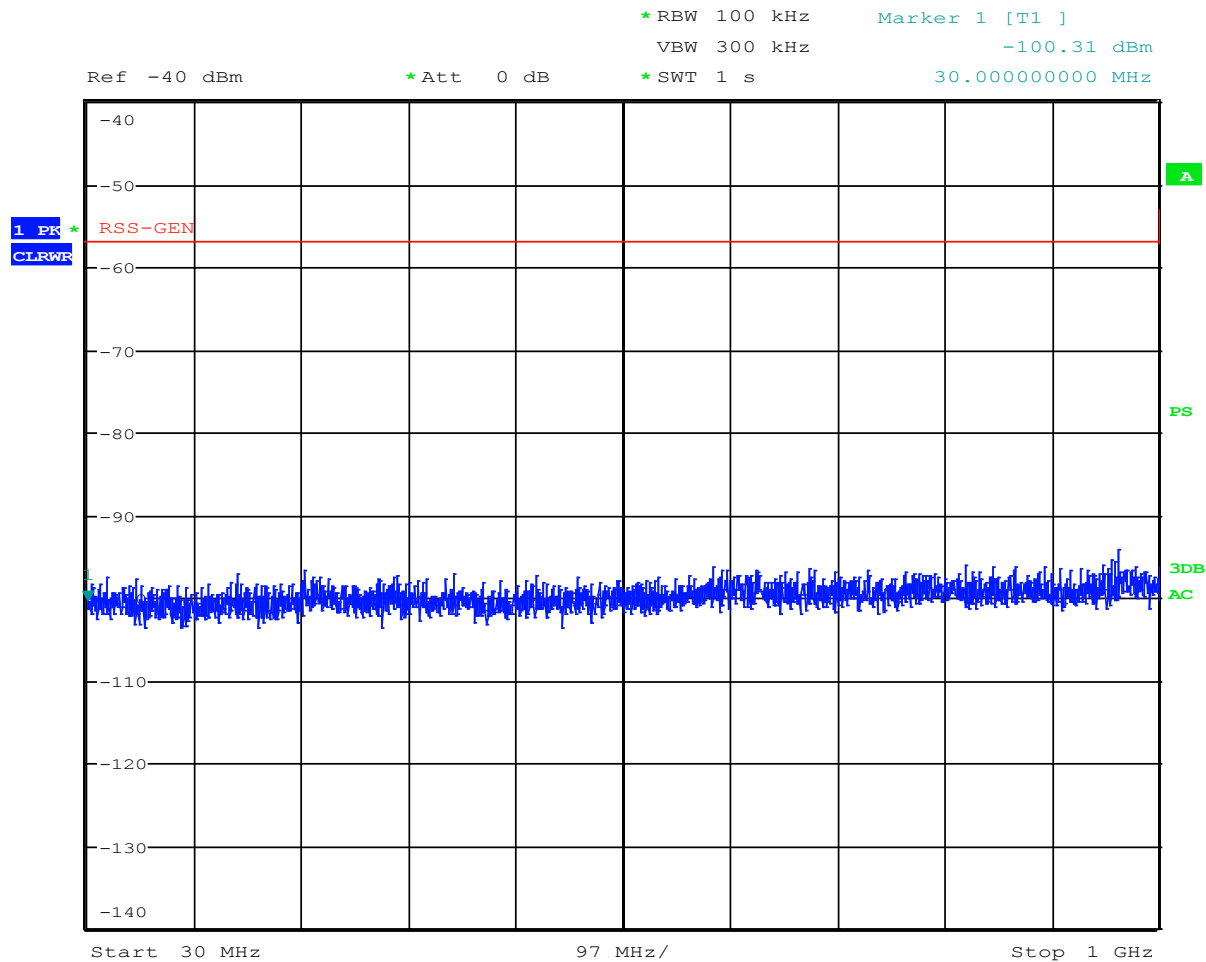
# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.13. Plot of emissions, made while receiving at 2441 MHz



T80 301893 InbandSpurs F5320 BW2 R12 P20 ANT4

Date: 9.JAN.2015 18:22:37

*Without written permission of laboratory, this report shall not be reproduced except in full.*



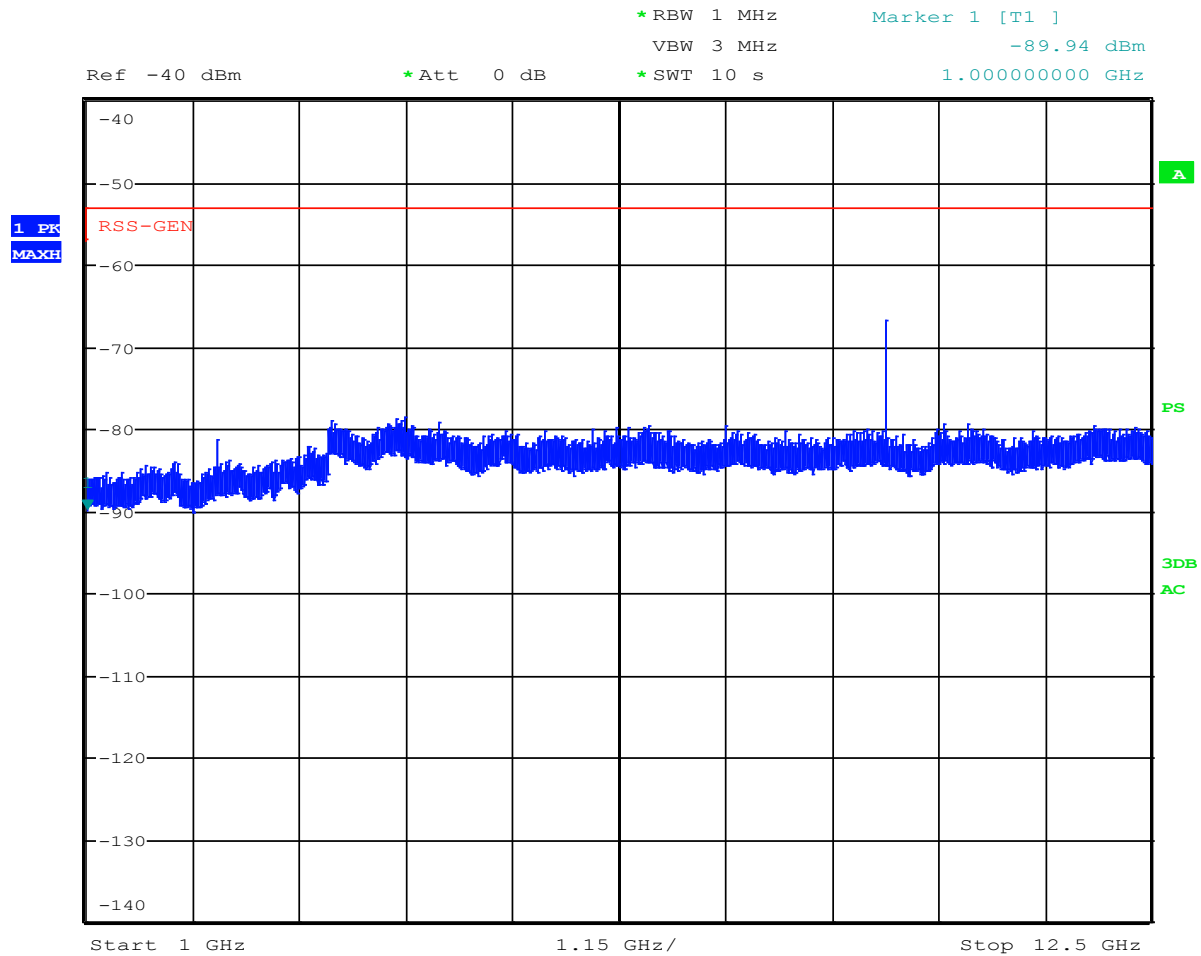
# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.14. Plot of emissions, made while receiving at 2441 MHz



T80 301893 InbandSpurs F5320 BW2 R12 P20 ANT4

Date: 9.JAN.2015 18:23:52

Without written permission of laboratory, this report shall not be reproduced except in full.



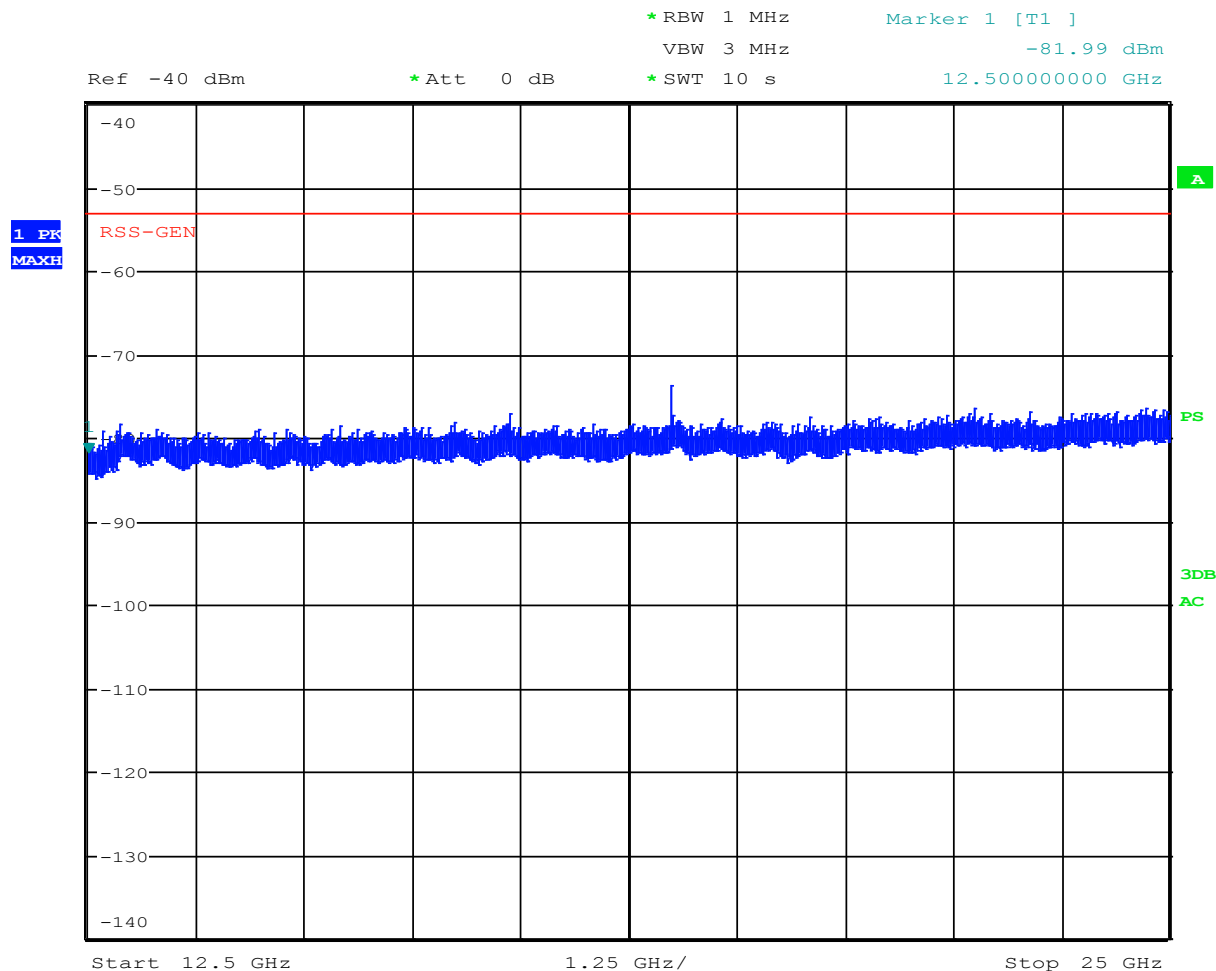
# Wireless Transceiver Test Report



FCC ID: A94416912A IC: 3232A-416912A

Certificate # 1514.1

## 6.15. Plot of emissions, made while receiving at 2441 MHz



T80 301893 InbandSpurs F5320 BW2 R12 P20 ANT4

Date: 9.JAN.2015 18:24:59

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

FCC ID: A94416912A IC: 3232A-416912A



Certificate # 1514.1

## 6.15.1. Test conclusion:

Pass

No emissions were found near the limit of 2 or 5 nW.

## 6.15.2. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESU40	TN1663	4/11/2014	4/11/2015
Cable	TE Connectivity	2032439-1		Verify	

## 6.15.3. Test information

<b>Date of test:</b>	1/9/2015	<b>Test location:</b>	Transmitter Test Bench
<b>Serial number:</b>	SN 0000	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

## 6.15.4. Conclusion:

Pass

*Without written permission of laboratory, this report shall not be reproduced except in full.*