



시험 성적서 TEST REPORT

페이지(page) : (1) / (총(Total) 56)

성적서 번호 Report No.		ICRT-TR-E191909-0A	
신청자 Client	기관명 Name	SENA TECHNOLOGIES.Inc	
	주소 Address	19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea	
시험대상품목 Sample description		50S	
모델명 Type designation		SP75	
정격 Ratings		DC 3.7 V	
시험기간 Date of test		08. Oct. 2019 ~ 21. Oct. 2019	
시험방법/항목 Test Method/Item		FCC Part 15 Subpart C §15.247 / IC RSS-247	
시험결과 Test Results		Refer to 3. Test Summary	
확인 Affirmation	작성자 Tested by	기술책임자 Technical Manager	
	성명 Name Yeong-Hwan, Hong (Signature)	성명 Name Jun-Hui, Lee (Signature)	
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112, Hwanggeum3-ro 7beon-gil, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea



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10.4 Test data 53

Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
ICRT-TR-E191909-0A	22-Oct-2019	Initial Issue	All



1. Applicant & Manufacturer & Test Laboratory Information

1.1 Applicant information

Applicant	SENA TECHNOLOGIES.Inc
Address	19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea
Contact Person	Seunghyun Kim
Telephone No.	+82-2-573-7772
Fax No.	+82-2-573-7710
E-mail	shkim77@sena.com

1.2 Manufacturer Information

Manufacturer	SENA TECHNOLOGIES.Inc
Address	19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea

1.3 Test Laboratory Information

Conducted tests were performed at	
Laboratory	ICR Co., Ltd.
Address	112, Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea
Telephone No.	+82-2-6351-9002
Fax No.	+82-2-6351-9007
RRA No.	KR0165
KOLAS No.	KT652



2. Equipment under Test(EUT) Information

2.1 General Information

Product Name	50S	
Brand Name	-	
Model Name	SP75	
Additional Model Name	-	
FCC ID / ISED number	S7A-SP75 / ISED number	
Hardware Version	1.0	
Software Version	Bluetooth LE	2.6.0(CSR Bluetest3)
	Mesh	EUT manual test
Power Supply	DC 3.7 V	
EUT Firmware Version	Bluetooth LE	1.0
	Mesh	1.0
Target Power	Bluetooth LE	4.0
	Mesh	15.0
EUT Serial Number	Test 1	

2.2 Additional Information

Equipment Class	DTS-Digital Transmission System	
Device Type	Stand-alone	
Operating Frequency	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	Mesh	2 405 MHz ~ 2 475 MHz
RF Output Power	Bluetooth LE	5.91 dBm
	Mesh	17.86 dBm
Number of Channel	Bluetooth LE	40
	Mesh	16
Modulation Type	GFSK	
Antenna Type	Bluetooth LE	Chip Antenna
	Mesh	PCB Pattern Antenna
Antenna Gain	Bluetooth LE	0.93 dBi
	Mesh	0.46 dBi
Antenna Operating Mode	Dual antenna equipment with each antenna	



2.3 Mode of operation during the test

- The EUT is continuous transmission mode during the test with set at Low Channel, Middle Channel, and High Channel. To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, YZ, XZ planes.

2.4 Modifications of EUT

- None



3. Test Summary

3.1 Test standards and results

FCC Part 15 Subpart C & RSS-247 Issue 2 & RSS-GEN Issue 5				
Clause		Test items	Applied	Results
§15.247 (a) (2)	RSS-247 5.2(a) RSS-GEN 6.7	6 dB Bandwidth & 99 % Bandwidth	<input checked="" type="checkbox"/>	PASS
§15.247 (b) (3)	RSS-247 5.4(d)	Maximum Conducted Output Power & e.i.r.p.	<input checked="" type="checkbox"/>	PASS
§15.247 (e)	RSS-247 5.2(b)	Power Spectral Density	<input checked="" type="checkbox"/>	PASS
§15.247 (d)	RSS-247 5.5	Conducted Spurious Emission	<input checked="" type="checkbox"/>	PASS
§15.247 (d) §15.209 §15.205	RSS-247 5.5 RSS-GEN 8.9 RSS-GEN 8.10	Radiated Spurious Emission	<input checked="" type="checkbox"/>	PASS
§15.207	RSS-GEN 8.8	Power Line Conducted Emission	<input checked="" type="checkbox"/>	PASS
§15.203	-	Antenna Requirement	<input checked="" type="checkbox"/>	PASS

3.2 Purpose of the test

- To determine whether the equipment under test fulfills the requirements of the standards stated in FCC Part 15 Subpart C Section 15.247 and IC RSS-247

3.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013.

Radiated testing was performed at a distance of 3 m from EUT to the antenna.

3.4 Configuration of Test System

3.4.1 Radiated emission test

Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m Semi Anechoic Chamber. The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

3.4.2 AC powerline conducted emission test

The EUT was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.



3.5 Antenna requirement

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The 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 replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.5.1 Result: Pass

The transmitter has a **Chip Antenna of Bluetooth LE** and **PCB Pattern Antenna of Mesh**.

The directional gain of the Chip antenna is **0.93 dBi** and PCB Pattern antenna is **0.46 dBi**



4. Used equipment on test

	Description	Model Name	Serial Number	Manufacturer	Last Cal. (cycle)
<input checked="" type="checkbox"/>	Spectrum analyzer	FSW85	100864	Rohde & Schwarz	2019. 03. 04 (1Y)
<input type="checkbox"/>	Spectrum analyzer	FSV40	101455	Rohde & Schwarz	2019 .06. 27 (1Y)
<input checked="" type="checkbox"/>	Signal Generator	SMB100A	180607	Rohde & Schwarz	2019. 03. 04 (1Y)
<input checked="" type="checkbox"/>	Wideband Power Sensor	NRP-Z81	103673	Rohde & Schwarz	2019. 03. 05 (1Y)
<input type="checkbox"/>	Open Switch and Control Platform	OSP150	101000	Rohde & Schwarz	2019. 03. 05 (1Y)
<input type="checkbox"/>	Environmental Test Chamber	MHK-408NKDA	1060908	TERCHY	2019. 03. 04 (1Y)
<input checked="" type="checkbox"/>	DC Power Supply	XDL 35-5P	J00385373	Sorensen	2019. 03. 05 (1Y)
<input type="checkbox"/>	DC Power Supply	6603D	672483	Topward	2019. 03. 05 (1Y)
<input checked="" type="checkbox"/>	Loop Antenna	HFH2-Z2	100506	Rohde & Schwarz	2019. 06. 27 (2Y)
<input checked="" type="checkbox"/>	TRILOG BROADBAND ANTENNA	VULB9162	120	SCHWARZBECK	2018. 11. 23 (2Y)
<input checked="" type="checkbox"/>	RF Pre Amplifier	SCU08	100747	Rohde & Schwarz	2019. 04. 17 (1Y)
<input checked="" type="checkbox"/>	DOUBLE-RIDGE WAVEGUIDE HORN ANTENNA	HF907	102556	Rohde & Schwarz	2019. 08. 19 (2Y)
<input checked="" type="checkbox"/>	RF Pre Amplifier	SCU18	102342	Rohde & Schwarz	2019. 04. 17 (1Y)
<input checked="" type="checkbox"/>	Horn Antenna	LB-42-10-C-KF	J202024625	AINFO Inc.	2018. 04. 23 (2Y)
<input checked="" type="checkbox"/>	RF Pre Amplifier	AMF-4F-18265-35-8P-1	771846	MITEQ	2019. 03. 04 (1Y)
<input type="checkbox"/>	Horn Antenna	LB-28-10-C-KF	J202024627	AINFO Inc.	2018. 04. 23 (2Y)
<input type="checkbox"/>	RF Pre Amplifier	AMF-4D-260400-45-6P	779919	MITEQ	2019. 03. 04 (1Y)
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR26	101461	Rohde & Schwarz	2019. 04. 17 (1Y)
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR26	101461	Rohde & Schwarz	2019. 04. 17 (1Y)
<input checked="" type="checkbox"/>	LISN	ENV216	102194	Rohde & Schwarz	2020. 04. 16 (1Y)
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR3	102119	Rohde & Schwarz	2020. 04. 16(1Y)
<input checked="" type="checkbox"/>	ATTENUATOR	WA76-20-1313	1633	WEINSCHL	2019. 03. 04 (1Y)
<input checked="" type="checkbox"/>	RF Cable	MULTIFLEX_86	-	HUBER & SUHNER	-
<input checked="" type="checkbox"/>	Chamber Cable	mwx221	-	Junkosha	-

※ All test equipment used is calibration on a regular basis.



5. 6 dB Bandwidth & 99 % Bandwidth

5.1 Operating environment

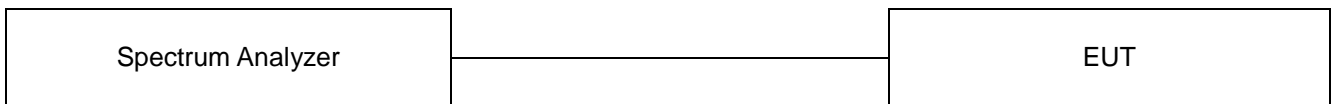
Temperature : 22 °C
Relative humidity : 46 %

5.2 Measurement method

Standard : §15.247 (a) (2) / RSS-247 (5.2 a) & RSS-Gen (6.7)

5.3 Test setup

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.





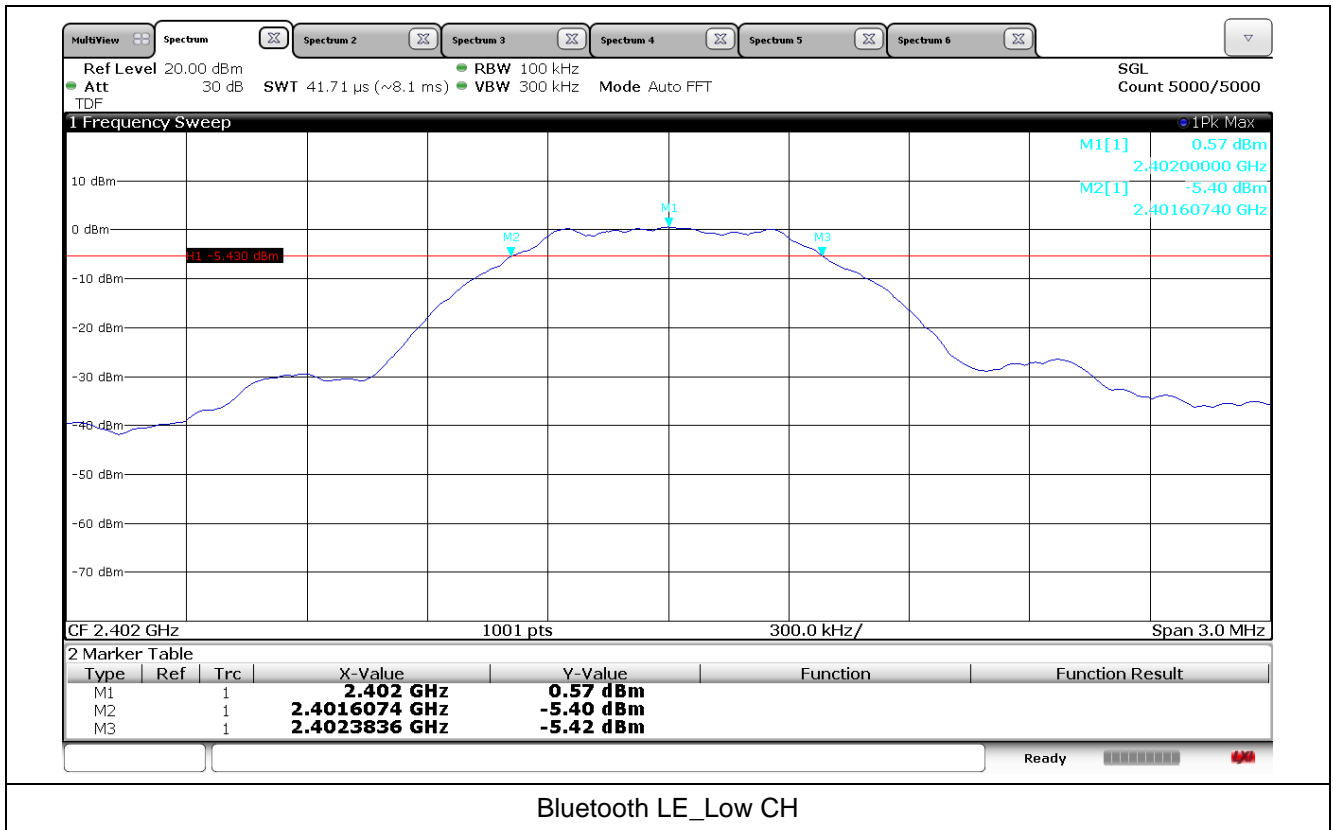
5.4 Test data

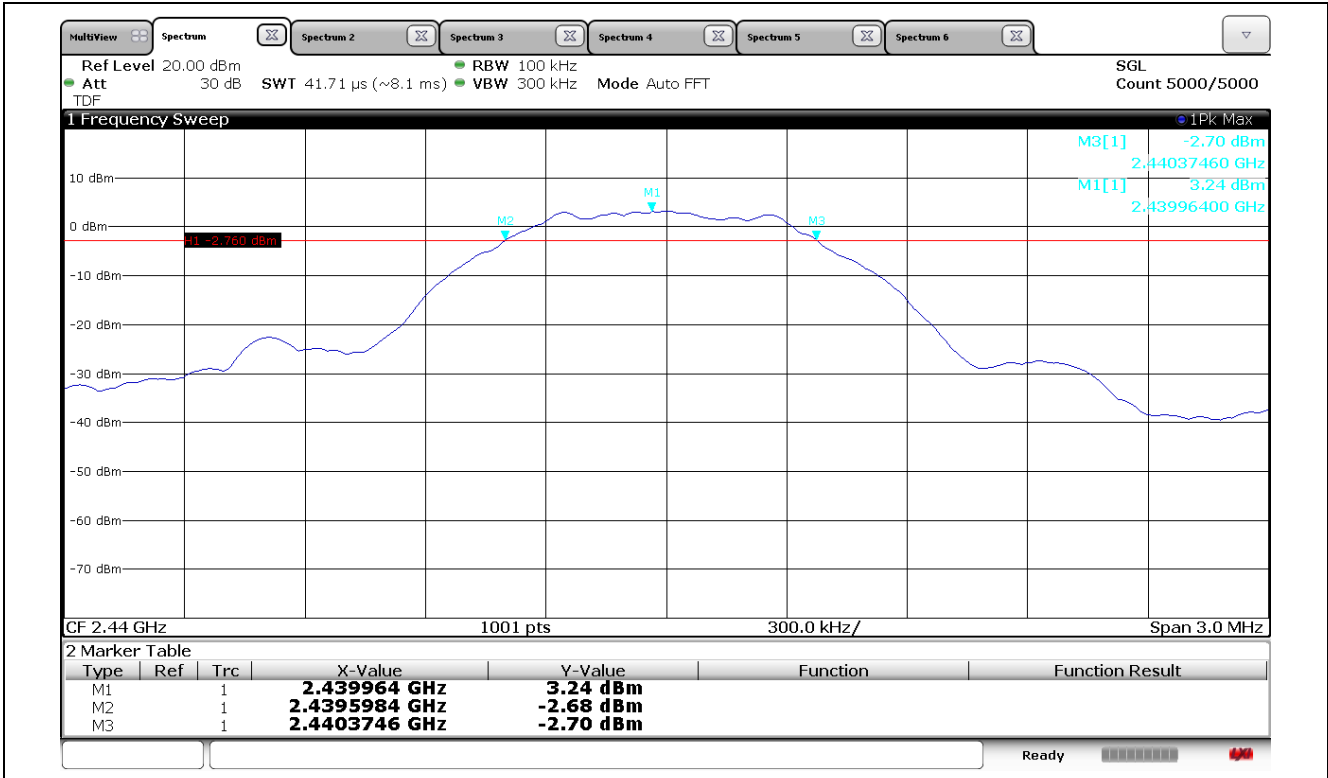
Test date : 08. Oct. 2019
 Operating mode : Transmit mode
 Test Result : Pass

5.4.1 Measured Results

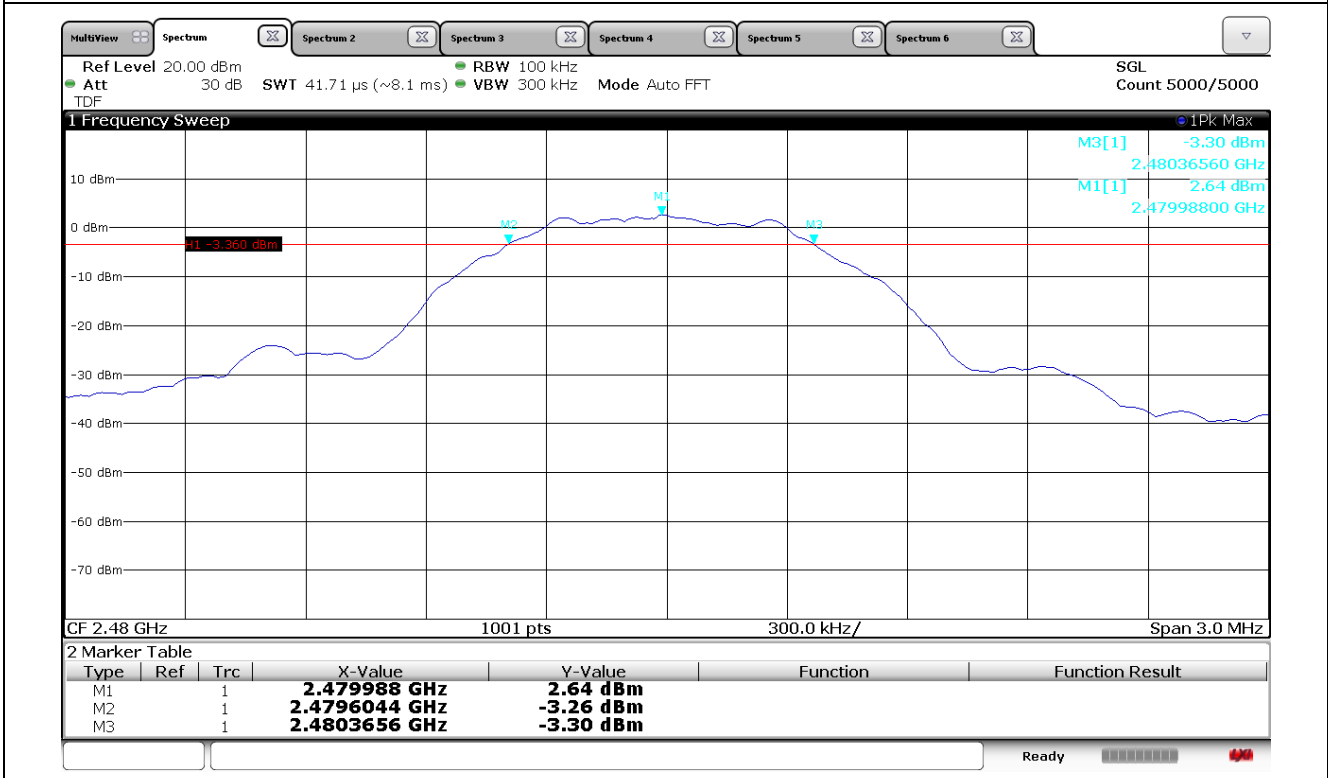
Modulation Type	Channel (Frequency)	6 dB Bandwidth (kHz)	99 % Occupied Bandwidth (kHz)	Limit (kHz)
Bluetooth LE	0 (2 402 MHz)	776.2	1031.2	at least 500
	19 (2 440 MHz)	776.2	1036.8	
	39 (2 480 MHz)	761.2	1038.0	
Mesh	12 (2 405 MHz)	1049.0	2342.9	
	19 (2 445 MHz)	1418.0	2515.7	
	25 (2 475 MHz)	1228.0	2559.8	

5.4.2 Measured Graph (6 dB Bandwidth)

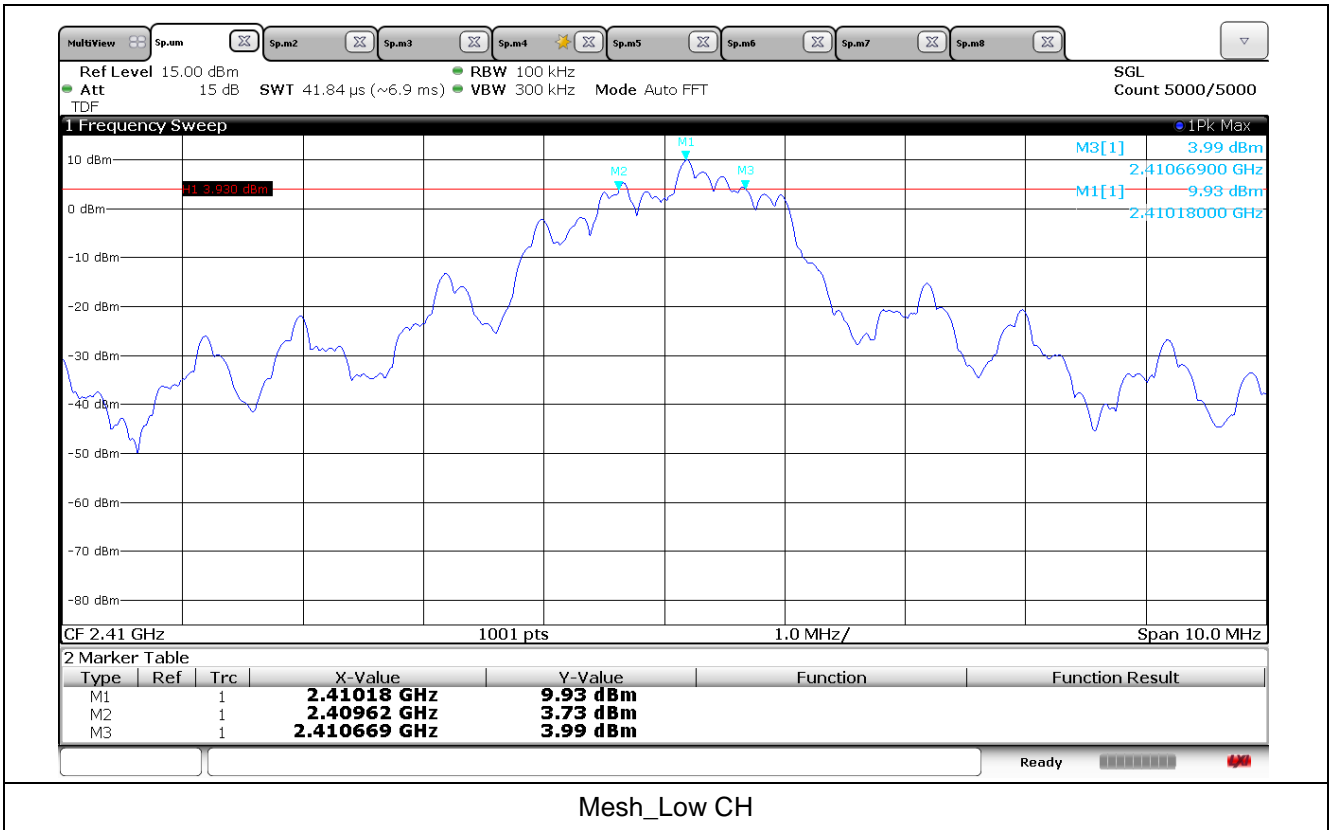


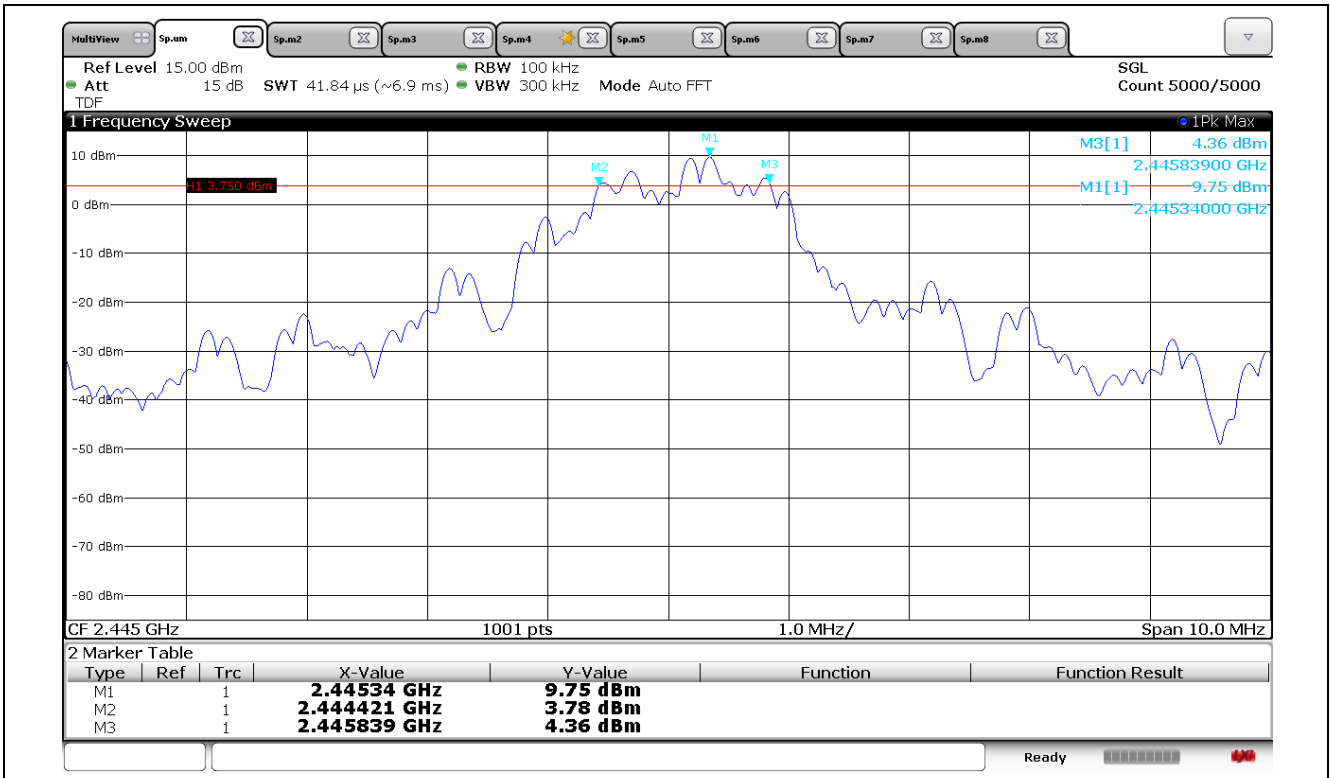


Bluetooth LE_Mid CH

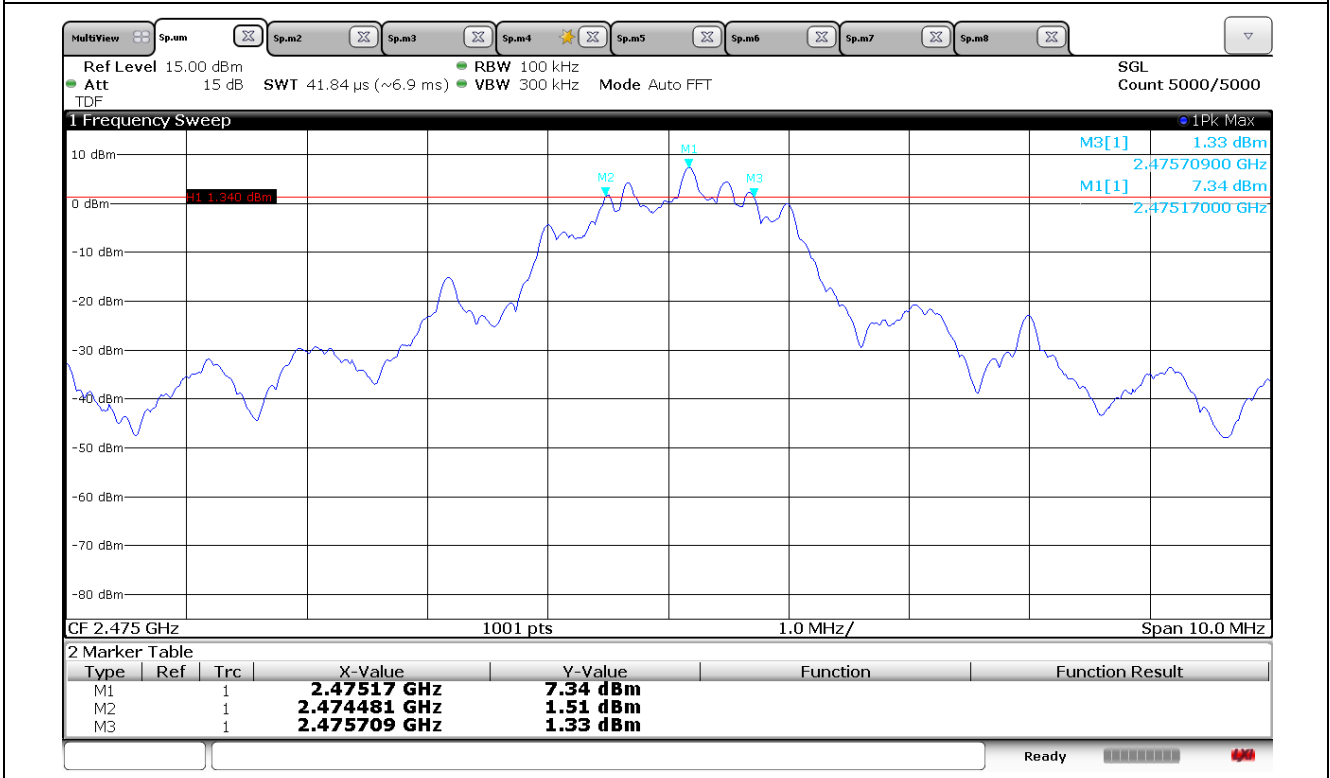


Bluetooth LE_High CH





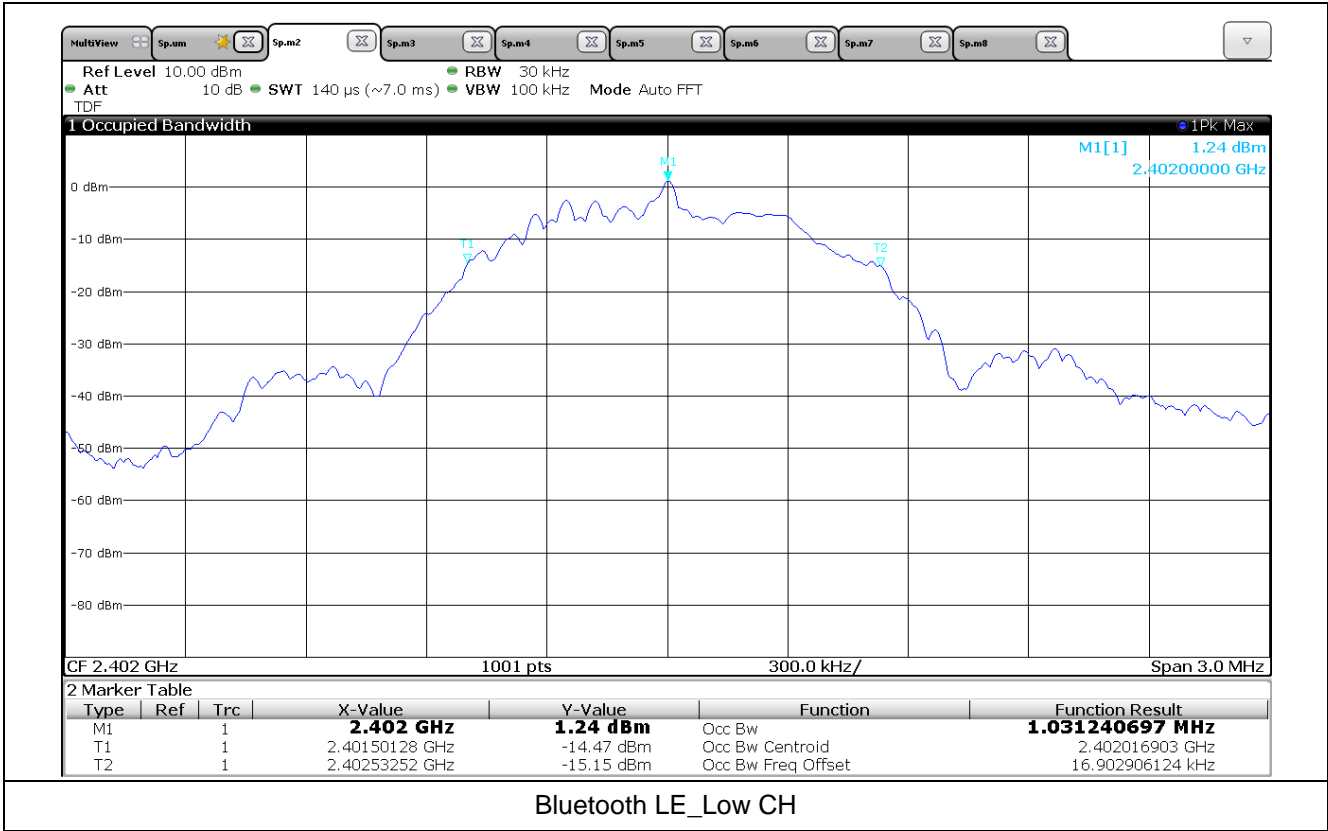
Mesh_Mid CH

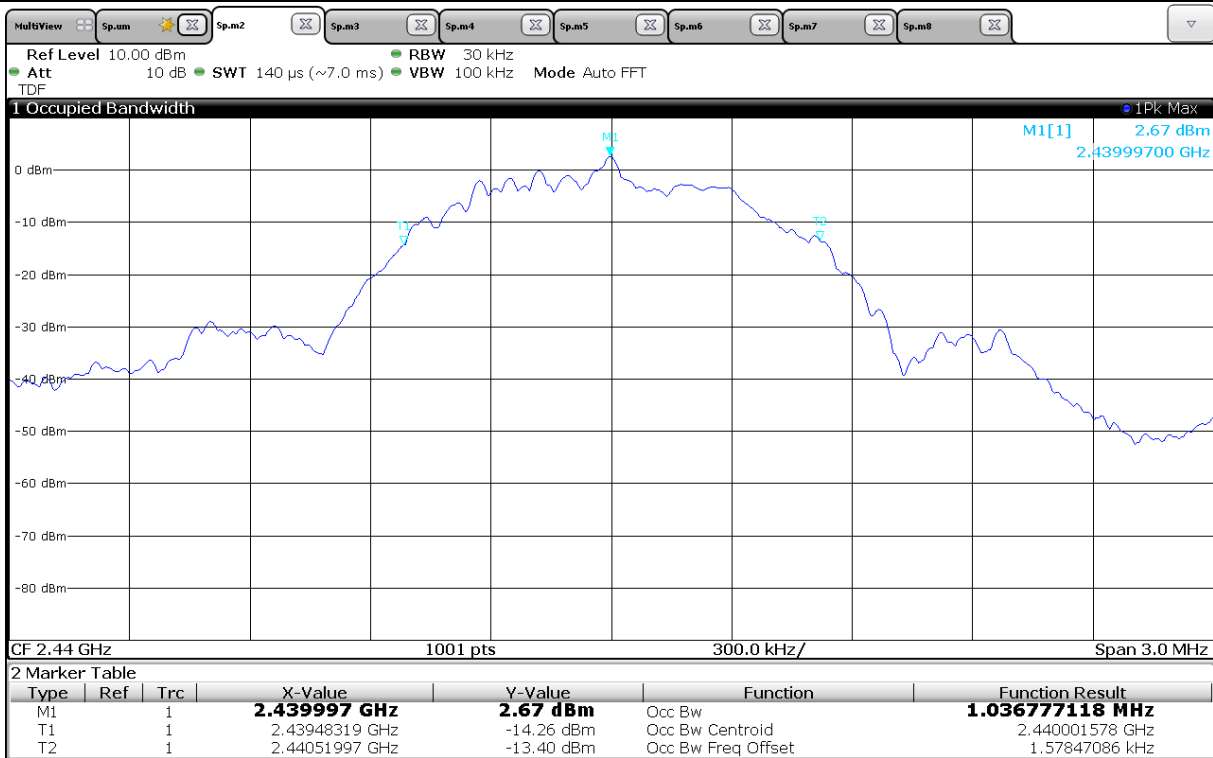


Mesh_High CH

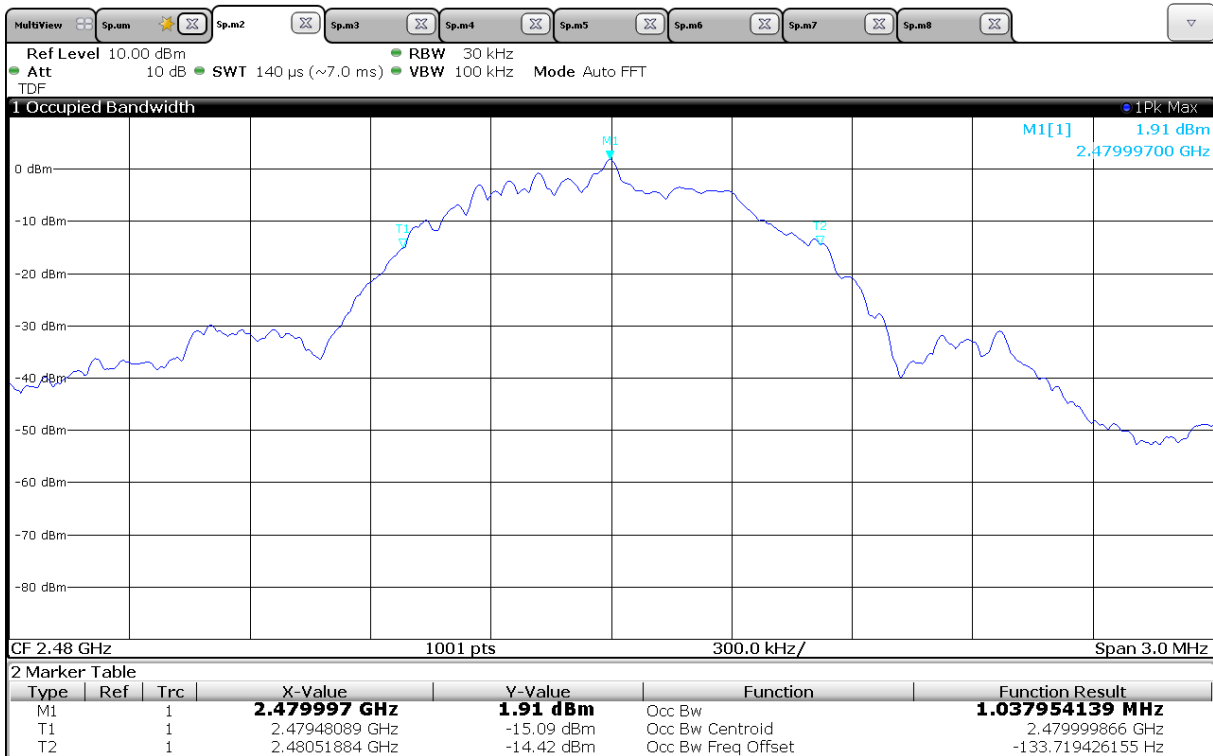


5.4.3 Measured Graph (99 % Bandwidth)

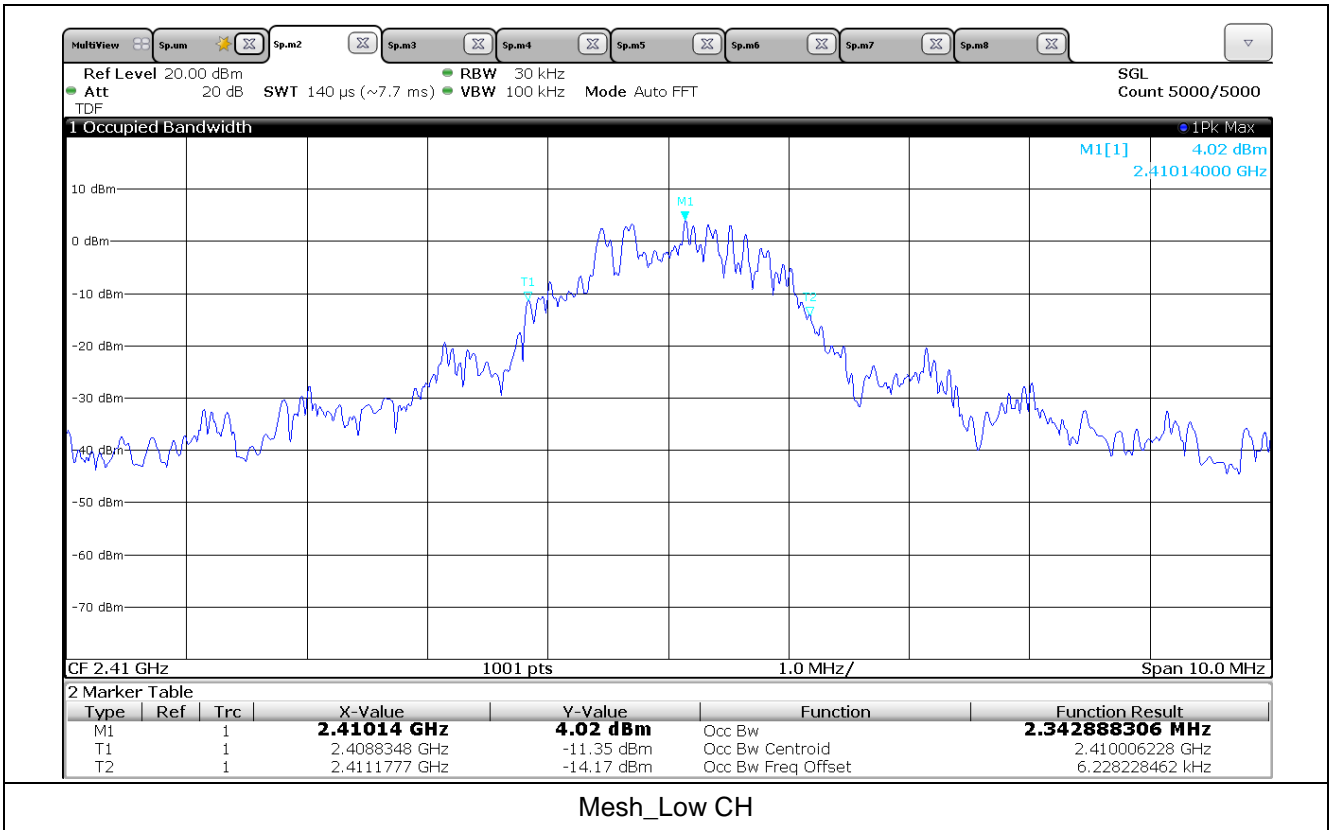


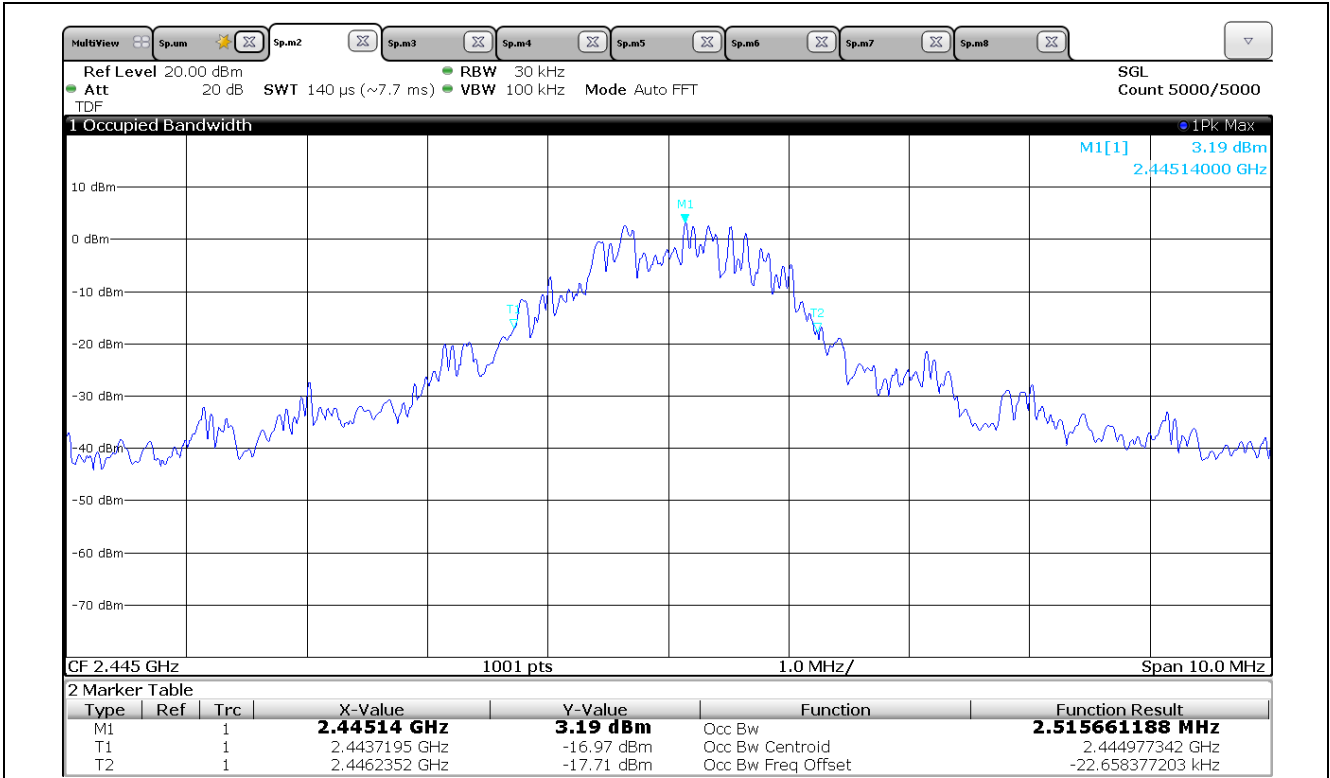


Bluetooth LE_Mid CH

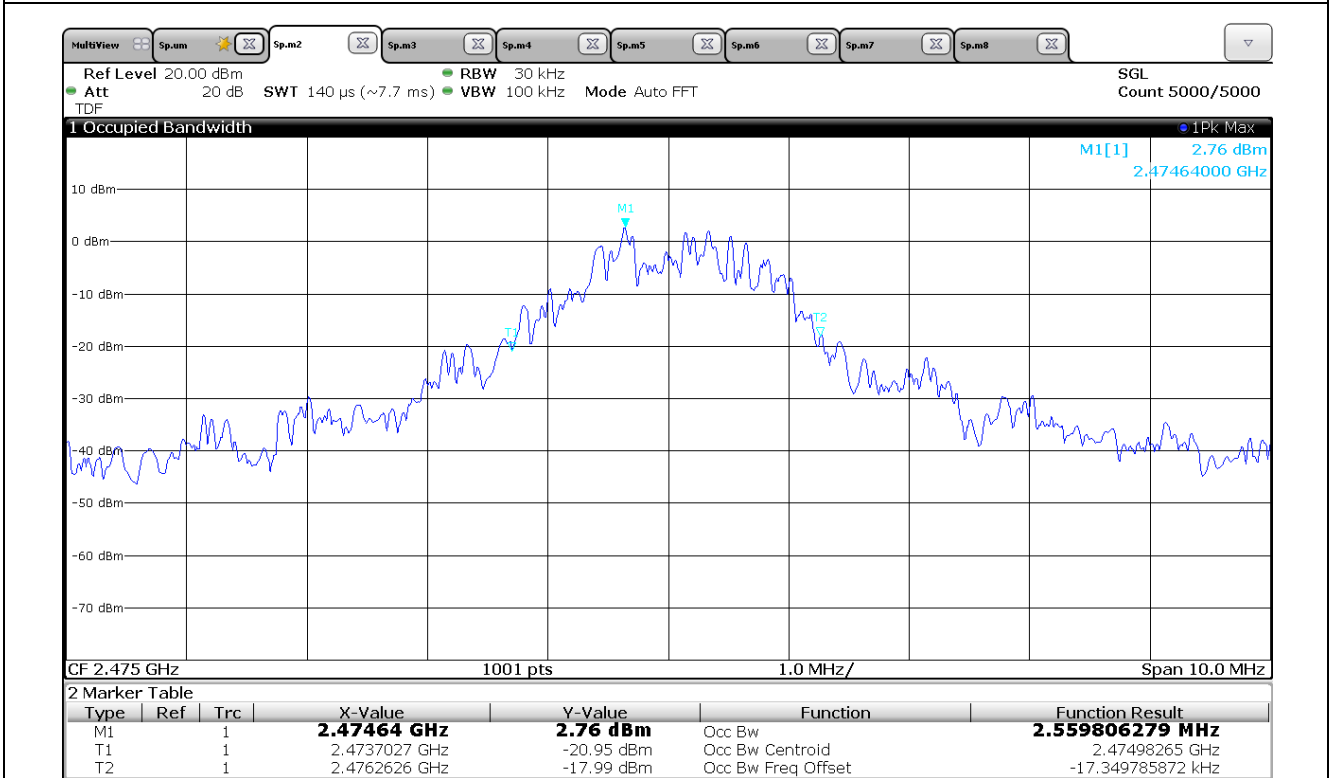


Bluetooth LE_High CH





Mesh_Mid CH



Mesh_High CH



6. Maximum Conducted Output Power & e.i.r.p.

6.1 Operating environment

Temperature : 22 °C
Relative humidity : 46 %

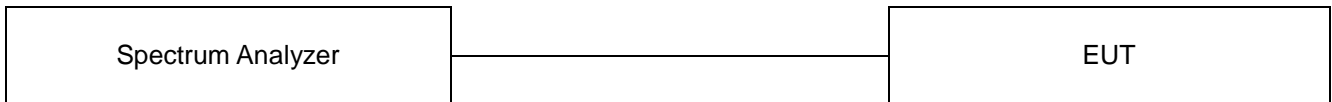
6.2 Measurement method

Standard : §15.247 (b) (3) / RSS-247 (5.4 d)

6.3 Test setup

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99 % bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.

And e.i.r.p. is added antenna maximum gain with the Maximum Conducted Output Power.





6.4 Test data

Test date : 08. Oct. 2019
 Operating mode : Transmit mode
 Test Result : Pass

6.4.1 Measured Results

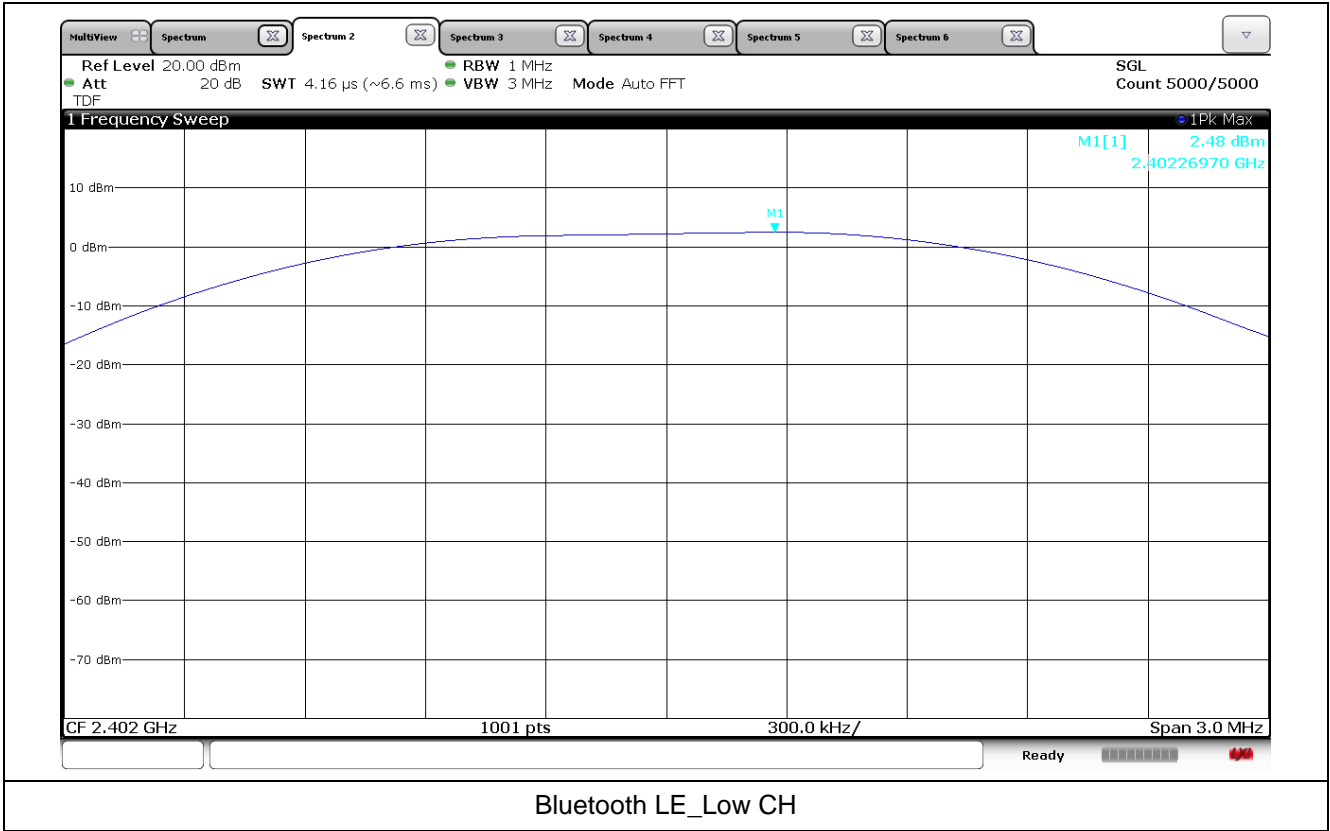
Modulation Type	Channel (Frequency)	Maximum Conducted Output Power			e.i.r.p.	
		Measured value (dBm)	Average Power(dBm)	Limit	Measured value (dBm)	Limit
Bluetooth LE	0 (2 402 MHz)	2.48	1.11	30 dBm (1 Watt)	3.41	36 dBm (4 Watt)
	19 (2 440 MHz)	4.98	3.40		5.91	
	39 (2 480 MHz)	4.18	2.88		5.11	
Mesh	0 (2 402 MHz)	17.40	8.17		17.86	
	19 (2 440 MHz)	16.68	7.98		17.14	
	39 (2 480 MHz)	15.64	7.15		16.10	

※Bluetooth LE Antenna Gain : 0.93 dBi

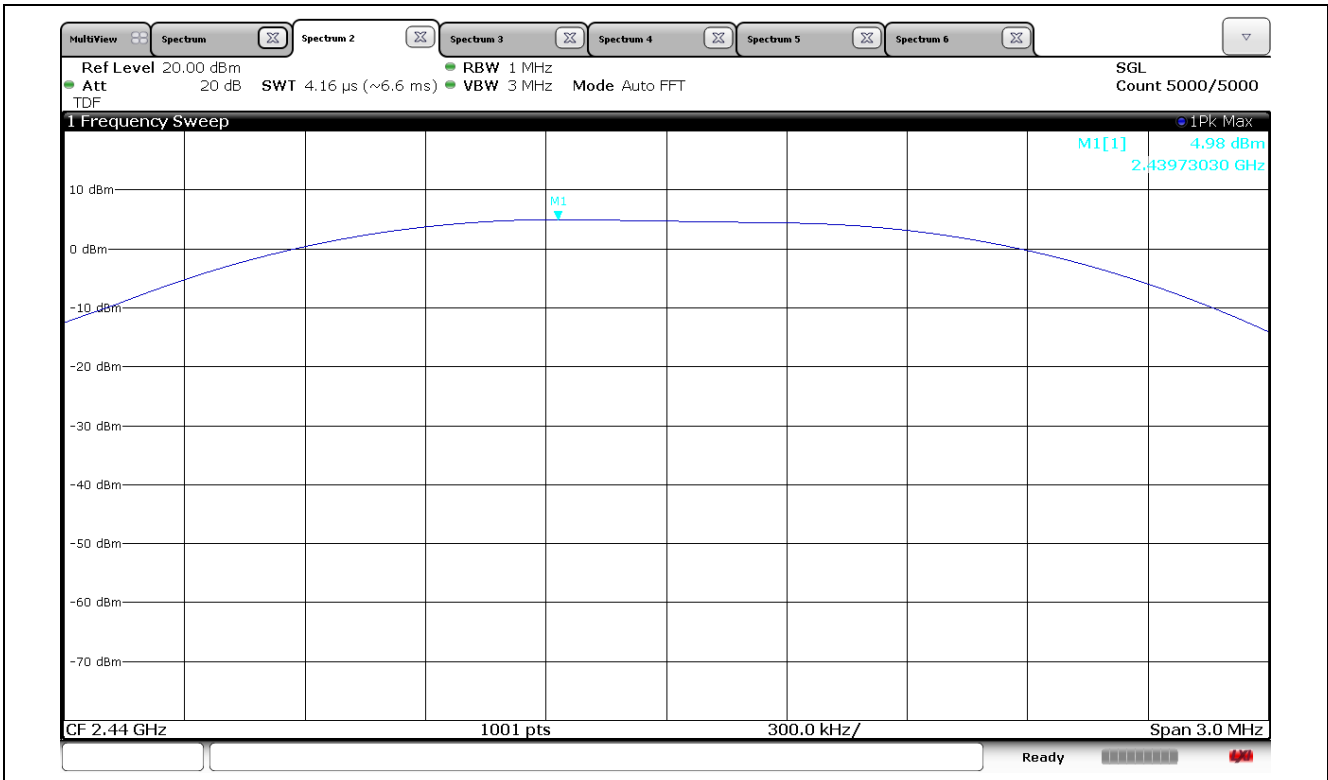
※Mesh Antenna Gain : 0.46 dBi



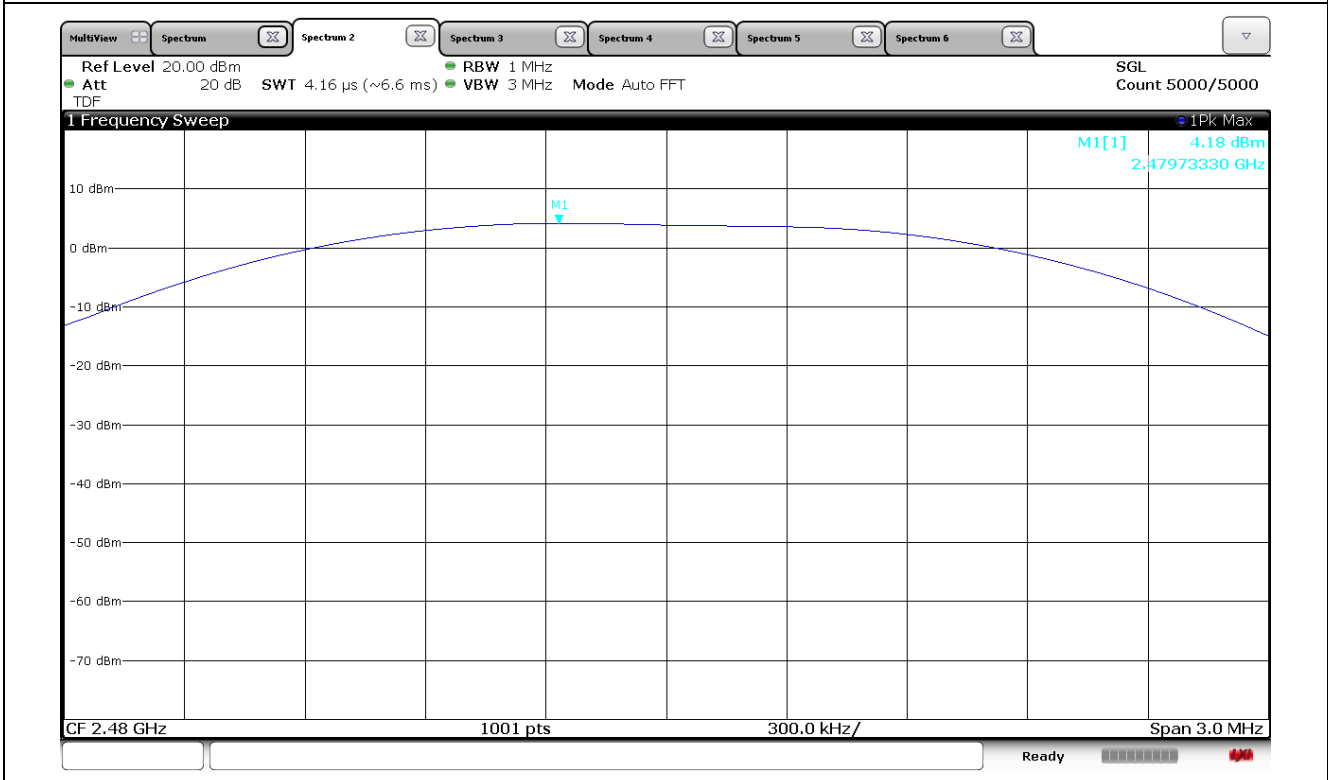
6.4.2 Measured Graph



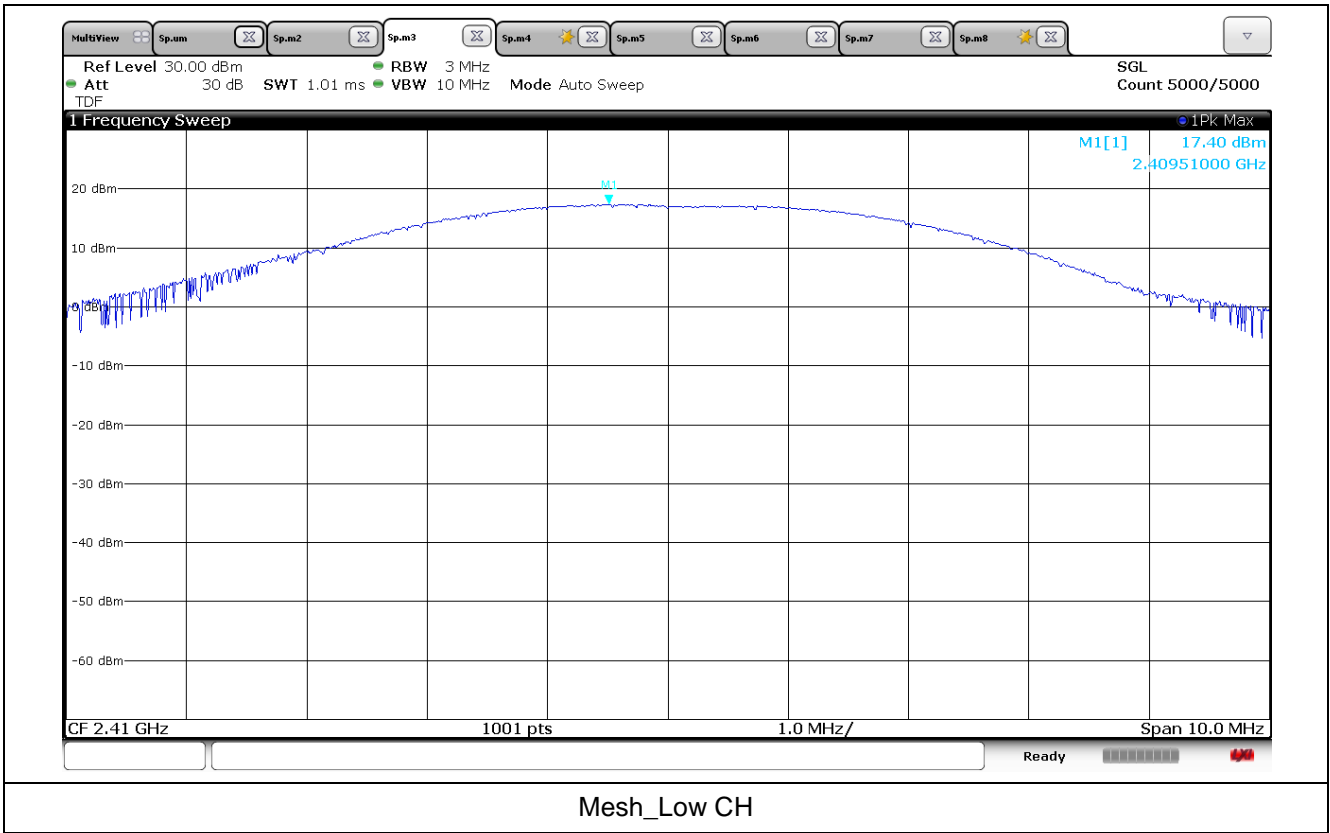
Bluetooth LE_Low CH



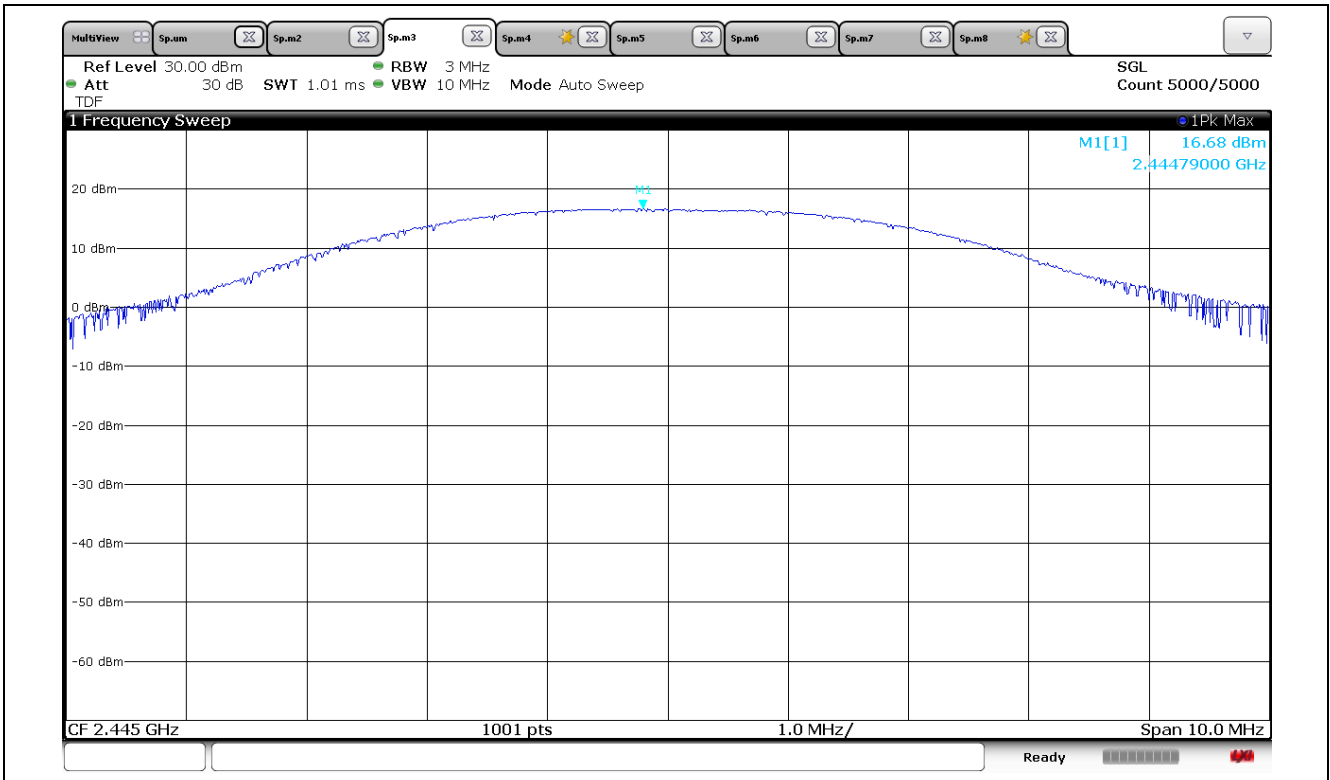
Bluetooth LE_Mid CH



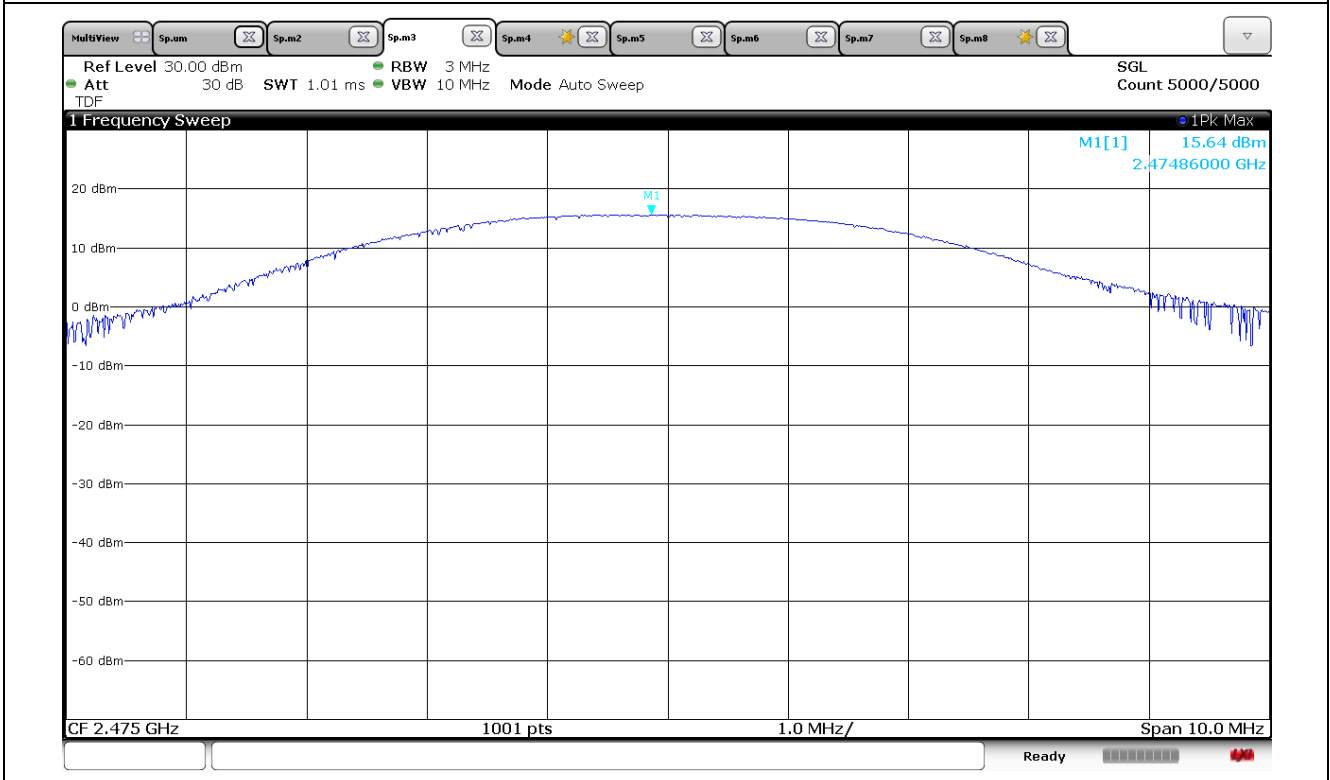
Bluetooth LE_High CH



Mesh_Low CH



Mesh_Mid CH



Mesh_High CH



7. Power Spectral Density

7.1 Operating environment

Temperature : 22 °C

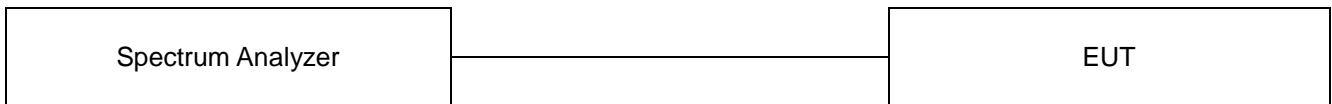
Relative humidity : 46 %

7.2 Measurement method

Standard : §15.247 (e) / RSS-247 (5.2 b)

7.3 Test setup

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 3 kHz, the video bandwidth is set to 3 times the resolution bandwidth.





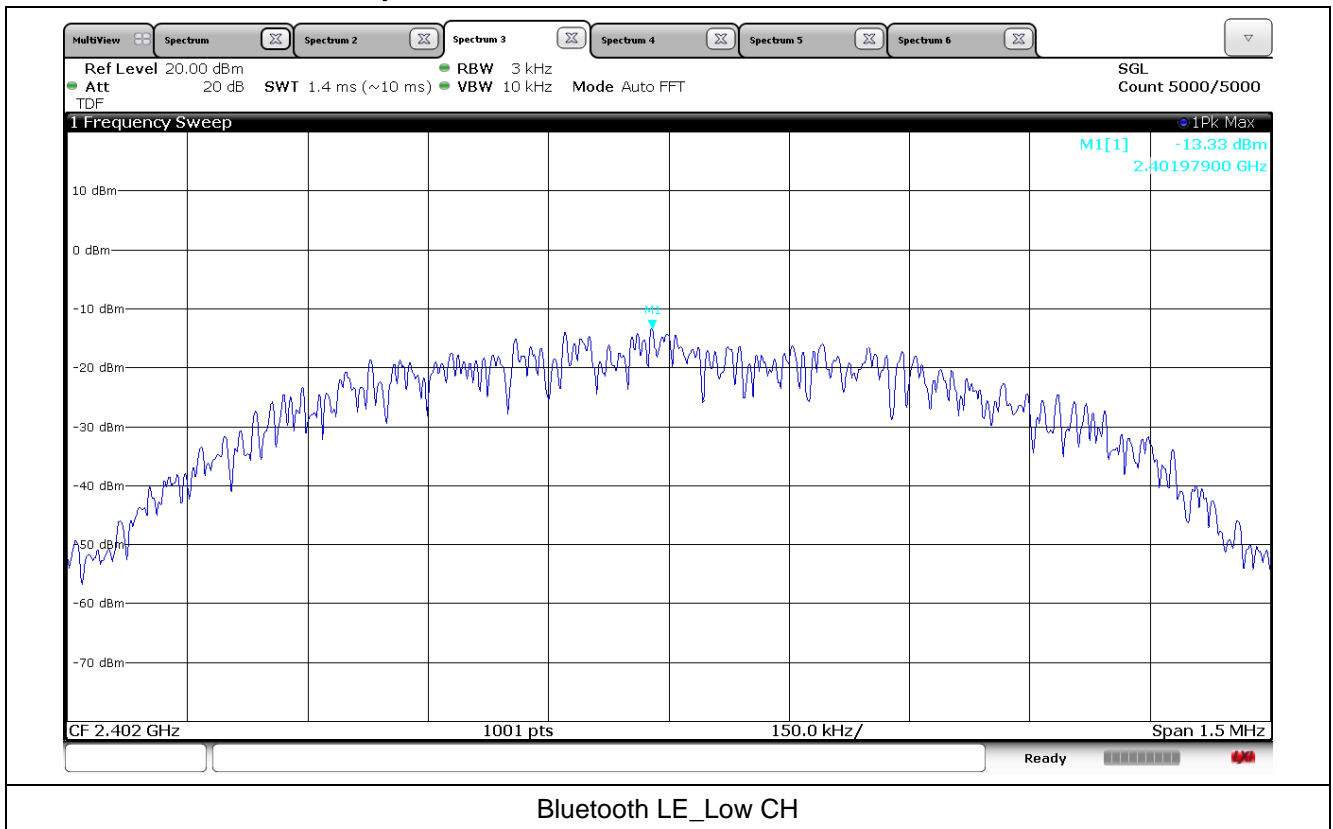
7.4 Test data

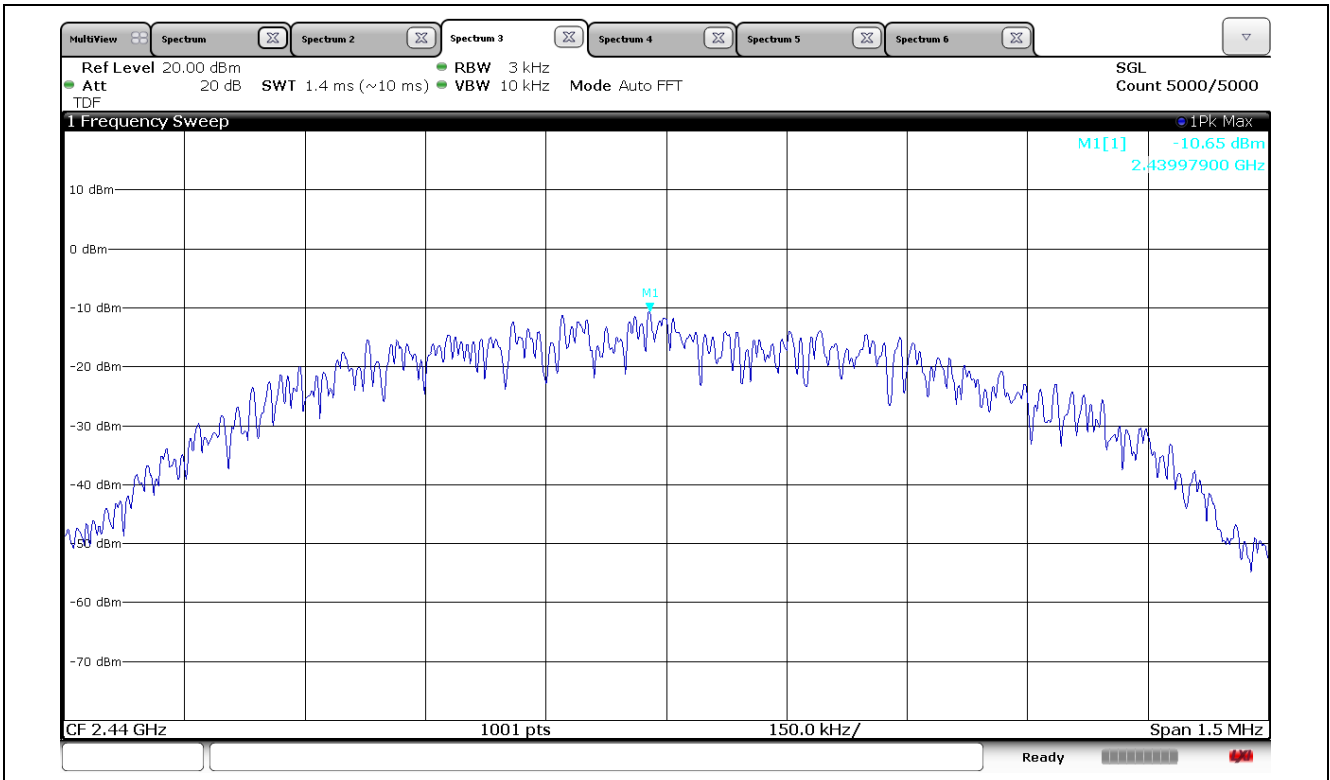
Test date : 08. Oct. 2019
 Operating mode : Transmit mode
 Test Result : Pass

7.4.1 Measured Results

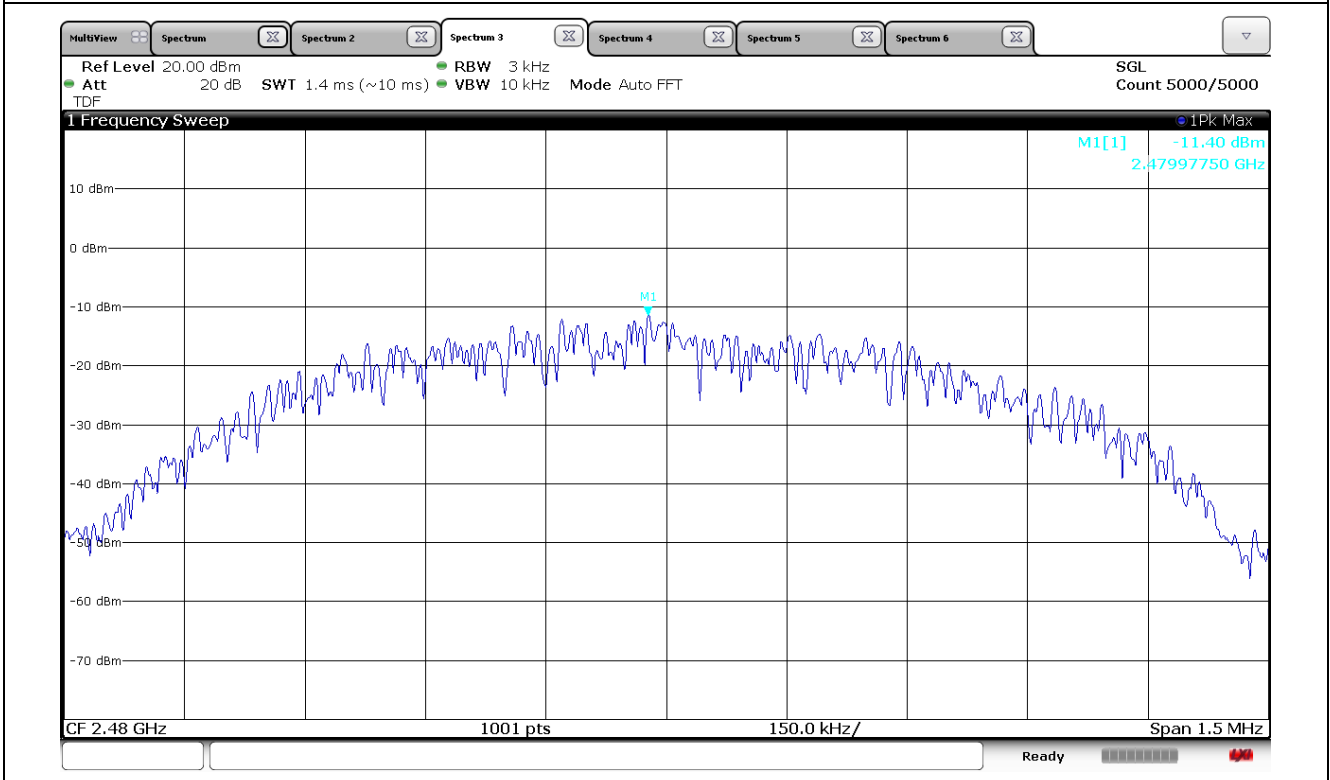
Modulation Type	Channel (Frequency)	Highest signal level (dBm)	Limit (dBm/3kHz)
Bluetooth LE	0 (2 402 MHz)	-13.33	8
	19 (2 440 MHz)	-10.65	
	39 (2 480 MHz)	-11.40	
Mesh	0 (2 405 MHz)	-4.66	
	19 (2 445 MHz)	-5.31	
	25 (2 475 MHz)	-6.54	

7.4.2 Measured Graph

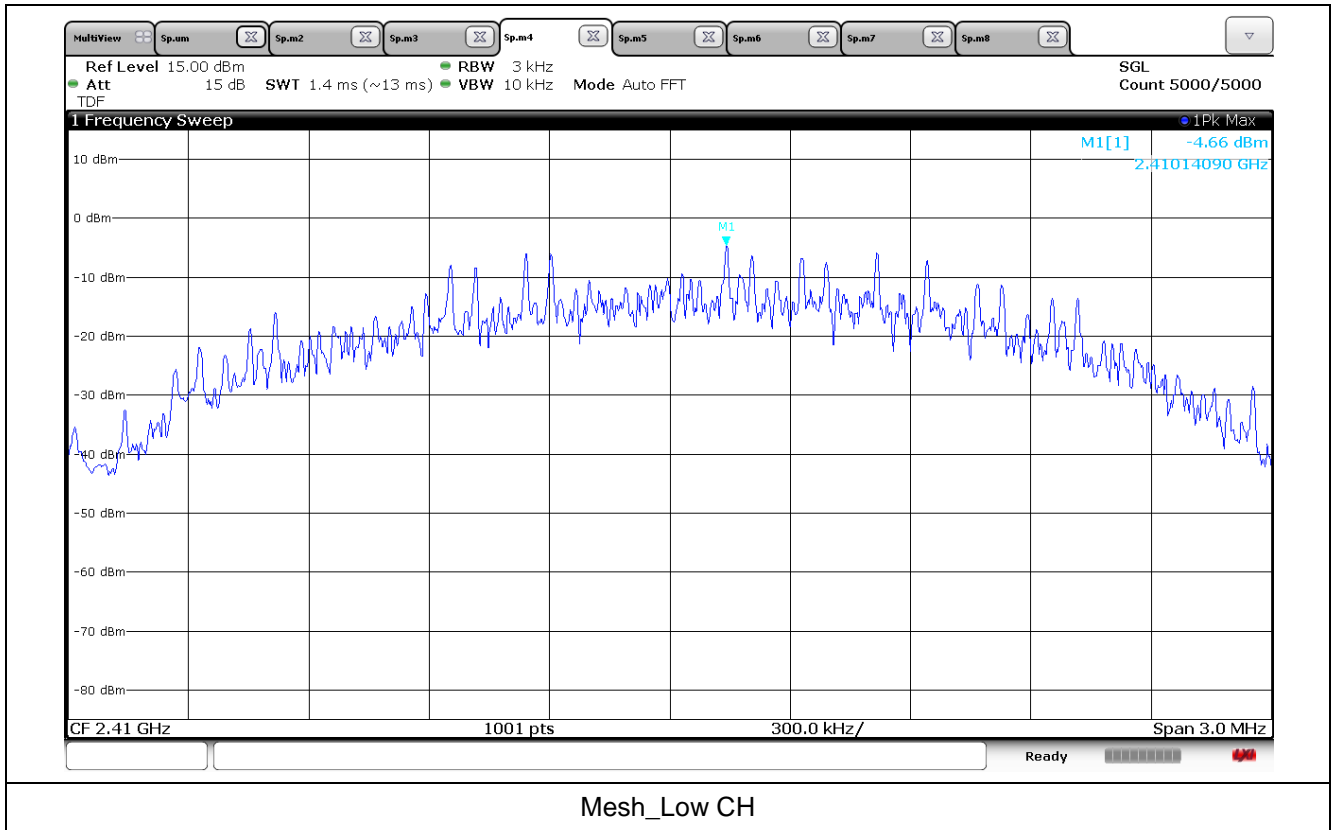


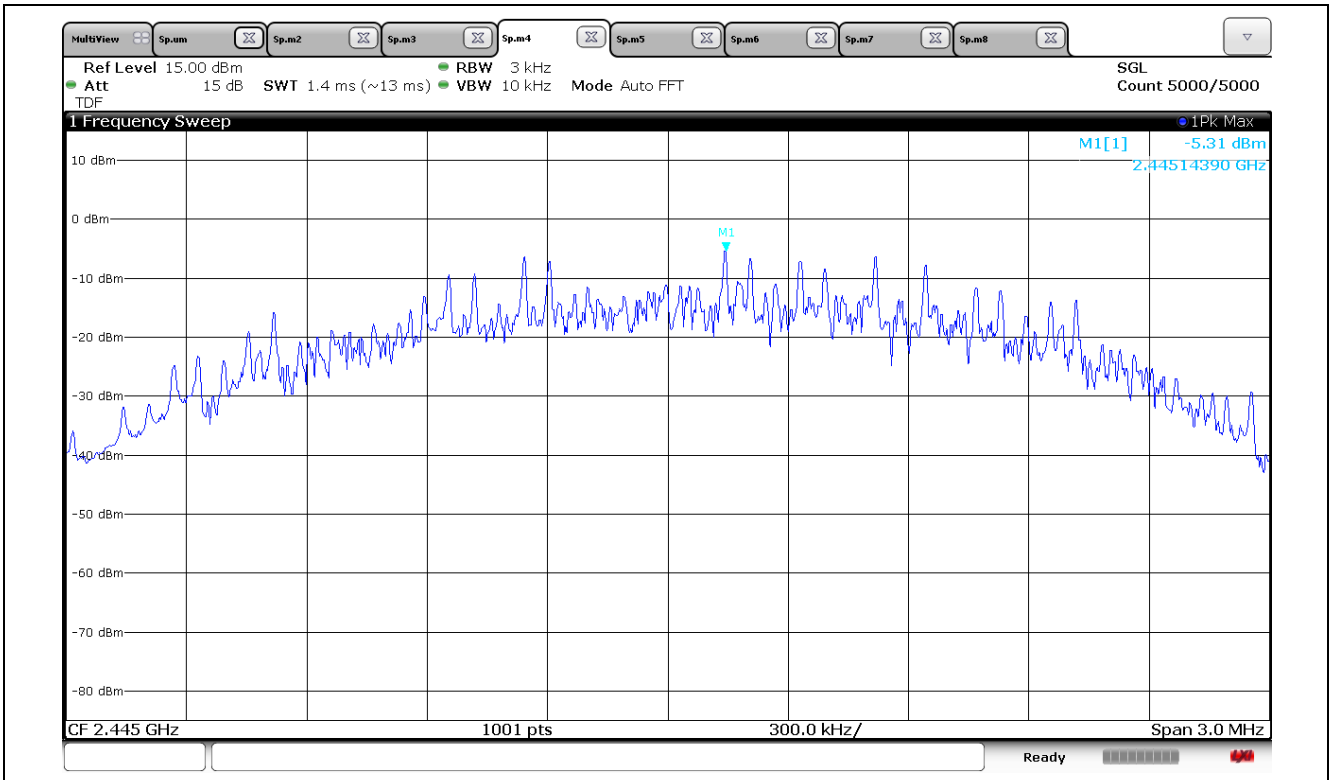


Bluetooth LE_Mid CH

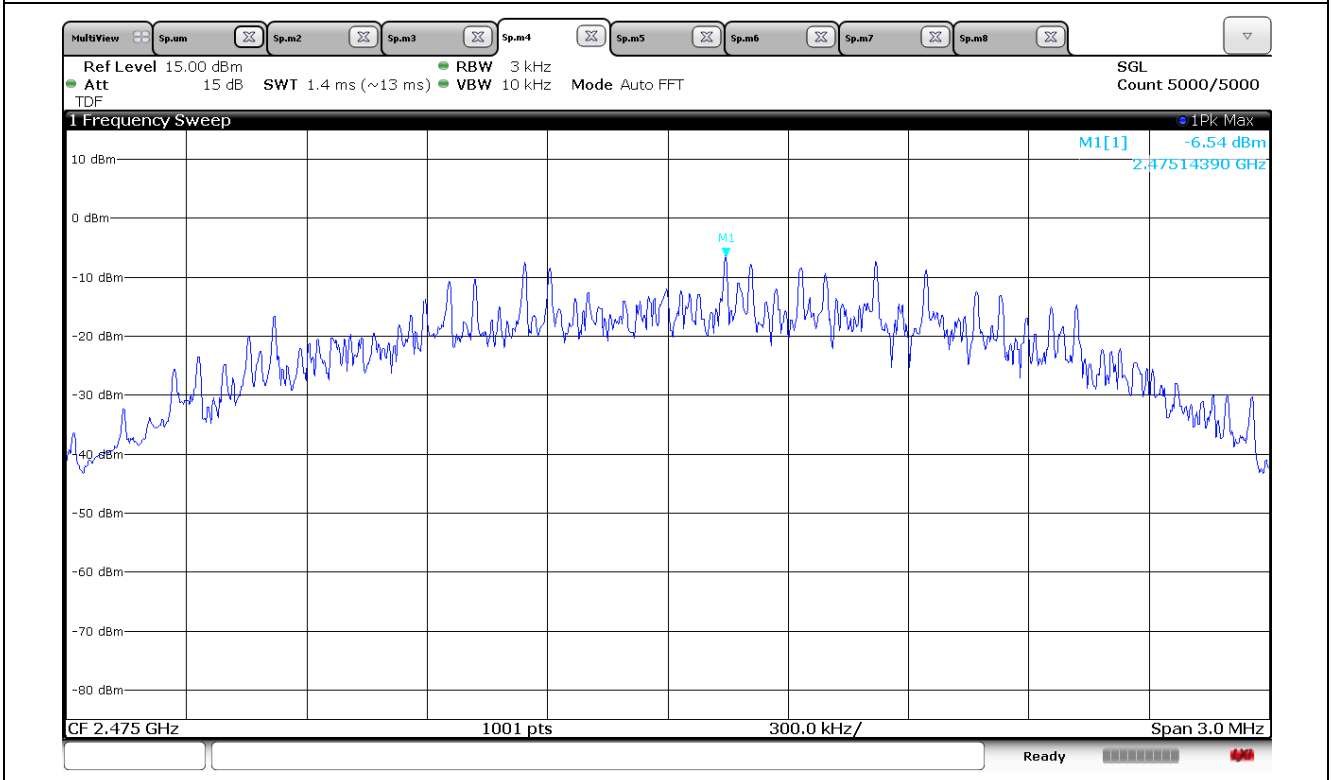


Bluetooth LE_High CH





Mesh_Mid CH



Mesh_High CH



8. Conducted Spurious Emission

8.1 Operating environment

Temperature : 22 °C

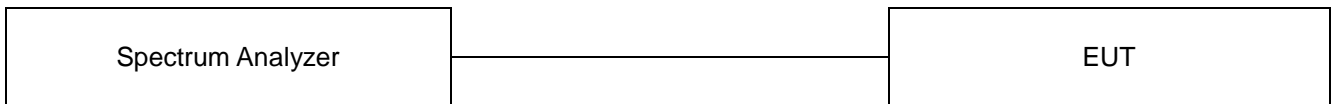
Relative humidity : 46 %

8.2 Measurement method

Standard : §15.247 (d) / RSS-247 (5.5)

8.3 Test setup

The antenna output of the EUT was connected to the spectrum analyzer. The resolution and video bandwidth is set to 100 kHz, and peak detection was used.



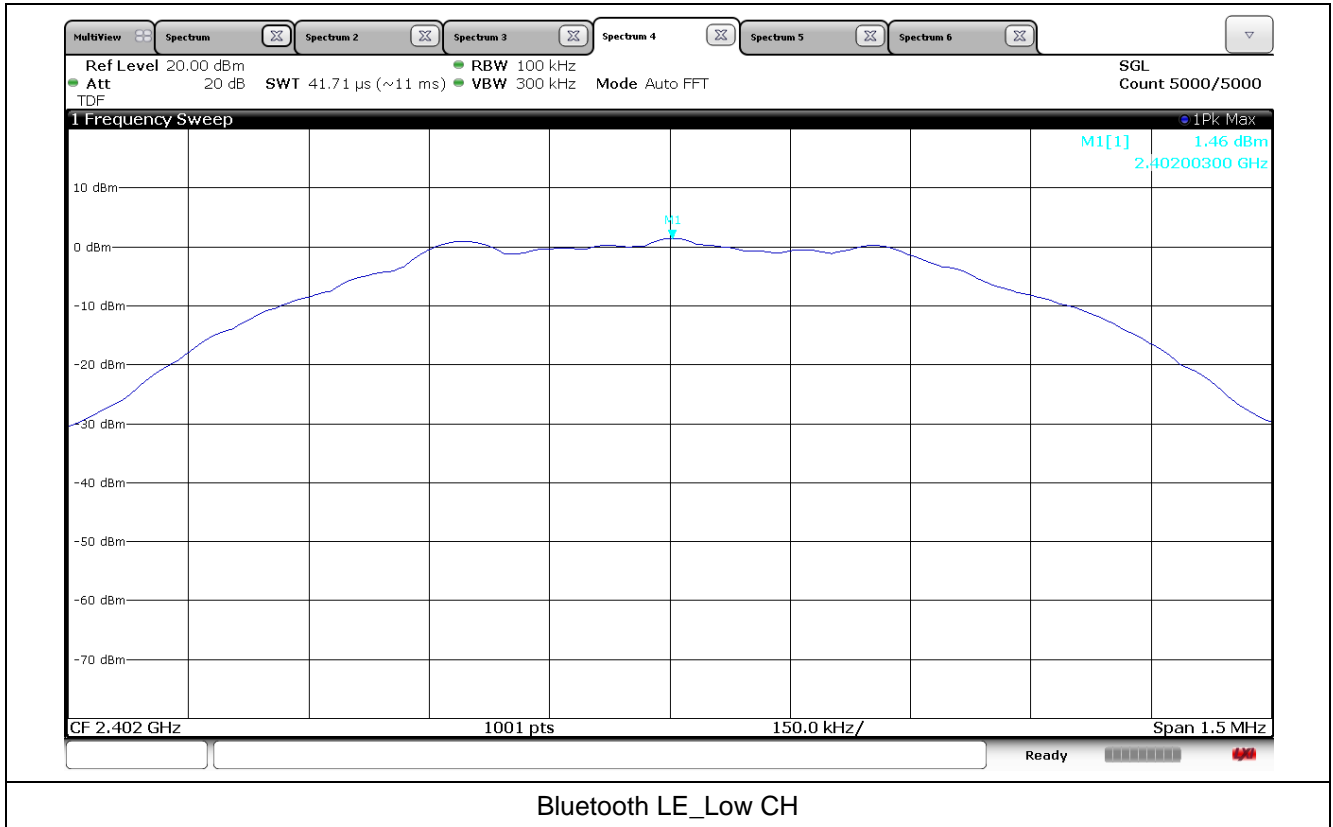


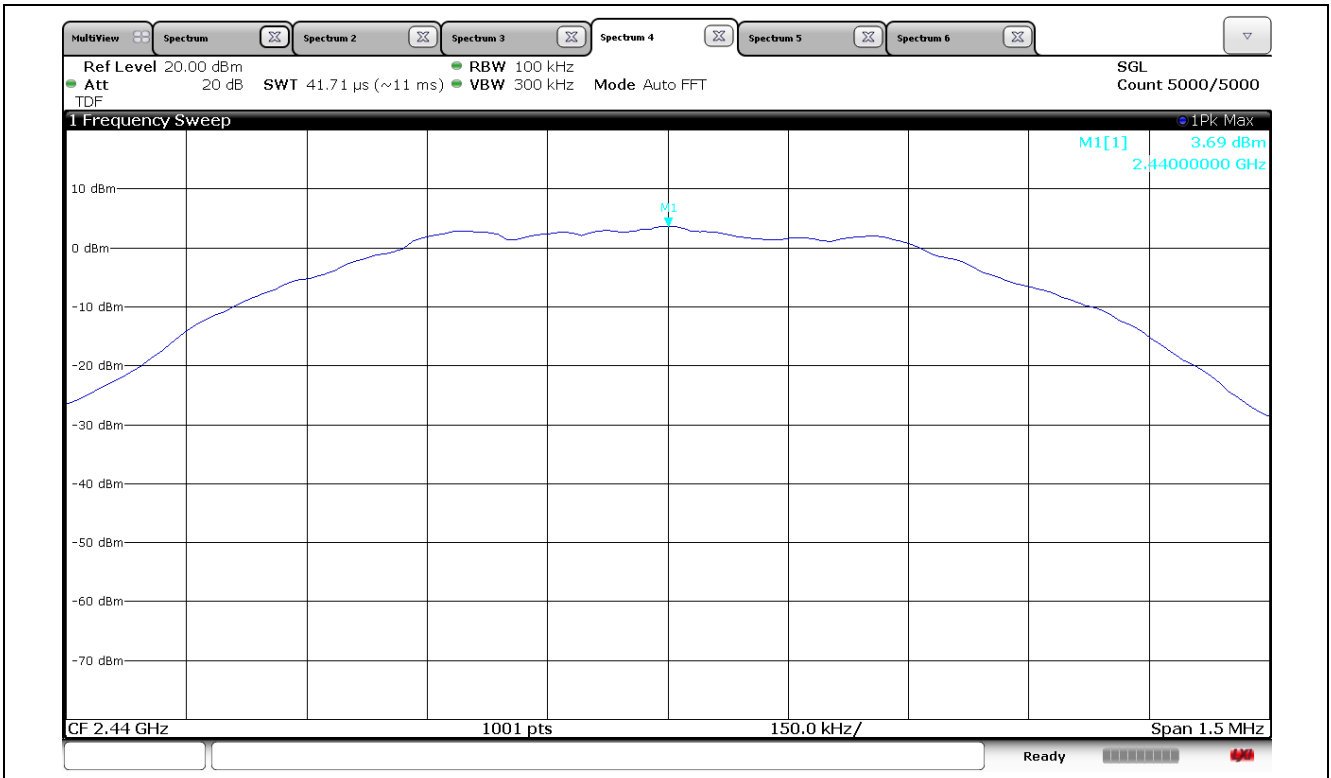
8.4 Test data

Test date : 08. Oct. 2019
Operating mode : Transmit mode
Test Result : Pass

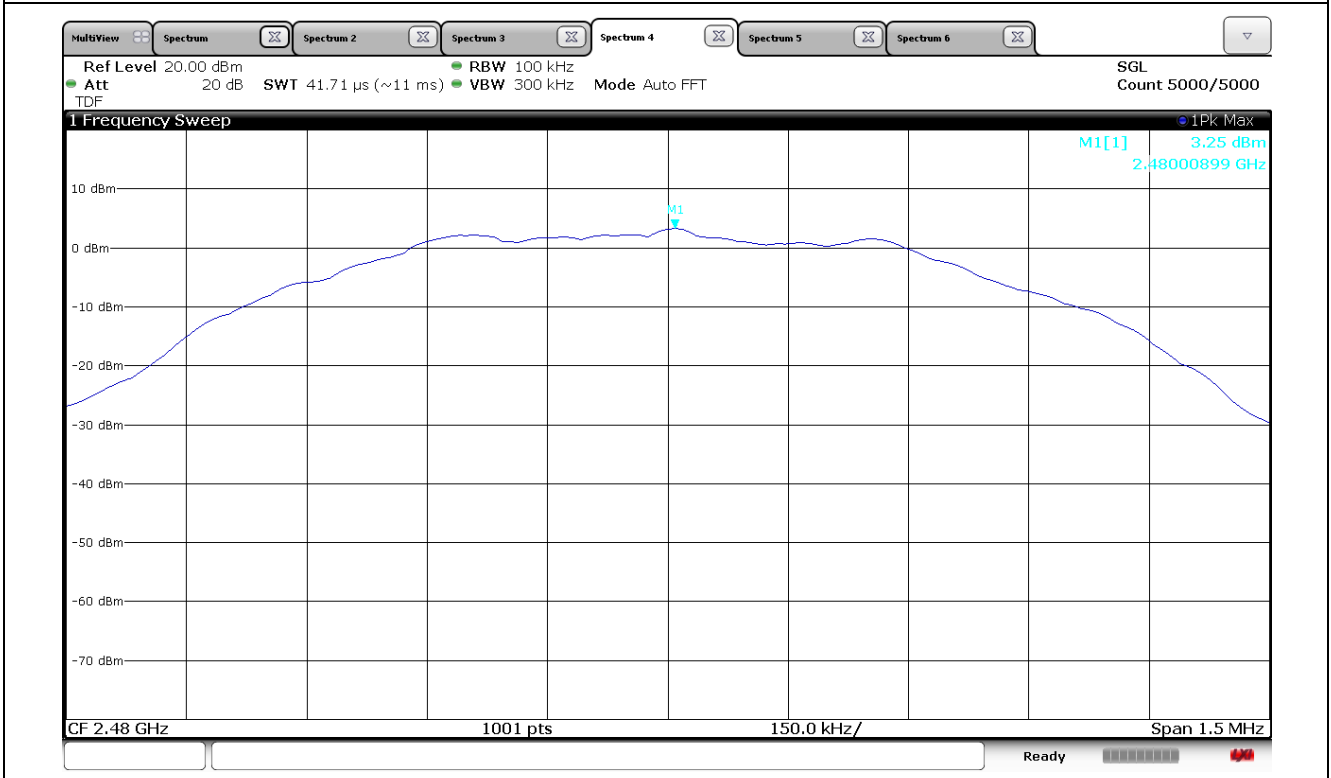
8.4.1 Measured Results

8.4.1.1 Signal level (dB m)

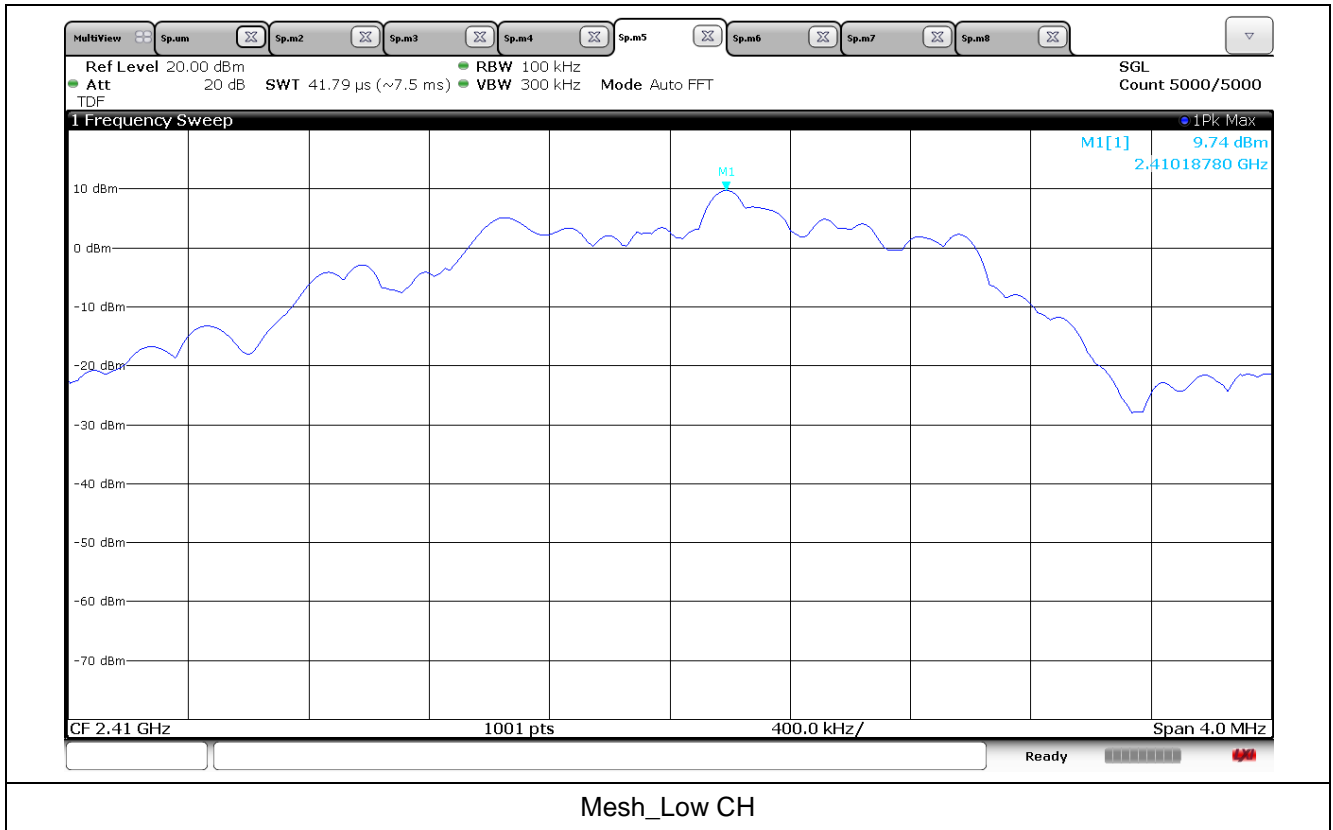


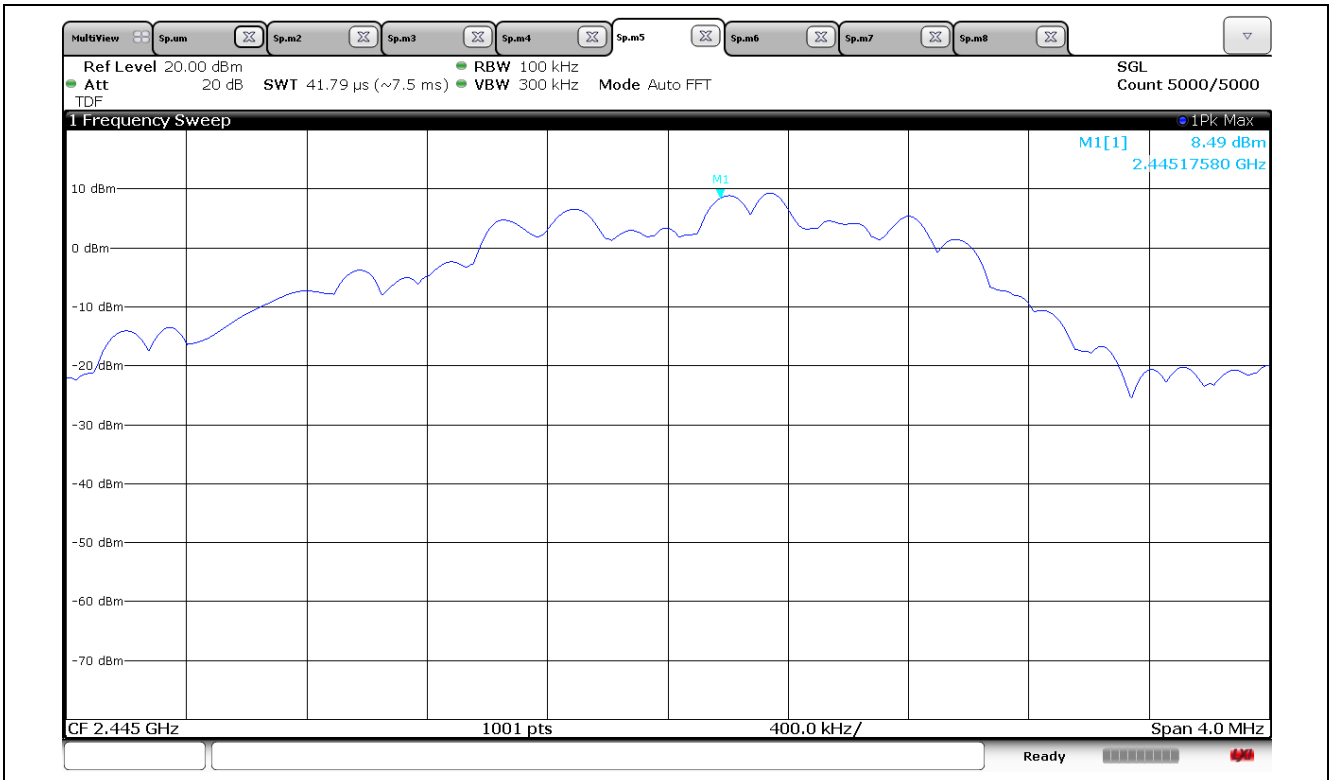


Bluetooth LE_Mid CH

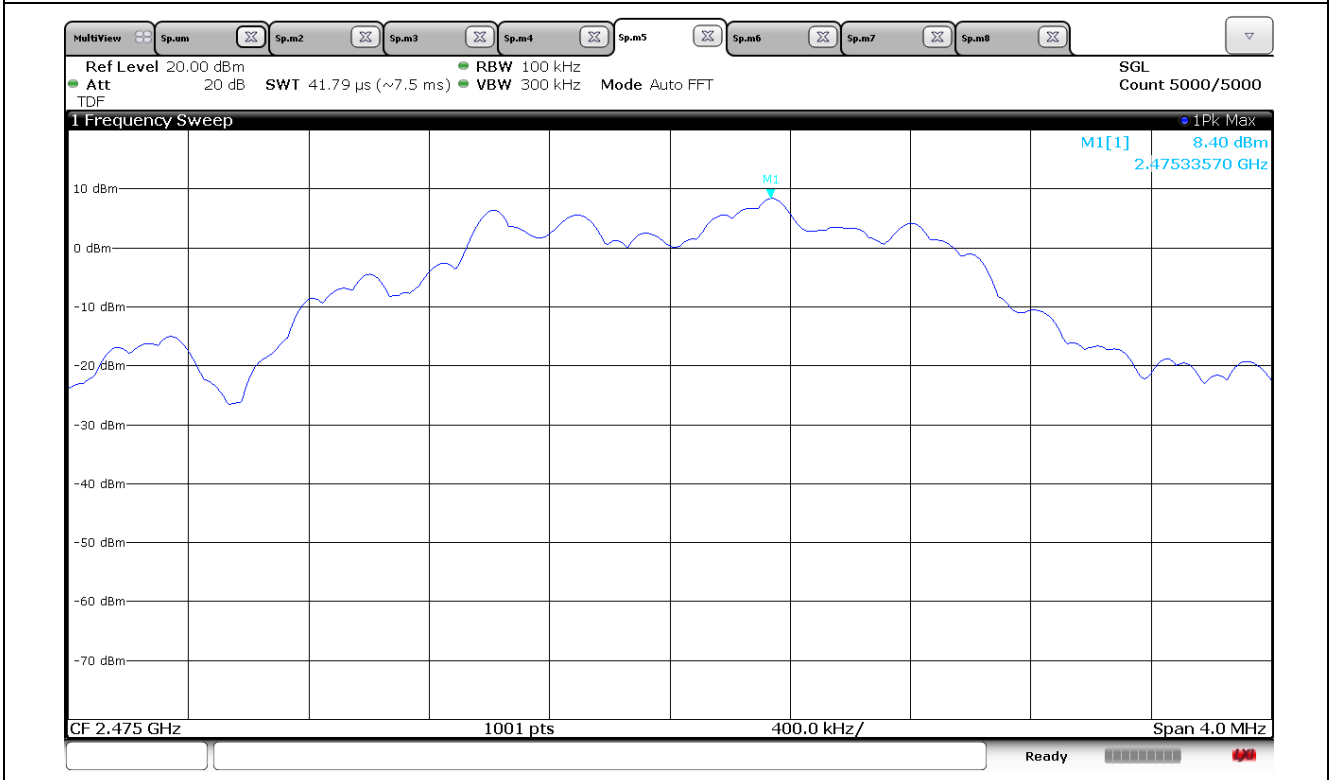


Bluetooth LE_High CH





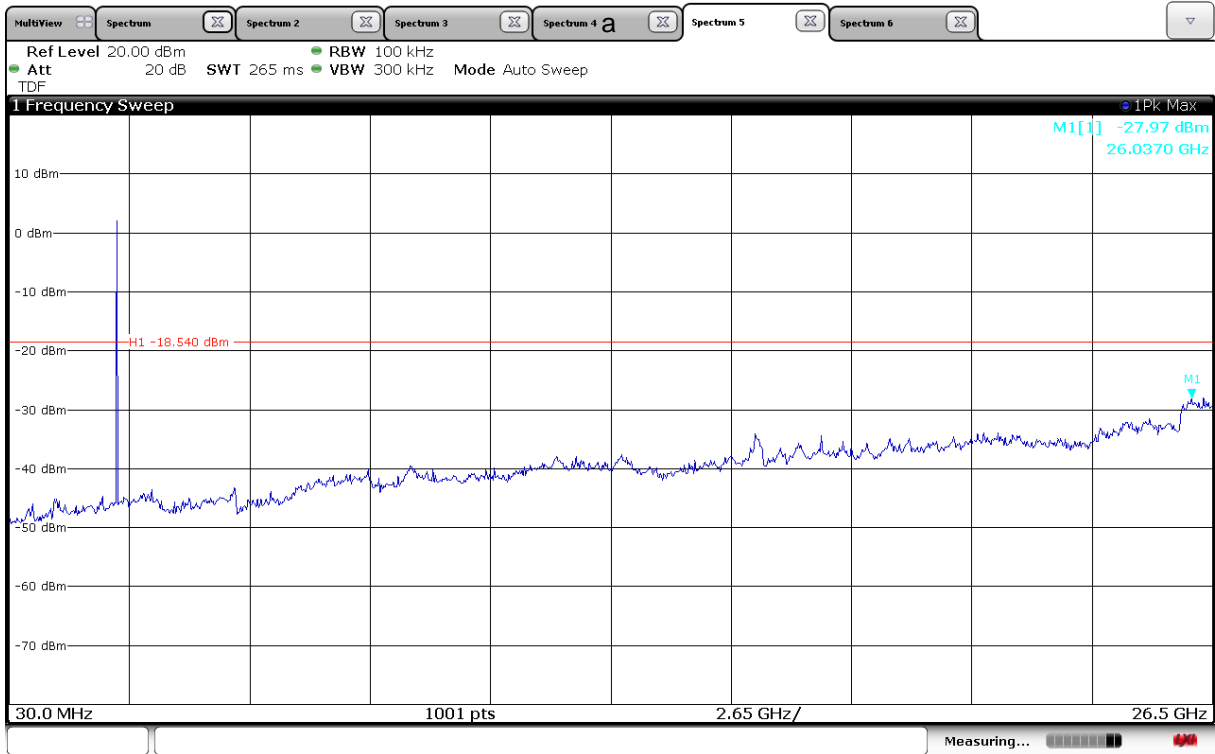
Mesh_Mid CH



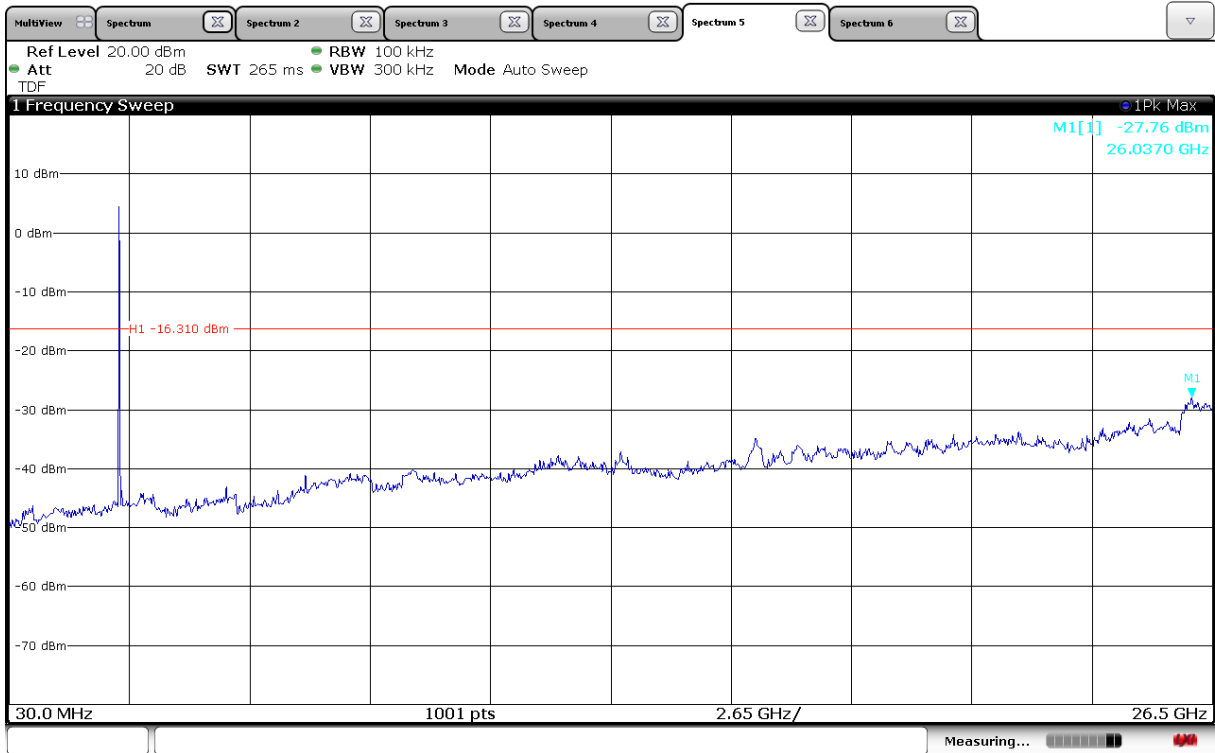
Mesh_High CH



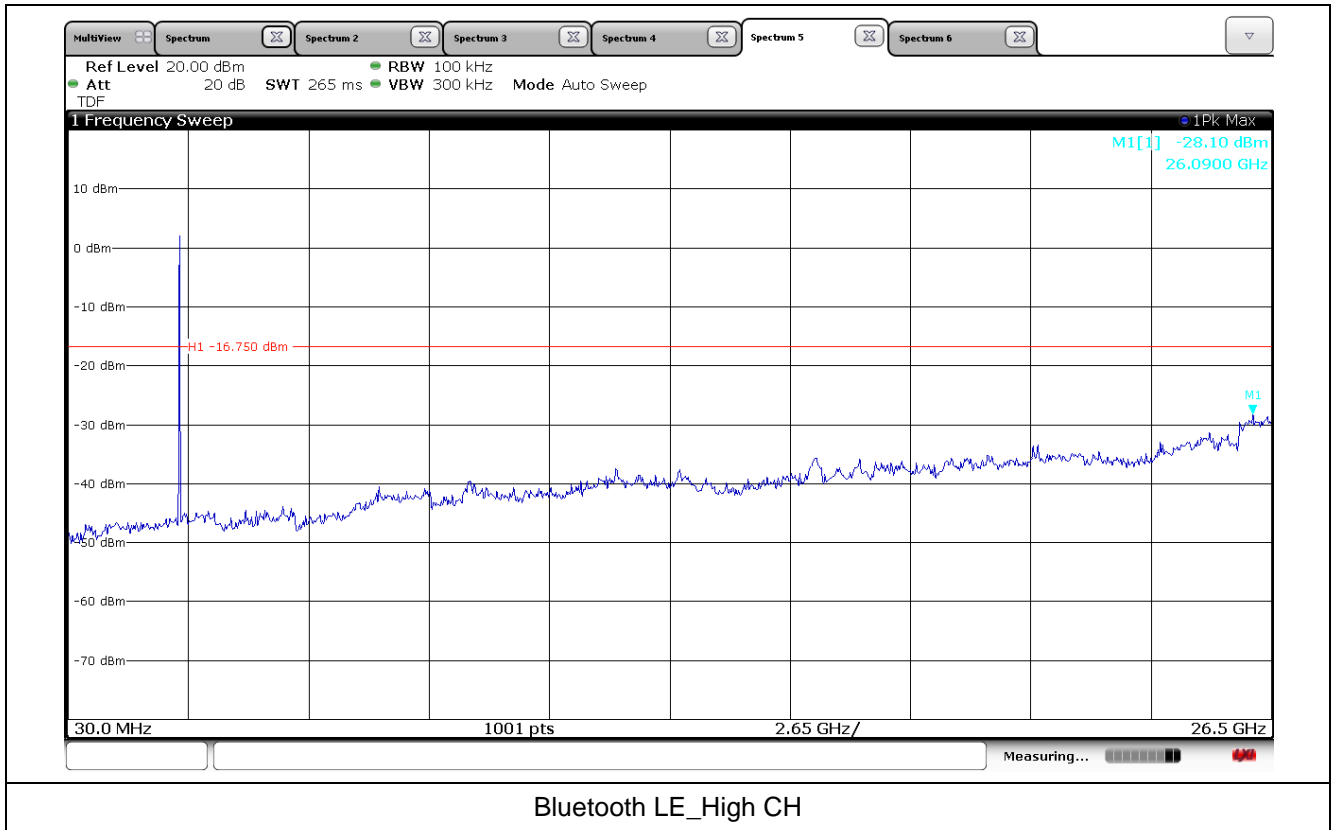
8.4.1.2 Unwanted Emissions In Non-Restricted Frequency Bands

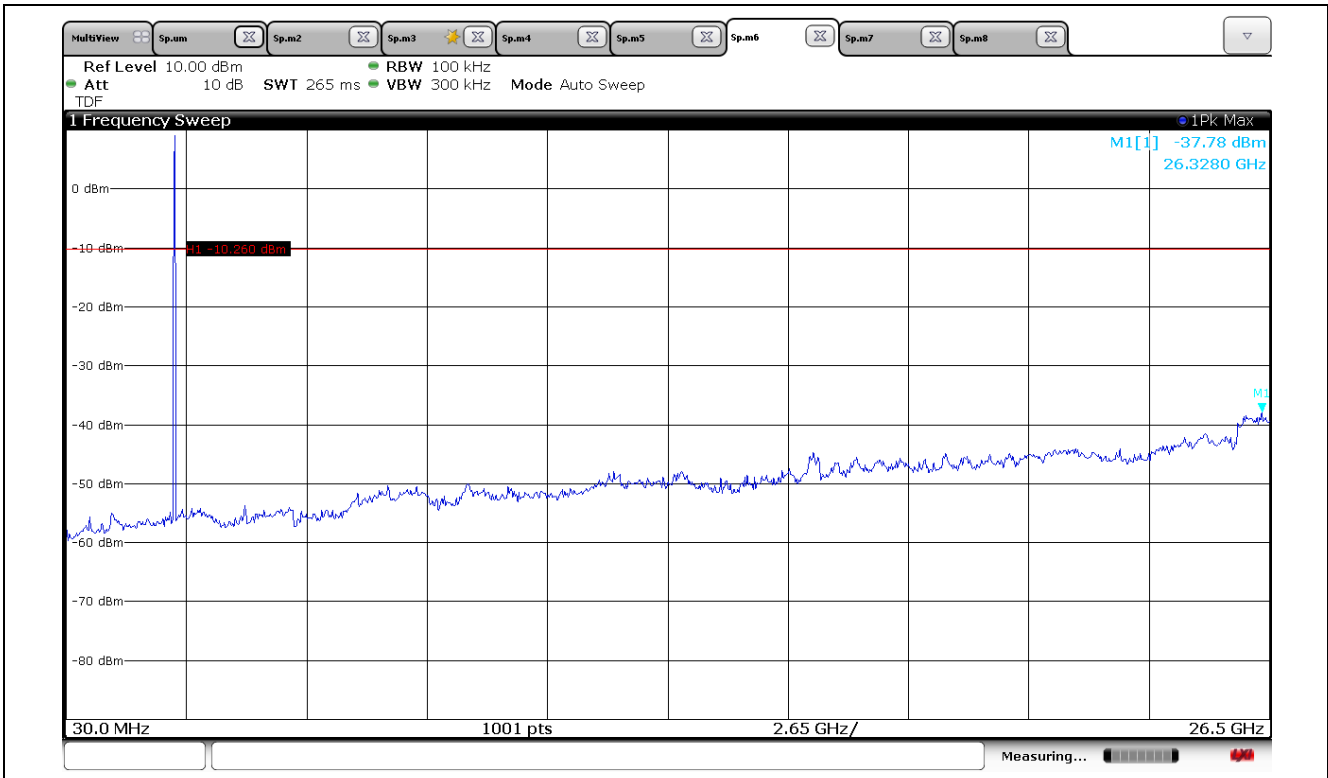


Bluetooth LE_Low CH

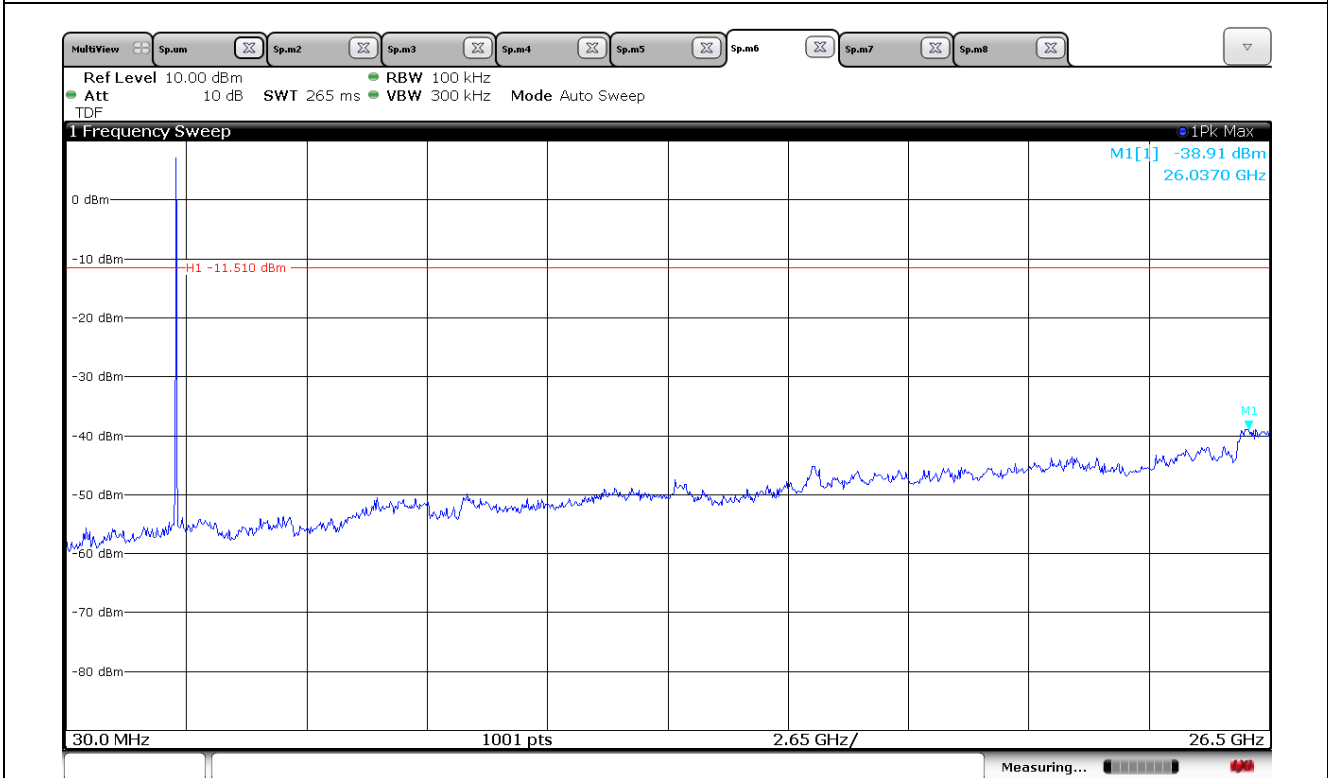


Bluetooth LE_Mid CH

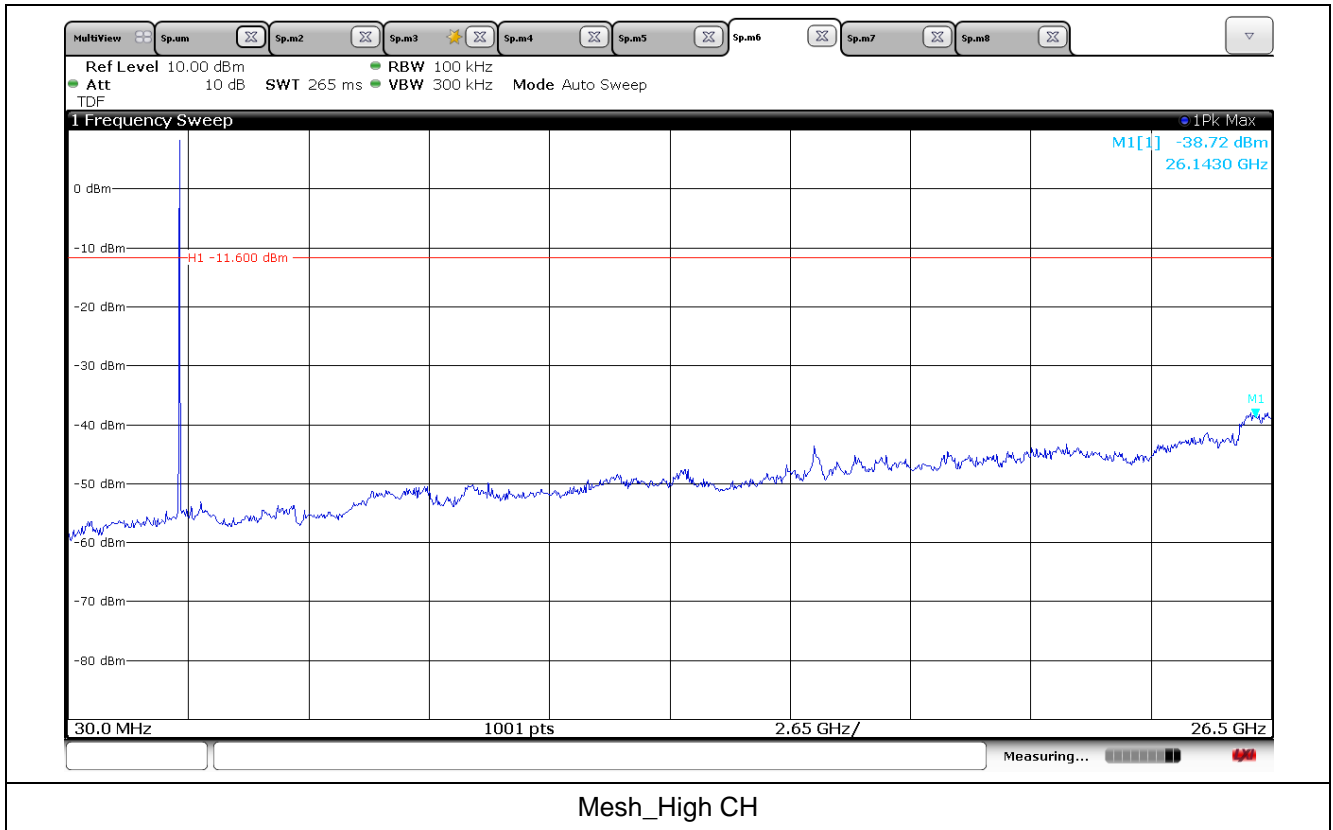




Mesh_Low CH

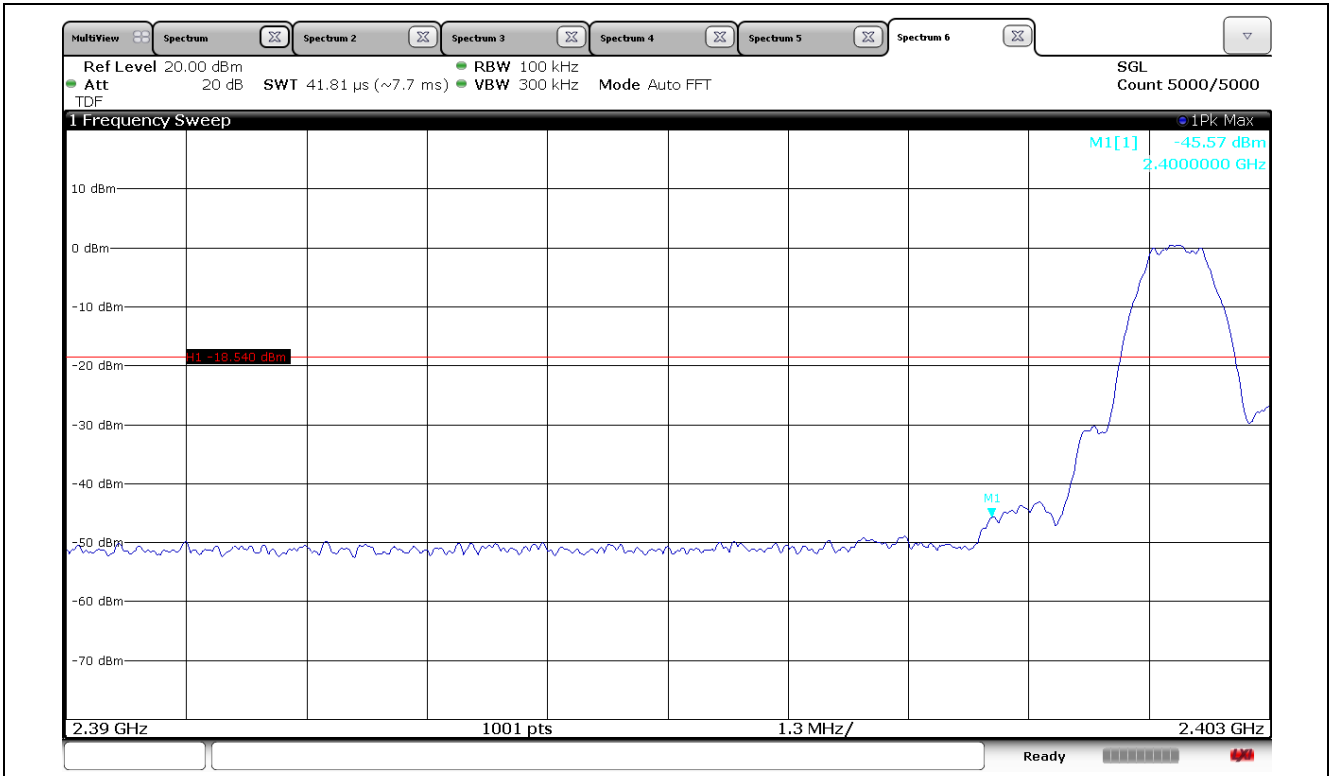


Mesh_Mid CH

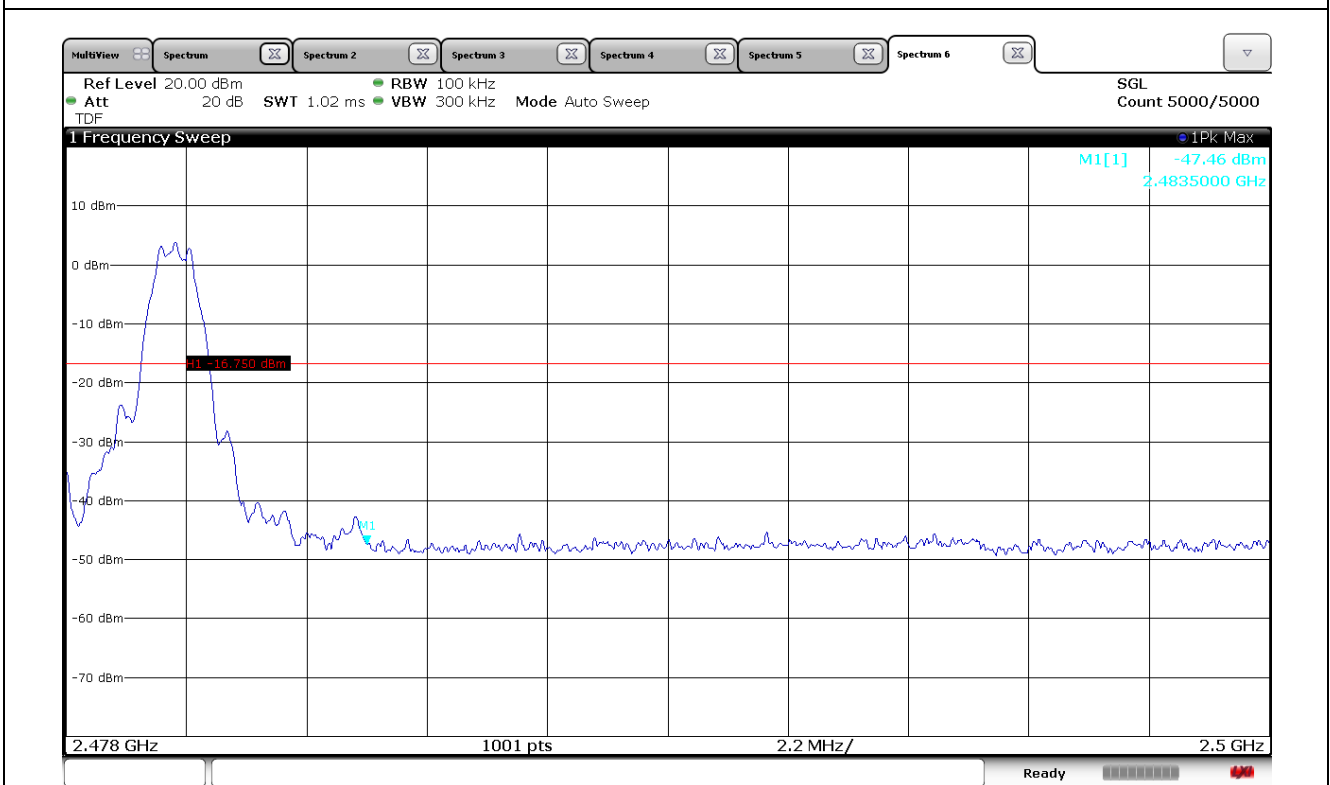




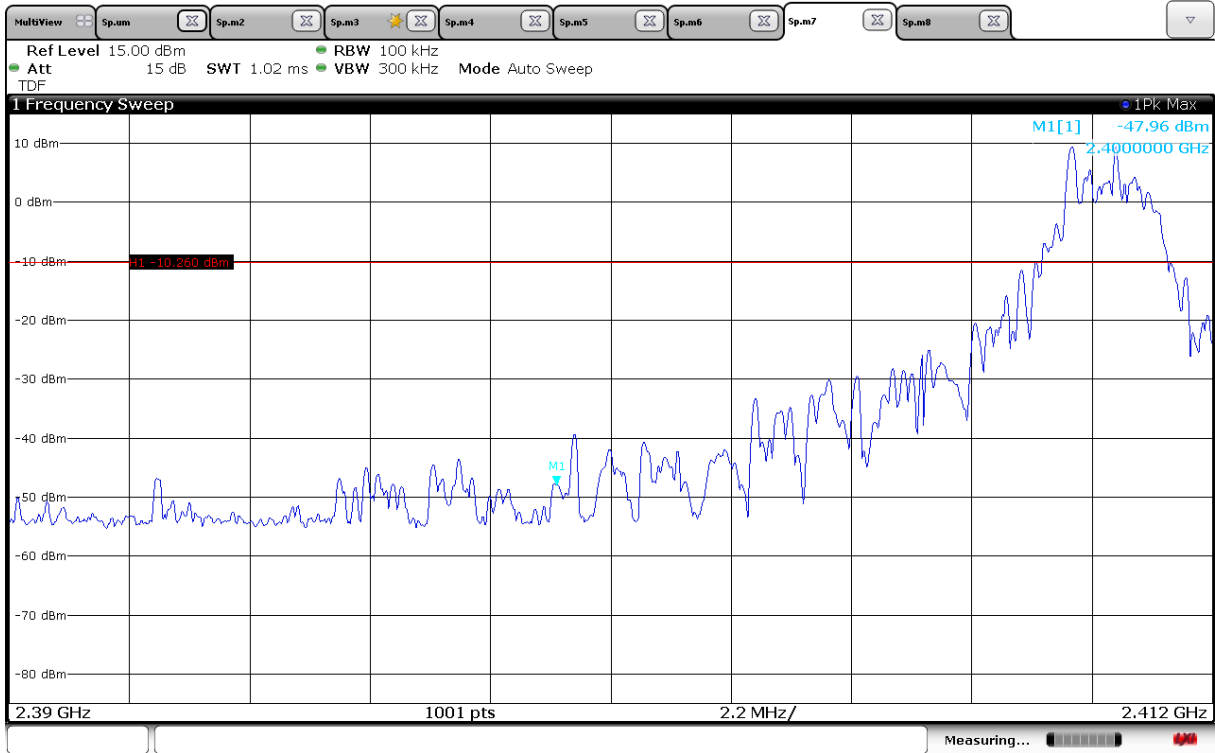
8.4.1.3 Band Edge



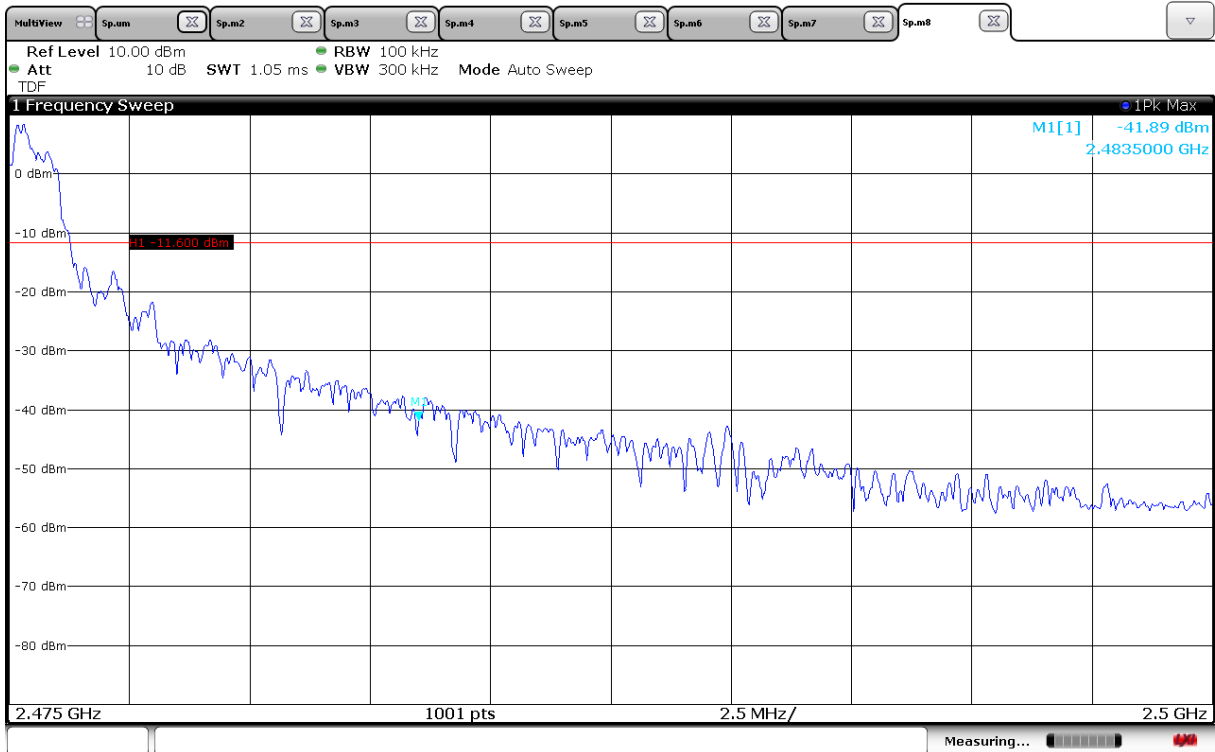
Bluetooth LE_Low CH



Bluetooth LE_High CH



Mesh_Low CH



Mesh_High CH



9. Radiated Spurious Emission

9.1 Operating environment

Temperature : (22 ~ 24) °C
Relative humidity : (47 ~ 49) %

9.2 Measurement method

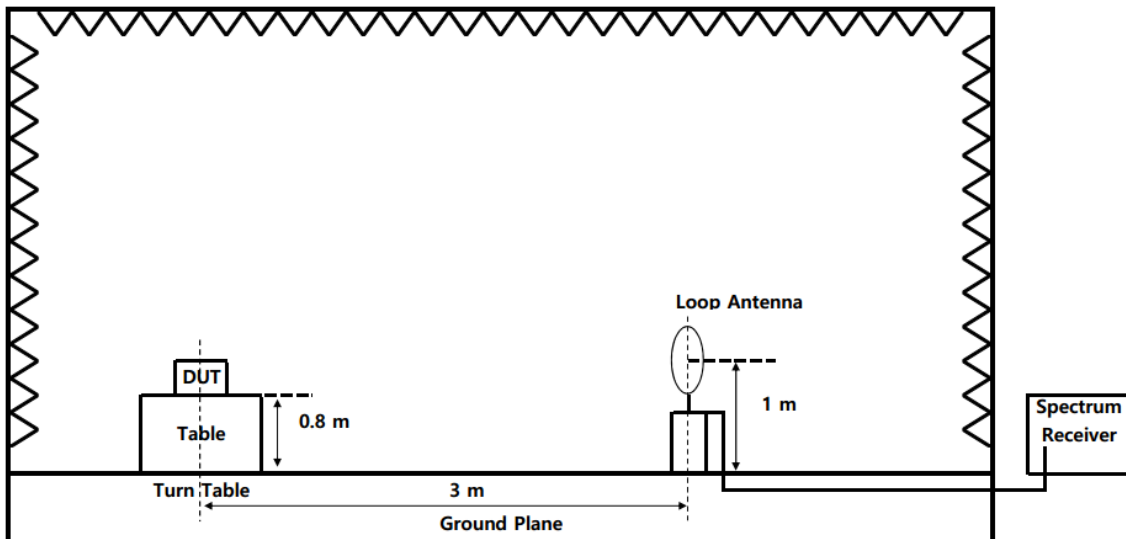
Standard : §15.247 (d), §15.209, §15.205 / RSS-247 (5.5), RSS-GEN (5.5), RSS-GEN (8.10)

9.3 Test setup

The radiated emissions measurements were performed on the 3 m, Semi-Anechoic Chamber. The EUT was placed on a non-conductive turntable above the ground plane.

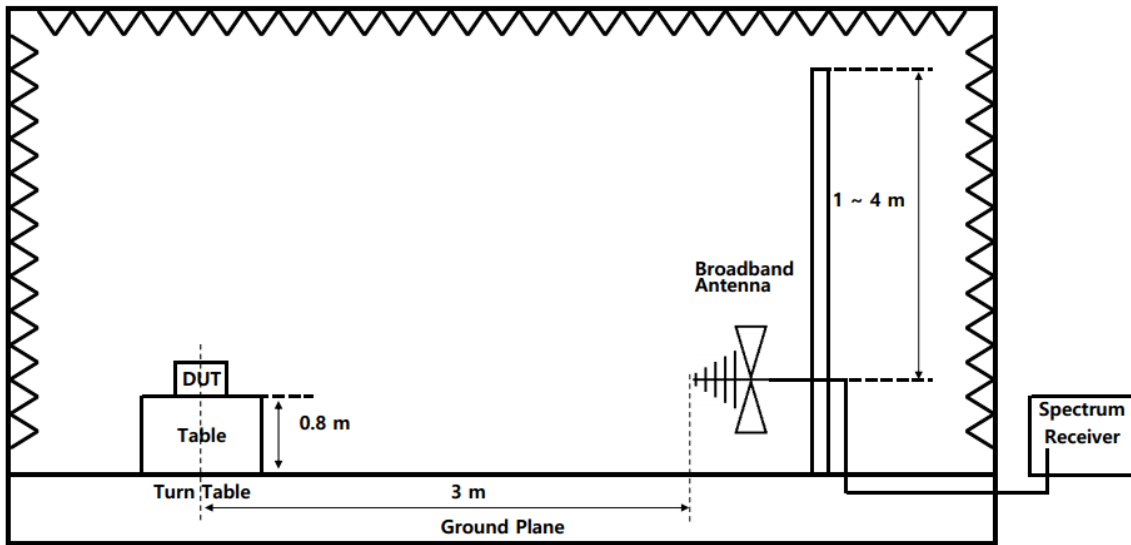
The frequency spectrum from 9 kHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

9.3.1 Below 30 MHz

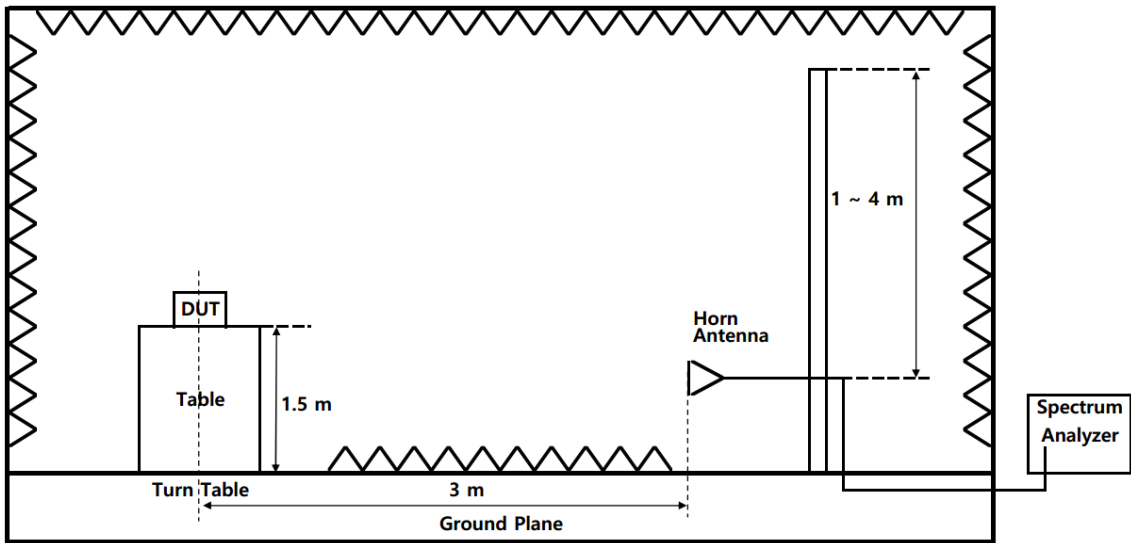




9.3.2 30 MHz to 1 GHz



9.3.3 Above 1 GHz





9.4 Test data

Test date : 18. Oct. 2019 ~ 21. Oct. 2019
 Operating mode : Transmit mode
 Test Result : Pass

9.4.1 Test data for Restricted band

9.4.1.1.1 Bluetooth LE

Frequency (MHz)	Reading (dBμV)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low CH							
2 324.19	51.28	Peak	H	-11.00	40.28	73.98	33.70
	35.78	Average	H		24.78	53.98	29.20
High CH							
2 483.51	59.99	Peak	H	-9.50	-9.5	73.98	83.48
	40.75	Average	H		31.25	53.98	22.73

- ※ Ant. Pol. : Antenna Polarization
- ※ Corr. Factor. : Antenna Factor + Cable Loss - Amplifier Gain
- ※ Result = Reading + Corr. Factor
- ※ Margin = Limit - Result

9.4.1.1.2 Mesh

Frequency (MHz)	Reading (dBμV)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low CH							
2 389.64	49.95	Peak	H	-11.00	38.95	73.98	35.03
	33.00	Average	H		22.00	53.98	31.98
High CH							
2 483.51	77.29	Peak	V	-9.50	67.79	73.98	6.19
	32.79	Average	V		23.29	53.98	30.69

- ※ Ant. Pol. : Antenna Polarization
- ※ Corr Factor. : Antenna Factor + Cable Loss - Amplifier Gain
- ※ DCCF(Duty Cycle Correction Factor): $20 * \text{Log}(\text{worst case dwell time} / 100 \text{ ms}) \text{ dB}$
- ※ Result = Reading + Corr Factor+ DCCF
- ※ Margin = Limit - Result



9.4.2 Test data for Spurious & Harmonic

9.4.2.1 Measurement Results for below 30 MHz

9.4.2.1.1 Bluetooth LE

Frequency (MHz)	Reading (dB μ V)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Low CH							
It was not found any emissions peaks found from the EUT.							
Mid CH							
It was not found any emissions peaks found from the EUT.							
High CH							
It was not found any emissions peaks found from the EUT.							

- ※ Ant. Pol. : Antenna Polarization
- ※ Corr. Factor. : Antenna Factor + Cable Loss - Amplifier Gain
- ※ Result = Reading + Corr. Factor
- ※ Margin = Limit - Result

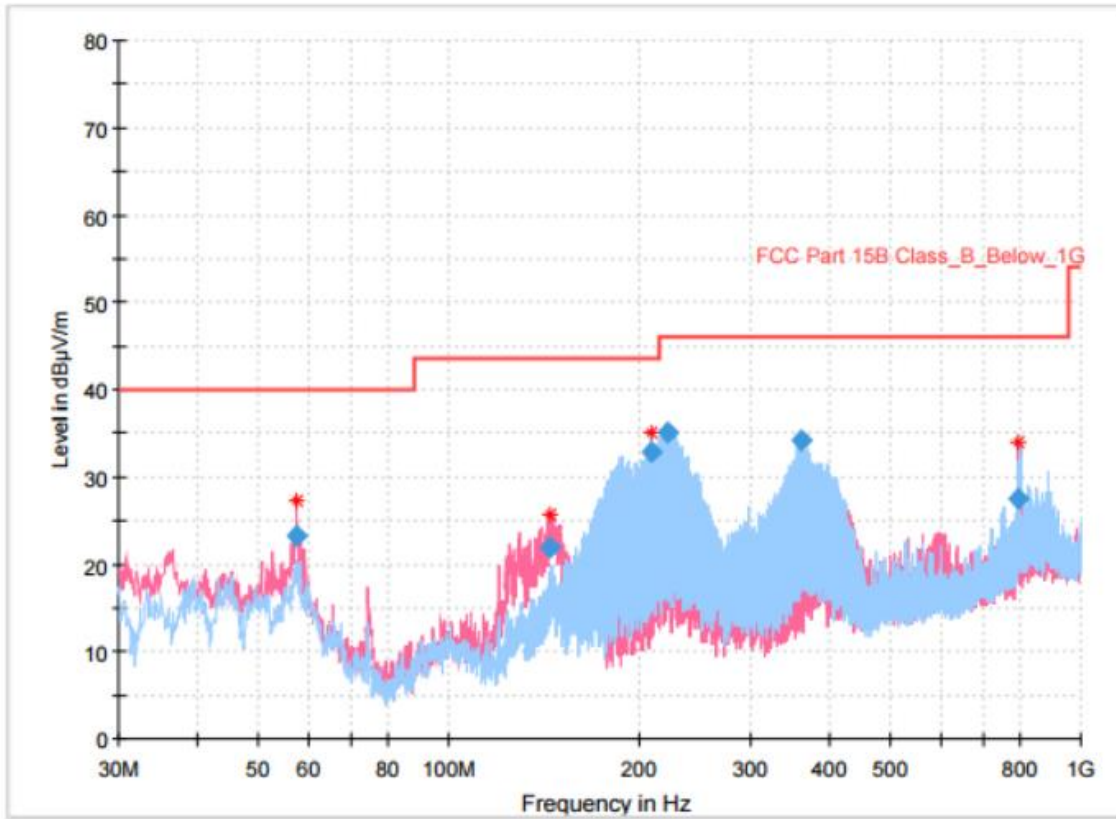
9.4.2.1.2 Mesh

Frequency (MHz)	Reading (dB μ V)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Low CH							
It was not found any emissions peaks found from the EUT.							
Mid CH							
It was not found any emissions peaks found from the EUT.							
High CH							
It was not found any emissions peaks found from the EUT.							

- ※ Ant. Pol. : Antenna Polarization
- ※ Corr. Factor. : Antenna Factor + Cable Loss - Amplifier Gain
- ※ Result = Reading + Corr. Factor
- ※ Margin = Limit - Result



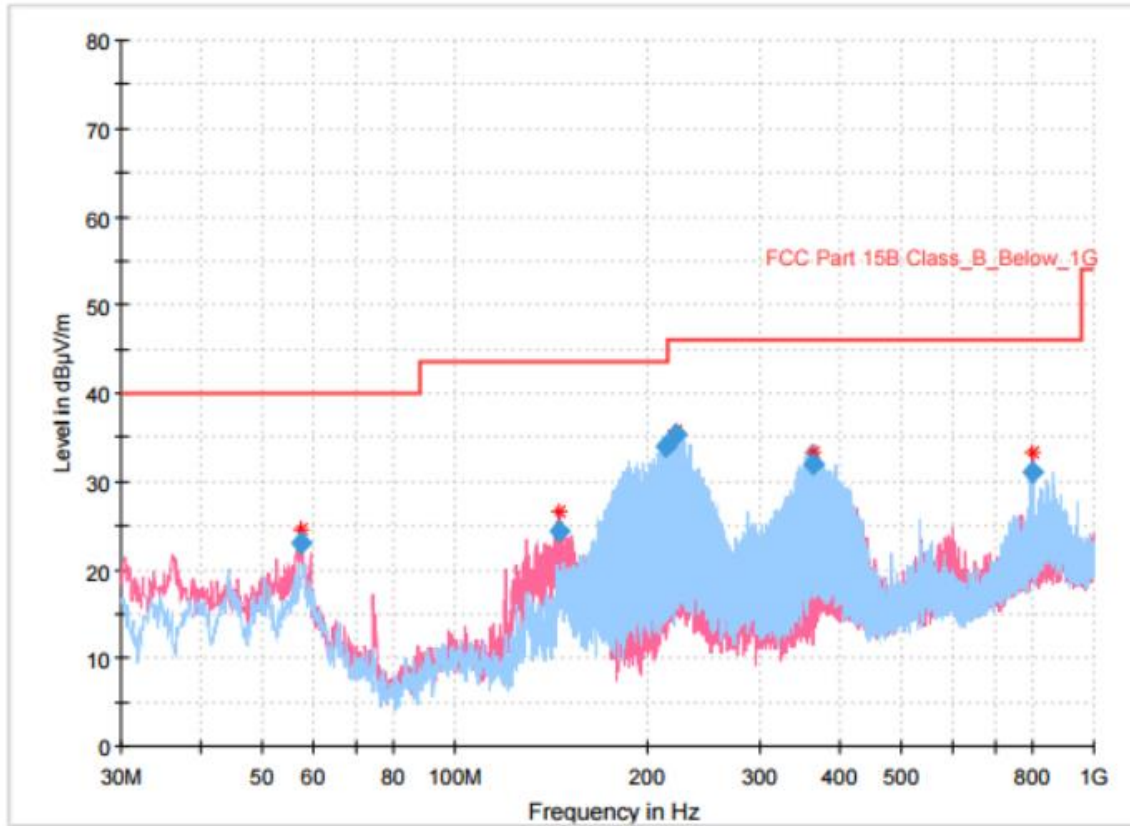
9.4.2.2 Measurement Results for below 1 GHz



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
57.548000	23.30	40.00	16.70	1000.0	120.000	99.9	V	288.0	-20.0
144.169000	21.98	43.50	21.52	1000.0	120.000	99.9	V	333.0	-24.7
209.256000	32.88	43.50	10.62	1000.0	120.000	99.9	H	237.0	-21.7
221.672000	35.20	46.00	10.80	1000.0	120.000	99.9	H	251.0	-21.1
360.188000	34.24	46.00	11.76	1000.0	120.000	99.9	H	337.0	-16.6
798.143000	27.50	46.00	18.50	1000.0	120.000	200.1	V	244.0	-8.8

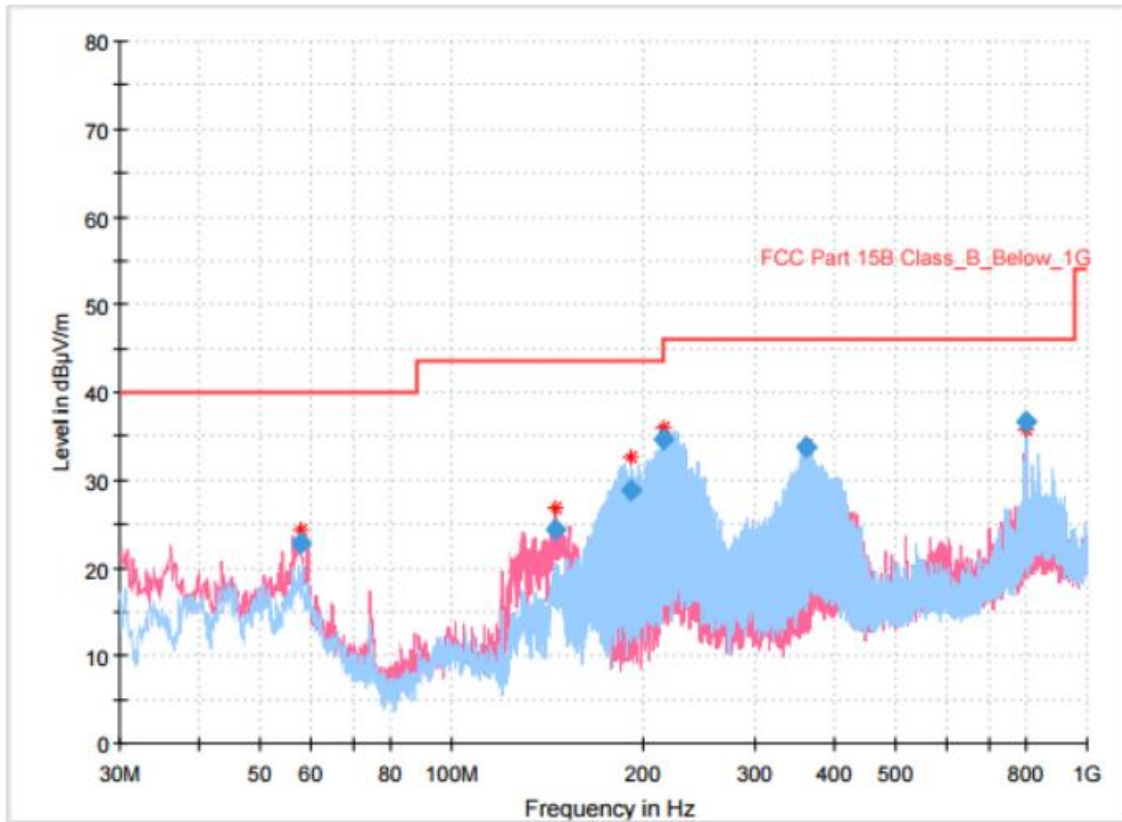
Bluetooth LE_Low CH



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
57.257000	23.12	40.00	16.88	1000.0	120.000	100.0	V	274.0	-20.1
145.915000	24.35	43.50	19.15	1000.0	120.000	100.0	V	307.0	-24.8
214.009000	34.01	43.50	9.49	1000.0	120.000	100.0	H	250.0	-21.7
221.672000	35.30	46.00	10.70	1000.0	120.000	100.0	H	261.0	-21.1
363.098000	32.02	46.00	13.98	1000.0	120.000	100.0	H	328.0	-16.5
799.695000	30.97	46.00	15.03	1000.0	120.000	200.1	V	281.0	-8.8

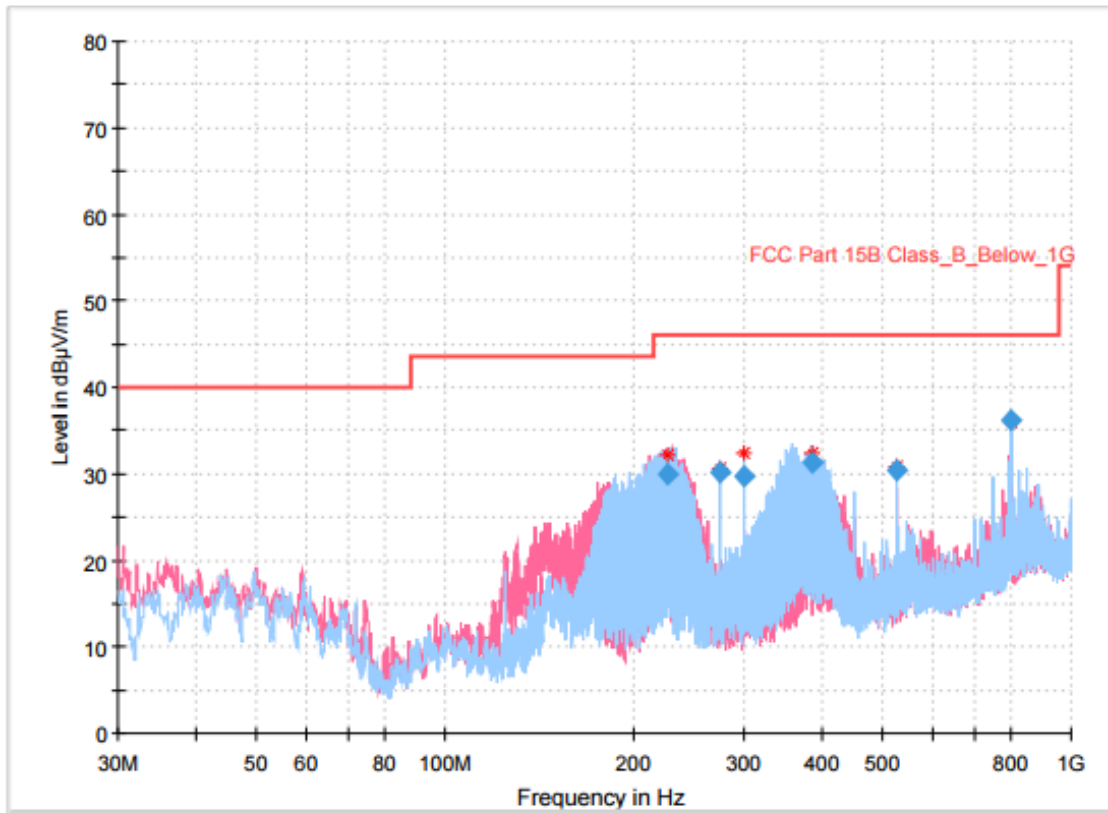
Bluetooth LE_Mid CH



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
57.742000	22.77	40.00	17.23	1000.0	120.000	100.1	V	284.0	-19.9
145.236000	24.32	43.50	19.18	1000.0	120.000	100.1	V	284.0	-24.8
191.020000	28.91	43.50	14.59	1000.0	120.000	199.9	H	258.0	-22.0
215.949000	34.71	43.50	8.79	1000.0	120.000	100.1	H	256.0	-21.4
360.285000	33.80	46.00	12.20	1000.0	120.000	100.1	H	335.0	-16.6
799.404000	36.67	46.00	9.33	1000.0	120.000	100.1	H	289.0	-8.8

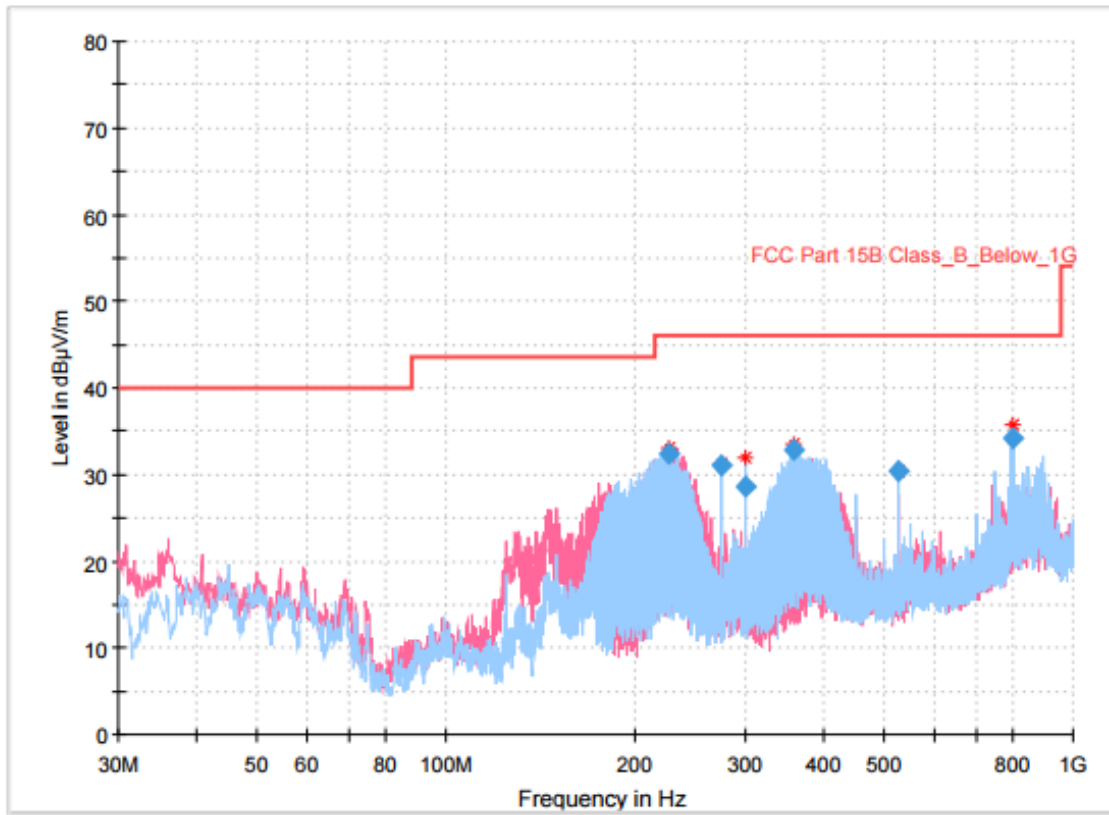
Bluetooth LE_High CH



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
227.298000	29.97	46.00	16.03	1000.0	120.000	200.1	V	319.0	-20.7
275.022000	30.06	46.00	15.94	1000.0	120.000	100.0	H	243.0	-18.9
300.048000	29.76	46.00	16.24	1000.0	120.000	100.0	H	279.0	-18.5
387.057000	31.35	46.00	14.65	1000.0	120.000	200.1	H	332.0	-15.8
524.991000	30.46	46.00	15.54	1000.0	120.000	100.0	H	174.0	-13.6
799.792000	36.30	46.00	9.70	1000.0	120.000	100.0	H	39.0	-8.8

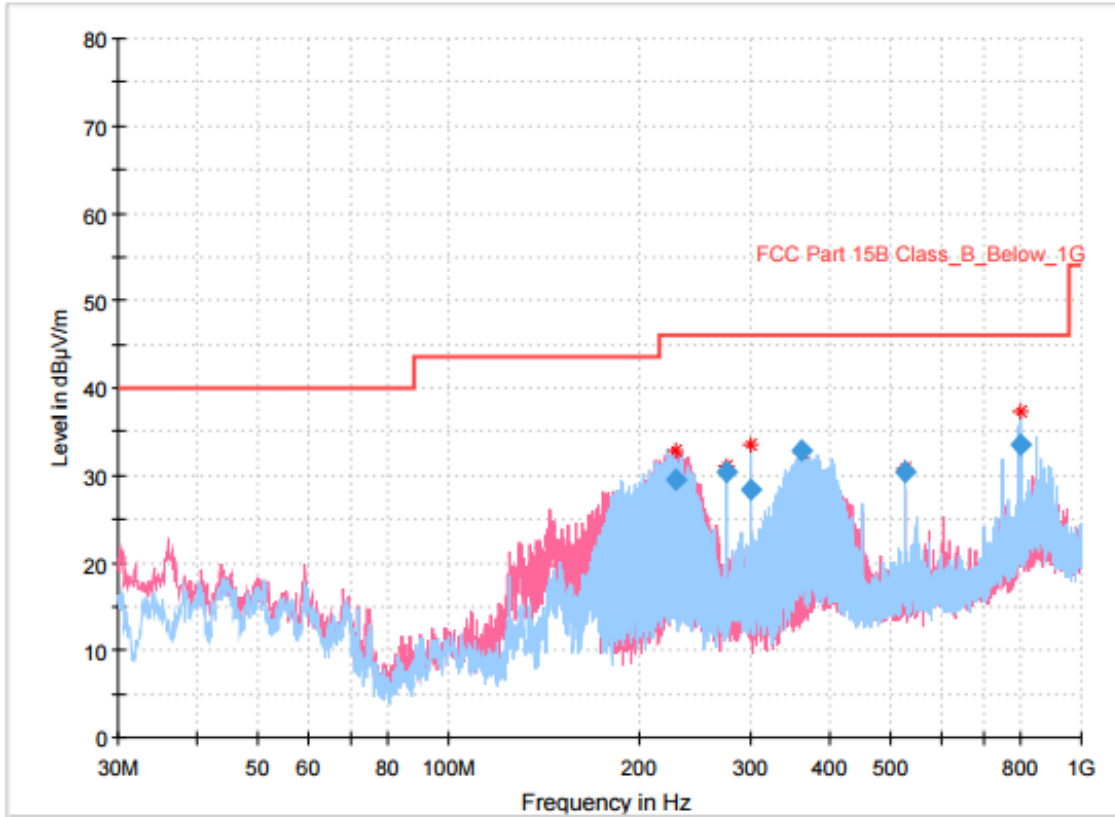
Mesh_Low CH



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
226.425000	32.40	46.00	13.60	1000.0	120.000	200.1	V	320.0	-20.7
275.022000	31.04	46.00	14.96	1000.0	120.000	100.0	H	311.0	-18.9
299.951000	28.60	46.00	17.40	1000.0	120.000	100.0	H	322.0	-18.5
359.315000	32.95	46.00	13.05	1000.0	120.000	100.0	H	333.0	-16.6
524.991000	30.50	46.00	15.50	1000.0	120.000	100.0	H	179.0	-13.6
799.695000	34.13	46.00	11.87	1000.0	120.000	200.1	V	310.0	-8.8

Mesh_Mid CH



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
228.268000	29.41	46.00	16.59	1000.0	120.000	200.1	V	324.0	-20.8
275.022000	30.50	46.00	15.50	1000.0	120.000	100.1	H	301.0	-18.9
299.951000	28.37	46.00	17.63	1000.0	120.000	100.1	H	288.0	-18.5
361.158000	32.83	46.00	13.17	1000.0	120.000	100.1	H	336.0	-16.6
524.991000	30.40	46.00	15.60	1000.0	120.000	100.1	H	200.0	-13.6
799.695000	33.53	46.00	12.47	1000.0	120.000	100.1	H	348.0	-8.8

Mesh_High CH



9.4.2.3 Measurement Results for Above 1 GHz

9.4.2.3.1 Bluetooth LE

Frequency (MHz)	Reading (dB μ V)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Low CH							
4 804.00	46.80	Peak	V	-1.00	45.80	73.98	28.18
	33.98	Average	V		32.98	53.98	21.00
Mid CH							
4 880.00	51.50	Peak	V	-1.60	44.46	73.98	29.52
	39.25	Average	V		31.92	53.98	22.06
High CH							
4 960.00	53.47	Peak	V	-2.10	45.43	73.98	28.55
	41.27	Average	V		32.50	53.98	21.48

- ※ Ant. Pol. : Antenna Polarization
- ※ Corr. Factor. : Antenna Factor + Cable Loss - Amplifier Gain
- ※ Result = Reading + Corr. Factor
- ※ Margin = Limit - Result

9.4.2.3.2 Mesh

Frequency (MHz)	Reading (dB μ V)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Low CH							
4 820.00	60.01	Peak	H	-1.20	58.81	73.98	15.17
	28.54	Average	H		27.34	53.98	26.64
Mid CH							
4 890.00	63.40	Peak	H	-1.50	61.90	73.98	12.08
	28.21	Average	H		26.71	53.98	27.27
High CH							
4 950.00	62.67	Peak	H	-2.10	60.57	73.98	13.41
	28.40	Average	H		26.30	53.98	27.68

- ※ Ant. Pol. : Antenna Polarization
- ※ Corr. Factor. : Antenna Factor + Cable Loss - Amplifier Gain
- ※ Result = Reading + Corr. Factor
- ※ Margin = Limit - Result



10. Power Line Conducted Emission

10.1 Operating environment

Temperature : 22 °C

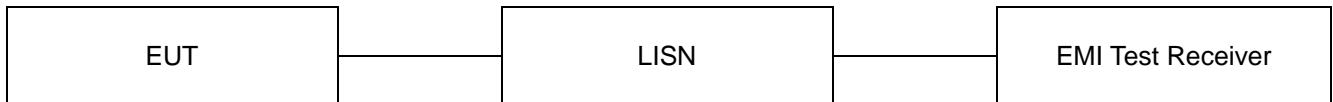
Relative humidity : 44 %

10.2 Measurement method

Standard : §15.207 / RSS-GEN 8.8

10.3 Test setup

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50Ω / $50 \mu\text{H}$ + 5Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

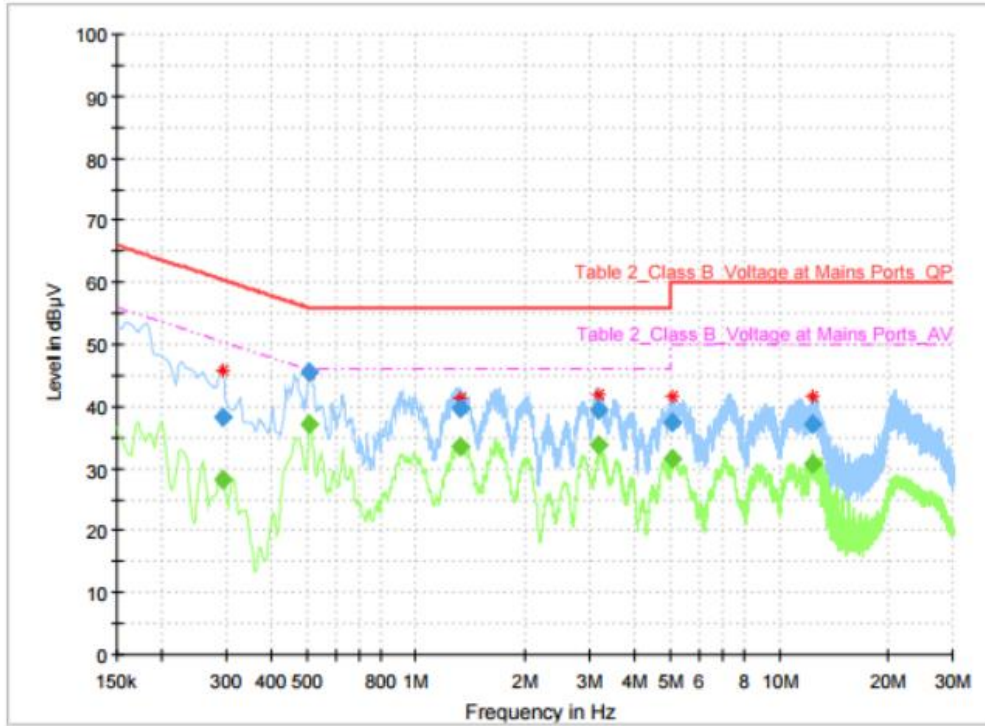




10.4 Test data

Test date : 21. Oct. 2019
 Operating mode : Transmit mode
 Test Result : Pass

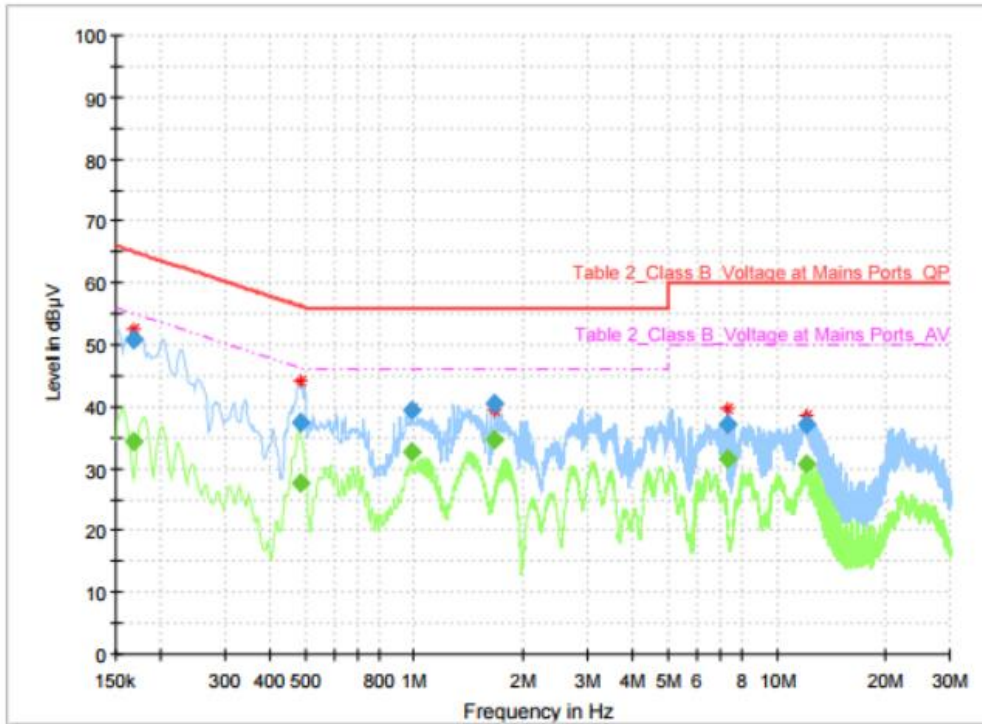
10.4.1 Measured Results & Graph



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.294000	---	28.19	50.41	22.22	1000.0	9.000	L1	ON	9.7
0.294000	38.27	---	60.41	22.14	1000.0	9.000	L1	ON	9.7
0.510000	---	37.29	46.00	8.71	1000.0	9.000	L1	ON	9.9
0.510000	45.43	---	56.00	10.57	1000.0	9.000	L1	ON	9.9
1.324500	---	33.53	46.00	12.47	1000.0	9.000	L1	ON	9.8
1.324500	39.78	---	56.00	16.22	1000.0	9.000	L1	ON	9.8
3.192000	---	33.84	46.00	12.16	1000.0	9.000	L1	ON	9.8
3.192000	39.46	---	56.00	16.54	1000.0	9.000	L1	ON	9.8
5.075250	---	31.43	50.00	18.57	1000.0	9.000	L1	ON	9.9
5.075250	37.39	---	60.00	22.61	1000.0	9.000	L1	ON	9.9
12.378750	---	30.79	50.00	19.21	1000.0	9.000	L1	ON	10.0
12.378750	37.09	---	60.00	22.91	1000.0	9.000	L1	ON	10.0

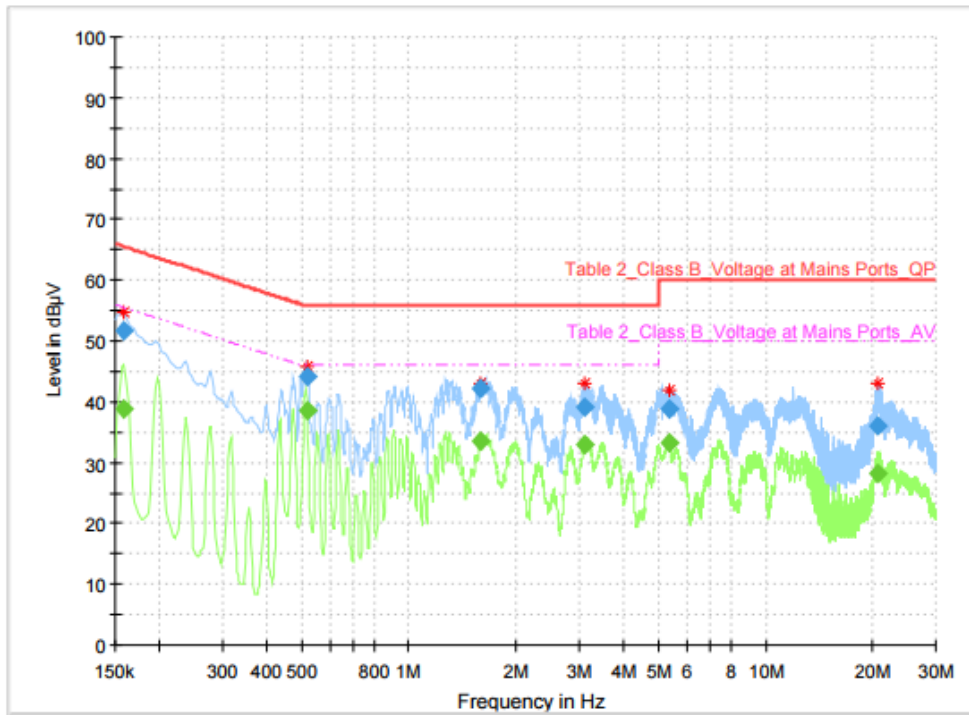
Bluetooth LE_Live line



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.168000	---	34.27	55.06	20.79	1000.0	9.000	N	ON	10.0
0.168000	50.87	---	65.06	14.19	1000.0	9.000	N	ON	10.0
0.483000	---	27.76	46.29	18.52	1000.0	9.000	N	ON	9.9
0.483000	37.51	---	56.29	18.78	1000.0	9.000	N	ON	9.9
0.982500	---	32.56	46.00	13.44	1000.0	9.000	N	ON	9.8
0.982500	39.35	---	56.00	16.65	1000.0	9.000	N	ON	9.8
1.664250	---	34.52	46.00	11.48	1000.0	9.000	N	ON	9.8
1.664250	40.45	---	56.00	15.55	1000.0	9.000	N	ON	9.8
7.336500	---	31.58	50.00	18.42	1000.0	9.000	N	ON	9.9
7.336500	37.17	---	60.00	22.83	1000.0	9.000	N	ON	9.9
12.079500	---	30.72	50.00	19.28	1000.0	9.000	N	ON	10.1
12.079500	37.04	---	60.00	22.96	1000.0	9.000	N	ON	10.1

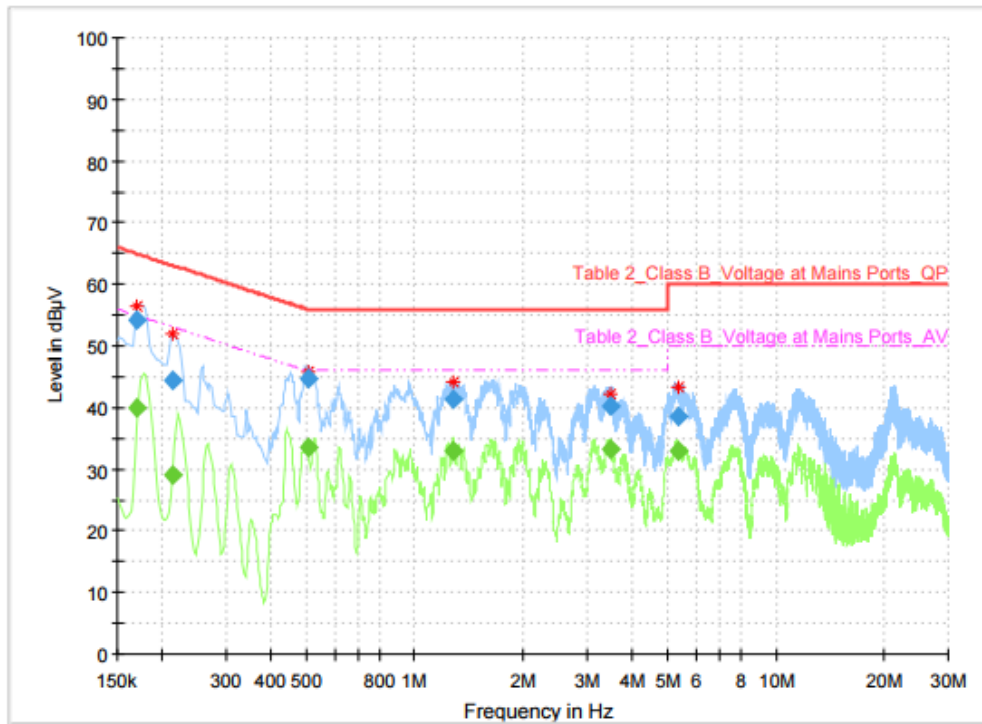
Bluetooth LE_Neutral line



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.159000	---	38.91	55.52	16.61	1000.0	9.000	L1	ON	9.9
0.159000	51.68	---	65.52	13.84	1000.0	9.000	L1	ON	9.9
0.516750	---	38.43	46.00	7.57	1000.0	9.000	L1	ON	9.9
0.516750	44.23	---	56.00	11.77	1000.0	9.000	L1	ON	9.9
1.592250	---	33.38	46.00	12.62	1000.0	9.000	L1	ON	9.7
1.592250	42.08	---	56.00	13.92	1000.0	9.000	L1	ON	9.7
3.106500	---	32.88	46.00	13.12	1000.0	9.000	L1	ON	9.8
3.106500	39.24	---	56.00	16.76	1000.0	9.000	L1	ON	9.8
5.379000	---	33.16	50.00	16.84	1000.0	9.000	L1	ON	9.9
5.379000	38.74	---	60.00	21.26	1000.0	9.000	L1	ON	9.9
20.699250	---	28.22	50.00	21.78	1000.0	9.000	L1	ON	10.1
20.699250	36.15	---	60.00	23.85	1000.0	9.000	L1	ON	10.1

Mesh_Live line



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.170250	---	39.85	54.95	15.10	1000.0	9.000	N	ON	10.0
0.170250	54.32	---	64.95	10.63	1000.0	9.000	N	ON	10.0
0.213000	---	28.95	53.09	24.14	1000.0	9.000	N	ON	9.8
0.213000	44.45	---	63.09	18.64	1000.0	9.000	N	ON	9.8
0.505500	---	33.44	46.00	12.56	1000.0	9.000	N	ON	9.9
0.505500	44.79	---	56.00	11.21	1000.0	9.000	N	ON	9.9
1.270500	---	32.94	46.00	13.06	1000.0	9.000	N	ON	9.8
1.270500	41.25	---	56.00	14.75	1000.0	9.000	N	ON	9.8
3.500250	---	33.27	46.00	12.73	1000.0	9.000	N	ON	9.8
3.500250	40.26	---	56.00	15.74	1000.0	9.000	N	ON	9.8
5.376750	---	33.03	50.00	16.97	1000.0	9.000	N	ON	9.9
5.376750	38.66	---	60.00	21.34	1000.0	9.000	N	ON	9.9

Mesh_Neutral line

- END OF REPORT.