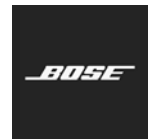




PRODUCT ASSURANCE ENGINEERING  
Wireless Transceiver DTS Test Report



FCC ID: A94BMD0011 IC: 3232A-BMD0011

Test Type: Emissions  Immunity

Product Type: Wireless Headphones

Product Name/Number: *Model Number(s): BMD0011*  
*FCC ID: A94BMD0011*  
*IC: 3232A-BMD0011*

Prepared For: *Product Assurance Engineering Department,*  
*Bose Corporation*

Test Results: Pass  Fail

Applicable Standards: FCC CFR 47 PART 15 SUBPART C  
Industry Canada RSS-247 Issue 2  
Industry Canada RSS-GEN Issue 5

Report Number: *EMC.433948.20.174.2*

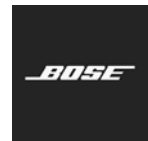
General Comments/Special Test Conditions:

This report relates only to the items tested. This report covers EMC marking requirements for model BMD0011

	Print Name	Signature	Date
Prepared By:	Karl Klemm		6/26/2020
Electrical Engineer Review* By:	Bryan Cerqua		6/24/2020

\* Since every test result is separately reviewed after its completion, the electrical engineer review indicated above represents a higher level review to ensure this report lists and contains all applicable and appropriate requirements.

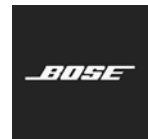
If the report carries the "accredited" logo, the reviewer must verify all the tests in this report are covered under the current ISO17025 accreditation. The A2LA-accredited logo must be removed if any of the tests in the report are not performed under the current scope of accreditation. It is the responsibility of the reviewer to ensure the A2LA advertising policy is followed.



## Table of Contents

### Tests Performed (Table of Contents):

Test Report Summary .....	3
6dB Bandwidth .....	5
99% Bandwidth.....	10
Conducted Output Power .....	15
Power Spectral Density .....	20
Conducted Spurious Emissions .....	24



# Test Report Summary

Product Information:

Description

*The EUT is a wireless headphone that contains DSS/DTS transceivers, manufactured by Qualcomm Technologies, QCC5127. The EUT uses Adaptive Frequency Hopping (AFH) mode, using a reduced hop set if interference is detected in band, however a minimum of 20 channels is always maintained.*

*There are two frame styles (Soprano and Tenor) which use identical electronics and are differentiated only by cosmetic differences in the enclosure. The differences in the enclosures have no impact on the transmitter function or characteristics. The Soprano frame style was used for testing.*

Setup (Cables and Accessories)

*For radio tests the radio was configured with Qualcomm Blue Suite software (details provided in SOFTWARE AND FIRMWARE section).*

EUT Antenna Description

*The antenna is an internal PIF variant with antenna gain of 2.8 dBi formed by printed circuit board etch.*

SOFTWARE AND FIRMWARE

*The firmware installed in the EUT during testing was version 0.3.103  
The test utility software used during testing was Polycomm, version 2.6.0 and Blue Suite version 3.2.3.*

Scope:

*This report covers EMC requirements. FCC CFR 47 PART 15 SUBPART C, Industry Canada RSS-247 Issue 2, and Industry Canada RSS-GEN Issue 5.*

*All measurements in this report were made with a direct connection to the antenna terminal, with the antenna disconnected.*

Test Objective:

*Verify product meets all applicable EMC requirements.*

Results:

*Product complies with all applicable EMC requirements. All final results represent worst-case emissions and/or immunity.*


Conclusions:

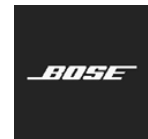
The device under test (D.U.T.):

meets all test standards selected in section 2 of this report.

does not meet all test standards selected in section 2 of this report.

Affirmation of Test Results:

	Print Name	Signature	Date
Testing Engineer/Technician	Karl Klemm		6/26/2020



# Test Standards

## Emissions:

- Standard
- FCC Part 15C
- Canada RSS-247
- Canada RSS-GEN

# Environmental Conditions

## Ambient:

- Temperature: 22±4°C
- Humidity: 30-60%RH
- Mains Voltage:  5 Vdc

# FCC Test Site Accreditation.

<u>Firm Name</u>	<u>Location</u>	<u>Accreditation</u>	<u>MRA Designation Number</u>	<u>Expiration Date</u>	<u>Contact</u>	<u>Contact Title</u>
<a href="#">Bose Corporation</a>	1 New York Avenue, Framingham, MA	American Association for Laboratory Accreditation	N/A US1088	09/30/2020	Carole Park	Quality Manager

# Canadian Test Site Registration.

Organization	CAB identifier	Scope / Recognition Date (yyyy-mm-dd)	Expiration (yyyy-mm-dd)
BOSE CORPORATION  1 New York Avenue Framingham, MA 01701 UNITED STATES  Website: <a href="https://www.bose.com/en_us/index.html">https://www.bose.com/en_us/index.html</a>  <b>ISED#: 3232A</b>  Contact: Benjamin Cerretani <a href="mailto:benjamin_cerretani@bose.com">benjamin_cerretani@bose.com</a>	US0210	RSS-GEN (2019-02-11)  RSS-210 (2019-02-11) RSS-247 (2019-02-11)	<b>RECOGNIZED UNTIL: 2020-07-31</b>  A2LA ISO/IEC 17025:2005 Expires: 2020-07-31



# 6dB Bandwidth Requirement:

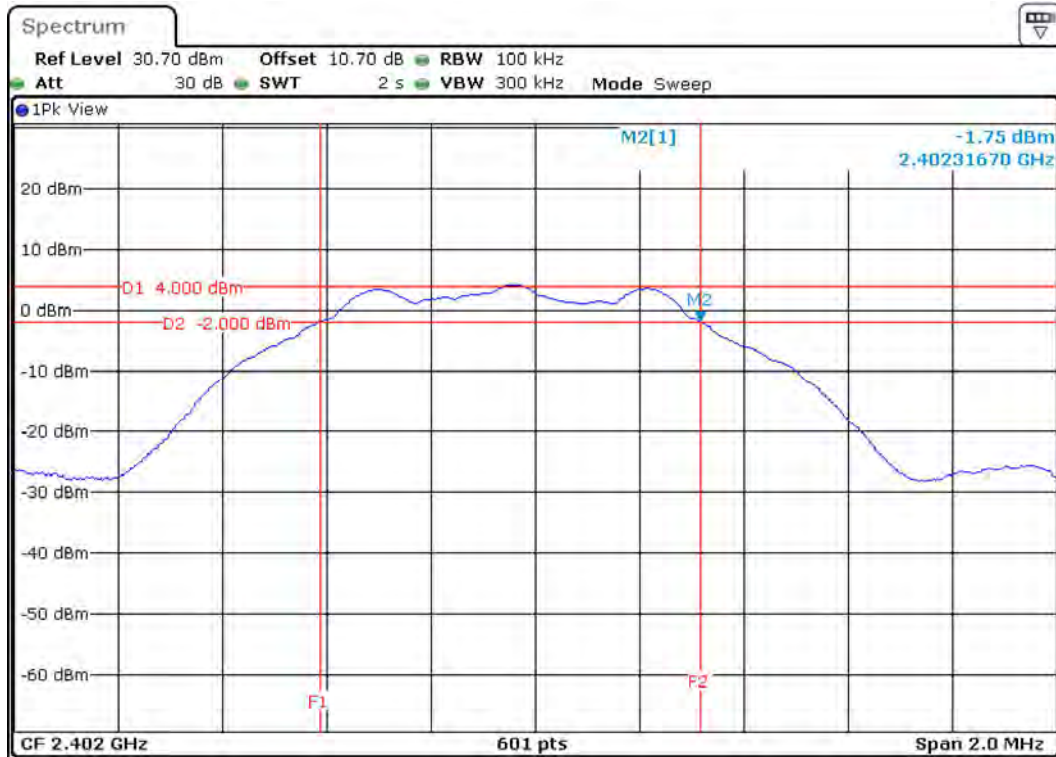
FCC 15.247(a)(2); IC RSS-247 5.2 (1)  
The minimum 6 dB bandwidth shall be at least 500 kHz.

## Test Procedure:

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1-5% of the 99% Occupied Bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

# Test Results:

DTS Bandwidth Summary Table (BLE 1M)						
Channel	Frequency (MHz)	Mode	DTS BW (kHz)	Limit (kHz)	Margin (kHz)	Result
Low	2402	BLE 1M	730.0	500	-230.0	Pass
Middle	2440	BLE 1M	730.0	500	-230.0	Pass
High	2480	BLE 1M	730.0	500	-230.0	Pass



BLE 1M on 2402 MHz



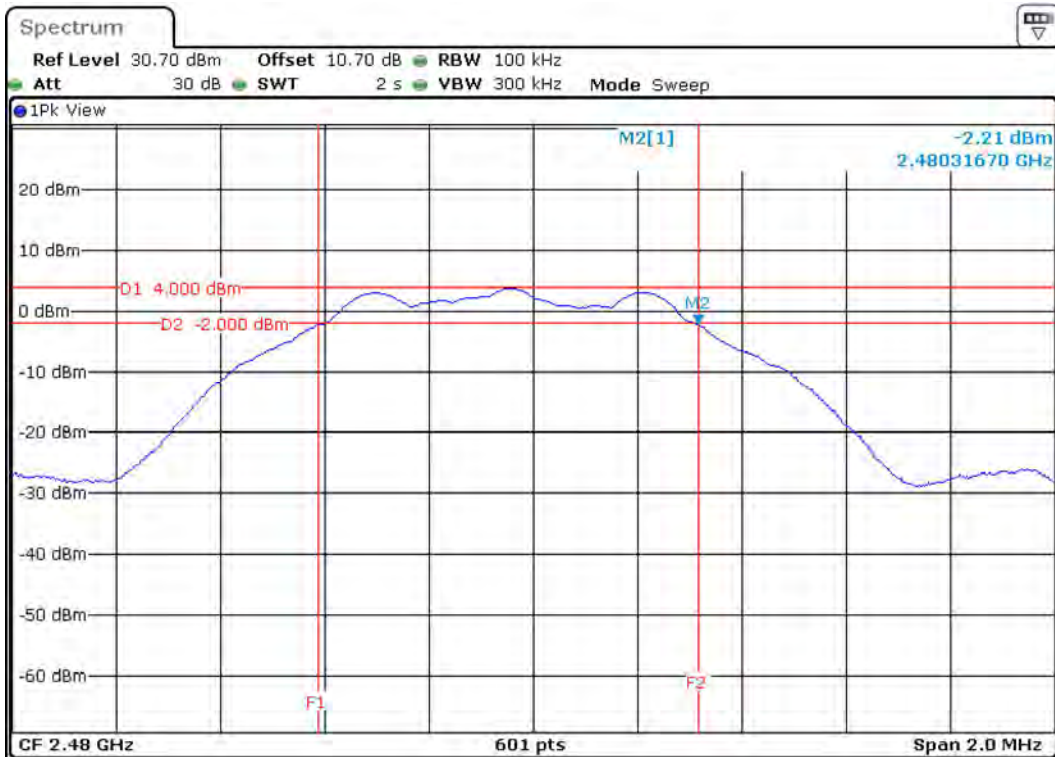
Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011

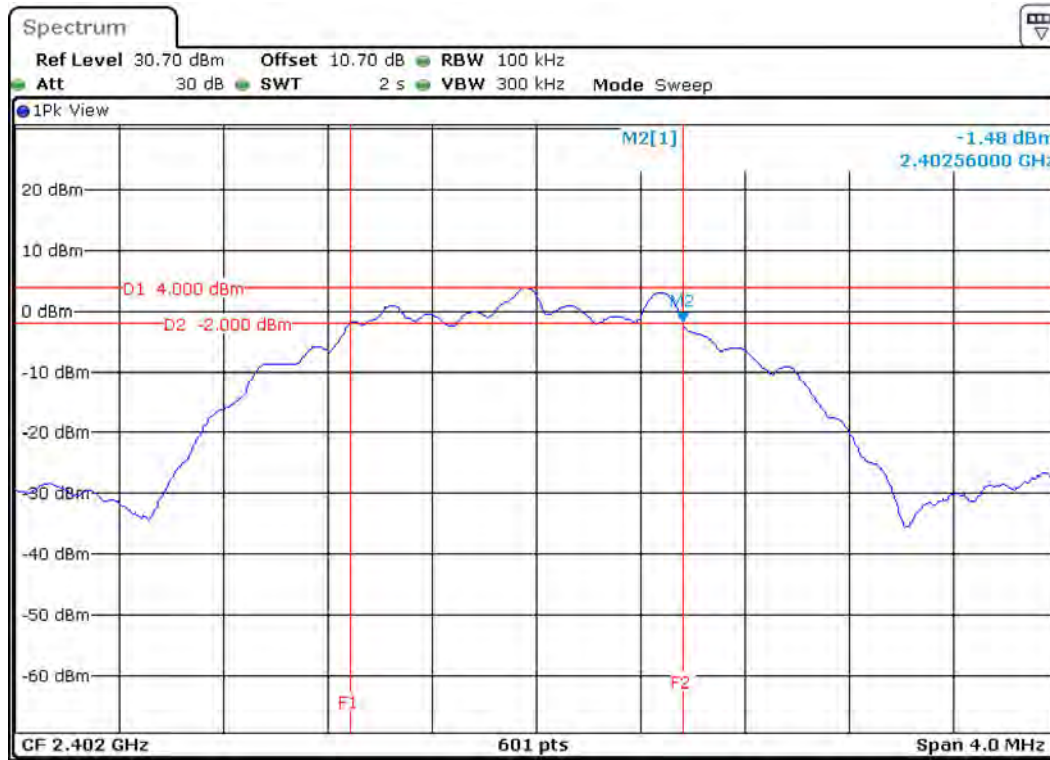


BLE 1M on 2440 MHz



BLE 1M on 2480 MHz

DTS Bandwidth Summary Table (BLE 2M)						
Channel	Frequency (MHz)	Mode	DTS BW (kHz)	Limit (kHz)	Margin (kHz)	Result
Low	2402	LE 2M	1273.3	500	-773.3	Pass
Middle	2440	LE 2M	1273.3	500	-773.3	Pass
High	2480	LE 2M	1266.7	500	-766.7	Pass



BLE 2M on 2402 MHz

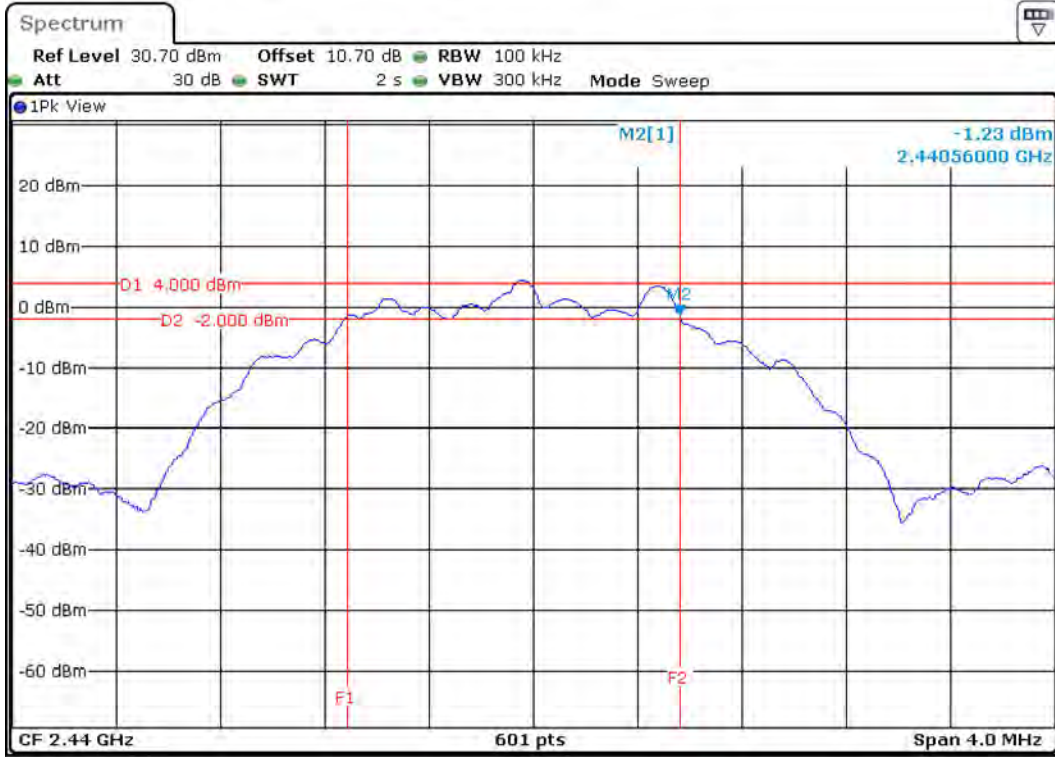




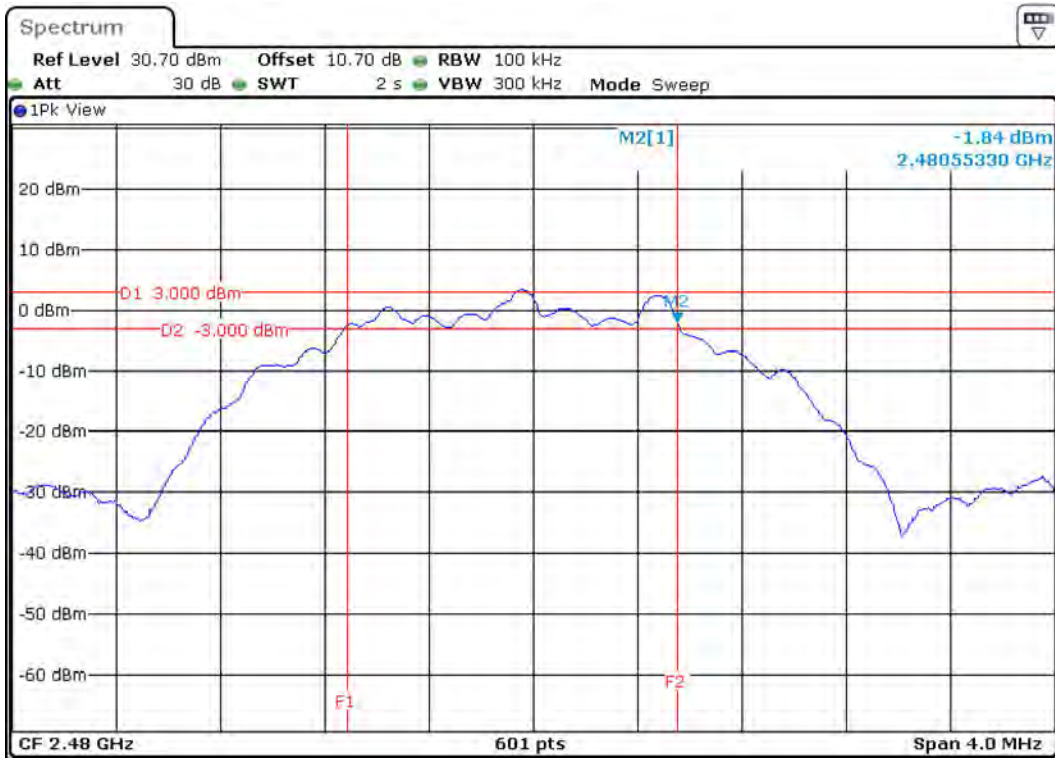
Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011



BLE 2M on 2440 MHz



BLE 2M on 2480 MHz



# 99% Bandwidth Requirement:

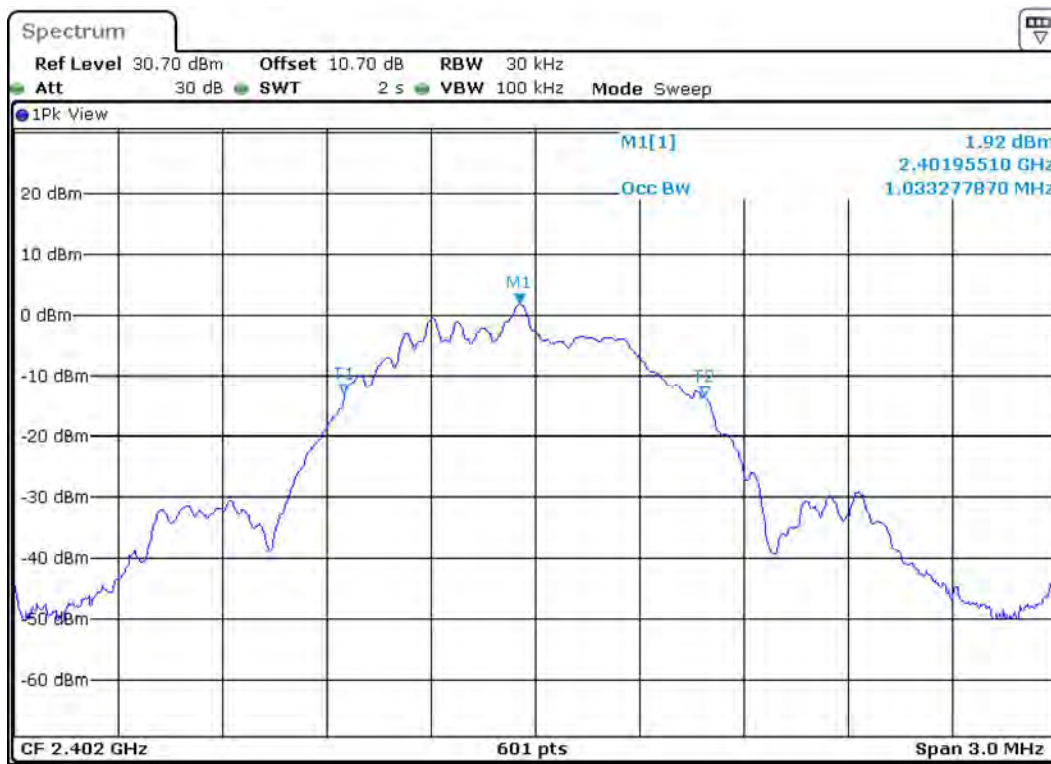
None; for reporting purposes, only. Test per FCC 15.247(a)(1); IC RSS-247 5.1 (1), RSS-Gen 6.6.

## Test Procedure:

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1-5% of the 99% Occupied Bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

# Test Results:

99% Bandwidth Summary Table (BLE 1M)			
Channel	Frequency (MHz)	Mode	99% Bandwidth (kHz)
Low	2402	BLE 1M	1033.3
Middle	2440	BLE 1M	1033.3
High	2480	BLE 1M	1038.3



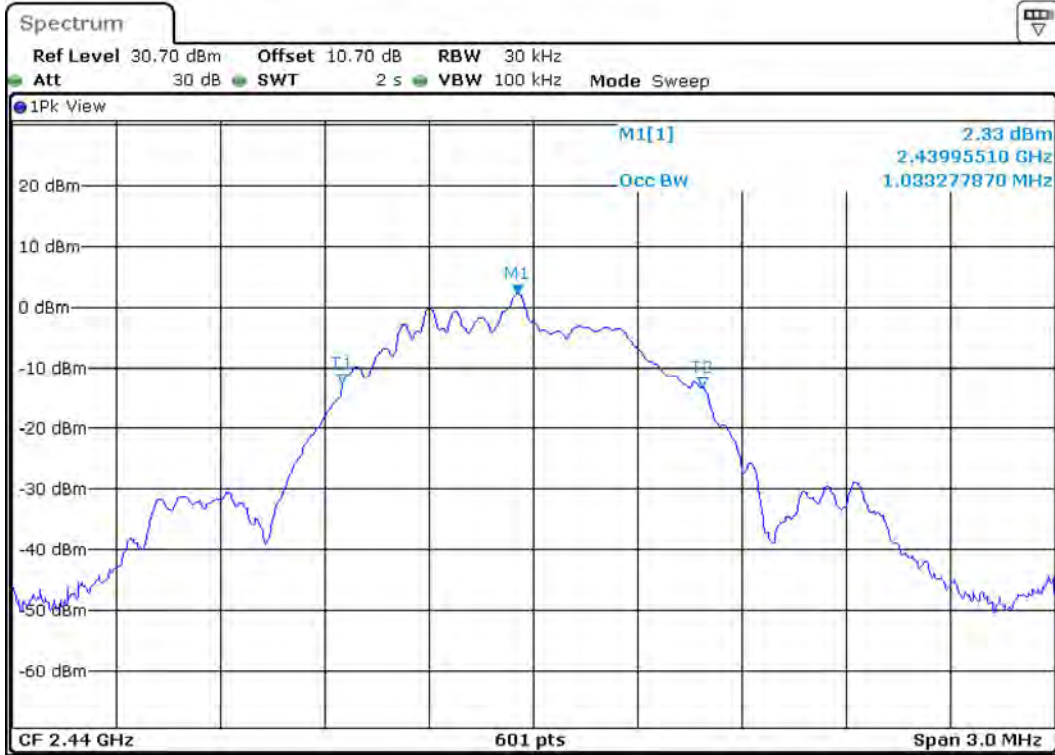
BLE 1M on 2402 MHz



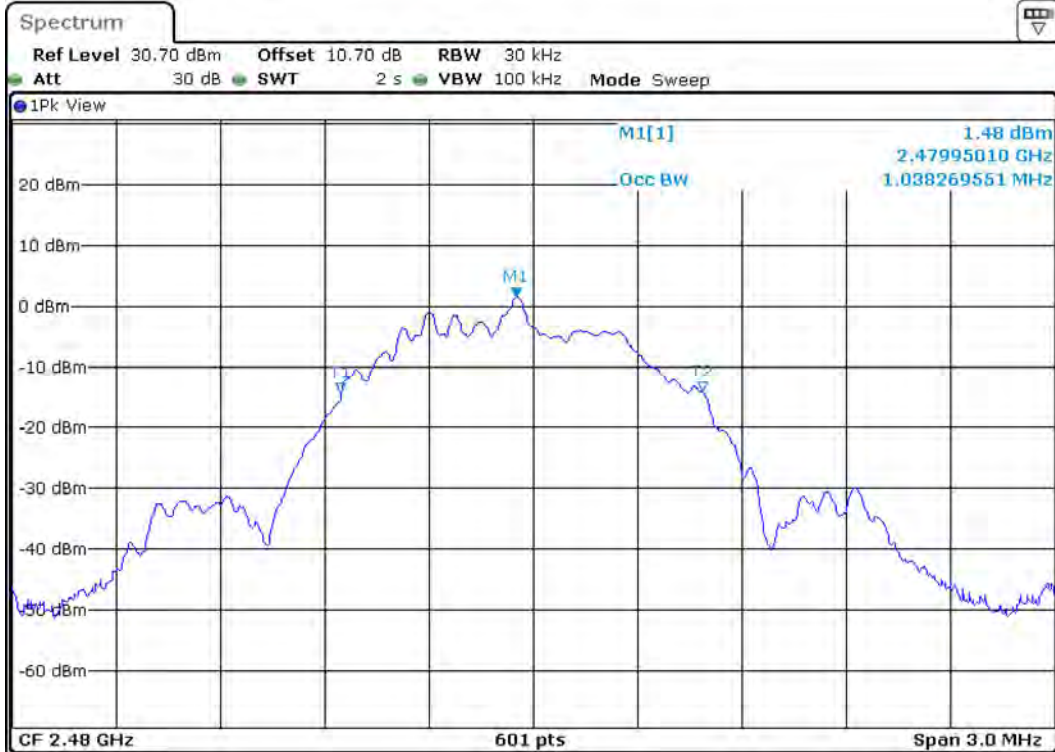
Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011



BLE 1M on 2440 MHz



BLE 1M on 2480 MHz

99% OBW Summary Table (BLE 2M)			
Channel	Frequency (MHz)	Mode	99% OBW (MHz)
Low	2402	LE 2M	2.090
Middle	2442	LE 2M	2.083
High	2480	LE 2M	2.090



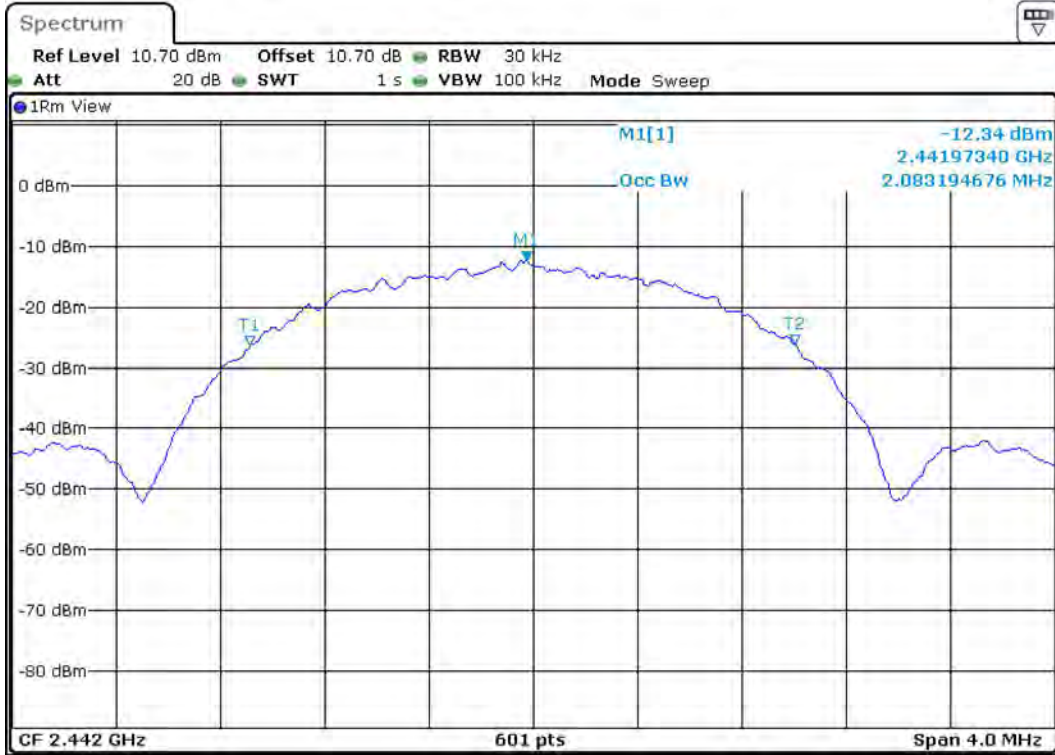
BLE 2M on 2402 MHz



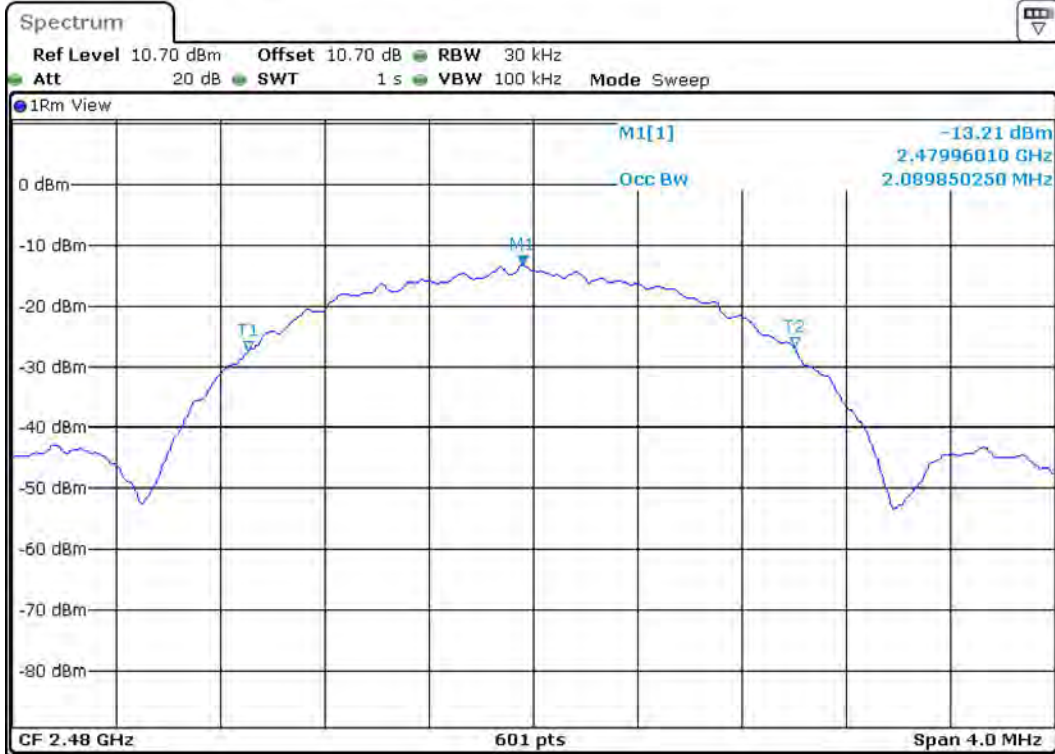
Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011



BLE 2M on 2440 MHz



BLE 2M on 2480 MHz



# Conducted Output Power Requirements:

## FCC 15.247 (b) (3)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## RSS-247 5.4 (4)

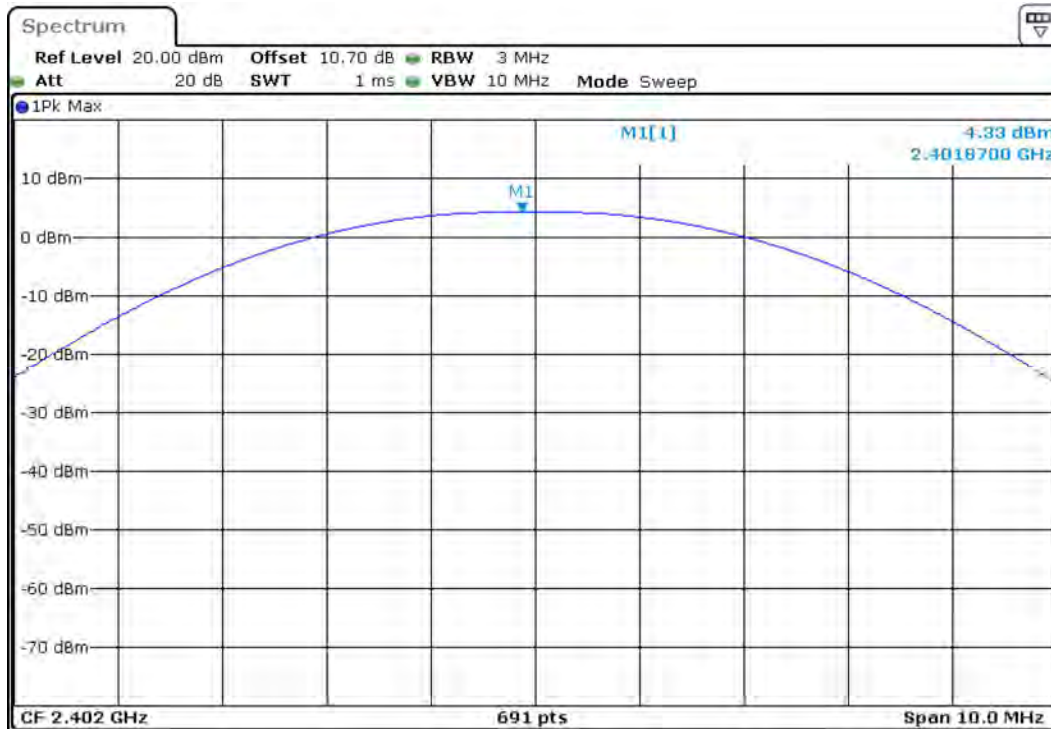
For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

## Test setup details:

The EUT is controlled via the USB port with Blue Suite software which is used to set the test modes of the Bluetooth device. The EUT antenna is disconnected. A temporary test connector is mounted to the PCB. An 8 inch SMA adapter cable with 0.7 dB loss and a 10 dB pad were used for all conducted measurements. To compensate for the cable loss and pad attenuation, the reference level offset feature of the spectrum analyzer was used. The EUT is programmed to operate on fixed frequencies at the low, middle, and high end of the authorized frequency band. The spectrum analyzer resolution bandwidth is set to 3 MHz (higher than the occupied bandwidth), peak detector and max hold. The maximum output power is recorded for each of the three frequencies.

# Test Results:

Output Power Summary Table (BLE 1M)						
Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	4.30	0	30	25.70	Pass
Middle	2440	5.00	0	30	25.00	Pass
High	2480	3.90	0	30	26.10	Pass



BLE 1M on 2402 MHz

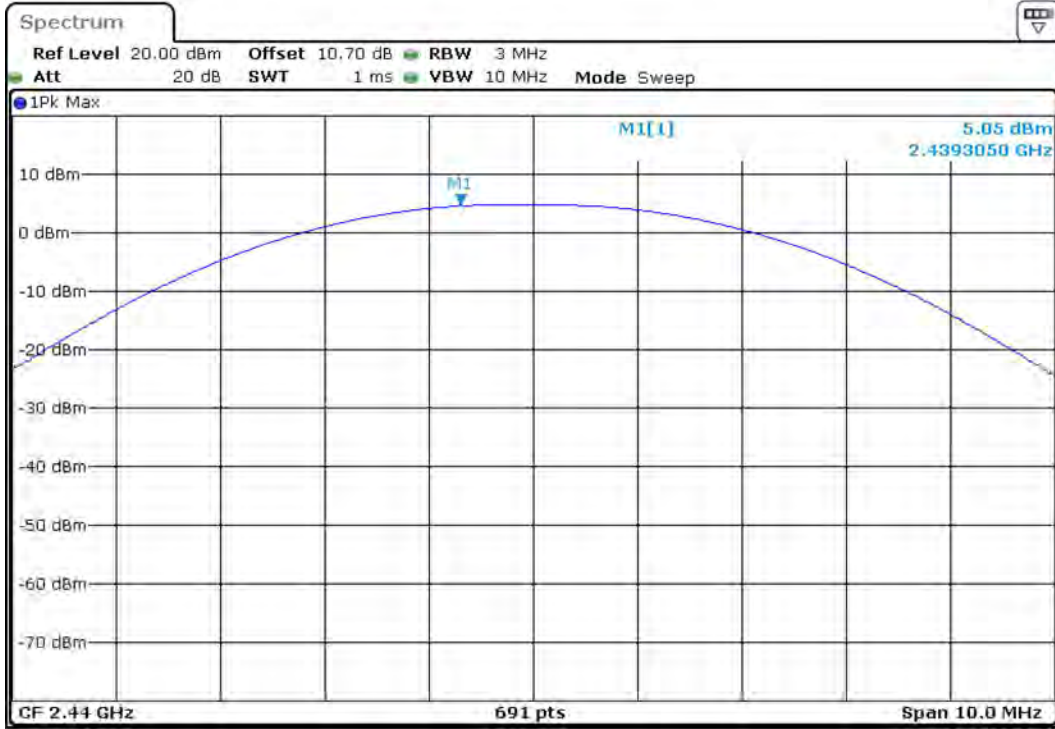




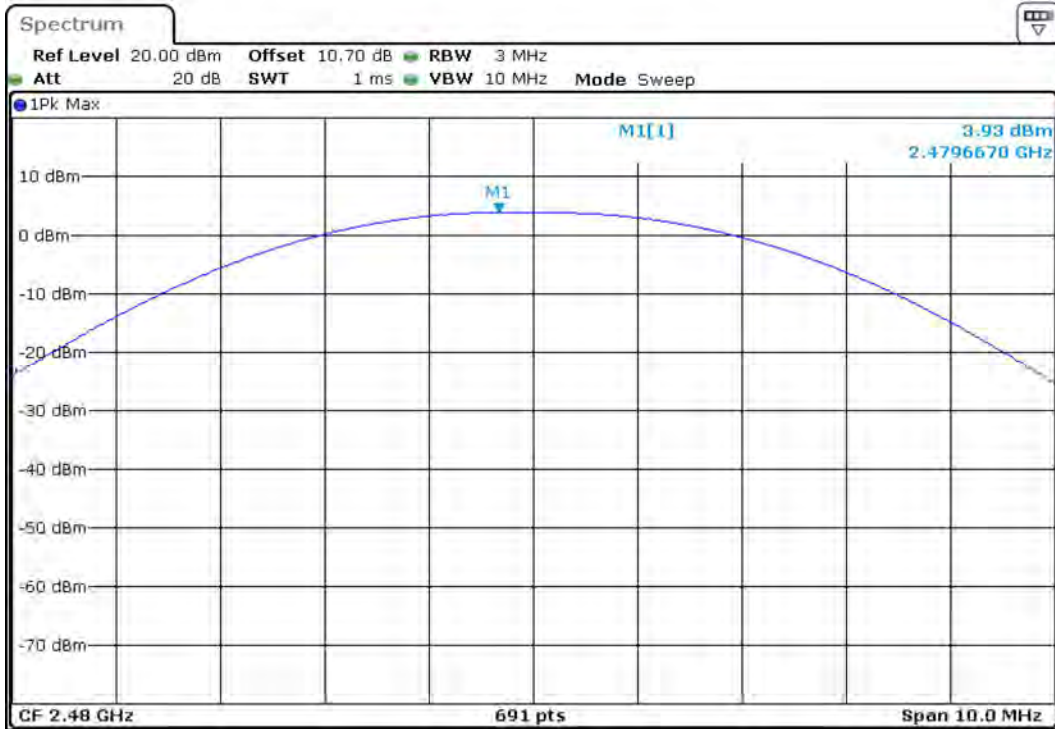
Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011

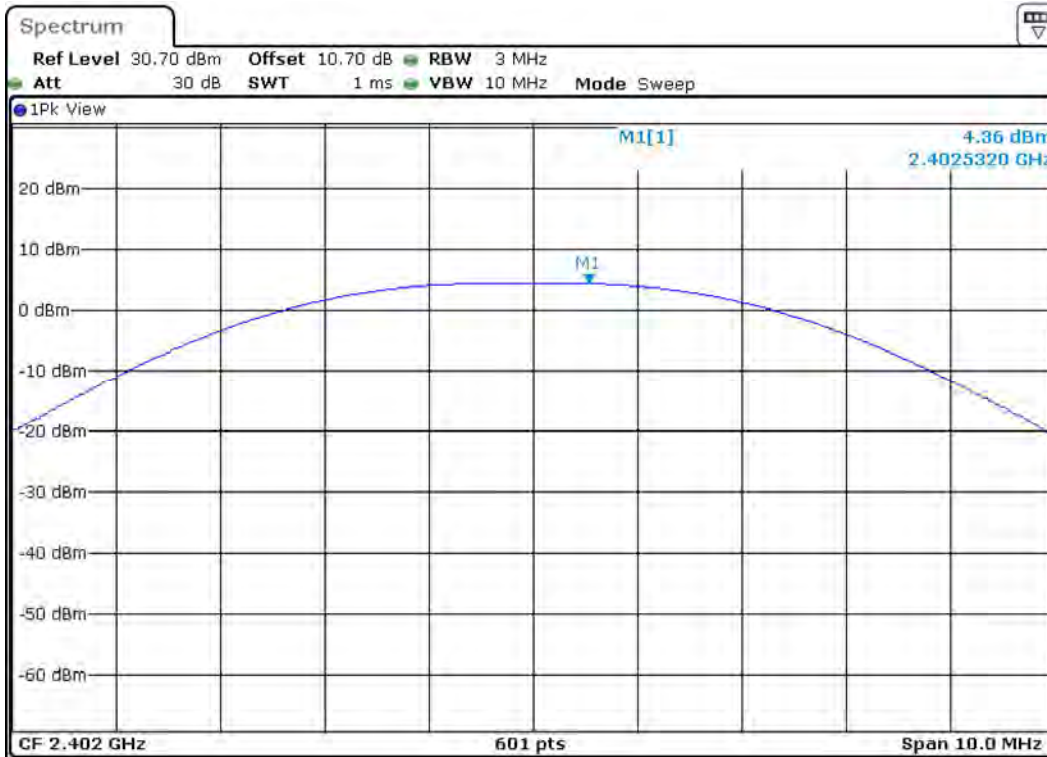


BLE 1M on 2440 MHz



BLE 1M on 2480 MHz

Output Power Summary Table (BLE 2M)						
Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	4.36	0	30	25.64	Pass
Middle	2440	4.78	0	30	25.22	Pass
High	2480	3.90	0	30	26.10	Pass



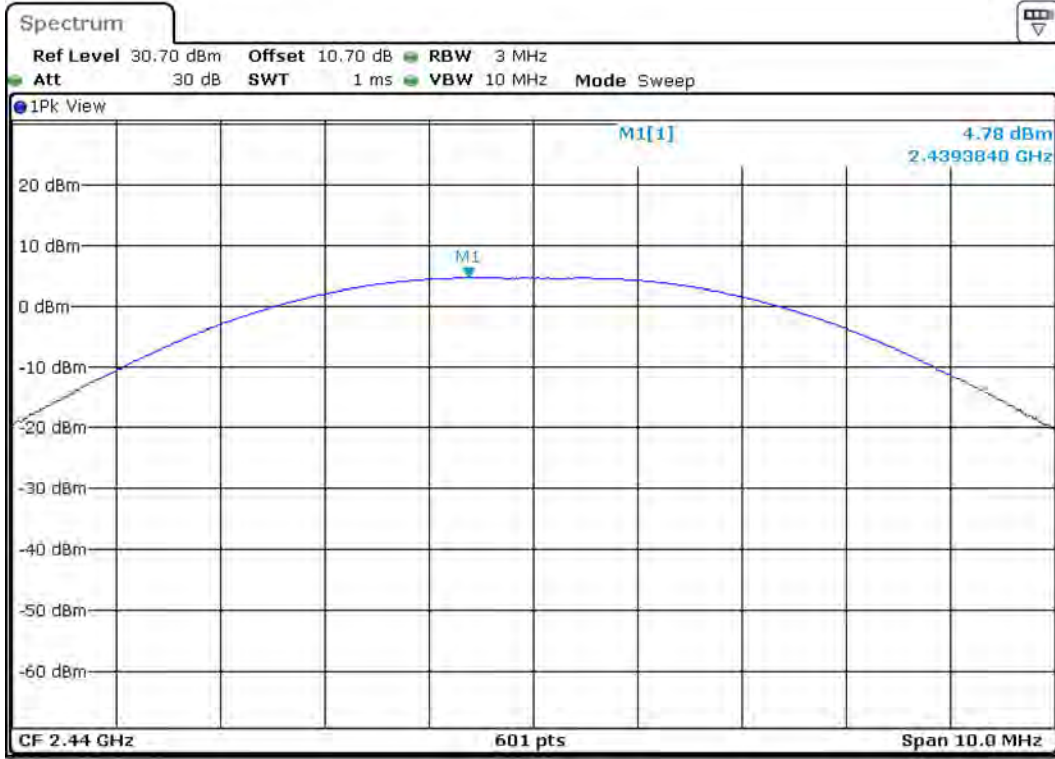
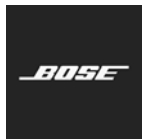
BLE 2M on 2402 MHz



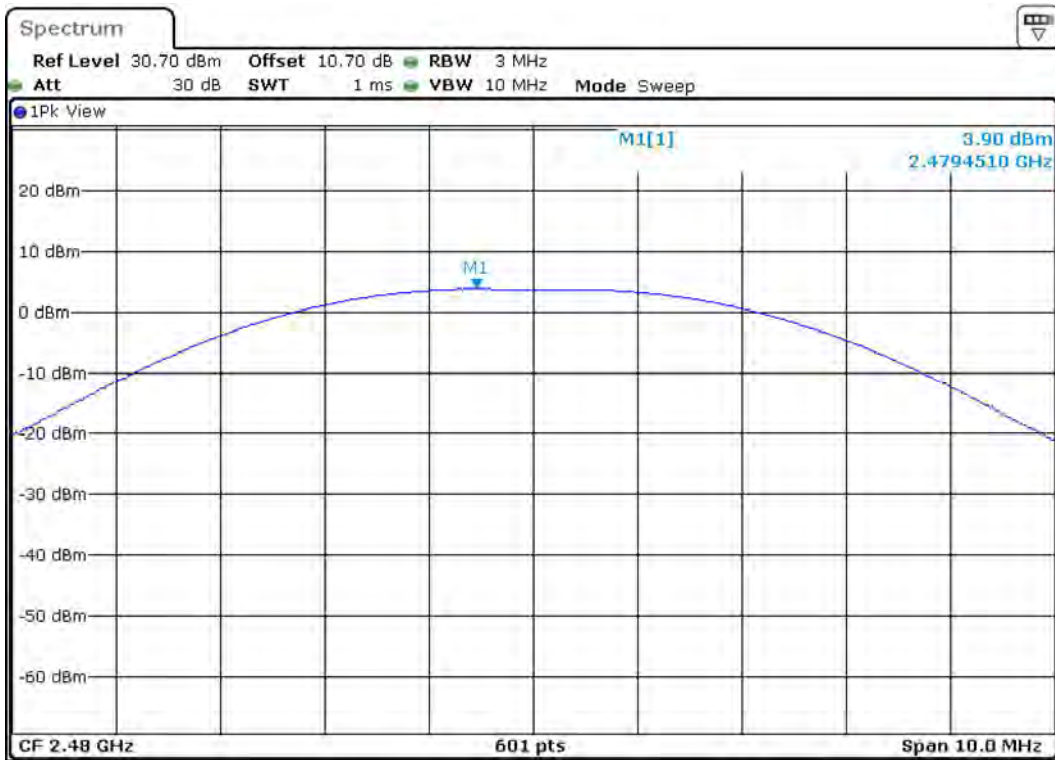
Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011



BLE 2M on 2440 MHz



BLE 2M on 2480 MHz

# Power Spectral Density

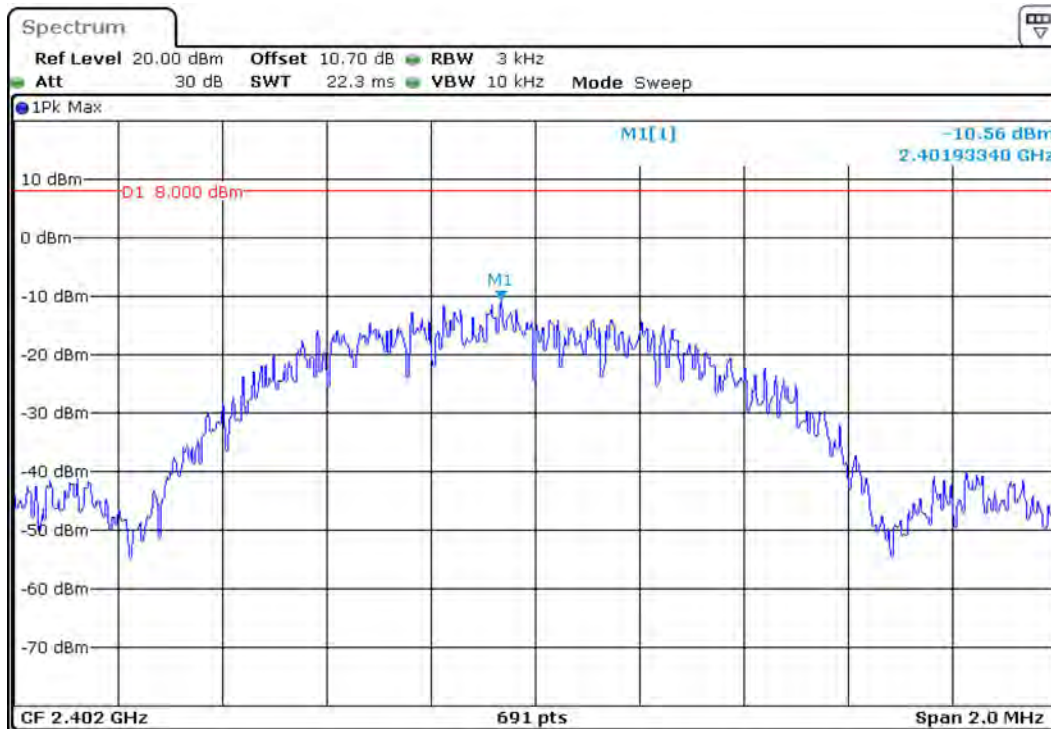
## Requirements:

FCC 15.247 (e) and IC RSS-247 5.2 (2)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

## Test Results:

Power Spectral Density Summary Table (BLE 1M)					
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)	Result
Low	2402	-10.60	8	18.60	Pass
Middle	2440	-10.10	8	18.10	Pass
High	2480	-11.00	8	19.00	Pass



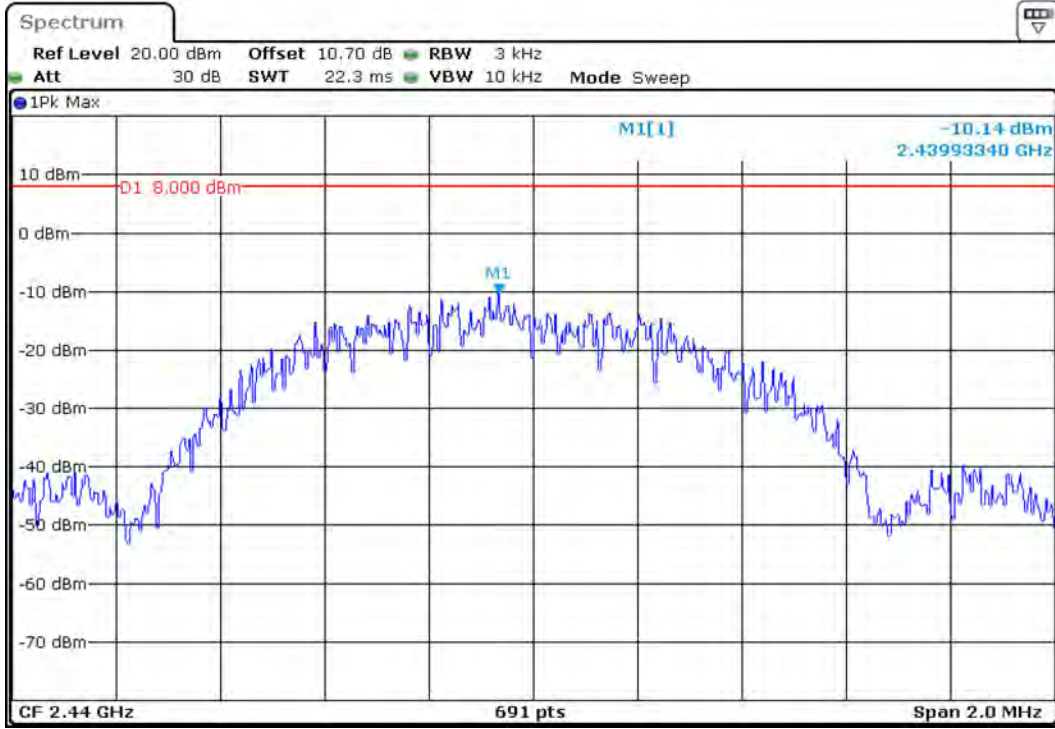
BLE 1M on 2402 MHz



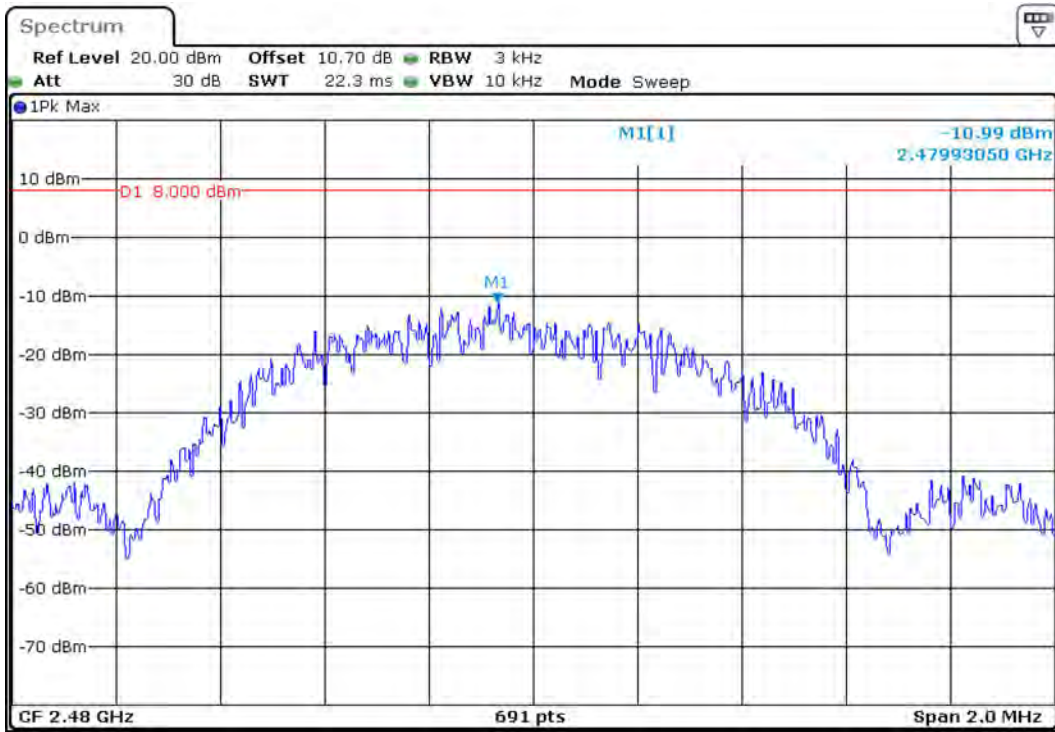
Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011

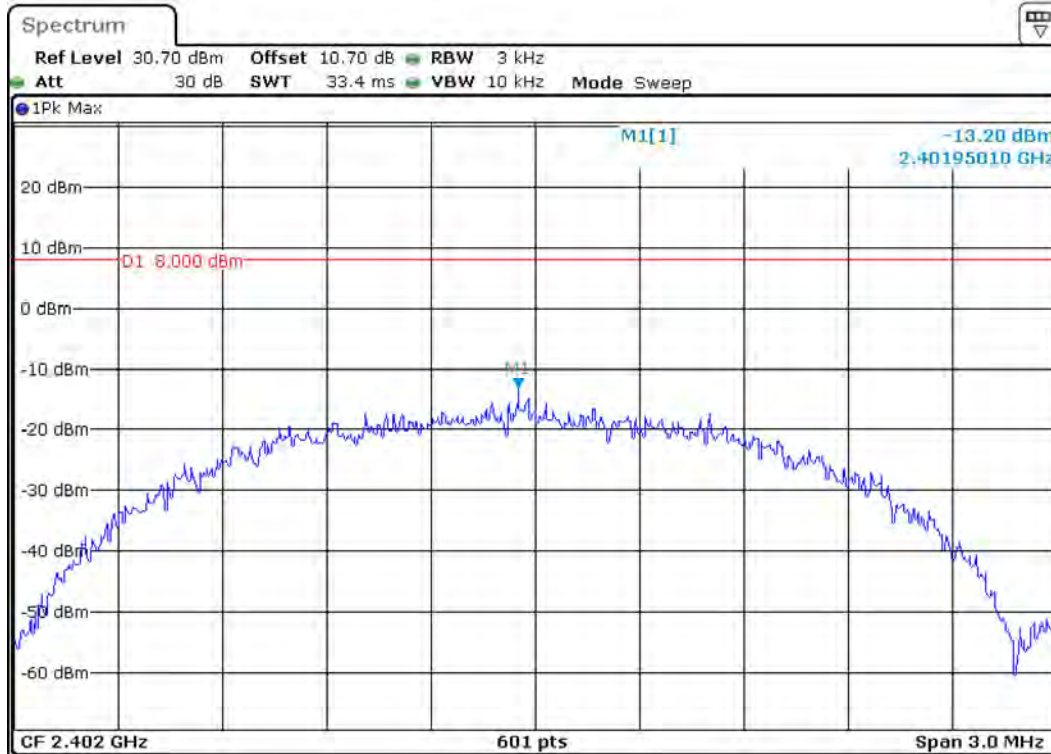


BLE 1M on 2440 MHz



BLE 1M on 2480 MHz

Power Spectral Density Summary Table (BLE 2M)					
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)	Result
Low	2402	-13.65	8	21.65	Pass
Middle	2440	-12.60	8	20.60	Pass
High	2480	-13.50	8	21.50	Pass



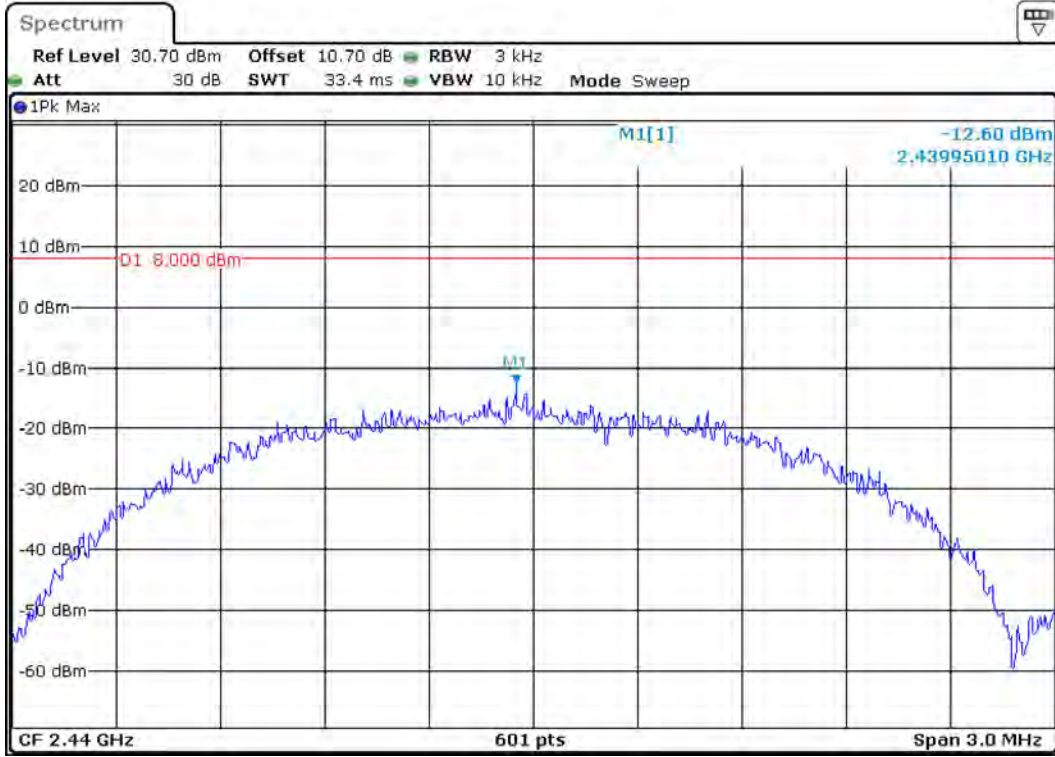
BLE 2M on 2402 MHz



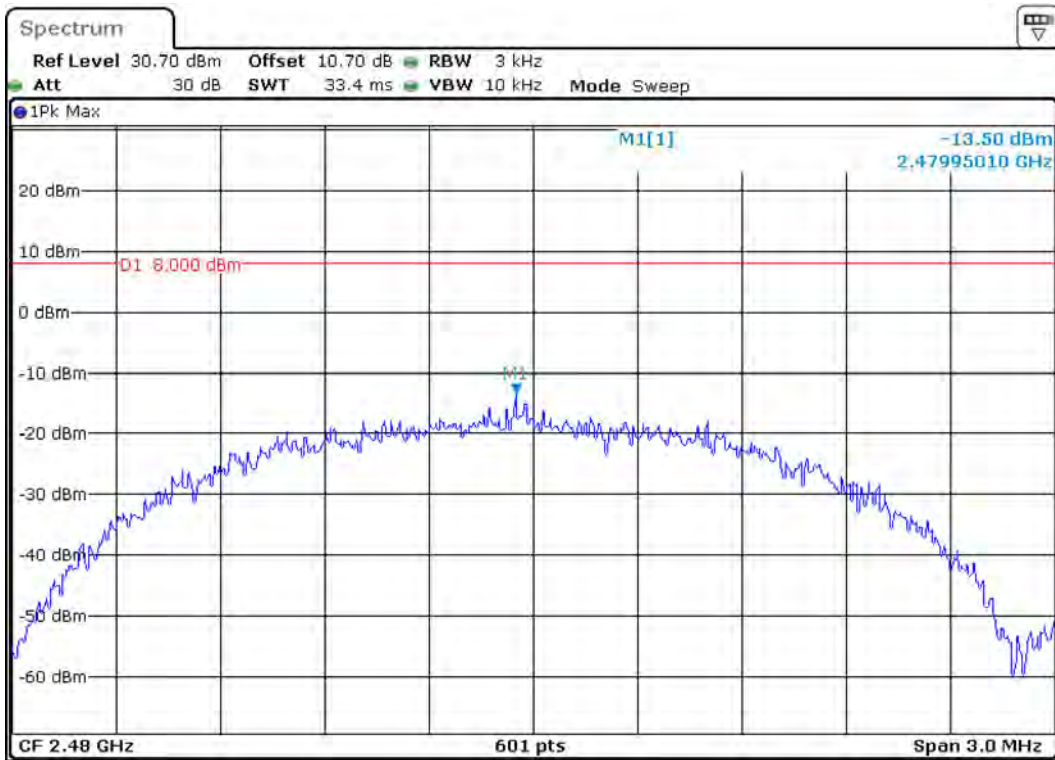
Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011



BLE 2M on 2440 MHz



BLE 2M on 2480 MHz



# Conducted Spurious Emissions

## Requirements:

### FCC 15.247 (d)

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

### IC RSS-247 5.5

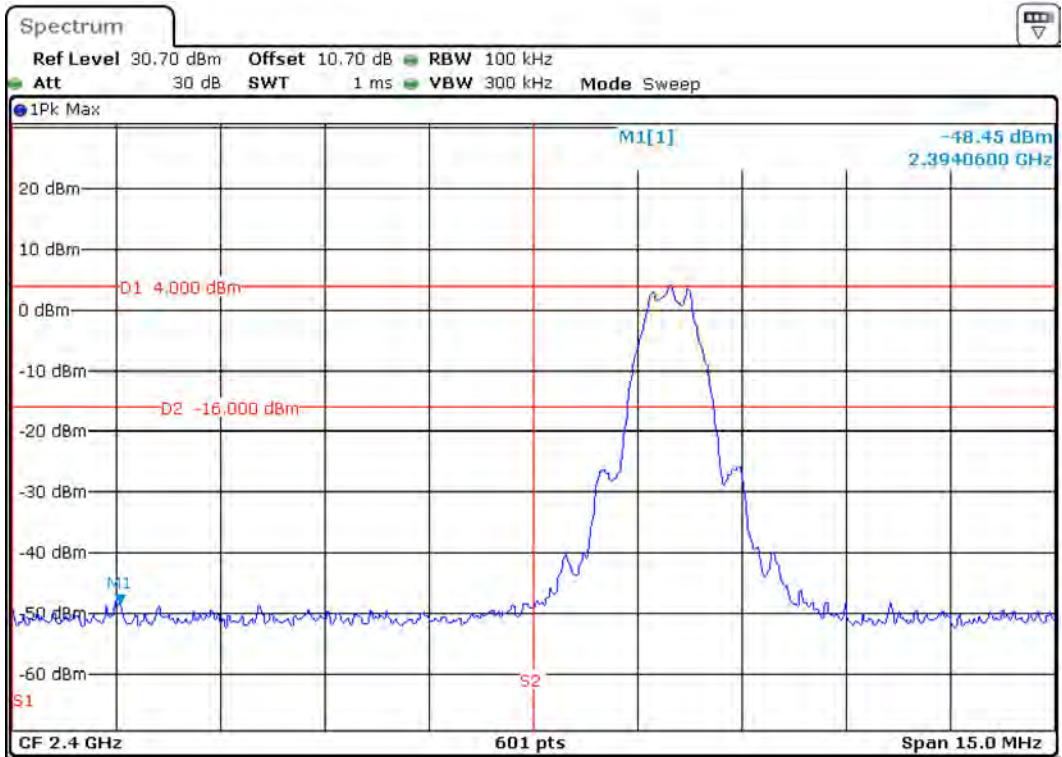
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Note: Antenna gain outside of the wanted band was assumed to be zero. The conducted spurious readings are for additional information as the radiated readings take precedence.



# Spurious Band-edge Emissions

Lower Band Edge (BLE)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Low	2402	BLE 1M	52.45	20	32.45	Pass
Low	2402	LE 2M	33.27	20	13.27	Pass



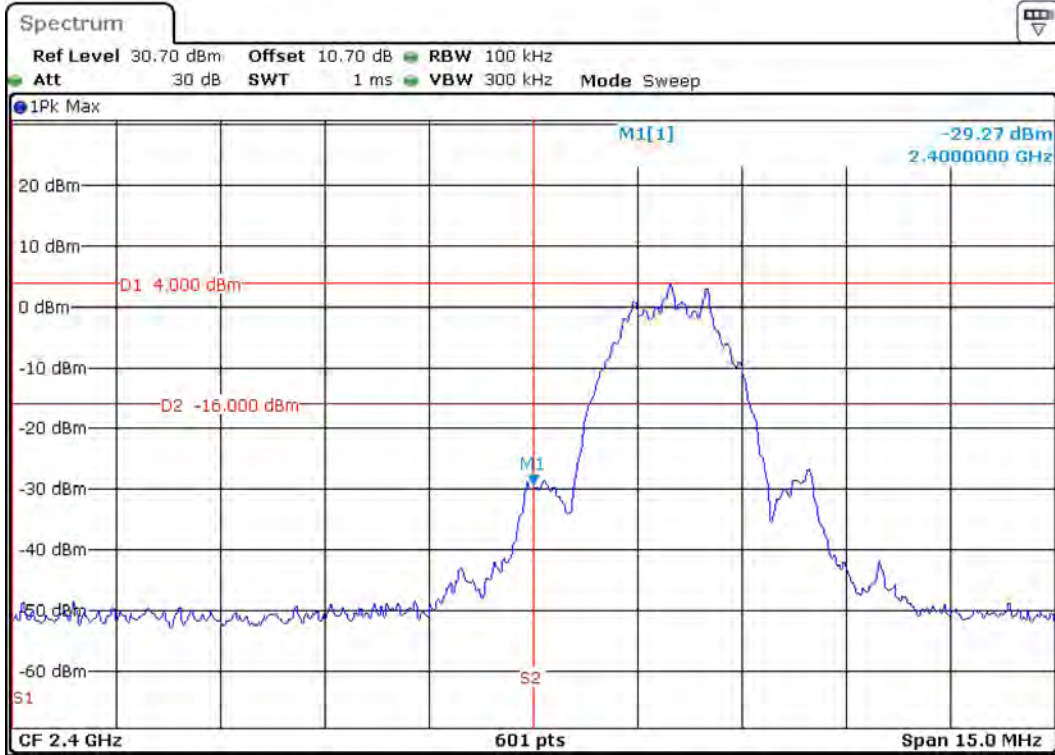
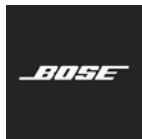
BLE 1M on 2402 MHz



Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011



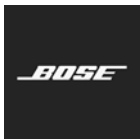
BLE 2M on 2402 MHz



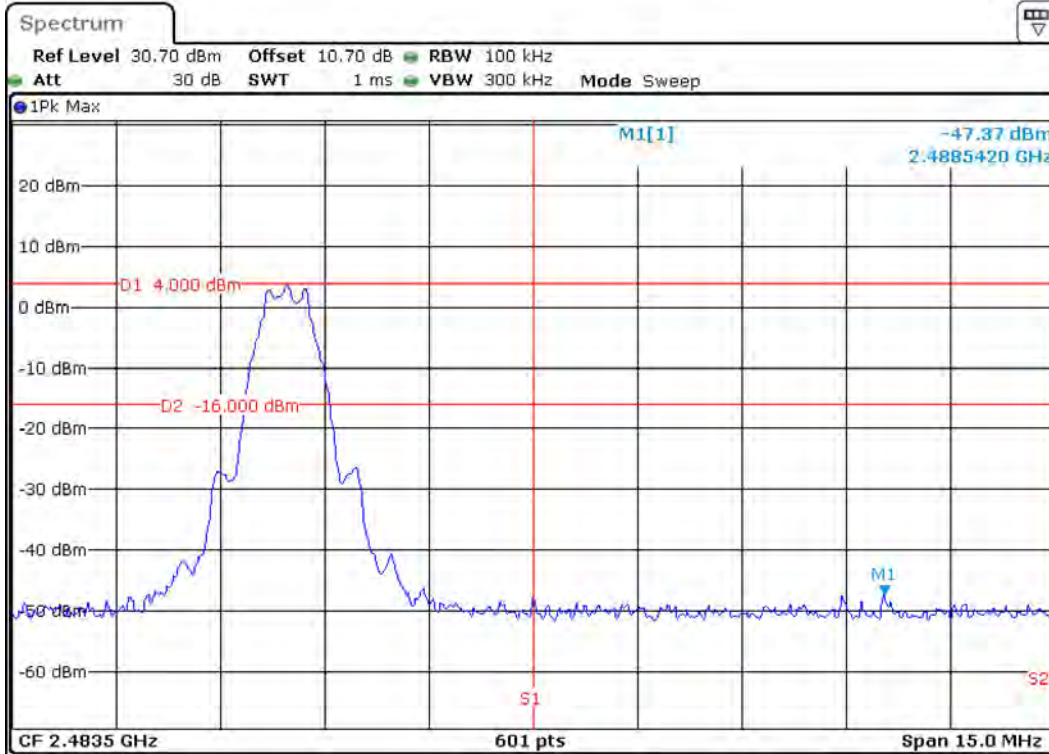
Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011



Upper Band Edge (BLE) (Peak Detector)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
High	2480	BLE 1M	51.37	20	31.37	Pass
High	2480	LE 2M	51.58	20	31.58	Pass



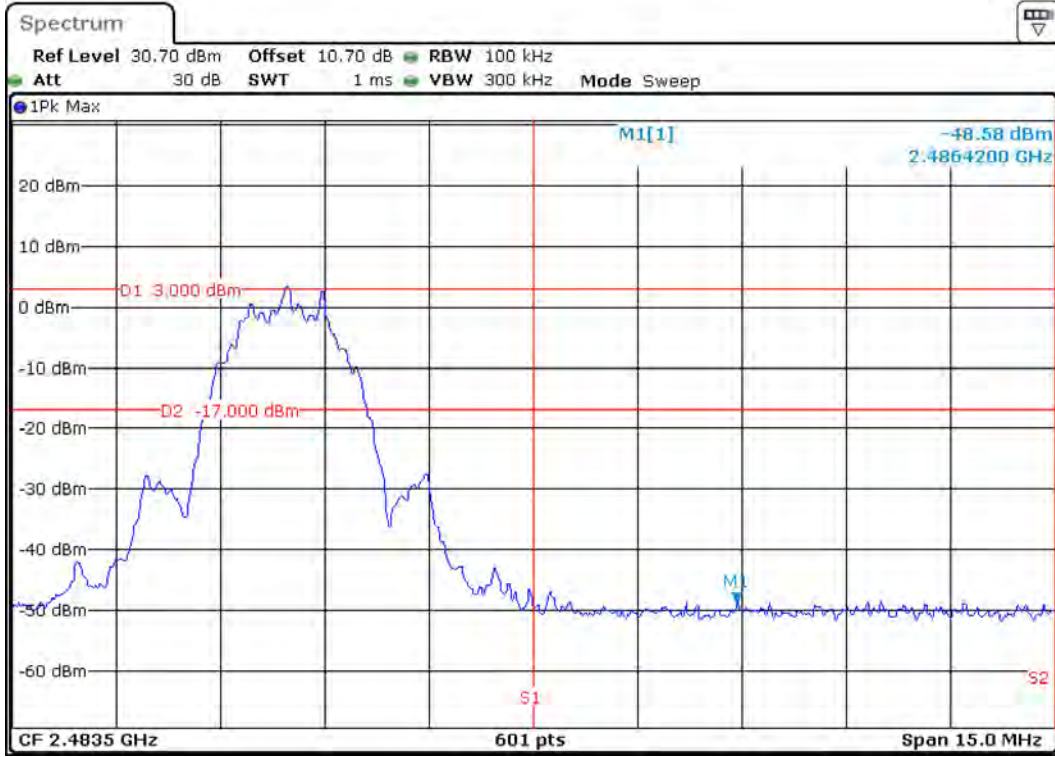
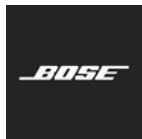
BLE 1M on 2480 MHz



Certificate # 1514.1

# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver DTS Test Report

FCC ID: A94BMD0011 IC: 3232A-BMD0011



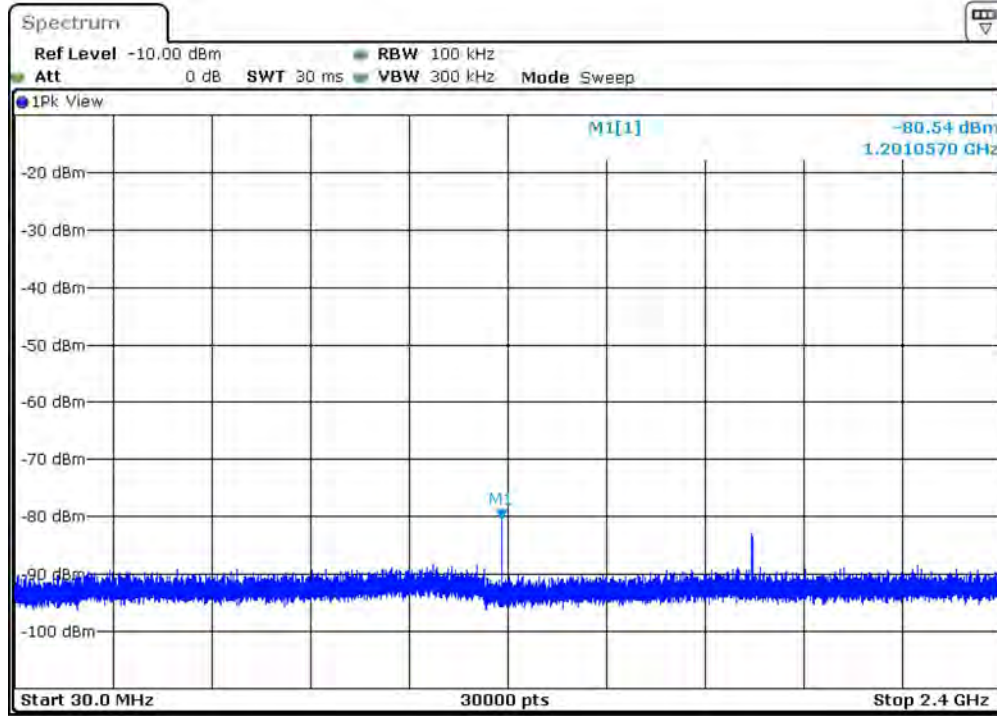
# Spurious Emissions

Spurious Summary Table (BLE 1M)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	BLE 1M	-80.5	0.7	10.0	2.8	-67.0	28.19	74	45.81	Pass
Low	2483.5 To 25000	BLE 1M	-73.8	0.7	10.0	2.8	-60.3	34.96	74	39.04	Pass
Mid	30 To 1000	BLE 1M	-79.6	0.7	10.0	2.8	-66.1	29.10	74	44.90	Pass
Mid	2483.5 To 25000	BLE 1M	-75.9	0.7	10.0	2.8	-62.4	32.88	74	41.12	Pass
High	30 To 1000	BLE 1M	-79.8	0.7	10.0	2.8	-66.3	28.93	74	45.07	Pass
High	2483.5 To 25000	BLE 1M	-74.7	0.7	10.0	2.8	-61.2	34.00	74	40.00	Pass

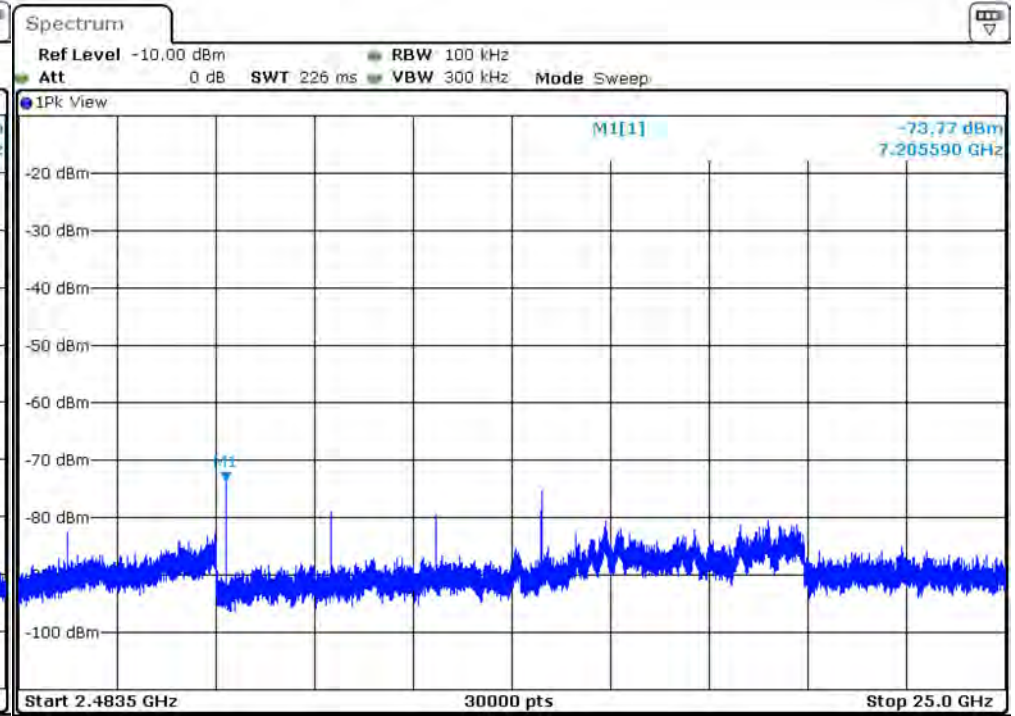
Spurious Summary Table (BLE 1M)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	BLE 1M	-83.5	0.7	10.0	2.8	-70.0	25.19	54	28.81	Pass
Low	2483.5 To 25000	BLE 1M	-85.7	0.7	10.0	2.8	-72.2	23.01	54	30.99	Pass
Mid	30 To 1000	BLE 1M	-81.1	0.7	10.0	2.8	-67.6	27.62	54	26.38	Pass
Mid	2483.5 To 25000	BLE 1M	-82.1	0.7	10.0	2.8	-68.6	26.63	54	27.37	Pass
High	30 To 1000	BLE 1M	-81.9	0.7	10.0	2.8	-68.4	26.83	54	27.17	Pass
High	2483.5 To 25000	BLE 1M	-83.9	0.7	10.0	2.8	-70.4	24.83	54	29.17	Pass

Spurious Summary Table (BLE 2M)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	LE 2M	-81.0	0.7	10.0	2.8	-67.5	27.72	74	46.28	Pass
Low	2483.5 To 25000	LE 2M	-73.9	0.7	10.0	2.8	-60.4	34.81	74	39.19	Pass
Mid	30 To 1000	LE 2M	-80.0	0.7	10.0	2.8	-66.5	28.72	74	45.28	Pass
Mid	2483.5 To 25000	LE 2M	-73.4	0.7	10.0	2.8	-59.9	35.36	74	38.64	Pass
High	30 To 1000	LE 2M	-80.1	0.7	10.0	2.8	-66.6	28.61	74	45.39	Pass
High	2483.5 To 25000	LE 2M	-78.5	0.7	10.0	2.8	-65.0	30.24	74	43.76	Pass

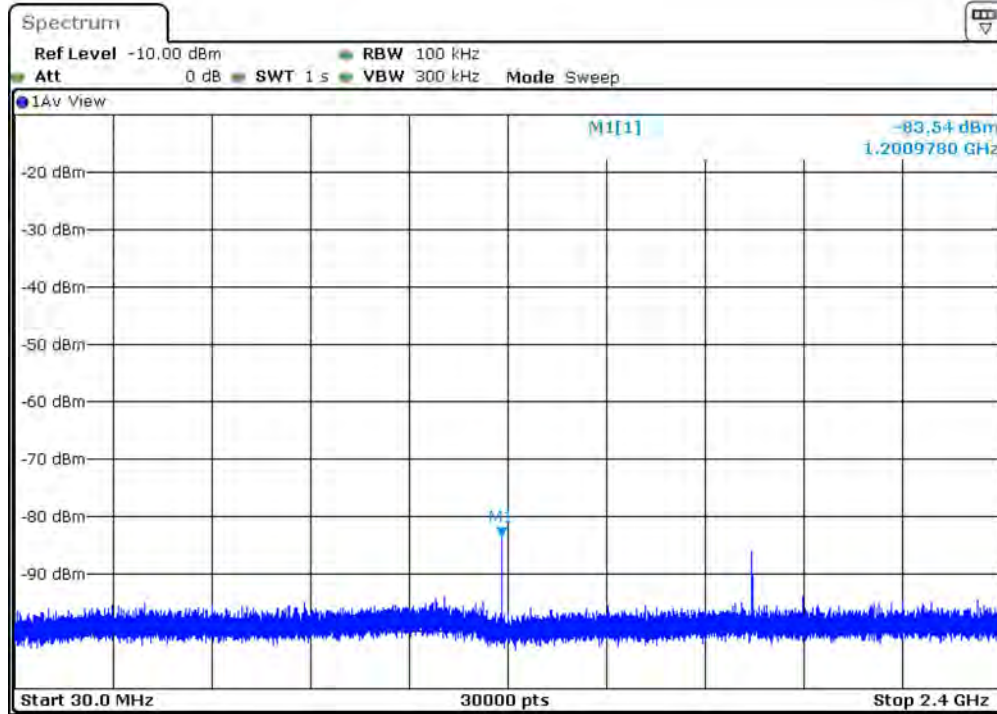
Spurious Summary Table (BLE 2M)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	LE 2M	-86.3	0.7	10.0	2.8	-72.8	22.43	54	31.57	Pass
Low	2483.5 To 25000	LE 2M	-83.0	0.7	10.0	2.8	-69.5	25.72	54	28.28	Pass
Mid	30 To 1000	LE 2M	-85.0	0.7	10.0	2.8	-71.5	23.76	54	30.24	Pass
Mid	2483.5 To 25000	LE 2M	-86.3	0.7	10.0	2.8	-72.8	22.47	54	31.53	Pass
High	30 To 1000	LE 2M	-82.9	0.7	10.0	2.8	-69.4	25.80	54	28.20	Pass
High	2483.5 To 25000	LE 2M	-87.8	0.7	10.0	2.8	-74.3	20.94	54	33.06	Pass



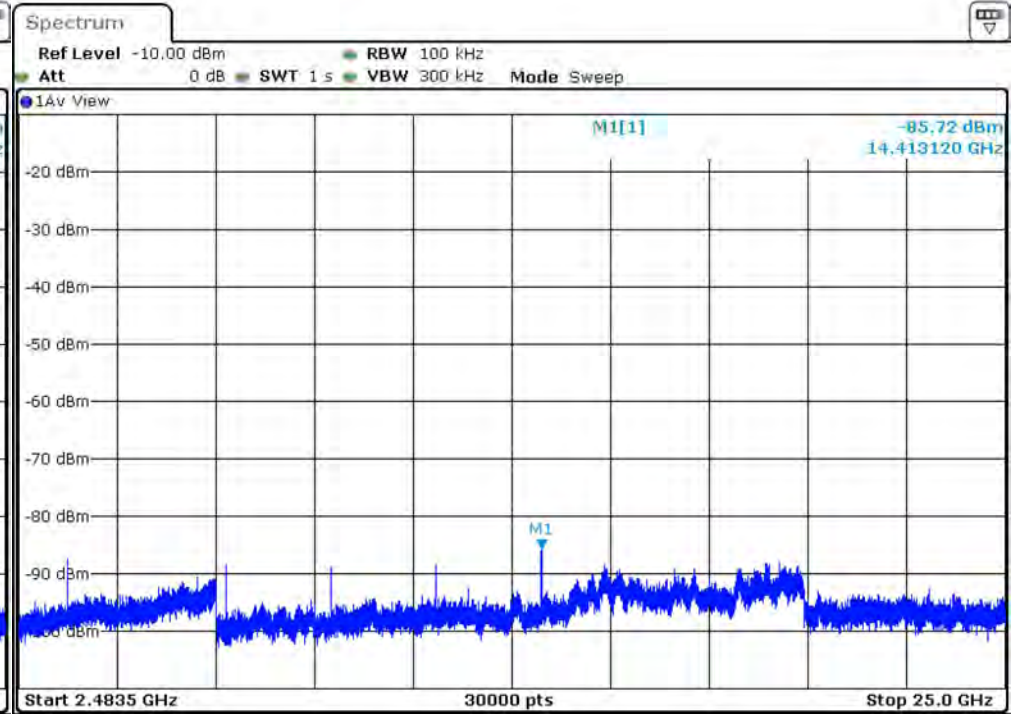
BLE 1M, 2402 MHz Peak Band 1



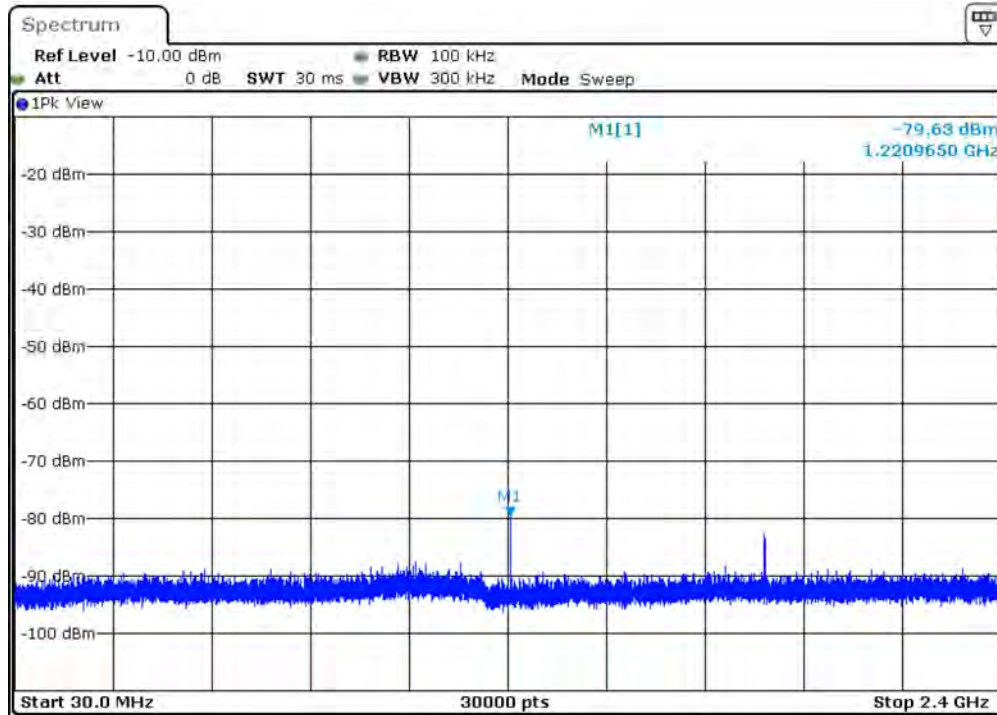
BLE 1M, 2402 MHz Peak Band 2



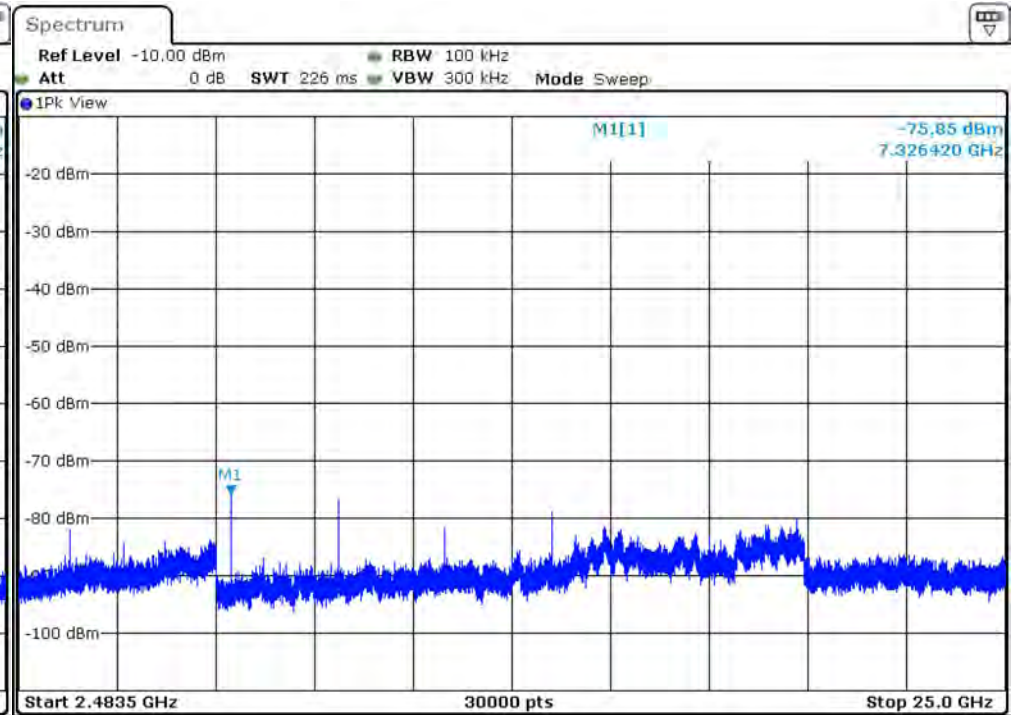
BLE 1M, 2402 MHz Average Band 1



BLE 1M, 2402 MHz Average Band 2

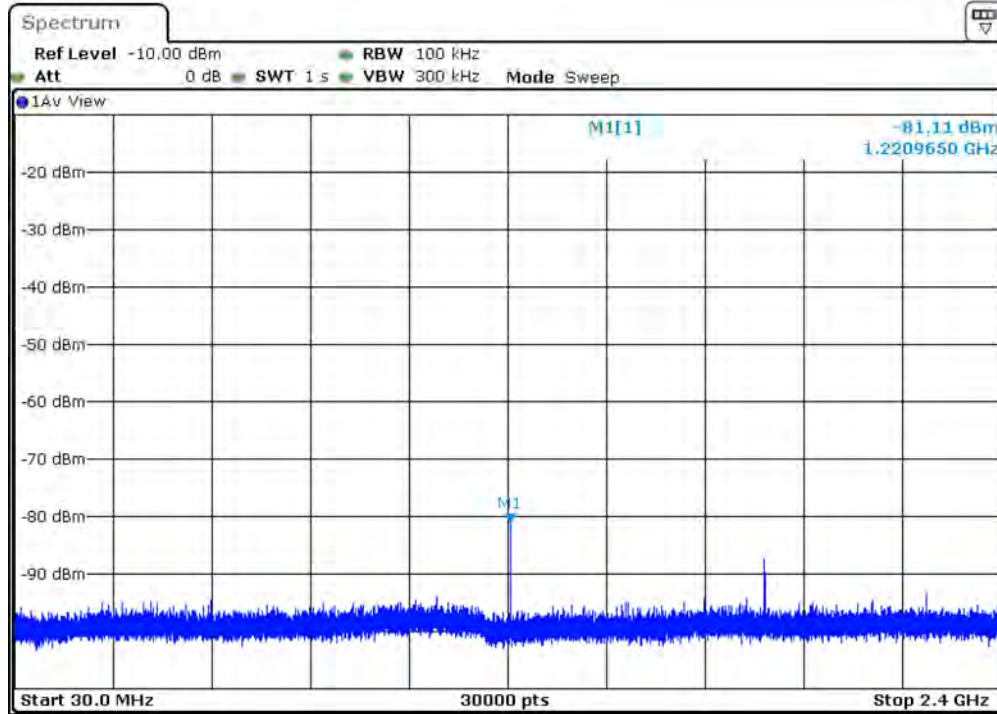


BLE 1M, 2442 MHz Peak Band 1

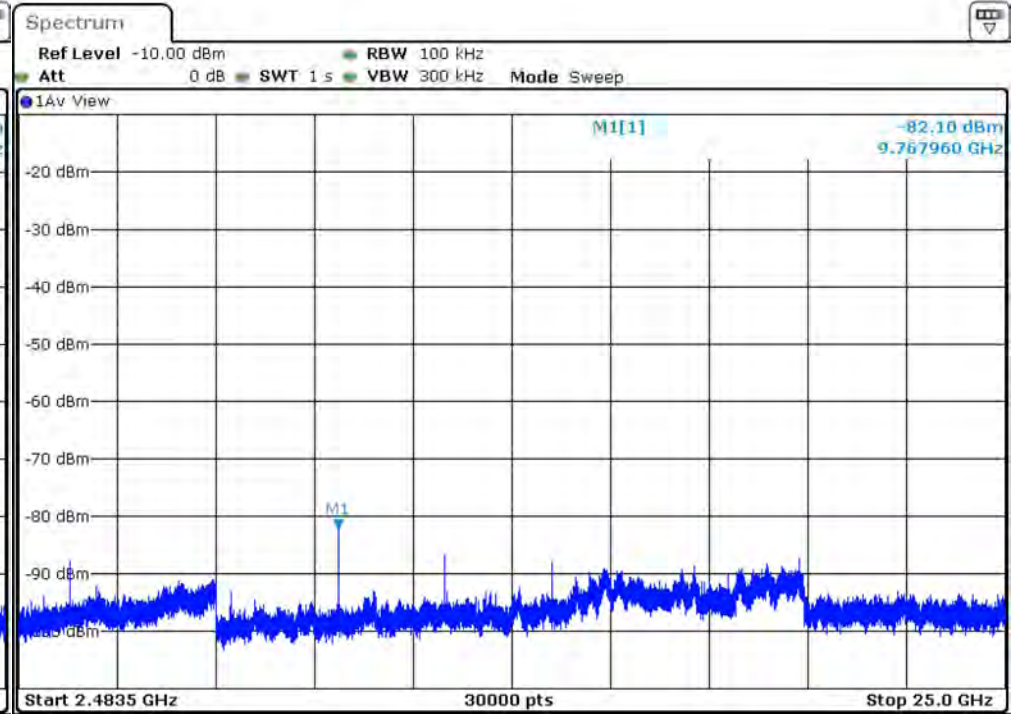


BLE 1M, 2442 MHz Peak Band 2

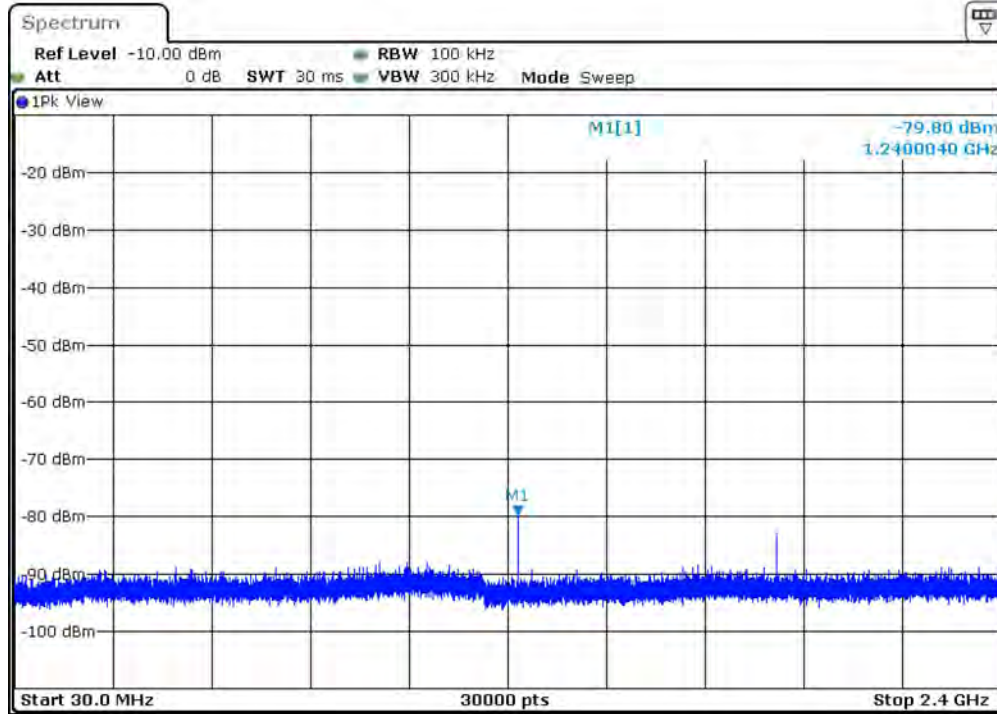




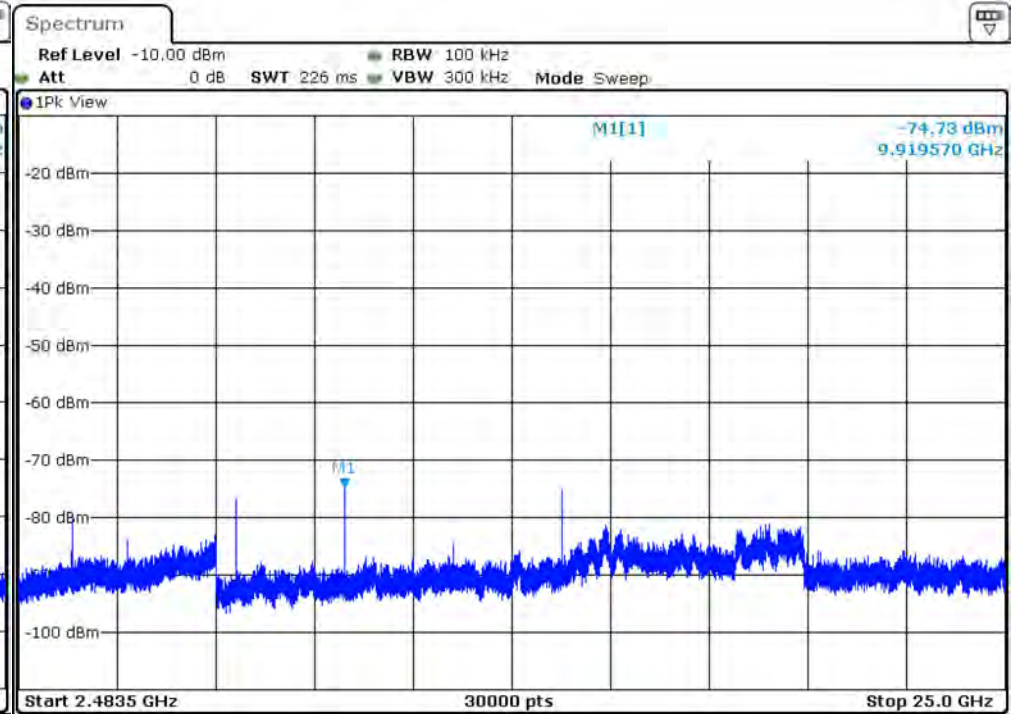
BLE 1M, 2442 MHz Average Band 1



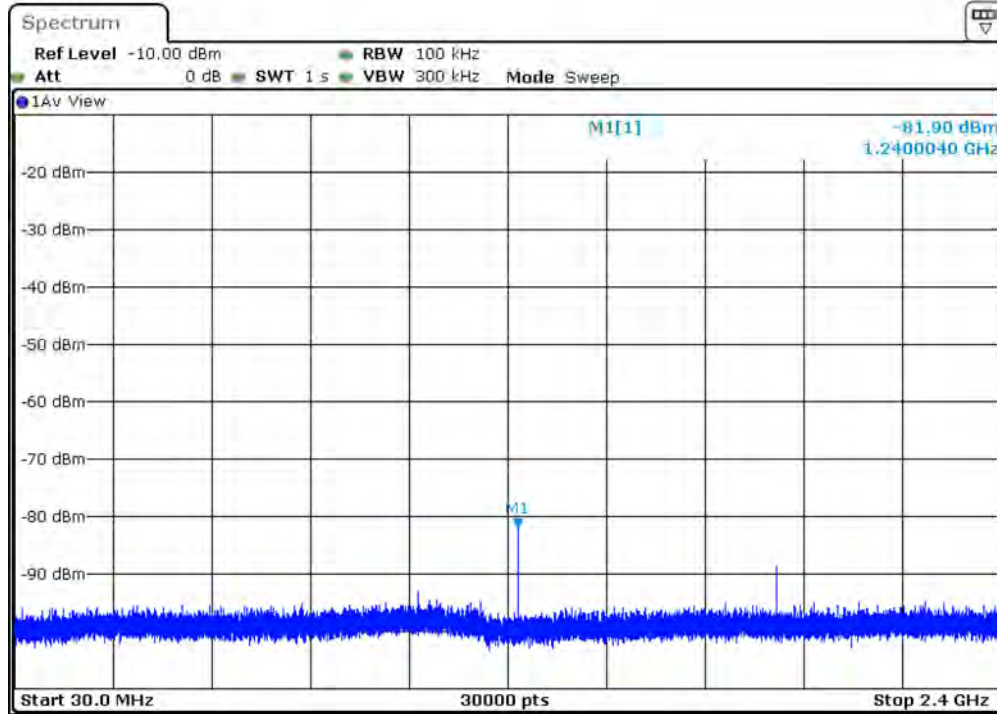
BLE 1M, 2442 MHz Average Band 2



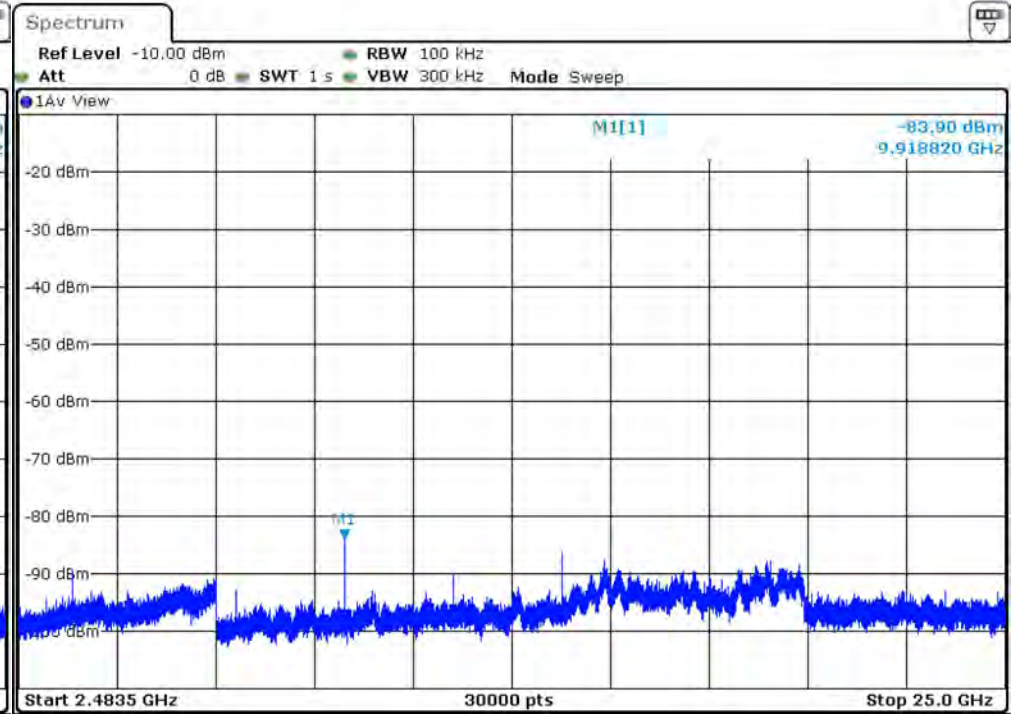
BLE 1M, 2480 MHz Peak Band 1



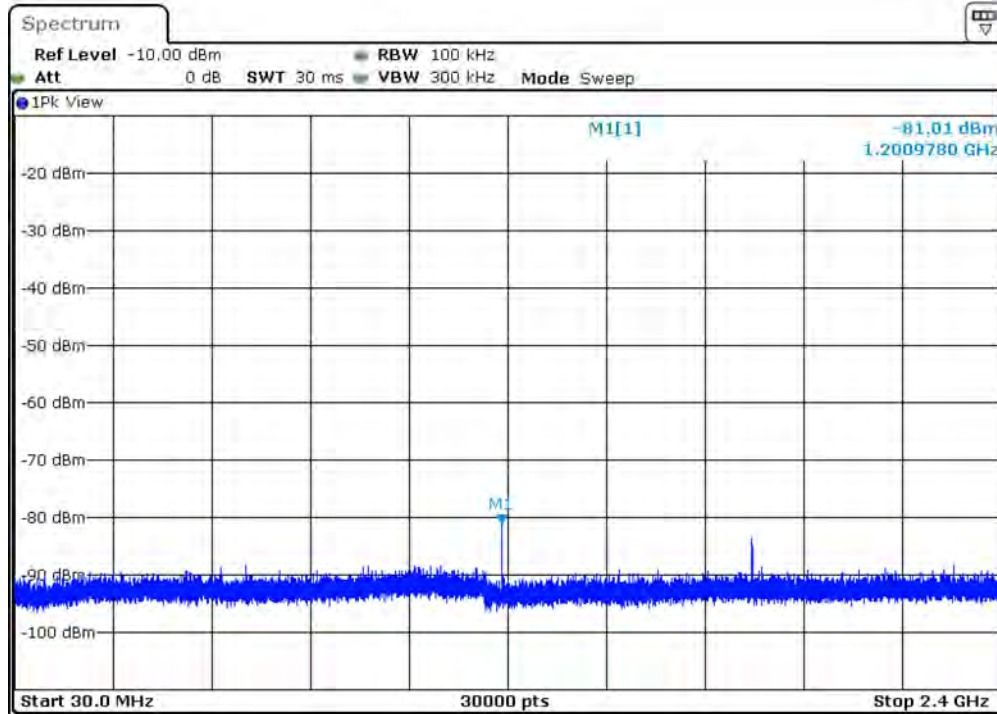
BLE 1M, 2480 MHz Peak Band 2



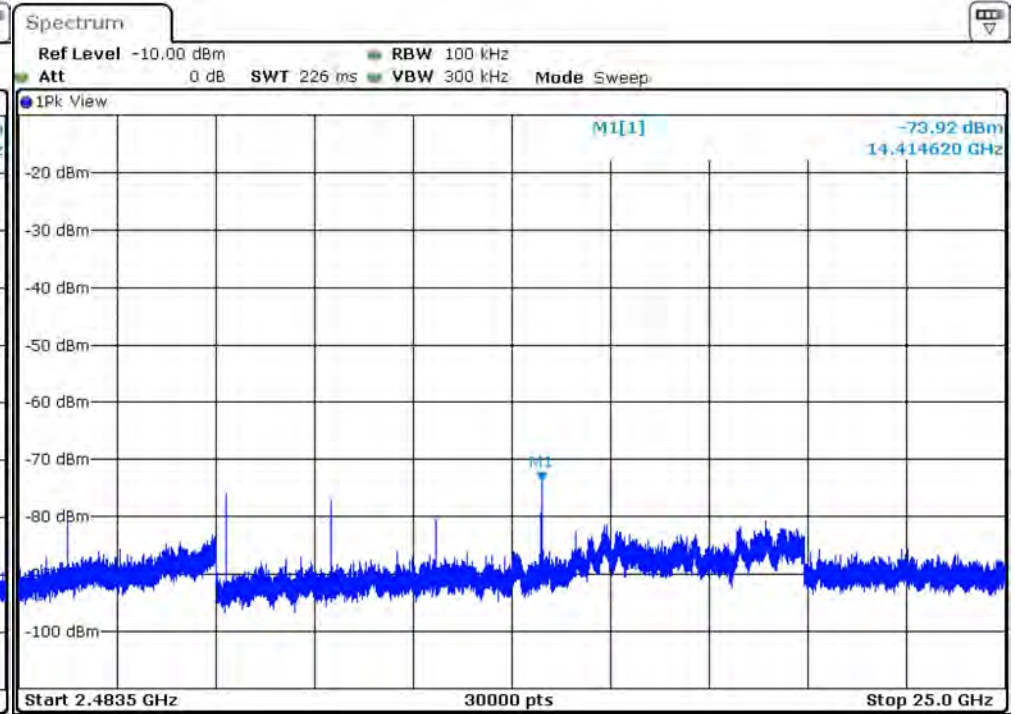
BLE 1M, 2480 MHz Average Band 1



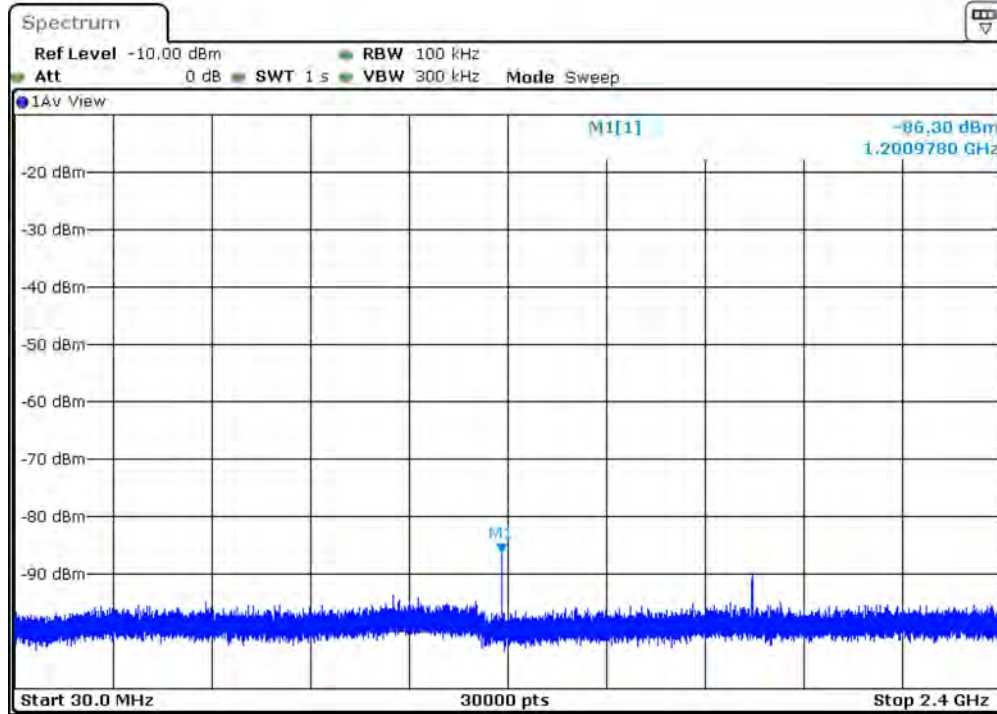
BLE 1M, 2480 MHz Average Band 2



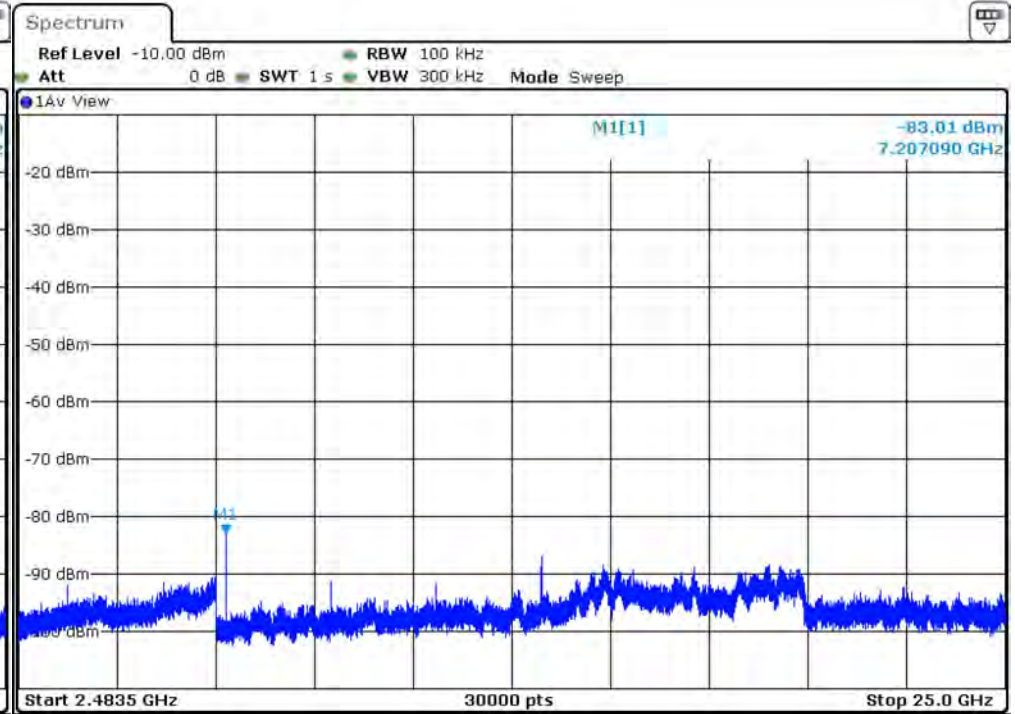
BLE 2M, 2402 MHz Peak Band 1



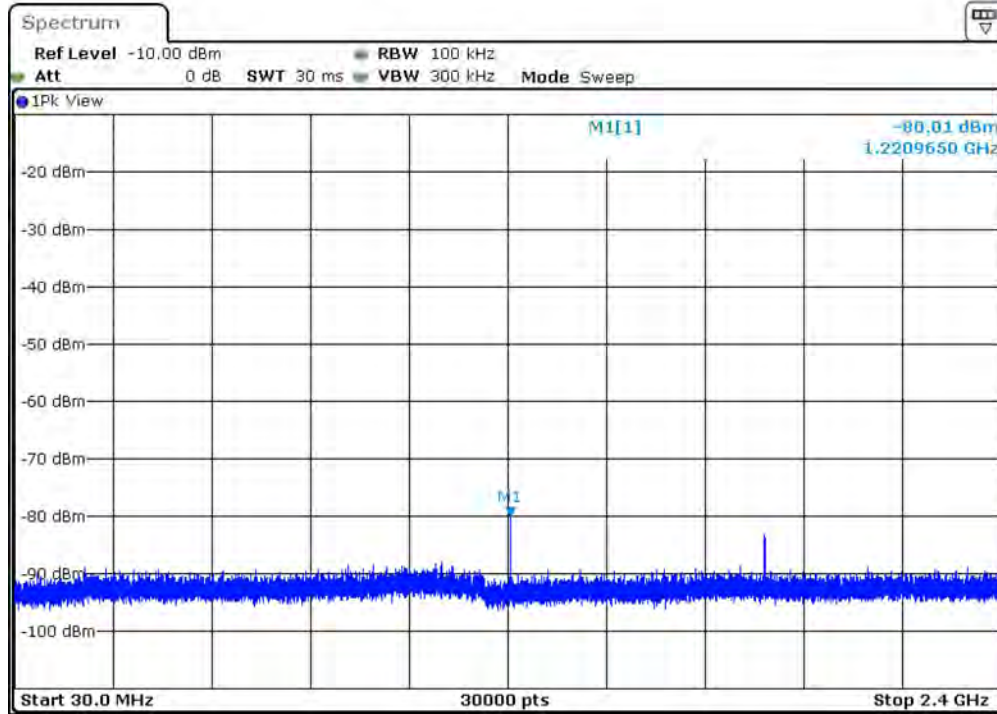
BLE 2M, 2402 MHz Peak Band 2



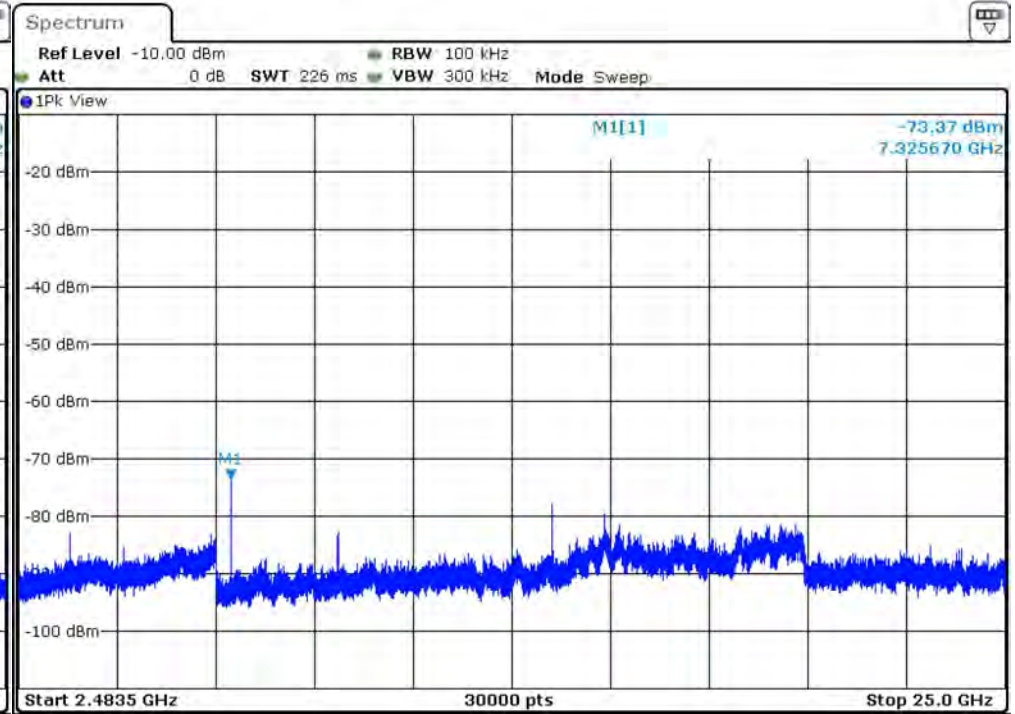
BLE 2M, 2402 MHz Average Band 1



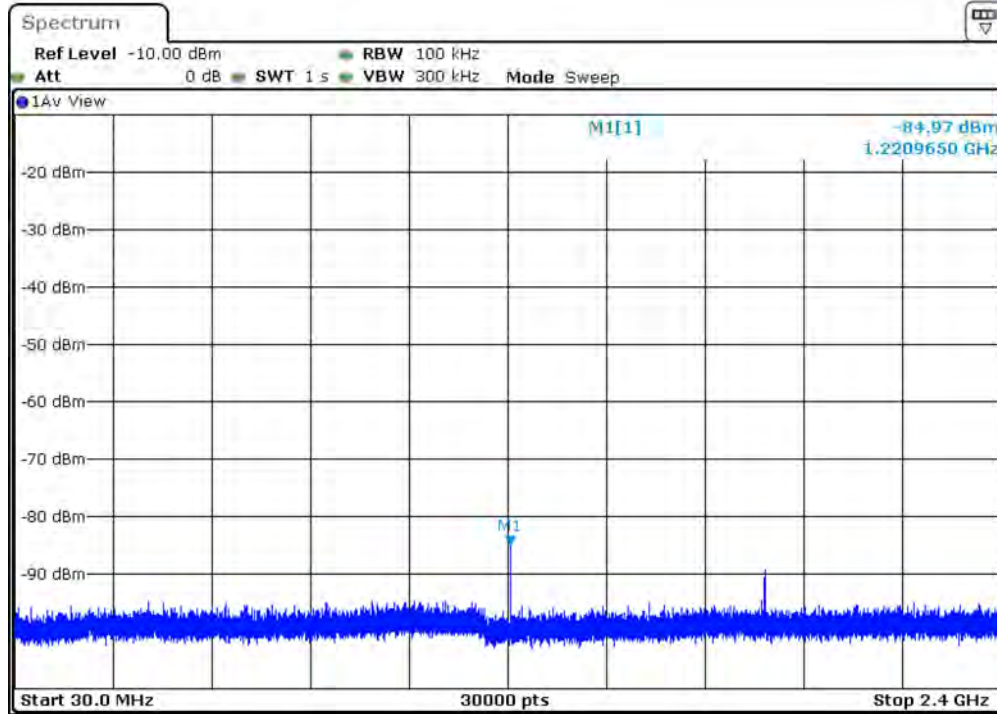
BLE 2M, 2402 MHz Average Band 2



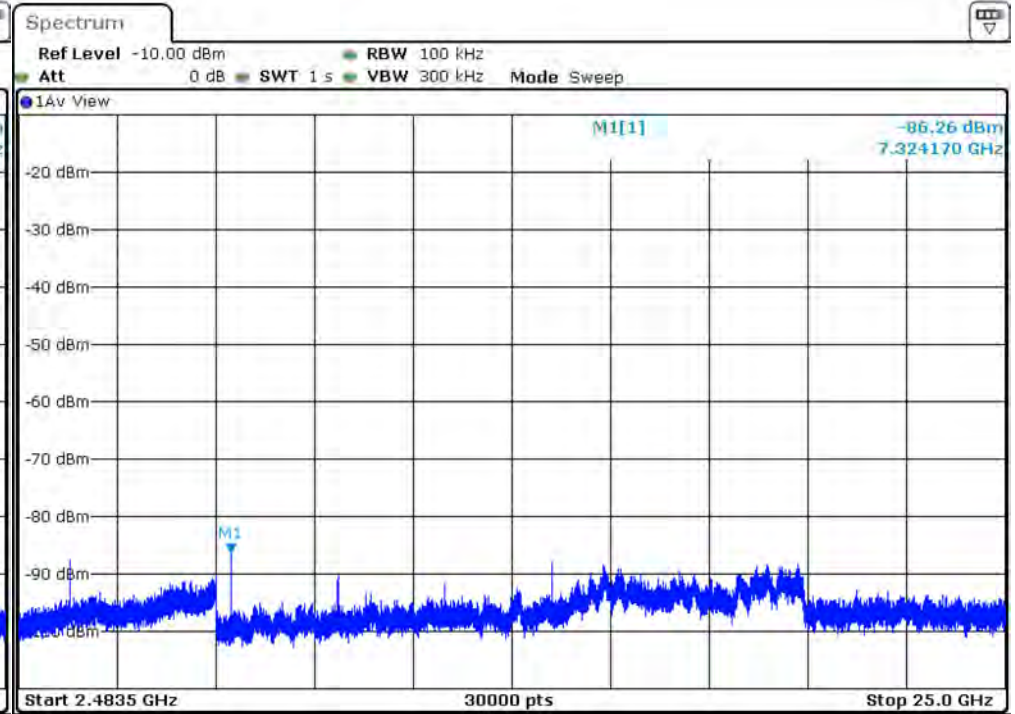
BLE 2M, 2442 MHz Peak Band 1



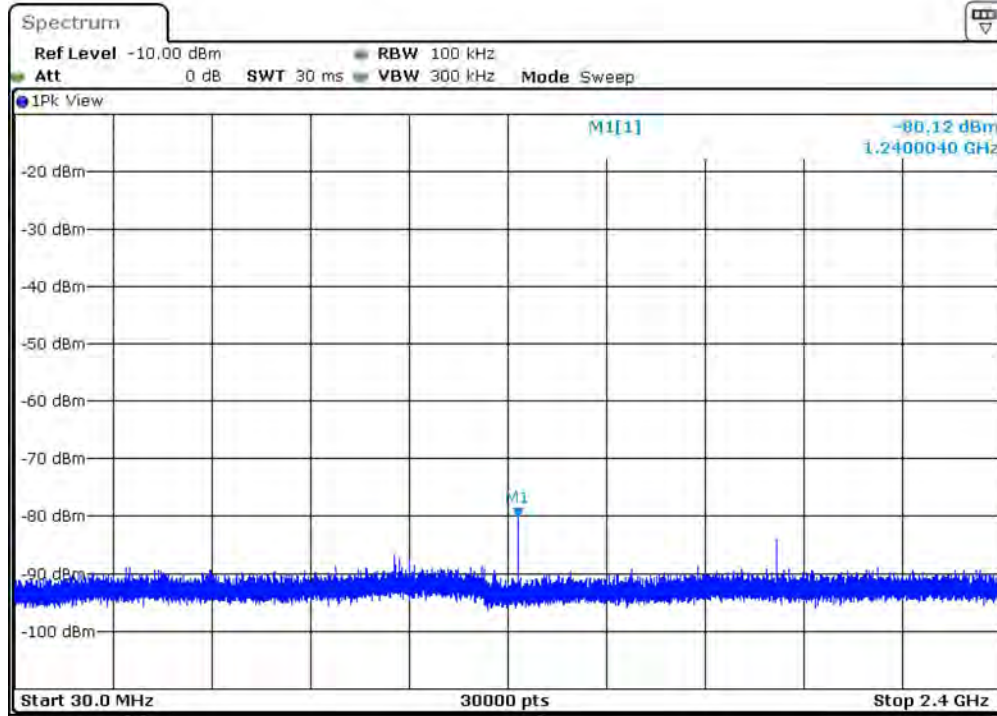
BLE 2M, 2442 MHz Peak Band 2



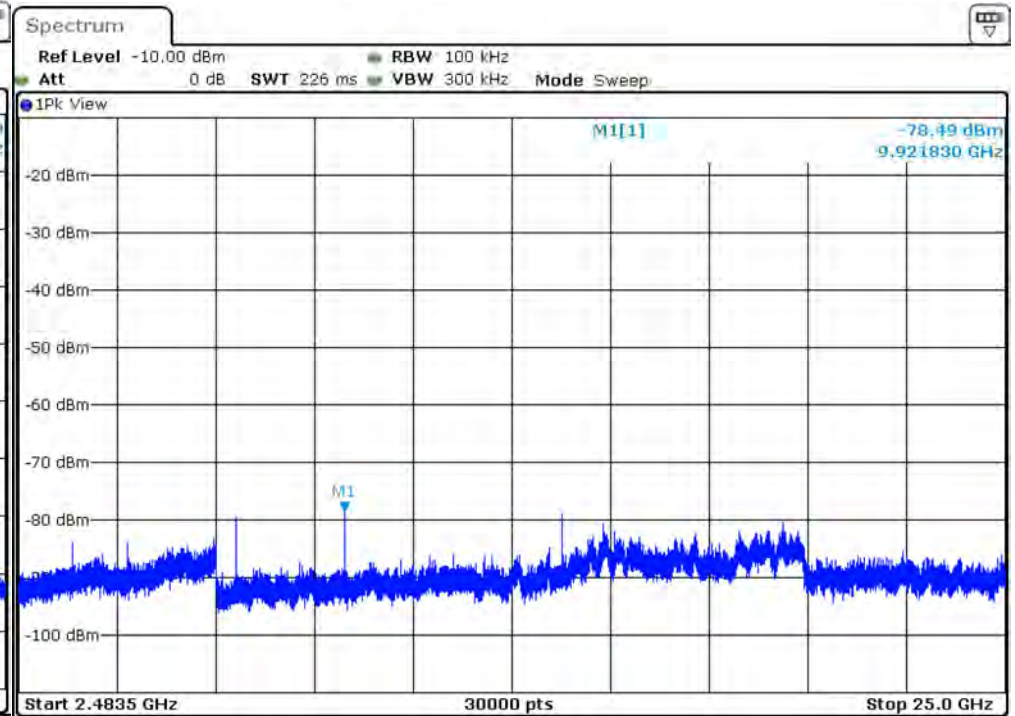
BLE 2M, 2442 MHz Average Band 1



BLE 2M, 2442 MHz Average Band 2

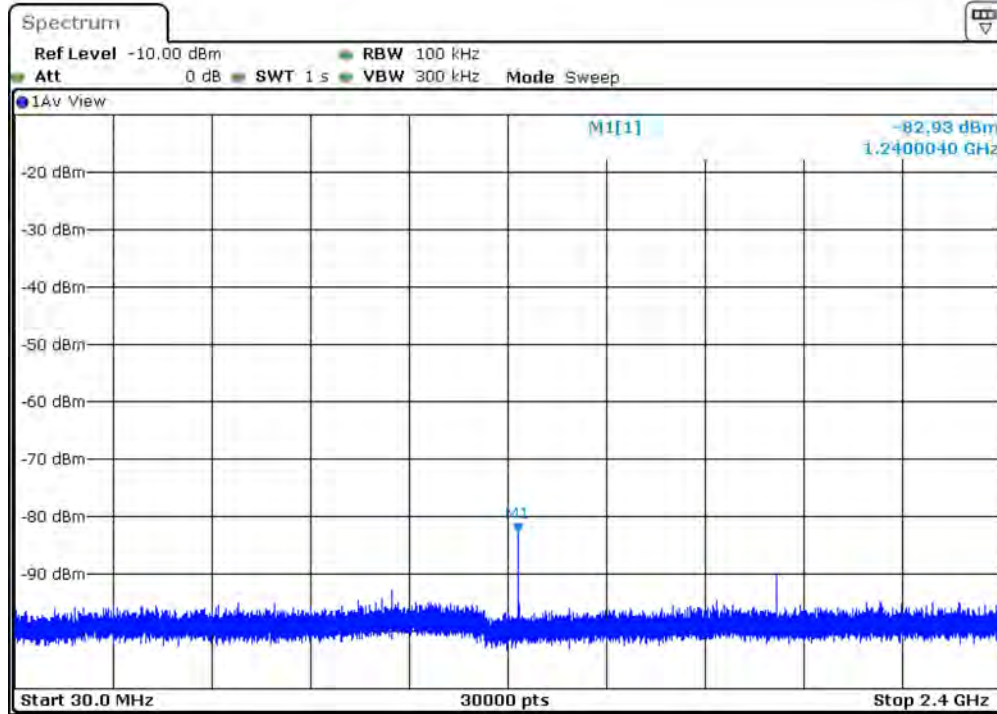


BLE 2M, 2480 MHz Peak Band 1

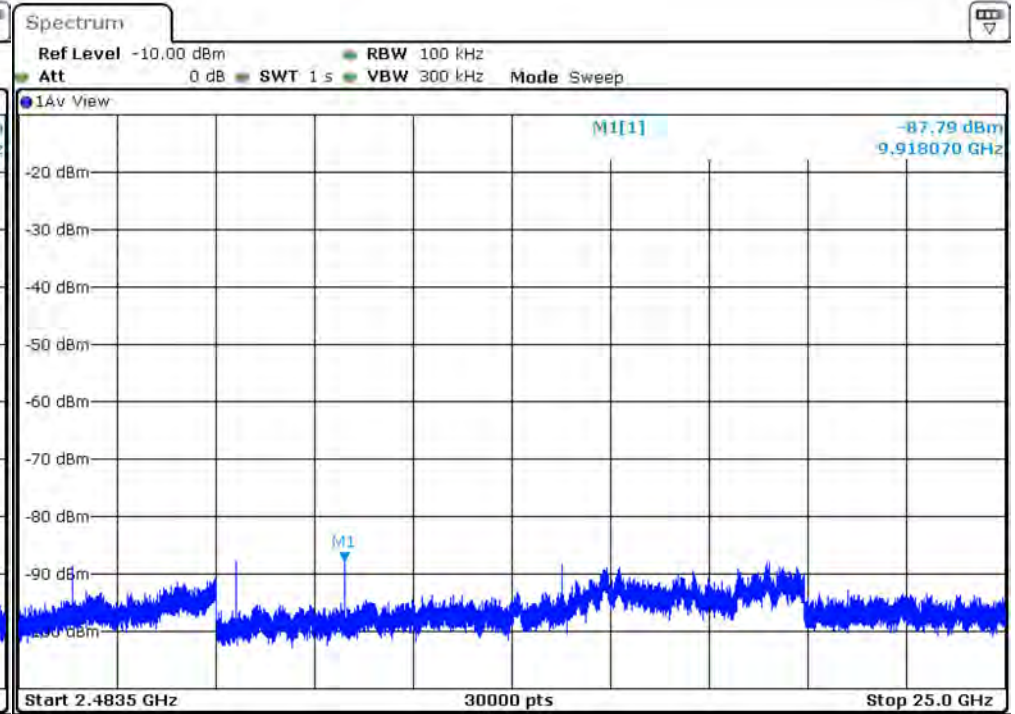


BLE 2M, 2480 MHz Peak Band 2





BLE 2M, 2480 MHz Average Band 1



BLE 2M, 2480 MHz Average Band 2



Certificate # 1514.1

# DESIGN ASSURANCE ENGINEERING COMPLIANCE EMC TEST REPORT



## Spurious Harmonic Emissions

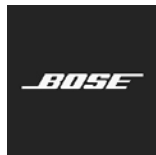
Spurious Harmonics Summary Table (BLE 1M)													
Channel	Frequency (MHz)	Harmonic	Harmonic Frequency (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Result
Low	2402	1	2402	BLE 1M	-79.1	0.7	10.0	2.8	-65.6	29.63	-	-	-
Low	2402	2	<b>4804</b>	BLE 1M	-82.5	0.7	10.0	2.8	-69.0	26.26	74	47.74	Pass
Low	2402	3	7206	BLE 1M	-76.5	0.7	10.0	2.8	-63.0	32.25	74	41.75	Pass
Low	2402	4	9608	BLE 1M	-78.1	0.7	10.0	2.8	-64.6	30.68	74	43.32	Pass
Low	2402	5	<b>12010</b>	BLE 1M	-74.4	0.7	10.0	2.8	-60.9	34.36	74	39.64	Pass
Low	2402	6	14412	BLE 1M	-71.9	0.7	10.0	2.8	-58.4	36.85	74	37.15	Pass
Low	2402	7	16814	BLE 1M	-80.8	0.7	10.0	2.8	-67.3	27.92	74	46.08	Pass
Low	2402	8	<b>19216</b>	BLE 1M	-81.5	0.7	10.0	2.8	-68.0	27.19	74	46.81	Pass
Low	2402	9	21618	BLE 1M	-85.9	0.7	10.0	2.8	-72.4	22.83	74	51.17	Pass
Low	2402	10	24020	BLE 1M	-86.5	0.7	10.0	2.8	-73.0	22.23	74	51.77	Pass
Mid	2440	1	2440	BLE 1M	-71.7	0.7	10.0	2.8	-58.2	37.04	-	-	-
Mid	2440	2	<b>4880</b>	BLE 1M	-83.4	0.7	10.0	2.8	-69.9	25.32	74	48.68	Pass
Mid	2440	3	<b>7320</b>	BLE 1M	-78.6	0.7	10.0	2.8	-65.1	30.15	74	43.85	Pass
Mid	2440	4	9760	BLE 1M	-71.9	0.7	10.0	2.8	-58.4	36.88	74	37.12	Pass
Mid	2440	5	<b>12200</b>	BLE 1M	-74.8	0.7	10.0	2.8	-61.3	33.96	74	40.04	Pass
Mid	2440	6	14640	BLE 1M	-76.3	0.7	10.0	2.8	-62.8	32.47	74	41.53	Pass
Mid	2440	7	17080	BLE 1M	-82.2	0.7	10.0	2.8	-68.7	26.51	74	47.49	Pass
Mid	2440	8	<b>19520</b>	BLE 1M	-81.2	0.7	10.0	2.8	-67.7	27.51	74	46.49	Pass
Mid	2440	9	21960	BLE 1M	-86.1	0.7	10.0	2.8	-72.6	22.64	74	51.36	Pass
Mid	2440	10	24400	BLE 1M	-86.5	0.7	10.0	2.8	-73.0	22.26	74	51.74	Pass
High	2480	1	2480	BLE 1M	-72.6	0.7	10.0	2.8	-59.1	36.09	-	-	-
High	2480	2	<b>4960</b>	BLE 1M	-82.2	0.7	10.0	2.8	-68.7	26.54	74	47.46	Pass
High	2480	3	<b>7440</b>	BLE 1M	-79.6	0.7	10.0	2.8	-66.1	29.12	74	44.88	Pass
High	2480	4	9920	BLE 1M	-70.9	0.7	10.0	2.8	-57.4	37.87	74	36.13	Pass
High	2480	5	<b>12400</b>	BLE 1M	-78.4	0.7	10.0	2.8	-64.9	30.34	74	43.66	Pass
High	2480	6	14880	BLE 1M	-72.6	0.7	10.0	2.8	-59.1	36.09	74	37.91	Pass
High	2480	7	17360	BLE 1M	-83.1	0.7	10.0	2.8	-69.6	25.66	74	48.34	Pass
High	2480	8	<b>19840</b>	BLE 1M	-81.0	0.7	10.0	2.8	-67.5	27.74	74	46.26	Pass
High	2480	9	22320	BLE 1M	-86.9	0.7	10.0	2.8	-73.4	21.85	74	52.15	Pass
High	2480	10	24800	BLE 1M	-87.0	0.7	10.0	2.8	-73.5	21.78	74	52.22	Pass

Spurious Harmonics Summary Table (BLE 1M)													
Channel	Frequency (MHz)	Harmonic	Harmonic Frequency (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Result
Low	2402	1	2402	BLE 1M	-79.4	0.7	10.0	2.8	-65.9	29.30	-	-	-
Low	2402	2	<b>4804</b>	BLE 1M	-82.8	0.7	10.0	2.8	-69.3	25.91	54	28.09	Pass
Low	2402	3	7206	BLE 1M	-77.3	0.7	10.0	2.8	-63.8	31.40	54	22.60	Pass
Low	2402	4	9608	BLE 1M	-79.0	0.7	10.0	2.8	-65.5	29.72	54	24.28	Pass
Low	2402	5	<b>12010</b>	BLE 1M	-75.3	0.7	10.0	2.8	-61.8	33.47	54	20.53	Pass
Low	2402	6	14412	BLE 1M	-72.9	0.7	10.0	2.8	-59.4	35.85	54	18.15	Pass
Low	2402	7	16814	BLE 1M	-81.3	0.7	10.0	2.8	-67.8	27.40	54	26.60	Pass
Low	2402	8	<b>19216</b>	BLE 1M	-83.2	0.7	10.0	2.8	-69.7	25.49	54	28.51	Pass
Low	2402	9	21618	BLE 1M	-86.7	0.7	10.0	2.8	-73.2	22.03	54	31.97	Pass
Low	2402	10	24020	BLE 1M	-87.6	0.7	10.0	2.8	-74.1	21.13	54	32.87	Pass
Mid	2440	1	2440	BLE 1M	-72.2	0.7	10.0	2.8	-58.7	36.57	-	-	-
Mid	2440	2	<b>4880</b>	BLE 1M	-83.7	0.7	10.0	2.8	-70.2	24.98	54	29.02	Pass
Mid	2440	3	<b>7320</b>	BLE 1M	-79.5	0.7	10.0	2.8	-66.0	29.18	54	24.82	Pass
Mid	2440	4	9760	BLE 1M	-72.5	0.7	10.0	2.8	-59.0	36.24	54	17.76	Pass
Mid	2440	5	<b>12200</b>	BLE 1M	-75.7	0.7	10.0	2.8	-62.2	33.07	54	20.93	Pass
Mid	2440	6	14640	BLE 1M	-76.4	0.7	10.0	2.8	-62.9	32.36	54	21.64	Pass
Mid	2440	7	17080	BLE 1M	-83.4	0.7	10.0	2.8	-69.9	25.36	54	28.64	Pass
Mid	2440	8	<b>19520</b>	BLE 1M	-82.3	0.7	10.0	2.8	-68.8	26.45	54	27.55	Pass
Mid	2440	9	21960	BLE 1M	-86.6	0.7	10.0	2.8	-73.1	22.08	54	31.92	Pass
Mid	2440	10	24400	BLE 1M	-87.1	0.7	10.0	2.8	-73.6	21.63	54	32.37	Pass
High	2480	1	2480	BLE 1M	-72.7	0.7	10.0	2.8	-59.2	36.02	-	-	-
High	2480	2	<b>4960</b>	BLE 1M	-82.3	0.7	10.0	2.8	-68.8	26.48	54	27.52	Pass
High	2480	3	<b>7440</b>	BLE 1M	-80.5	0.7	10.0	2.8	-67.0	28.21	54	25.79	Pass
High	2480	4	9920	BLE 1M	-71.8	0.7	10.0	2.8	-58.3	36.96	54	17.04	Pass
High	2480	5	<b>12400</b>	BLE 1M	-79.5	0.7	10.0	2.8	-66.0	29.21	54	24.79	Pass
High	2480	6	14880	BLE 1M	-73.2	0.7	10.0	2.8	-59.7	35.51	54	18.49	Pass
High	2480	7	17360	BLE 1M	-83.8	0.7	10.0	2.8	-70.3	24.94	54	29.06	Pass
High	2480	8	<b>19840</b>	BLE 1M	-82.6	0.7	10.0	2.8	-69.1	26.17	54	27.83	Pass
High	2480	9	22320	BLE 1M	-87.7	0.7	10.0	2.8	-74.2	21.02	54	32.98	Pass
High	2480	10	24800	BLE 1M	-88.0	0.7	10.0	2.8	-74.5	20.76	54	33.24	Pass



Certificate # 1514.1

# DESIGN ASSURANCE ENGINEERING COMPLIANCE EMC TEST REPORT



Spurious Harmonics Summary Table (BLE 2M)

Channel	Frequency (MHz)	Harmonic	Harmonic Frequency (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Result
Low	2402	1	2402	LE 2M	-79.3	0.7	10.0	2.8	-65.8	29.48	-	-	-
Low	2402	2	<b>4804</b>	LE 2M	-82.8	0.7	10.0	2.8	-69.3	25.96	74	48.04	Pass
Low	2402	3	7206	LE 2M	-69.8	0.7	10.0	2.8	-56.3	38.91	74	35.09	Pass
Low	2402	4	9608	LE 2M	-75.9	0.7	10.0	2.8	-62.4	32.84	74	41.16	Pass
Low	2402	5	<b>12010</b>	LE 2M	-74.5	0.7	10.0	2.8	-61.0	34.24	74	39.76	Pass
Low	2402	6	14412	LE 2M	-73.8	0.7	10.0	2.8	-60.3	34.96	74	39.04	Pass
Low	2402	7	16814	LE 2M	-80.4	0.7	10.0	2.8	-66.9	28.33	74	45.67	Pass
Low	2402	8	<b>19216</b>	LE 2M	-81.9	0.7	10.0	2.8	-68.4	26.84	74	47.16	Pass
Low	2402	9	21618	LE 2M	-85.1	0.7	10.0	2.8	-71.6	23.61	74	50.39	Pass
Low	2402	10	24020	LE 2M	-85.4	0.7	10.0	2.8	-71.9	23.32	74	50.68	Pass
Mid	2440	1	2440	LE 2M	-72.6	0.7	10.0	2.8	-59.1	36.15	-	-	-
Mid	2440	2	<b>4880</b>	LE 2M	-82.2	0.7	10.0	2.8	-68.7	26.54	74	47.46	Pass
Mid	2440	3	<b>7320</b>	LE 2M	-72.0	0.7	10.0	2.8	-58.5	36.74	74	37.26	Pass
Mid	2440	4	9760	LE 2M	-74.4	0.7	10.0	2.8	-60.9	34.34	74	39.66	Pass
Mid	2440	5	<b>12200</b>	LE 2M	-77.9	0.7	10.0	2.8	-64.4	30.81	74	43.19	Pass
Mid	2440	6	14640	LE 2M	-77.7	0.7	10.0	2.8	-64.2	31.07	74	42.93	Pass
Mid	2440	7	17080	LE 2M	-83.2	0.7	10.0	2.8	-69.7	25.55	74	48.45	Pass
Mid	2440	8	<b>19520</b>	LE 2M	-81.3	0.7	10.0	2.8	-67.8	27.43	74	46.57	Pass
Mid	2440	9	21960	LE 2M	-85.7	0.7	10.0	2.8	-72.2	23.02	74	50.98	Pass
Mid	2440	10	24400	LE 2M	-86.1	0.7	10.0	2.8	-72.6	22.62	74	51.38	Pass
High	2480	1	2480	LE 2M	-72.7	0.7	10.0	2.8	-59.2	36.01	-	-	-
High	2480	2	<b>4960</b>	LE 2M	-80.2	0.7	10.0	2.8	-66.7	28.50	74	45.50	Pass
High	2480	3	<b>7440</b>	LE 2M	-74.3	0.7	10.0	2.8	-60.8	34.46	74	39.54	Pass
High	2480	4	9920	LE 2M	-74.6	0.7	10.0	2.8	-61.1	34.10	74	39.90	Pass
High	2480	5	<b>12400</b>	LE 2M	-81.4	0.7	10.0	2.8	-67.9	27.28	74	46.72	Pass
High	2480	6	14880	LE 2M	-73.8	0.7	10.0	2.8	-60.3	34.94	74	39.06	Pass
High	2480	7	17360	LE 2M	-83.5	0.7	10.0	2.8	-70.0	25.19	74	48.81	Pass
High	2480	8	<b>19840</b>	LE 2M	-80.5	0.7	10.0	2.8	-67.0	28.27	74	45.73	Pass
High	2480	9	22320	LE 2M	-86.0	0.7	10.0	2.8	-72.5	22.70	74	51.30	Pass
High	2480	10	24800	LE 2M	-86.4	0.7	10.0	2.8	-72.9	22.34	74	51.66	Pass

Spurious Harmonics Summary Table (BLE 2M)

Channel	Frequency (MHz)	Harmonic	Harmonic Frequency (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Result
Low	2402	1	2402	LE 2M	-79.9	0.7	10.0	2.8	-66.4	28.86	-	-	-
Low	2402	2	<b>4804</b>	LE 2M	-82.4	0.7	10.0	2.8	-68.9	26.33	54	27.67	Pass
Low	2402	3	7206	LE 2M	-71.1	0.7	10.0	2.8	-57.6	37.63	54	16.37	Pass
Low	2402	4	9608	LE 2M	-78.1	0.7	10.0	2.8	-64.6	30.61	54	23.39	Pass
Low	2402	5	<b>12010</b>	LE 2M	-76.5	0.7	10.0	2.8	-63.0	32.26	54	21.74	Pass
Low	2402	6	14412	LE 2M	-73.6	0.7	10.0	2.8	-60.1	35.15	54	18.85	Pass
Low	2402	7	16814	LE 2M	-82.3	0.7	10.0	2.8	-68.8	26.38	54	27.62	Pass
Low	2402	8	<b>19216</b>	LE 2M	-83.6	0.7	10.0	2.8	-70.1	25.10	54	28.90	Pass
Low	2402	9	21618	LE 2M	-87.2	0.7	10.0	2.8	-73.7	21.50	54	32.50	Pass
Low	2402	10	24020	LE 2M	-87.4	0.7	10.0	2.8	-73.9	21.32	54	32.68	Pass
Mid	2440	1	2440	LE 2M	-72.1	0.7	10.0	2.8	-58.6	36.61	-	-	-
Mid	2440	2	<b>4880</b>	LE 2M	-82.7	0.7	10.0	2.8	-69.2	26.01	54	27.99	Pass
Mid	2440	3	<b>7320</b>	LE 2M	-74.1	0.7	10.0	2.8	-60.6	34.63	54	19.37	Pass
Mid	2440	4	9760	LE 2M	-76.2	0.7	10.0	2.8	-62.7	32.55	54	21.45	Pass
Mid	2440	5	<b>12200</b>	LE 2M	-79.9	0.7	10.0	2.8	-66.4	28.88	54	25.12	Pass
Mid	2440	6	14640	LE 2M	-78.8	0.7	10.0	2.8	-65.3	29.95	54	24.05	Pass
Mid	2440	7	17080	LE 2M	-84.7	0.7	10.0	2.8	-71.2	24.01	54	29.99	Pass
Mid	2440	8	<b>19520</b>	LE 2M	-82.2	0.7	10.0	2.8	-68.7	26.55	54	27.45	Pass
Mid	2440	9	21960	LE 2M	-88.1	0.7	10.0	2.8	-74.6	20.61	54	33.39	Pass
Mid	2440	10	24400	LE 2M	-88.1	0.7	10.0	2.8	-74.6	20.62	54	33.38	Pass
High	2480	1	2480	LE 2M	-72.7	0.7	10.0	2.8	-59.2	36.07	-	-	-
High	2480	2	<b>4960</b>	LE 2M	-81.0	0.7	10.0	2.8	-67.5	27.75	54	26.25	Pass
High	2480	3	<b>7440</b>	LE 2M	-74.7	0.7	10.0	2.8	-61.2	34.02	54	19.98	Pass
High	2480	4	9920	LE 2M	-74.9	0.7	10.0	2.8	-61.4	33.85	54	20.15	Pass
High	2480	5	<b>12400</b>	LE 2M	-82.0	0.7	10.0	2.8	-68.5	26.73	54	27.27	Pass
High	2480	6	14880	LE 2M	-74.5	0.7	10.0	2.8	-61.0	34.26	54	19.74	Pass
High	2480	7	17360	LE 2M	-86.0	0.7	10.0	2.8	-72.5	22.74	54	31.26	Pass
High	2480	8	<b>19840</b>	LE 2M	-82.4	0.7	10.0	2.8	-68.9	26.35	54	27.65	Pass
High	2480	9	22320	LE 2M	-87.8	0.7	10.0	2.8	-74.3	20.94	54	33.06	Pass
High	2480	10	24800	LE 2M	-88.3	0.7	10.0	2.8	-74.8	20.40	54	33.60	Pass

**BOLDed frequencies are in the restricted bands.**



DESIGN ASSURANCE ENGINEERING  
COMPLIANCE  
EMC TEST REPORT



## Conducted Measurements Resources Used

TN	Description	Model	S/N	Manufacturer	Most Recent Service	Service Due Date
2409	Signal and Spectrum Analyzer	FSV40	101413	Rohde & Schwarz	22-Apr-2020	22-Apr-2021
2414	Band Reject Filter (2.4GHz)	BRM50702-07	003	Micro-Tronics	10-Apr-2020	10-Apr-2021

Date(s) of test: 01-JUN-2020 to 04-JUN-2020



DESIGN ASSURANCE ENGINEERING  
COMPLIANCE  
EMC TEST REPORT



# End of Report