Certificate #4312.01

TEST REPORT

Product Name:	IP Phone
Trade Mark:	GRANDSTREAM
Model No.:	GRP2670
HVIN:	GRP2670V2
Report Number:	24032510313RFC-1
Test Standards:	FCC 47 CFR Part 15 Subpart C RSS-247 Issue 3 RSS-Gen Issue 5
FCC ID:	YZZGRP2670V2
IC:	11964A-GRP2670V2
Test Result:	PASS
Date of Issue:	July 25, 2024

Prepared for:

Grandstream Networks, Inc.
126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
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Prepared by: David Chen — David Chen, Senior Project Engineer

Reviewed by: Henry Lu — Henry Lu, Team Leader

Approved by: Eathen Chen — Eathen Chen, Assistant Manager

Date: July 25, 2024

Version

Version No.	Date	Description
V1.0	July 25, 2024	Original

CONTENTS

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Grandstream Networks, Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks, Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	IP Phone		
Model No.:	GRP2670		
HVIN:	GRP2670V2		
Trade Mark:	GRANDSTREAM		
DUT Stage:	Identical Prototype		
EUT Supports Function: (Provided by the customer)	2.4 GHz ISM Band:	IEEE 802.11b/g/n/ax	
		Bluetooth V5.0	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac/ax
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n/ac/ax
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n/ac/ax
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac/ax
Sample Received Date:	March 23, 2024		
Sample Tested Date:	May 10, 2024 to June 22, 2024		

Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.

1.2.2 Description of Accessories

Adapter (1)	
Model No.:	GQ12-120100-AU
Input:	100-240V~50/60Hz 0.4 A Max
Output:	12.0V⎓1.0 A
DC Cable	2.5 Meter, Unshielded without ferrite
Manufacture:	Dong Guan City GangQi Electronic Co., Ltd.

Adapter (2)	
Model No.:	F12US1200100A
Input:	100-240V~50/60Hz 0.5 A Max
Output:	12.0V⎓1.0 A
DC Cable	2.5 Meter, Unshielded without ferrite
Manufacture:	SHENZHEN SUNLIGHT ELECTRONIC TECHNOLOGY CO LTD

Adapter (3)	
Model No.:	DCT12W120100US-A2
Input:	100-240V~50/60Hz 0.3 A Max
Output:	12.0V⎓1.0 A
DC Cable	2.5 Meter, Unshielded without ferrite

Manufacture:	Zhuzhou Dachuan Electronic Technology Co., Ltd.

Cable(1)	
Description:	Ethernet Cable
Cable Type:	Unshielded without ferrite
Length:	1.5 Meter

Cable(2)	
Description:	Phone Cord
Cable Type:	Unshielded without ferrite
Length:	3.5 Meter

Others
1x Handset, 1x Phone Stand

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/2LE/LE Code
Type of Modulation:	GFSK
Number of Channels:	40
Channel Separation:	2 MHz
Antenna Type:	Dipole Antenna
Antenna Gain: (Provided by the customer)	4.5 dBi
Maximum Peak Power:	7.85 dBm
Normal Test Voltage:	12Vdc

1.4 OTHER INFORMATION

Operation Frequency Each of Channel
f = 2402 + 2k MHz, k = 0,…,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	Latitude 3400	16238087894	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.1Meter	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	± 4.9 dB
5	Radiated emission 1GHz-18GHz	± 4.8 dB
6	Radiated emission 18GHz-26GHz	± 5.1 dB
7	Radiated emission 26GHz-40GHz	± 5.1 dB
8	Conducted spurious emissions	± 2.7 dB
9	RF Power, Conducted	± 0.68 dB
10	Occupied Bandwidth	± 1.86 %
11	Radio Frequency	2.4 GHz: ± 6.5 x 10^{-8}
12	Transmission Time	± 0.19 %

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 (b)(4) 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	PASS
Conducted Peak Output Power	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(3) RSS-247 Issue 3, 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 3, 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 3, 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 3, 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 3, Section 5.5	ANSI C63.10-2013 Clause 11.13	PASS
Disclaimer and Explanations: The declared of product specification and data (e.g. antenna gain, RF specification, etc) for EUT presented in the report are provided by the customer, and the customer takes all the responsibilities for the accuracy of product specification.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☒	3m SAC	ETS-LINDGREN	3m	Euroshiedpn-CT001270-1317	11-Nov-2023	10-Nov-2026
☒	Receiver	R&S	ESIB26	100114	27-Oct-2023	26-Oct-2024
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	29-Mar-2024	28-Mar-2025
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	30-Oct-2023	29-Oct-2024
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	30-Oct-2023	29-Oct-2024
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	30-Oct-2023	29-Oct-2024
☒	Preamplifier	HP	8447F	2805A02960	31-Oct-2023	30-Oct-2024
☒	Band Rejection Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	27-Oct-2023	26-Oct-2024
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	1-Apr-2024	31-Mar-2025
☒	Pre-amplifier	ETS-Lindgren	00118385	00201874	1-Apr-2024	31-Mar-2025
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	30-Oct-2023	29-Oct-2024
☒	Pre-amplifier	ETS-Lindgren	00118384	00202652	30-Oct-2023	29-Oct-2024
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	27-Oct-2023	26-Oct-2024
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	27-Oct-2023	26-Oct-2024
☒	LISN	R&S	ESH2-Z5	860014/024	27-Oct-2023	26-Oct-2024
☒	LISN	ETS-Lindgren	3816/2SH	00201088	27-Oct-2023	26-Oct-2024
☒	Test Software	EZ-EMC	EZ-CON	Software Version: EMC-CON 3A1.1		

Conducted RF test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	29-Mar-2024	28-Mar-2025
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	27-Oct-2023	26-Oct-2024
☐	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	27-Oct-2023	26-Oct-2024

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	12	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
AC Power Line Conducted Emission	23.3	62.4	100.4	S202403232937-ZJA02/4	Linson Xie
Conducted Peak Output Power	24.4	55.2	100.2	S202403232937-ZJA03/4	Allen Zhou
6dB Bandwidth & Occupied Bandwidth					
Power Spectral Density					
Conducted Out of Band Emission					
Radiated Spurious Emissions	21.3	54.5	100.2	S202403232937-ZJA04/4	Fire Huo
Band Edge Measurements (Radiated)					

4.2 TEST CHANNELS

Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
GFSK	2402 MHz to 2480 MHz	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(Provided by the customer)
Power Setting: not applicable, test used software default power level.

Test Software(Provided by the customer)
Test software name: Command

4.4 TEST SETUP

4.4.1 For Radiated Emissions test setup

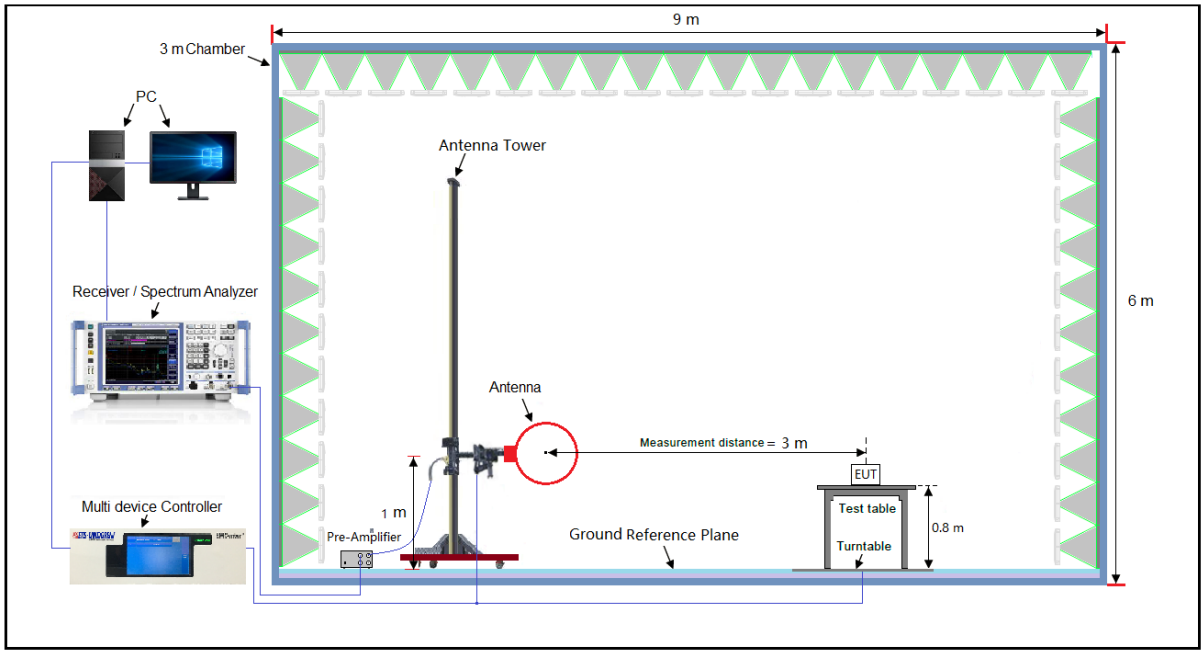


Figure 1. Below 30MHz

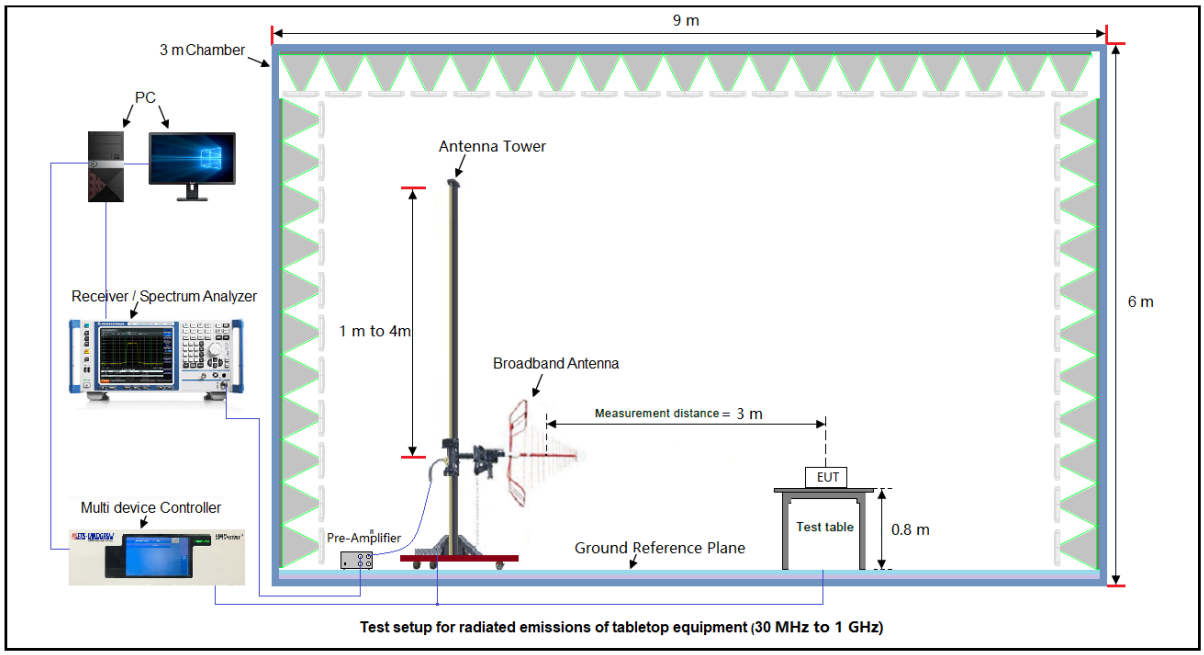


Figure 2. 30MHz to 1GHz

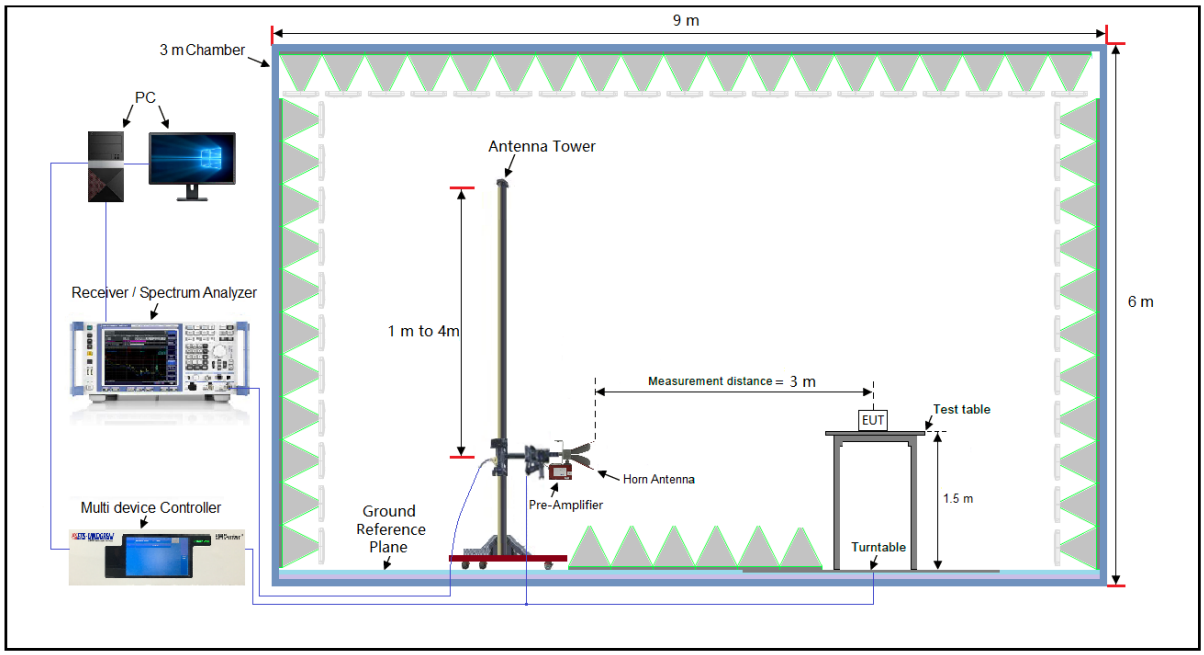
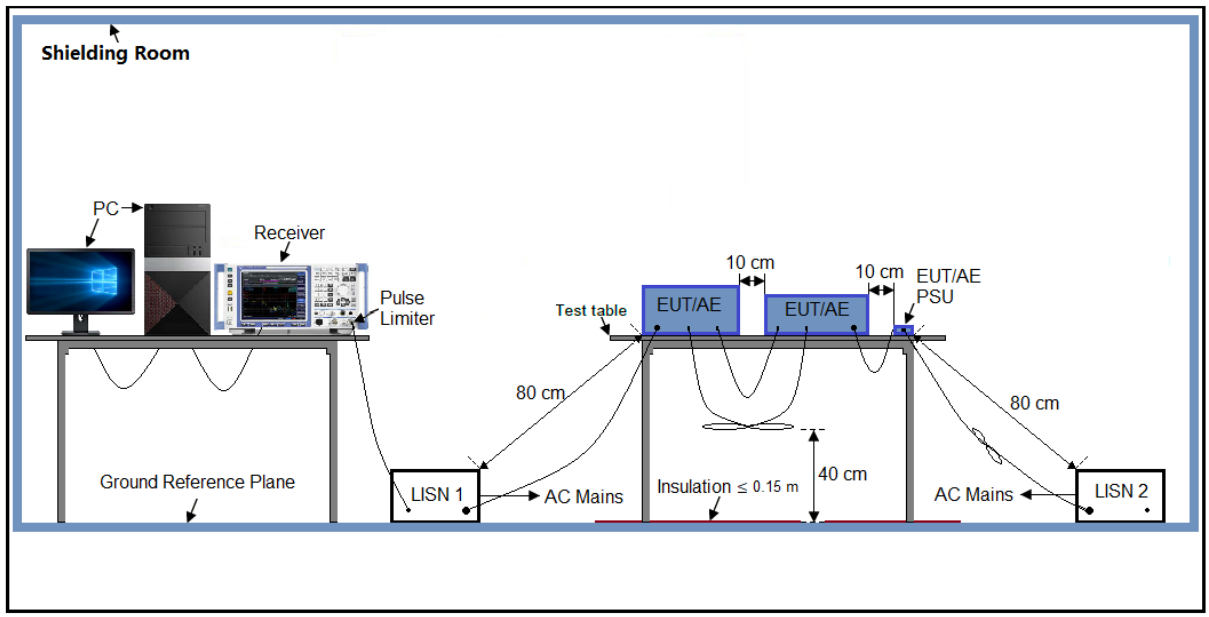
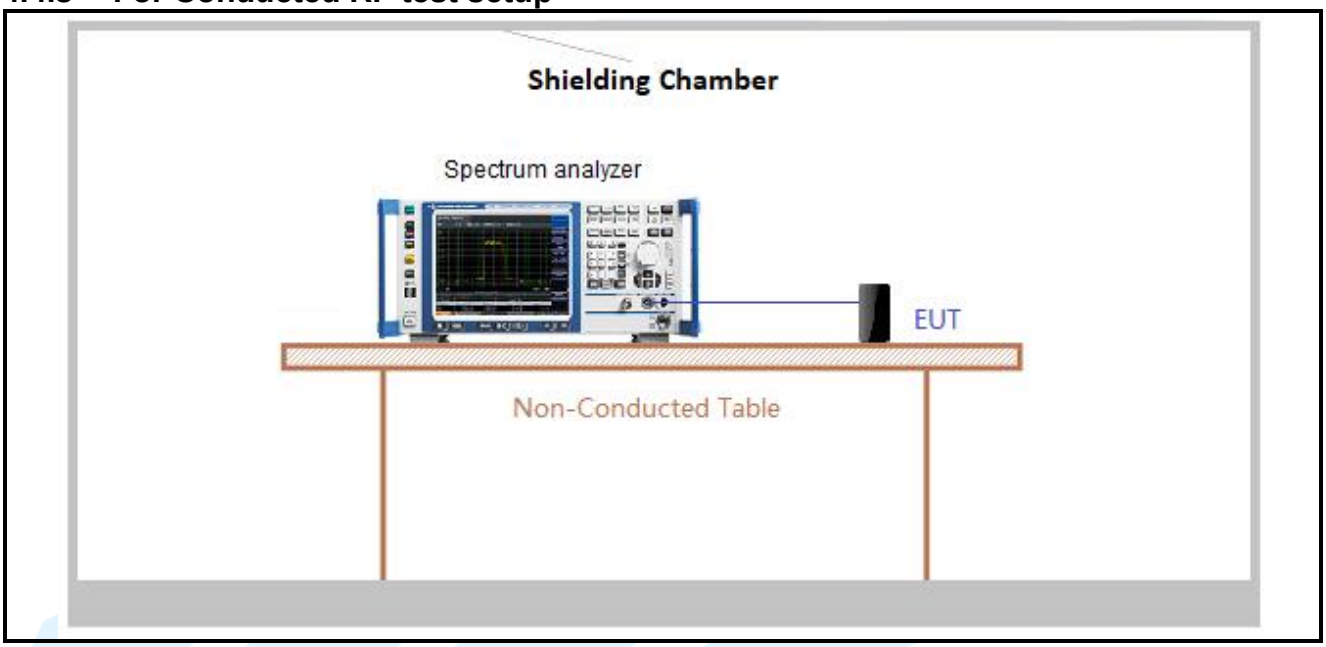


Figure 3. Above 1GHz

4.4.2 For Conducted Emissions test setup



4.4.3 For Conducted RF test setup



4.5 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. 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	Z 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.

4.6 DUTY CYCLE

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

Test Results

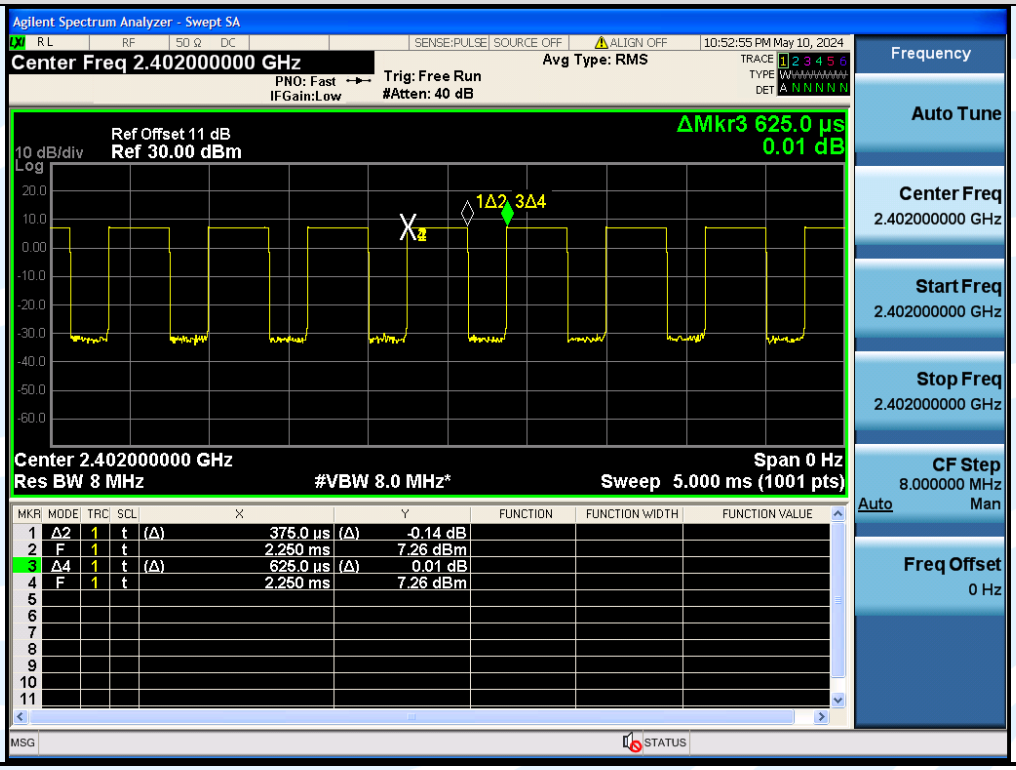
Mode	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/T Minimum VBW (kHz)
LE	0.375	0.625	0.60	60.00	2.22	2.67
2LE	0.185	0.625	0.30	29.60	5.29	5.41
LE Code (S=2)	1.040	1.870	0.56	55.61	2.55	0.96
LE Code (S=8)	3.075	3.750	0.82	82.00	0.86	0.33

Remark:

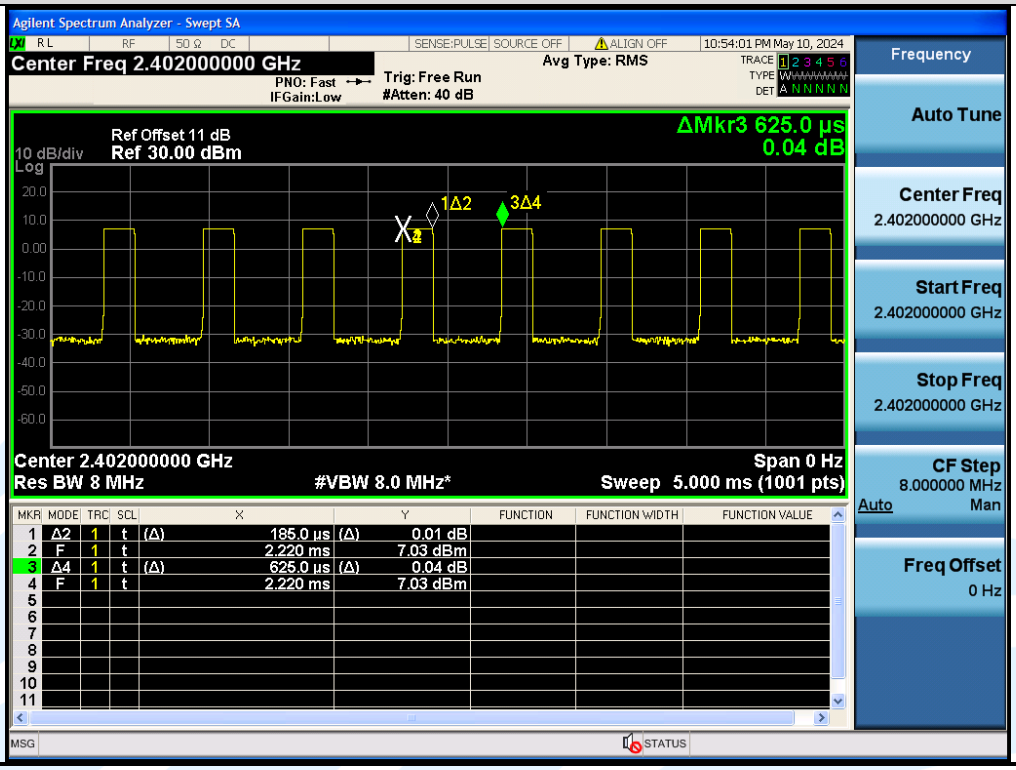
1) Duty cycle= On Time/ Period;
2) Duty Cycle factor = 10 * log(1/ Duty cycle);
3) Average factor = 20 $\log_{10}$ Duty Cycle.

The test plot as follows

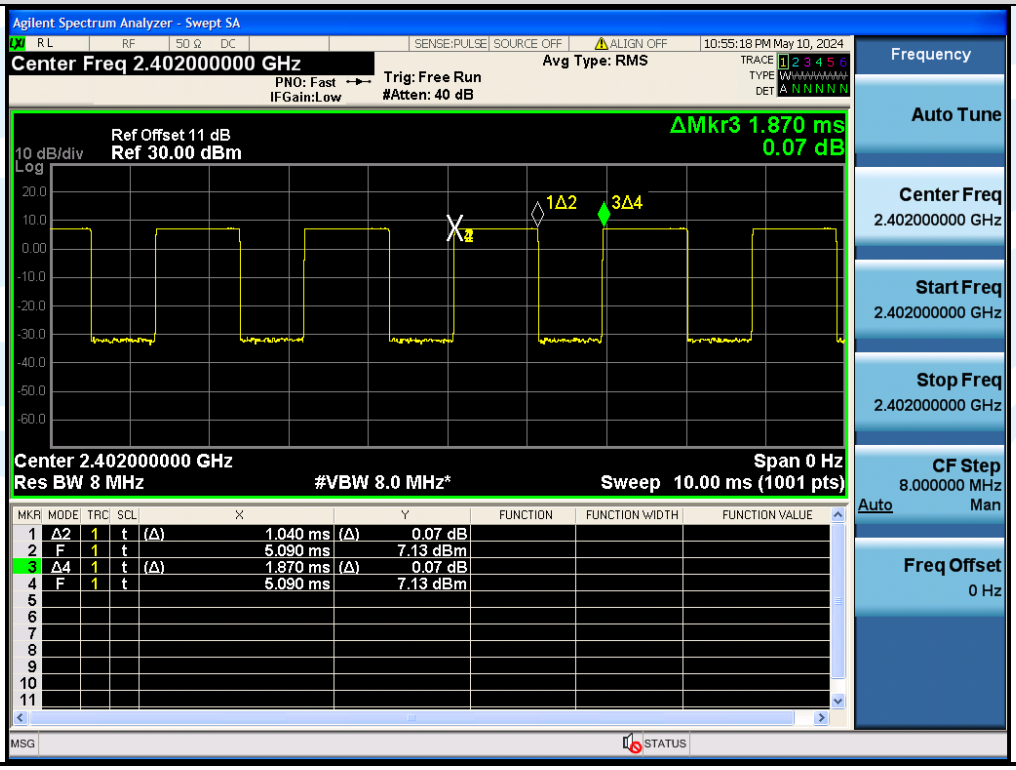
LE



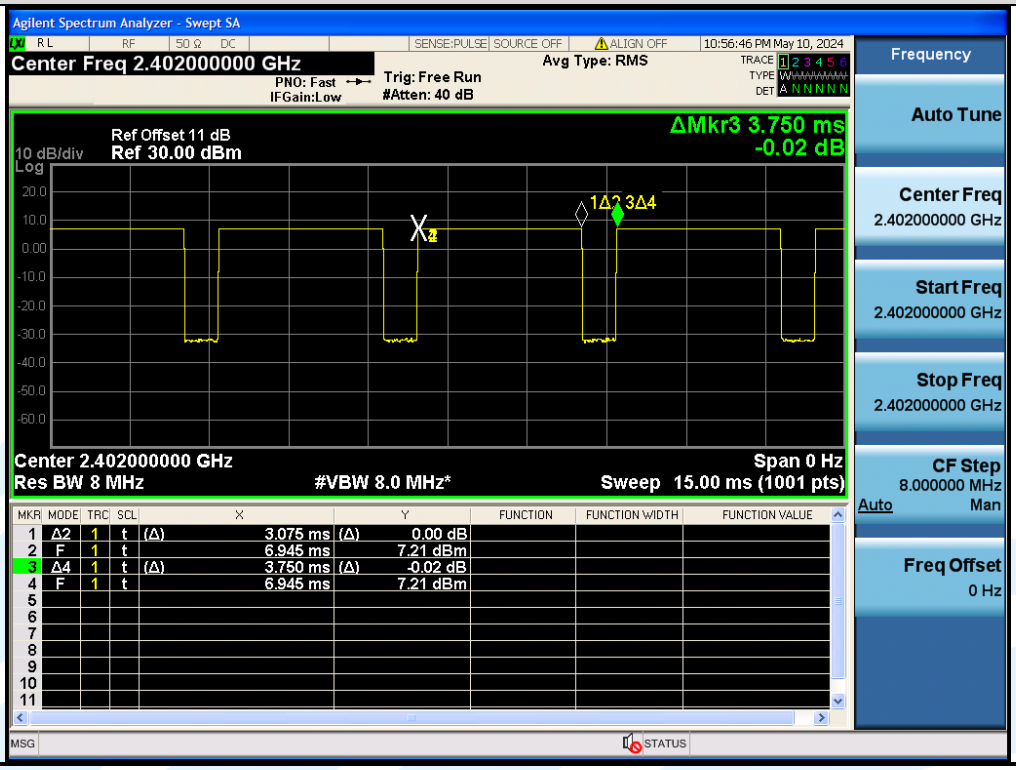
2LE



LE Code S=2



LE Code S=8


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.402000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: RMS
10:56:46 PM May 10, 2024
Ref Offset 11 dB
10 dB/div
Log
Ref 30.00 dBm
ΔMkr3 3.750 ms
-0.02 dB
Center 2.402000000 GHz
Res BW 8 MHz
#VBW 8.0 MHz*
Span 0 Hz
Sweep 15.00 ms (1001 pts)
1 Δ2 3.075 ms 0.00 dB
2 F 6.945 ms 7.21 dBm
3 Δ4 3.750 ms -0.02 dB
4 F 6.945 ms 7.21 dBm
Frequency
Auto Tune
Center Freq
2.402000000 GHz
Start Freq
2.402000000 GHz
Stop Freq
2.402000000 GHz
CF Step
8.000000 MHz
Auto
Man
Freq Offset
0 Hz

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 3	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 Unlicesed 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 4.5 dBi.

5.3 CONDUCTED PEAK OUTPUT POWER

Test Requirement: FCC 47 CFR Part 15 Subpart C Section15.247 (b)(3)
RSS-247 Issue 3, 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		Maximum e.i.r.p	Peak Power Limit	Maximum e.i.r.p Limit	Result
	(MHz)	(dBm)	(W)	(dBm)	(dBm)	(dBm)	
LE	2402	7.45	0.00556	11.95	30	36.02	Pass
	2440	7.72	0.00592	12.22	30	36.02	Pass
	2480	7.85	0.00610	12.35	30	36.02	Pass
2LE	2402	7.43	0.00553	11.93	30	36.02	Pass
	2440	7.70	0.00589	12.20	30	36.02	Pass
	2480	7.83	0.00607	12.33	30	36.02	Pass
LE Code (S=2)	2402	7.46	0.00557	11.96	30	36.02	Pass
	2440	7.70	0.00589	12.20	30	36.02	Pass
	2480	7.84	0.00608	12.34	30	36.02	Pass
LE Code (S=8)	2402	7.47	0.00558	11.97	30	36.02	Pass
	2440	7.70	0.00589	12.20	30	36.02	Pass
	2480	7.83	0.00607	12.33	30	36.02	Pass

Note:
1. The antenna gain of 4.5 dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.
2. The maximum EIRP is calculated from max output power and antenna gain, the antenna gain provided by the customer, and the customer takes all the responsibilities for the accuracy of antenna gain.

5.46 DB BANDWIDTH & OCCUPIED BANDWIDTH

Test Requirement:	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(2) RSS-247 Issue 3, 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** a) Set RBW = 100 kHz. b) Set the video bandwidth (VBW) ≥ 3 x RBW. c) Detector = Peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize. g) 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** a) Set RBW = 1% to 5% of the occupied bandwidth b) Set the video bandwidth (VBW) ≥ 3 x RBW. c) Detector = Peak. d) Trace mode = max hold. e) Sweep = auto couple. f) 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 Mode:	Link mode
Test Results:	**Please refer to Appendix A**

5.5 POWER SPECTRAL DENSITY

Test Requirement:	FCC 47 CFR Part 15 Subpart C Section 15.247 (e) RSS-247 Issue 3, 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: a) Set analyzer center frequency to DTS channel center frequency. b) Set the span to 1.5 times the DTS bandwidth. c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz. d) Set the VBW ≥ 3 x 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 amplitude level within the RBW. j) 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 Mode:	Link mode
Test Results:	**Please refer to Appendix A**

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 in 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 ≥ 3 x 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 Mode:	Link mode
Test Results:	**Please refer to Appendix A**

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 (dBμV/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 (dBuV/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 camber. 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).

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 Z 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.

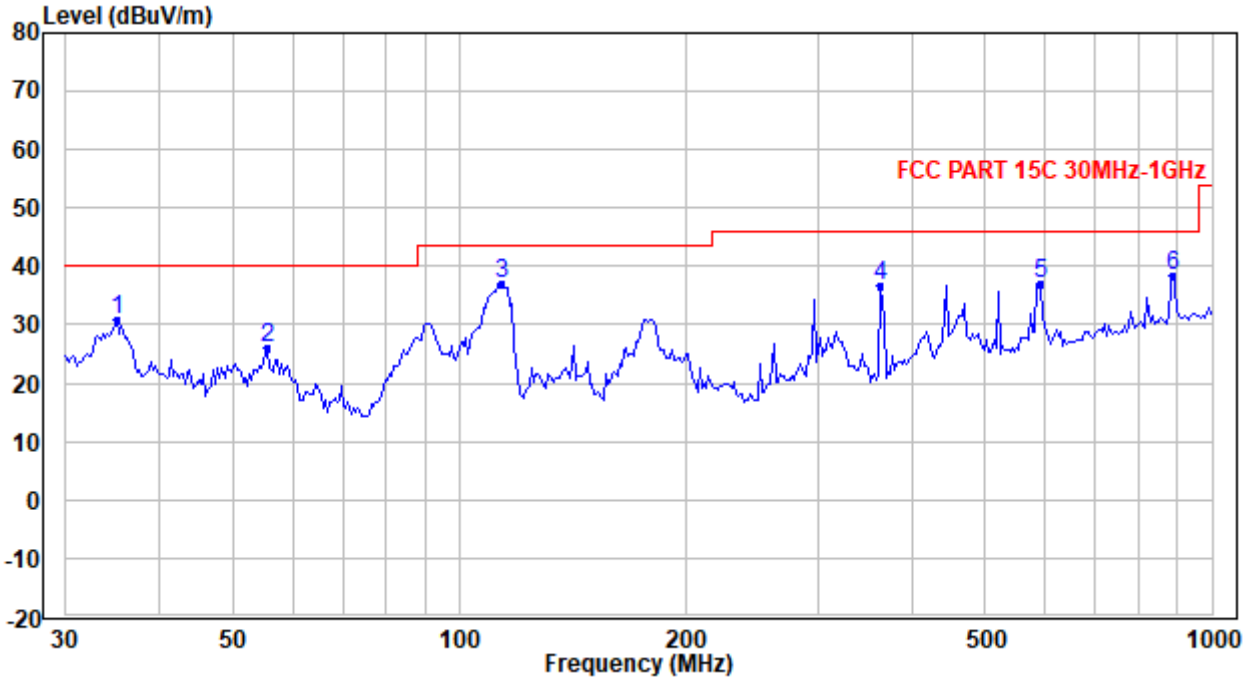
Test Result: Pass

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.

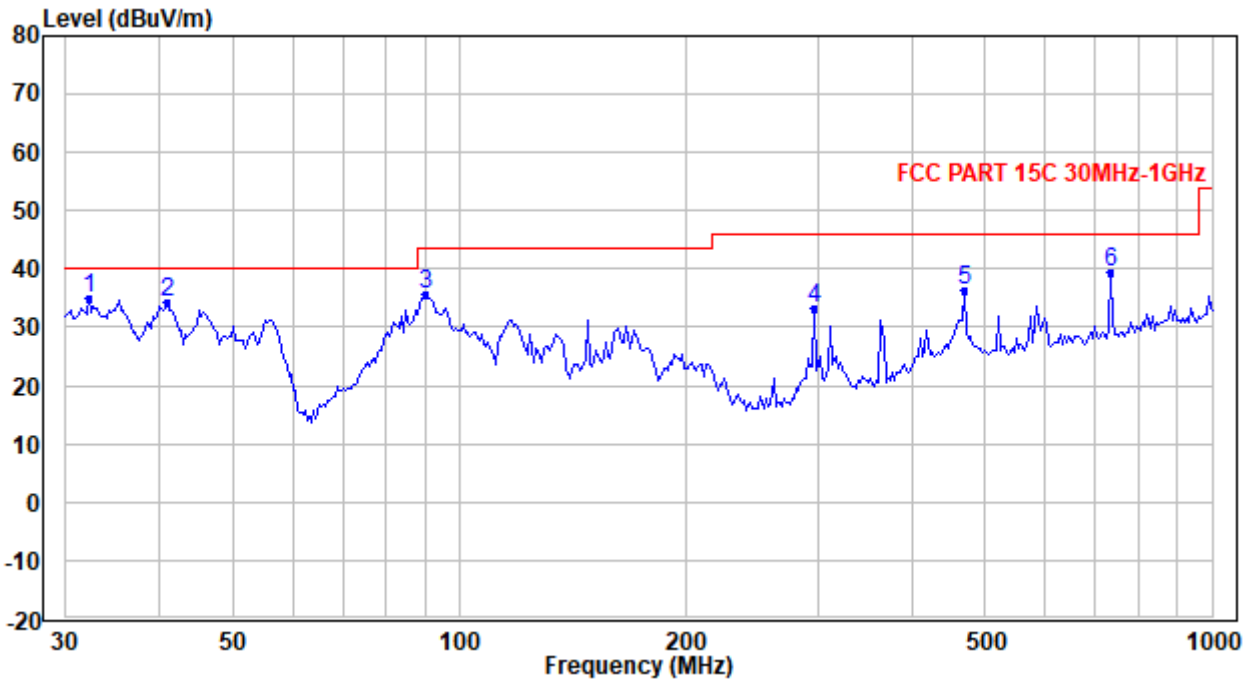
Radiated Emission Test Data (30 MHz ~ 1 GHz):
Worst-Case Configuration(LE Code(S=8) Channel 39)

Horizontal



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	35.016	37.52	-6.75	30.77	40.00	-9.23	QP
2	55.678	42.82	-16.65	26.17	40.00	-13.83	QP
3	114.018	52.56	-15.51	37.05	43.50	-6.45	QP
4	363.523	43.16	-6.45	36.71	46.00	-9.29	QP
5	590.351	38.09	-1.03	37.06	46.00	-8.94	QP
6	887.398	33.91	4.58	38.49	46.00	-7.51	QP

Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	32.184	40.99	-6.18	34.81	40.00	-5.19	QP
2	40.870	43.52	-9.19	34.33	40.00	-5.67	QP
3	90.420	51.85	-16.16	35.69	43.50	-7.81	QP
4	296.502	42.25	-9.10	33.15	46.00	-12.85	QP
5	468.165	39.84	-3.33	36.51	46.00	-9.49	QP
6	734.037	37.26	2.12	39.38	46.00	-6.62	QP

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	35.68	-2.08	33.60	54.00	-20.40	Average	Horizontal
2	4804	50.54	-2.08	48.46	74.00	-25.54	Peak	Horizontal
3	7206	35.26	1.30	36.56	54.00	-17.44	Average	Horizontal
4	7206	47.07	1.30	48.37	74.00	-25.63	Peak	Horizontal
5	4804	35.90	-2.08	33.82	54.00	-20.18	Average	Vertical
6	4804	51.37	-2.08	49.29	74.00	-24.71	Peak	Vertical
7	7206	35.11	1.30	36.41	54.00	-17.59	Average	Vertical
8	7206	46.91	1.30	48.21	74.00	-25.79	Peak	Vertical
LE_ Middle Channel:								
1	4880	35.73	-2.05	33.68	54.00	-20.32	Average	Horizontal
2	4880	51.85	-2.05	49.80	74.00	-24.20	Peak	Horizontal
3	7320	35.37	1.31	36.68	54.00	-17.32	Average	Horizontal
4	7320	47.99	1.31	49.30	74.00	-24.70	Peak	Horizontal
5	4880	35.69	-2.05	33.64	54.00	-20.36	Average	Vertical
6	4880	51.88	-2.05	49.83	74.00	-24.17	Peak	Vertical
7	7320	35.34	1.31	36.65	54.00	-17.35	Average	Vertical
8	7320	49.30	1.31	50.61	74.00	-23.39	Peak	Vertical
LE_ Highest Channel:								
1	4960	36.03	-2.02	34.01	54.00	-19.99	Average	Horizontal
2	4960	50.56	-2.02	48.54	74.00	-25.46	Peak	Horizontal
3	7440	35.29	1.32	36.61	54.00	-17.39	Average	Horizontal
4	7440	50.41	1.32	51.73	74.00	-22.27	Peak	Horizontal
5	4960	36.56	-2.02	34.54	54.00	-19.46	Average	Vertical
6	4960	51.05	-2.02	49.03	74.00	-24.97	Peak	Vertical
7	7440	36.05	1.32	37.37	54.00	-16.63	Average	Vertical
8	7440	53.01	1.32	54.33	74.00	-19.67	Peak	Vertical

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	35.87	-2.08	33.79	54.00	-20.21	Average	Horizontal
2	4804	51.38	-2.08	49.30	74.00	-24.70	Peak	Horizontal
3	7206	35.21	1.30	36.51	54.00	-17.49	Average	Horizontal
4	7206	47.13	1.30	48.43	74.00	-25.57	Peak	Horizontal
5	4804	35.83	-2.08	33.75	54.00	-20.25	Average	Vertical
6	4804	50.73	-2.08	48.65	74.00	-25.35	Peak	Vertical
7	7206	35.11	1.30	36.41	54.00	-17.59	Average	Vertical
8	7206	49.04	1.30	50.34	74.00	-23.66	Peak	Vertical
2LE_ Middle Channel:								
1	4880	35.62	-2.05	33.57	54.00	-20.43	Average	Horizontal
2	4880	50.26	-2.05	48.21	74.00	-25.79	Peak	Horizontal
3	7320	35.29	1.31	36.60	54.00	-17.40	Average	Horizontal
4	7320	46.99	1.31	48.30	74.00	-25.70	Peak	Horizontal
5	4880	36.01	-2.05	33.96	54.00	-20.04	Average	Vertical
6	4880	50.95	-2.05	48.90	74.00	-25.10	Peak	Vertical
7	7320	35.27	1.31	36.58	54.00	-17.42	Average	Vertical
8	7320	50.12	1.31	51.43	74.00	-22.57	Peak	Vertical
2LE_ Highest Channel:								
1	4960	35.87	-2.02	33.85	54.00	-20.15	Average	Horizontal
2	4960	49.01	-2.02	46.99	74.00	-27.01	Peak	Horizontal
3	7440	35.09	1.32	36.41	54.00	-17.59	Average	Horizontal
4	7440	50.24	1.32	51.56	74.00	-22.44	Peak	Horizontal
5	4960	36.30	-2.02	34.28	54.00	-19.72	Average	Vertical
6	4960	50.13	-2.02	48.11	74.00	-25.89	Peak	Vertical
7	7440	36.10	1.32	37.42	54.00	-16.58	Average	Vertical
8	7440	53.69	1.32	55.01	74.00	-18.99	Peak	Vertical

LE Code (S=2)_ Lowest Channel:								
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4804	35.80	-2.08	33.72	54.00	-20.28	Average	Horizontal
2	4804	50.03	-2.08	47.95	74.00	-26.05	Peak	Horizontal
3	7206	35.39	1.30	36.69	54.00	-17.31	Average	Horizontal
4	7206	47.96	1.30	49.26	74.00	-24.74	Peak	Horizontal
5	4804	35.85	-2.08	33.77	54.00	-20.23	Average	Vertical
6	4804	50.58	-2.08	48.50	74.00	-25.50	Peak	Vertical
7	7206	35.14	1.30	36.44	54.00	-17.56	Average	Vertical
8	7206	47.12	1.30	48.42	74.00	-25.58	Peak	Vertical
LE Code (S=2)_ Middle Channel:								
1	4880	35.76	-2.05	33.71	54.00	-20.29	Average	Horizontal
2	4880	50.11	-2.05	48.06	74.00	-25.94	Peak	Horizontal
3	7320	35.34	1.31	36.65	54.00	-17.35	Average	Horizontal
4	7320	47.63	1.31	48.94	74.00	-25.06	Peak	Horizontal
5	4880	35.62	-2.05	33.57	54.00	-20.43	Average	Vertical
6	4880	51.41	-2.05	49.36	74.00	-24.64	Peak	Vertical
7	7320	35.37	1.31	36.68	54.00	-17.32	Average	Vertical
8	7320	49.38	1.31	50.69	74.00	-23.31	Peak	Vertical
LE Code (S=2)_ Highest Channel:								
1	4960	36.23	-2.02	34.21	54.00	-19.79	Average	Horizontal
2	4960	51.36	-2.02	49.34	74.00	-24.66	Peak	Horizontal
3	7440	35.32	1.32	36.64	54.00	-17.36	Average	Horizontal
4	7440	49.59	1.32	50.91	74.00	-23.09	Peak	Horizontal
5	4960	36.10	-2.02	34.08	54.00	-19.92	Average	Vertical
6	4960	50.48	-2.02	48.46	74.00	-25.54	Peak	Vertical
7	7440	35.92	1.32	37.24	54.00	-16.76	Average	Vertical
8	7440	52.35	1.32	53.67	74.00	-20.33	Peak	Vertical

LE Code (S=8)_ Lowest Channel:								
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4804	35.76	-2.08	33.68	54.00	-20.32	Average	Horizontal
2	4804	50.75	-2.08	48.67	74.00	-25.33	Peak	Horizontal
3	7206	35.21	1.30	36.51	54.00	-17.49	Average	Horizontal
4	7206	47.75	1.30	49.05	74.00	-24.95	Peak	Horizontal
5	4804	35.71	-2.08	33.63	54.00	-20.37	Average	Vertical
6	4804	50.08	-2.08	48.00	74.00	-26.00	Peak	Vertical
7	7206	35.21	1.30	36.51	54.00	-17.49	Average	Vertical
8	7206	48.16	1.30	49.46	74.00	-24.54	Peak	Vertical
LE Code (S=8)_ Middle Channel:								
1	4880	37.57	-2.05	35.52	54.00	-18.48	Average	Horizontal
2	4880	51.69	-2.05	49.64	74.00	-24.36	Peak	Horizontal
3	7320	35.37	1.31	36.68	54.00	-17.32	Average	Horizontal
4	7320	46.96	1.31	48.27	74.00	-25.73	Peak	Horizontal
5	4880	35.71	-2.05	33.66	54.00	-20.34	Average	Vertical
6	4880	50.85	-2.05	48.80	74.00	-25.20	Peak	Vertical
7	7320	35.39	1.31	36.70	54.00	-17.30	Average	Vertical
8	7320	48.18	1.31	49.49	74.00	-24.51	Peak	Vertical
LE Code (S=8)_ Highest Channel:								
1	4960	36.28	-2.02	34.26	54.00	-19.74	Average	Horizontal
2	4960	50.85	-2.02	48.83	74.00	-25.17	Peak	Horizontal
3	7440	35.39	1.32	36.71	54.00	-17.29	Average	Horizontal
4	7440	49.90	1.32	51.22	74.00	-22.78	Peak	Horizontal
5	4960	36.45	-2.02	34.43	54.00	-19.57	Average	Vertical
6	4960	50.69	-2.02	48.67	74.00	-25.33	Peak	Vertical
7	7440	35.92	1.32	37.24	54.00	-16.76	Average	Vertical
8	7440	52.47	1.32	53.79	74.00	-20.21	Peak	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 3, 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 (dBμV/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.

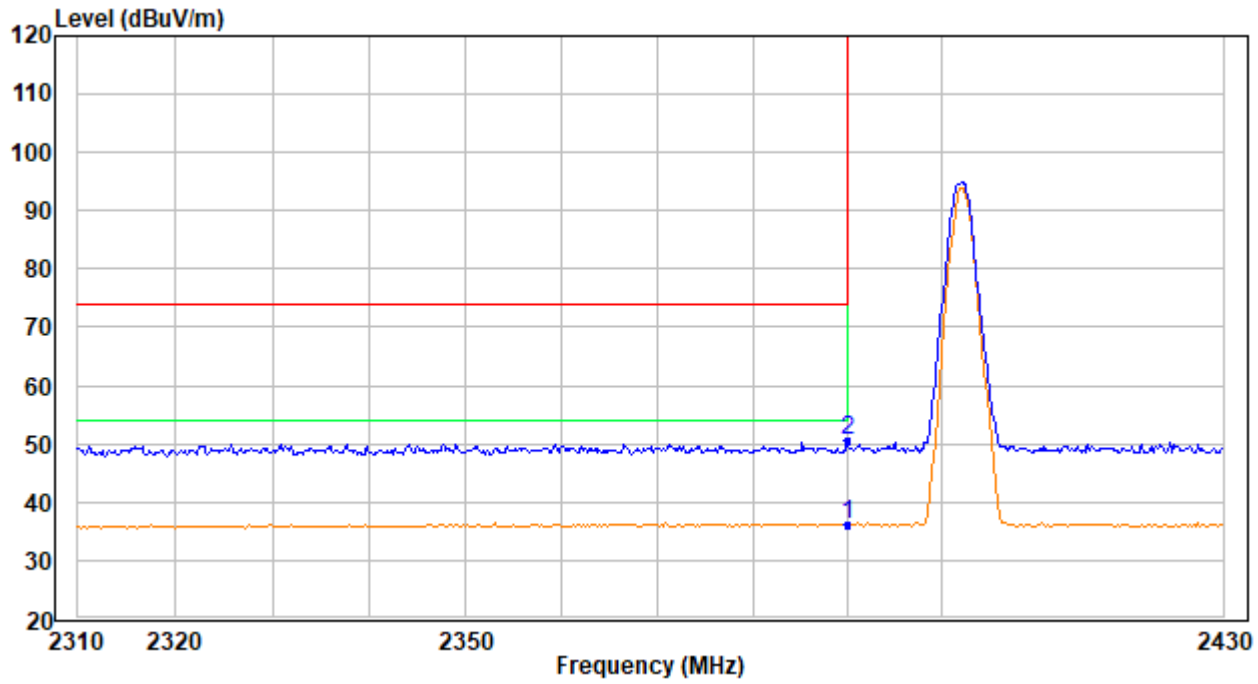
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

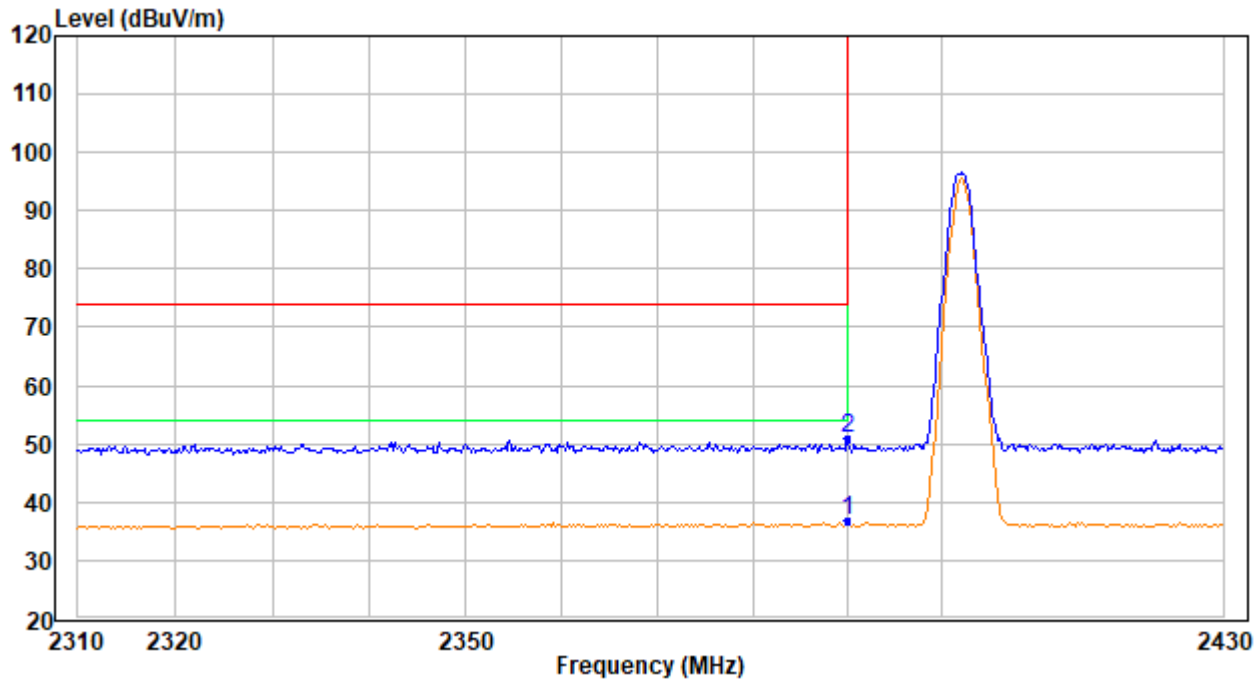
LE Mode:

Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



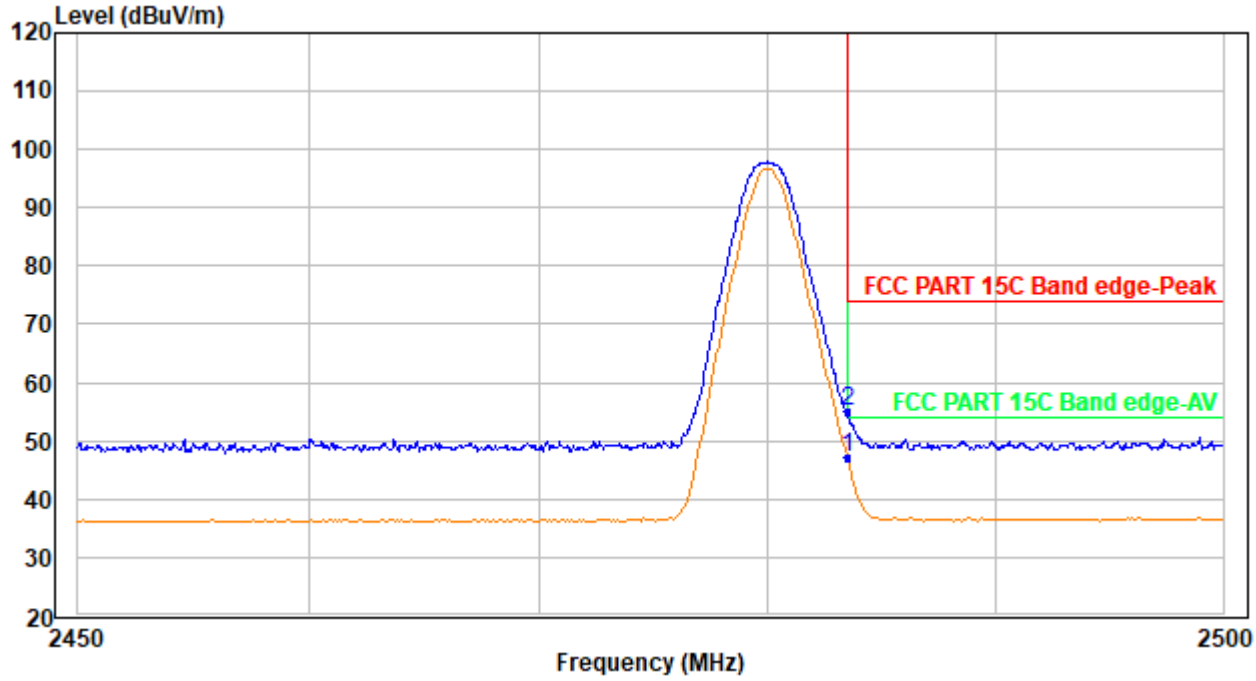
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2390.000	50.64	74.00	36.01	54.00	Pass

Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



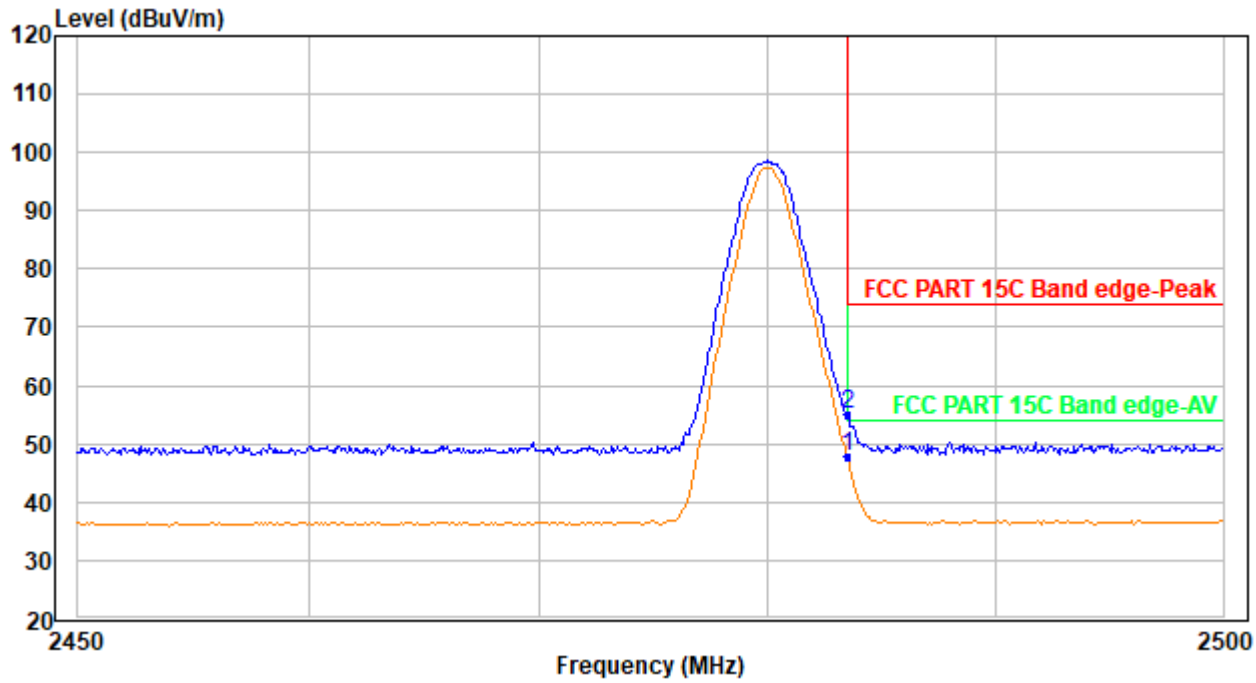
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2390.000	50.90	74.00	36.93	54.00	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	55.00	74.00	47.21	54.00	Pass

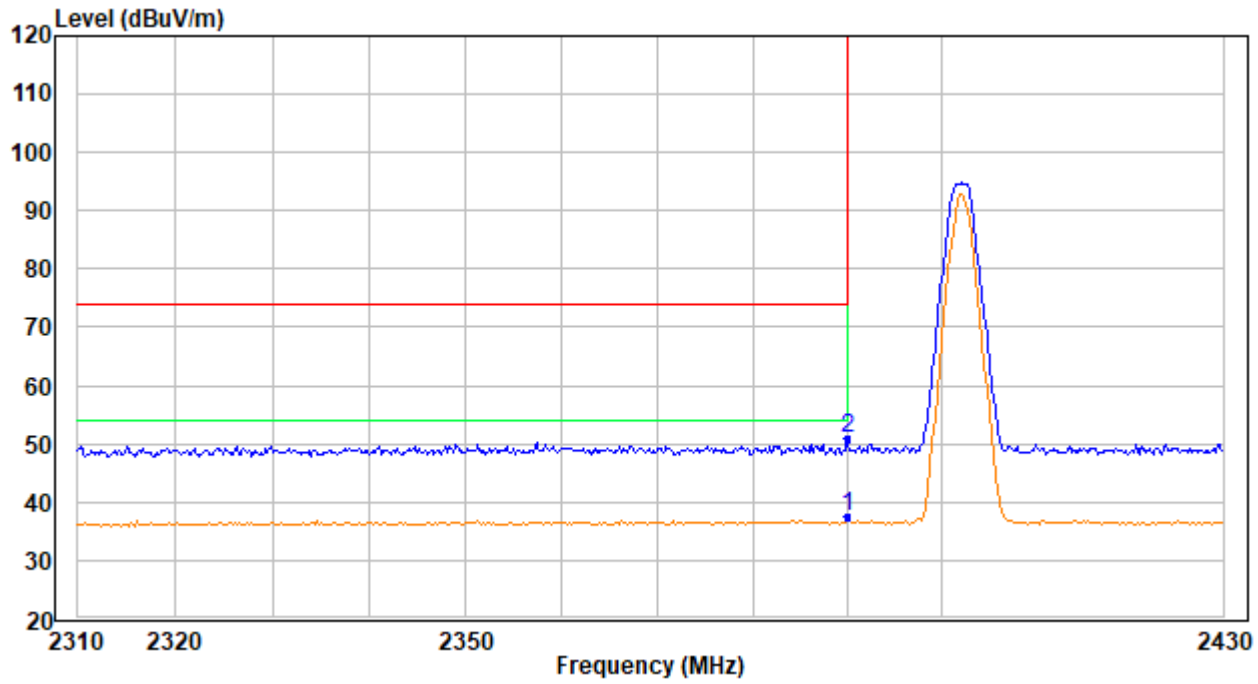
Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	54.97	74.00	47.78	54.00	Pass

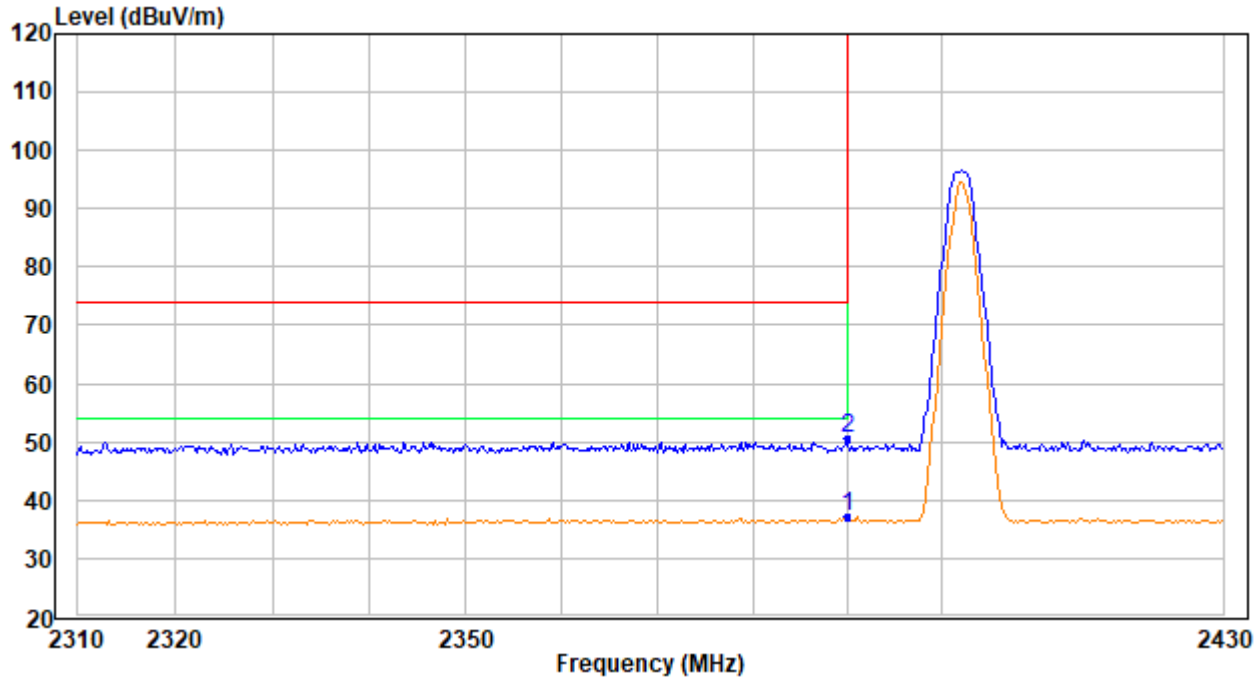
2LE Mode:

Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



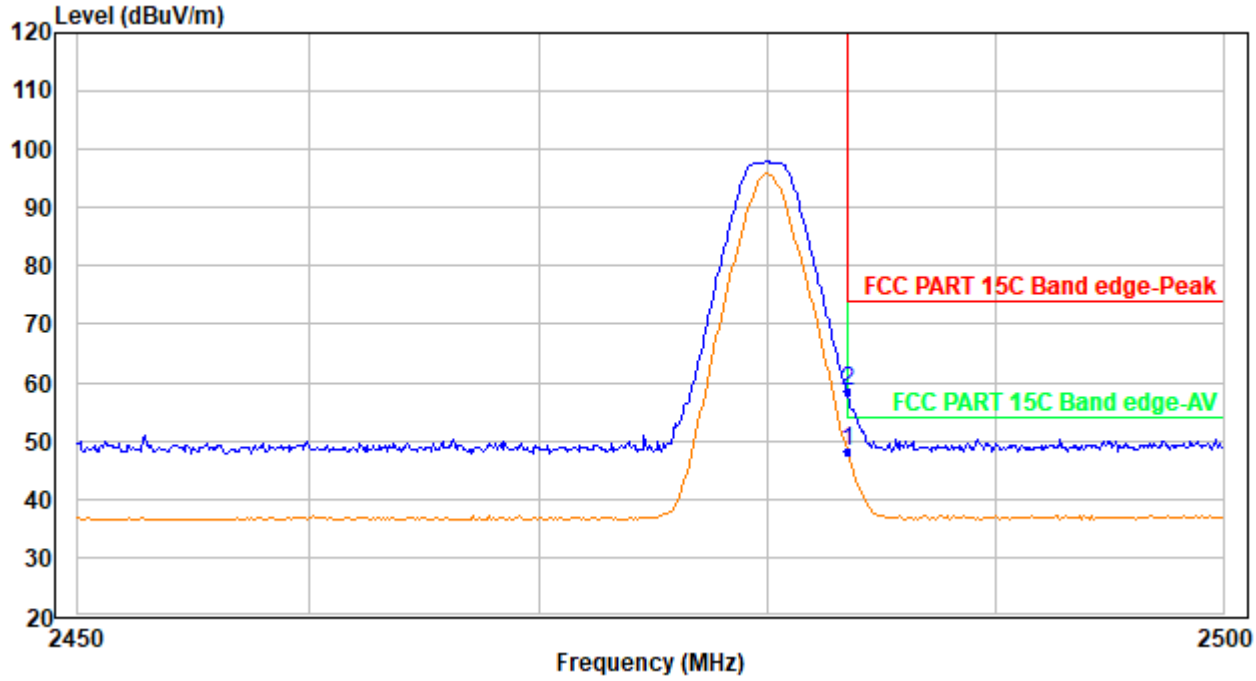
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2390.000	50.86	74.00	37.48	54.00	Pass

Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



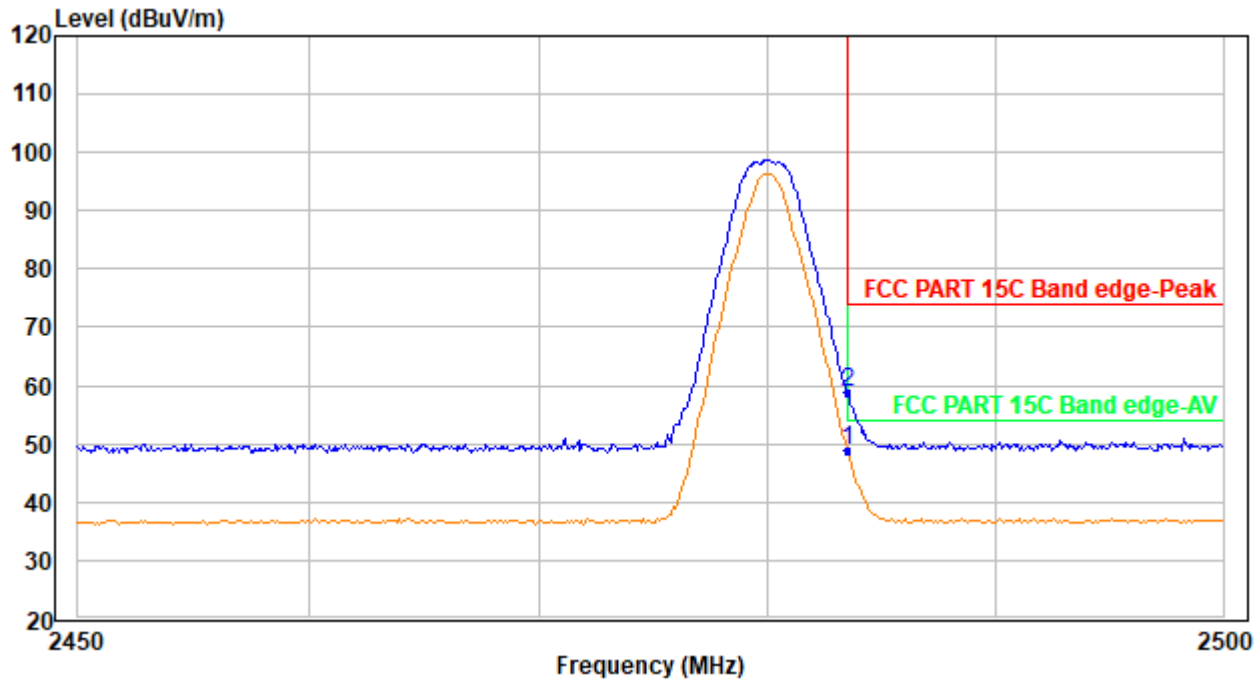
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2390.000	50.73	74.00	37.20	54.00	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	58.48	74.00	48.28	54.00	Pass

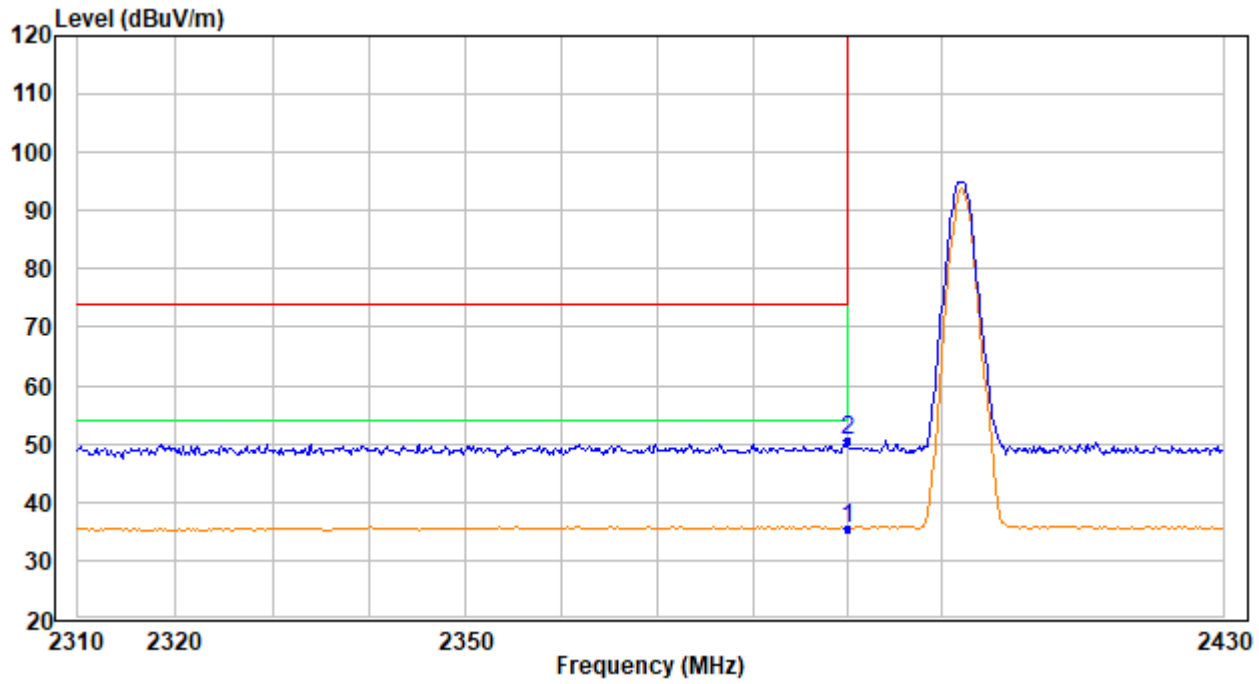
Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	58.88	74.00	49.02	54.00	Pass

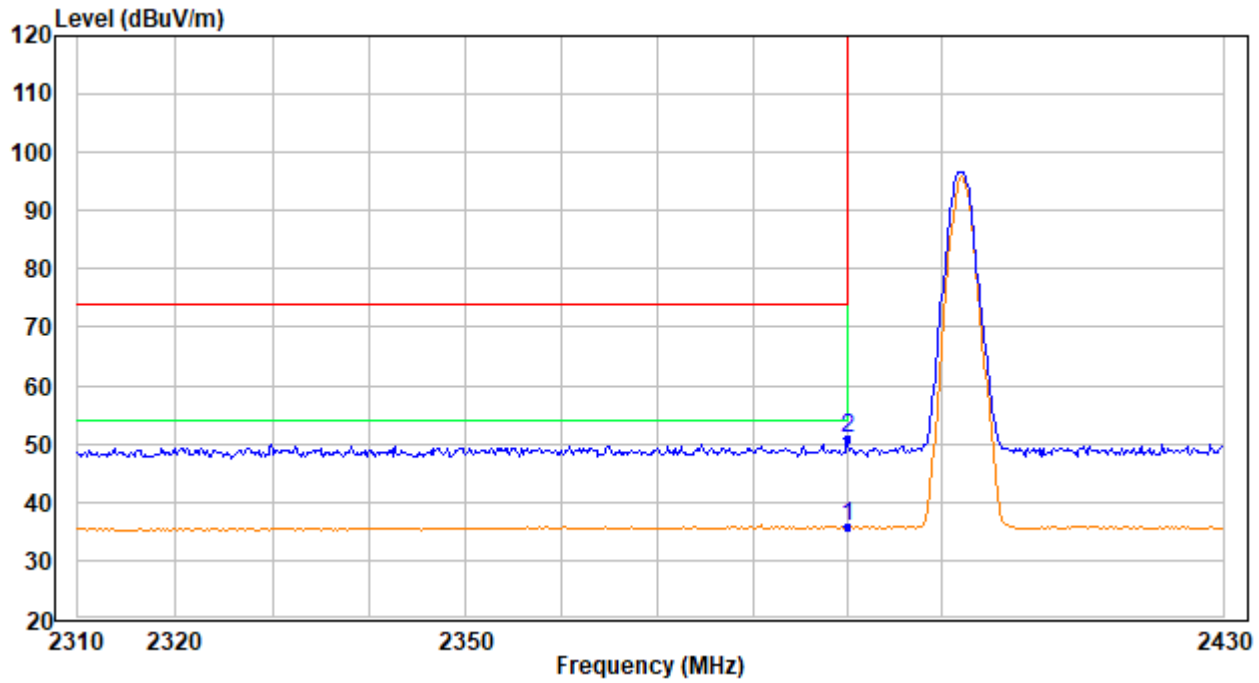
LE Code (S=2) Mode:

Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



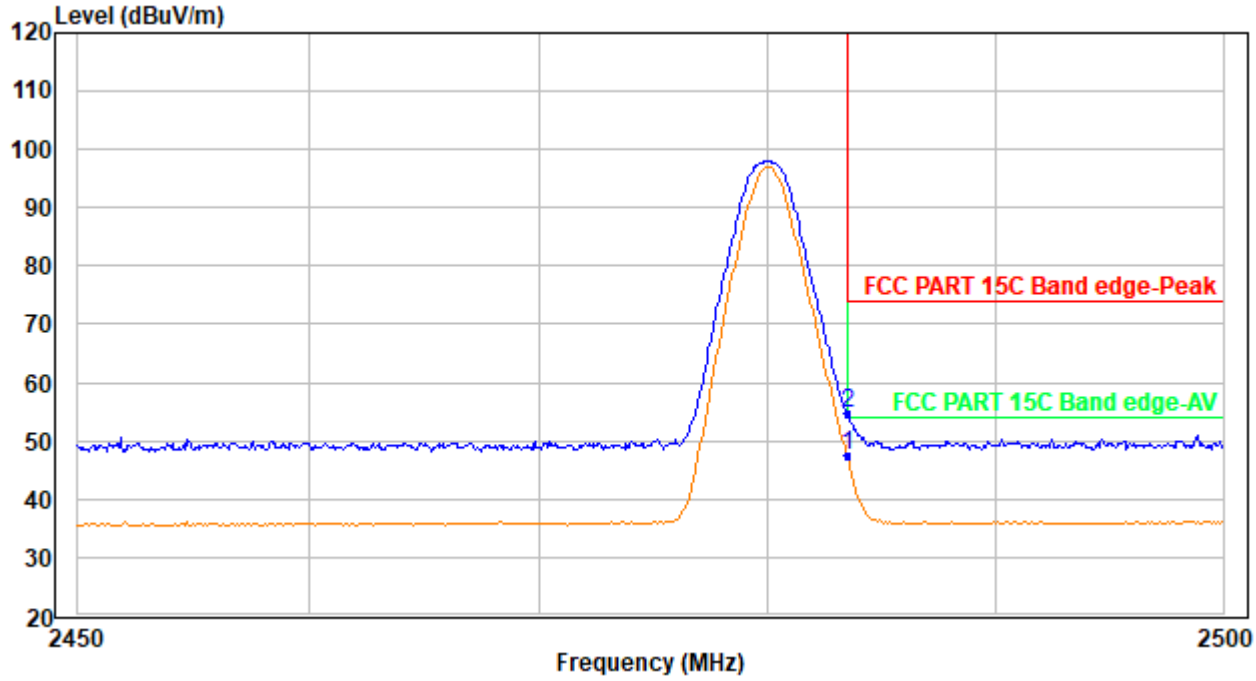
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2390.000	50.53	74.00	35.46	54.00	Pass

Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



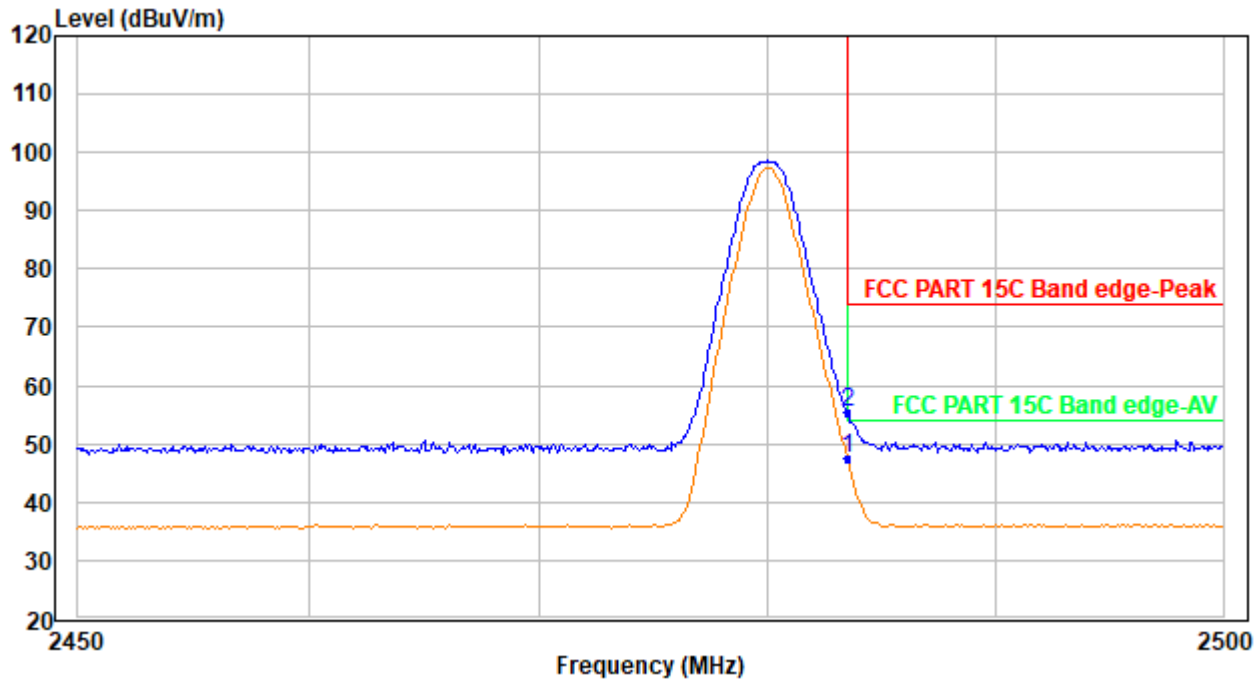
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2390.000	50.80	74.00	35.66	54.00	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	54.83	74.00	47.34	54.00	Pass

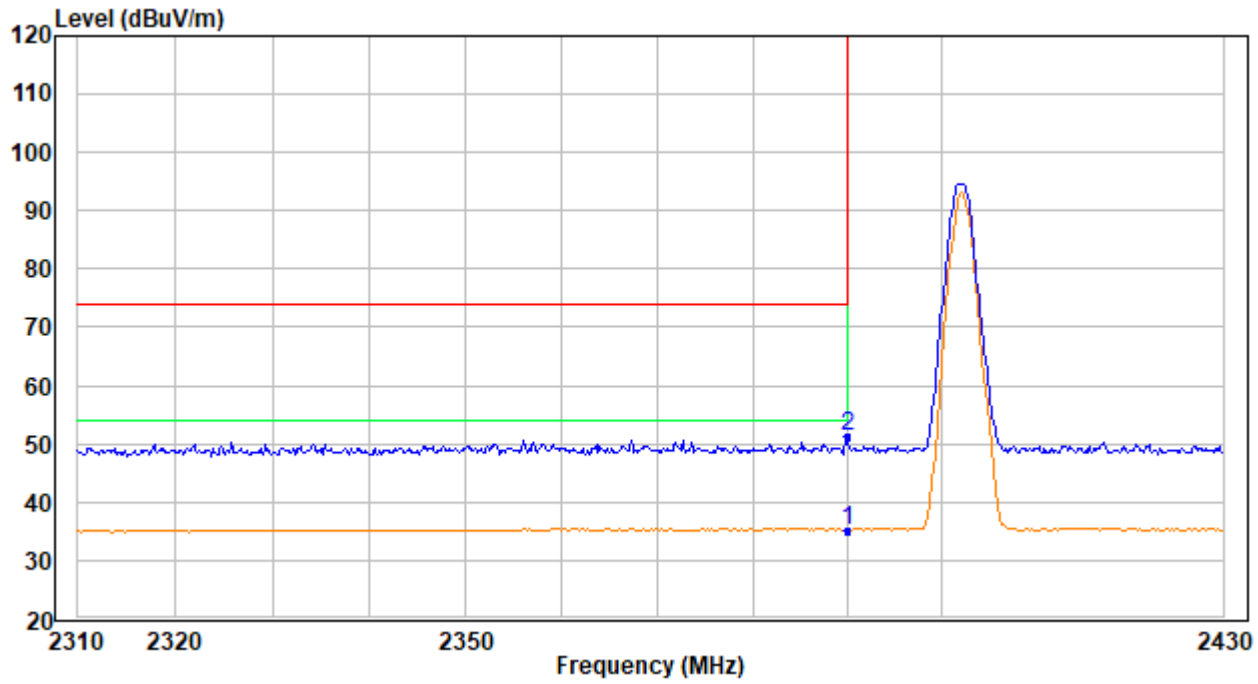
Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	55.44	74.00	47.63	54.00	Pass

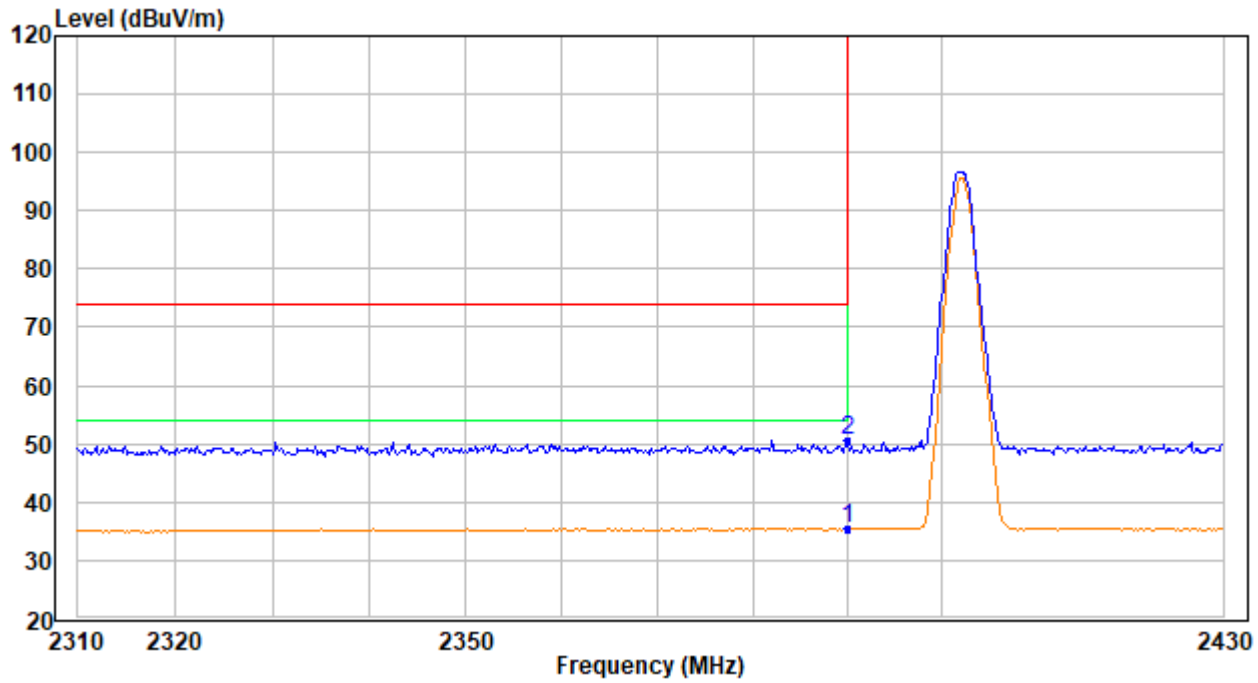
LE Code (S=8) Mode:

Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



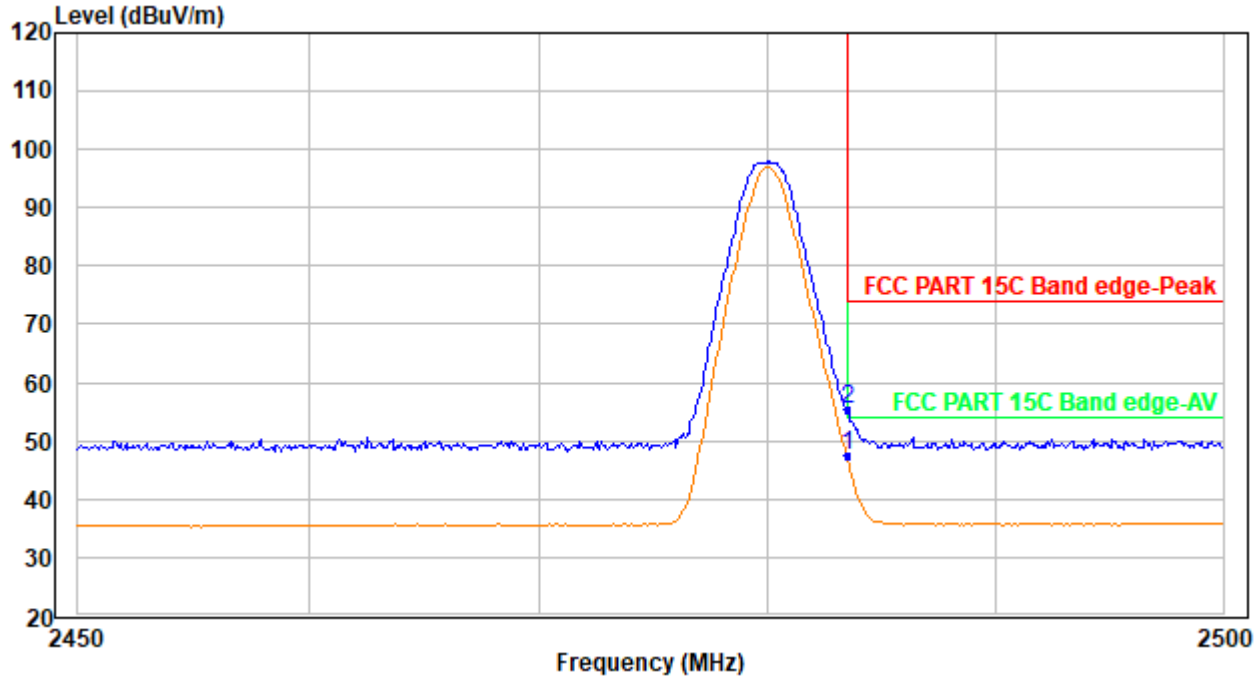
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2390.000	51.20	74.00	35.29	54.00	Pass

Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



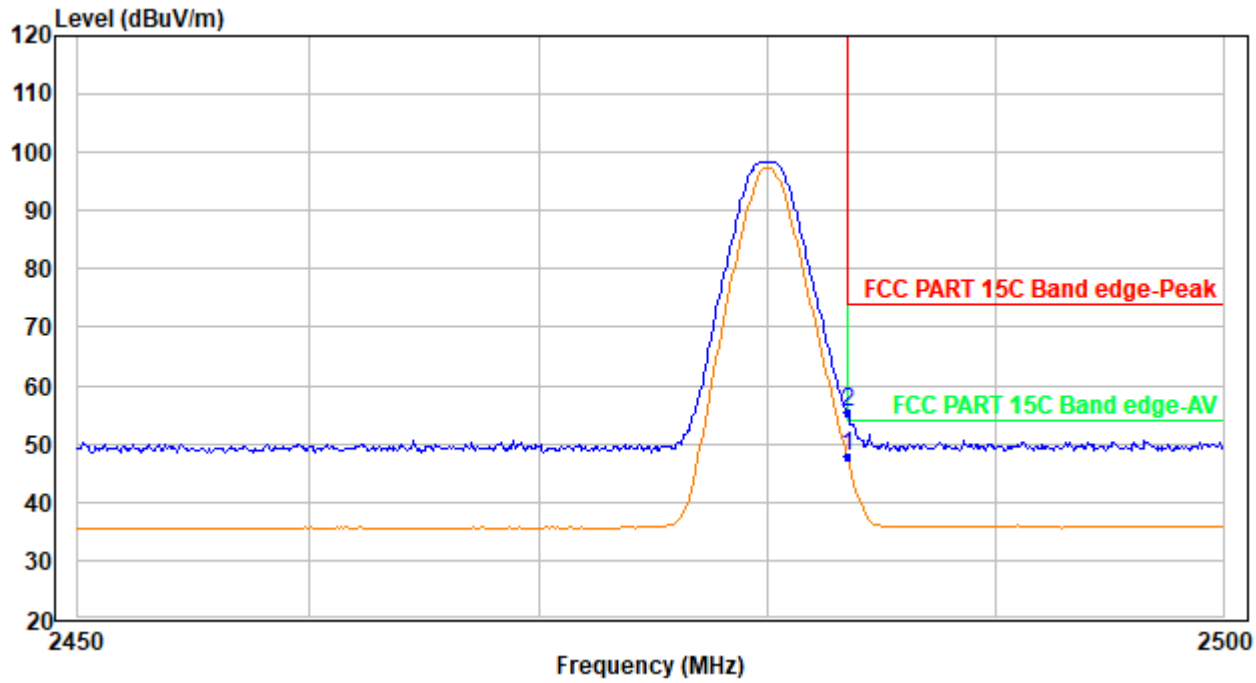
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2390.000	50.72	74.00	35.39	54.00	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	55.53	74.00	47.42	54.00	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	55.37	74.00	47.89	54.00	Pass

5.9 CONDUCTED EMISSION

Test Requirement: 47 CFR Part 15C Section 15.207
RSS-Gen Issue 5, Section 8.8

Test Method: ANSI C63.10-2013 Section 6.2

Limits:

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.4.2 for details.

Test Procedures:

Test frequency range :150KHz-30MHz

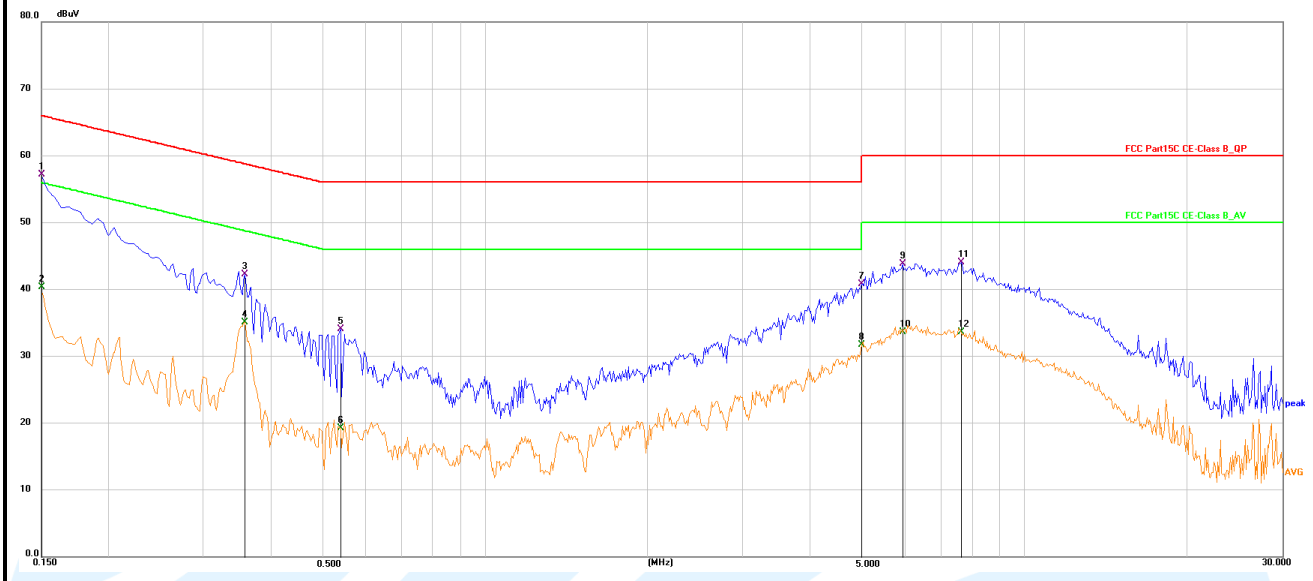
1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

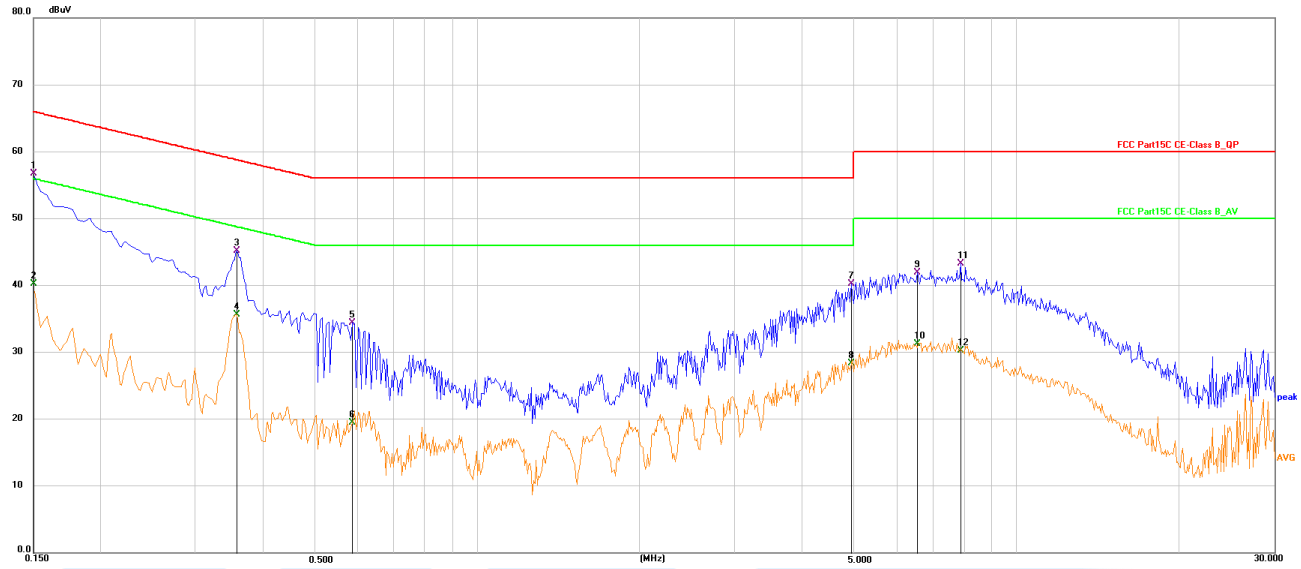
The worst measurement data as follows:
Quasi Peak and Average:
Mode: BT Link

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.1500	46.98	10.20	57.18	66.00	-8.82	QP
2	0.1500	30.14	10.20	40.34	56.00	-15.66	AVG
3	0.3570	32.10	10.16	42.26	58.80	-16.54	QP
4	0.3570	24.90	10.16	35.06	48.80	-13.74	AVG
5	0.5370	23.87	10.19	34.06	56.00	-21.94	QP
6	0.5370	9.02	10.19	19.21	46.00	-26.79	AVG
7	4.9920	30.51	10.23	40.74	56.00	-15.26	QP
8	4.9920	21.42	10.23	31.65	46.00	-14.35	AVG
9	5.9325	33.52	10.35	43.87	60.00	-16.13	QP
10	5.9325	23.23	10.35	33.58	50.00	-16.42	AVG
11	7.6110	33.55	10.49	44.04	60.00	-15.96	QP
12	7.6110	23.13	10.49	33.62	50.00	-16.38	AVG

Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.1500	46.55	10.19	56.74	66.00	-9.26	QP
2	0.1500	30.01	10.19	40.20	56.00	-15.80	AVG
3	0.3570	34.98	10.15	45.13	58.80	-13.67	QP
4	0.3570	25.50	10.15	35.65	48.80	-13.15	AVG
5	0.5865	24.17	10.27	34.44	56.00	-21.56	QP
6	0.5865	9.21	10.27	19.48	46.00	-26.52	AVG
7	4.9335	29.92	10.28	40.20	56.00	-15.80	QP
8	4.9335	18.03	10.28	28.31	46.00	-17.69	AVG
9	6.5265	31.67	10.28	41.95	60.00	-18.05	QP
10	6.5265	20.98	10.28	31.26	50.00	-18.74	AVG
11	7.8765	32.90	10.32	43.22	60.00	-16.78	QP
12	7.8765	19.89	10.32	30.21	50.00	-19.79	AVG

Remark:

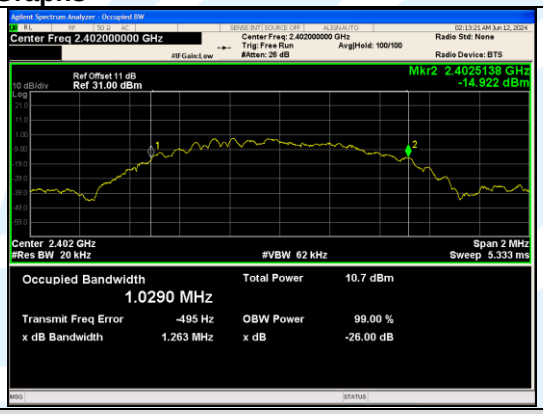
1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

APPENDIX A RF TEST DATA

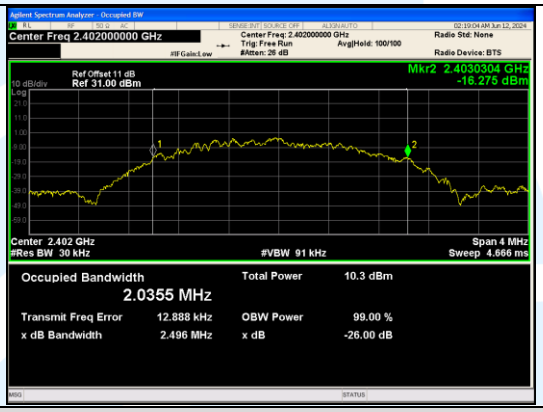
A.1 99% BANDWIDTH

Mode	Channel	Center Frequency (MHz)	99% BW (MHz)
BLE 1M	0	2402	1.0290
BLE 1M	19	2440	1.0438
BLE 1M	39	2480	1.0460
BLE 2M	0	2402	2.0355
BLE 2M	19	2440	2.0368
BLE 2M	39	2480	2.0362
LE Coded (S=2)	0	2402	1.0156
LE Coded (S=2)	19	2440	1.0325
LE Coded (S=2)	39	2480	1.0244
LE Coded (S=8)	0	2402	1.0434
LE Coded (S=8)	19	2440	1.0503
LE Coded (S=8)	39	2480	1.0580

Test Graphs



BLE 1M_Channel 0



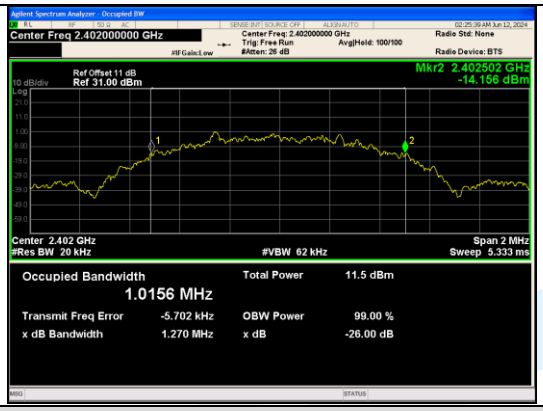
BLE 2M_Channel 0

BLE 1M_Channel 19

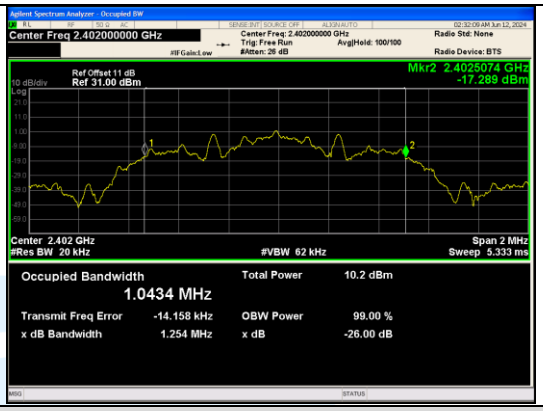
BLE 2M_Channel 19

BLE 1M_Channel 39

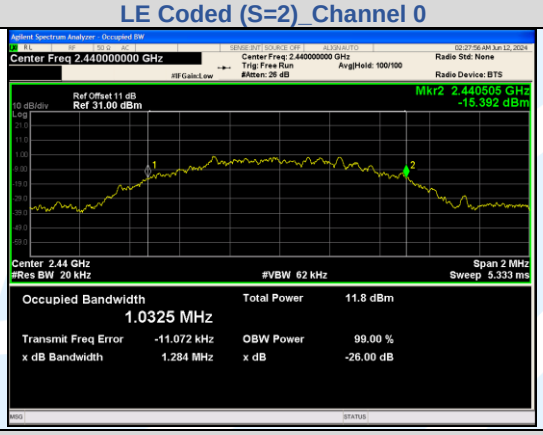
BLE 2M_Channel 39



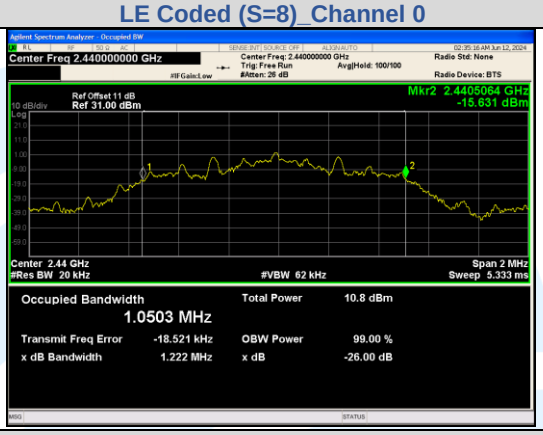
LE Coded (S=2)_Channel 0



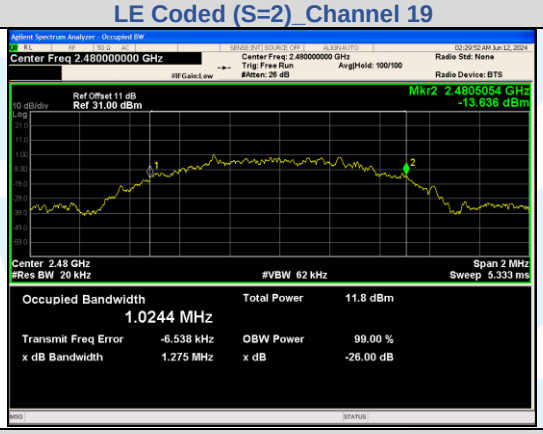
LE Coded (S=8)_Channel 0



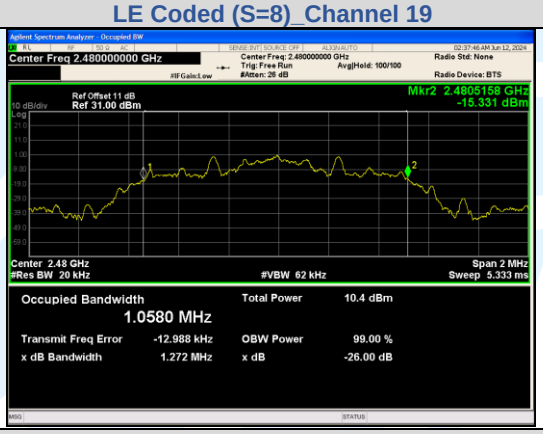
LE Coded (S=2)_Channel 19



LE Coded (S=8)_Channel 19



LE Coded (S=2)_Channel 39

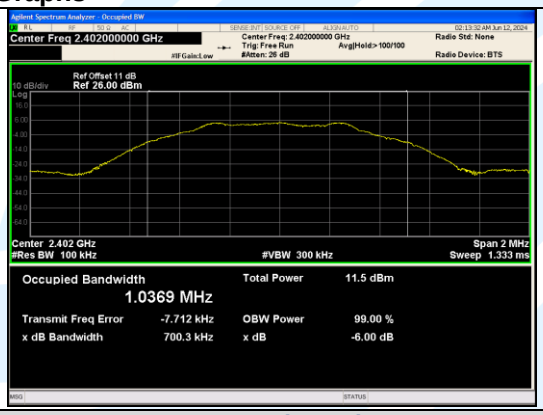


LE Coded (S=8)_Channel 39

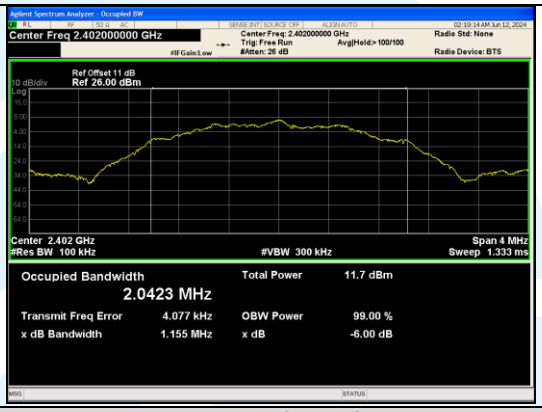
A.2 6DB BANDWIDTH

Mode	Channel	Center Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
BLE 1M	0	2402	0.7003	≥0.5	PASS
	19	2440	0.7396		PASS
	39	2480	0.7172		PASS
BLE 2M	0	2402	1.155		PASS
	19	2440	1.254		PASS
	39	2480	1.179		PASS
LE Coded (S=2)	0	2402	0.6567		PASS
	19	2440	0.7214		PASS
	39	2480	0.6761		PASS
LE Coded (S=8)	0	2402	0.6738		PASS
	19	2440	0.6979		PASS
	39	2480	0.6764		PASS

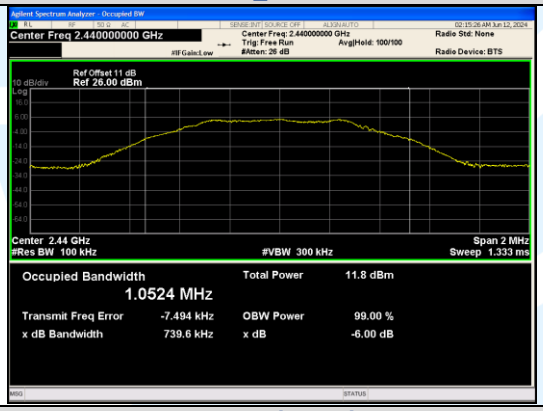
Test Graphs



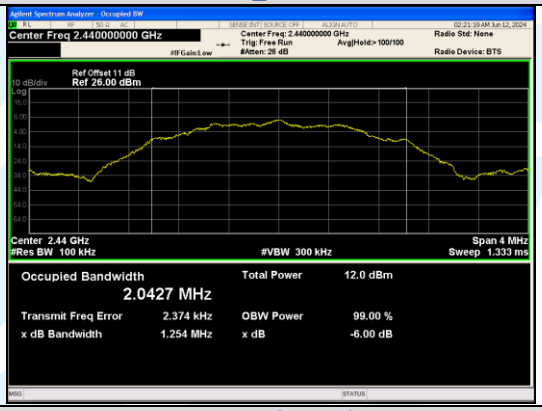
BLE 1M_Channel 0



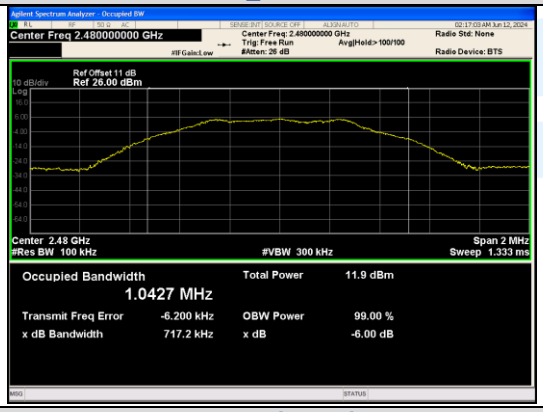
BLE 2M_Channel 0



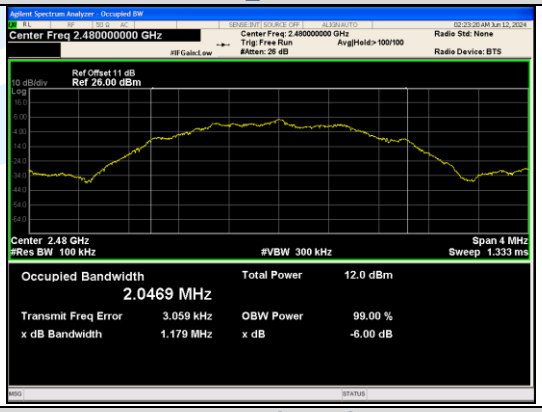
BLE 1M_Channel 19



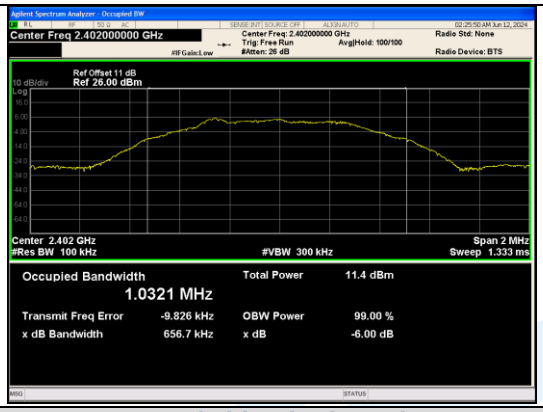
BLE 2M_Channel 19



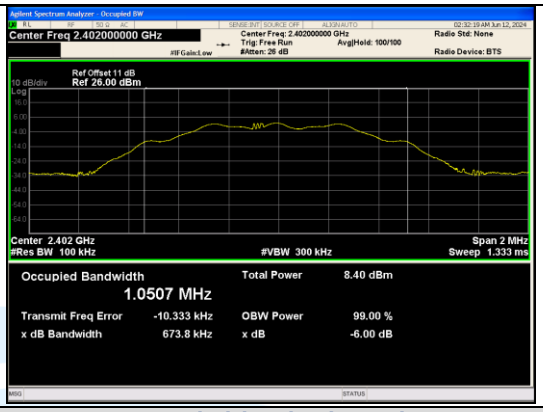
BLE 1M_Channel 39



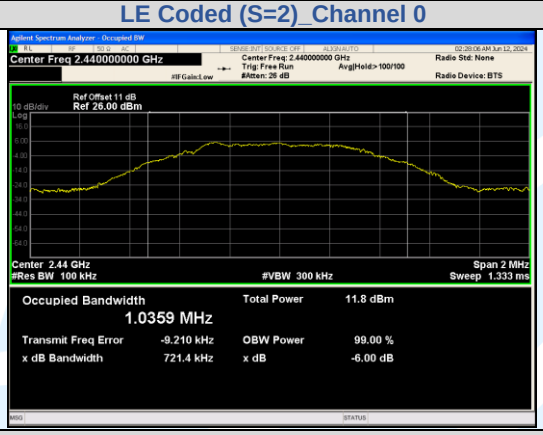
BLE 2M_Channel 39



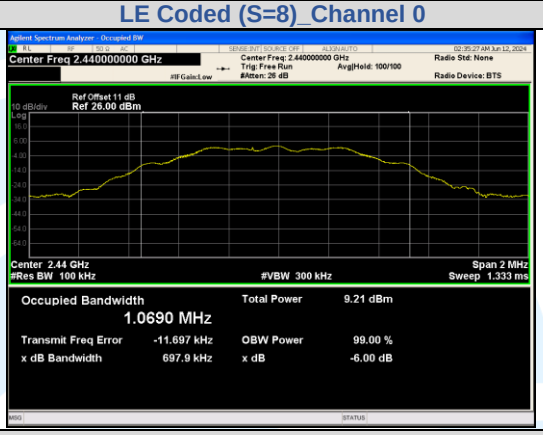
LE Coded (S=2)_Channel 0



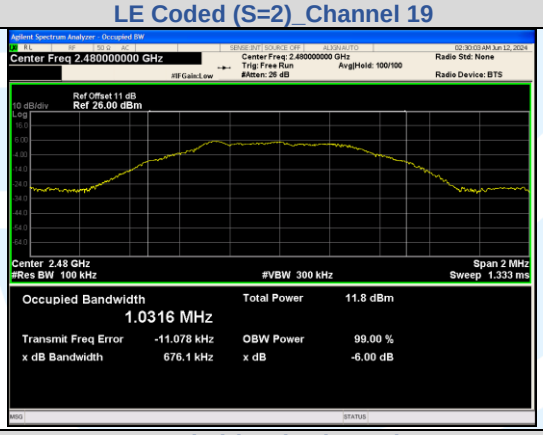
LE Coded (S=8)_Channel 0



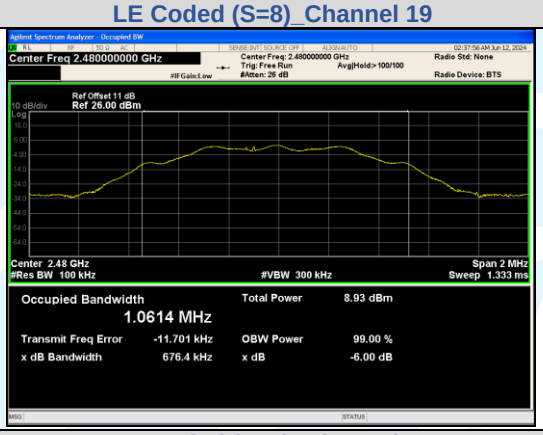
LE Coded (S=2)_Channel 19



LE Coded (S=8)_Channel 19



LE Coded (S=2)_Channel 39

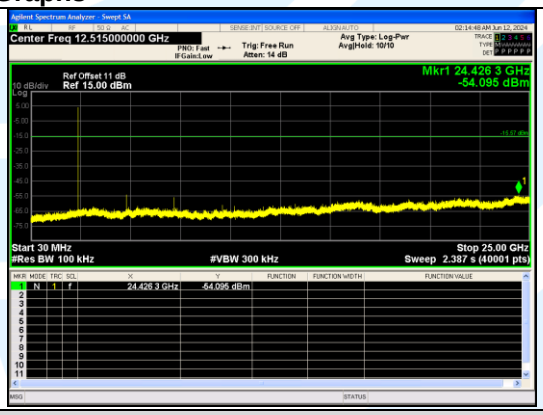


LE Coded (S=8)_Channel 39

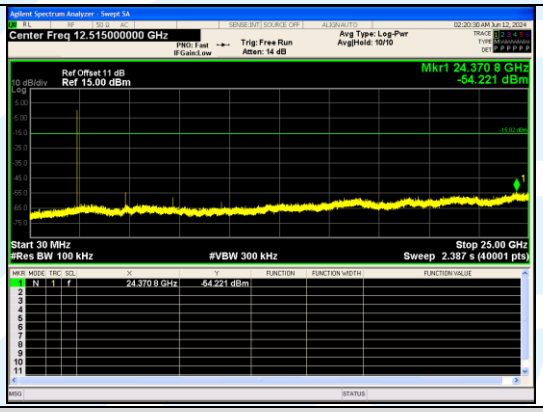
A.3 CONDUCTED OUT OF BAND EMISSION

Mode	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
BLE 1M	0	2400.00	-46.466	-15.57	-30.896	PASS
		24426.3	-54.095	-15.57	-38.525	PASS
	19	24887.0	-54.087	-15.34	-38.748	PASS
	39	2483.50	-54.035	-15.21	-38.825	PASS
		24305.8	-53.649	-15.21	-38.439	PASS
BLE 2M	0	2400.00	-29.552	-15.82	-13.732	PASS
		24370.8	-54.221	-15.82	-38.401	PASS
	19	4879.80	-53.291	-15.58	-37.711	PASS
	39	2483.50	-52.657	-15.43	-37.227	PASS
		24151.6	-54.128	-15.43	-38.698	PASS
LE Coded (S=2)	0	2400.00	-46.517	-14.87	-31.647	PASS
		4804.26	-53.281	-14.87	-38.411	PASS
	19	24936.3	-54.255	-14.77	-39.485	PASS
	39	2483.50	-53.853	-14.6	-39.253	PASS
		24996.2	-53.671	-14.6	-39.071	PASS
LE Coded (S=8)	0	2400.00	-47.773	-17.94	-29.833	PASS
		24184.7	-54.750	-17.94	-36.810	PASS
	19	24914.5	-54.746	-17.24	-37.506	PASS
	39	2483.50	-53.010	-17.41	-35.600	PASS
		24838.9	-54.386	-17.41	-36.975	PASS

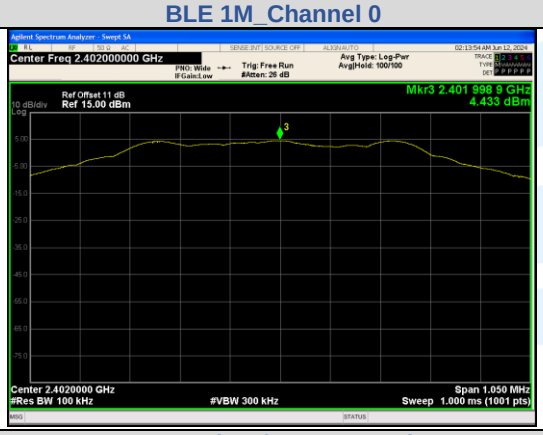
Test Graphs



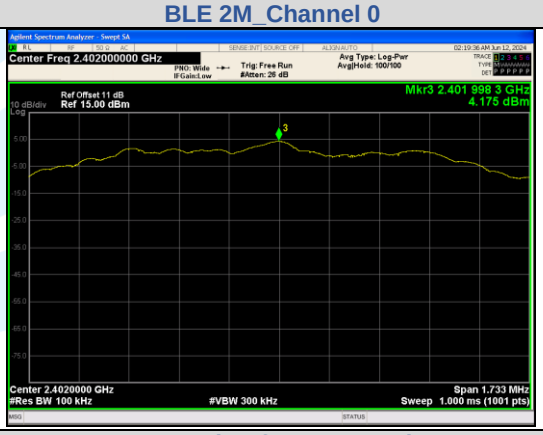
30.0 MHz - 25000.0 MHz
BLE 1M_Channel 0



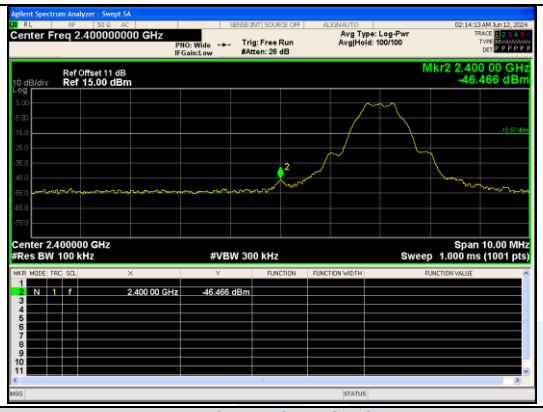
30.0 MHz - 25000.0 MHz
BLE 2M_Channel 0



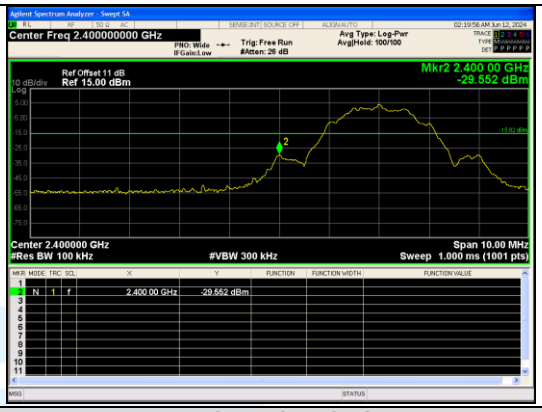
In-Band Reference Level
BLE 1M_Channel 0



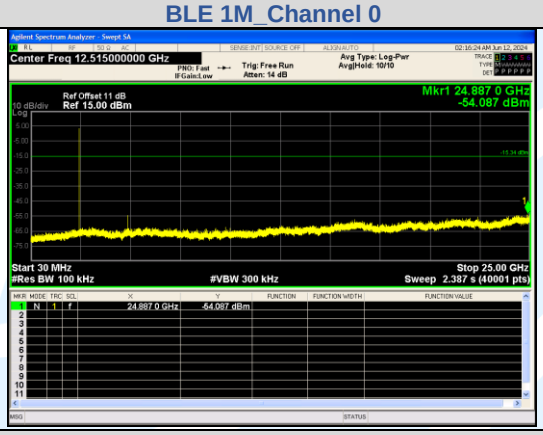
In-Band Reference Level
BLE 2M_Channel 0



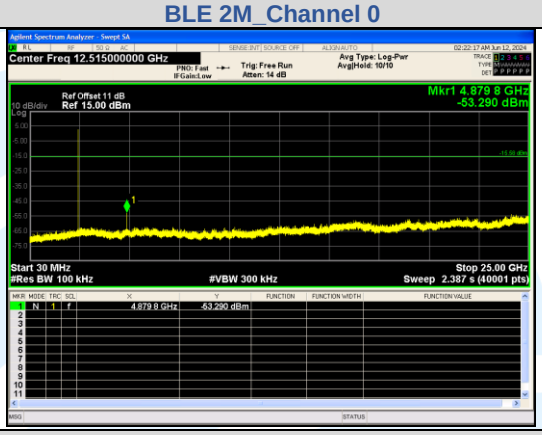
Out Of Band Emission
BLE 1M_Channel 0



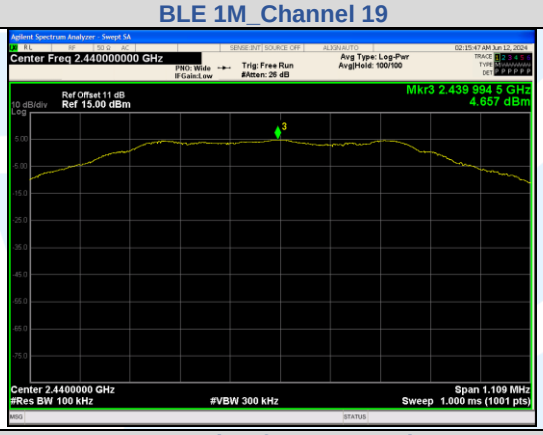
Out Of Band Emission
BLE 2M_Channel 0



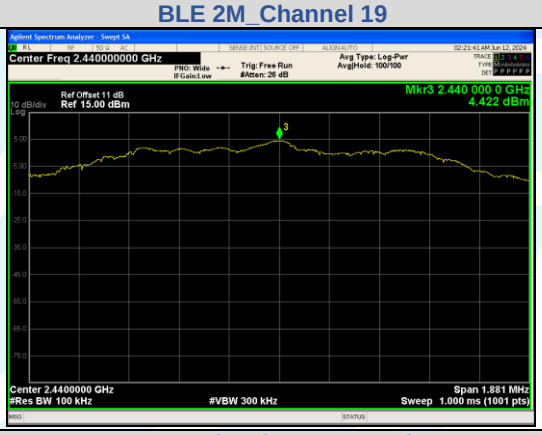
30.0 MHz - 25000.0 MHz
BLE 1M_Channel 19



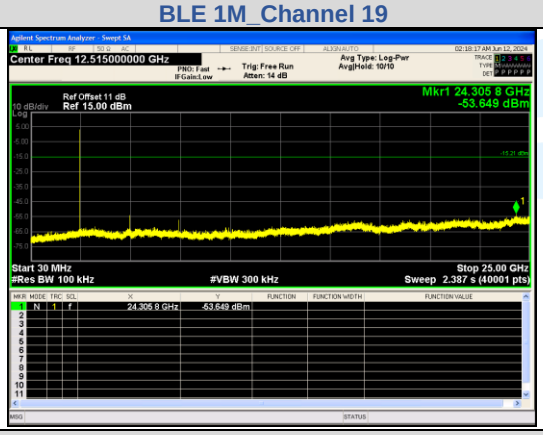
30.0 MHz - 25000.0 MHz
BLE 2M_Channel 19



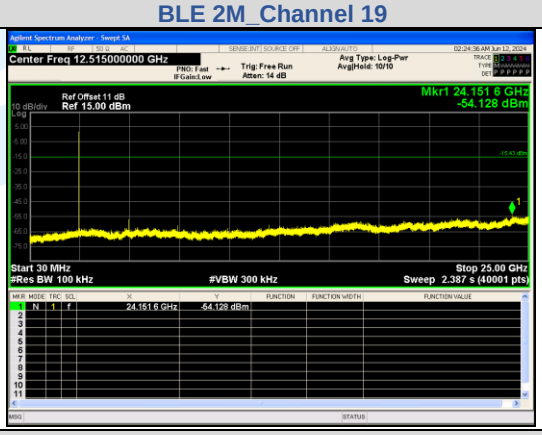
In-Band Reference Level
BLE 1M_Channel 19



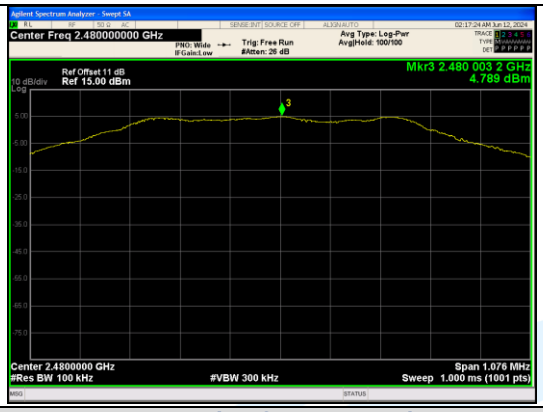
In-Band Reference Level
BLE 2M_Channel 19



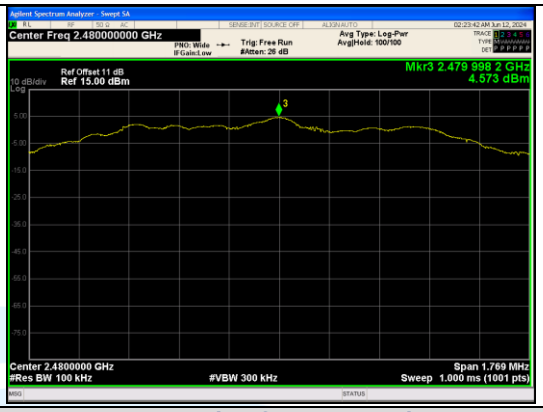
30.0 MHz - 25000.0 MHz
BLE 1M_Channel 39



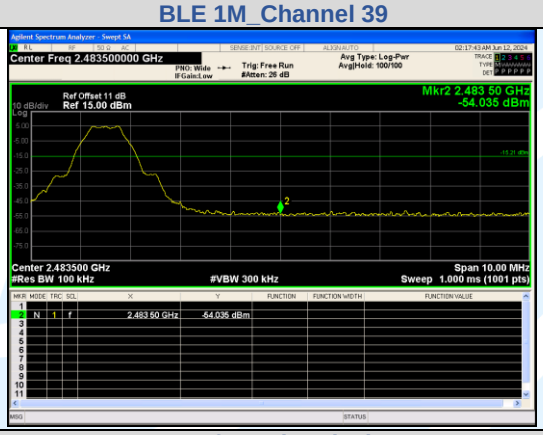
30.0 MHz - 25000.0 MHz
BLE 2M_Channel 39



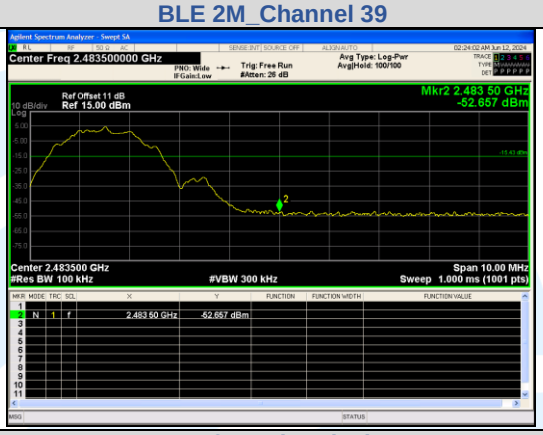
In-Band Reference Level
BLE 1M_Channel 39



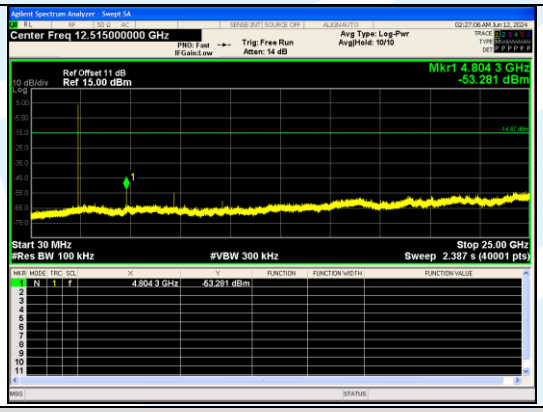
In-Band Reference Level
BLE 2M_Channel 39



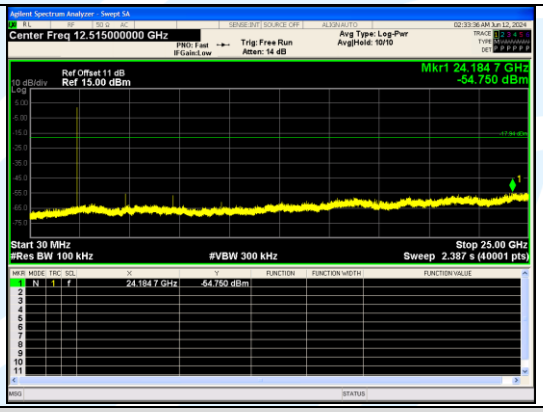
Out Of Band Emission
BLE 1M_Channel 39



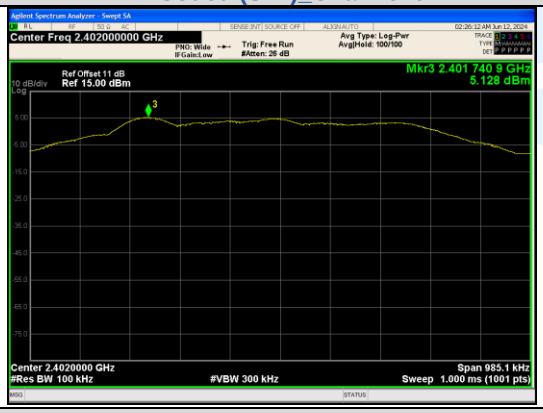
Out Of Band Emission
BLE 2M_Channel 39



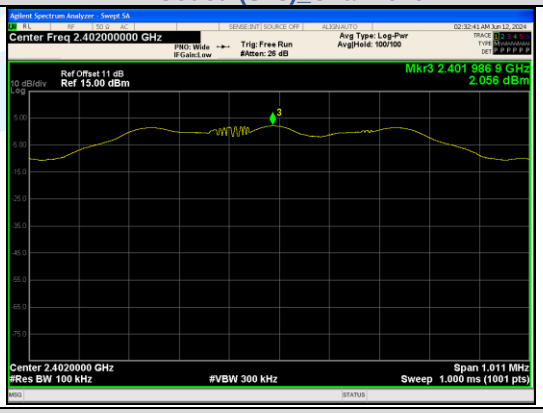
30.0 MHz - 25000.0 MHz
LE Coded (S=2)_Channel 0



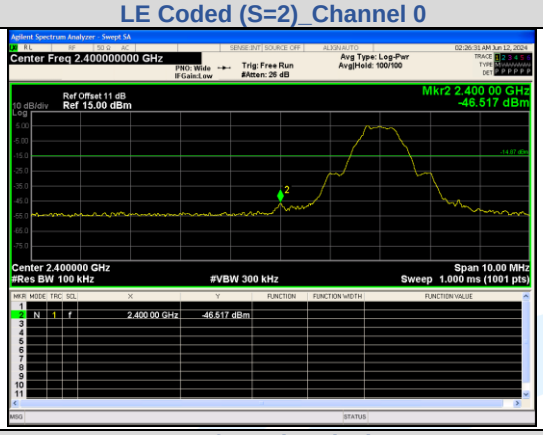
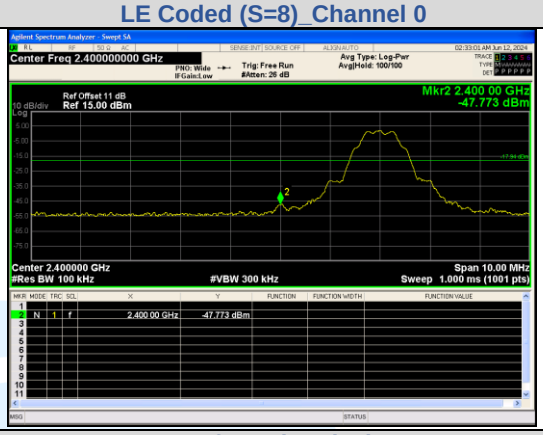
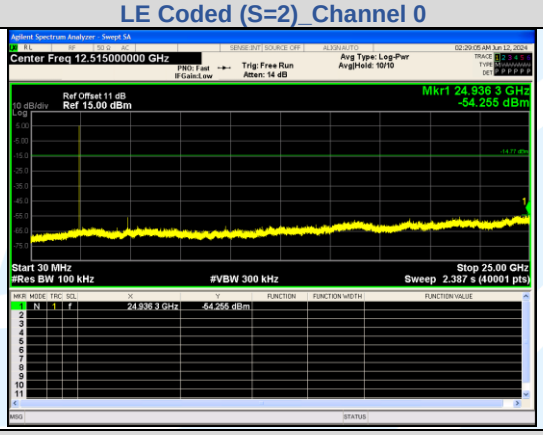
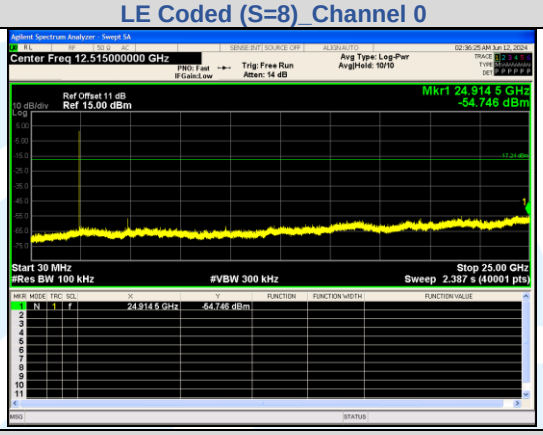
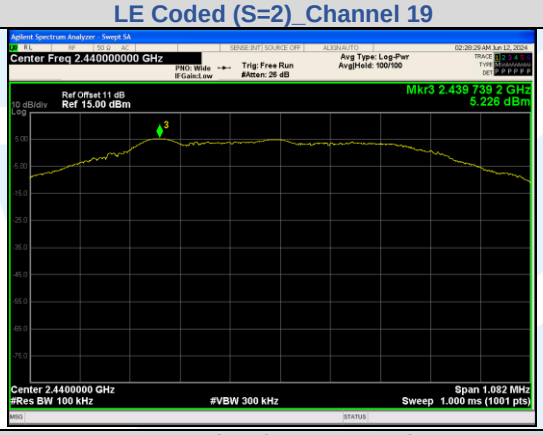
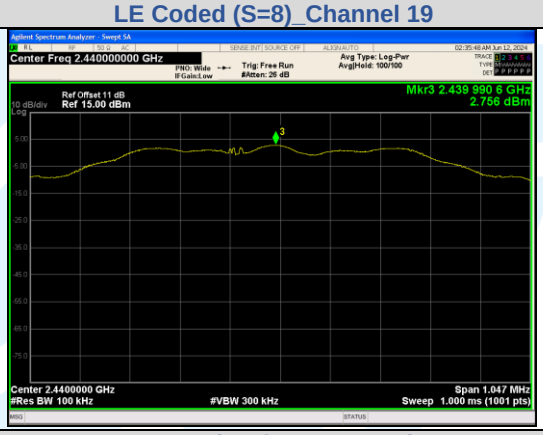
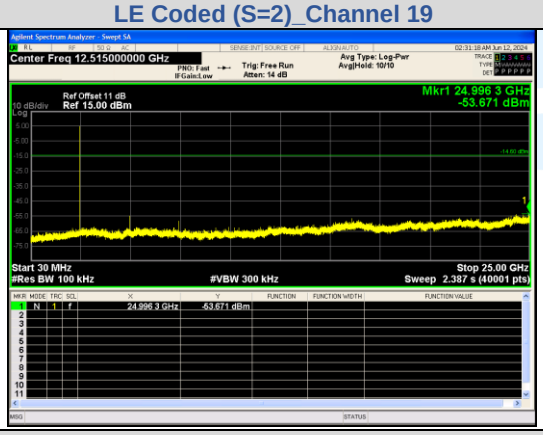
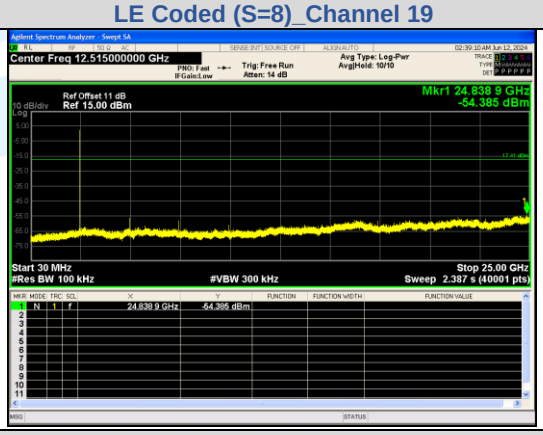
30.0 MHz - 25000.0 MHz
LE Coded (S=8)_Channel 0

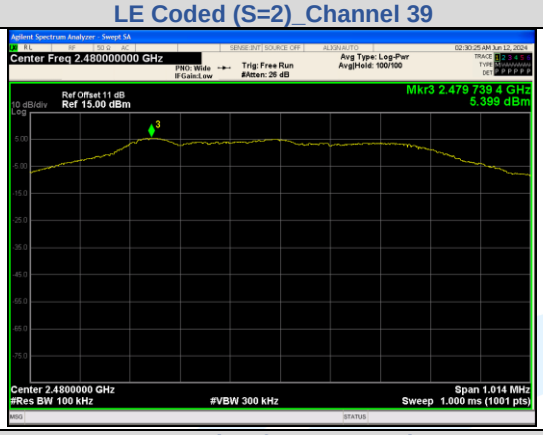
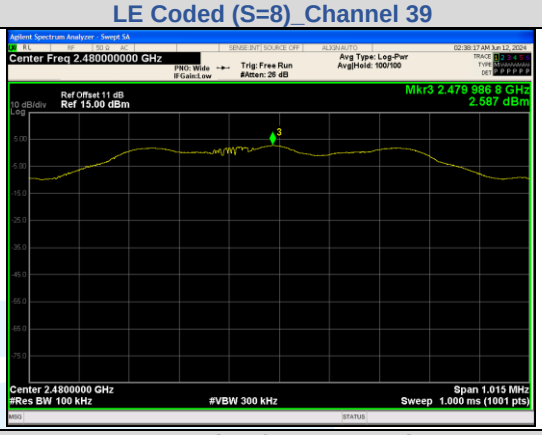
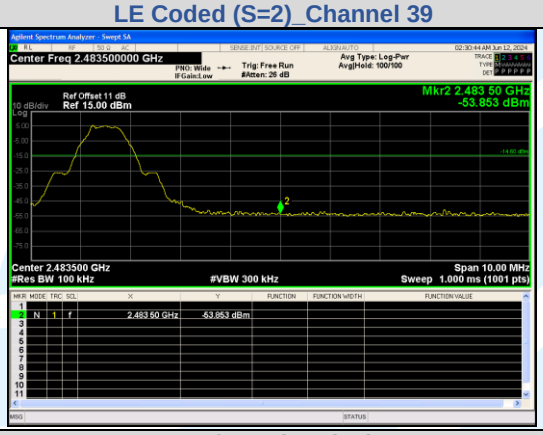
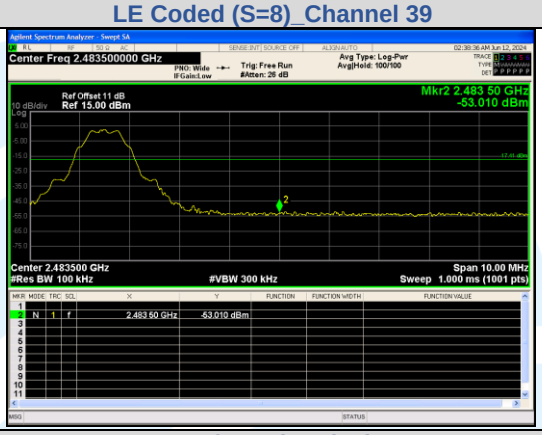


In-Band Reference Level



In-Band Reference Level

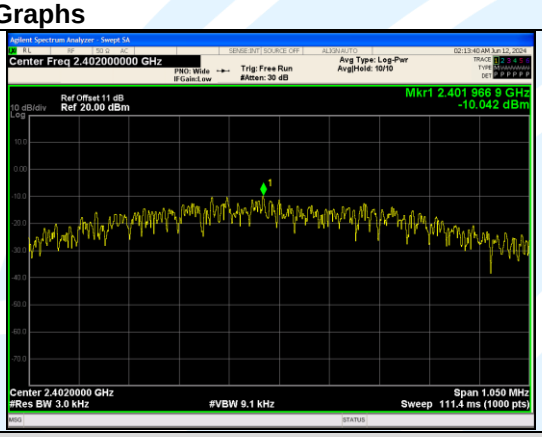
LE Coded (S=2)_Channel 0	LE Coded (S=8)_Channel 0
	
Out Of Band Emission LE Coded (S=2)_Channel 0	**Out Of Band Emission LE Coded (S=8)_Channel 0**
	
30.0 MHz - 25000.0 MHz LE Coded (S=2)_Channel 19	**30.0 MHz - 25000.0 MHz LE Coded (S=8)_Channel 19**
	
In-Band Reference Level LE Coded (S=2)_Channel 19	**In-Band Reference Level LE Coded (S=8)_Channel 19**
	
30.0 MHz - 25000.0 MHz	**30.0 MHz - 25000.0 MHz**

LE Coded (S=2)_Channel 39	LE Coded (S=8)_Channel 39
	
In-Band Reference Level LE Coded (S=2)_Channel 39	**In-Band Reference Level LE Coded (S=8)_Channel 39**
	
Out Of Band Emission LE Coded (S=2)_Channel 39	**Out Of Band Emission LE Coded (S=8)_Channel 39**

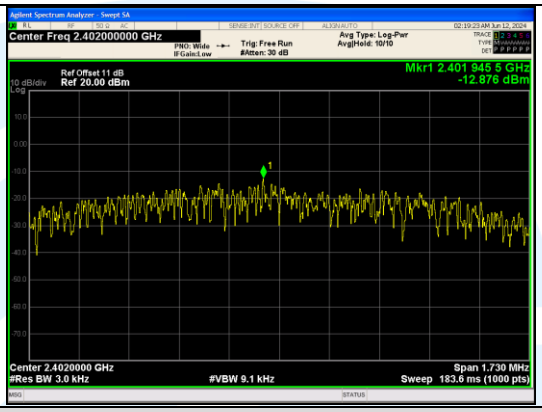
A.4 POWER SPECTRAL DENSITY

Mode	Channel	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
BLE 1M	0	-10.042	≤8	PASS
BLE 1M	19	-10.229	≤8	PASS
BLE 1M	39	-9.391	≤8	PASS
BLE 2M	0	-12.876	≤8	PASS
BLE 2M	19	-12.511	≤8	PASS
BLE 2M	39	-12.790	≤8	PASS
LE Coded (S=2)	0	-1.062	≤8	PASS
LE Coded (S=2)	19	-1.520	≤8	PASS
LE Coded (S=2)	39	-1.299	≤8	PASS
LE Coded (S=8)	0	-0.999	≤8	PASS
LE Coded (S=8)	19	-0.809	≤8	PASS
LE Coded (S=8)	39	-0.862	≤8	PASS

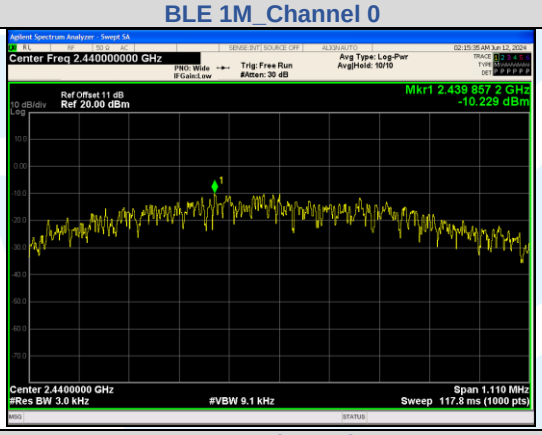
Test Graphs



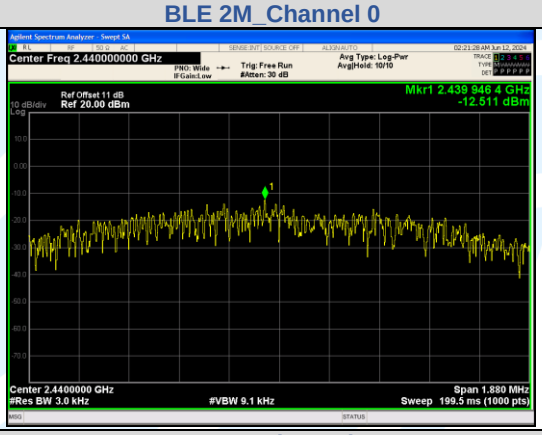
BLE 1M_Channel 0



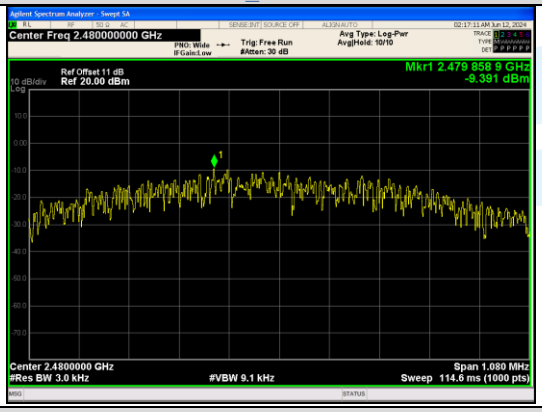
BLE 2M_Channel 0



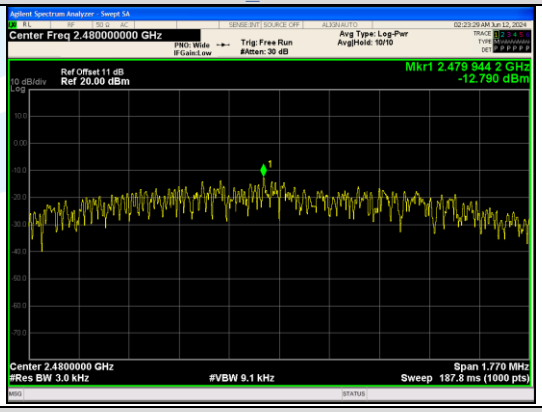
BLE 1M_Channel 19



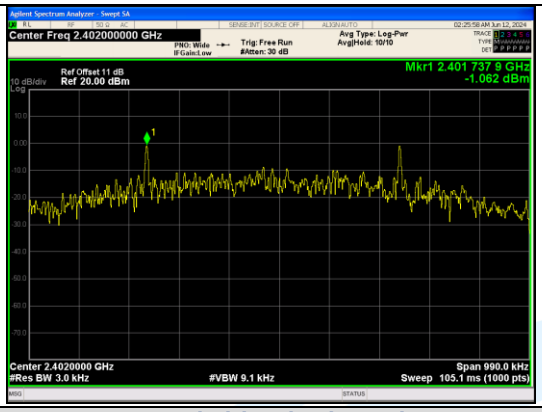
BLE 2M_Channel 19



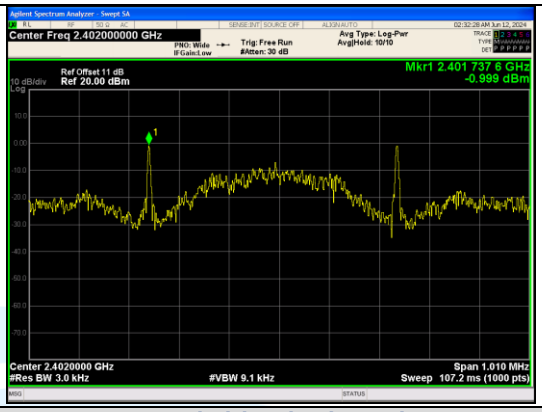
BLE 1M_Channel 39



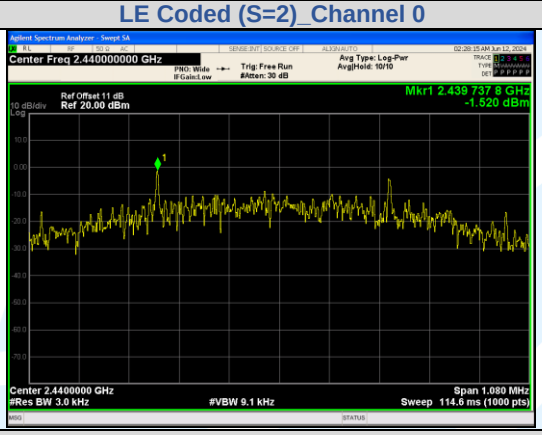
BLE 2M_Channel 39



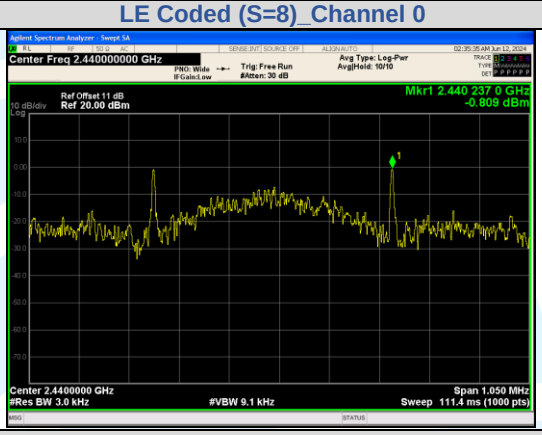
LE Coded (S=2)_Channel 0



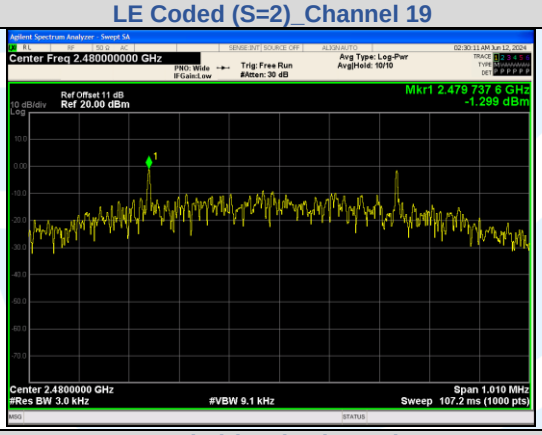
LE Coded (S=8)_Channel 0



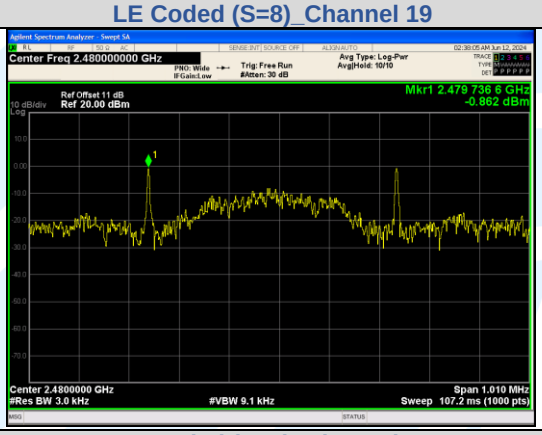
LE Coded (S=2)_Channel 19



LE Coded (S=8)_Channel 19



LE Coded (S=2)_Channel 39



LE Coded (S=8)_Channel 39

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 ***
