

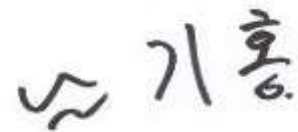
ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : OT-209-RWD-046
Reception No. : 2008003235
Applicant : Samsung Electronics Co Ltd
Address : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States
Manufacturer : Samsung Electronics Co Ltd
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Korea
Type of Equipment : Wi-Fi/BT Transceiver
FCC ID. : A3LWCA731M
Model Name : WCA731M
Multiple Model Name : WCA734M
Serial number : N/A
Total page of Report : 63 pages (including this page)
Date of Incoming : August 20, 2020
Date of issue : September 21, 2020

SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.247*
 This test report only contains the result of a single test of the sample supplied for the examination.
 It is not a generally valid assessment of the features of the respective products of the mass-production.





Tested by
 Ju Yun Park / Assistant Manager
 ONETECH Corp.

Reviewed by
 Tae-Ho, Kim / Senior Manager
 ONETECH Corp.

Approved by
 Ki-Hong, Nam / General Manager
 ONETECH Corp.

CONTENTS**PAGE**

1. VERIFICATION OF COMPLIANCE	6
2. TEST SUMMARY.....	7
2.1 TEST ITEMS AND RESULTS	7
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	7
2.3 RELATED SUBMITTAL(S) / GRANT(S)	7
2.4 PURPOSE OF THE TEST	7
2.5 TEST METHODOLOGY.....	7
2.6 TEST FACILITY.....	7
3. GENERAL INFORMATION.....	8
3.1 PRODUCT DESCRIPTION.....	8
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	13
4. EUT MODIFICATIONS.....	13
5. SYSTEM TEST CONFIGURATION	14
5.1 JUSTIFICATION.....	14
5.2 PERIPHERAL EQUIPMENT	14
5.3 MODE OF OPERATION DURING THE TEST	14
5.4 CONFIGURATION OF TEST SYSTEM.....	17
6. PRELIMINARY TEST	17
6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....	17
6.2 GENERAL RADIATED EMISSIONS TESTS	17
7. MINIMUM 6 DB BANDWIDTH.....	18
7.1 OPERATING ENVIRONMENT	18
7.2 TEST SET-UP	18
7.3 TEST DATE	18
7.4 TEST DATA FOR 1 MBPS	19
7.5 TEST DATA FOR 2 MBPS	21
8. MAXIMUM PEAK OUTPUT POWER.....	23
8.1 OPERATING ENVIRONMENT	23
8.2 TEST SET-UP	23
8.3 TEST DATE	23
8.4 TEST DATA FOR 1 MBPS	24
8.5 TEST DATA FOR 2 MBPS	26


9. 100 KHZ BANDWIDTH OUTSIDE THE FREQUENCY BAND.....	28
9.1 OPERATING ENVIRONMENT	28
9.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	28
9.3 TEST SET-UP FOR RADIATED MEASUREMENT.....	28
9.4 TEST DATE	28
9.5 TEST DATA FOR CONDUCTED EMISSION	29
9.5.1 TEST DATA FOR 1 MBPS	29
9.5.2 TEST DATA FOR 2 MBPS	34
9.6 TEST DATA FOR RADIATED EMISSION.....	39
<i>9.6.1 Radiated Emission which fall in the Restricted Band.....</i>	<i>39</i>
<i>9.6.2 Spurious & Harmonic Radiated Emission.....</i>	<i>41</i>
10. PEAK POWER SPECTRAL DENSITY	43
10.1 OPERATING ENVIRONMENT	43
10.2 TEST SET-UP	43
10.3 TEST DATE	43
10.4 TEST DATA FOR 1 MBPS	44
10.5 TEST DATA FOR 2 MBPS	46
11. RADIATED EMISSION TEST	48
11.1 OPERATING ENVIRONMENT	48
11.2 TEST SET-UP	48
11.3 TEST DATE	48
11.4 TEST DATA FOR 30 MHZ ~ 1000 MHZ	49
<i>11.4.1 Test data for Basic Model (WCA731M).....</i>	<i>49</i>
<i>11.4.2 Test data for Multiple Model (WCA734M).....</i>	<i>51</i>
11.5 TEST DATA FOR BELOW 30 MHZ	53
11.6 TEST DATA FOR ABOVE 1 GHZ	53
12. CONDUCTED EMISSION TEST.....	54
12.1 OPERATING ENVIRONMENT	54
12.2 TEST SET-UP	54
12.3 TEST DATE	54
12.4 TEST DATA FOR BASIC MODEL (WCA731M).....	55
<i>12.4.1 Test data for Bluetooth LE</i>	<i>55</i>
<i>12.4.2 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)</i>	<i>57</i>
12.5 TEST DATA FOR MULTIPLE MODEL (WCA734M).....	59
<i>12.5.1 Test data for Bluetooth LE</i>	<i>59</i>
<i>12.5.2 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)</i>	<i>61</i>

13. LIST OF TEST EQUIPMENT63

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-209-RWD-046	September 21, 2020	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Samsung Electronics Co Ltd
 Address : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States
 Contact Person : Youngjoong Noh / Principal Engineer
 Telephone No. : +82-31-277-0598
 FCC ID : A3LWCA731M
 Model Name : WCA731M
 Brand Name : 
 Serial Number : N/A
 Date : September 21, 2020

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Modular Transmitter, Wi-Fi/BT Transceiver
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	Minimum 6 dB Bandwidth	Met the Limit / PASS
15.247 (b) (3)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Peak Power Spectral Density	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

2.5 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.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The Samsung Electronics Co Ltd, Model WCA731M (referred to as the EUT in this report) is a Wi-Fi/BT Transceiver. The product specification described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	Wi-Fi/BT Transceiver	
Temperature Range	-20 °C ~ 50 °C	
OPERATING FREQUENCY	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	Bluetooth	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 472 MHz (802.11b/g/n(HT20))
		2 422 MHz ~ 2 462 MHz (802.11n(HT40))
	5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz (802.11a/n(HT20)/ac(VHT20))
		5 190 MHz ~ 5 230 MHz (802.11n(HT40)/ac(VHT40))
		5 210 MHz (802.11ac(VHT80))
	5 250 MHz ~ 5 350 MHz Band	5 260 MHz ~ 5 320 MHz (802.11a/n(HT20)/ac(VHT20))
		5 270 MHz ~ 5 310 MHz (802.11n(HT40)/ac(VHT40))
		5 290 MHz (802.11ac(VHT80))
	5 470 MHz ~ 5 725 MHz Band	5 500 MHz ~ 5 700 MHz (802.11a/n(HT20)/ac(VHT20))
		5 510 MHz ~ 5 670 MHz (802.11n(HT40)/ac(VHT40))
		5 530 MHz (802.11ac(VHT80))
	5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz (802.11a/n(HT20)/ac(VHT20))
		5 755 MHz ~ 5 795 MHz (802.11n(HT40)/ac(VHT40))
5 775 MHz (802.11ac(VHT80))		
MODULATION TYPE	Bluetooth LE	GFSK for 1 Mbps / 2 Mbps
	Bluetooth	GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps, 8-DPSK for 3Mbps
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK)
		802.11g/n(HT20)/n(HT40): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
WLAN 5 GHz	802.11a/n(HT20)/n(HT40)/ac(VHT80): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	

RF OUTPUT POWER	Bluetooth LE	1 Mbps	11.06 dBm
		2 Mbps	11.07 dBm
	Bluetooth	1 Mbps	11.07 dBm
		2 Mbps	10.74 dBm
		3 Mbps	10.80 dBm
	WLAN 2.4 GHz	Antenna 0	18.09 dBm(802.11b)
			14.56 dBm(802.11g)
			14.34 dBm(802.11n_HT20)
			12.40 dBm(802.11n_HT40)
		Antenna 1	20.03 dBm(802.11b)
			14.26 dBm(802.11g)
Multiple Antenna	14.14 dBm(802.11n_HT20)		
	12.20 dBm(802.11n_HT40)		
	17.42 dBm(802.11g)		
		17.25 dBm(802.11n_HT20)	
		15.31 dBm(802.11n_HT40)	

RF OUTPUT POWER	5 150 MHz ~ 5 250 MHz Band	Antenna 0	15.50 dBm(802.11a) 13.81 dBm(802.11n_HT20) 13.85 dBm(802.11n_HT40) 13.95 dBm(802.11ac_VHT80)
		Antenna 1	12.85 dBm(802.11a) 12.91 dBm(802.11n_HT20) 12.24 dBm(802.11n_HT40) 11.15 dBm(802.11ac_VHT80)
		Multiple Antenna	17.38 dBm(802.11a) 16.18 dBm(802.11n_HT20) 16.04 dBm(802.11n_HT40) 15.78 dBm(802.11ac_VHT80)
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	14.95 dBm(802.11a) 12.94 dBm(802.11n_HT20) 13.25 dBm(802.11n_HT40) 12.46 dBm(802.11ac_VHT80)
		Antenna 1	12.96 dBm(802.11a) 12.68 dBm(802.11n_HT20) 11.37 dBm(802.11n_HT40) 10.71 dBm(802.11ac_VHT80)
		Multiple Antenna	17.08 dBm(802.11a) 15.71 dBm(802.11n_HT20) 15.42 dBm(802.11n_HT40) 14.68 dBm(802.11ac_VHT80)

RF OUTPUT POWER	5 470 MHz ~ 5 725 MHz Band	Antenna 0	14.54 dBm(802.11a) 11.51 dBm(802.11n_HT20) 12.40 dBm(802.11n_HT40) 10.77 dBm(802.11ac_VHT80)
		Antenna 0_Straddle	12.82 dBm(802.11a) 12.95 dBm(802.11n_HT20) 11.61 dBm(802.11n_HT40) 11.90 dBm(802.11ac_VHT80)
		Antenna 1	12.72 dBm(802.11a) 10.85 dBm(802.11n_HT20) 11.73 dBm(802.11n_HT40) 8.73 dBm(802.11ac_VHT80)
		Antenna 1_Straddle	14.04 dBm(802.11a) 14.11 dBm(802.11n_HT20) 13.53 dBm(802.11n_HT40) 12.55 dBm(802.11ac_VHT80)
		Multiple Antenna	16.65 dBm(802.11a) 14.06 dBm(802.11n_HT20) 15.09 dBm(802.11n_HT40) 12.88 dBm(802.11ac_VHT80)
		Multiple Antenna _Straddle	16.48 dBm(802.11a) 16.58 dBm(802.11n_HT20) 15.69 dBm(802.11n_HT40) 15.25 dBm(802.11ac_VHT80)

RF OUTPUT POWER	5 725 MHz ~ 5 850 MHz Band	Antenna 0	13.89 dBm(802.11a) 13.84 dBm(802.11n_HT20) 12.19 dBm(802.11n_HT40) 11.41 dBm(802.11ac_VHT80)
		Antenna 0_Straddle	5.28 dBm(802.11a) 5.39 dBm(802.11n_HT20) -0.48 dBm(802.11n_HT40) -2.93 dBm(802.11ac_VHT80)
		Antenna 1	13.35 dBm(802.11a) 14.23 dBm(802.11n_HT20) 11.53 dBm(802.11n_HT40) 10.94 dBm(802.11ac_VHT80)
		Antenna 1_Straddle	5.61 dBm(802.11a) 6.29 dBm(802.11n_HT20) 1.25 dBm(802.11n_HT40) -1.99 dBm(802.11ac_VHT80)
		Multiple Antenna	16.75 dBm(802.11a) 16.87 dBm(802.11n_HT20) 14.76 dBm(802.11n_HT40) 14.19 dBm(802.11ac_VHT80)
		Multiple Antenna _Straddle	8.46 dBm(802.11a) 8.87 dBm(802.11n_HT20) 3.48 dBm(802.11n_HT40) 0.58 dBm(802.11ac_VHT80)

ANTENNA TYPE	Chip Antenna			
ANTENNA GAIN	Bluetooth LE	-4.00 dBi		
	Bluetooth	-4.00 dBi		
	WLAN 2.4 GHz	Antenna 0	-1.54 dBi	
		Antenna 1	1.72 dBi	
		Multiple Antenna	3.40 dBi	
	5 150 MHz ~ 5 250 MHz Band	Antenna 0	-2.68 dBi	
		Antenna 1	-0.90 dBi	
		Multiple Antenna	1.31 dBi	
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	-2.54 dBi	
		Antenna 1	-0.55 dBi	
		Multiple Antenna	1.58 dBi	
	5 470 MHz ~ 5 725 MHz Band	Antenna 0	-0.70 dBi	
		Antenna 1	-0.29 dBi	
		Multiple Antenna	2.52 dBi	
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	-1.26 dBi	
		Antenna 1	-2.11 dBi	
		Multiple Antenna	1.35 dBi	
	List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	40 MHz		

3.2 Alternative type(s)/model(s); also covered by this test report.

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
WCA731M	Basic Model	<input checked="" type="checkbox"/>
WCA734M	The difference from the basic model is the removal of mic part.	<input checked="" type="checkbox"/>

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	Samsung Electronics Co Ltd	WCA731M	N/A

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
WCA731M	Samsung Electronics Co Ltd	Wi-Fi/BT Transceiver (EUT)	
HP Probook	HP	Notebook PC	EUT
PPP009L-E	LIE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	AC Adapter	

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 2 402 MHz, 2 440 MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis, but the worst data was recorded in this report.

-. Frequency / Channel Operations

Channel	Frequency
0	2 402
19	2 440
39	2 480

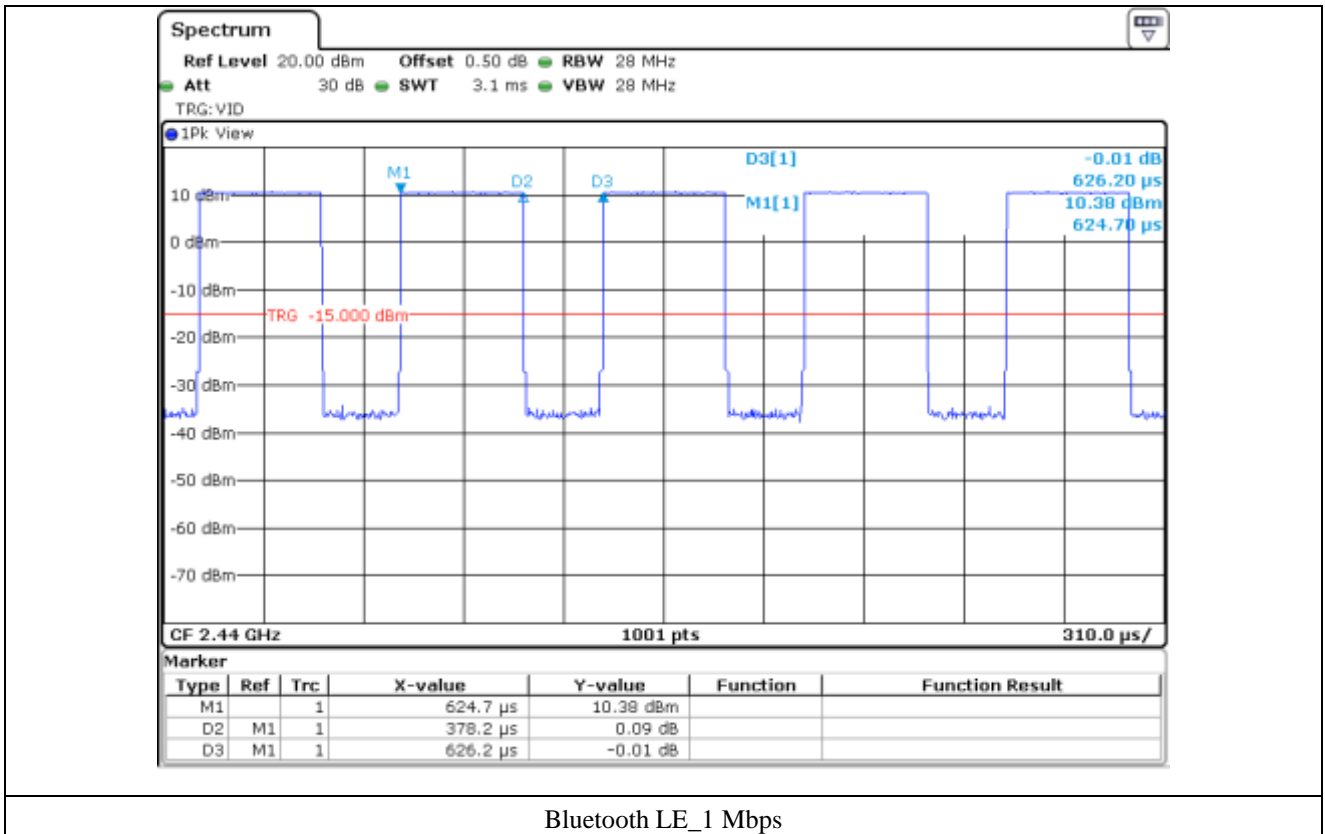
- Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth LE [1 Mbps]	0.378 2	0.248 0	60.40	2.19
Bluetooth LE [2 Mbps]	0.195 3	0.430 9	31.19	5.06

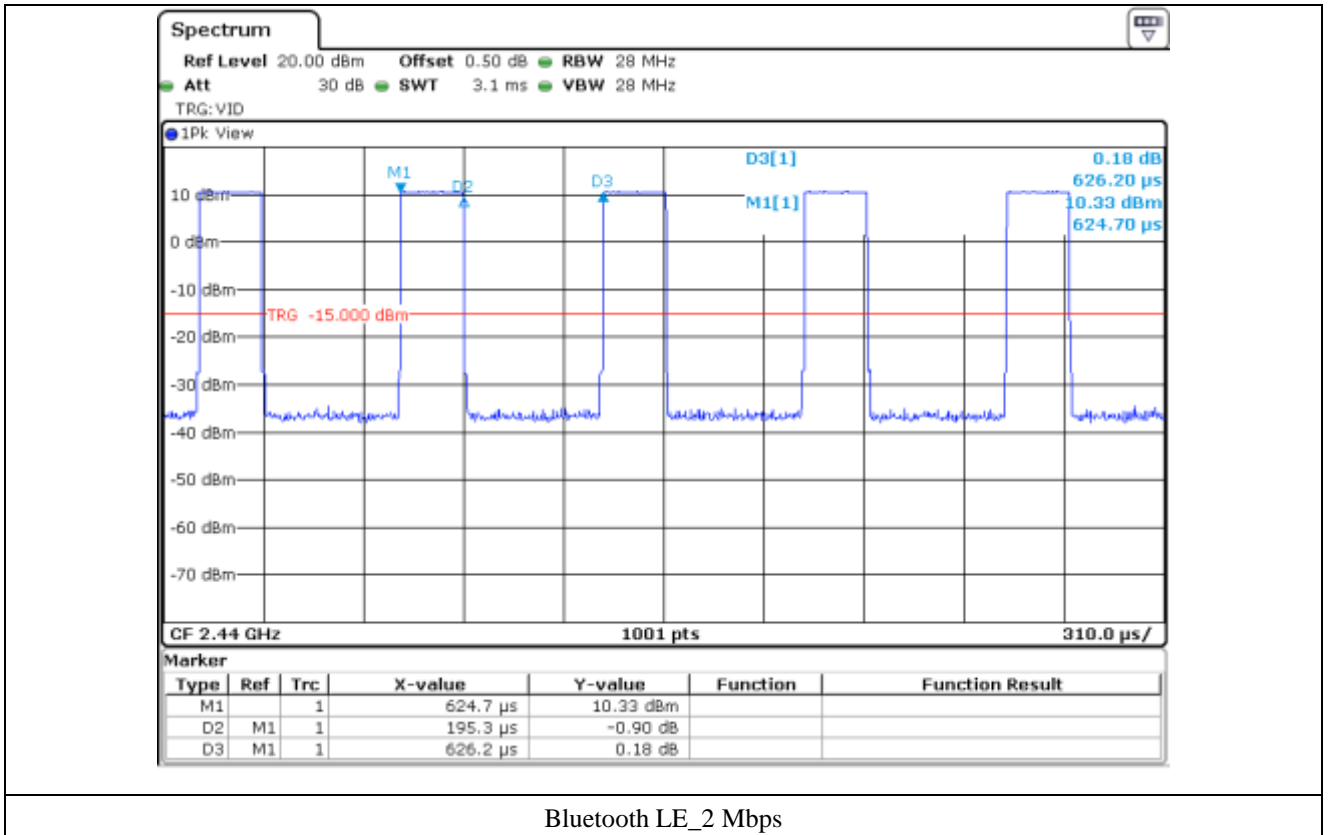
Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

Correction Factor : 10 * Log(1 / (Duty Cycle / 100))

- Test Plot



Bluetooth LE_1 Mbps



5.4 Configuration of Test System

Line Conducted Test: The EUT was connected to USB and the power of USB was connected to Notebook PC. 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.

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 meter 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.

5.5 Antenna Requirement

For intentional device, according to section 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.

Antenna Construction:

The antenna of the EUT is a Chip Antenna on the main board in the EUT, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

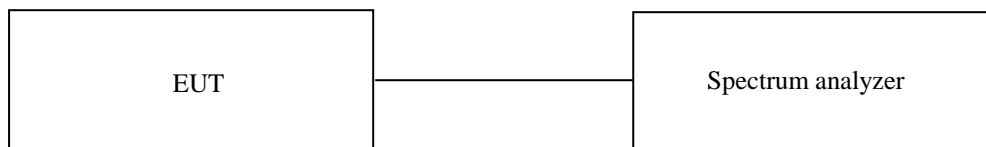
7. MINIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % R.H.

7.2 Test set-up

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.



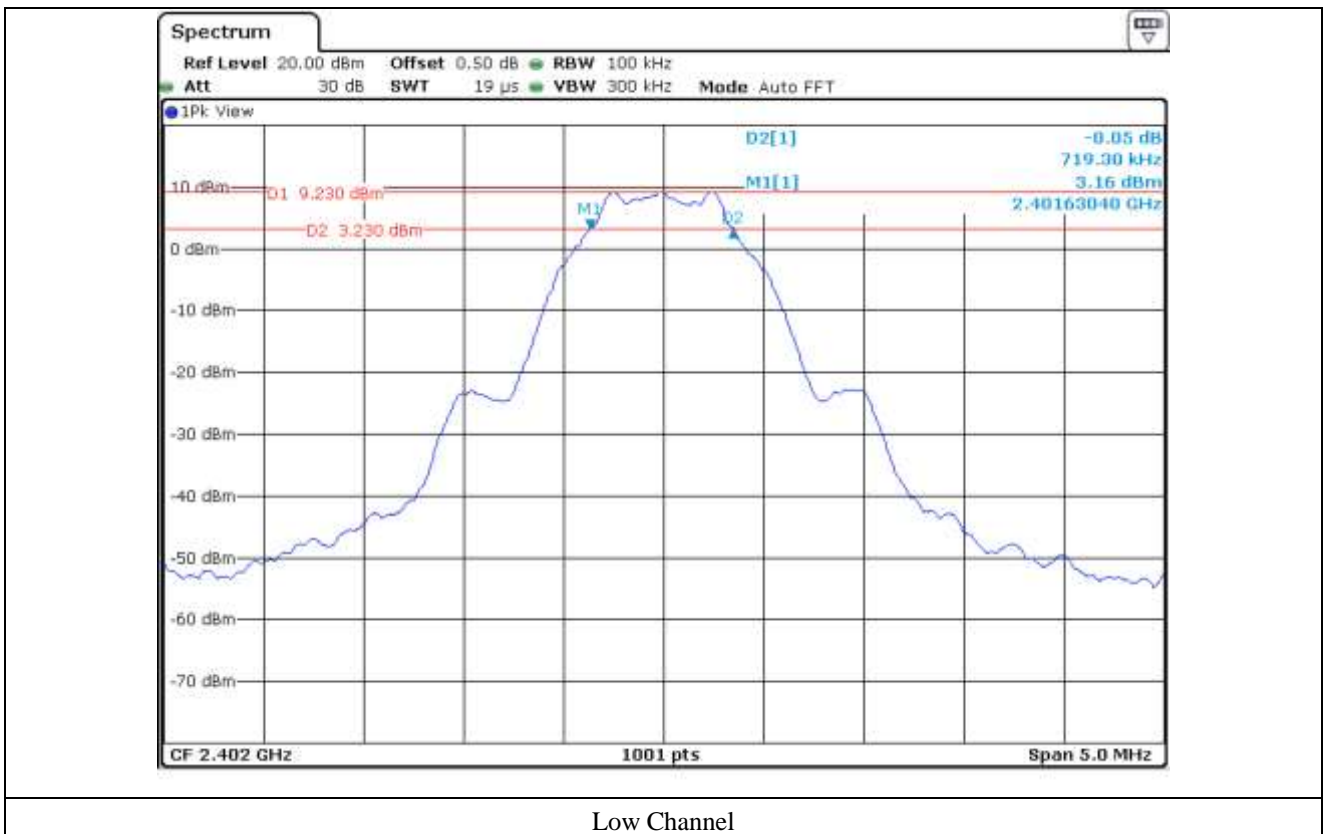
7.3 Test Date

August 21, 2020 ~ September 08, 2020

7.4 Test data for 1 Mbps

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	719.30	500.00	219.30
Middle	2 440.00	719.30	500.00	219.30
High	2 480.00	719.30	500.00	219.30

Remark. Margin = Measured Value - Limit





Middle Channel

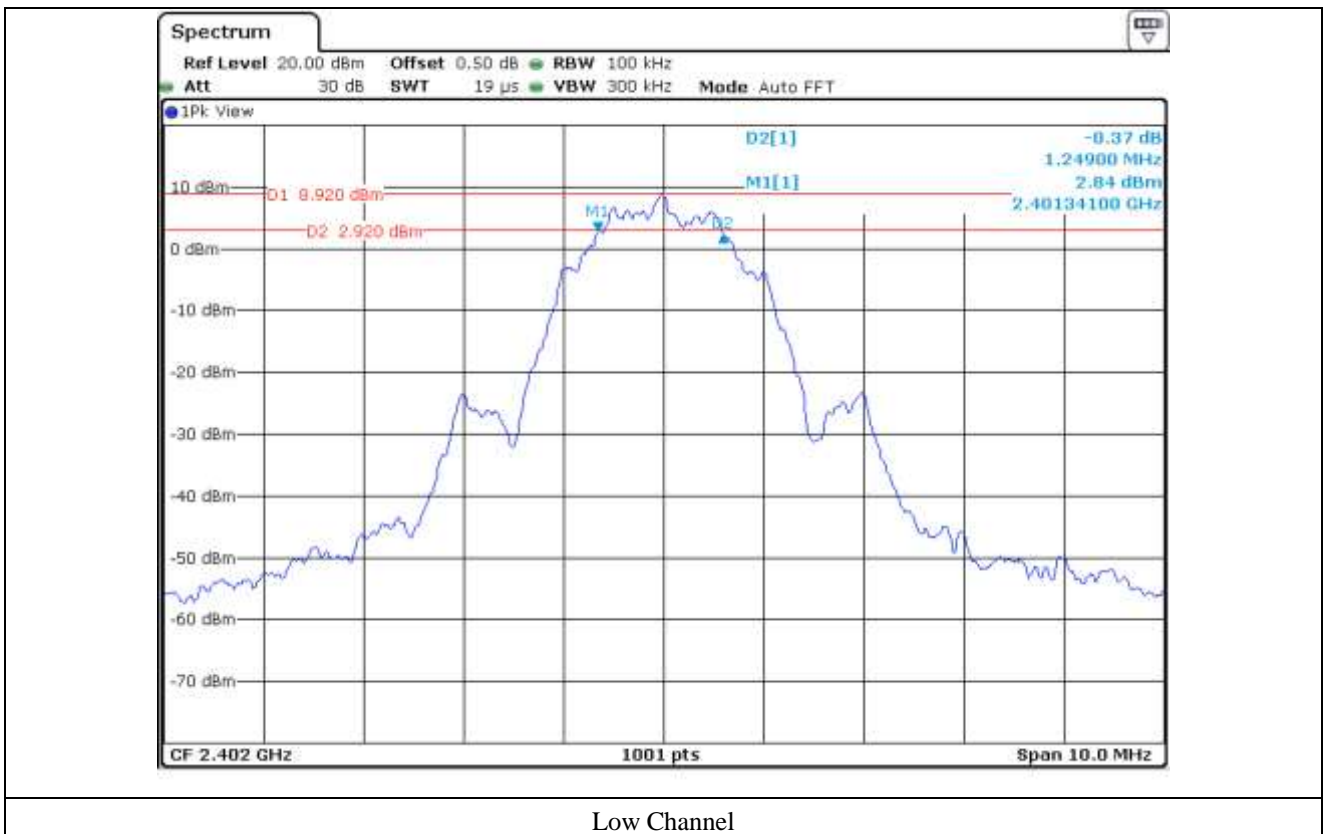


High Channel

7.5 Test data for 2 Mbps

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	1 249.00	500.00	749.00
Middle	2 440.00	1 249.00	500.00	749.00
High	2 480.00	1 259.00	500.00	759.00

Remark. Margin = Measured Value - Limit





Middle Channel



High Channel

8. MAXIMUM PEAK OUTPUT POWER

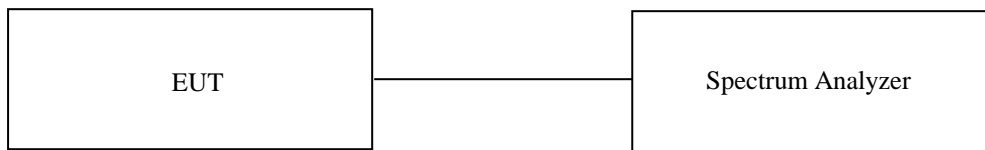
8.1 Operating environment

Temperature : 23 °C
 Relative humidity : 41 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to \geq DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.



8.3 Test Date

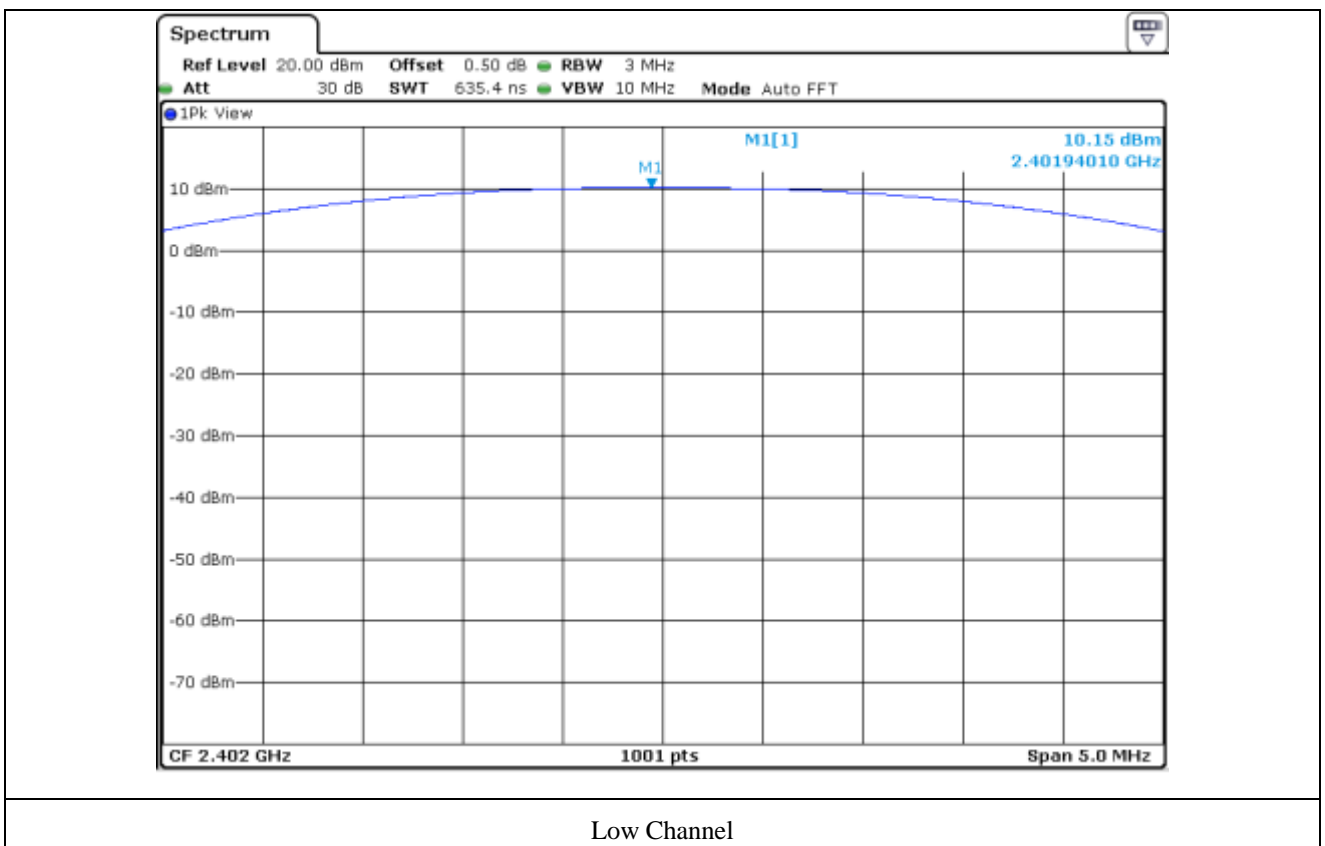
August 21, 2020 ~ September 08, 2020

8.4 Test data for 1 Mbps

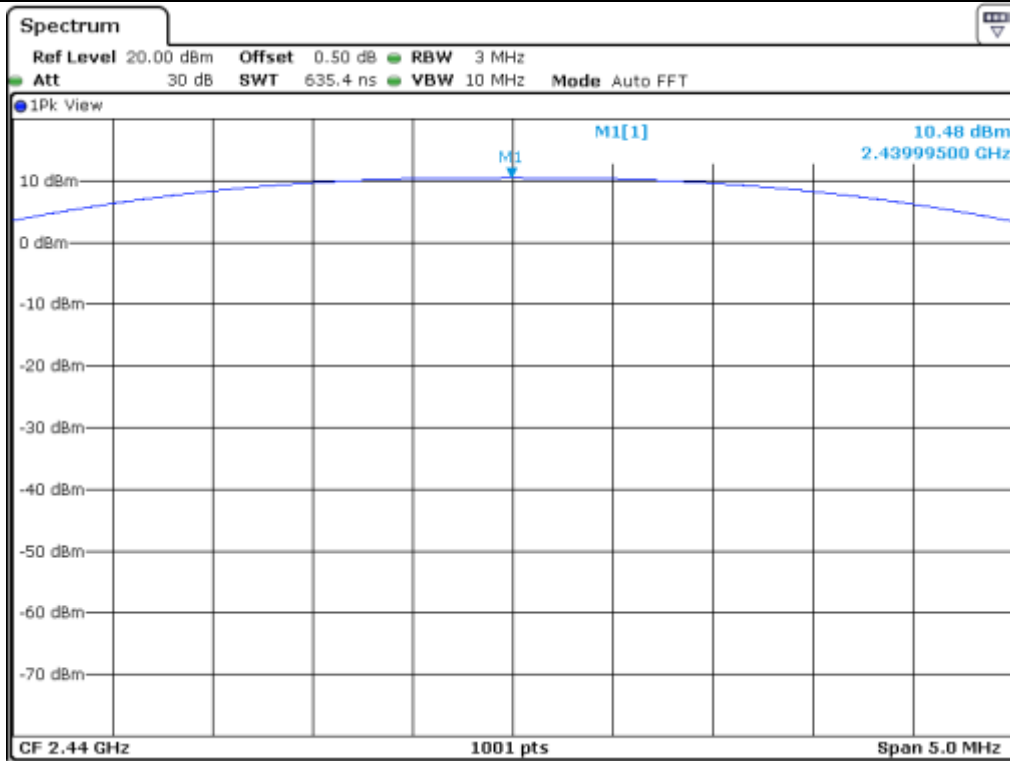
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	10.15	30.00	19.85
MIDDLE	2 440.00	10.48	30.00	19.52
HIGH	2 480.00	11.06	30.00	18.94

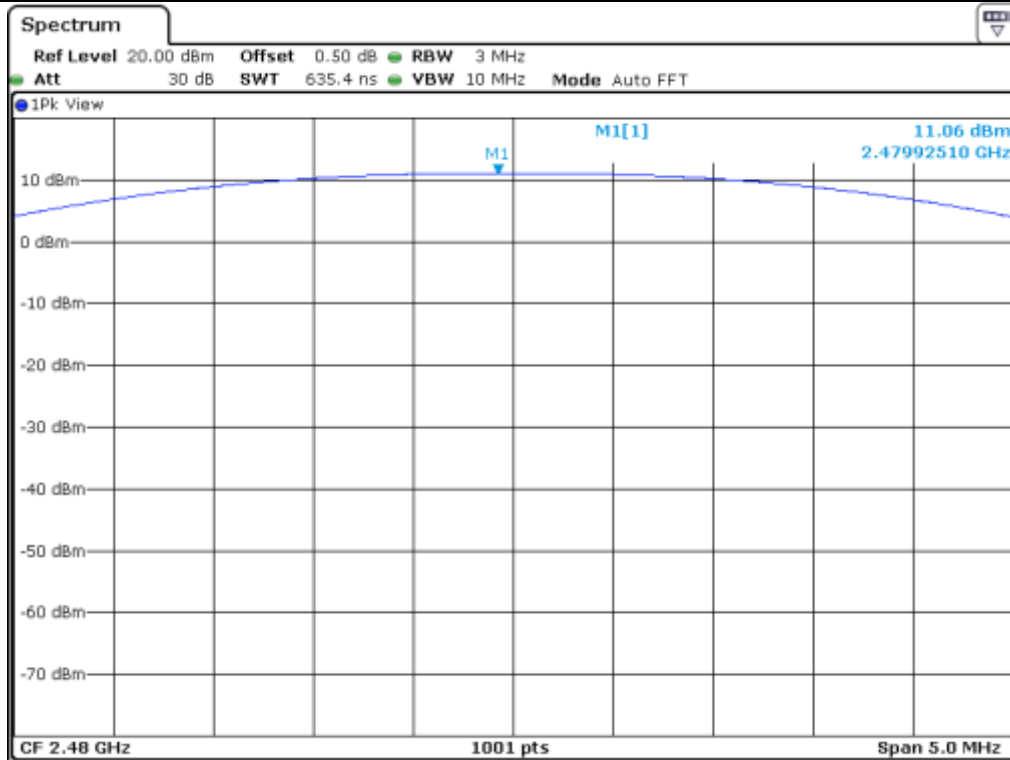
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Low Channel



Middle Channel



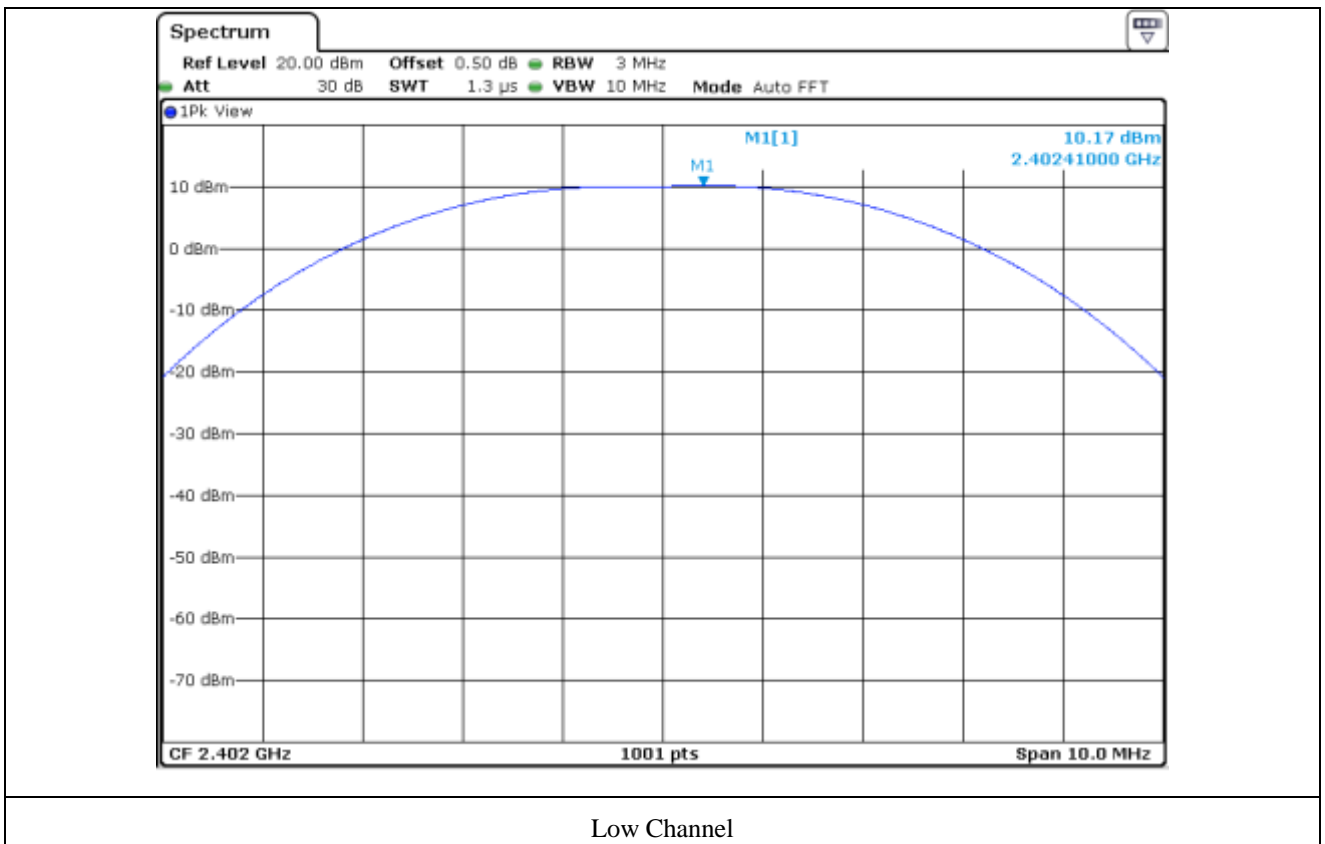
High Channel

8.5 Test data for 2 Mbps

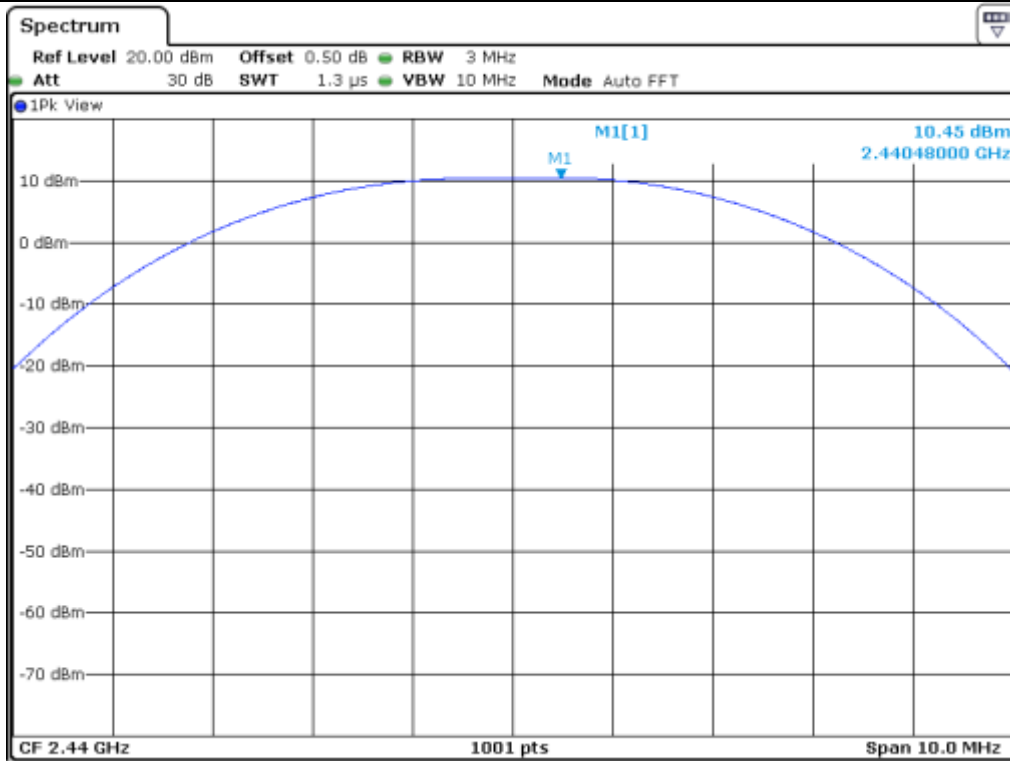
- Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	10.17	30.00	19.83
MIDDLE	2 440.00	10.45	30.00	19.55
HIGH	2 480.00	11.07	30.00	18.93

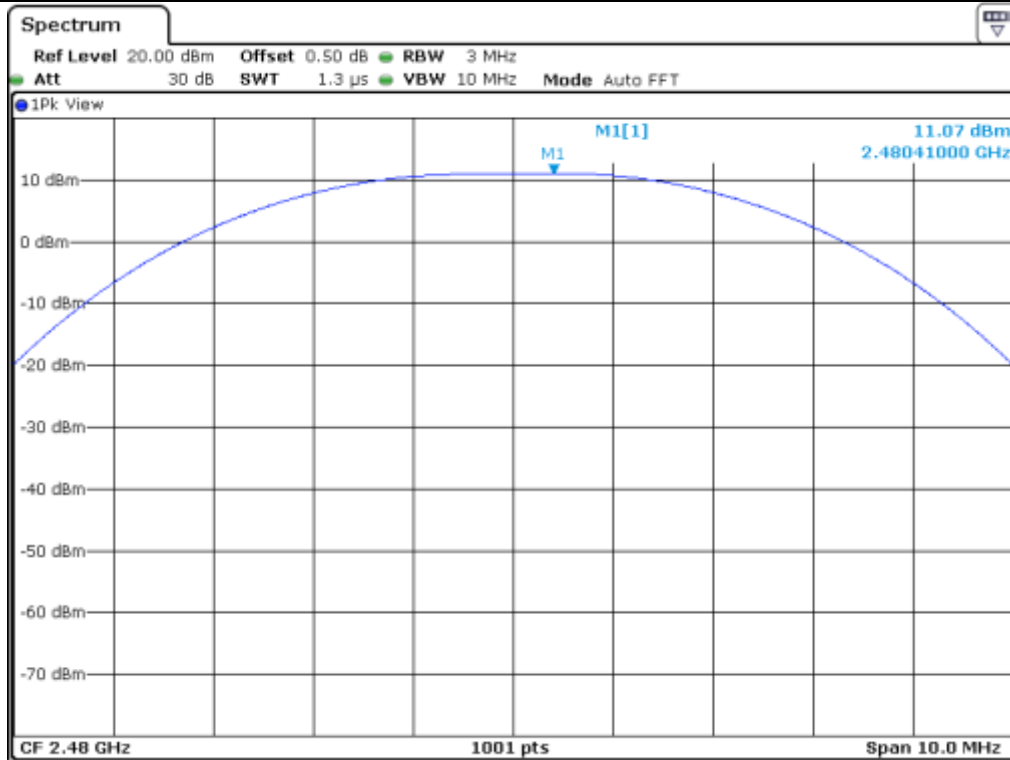
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Low Channel



Middle Channel



High Channel

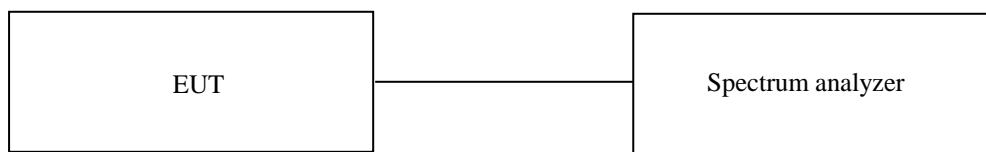
9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature : 23 °C
 Relative humidity : 41 % R.H.

9.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, the video bandwidth is set to 3 times the resolution bandwidth and peak detection was used.



9.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

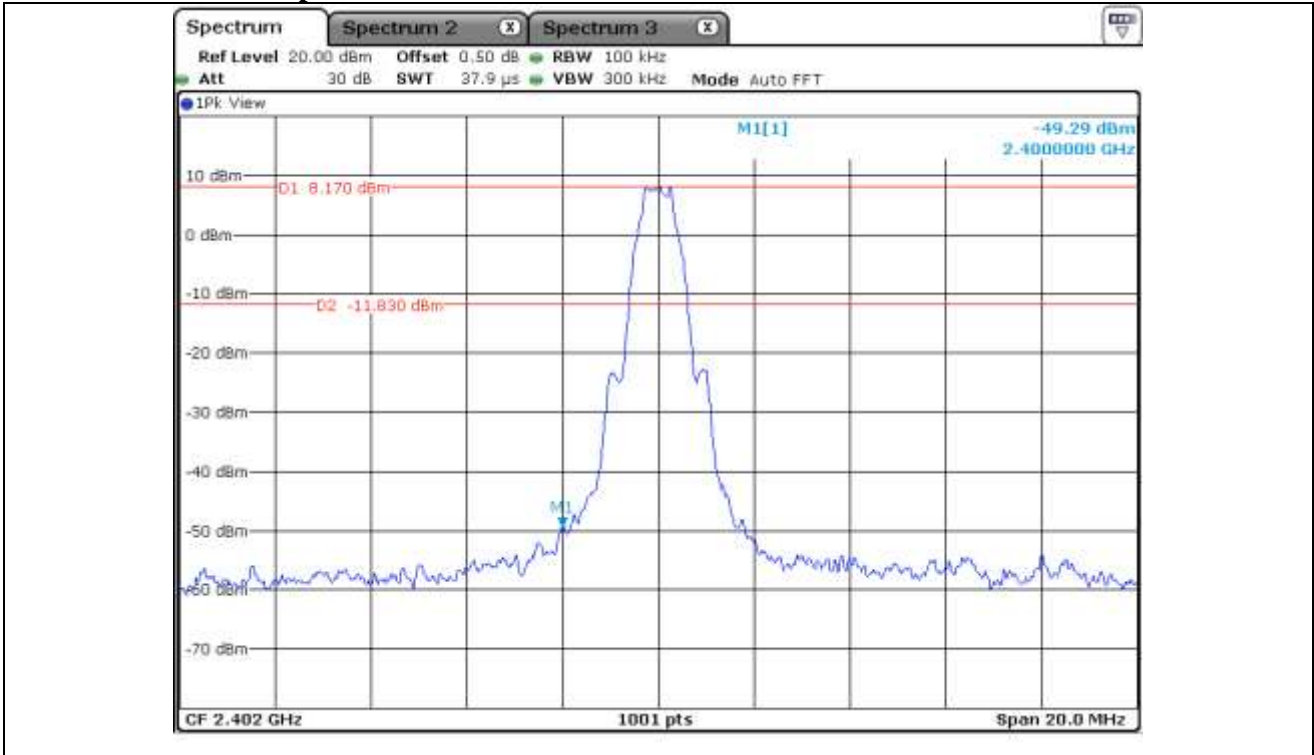
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

9.4 Test Date

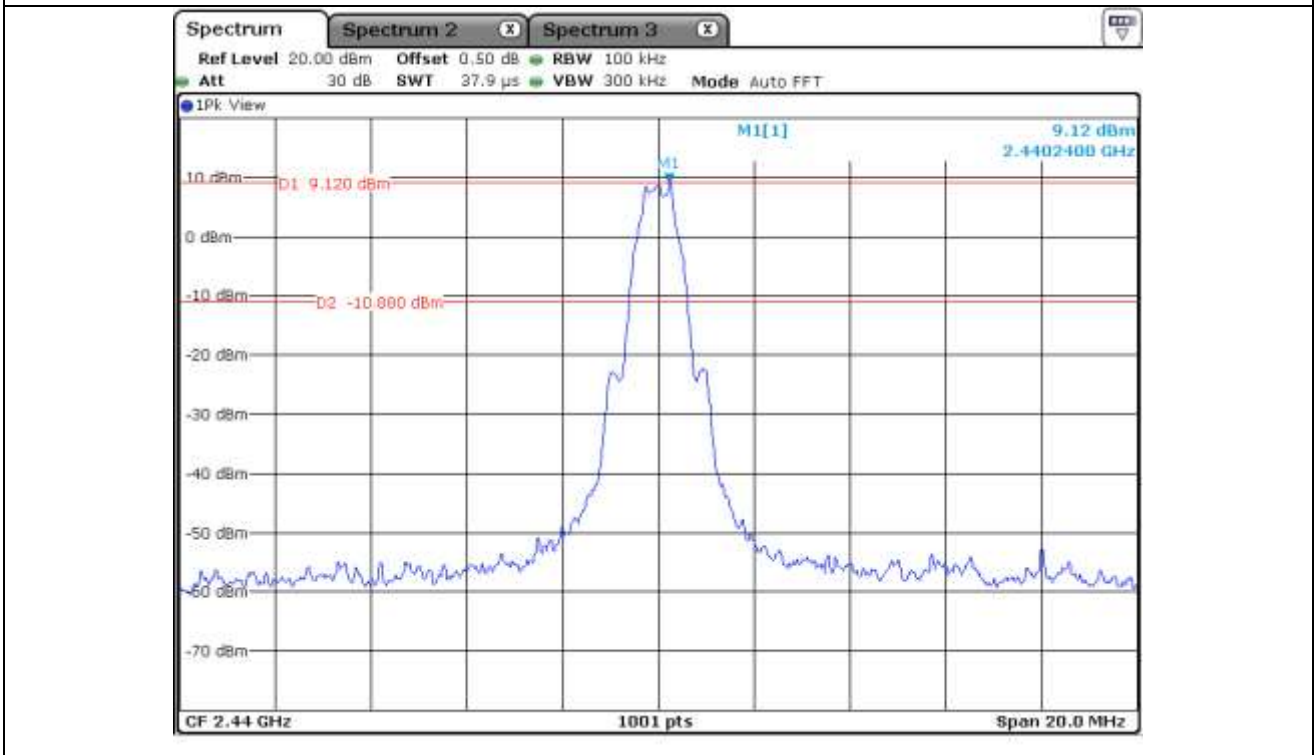
August 21, 2020 ~ September 08, 2020

9.5 Test data for conducted emission

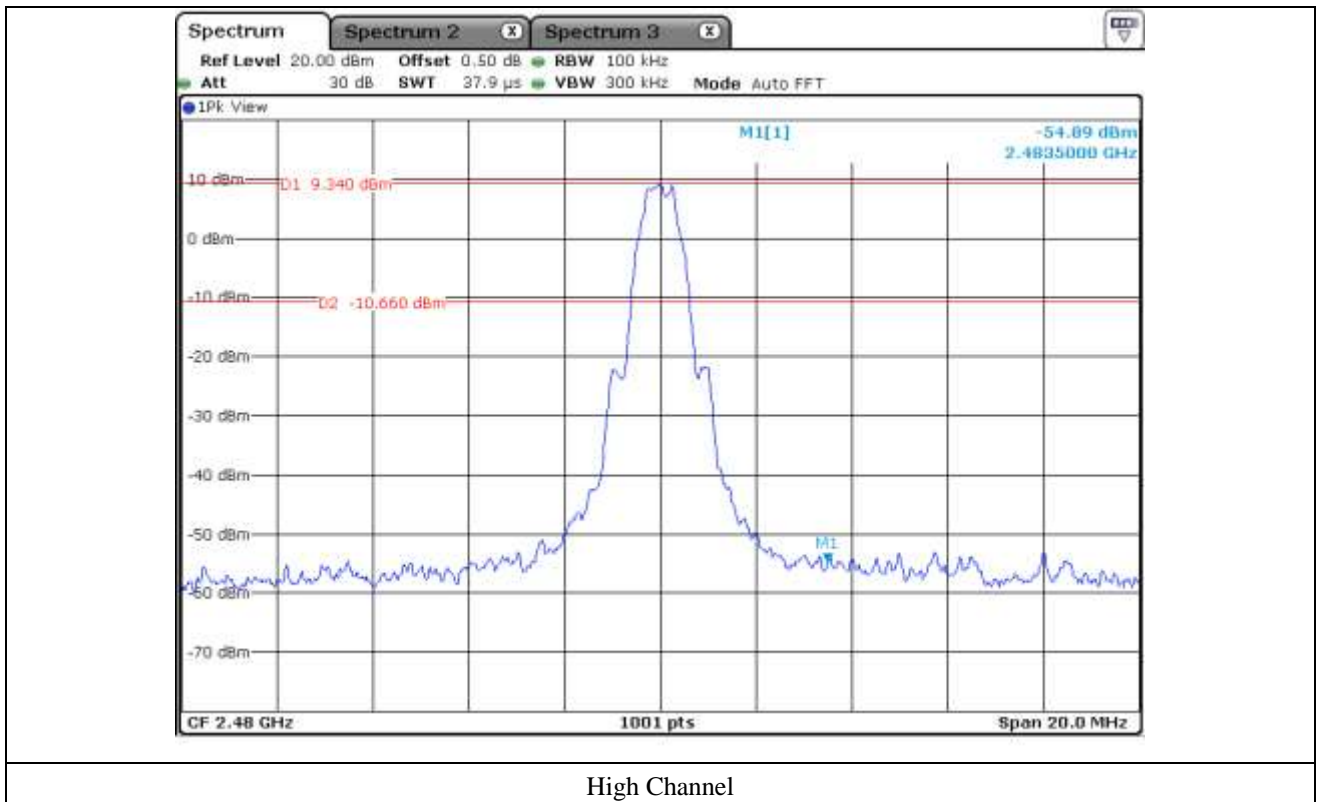
9.5.1 Test data for 1 Mbps



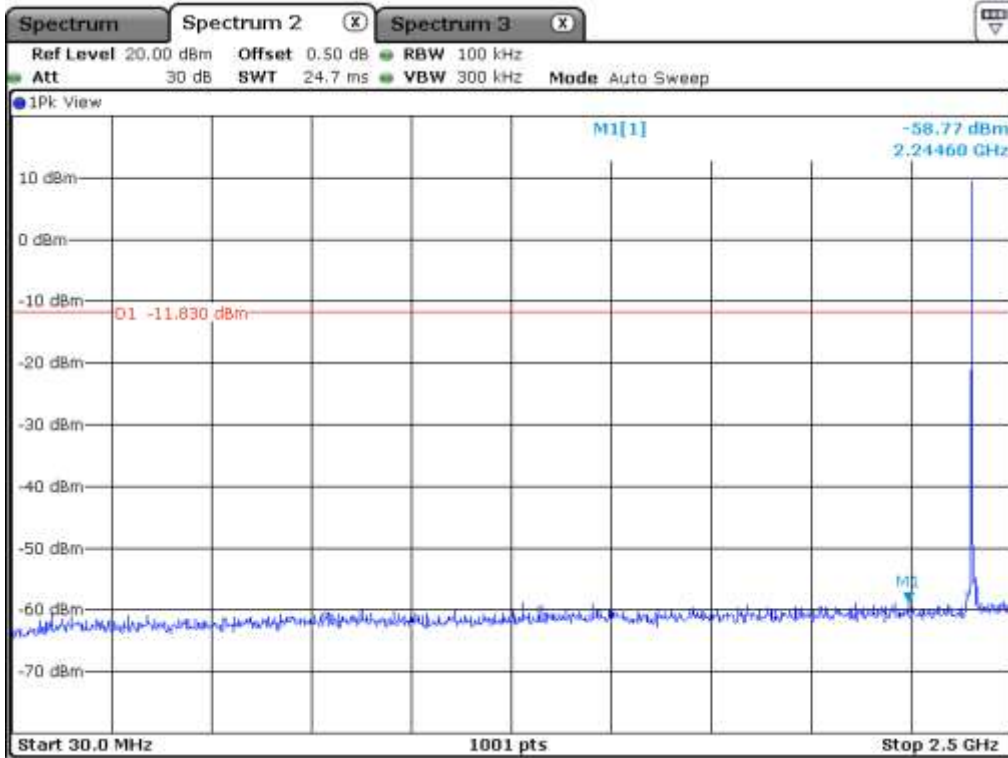
Low Channel



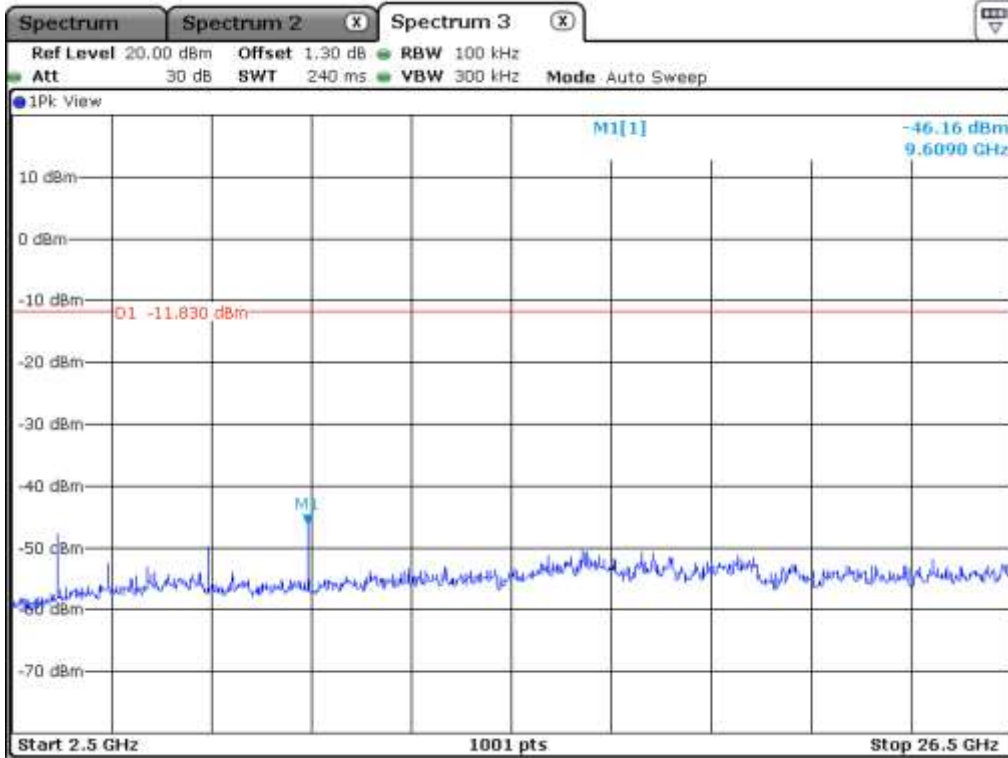
Middle Channel



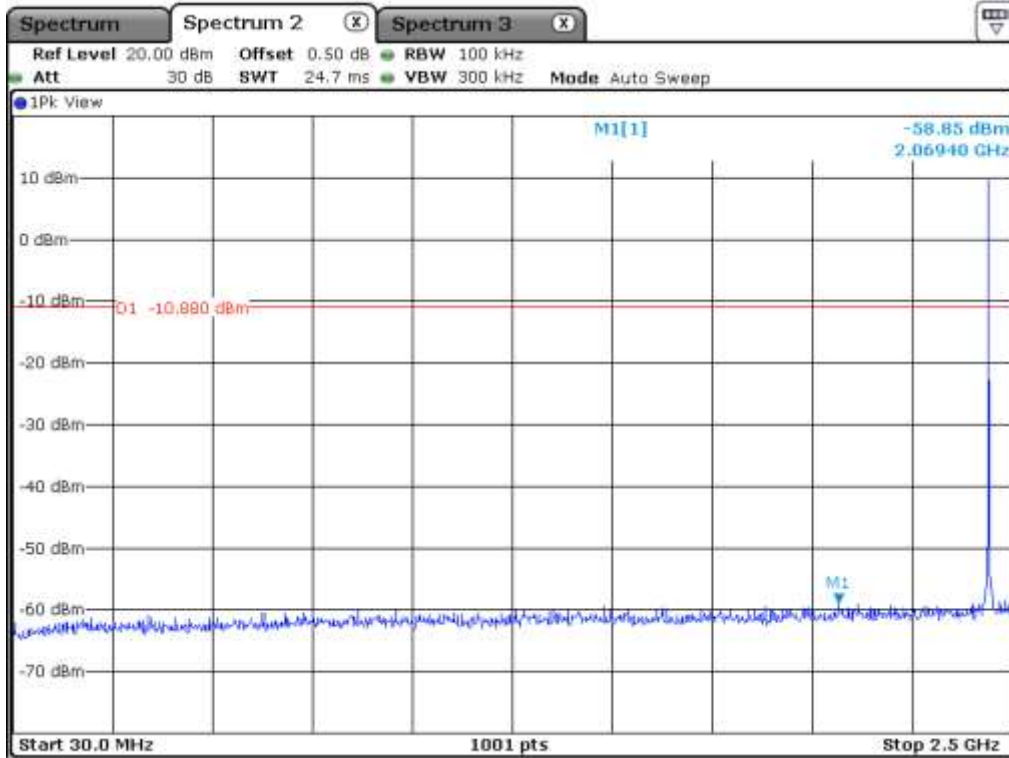
High Channel



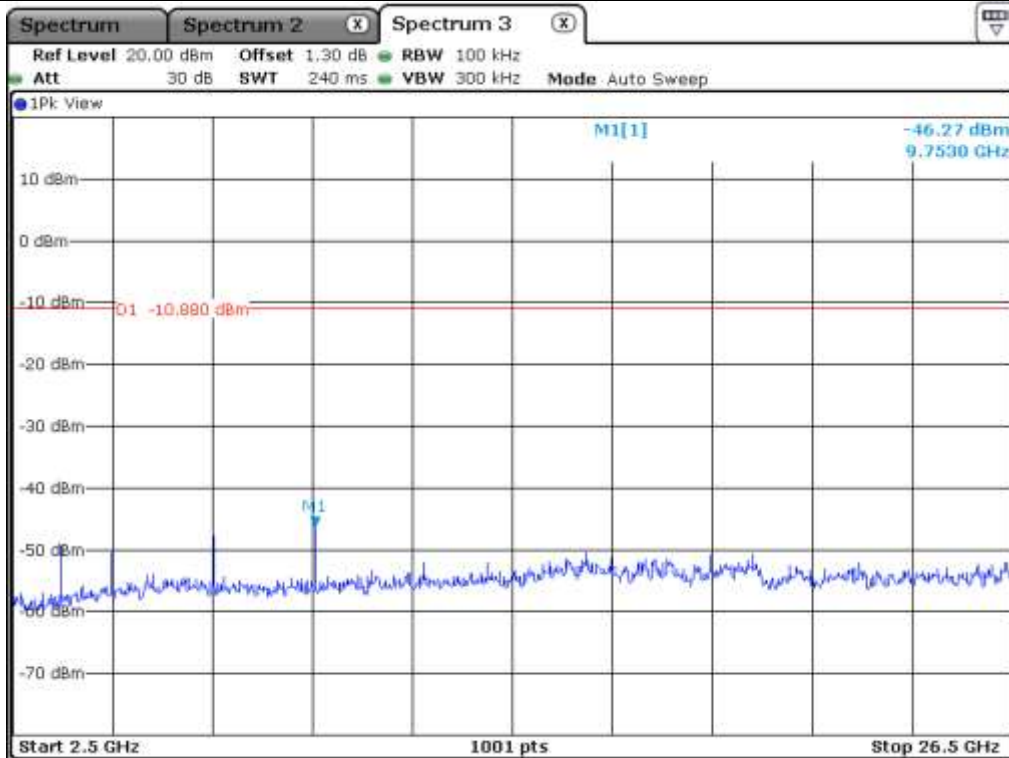
Low Channel



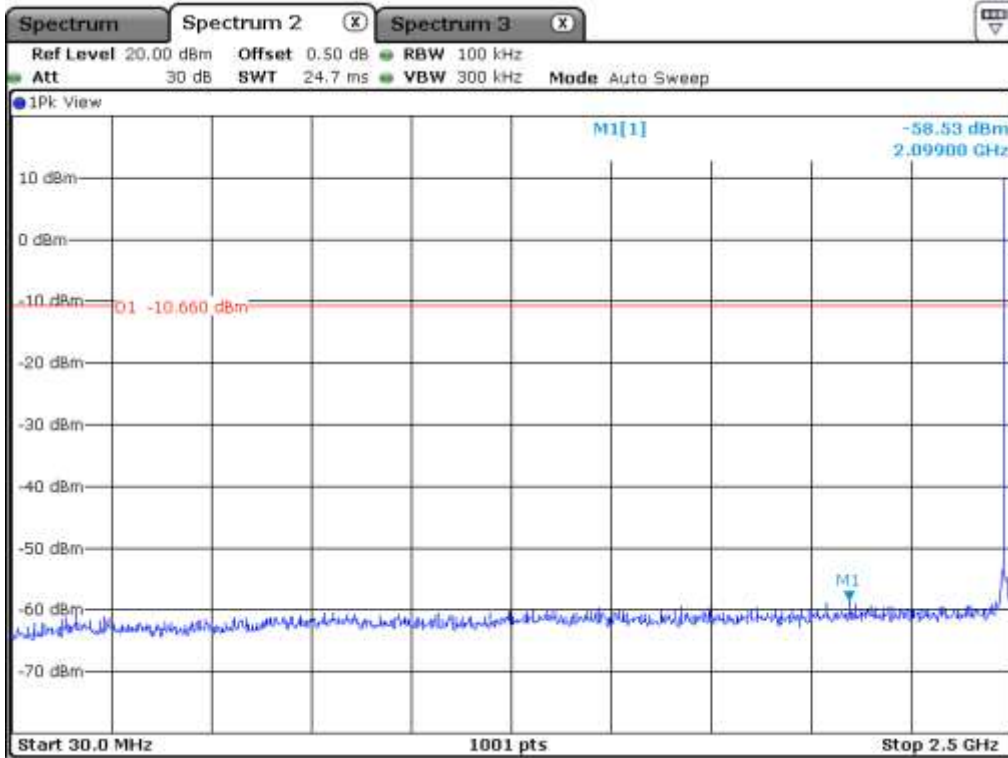
Low Channel



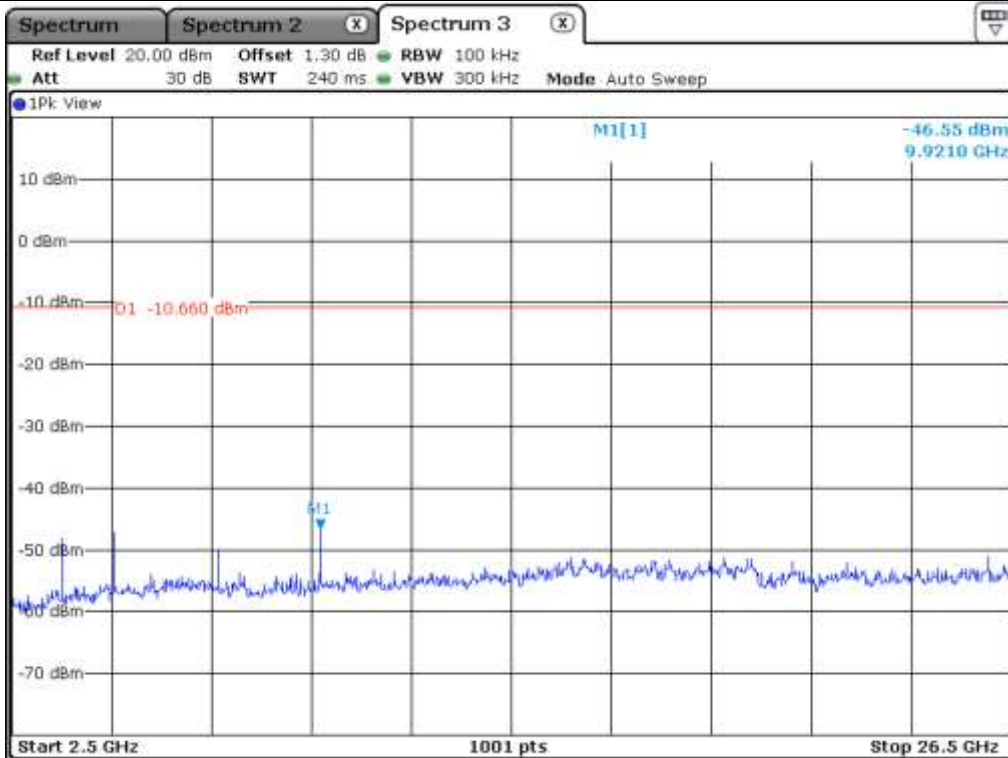
Middle Channel



Middle Channel

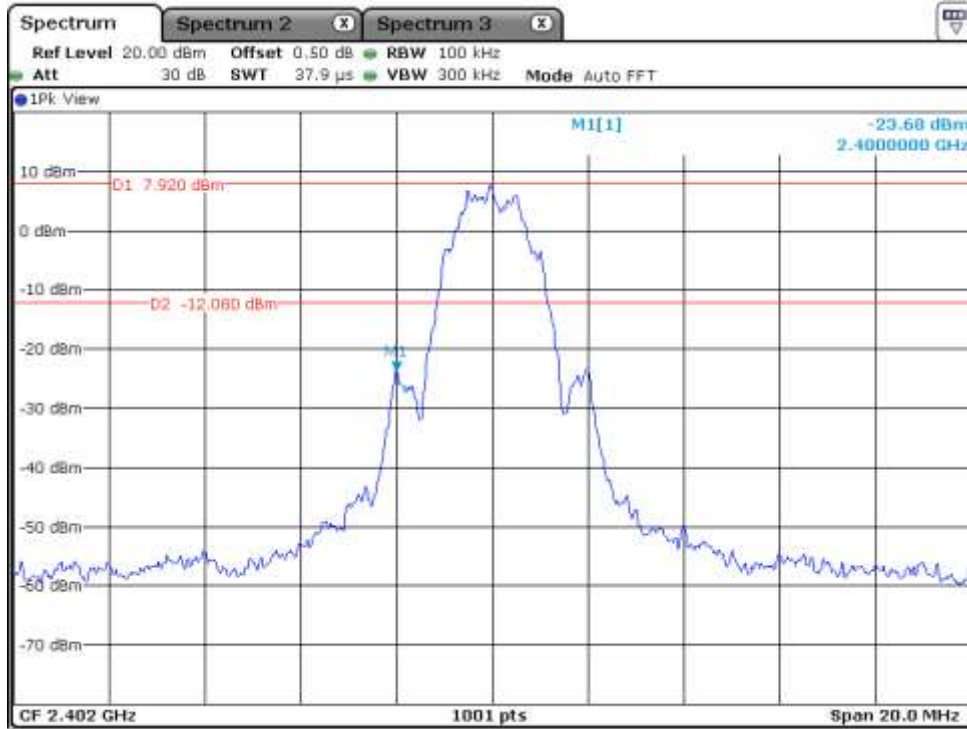


High Channel

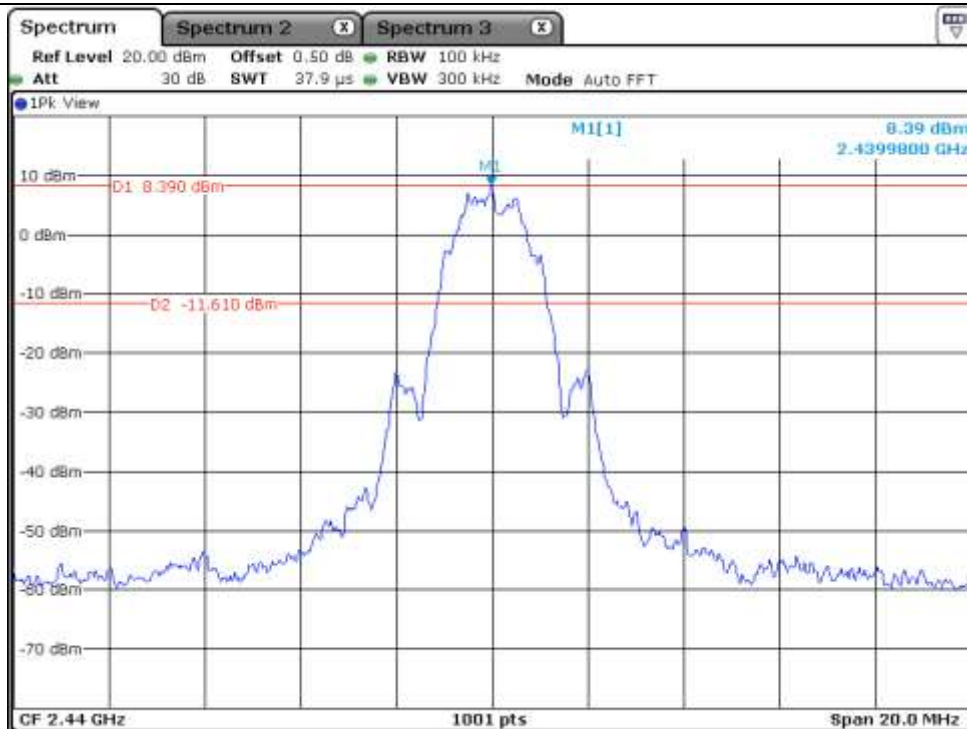


High Channel

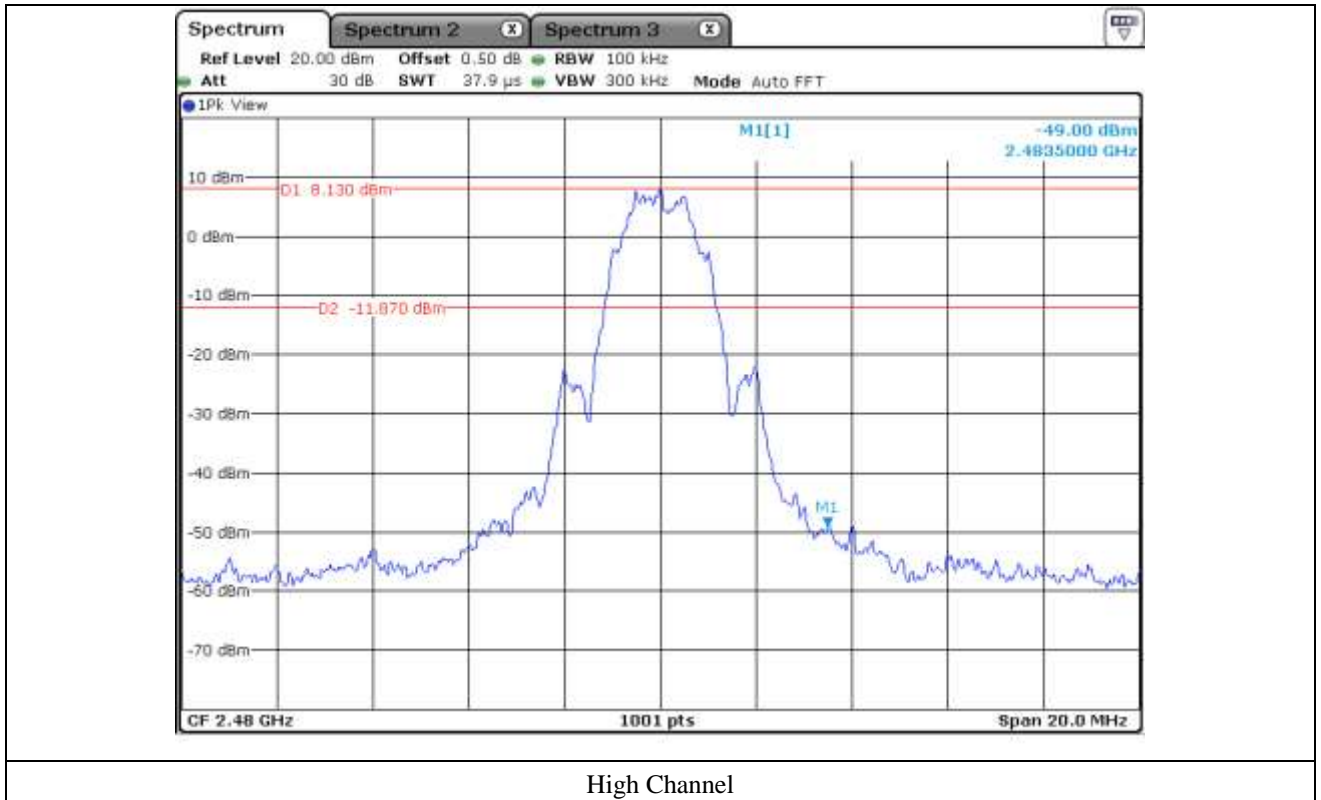
9.5.2 Test data for 2 Mbps

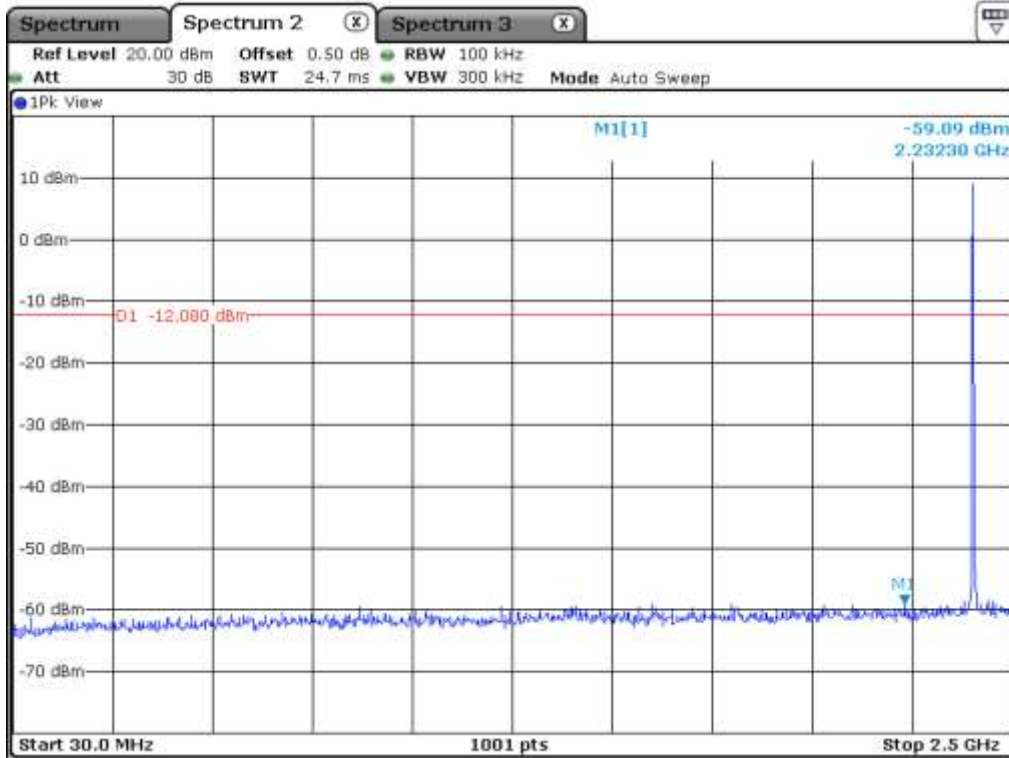


Low Channel

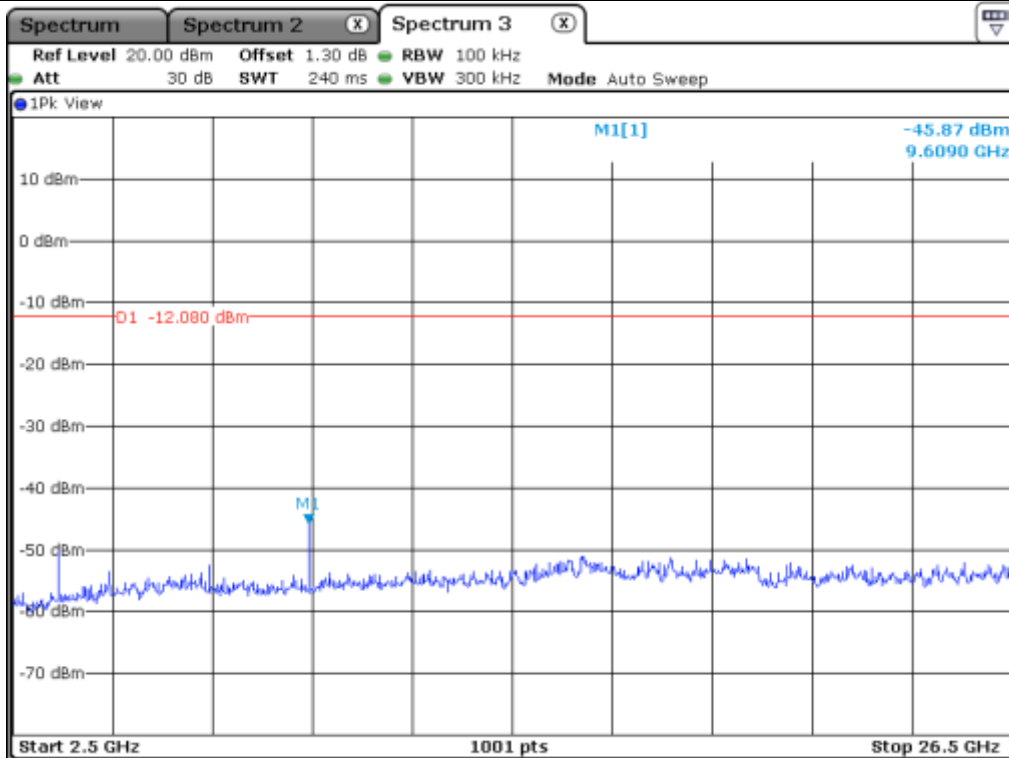


Middle Channel

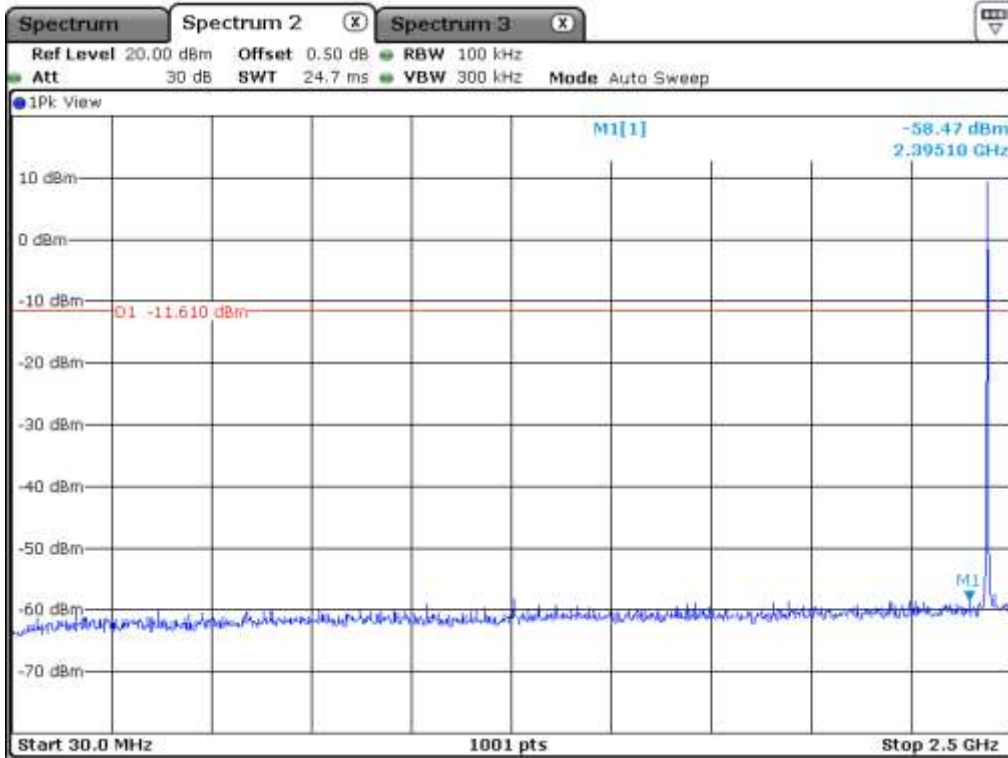




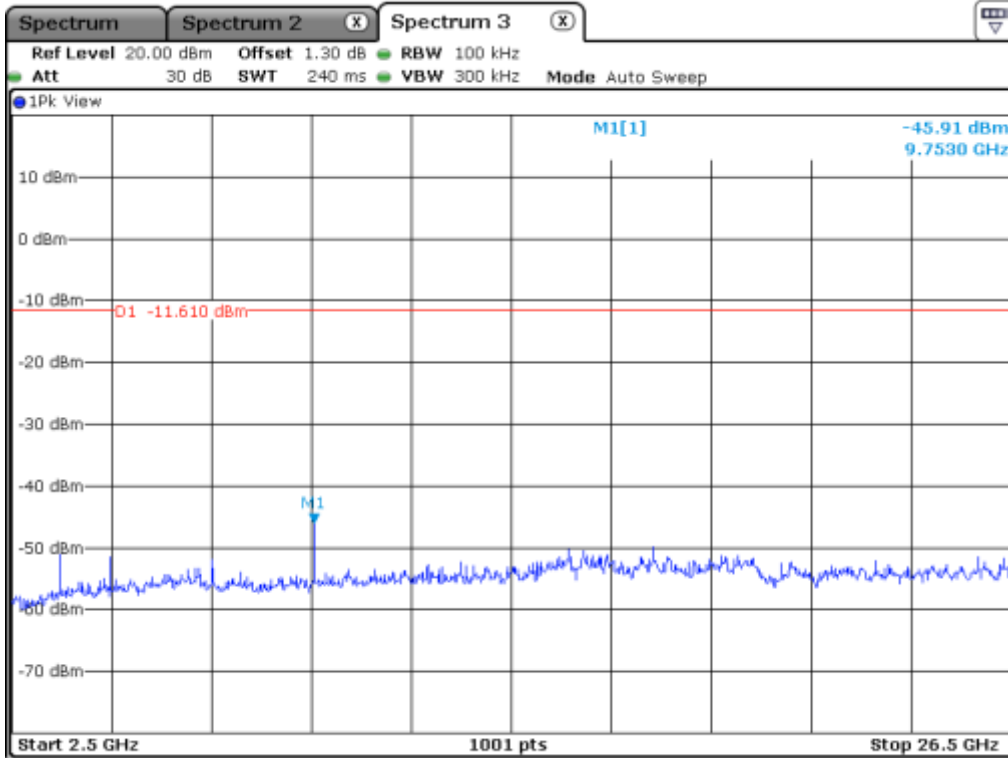
Low Channel



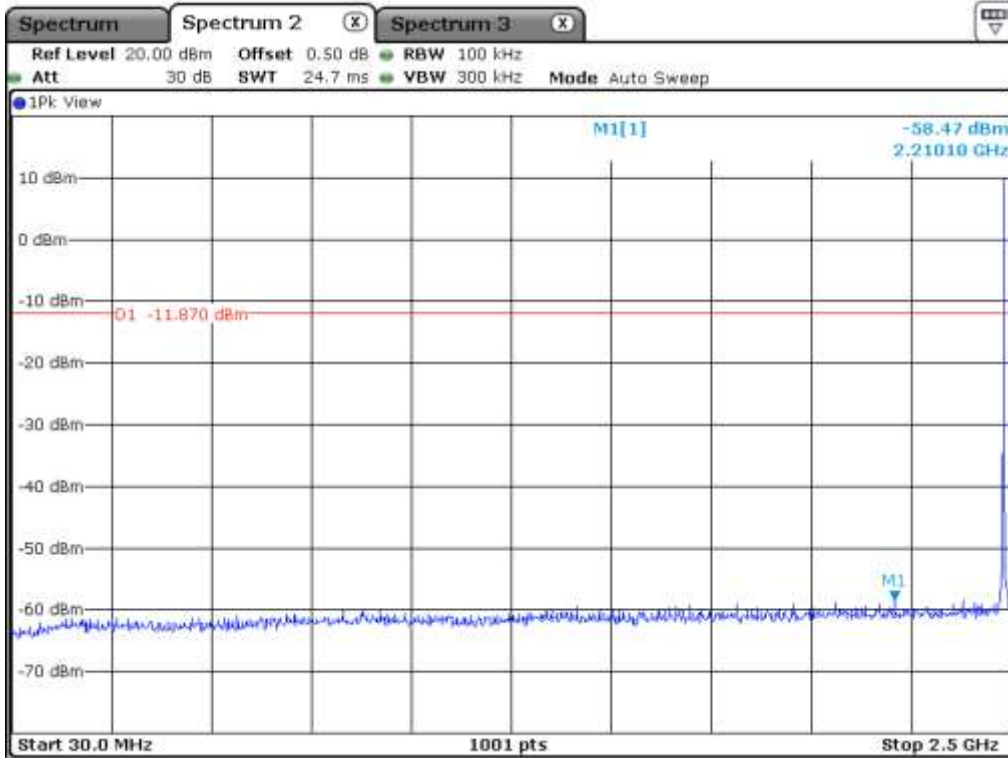
Low Channel



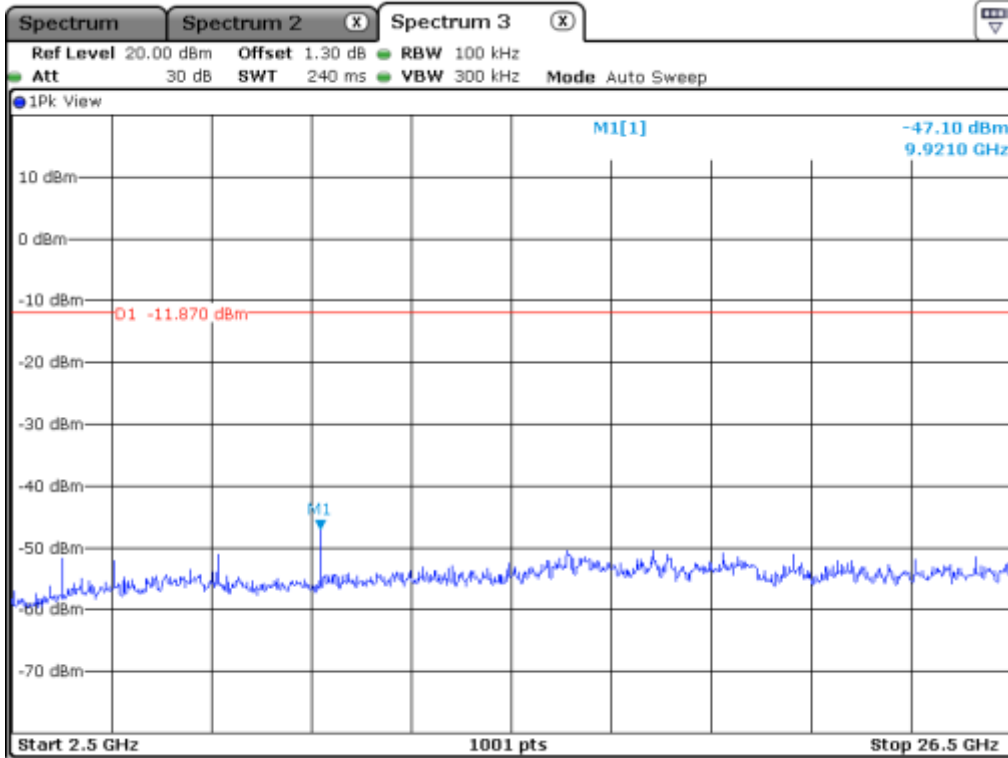
Middle Channel



Middle Channel



High Channel



High Channel

9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

9.6.1.1 Test data for 1 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 60.40 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 343.829	17.86	Peak	H	26.90	3.07	-	47.83	74.00	26.17
2 341.163	6.97	Average	H	26.90	3.07	2.19	39.13	54.00	14.87
2 343.408	17.37	Peak	V	26.90	3.07	-	47.34	74.00	26.66
2 338.043	6.56	Average	V	26.90	3.07	2.19	38.72	54.00	15.28
Test Data for High Channel									
2 483.508	19.15	Peak	H	26.60	3.16	-	48.91	74.00	25.09
2 484.825	10.88	Average	H	26.60	3.16	2.19	42.83	54.00	11.17
2 494.857	17.25	Peak	V	26.60	3.16	-	47.01	74.00	26.99
2 484.308	4.93	Average	V	26.60	3.16	2.19	36.88	54.00	17.12

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{Correction Factor}$$

9.6.1.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 31.19 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 344.024	17.96	Peak	H	26.90	3.07	-	47.93	74.00	26.07
2 340.666	5.95	Average	H	26.90	3.07	5.06	40.98	54.00	13.02
2 338.040	17.96	Peak	V	26.90	3.07	-	47.93	74.00	26.07
2 337.443	5.95	Average	V	26.90	3.07	5.06	40.98	54.00	13.02
Test Data for High Channel									
2 483.508	23.93	Peak	H	26.60	3.16	-	53.69	74.00	20.31
2 483.508	13.72	Average	H	26.60	3.16	5.06	48.54	54.00	5.46
2 483.825	17.45	Peak	V	26.60	3.16	-	47.21	74.00	26.79
2 483.664	6.46	Average	V	26.60	3.16	5.06	41.28	54.00	12.72

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{Correction Factor}$$

9.6.2 Spurious & Harmonic Radiated Emission

9.6.2.1 Test data for 1 Mbps

- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 60.40 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	18.82	Peak	H	28.20	4.85	-	51.87	74.00	22.13
4 804.000	6.84	Average	H	28.20	4.85	2.19	42.08	54.00	11.92
4 804.000	17.71	Peak	V	28.20	4.85	-	50.76	74.00	23.24
4 804.000	6.45	Average	V	28.20	4.85	2.19	41.69	54.00	12.31
Test Data for Middle Channel									
4 880.000	17.73	Peak	H	28.30	4.91	-	50.94	74.00	23.06
4 880.000	7.80	Average	H	28.30	4.91	2.19	43.20	54.00	10.80
4 880.000	18.48	Peak	V	28.30	4.91	-	51.69	74.00	22.31
4 880.000	6.58	Average	V	28.30	4.91	2.19	41.98	54.00	12.02
Test Data for High Channel									
4 960.000	17.63	Peak	H	28.60	5.04	-	51.27	74.00	22.73
4 960.000	7.92	Average	H	28.60	5.04	2.19	43.75	54.00	10.25
4 960.000	17.86	Peak	V	28.60	5.04	-	51.50	74.00	22.50
4 960.000	6.29	Average	V	28.60	5.04	2.19	42.12	54.00	11.88

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{Correction Factor}$$

9.6.2.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 31.19 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	18.65	Peak	H	28.20	4.85	-	51.70	74.00	22.30
4 804.000	6.71	Average	H	28.20	4.85	5.06	44.82	54.00	9.18
4 804.000	18.04	Peak	V	28.20	4.85	-	51.09	74.00	22.91
4 804.000	6.12	Average	V	28.20	4.85	5.06	44.23	54.00	9.77
Test Data for Middle Channel									
4 880.000	18.11	Peak	H	28.30	4.91	-	51.32	74.00	22.68
4 880.000	7.68	Average	H	28.30	4.91	5.06	45.95	54.00	8.05
4 880.000	18.69	Peak	V	28.30	4.91	-	51.90	74.00	22.10
4 880.000	6.14	Average	V	28.30	4.91	5.06	44.41	54.00	9.59
Test Data for High Channel									
4 960.000	18.26	Peak	H	28.60	5.04	-	51.90	74.00	22.10
4 960.000	7.54	Average	H	28.60	5.04	5.06	46.24	54.00	7.76
4 960.000	18.32	Peak	V	28.60	5.04	-	51.96	74.00	22.04
4 960.000	6.43	Average	V	28.60	5.04	5.06	45.13	54.00	8.87

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{Correction Factor}$$

10. PEAK POWER SPECTRAL DENSITY

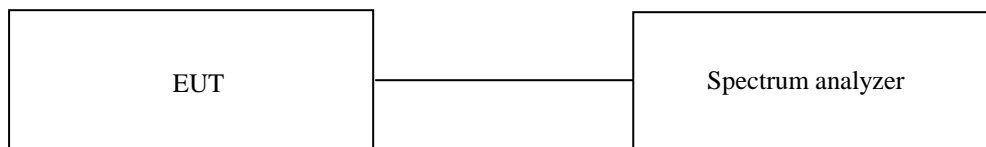
10.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % R.H.

10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$, the video bandwidth is set to 3 times the resolution bandwidth.



10.3 Test Date

August 21, 2020 ~ September 08, 2020

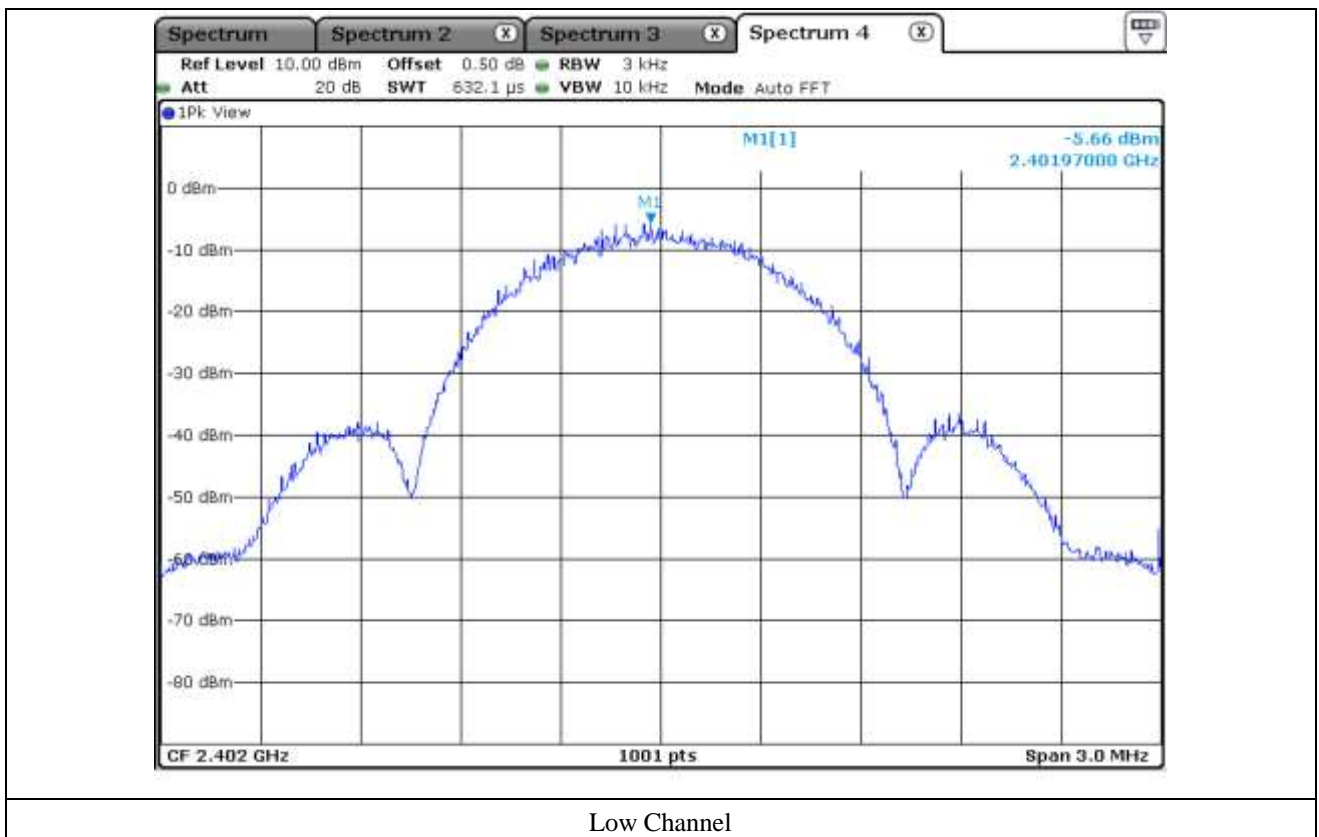
10.4 Test data for 1 Mbps

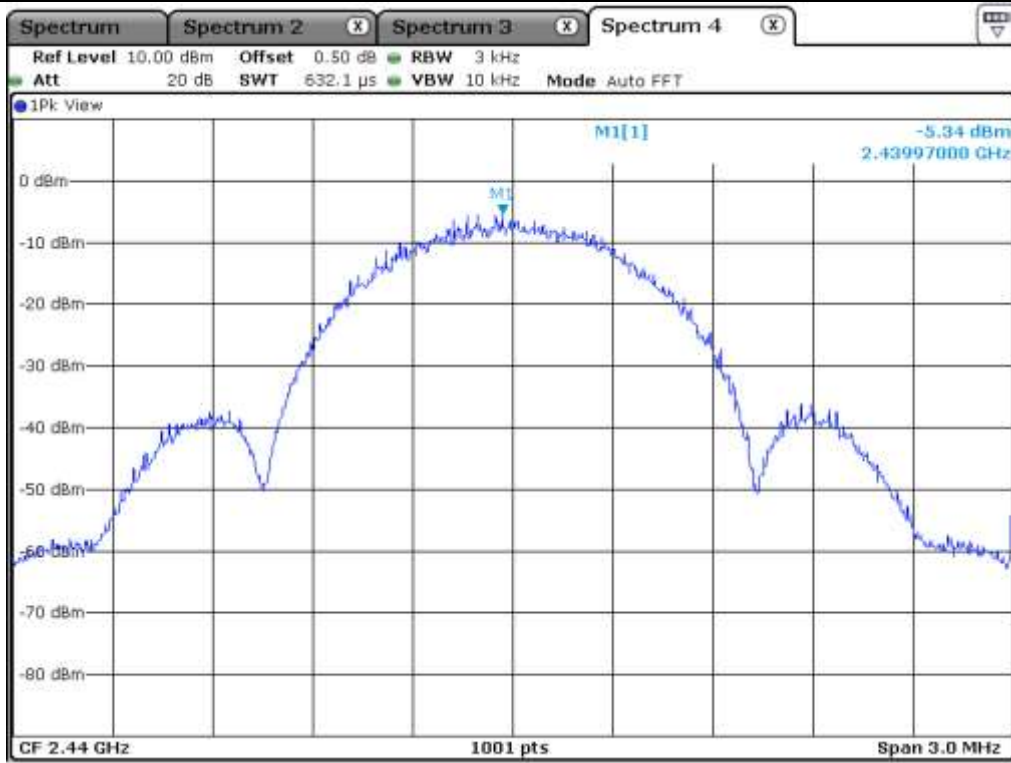
- Test Result : Pass

- Operating Condition : Continuous transmitting mode

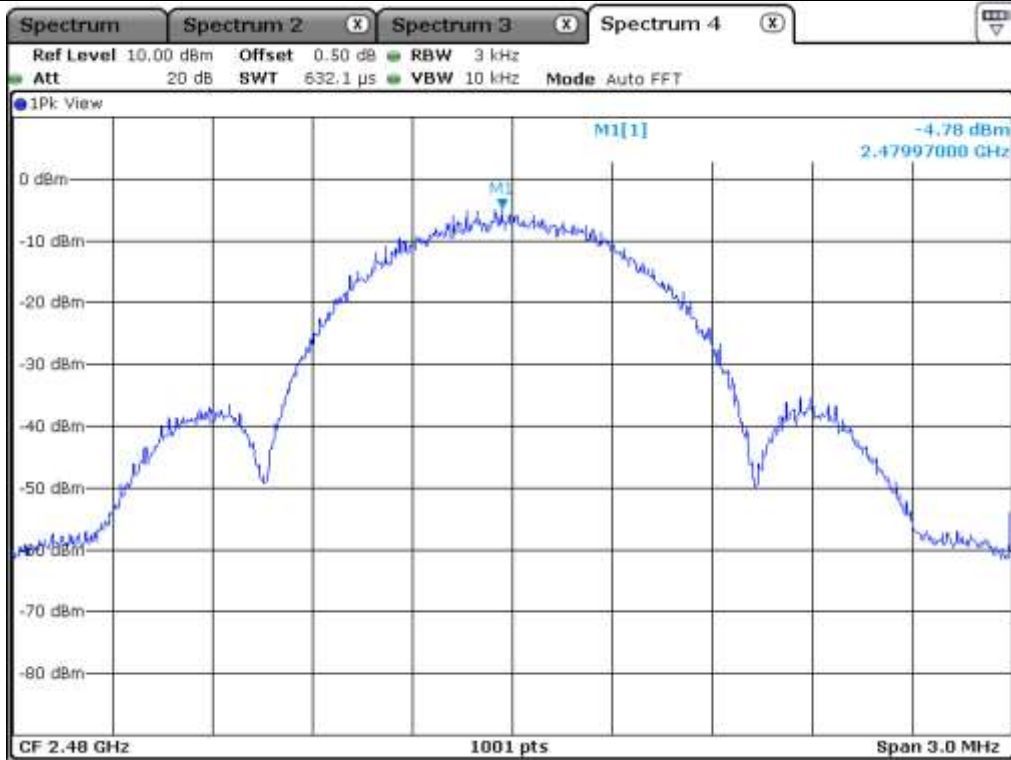
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-5.66	8.00	13.66
Middle	2 440.00	-5.34	8.00	13.34
High	2 480.00	-4.78	8.00	12.78

Remark. Margin = Limit – Measured value





Middle Channel



High Channel

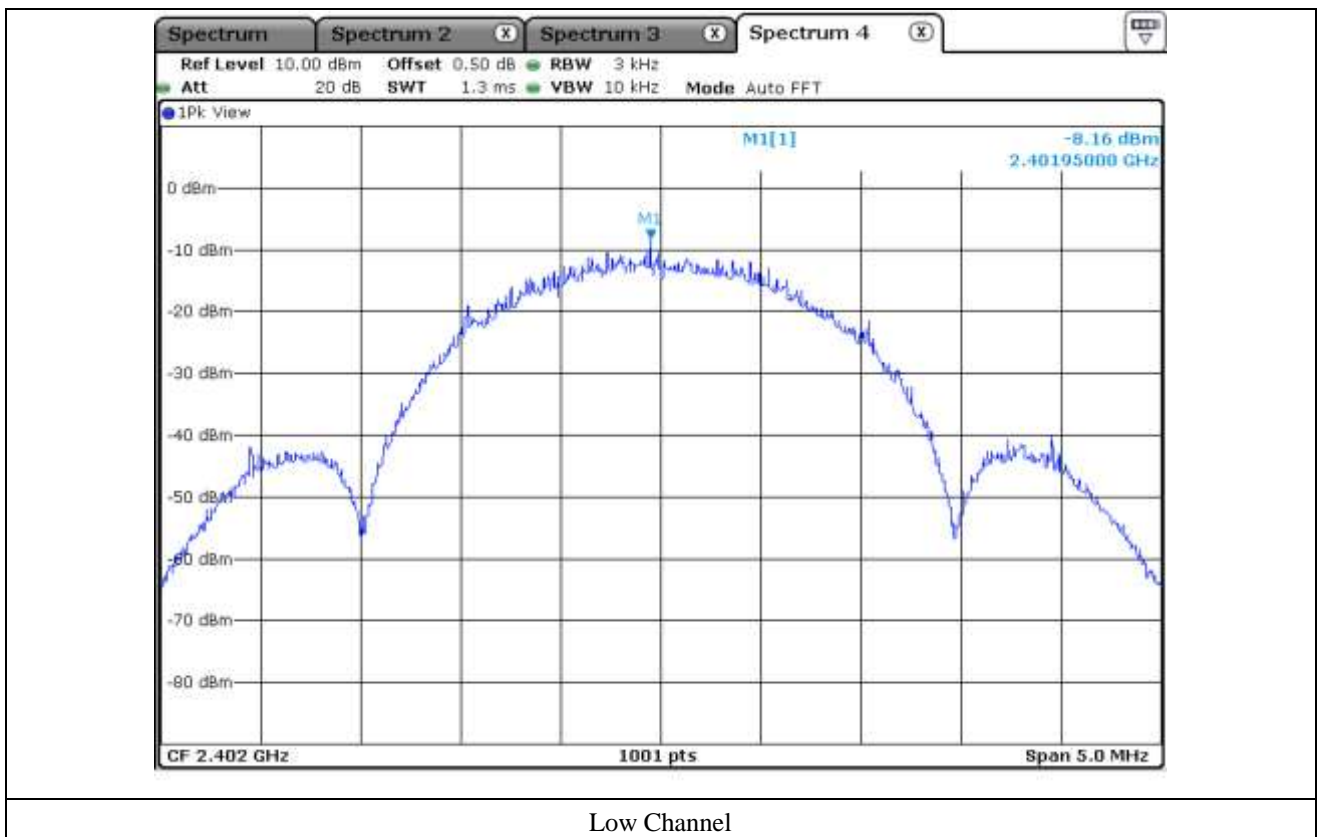
10.5 Test data for 2 Mbps

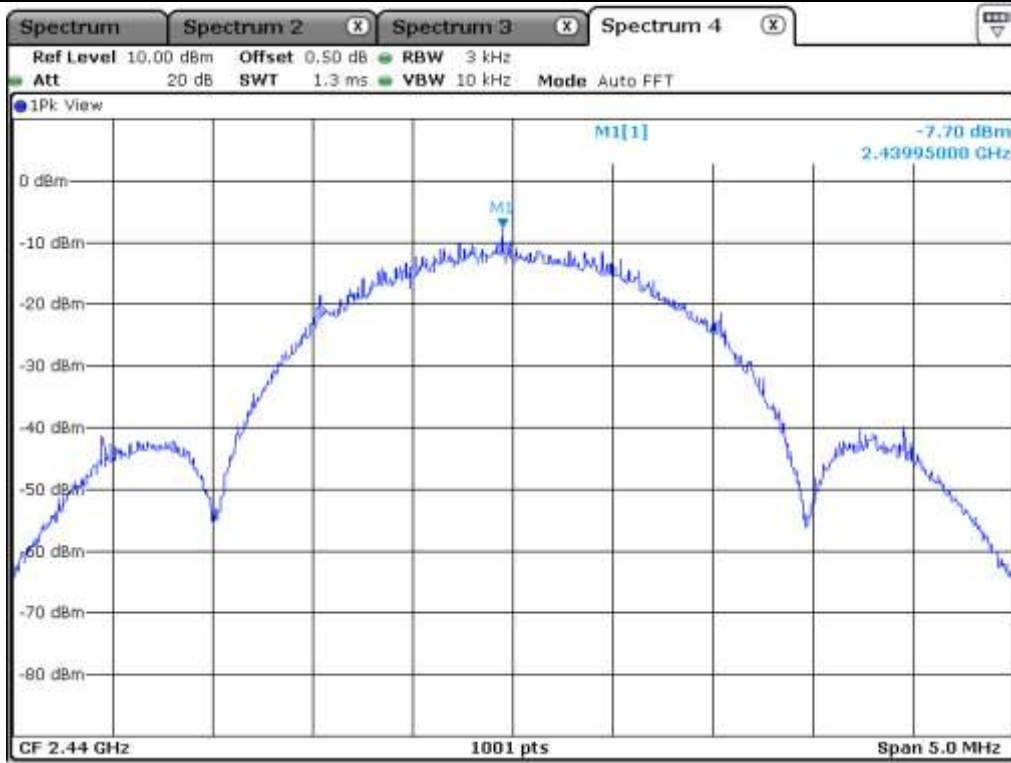
- Test Result : Pass

- Operating Condition : Continuous transmitting mode

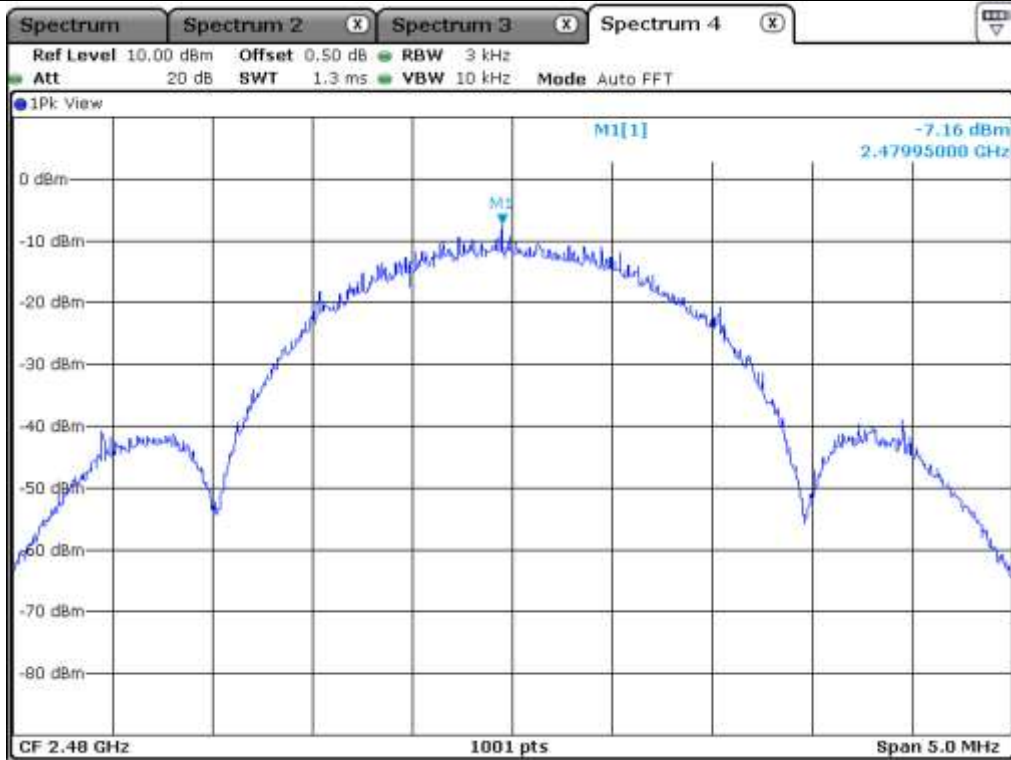
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-8.16	8.00	16.16
Middle	2 440.00	-7.70	8.00	15.70
High	2 480.00	-7.16	8.00	15.16

Remark. Margin = Limit – Measured value





Middle Channel



High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % R.H.

11.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

11.3 Test Date

August 21, 2020 ~ September 08, 2020

11.4 Test data for 30 MHz ~ 1000 MHz

11.4.1 Test data for Basic Model (WCA731M)

11.4.1.1 Test data for Bluetooth LE

Humidity Level : 41 % R.H.

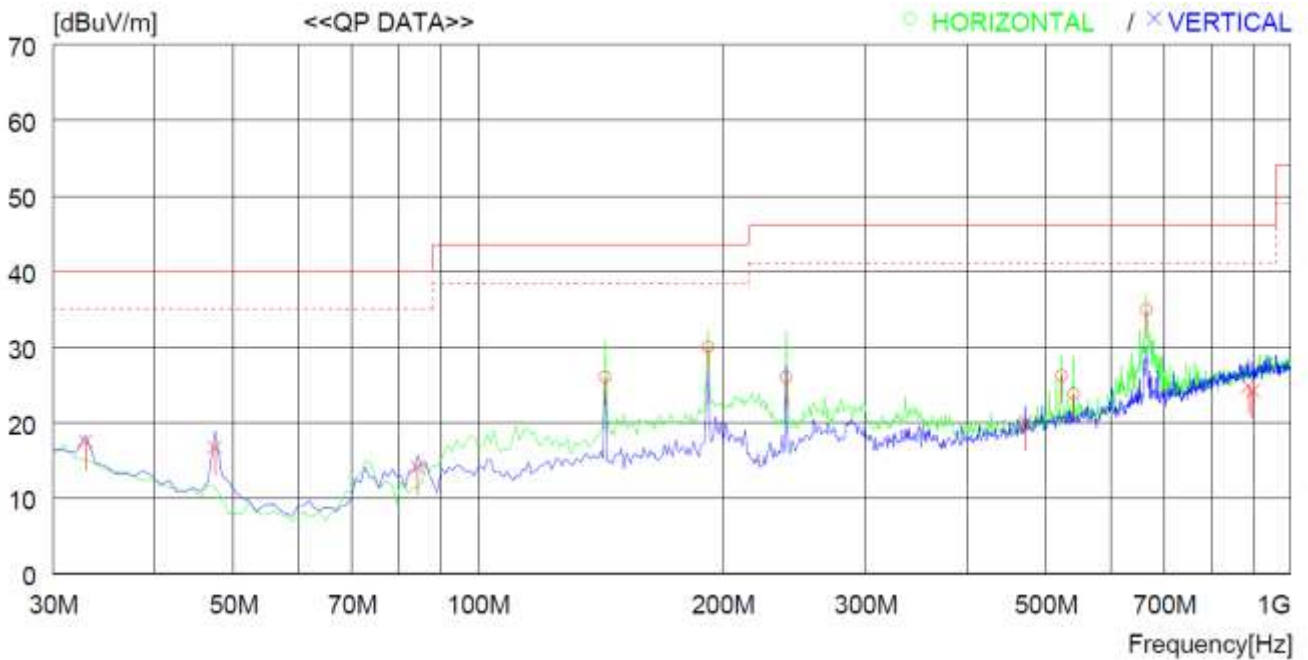
Temperature: 23 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Wi-Fi/BT Transceiver

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	143.490	46.5	11.1	1.1	32.7	26.0	43.5	17.5	400	158
2	191.990	48.5	12.8	1.3	32.6	30.0	43.5	13.5	400	358
3	239.520	46.5	10.6	1.5	32.6	26.0	46.0	20.0	400	358
4	522.760	38.7	18.2	2.2	32.9	26.2	46.0	19.8	400	358
5	541.190	35.8	18.6	2.3	32.9	23.8	46.0	22.2	400	358
6	665.346	44.7	20.6	2.5	32.9	34.9	46.0	11.1	400	358
----- Vertical -----										
7	32.910	38.6	11.0	0.5	32.6	17.5	40.0	22.5	400	228
8	47.460	38.7	10.1	0.6	32.7	16.7	40.0	23.3	400	3
9	84.320	38.2	7.8	0.8	32.7	14.1	40.0	25.9	400	3
10	471.351	33.3	17.4	2.1	32.8	20.0	46.0	26.0	400	3
11	887.469	31.0	23.1	2.8	32.1	24.8	46.0	21.2	400	3
12	898.139	30.0	23.3	2.9	32.0	24.2	46.0	21.8	400	3

11.4.1.2 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)

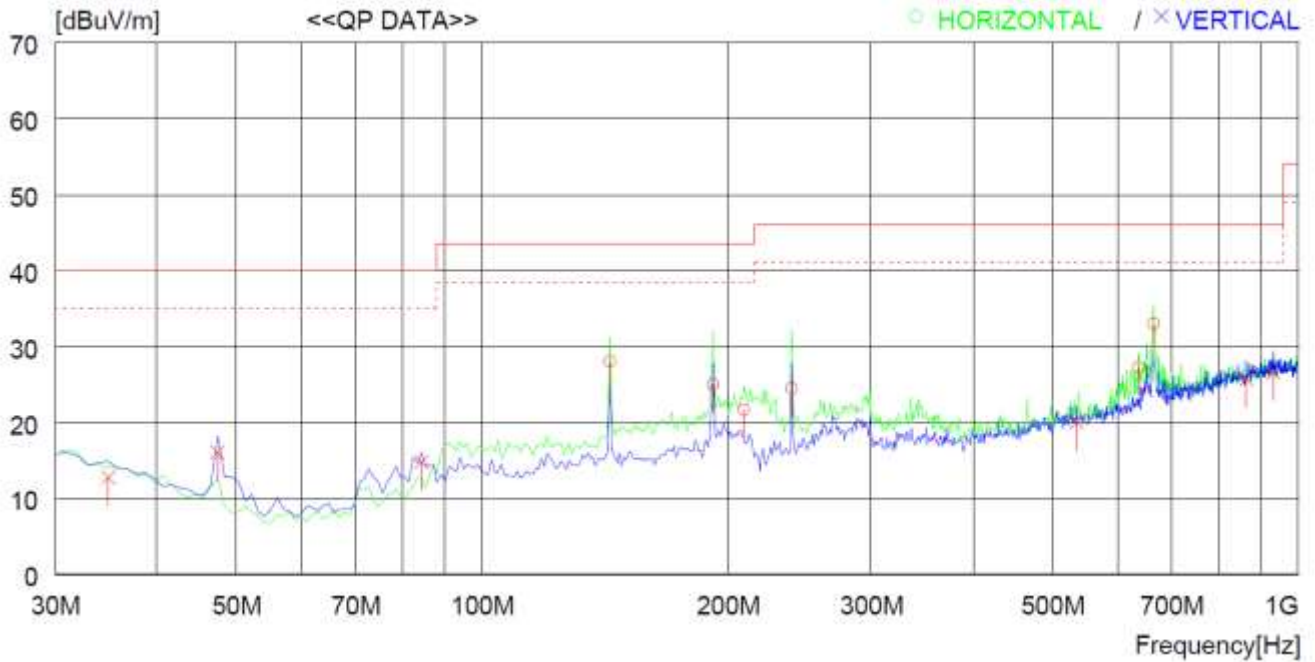
Humidity Level : 41 % R.H. Temperature: 23 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Wi-Fi/BT Transceiver

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	143.490	48.5	11.1	1.1	32.7	28.0	43.5	15.5	400	352
2	191.990	43.5	12.8	1.3	32.6	25.0	43.5	18.5	400	4
3	209.450	40.8	12.1	1.4	32.6	21.7	43.5	21.8	400	352
4	239.520	45.0	10.6	1.5	32.6	24.5	46.0	21.5	400	352
5	637.217	37.5	20.2	2.5	33.0	27.2	46.0	18.8	400	300
6	664.376	42.8	20.6	2.5	32.9	33.0	46.0	13.0	400	316
----- Vertical -----										
7	34.850	33.8	11.1	0.5	32.6	12.8	40.0	27.2	400	175
8	47.460	38.0	10.1	0.6	32.7	16.0	40.0	24.0	400	5
9	84.320	38.9	7.8	0.8	32.7	14.8	40.0	25.2	400	5
10	535.370	32.2	18.5	2.2	32.9	20.0	46.0	26.0	400	5
11	863.220	32.5	22.8	2.6	32.2	25.7	46.0	20.3	400	5
12	932.088	32.1	23.4	2.9	31.8	26.6	46.0	19.4	400	226

11.4.2 Test data for Multiple Model (WCA734M)

11.4.2.1 Test data for Bluetooth LE

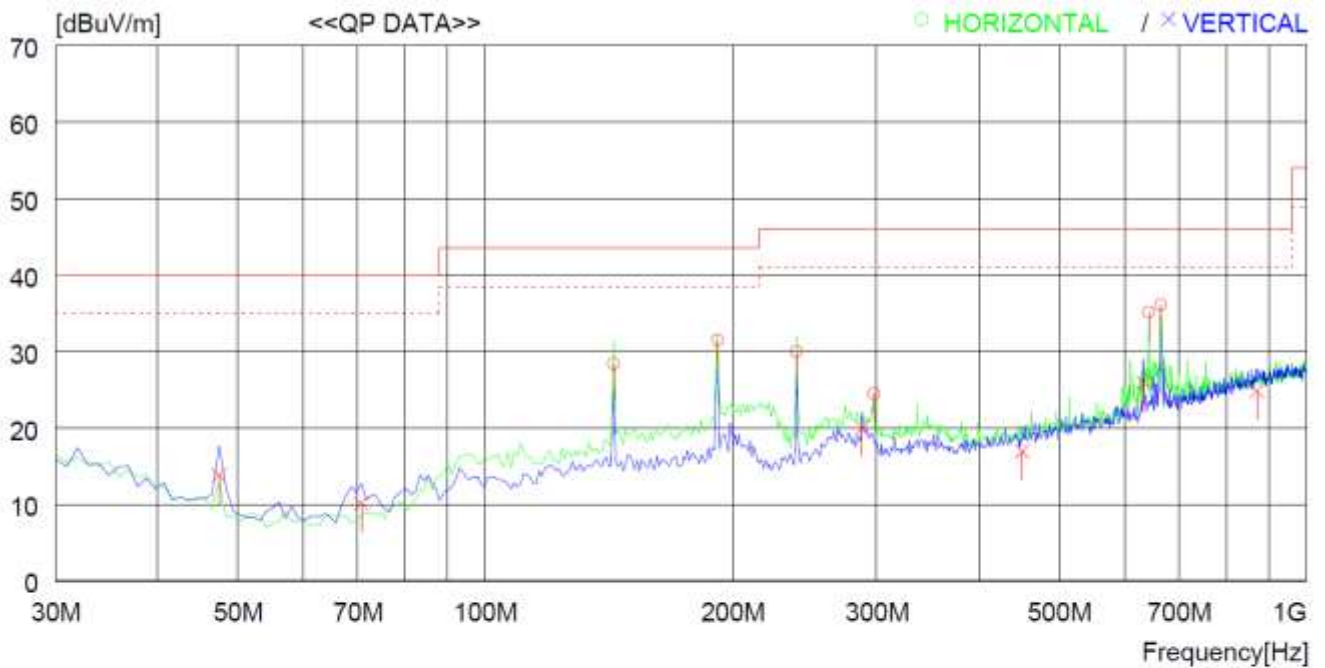
Humidity Level : 41 % R.H. Temperature: 23 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Wi-Fi/BT Transceiver

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	143.490	40.0	18.6	2.3	32.5	28.4	43.5	15.1	400	164
2	191.990	45.1	16.2	2.7	32.5	31.5	43.5	12.0	400	351
3	239.520	42.2	17.2	3.0	32.4	30.0	46.0	16.0	400	34
4	297.720	34.4	19.3	3.3	32.5	24.5	46.0	21.5	400	355
5	642.067	36.6	26.1	5.0	32.6	35.1	46.0	10.9	400	5
6	664.376	37.2	26.4	5.1	32.6	36.1	46.0	9.9	400	355
----- Vertical -----										
7	870.980	22.2	28.8	5.7	31.9	24.8	46.0	21.2	400	214
8	47.460	25.2	19.6	1.5	32.5	13.8	40.0	26.2	400	4
9	70.740	23.3	17.5	1.8	32.5	10.1	40.0	29.9	400	336
10	288.020	30.1	19.1	3.2	32.4	20.0	46.0	26.0	400	4
11	450.981	22.3	23.0	4.0	32.4	16.9	46.0	29.1	400	74
12	633.337	27.6	26.0	4.9	32.6	25.9	46.0	20.1	400	4

11.4.2.1 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)

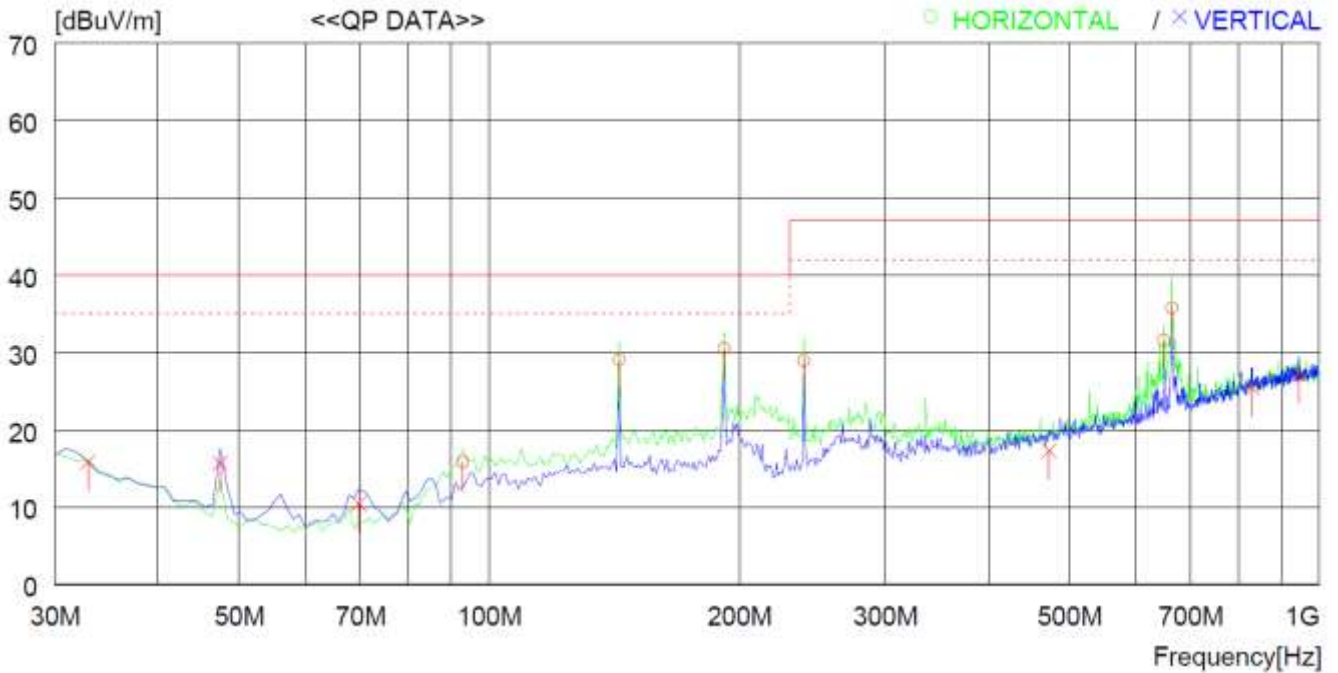
Humidity Level : 41 % R.H. Temperature: 23 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Wi-Fi/BT Transceiver

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	93.050	33.3	14.0	1.2	32.7	15.8	40.0	24.2	400	122
2	143.490	41.1	19.2	1.4	32.7	29.0	40.0	11.0	400	164
3	191.990	45.4	16.0	1.7	32.6	30.5	40.0	9.5	400	355
4	239.520	42.3	17.3	1.9	32.6	28.9	47.0	18.1	400	355
5	649.826	36.5	24.9	3.2	33.0	31.6	47.0	15.4	400	355
6	664.376	40.2	25.1	3.3	32.9	35.7	47.0	11.3	400	214
----- Vertical -----										
7	32.910	27.8	19.9	0.8	32.6	15.9	40.0	24.1	400	3
8	47.460	33.3	14.2	0.9	32.7	15.7	40.0	24.3	400	3
9	69.770	29.4	12.9	0.9	32.7	10.5	40.0	29.5	400	354
10	472.321	25.1	22.4	2.6	32.8	17.3	47.0	29.7	400	3
11	830.241	26.5	27.2	4.1	32.4	25.4	47.0	21.6	400	3
12	945.668	26.4	28.0	4.6	31.8	27.2	47.0	19.8	400	46

11.5 Test data for Below 30 MHz

- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

11.6 Test data for above 1 GHz

- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % R.H.

12.2 Test set-up

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

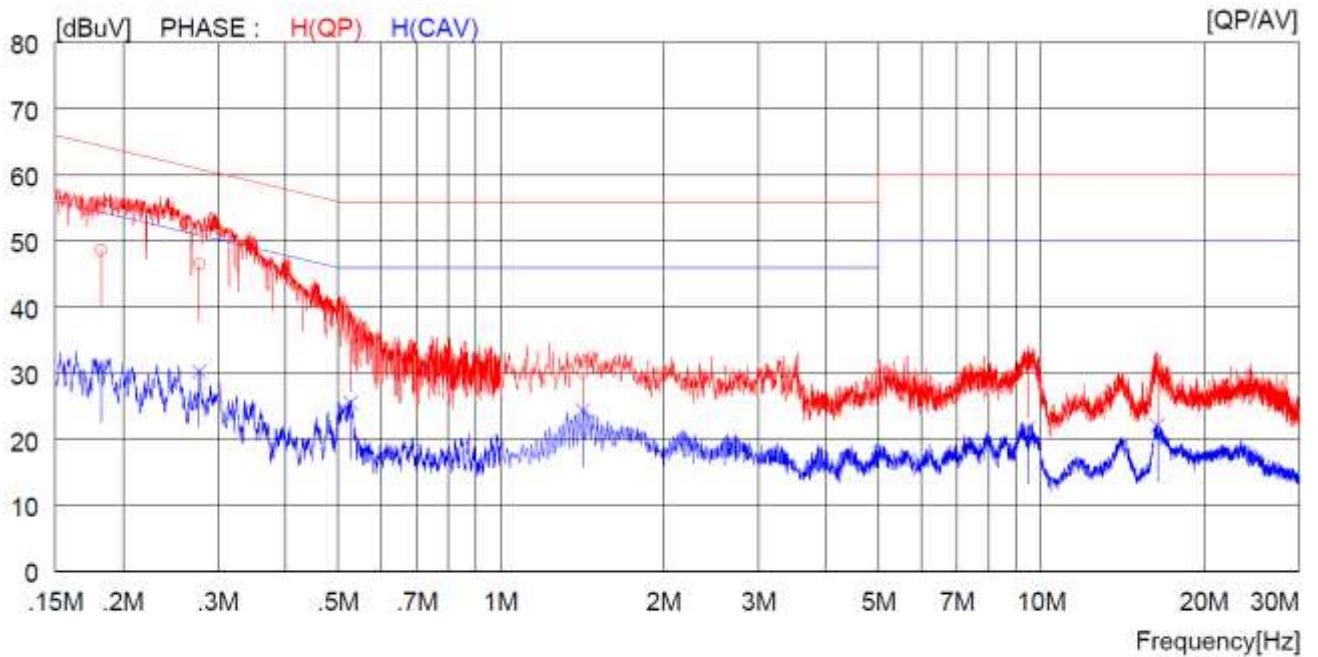
12.3 Test Date

August 21, 2020 ~ September 08, 2020

12.4 Test data for Basic Model (WCA731M)

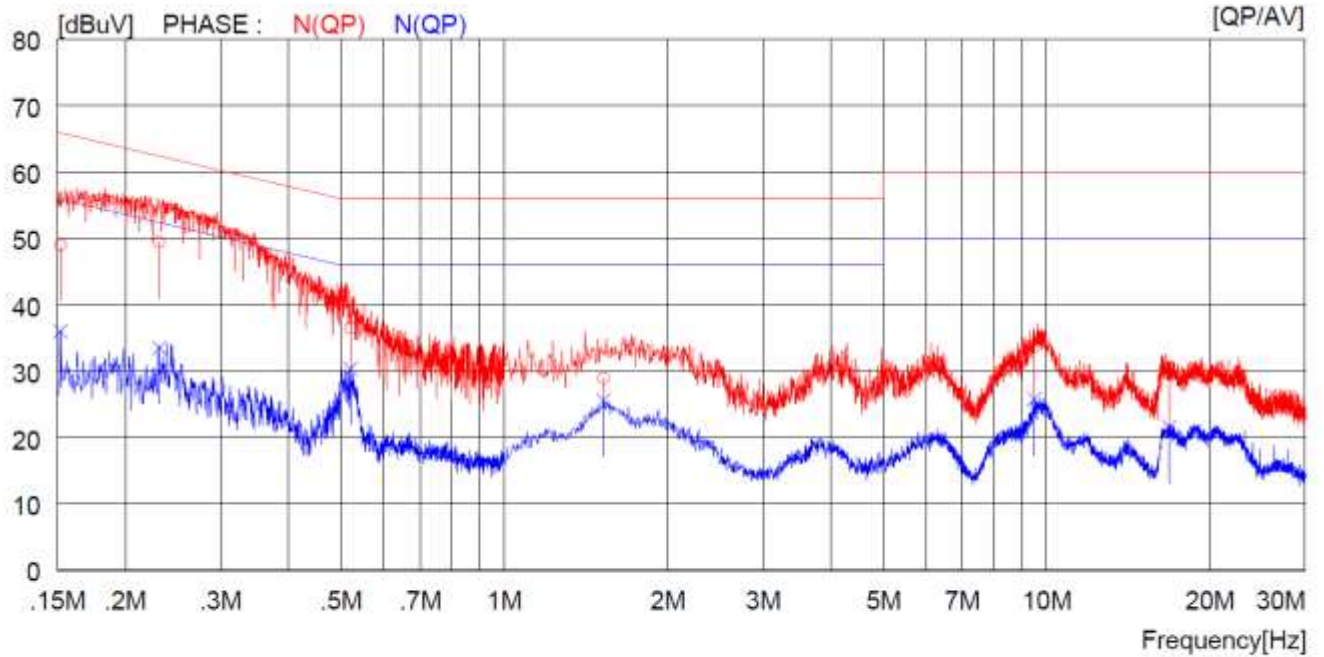
12.4.1 Test data for Bluetooth LE

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ	READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
		QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.18200	38.6	---	10.0	48.6	---	64.4	---	15.8	---	---	H(QP)
2	0.27700	36.6	---	9.9	46.5	---	60.9	---	14.4	---	---	H(QP)
3	0.52800	25.5	---	10.0	35.5	---	56.0	---	20.5	---	---	H(QP)
4	1.42000	19.9	---	10.1	30.0	---	56.0	---	26.0	---	---	H(QP)
5	9.47500	21.5	---	10.2	31.7	---	60.0	---	28.3	---	---	H(QP)
6	16.40000	18.8	---	10.3	29.1	---	60.0	---	30.9	---	---	H(QP)
7	0.18200	---	20.9	10.0	---	30.9	---	54.4	---	23.5	---	H(CAV)
8	0.27700	---	20.4	9.9	---	30.3	---	50.9	---	20.6	---	H(CAV)
9	0.52800	---	15.5	10.0	---	25.5	---	46.0	---	20.5	---	H(CAV)
10	1.42000	---	14.3	10.1	---	24.4	---	46.0	---	21.6	---	H(CAV)
11	9.47500	---	11.5	10.2	---	21.7	---	50.0	---	28.3	---	H(CAV)
12	16.40000	---	11.8	10.3	---	22.1	---	50.0	---	27.9	---	H(CAV)

-. Tested Line : NEUTRAL LINE



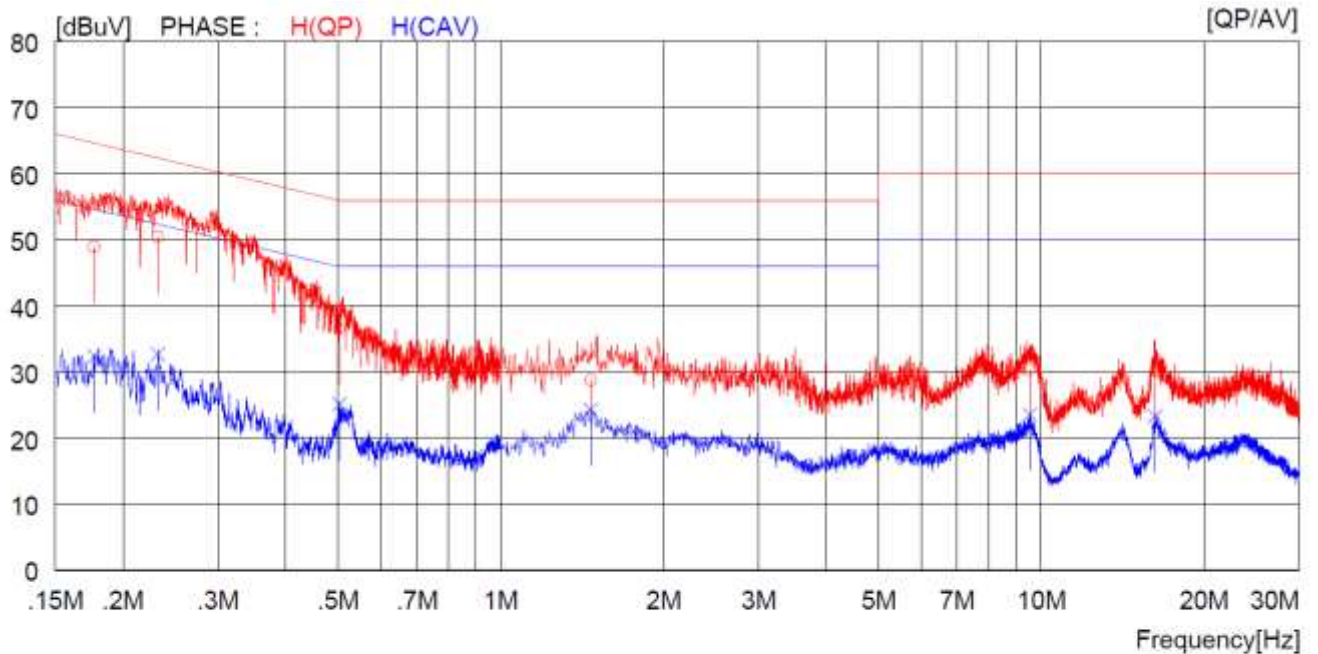
NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT	MARGIN		PHASE	
		QP	AV		QP	AV		QP	AV		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]		
1	0.15200	38.9	---	10.0	48.9	---	65.9	---	17.0	---	N(QP)
2	0.23100	39.5	---	9.9	49.4	---	62.4	---	13.0	---	N(QP)
3	0.52100	26.5	---	10.0	36.5	---	56.0	---	19.5	---	N(QP)
4	1.52400	18.8	---	10.1	28.9	---	56.0	---	27.1	---	N(QP)
5	9.49500	23.3	---	10.2	33.5	---	60.0	---	26.5	---	N(QP)
6	16.84000	19.2	---	10.3	29.5	---	60.0	---	30.5	---	N(QP)
7	0.15200	---	26.0	10.0	---	36.0	---	55.9	---	19.9	N(CAV)
8	0.23100	---	23.6	9.9	---	33.5	---	52.4	---	18.9	N(CAV)
9	0.52100	---	20.4	10.0	---	30.4	---	46.0	---	15.6	N(CAV)
10	1.52400	---	15.5	10.1	---	25.6	---	46.0	---	20.4	N(CAV)
11	9.49500	---	15.6	10.2	---	25.8	---	50.0	---	24.2	N(CAV)
12	16.84000	---	11.3	10.3	---	21.6	---	50.0	---	28.4	N(CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

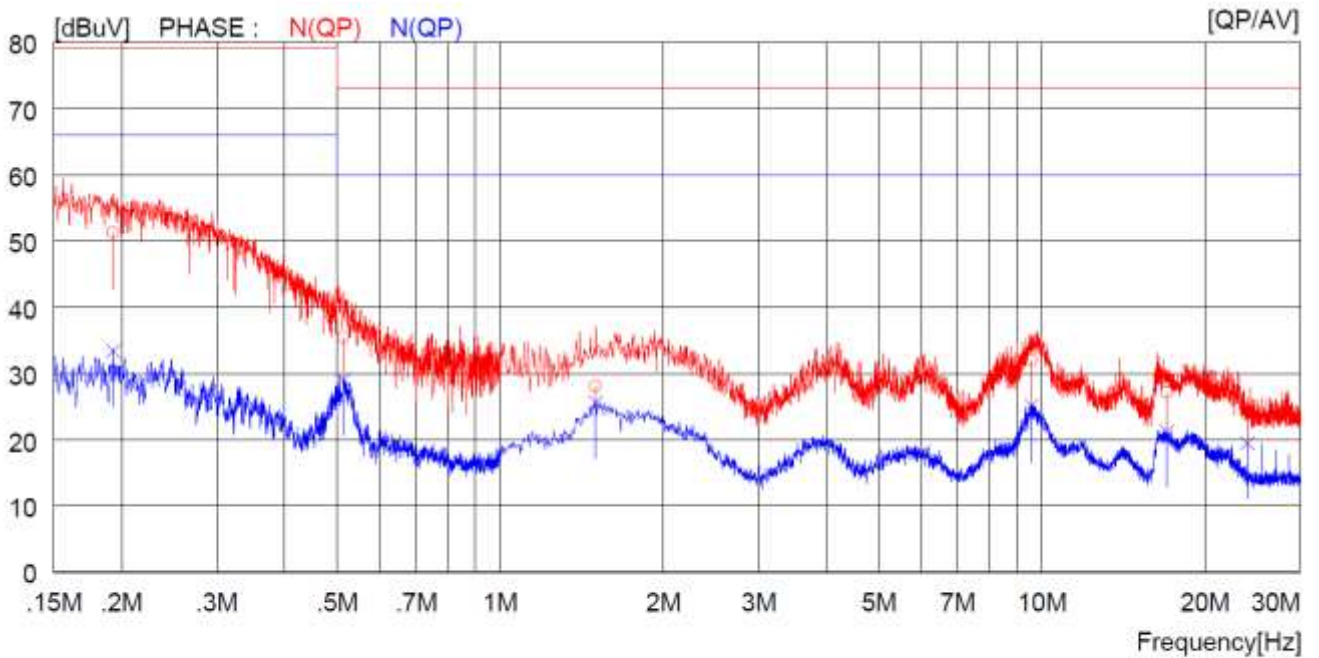
12.4.2 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ		READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.17700	38.9	---	10.0	48.9	---	64.6	---	15.7	---			H(QP)
2	0.23200	40.5	---	9.9	50.4	---	62.4	---	12.0	---			H(QP)
3	0.50300	26.5	---	10.0	36.5	---	56.0	---	19.5	---			H(QP)
4	1.46800	18.6	---	10.1	28.7	---	56.0	---	27.3	---			H(QP)
5	9.52000	20.1	---	10.2	30.3	---	60.0	---	29.7	---			H(QP)
6	16.27000	19.9	---	10.3	30.2	---	60.0	---	29.8	---			H(QP)
7	0.17700	---	22.4	10.0	---	32.4	---	54.6	---	22.2			H(CAV)
8	0.23200	---	22.8	9.9	---	32.7	---	52.4	---	19.7			H(CAV)
9	0.50300	---	15.1	10.0	---	25.1	---	46.0	---	20.9			H(CAV)
10	1.46800	---	14.2	10.1	---	24.3	---	46.0	---	21.7			H(CAV)
11	9.52000	---	13.4	10.2	---	23.6	---	50.0	---	26.4			H(CAV)
12	16.27000	---	13.0	10.3	---	23.3	---	50.0	---	26.7			H(CAV)

- Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR		RESULT		LIMIT		MARGIN	PHASE
		QP	AV	QP	AV	QP	AV	QP	AV		
		[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]		
1	0.19300	41.2	---	10.0	51.2	---	79.0	---	27.8	---	N(QP)
2	0.51400	25.5	---	10.0	35.5	---	73.0	---	37.5	---	N(QP)
3	1.50000	18.0	---	10.1	28.1	---	73.0	---	44.9	---	N(QP)
4	9.57000	21.8	---	10.2	32.0	---	73.0	---	41.0	---	N(QP)
5	17.04000	16.9	---	10.3	27.2	---	73.0	---	45.8	---	N(QP)
6	23.99000	13.3	---	10.5	23.8	---	73.0	---	49.2	---	N(QP)
7	0.19300	---	23.4	10.0	---	33.4	---	66.0	---	32.6	N(CAV)
8	0.51400	---	19.0	10.0	---	29.0	---	60.0	---	31.0	N(CAV)
9	1.50000	---	15.5	10.1	---	25.6	---	60.0	---	34.4	N(CAV)
10	9.57000	---	14.9	10.2	---	25.1	---	60.0	---	34.9	N(CAV)
11	17.04000	---	11.0	10.3	---	21.3	---	60.0	---	38.7	N(CAV)
12	23.99000	---	9.0	10.5	---	19.5	---	60.0	---	40.5	N(CAV)

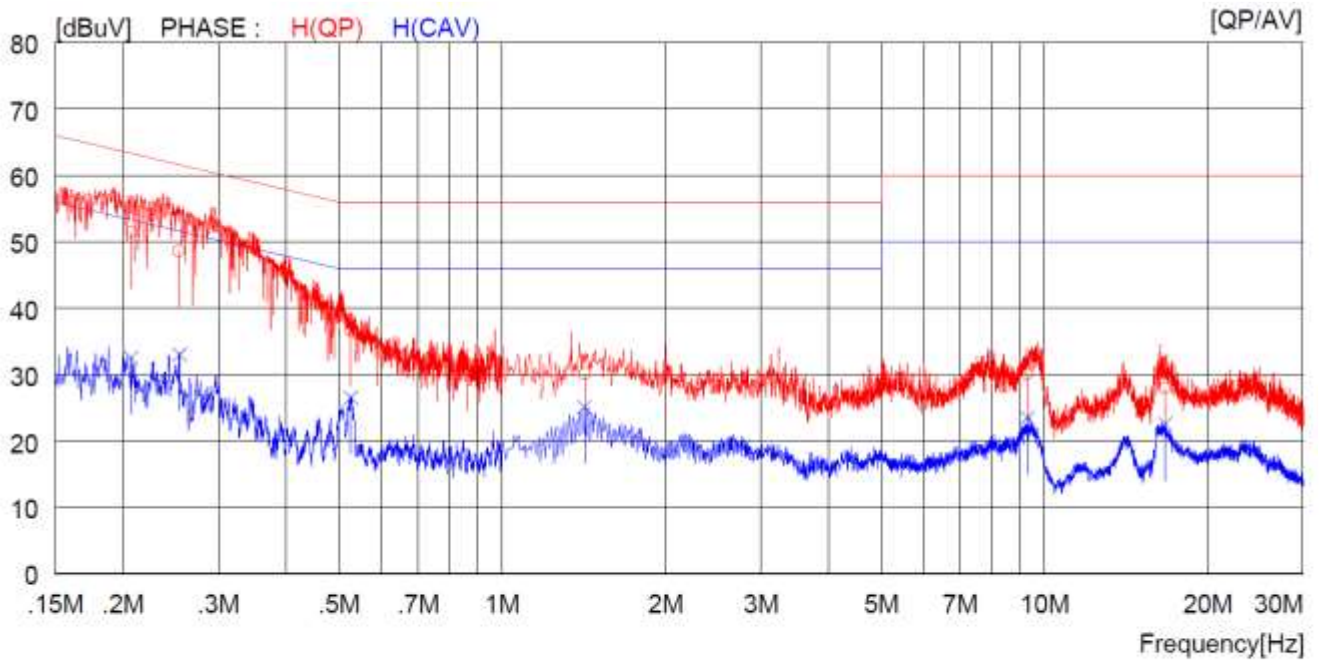
Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

12.5 Test data for Multiple Model (WCA734M)

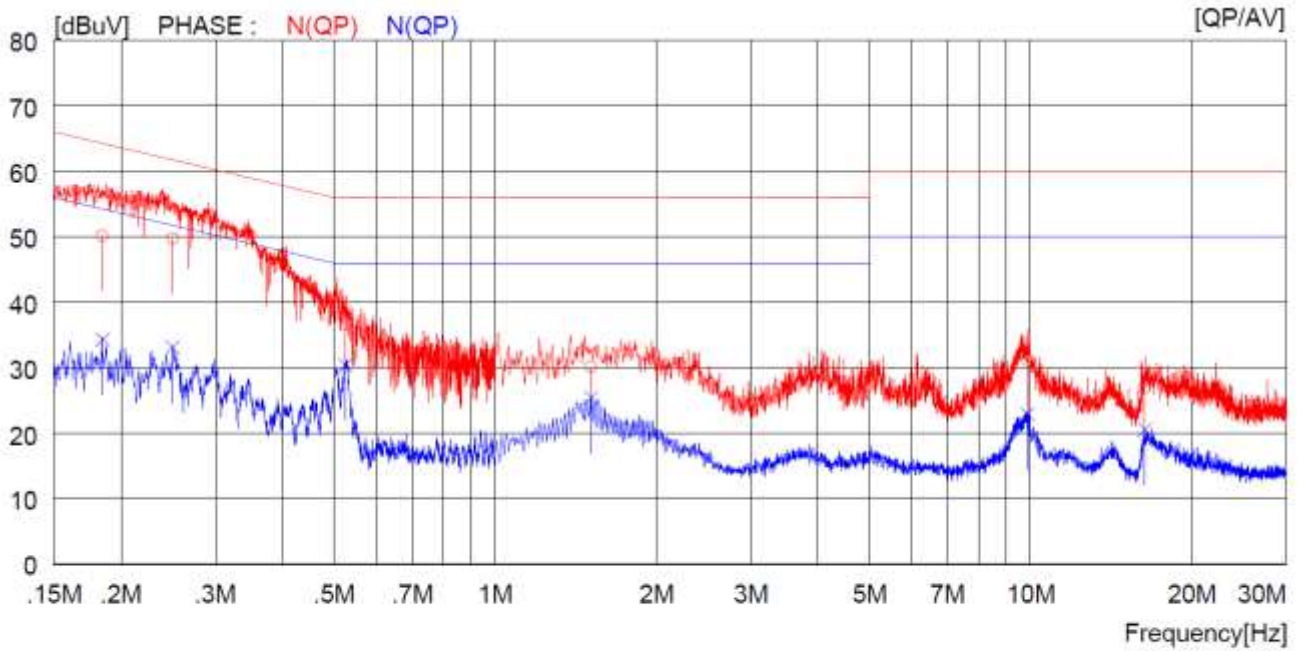
12.5.1 Test data for Bluetooth LE

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
		QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
		[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.20700	41.5	---	9.9	51.4	---	63.3	---	11.9	---	H(QP)	
2	0.25400	38.7	---	9.9	48.6	---	61.6	---	13.0	---	H(QP)	
3	0.52600	26.6	---	10.0	36.6	---	56.0	---	19.4	---	H(QP)	
4	1.42000	20.0	---	10.1	30.1	---	56.0	---	25.9	---	H(QP)	
5	9.30500	19.9	---	10.2	30.1	---	60.0	---	29.9	---	H(QP)	
6	16.71000	17.7	---	10.3	28.0	---	60.0	---	32.0	---	H(QP)	
7	0.20700	---	22.6	9.9	---	32.5	---	53.3	---	20.8	H(CAV)	
8	0.25400	---	23.1	9.9	---	33.0	---	51.6	---	18.6	H(CAV)	
9	0.52600	---	16.5	10.0	---	26.5	---	46.0	---	19.5	H(CAV)	
10	1.42000	---	15.0	10.1	---	25.1	---	46.0	---	20.9	H(CAV)	
11	9.30500	---	13.3	10.2	---	23.5	---	50.0	---	26.5	H(CAV)	
12	16.71000	---	12.3	10.3	---	22.6	---	50.0	---	27.4	H(CAV)	

- Tested Line : NEUTRAL LINE



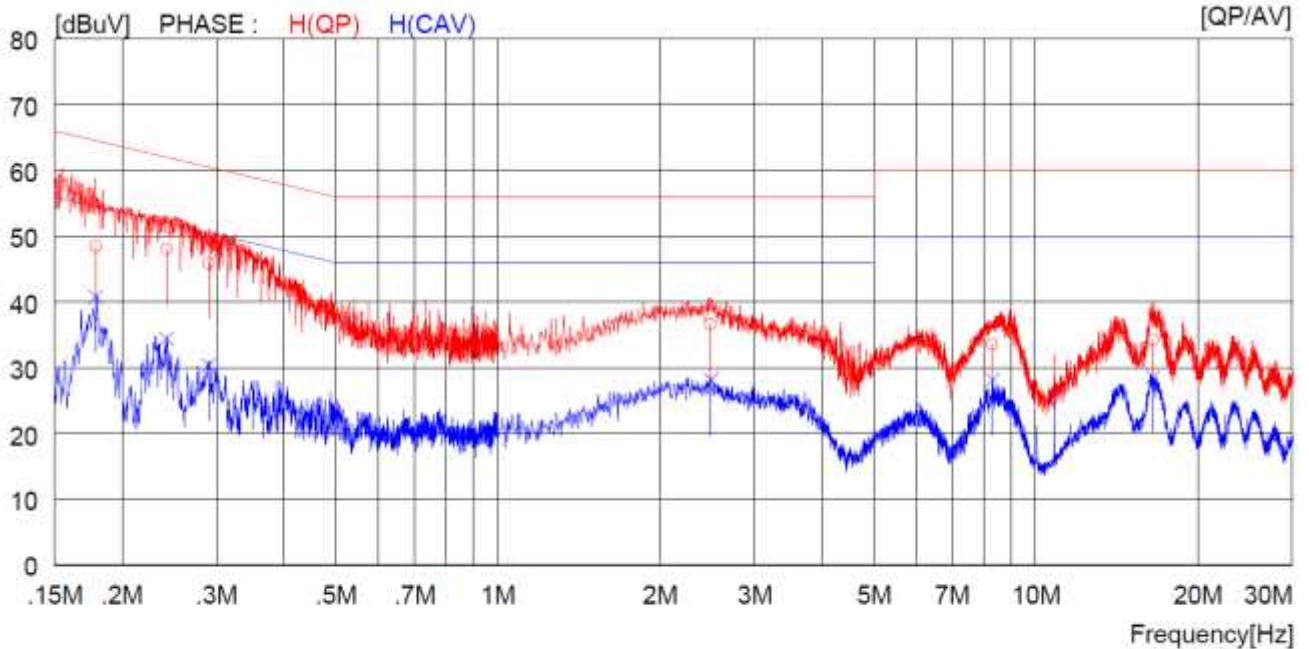
NO	FREQ [MHz]	READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
		QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
		[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.18500	40.1	---	10.0	50.1	---	64.3	---	14.2	---	N(QP)	
2	0.25000	39.8	---	9.9	49.7	---	61.8	---	12.1	---	N(QP)	
3	0.52500	26.6	---	10.0	36.6	---	56.0	---	19.4	---	N(QP)	
4	1.51200	20.0	---	10.1	30.1	---	56.0	---	25.9	---	N(QP)	
5	9.88000	20.9	---	10.2	31.1	---	60.0	---	28.9	---	N(QP)	
6	16.34000	16.6	---	10.3	26.9	---	60.0	---	33.1	---	N(QP)	
7	0.18500	---	24.3	10.0	---	34.3	---	54.3	---	20.0	N(CAV)	
8	0.25000	---	23.2	9.9	---	33.1	---	51.8	---	18.7	N(CAV)	
9	0.52500	---	20.4	10.0	---	30.4	---	46.0	---	15.6	N(CAV)	
10	1.51200	---	15.3	10.1	---	25.4	---	46.0	---	20.6	N(CAV)	
11	9.88000	---	12.7	10.2	---	22.9	---	50.0	---	27.1	N(CAV)	
12	16.34000	---	10.3	10.3	---	20.6	---	50.0	---	29.4	N(CAV)	

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

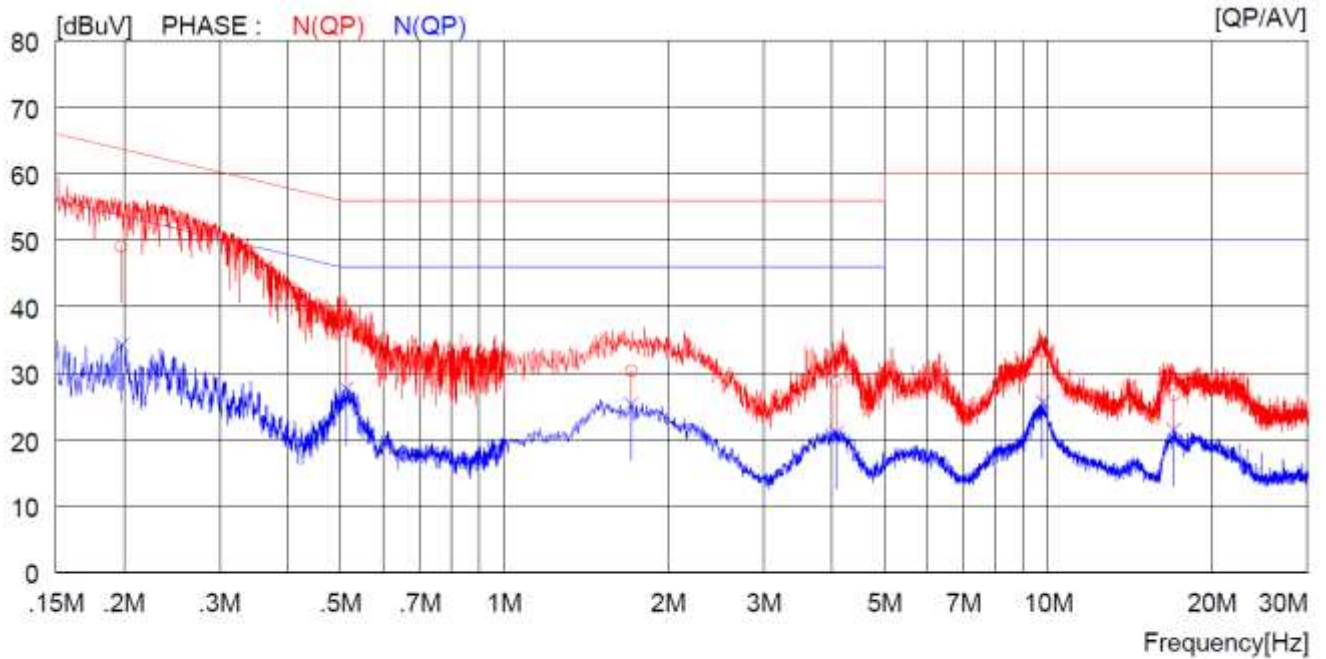
12.5.2 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ	READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
		QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.17900	38.4	---	10.0	48.4	---	64.5	---	16.1	---	H(QP)	
2	0.24200	38.1	---	9.9	48.0	---	62.0	---	14.0	---	H(QP)	
3	0.29000	36.0	---	9.9	45.9	---	60.5	---	14.6	---	H(QP)	
4	2.48800	26.5	---	10.1	36.6	---	56.0	---	19.4	---	H(QP)	
5	8.30500	23.3	---	10.2	33.5	---	60.0	---	26.5	---	H(QP)	
6	16.52000	24.0	---	10.3	34.3	---	60.0	---	25.7	---	H(QP)	
7	0.17900	---	30.8	10.0	---	40.8	---	54.5	---	13.7	H(CAV)	
8	0.24200	---	24.5	9.9	---	34.4	---	52.0	---	17.6	H(CAV)	
9	0.29000	---	20.5	9.9	---	30.4	---	50.5	---	20.1	H(CAV)	
10	2.48800	---	18.0	10.1	---	28.1	---	46.0	---	17.9	H(CAV)	
11	8.30500	---	17.9	10.2	---	28.1	---	50.0	---	21.9	H(CAV)	
12	16.52000	---	18.3	10.3	---	28.6	---	50.0	---	21.4	H(CAV)	

- Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.19800	39.0	----	10.0	49.0	----	63.7	----	14.7	----	N (QP)
2	0.51300	26.3	----	10.0	36.3	----	56.0	----	19.7	----	N (QP)
3	1.71200	20.2	----	10.1	30.3	----	56.0	----	25.7	----	N (QP)
4	4.08000	18.6	----	10.1	28.7	----	56.0	----	27.3	----	N (QP)
5	9.77000	23.0	----	10.2	33.2	----	60.0	----	26.8	----	N (QP)
6	17.03000	16.4	----	10.3	26.7	----	60.0	----	33.3	----	N (QP)
7	0.19800	----	24.2	10.0	----	34.2	----	53.7	----	19.5	N (CAV)
8	0.51300	----	17.6	10.0	----	27.6	----	46.0	----	18.4	N (CAV)
9	1.71200	----	15.2	10.1	----	25.3	----	46.0	----	20.7	N (CAV)
10	4.08000	----	11.0	10.1	----	21.1	----	46.0	----	24.9	N (CAV)
11	9.77000	----	15.4	10.2	----	25.6	----	50.0	----	24.4	N (CAV)
12	17.03000	----	11.2	10.3	----	21.5	----	50.0	----	28.5	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

13. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV40-N	Rohde & Schwarz	Signal Analyzer	102165	Apr. 20, 2020 (1Y)
ESW	Rohde & Schwarz	EMI Test Receiver	101851	Mar. 27, 2020 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 16, 2020 (1Y)
BBV 9718 B	Schwarzbeck	Broadband Preamplifier	00009	Mar. 16, 2020 (1Y)
SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Feb. 20, 2020 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 15, 2020 (1Y)
DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A
VULB9163	Schwarzbeck	TRILOG Broadband Antenna	777	Apr. 08, 2020 (2Y)
BBHA 9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 23, 2020 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2020(1Y)
ESCI	Rohde & Schwarz	Test Receiver	101012	Oct. 22, 2019 (1Y)
NSLK8126	Schwarzbeck	AMN	8126-404	Mar. 16, 2020 (1Y)
3825/2	EMCO	AMN	9109-1869	Mar. 16, 2020 (1Y)