RF TEST REPORT

FCC ID: 2AJYL-AB23

Product Name	:	AIRBOLT CELLULAR GPS
Brand Name	:	AIRBOLT
Test Model	:	ABGPS-23
Series Model	:	N/A
Applicant	:	AirBolt Pty Ltd
Address	:	PO Box 192,Bulleen,Victoria,Australia 3105
Manufacturer	:	BOTERLAN TECHNOLOGY CO.,LIMITED
Address	:	4F,Buliding B2,Guangshen high and new science and technology park Youmagang,Jiangshi,Gongming,Guangming new zone,Shenzhen, Guangdong,China
Date of Receipt	:	2022.12.27
Date of Test	:	2022.12.27-2023.01.06
Issued Date	:	2023.01.06
Report Version	:	V1.0
Test Sample	:	Engineering Sample No.: AIT22122704-1
Standard(s)	:	FCC CFR Title 47 Part 15 Subpart C Section 15.247

Lab:Dongguan Yaxu (AiT) Technology Limited
Add:No.22,Jinqianling 3rd Street,Jitigang,Huangjiang,Dongguan, Guangdong,China
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This device described above has been tested by Dongguan Yaxu (AiT) Technology Limited and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Reviewed by: Simba huang **Approved by:** Seal Chen

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Revision History

Revision	Issue Date	Revisions	Revised By
V1.0	2023.01.06	Initial Issue	Seal Chen

1 .Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	§15.203	Pass
On Time and Duty Cycle	/	/
Maximum Conducted Peak Output Power	§15.247 (b)(3)	Pass
Power Spectral Density	§15.247 (e)	Pass
6dB Bandwidth	§15.247 (a)(2)	Pass
Radiated Spurious Emissions	§15.205/15.209	PASS
Emissions at Restricted Band	§15.205/15.209	Pass
Conducted Spurious Emissions and Band Edges Emissions	§15.205, §15.247(d)	Pass
AC Mains Conducted Emissions	§ 15.207(a)	Pass

Note

1. *Test according to ANSI C63.10:2013.*
2. *The measurement uncertainty is not included in the test result.*
3. *Test results in other test report (RF Exposure Evaluation Report)*

1.1 Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the AiT quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.2 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	0.009MHz-30MHz	3.10dB	(1)
Radiated Emission	30MHz-1GHz	3.75dB	(1)
Radiated Emission	1GHz-18GHz	3.88dB	(1)
Radiated Emission	18GHz-40GHz	3.88dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	1.20dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

2 .Test Facility

Company:	Dongguan Yaxu (AiT) Technology Limited
Address:	No.22, Jinqianling 3rd Street, Jitigang, Huangjiang,Dongguan, Guangdong, China
CNAS Registration Number:	CNAS L6177
A2LA Registration Number:	6317.01
FCC Accredited Lab. Designation Number:	CN1313
FCC Test Firm Registration Number:	703111

2.1 Deviation from standard

None

2.2 Abnormalities from standard conditions

None

3 .General Information

EUT Name:	AIRBOLT CELLULAR GPS
Model No:	ABGPS-23
Serial Model:	N/A
Serial No.:	N/A
Operation frequency:	2402MHz-2480MHz
Channel Number:	40 channels
Modulation Technology:	GFSK
Antenna Type:	Ceram antenna
Antenna gain:	1.5 dBi
Hardware version.:	N/A
Software version.:	N/A
Power supply:	DC 3.7V 400mAh
Note:	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

3.1 Test frequencies

EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	19	2440	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454	--	--
13	2428	27	2456	--	--

3.2 EUT Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3.3 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	Adapter	NOKIA	CE	AD-10WU	N/A	N/A	N/A

3.4 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Dongguan Yaxu (AiT) Technology Limit.

EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

EUT Exercise

The EUT was operated in the normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C, ANSI C63.10-2013.

General Test Procedures

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

3.5 Description of Test Modes

The EUT has been tested under operating condition.

AC main conducted emission pre-test voltage at both AC 120V/60Hz and AC 240V/50Hz, recorded worst case;

AC main conducted emission pre-test at charge from power adapter modes, recorded worst case;

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be TX (1Mbps).

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be TX(3Mbps-Low Channel).

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Transmitting mode	Keep the EUT in continuously transmitting mode.		
Test software:	EMI_Test_Tool		
Frequency	2402 MHz	2440 MHz	2480 MHz
Parameters(1Mbps)	Default	Default	Default
Parameters(2Mbps)	Default	Default	Default

4 .Equipment Used during Test

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	R&S	FSV40	101470	2022.09.02	2023.09.01
2	EMI Measuring Receiver	R&S	ESR	101660	2022.09.02	2023.09.01
3	Low Noise Pre Amplifier	HP	HP8447E	1937A01855	2022.09.02	2023.09.01
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2022.09.02	2023.09.01
5	Passive Loop	ETS	6512	00165355	2022.09.03	2024.09.02
6	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2021.08.29	2024.08.28
7	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2021.08.29	2024.08.28
8	SHF-EHF Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170367d	2020.11.24	2023.11.23
9	EMI Test Receiver	R&S	ESCI	100124	2022.09.02	2023.09.01
10	LISN	Kyoritsu	KNW-242	8-837-4	2022.09.02	2023.09.01
11	LISN	R&S	ESH3-Z2	0357.8810.54-101161-S2	2022.09.02	2023.09.01
12	Pro.Temp&Humi.chamber	MENTEK	MHP-150-1C	MAA08112501	2022.09.02	2023.09.01
13	RF Automatic Test system	MW	MW100-RFCB	21033016	2022.09.02	2023.09.01
14	Signal Generator	Agilent	N5182A	MY501430009	2022.09.02	2023.09.01
15	Wideband Radio communication tester	R&S	CMW500	1201.0002K50	2022.09.02	2023.09.01
16	RF Automatic Test system	MW	MW100-RFCB	21033016	2022.09.02	2023.09.01
17	DC power supply	ZHAOXIN	RXN-305D-2	28070002559	N/A	N/A
18	RE Software	EZ	EZ-EMC_RE	Ver.AIT-03A	N/A	N/A
19	CE Software	EZ	EZ-EMC_CE	Ver.AIT-03A	N/A	N/A
20	RF Software	MW	MTS 8310	2.0.0.0	N/A	N/A
21	temporary antenna connector(Note)	NTS	R001	N/A	N/A	N/A

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5 .EN300 328Test Requirements

5.1 Antenna requirement

6.1.1 Standard reqSuirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded. And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.
6.1.2 EUT Antenna:
The antenna is PCB antenna, the best case gain of the antenna is 1.5 dBi reference to the Internal photos for details

5.2 On Time and Duty Cycle

6.2.1 Standard requirement:

None; for reporting purpose only

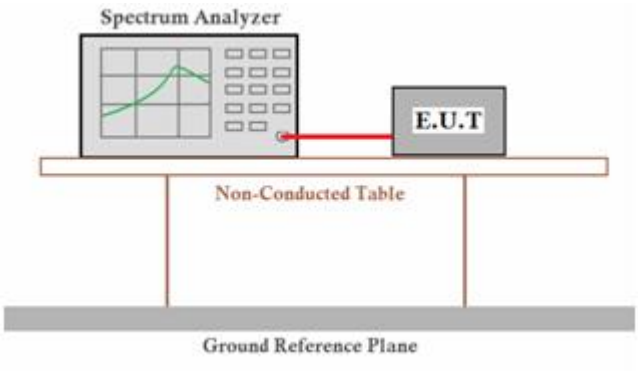
6.2.2 Measuring Instruments and Setting:

Please refer to equipments list in this report. The following table is the setting of the spectrum analyser.

6.2.3 Test Procedures

1. Set the centre frequency of the spectrum analyser to the transmitting frequency;
2. Set the span=0MHz, RBW=8MHz, VBW=50MHz, Sweep time=20.27ms;
3. Detector = peak;
4. Trace mode = Single hold

6.2.4 Test Setup Layout



6.2.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.2.6 Test result

For reporting purpose only.

Please refer to Appendix A

5.3 Maximum Conducted Output Peak Power Measurement

6.3.1 Standard requirement:

According to §15.247(b): For systems using digital modulation in the 2400-2483.5 MHz and 5725-5850 MHz band, the limit for maximum peak conducted output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceeds 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter peak output power.

6.3.2 Measuring Instruments:

Please refer to equipment's list in this report.

6.3.3 Test Procedures:

The transmitter output (antenna port) was connected to the spectrum analyzer.

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power 9.1.1.

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

a) Set the RBW ≥ DTS bandwidth.

b) Set VBW ≥ 3 × RBW. Set span ≥ 3 x RBW。

c) Sweep time = auto couple.

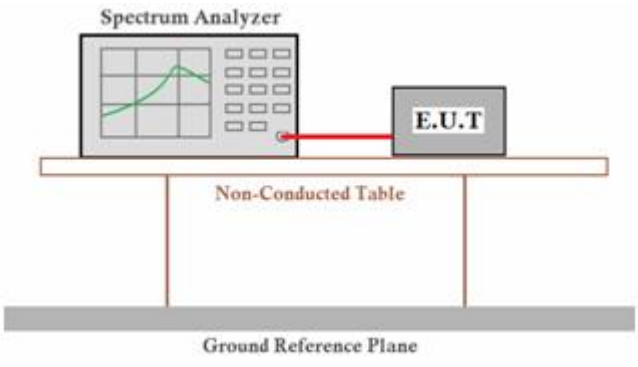
d) Detector = peak.

e) Trace mode = max hold.

f) Allow trace to fully stabilize.

g) Use peak marker function to determine the peak amplitude level.

6.3.4 Test Setup Layout



6.3.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.3.6 Test result

Pass

Please refer to Appendix B

Remark: 1) Test results including cable loss.

5.4 6 dB Spectrum Bandwidth Measurement

6.4.1 Standard requirement:

FCC Part15 C Section 15.247 (a)(2):

DTSs include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to the bands 902-928 MHz and 2400-2483.5 MHz:

a). The minimum 6 dB bandwidth shall be 500 kHz.

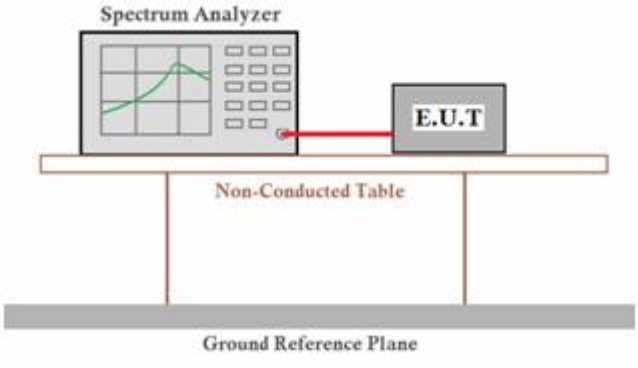
6.4.2 Measuring Instruments:

Please refer to equipment's list in this report.

6.4.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. Set RBW/VBW = 100 KHz/300KHz.
3. Measured the 6dB bandwidth by related function of the spectrum analyzer.

6.4.4 Test Setup Layout



6.4.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.4.6 Test result

PASS

Please refer to Appendix C

Remark:

1). Measured 6dB Bandwidth at difference data rate for each mode and recorded worst case for each mode.

2). Test results including cable loss;

5.5 Power Spectral Density

6.5.1 Standard requirement:

According to §15.247(e): 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.

6.5.2 Measuring Instruments and Setting:

Please refer to equipment's list in this report.

6.5.3 Test Procedures

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.

2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.

3. Set the RBW = 3 kHz.

4. Set the VBW ≥ 3*RBW

5. Set the span to 1.5 times the DTS channel bandwidth.

6. Detector = peak.

7. Sweep time = auto couple.

8. Trace mode = max hold.

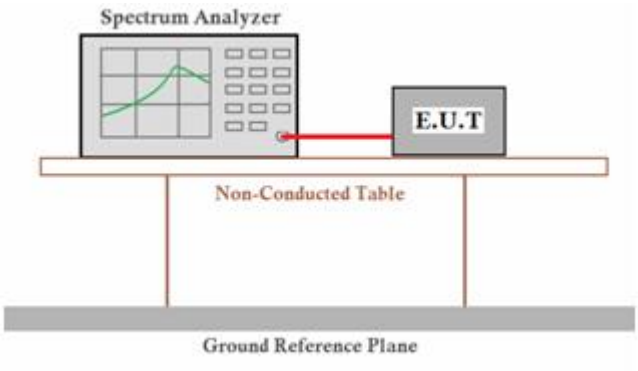
9. Allow trace to fully stabilize.

10. Use the peak marker function to determine the maximum power level.

11. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

12. The resulting peak PSD level must be 8 dBm.

6.5.4 Test Setup Layout



6.5.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.5.6 Test result

PASS

Please refer to Appendix D

Remark: 1). Test results including cable loss;

5.6 Conducted Spurious Emissions and Band Edges Test

6.6.1 Standard requirement:

According to §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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.6.2 Measuring Instruments and Setting:

Please refer to equipment list in this report. The following table is the setting of the spectrum analyzer.

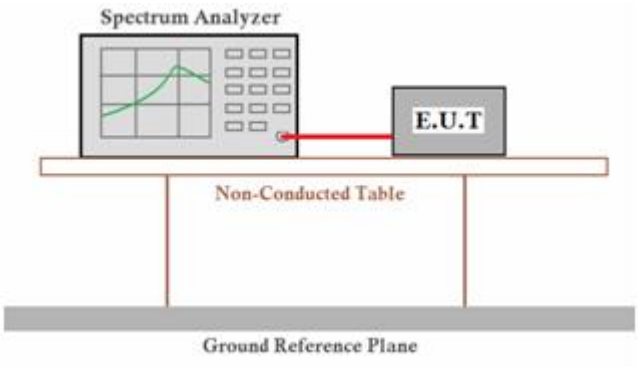
Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
RB / VB (Emission in restricted band)	100KHz/300KHz
RB / VB (Emission in non-restricted band)	100KHz/300KHz

6.6.3 Test Procedures

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

The spectrum from 9 kHz to 26.5GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

6.6.4 Test Setup Layout



6.6.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.6.6 Test result

PASS

Please refer to Appendix E for conducted spurious emissions;

Please refer to Appendix F for conducted band edge emission.

Remark:

1). Test results including cable loss;

2).. Not recorded emission from 9 KHz to 30 MHz as emission level at least 20dBc lower than emission limit.

5.7 Restrict-band Band-edge Measurements

6.7.1 Standard requirement:

According to §15.247(d)/§15.209/ §15.205 or RSS-247§5.5/RSS-Gen

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)).

6.7.2 Measuring Instruments and Setting:

Please refer to equipment list in this report.

6.7.3 Test Procedures

According to KDB 558074 D01 for Antenna-port conducted measurement. Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

1). Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2). Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to an EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.

3). Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=1/B for AV detector.

4). Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

5). Repeat above procedures until all measured frequencies were complete.

6). Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

7). Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)

8). Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

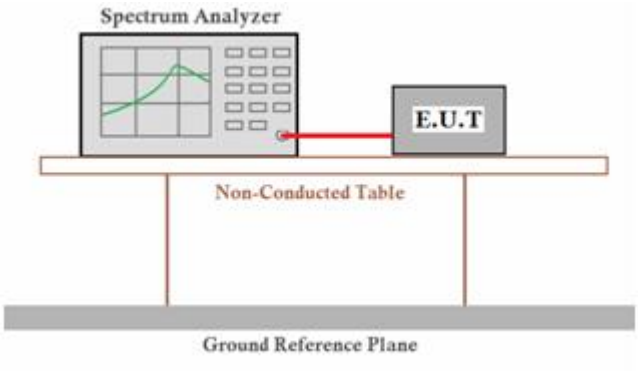
9). For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).

10). Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

E = EIRP – 20log D + 104.77=EIRP+95.23

Where:
E = electric field strength in dBμV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.
11). Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.
12). Compare the resultant electric field strength level to the applicable regulatory limit.
13). Perform radiated spurious emission test duress until all measured frequencies were complete.

6.7.4 Test Setup Layout



6.7.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.7.6 Test result

PASS

Please refer to Appendix G

Remark:

Remark:
1). Test results including cable loss;
2). "---"means that the fundamental frequency not for 15.209 limits requirement;
3). The average measurement was not performed when the peak measured data under the limit of average detection.
4). Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=10Hz/Sweep time=Auto/Detector

=Peak.

5). Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

5.8 Radiated Emissions Measurement

6.8.1 Standard requirement:

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

6.8.2 Measuring Instruments and Setting:

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10^{th} carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

6.8.3 Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.5 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

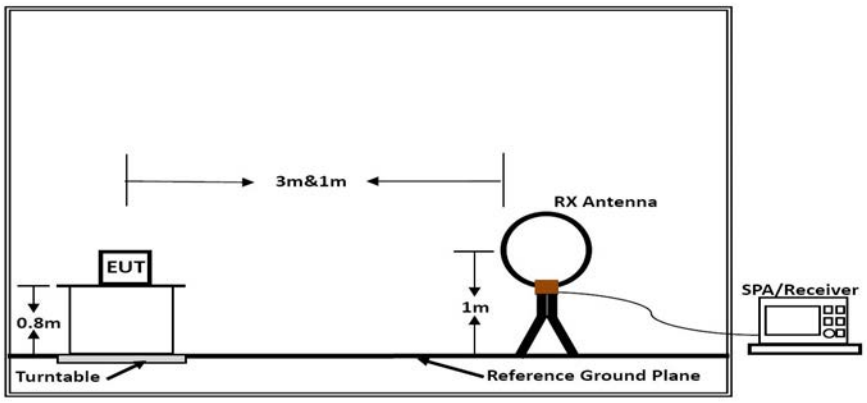
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

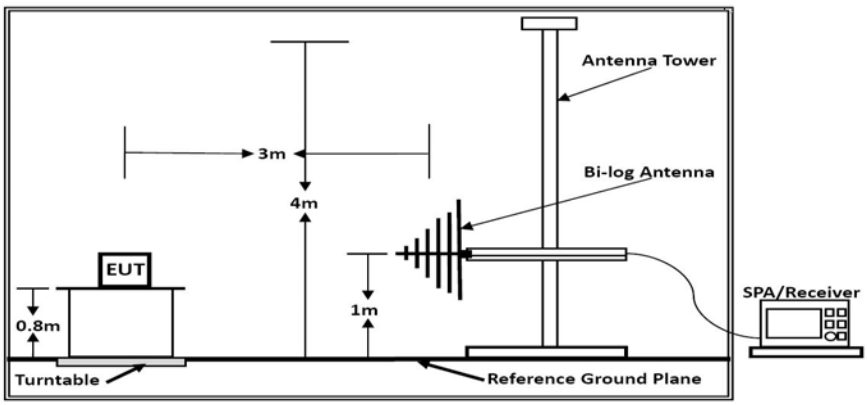
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

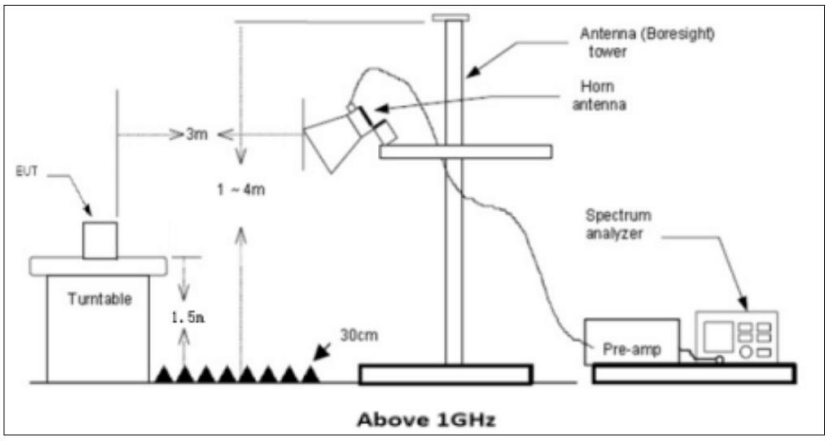
6.8.4 Test Setup Layout



Below 30MHz



Below 1GHz



Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

6.8.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.8.6 Test result

.

Temperature	26.2℃	Humidity	52.1%
Test Engineer	Simba Huang	Configurations	BLE

Remarks:

1. *Only the worst case Main Antenna test data.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

■ **Results of Radiated Emissions (9 KHz~30MHz)**

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

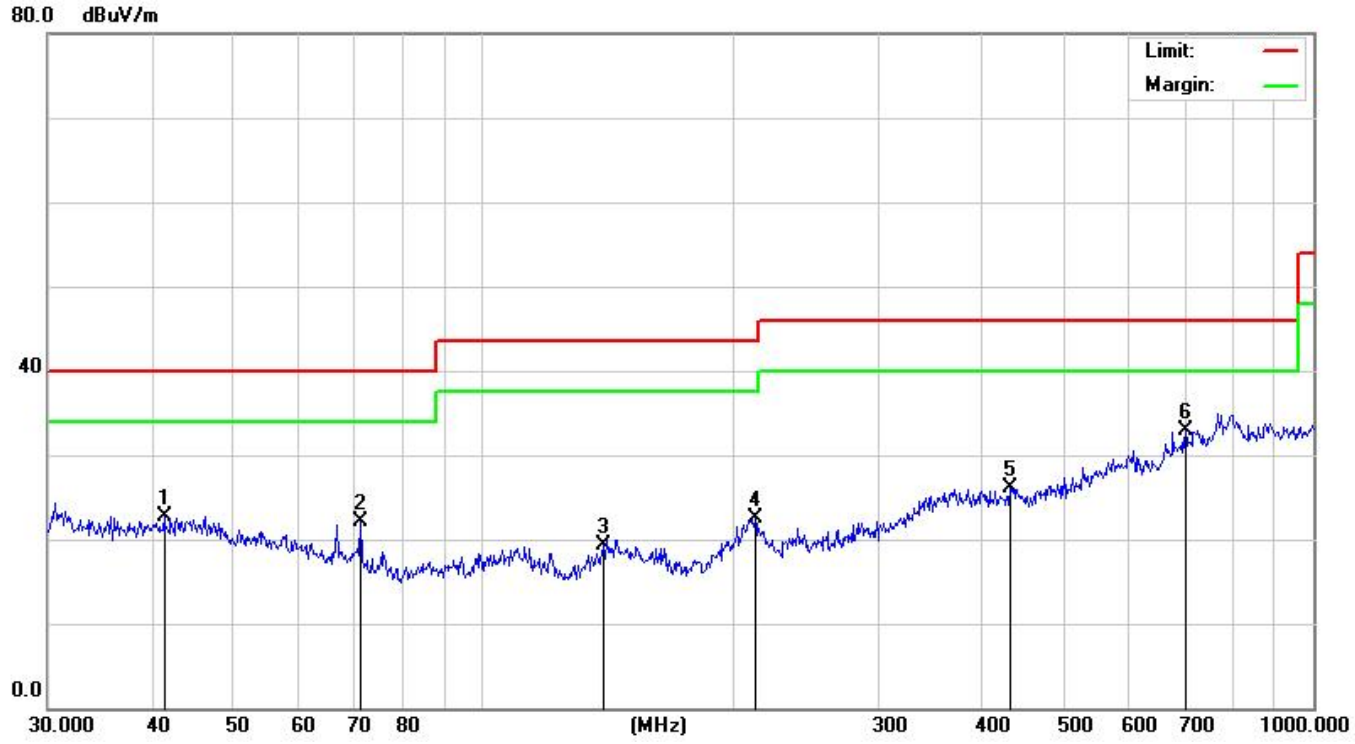
The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

■ **Results of Radiated Emissions (30MHz~1GHz)**

Pre-scan all test modes, found worst case at GFSK (LCH), and so only show the test result of GFSK (LCH).

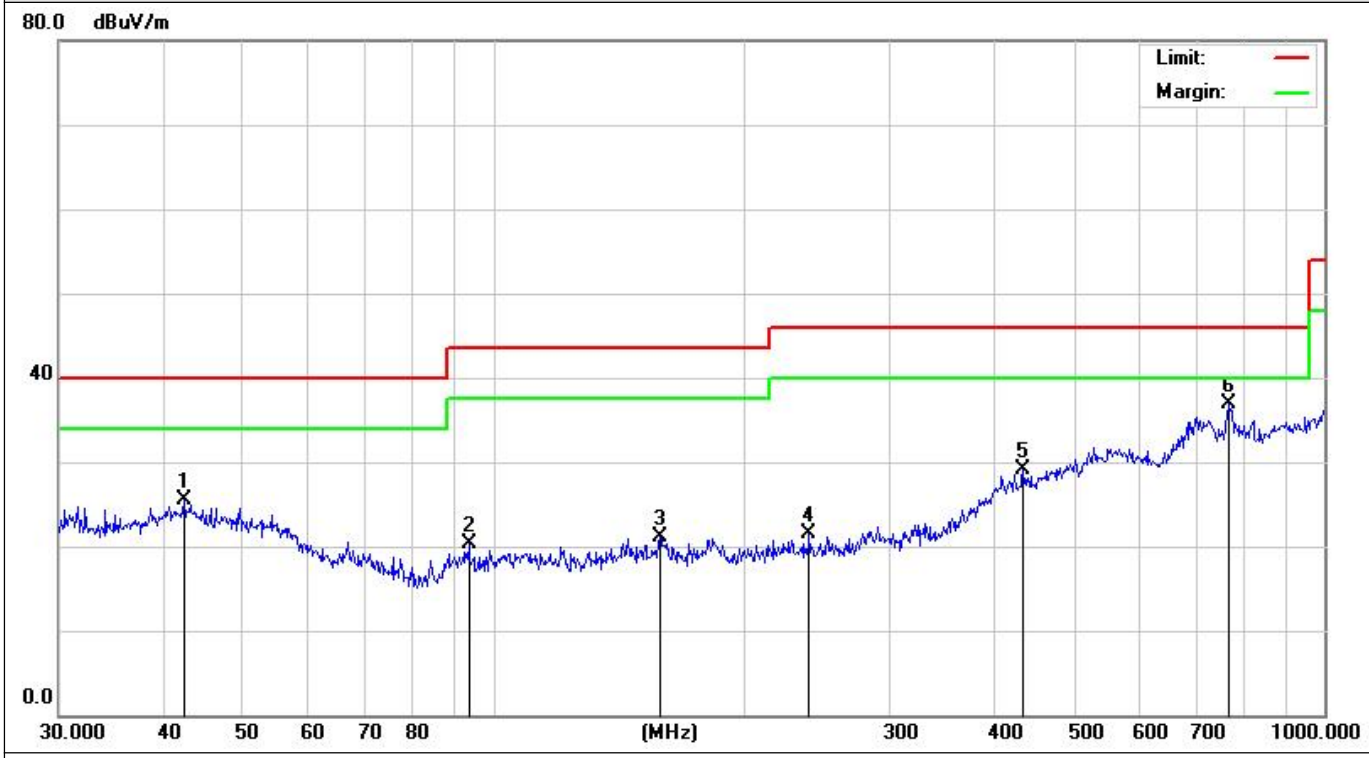
Model name:	ABGPS-23	Test Date :	2022-12-28
Polarization :	Vertical	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		41.4215	27.12	-4.34	22.78	40.00	-17.22	QP
2		71.3300	32.50	-10.46	22.04	40.00	-17.96	QP
3		139.8508	26.94	-7.71	19.23	43.50	-24.27	QP
4		213.0151	27.27	-4.82	22.45	43.50	-21.05	QP
5		431.0316	27.36	-1.17	26.19	46.00	-19.81	QP
6	*	701.7610	29.72	3.27	32.99	46.00	-13.01	QP

Model name:	ABGPS-23	Test Date :	2022-12-28
Polarization :	Horizontal	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		42.4508	27.42	-1.97	25.45	40.00	-14.55	QP
2		93.4402	28.94	-8.57	20.37	43.50	-23.13	QP
3		158.6677	27.80	-6.68	21.12	43.50	-22.38	QP
4		239.9874	28.33	-6.78	21.55	46.00	-24.45	QP
5		434.0651	27.67	1.46	29.13	46.00	-16.87	QP
6	*	768.7481	30.55	6.39	36.94	46.00	-9.06	QP

Results for Radiated Emissions (1- 26 GHz)

Test channel:	Lowest channel

H

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
4804.000	47.08	5.06	52.14	74.00	-21.86	PEAK
4804.000	35.55	5.06	40.61	54.00	-13.39	AVG
7206.000	43.01	7.03	50.04	74.00	-23.96	PEAK
7206.000	30.64	7.03	37.67	54.00	-16.33	AVG

V

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
4804.000	45.91	5.06	50.97	74.00	-23.03	PEAK
4804.000	35.43	5.06	40.49	54.00	-13.51	AVG
7206.000	40.43	7.03	47.46	74.00	-26.54	PEAK
7206.000	31.69	7.03	38.72	54.00	-15.28	AVG

Test channel:	Middle channel

H

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
4880.000	47.49	5.14	52.63	74.00	-21.37	PEAK
4880.000	35.04	5.14	40.18	54.00	-13.82	AVG
7320.000	41.51	7.52	49.03	74.00	-24.97	PEAK
7320.000	31.45	7.52	38.97	54.00	-15.03	AVG

V

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
4880.000	43.87	5.14	49.01	74.00	-24.99	PEAK
4880.000	36.08	5.14	41.22	54.00	-12.78	AVG
7320.000	39.87	7.52	47.39	74.00	-26.61	PEAK
7320.000	31.76	7.52	39.28	54.00	-14.72	AVG

Test channel:	Highest channel

H

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
4960.000	46.66	5.22	51.88	74.00	-22.12	PEAK
4960.000	34.36	5.22	39.58	54.00	-14.42	AVG
7440.000	39.60	8.06	47.66	74.00	-26.34	PEAK
7440.000	30.36	8.06	38.42	54.00	-15.58	AVG

V

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
4960.000	45.76	5.22	50.98	74.00	-23.02	PEAK
4960.000	34.83	5.22	40.05	54.00	-13.95	AVG
7440.000	38.90	8.06	46.96	74.00	-27.04	PEAK
7440.000	30.74	8.06	38.80	54.00	-15.20	AVG

Remarks:

1). Measuring frequencies from 9 KHz - 10th harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.
2). Radiated emissions *measured in frequency range from 9 KHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.*
3). Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4). Margin= Final Level – Limit
5).Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
6). All the modes have been tested and the only shows the worst case GFSK mode

5.9 Conducted Emissions

6.9.1 Standard requirement:

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

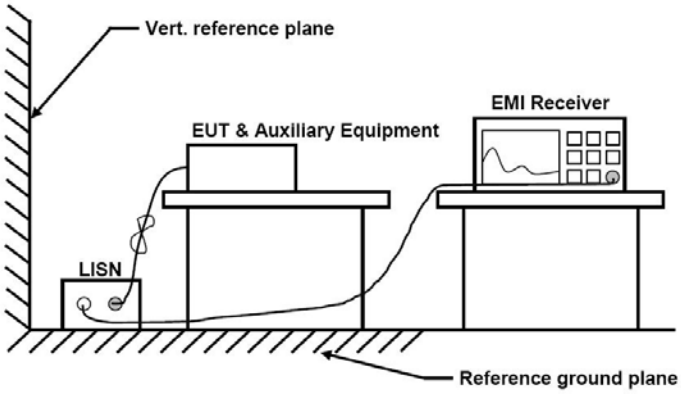
* Decreasing linearly with the logarithm of the frequency

6.9.2 Test Procedures

The transmitter output is connected to EMI receiver. The resolution bandwidth is set to 9 kHz. The video bandwidth is set to 30 kHz, Sweep time=Auto

The spectrum from 150 kHz to 30MHz is investigated with the transmitter set to the lowest, middle, and highest channels.

6.9.3 Test Setup Layout



6.9.4 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.9.5 Test result

PASS

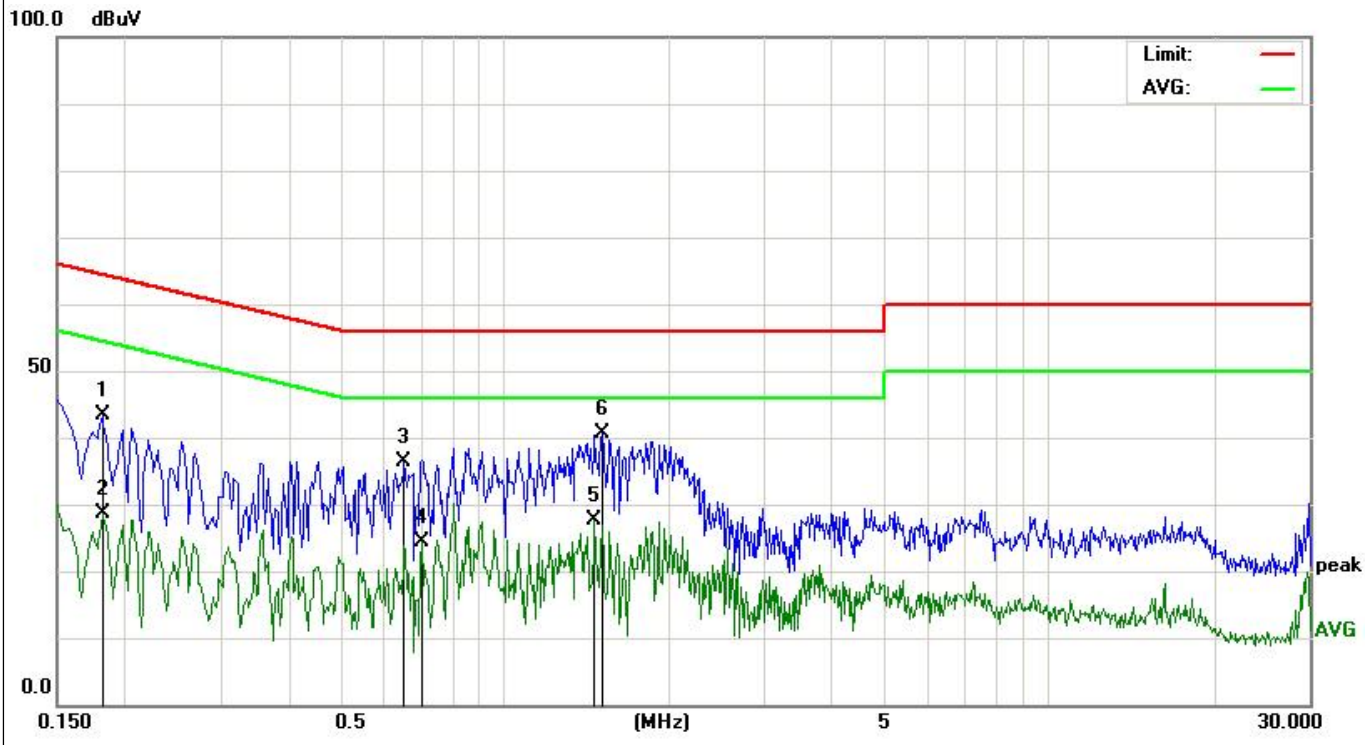
The test data please refer to following page.

Temperature	26.2℃	Humidity	52.1%
Test Engineer	Simba Huang	Configurations	BLE

Measurement data:

Pre-scan all test modes, found worst case at GFSK 2480MHz, and so only show the test result of GFSK 2480MHz

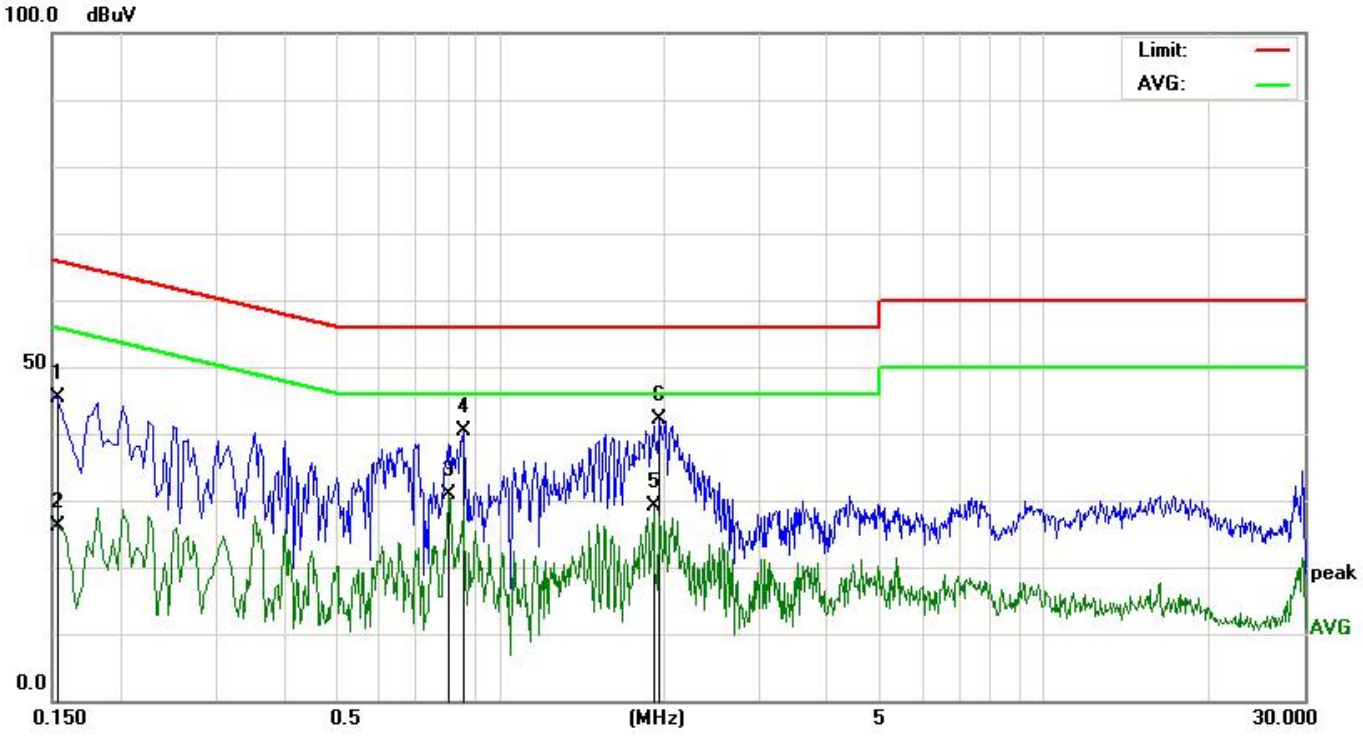
Model name:	ABGPS-23	Test Date :	2022-12-28
ATM Pressure:	101 kPa	Test by:	Simba Huang
Phase :	Line	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1819	32.02	11.36	43.38	64.39	-21.01	QP
2		0.1819	17.34	11.36	28.70	54.39	-25.69	AVG
3		0.6540	26.48	9.95	36.43	56.00	-19.57	QP
4		0.7019	14.44	9.94	24.38	46.00	-21.62	AVG
5		1.4620	17.58	9.93	27.51	46.00	-18.49	AVG
6	*	1.5060	30.60	9.93	40.53	56.00	-15.47	QP

Model name:	ABGPS-23	Test Date :	2022-12-28
ATM Pressure:	101 kPa	Test by:	Simba Huang
Phase :	Neutral	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1539	33.52	11.84	45.36	65.78	-20.42	QP
2		0.1539	14.24	11.84	26.08	55.78	-29.70	AVG
3		0.8059	21.01	9.92	30.93	46.00	-15.07	AVG
4		0.8540	30.45	9.91	40.36	56.00	-15.64	QP
5		1.9140	19.05	9.96	29.01	46.00	-16.99	AVG
6	*	1.9620	32.06	9.96	42.02	56.00	-13.98	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

6 .Appendix test data

Appendix A. On Time and Duty Cycle

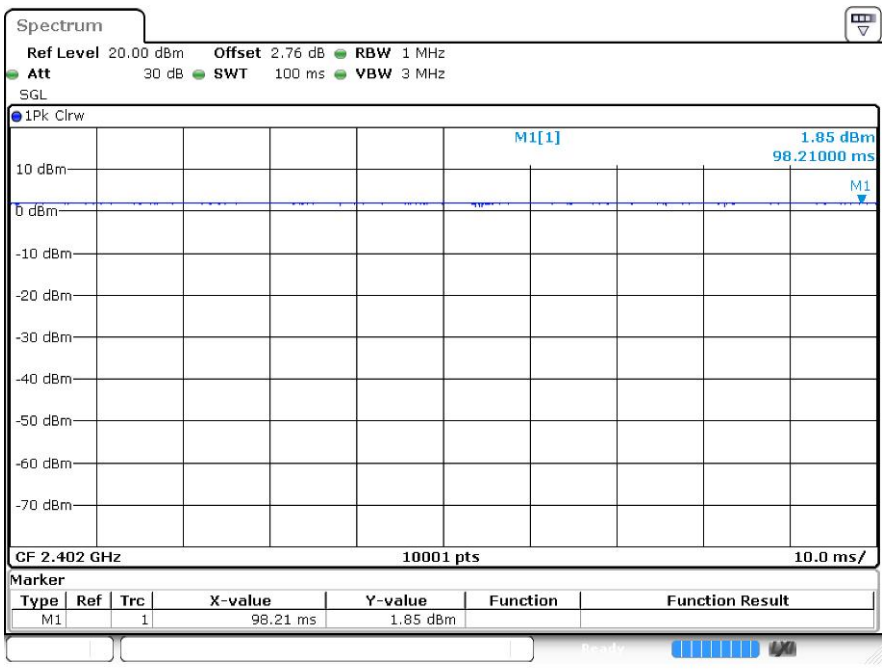
Test Result

Mode	Frequency (MHz)	Duty Cycle (%)	1/T (kHz)
BLE 1M	2402	100	0.01
BLE 1M	2440	100	0.01
BLE 1M	2480	100	0.01
BLE 2M	2402	100	0.01
BLE 2M	2440	100	0.01
BLE 2M	2480	100	0.01

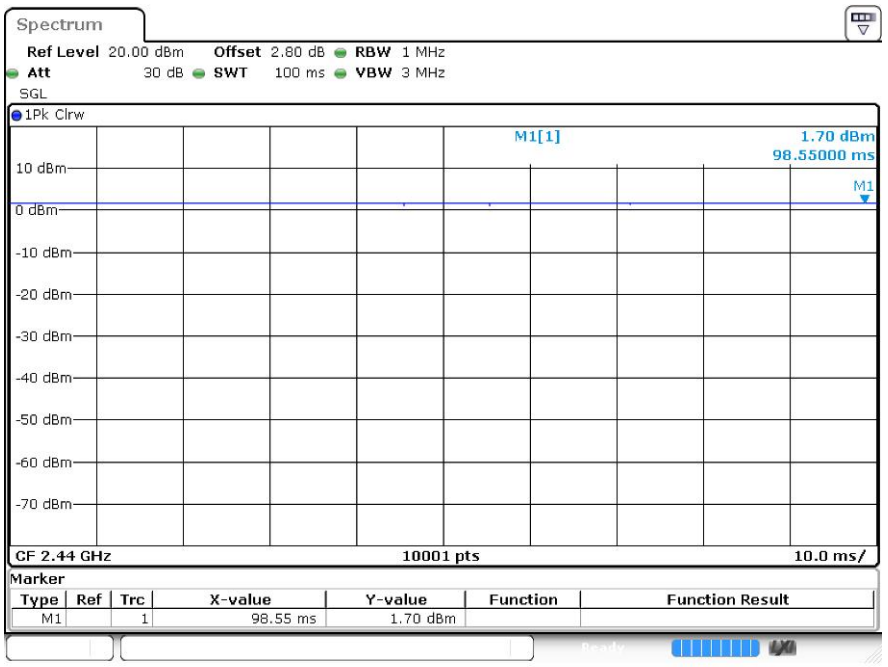
Test Graphs

Test Graphs

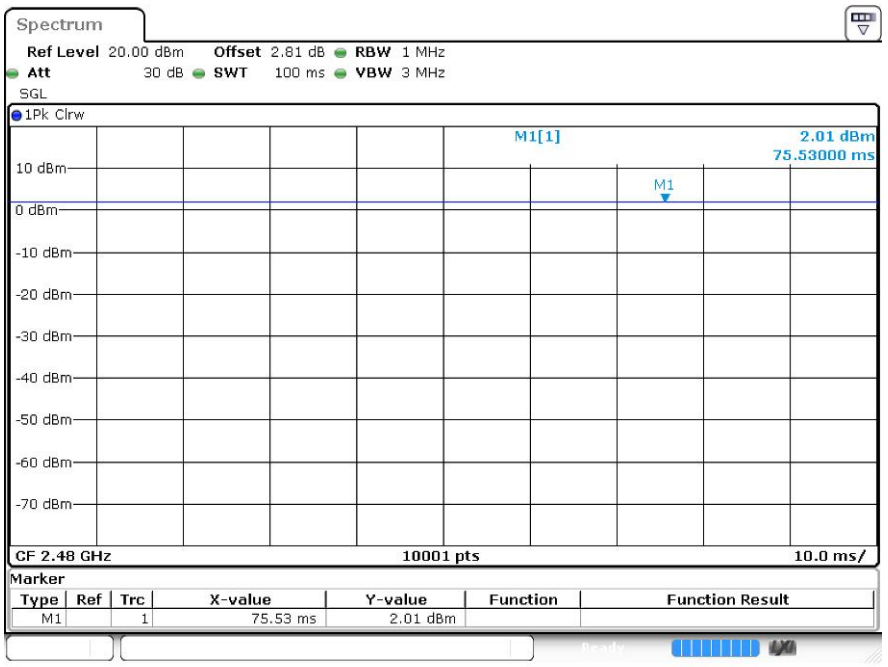
BLE 1M 2402MHz



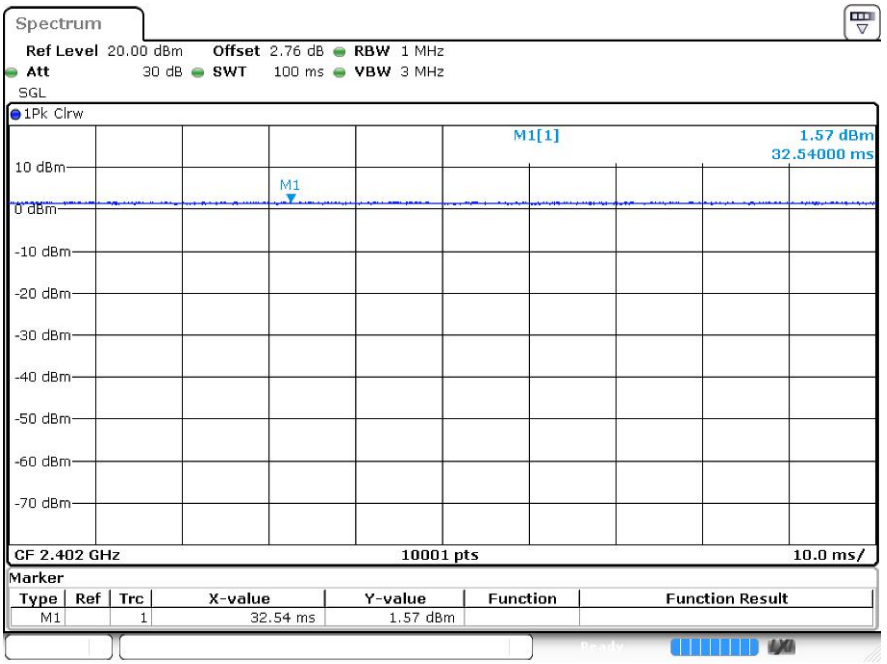
BLE 1M 2440MHz



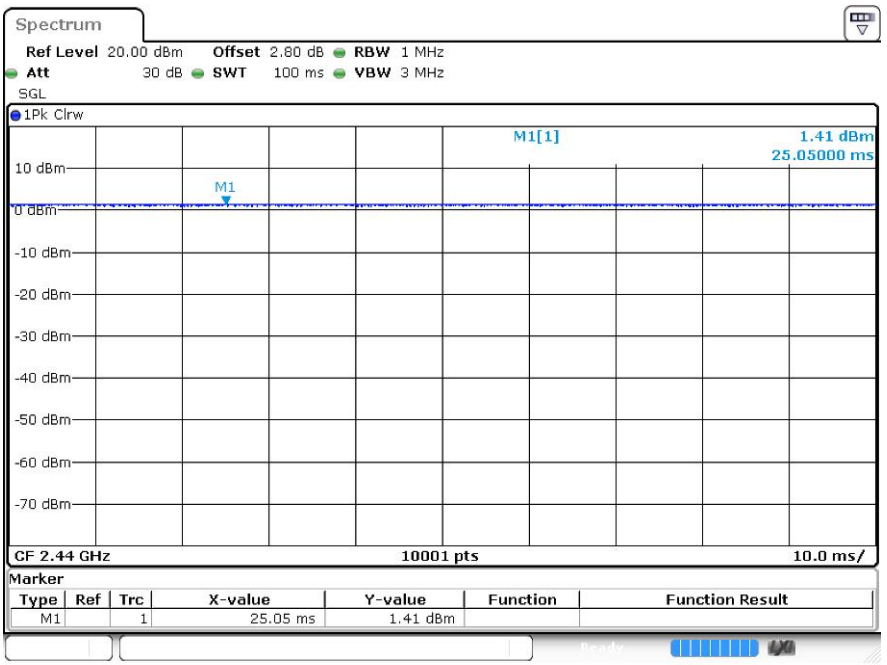
BLE 1M 2480MHz



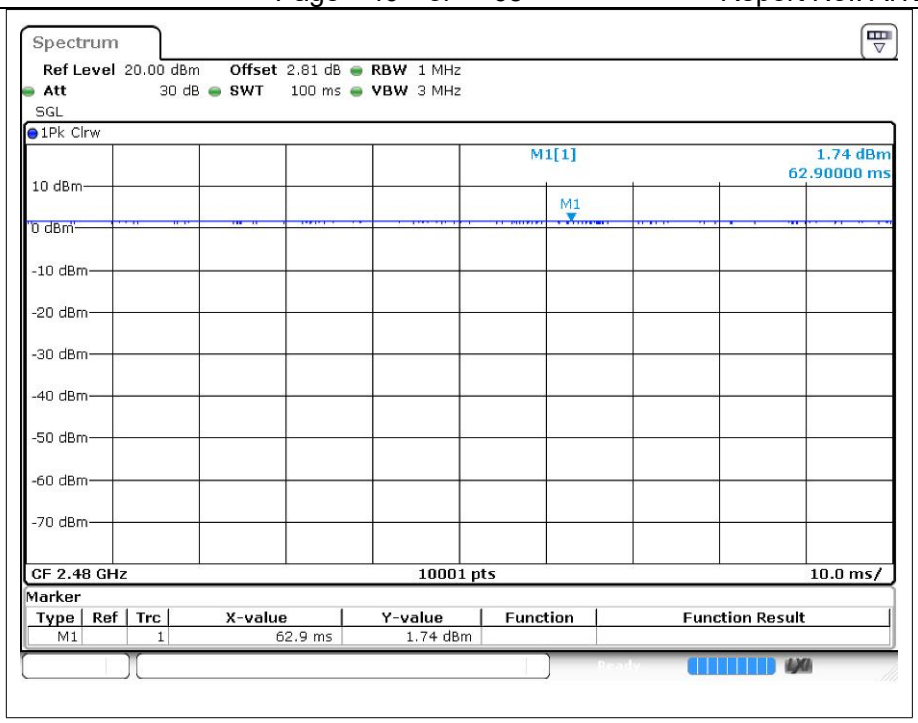
BLE 2M 2402MHz



BLE 2M 2440MHz



BLE 2M 2480MHz


Spectrum
Ref Level 20.00 dBm Offset 2.81 dB RBW 1 MHz
Att 30 dB SWT 100 ms VBW 3 MHz
SGL
1Pk Clrw
M1[1] 1.74 dBm
62.90000 ms
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.48 GHz
10001 pts
10.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 62.9 ms 1.74 dBm

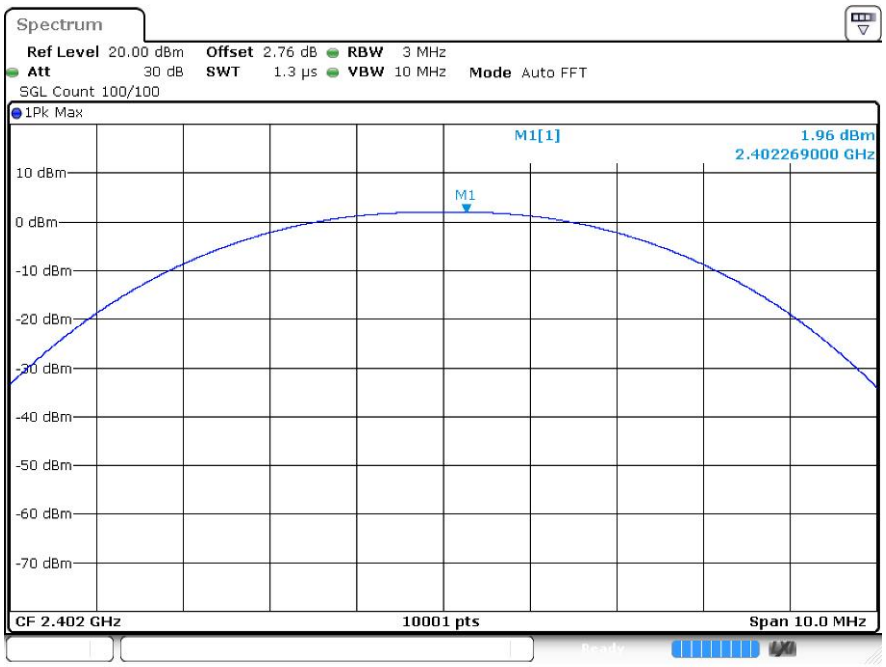
Appendix B. Maximum Conducted Output Peak Power Measurement

Test Result

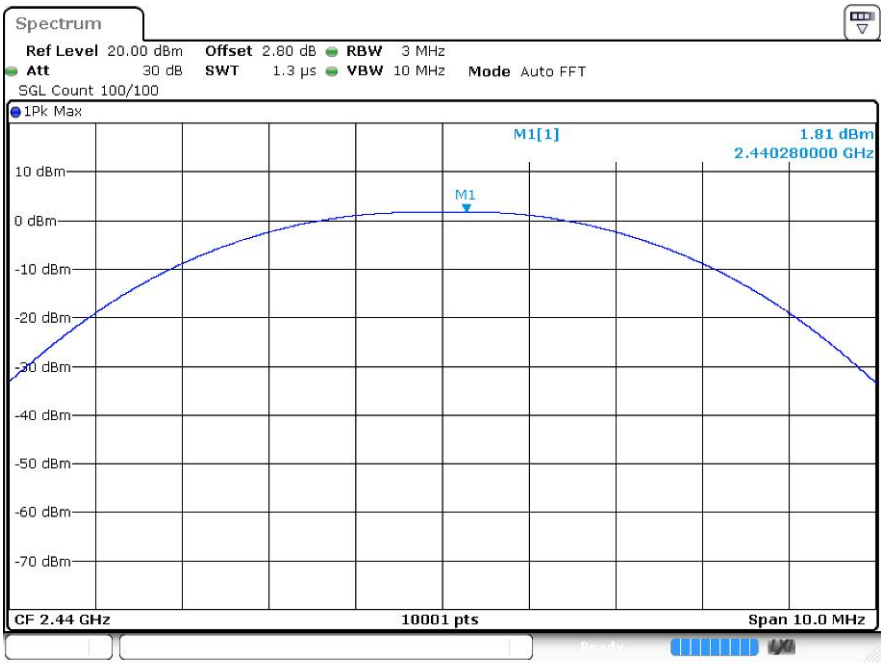
Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
BLE 1M	2402	1.96	30	Pass
BLE 1M	2440	1.81	30	Pass
BLE 1M	2480	2.11	30	Pass
BLE 2M	2402	1.93	30	Pass
BLE 2M	2440	1.8	30	Pass
BLE 2M	2480	2.1	30	Pass

Test Graphs

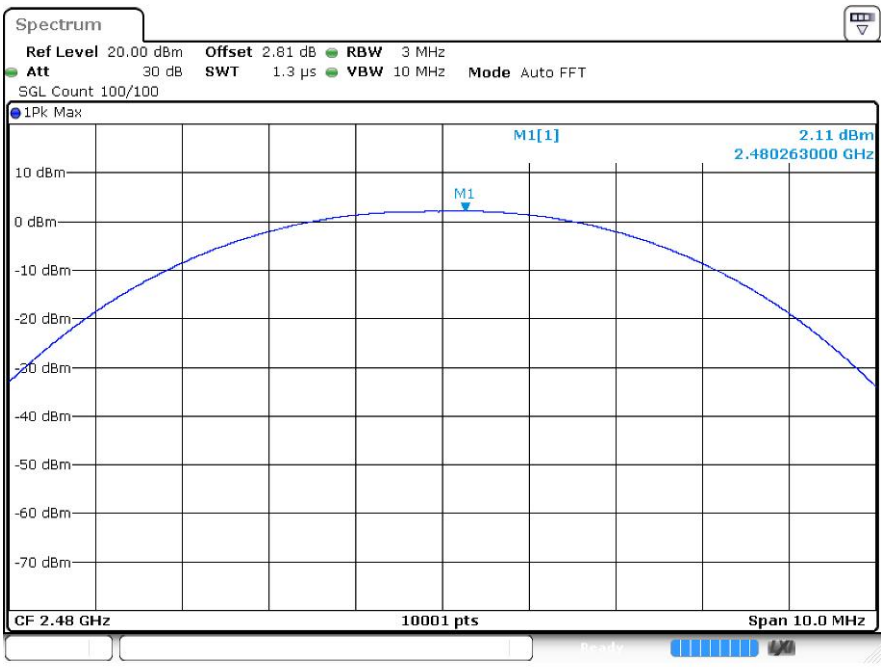
BLE 1M 2402MHz



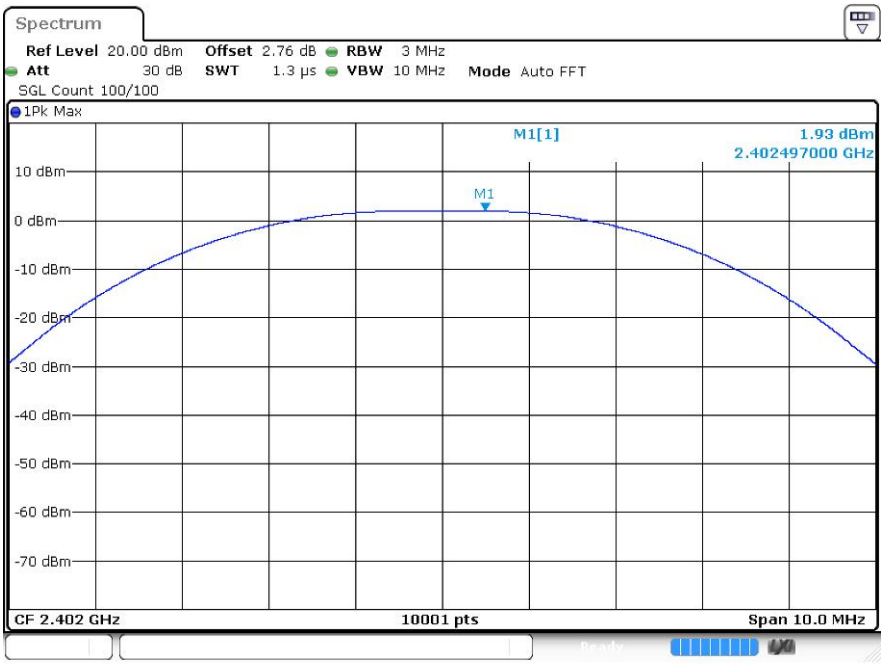
BLE 1M 2440MHz



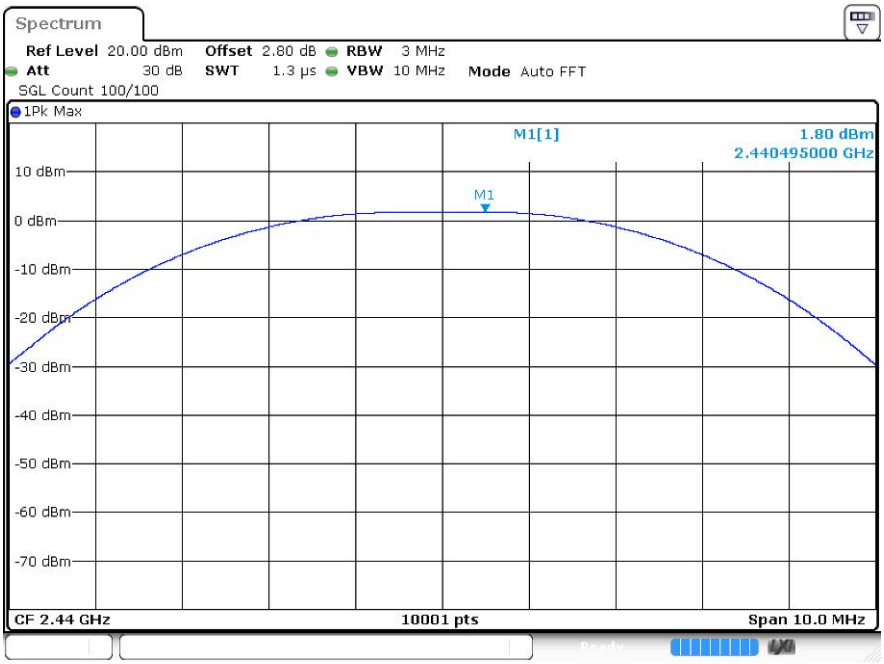
BLE 1M 2480MHz



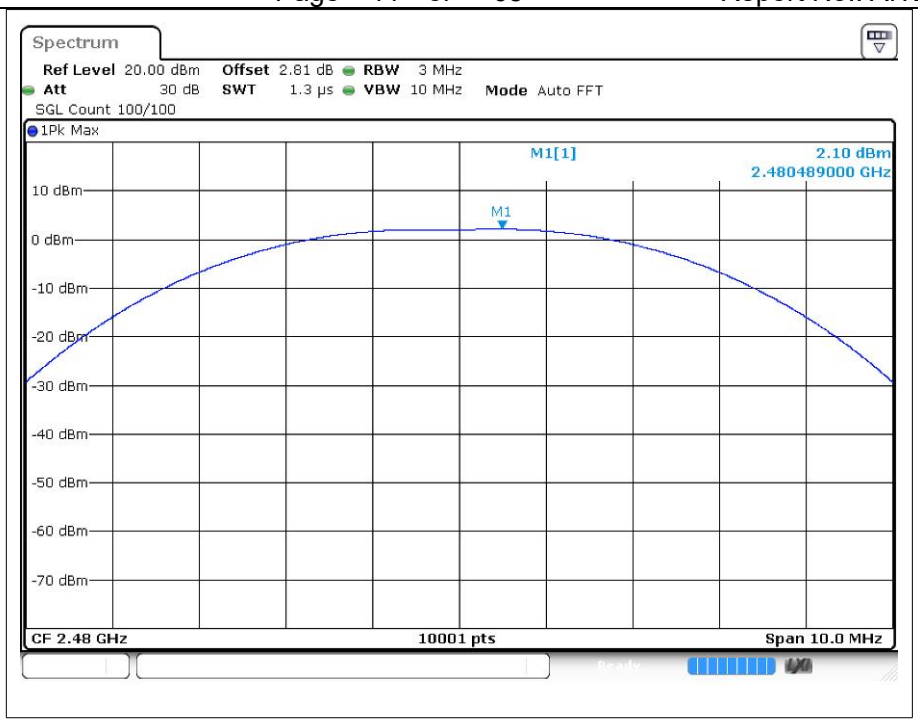
BLE 2M 2402MHz



BLE 2M 2440MHz



BLE 2M 2480MHz


Spectrum
Ref Level 20.00 dBm Offset 2.81 dB RBW 3 MHz
Att 30 dB SWT 1.3 µs VBW 10 MHz Mode Auto FFT
SGL Count 100/100
1Pk Max
M1[1] 2.10 dBm
2.480489000 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.48 GHz
10001 pts
Span 10.0 MHz

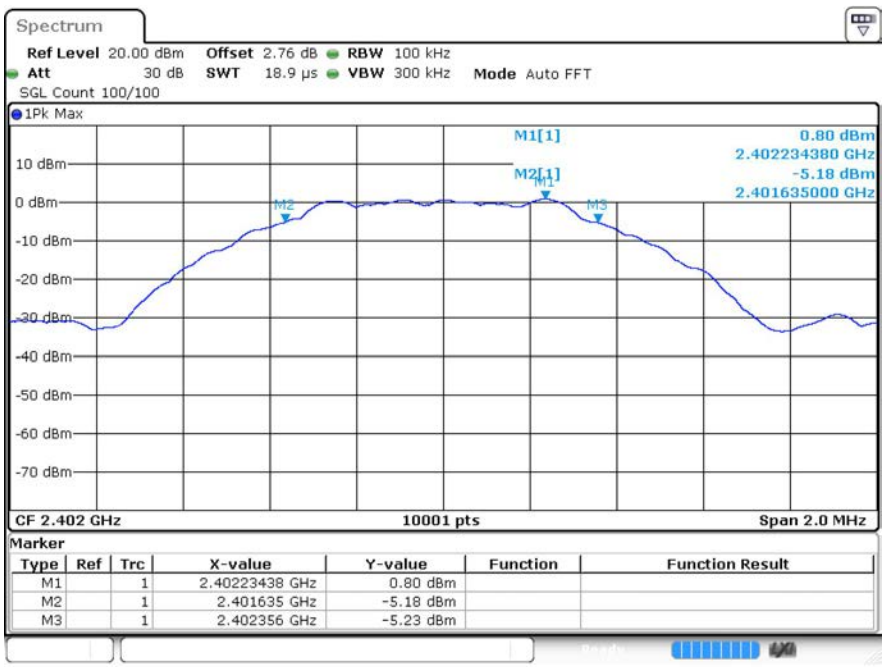
Appendix C. 6 dB Spectrum Bandwidth Measurement

Test Result

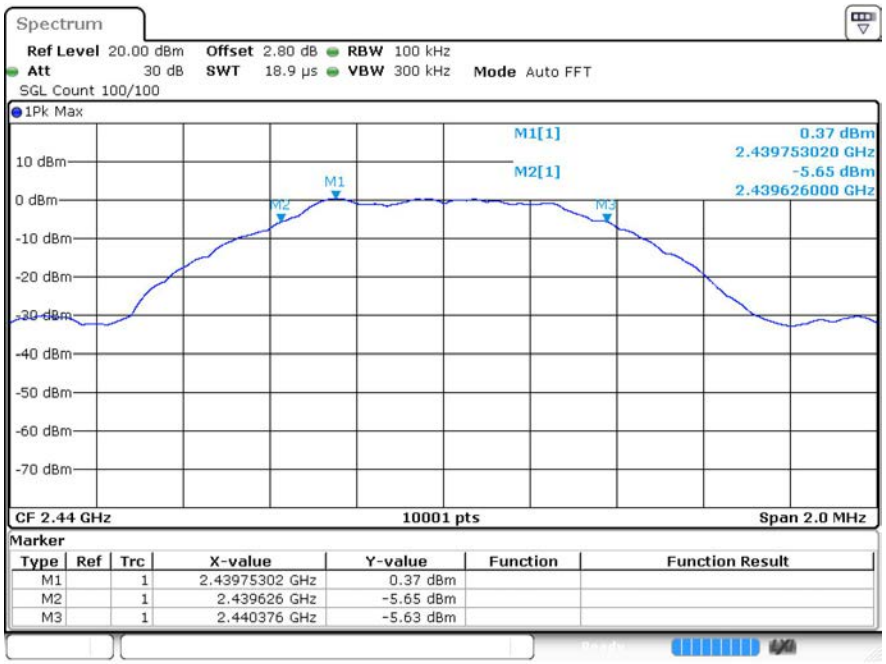
Mode	Frequency (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
BLE 1M	2402	0.721	0.5	Pass
BLE 1M	2440	0.75	0.5	Pass
BLE 1M	2480	0.746	0.5	Pass
BLE 2M	2402	1.305	0.5	Pass
BLE 2M	2440	1.341	0.5	Pass
BLE 2M	2480	1.288	0.5	Pass

Test Graphs

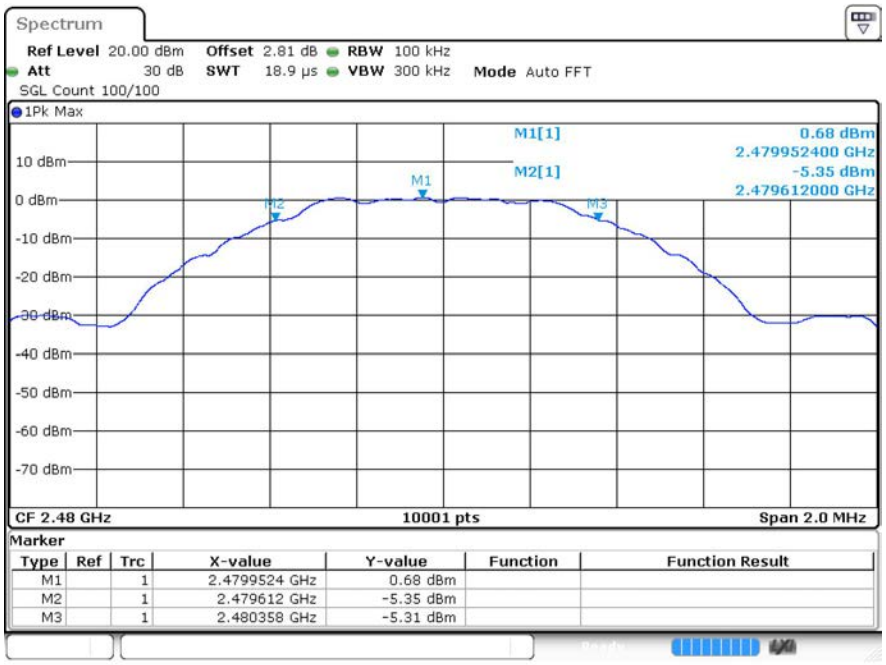
BLE 1M 2402MHz



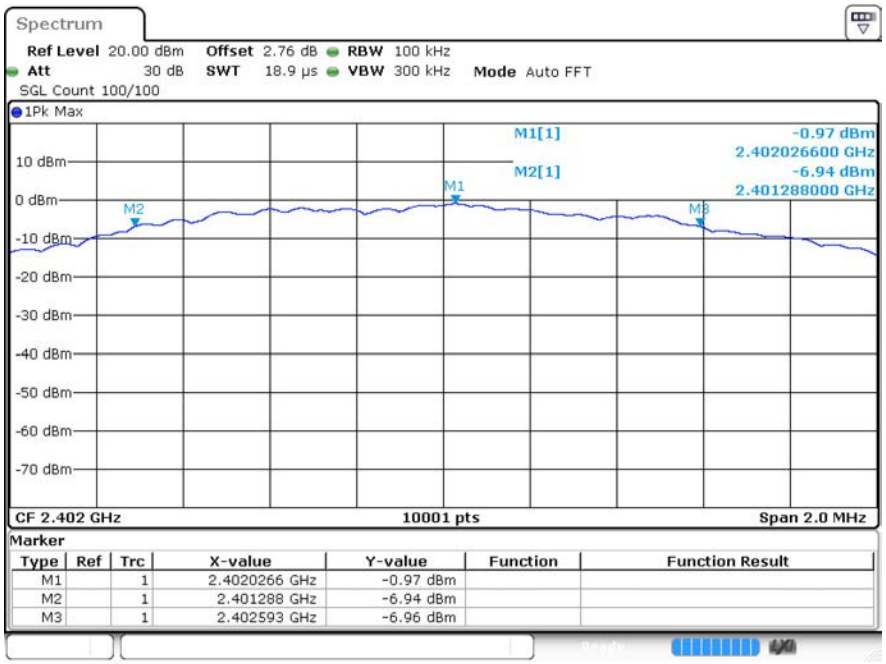
BLE 1M 2440MHz



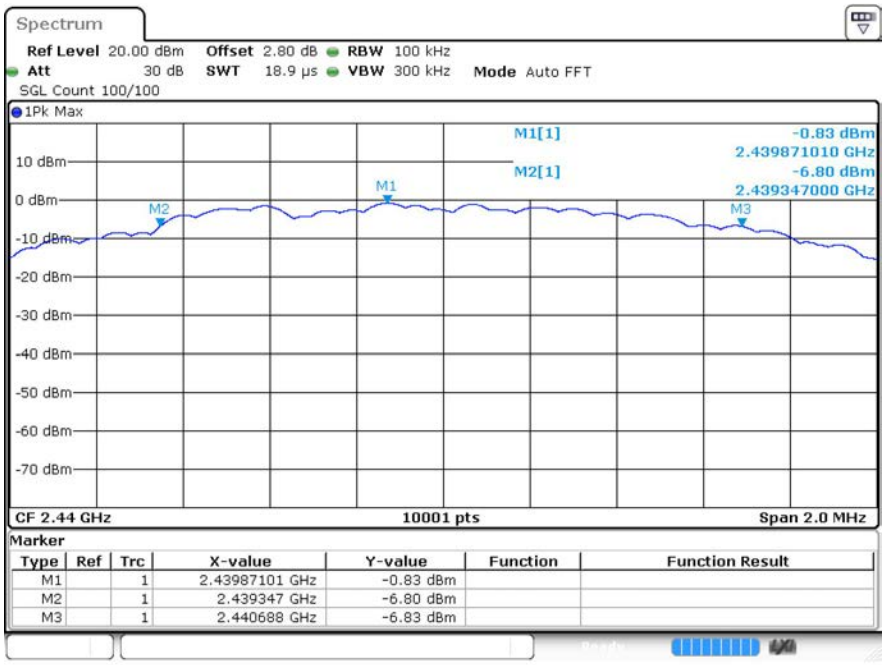
BLE 1M 2480MHz



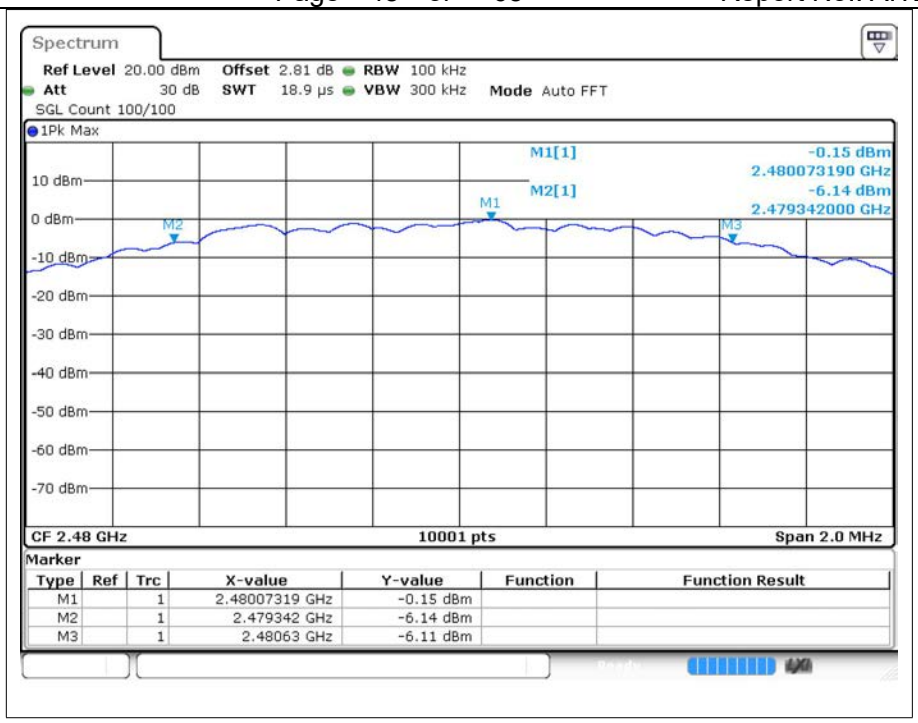
BLE 2M 2402MHz



BLE 2M 2440MHz



BLE 2M 2480MHz


Spectrum
Ref Level 20.00 dBm Offset 2.81 dB RBW 100 kHz
Att 30 dB SWT 18.9 µs VBW 300 kHz Mode Auto FFT
SGL Count 100/100
1Pk Max
M1[1] -0.15 dBm
2.480073190 GHz
M2[1] -6.14 dBm
2.479342000 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
M2
M3
CF 2.48 GHz
10001 pts
Span 2.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.48007319 GHz -0.15 dBm
M2 1 2.479342 GHz -6.14 dBm
M3 1 2.48063 GHz -6.11 dBm

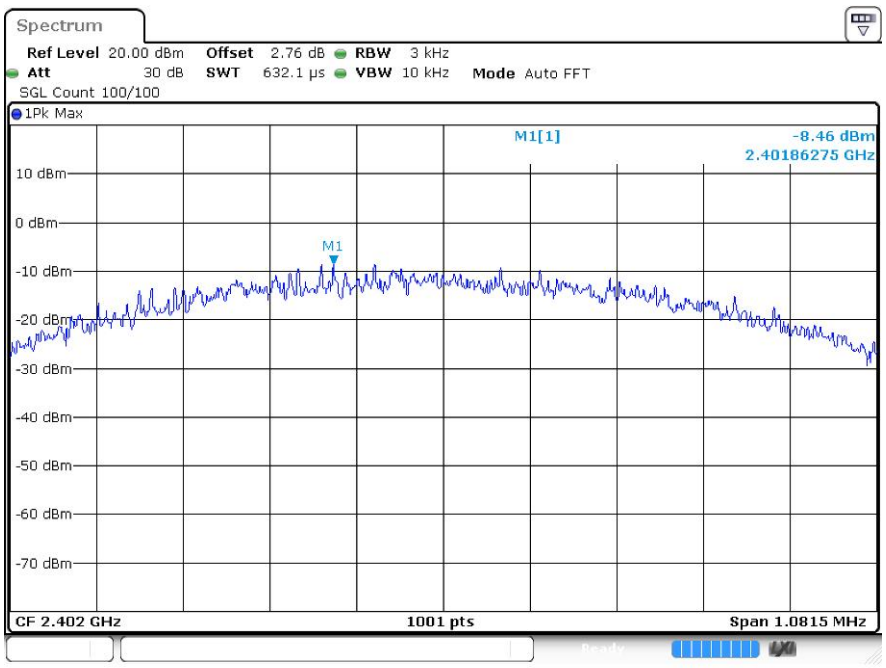
Appendix D. Power Spectral Density

Test Result

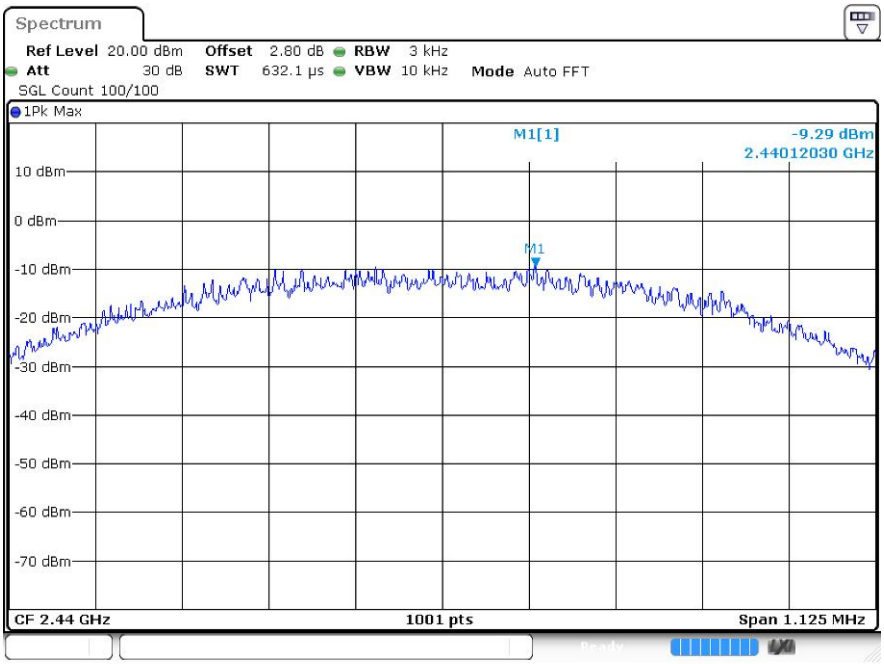
Mode	Frequency (MHz)	Conducted PSD (dBm/3-100kHz)	Limit (dBm/3kHz)	Verdict
BLE 1M	2402	-8.46	≤8	Pass
BLE 1M	2440	-9.29	≤8	Pass
BLE 1M	2480	-9.32	≤8	Pass
BLE 2M	2402	-10.58	≤8	Pass
BLE 2M	2440	-11.28	≤8	Pass
BLE 2M	2480	-11.64	≤8	Pass

Test Graphs

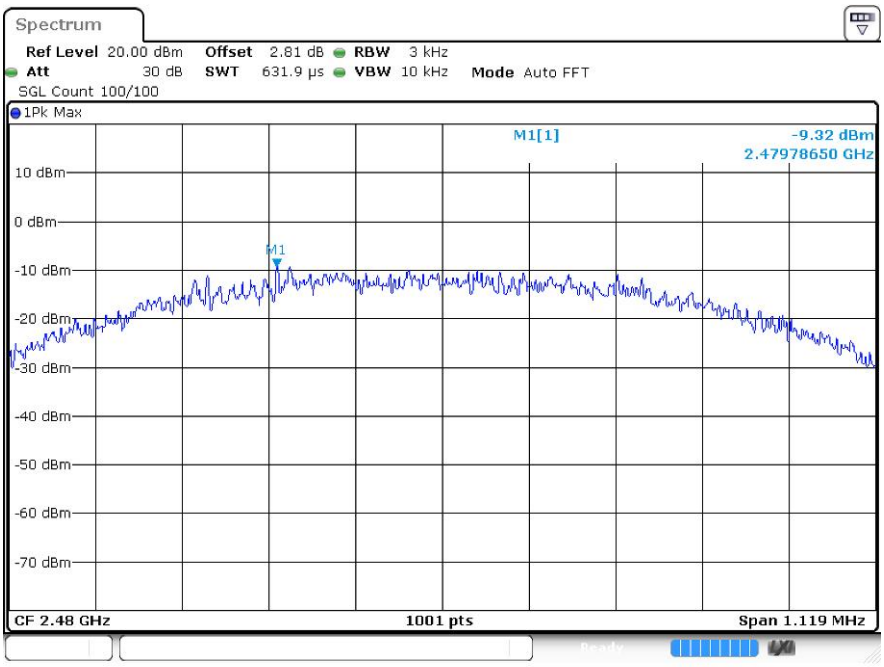
BLE 1M 2402MHz



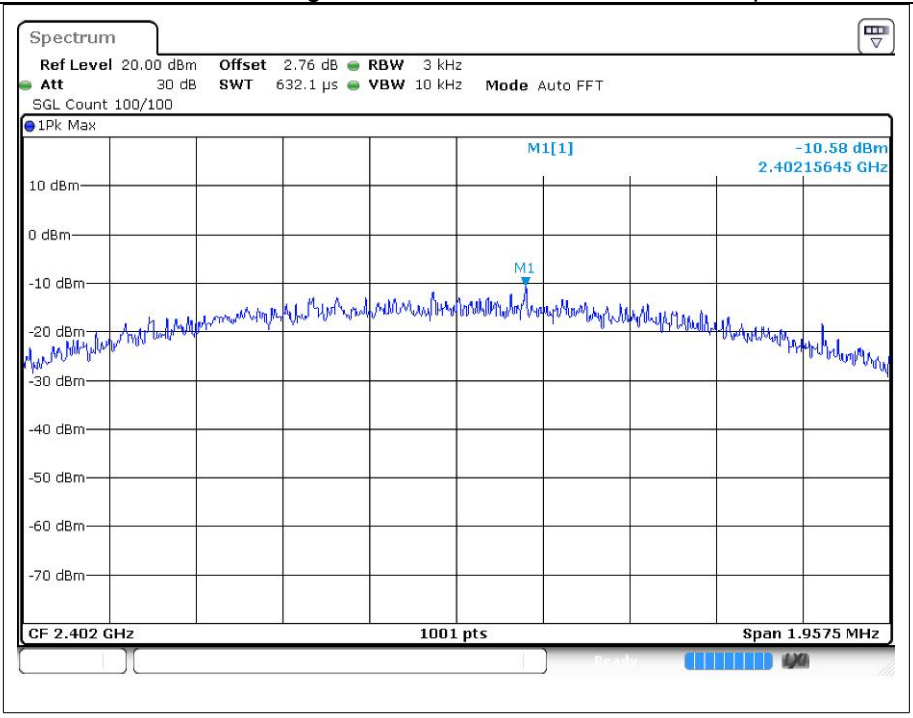
BLE 1M 2440MHz



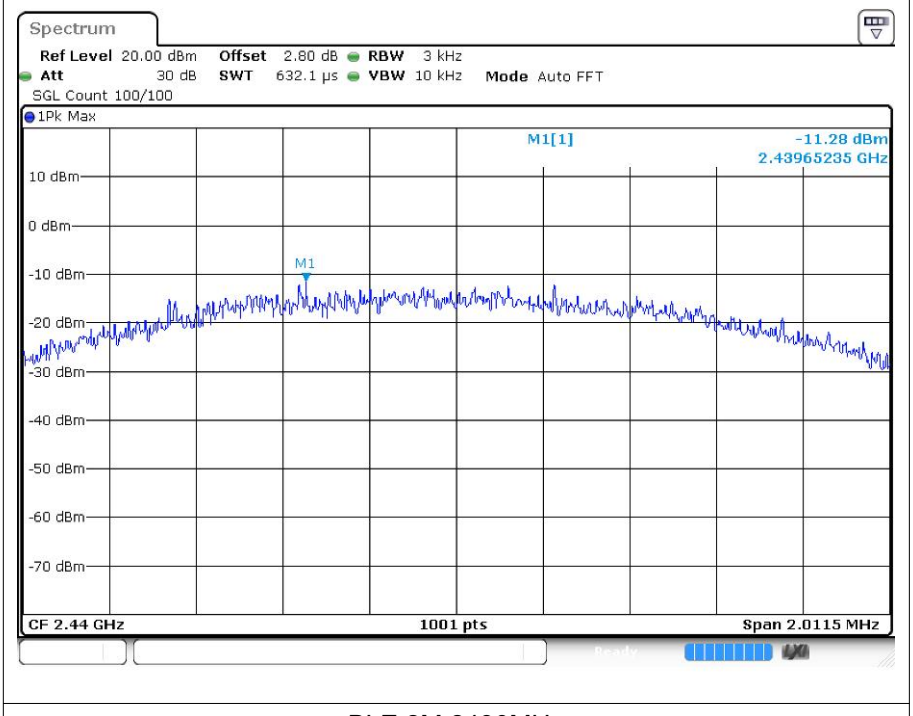
BLE 1M 2480MHz



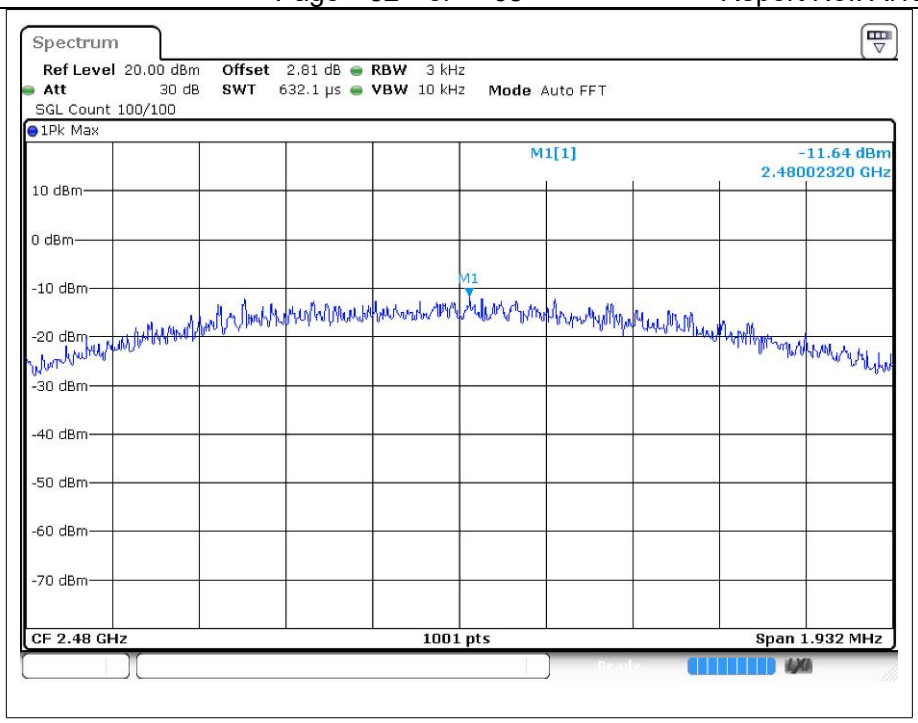
BLE 2M 2402MHz



BLE 2M 2440MHz



BLE 2M 2480MHz


Spectrum
Ref Level 20.00 dBm Offset 2.81 dB RBW 3 kHz
Att 30 dB SWT 632.1 µs VBW 10 kHz Mode Auto FFT
SGL Count 100/100
1Pk Max
M1[1] -11.64 dBm
2.48002320 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.48 GHz
1001 pts
Span 1.932 MHz

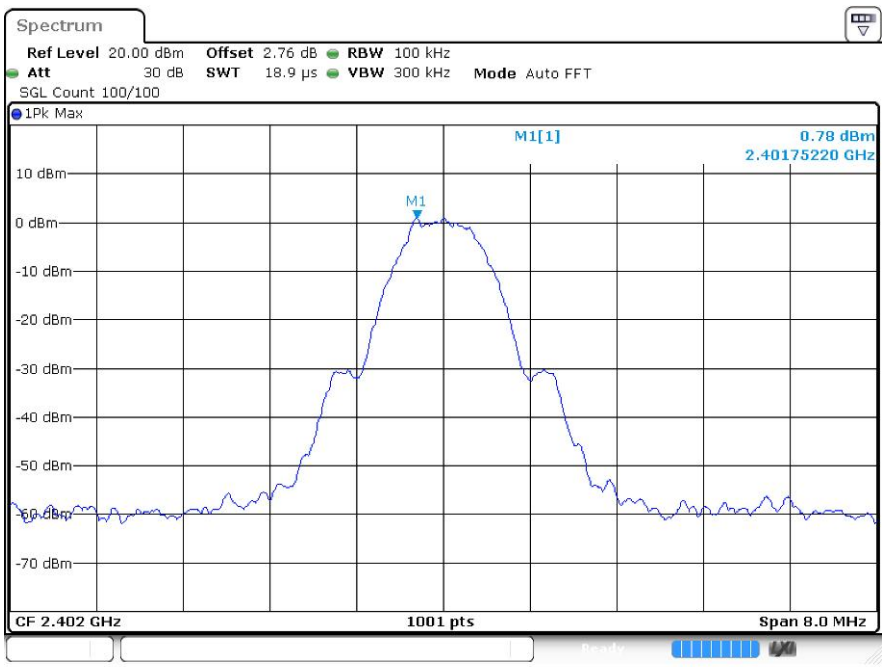
Appendix E. Conducted Spurious Emissions and Band Edges Test

Test Result

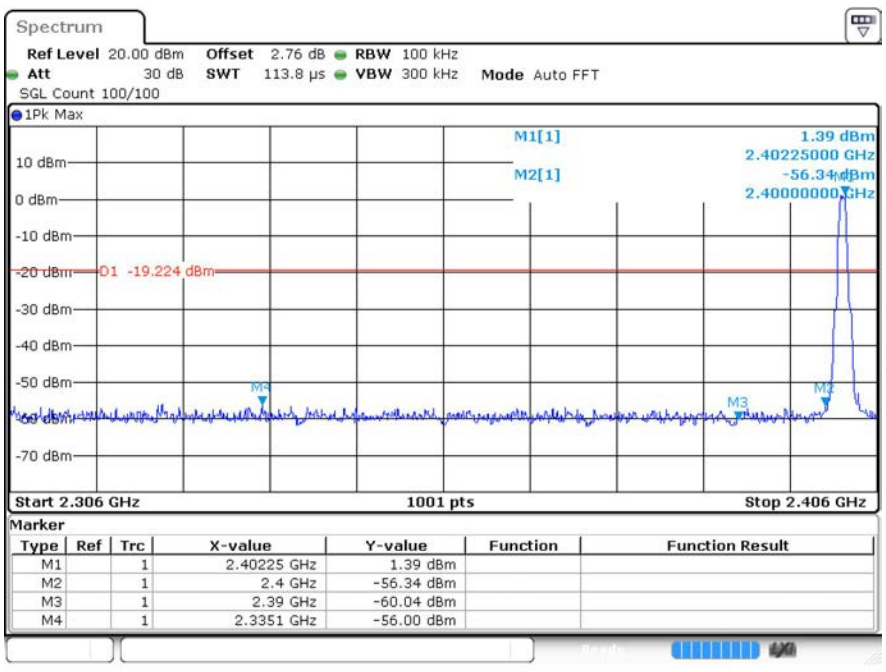
Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
BLE 1M	2402	-56.78	-20	Pass
BLE 1M	2480	-57.82	-20	Pass
BLE 2M	2402	-55.71	-20	Pass
BLE 2M	2480	-56.12	-20	Pass

Test Graphs

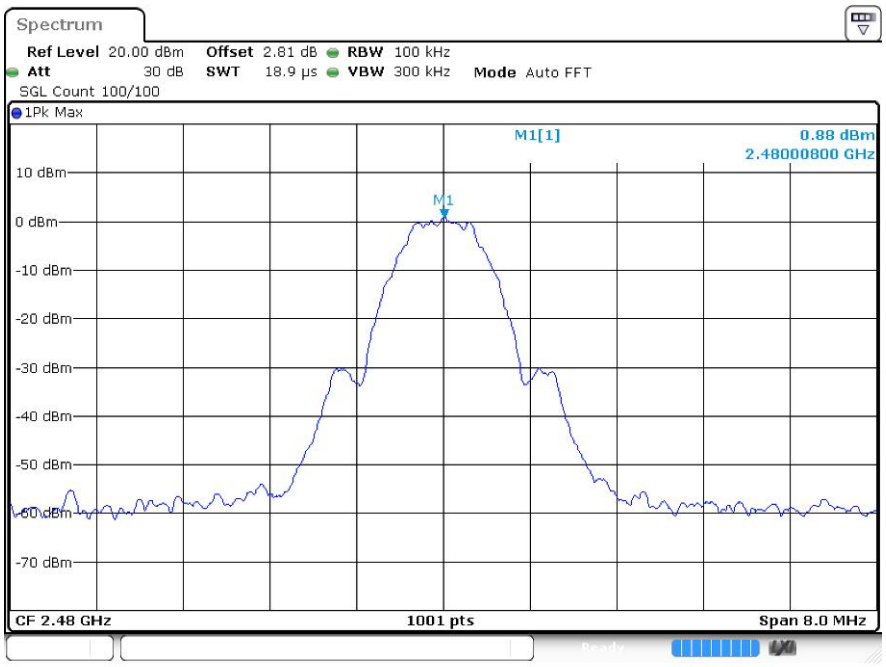
BLE 1M 2402MHz Ref



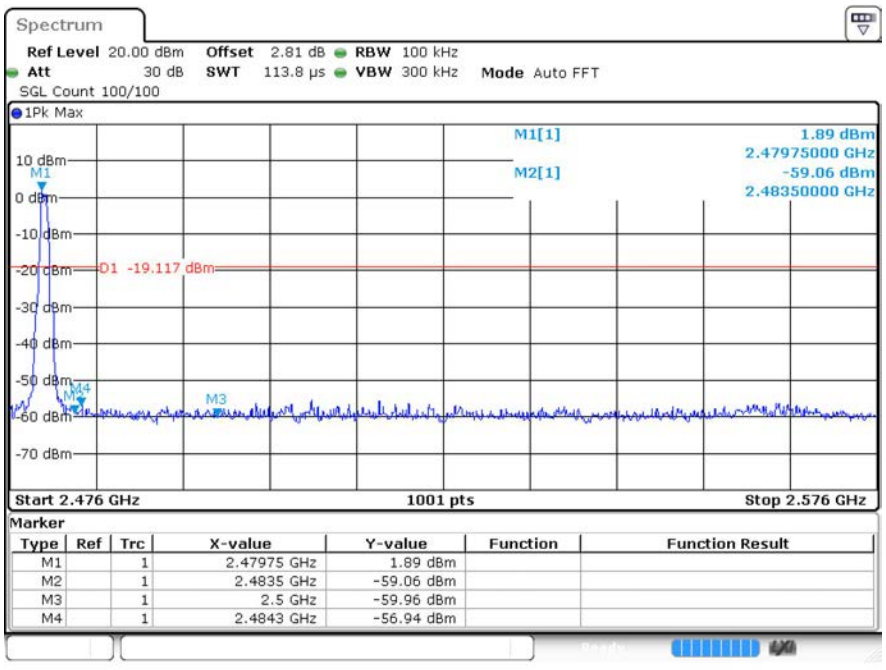
BLE 1M 2402MHz Emission



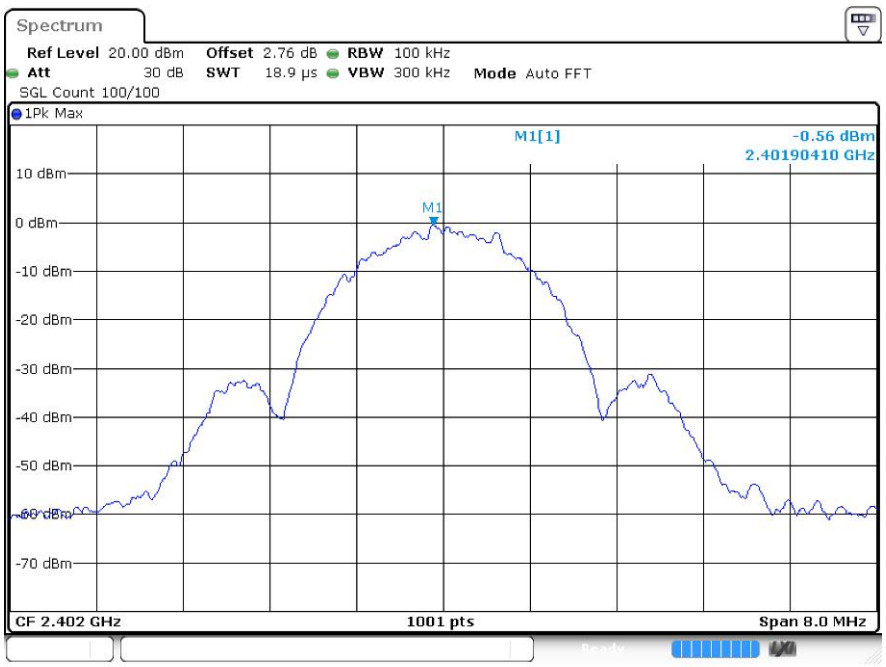
BLE 1M 2480MHz Ref



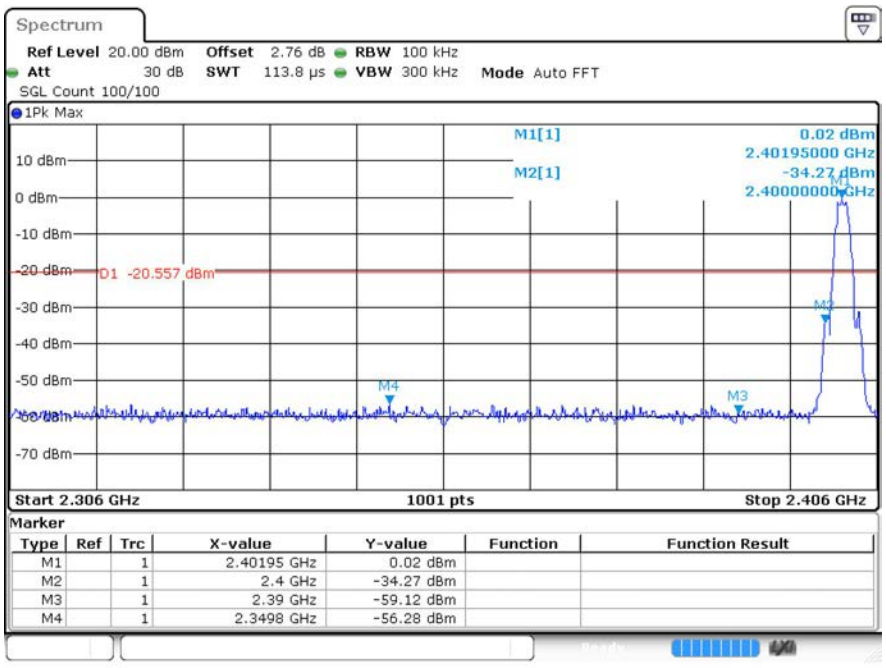
BLE 1M 2480MHz Emission



BLE 2M 2402MHz Ref

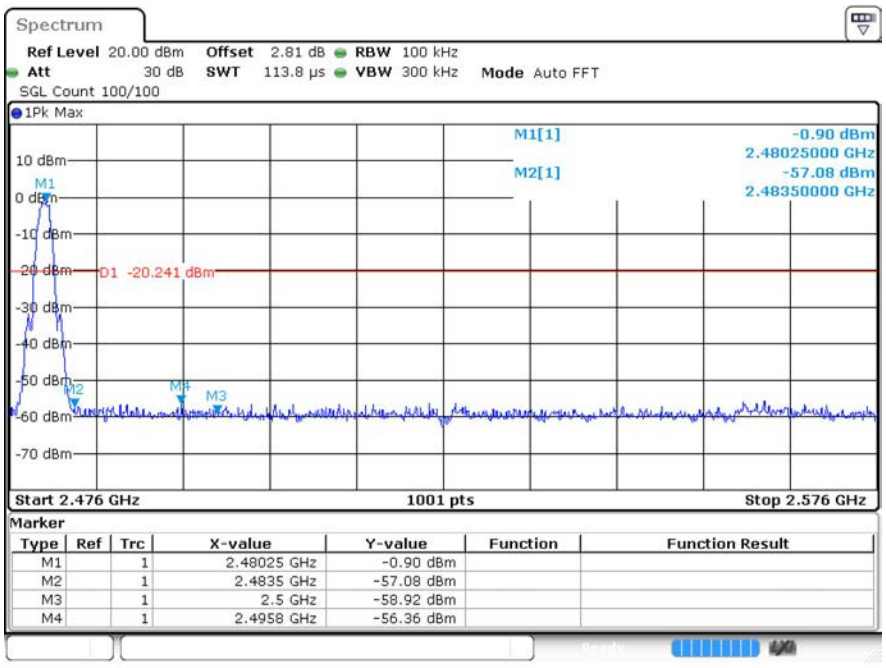


BLE 2M 2402MHz Emission



BLE 2M 2480MHz Ref

BLE 2M 2480MHz Emission



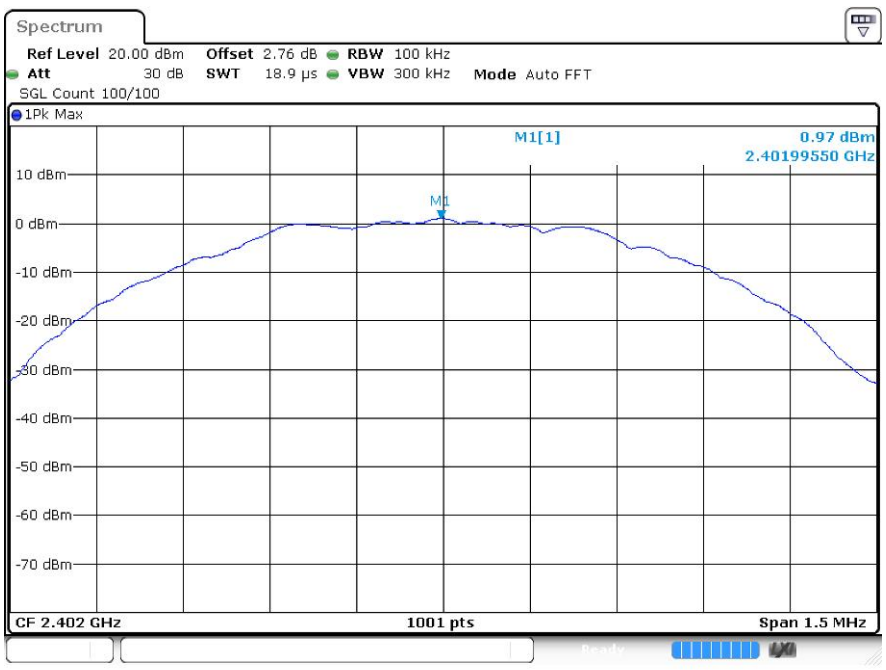
Appendix F. Conducted RF Spurious Emission

Test Result

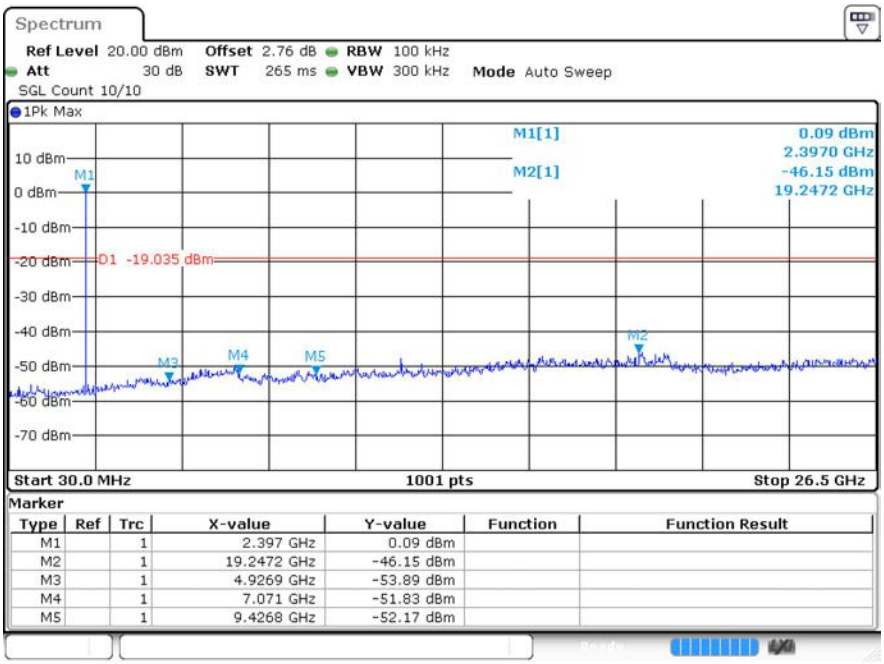
Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
BLE 1M	2402	-47.12	-20	Pass
BLE 1M	2440	-47.25	-20	Pass
BLE 1M	2480	-47.05	-20	Pass
BLE 2M	2402	-44.7	-20	Pass
BLE 2M	2440	-45.33	-20	Pass
BLE 2M	2480	-45.02	-20	Pass

Test Graphs

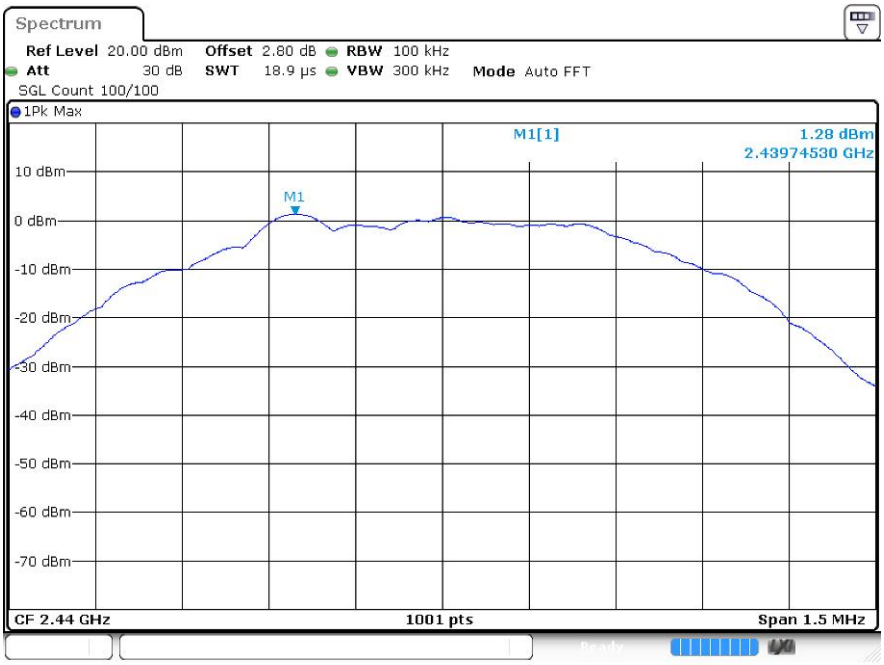
BLE 1M 2402MHz Ref



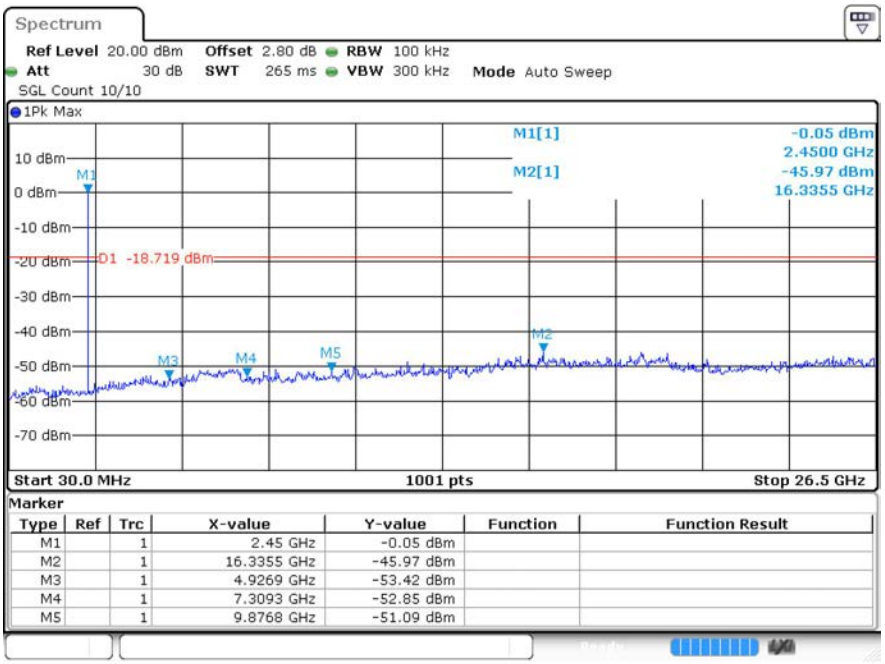
BLE 1M 2402MHz Emission



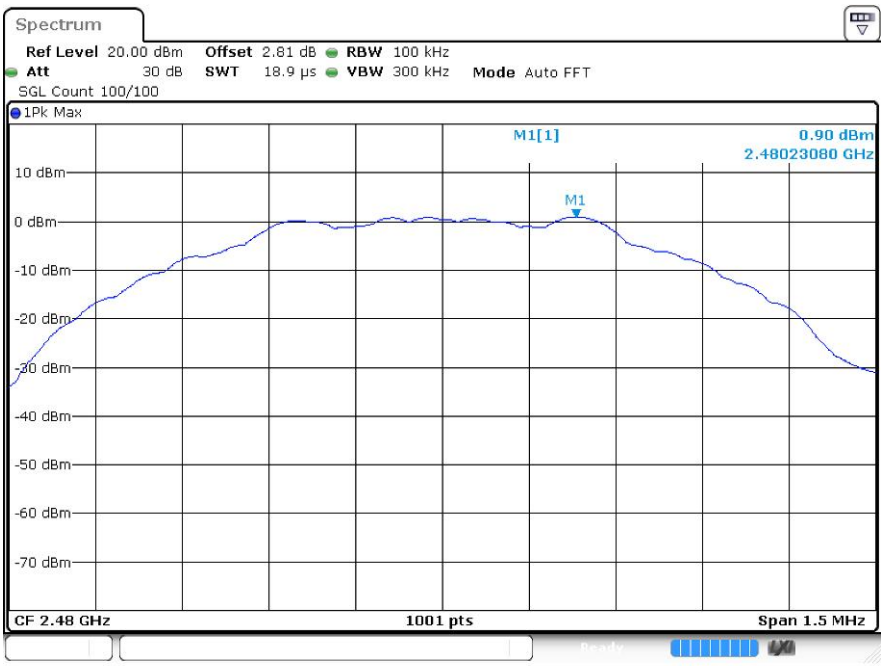
BLE 1M 2440MHz Ref



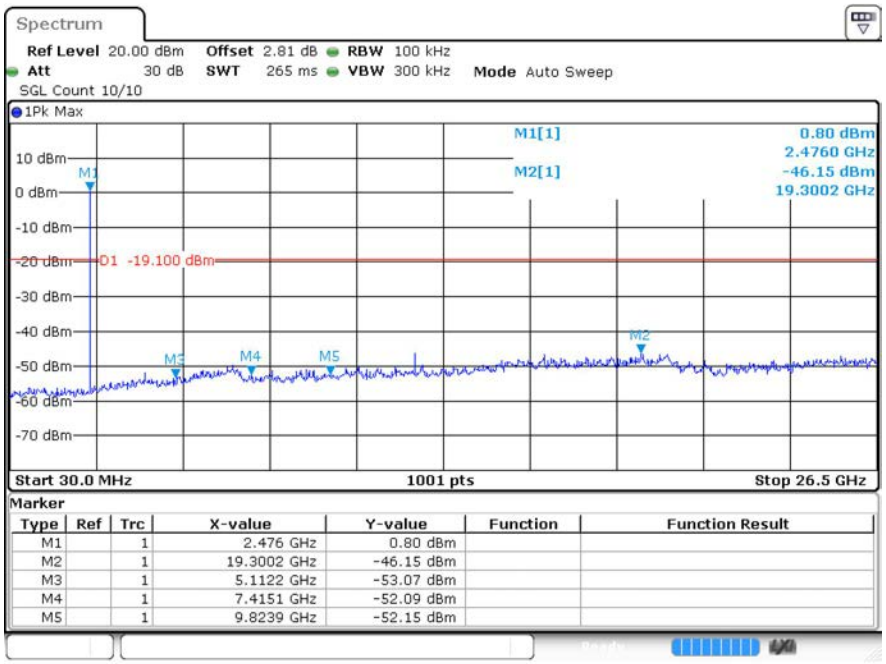
BLE 1M 2440MHz Emission



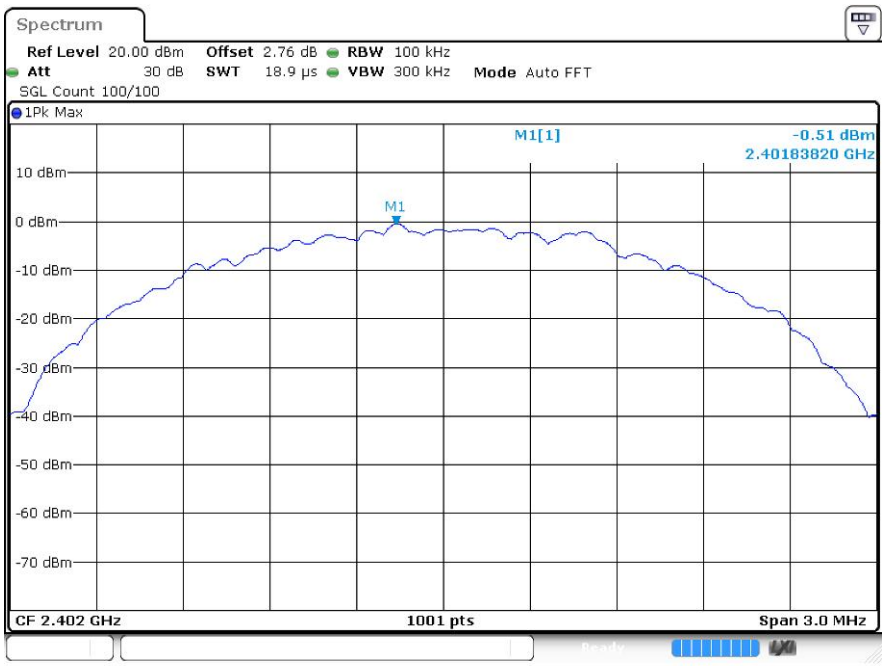
BLE 1M 2480MHz Ref



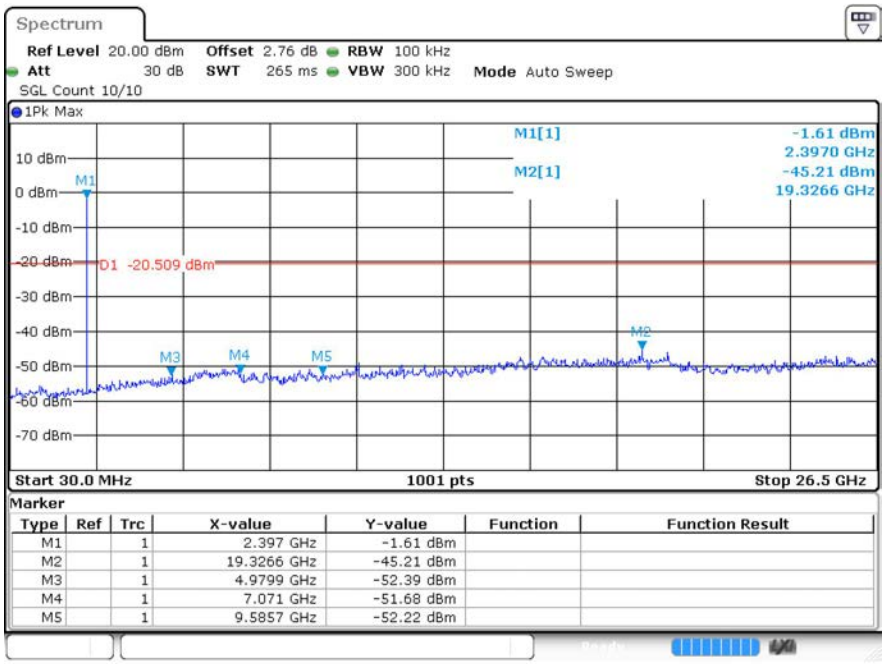
BLE 1M 2480MHz Emission



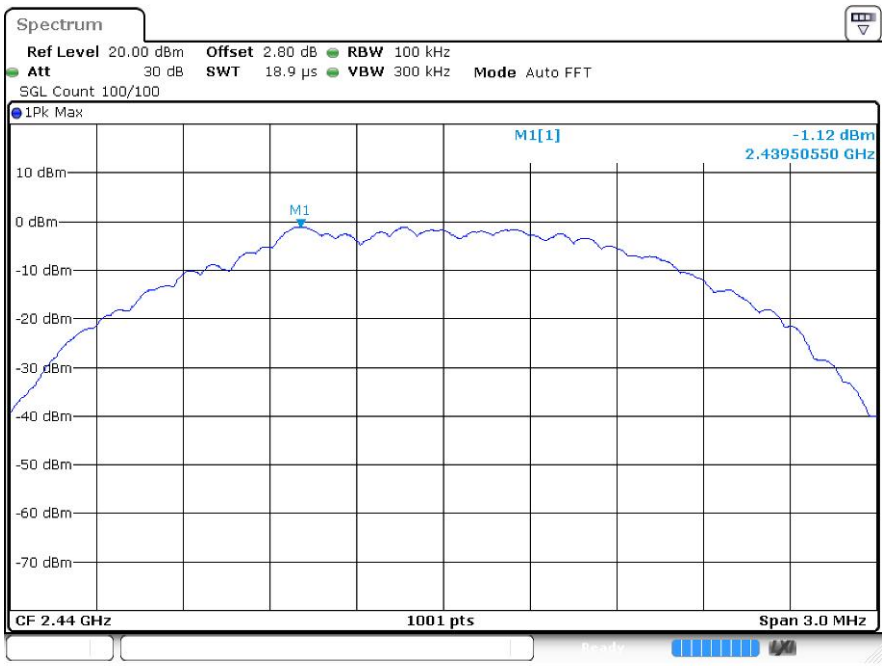
BLE 2M 2402MHz Ref



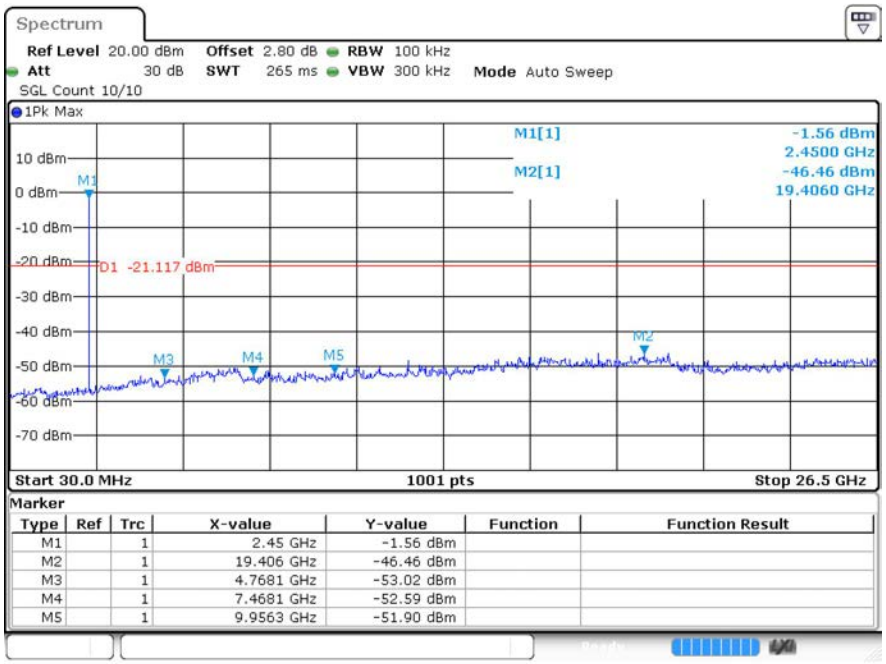
BLE 2M 2402MHz Emission



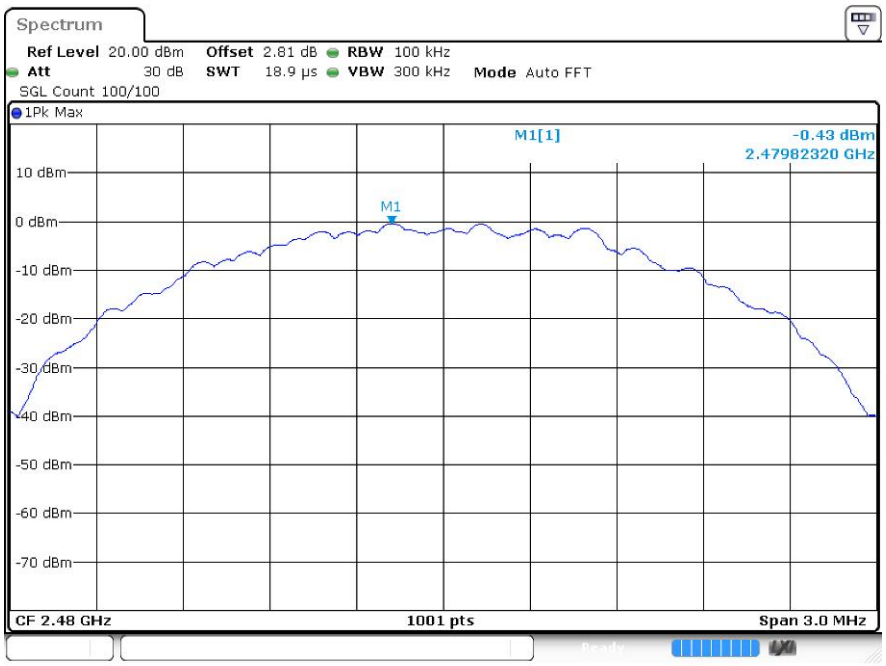
BLE 2M 2440MHz Ref



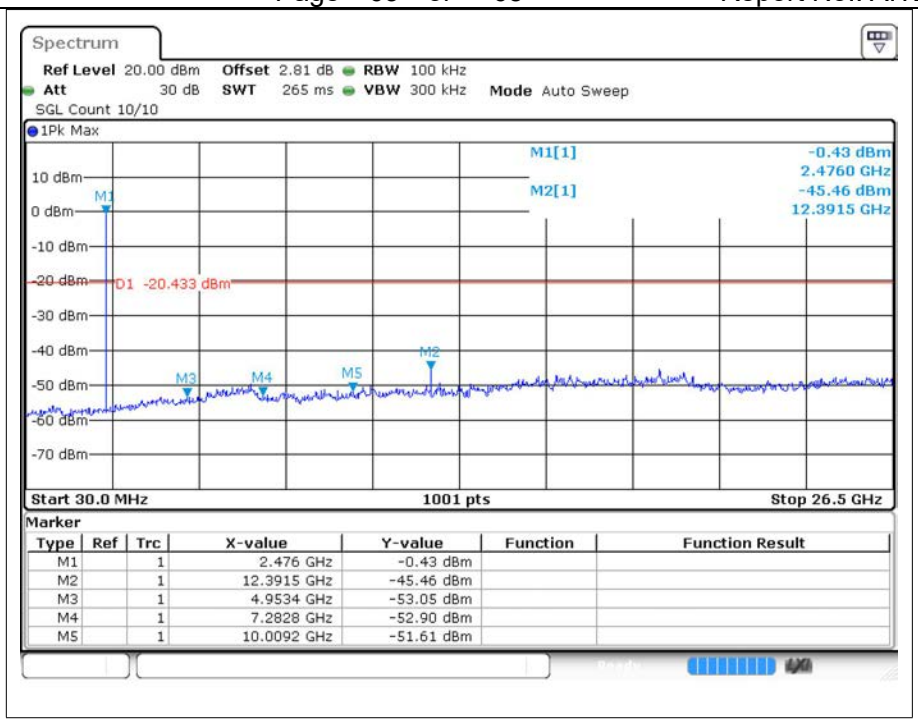
BLE 2M 2440MHz Emission



BLE 2M 2480MHz Ref



BLE 2M 2480MHz Emission


Spectrum
Ref Level 20.00 dBm Offset 2.81 dB RBW 100 kHz
Att 30 dB SWT 265 ms VBW 300 kHz Mode Auto Sweep
SGL Count 10/10
1Pk Max
M1[1] -0.43 dBm
2.4760 GHz
M2[1] -45.46 dBm
12.3915 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
D1 -20.433 dBm
M1
M2
M3
M4
M5
Start 30.0 MHz
1001 pts
Stop 26.5 GHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.476 GHz -0.43 dBm
M2 1 12.3915 GHz -45.46 dBm
M3 1 4.9534 GHz -53.05 dBm
M4 1 7.2828 GHz -52.90 dBm
M5 1 10.0092 GHz -51.61 dBm

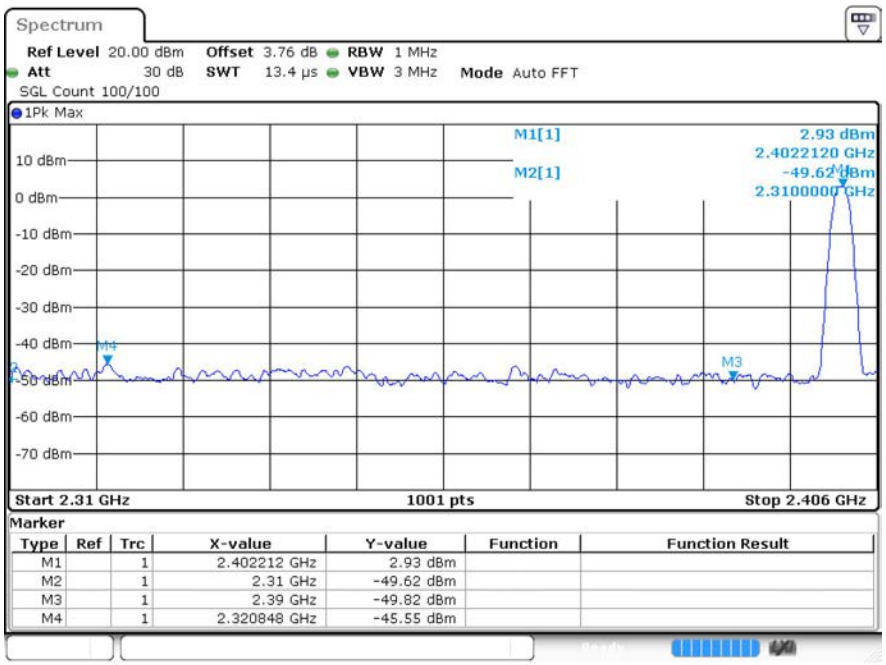
Appendix G. Restrict Band

Test Result

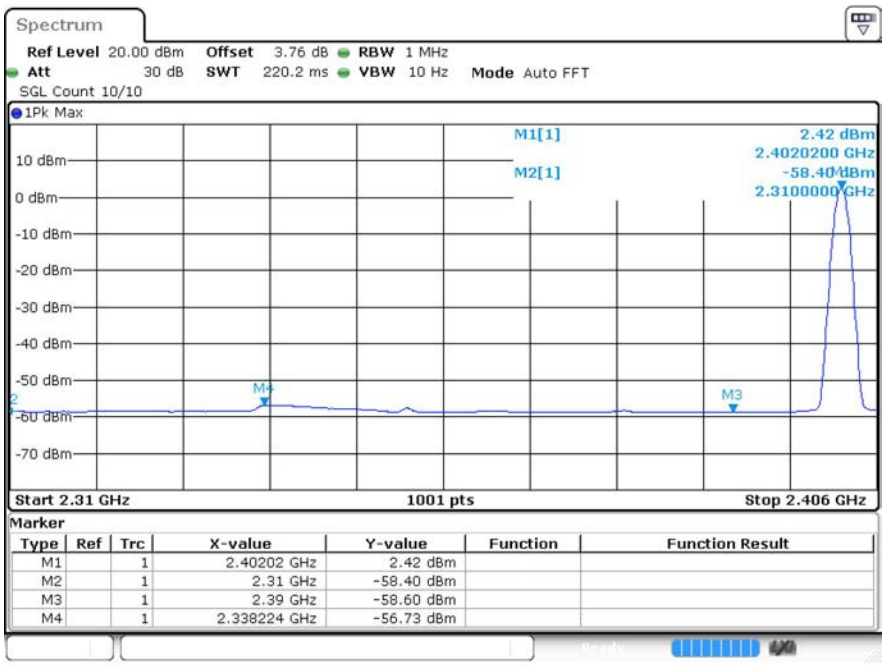
Mode	Frequency (MHz)	Spur Freq (MHz)	Power (dBm)	Gain (dBi)	E (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
BLE 1M	2402	2310	-49.62	1.5	47.14	Peak	74	Pass
BLE 1M	2402	2310	-58.39	1.5	38.37	Average	54	Pass
BLE 1M	2402	2320.848	-45.55	1.5	51.21	Peak	74	Pass
BLE 1M	2402	2338.224	-56.73	1.5	40.03	Average	54	Pass
BLE 1M	2402	2390	-49.81	1.5	46.95	Peak	74	Pass
BLE 1M	2402	2390	-58.6	1.5	38.16	Average	54	Pass
BLE 1M	2480	2483.5	-48.39	1.5	48.37	Peak	74	Pass
BLE 1M	2480	2483.5	-57.78	1.5	38.98	Average	54	Pass
BLE 1M	2480	2490.52	-47.3	1.5	49.46	Peak	74	Pass
BLE 1M	2480	2483.512	-57.78	1.5	38.98	Average	54	Pass
BLE 1M	2480	2500	-50.09	1.5	46.67	Peak	74	Pass
BLE 1M	2480	2500	-58.14	1.5	38.62	Average	54	Pass
BLE 2M	2402	2310	-50.29	1.5	46.47	Peak	74	Pass
BLE 2M	2402	2310	-58.38	1.5	38.38	Average	54	Pass
BLE 2M	2402	2340.72	-45.41	1.5	51.35	Peak	74	Pass
BLE 2M	2402	2338.32	-56.7	1.5	40.06	Average	54	Pass
BLE 2M	2402	2390	-48.03	1.5	48.73	Peak	74	Pass
BLE 2M	2402	2390	-58.62	1.5	38.14	Average	54	Pass
BLE 2M	2480	2483.5	-47.54	1.5	49.22	Peak	74	Pass
BLE 2M	2480	2483.5	-56.36	1.5	40.4	Average	54	Pass
BLE 2M	2480	2499.712	-46.74	1.5	50.02	Peak	74	Pass
BLE 2M	2480	2483.512	-56.36	1.5	40.4	Average	54	Pass
BLE 2M	2480	2500	-47.29	1.5	49.47	Peak	74	Pass
BLE 2M	2480	2500	-58.16	1.5	38.6	Average	54	Pass

Test Graphs

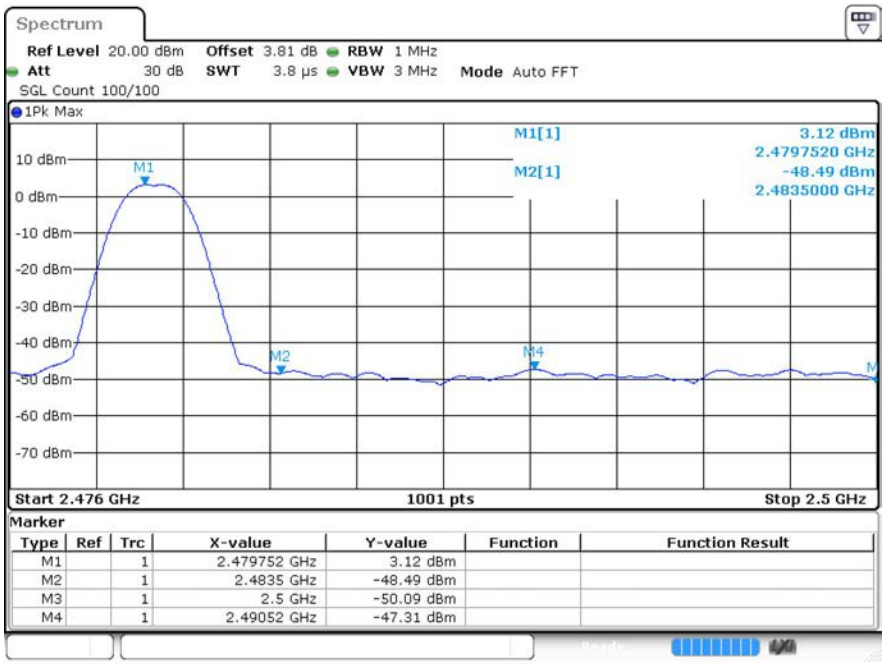
BLE 1M 2402MHz Peak



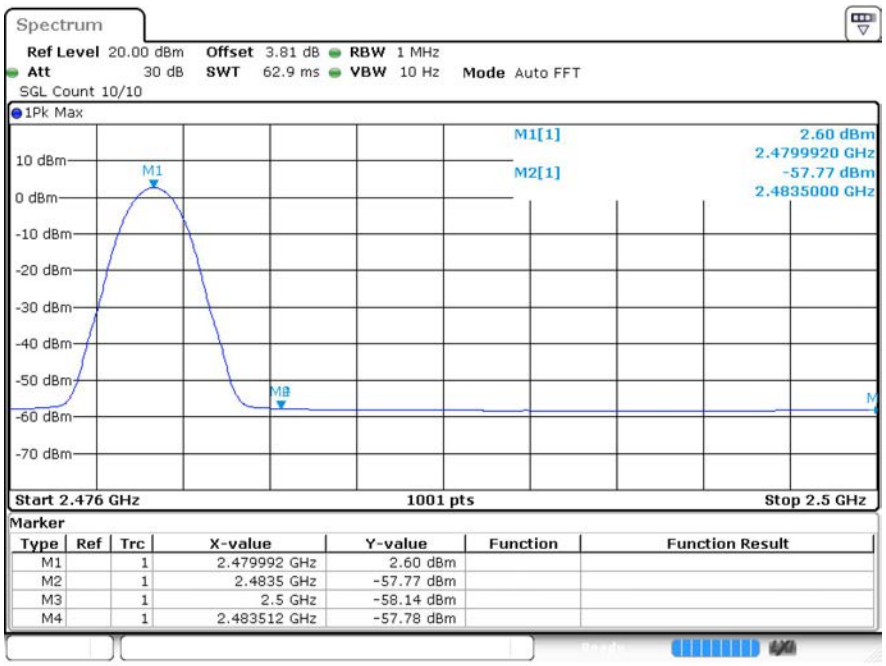
BLE 1M 2402MHz Average



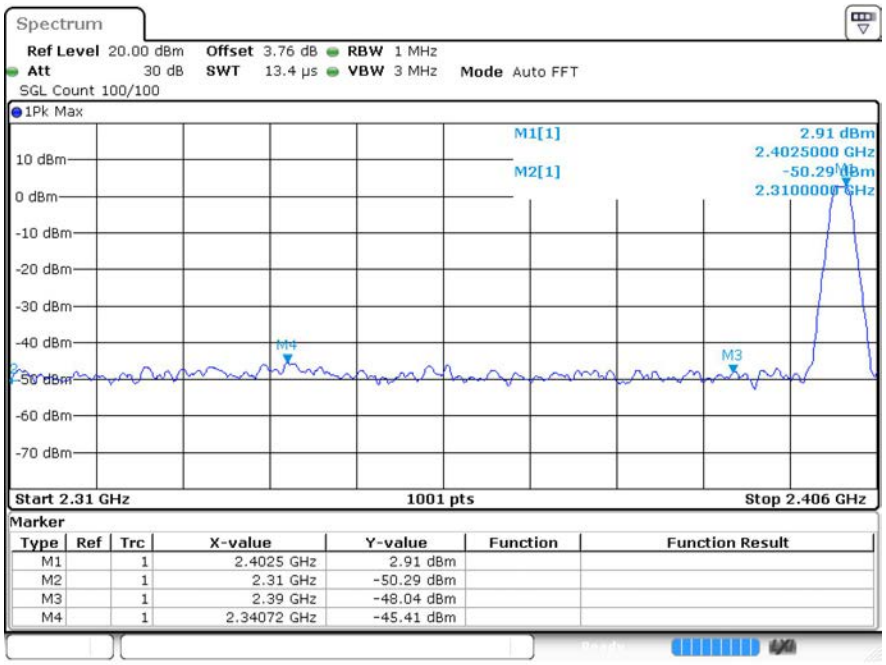
BLE 1M 2480MHz Peak



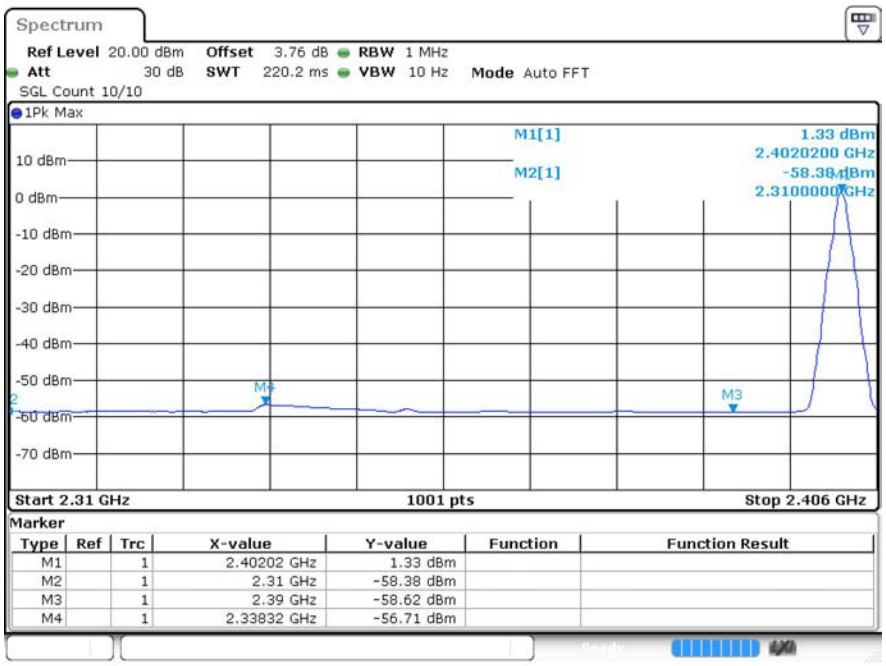
BLE 1M 2480MHz Average



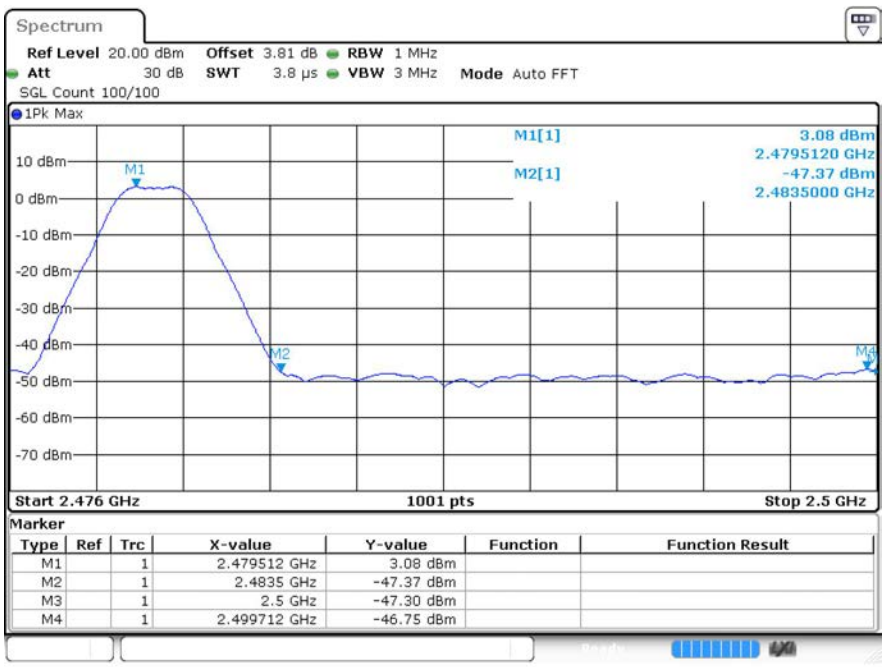
BLE 2M 2402MHz Peak



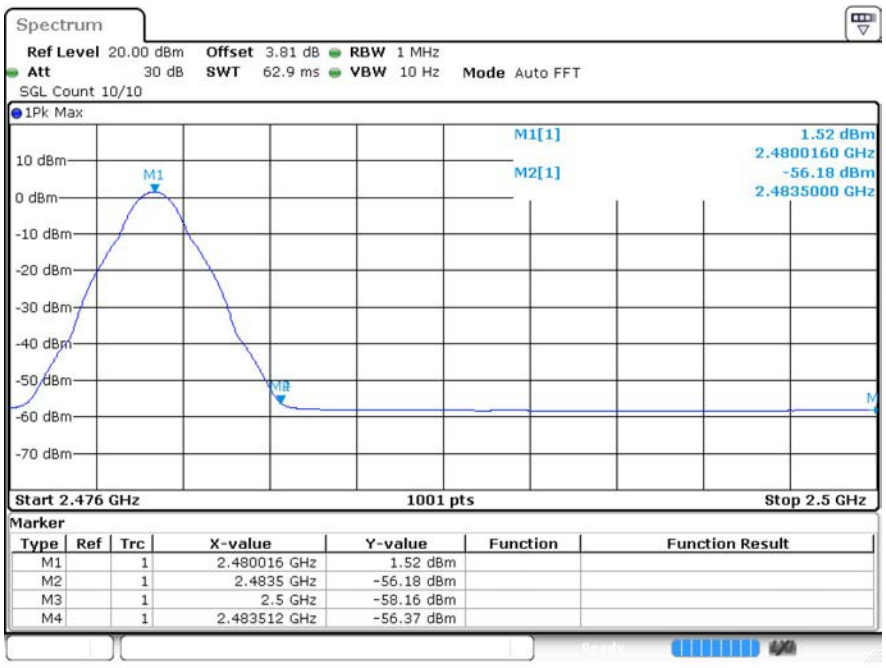
BLE 2M 2402MHz Average



BLE 2M 2480MHz Peak



BLE 2M 2480MHz Average



----END OF REPORT----