

FCC & ISED TEST REPORT

Product Name: Sports headphones

Trade Mark:  or PHILIPS

Model No./HVIN: TAA5508

Add. Model No.: TAA5508xx/yy, TAA5508 II, TAA5508 II
xx/yy (xx=AA-ZZ or blank denoted different
color; yy=00-99 denoted different country
destination)

Report Number: 2212163226RFC-1

Test Standards: FCC 47 CFR Part 15 Subpart C
RSS-247 Issue 2
RSS-Gen Issue 5

FCC ID: 2AR2STAA5508

IC: 24589-TAA5508

Test Result: PASS

Date of Issue: March 21, 2023

Prepared for:

MMD Hong Kong Holding Limited
Units 1208-11, 12th Floor, C-Bons International Center, 108 Wai Yip
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Prepared by:

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UTTR-RF-RSS247-V1.1

Version

Version No.	Date	Description
V1.0	March 21, 2023	Original



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CONTENTS

1. GENERAL INFORMATION	4
1.1 CLIENT INFORMATION	4
1.2 EUT INFORMATION	4
1.2.1 GENERAL DESCRIPTION OF EUT	4
1.2.2 DESCRIPTION OF ACCESSORIES	4
1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD	5
1.4 OTHER INFORMATION.....	5
1.5 DESCRIPTION OF SUPPORT UNITS	5
1.6 TEST LOCATION.....	5
1.7 TEST FACILITY.....	6
1.8 DEVIATION FROM STANDARDS	6
1.9 ABNORMALITIES FROM STANDARD CONDITIONS.....	6
1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER	6
1.11 MEASUREMENT UNCERTAINTY	7
2. TEST SUMMARY	8
3. EQUIPMENT LIST	9
4. TEST CONFIGURATION	10
4.1 ENVIRONMENTAL CONDITIONS FOR TESTING	10
4.1.1 NORMAL OR EXTREME TEST CONDITIONS	10
4.1.2 RECORD OF NORMAL ENVIRONMENT.....	10
4.2 TEST CHANNELS	10
4.3 EUT TEST STATUS	10
4.4 PRE-SCAN.....	11
4.5 TEST SETUP	11
4.5.1 FOR RADIATED EMISSIONS TEST SETUP	11
4.5.2 FOR CONDUCTED EMISSIONS TEST SETUP	13
4.5.3 FOR CONDUCTED RF TEST SETUP	13
4.6 SYSTEM TEST CONFIGURATION	14
4.7 DUTY CYCLE	15
5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION	17
5.1 REFERENCE DOCUMENTS FOR TESTING	17
5.2 ANTENNA REQUIREMENT	17
5.3 CONDUCTED PEAK OUTPUT POWER.....	18
5.4 6 dB BANDWIDTH & OCCUPIED BANDWIDTH.....	19
5.5 POWER SPECTRAL DENSITY	22
5.6 CONDUCTED OUT OF BAND EMISSION	24
5.7 RADIATED SPURIOUS EMISSIONS.....	29
5.8 BAND EDGE MEASUREMENTS (RADIATED).....	42
APPENDIX 1 PHOTOS OF TEST SETUP	51
APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS	51

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	MMD Hong Kong Holding Limited
Address of Applicant:	Units 1208-11,12th Floor,C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon,Hong Kong
Manufacturer:	MMD Hong Kong Holding Limited
Address of Manufacturer:	Units 1208-11,12th Floor,C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon,Hong Kong

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Sports headphones	
Model No. /HVIN:	TAA5508	
Add. Model No.:	TAA5508xx/yy,TAA5508 II ,TAA5508 II xx/yy (xx=AA-ZZ or blank denoted different color; yy=00-99 denoted different country destination)	
Trade Mark:	 or PHILIPS	
DUT Stage:	Production Unit	
EUT Supports Function: (Provided by the customer)	2.4 GHz ISM Band:	Bluetooth 5.3
Software Version:	V1.1.0.19(Provided by the customer)	
Hardware Version:	V04(Provided by the customer)	
Sample Received Date:	December 14, 2022	
Sample Tested Date:	February 7, 2023 to February 28, 2023	
Note: The additional model TAA5508xx/yy,TAA5508 II ,TAA5508 II xx/yy (xx=AA-ZZ or blank denoted different color; yy=00-99 denoted different country destination) is identical with the test model TAA5508 except the model number for marketing purpose.		

1.2.2 Description of Accessories

Cable	
Description:	USB Type-C Plug Cable
Cable Type:	Unshielded without ferrite
Length:	0.3 Meter

Battery (Charging Box)	
Model No.:	902035
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.7 Vdc
Limited Charge Voltage:	4.2 Vdc
Rated Capacity:	600 mAh

Battery (Earbuds)	
Model No.:	M1154A6-S01
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.85 Vdc
Limited Charge Voltage:	4.4 Vdc
Rated Capacity:	53 mAh

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UTTR-RF-RSS247-V1.1

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	2400 MHz to 2483.5 MHz	
Frequency Range:	2402 MHz to 2480 MHz	
Bluetooth Version:	Bluetooth LE	
Type of Modulation:	GFSK	
Number of Channels:	40	
Channel Separation:	2 MHz	
Antenna Type:	FPCB Antenna	
Antenna Gain: (Provided by the customer)	-0.5 dBi	
Maximum Conducted Peak Power:	LE	10.01 dBm
	2LE	10.02 dBm
Normal Test Voltage:	3.85 Vdc	

1.4 OTHER INFORMATION

Operation Frequency Each of Channel	
$f = 2402 + 2k \text{ MHz, } k = 0, \dots, 39$	
Note:	
f	is the operating frequency (MHz);
k	is the operating channel.

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	DELL	Latitude3400	16238087894	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.10 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Telephone: +86 (0) 755 2823 0888

Fax: +86 (0) 755 2823 0886

1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.2 dB
2	Conducted emission 150KHz-30MHz	±2.7 dB
3	Radiated emission 9KHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 dB
8	RF Power, Conducted	± 0.69 dB
9	Transmission Time	± 0.19 %
10	Occupied Bandwidth	± 1.86 %
11	Power Spectral Density, conducted	± 0.6 dB
12	Radio Frequency	± 6.5 x 10 ⁻⁸
13	Conducted out of band emission	± 2.7 dB

2. TEST SUMMARY

Test Cases			
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203/15.247 (c) RSS-Gen Issue 5, Section 6.8	N/A	PASS
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207 RSS-Gen Issue 5, Section 8.8	ANSI C63.10-2013 Clause 6.2	N/A NOTE 2
Conducted Peak Output Power	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(3) RSS-247 Issue 2, Section 5.4(d)	ANSI C63.10-2013 Clause 11.9.1.3	PASS
6dB Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(2) RSS-247 Issue 2, Section 5.2(a)	ANSI C63.10-2013 Clause 11.8.1	PASS
Occupied Bandwidth	RSS-Gen Issue 5, Section 6.7	RSS-Gen Issue 5, Section 6.7	PASS
Power Spectral Density	FCC 47 CFR Part 15 Subpart C Section 15.247 (e) RSS-247 Issue 2, Section 5.2(b)	ANSI C63.10-2013 Clause 11.10.2	PASS
Conducted Out of Band Emission	FCC 47 CFR Part 15 Subpart C Section 15.247(d) RSS-247 Issue 2, Section 5.5	ANSI C63.10-2013 Clause 11.11	PASS
Radiated Spurious Emissions	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209 RSS-Gen Issue 5, Section 6.13/8.9/8.10	ANSI C63.10-2013 Clause 11.11 & Clause 11.12	PASS
Band Edge Measurements (Radiated)	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209 RSS-247 Issue 2, Section 5.5	ANSI C63.10-2013 Clause 11.13	PASS
Note: 1) N/A: In this whole report not applicable. 2) This EUT is charged by AC adapter to the battery, when charging, it doesn't transmitting while charging.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (dd mm, yyyy)	Cal. Due date (dd mm, yyyy)
☒	3m SAC	ETS-Lindgren	3m	Euroshiedpn-C T001270-1317	22-Jan-2021	21-Jan-2024
☒	Loop Antenna	ETS-Lindgren	6502	00202525	11-Nov-2021	10-Nov-2023
☒	Receiver	ROHDE & SCHWARZ	ESIB26	100114	3-Nov-2022	2-Nov-2023
☒	Broadband Antenna (Pre-amplifier)	ETS-Lindgren	3142E	00201566	11-Nov-2021	10-Nov-2023
☒	Pre-amplifier	HP	8447F	2805A02960	1-Nov-2022	31-Oct-2023
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	11-Nov-2021	10-Nov-2023
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-Lindgren	3117-PA	00201541	17-Apr-2022	16-Apr-2024
☒	Pre-amplifier	ETS-Lindgren	00118385	00201874	1-Nov-2022	31-Oct-2023
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-Lindgren	3116C-PA	00202652	21-Nov-2022	20-Nov-2023
☒	Pre-amplifier	ETS-Lindgren	00118384	202652	21-Nov-2022	20-Nov-2023
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (dd mm, yyyy)	Cal. Due date (dd mm, yyyy)
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	15-Apr-2022	14-Apr-2023
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	3-Nov-2022	2-Nov-2023
☒	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	1-Nov-2022	31-Oct-2023
☒	Wideband Radio Communication Tester	R&S	CMW500	120932	15-Apr-2022	14-Apr-2023
☒	Test Software	Automation Test System	ECIT	Software Version: 1.0.7515.16529		

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NT/NV	+15 to +35	3.85 and or 5VDC	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Conducted Peak Output Power	23.2	53.7	99.9	S20221214934-ZJA26/26	Bowie Zhang
6dB Bandwidth & Occupied Bandwidth	23.2	53.7	99.9	S20221214934-ZJA26/26	Bowie Zhang
Power Spectral Density	23.2	53.7	99.9	S20221214934-ZJA26/26	Bowie Zhang
Conducted Out of Band Emission	23.2	53.7	99.9	S20221214934-ZJA26/26	Bowie Zhang
Radiated Spurious Emissions	22.5	38.6	101.8	S20221214934-ZJA26/26	Lucas Ouyang
Band Edge Measurements (Radiated)	22.5	38.6	101.8	S20221214934-ZJA26/26	Lucas Ouyang

4.2 TEST CHANNELS

Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
GFSK	2402 MHz to 2480 MHz	Lowest(L)	Middle(M)	Highest(H)
		Channel 0	Channel 19	Channel 39
		2402 MHz	2440 MHz	2480 MHz

4.3 EUT TEST STATUS

Type of Modulation	Tx Function	Description
GFSK	1Tx	1. Keep the EUT in continuously transmitting with modulation test single.

Power Setting
Power Setting: power level is 7

Test Software
Test software name: bt_tool_v1.1.2

4.4 PRE-SCAN

Conducted Average Power						
Type of Modulation	GFSK (LE)			GFSK (2LE)		
Channel	Channel 0	Channel 19	Channel 39	Channel 0	Channel 19	Channel 39
Power (dBm)	7.80	7.44	7.44	5.09	4.85	4.84

4.5 TEST SETUP

4.5.1 For Radiated Emissions test setup

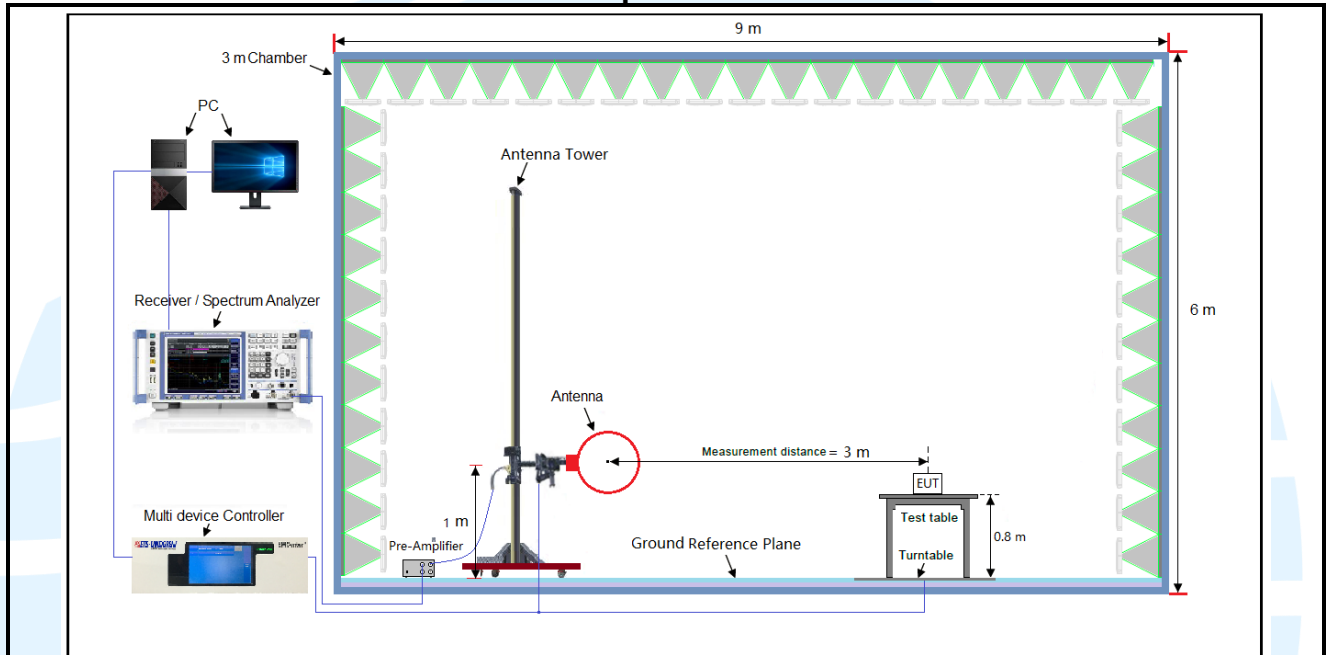


Figure 1. Below 30MHz

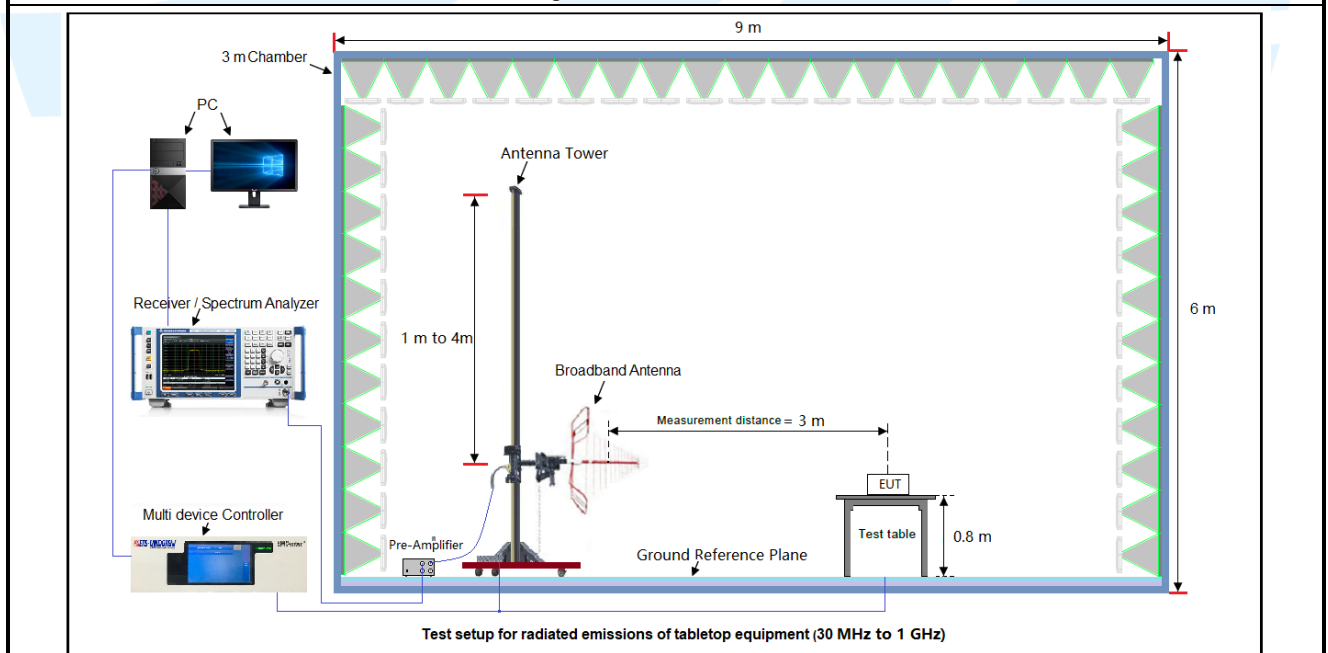
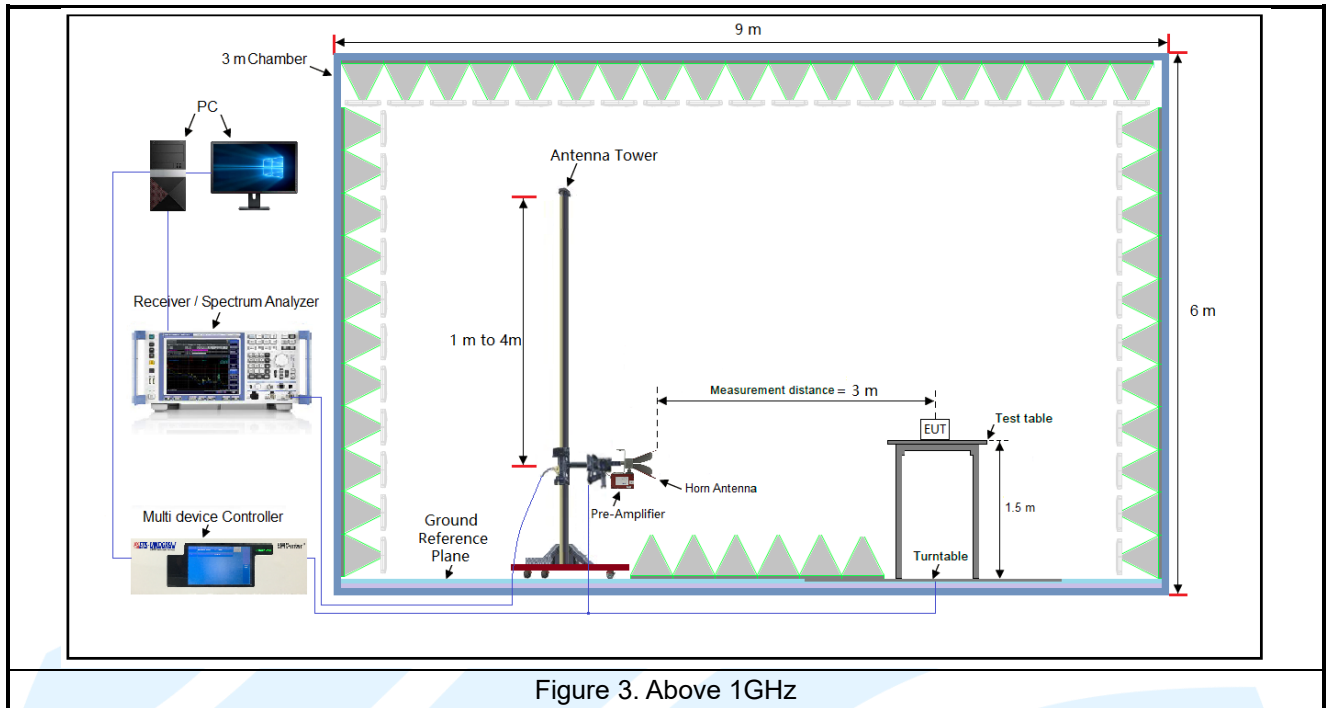
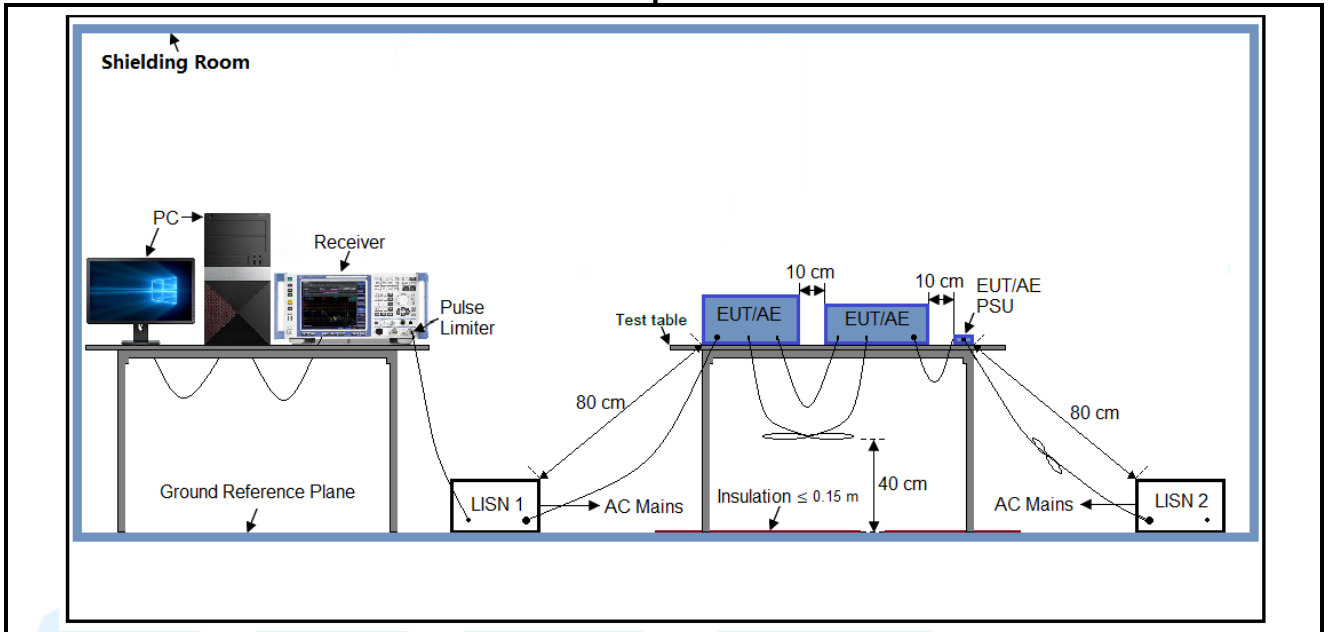


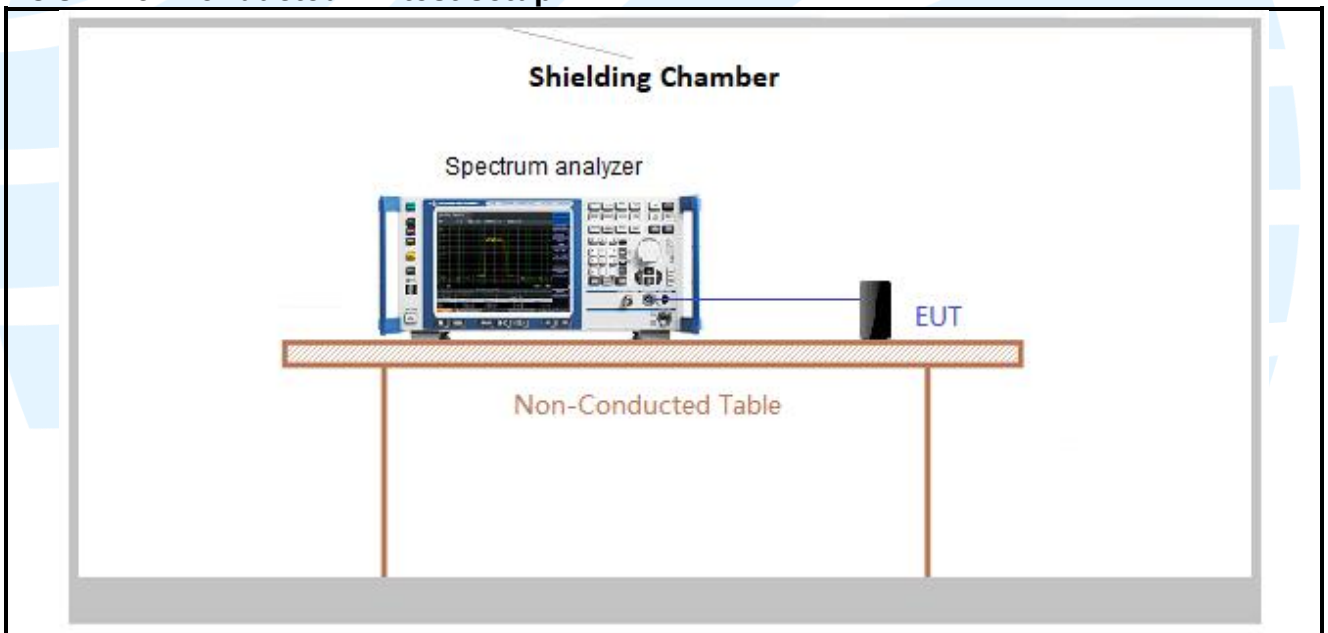
Figure 2. 30MHz to 1GHz



4.5.2 For Conducted Emissions test setup



4.5.3 For Conducted RF test setup



4.6 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.7V battery. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1GHz	1TX	Chain 0	Y axis

All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.7 DUTY CYCLE

Test Procedure: ANSI C63.10-2013 Clause 11.6.

Test Results

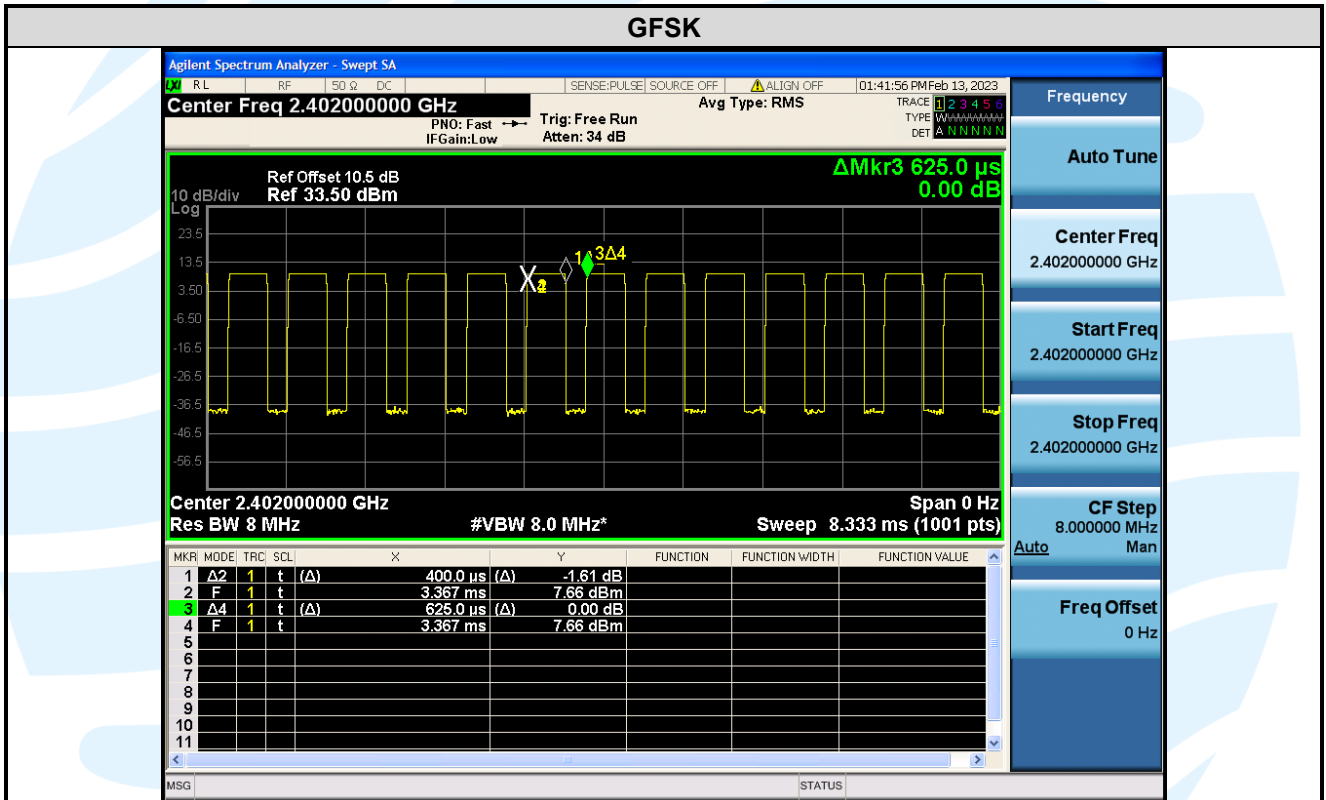
Modulation	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/T Minimum VBW (kHz)
LE	0.400	0.625	0.6400	64.00	1.938	2.50
2LE	0.217	0.625	0.3472	34.72	4.594	4.61

Remark:

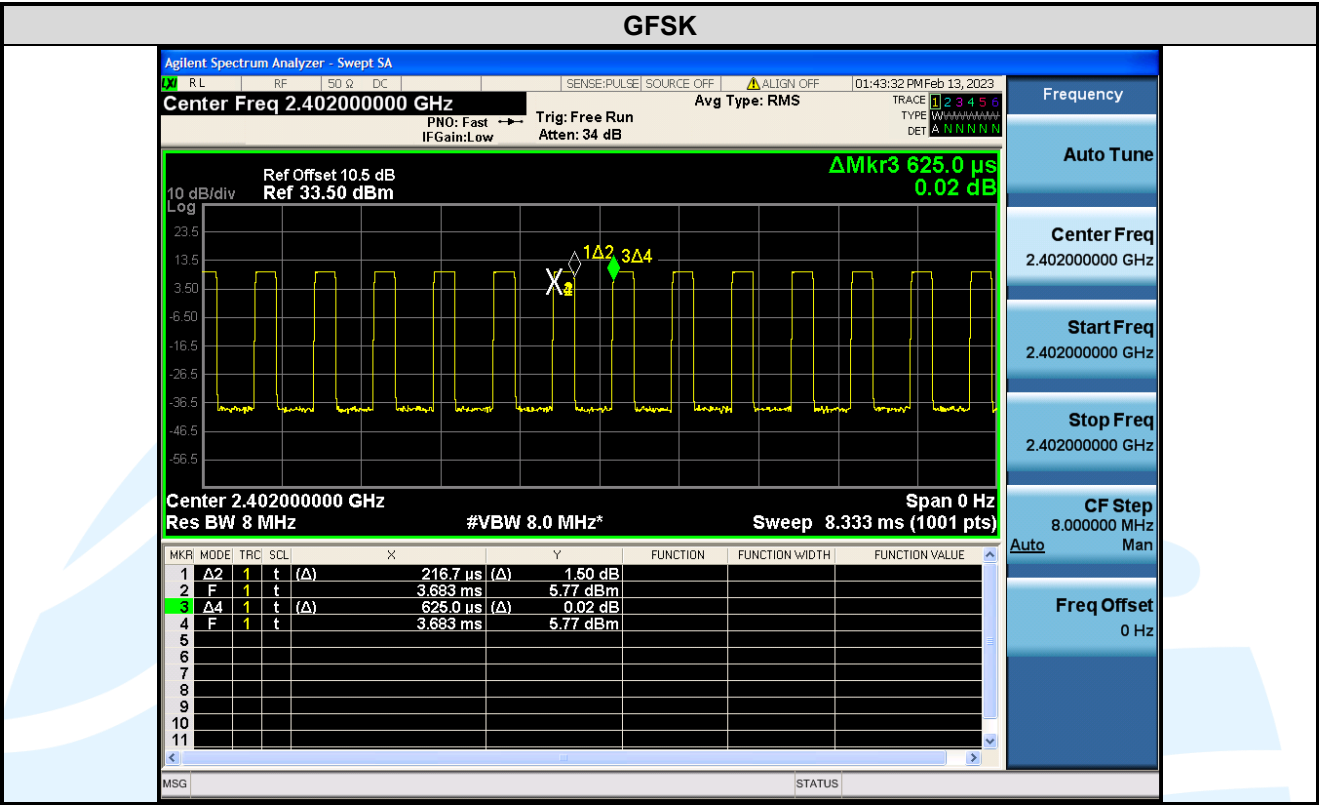
- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = $10 * \log(1/ \text{Duty cycle})$;
- 3) Average factor = $20 \log_{10} \text{Duty Cycle}$.

The test plot as follows

LE



2LE



5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
4	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
6	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum system, and Hybrid system devices operating under Section 15.247 of the FCC rules

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi. RSS-Gen Issue 5, Section 6.8 requirement: According to RSS-Gen Issue 5, Section 6.8, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. EUT Antenna: Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is -0.5 dBi.

5.3 CONDUCTED PEAK OUTPUT POWER

- Test Requirement:** FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(3)
RSS-247 Issue 2, Section 5.4(d)
- Test Method:** ANSI C63.10-2013 Clause 11.9.1.3
- Limit:** For DTSs employing digital modulation techniques operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W.
- Test Procedure:** 1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.
2. Measure out each test modes' peak or average output power, record the power level.
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.
- Test Setup:** Refer to section 4.4.3 for details.
- Instruments Used:** Refer to section 3 for details
- Test Results:** Pass

Mode	Frequency	Max. Peak Power	Peak Power Limit	ISED EIRP	ISED EIRP Limit	Max. Avg. Power	Result
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	
LE	2402	10.01	30	9.51	36.02	7.80	Pass
	2440	9.71	30	9.21	36.02	7.44	Pass
	2480	9.70	30	9.20	36.02	7.44	Pass
2LE	2402	10.02	30	9.52	36.02	5.09	Pass
	2440	9.81	30	9.31	36.02	4.85	Pass
	2480	9.79	30	9.29	36.02	4.84	Pass

Note: The antenna gain of -0.5dBi less than 6dBi maximum permission antenna gain value based on 125 mW peak output power limit.

5.46 DB BANDWIDTH & OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(2)
RSS-247 Issue 2, Section 5.2(a)
RSS-Gen Issue 5, Section 6.7

Test Method: ANSI C63.10-2013 Clause 11.8.1
RSS-Gen Issue 5, Section 6.7

Limit: For digital transmission systems, the minimum 6 dB bandwidth shall be 500 kHz.

Test Procedure: Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Use the following spectrum analyzer settings:

6dB Bandwidth

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

- Set RBW = 1% to 5% of the occupied bandwidth
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.4.3 for details.

Instruments Used: Refer to section 3 for details

Test Results:

LE

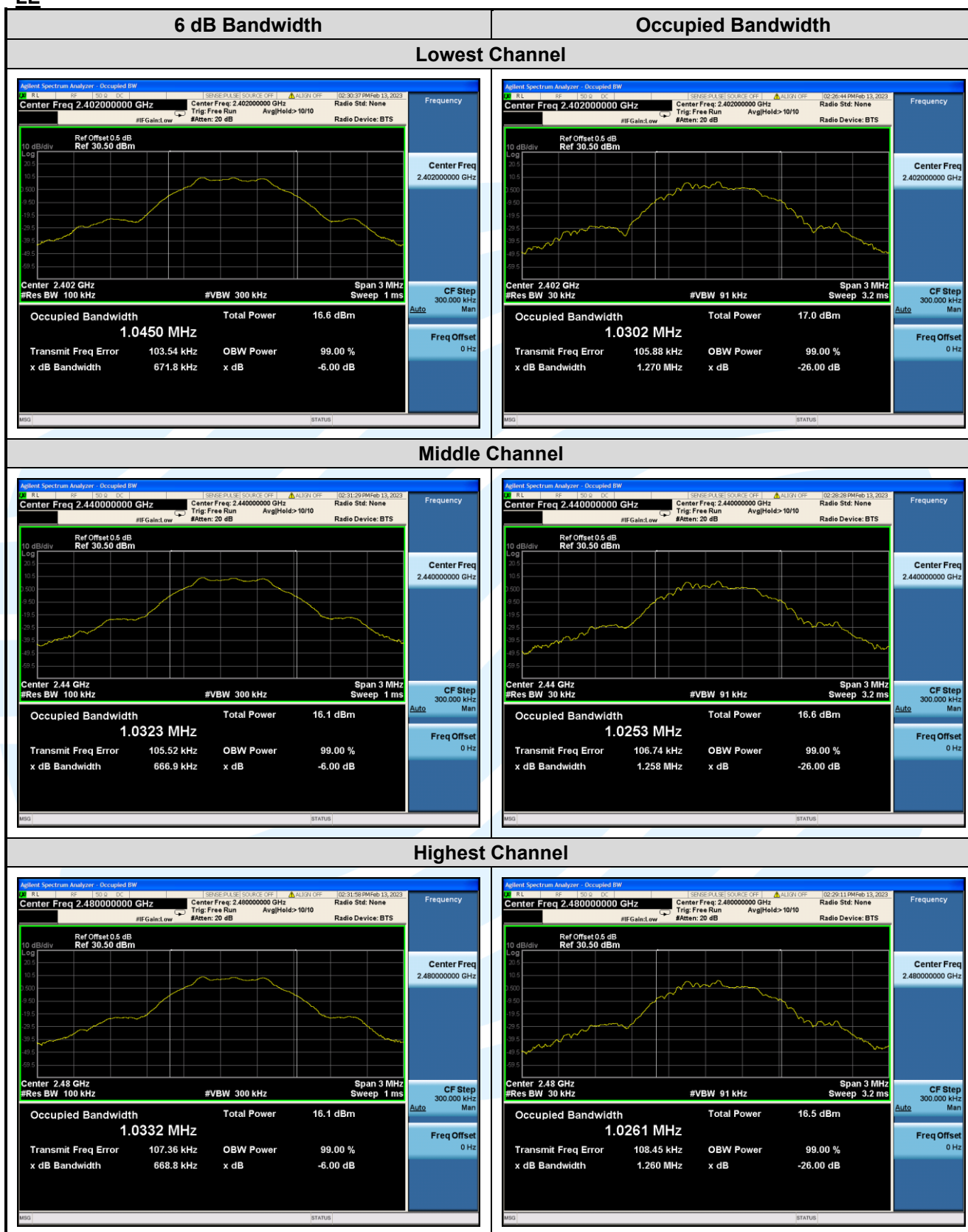
Type of Modulation	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Occupied Bandwidth (MHz)	6 dB Bandwidth Limit	Pass / Fail
GFSK	0	2402	0.6718	1.0302	> 500 kHz	Pass
	19	2440	0.6669	1.0253	> 500 kHz	Pass
	39	2480	0.6688	1.0261	> 500 kHz	Pass

2LE

Type of Modulation	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Occupied Bandwidth (MHz)	6 dB Bandwidth Limit	Pass / Fail
GFSK	0	2402	1.166	2.0406	> 500 kHz	Pass
	19	2440	1.165	2.0238	> 500 kHz	Pass
	39	2480	1.158	2.0221	> 500 kHz	Pass

The test plots as follows:

LE



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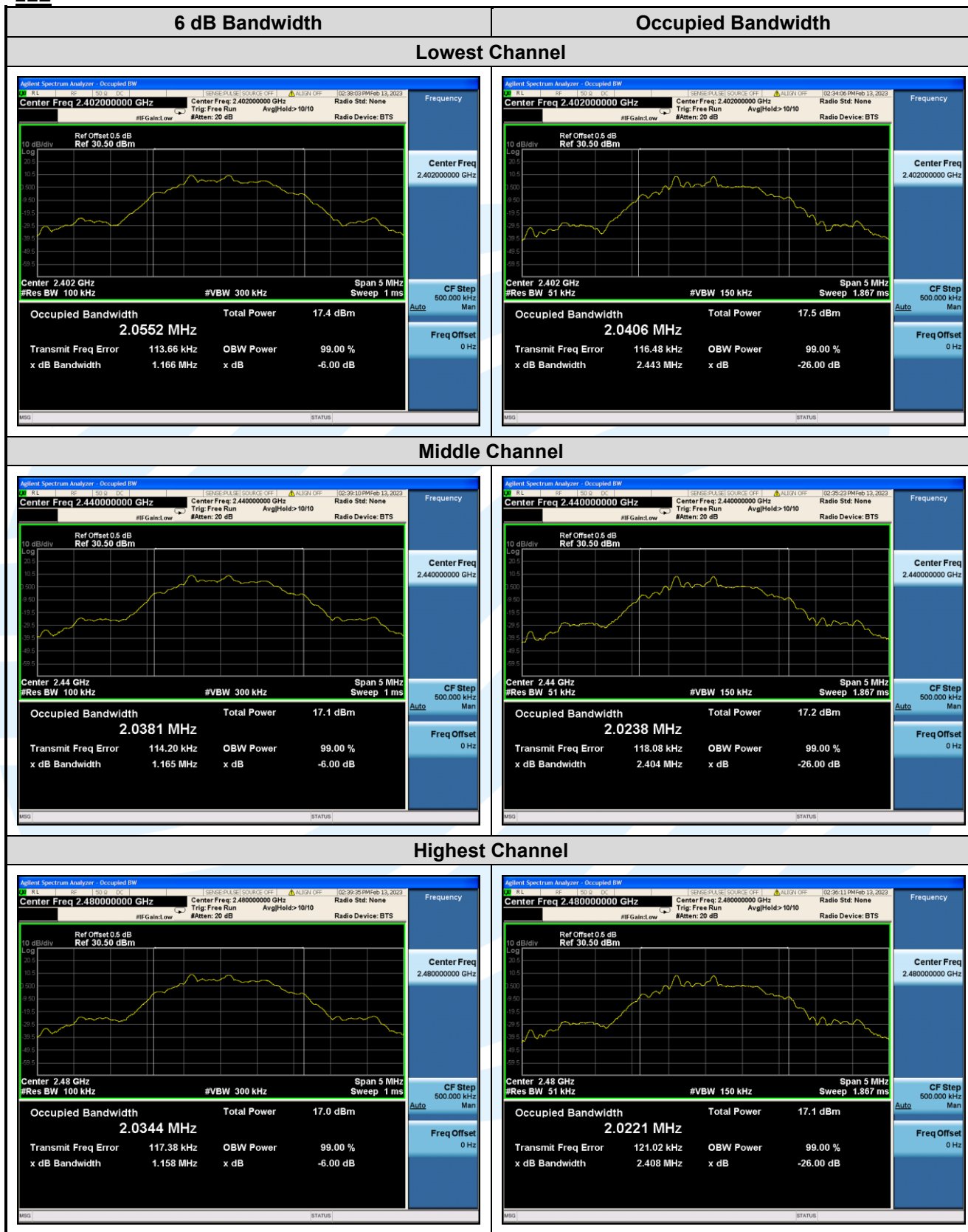
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2LE



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5.5 POWER SPECTRAL DENSITY

- Test Requirement:** FCC 47 CFR Part 15 Subpart C Section 15.247 (e)
RSS-247 Issue 2, Section 5.2(b)
- Test Method:** ANSI C63.10-2013 Clause 11.10.2
- Limit:** For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.
- Test Procedure:** Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Use the following spectrum analyzer settings:
- Set analyzer center frequency to DTS channel center frequency.
 - Set the span to 1.5 times the DTS bandwidth.
 - Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - Set the VBW $\geq 3 \times \text{RBW}$.
 - Detector = peak.
 - Sweep time = auto couple.
 - Trace mode = max hold.
 - Allow trace to fully stabilize.
 - Use the peak marker function to determine the maximum amplitude level within the RBW.
 - If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
- Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.
- Test Setup:** Refer to section 4.4.3 for details.
- Instruments Used:** Refer to section 3 for details
- Test Results:**

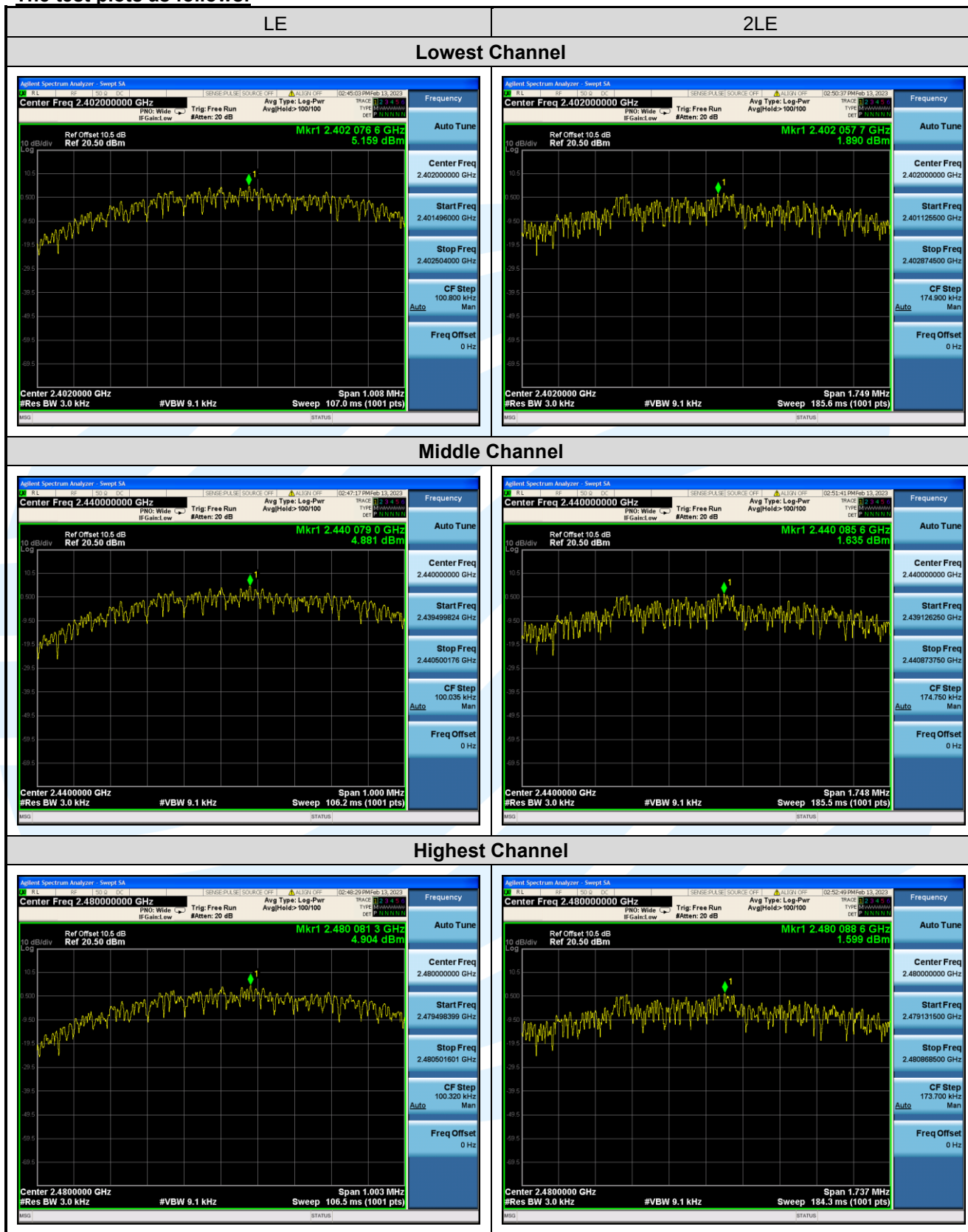
LE

Type of Modulation	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result (Pass / Fail)
GFSK	0	2402	5.159	8	Pass
	19	2440	4.881	8	Pass
	39	2480	4.904	8	Pass

2LE

Type of Modulation	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result (Pass / Fail)
GFSK	0	2402	1.890	8	Pass
	19	2440	1.635	8	Pass
	39	2480	1.599	8	Pass

The test plots as follows:



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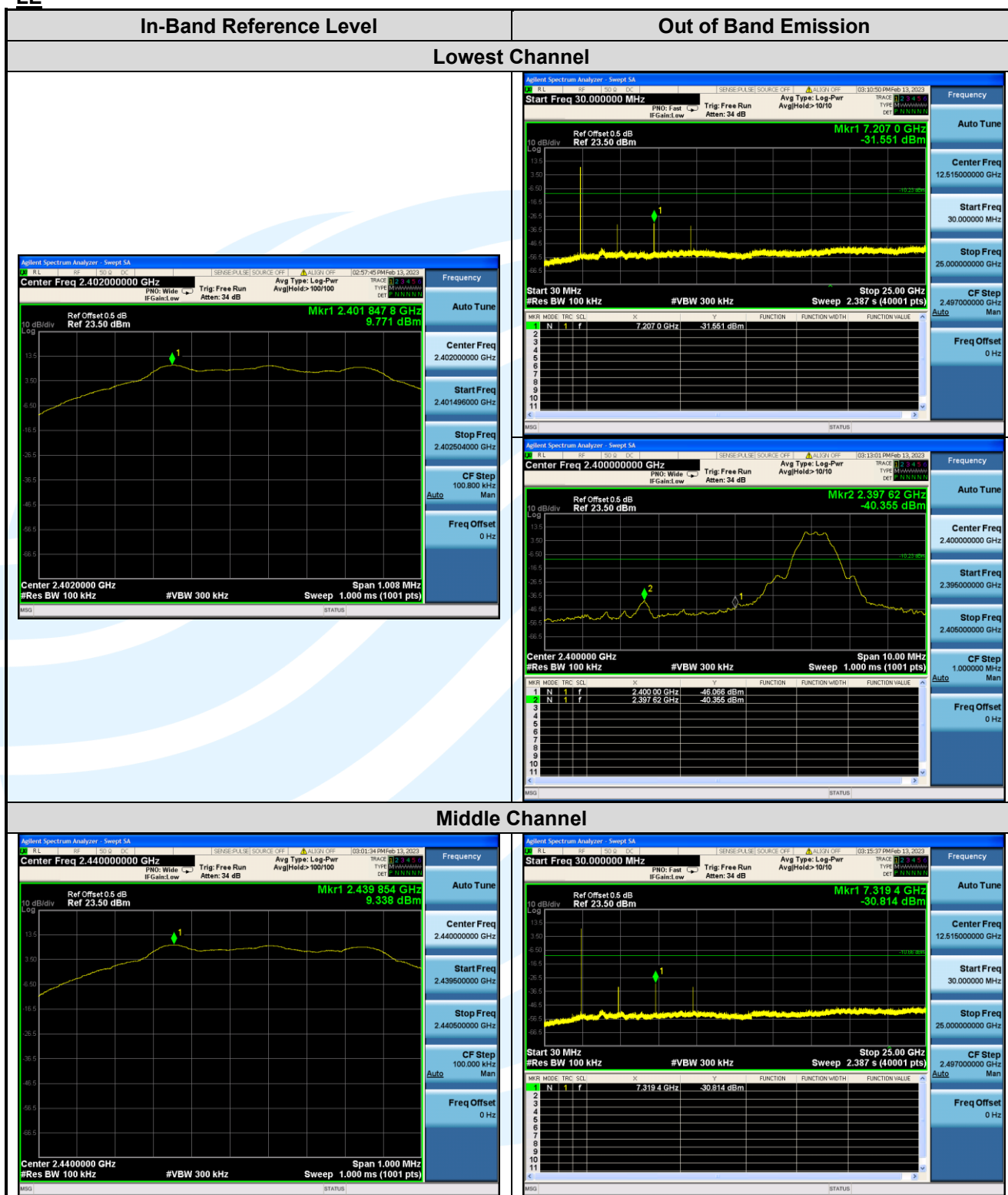
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5.6 CONDUCTED OUT OF BAND EMISSION

Test Requirement:	FCC 47 CFR Part 15 Subpart C Section 15.247(d) RSS-247 Issue 2, Section 5.5
Test Method:	ANSI C63.10-2013 Clause 11.11
Limit:	In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.
Test Procedure:	Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer. Use the following spectrum analyzer settings: Step 1: Reference level measurement a) Set instrument center frequency to DTS channel center frequency. b) Set the span to ≥ 1.5 times the DTS bandwidth. c) Set the RBW = 100 kHz. d) Set the VBW $\geq 3 \times$ RBW. e) Detector = peak. f) Sweep time = auto couple. g) Trace mode = max hold. h) Allow trace to fully stabilize. i) Use the peak marker function to determine the maximum PSD level. Note that the channel found to contain the maximum PSD level can be used to establish the reference level. Step 2: Emission level measurement a) Set RBW = 100 kHz. b) Set VBW ≥ 300 kHz. c) Detector = peak. d) Sweep = auto couple. e) Trace Mode = max hold. f) Allow trace to fully stabilize. g) Use the peak marker function to determine the maximum amplitude level. Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.
Test Setup:	Refer to section 4.4.3 for details.
Instruments Used:	Refer to section 3 for details
Test Results:	Pass

The test plot as follows:

LE



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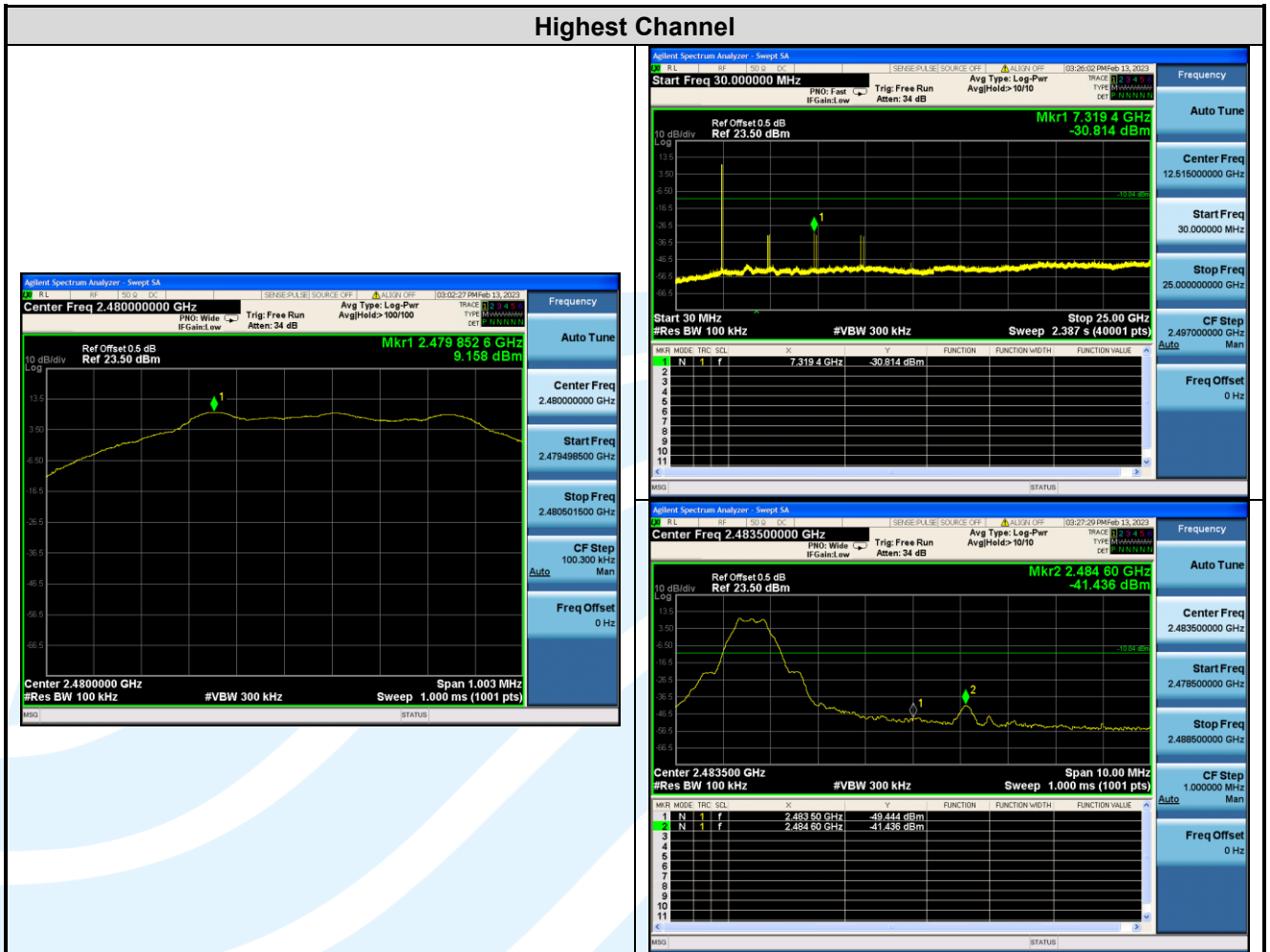
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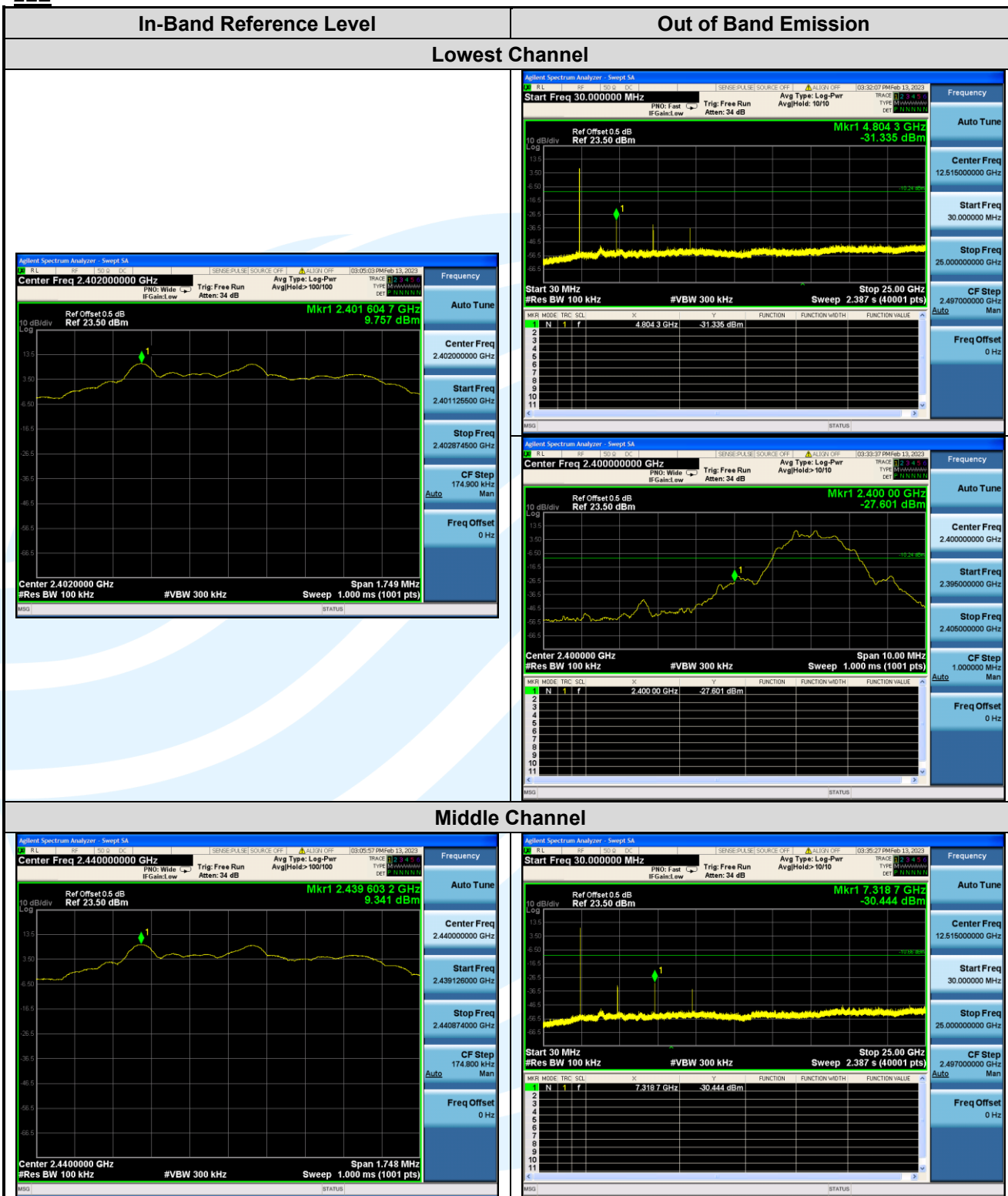
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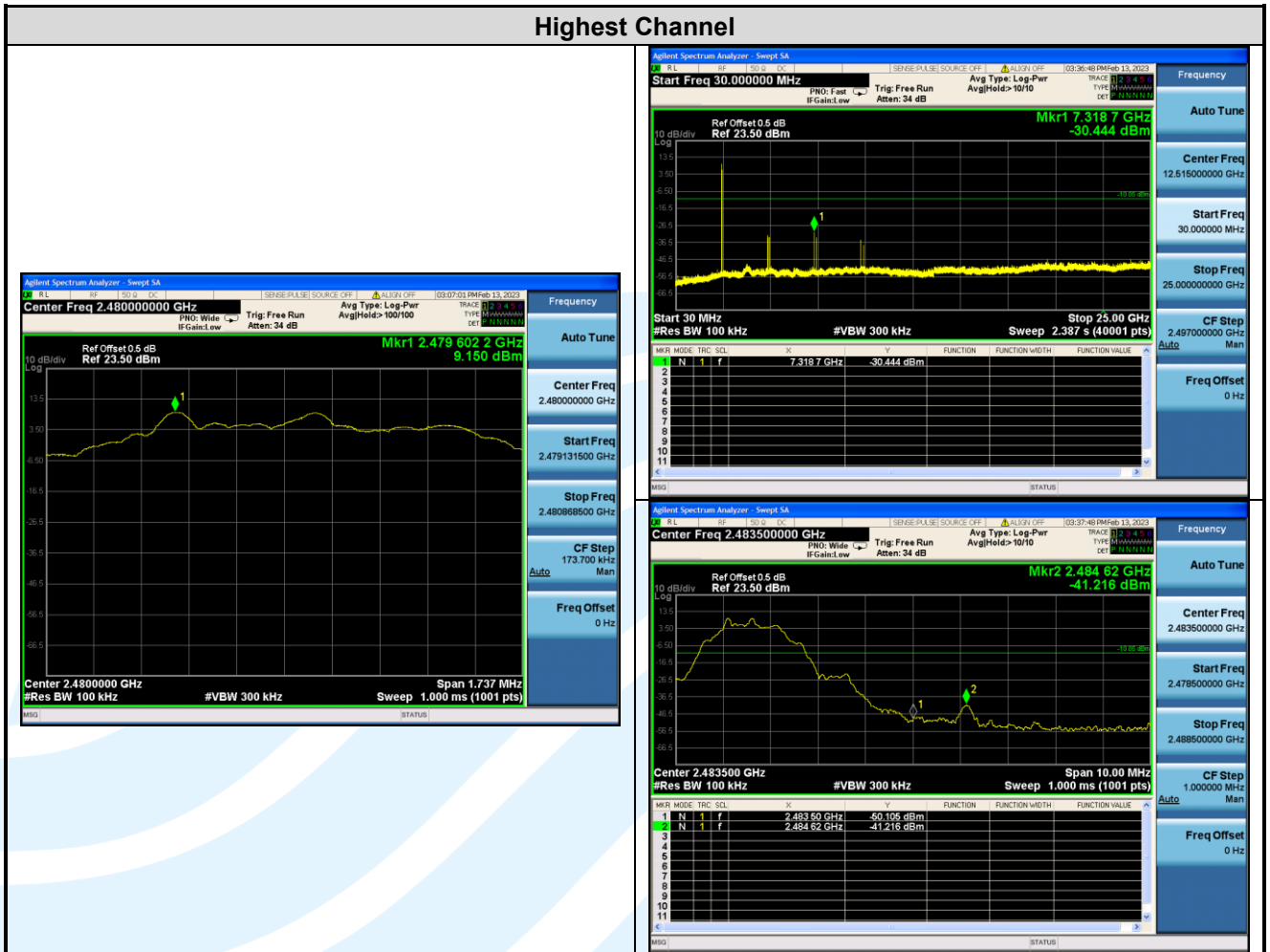
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2LE





5.7 RADIATED SPURIOUS EMISSIONS

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.205/15.209
RSS-Gen Issue 5, Section 6.13/8.9/8.10

Test Method: ANSI C63.10-2013 Clause 11.11 & Clause 11.12

Receiver Setup:

Frequency	RBW
0.009 MHz-0.150 MHz	200/300 kHz
0.150 MHz -30 MHz	9/10 kHz
30 MHz-1 GHz	100/120 kHz
Above 1 GHz	1 MHz

Limits:

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dB μ V/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB μ V/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:

- 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

2. Above 1GHz test procedure as below:

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).

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- 2) Test the EUT in the lowest channel ,middle channel, the Highest channel
- 3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Y axis positioning which it is worse case.
- 4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Radiated Emission Test Data (9 KHz ~ 30 MHz):

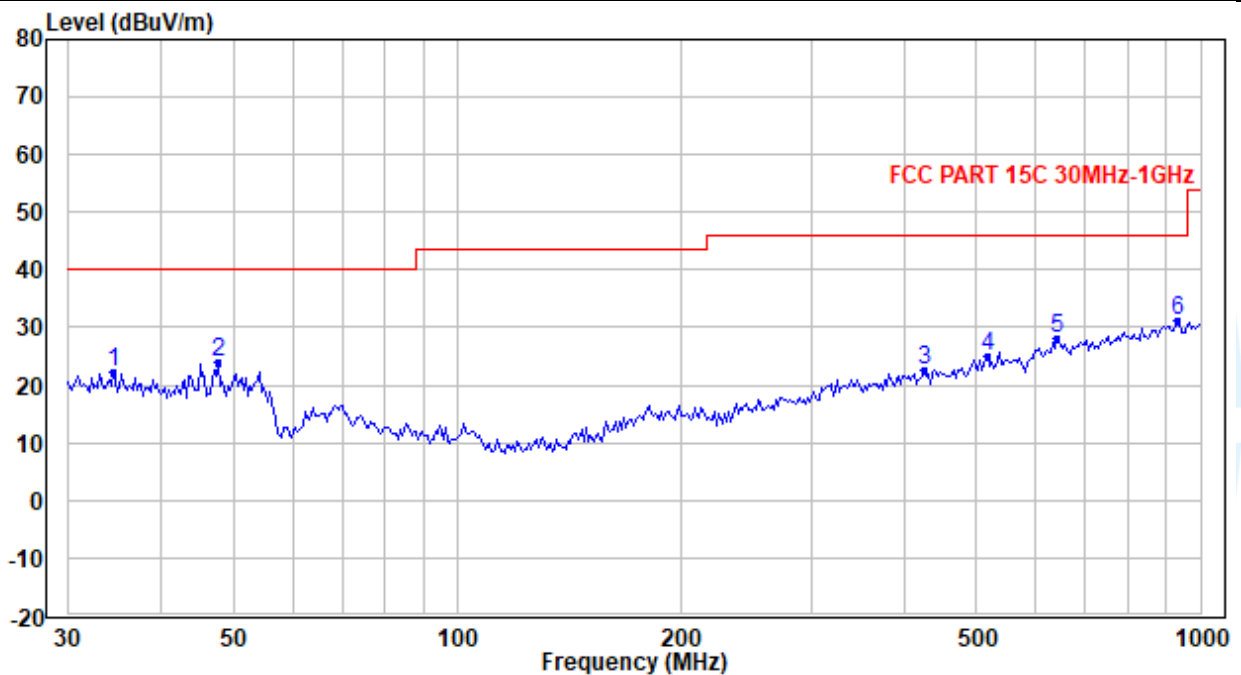
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value need not be reported.

Left Earbuds

Radiated Emission Test Data (30 MHz ~ 1 GHz):

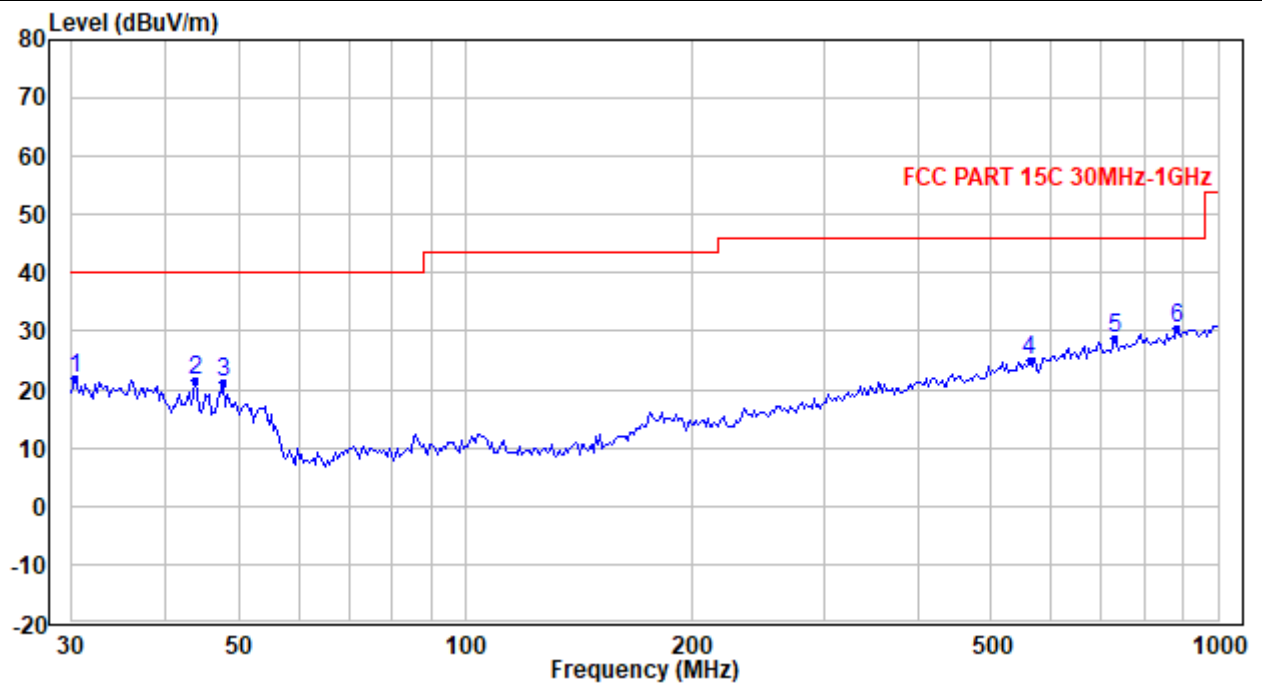
LE_Worst-Case Configuration

Horizontal



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	34.527	27.72	-5.48	22.24	40.00	-17.76	QP
2	47.703	37.25	-13.31	23.94	40.00	-16.06	QP
3	424.300	26.60	-4.15	22.45	46.00	-23.55	QP
4	516.565	27.03	-2.06	24.97	46.00	-21.03	QP
5	642.292	27.40	0.58	27.98	46.00	-18.02	QP
6	932.141	26.29	4.93	31.22	46.00	-14.78	QP

Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	30.212	26.72	-4.84	21.88	40.00	-18.12	QP
2	43.845	32.03	-10.54	21.49	40.00	-18.51	QP
3	47.703	34.40	-13.31	21.09	40.00	-18.91	QP
4	562.014	26.68	-1.80	24.88	46.00	-21.12	QP
5	728.897	27.40	1.43	28.83	46.00	-17.17	QP
6	881.184	26.64	3.72	30.36	46.00	-15.64	QP

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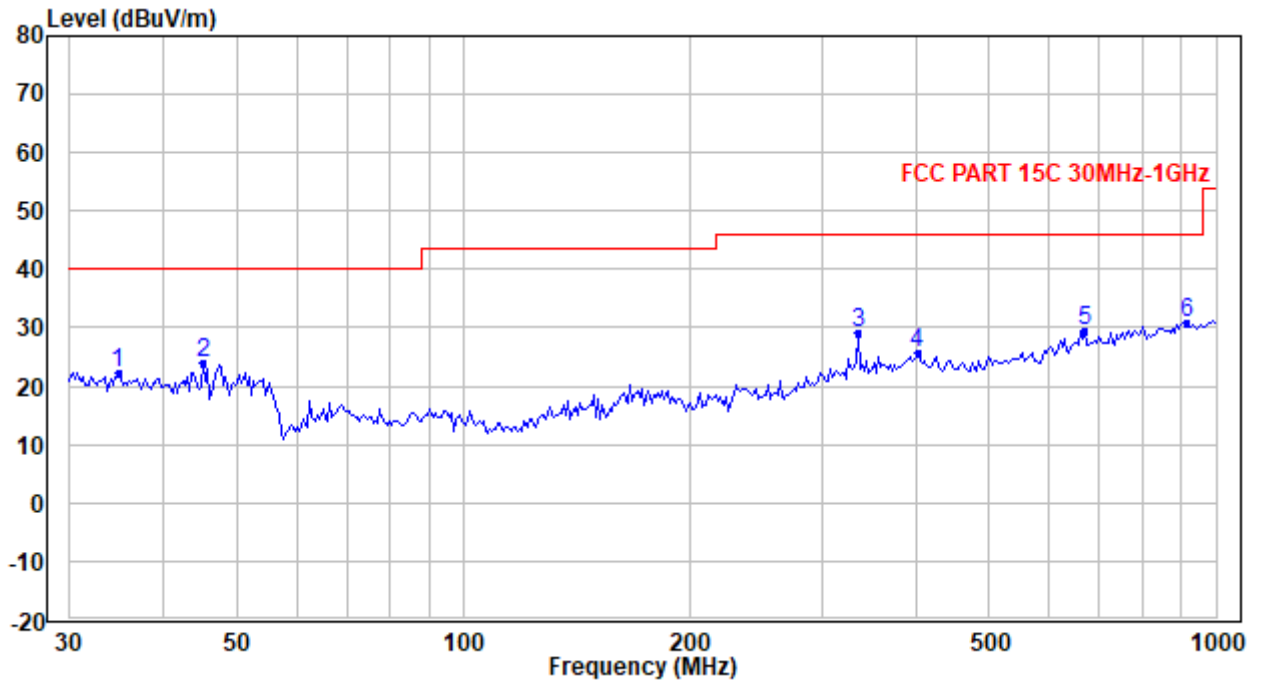
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Radiated Emission Test Data (30 MHz ~ 1 GHz):
2LE_Worst-Case Configuration
Horizontal


No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	34.770	27.92	-5.52	22.40	40.00	-17.60	QP
2	45.095	35.45	-11.53	23.92	40.00	-16.08	QP
3	334.126	34.61	-5.34	29.27	46.00	-16.73	QP
4	401.105	29.56	-4.01	25.55	46.00	-20.45	QP
5	669.952	28.70	0.84	29.54	46.00	-16.46	QP
6	912.695	26.55	4.47	31.02	46.00	-14.98	QP

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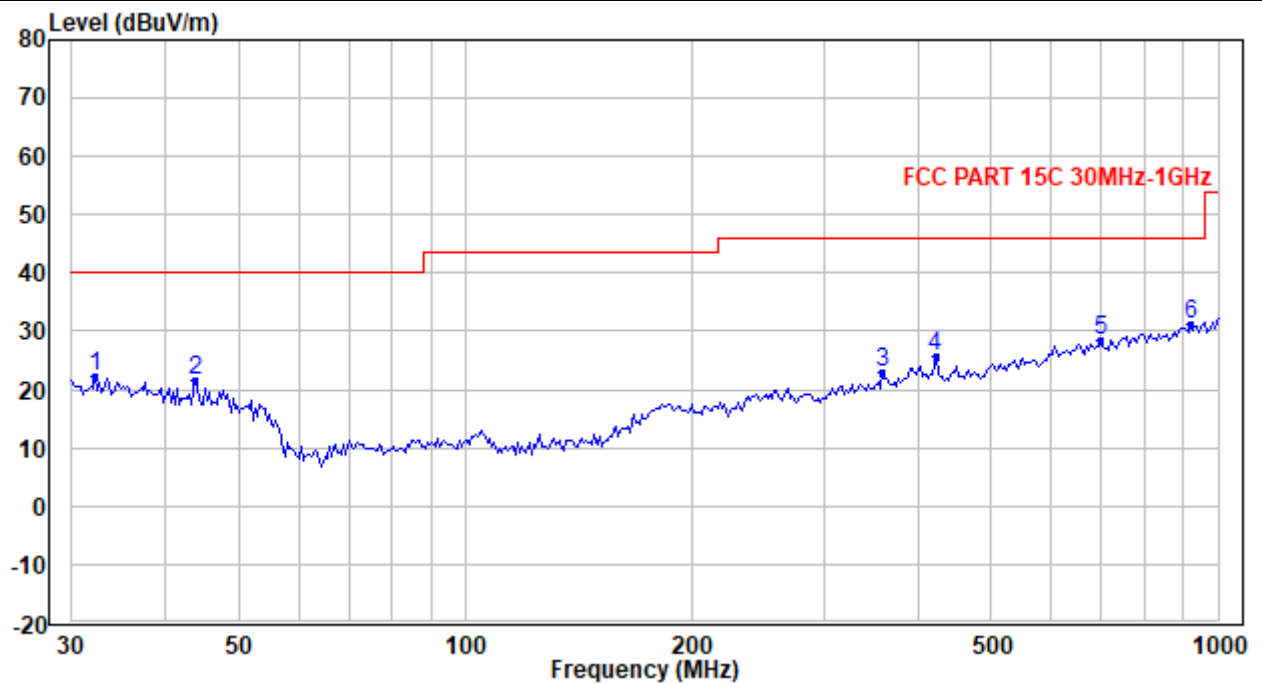
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Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	32.184	27.31	-5.17	22.14	40.00	-17.86	QP
2	43.845	32.15	-10.54	21.61	40.00	-18.39	QP
3	358.450	28.21	-5.11	23.10	46.00	-22.90	QP
4	421.329	29.69	-4.08	25.61	46.00	-20.39	QP
5	698.804	26.65	1.87	28.52	46.00	-17.48	QP
6	919.132	26.59	4.59	31.18	46.00	-14.82	QP

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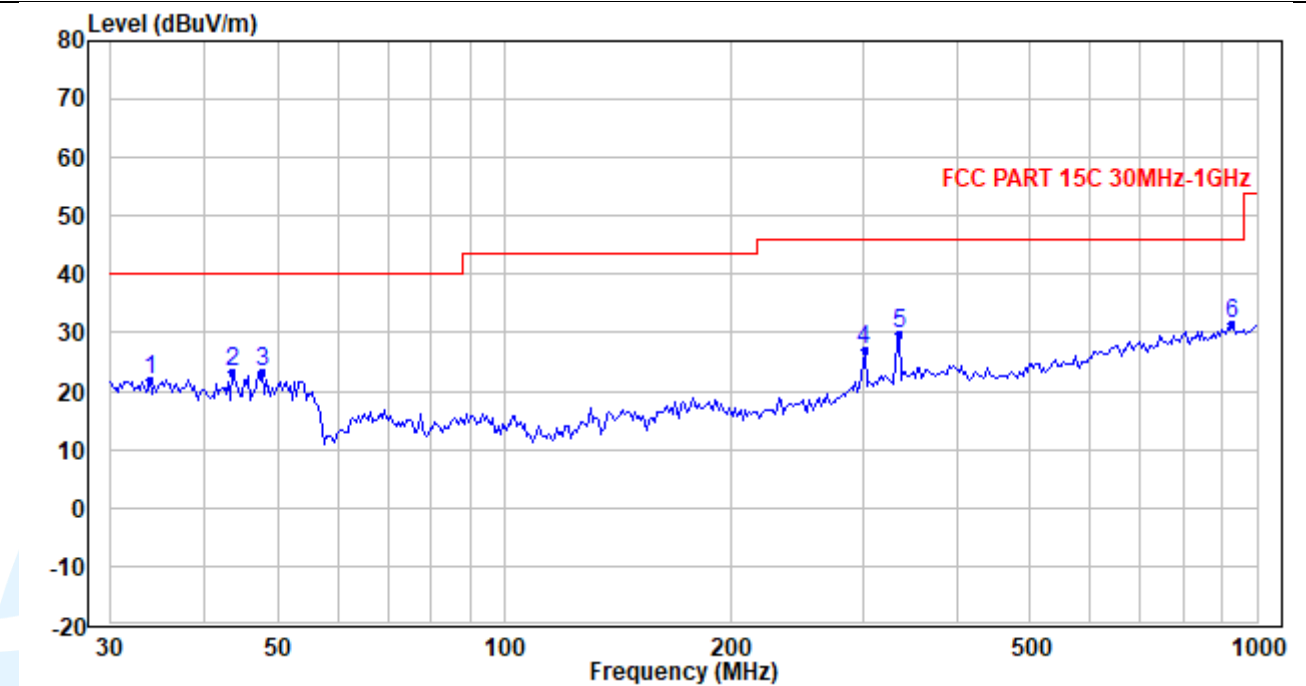
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Right Earbuds

Radiated Emission Test Data (30 MHz ~ 1 GHz):

LE_Worst-Case Configuration

Horizontal



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	33.807	27.36	-5.37	21.99	40.00	-18.01	QP
2	43.538	33.51	-10.14	23.37	40.00	-16.63	QP
3	47.703	36.48	-13.31	23.17	40.00	-16.83	QP
4	300.699	33.71	-6.77	26.94	46.00	-19.06	QP
5	334.126	35.14	-5.34	29.80	46.00	-16.20	QP
6	925.613	26.77	4.79	31.56	46.00	-14.44	QP

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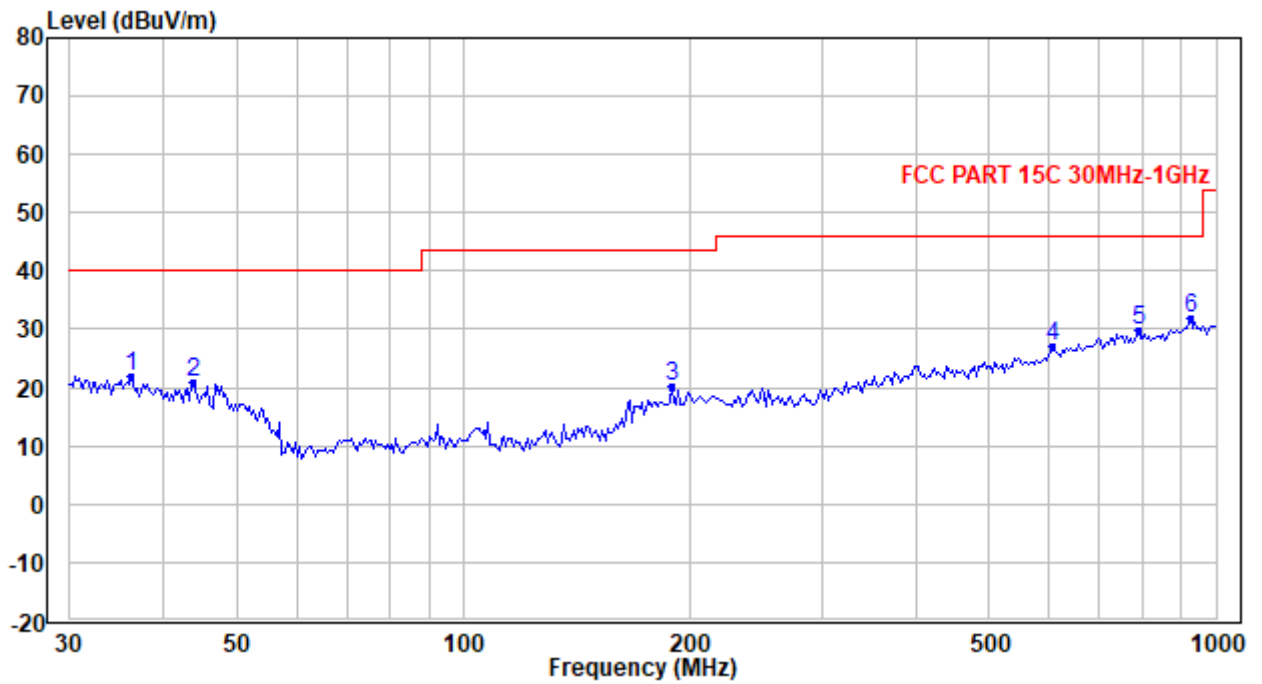
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Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	36.268	27.92	-5.85	22.07	40.00	-17.93	QP
2	43.845	31.43	-10.54	20.89	40.00	-19.11	QP
3	189.108	30.58	-10.50	20.08	43.50	-23.42	QP
4	607.181	27.17	-0.10	27.07	46.00	-18.93	QP
5	787.475	27.05	2.93	29.98	46.00	-16.02	QP
6	925.613	27.07	4.79	31.86	46.00	-14.14	QP

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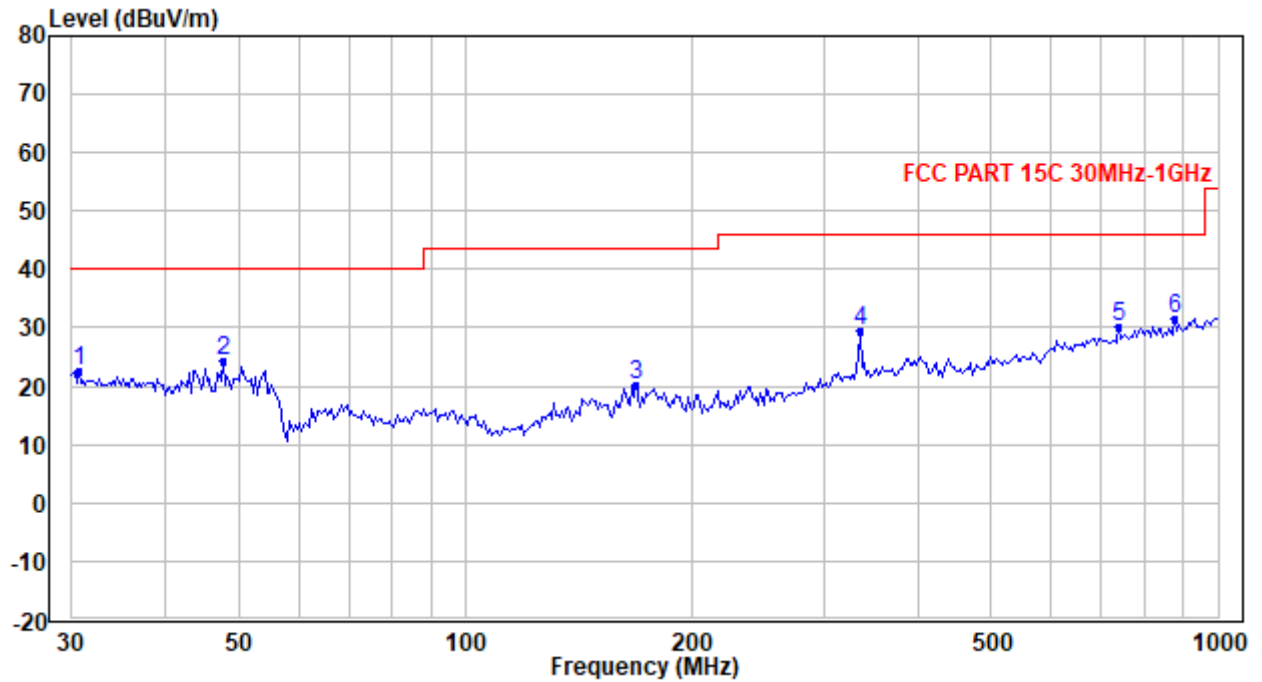
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Radiated Emission Test Data (30 MHz ~ 1 GHz):
2LE_Worst-Case Configuration
Horizontal


No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	30.639	27.61	-4.96	22.65	40.00	-17.35	QP
2	47.703	37.49	-13.31	24.18	40.00	-15.82	QP
3	168.997	31.99	-11.95	20.04	43.50	-23.46	QP
4	334.126	34.84	-5.34	29.50	46.00	-16.50	QP
5	739.214	28.46	1.72	30.18	46.00	-15.82	QP
6	875.013	27.58	4.07	31.65	46.00	-14.35	QP

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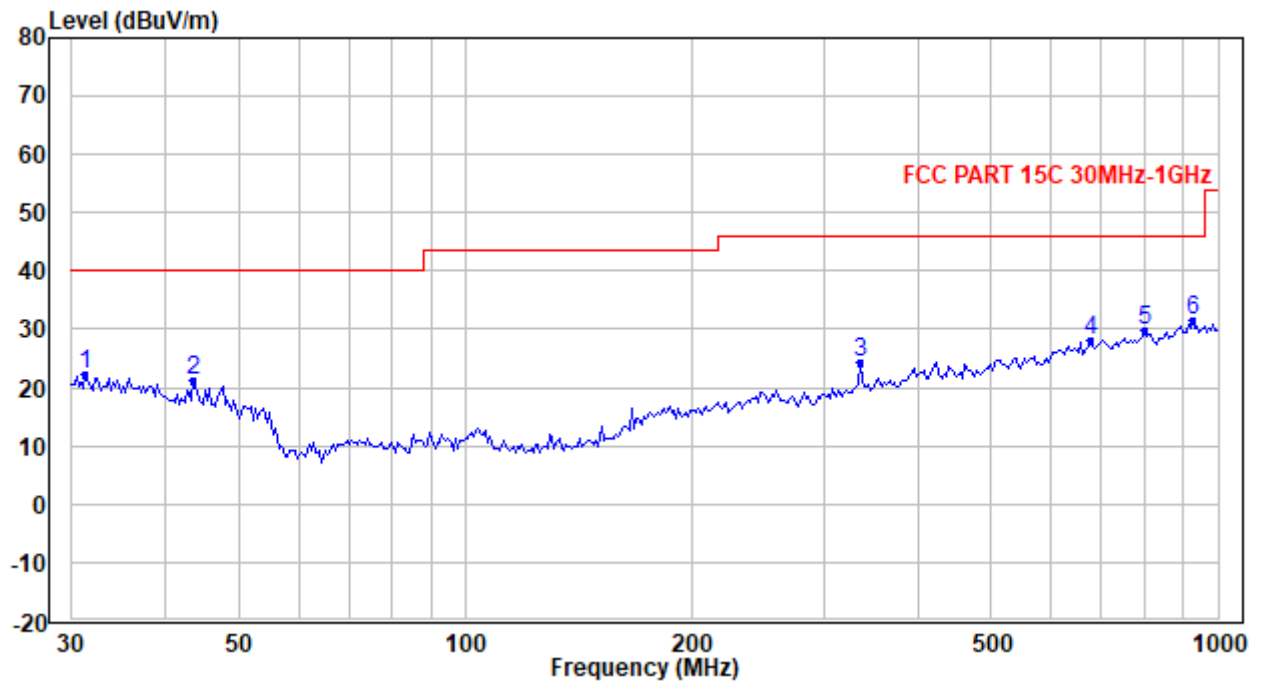
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Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	31.292	27.52	-5.09	22.43	40.00	-17.57	QP
2	43.538	31.40	-10.14	21.26	40.00	-18.74	QP
3	334.126	29.52	-5.34	24.18	46.00	-21.82	QP
4	679.435	27.09	1.14	28.23	46.00	-17.77	QP
5	798.620	26.89	2.99	29.88	46.00	-16.12	QP
6	925.613	26.62	4.79	31.41	46.00	-14.59	QP

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Left Earbuds

Radiated Emission Test Data (Above 1GHz):								
LE_Lowest Channel:								
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4804.00	37.84	-2.42	35.42	74.00	-38.58	Peak	Horizontal
2	4804.00	26.71	-2.42	24.29	54.00	-29.71	Average	Horizontal
3	7206.00	36.50	1.62	38.12	74.00	-35.88	Peak	Horizontal
4	7206.00	23.12	1.62	24.74	54.00	-29.26	Average	Horizontal
5	4804.00	37.99	-2.42	35.57	74.00	-38.43	Peak	Vertical
6	4804.00	26.78	-2.42	24.36	54.00	-29.64	Average	Vertical
7	7206.00	36.37	1.62	37.99	74.00	-36.01	Peak	Vertical
8	7206.00	24.52	1.62	26.14	54.00	-27.86	Average	Vertical
LE_Middle Channel:								
1	4880.00	39.59	-2.35	37.24	74.00	-36.76	Peak	Horizontal
2	4880.00	26.73	-2.35	24.38	54.00	-29.62	Average	Horizontal
3	7320.00	35.99	1.69	37.68	74.00	-36.32	Peak	Horizontal
4	7320.00	22.17	1.69	23.86	54.00	-30.14	Average	Horizontal
5	4880.00	38.89	-2.35	36.54	74.00	-37.46	Peak	Vertical
6	4880.00	26.73	-2.35	24.38	54.00	-29.62	Average	Vertical
7	7320.00	34.75	1.69	36.44	74.00	-37.56	Peak	Vertical
8	7320.00	23.34	1.69	25.03	54.00	-28.97	Average	Vertical
LE_Highest Channel:								
1	4960.00	37.59	-2.27	35.32	74.00	-38.68	Peak	Horizontal
2	4960.00	25.25	-2.27	22.98	54.00	-31.02	Average	Horizontal
3	7440.00	36.46	1.77	38.23	74.00	-35.77	Peak	Horizontal
4	7440.00	23.69	1.77	25.46	54.00	-28.54	Average	Horizontal
5	4960.00	37.43	-2.27	35.16	74.00	-38.84	Peak	Vertical
6	4960.00	25.33	-2.27	23.06	54.00	-30.94	Average	Vertical
7	7440.00	34.46	1.77	36.23	74.00	-37.77	Peak	Vertical
8	7440.00	22.03	1.77	23.80	54.00	-30.20	Average	Vertical

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Radiated Emission Test Data (Above 1GHz):
2LE_Lowest Channel:

No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4804.00	38.43	-2.42	36.01	74.00	-37.99	Peak	Horizontal
2	4804.00	26.71	-2.42	24.29	54.00	-29.71	Average	Horizontal
3	7206.00	34.56	1.62	36.18	74.00	-37.82	Peak	Horizontal
4	7206.00	21.46	1.62	23.08	54.00	-30.92	Average	Horizontal
5	4804.00	38.38	-2.42	35.96	74.00	-38.04	Peak	Vertical
6	4804.00	26.65	-2.42	24.23	54.00	-29.77	Average	Vertical
7	7206.00	36.07	1.62	37.69	74.00	-36.31	Peak	Vertical
8	7206.00	23.42	1.62	25.04	54.00	-28.96	Average	Vertical

2LE_Middle Channel:

1	4880.00	39.21	-2.35	36.86	74.00	-37.14	Peak	Horizontal
2	4880.00	26.60	-2.35	24.25	54.00	-29.75	Average	Horizontal
3	7320.00	35.32	1.69	37.01	74.00	-36.99	Peak	Horizontal
4	7320.00	21.09	1.69	22.78	54.00	-31.22	Average	Horizontal
5	4880.00	38.55	-2.35	36.20	74.00	-37.80	Peak	Vertical
6	4880.00	26.80	-2.35	24.45	54.00	-29.55	Average	Vertical
7	7320.00	32.71	1.69	34.40	74.00	-39.60	Peak	Vertical
8	7320.00	20.00	1.69	21.69	54.00	-32.31	Average	Vertical

2LE_Highest Channel:

1	4960.00	37.35	-2.27	35.08	74.00	-38.92	Peak	Horizontal
2	4960.00	25.33	-2.27	23.06	54.00	-30.94	Average	Horizontal
3	7440.00	36.35	1.77	38.12	74.00	-35.88	Peak	Horizontal
4	7440.00	23.10	1.77	24.87	54.00	-29.13	Average	Horizontal
5	4960.00	37.92	-2.27	35.65	74.00	-38.35	Peak	Vertical
6	4960.00	25.33	-2.27	23.06	54.00	-30.94	Average	Vertical
7	7440.00	34.27	1.77	36.04	74.00	-37.96	Peak	Vertical
8	7440.00	22.26	1.77	24.03	54.00	-29.97	Average	Vertical

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Radiated Emission Test Data (Above 1GHz):								
LE_Lowest Channel:								
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4804.00	39.19	-2.42	36.77	74.00	-37.23	Peak	Horizontal
2	4804.00	26.58	-2.42	24.16	54.00	-29.84	Average	Horizontal
3	7206.00	38.52	1.62	40.14	74.00	-33.86	Peak	Horizontal
4	7206.00	26.02	1.62	27.64	54.00	-26.36	Average	Horizontal
5	4804.00	39.43	-2.42	37.01	74.00	-36.99	Peak	Vertical
6	4804.00	26.65	-2.42	24.23	54.00	-29.77	Average	Vertical
7	7206.00	39.36	1.62	40.98	74.00	-33.02	Peak	Vertical
8	7206.00	26.09	1.62	27.71	54.00	-26.29	Average	Vertical
LE_Middle Channel:								
1	4880.00	39.35	-2.35	37.00	74.00	-37.00	Peak	Horizontal
2	4880.00	26.67	-2.35	24.32	54.00	-29.68	Average	Horizontal
3	7320.00	39.39	1.69	41.08	74.00	-32.92	Peak	Horizontal
4	7320.00	26.78	1.69	28.47	54.00	-25.53	Average	Horizontal
5	4880.00	38.67	-2.35	36.32	74.00	-37.68	Peak	Vertical
6	4880.00	26.67	-2.35	24.32	54.00	-29.68	Average	Vertical
7	7320.00	38.95	1.69	40.64	74.00	-33.36	Peak	Vertical
8	7320.00	26.53	1.69	28.22	54.00	-25.78	Average	Vertical
LE_Highest Channel:								
1	4960.00	38.25	-2.27	35.98	74.00	-38.02	Peak	Horizontal
2	4960.00	24.93	-2.27	22.66	54.00	-31.34	Average	Horizontal
3	7440.00	39.35	1.77	41.12	74.00	-32.88	Peak	Horizontal
4	7440.00	26.14	1.77	27.91	54.00	-26.09	Average	Horizontal
5	4960.00	37.57	-2.27	35.30	74.00	-38.70	Peak	Vertical
6	4960.00	24.85	-2.27	22.58	54.00	-31.42	Average	Vertical
7	7440.00	38.32	1.77	40.09	74.00	-33.91	Peak	Vertical
8	7440.00	25.70	1.77	27.47	54.00	-26.53	Average	Vertical

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Radiated Emission Test Data (Above 1GHz):								
2LE_Lowest Channel:								
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4804.00	38.50	-2.42	36.08	74.00	-37.92	Peak	Horizontal
2	4804.00	26.65	-2.42	24.23	54.00	-29.77	Average	Horizontal
3	7206.00	34.99	1.62	36.61	74.00	-37.39	Peak	Horizontal
4	7206.00	22.28	1.62	23.90	54.00	-30.10	Average	Horizontal
5	4804.00	37.38	-2.42	34.96	74.00	-39.04	Peak	Vertical
6	4804.00	26.30	-2.42	23.88	54.00	-30.12	Average	Vertical
7	7206.00	38.11	1.62	39.73	74.00	-34.27	Peak	Vertical
8	7206.00	25.42	1.62	27.04	54.00	-26.96	Average	Vertical
2LE_Middle Channel:								
1	4880.00	38.67	-2.35	36.32	74.00	-37.68	Peak	Horizontal
2	4880.00	26.60	-2.35	24.25	54.00	-29.75	Average	Horizontal
3	7320.00	33.57	1.69	35.26	74.00	-38.74	Peak	Horizontal
4	7320.00	22.70	1.69	24.39	54.00	-29.61	Average	Horizontal
5	4880.00	39.04	-2.35	36.69	74.00	-37.31	Peak	Vertical
6	4880.00	26.60	-2.35	24.25	54.00	-29.75	Average	Vertical
7	7320.00	36.06	1.69	37.75	74.00	-36.25	Peak	Vertical
8	7320.00	24.00	1.69	25.69	54.00	-28.31	Average	Vertical
2LE_Highest Channel:								
1	4960.00	38.14	-2.27	35.87	74.00	-38.13	Peak	Horizontal
2	4960.00	25.25	-2.27	22.98	54.00	-31.02	Average	Horizontal
3	7440.00	34.81	1.77	36.58	74.00	-37.42	Peak	Horizontal
4	7440.00	21.92	1.77	23.69	54.00	-30.31	Average	Horizontal
5	4960.00	37.57	-2.27	35.30	74.00	-38.70	Peak	Vertical
6	4960.00	25.01	-2.27	22.74	54.00	-31.26	Average	Vertical
7	7440.00	38.31	1.77	40.08	74.00	-33.92	Peak	Vertical
8	7440.00	25.32	1.77	27.09	54.00	-26.91	Average	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit

5.8 BAND EDGE MEASUREMENTS (RADIATED)

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.205/15.209
RSS-247 Issue 2, Section 5.5

Test Method: ANSI C63.10-2013 Clause 11.13

Limits:

Radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).

Frequency	Limit (dB μ V/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
	74.0	Peak Value

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

Radiated band edge measurements at 2390 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

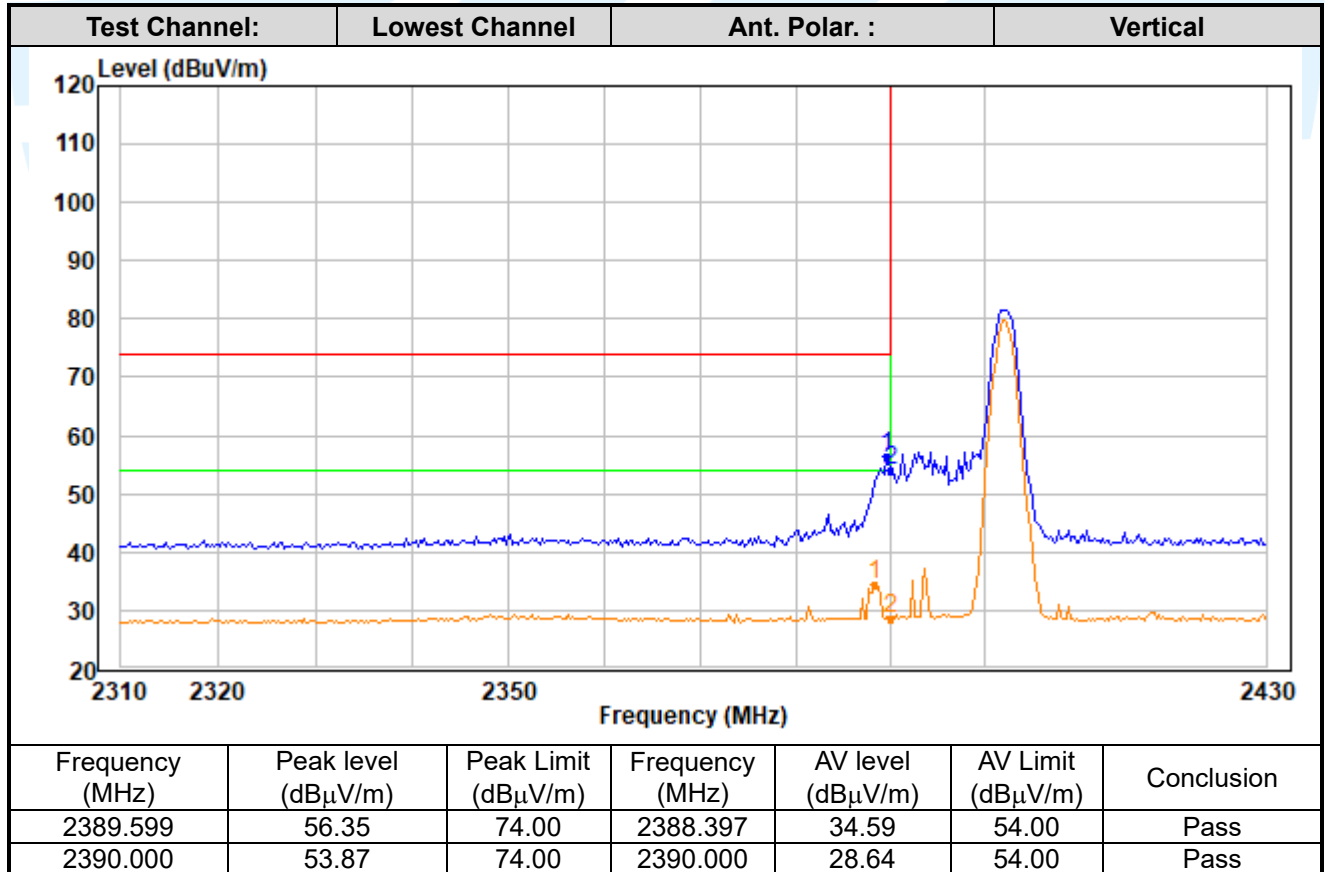
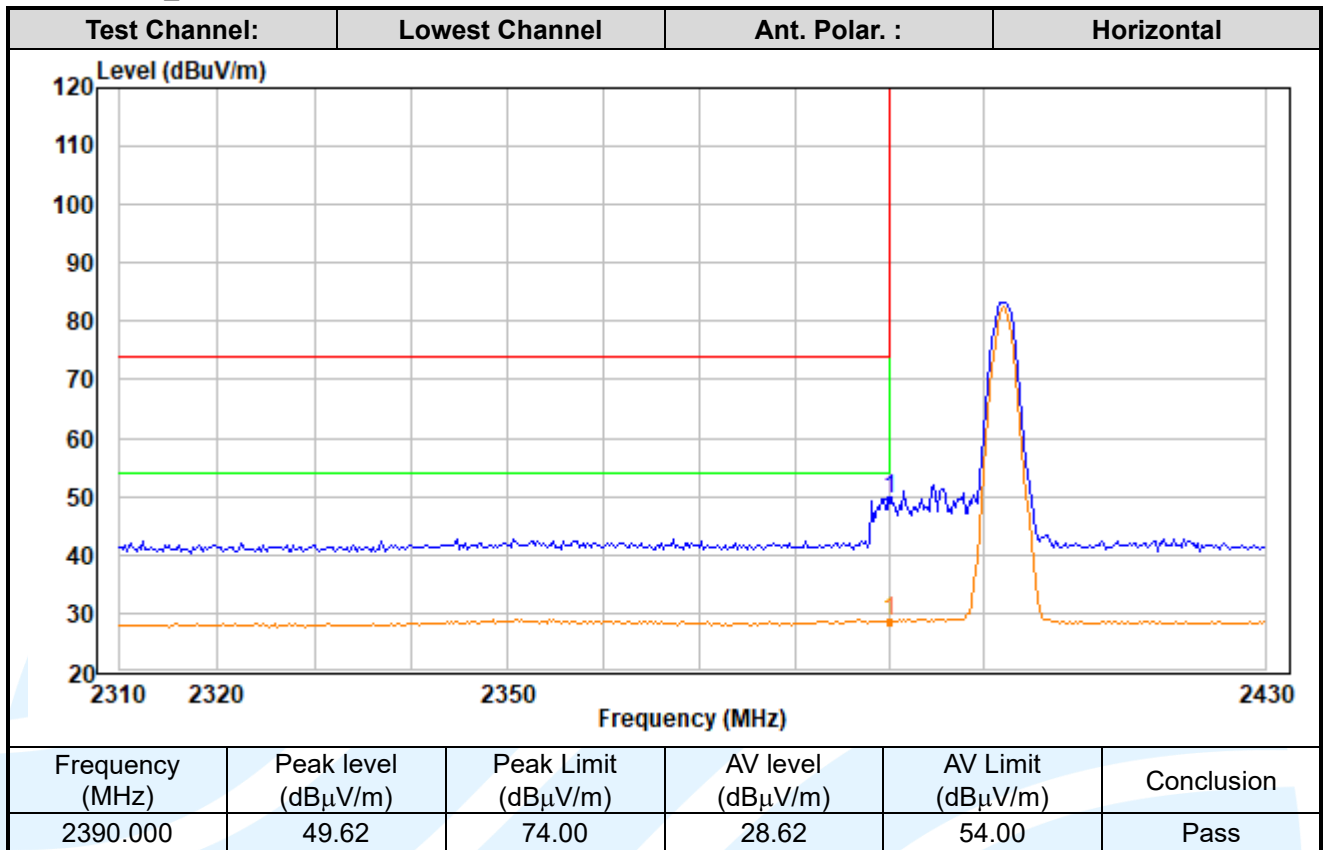
1. Use radiated spurious emission test procedure described in clause 5.10. The transmitter output (antenna port) was connected to the test receiver.
2. Set the PK and AV limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Left Earbuds_LE



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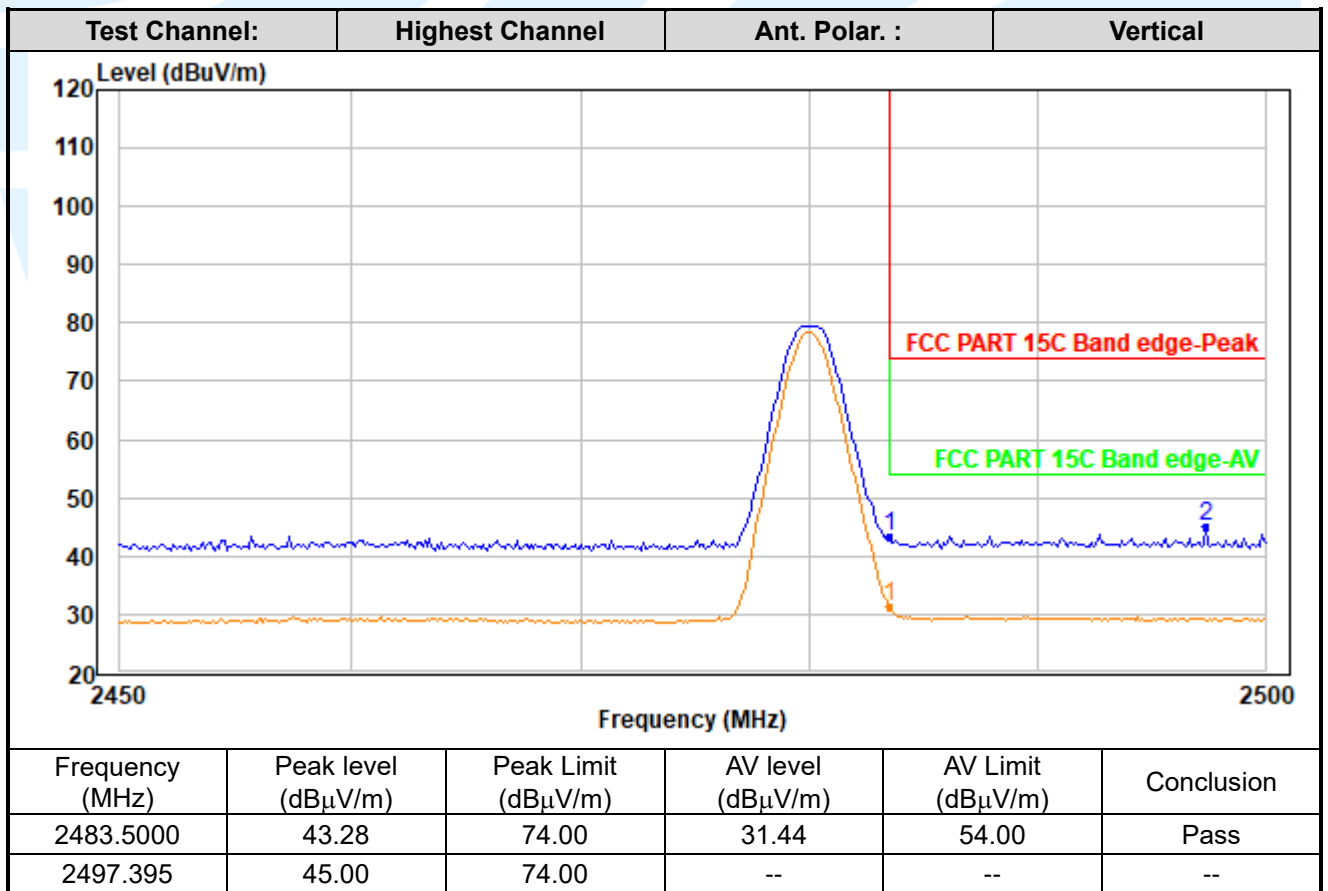
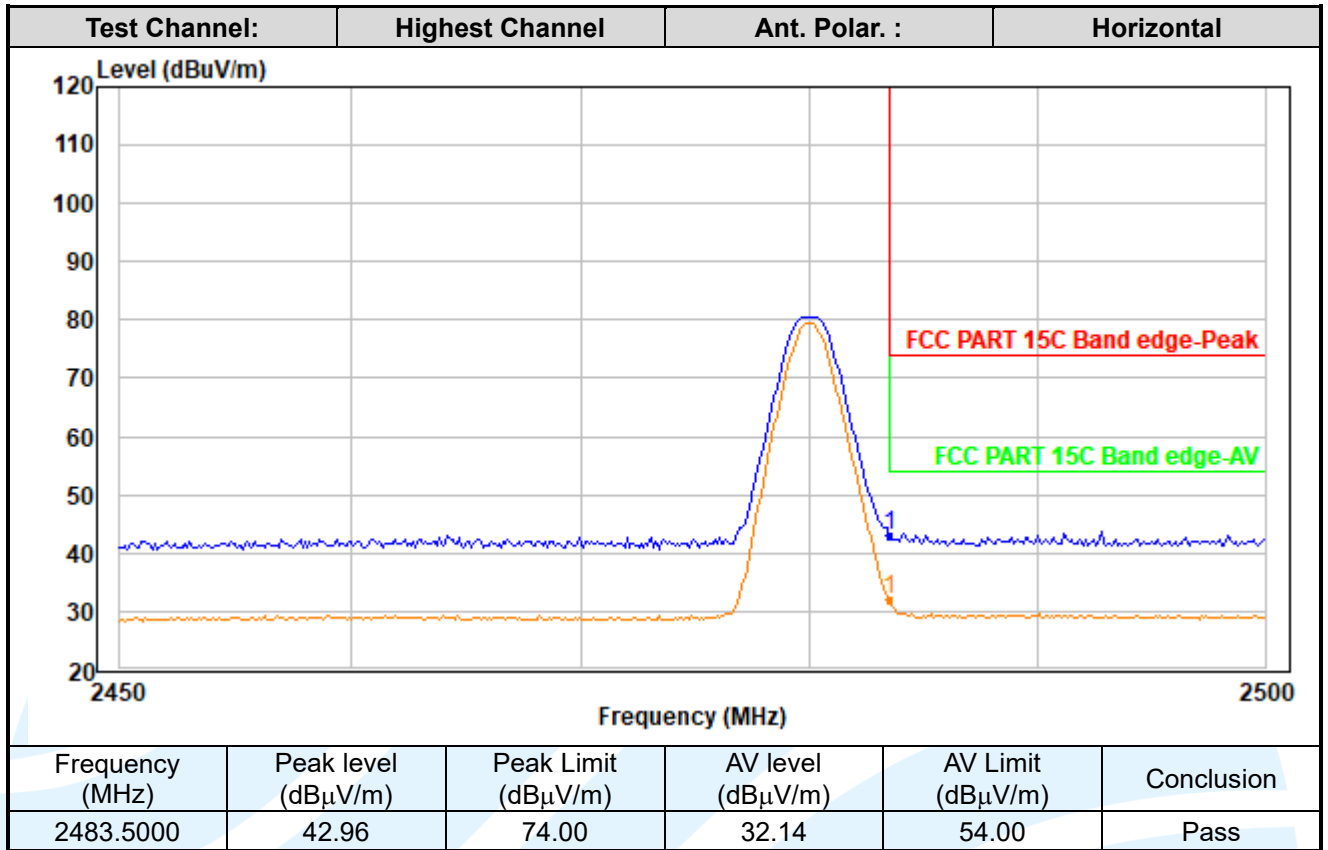
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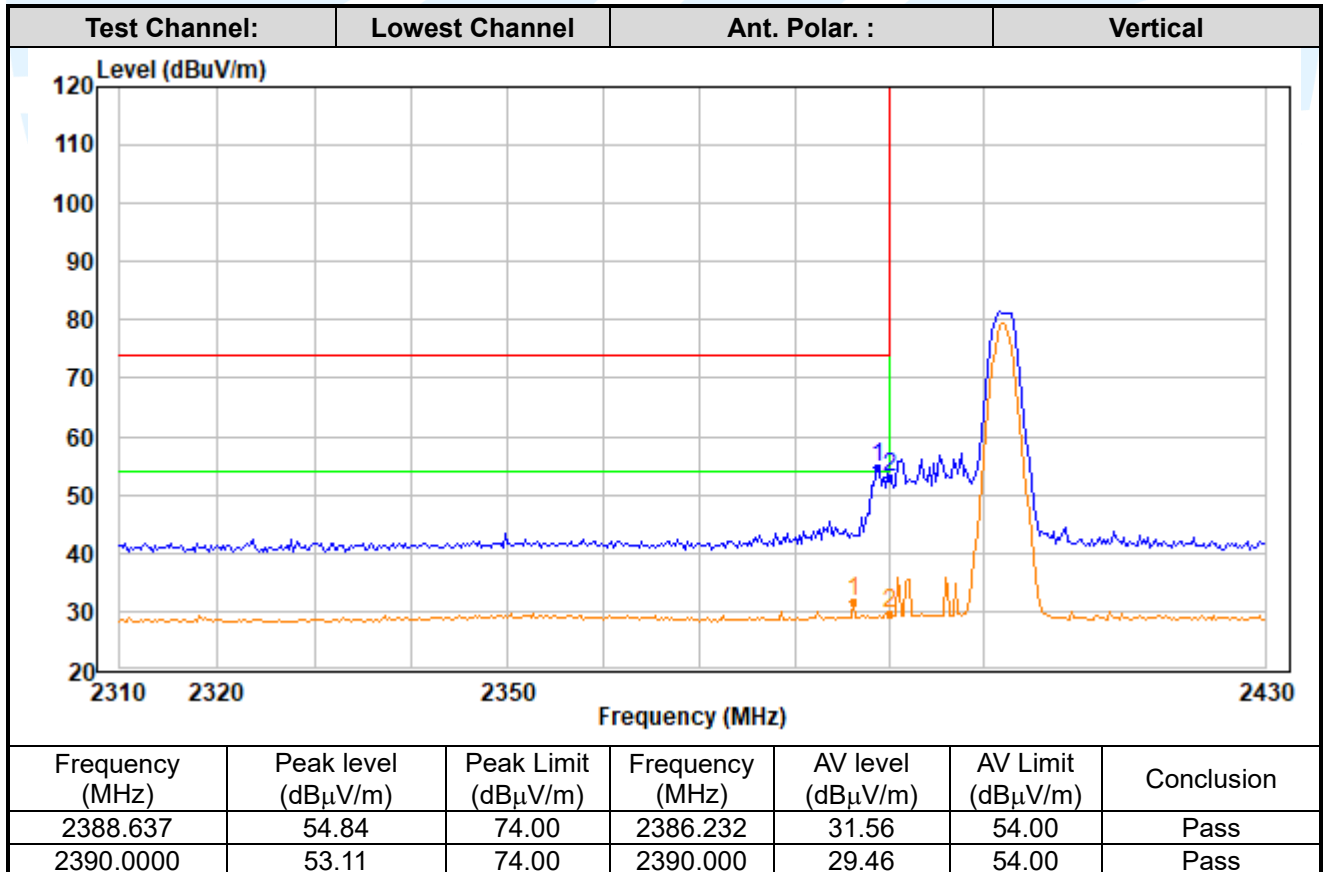
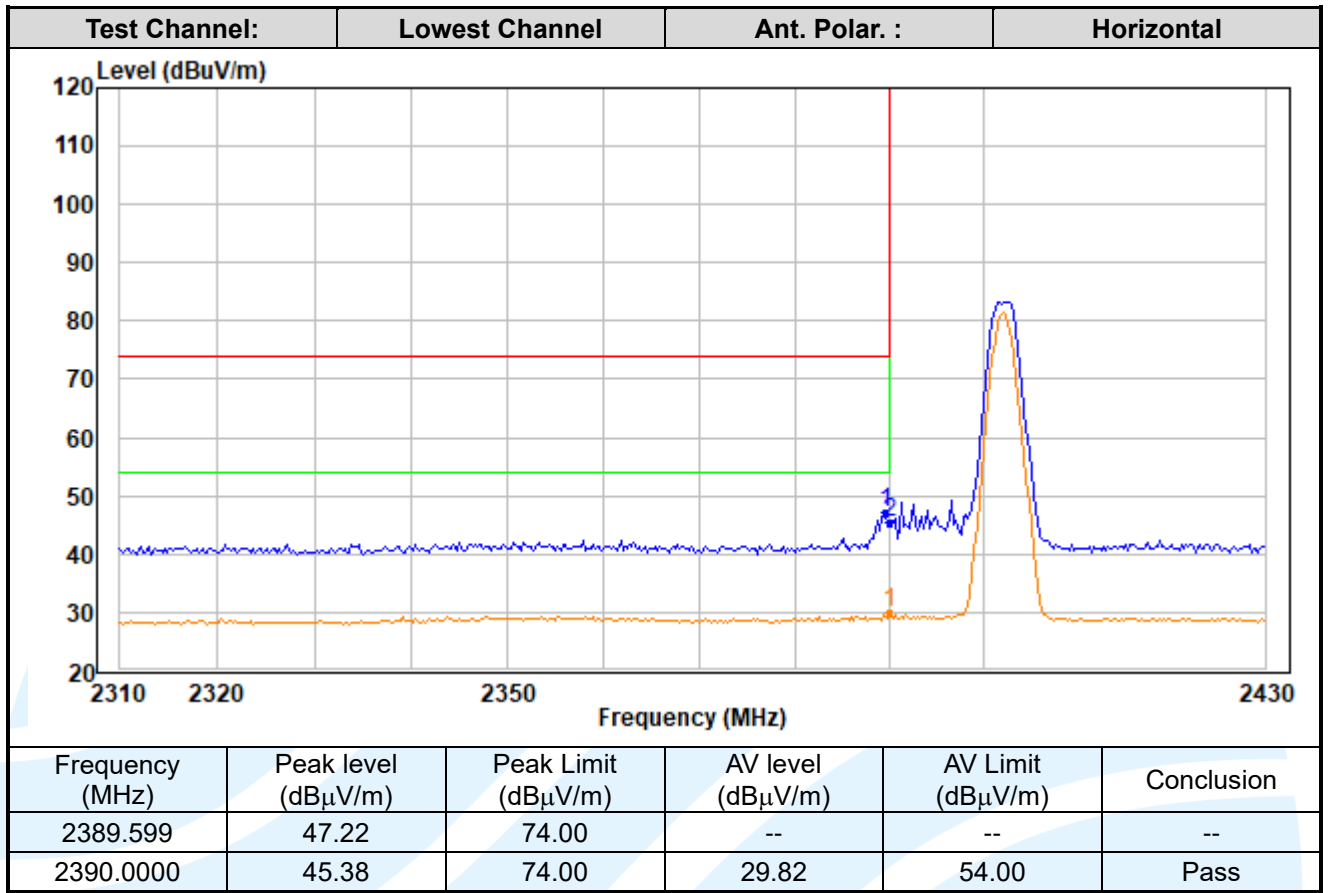
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2LE



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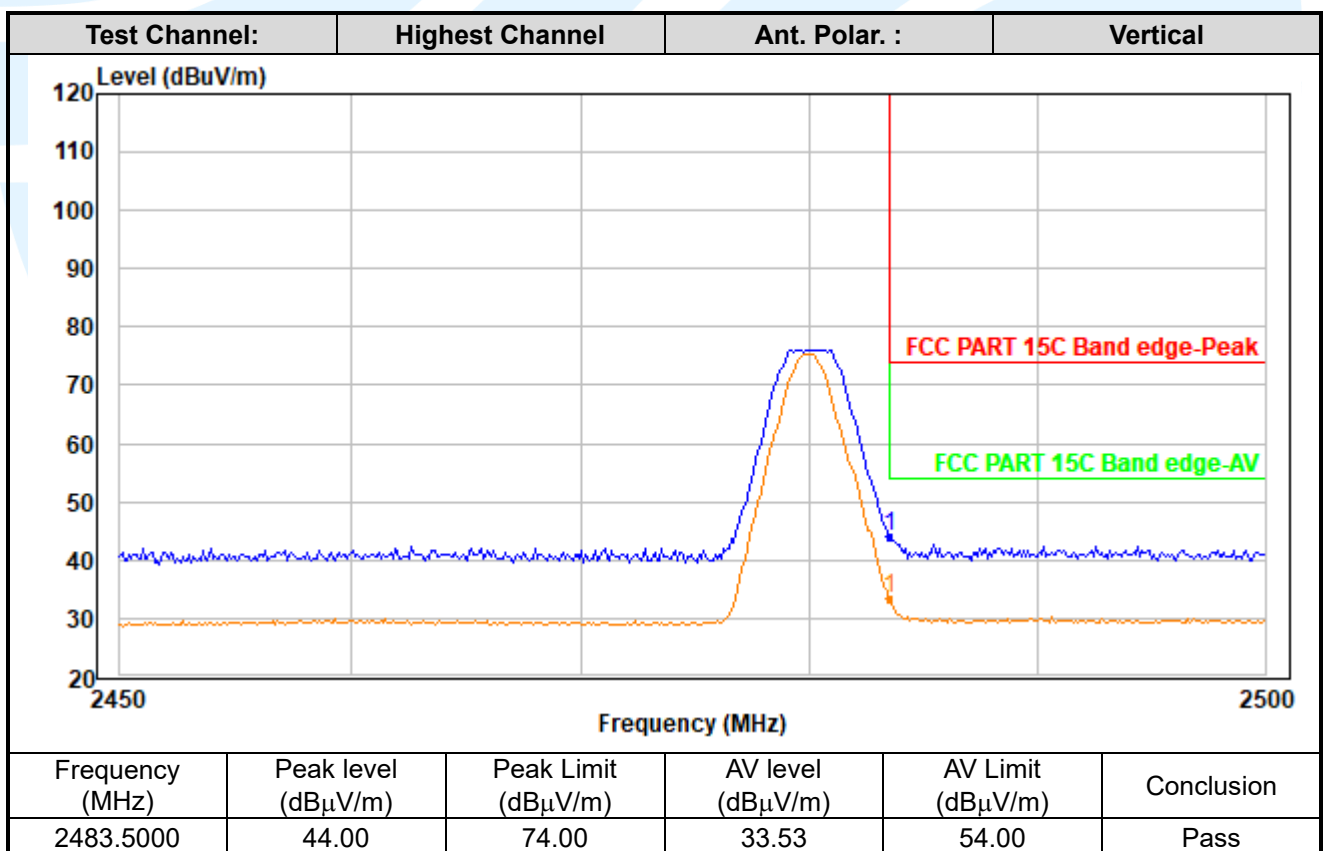
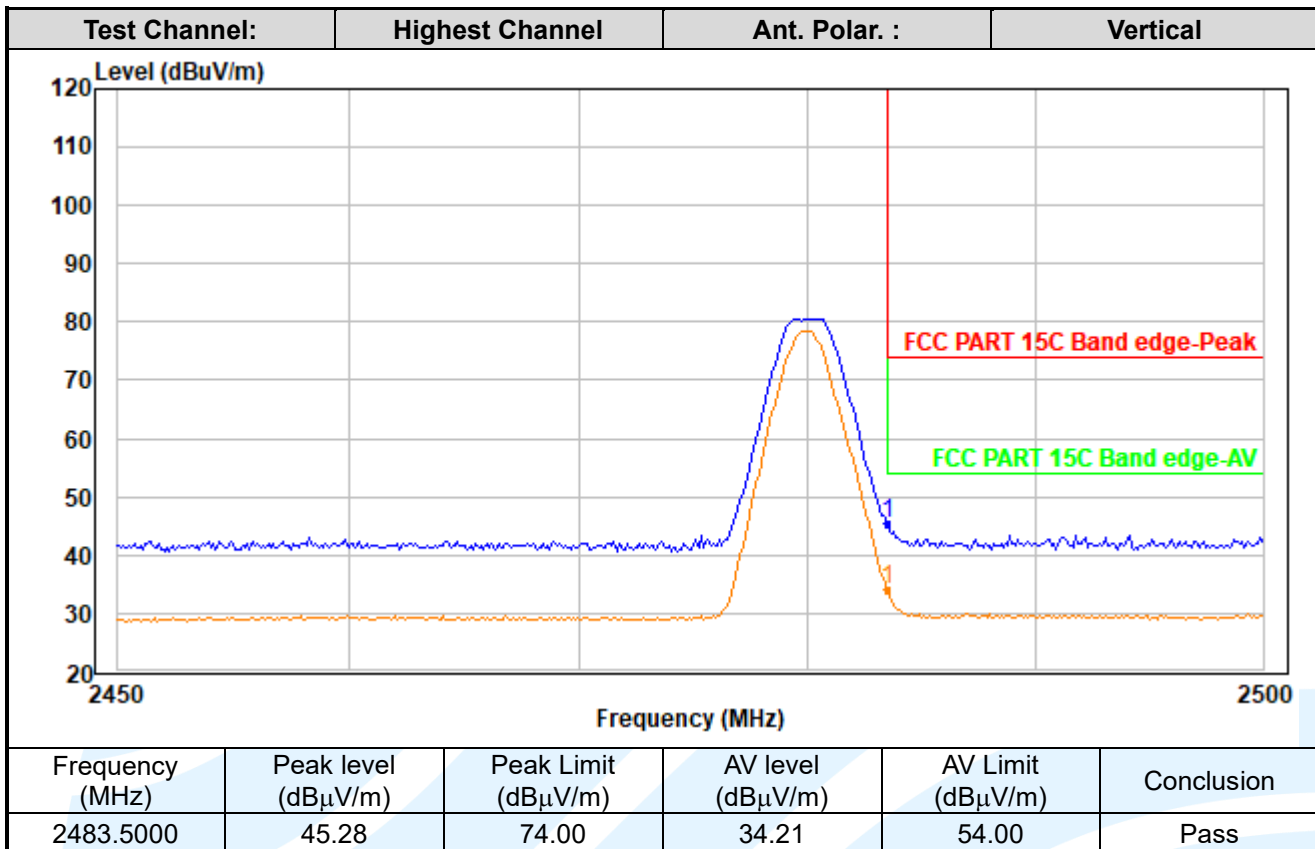
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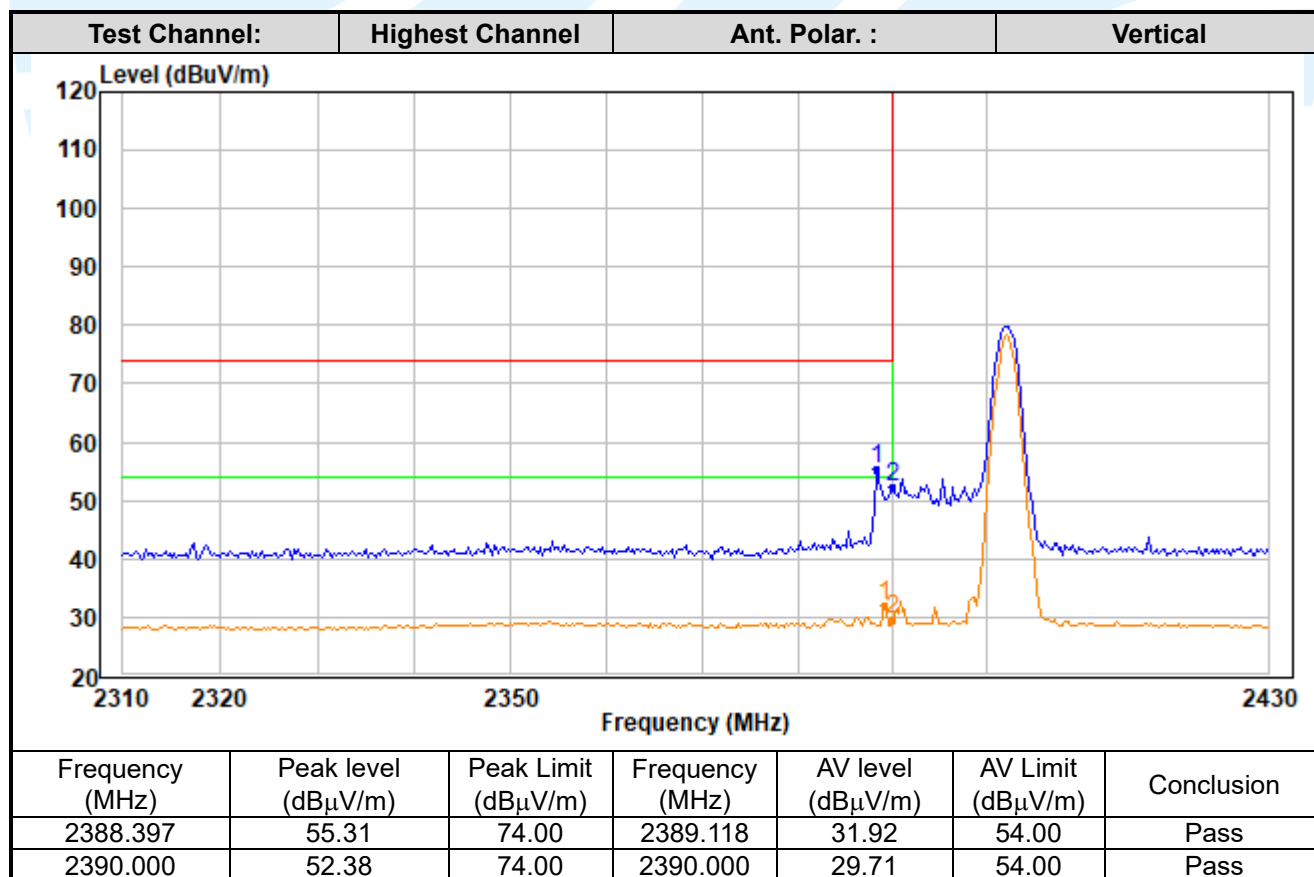
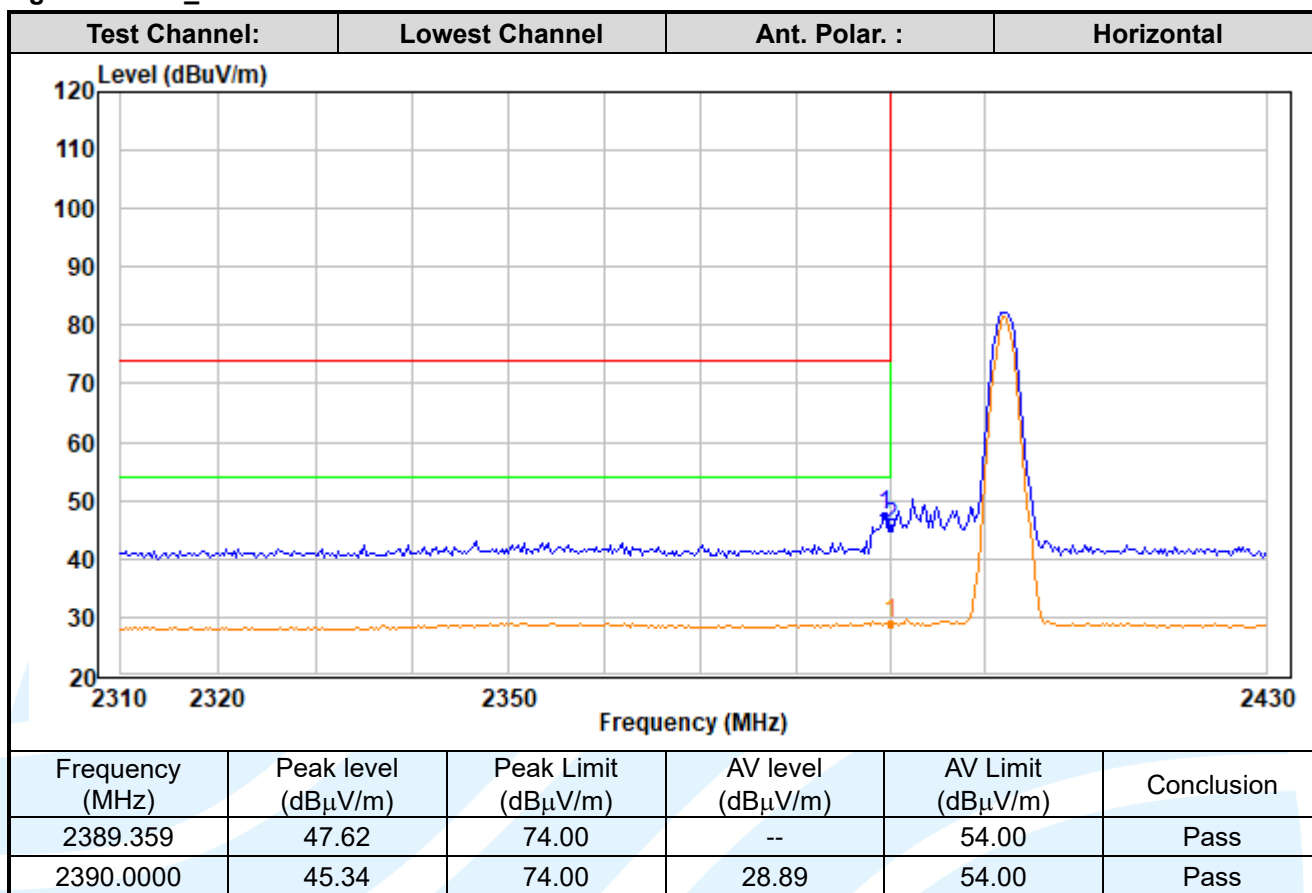
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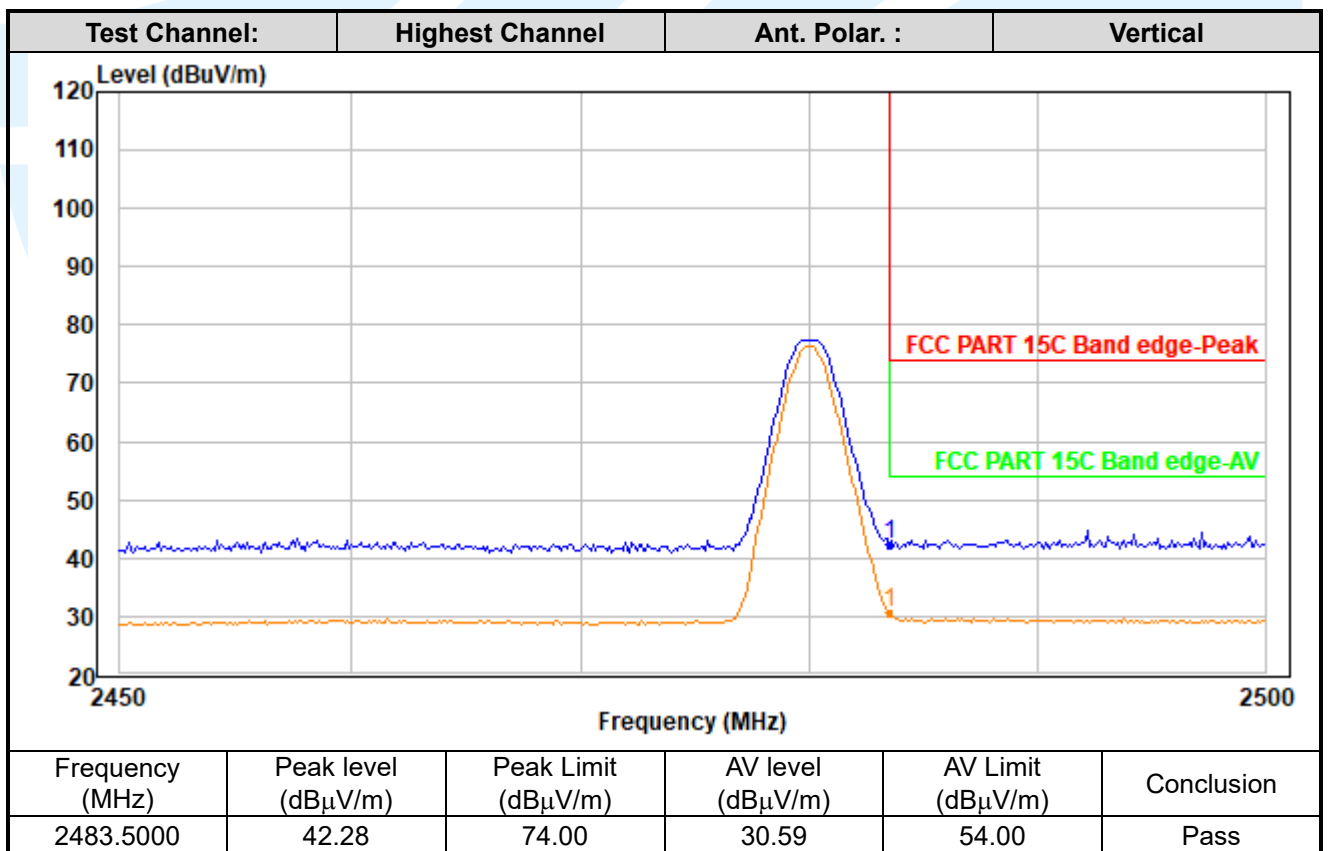
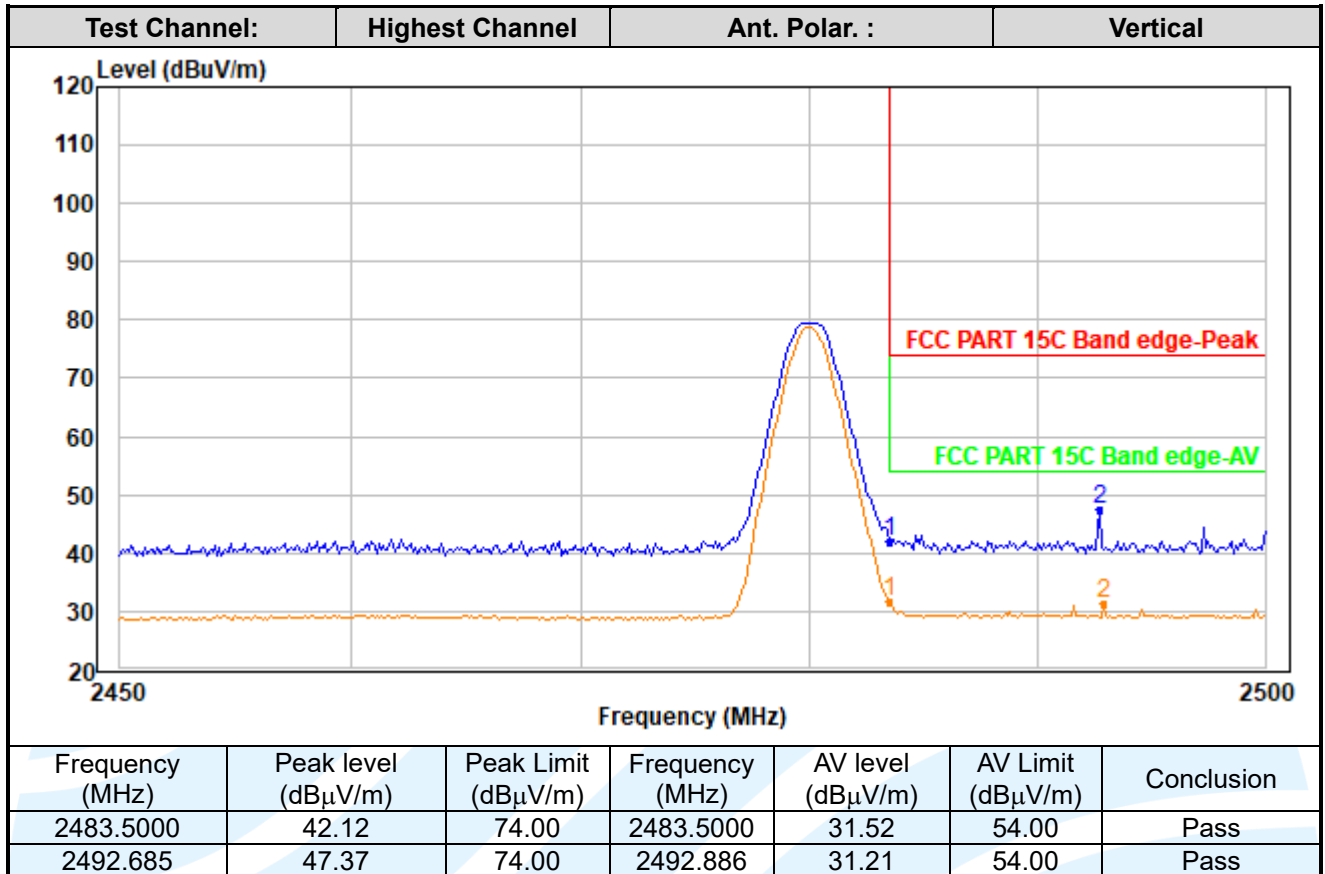
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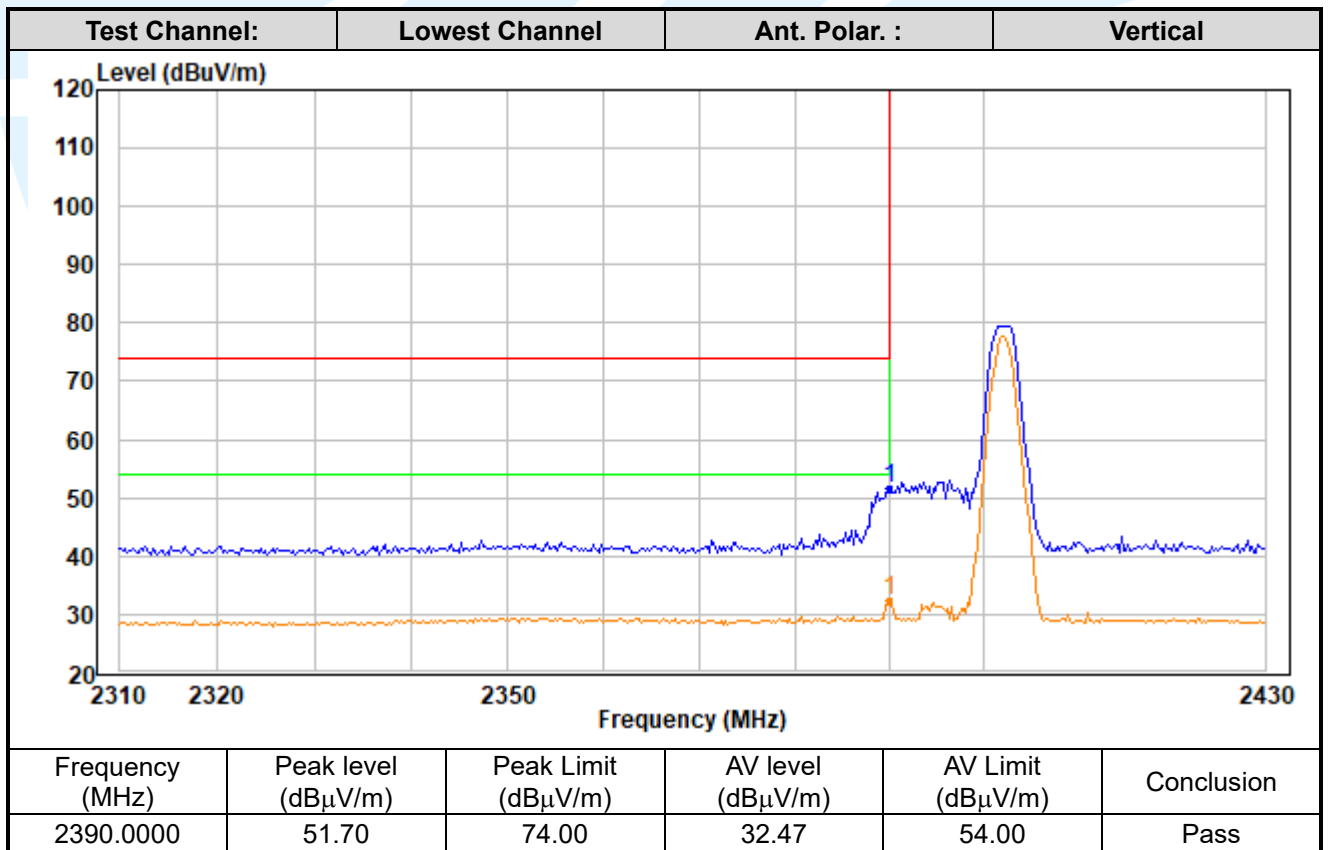
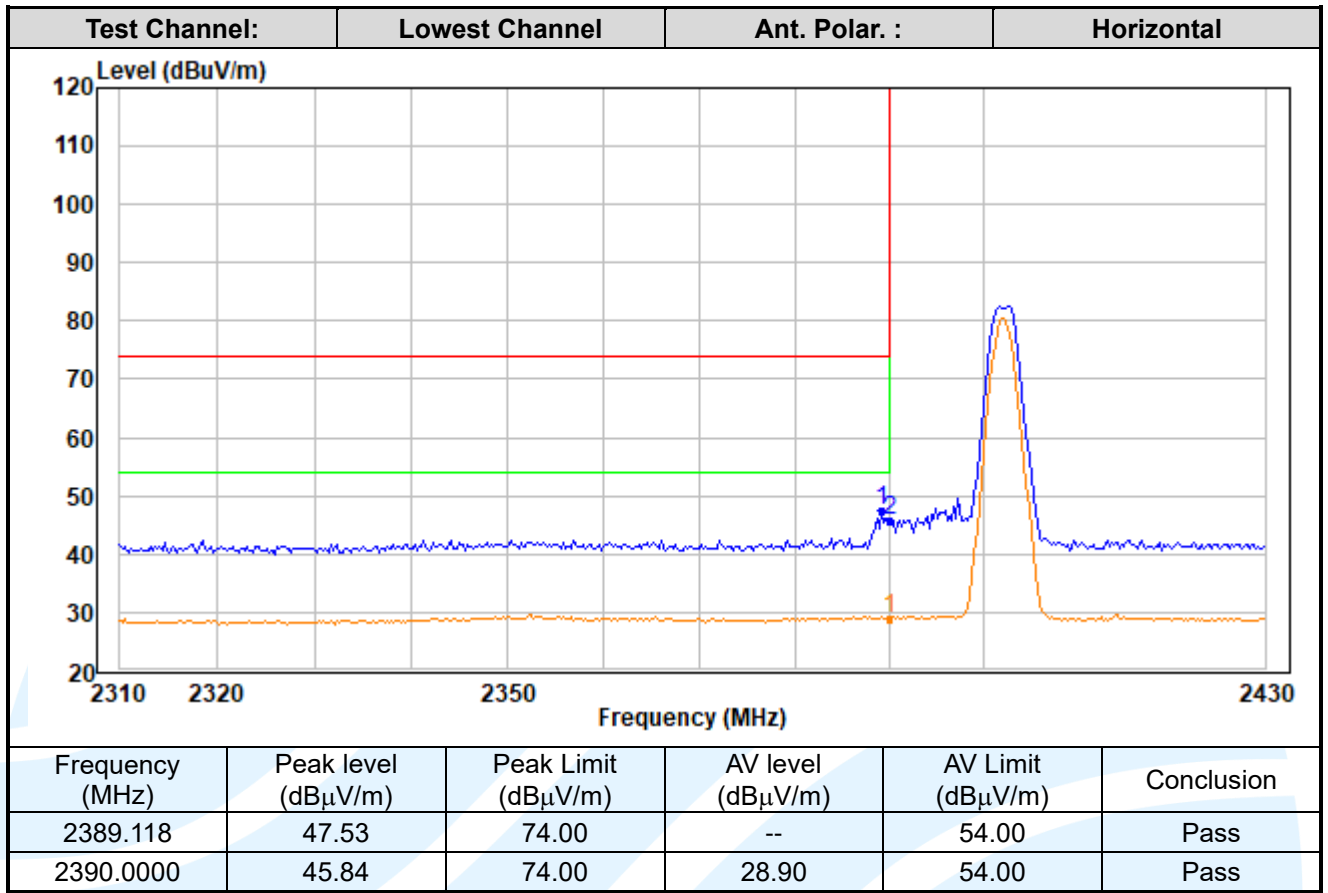
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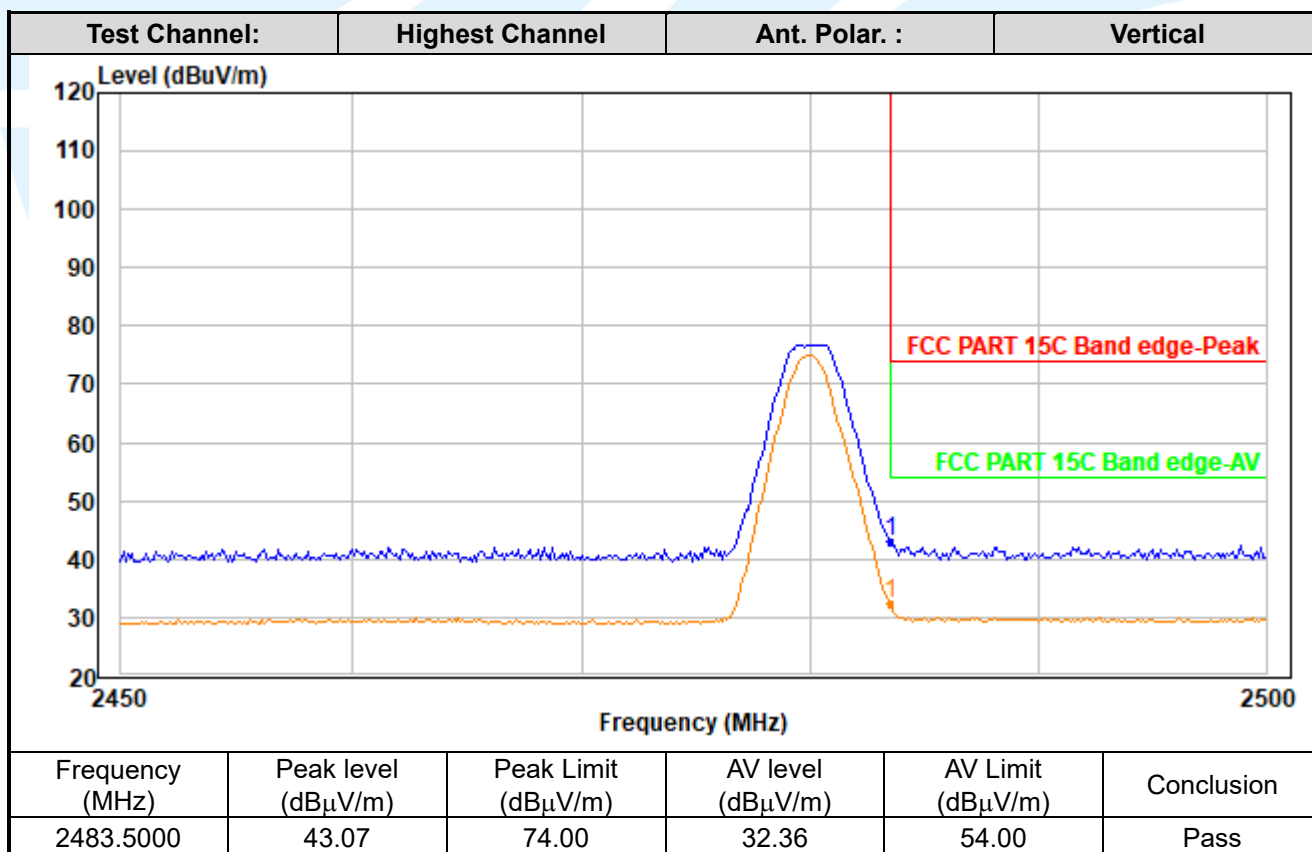
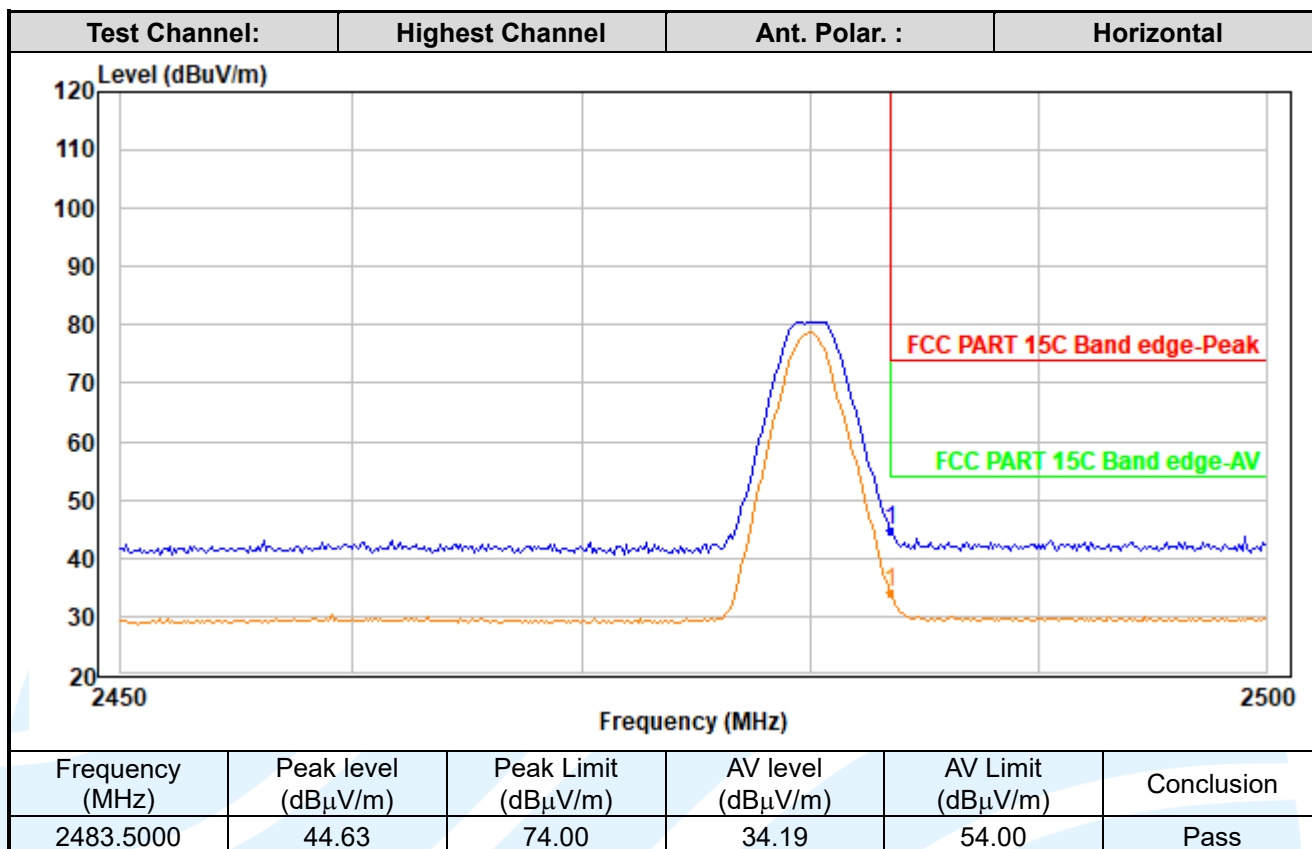
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APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***

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