



# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

**Report number:** EMC.422850.16.301.3

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

**Product Tested:** Bose® Wireless Headset

**Standards:** FCC part 15.247,  
ANSI C63.10  
KDB 558074d01 V03R05

**Report prepared by:** Michael Royer

**Signature:**   
November 4, 2016

**Report reviewed by:** 

**Signature:**   
November 4, 2016

**Report issue date:** November 4, 2016

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## Table of Contents

1. Report Summary.....	5
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:.....	13
6.1.5. Test Equipment.....	13
6.1.6. Test information .....	13
6.2. Radiated emissions 30 MHz – 1 GHz.....	14
6.2.1. Requirements .....	14
6.2.2. Test setup details.....	14
6.2.3. Test data.....	15
6.2.4. Test conclusion:.....	16
6.2.5. Test Equipment.....	16
6.2.6. Test information .....	16
6.3. Transmitter Output power .....	17
6.3.1. Requirements: .....	17
6.3.2. Test setup details:.....	17
6.3.3. Output power table: BT mode. ....	18
6.3.4. Test conclusion: BT .....	19
6.3.5. Output power table: BLE mode. ....	20
6.3.6. Output.....	20
power screen shots: BLE mode. ....	20
6.3.7. Test Equipment.....	24
6.3.8. Test information .....	24
6.4. Occupied Bandwidth/Channel Spacing BT.....	25
6.4.1. Requirements .....	25
6.4.2. Test setup details.....	25
6.4.3. Test conclusion:.....	26

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

6.4.4.	Test Equipment.....	27
6.4.5.	Test information .....	27
6.5.	Number of Channels, BT.....	28
6.5.1.	Test Conclusion: .....	31
6.5.2.	Channel separation. BLE .....	32
6.5.3.	Channel separation. BT .....	32
6.5.4.	Test Equipment.....	35
6.5.5.	Test information .....	35
6.6.	Power spectral density BLE .....	36
6.6.1.	Summary of measurement data .....	36
6.6.2.	Measurement plots .....	37
6.6.3.	Conclusion, the low mid and high frequencies all meet the 8 dBm maximum limit. 39	
6.6.4.	Test Equipment.....	40
6.6.5.	Test information .....	40
6.7.	6 dB Bandwidth BLE .....	41
6.7.1.	Test Equipment.....	43
6.7.2.	Test information .....	43
6.8.	Time of occupancy BT .....	44
6.8.1.	Requirements BT .....	44
6.8.2.	Test setup details BT .....	44
6.8.3.	Test data BT .....	45
6.8.4.	Test conclusion: BT .....	47
6.8.5.	Test Equipment.....	48
6.8.6.	Test information .....	48
6.9.	Band Edge Emissions- Radiated measurements in BLE .....	49
6.9.1.	Requirements .....	49
6.9.2.	Test Setup .....	49
6.9.3.	Test data BLE .....	49
6.9.4.	Test data BT .....	53
6.9.5.	Test Equipment.....	69
6.10.	Spurious emissions- Radiated .....	70
6.10.1.	Requirements .....	70
6.10.2.	Test Setup .....	70
6.10.3.	Test data BLE .....	71
6.10.4.	Test data BT .....	77

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

6.10.5. Test Equipment.....	79
6.10.6. Test information .....	79
6.11. Harmonic emissions- Radiated .....	80
6.11.1. Requirements .....	80
6.11.2. Test Setup .....	80
6.11.3. Test Data, BLE .....	81
6.11.4. Test Data, BT.....	82
6.11.5. Test conclusion:.....	82
6.11.6. Test Equipment.....	83
6.11.7. Test information .....	83

---

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 1. Report Summary

### 1.1 Product

**Bose® Wireless Headset**

### 1.2 Client

Bose Corporation  
The Mountain, Framingham, MA 01701

### 1.3 Applicable Standards

**FCC part 15.B and C**

Test Results: Pass  Fail

### 1.4 Test Laboratory

Bose DAE laboratories  
1 New York Ave  
Framingham, MA01701  
FCC site registration under A2LA cert. #1514

This report relates only to the items tested.

## 2. Product description

The product is a wireless headset for listening to music. The product operates from a rechargeable battery.

A battery charger is not supplied.

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 3. Applicable standards, requirements and tests

FCC part 15	Test references.	Result / Data section
15.15(b)	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.  This requirement is met, as the antenna is not accessible by the user.	Complies
15.205	The device does not operate in restricted bands	Complies
15.107 15.207	Conducted emissions, 150kHz–30 MHz	Complies Section 6.1
15.109 15.209	Radiated emissions, 30MHz–1GHz	Complies Section 6.2
15.247 (b)(1)	Transmitter output power:	Complies Section 6.3
15.247 (a)(1)	Hopper Occupied Bandwidth / channel spacing	Complies Section 6.4
15.247(a) (1) iii	Minimum number of channels.	Complies Section 6.5
15.247(d)	6 dB Bandwidth	Complies Section 6.6
15.247(d)	Time of Occupancy	Complies Section 6.7
15.247(d)	Band edge emissions Radiated	Complies Section 6.8
KDB 447498	Spurious Emissions Radiated	Complies Section 6.9

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

15.247	Harmonic Emissions Radiated	Complies Section 6.10
15.247	MPE assessment for SAR compliance	Complies Section 6.11

## 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 a USB cable and AC adapter. The AC adapter is not supplied with the unit.

For transmitter testing, the product was tested in a typical link or in forced modes under computer control as appropriate.

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6. Detailed Test Results

### 6.1. Conducted Emissions

#### 6.1.1. Requirements

47CFR15.207, RSS 210 section 7.2.4

Frequency	Limits dB( $\mu$ V)	
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 use. The EUT was in the charging mode. There is no play while charging.

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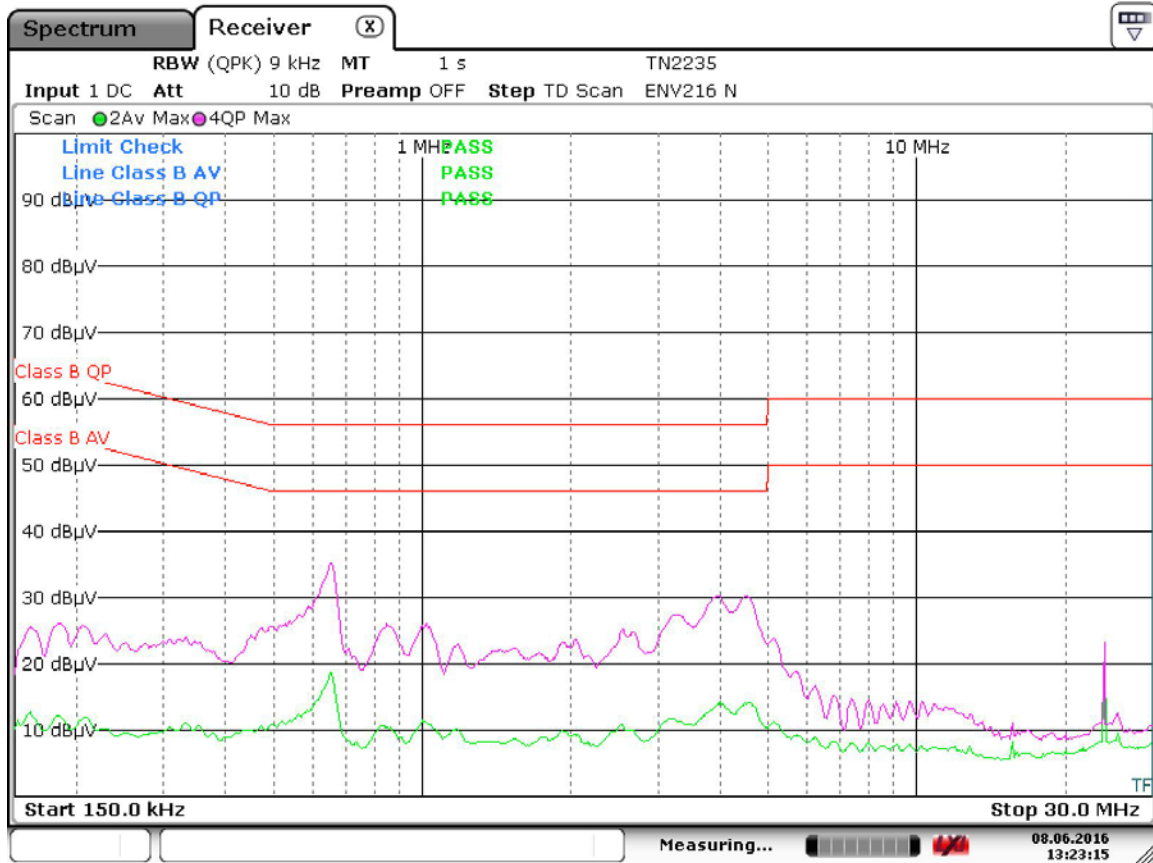
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Certificate # 1514.1

## 6.1.3. Test data

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



Date: 8.JUN.2016 13:23:16

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FCC ID: A94TR1



Certificate # 1514.1

FCC 15B Class B, CISPR 13, CISPR 22 Class B Product						
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
0.150		10.3	66.0	56.0		45.7
0.654		18.7	56.0	46.0		27.3
4.002		14.3	56.0	46.0		31.7
24.025		21.8	60.0	50.0		28.2
0.150	18.4		66.0	56.0	47.6	
0.654	35.28		56.0	46.0	20.7	
1.023	26.06		56.0	46.0	29.9	
3.980	30.18		56.0	46.0	25.8	
24.027	23.23		60.0	50.0	36.8	

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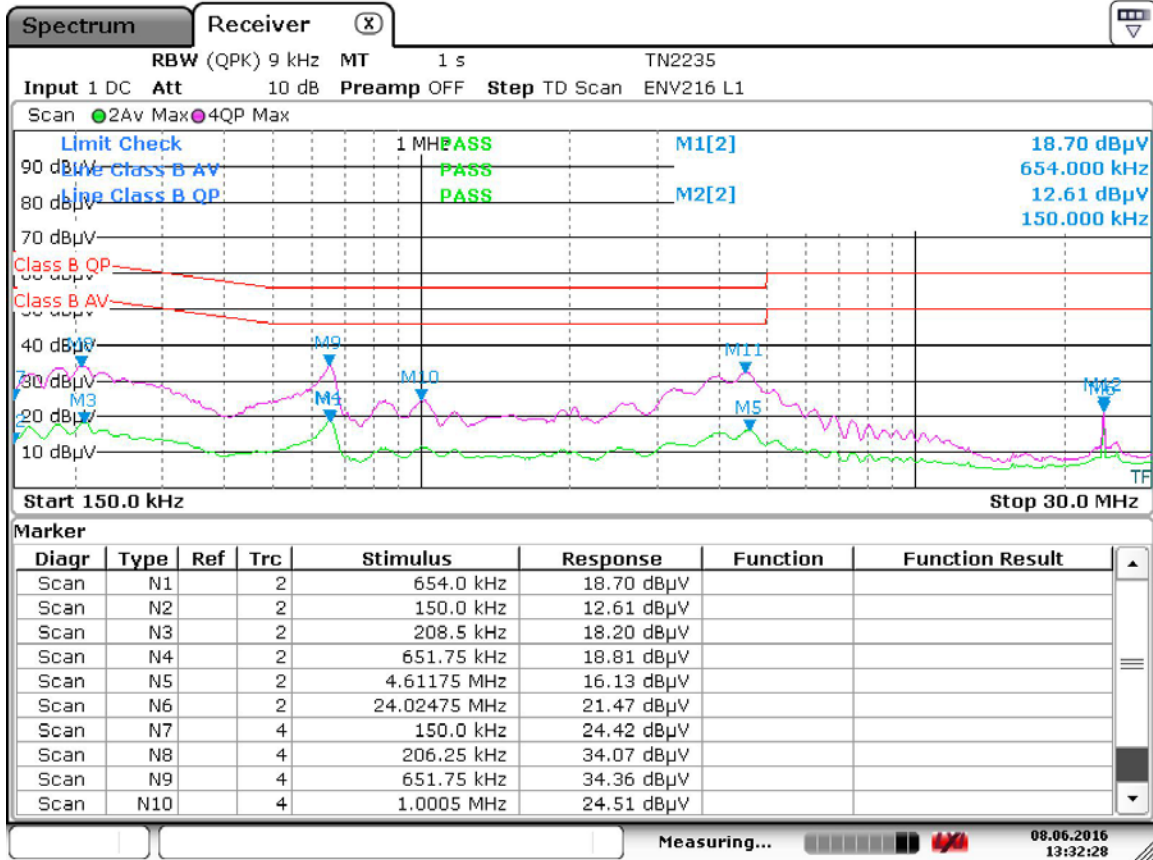
# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

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



Date: 8.JUN.2016 13:32:28

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

FCC 15B Class B, CISPR 13, CISPR 22 Class B Product						
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
0.150		12.6	66.0	56.0		43.4
0.209		18.2	63.3	53.3		35.1
0.652		18.8	56.0	46.0		27.2
4.612		16.1	56.0	46.0		29.9
24.025		21.47	60.0	50.0		28.5
0.150	24.42		66.0	56.0	41.6	
0.206	34.07		63.3	53.3	29.3	
0.652	34.36		56.0	46.0	21.6	
1.001	24.51		56.0	46.0	31.5	
4.540	32.33		56.0	46.0	23.7	
24.027	22.76		60.0	50.0	37.2	

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

#### 6.1.4. Test conclusion:

Pass. The worst case emission is 20.7 dB below the limit, at 0.652 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	12/3/2015	12/3/2017
EMI Test Receiver	Rohde & Schwarz	ESR7	TN2247	4/8/2016	4/8/2017
Conducted Comb Generator	Com-Power	CGC-510	TN1380	3/28/2016	3/28/2017

#### 6.1.6. Test information

<b>Date of test:</b>	6/8/2016	<b>Test location :</b>	DCE lab – Henry room
<b>EUT serial:</b>	3	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.2. Radiated emissions 30 MHz – 1 GHz

### 6.2.1. Requirements

FCC rules part 15.109 (g), 15.209

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 two modes of operation were made. The modes were charging, and playback. There were no signals to detect in either mode. The measurement data is the same as an ambient scan. Data shown represents the worst case operating mode. The headset played full volume.

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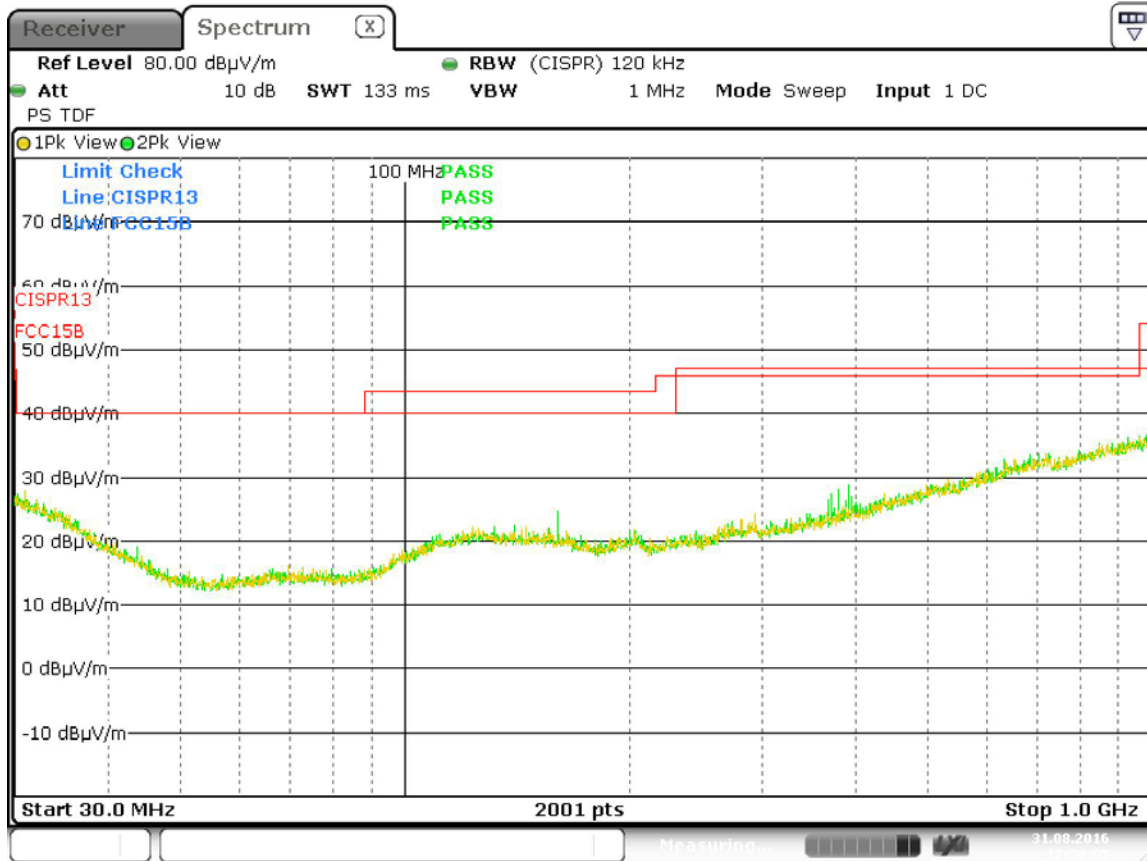
FCC ID: A94TR1



Certificate # 1514.1

## 6.2.3. Test data

### 6.2.3.1. Radiated emissions showing both Horizontal and Vertical Polarization



Date: 31.AUG.2016 17:20:05

Frequency	Emissions result dBuV/m
MHz	Peak
30	28
30.5	28
40	20
600	30
800	33
1000	36

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FCC ID: A94TR1



Certificate # 1514.1

## 6.2.4. Test conclusion:

Pass. The worst case emission can't be determined because the signal levels are unknown. The signals are not detected in either charging or playback modes.

## 6.2.5. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				Last	Due
Antenna	Sunol Sciences	JB6	TN1823	9/25/2015	9/25/2016
EMI Test Receiver	Rohde & Schwarz	ESR26	TN2319	4/14/2016	4/14/2017
Pre-amplifier	Bose		TN2077	3/21/2016	3/21/2017
Maxwell House Radiated Emissions Cable Set	Bose Corporation	N/A	TN1445	3/21/2016	3/21/2017
Maxwell house chamber			TN644	3/23/2016	3/23/2017

## 6.2.6. Test information

<b>Date of test:</b>	8/31/2016	<b>Test location :</b>	DCE - Maxwell House
<b>EUT serial:</b>	SN 125	<b>Tested by:</b>	M. Royer
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.3. Transmitter Output power

### 6.3.1. Requirements:

FCC 15.247(a) (1)

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 at the measurement end. The cable has a uFL connector at the product end. This cable is measured at a loss of .75 dB of at 2.48 GHz. A 10 dB attenuator is also used. The EUT is commanded to stop hopping and operate 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 3 MHz, peak detection 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.

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 6.3.3. Output power table: BT mode.

Output Power Summary Table (Basic Rate: 1 Mbps)						
Channel	Frequency (MHz)	Mode	Output Power (dBm)	Limit (dB)	Margin (dB)	Result
Low	2402	DH5	8.24	30	21.76	Pass
Middle	2441	DH5	9.49	30	20.51	Pass
High	2480	DH5	8.85	30	21.15	Pass

Output Power Summary Table (Enhanced Rate: 2 Mbps)						
Channel	Frequency (MHz)	Mode	Output Power (dBm)	Limit (dB)	Margin (dB)	Result
Low	2402	2-DH5	6.39	30	23.61	Pass
Middle	2441	2-DH5	8.12	30	21.88	Pass
High	2480	2-DH5	7.51	30	22.49	Pass

Output Power Summary Table (Enhanced Rate: 3 Mbps)						
Channel	Frequency (MHz)	Mode	Output Power (dBm)	Limit (dB)	Margin (dB)	Result
Low	2402	3-DH5	6.90	30	23.10	Pass
Middle	2441	3-DH5	8.36	30	21.64	Pass
High	2480	3-DH5	7.88	30	22.12	Pass

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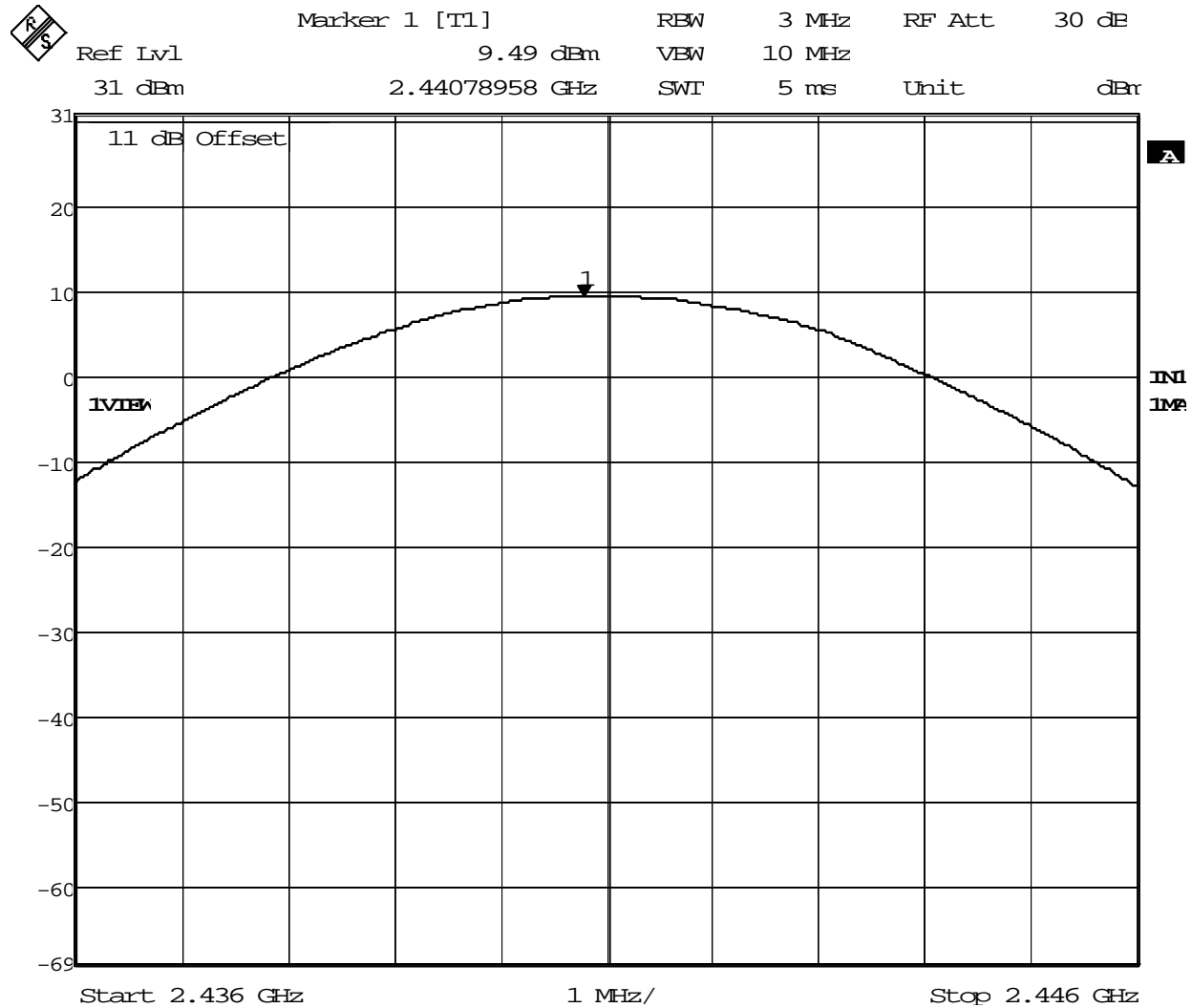
# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 6.3.3.1. Output power screen shot



Comment A: Plot2 Power DH5 2441 MHz  
 Date: 9.SEP.2016 16:15:36

### 6.3.4. Test conclusion: BT

Pass. The worst case is 9.49 dBm Peak at 2441 MHz or 8.89 mW in DH5 mode.

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FCC ID: A94TR1



Certificate # 1514.1

### 6.3.5. Output power table: BLE mode.

Output Power Summary Table (BLE)						
Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	8.12	0	30	21.88	Pass
Middle	2440	9.49	0	30	20.51	Pass
High	2480	8.85	0	30	21.15	Pass

### 6.3.6. Output

Output Power Summary Table (BLE)					
Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)
Low	2402	8.12	0	30	21.88
Middle	2440	9.49	0	30	20.51
High	2480	8.85	0	30	21.15

power screen shots: BLE mode.

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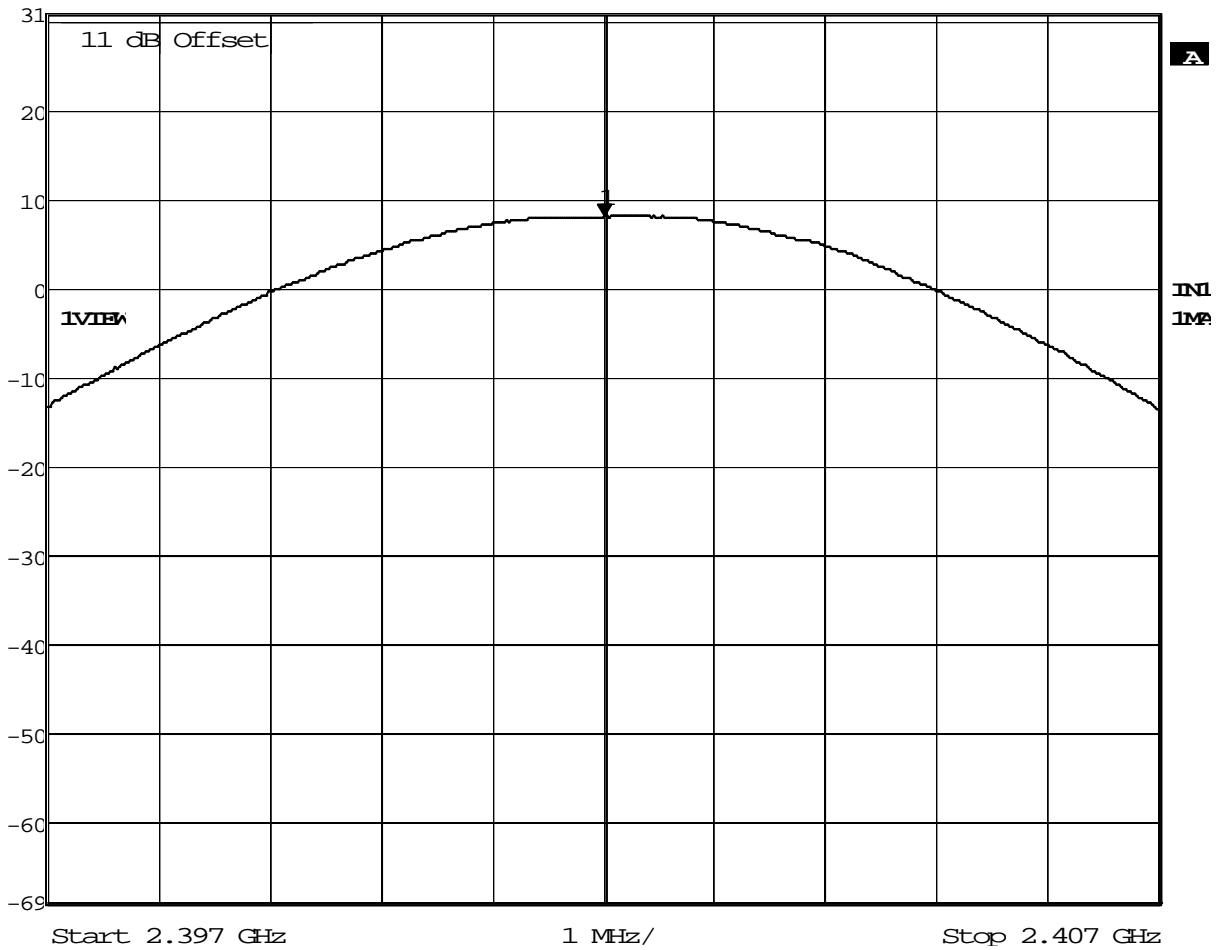
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW      3 MHz      RF Att      30 dB  
 Ref Lvl              8.12 dBm      VBW      10 MHz  
 31 dBm              2.40201002 GHz      SWF      5 ms      Unit      dBm



Comment A: Plot1 BLE Power 2402 MHz  
 Date: 9.SEP.2016 17:44:24

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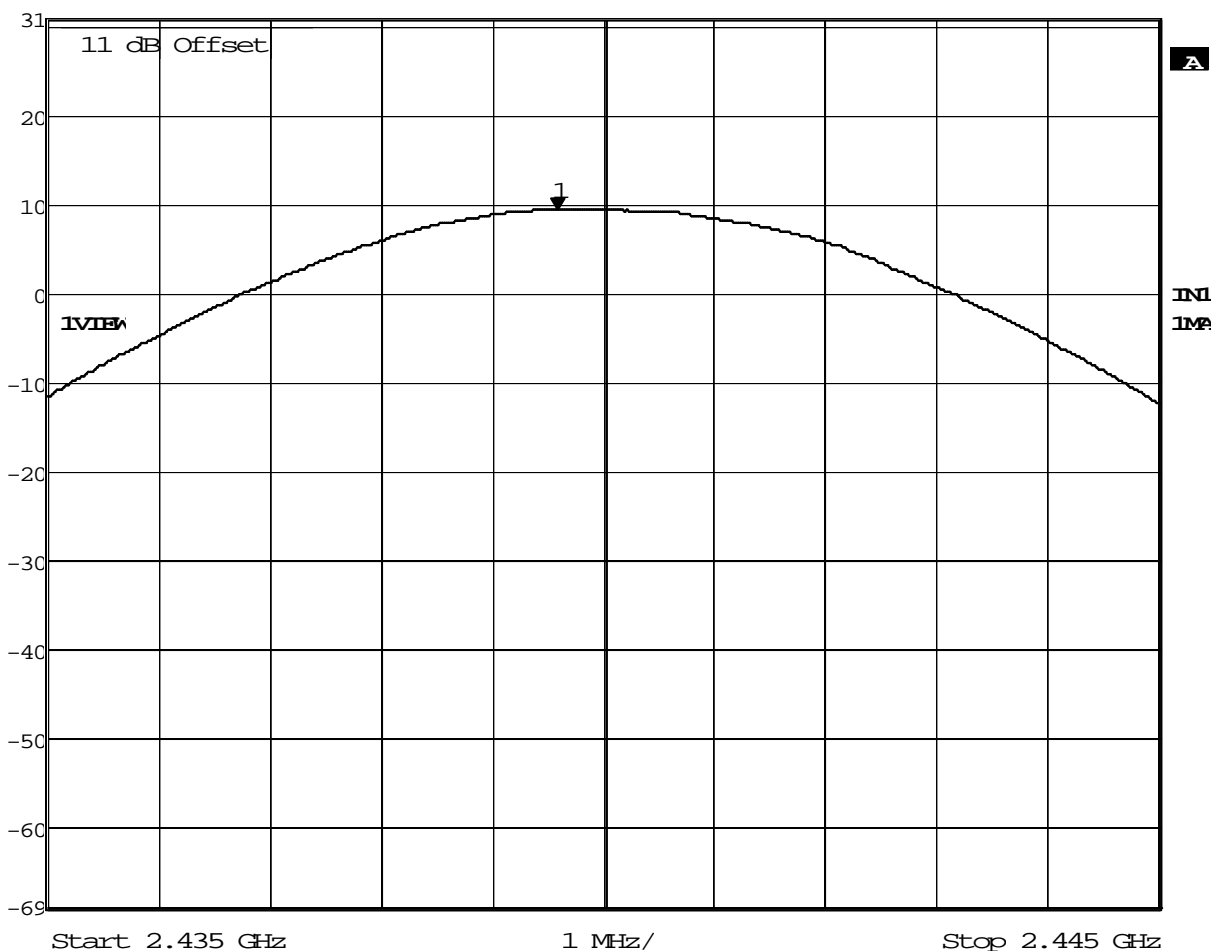
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW      3 MHz      RF Att      30 dB  
 Ref Lvl              9.49 dBm      VBW      10 MHz  
 31 dBm              2.43958918 GHz      SWF      5 ms      Unit      dBm



Comment A: Plot2 BLE Power 2440 MHz  
 Date: 9.SEP.2016 17:44:46

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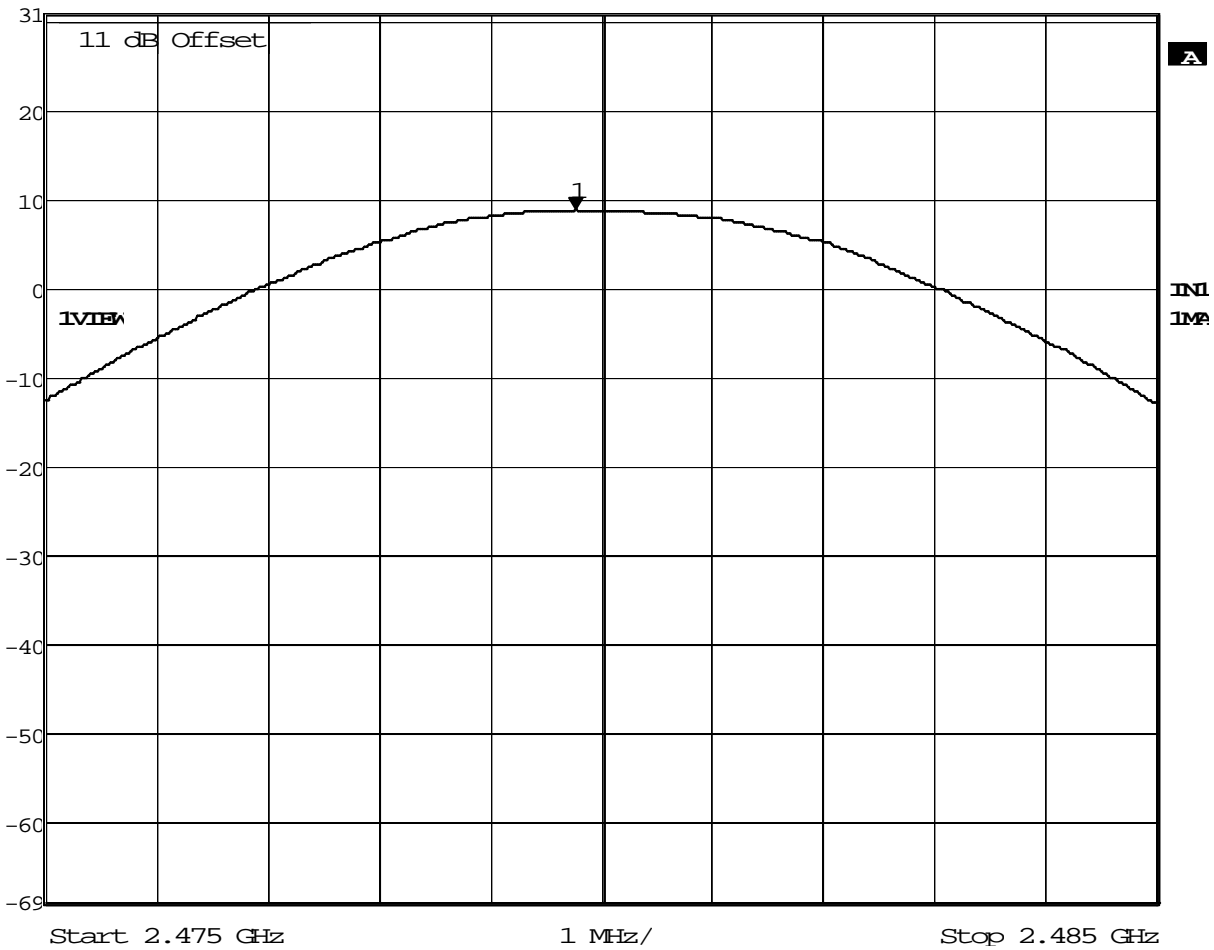
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW      3 MHz      RF Att      30 dB  
 Ref Lvl              8.85 dBm      VBW      10 MHz  
 31 dBm              2.47976954 GHz      SWF      5 ms      Unit      dBm



Comment A: Plot3 BLE Power 2480 MHz  
 Date: 9.SEP.2016 17:45:09

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.3.7. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI test receiver	Rohde & Schwarz	ESU 40	TN1663	4/6/2016	4/6/2017

## 6.3.8. Test information

<b>Date of test:</b>	9/9/2016	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	SN 3	<b>Tested by:</b>	B. Cerqua
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.4. Occupied Bandwidth/Channel Spacing BT

### 6.4.1. Requirements

FCC part 15.247(a)(1)

The hopping channel carrier frequencies are separated by at least 2/3<sup>rd</sup> 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:

Channel	Frequency (MHz)	Mode	20 dB OBW (MHz)
Low	2402	DH5	0.896
Middle	2441	DH5	0.896
High	2480	DH5	0.896
Channel	Frequency (MHz)	Mode	20 dB OBW (MHz)
Low	2402	2-DH5	1.263
Middle	2441	2-DH5	1.263
High	2480	2-DH5	1.263
Channel	Frequency (MHz)	Mode	20 dB OBW (MHz)
Low	2402	3-DH5	1.269
Middle	2441	3-DH5	1.281
High	2480	3-DH5	1.281

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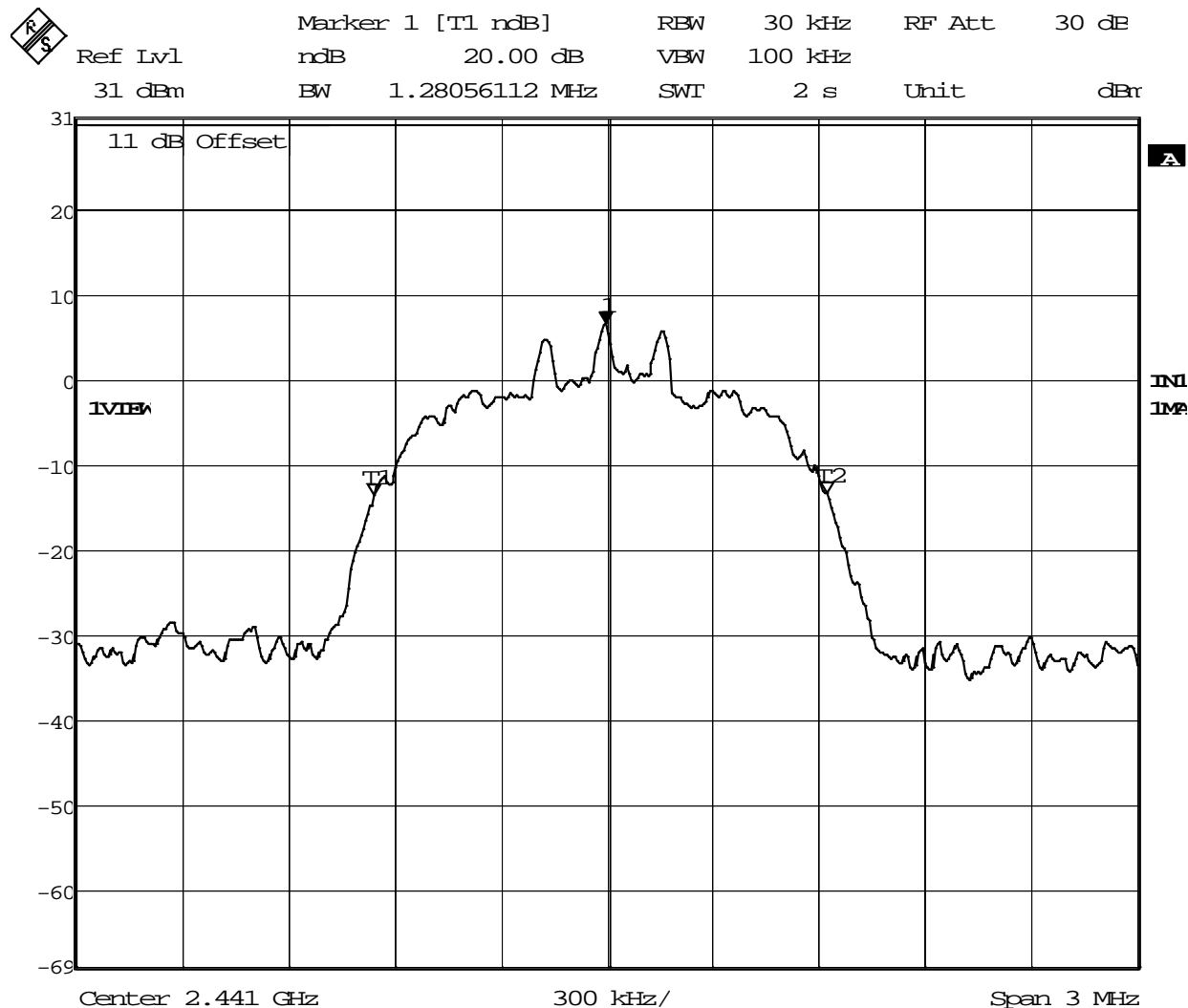
# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 6.4.2.1. Spectrum analyzer plot showing how the 20 dB bandwidth is measured.



Comment A: Plot8 20dB OEW 3DH5 2441 MHz  
Date: 9.SEP.2016 14:50:17

### 6.4.3. Test conclusion:

Pass

The greatest BW in BT mode is 1.281 MHz

$$\frac{2}{3} \cdot 1.281 = 854 \text{ kHz} < \text{limit of channel spacing } 1 \text{ MHz}$$

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

#### 6.4.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI test receiver	Rohde & Schwarz	ESU 40	TN1663	4/6/2016	4/6/2017

#### 6.4.5. Test information

<b>Date of test:</b>	9/9/2016	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	SN 3	<b>Tested by:</b>	B. Cerqua
<b>Test Conclusion:</b>	Pass		

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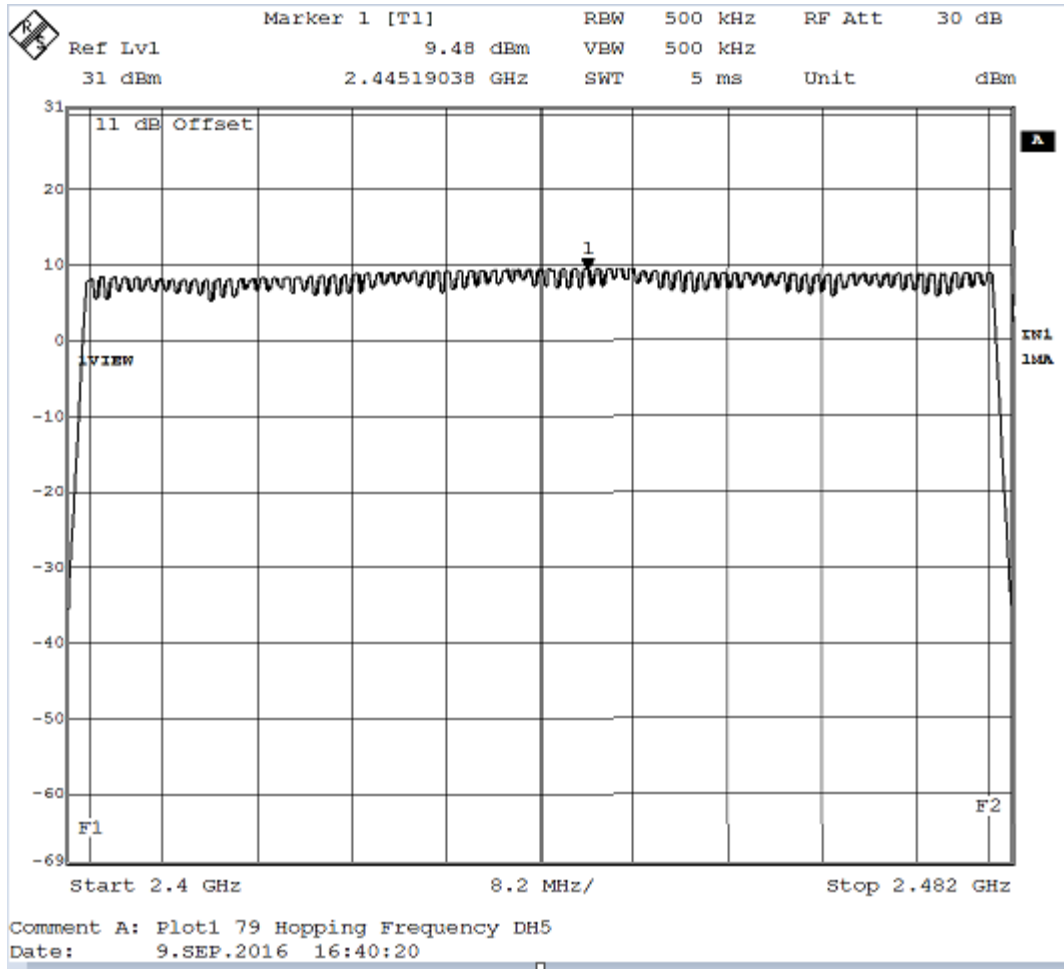
# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.5. Number of Channels, BT



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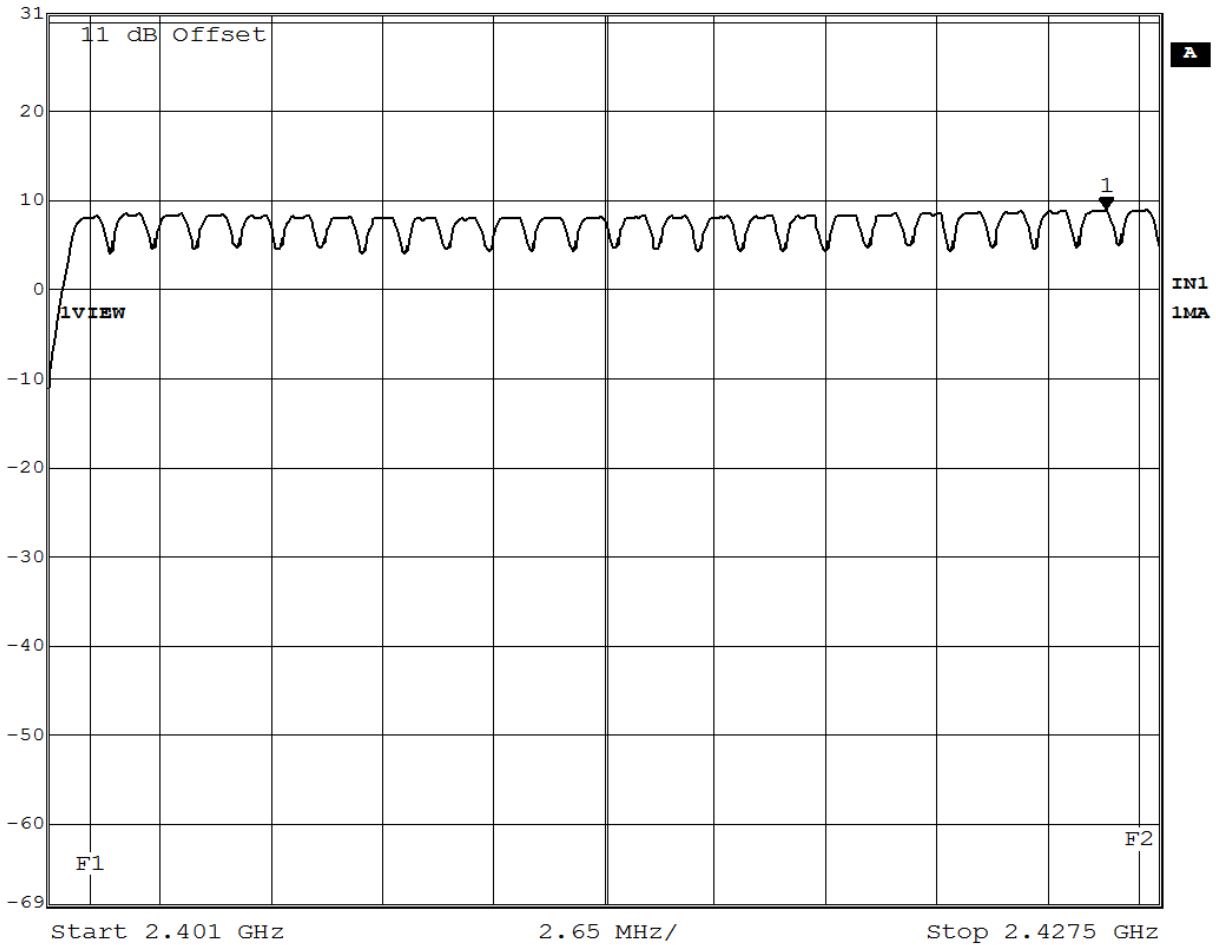
FCC ID: A94TR1



Certificate # 1514.1



Ref Lvl	Marker 1 [T1]	RBW	500 kHz	RF Att	30 dB
31 dBm	8.76 dBm	VBW	500 kHz		
	2.42622545 GHz	SWT	5 ms	Unit	dBm



Comment A: Plot2 1st segment DH5 (26 Frequencies)  
Date: 9.SEP.2016 16:41:39

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# Wireless Transceiver Test Report

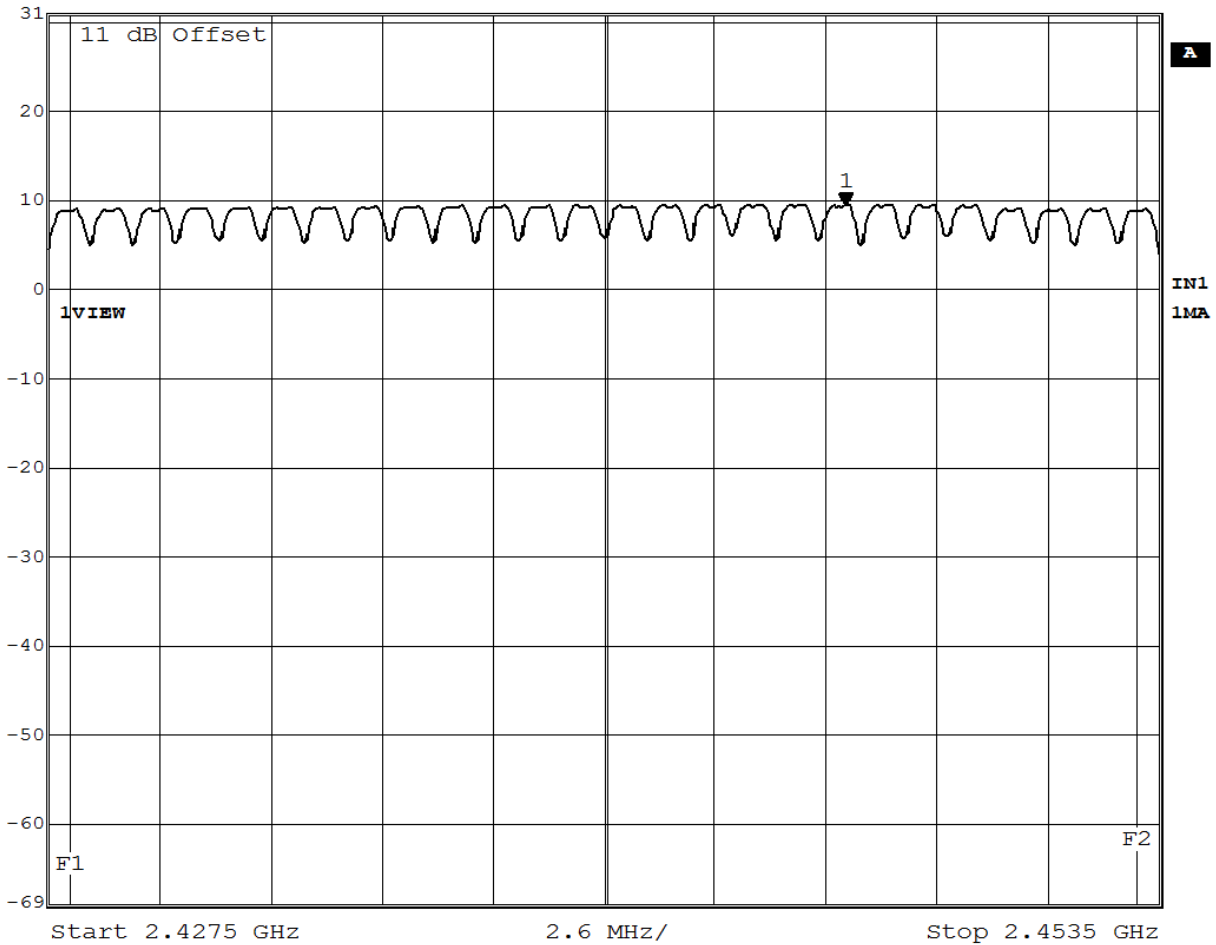
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]	RBW	500 kHz	RF Att	30 dB
Ref Lvl	9.44 dBm	VBW	500 kHz	
31 dBm	2.44615331 GHz	SWT	5 ms	Unit dBm



Comment A: Plot3 2nd segment DH5 (26 Frequencies)  
Date: 9.SEP.2016 16:42:59

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# Wireless Transceiver Test Report

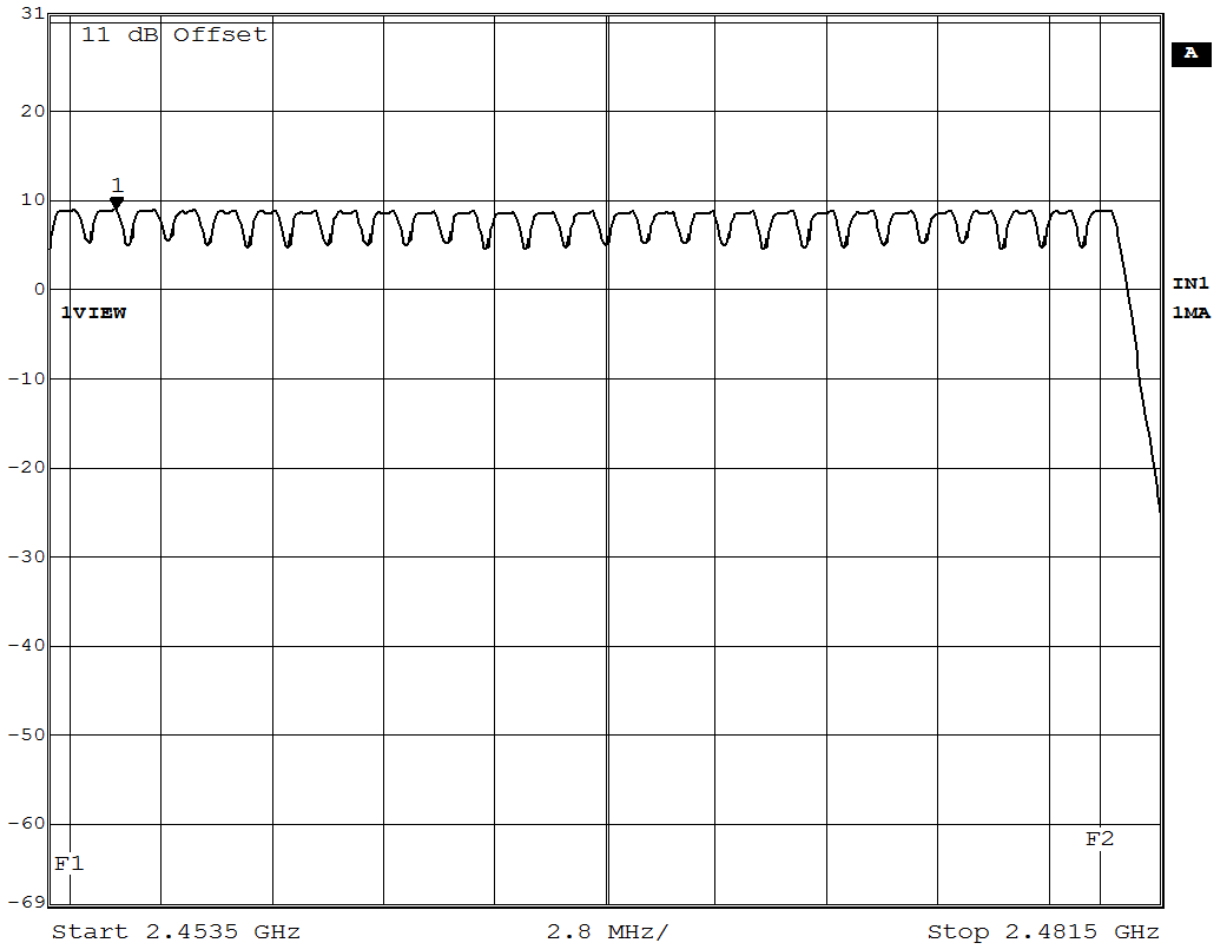
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]	RBW	500 kHz	RF Att	30 dB
Ref Lvl	8.76 dBm	VBW	500 kHz	
31 dBm	2.45518337 GHz	SWT	5 ms	Unit dBm



Comment A: Plot4 3rd segment DH5 (27 Frequencies)  
Date: 9.SEP.2016 16:44:18

### 6.5.1. Test Conclusion:

Pass.

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

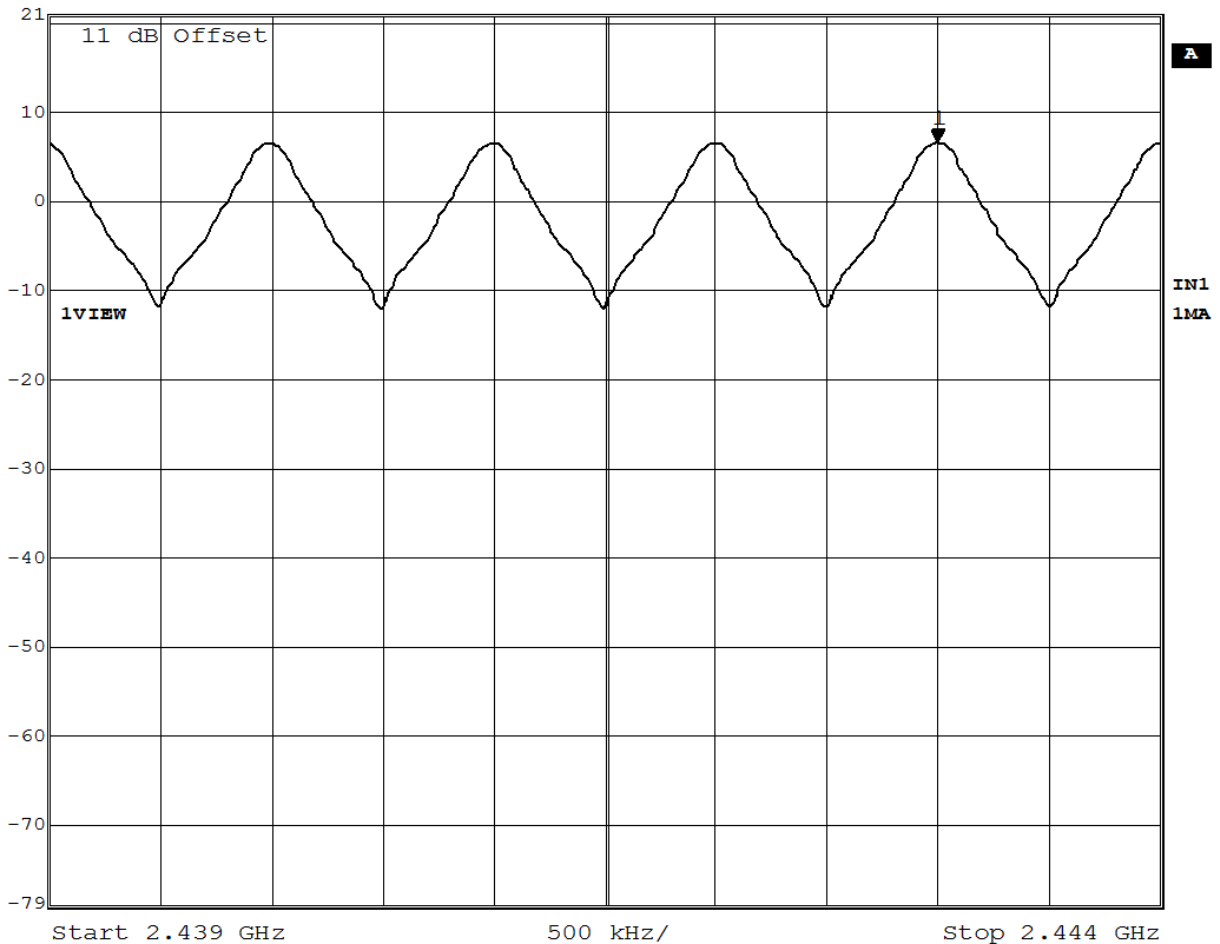
### 6.5.2. Channel separation. BLE

There are 40 channels between 2402 MHz and 2480 MHz = 2 MHz/channel. BLE is not treated as a Frequency Hopping transmitter, So channel separation is not regulated

### 6.5.3. Channel separation. BT



	Marker 1 [T1]	RBW	200 kHz	RF Att	20 dB
Ref Lvl	6.53 dBm	VBW	300 Hz		
21 dBm	2.44299800 GHz	SWT	60 s	Unit	dBm



Comment A: Plot1 Frequency Separation DH5 Hopping  
Date: 9.SEP.2016 16:48:05

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# Wireless Transceiver Test Report

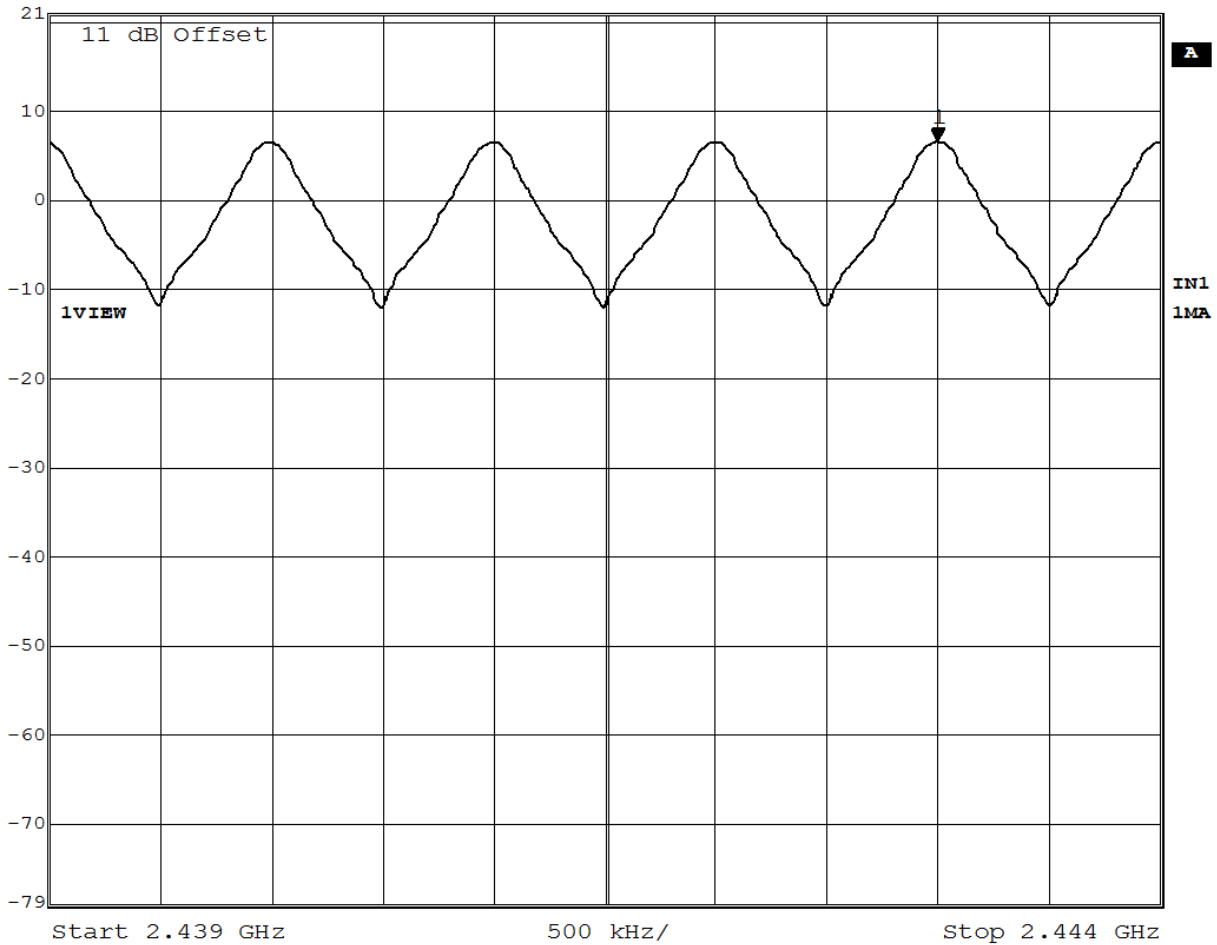
FCC ID: A94TR1



Certificate # 1514.1



Ref Lvl	Marker 1 [T1]	RBW	200 kHz	RF Att	20 dB
21 dBm	6.53 dBm	VBW	300 Hz		
	2.44299800 GHz	SWT	60 s	Unit	dBm



Comment A: Plot1 Frequency Separation DH5 Hopping  
Date: 9.SEP.2016 16:48:05

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# Wireless Transceiver Test Report

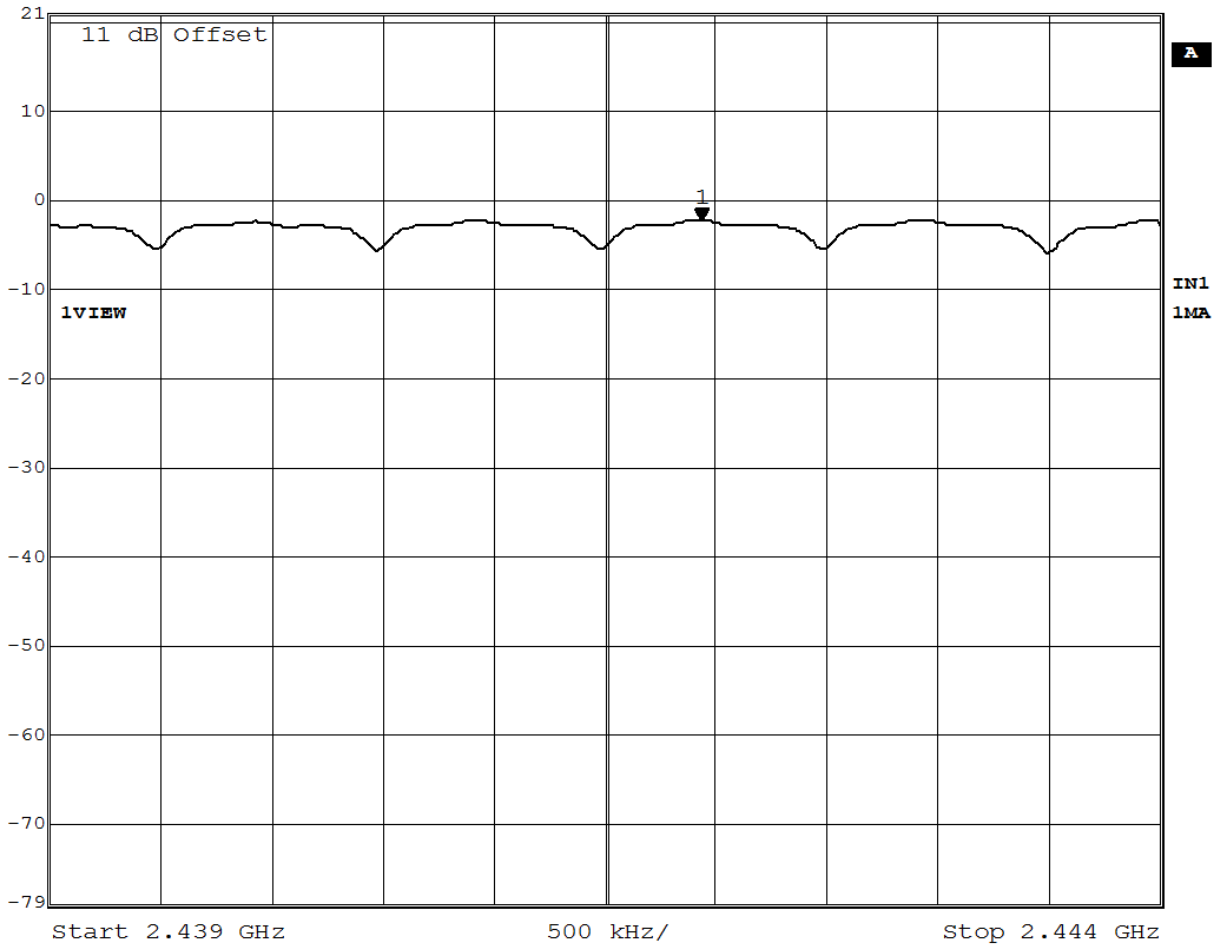
FCC ID: A94TR1



Certificate # 1514.1



Ref Lvl	Marker 1 [T1]	RBW	200 kHz	RF Att	20 dB
21 dBm	-2.36 dBm	VBW	300 Hz		
	2.44193587 GHz	SWT	60 s	Unit	dBm



Comment A: Plot3 Frequency Separation 3DH5 Hopping  
Date: 9.SEP.2016 16:54:44

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.5.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI test receiver	Rohde & Schwarz	ESU 40	TN1663	4/6/2016	4/6/2017

## 6.5.5. Test information

<b>Date of test:</b>	9/29/2016	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	3	<b>Test by:</b>	B. Cerqua
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.6. Power spectral density BLE

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

### 6.6.1. Summary of measurement data

Power Spectral Density Summary Table (BLE)					
Channel	Frequency (MHz)	PSD (dBm)	Limit (dB)	Margin (dB)	Result
Low	2402	-7.77	8	15.85	Pass
Middle	2440	-6.33	8	14.33	Pass
High	2480	-7.08	8	15.08	Pass

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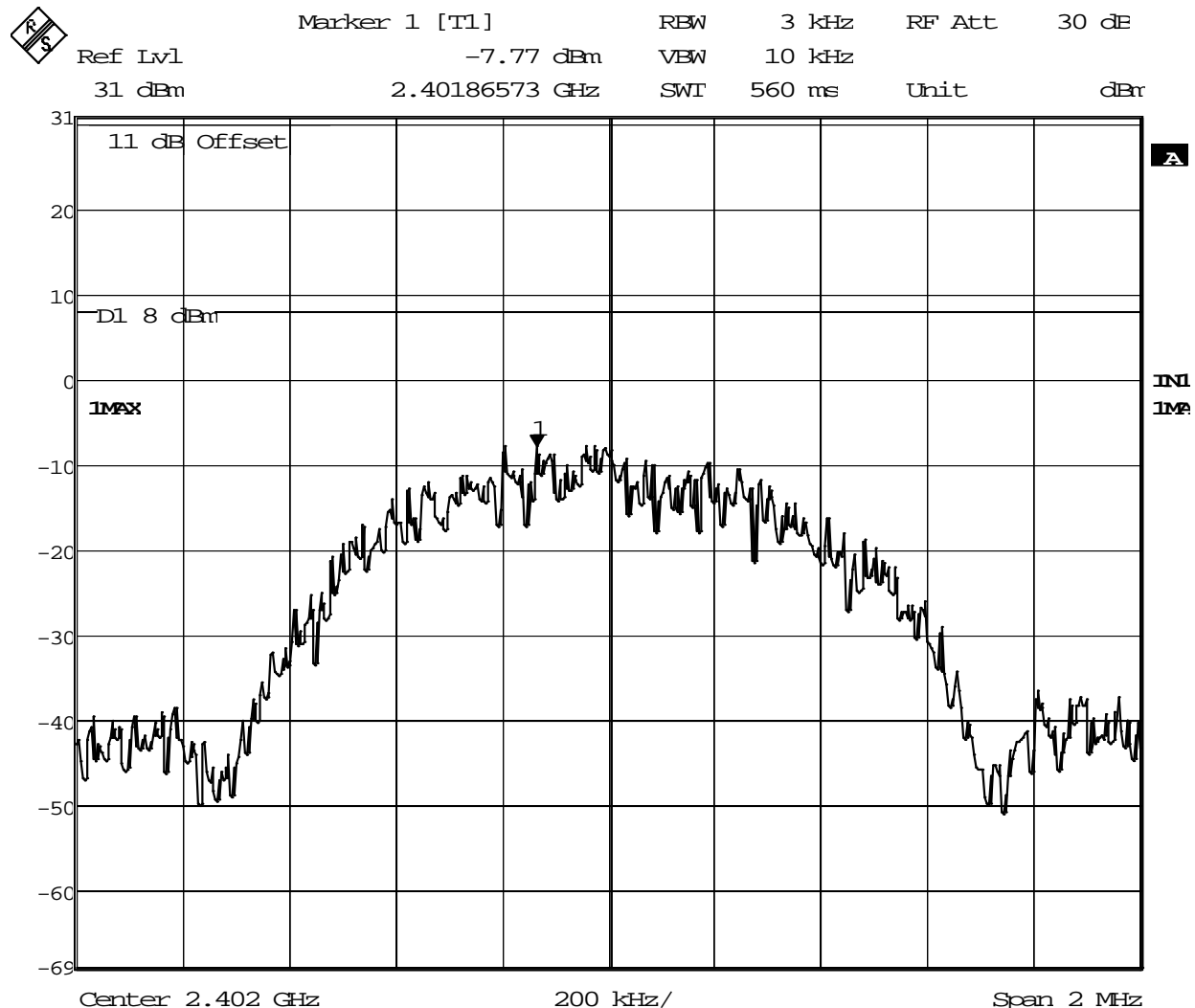
# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.6.2. Measurement plots



Comment A: Plot1 BLE PSD 2402 MHz  
 Date: 9.SEP.2016 17:45:52

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# Wireless Transceiver Test Report

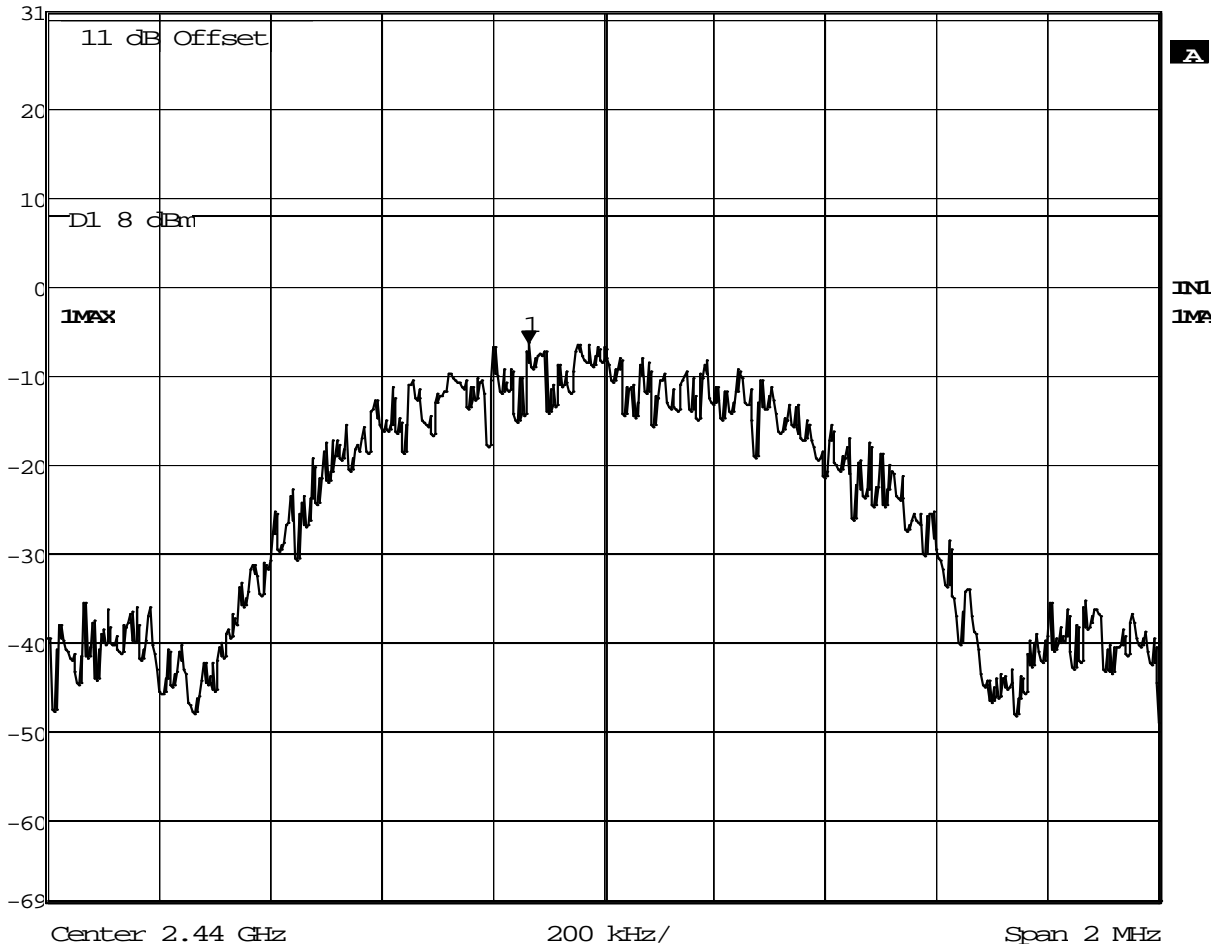
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW      3 kHz      RF Att      30 dB  
 Ref Lvl                      -6.33 dBm      VBW      10 kHz  
 31 dBm                      2.43986573 GHz      SWF      560 ms      Unit      dBm



Comment A: Plot2 BLE PSD 2440 MHz  
 Date: 9.SEP.2016 17:46:10

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# Wireless Transceiver Test Report

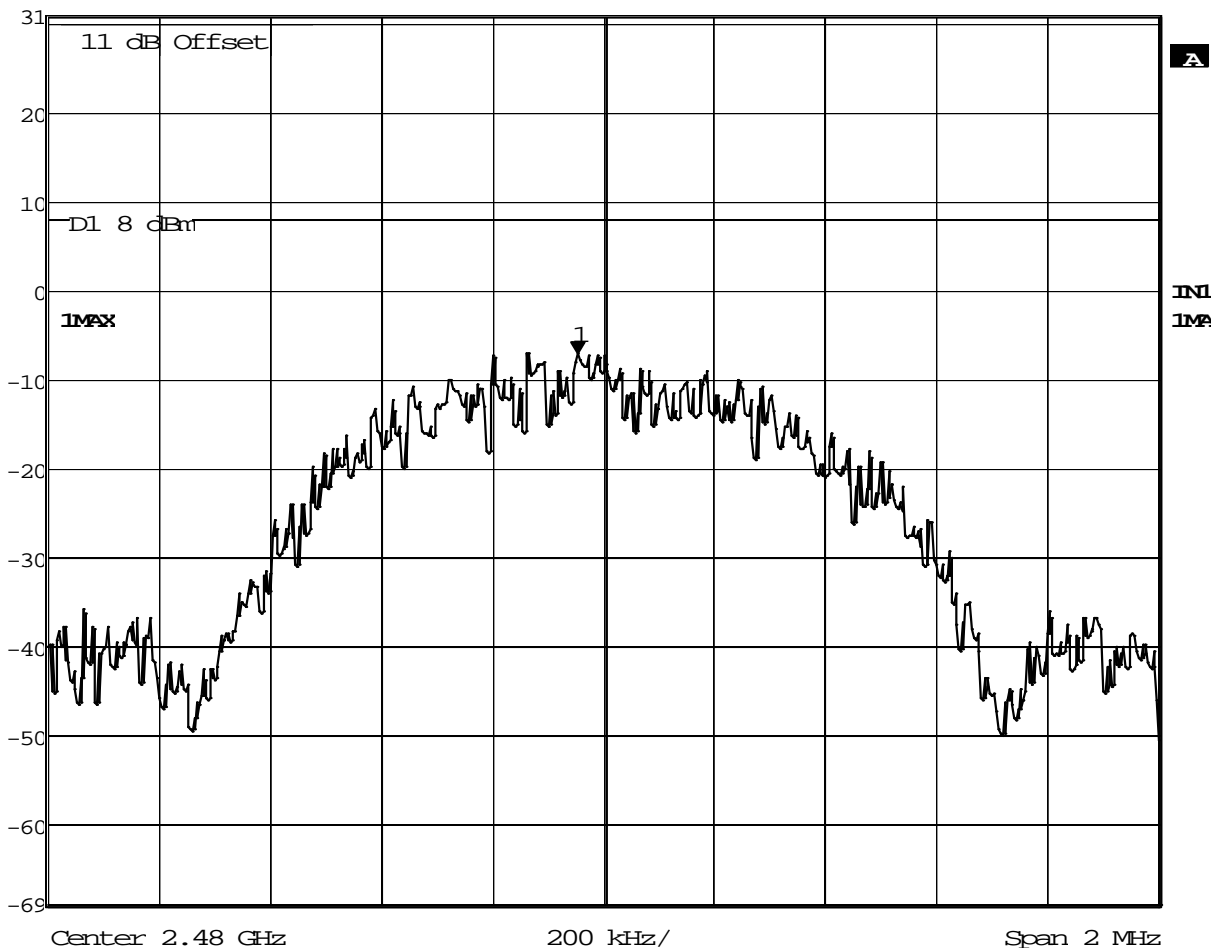
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW      3 kHz      RF Att      30 dB  
 Ref Lvl                      -7.08 dBm      VBW      10 kHz  
 31 dBm                      2.47995391 GHz      SWF      560 ms      Unit      dBm



Comment A: Plot3 BLE PSD 2480 MHz  
 Date: 9.SEP.2016 17:46:29

**6.6.3. Conclusion, the low mid and high frequencies all meet the 8 dBm maximum limit.**

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# Wireless Transceiver Test Report

FCC ID: A94TR1



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	ESU 40	TN1663	4/6/2016	4/6/2017

## 6.6.5. Test information

<b>Date of test:</b>	9/9/2015	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	SN 3	<b>Tested by:</b>	B. Cerqua
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.7. 6 dB Bandwidth BLE

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

The 6 dB bandwidth is

DTS Bandwidth Summary Table (BLE)						
Channel	Frequency (MHz)	Mode	DTS BW (kHz)	Limit (kHz)	Margin (kHz)	Result
Low	2402	BLE	737.5	500	-237.5	Pass
Middle	2440	BLE	741.5	500	-241.5	Pass
High	2480	BLE	745.5	500	-245.5	Pass

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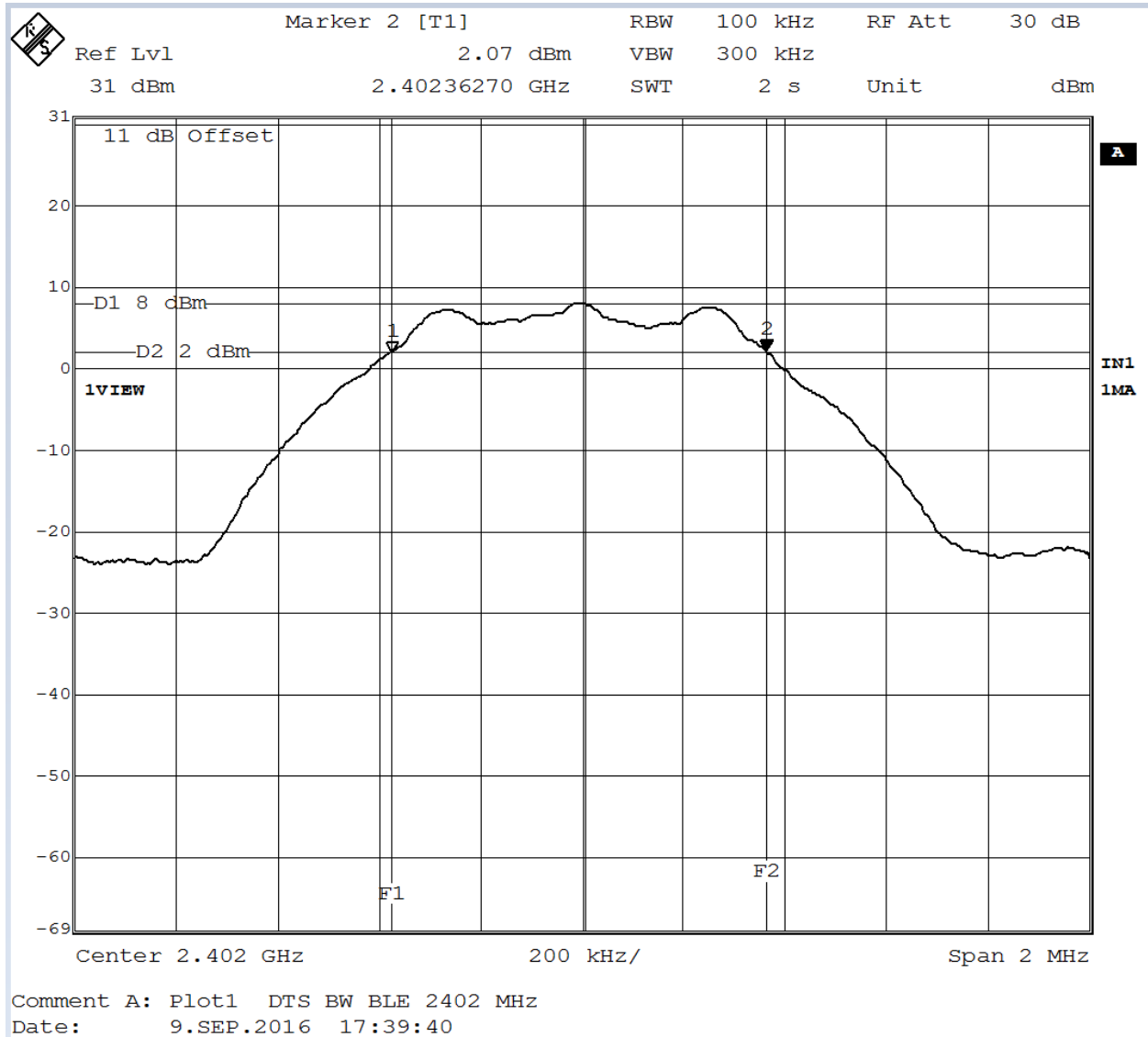
# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

6.7.0.1. Spectrum analyzer plot showing how the 6 dB bandwidth is measured.



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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.7.1. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI test receiver	Rohde & Schwarz	ESU 40	TN1663	4/6/2016	4/6/2017

## 6.7.2. Test information

<b>Date of test:</b>	9/9/2015	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	SN 3	<b>Tested by:</b>	B. Cerqua
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.8. Time of occupancy BT

### 6.8.1. Requirements BT

FCC 15.247 (a) (1) iii

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

### 6.8.2. Test setup details BT

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 put into transmit modes using the Bluetest 3 software. 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 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.

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 6.8.3. Test data BT

#### 6.8.3.1. Table of calculations BT

TX Pulse Width (xDH1)									
Channel	Frequency (MHz)	Mode	Pulse Width (mS)	Number of pulses in 3.16 S	Number of pulses in 31.6 S (X 10)	Time of occupancy (Pulse Width X Number of pulses) (mS)	Limit (mS)	Margin (mS)	Result
Middle	2441	DH1	0.410	33	330	135.4	400	264.57	Pass
Middle	2441	2-DH1	0.424	32	320	135.6	400	264.45	Pass
Middle	2441	3-DH1	0.424	33	330	139.8	400	260.21	Pass
TX Pulse Width (xDH3)									
Channel	Frequency (MHz)	Mode	Pulse Width (mS)	Number of pulses in 3.16 S	Number of pulses in 31.6 S (X 10)	Time of occupancy (Pulse Width X Number of pulses) (mS)	Limit (mS)	Margin (mS)	Result
Middle	2441	DH3	1.670	17	170	283.9	400	116.13	Pass
Middle	2441	2-DH3	1.674	17	170	284.6	400	115.35	Pass
Middle	2441	3-DH3	1.674	17	170	284.6	400	115.35	Pass
TX Pulse Width (xDH5)									
Channel	Frequency (MHz)	Mode	Pulse Width (mS)	Number of pulses in 3.16 S	Number of pulses in 31.6 S (X 10)	Time of occupancy (Pulse Width X Number of pulses) (mS)	Limit (mS)	Margin (mS)	Result
Middle	2441	DH5	2.920	11	110	321.2	400	78.80	Pass
Middle	2441	2-DH5	2.920	11	110	321.2	400	78.80	Pass
Middle	2441	3-DH5	2.928	11	110	322.1	400	77.92	Pass

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# Wireless Transceiver Test Report

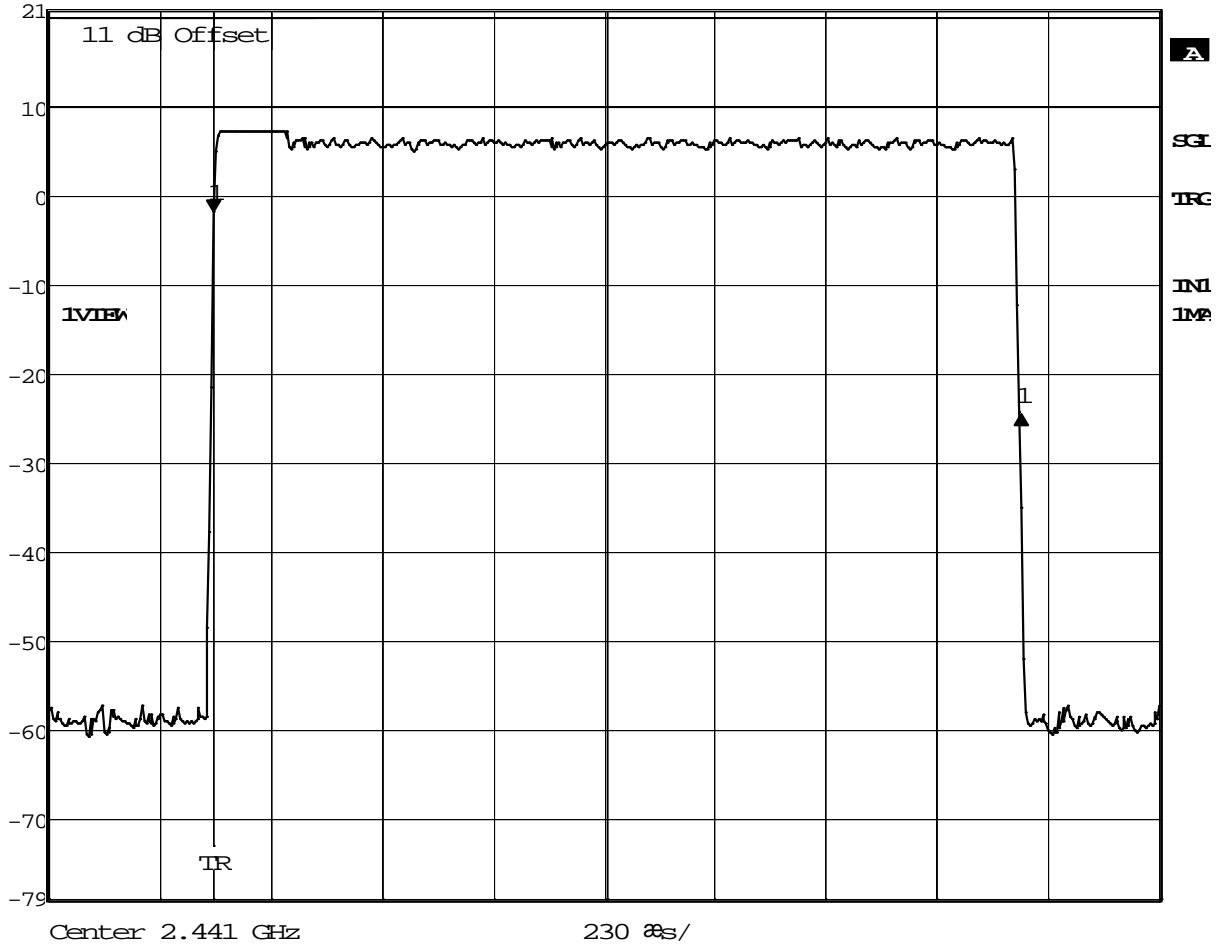
FCC ID: A94TR1



Certificate # 1514.1

### 6.8.3.2. Individual pulse plot BT

	Delta 1 [T1]	RBW	2 MHz	RF Att	20 dB
Ref Lvl	-22.70 dB	VBW	50 kHz		
21 dBm	1.674400 ms	SWT	2.3 ms	Unit	dBm



Comment A: Plot6 2441 TX pulse width 3dB3  
Date: 9.SEP.2016 16:32:51

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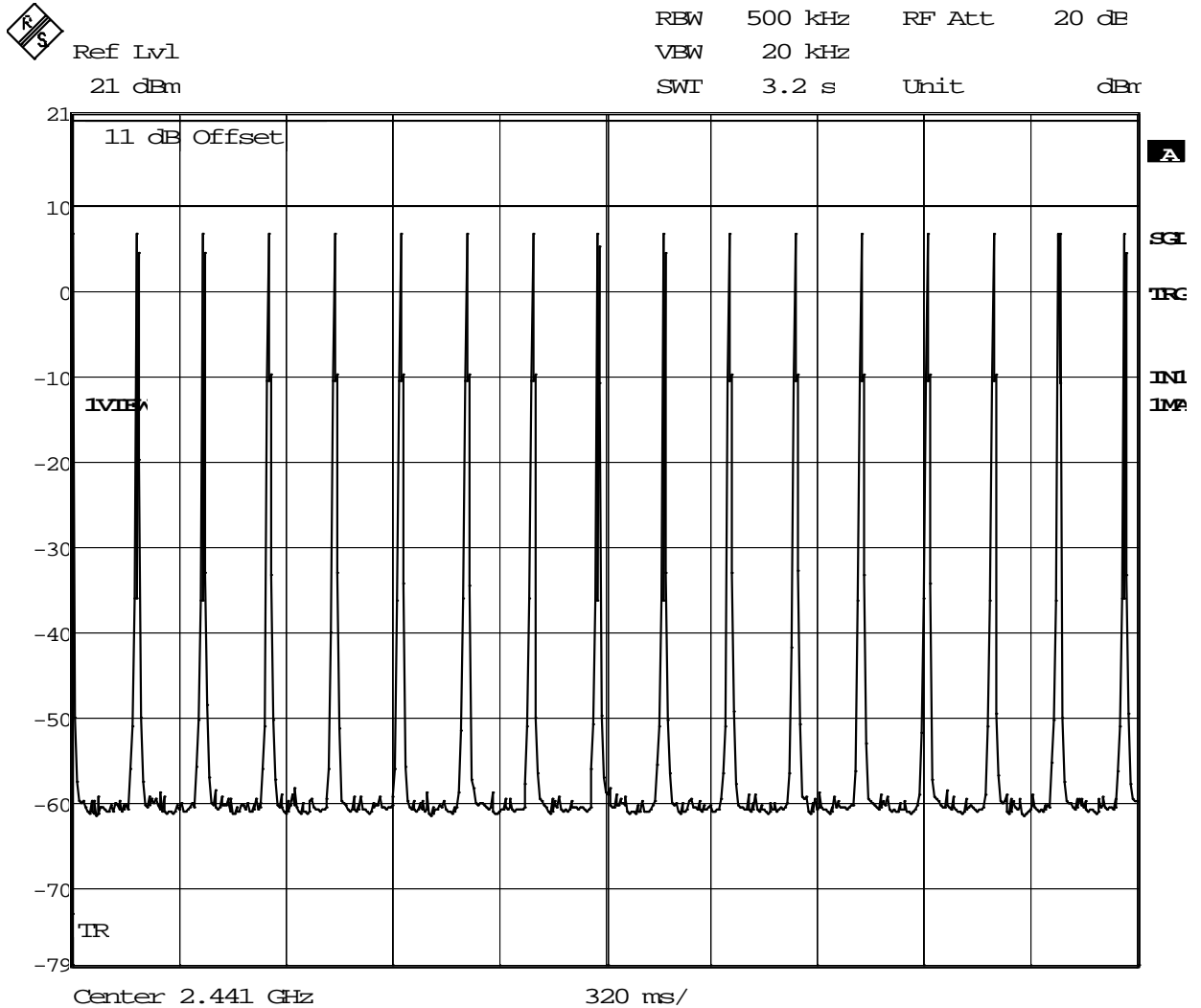
# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 6.8.3.3. The 36.1 second plot BT



Comment A: Plot15 2441 TX pulse count 3DH3  
Date: 9.SEP.2016 16:36:19

### 6.8.4. Test conclusion: BT

Pass. The occupancy time is 322.1

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.8.5. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI test receiver	Rohde & Schwarz	ESU 40	TN1663	4/6/2016	4/6/2017

## 6.8.6. Test information

<b>Date of test:</b>	9/9/2015	<b>Test location:</b>	Transmitter Test Bench
<b>EUT serial:</b>	SN 3	<b>Tested by:</b>	B. Cerqua
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.9. Band Edge Emissions- Radiated measurements in BLE

### 6.9.1. Requirements

FCC part 15.247(d),

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

### 6.9.2. Test Setup

The EUT is controlled via the USB cable with software which is used to set the product in various operation modes. The spectrum analyzer resolution bandwidth is set to 1 MHz peak detector. The sweep and turntable rates are slow..

### 6.9.3. Test data BLE

Lower Band Edge (BLE)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Low	2402	BLE	45.57	20	25.57	Pass

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# Wireless Transceiver Test Report

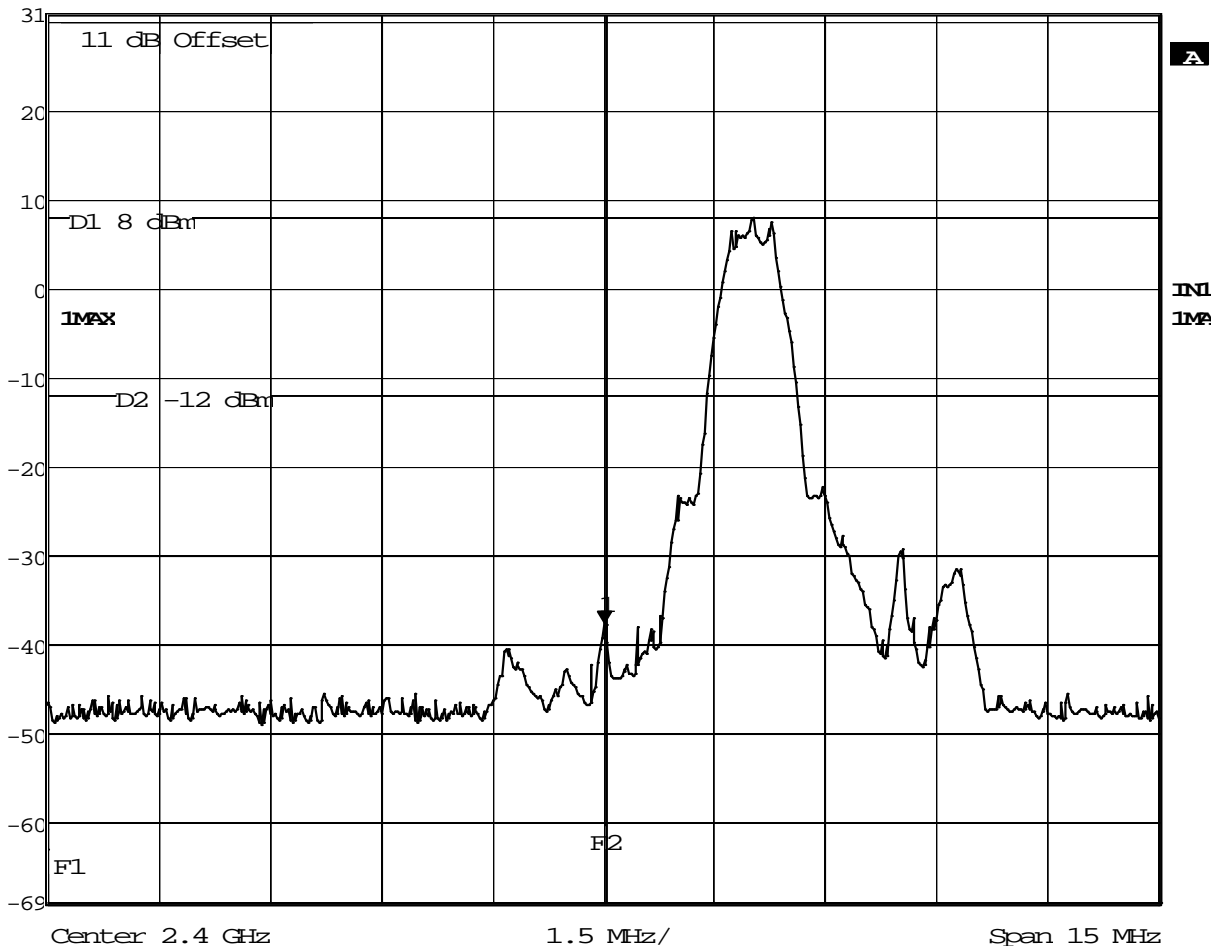
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW 100 kHz      RF Att 30 dB  
 Ref Lvl                      -37.57 dBm      VBW 300 kHz  
 31 dBm                      2.4000000 GHz      SWF 5 ms      Unit dBm



Comment A: Plot1 Lower Band Edge BLE PK 2402 MHz  
 Date: 9.SEP.2016 17:43:39

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

Upper Band Edge (BLE) (Peak Detector)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
High	2480	BLE	54.08	20	34.08	Pass

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# Wireless Transceiver Test Report

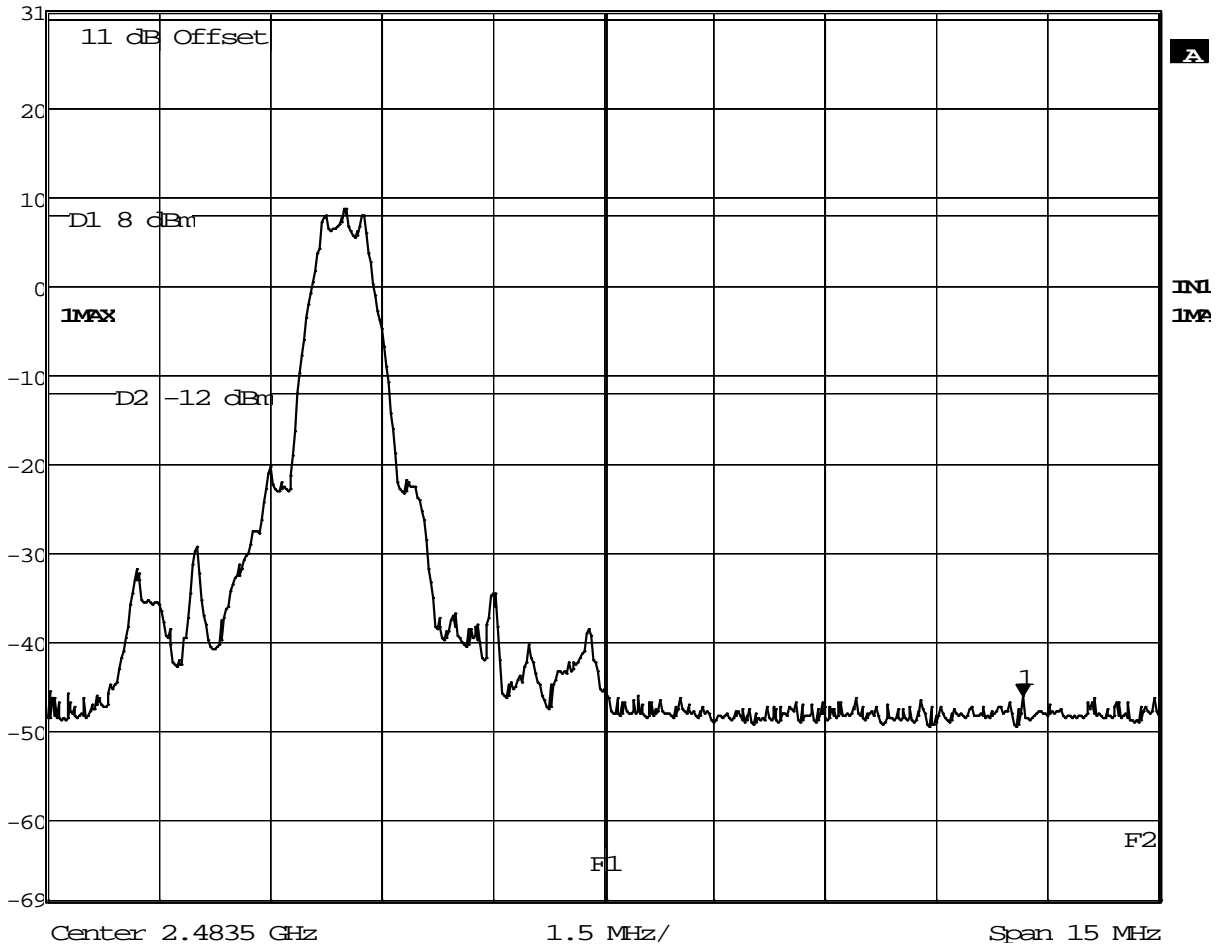
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1] REW 100 kHz RF Att 30 dB  
 Ref Lvl -46.08 dBm VEW 300 kHz  
 31 dBm 2.48916633 GHz SWF 5 ms Unit dBm



Comment A: Plot1 Upper Band Edge BLE Peak 2480 MHz  
 Date: 9.SEP.2016 17:54:26

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.9.4. Test data BT

### 6.9.4.1. Band Edge compliance, Lower edge. Conducted measurement BT Summary

Lower Band Edge (Basic Rate: 1 Mbps) (Hopping Mode)						
Mode	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Hopping	All	DH5	50.65	20	30.65	Pass

Lower Band Edge (Enhanced Rate: 2 Mbps) (Hopping Mode)						
Mode	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Hopping	All	2-DH5	37.99	20	17.99	Pass

Lower Band Edge (Enhanced Rate: 3 Mbps) (Hopping Mode)						
Mode	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Hopping	All	3-DH5	41.73	20	21.73	Pass

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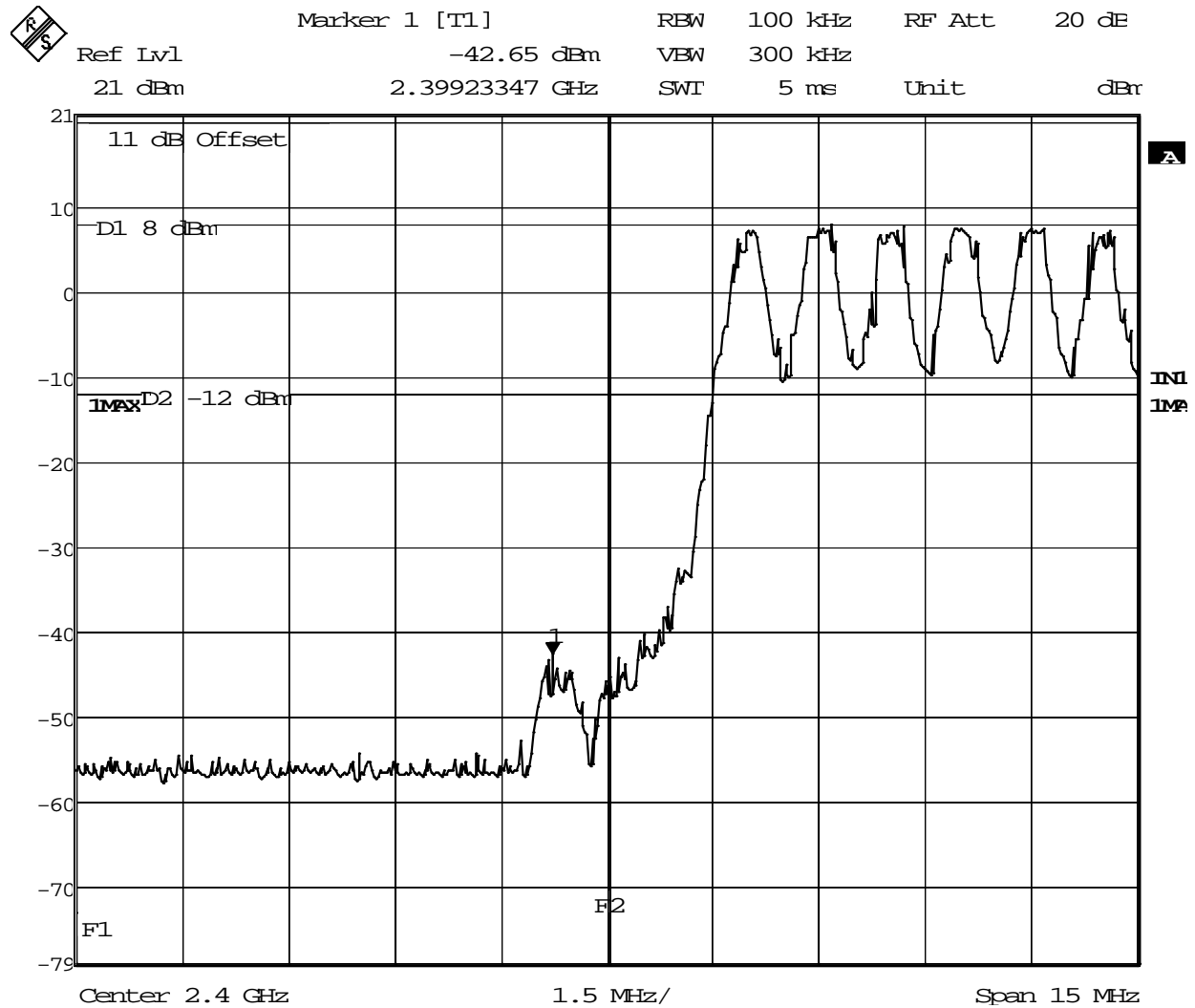
# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.9.4.2. Band Edge compliance, Hopping Conducted measurements



Comment A: Plot1 Lower Band Edge FHSS Hopping  
 Date: 9.SEP.2016 16:23:10

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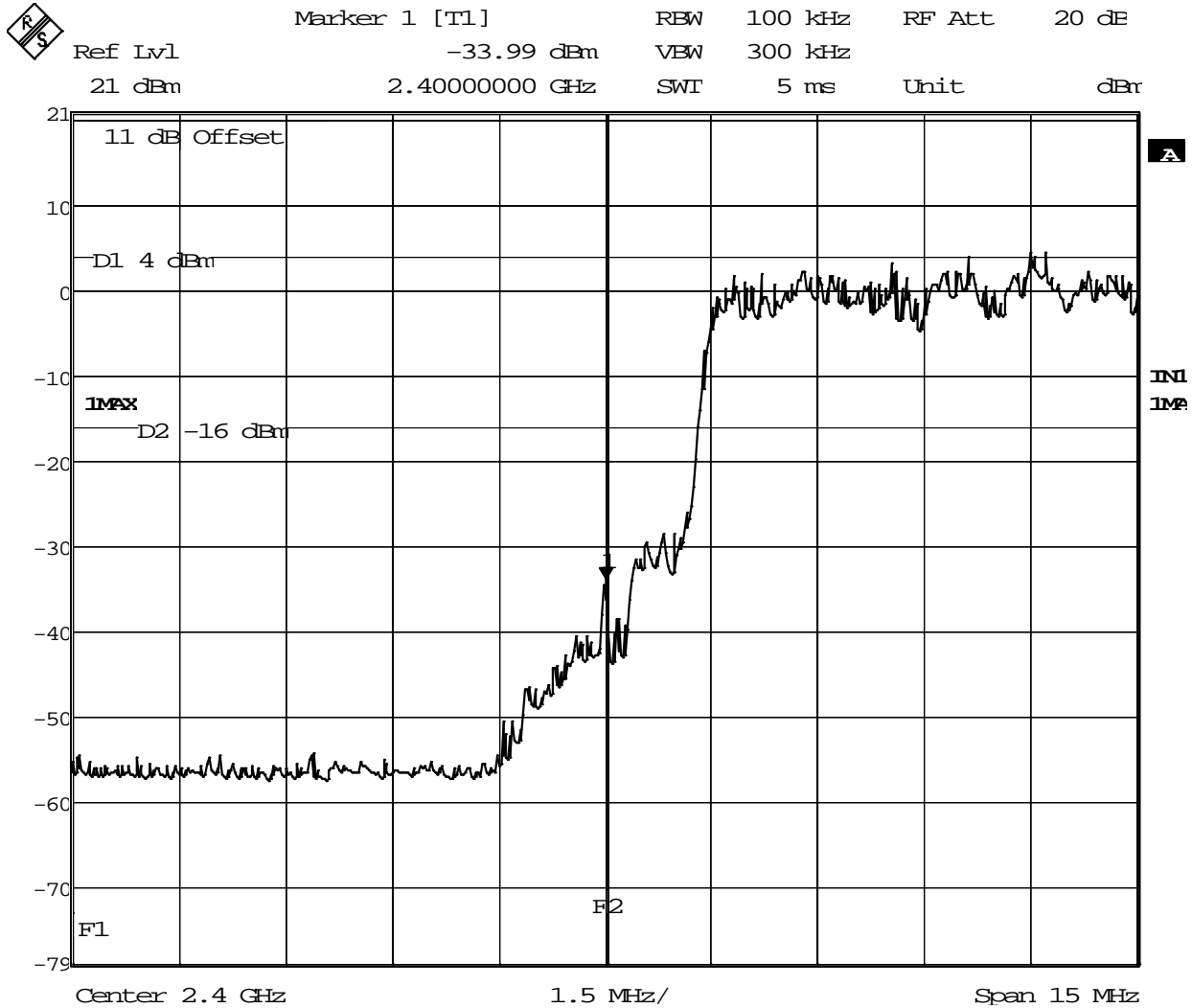


# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1



Comment A: Plot2 Lower Band Edge 2DH5 Hopping  
 Date: 9.SEP.2016 16:23:58

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# Wireless Transceiver Test Report

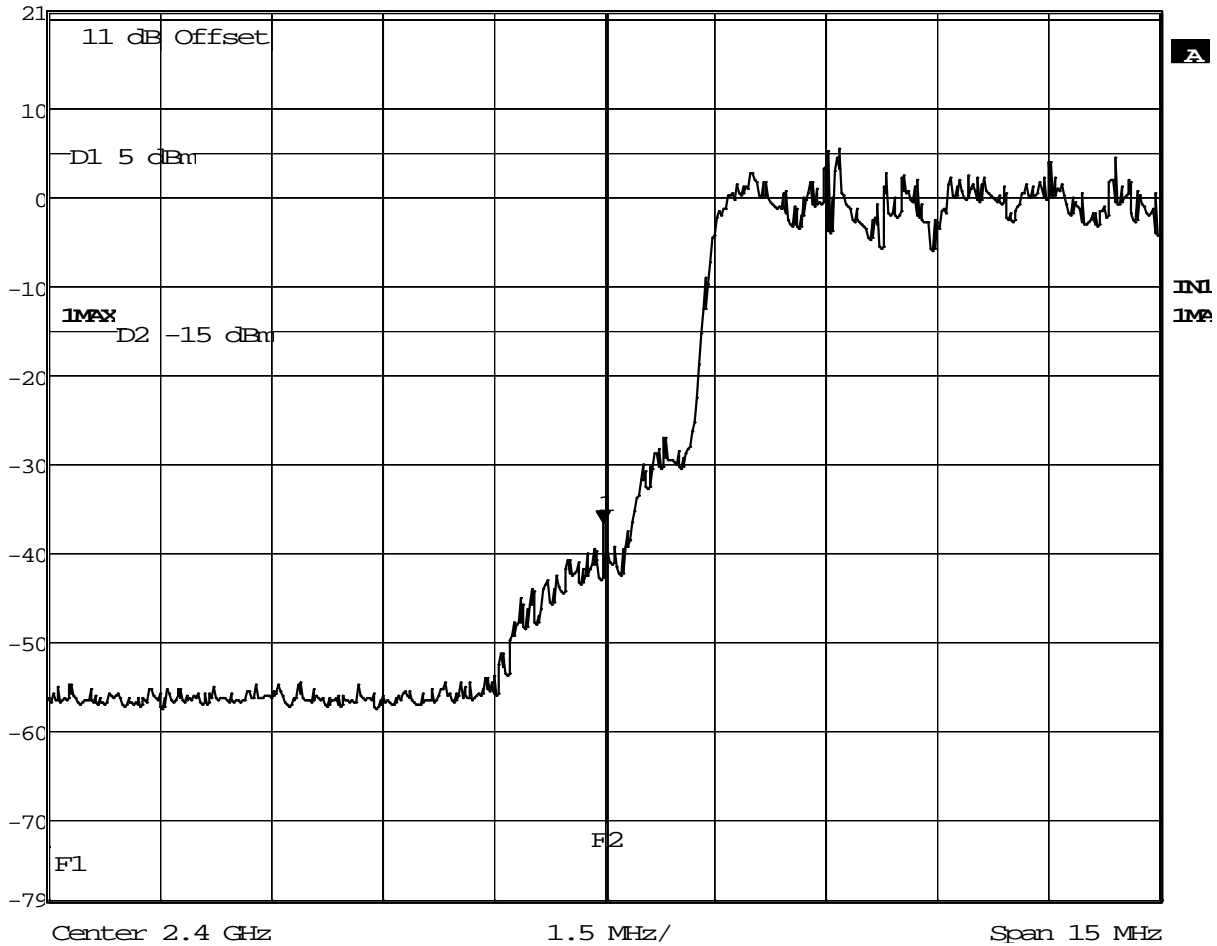
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW 100 kHz      RF Att 20 dB  
 Ref Lvl -36.73 dBm      VBW 300 kHz  
 21 dBm      2.39998497 GHz      SWT 5 ms      Unit dBm



Comment A: Plot3 Lower Band Edge 3DH5 Hopping  
 Date: 9.SEP.2016 16:24:45

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

Lower Band Edge (Basic Rate: 1 Mbps) (Non-Hopping Mode)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Low	2402	DH5	45.92	20	25.92	Pass

Lower Band Edge (Enhanced Rate: 2 Mbps) (Non-Hopping Mode)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Low	2402	2-DH5	38.86	20	18.86	Pass

Lower Band Edge (Enhanced Rate: 3 Mbps) (Non-Hopping Mode)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Low	2402	3-DH5	39.84	20	19.84	Pass

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# Wireless Transceiver Test Report

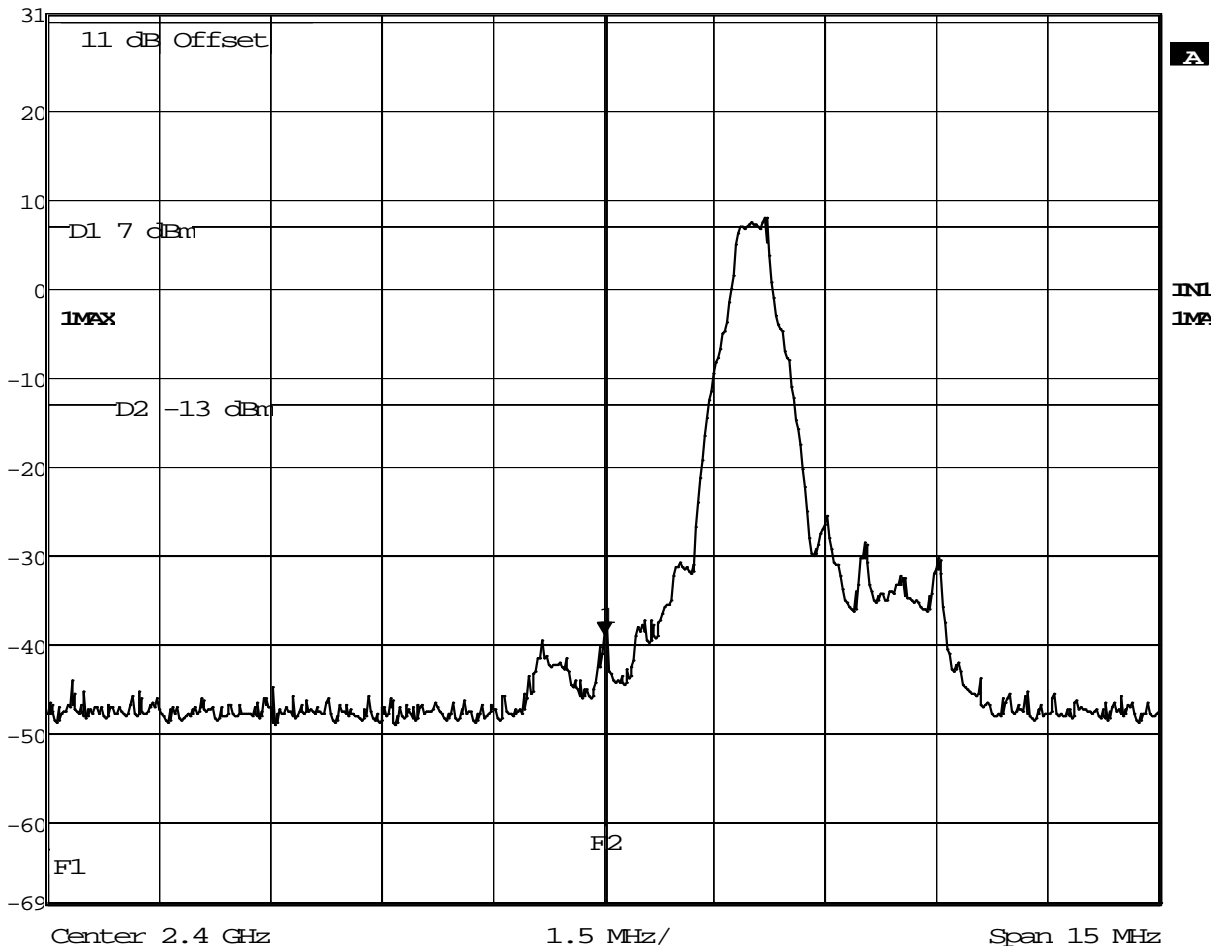
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW 100 kHz      RF Att 30 dB  
 Ref Lvl -38.92 dBm      VBW 300 kHz  
 31 dBm      2.4000000 GHz      SWF 5 ms      Unit dBm



Comment A: Plot1 Lower Band Edge DH5 2402 MHz  
 Date: 9.SEP.2016 16:21:17

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# Wireless Transceiver Test Report

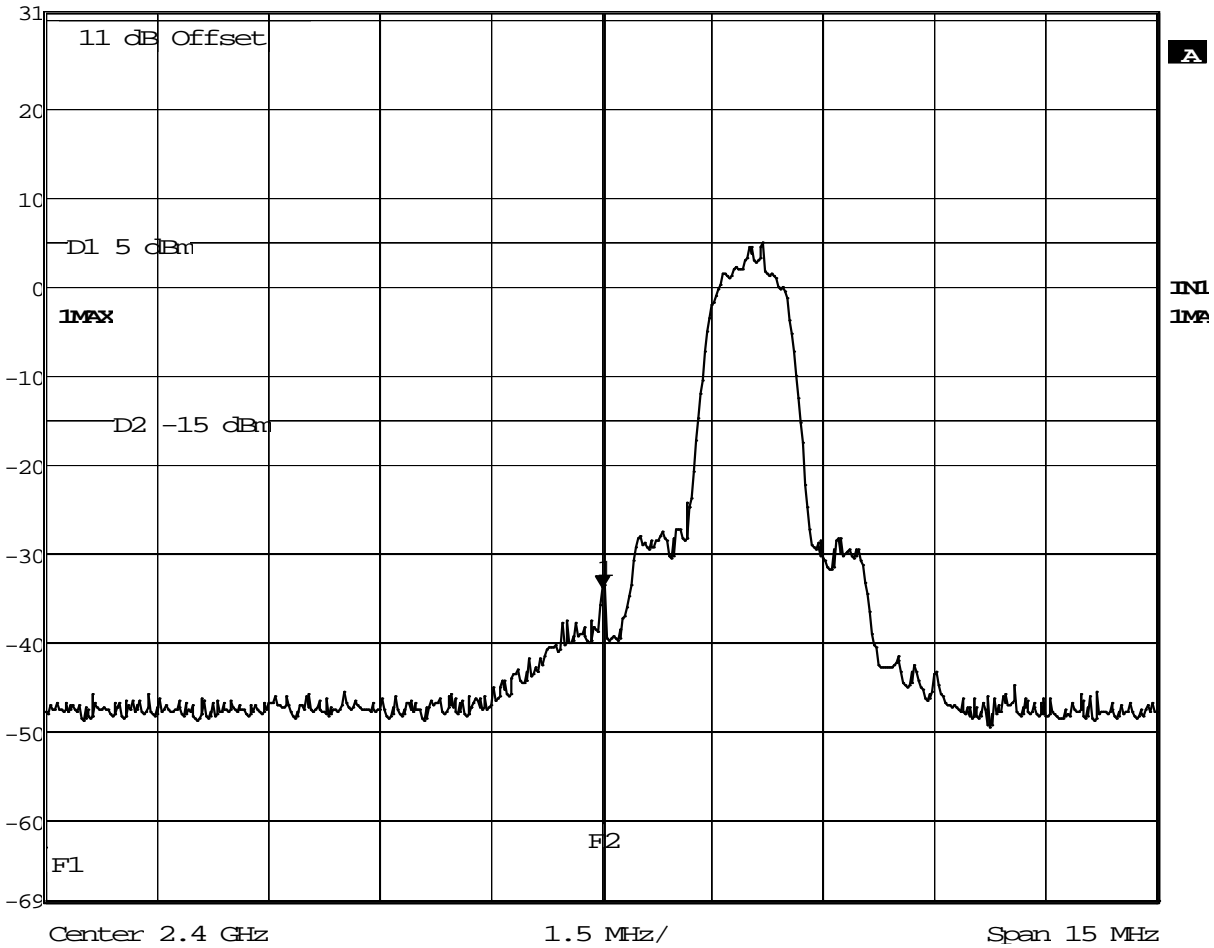
FCC ID: A94TR1



Certificate # 1514.1



Ref Lvl	Marker 1 [T1]	RBW	100 kHz	RF Att	30 dB
31 dBm	-33.86 dBm	VBW	300 kHz		
	2.4000000 GHz	SWT	5 ms	Unit	dBm



Comment A: Plot2 Lower Band Edge 2DH5 2402 MHz  
Date: 9.SEP.2016 16:21:37

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# Wireless Transceiver Test Report

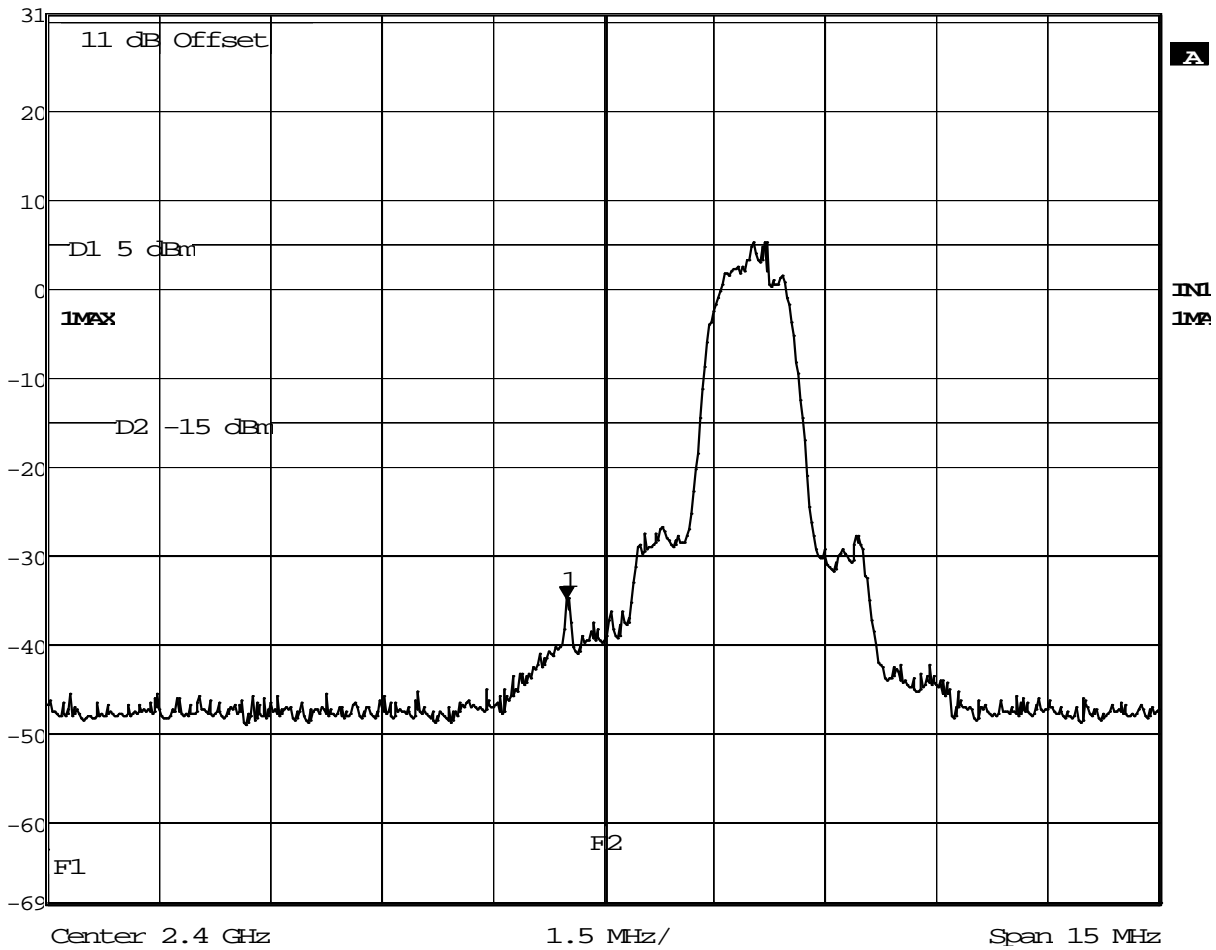
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW 100 kHz      RF Att 30 dB  
 Ref Lvl                      -34.84 dBm      VBW 300 kHz  
 31 dBm                      2.39950401 GHz      SWF 5 ms      Unit dBm



Comment A: Plot3 Lower Band Edge 3DH5 2402 MHz  
 Date: 9.SEP.2016 16:21:56

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

Upper Band Edge (Basic Rate: 1 Mbps) (Hopping Mode)						
Mode	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Hopping	All	DH5	-53.90	20	73.90	Pass

Upper Band Edge (Enhanced Rate: 2 Mbps) (Hopping Mode)						
Mode	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Hopping	All	2-DH5	-53.40	20	73.40	Pass

Upper Band Edge (Enhanced Rate: 3 Mbps) (Hopping Mode)						
Mode	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Hopping	All	3-DH5	-55.10	20	75.10	Pass

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# Wireless Transceiver Test Report

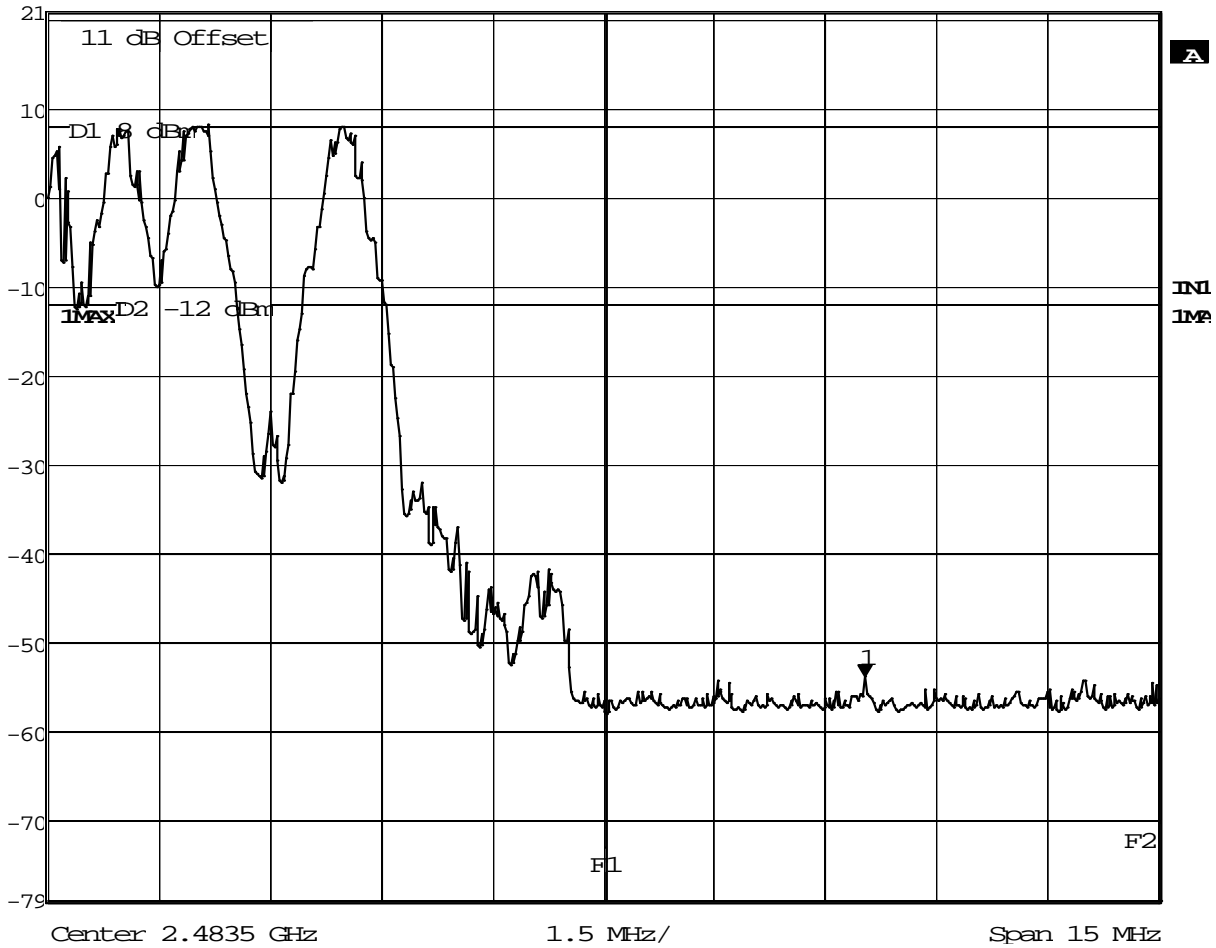
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1] REW 100 kHz RF Att 20 dB  
 Ref Lvl -53.93 dBm VEW 300 kHz  
 21 dBm 2.48703206 GHz SWF 5 ms Unit dBm



Comment A: Plot1 Upper Band Edge DHS Hopping  
 Date: 9.SEP.2016 15:11:08

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# Wireless Transceiver Test Report

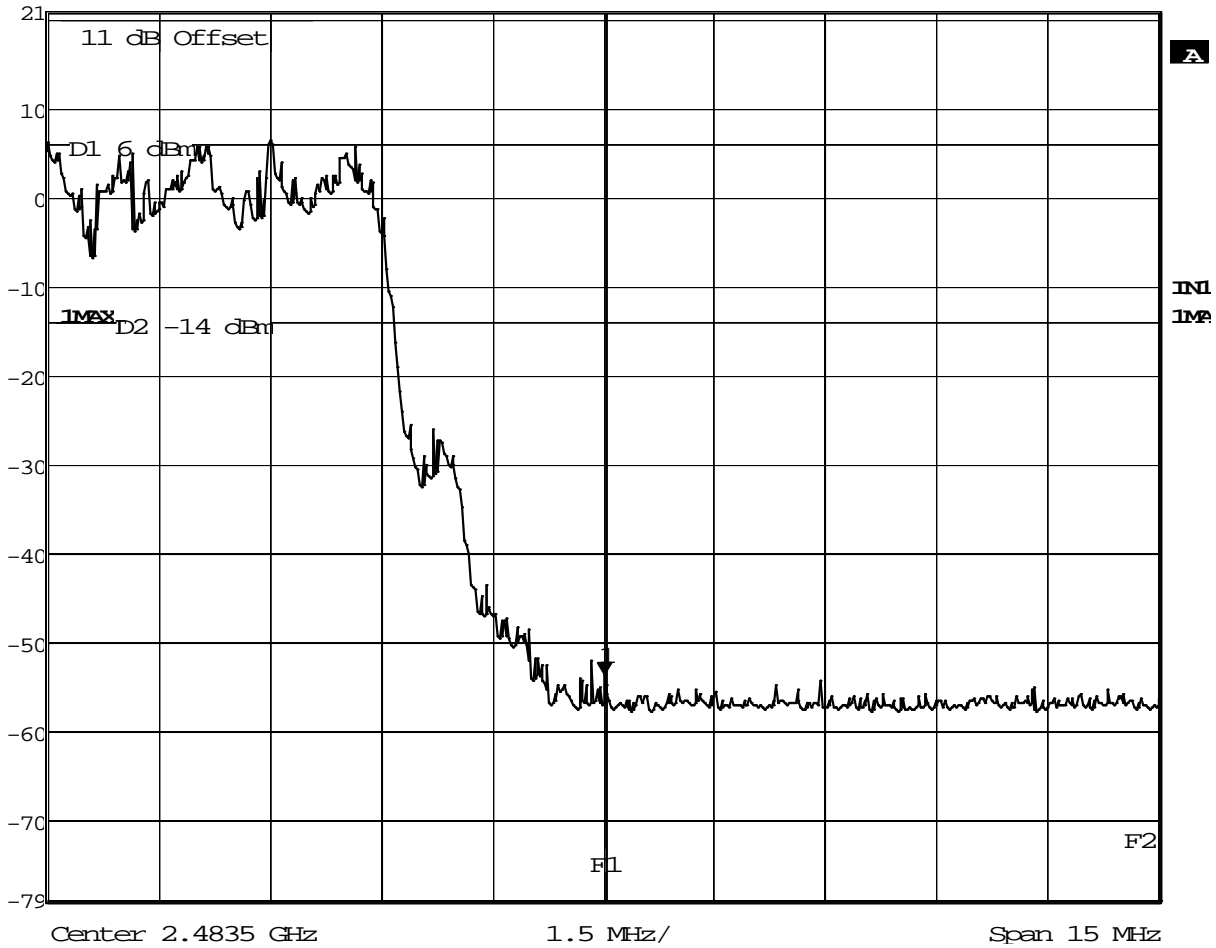
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW 100 kHz      RF Att 20 dB  
 Ref Lvl -53.64 dBm      VBW 300 kHz  
 21 dBm      2.48351503 GHz      SWF 5 ms      Unit dBm



Comment A: Plot2 Upper Band Edge 2DH5 Hopping  
 Date: 9.SEP.2016 15:11:56

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# Wireless Transceiver Test Report

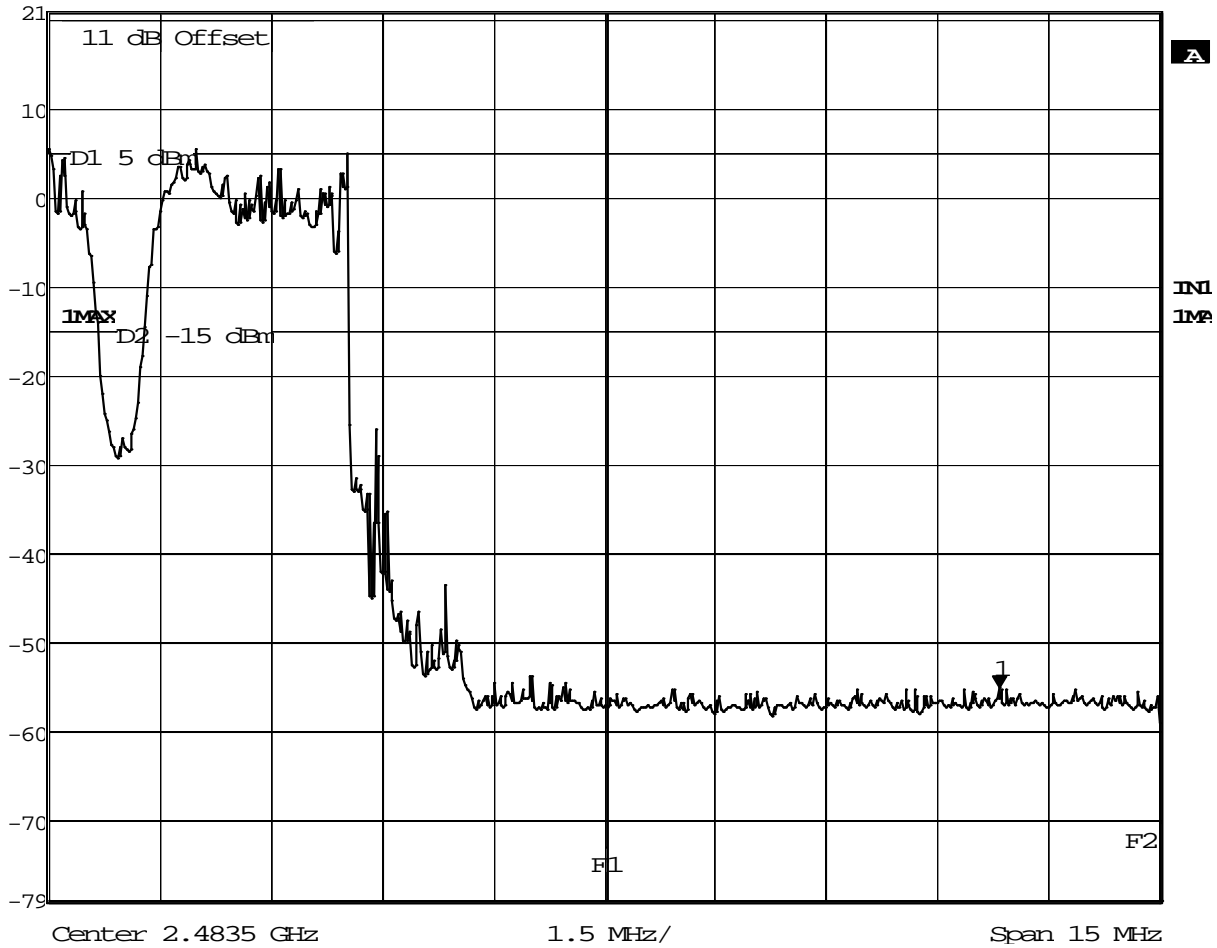
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW 100 kHz      RF Att 20 dB  
 Ref Lvl -55.10 dBm      VBW 300 kHz  
 21 dBm      2.48883567 GHz      SWF 5 ms      Unit dBm



Comment A: Plot3 Upper Band Edge 3DH5 Hopping  
 Date: 9.SEP.2016 15:12:43

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

Upper Band Edge (Basic Rate: 1 Mbps) (Non-Hopping Mode)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
High	2480	DH5	53.88	20	33.88	Pass

Upper Band Edge (Enhanced Rate: 2 Mbps) (Non-Hopping Mode)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
High	2480	2-DH5	48.84	20	28.84	Pass

Upper Band Edge (Enhanced Rate: 3 Mbps) (Non-Hopping Mode)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
High	2480	3-DH5	52.46	20	32.46	Pass

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# Wireless Transceiver Test Report

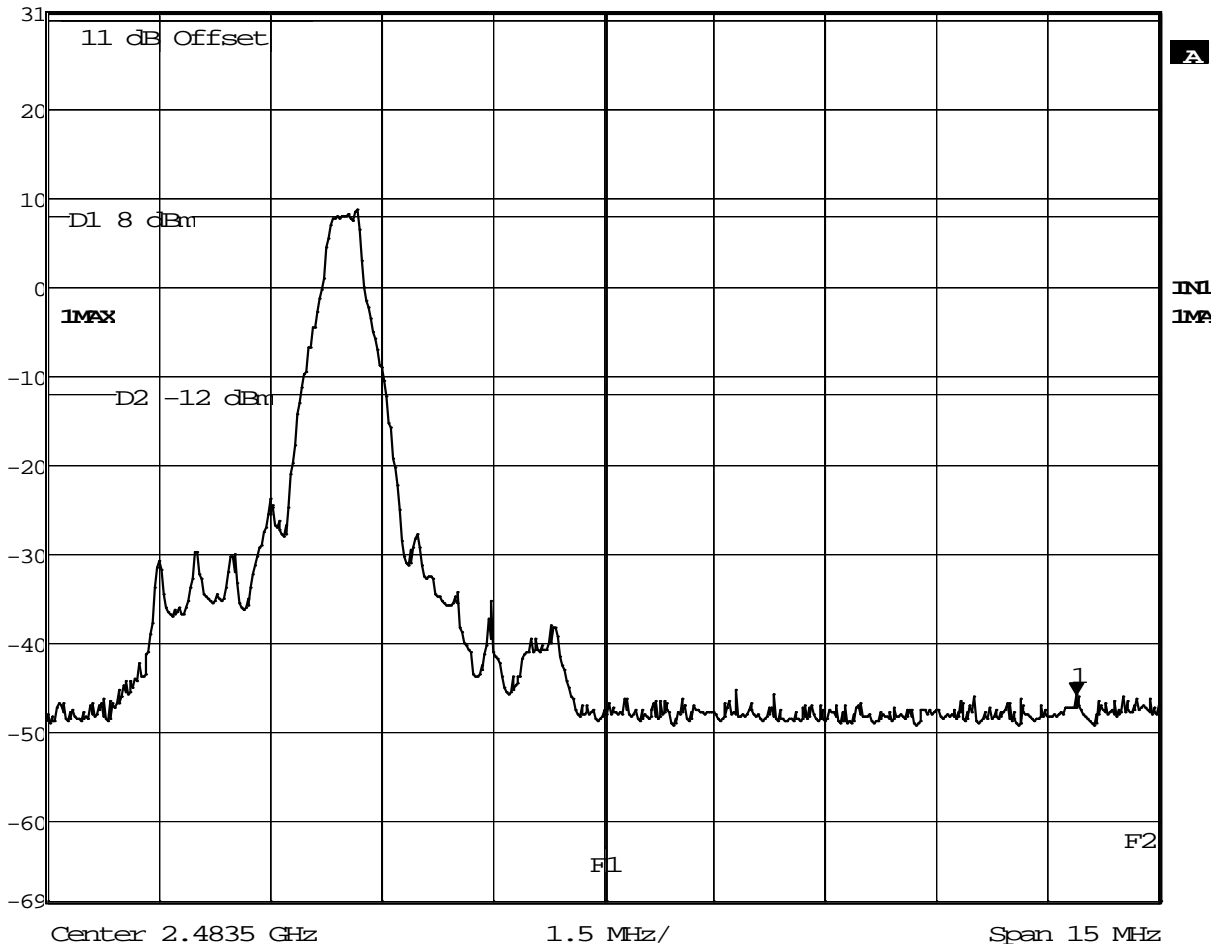
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1] REW 100 kHz RF Att 30 dB  
 Ref Lvl -45.88 dBm VBW 300 kHz  
 31 dBm 2.48988778 GHz SWI 5 ms Unit dBm



Comment A: Plot1 Upper Band Edge DH5 2480 MHz  
 Date: 9.SEP.2016 15:09:16

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# Wireless Transceiver Test Report

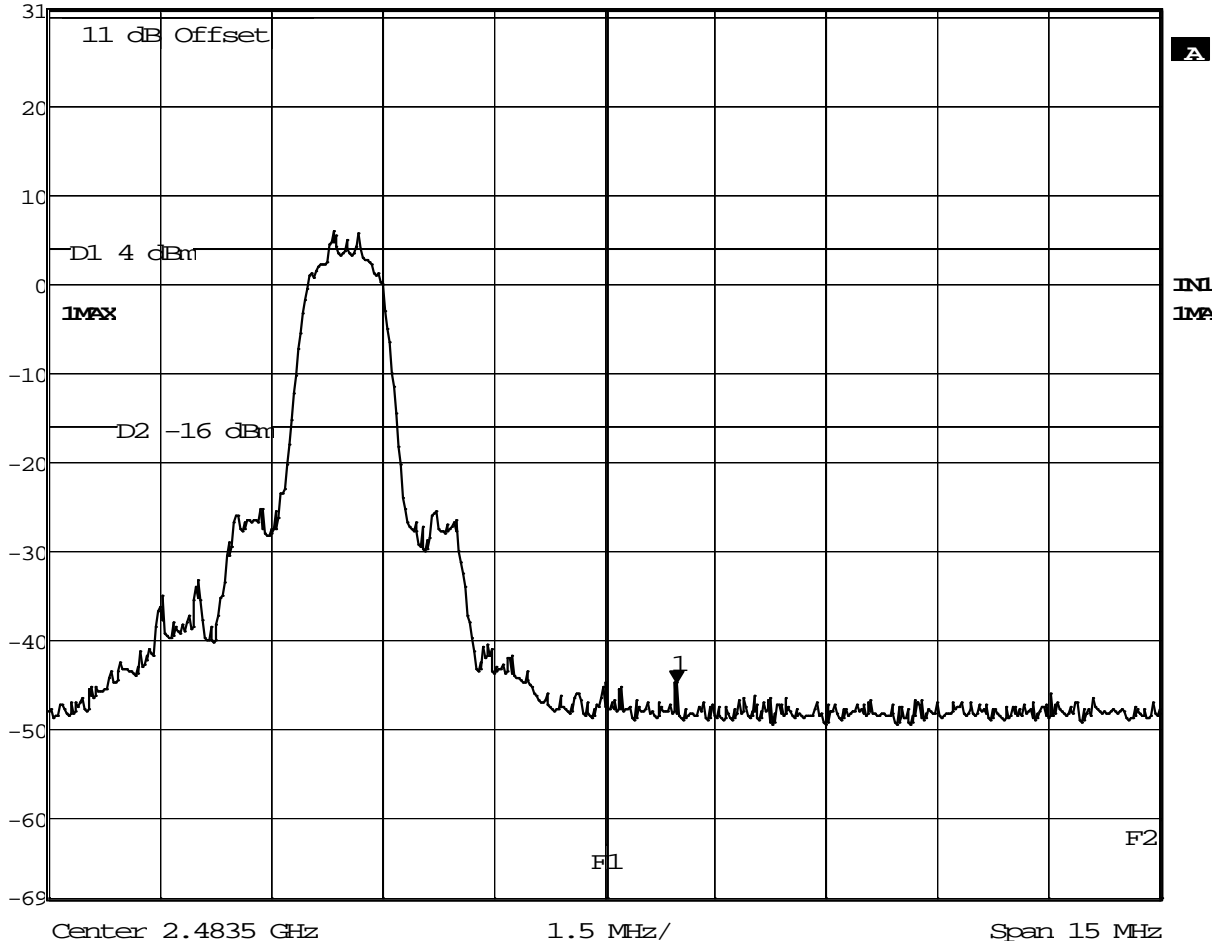
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1] REW 100 kHz RF Att 30 dB  
 Ref Lvl -44.84 dBm VBW 300 kHz  
 31 dBm 2.48447695 GHz SWI 5 ms Unit dBm



Comment A: Plot2 Upper Band Edge 2DH5 2480 MHz  
 Date: 9.SEP.2016 15:09:36

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# Wireless Transceiver Test Report

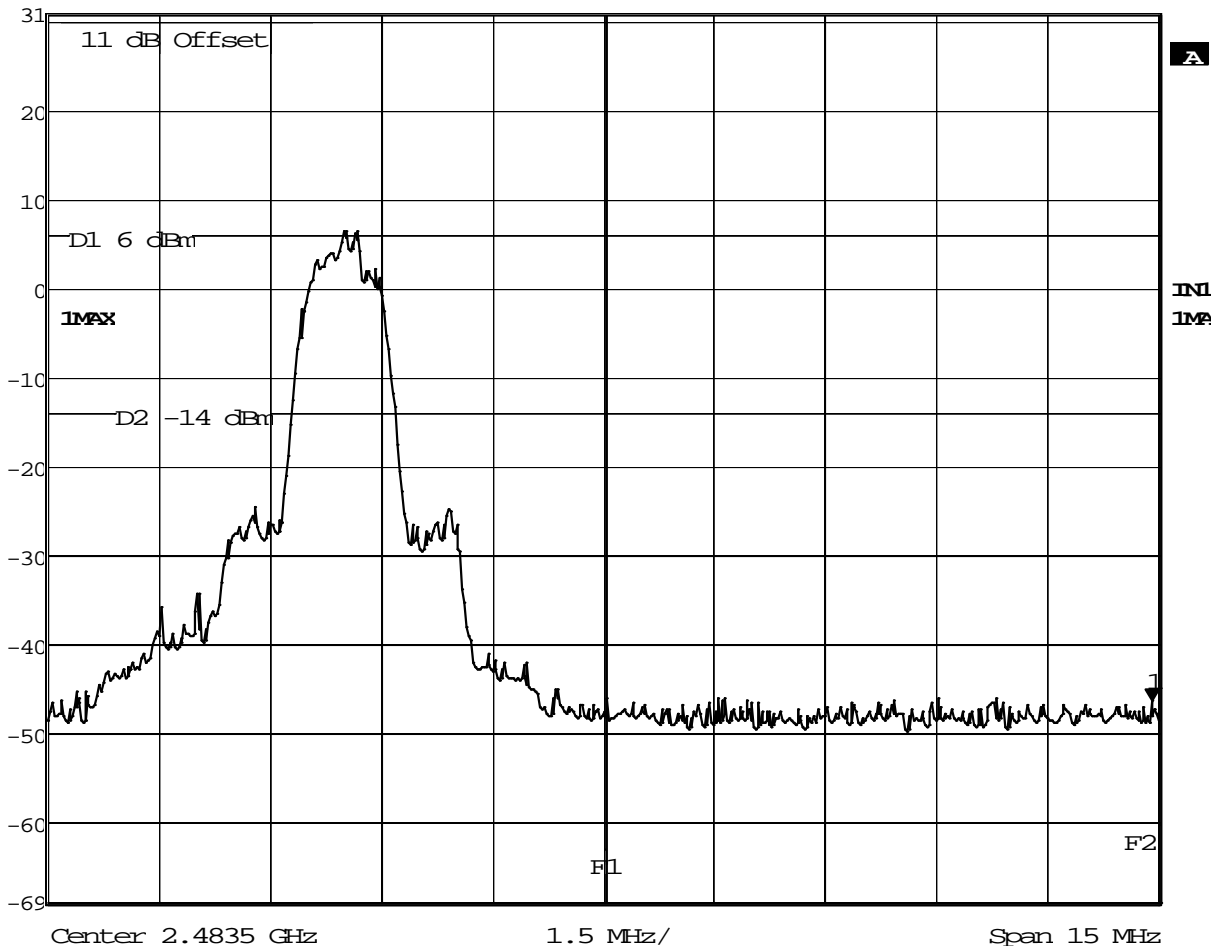
FCC ID: A94TR1



Certificate # 1514.1



Marker 1 [T1]      RBW 100 kHz      RF Att 30 dB  
 Ref Lvl                      -46.46 dBm      VBW 300 kHz  
 31 dBm                      2.49090982 GHz      SWF 5 ms      Unit dBm



Comment A: Plot3 Upper Band Edge 3DH5 2480 MHz  
 Date: 9.SEP.2016 15:09:56

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.9.5. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESU40	TN1663	4/6/2016	4/6/2017
Double Ridge Waveguide Horn Antenna 1-18GHz	ETS Lindgren	3117	TN2349	10/29/2015	10/29/2016
Comb Generator	Com-Power	CGO-5100	TN 1620	Verify	Verify
Pre-Amp 100 MHz to 20 GHz	Miteq	AFS4-00102000-30-10P-4	TN2261	1/8/2016	1/8/2017
Band Reject Filter	Band Reject Filter	BRM50702-07	TN 2342	3/29/2016	3/29/2017
Cable set			TN 2357	1/8/2016	1/8/2017
Horn Antenna 18GHz - 26.5GHz	EMCO	3160-09	TN1307	3/13/2014	3/13/2017
Amplifier	Miteq	TTA1840	TN 2397	Verify	
Cable			TN2369	1/8/2016	1/8/2017
Cable			TN2373	1/8/2016	1/8/2017
Cable			TN2478	1/8/2016	1/8/2017
Shielded Room		Marconi Manor	TN2385	4/11/2016	4/11/2017
Pre-amplifier			TN2602	4/11/2016	4/11/2017

<b>Date of test:</b>	10/3/2016	<b>Test Location:</b>	Marconi Manor
<b>EUT serial:</b>	SN004	<b>Tested by:</b>	Nate Sanford
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.10. Spurious emissions- Radiated

### 6.10.1. Requirements

FCC part 15.247(d)

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

### 6.10.2. Test Setup

The EUT is controlled via the USB cable with software which is used to stop the hopping (BLE) or cause the EUT to hop on only the low-mid-high channels (BT). 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 antenna 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 signal loss of this notch filter is compensated for using 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 search every polarization, place, and angle possible for emissions.

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.10.3. Test data BLE

### 6.10.3.1. Spurious emissions. Radiated measurement transmitting lowest frequency BLE



Max-Hold Peak Pre-scan, 1 GHz to 6GHz (Channel 0, 2402MHz)

Blue = Vertical      Black = Horizontal

Emissions around 2.4GHz will be measured during intentional radiator testing

Emissions around 4.8GHz will be measured below with harmonic measurements

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

6.10.3.2. *Spurious emissions. Radiated measurement transmitting middle frequency.*



Max-Hold Peak Pre-scan, 1 GHz to 6GHz (Channel 19, 2440MHz)

Blue = Vertical      Black = Horizontal

Emissions around 2.4GHz will be measured during intentional radiator testing

Emissions around 4.8GHz will be measured below with harmonic measurements

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 6.10.3.3. Spurious emissions. Radiated measurement transmitting highest frequency. BLE



Max-Hold Peak Pre-scan, 1 GHz to 6GHz (Channel 39, 2480 MHz)

Blue = Vertical      Black = Horizontal

Emissions around 2.4GHz will be measured during intentional radiator testing

Emissions around 4.8GHz will be measured below with harmonic measurements

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

6.10.3.4. *Spurious emissions. Radiated measurement transmitting lowest frequency BLE*



Max-Hold Peak Pre-scan, 6GHz to 18GHz (Channel 0, 2402 MHz)  
 Blue = Vertical      Black = Horizontal

Emissions around 7.4GHz will be measured below with harmonic measurements

No emissions were found above the noise floor from 18-26.5 GHz

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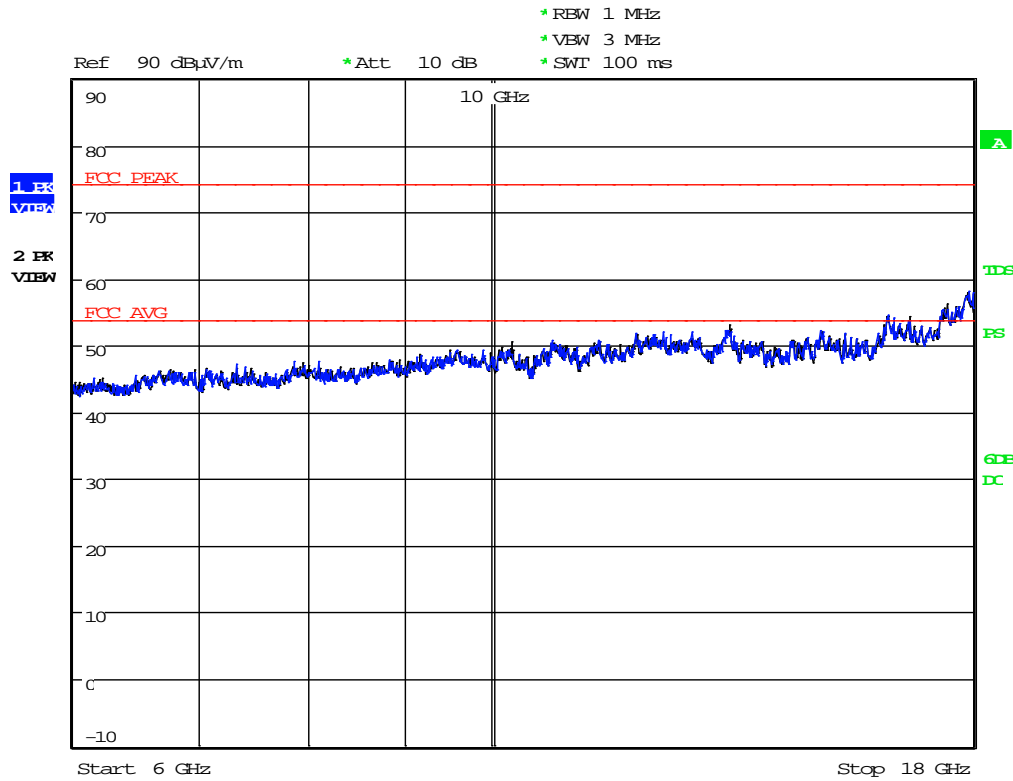
# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 6.10.3.5. Spurious emissions. Radiated measurement transmitting middle frequency BLE



Max-Hold Peak Pre-scan, 6GHz to 18GHz (Channel 19, 2440 MHz)

Blue = Vertical Black = Horizontal

Emissions around 7.4GHz will be measured below with harmonic measurements

No emissions were found above the noise floor from 18-26.5GHz

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

6.10.3.6. *Spurious emissions. Radiated measurement transmitting the highest frequency BLE*



Max-Hold Peak Pre-scan, 6GHz to 18GHz (Channel 39, 2480 MHz)  
 Blue = Vertical      Black = Horizontal

Emissions around 7.4GHz will be measured below with harmonic measurements

No emissions were found above the noise floor from 18-26.5GHz

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# Wireless Transceiver Test Report

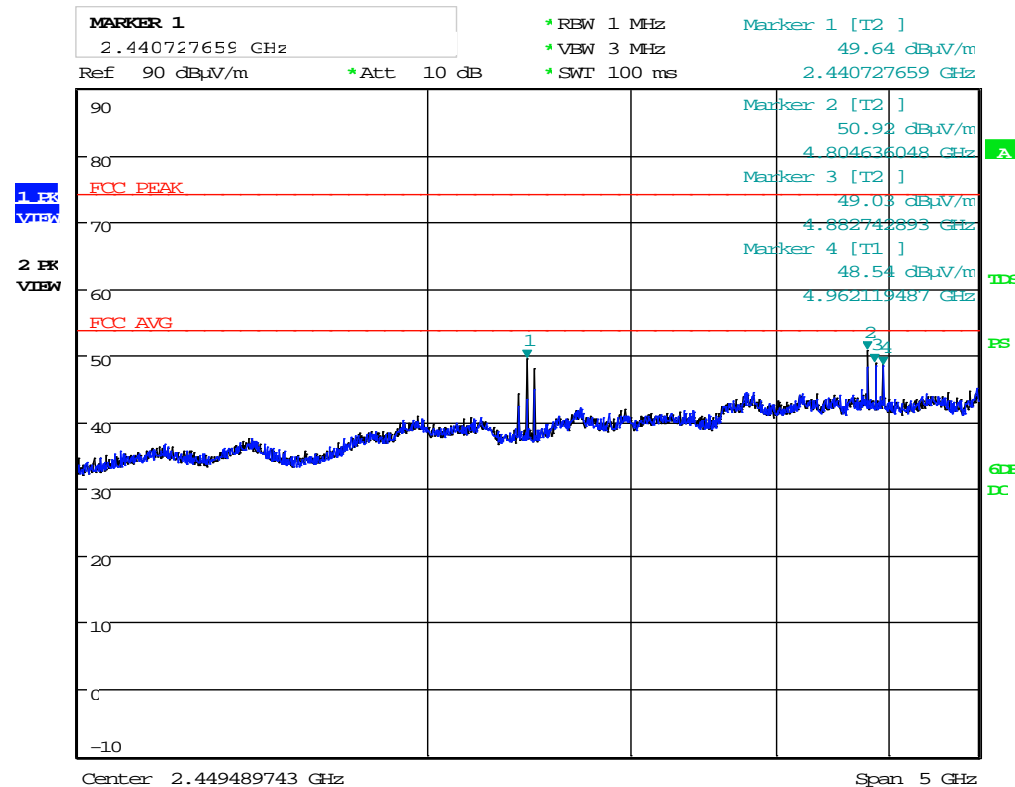
FCC ID: A94TR1



Certificate # 1514.1

## 6.10.4. Test data BT

### 6.10.4.1. Spurious emissions. Radiated measurement transmitting lowest frequency BT.



Max-

(Hopping on Channels 0, 39, 79:, 2402 MHz 2441 MHz 2480 MHz)

Hold Peak Pre-scan, 1 GHz to 6GHz

Blue = Vertical      Black = Horizontal

Emissions around 2.4GHz will be measured during intentional radiator testing

Emissions around 4.8GHz will be measured below with harmonic measurements

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

6.10.4.2. *Spurious emissions. Radiated measurement transmitting highest frequency BT.*



(Hopping on Channels 0, 39, 79: 2402 MHz 2441 MHz 2480 MHz)

Blue = Vertical      Black = Horizontal

Emissions around 7.4GHz will be measured below with harmonic measurements

No emissions were found above the noise floor from 18-26.5GHz

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# Wireless Transceiver Test Report

FCC ID: A94TR1



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	4/6/2016	4/6/2017
Double Ridge Waveguide Horn Antenna 1-18GHz	ETS Lindgren	3117	TN2348	11/18/2015	11/18/2016
Comb Generator	Com-Power	CGO-5100	TN1620	Verify	Verify
Pre-Amp 100 MHz to 20 GHz	Miteq	AFS4-00102000-30-10P-4	TN2261	1/8/2016	1/8/2017
Band Reject Filter	Band Reject Filter	BRM50702-07	TN2342	3/29/2016	3/29/2017
Cable set			TN2357	1/8/2016	1/8/2017
Horn Antenna 18GHz - 26.5GHz	EMCO	3160-09	TN1307	3/13/2014	3/13/2017
Amplifier	Miteq	TTA1840	TN2397	Verify	
Cable			TN2369	1/8/2016	1/8/2017
Cable			TN2373	1/8/2016	1/8/2017
Cable			TN2478	1/8/2016	1/8/2017
Shielded Room		Marconi Manor	TN2385	4/11/2016	4/11/2017
Pre-amplifier			TN2602	4/11/2016	4/11/2017

### 6.10.6. Test information

<b>Date of test:</b>	10/3/2016	<b>Test Location:</b>	Marconi Manor
<b>EUT serial:</b>	SN004	<b>Tested by:</b>	Nate Sanford
<b>Test Conclusion:</b>	Pass		

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.11. Harmonic emissions- Radiated

### 6.11.1. Requirements

FCC part 15.247(d)

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

This section makes investigation into the frequencies that are harmonics of the in band signal.

### 6.11.2. Test Setup

The EUT is controlled via the USB cable with software which is used to stop the hopping (BLE) or hop on three frequencies; low, mid and high (BT). 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. These emissions measurements were taken in horizontal and vertical antenna 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 signal loss of this notch filter is compensated for using 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 search every polarization, place, and angle possible for emissions.

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 6.11.3. Test Data, BLE

Emission Frequency (MHz)	Measured Amplitude (dBµV/m) AVG	Measured Amplitude (dBµV/m) Peak	FCC 15B				Table Azimuth (0° closest to ant)	Receiving Antenna		Notes / Mode
			Limit (dBµV/m) AVG	Limit (dBµV/m) Peak	Margin (dB) AVG	Margin (dB) Peak		Pol (H/V)	Height (Meters)	
4804.000	44.00	53.80	54.0	74.0	10.0	20.2	307	H	1.2	2nd harmonic
4880.000	42.80	53.00	54.0	74.0	11.2	21.0	318	H	1.0	
4960.000	42.90	53.60	54.0	74.0	11.1	20.4	318	H	1.0	
7206.000	34.70	48.10	54.0	74.0	19.3	25.9	0	V	1.0	3rd harmonic - noise floor
7320.000	35.50	49.30	54.0	74.0	18.5	24.7	0	V	1.0	
7440.000	42.90	53.60	54.0	74.0	11.1	20.4	0	V	1.0	
9608.000	38.90	52.40	54.0	74.0	15.1	21.6	0	V	1.0	4th harmonic - noise floor
9760.000	38.10	51.60	54.0	74.0	15.9	22.4	0	V	1.0	
9920.000	38.10	51.00	54.0	74.0	15.9	23.0	0	V	1.0	
12010.000	40.10	53.30	54.0	74.0	13.9	20.7	0	V	1.0	5th harmonic - noise floor
12200.000	40.90	54.60	54.0	74.0	13.1	19.4	0	V	1.0	
12400.000	39.10	53.00	54.0	74.0	14.9	21.0	0	V	1.0	
14412.000	40.40	53.90	54.0	74.0	13.6	20.1	0	V	1.0	6th harmonic - noise floor
14640.000	40.30	54.00	54.0	74.0	13.7	20.0	0	V	1.0	
14880.000	39.90	53.20	54.0	74.0	14.1	20.8	0	V	1.0	
16814.000	40.50	53.80	54.0	74.0	13.5	20.2	0	V	1.0	7th harmonic - noise floor
17080.000	41.80	54.70	54.0	74.0	12.2	19.3	0	V	1.0	
17360.000	44.60	58.80	54.0	74.0	9.4	15.2	0	V	1.0	
19216.000	43.50	57.20	54.0	74.0	10.5	16.8	0	V	1.0	8th harmonic - noise floor
19520.000	43.60	57.30	54.0	74.0	10.4	16.7	0	V	1.0	
19840.000	43.50	57.10	54.0	74.0	10.5	16.9	0	V	1.0	
21618.000	44.50	57.50	54.0	74.0	9.5	16.5	0	V	1.0	9th harmonic - noise floor
21960.000	44.70	58.30	54.0	74.0	9.3	15.7	0	V	1.0	
22320.000	44.50	58.60	54.0	74.0	9.5	15.4	0	V	1.0	
24020.000	44.20	58.40	54.0	74.0	9.8	15.6	0	V	1.0	10th harmonic - noise floor
24400.000	46.50	59.30	54.0	74.0	7.5	14.7	0	V	1.0	
24800.000	46.10	60.50	54.0	74.0	7.9	13.5	0	V	1.0	

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

## 6.11.4. Test Data, BT

Emission Frequency (MHz)	Measured Amplitude (dBµV/m) AVG	Measured Amplitude (dBµV/m) Peak	FCC 15B				Table Azimuth (0° closest to ant)	Receiving Antenna		Notes / Mode
			Limit (dBµV/m) AVG	Limit (dBµV/m) Peak	Margin (dB) AVG	Margin (dB) Peak		Pol (H/V)	Height (Meters)	
<b>4804.000</b>	40.50	53.80	54.0	74.0	13.5	20.2	316	H	1.0	2nd harmonic
<b>4882.000</b>	39.80	53.50	54.0	74.0	14.2	20.5	315	H	1.0	
<b>4960.000</b>	39.20	52.50	54.0	74.0	14.8	21.5	316	H	1.0	
<b>7206.000</b>	34.70	48.20	54.0	74.0	19.3	25.8	0	V	1.0	3rd harmonic - noise floor
<b>7323.000</b>	35.60	49.10	54.0	74.0	18.4	24.9	0	V	1.0	
<b>7440.000</b>	35.50	49.50	54.0	74.0	18.5	24.5	0	V	1.0	
<b>9608.000</b>	38.90	51.80	54.0	74.0	15.1	22.2	0	V	1.0	4th harmonic - noise floor
<b>9764.000</b>	38.00	51.10	54.0	74.0	16.0	22.9	0	V	1.0	
<b>9920.000</b>	38.10	51.40	54.0	74.0	15.9	22.6	0	V	1.0	
<b>12010.000</b>	40.20	53.40	54.0	74.0	13.8	20.6	0	V	1.0	5th harmonic - noise floor
<b>12205.000</b>	40.70	53.90	54.0	74.0	13.3	20.1	0	V	1.0	
<b>12400.000</b>	39.10	52.60	54.0	74.0	14.9	21.4	0	V	1.0	
<b>14412.000</b>	40.40	54.00	54.0	74.0	13.6	20.0	0	V	1.0	6th harmonic - noise floor
<b>14646.000</b>	40.40	53.80	54.0	74.0	13.6	20.2	0	V	1.0	
<b>14880.000</b>	39.90	53.90	54.0	74.0	14.1	20.1	0	V	1.0	
<b>16814.000</b>	40.50	53.70	54.0	74.0	13.5	20.3	0	V	1.0	7th harmonic - noise floor
<b>17087.000</b>	41.60	55.30	54.0	74.0	12.4	18.7	0	V	1.0	
<b>17360.000</b>	44.60	58.40	54.0	74.0	9.4	15.6	0	V	1.0	
<b>19216.000</b>	43.50	57.40	54.0	74.0	10.5	16.6	0	V	1.0	8th harmonic - noise floor
<b>19528.000</b>	43.40	57.20	54.0	74.0	10.6	16.8	0	V	1.0	
<b>19840.000</b>	43.80	57.40	54.0	74.0	10.2	16.6	0	V	1.0	
<b>21618.000</b>	44.80	57.40	54.0	74.0	9.2	16.6	0	V	1.0	9th harmonic - noise floor
<b>21969.000</b>	45.20	58.20	54.0	74.0	8.8	15.8	0	V	1.0	
<b>22320.000</b>	44.50	58.30	54.0	74.0	9.5	15.7	0	V	1.0	
<b>24020.000</b>	44.40	58.40	54.0	74.0	9.6	15.6	0	V	1.0	10th harmonic - noise floor
<b>24410.000</b>	46.30	59.30	54.0	74.0	7.7	14.7	0	V	1.0	
<b>24800.000</b>	46.40	60.50	54.0	74.0	7.6	13.5	0	V	1.0	

## 6.11.5. Test conclusion:

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

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# Wireless Transceiver Test Report

FCC ID: A94TR1



Certificate # 1514.1

### 6.11.6. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
EMI Test Receiver	Rohde & Schwarz	ESU40	TN1663	4/6/2016	4/6/2017
Double Ridge Waveguide Horn Antenna 1-18GHz	ETS Lindgren	3117	TN2348	11/18/2015	11/18/2016
Comb Generator	Com-Power	CGO-5100	TN1620	Verify	Verify
Pre-Amp 100 MHz to 20 GHz	Miteq	AFS4-00102000-30-10P-4	TN2261	1/8/2016	1/8/2017
Band Reject Filter	Band Reject Filter	BRM50702-07	TN2342	3/29/2016	3/29/2017
Cable set			TN2357	1/8/2016	1/8/2017
Horn Antenna 18GHz - 26.5GHz	EMCO	3160-09	TN1307	3/13/2014	3/13/2017
Amplifier	Miteq	TTA1840	TN2397	Verify	
Cable			TN2369	1/8/2016	1/8/2017
Cable			TN2373	1/8/2016	1/8/2017
Cable			TN2478	1/8/2016	1/8/2017
Shielded Room		Marconi Manor	TN2385	4/11/2016	4/11/2017
Pre-amplifier			TN2602	4/11/2016	4/11/2017

### 6.11.7. Test information

<b>Date of test:</b>	10/3/2016	<b>Test Location:</b>	Marconi Manor
<b>EUT serial:</b>	SN004	<b>Tested by:</b>	Nate Sanford
<b>Test Conclusion:</b>	Pass		

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