

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

Test Report No. : OT-207-RWD-052
AGR No. : A207A-155
Applicant : LG Electronics USA, Inc.
Address : 111 Sylvan Ave, North Building, Englewood Cliffs, New Jersey, 07632, United States
Manufacturer : LG Electronics Inc.
Address : 222 LG-ro Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, Korea
Type of Equipment : Bluetooth Earbud
FCC ID. : ZNFHBSFN7
Model Name : TONE-FN7
Multiple Model Name : HBS-TFN7, HBS-FN7, HBS-FN7W
Serial number : N/A
Total page of Report : 79 pages (including this page)
Date of Incoming : July 13, 2020
Date of issue : July 29, 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.

Reviewed by: 

 Tae-Ho, Kim / Senior Manager
 ONETECH Corp.

Approved by: 

 Ki-Hong, Nam / General Manager
 ONETECH Corp.

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-207-RWD-052	July 29, 2020	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : LG Electronics USA, Inc.
 Address : 111 Sylvan Ave, North Building, Englewood Cliffs, New Jersey, 07632, United States
 Contact Person : Kyung-Su, Han / Director, Standards & Compliance
 Telephone No. : 201-266-2215
 FCC ID : ZNFHBSFN7
 Model Name : TONE-FN7
 Brand Name : -
 Serial Number : N/A
 Date : July 29, 2020

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Bluetooth Earbud
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	N/A (See Note)
15.203	Antenna Requirement	Met requirement / PASS

Note: This test is not performed because the EUT is wireless function does not work while charging mode.

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 LG Electronics USA, Inc., Model TONE-FN7 (referred to as the EUT in this report) is a Bluetooth Earbud. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Bluetooth Earbud		
Temperature Range	0 °C ~ 40 °C		
OPERATING FREQUENCY	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
	Bluetooth	2 402 MHz ~ 2 480 MHz	
MODULATION TYPE	Bluetooth LE	1 Mbps	GFSK
		2 Mbps	GFSK
	Bluetooth	1 Mbps	GFSK
		2 Mbps	$\pi/4$ -DQPSK
		3 Mbps	8-DPSK
RF OUTPUT POWER	Bluetooth LE	1 Mbps	6.33 dBm(Bluetooth Earbud LEFT)
			6.02 dBm(Bluetooth Earbud RIGHT)
		2 Mbps	6.28 dBm(Bluetooth Earbud LEFT)
			6.01 dBm(Bluetooth Earbud RIGHT)
	Bluetooth	1 Mbps	5.98 dBm(Bluetooth Earbud LEFT)
			5.87 dBm(Bluetooth Earbud RIGHT)
		2 Mbps	5.09 dBm(Bluetooth Earbud LEFT)
			5.20 dBm(Bluetooth Earbud RIGHT)
		3 Mbps	5.34 dBm(Bluetooth Earbud LEFT)
			5.47 dBm(Bluetooth Earbud RIGHT)
ANTENNA TYPE	FPCB Antenna		
ANTENNA GAIN	Bluetooth Earbud LEFT	1.31 dBi	
	Bluetooth Earbud RIGHT	1.43 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	26 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
TONE-FN7	Basic Model (UV-C LED: X)	<input type="checkbox"/>
HBS-TFN7	The models are identical to basic model but the use function is different. (UV-C LED: O)	<input type="checkbox"/>
HBS-FN7W	The models are identical to basic model but the use function is different. (UV-C LED: X)	<input type="checkbox"/>
HBS-FN7	The models are identical to basic model but the use function is different. (UV-C LED: O)	<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.

-. Earbud Cradle

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	LG Electronics Inc.	HBS-FN7 CRADLE MAIN V1.0	N/A
Battery	Spring power technology(ShenZhen)Co., Ltd	N/A	N/A

-. Bluetooth Earbud Left

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	LG Electronics Inc.	HBS-FN7 V1.0_DK06	N/A
Sub Board	N/A	V1.0_DK04	N/A
Touch Sensor	N/A	HBS_FN7 TOUCH V1.0A	N/A
Speaker	N/A	N/A	N/A
MIC	N/A	N/A	N/A
Battery	N/A	N/A	N/A
Antenna Board	N/A	HBS-FN6 Rev4.0A	N/A

-. Bluetooth Earbud Right

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	LG Electronics Inc.	HBS-FN7 V1.0DK06	N/A
Sub Board	N/A	V1.0BK04	N/A
Touch Sensor	N/A	HBS_FN7 TOUCH V1.0A	N/A
Speaker	N/A	N/A	N/A
MIC	N/A	N/A	N/A
Battery	N/A	N/A	N/A
Antenna Board	N/A	HBS-FN6 Rev4.0A	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
TONE-FN7	LG Electronics Inc.	Bluetooth Earbud (EUT)	-
HP ProtectSmart	HP	Notebook PC	Jig Board
PPP009C	LIE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	AC Adaptor	Notebook PC
UMFT234XD	FTDI Chip	Jig Board	EUT

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 “XZ” axis, but the worst data was recorded in this report.

- Channel List (Bluetooth LE)

Channel	Frequency[MHz]	Channel	Frequency[MHz]	Channel	Frequency[MHz]
0	2 402.00	14	2 430.00	28	2 458.00
1	2 404.00	15	2 432.00	29	2 460.00
2	2 406.00	16	2 434.00	30	2 462.00
3	2 408.00	17	2 436.00	31	2 464.00
4	2 410.00	18	2 438.00	32	2 466.00
5	2 412.00	19	2 440.00	33	2 468.00
6	2 414.00	20	2 442.00	34	2 470.00
7	2 416.00	21	2 444.00	35	2 472.00
8	2 418.00	22	2 446.00	36	2 474.00
9	2 420.00	23	2 448.00	37	2 476.00
10	2 422.00	24	2 450.00	38	2 478.00
11	2 424.00	25	2 452.00	39	2 480.00
12	2 426.00	26	2 454.00		
13	2 428.00	27	2 456.00		

-. Duty Cycle(Bluetooth Earbud LEFT)

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth LE [1 Mbps]	2.12	0.38	84.80	0.72
Bluetooth LE [2 Mbps]	1.07	0.81	56.91	2.45

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

Correction Factor : $10 * \log(1 / (Duty\ Cycle / 100))$

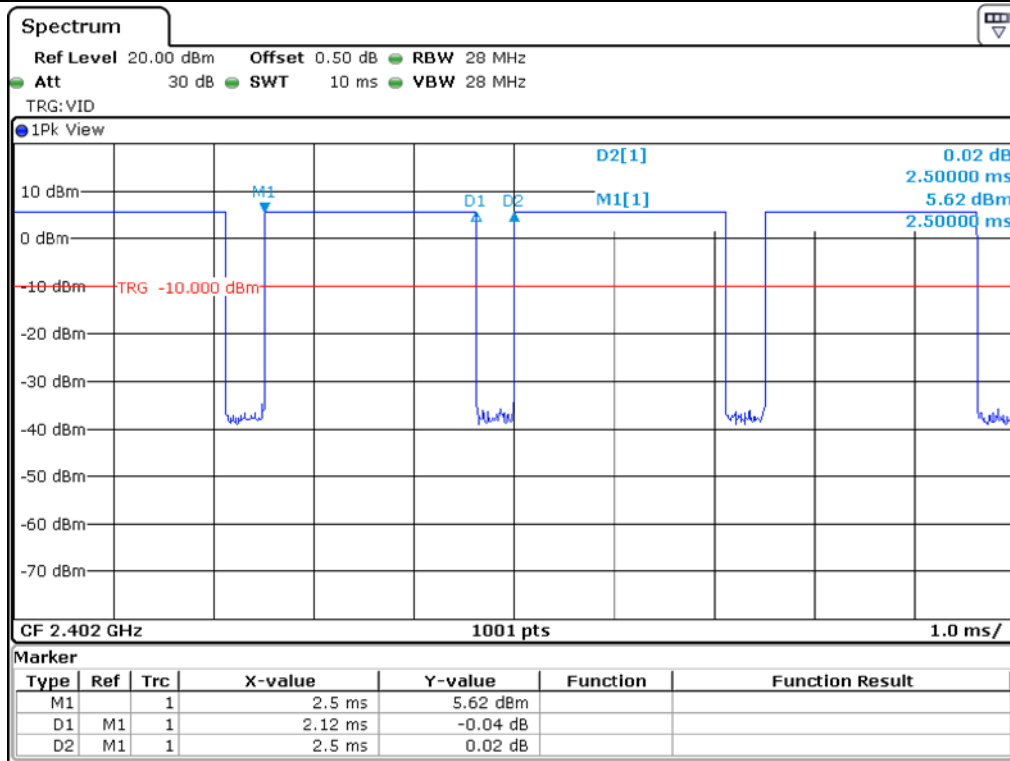
-. Duty Cycle(Bluetooth Earbud RIGHT)

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth LE [1 Mbps]	2.12	0.38	84.80	0.72
Bluetooth LE [2 Mbps]	1.06	0.82	56.38	2.49

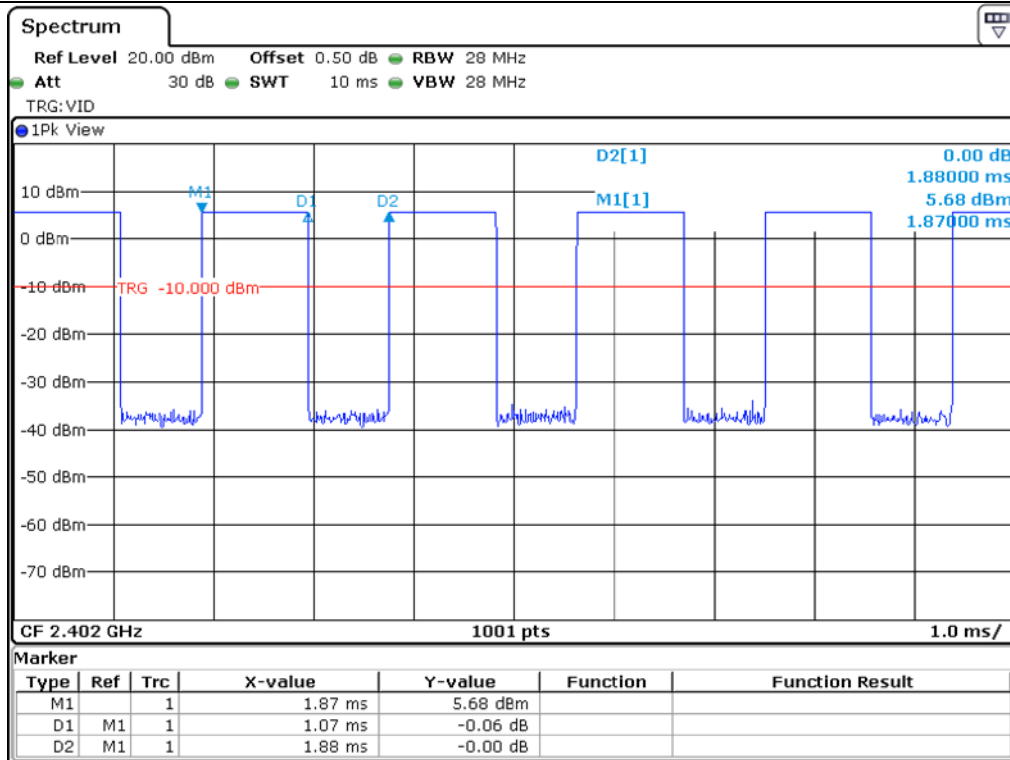
Note – Duty Cycle : $(Tx\ On\ Time / (Tx\ On\ Time + Tx\ Off\ Time)) * 100$

Correction Factor : $10 * \log(1 / (Duty\ Cycle / 100))$

-. Test Plot(Bluetooth Earbud LEFT)

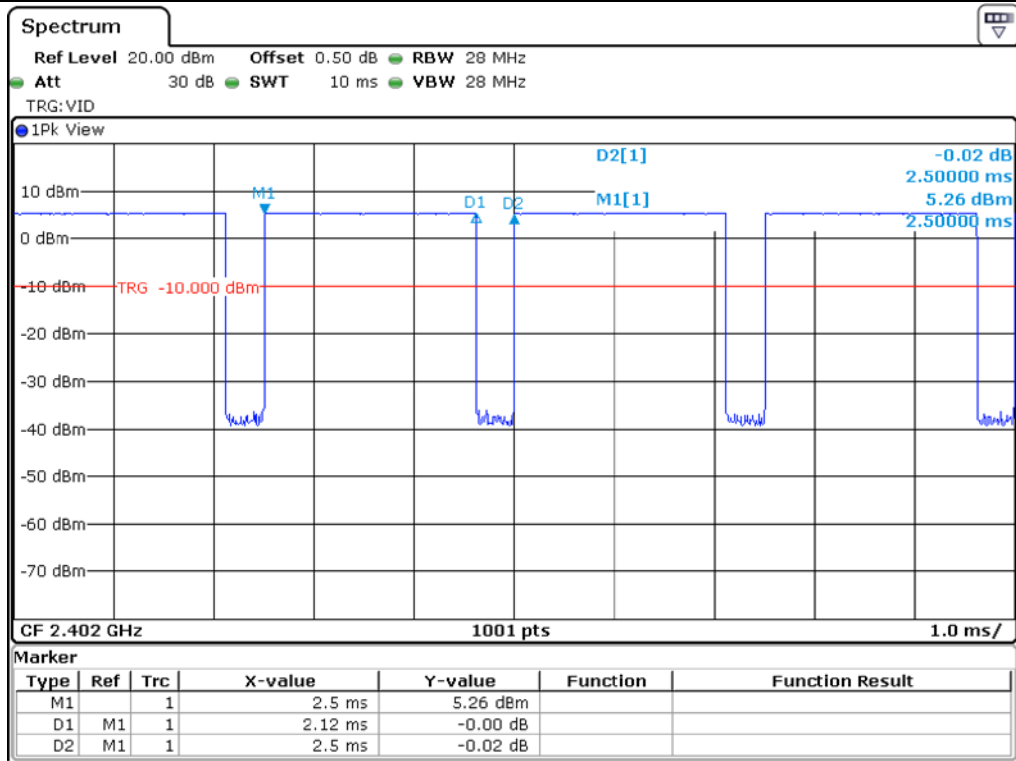


Bluetooth LE_1 Mbps

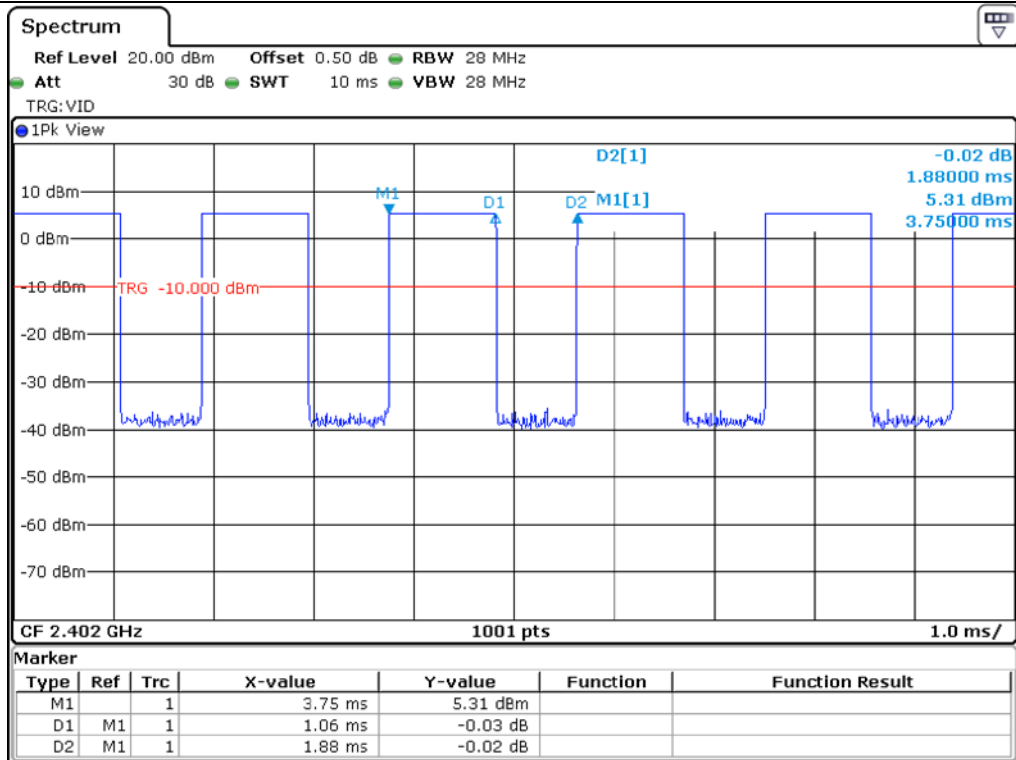


Bluetooth LE_2 Mbps

-. Test Plot(Bluetooth Earbud RIGHT)



Bluetooth LE_1 Mbps



Bluetooth LE_2 Mbps

5.4 Configuration of Test System

Line Conducted Test: This test is not performed because the EUT is wireless function does not work while charging mode.

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 10 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 FPCB 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)
This test is not performed because the EUT is wireless function does not work while charging mode.	

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

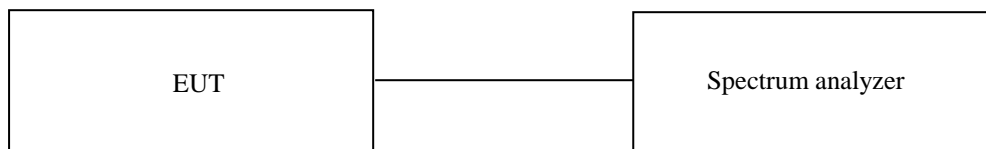
7. MINIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature : 23 °C
 Relative humidity : 45 % 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 equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Feb. 21, 2020 (1Y)

All test equipment used is calibrated on a regular basis.

7.4 Test data for 1 Mbps

7.4.1 Test data for Bluetooth Earbud LEFT

-. Test Date : July 13, 2020 ~ July 17, 2020

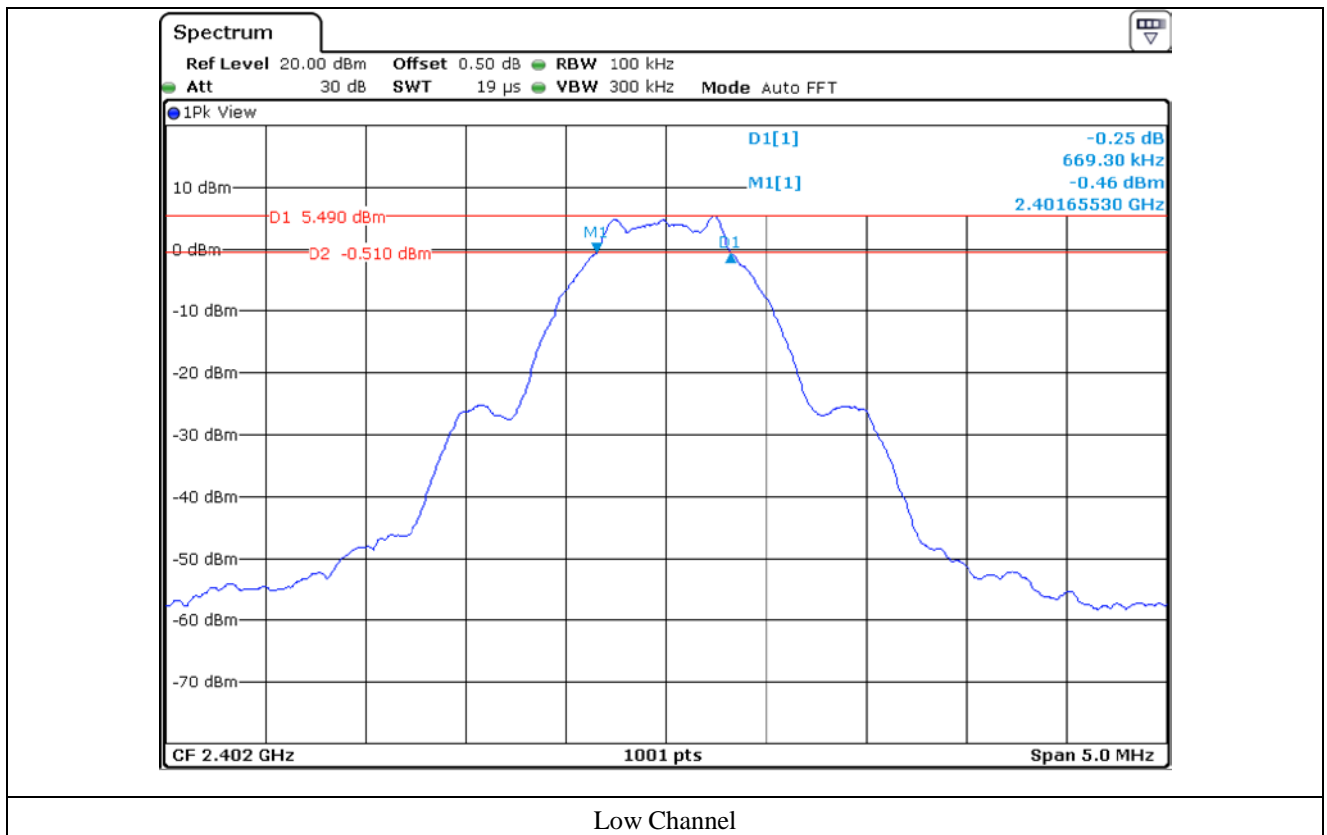
-. Test Result : Pass

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	669.30	500.00	169.30
Middle	2 440.00	679.30	500.00	179.30
High	2 480.00	679.30	500.00	179.30

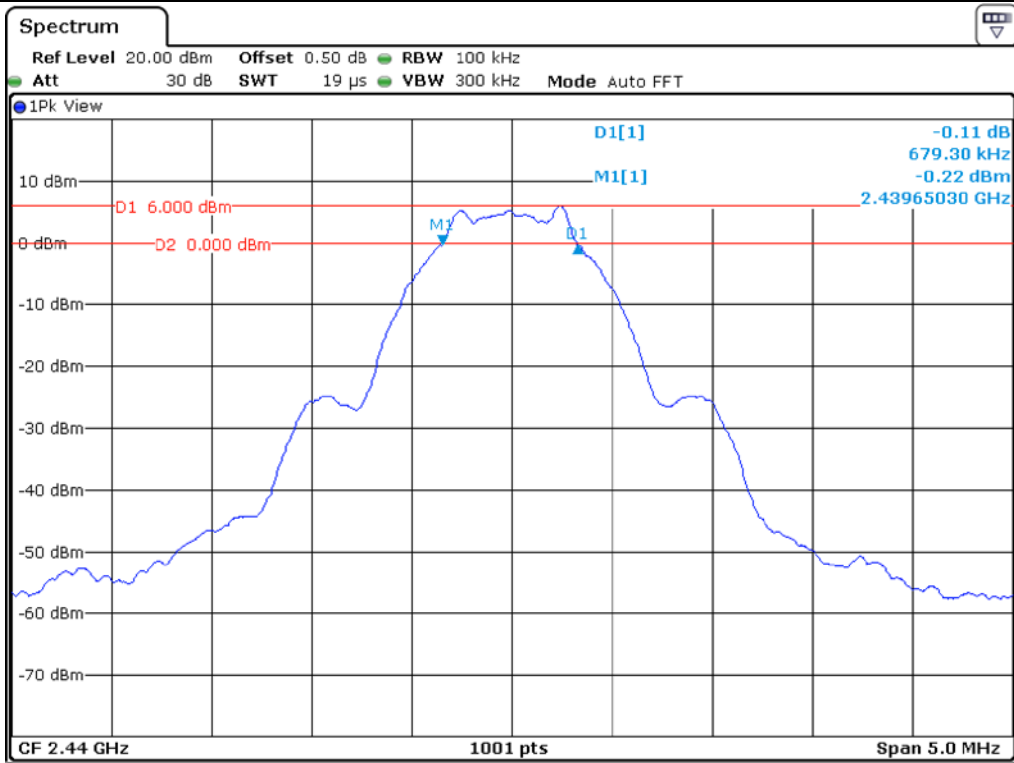
Remark. Margin = Measured Value - Limit



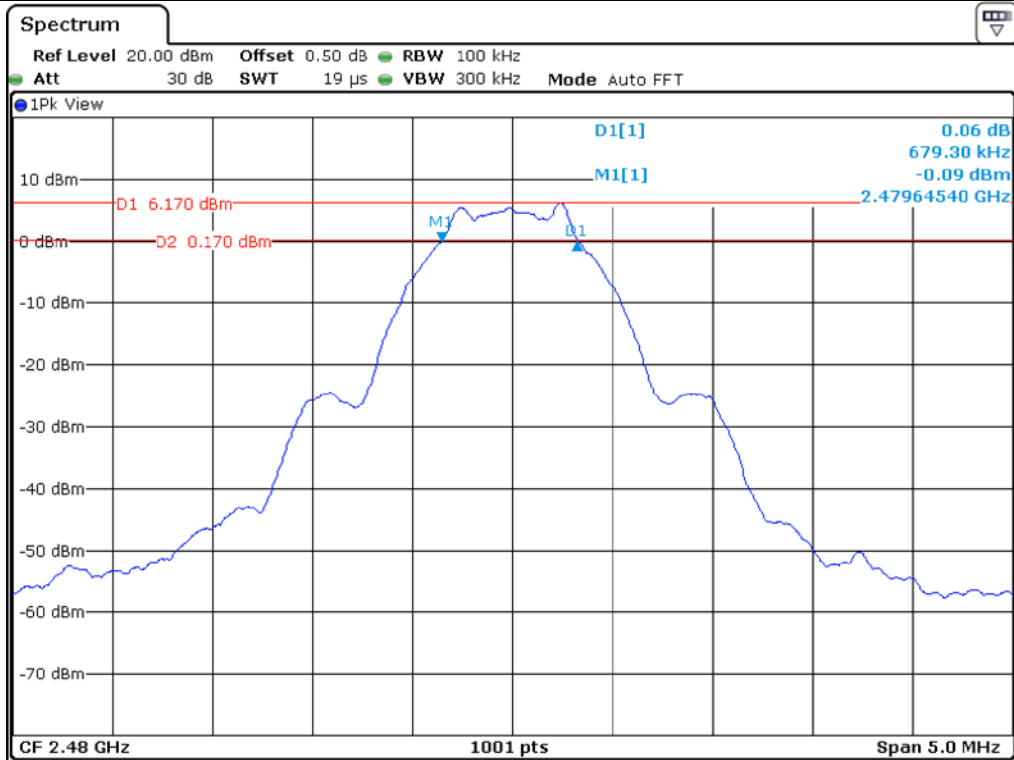
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

7.4.2 Test data for Bluetooth Earbud RIGHT

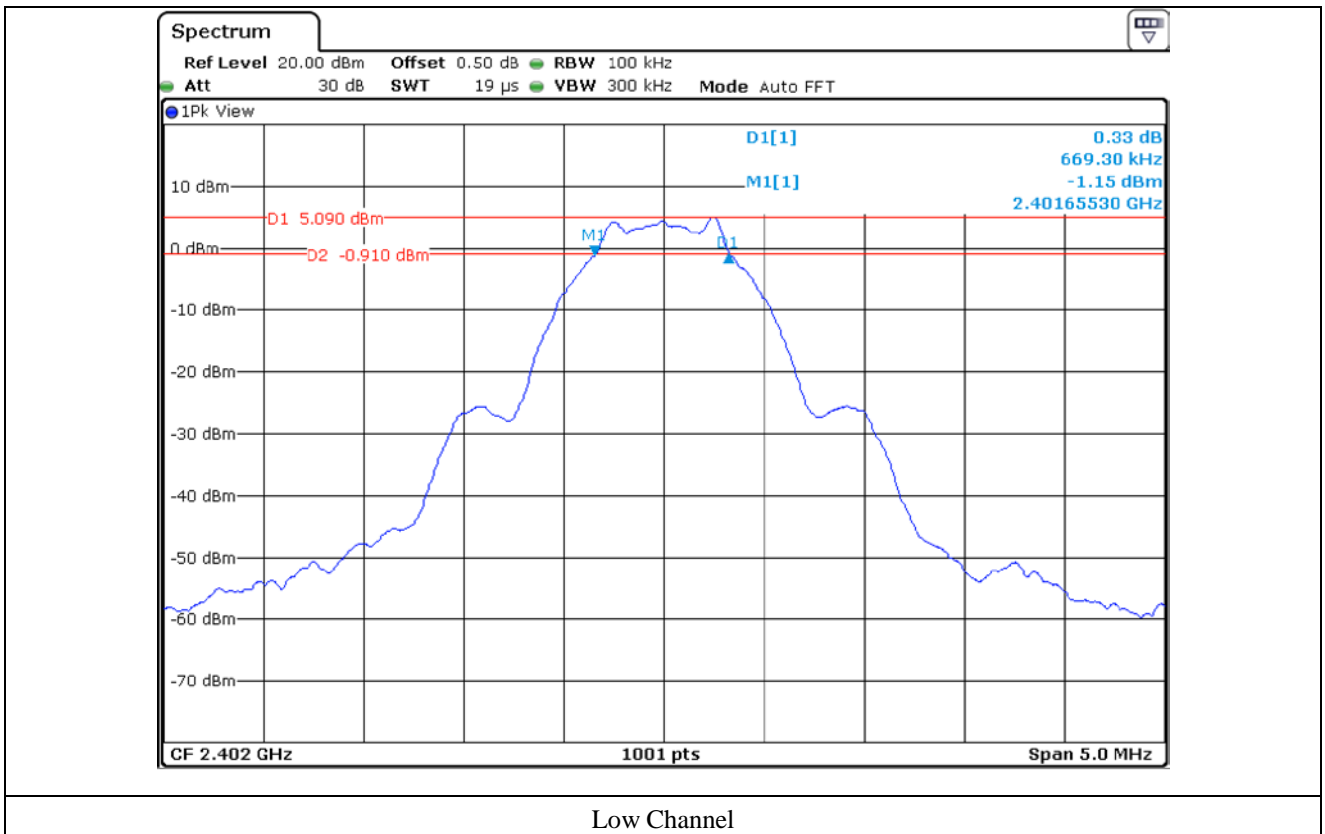
- Test Date : July 13, 2020 ~ July 17, 2020
 - Test Result : Pass

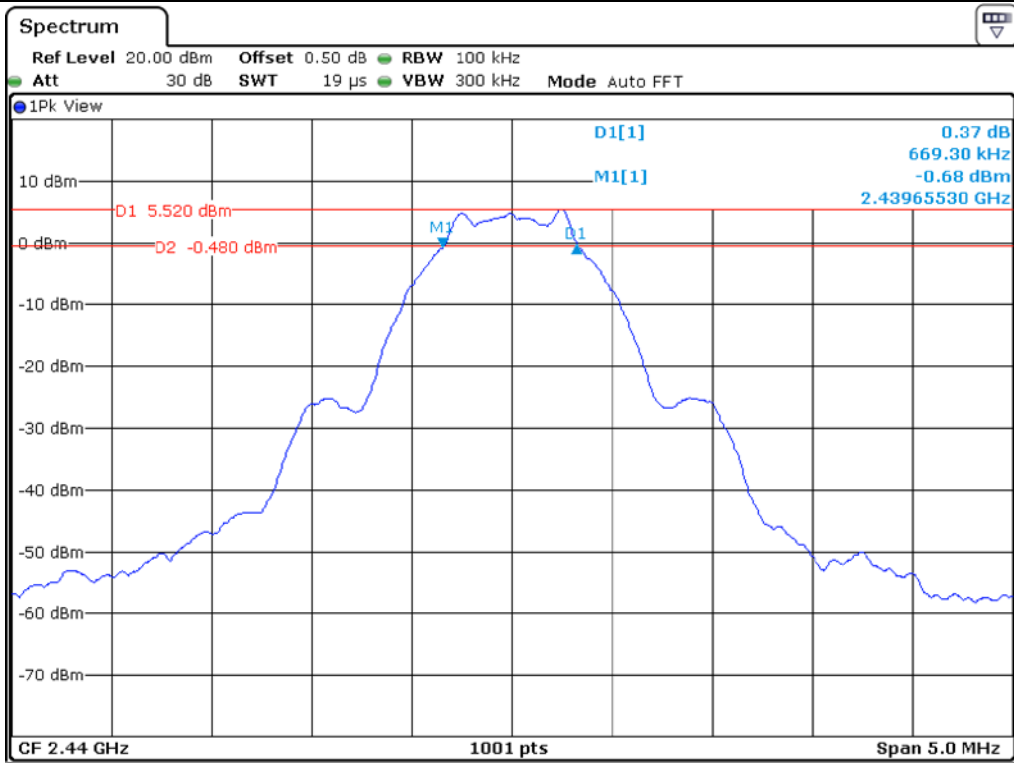
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	669.30	500.00	169.30
Middle	2 440.00	669.30	500.00	169.30
High	2 480.00	669.30	500.00	169.30

Remark. Margin = Measured Value - Limit

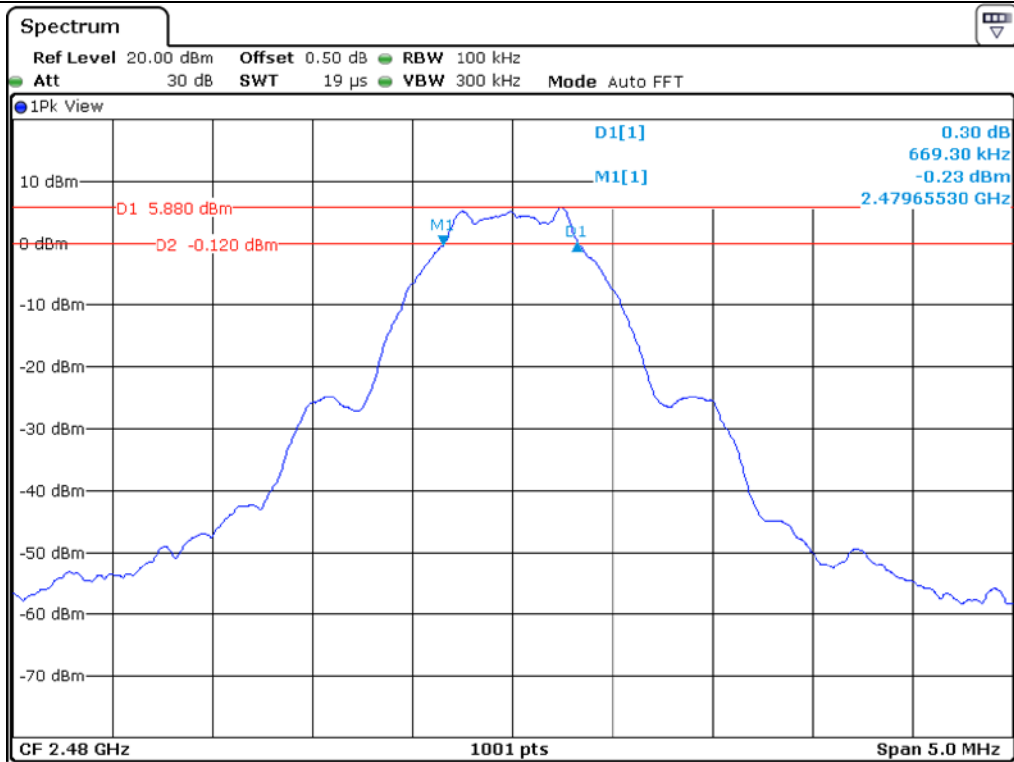


Tested by: Hyung-Kwon, Oh / Manager





Middle Channel



High Channel

7.5 Test data for 2 Mbps

7.5.1 Test data for Bluetooth Earbud LEFT

-. Test Date : July 13, 2020 ~ July 17, 2020

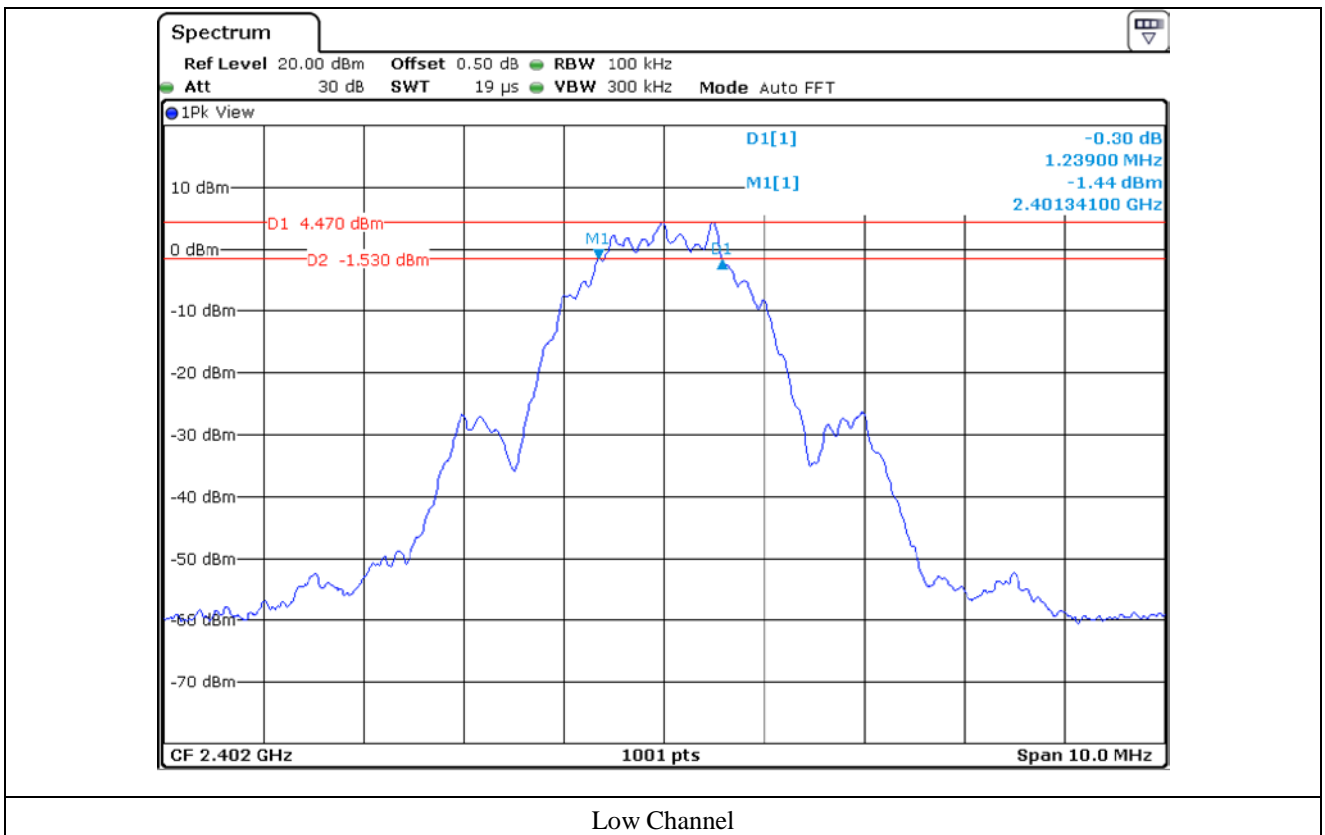
-. Test Result : Pass

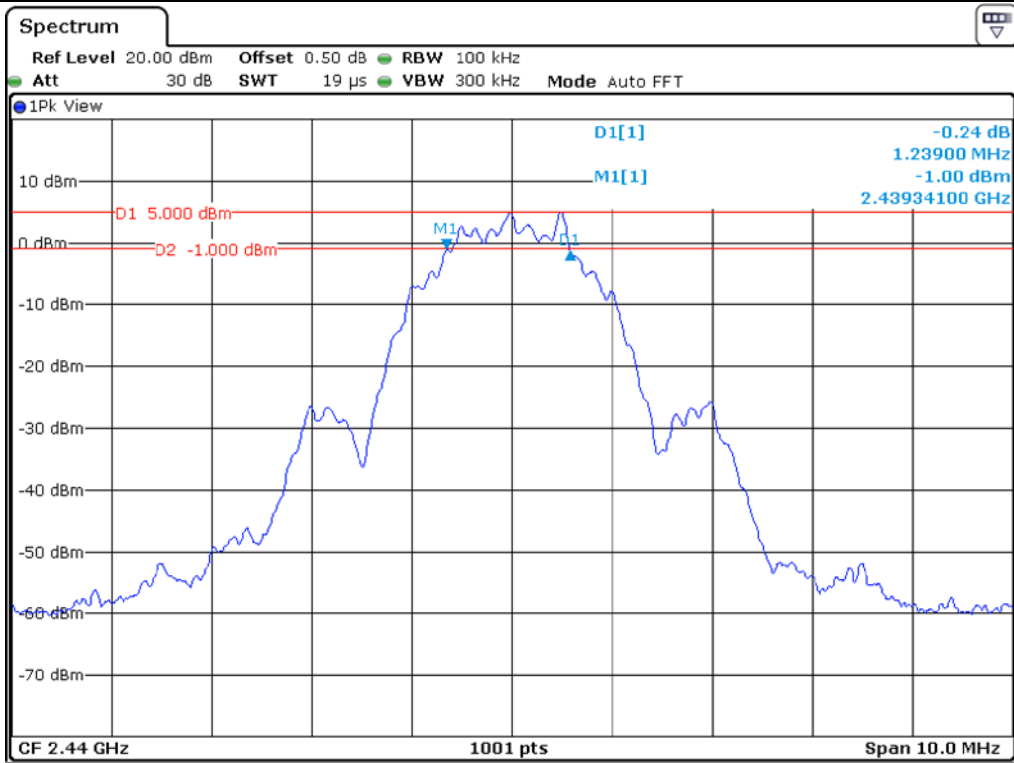
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	1 239.00	500.00	739.00
Middle	2 440.00	1 239.00	500.00	739.00
High	2 480.00	1 249.00	500.00	749.00

Remark. Margin = Measured Value - Limit

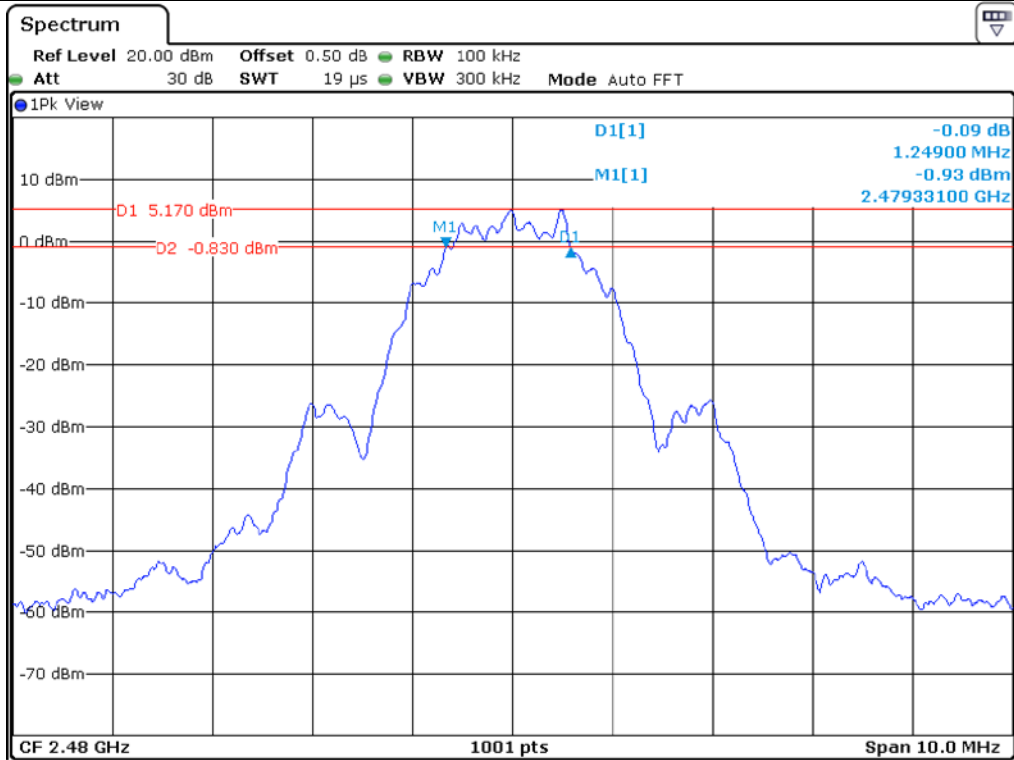


Tested by: Hyung-Kwon, Oh / Manager





Middle Channel



High Channel

7.5.2 Test data for Bluetooth Earbud RIGHT

-. Test Date : July 13, 2020 ~ July 17, 2020

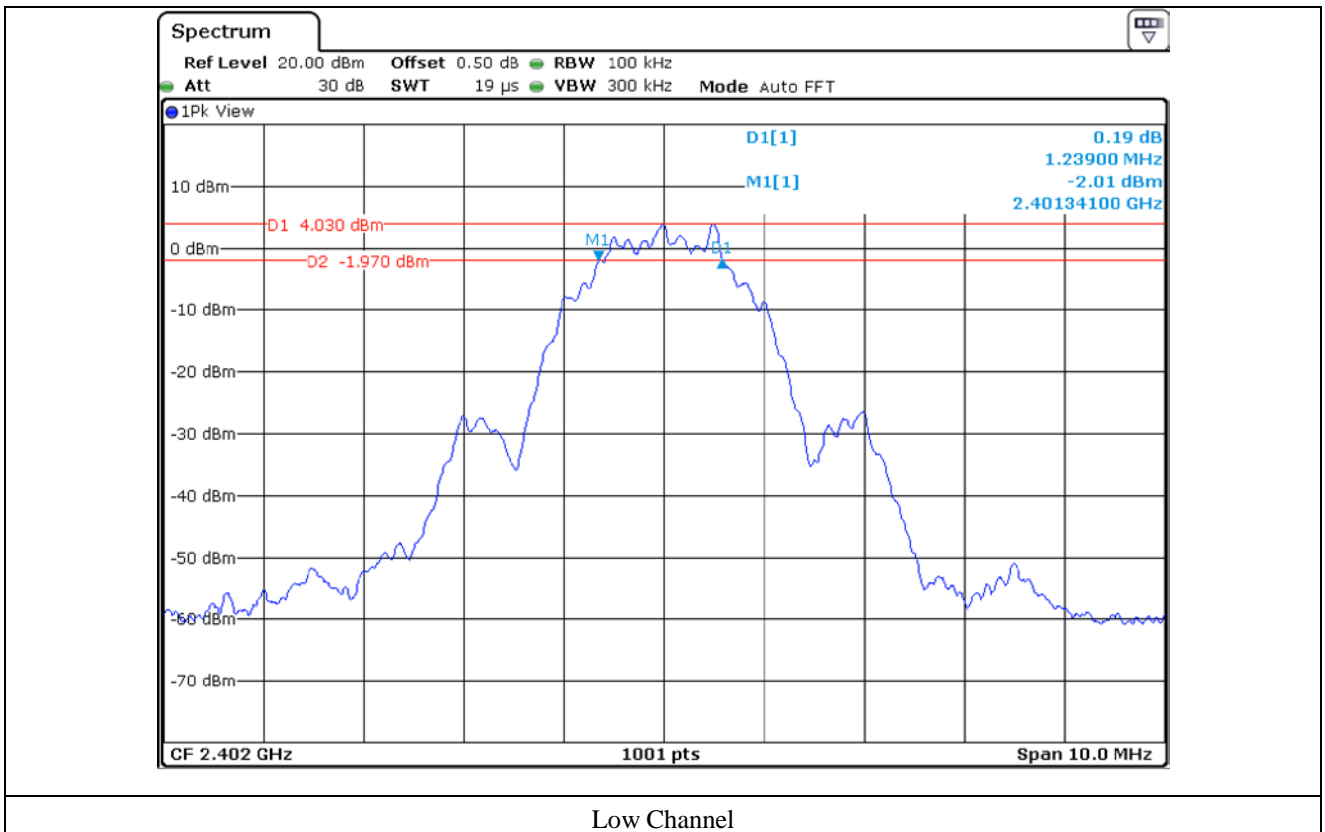
-. Test Result : Pass

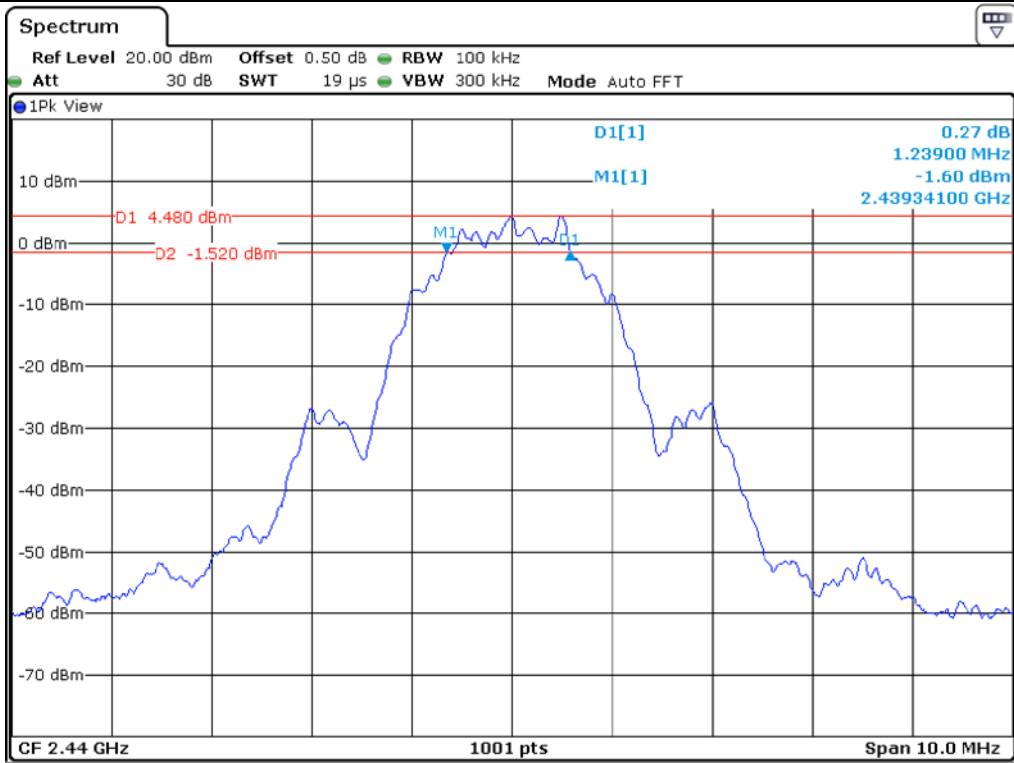
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	1 239.00	500.00	739.00
Middle	2 440.00	1 239.00	500.00	739.00
High	2 480.00	1 239.00	500.00	739.00

Remark. Margin = Measured Value - Limit

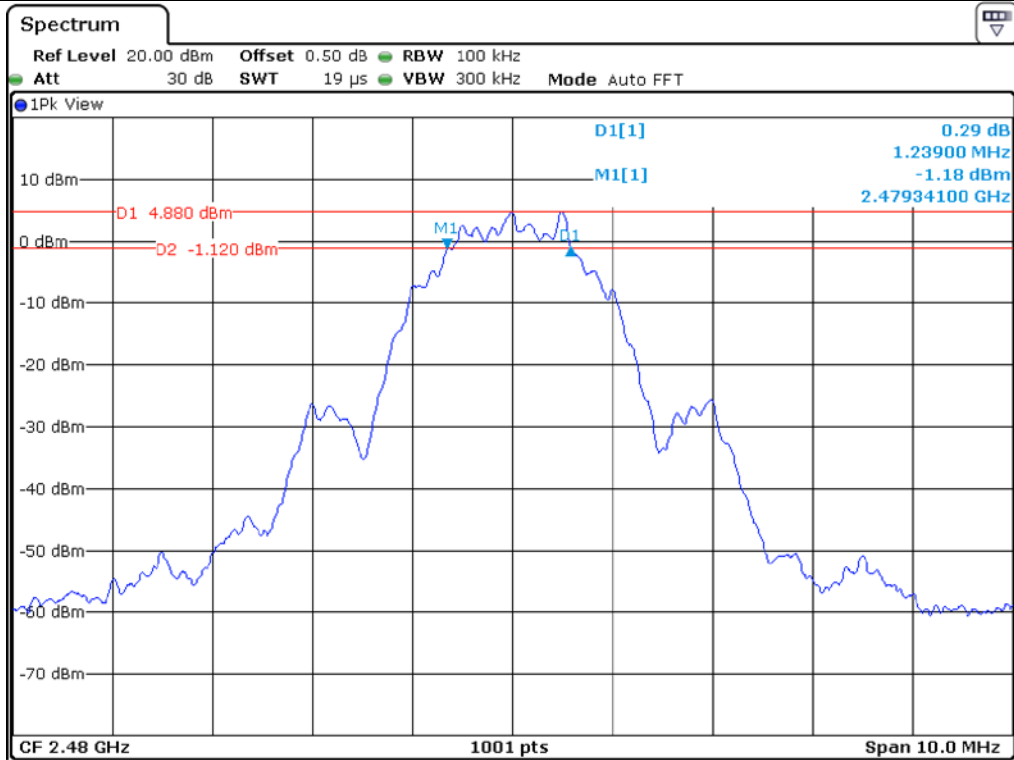


Tested by: Hyung-Kwon, Oh / Manager





Middle Channel



High Channel

8. MAXIMUM PEAK OUTPUT POWER

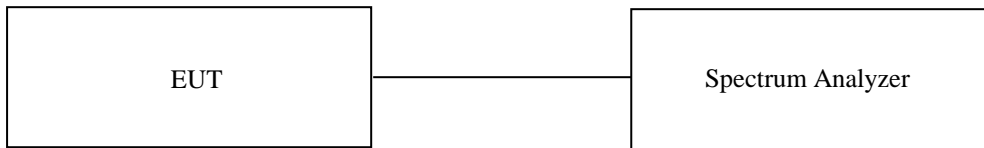
8.1 Operating environment

Temperature : 23 °C
 Relative humidity : 45 % 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 equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Feb. 21, 2020 (1Y)

All test equipment used is calibrated on a regular basis.

8.4 Test data for 1 Mbps

8.4.1 Test data for Bluetooth Earbud LEFT

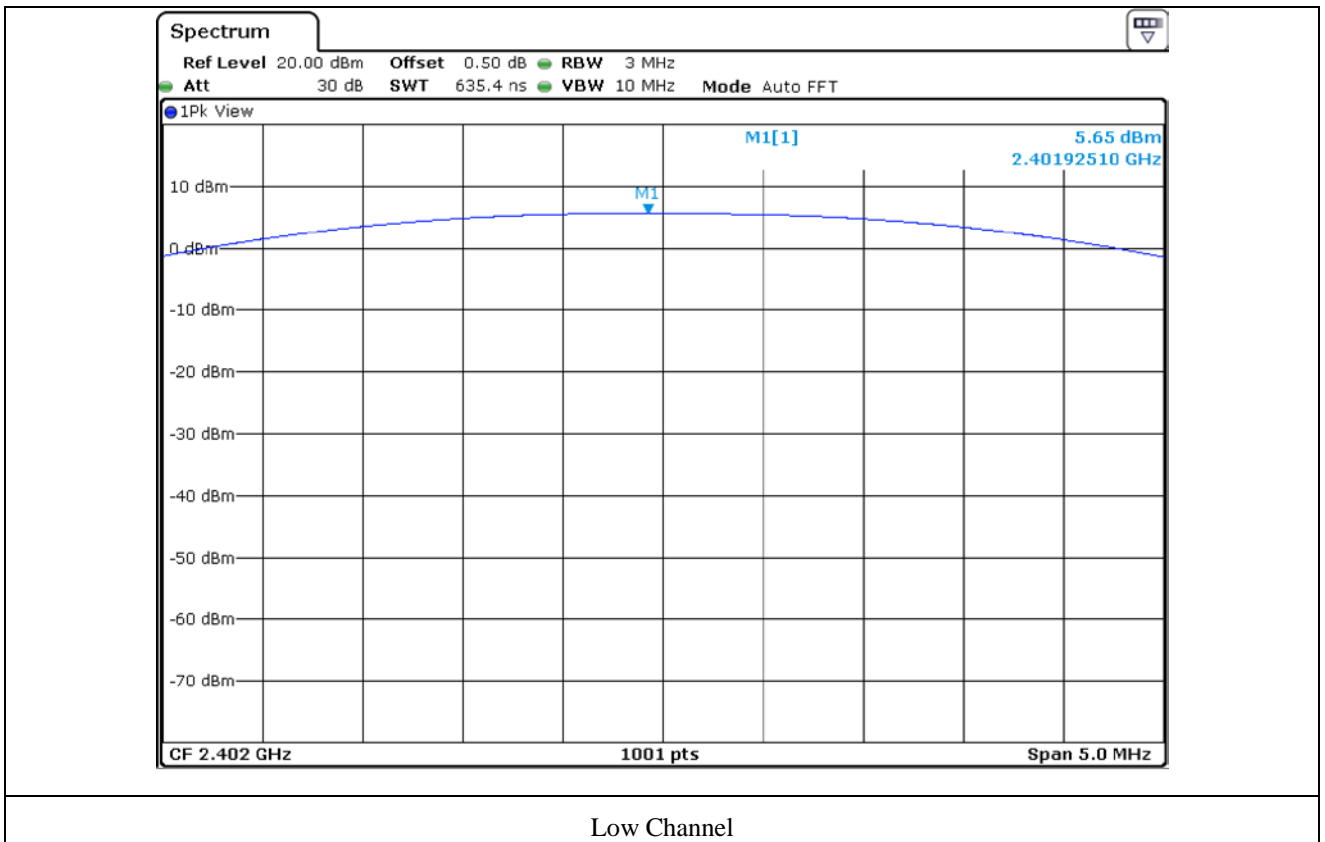
- Test Date : July 13, 2020 ~ July 17, 2020

- Test Result : Pass

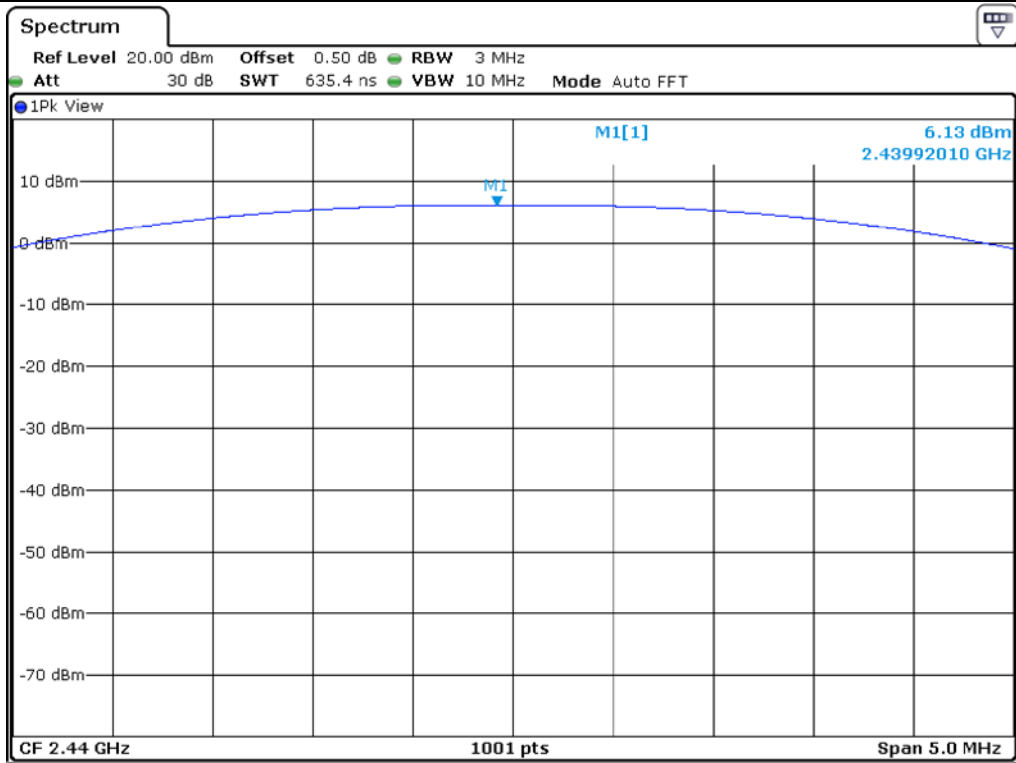
CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	5.65	30.00	24.35
MIDDLE	2 440.00	6.13	30.00	23.87
HIGH	2 480.00	6.33	30.00	23.67

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

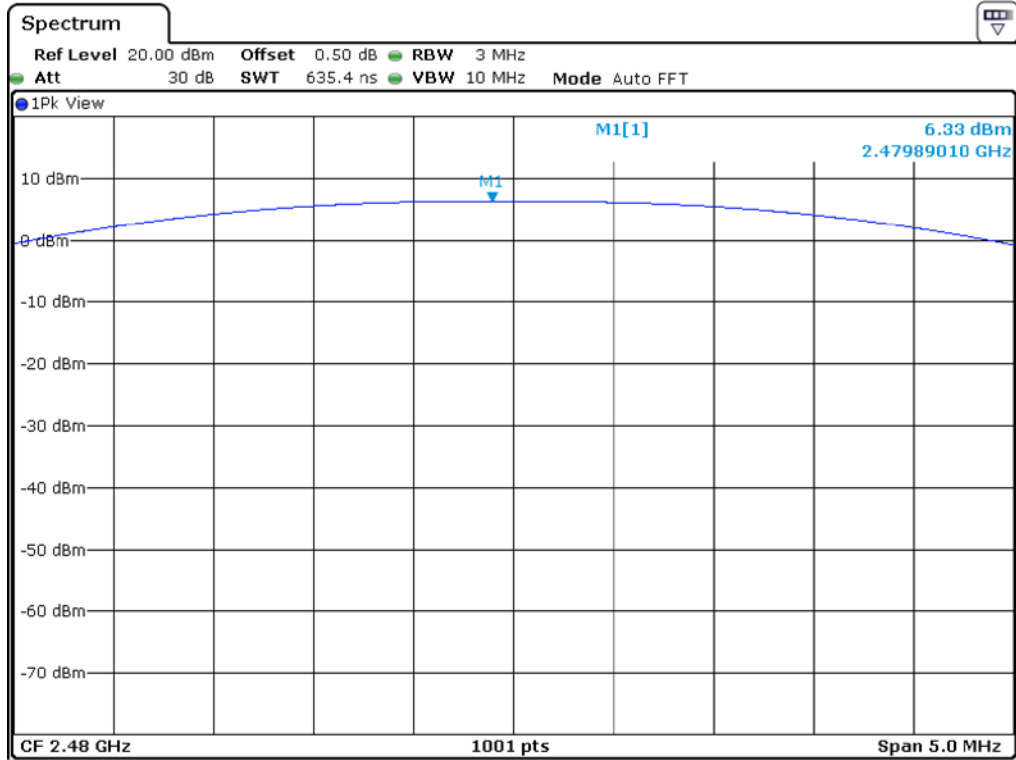
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

8.4.2 Test data for Bluetooth Earbud RIGHT

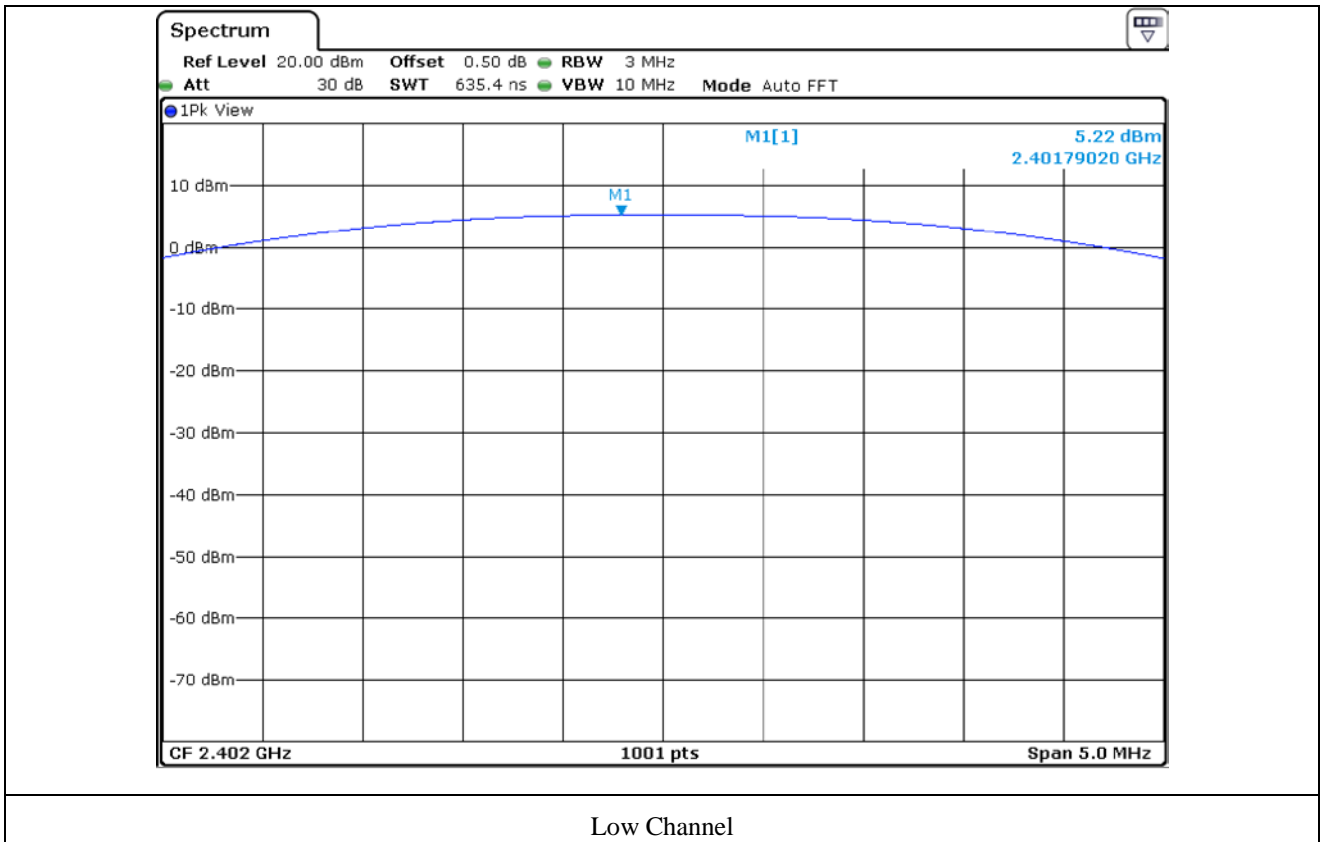
- Test Date : July 13, 2020 ~ July 17, 2020
- Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	5.22	30.00	24.78
MIDDLE	2 440.00	5.66	30.00	24.34
HIGH	2 480.00	6.02	30.00	23.98

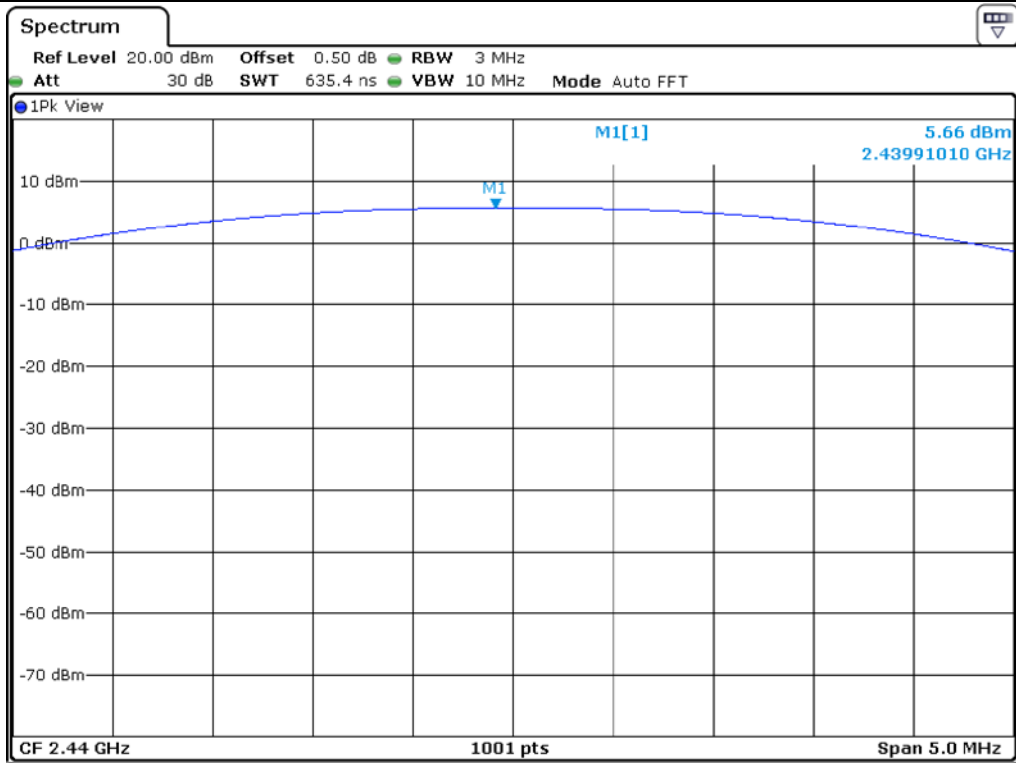
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



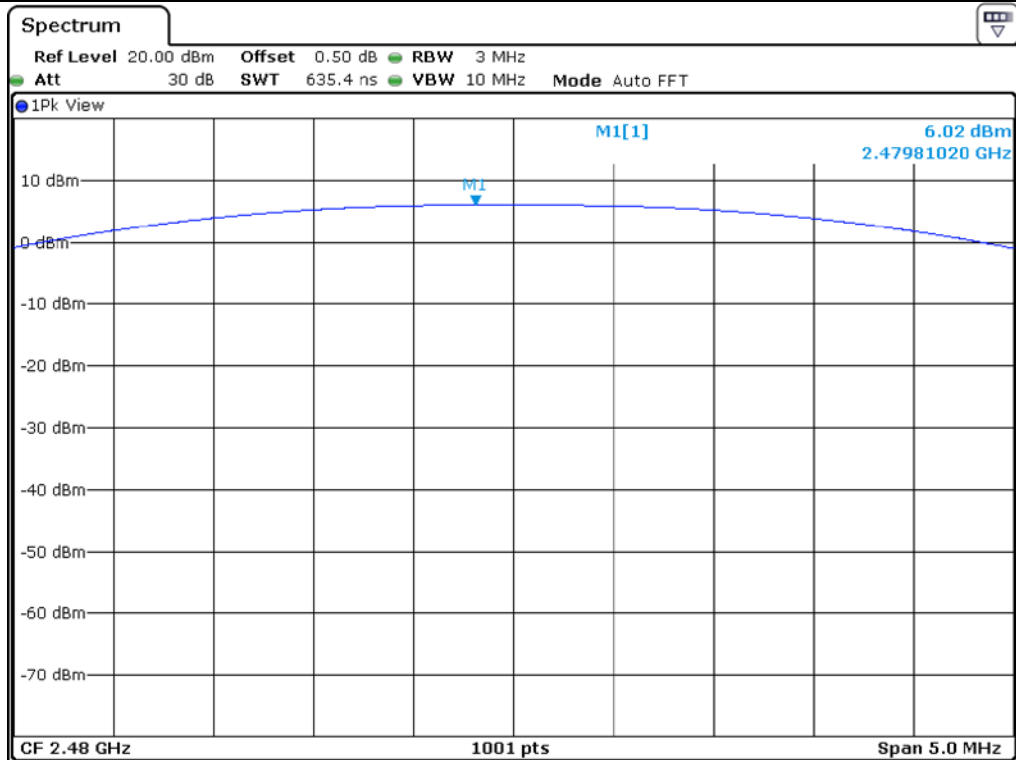
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

8.5 Test data for 2 Mbps

8.5.1 Test data for Bluetooth Earbud LEFT

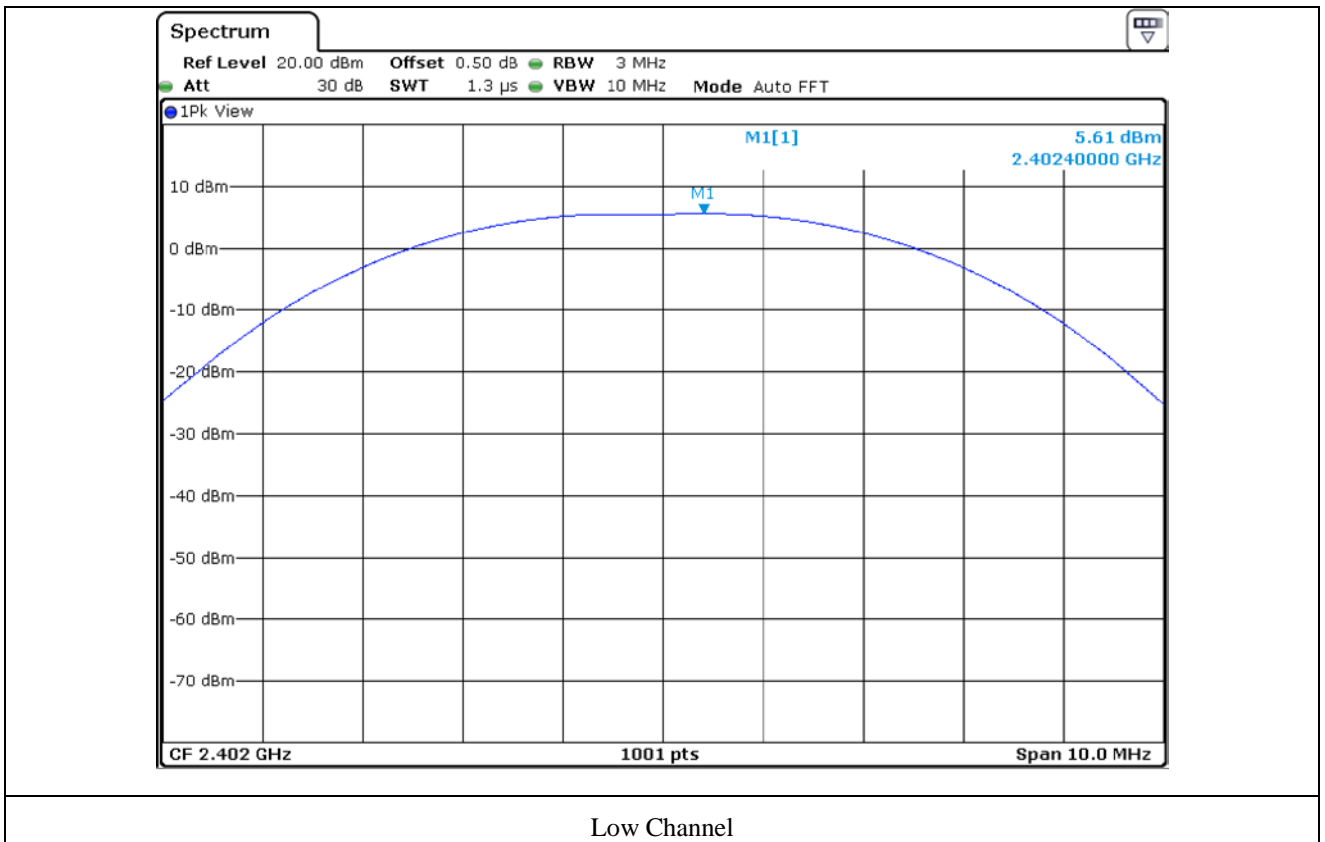
-. Test Date : July 13, 2020 ~ July 17, 2020

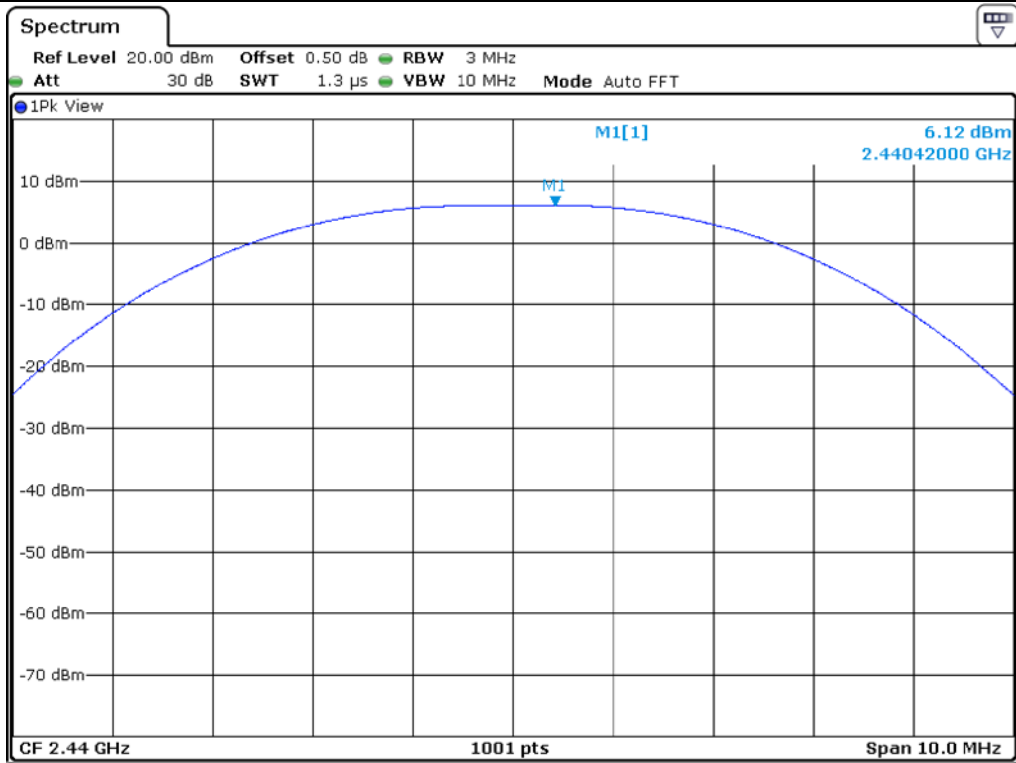
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	5.61	30.00	24.39
MIDDLE	2 440.00	6.12	30.00	23.88
HIGH	2 480.00	6.28	30.00	23.72

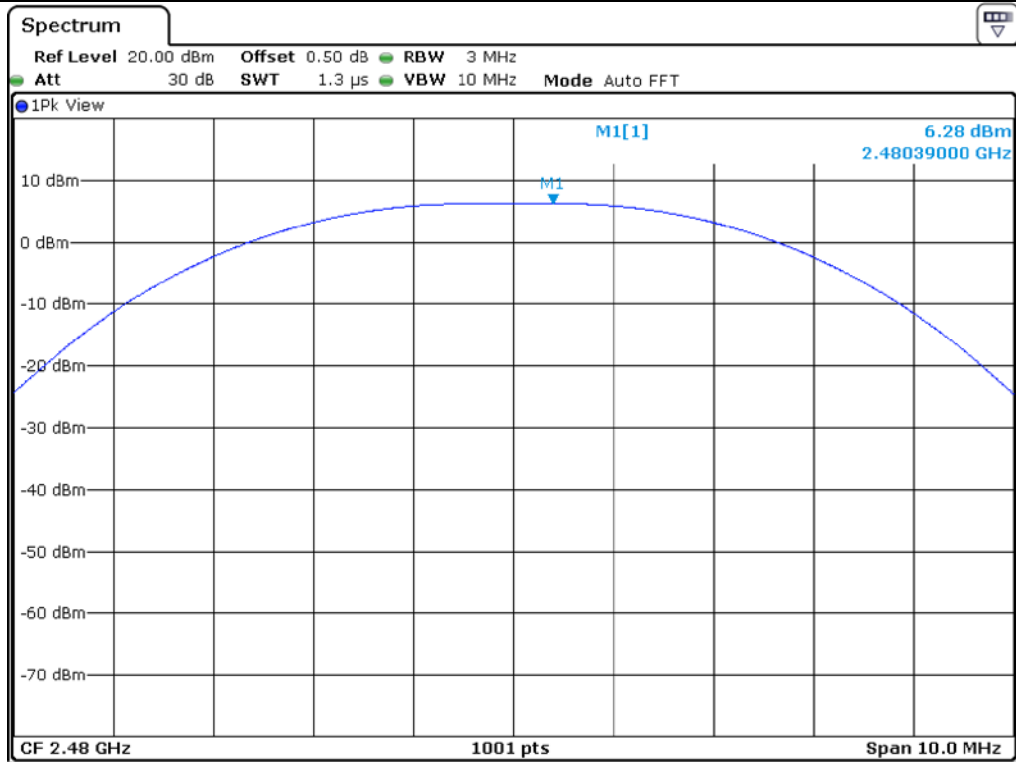
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Tested by: Hyung-Kwon, Oh / Manager





Middle Channel



High Channel

8.5.2 Test data for Bluetooth Earbud RIGHT

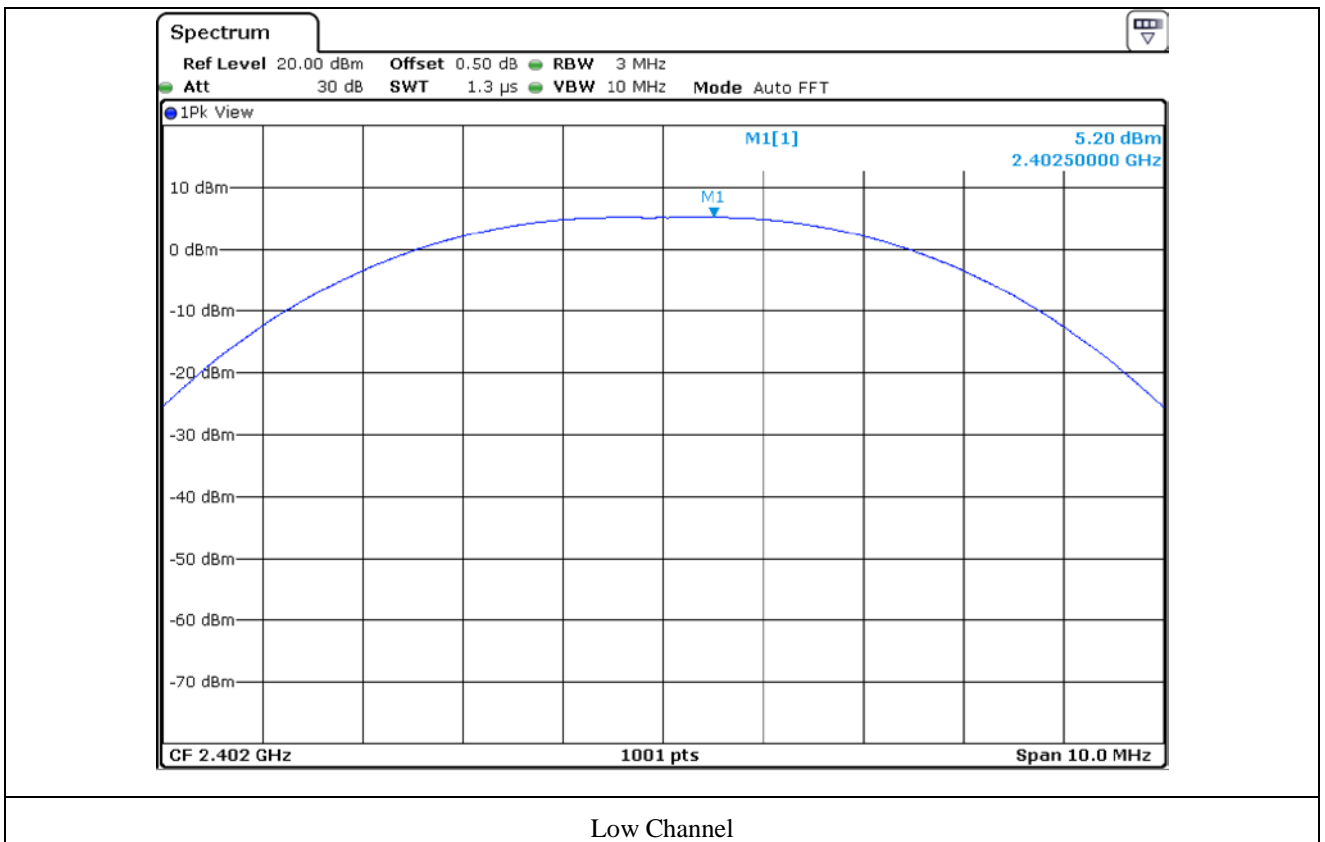
- Test Date : July 13, 2020 ~ July 17, 2020
 - Test Result : Pass

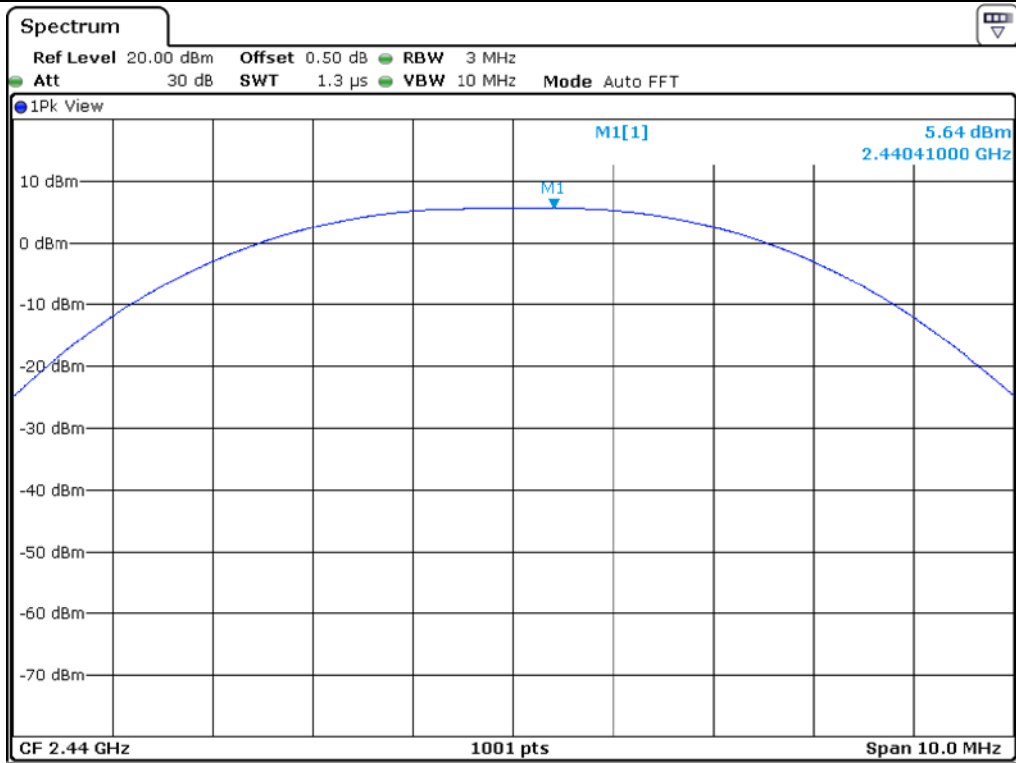
CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	5.20	30.00	24.80
MIDDLE	2 440.00	5.64	30.00	24.36
HIGH	2 480.00	6.01	30.00	23.99

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

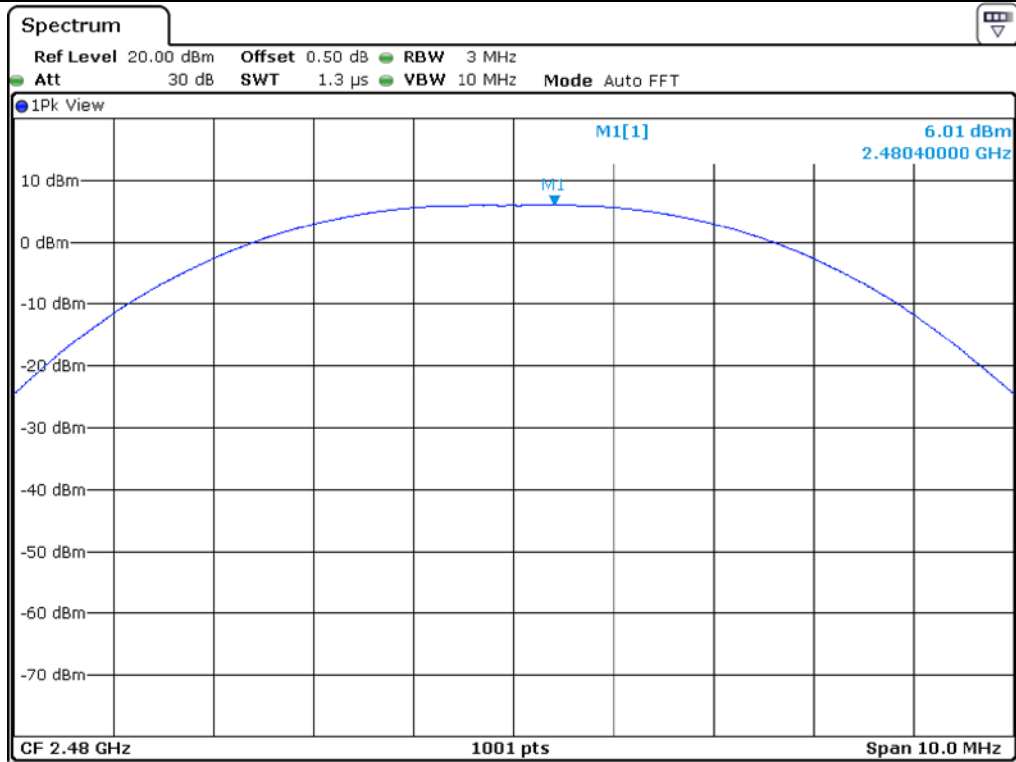


Tested by: Hyung-Kwon, Oh / Manager





Middle Channel



High Channel

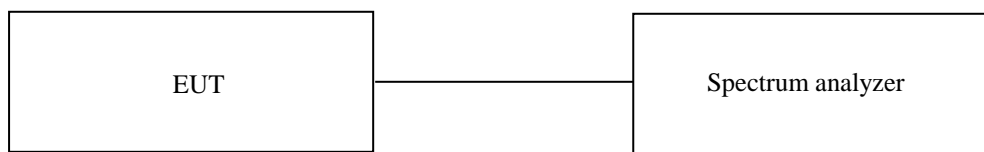
9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature : 23 °C
 Relative humidity : 45 % 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 10 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 equipment used

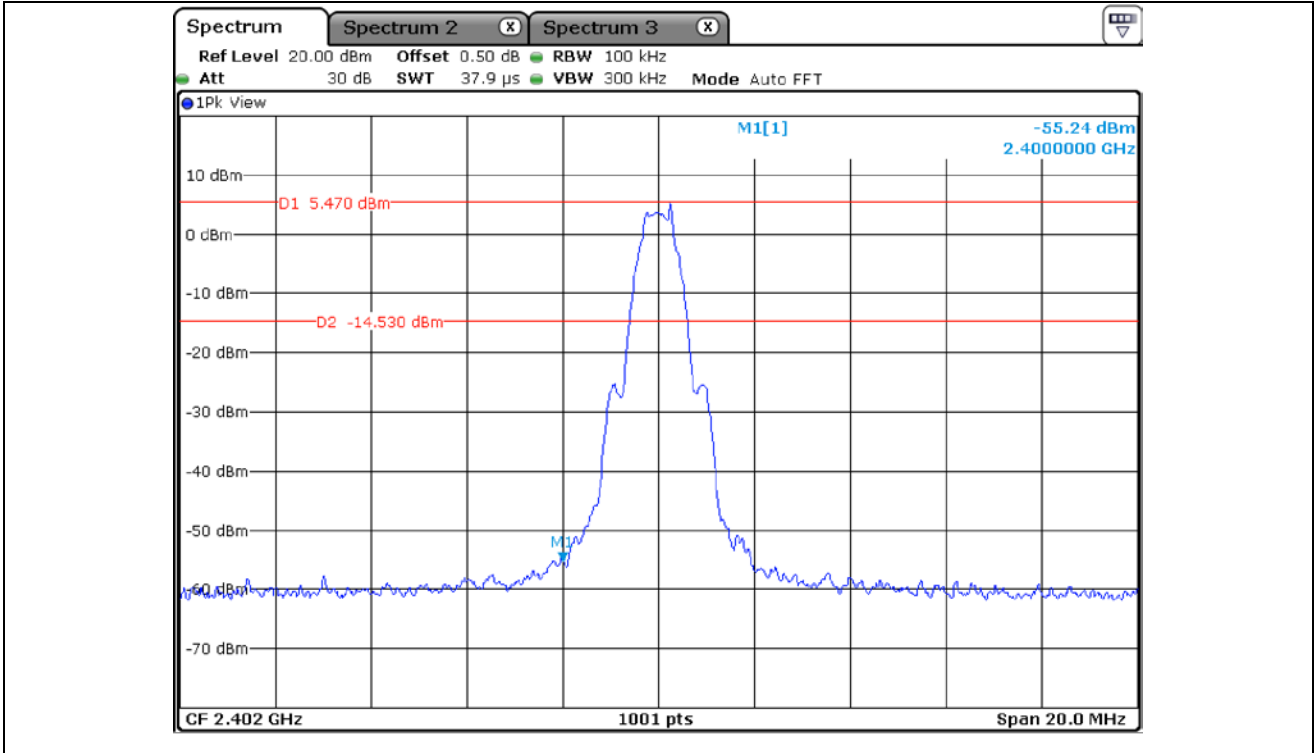
Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Feb. 21, 2020 (1Y)
■ - ESW	Rohde & Schwarz	EMI Test Receiver	101851	Aug. 07, 2019 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 16, 2020 (1Y)
■ - BBV 9718 B	Schwarzbeck	Broadband 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. 24, 2019(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)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 23, 2020 (1Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2020(1Y)

All test equipment used is calibrated on a regular basis.

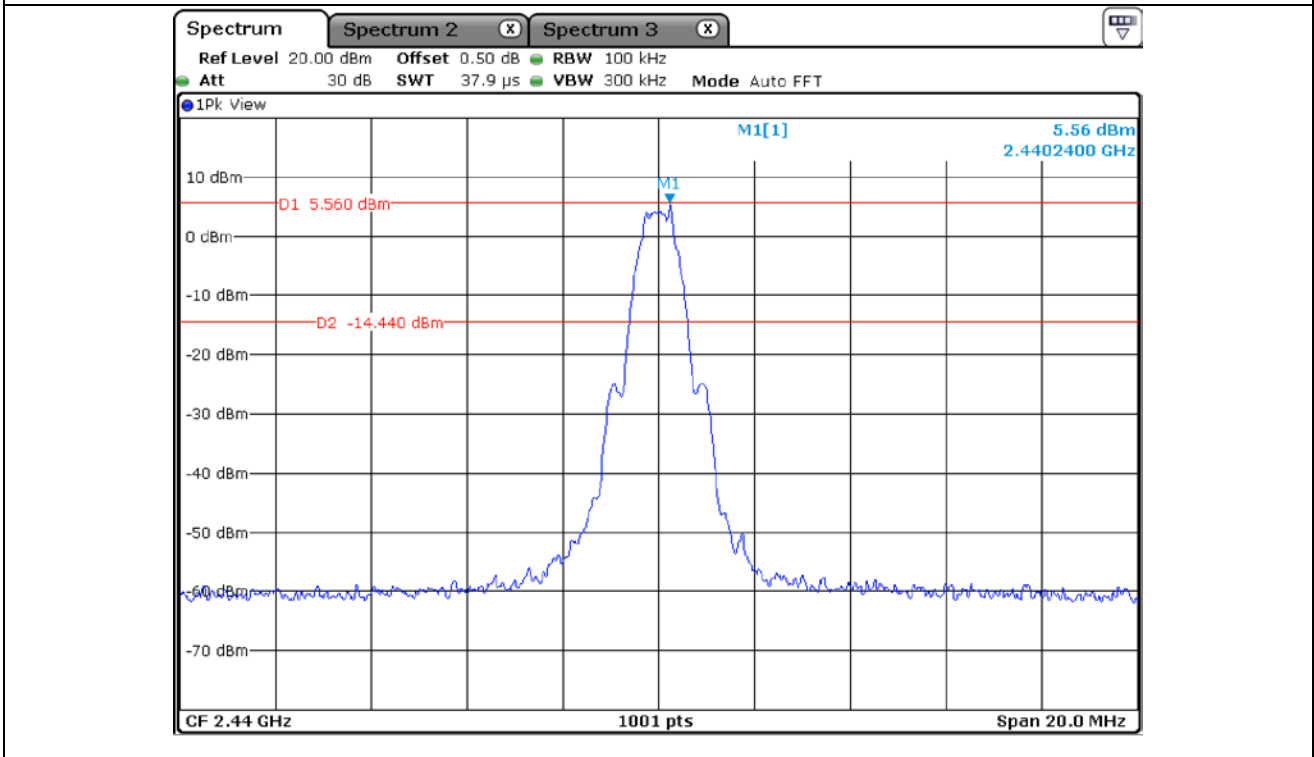
9.5 Test data for conducted emission

9.5.1 Test data for 1 Mbps

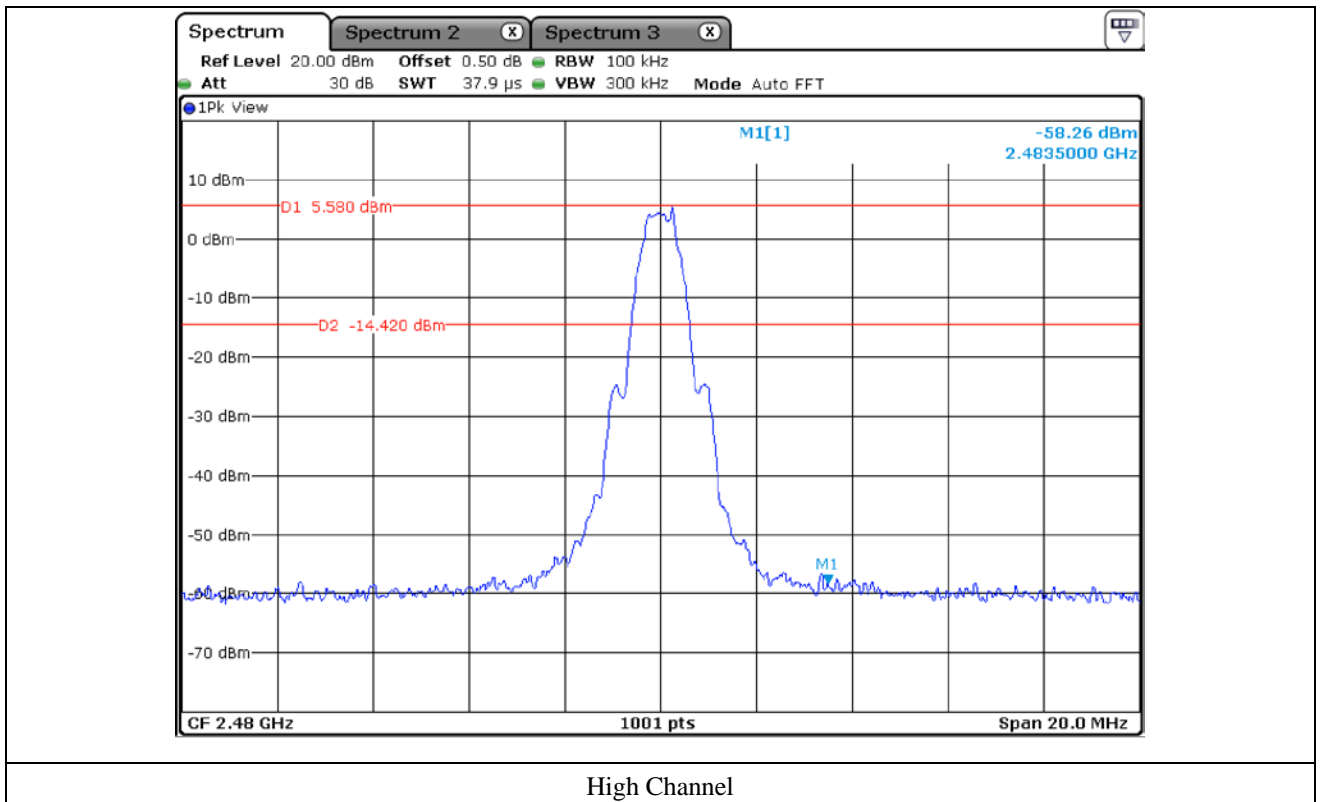
9.5.1.1 Test data for Bluetooth Earbud LEFT



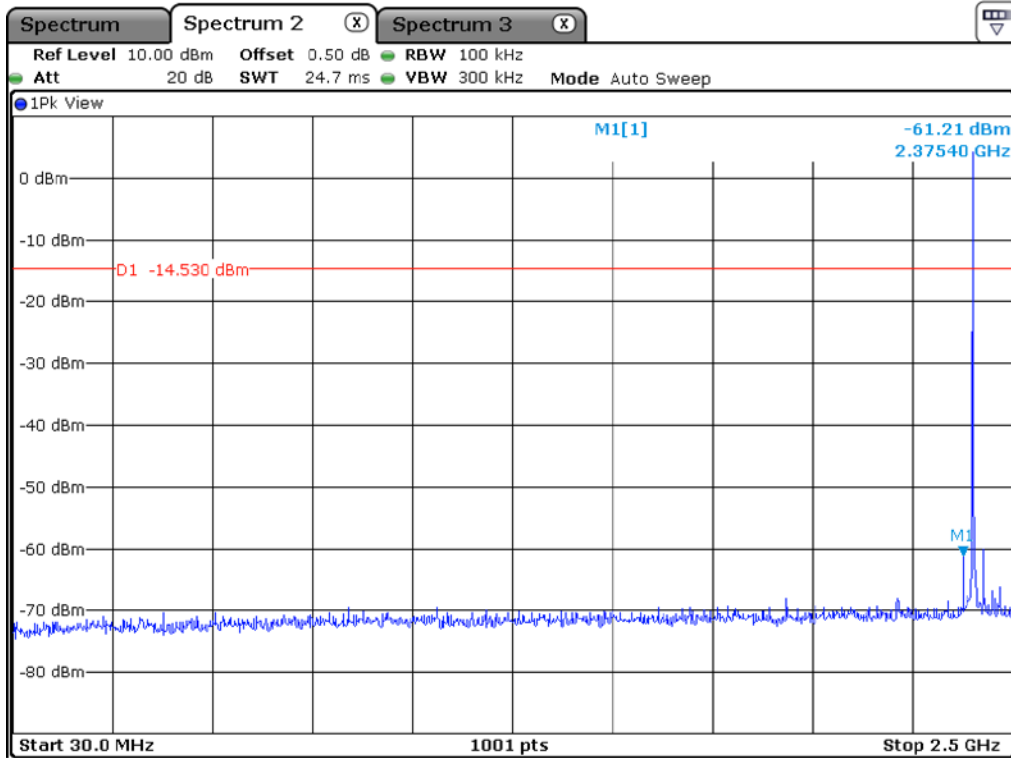
Low Channel



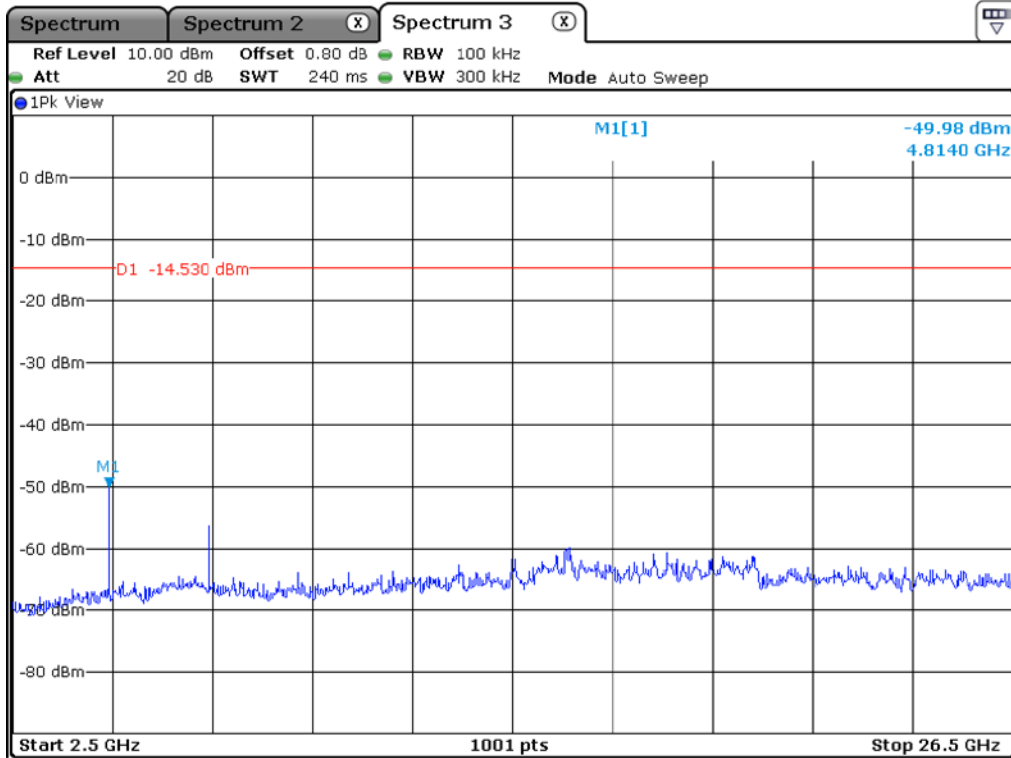
Middle Channel



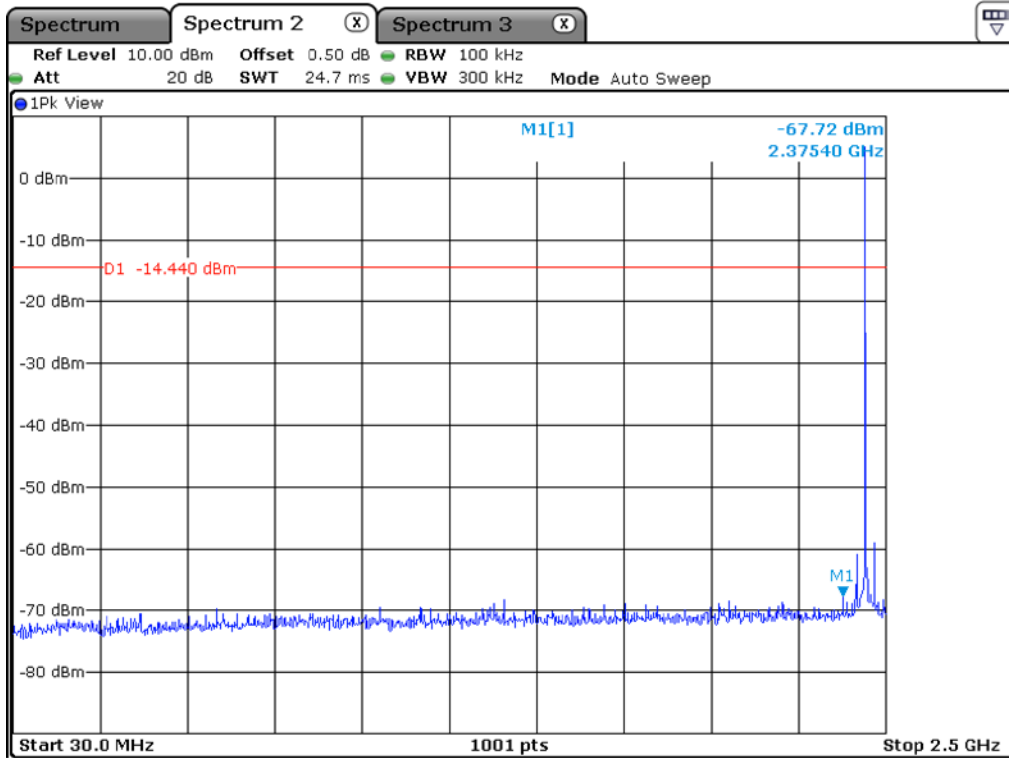
High Channel



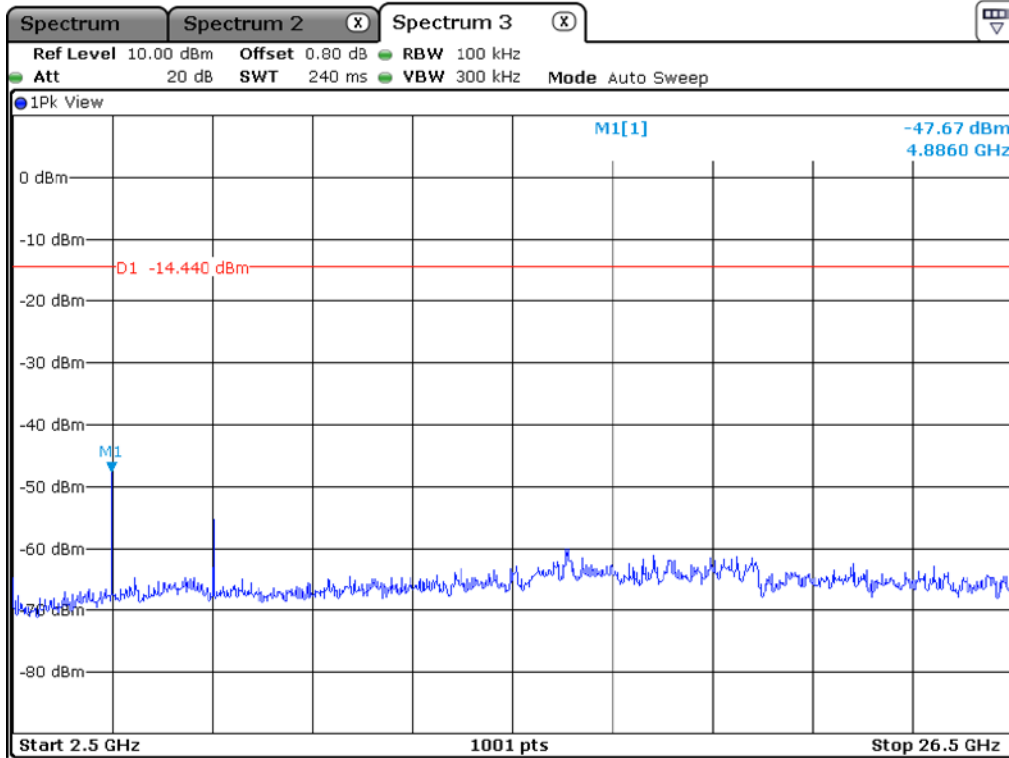
Low Channel



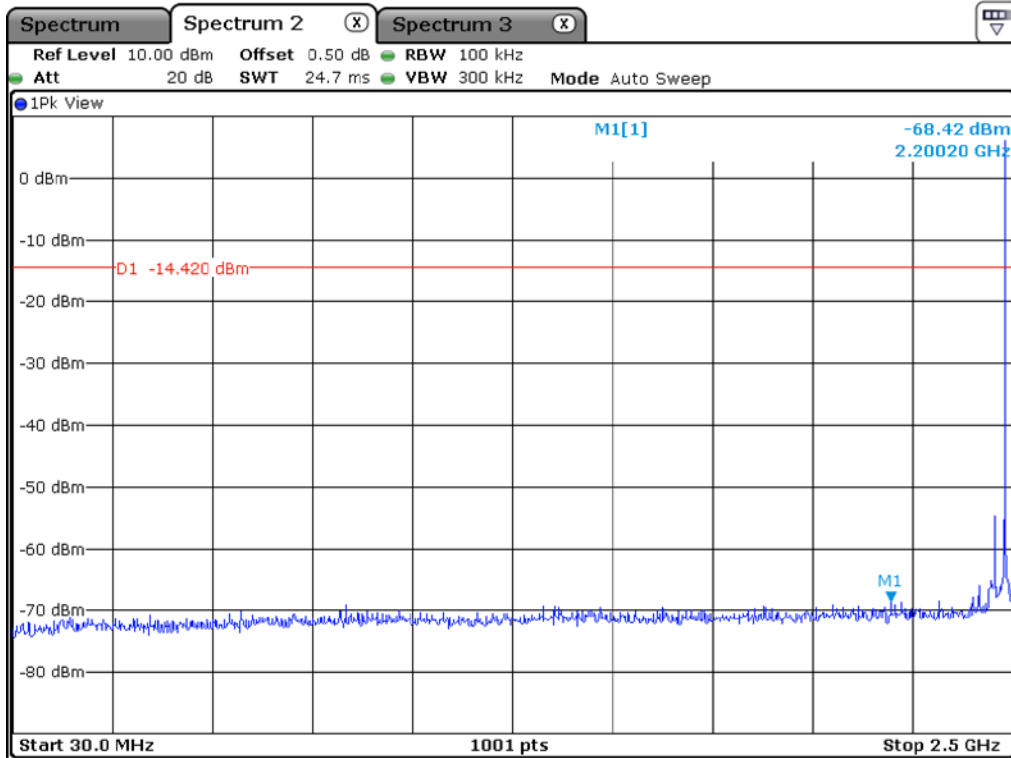
Low Channel



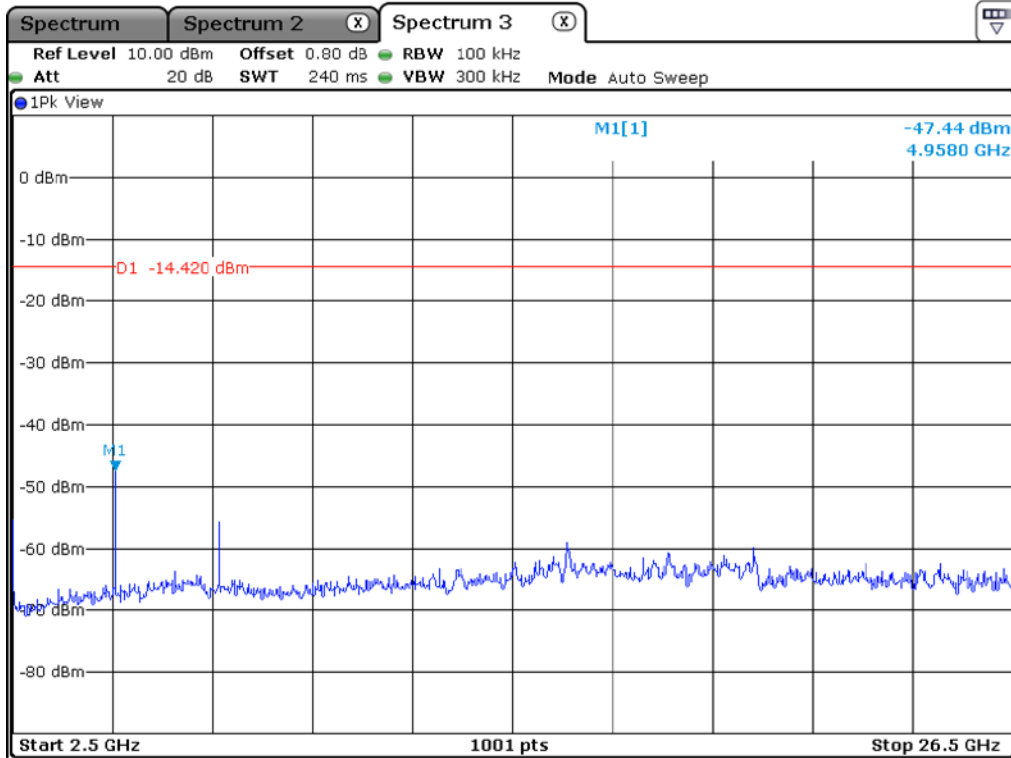
Middle Channel



Middle Channel

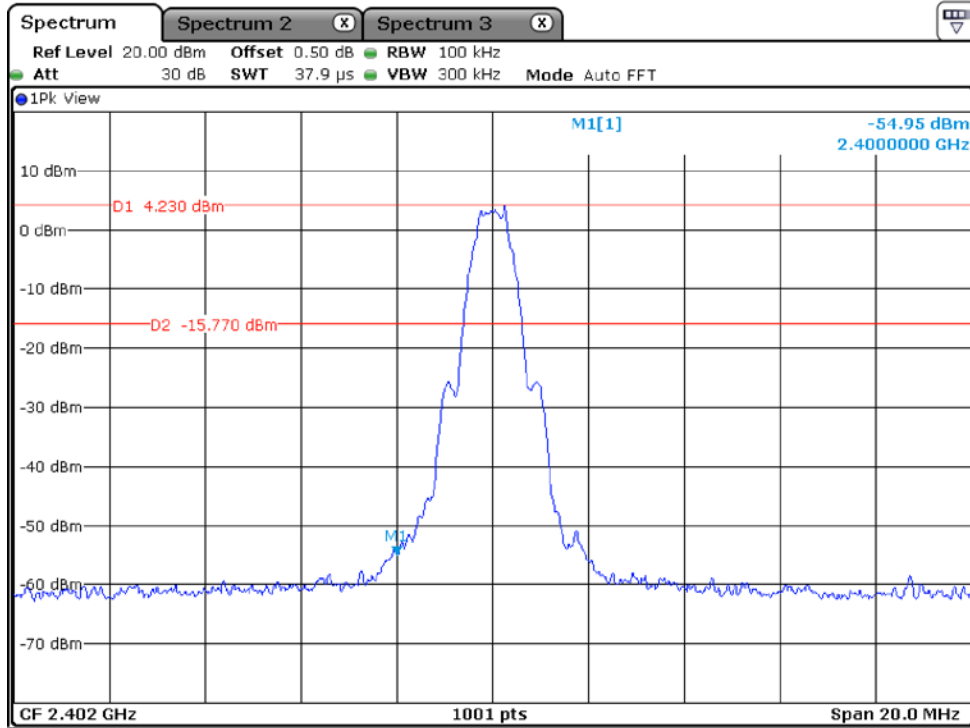


High Channel

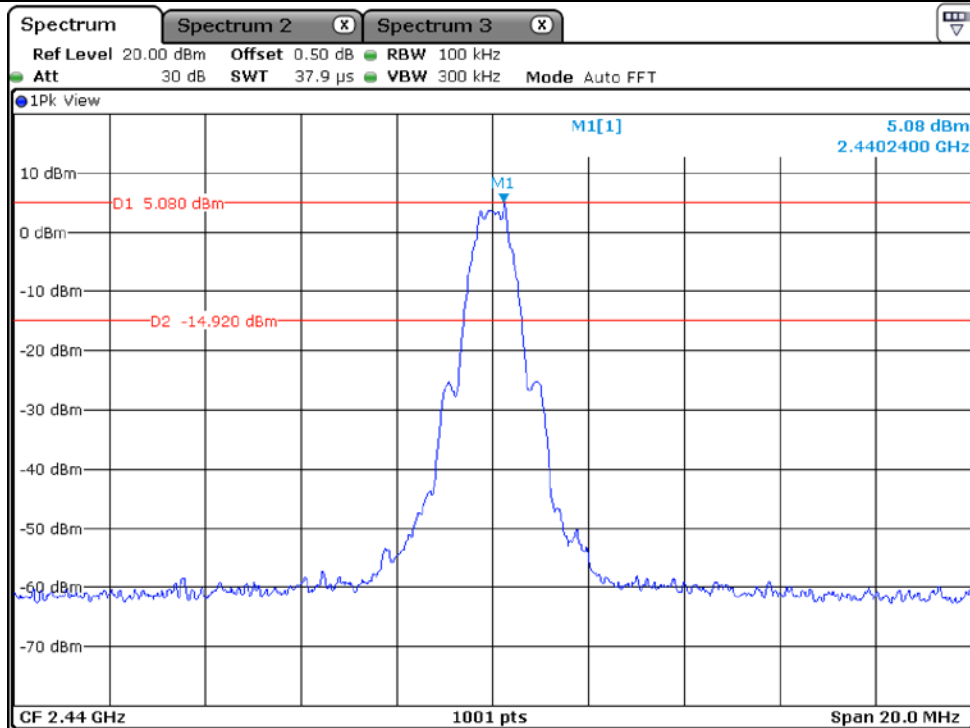


High Channel

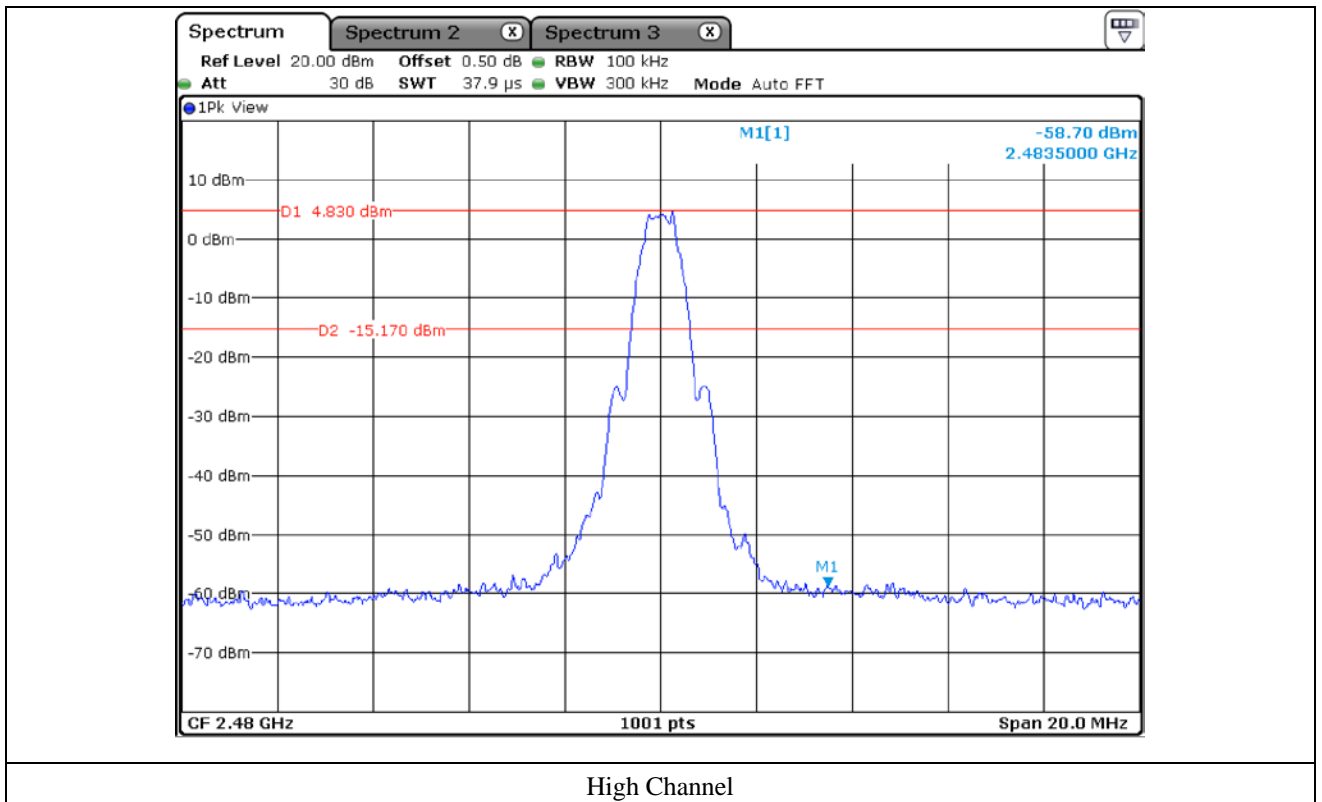
9.5.1.2 Test data for Bluetooth Earbud RIGHT

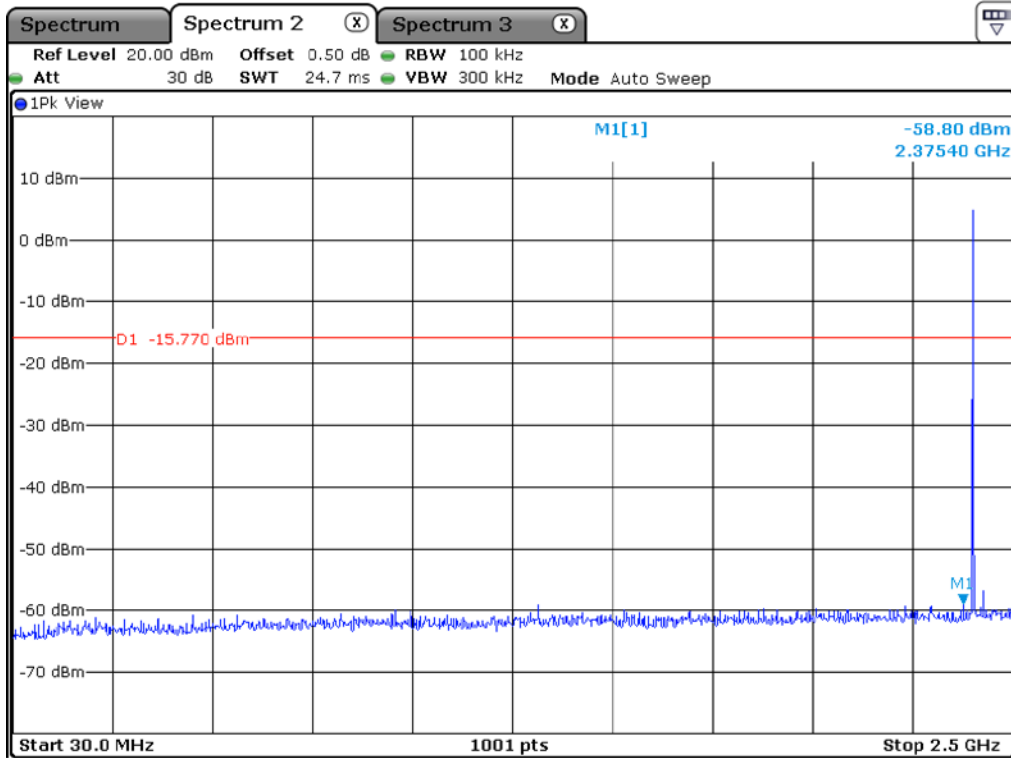


Low Channel

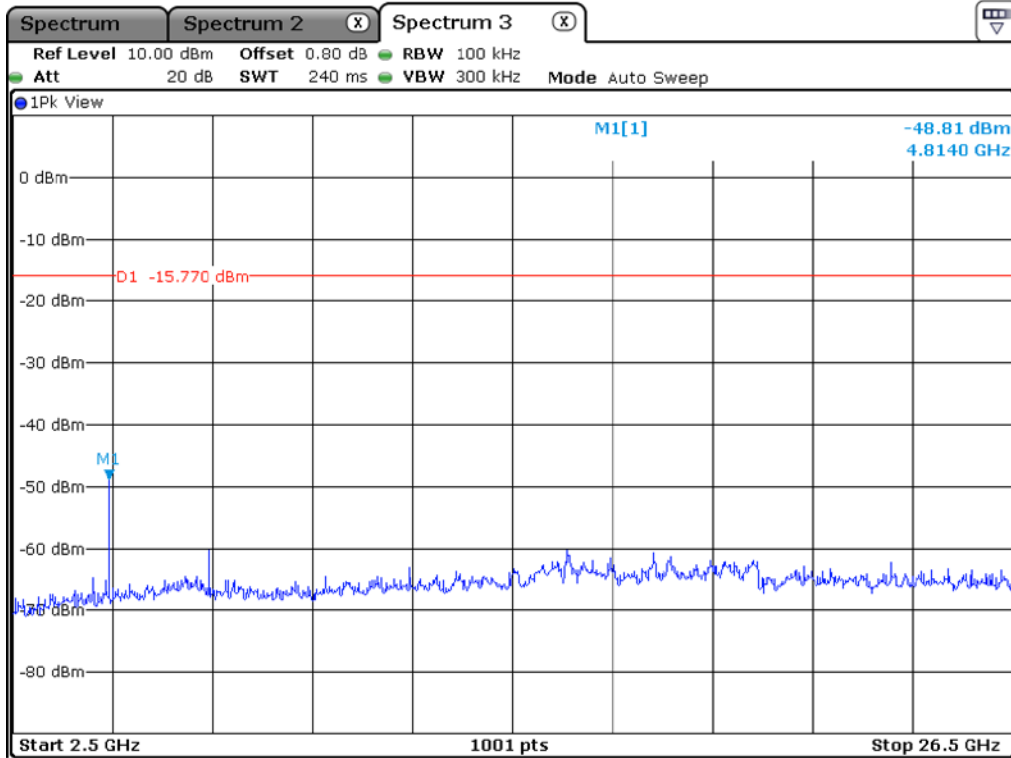


Middle Channel

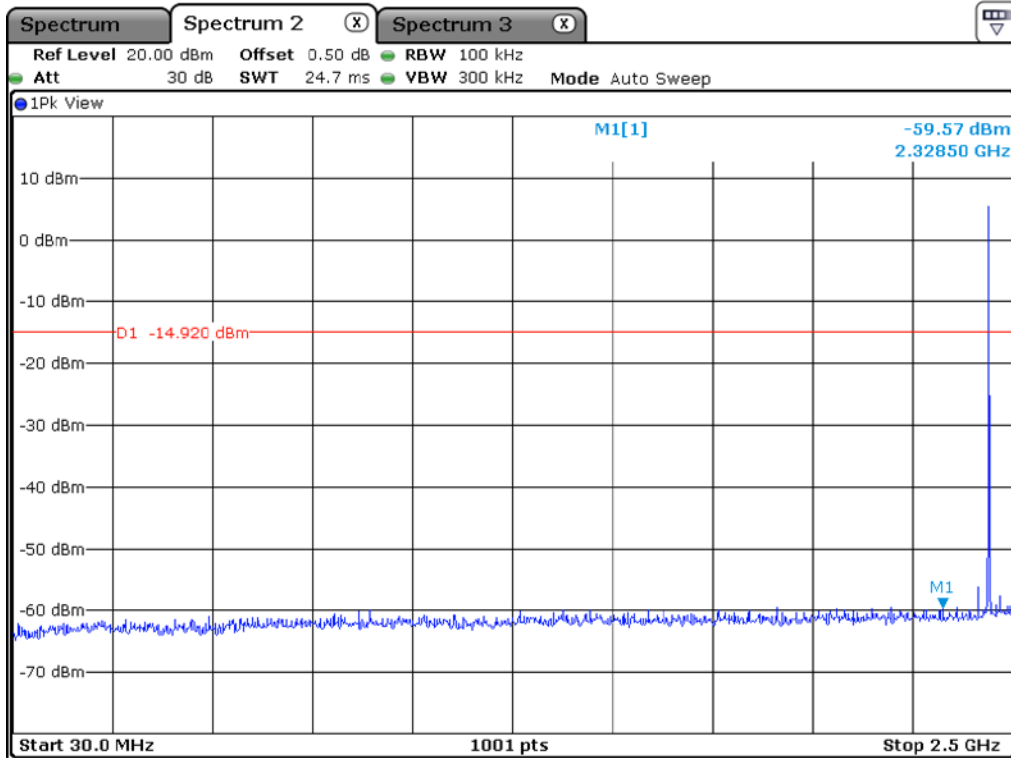




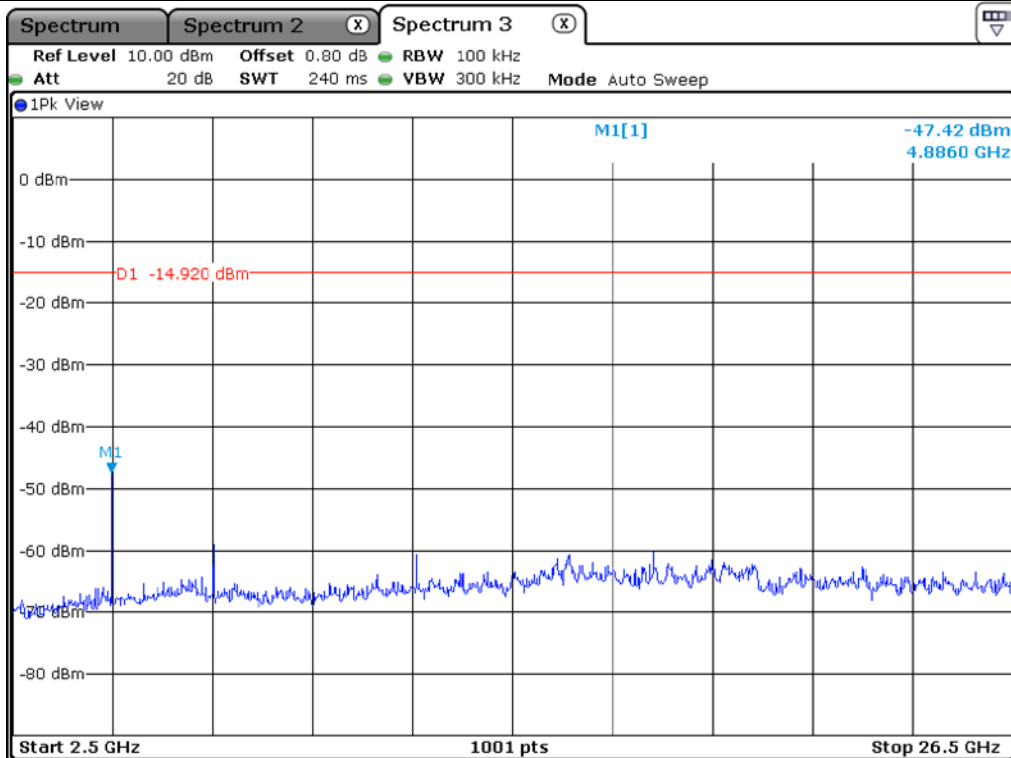
Low Channel



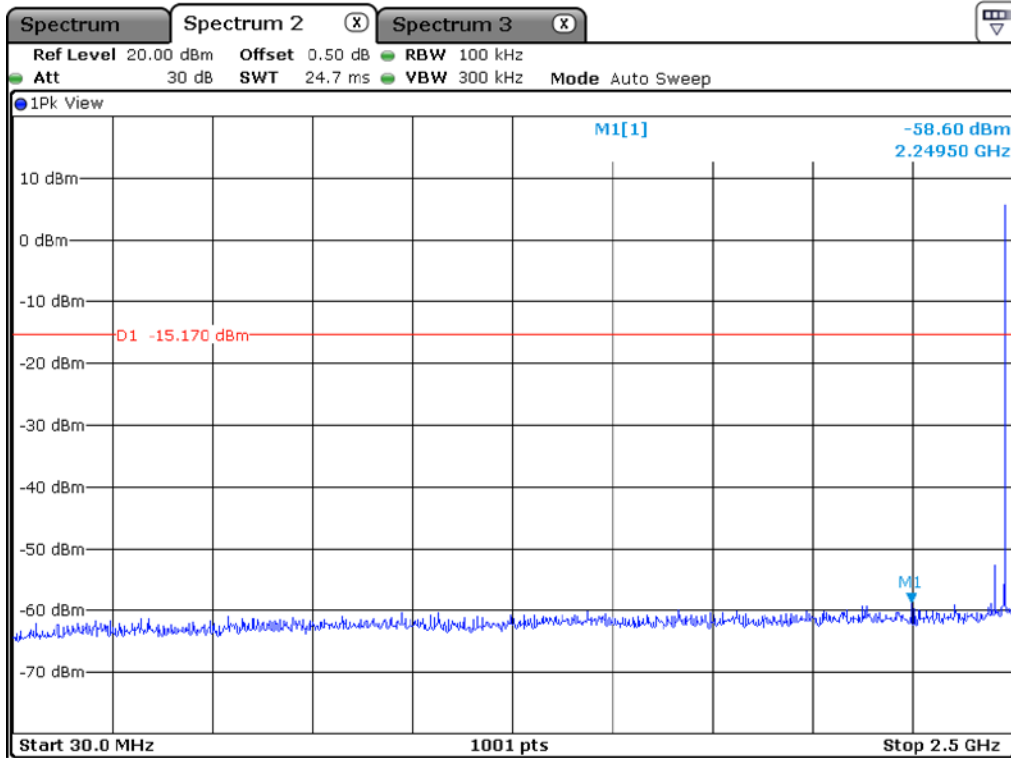
Low Channel



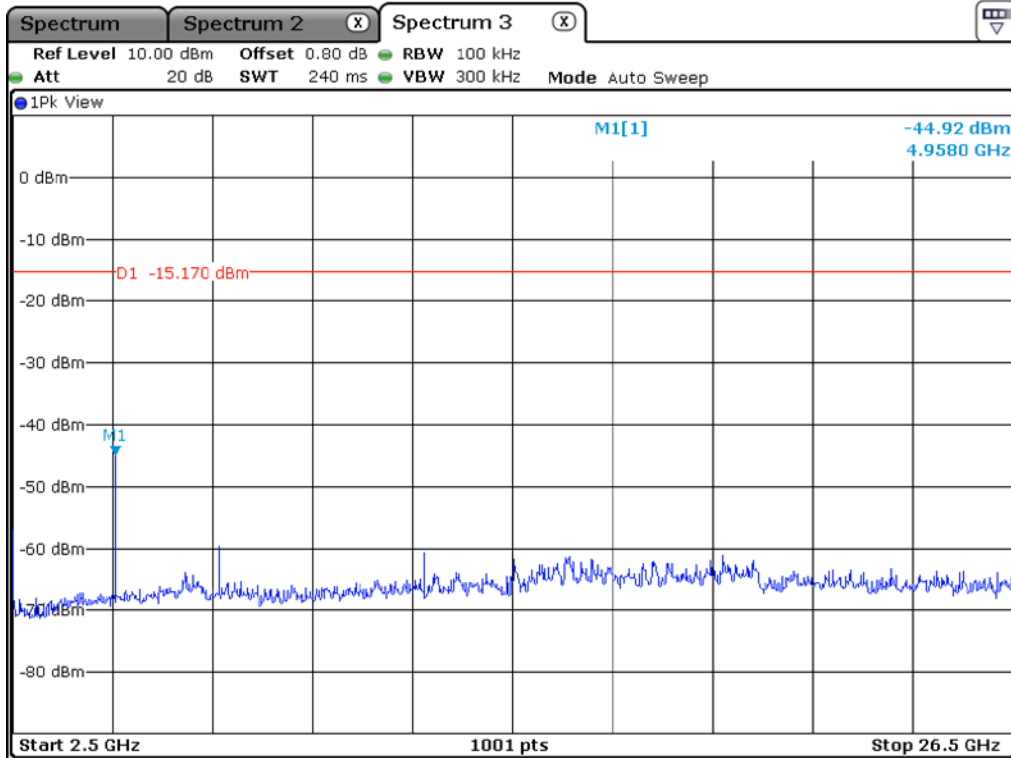
Middle Channel



Middle Channel



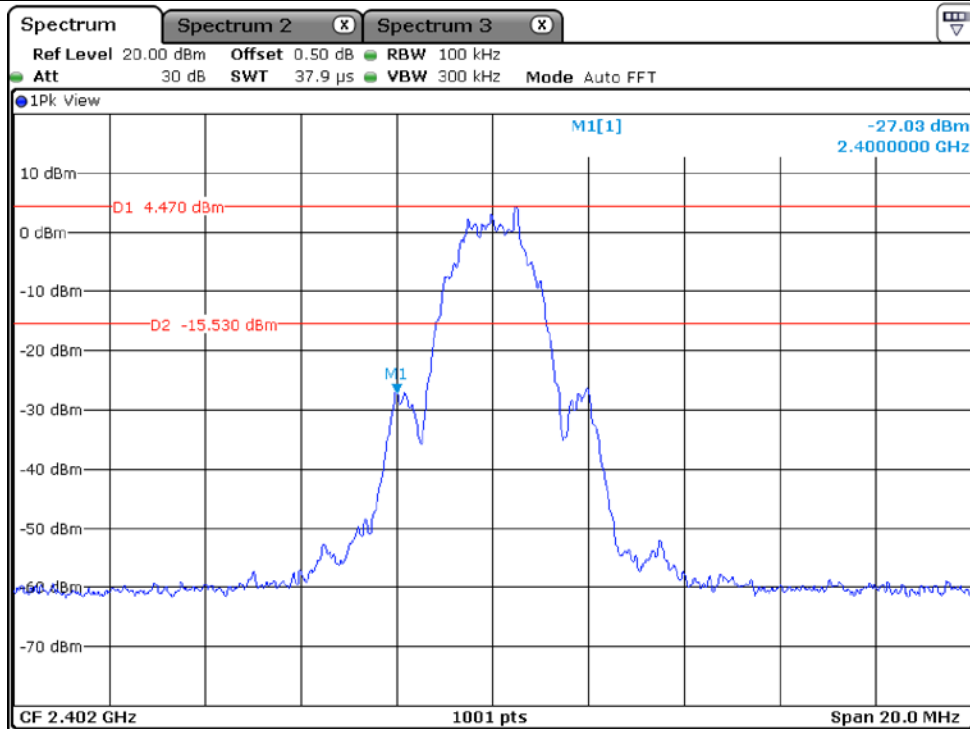
High Channel



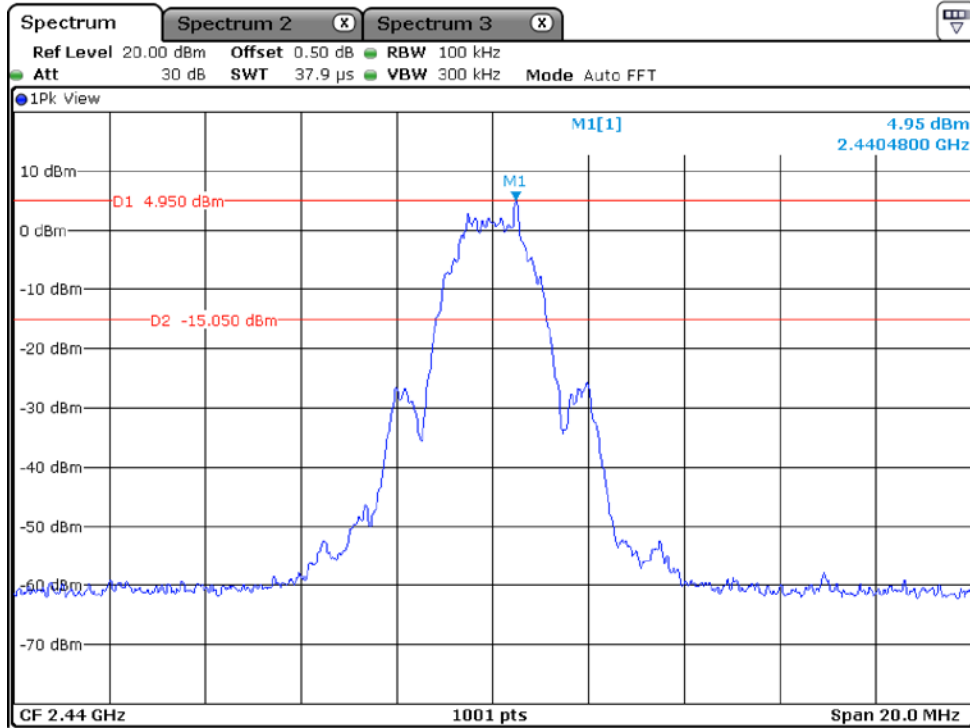
High Channel

9.5.2 Test data for 2 Mbps

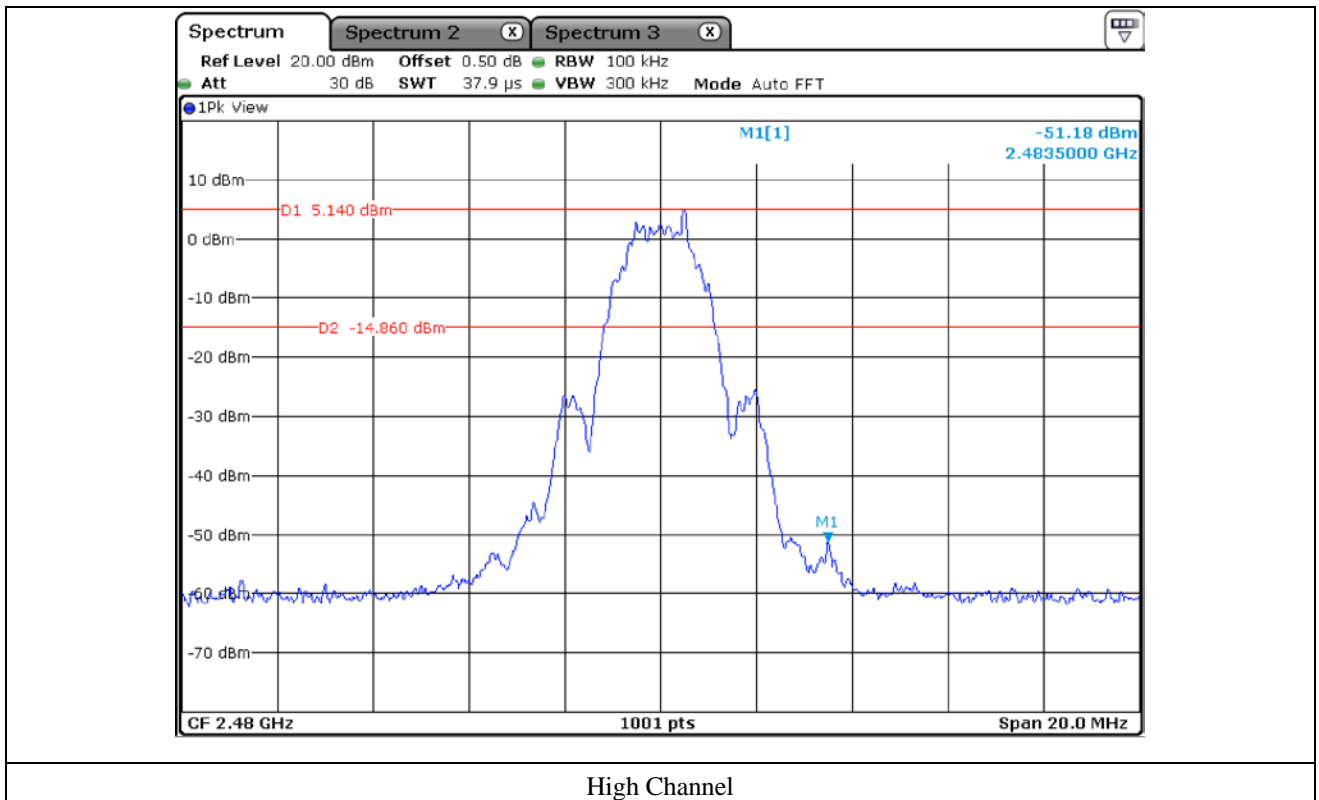
9.5.2.1 Test data for Bluetooth Earbud LEFT

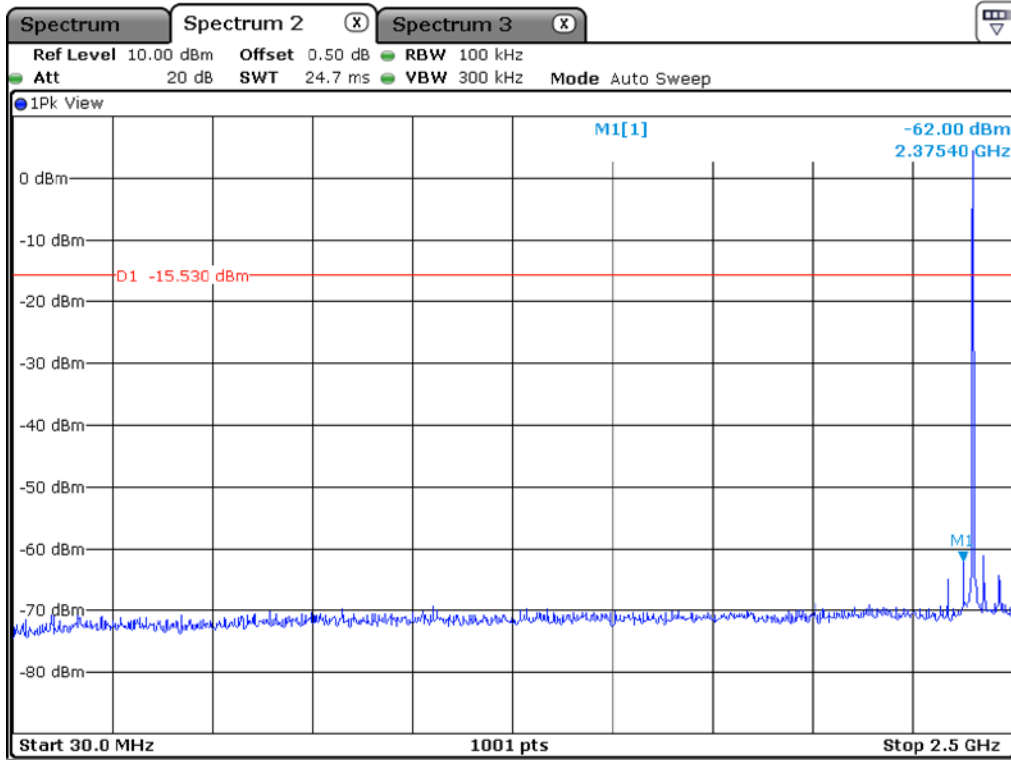


Low Channel

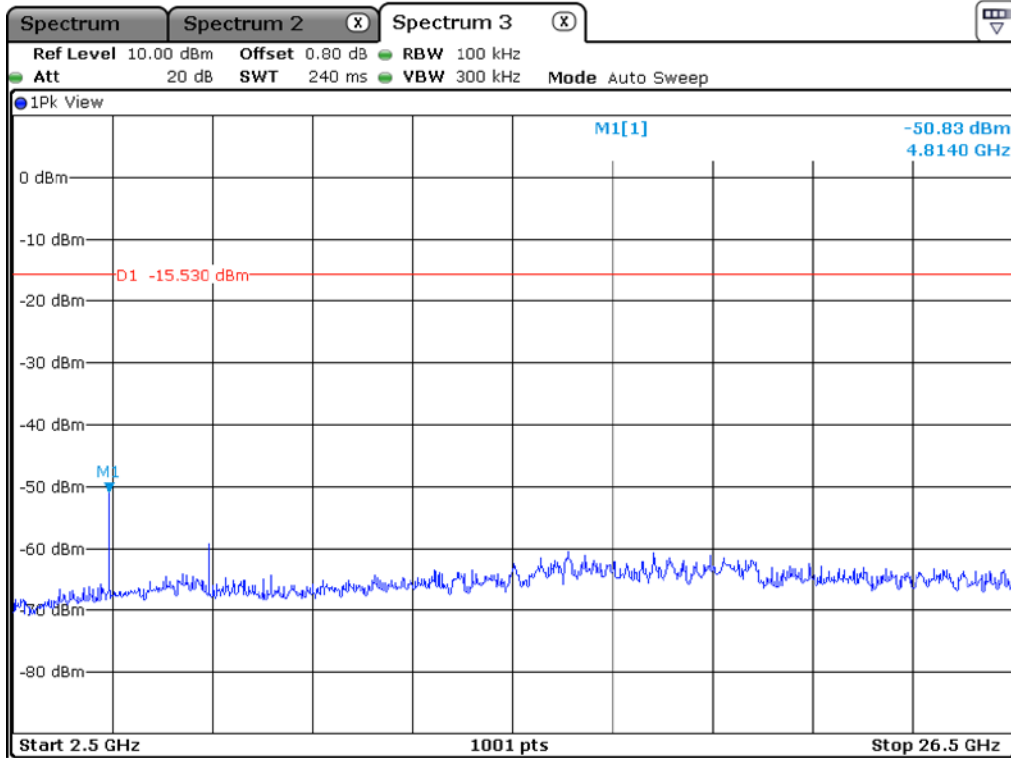


Middle Channel

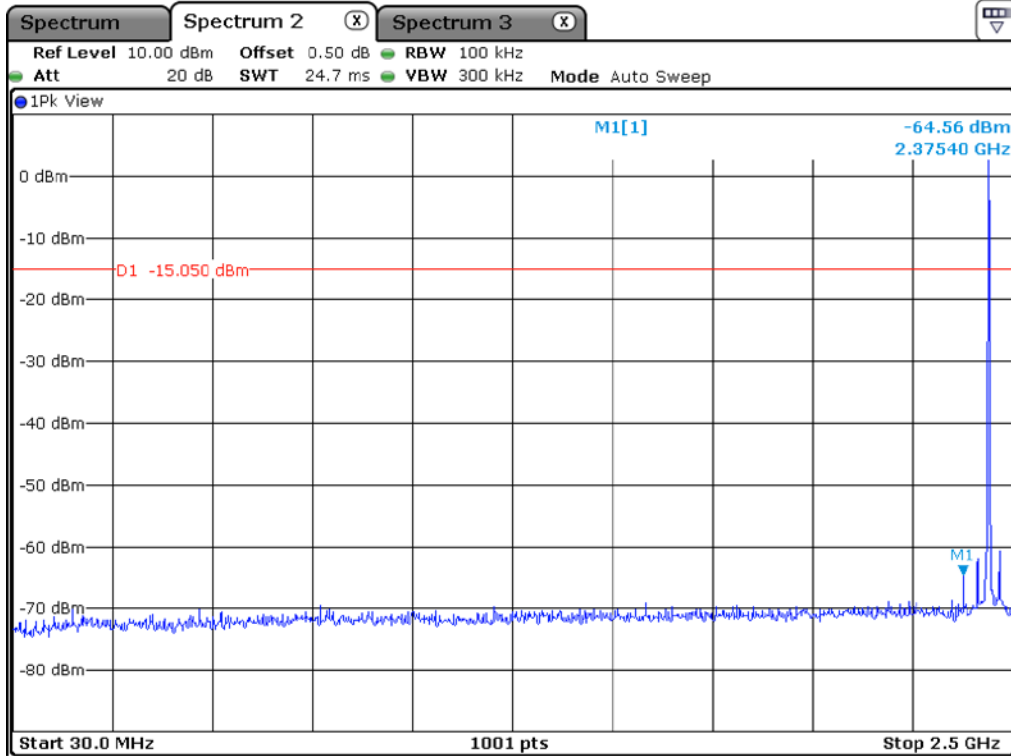




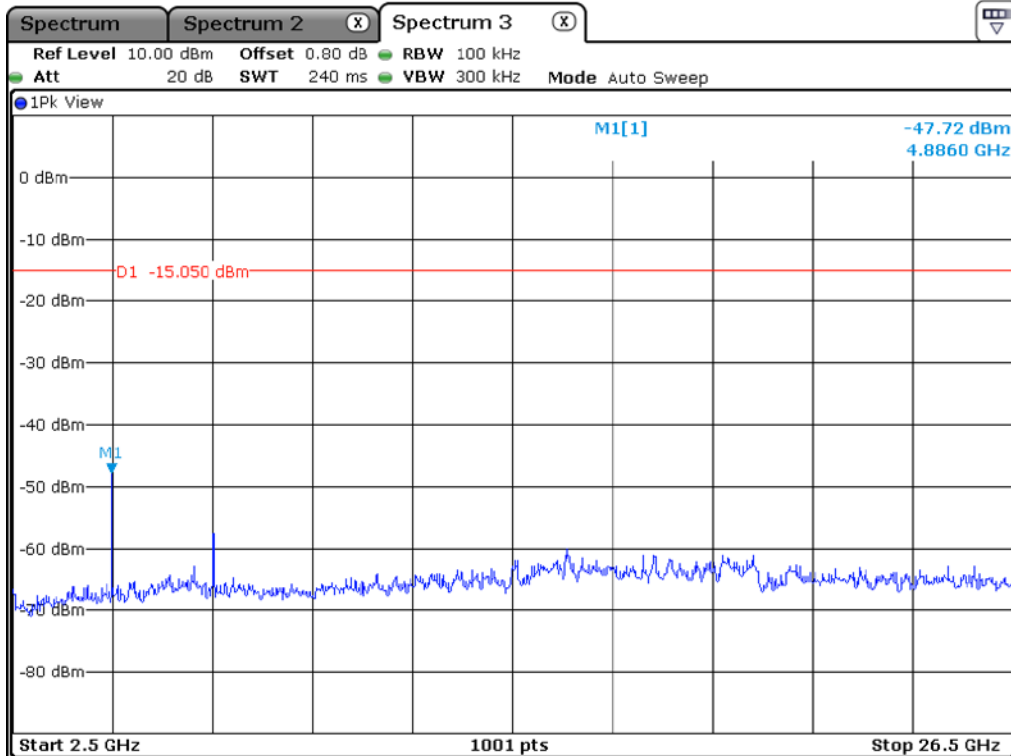
Low Channel



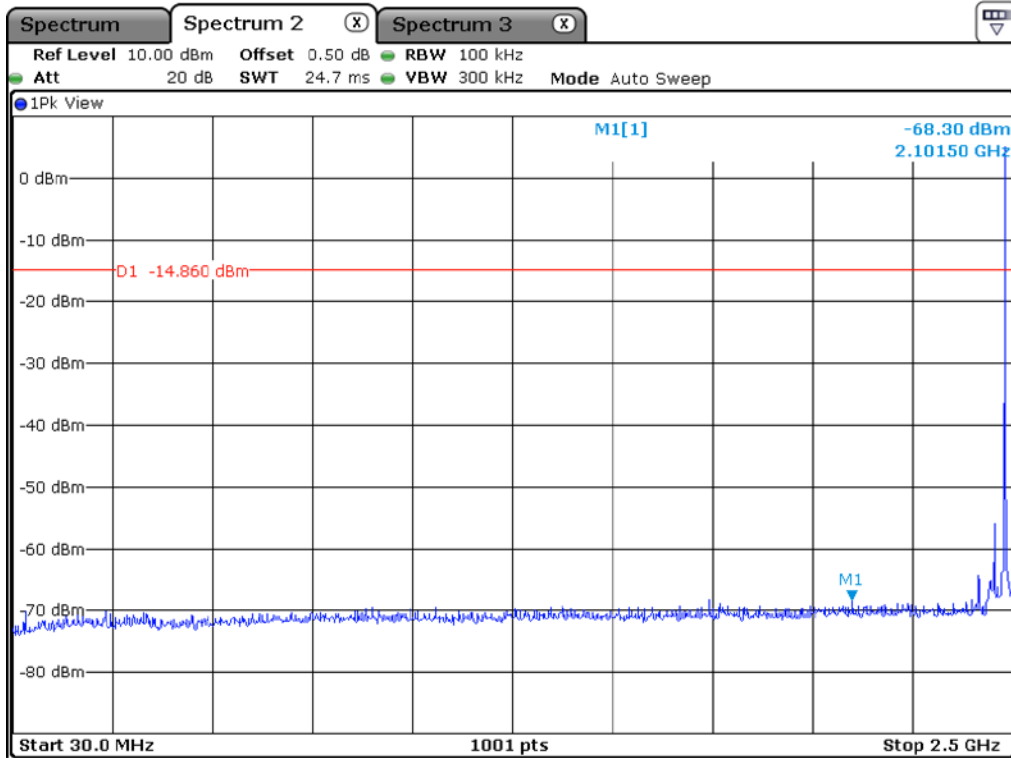
Low Channel



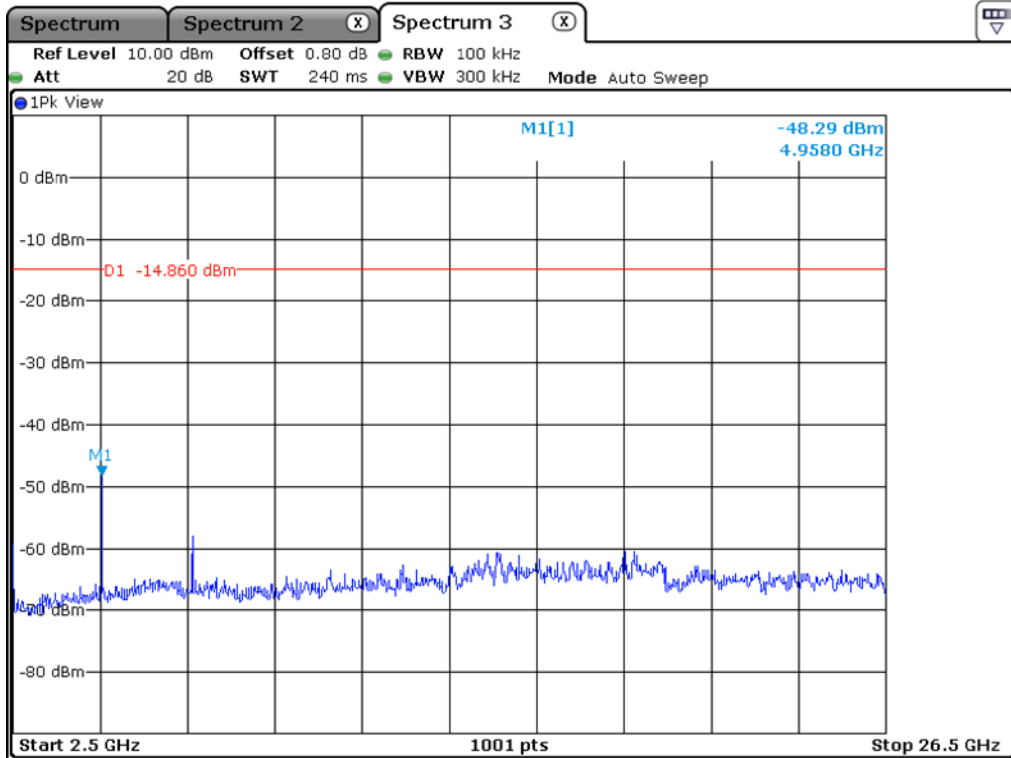
Middle Channel



Middle Channel

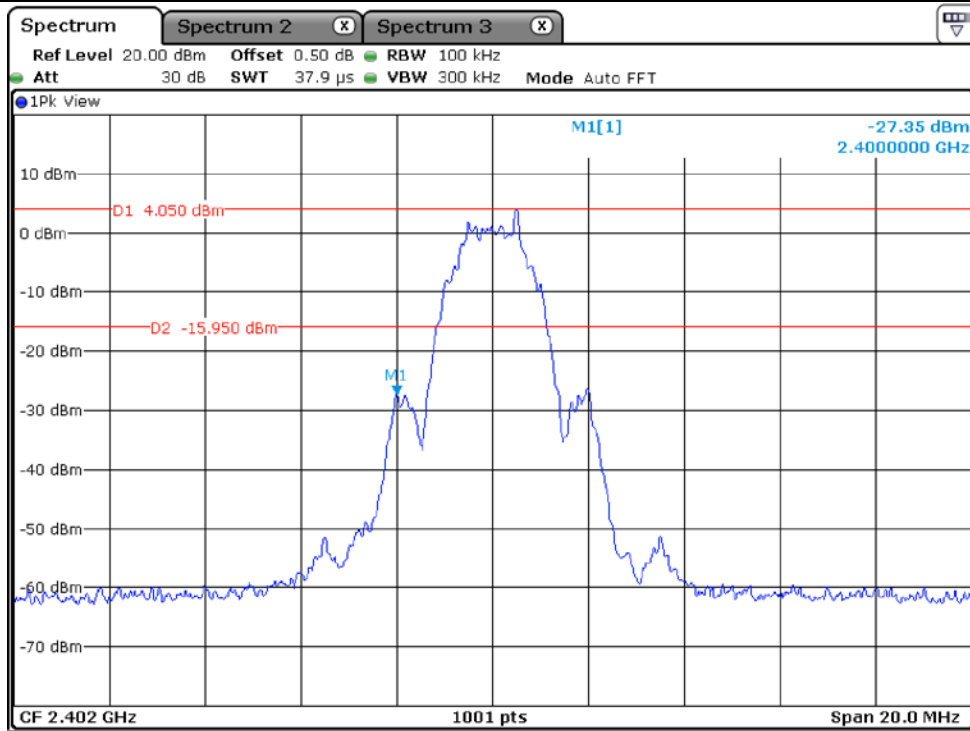


High Channel

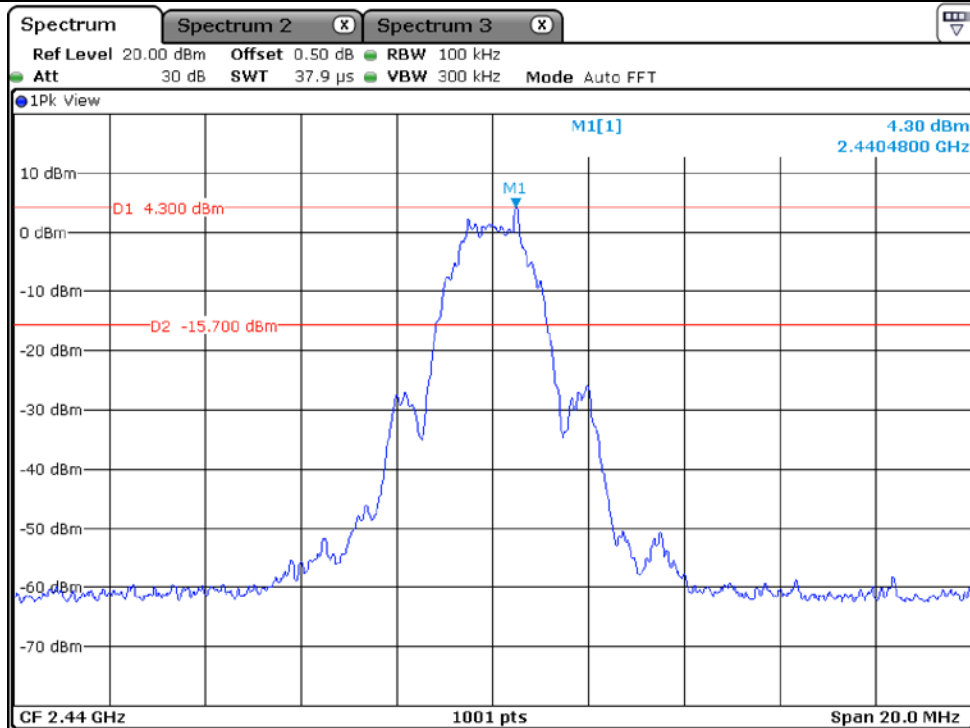


High Channel

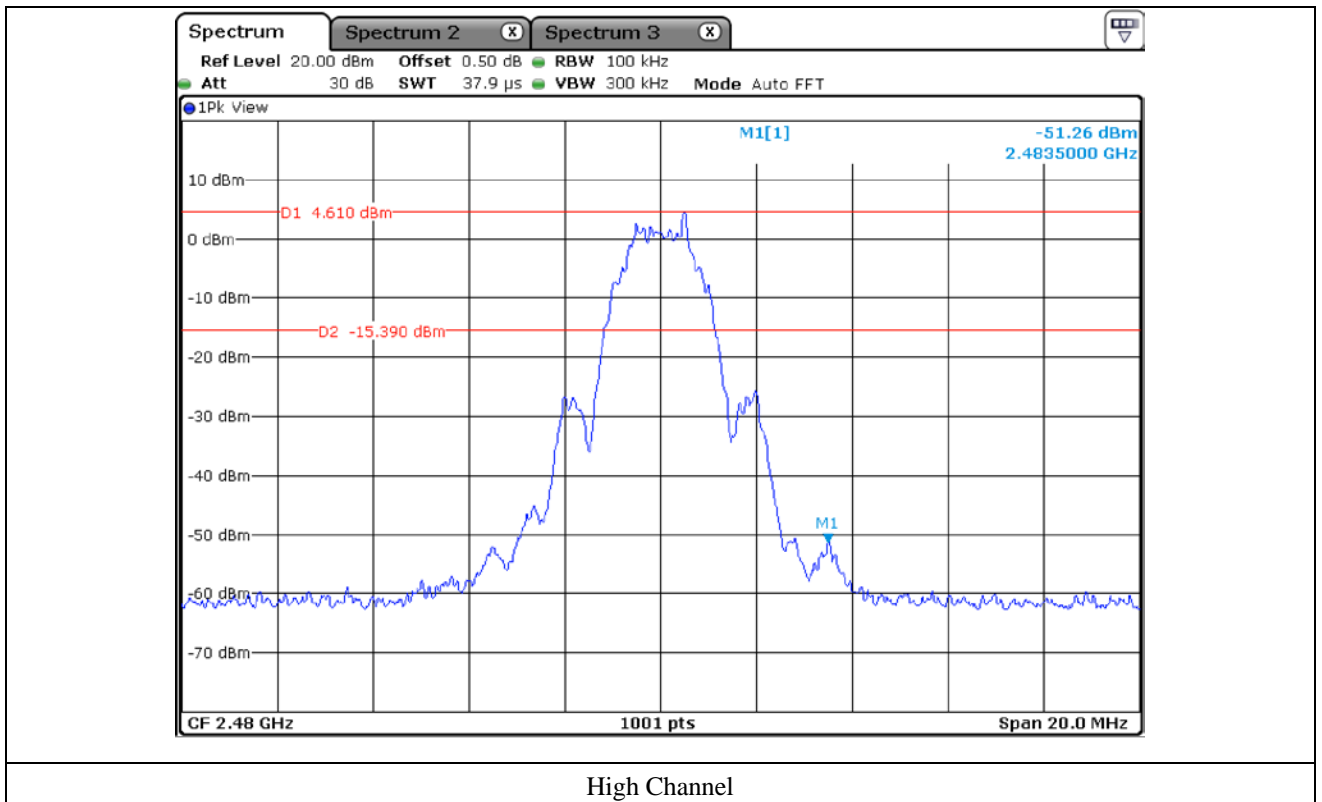
9.5.2.1 Test data for Bluetooth Earbud RIGHT

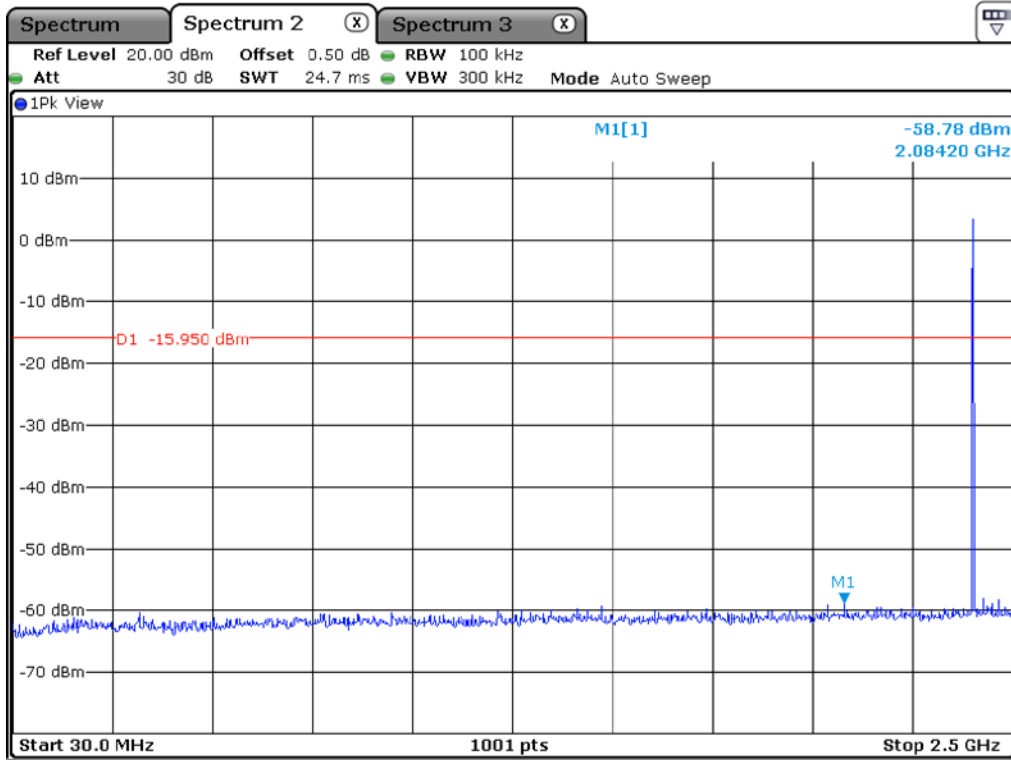


Low Channel

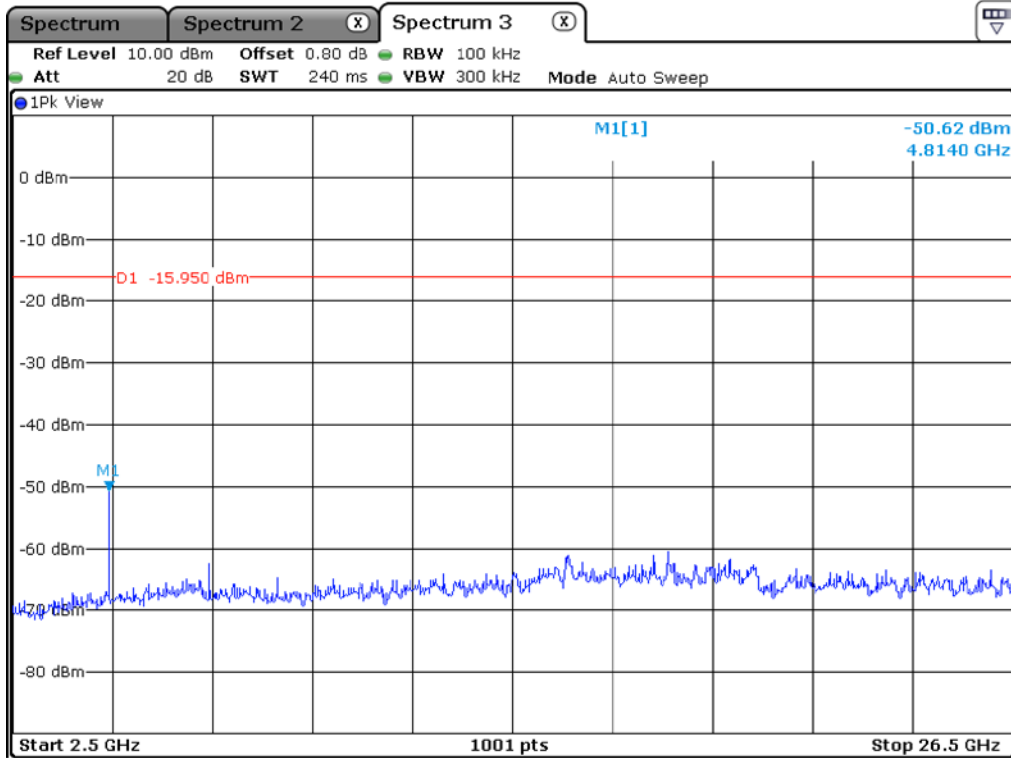


Middle Channel

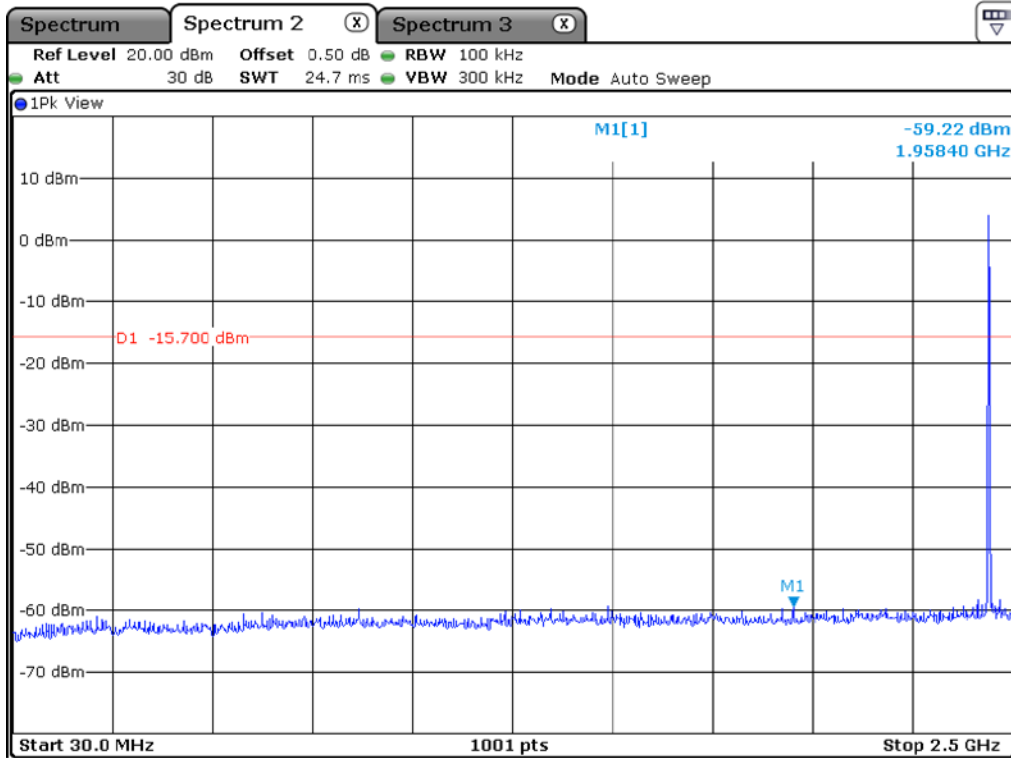




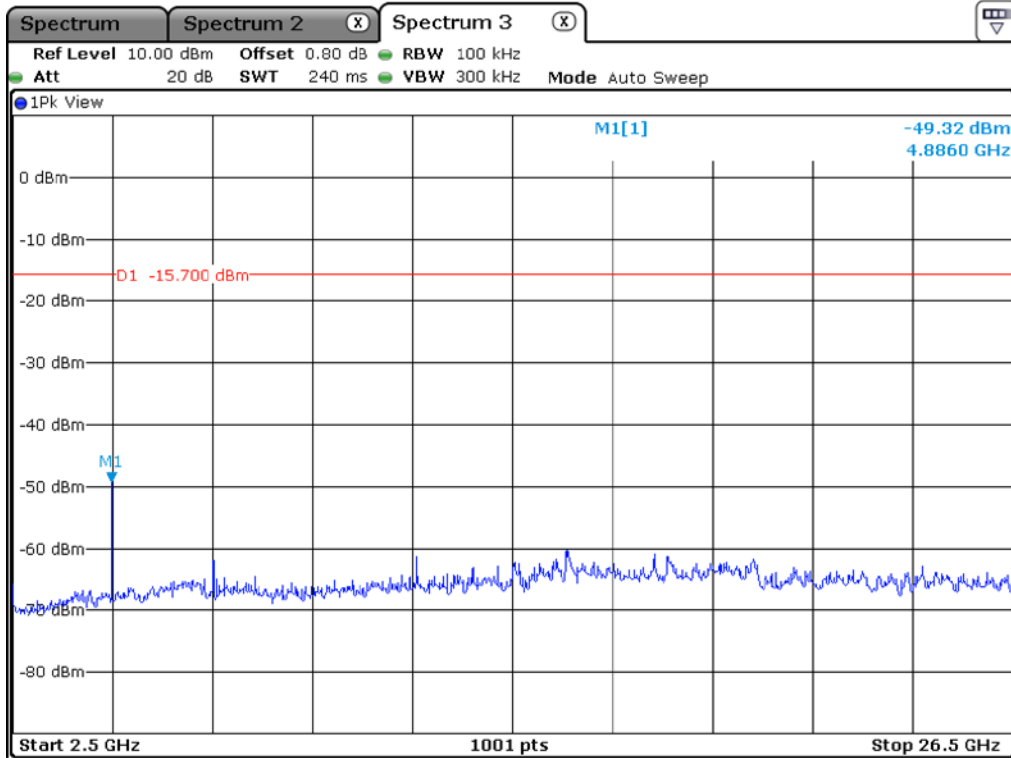
Low Channel



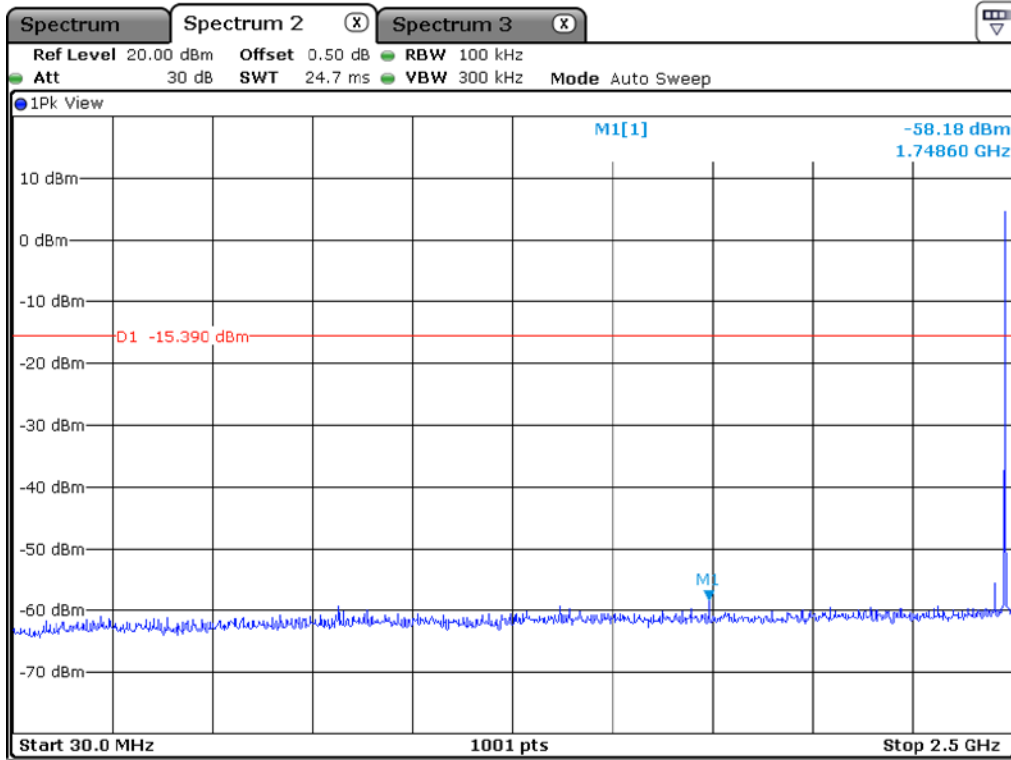
Low Channel



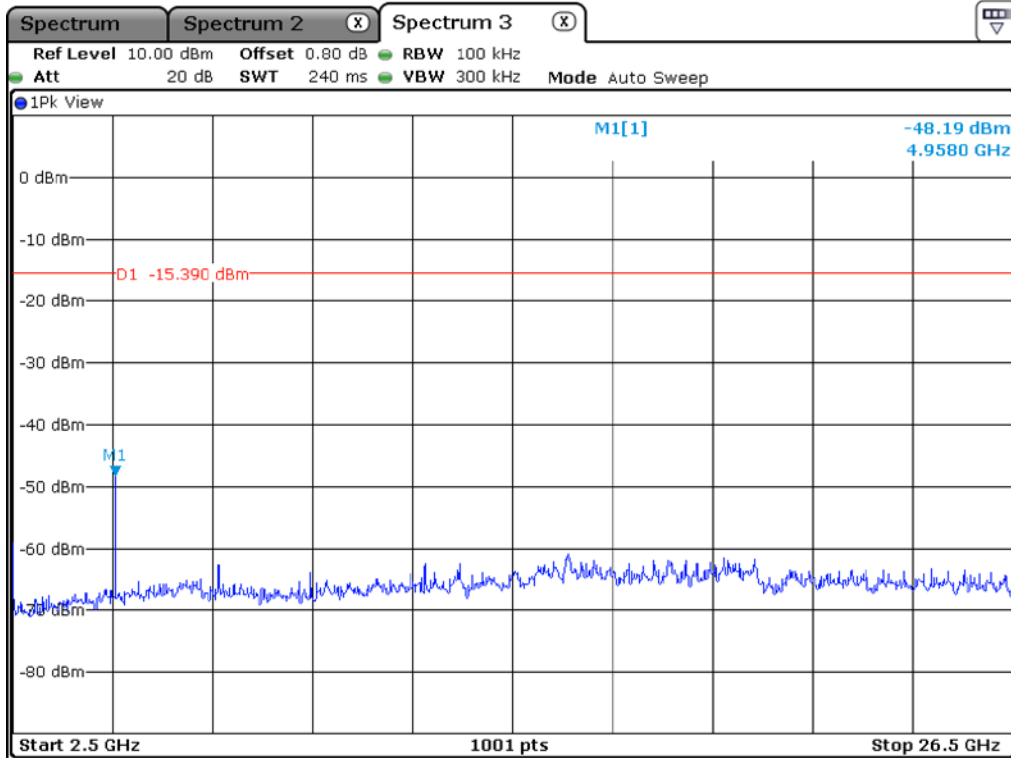
Middle Channel



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

9.6.1.1.1 Test data for Bluetooth Earbud LEFT

- . Test Date : July 13, 2020 ~ July 17, 2020
- . 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 : 84.80 %
- . 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									
2 341.848	18.20	Peak	H	26.94	9.20	-	54.34	74.00	19.66
2 338.971	7.27	Average	H			0.72	44.13	54.00	9.87
2 341.289	18.59	Peak	V			-	54.73	74.00	19.27
2 346.643	7.31	Average	V			0.72	44.17	54.00	9.83
Test Data for High Channel									
2 489.788	18.99	Peak	H	27.47	9.49	-	55.95	74.00	18.05
2 497.964	6.75	Average	H			0.72	44.43	54.00	9.57
2 487.415	18.51	Peak	V			-	55.47	74.00	18.53
2 484.217	6.84	Average	V			0.72	44.52	54.00	9.48

Tabulated test data for Restricted Band

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Correction Factor



Tested by: Hyung-Kwon, Oh / Manager

9.6.1.1.2 Test data for Bluetooth Earbud RIGHT

- Test Date : July 13, 2020 ~ July 17, 2020
- 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 : 84.80 %
- 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									
2 315.714	18.78	Peak	H	26.94	9.20	-	54.92	74.00	19.08
2 346.484	7.22	Average	H			0.72	44.08	54.00	9.92
2 341.768	18.65	Peak	V			-	54.79	74.00	19.21
2 346.803	7.28	Average	V			0.72	44.14	54.00	9.86
Test Data for High Channel									
2 491.124	19.28	Peak	H	27.47	9.49	-	56.24	74.00	17.76
2 483.821	6.87	Average	H			0.72	44.55	54.00	9.45
2 488.618	19.68	Peak	V			-	56.64	74.00	17.36
2 491.074	6.82	Average	V			0.72	44.50	54.00	9.50

Tabulated test data for Restricted Band

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

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

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



Tested by: Hyung-Kwon, Oh / Manager

9.6.1.2 Test data for 2 Mbps

9.6.1.2.1 Test data for Bluetooth Earbud LEFT

- Test Date : July 13, 2020 ~ July 17, 2020
- 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 : 56.91 %
- 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									
2 349.041	18.60	Peak	H	26.94	9.20	-	54.74	74.00	19.26
2 346.963	7.22	Average	H			2.45	45.81	54.00	8.19
2 347.123	18.27	Peak	V			-	54.41	74.00	19.59
2 342.488	7.33	Average	V			2.45	45.92	54.00	8.08
Test Data for High Channel									
2 490.662	19.10	Peak	H	27.47	9.49	-	56.06	74.00	17.94
2 483.508	7.51	Average	H			2.45	46.92	54.00	7.08
2 494.569	18.46	Peak	V			-	55.42	74.00	18.58
2 483.508	7.01	Average	V			2.45	46.42	54.00	7.58

Tabulated test data for Restricted Band

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

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

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



Tested by: Hyung-Kwon, Oh / Manager

9.6.1.2.2 Test data for Bluetooth Earbud RIGHT

- Test Date : July 13, 2020 ~ July 17, 2020
- 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 : 56.38 %
- 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									
2 312.438	18.48	Peak	H	26.94	9.20	-	54.62	74.00	19.38
2 343.846	7.28	Average	H			2.49	45.91	54.00	8.09
2 324.665	18.47	Peak	V			-	54.61	74.00	19.39
2 342.807	7.30	Average	V			2.49	45.93	54.00	8.07
Test Data for High Channel									
2 483.508	19.46	Peak	H	27.47	9.49	-	56.42	74.00	17.58
2 483.508	8.88	Average	H			2.49	48.33	54.00	5.67
2 490.168	18.34	Peak	V			-	55.30	74.00	18.70
2 483.508	6.96	Average	V			2.49	46.41	54.00	7.59

Tabulated test data for Restricted Band

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

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

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



Tested by: Hyung-Kwon, Oh / Manager

9.6.2 Spurious & Harmonic Radiated Emission

9.6.1.1 Test data for 1 Mbps

9.6.1.1.1 Test data for Bluetooth Earbud LEFT

- Test Date : July 13, 2020 ~ July 17, 2020
- 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 : 84.80 %
- 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									
4 804.00	20.22	Peak	H	28.84	10.31	-	59.37	74.00	14.63
	9.08	Average	H			0.72	48.95	54.00	5.05
	20.39	Peak	V			-	59.54	74.00	14.46
	9.37	Average	V			0.72	49.24	54.00	4.76
Test Data for Middle Channel									
4 880.00	20.01	Peak	H	28.01	10.43	-	58.45	74.00	15.55
	8.32	Average	H			0.72	47.48	54.00	6.52
	20.21	Peak	V			-	58.65	74.00	15.35
	8.59	Average	V			0.72	47.75	54.00	6.25
Test Data for High Channel									
4 960.00	20.30	Peak	H	29.15	10.81	-	60.26	74.00	13.74
	8.44	Average	H			0.72	49.12	54.00	4.88
	19.98	Peak	V			-	59.94	74.00	14.06
	8.95	Average	V			0.72	49.63	54.00	4.37

Tabulated test data for Restricted Band

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

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

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



Tested by: Hyung-Kwon, Oh / Manager

9.6.1.1.2 Test data for Bluetooth Earbud RIGHT

- Test Date : July 13, 2020 ~ July 17, 2020
- 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 : 84.80 %
- 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									
4 804.00	20.54	Peak	H	28.84	10.31	-	59.69	74.00	14.31
	9.10	Average	H			0.72	48.97	54.00	5.03
	20.01	Peak	V			-	59.16	74.00	14.84
	9.99	Average	V			0.72	49.86	54.00	4.14
Test Data for Middle Channel									
4 880.00	20.65	Peak	H	28.01	10.43	-	59.09	74.00	14.91
	9.13	Average	H			0.72	48.29	54.00	5.71
	20.17	Peak	V			-	58.61	74.00	15.39
	8.92	Average	V			0.72	48.08	54.00	5.92
Test Data for High Channel									
4 960.00	20.02	Peak	H	29.15	10.81	-	59.98	74.00	14.02
	8.85	Average	H			0.72	49.53	54.00	4.47
	19.85	Peak	V			-	59.81	74.00	14.19
	8.80	Average	V			0.72	49.48	54.00	4.52

Tabulated test data for Restricted Band

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

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

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



Tested by: Hyung-Kwon, Oh / Manager

9.6.1.2 Test data for 2 Mbps

9.6.1.2.1 Test data for Bluetooth Earbud LEFT

- Test Date : July 13, 2020 ~ July 17, 2020
- 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 : 56.91 %
- 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									
4 804.00	20.25	Peak	H	28.84	10.31	-	59.40	74.00	14.60
	9.23	Average	H			2.45	50.83	54.00	3.17
	19.49	Peak	V			-	58.64	74.00	15.36
	8.49	Average	V			2.45	50.09	54.00	3.91
Test Data for Middle Channel									
4 880.00	19.99	Peak	H	28.01	10.43	-	58.43	74.00	15.57
	8.28	Average	H			2.45	49.17	54.00	4.83
	19.49	Peak	V			-	57.93	74.00	16.07
	8.25	Average	V			2.45	49.14	54.00	4.86
Test Data for High Channel									
4 960.00	19.32	Peak	H	29.15	10.81	-	59.28	74.00	14.72
	8.20	Average	H			2.45	50.61	54.00	3.39
	18.96	Peak	V			-	58.92	74.00	15.08
	8.01	Average	V			2.45	50.42	54.00	3.58

Tabulated test data for Restricted Band

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

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

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



Tested by: Hyung-Kwon, Oh / Manager

9.6.1.2.2 Test data for Bluetooth Earbud RIGHT

- Test Date : July 13, 2020 ~ July 17, 2020
- 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 : 56.38 %
- 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									
4 804.00	21.17	Peak	H	28.84	10.31	-	60.32	74.00	13.68
	8.80	Average	H			2.49	50.44	54.00	3.56
	21.75	Peak	V			-	60.90	74.00	13.10
	8.37	Average	V			2.49	50.01	54.00	3.99
Test Data for Middle Channel									
4 880.00	20.98	Peak	H	28.01	10.43	-	59.42	74.00	14.58
	8.53	Average	H			2.49	49.46	54.00	4.54
	20.11	Peak	V			-	58.55	74.00	15.45
	8.46	Average	V			2.49	49.39	54.00	4.61
Test Data for High Channel									
4 960.00	20.30	Peak	H	29.15	10.81	-	60.26	74.00	13.74
	8.35	Average	H			2.49	50.80	54.00	3.20
	19.95	Peak	V			-	59.91	74.00	14.09
	8.11	Average	V			2.49	50.56	54.00	3.44

Tabulated test data for Restricted Band

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

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

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



Tested by: Hyung-Kwon, Oh / Manager

10. PEAK POWER SPECTRAL DENSITY

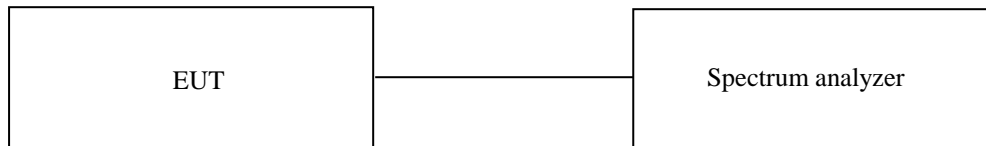
10.1 Operating environment

Temperature : 23 °C
 Relative humidity : 45 % 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 equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Feb. 21, 2020 (1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test data for 1 Mbps

10.4.1 Test data for Bluetooth Earbud LEFT

-. Test Date : July 13, 2020 ~ July 17, 2020

-. Test Result : Pass

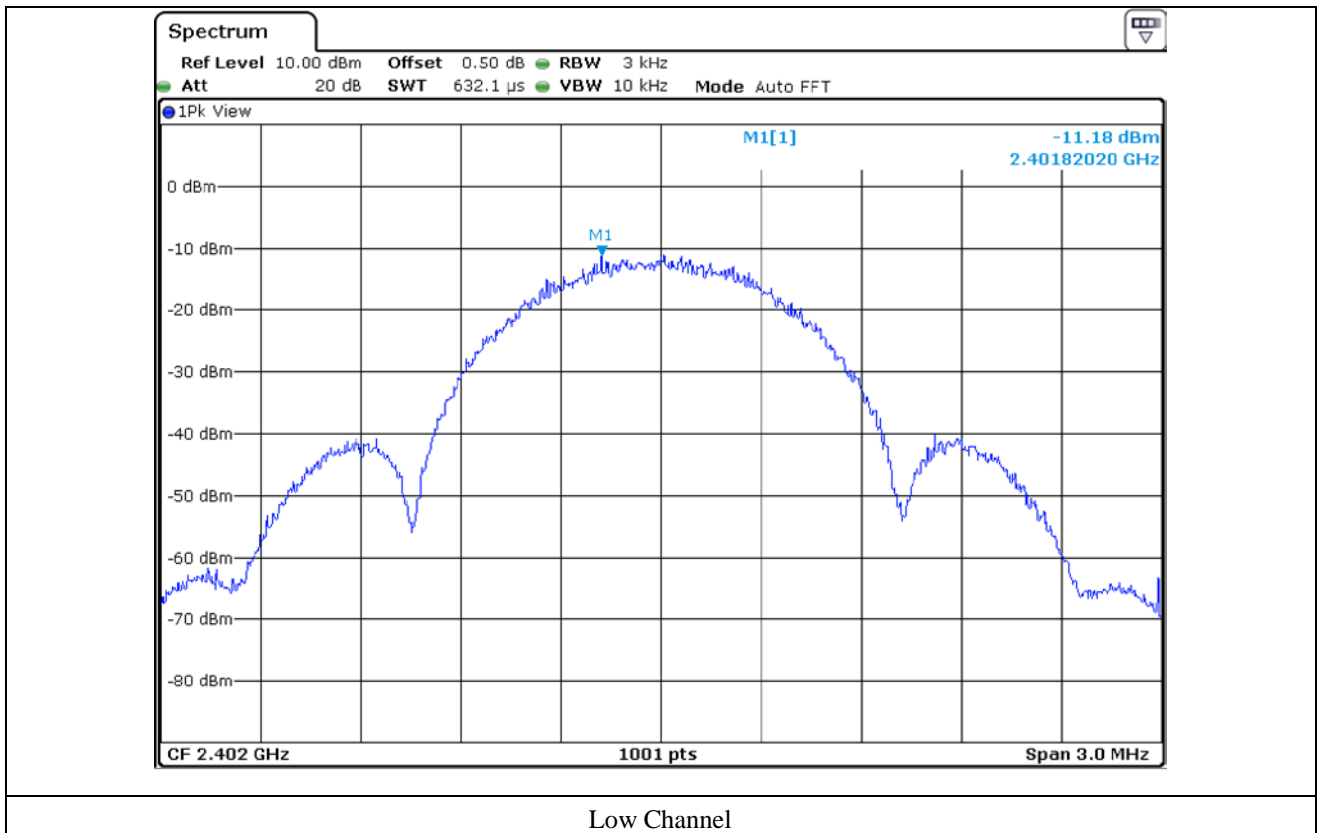
-. Operating Condition : Continuous transmitting mode

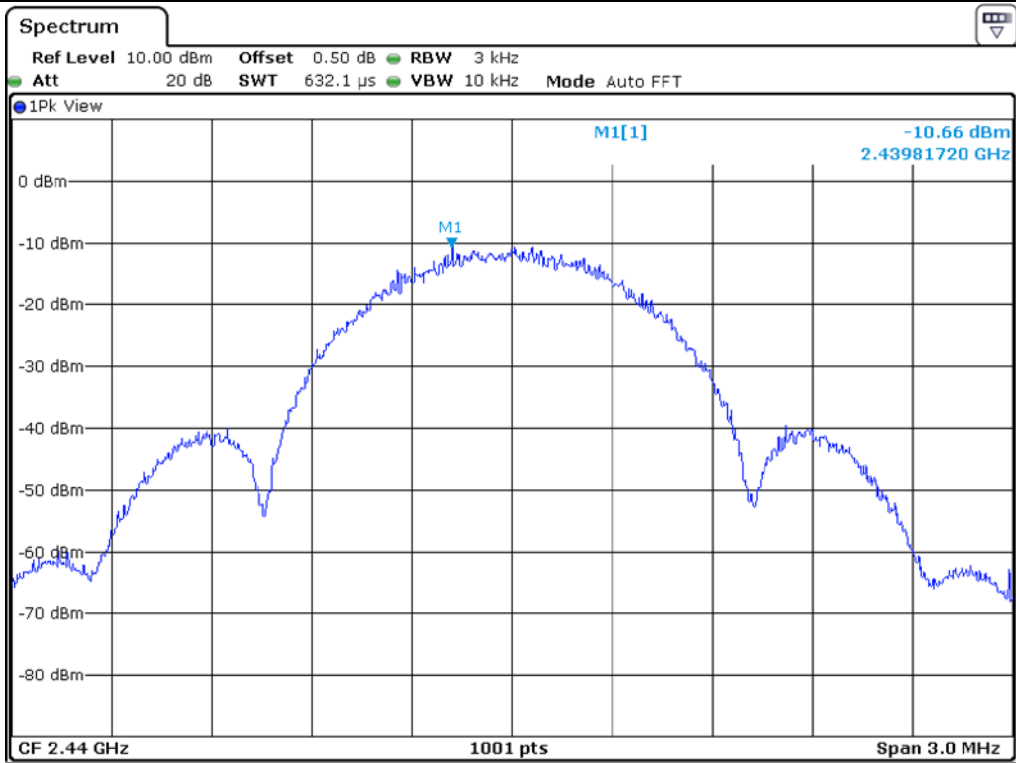
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-11.18	8.00	19.18
Middle	2 440.00	-10.66	8.00	18.66
High	2 480.00	-10.47	8.00	18.47

Remark. Margin = Limit – Measured value

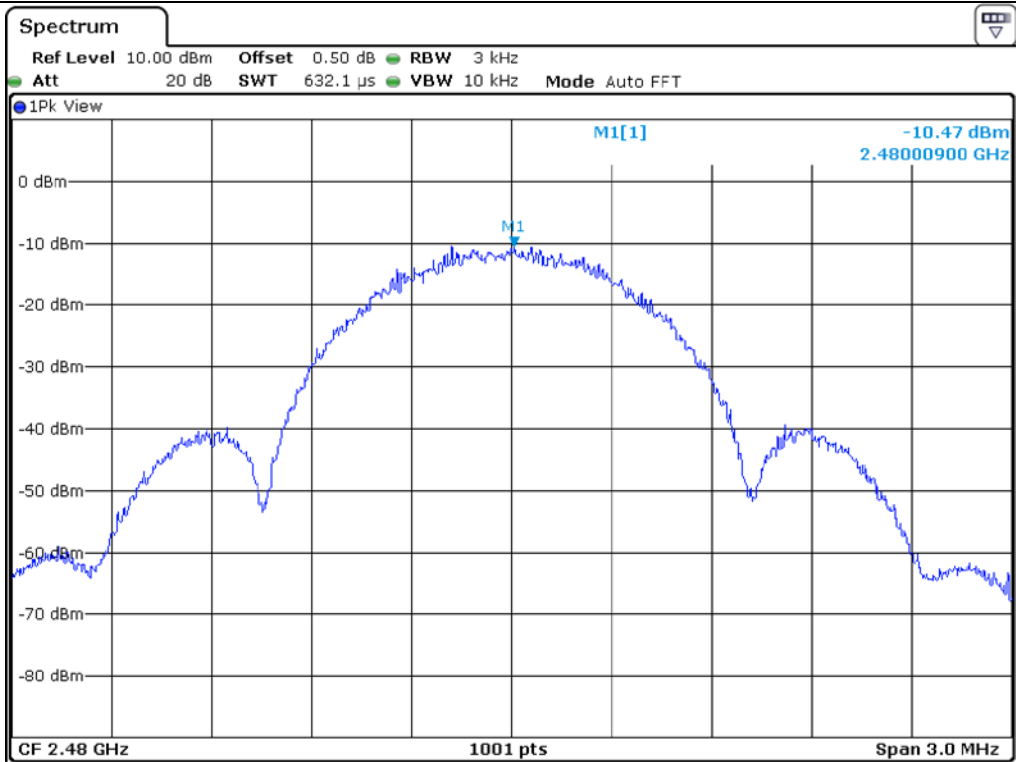


Tested by: Hyung-Kwon, Oh / Manager





Middle Channel



High Channel

10.4.2 Test data for Bluetooth Earbud RIGHT

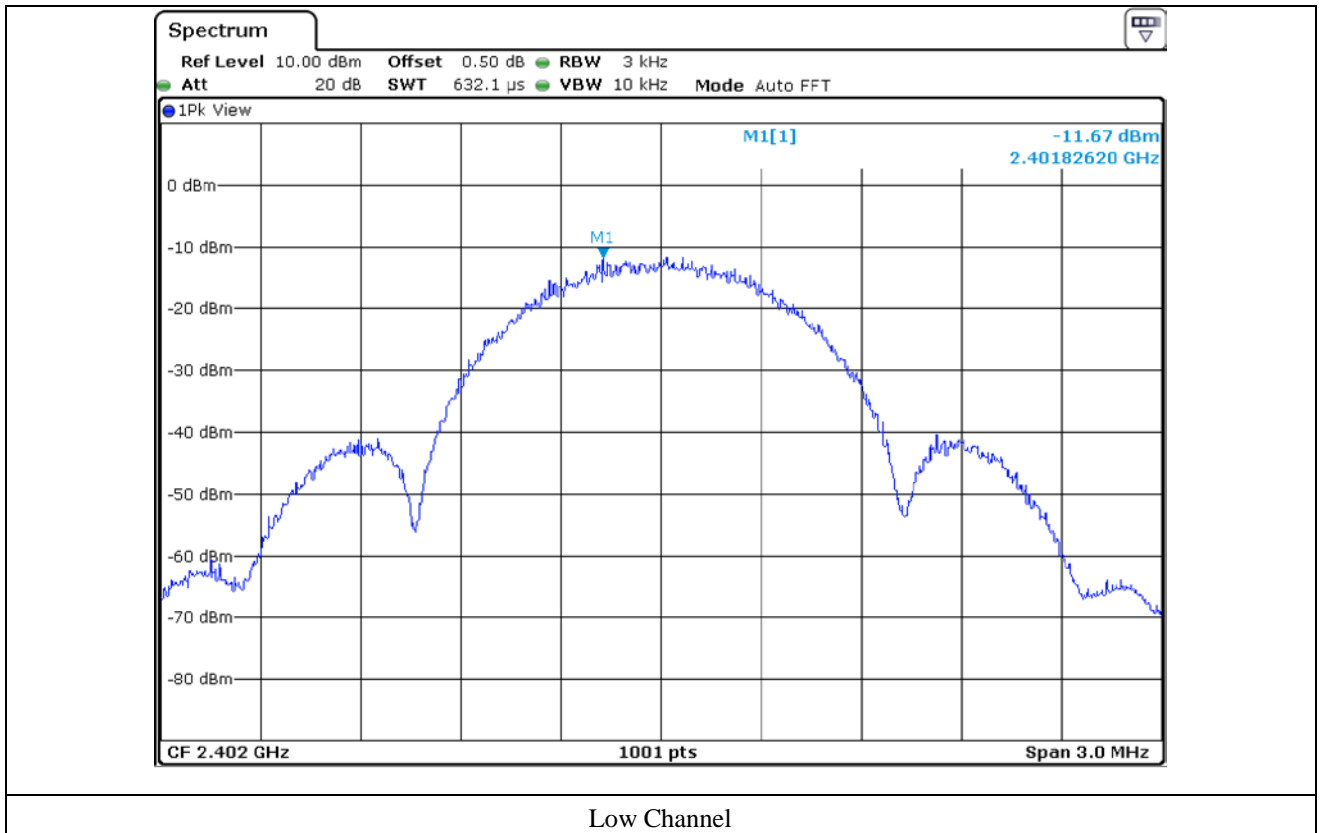
- Test Date : July 13, 2020 ~ July 17, 2020
- Test Result : Pass
- Operating Condition : Continuous transmitting mode

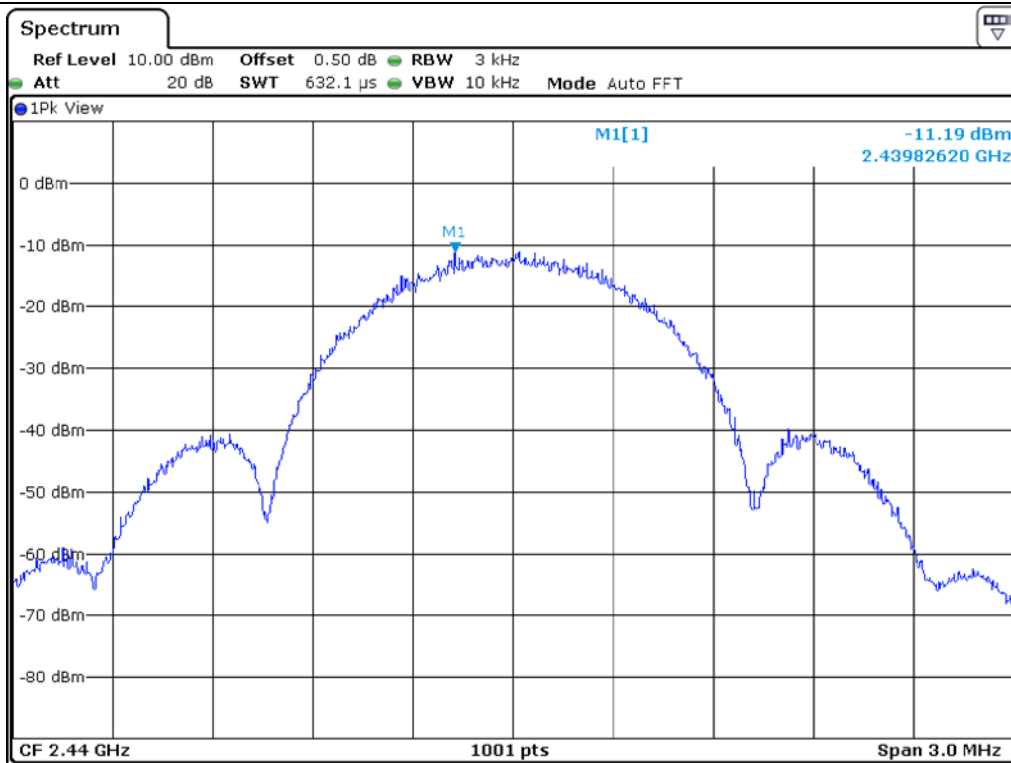
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-11.67	8.00	19.67
Middle	2 440.00	-11.19	8.00	19.19
High	2 480.00	-10.83	8.00	18.83

Remark. Margin = Limit – Measured value

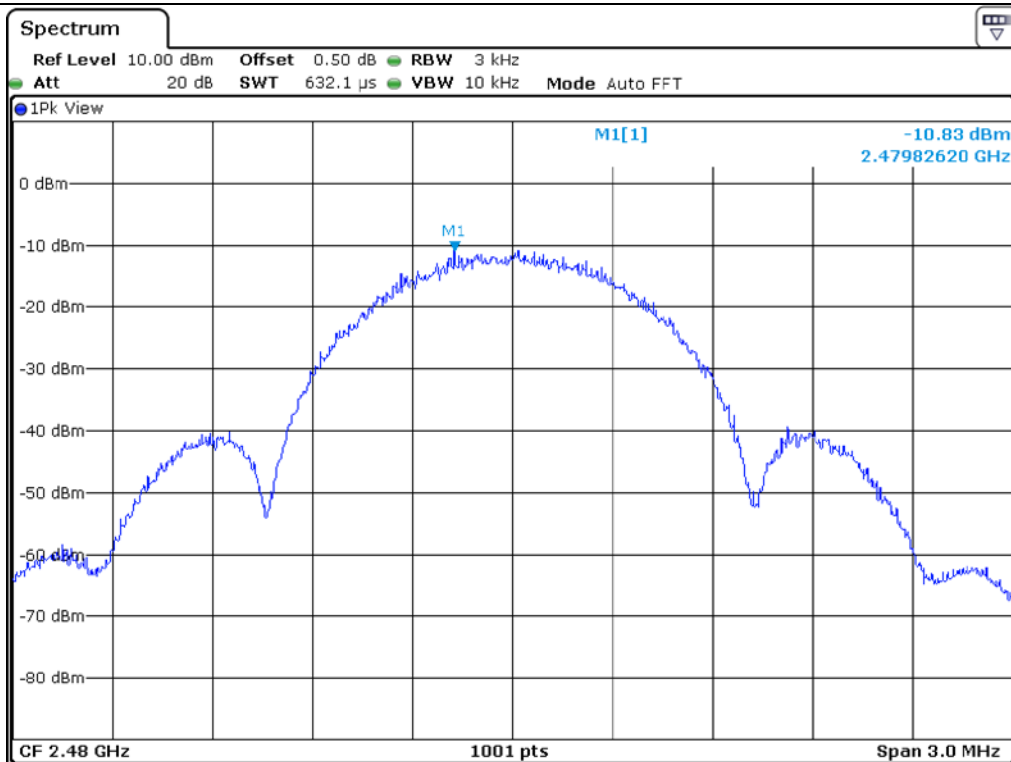


Tested by: Hyung-Kwon, Oh / Manager





Middle Channel



High Channel

10.5 Test data for 2 Mbps

10.5.1 Test data for Bluetooth Earbud LEFT

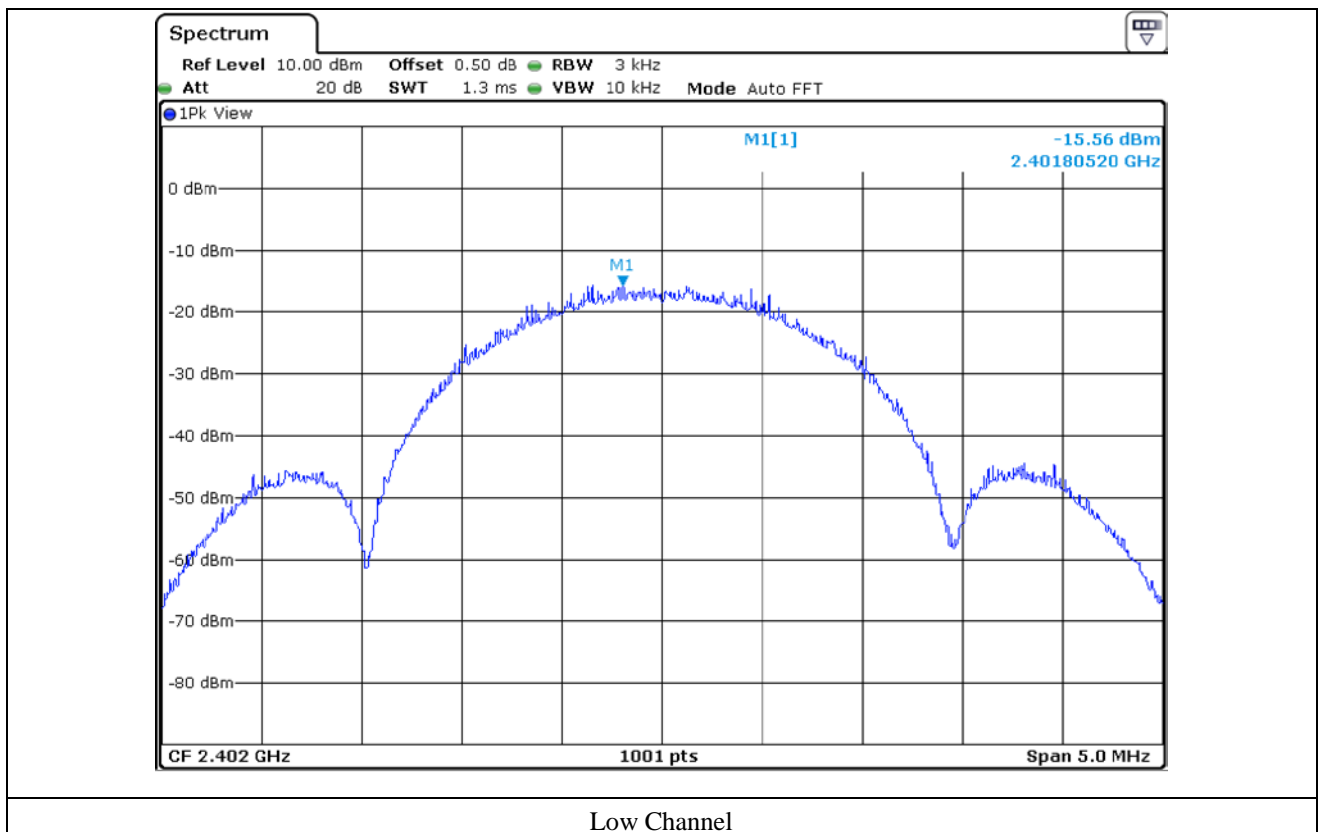
- Test Date : July 13, 2020 ~ July 17, 2020
- Test Result : Pass
- Operating Condition : Continuous transmitting mode

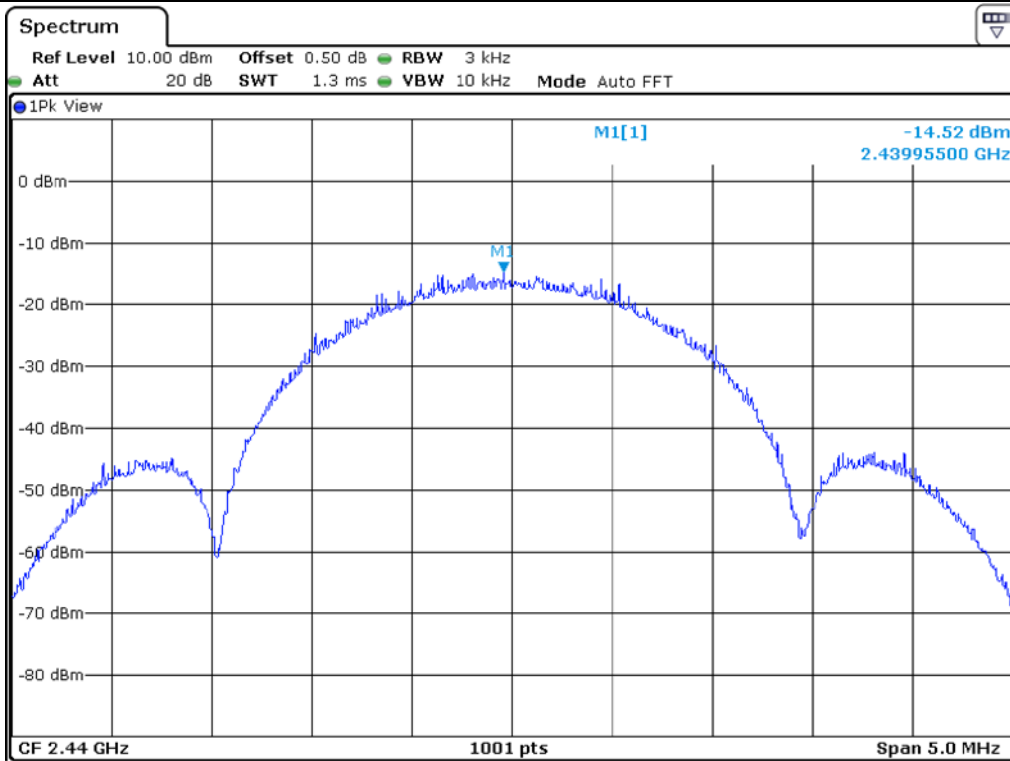
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-15.56	8.00	23.56
Middle	2 440.00	-14.52	8.00	22.52
High	2 480.00	-14.39	8.00	22.39

Remark. Margin = Limit – Measured value

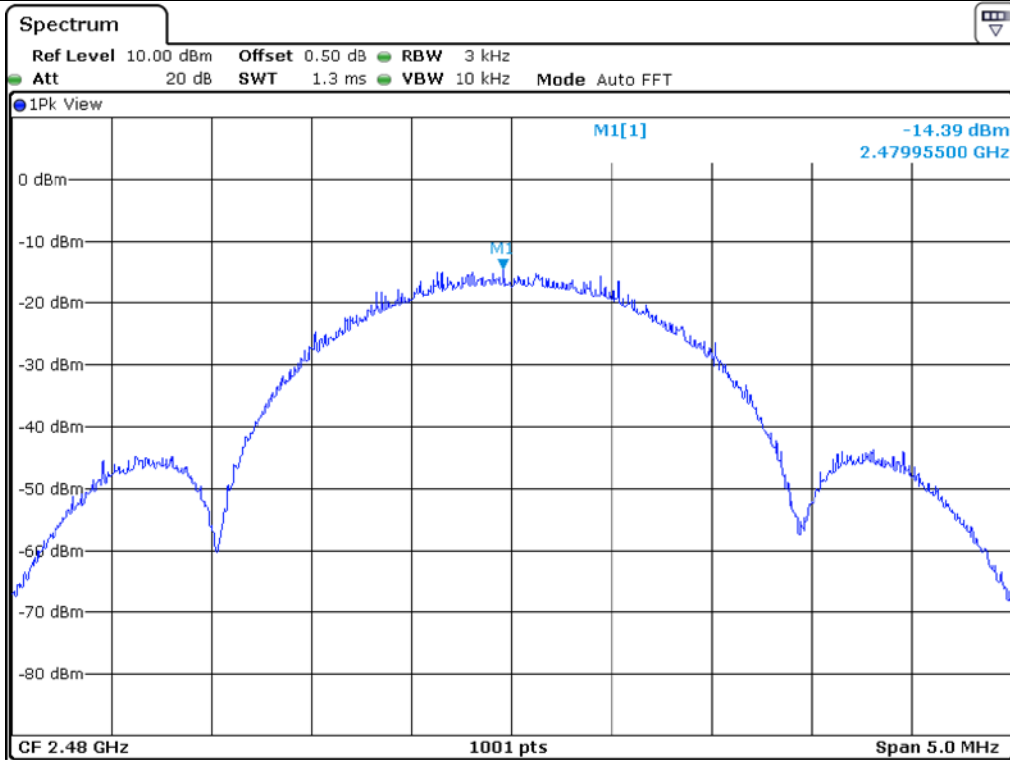


Tested by: Hyung-Kwon, Oh / Manager





Middle Channel



High Channel

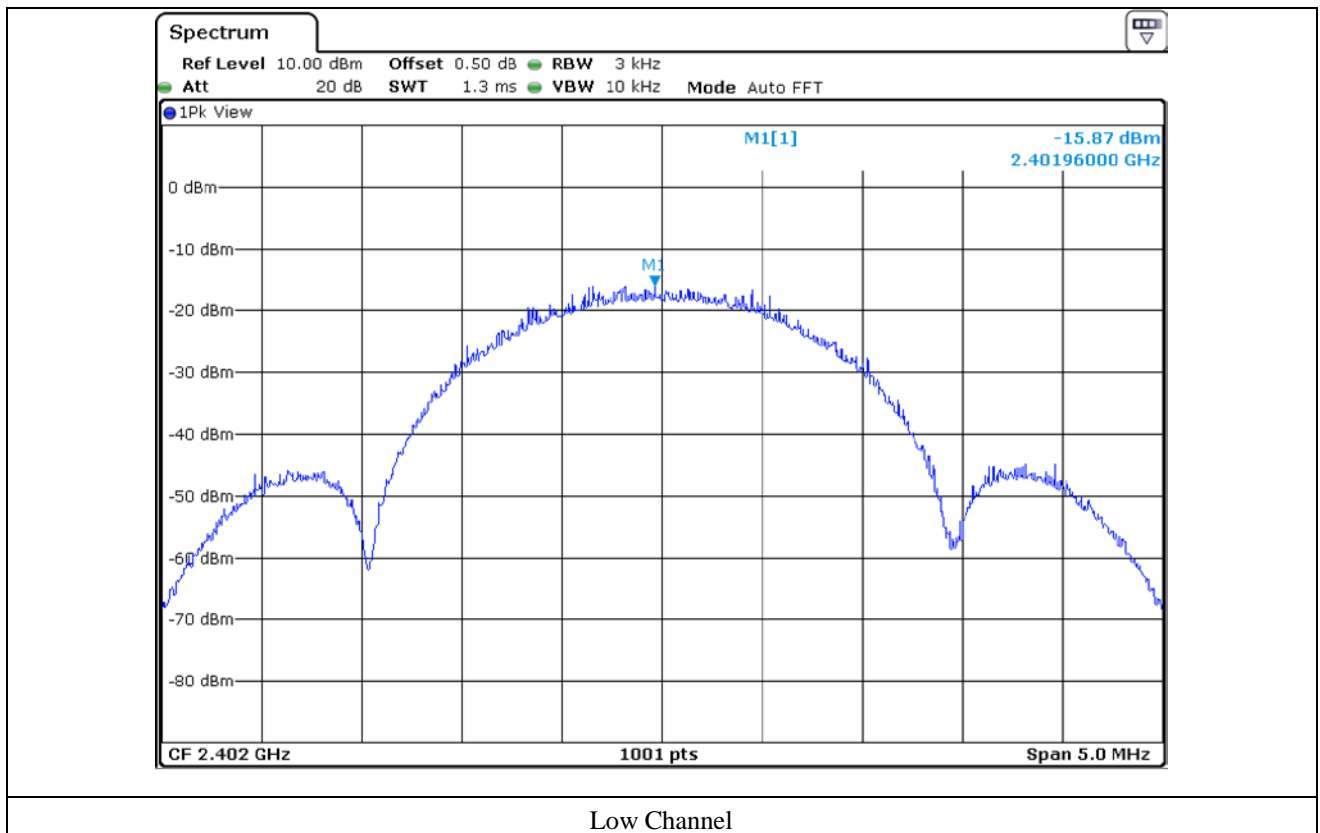
10.5.2 Test data for Bluetooth Earbud RIGHT

- Test Date : July 13, 2020 ~ July 17, 2020
- Test Result : Pass
- Operating Condition : Continuous transmitting mode

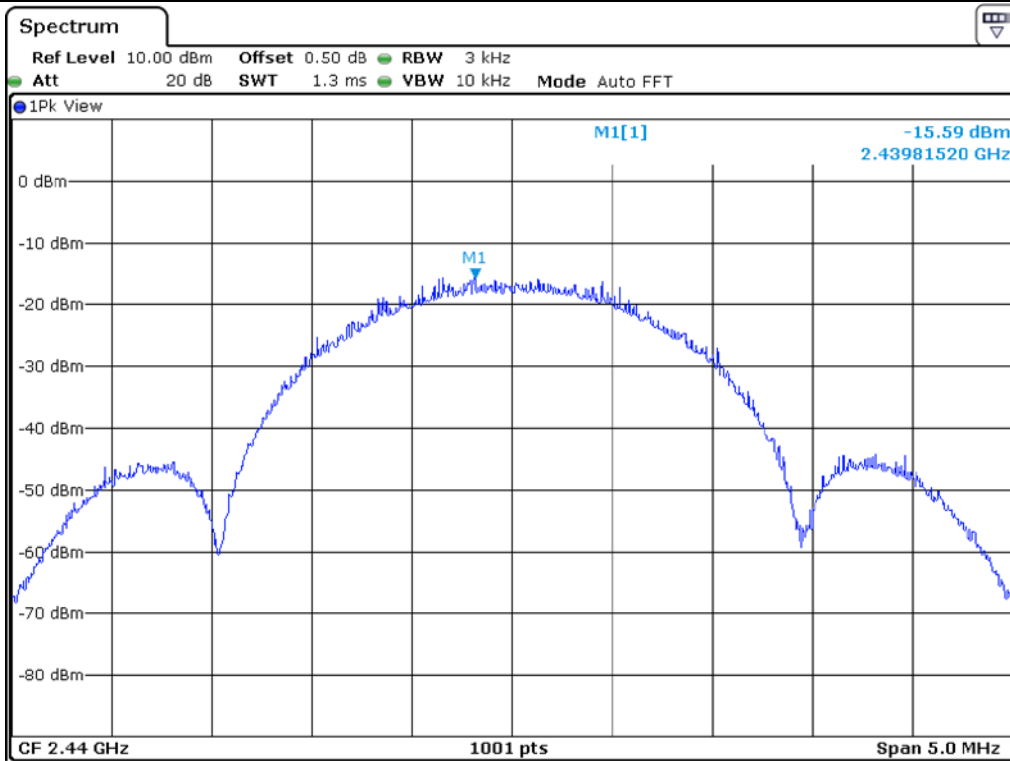
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-15.87	8.00	23.87
Middle	2 440.00	-15.59	8.00	23.59
High	2 480.00	-15.19	8.00	23.19

Remark. Margin = Limit – Measured value

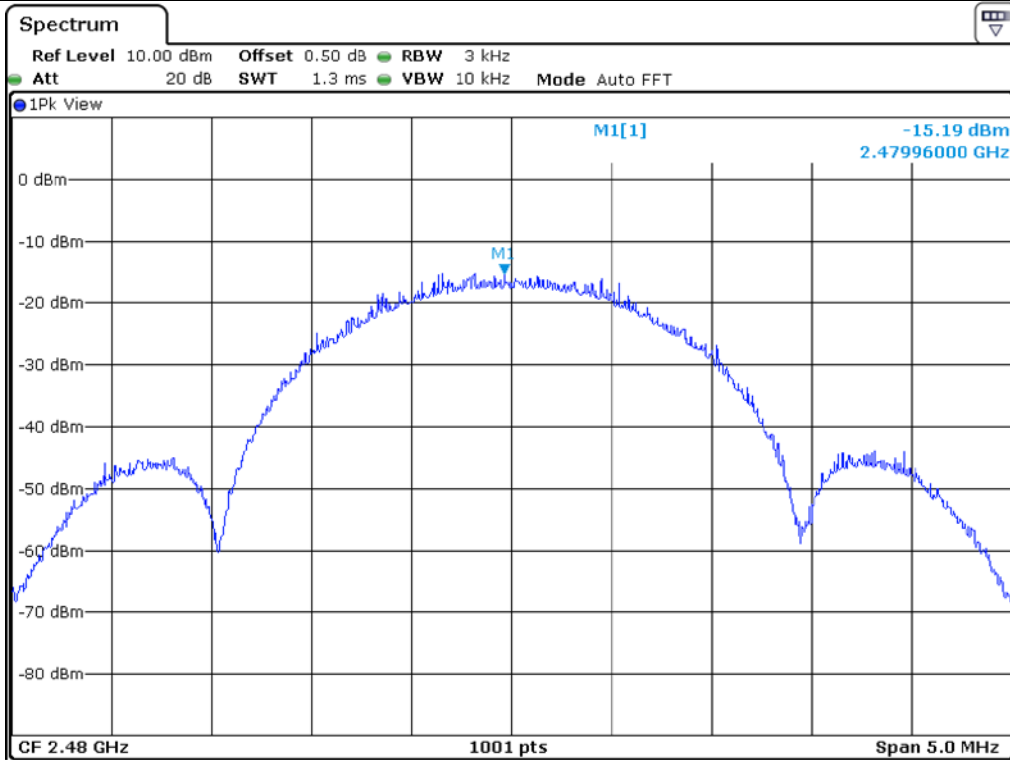
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 23 °C
 Relative humidity : 45 % R.H.

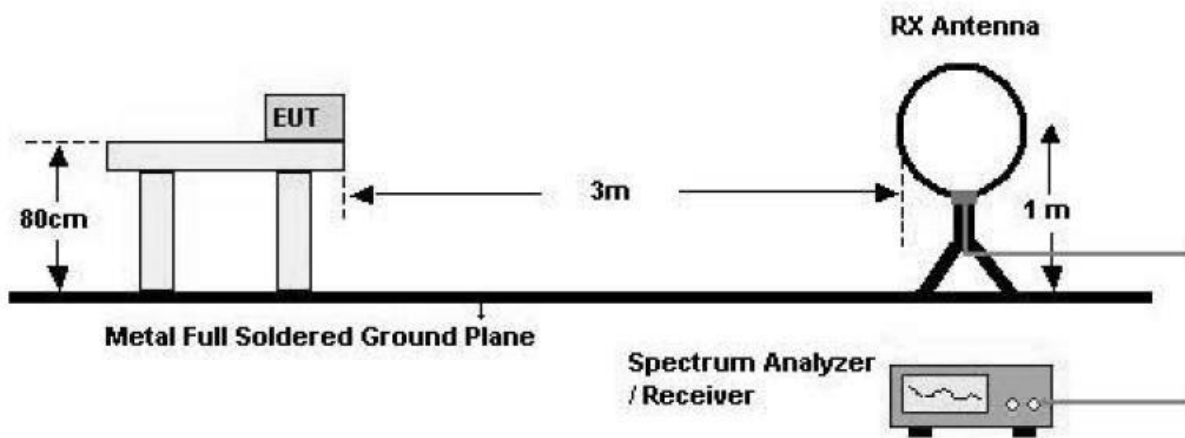
11.2 Test set-up

The radiated emissions measurements were on the 10 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.

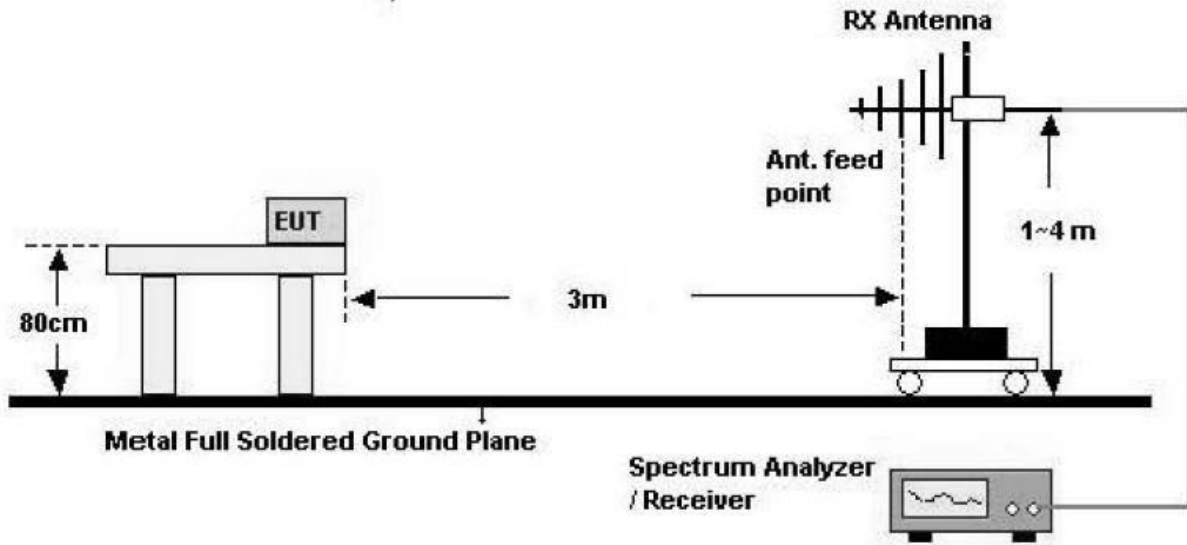
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal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

- Test Configuration

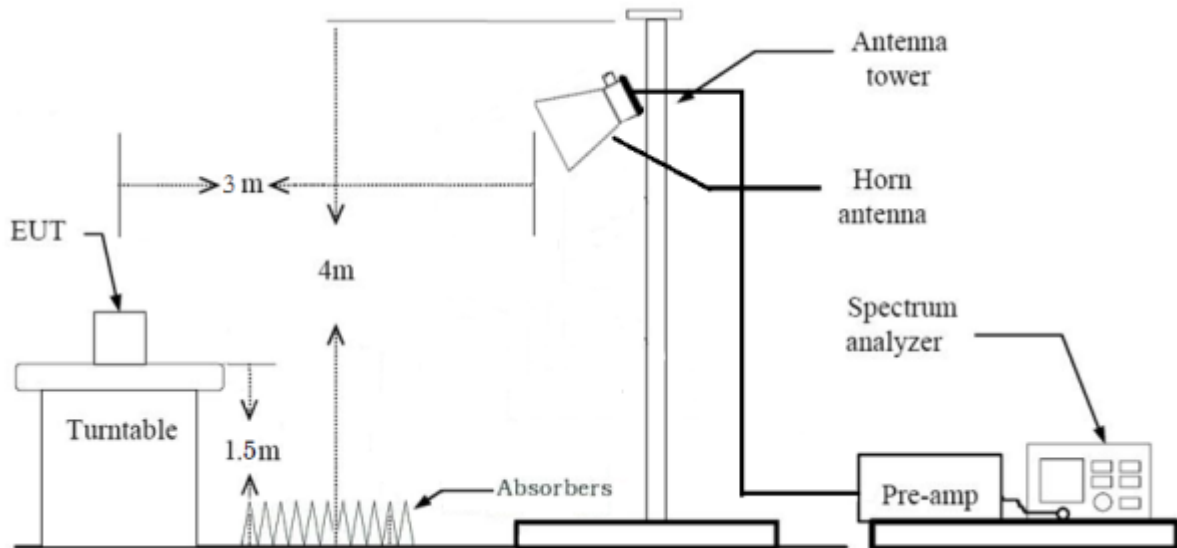
1. Below 30 MHz



2. 30 MHz - 1 GHz



3. Above 1 GHz



11.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Feb. 21, 2020 (1Y)
■ - ESW	Rohde & Schwarz	EMI Test Receiver	101851	Aug. 07, 2019 (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. 24, 2019(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)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 23, 2020 (1Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2020(1Y)

All test equipment used is calibrated on a regular basis.

11.4 Test data for Bluetooth Earbud LEFT

11.4.1 Test data for 30 MHz ~ 1 GHz

Humidity Level : 45 % R.H.

Temperature: 23 °C

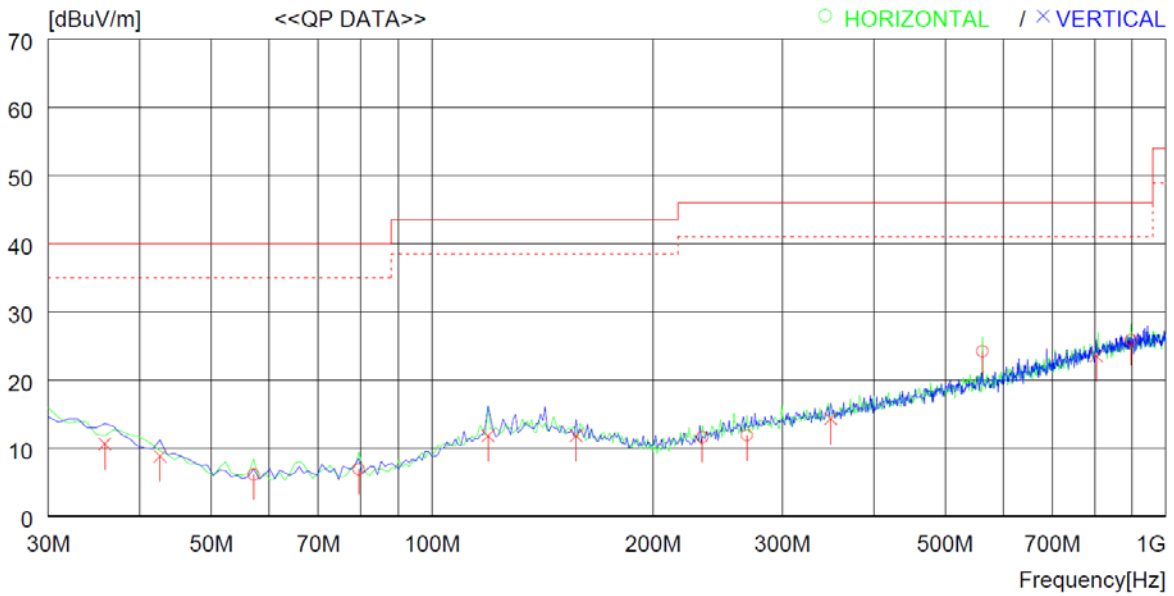
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Bluetooth Earbud

Date: July 13, 2020 ~ July 17, 2020

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	57.160	17.7	19.3	1.6	32.5	6.1	40.0	33.9	100	359
2	79.470	22.1	15.4	1.9	32.5	6.9	40.0	33.1	100	359
3	233.700	24.4	16.7	2.9	32.4	11.6	46.0	34.4	100	308
4	268.620	22.9	18.3	3.1	32.4	11.9	46.0	34.1	100	359
5	562.529	27.4	24.9	4.5	32.6	24.2	46.0	21.8	100	149
6	896.199	22.8	29.0	5.8	31.7	25.9	46.0	20.1	100	133
----- Vertical -----										
7	35.820	23.5	18.3	1.3	32.5	10.6	40.0	29.4	100	17
8	42.610	20.5	19.3	1.5	32.5	8.8	40.0	31.2	100	166
9	119.240	25.5	16.6	2.2	32.5	11.8	43.5	31.7	100	0
10	157.070	22.9	19.0	2.4	32.5	11.8	43.5	31.7	100	17
11	349.130	23.0	20.3	3.5	32.5	14.3	46.0	31.7	100	0
12	804.052	22.2	28.2	5.4	32.3	23.5	46.0	22.5	100	0

Tested by: Hyung-Kwon, Oh / Manager

11.4.2 Test data for Below 30 MHz

- . Test Date : July 13, 2020 ~ July 17, 2020
- . 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 (dB μ V)	Ant. Pol. (H/V)	Ant. Height (m)	Angle ($^{\circ}$)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

11.4.3 Test data for above 1 GHz

- . Test Date : July 13, 2020 ~ July 17, 2020
- . 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 (dB μ V)	Ant. Pol. (H/V)	Ant. Height (m)	Angle ($^{\circ}$)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									



Tested by: Hyung-Kwon, Oh / Manager

11.5 Test data for Bluetooth Earbud RIGHT

11.5.1 Test data for 30 MHz ~ 1 GHz

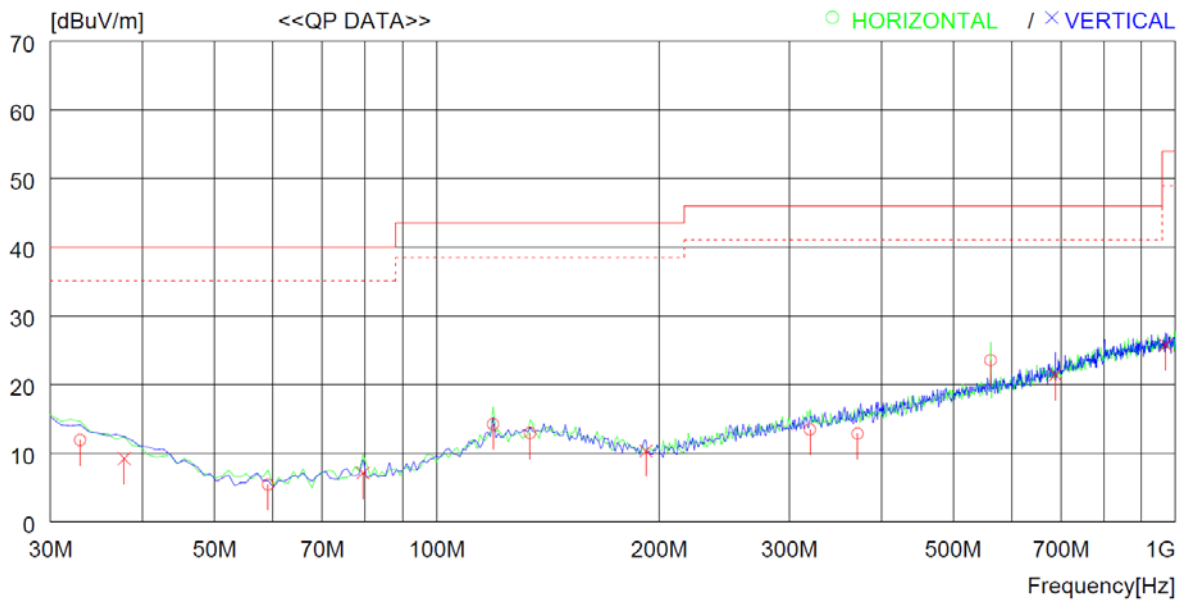
Humidity Level : 45 % R.H. Temperature: 23 °C

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

Result : PASSED

EUT : Bluetooth Earbud Date: July 13, 2020 ~ July 17, 2020

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	32.910	33.0	11.0	0.5	32.6	11.9	40.0	28.1	100	188
2	59.100	28.0	9.4	0.7	32.7	5.4	40.0	34.6	100	16
3	119.240	35.1	10.8	1.0	32.7	14.2	43.5	29.3	100	359
4	133.790	33.7	10.8	1.1	32.7	12.9	43.5	30.6	100	359
5	320.030	30.2	14.2	1.7	32.7	13.4	46.0	32.6	100	313
6	371.440	28.0	15.6	1.9	32.7	12.8	46.0	33.2	100	40
7	562.529	35.1	19.1	2.3	33.0	23.5	46.0	22.5	100	359
----- Vertical -----										
8	37.760	30.5	10.9	0.5	32.7	9.2	40.0	30.8	100	1
9	79.470	31.2	7.8	0.8	32.7	7.1	40.0	32.9	100	1
10	191.990	28.8	12.8	1.3	32.6	10.3	43.5	33.2	100	129
11	687.655	31.0	20.8	2.5	32.9	21.4	46.0	24.6	100	1
12	968.947	30.9	23.6	3.0	31.7	25.8	54.0	28.2	100	1

Tested by: Hyung-Kwon, Oh / Manager

11.5.2 Test data for Below 30 MHz

- . Test Date : July 13, 2020 ~ July 17, 2020
- . 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.									

11.5.3 Test data for above 1 GHz

- . Test Date : July 13, 2020 ~ July 17, 2020
- . 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.									



Tested by: Hyung-Kwon, Oh / Manager