

FCC TEST REPORT

Product Name: Smart Phone
Trade Mark: N/A
Model No.: Helium Pro
Add. Model No.: N/A
Report Number: 2209171673RFC-1
Test Standards: FCC 47 CFR Part 15 Subpart C
FCC ID: 2AUOUHP
Test Result: PASS
Date of Issue: November 8, 2022

Prepared for:

Rhino Mobility LLC
8 The Green, Suite A, Dover, Delaware, 19901, USA

Prepared by:


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November 8, 2022

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UTTR-RF-FCCPART15.247-V1.1

Version

Version No.	Date	Description
V1.0	November 8, 2022	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Rhino Mobility LLC
Address of Applicant:	8 The Green, Suite A, Dover, Delaware, 19901, USA
Manufacturer:	Rhino Mobility LLC
Address of Manufacturer:	8 The Green, Suite A, Dover, Delaware, 19901, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Smart Phone			
Model No.:	Helium Pro			
Add. Model No.:	N/A			
Trade Mark:	N/A			
DUT Stage:	Identical Prototype			
EUT Supports Function: (Provided by the customer)	GSM Bands:	GSM850/1900		
	UTRA Bands:	Band II/ Band IV/ Band V		
	E-UTRA Bands:	FDD Band 2/ Band 4/ Band 5/ Band 12/ Band 17/ Band 29/ Band 30/ Band 66		
	2.4 GHz ISM Band:	IEEE 802.11b/g/n		
		Bluetooth 5.0		
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n	
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n	
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n	
5 725 MHz to 5 850 MHz		IEEE 802.11a/n		
RNSS Bands:	1559 MHz to 1610 MHz	GPS		
BSR:	VHF Band II	FM		
Software Version:	Helium Pro_20221022 (Provided by the customer)			
Hardware Version:	G2251E-MA-V1.1 (Provided by the customer)			
Sample Received Date:	September 17, 2022			
Sample Tested Date:	September 17, 2022 to October 2, 2022			
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	
Model No.:	HJ-0501000E1-US
Input:	100-240 V~50/60 Hz 0.2 A Max
Output:	5.0 V \equiv 1.0 A
AC Cable:	N/A
DC Cable:	N/A

Battery	
Model No.:	THP
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.8 Vdc
Limited Charge Voltage:	4.35 Vdc
Rated Capacity:	2500 mAh

Cable	
Description:	USB Type-C Plug Cable
Cable Type:	Shielded without ferrite
Length:	1 Meter

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: (Provided by the customer)	PIFA Antenna
Antenna Gain: (Provided by the customer)	1.69 dBi
Maximum Peak Power:	-0.68 dBm
Normal Test Voltage:	3.8 Vdc and/or 120V~60Hz

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
--	--	--	--	--

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.05 Meter	Applicant

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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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-40GHz	±4.6 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart C Test Cases			
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203/15.247 (b)	N/A	PASS
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013 Clause 6.2	PASS
Conducted Peak Output Power	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013 Clause 11.9.1.3	PASS
6dB Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013 Clause 11.8.1	PASS
Power Spectral Density	FCC 47 CFR Part 15 Subpart C Section 15.247 (e)	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)	ANSI C63.10-2013 Clause 11.11	PASS
Radiated Spurious Emissions	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209	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	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
<input checked="" type="checkbox"/>	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	Euroshiedpn-CT001270-1317	22-Jan-2021	21-Jan-2024
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	100114	5-Nov-2021	4-Nov-2022
<input type="checkbox"/>	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	15-Apr-2022	14-Apr-2023
<input checked="" type="checkbox"/>	Loop Antenna	ETS-LINDGREN	6502	00202525	11-Nov-2021	10-Nov-2023
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	11-Nov-2021	10-Nov-2023
<input checked="" type="checkbox"/>	6dB Attenuator	Talent	RA6A5-N-18	18103001	11-Nov-2021	10-Nov-2023
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	2805A02960	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	17-Apr-2022	16-Apr-2024
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-LINDGREN	00118385	00201874	6-Nov-2021	5-Nov-2022
<input type="checkbox"/>	Horn Antenna	ETS-LINDGREN	3116C	00200180	17-Apr-2022	16-Apr-2024
<input checked="" type="checkbox"/>	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	14-Nov-2020	13-Nov-2022
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-LINDGREN	00118384	00202652	17-Nov-2020	16-Nov-2022
<input checked="" type="checkbox"/>	Band Reject Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	6-Nov-2021	5-Nov-2022
<input checked="" type="checkbox"/>	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
<input checked="" type="checkbox"/>	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
<input checked="" type="checkbox"/>	Receiver	R&S	ESR7	101181	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	LISN	R&S	ESH2-Z5	860014/024	5-Nov-2021	4-Nov-2022
<input type="checkbox"/>	LISN	ETS-Lindgren	3816/2SH	00201088	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9 20151119i		

RF Conducted Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
<input checked="" type="checkbox"/>	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	15-Apr-2022	14-Apr-2023
<input type="checkbox"/>	EXA Spectrum Analyzer	KEYSIGHT	N9020A	MY51286807	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	5-Nov-2021	4-Nov-2022
<input type="checkbox"/>	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430023	5-Nov-2021	4-Nov-2022

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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	Relative Humidity (%)
NT/NV	+15 to +35	3.8 Vdc and/or 120V~60Hz	20 to 75
Remark:			
1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temp. (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
AC Power Line Conducted Emission	23.2	45.1	99.56	S20220917543-ZJA04/8	David Zhang
Conducted Peak Output Power	24.1	41	100.1	S20220917543-ZJA05/8	Hank Wu
6dB Bandwidth					
Power Spectral Density					
Conducted Out of Band Emission	25.2	50	100.6	S20220917543-ZJA04/8	Andy Lin
Radiated Spurious Emissions Band Edge Measurements (Radiated)					

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

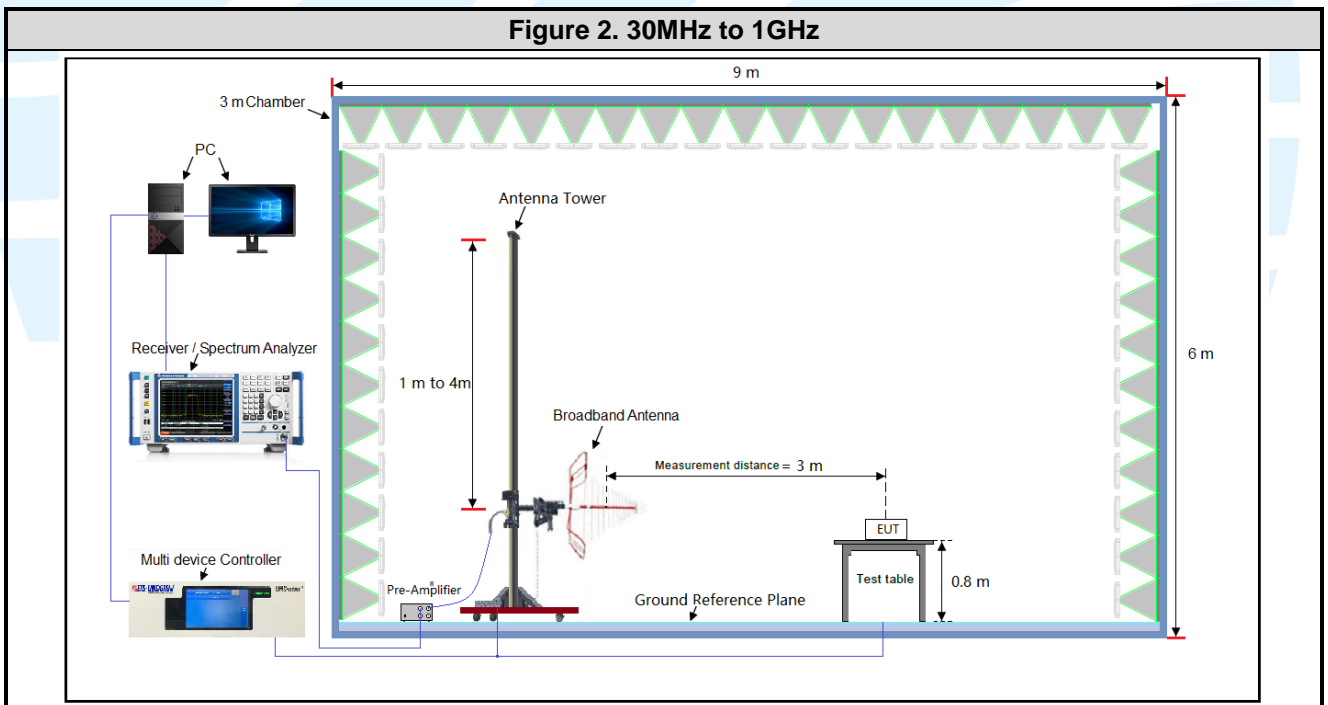
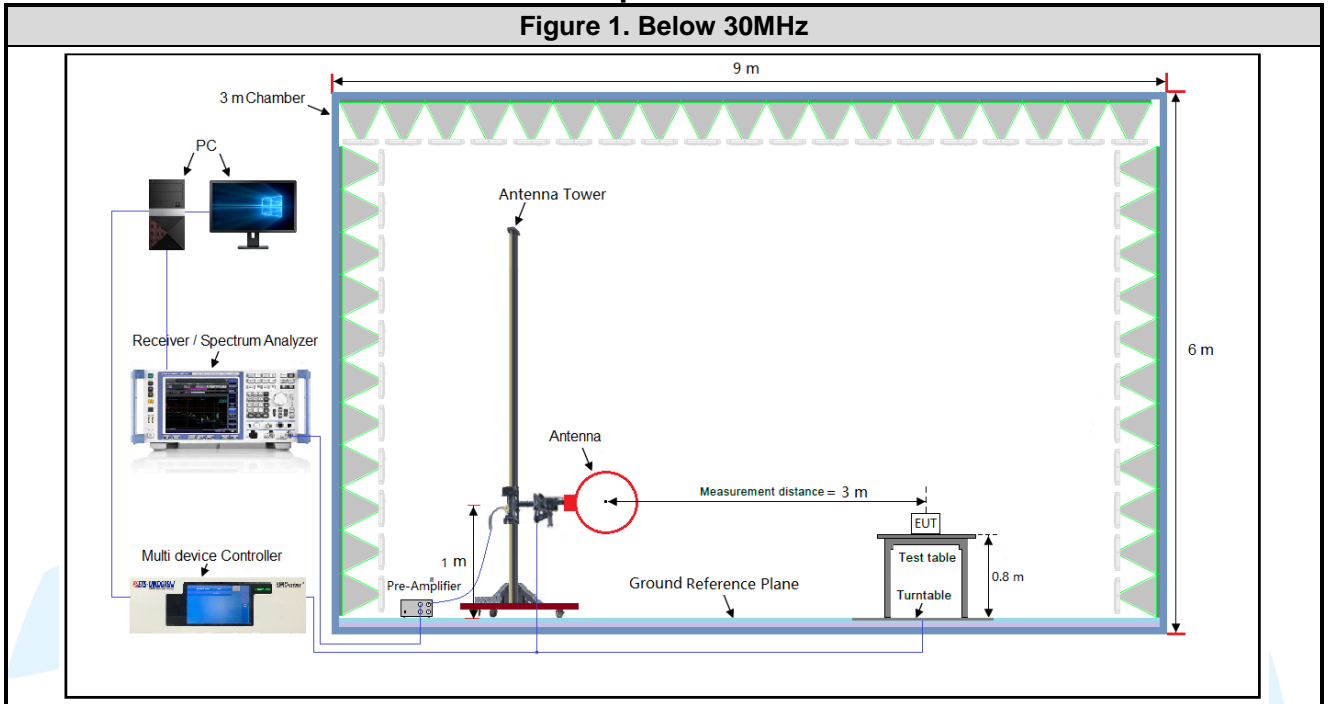
Type of Modulation	Tx Function	Description
GFSK	1Tx	1. Keep the EUT in continuously transmitting with modulation test single.

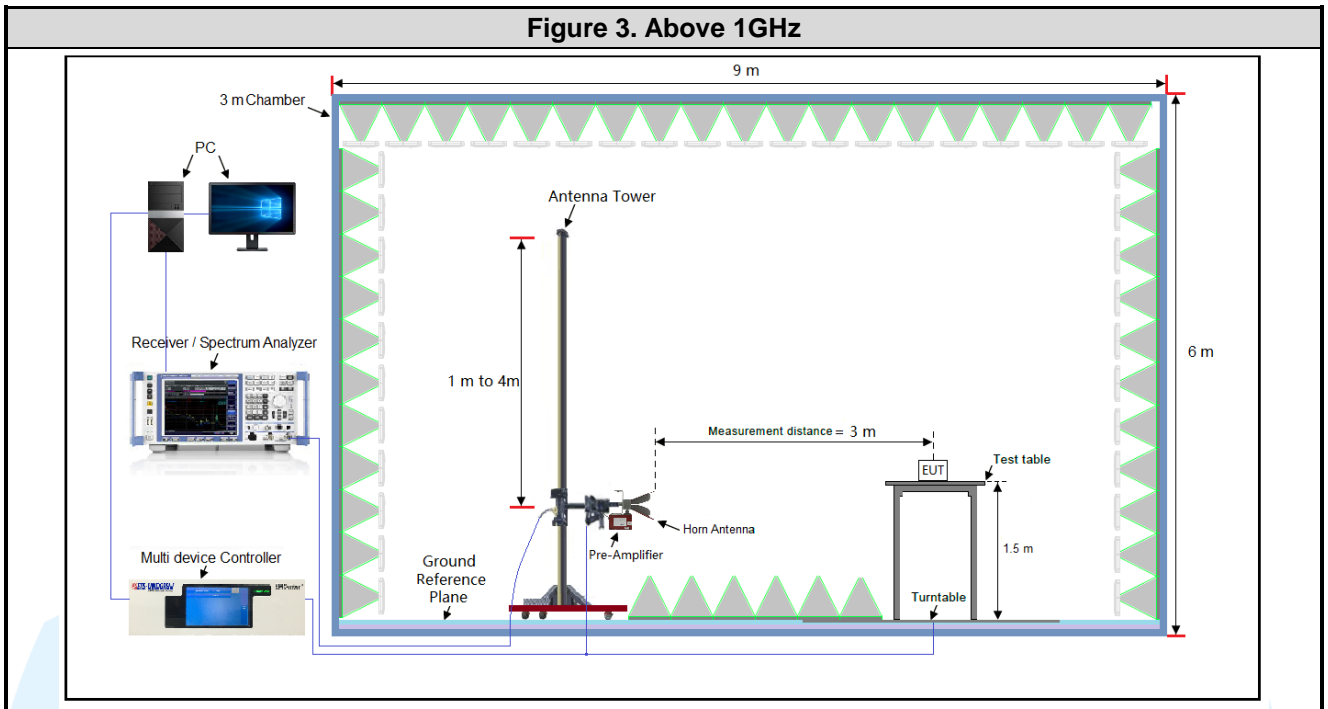
Power Setting (Provided by the customer)
Power Setting: not applicable, test used software default power level.

Test Software (Provided by the customer)
Engineering mode: **3646633**

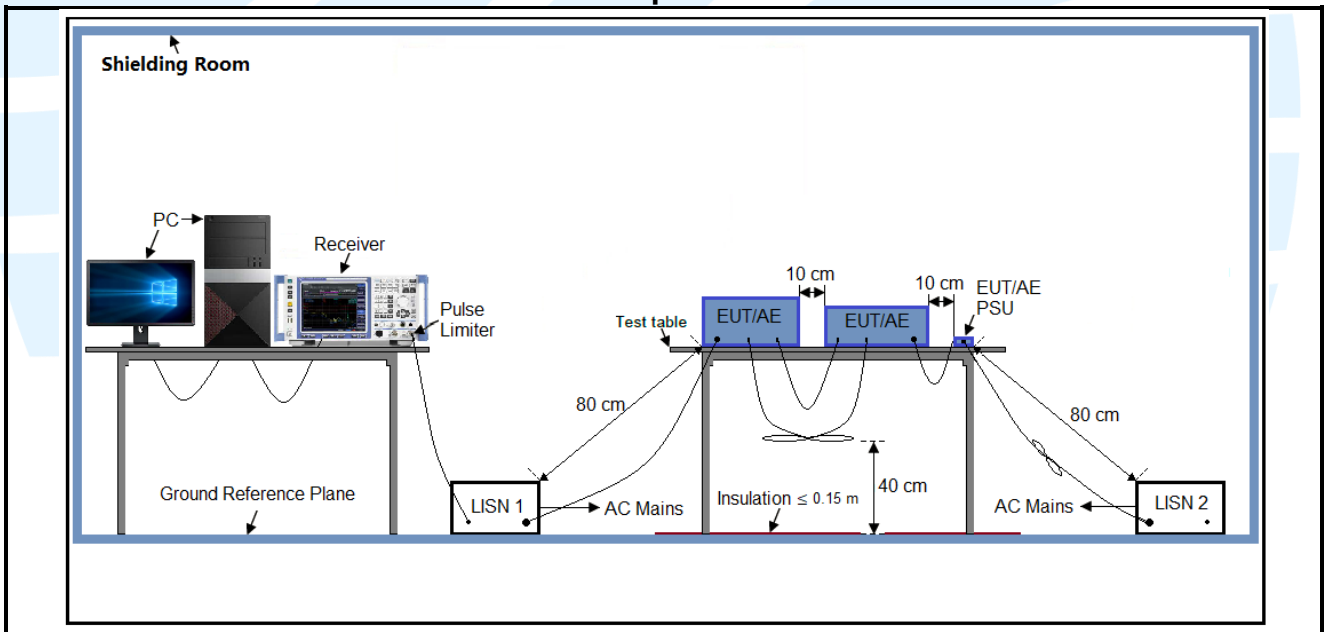
4.4 TEST SETUP

4.4.1 For Radiated Emissions test setup

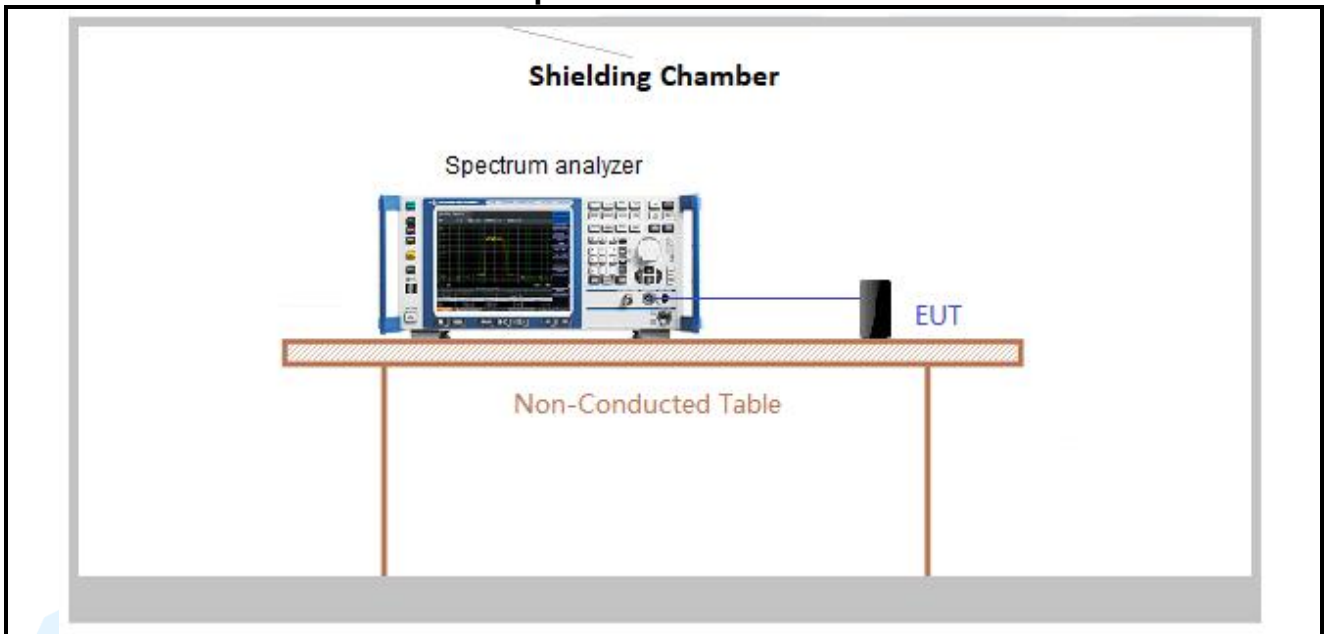




4.4.2 For Conducted Emissions test setup



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. It was powered by a 3.8V 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 orientation.

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.

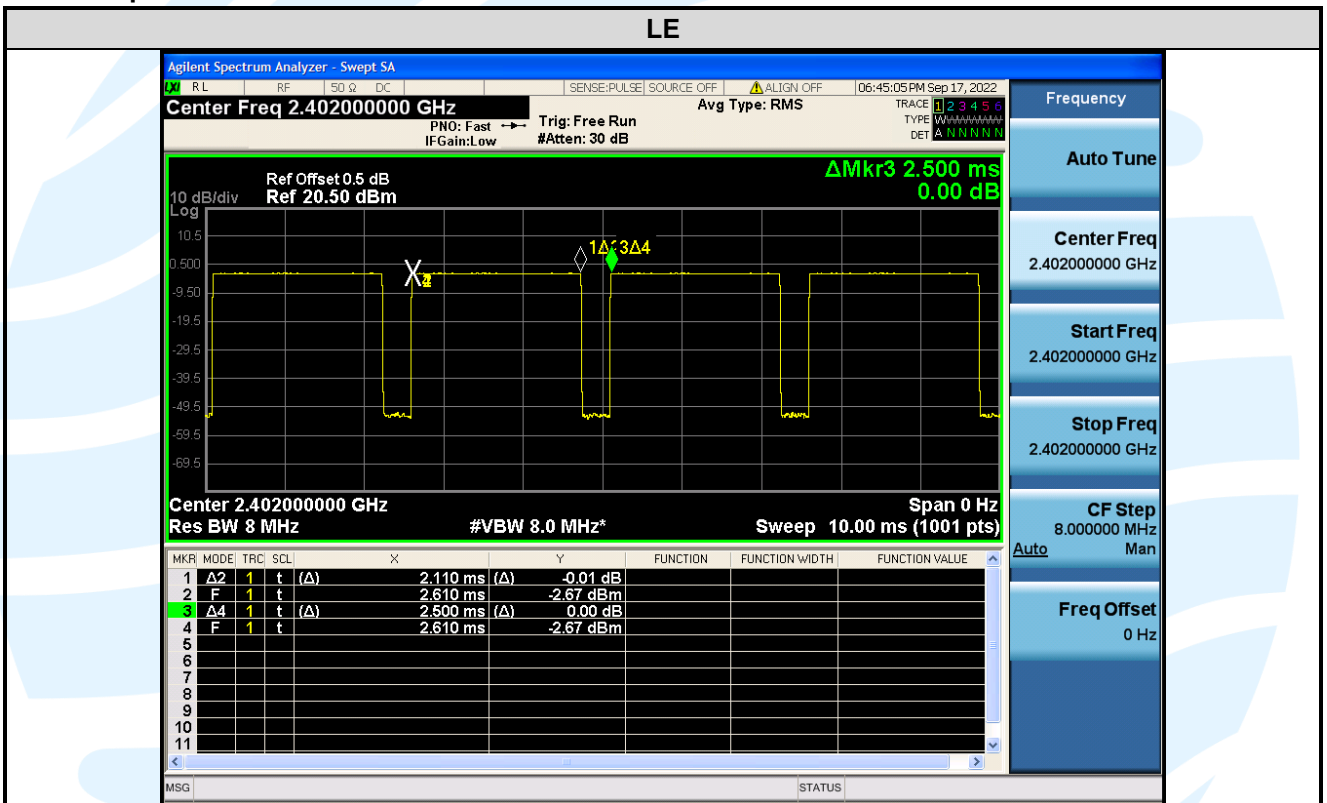
Test Results

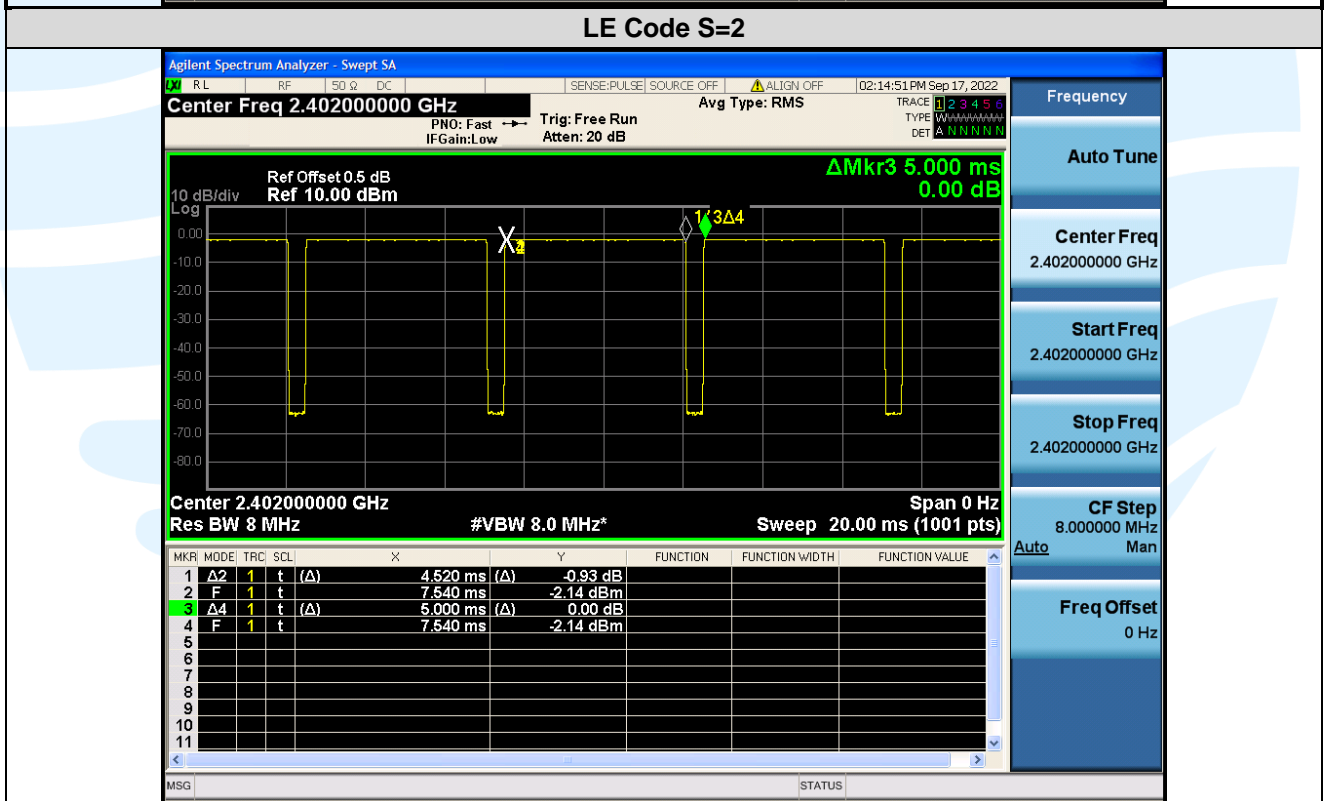
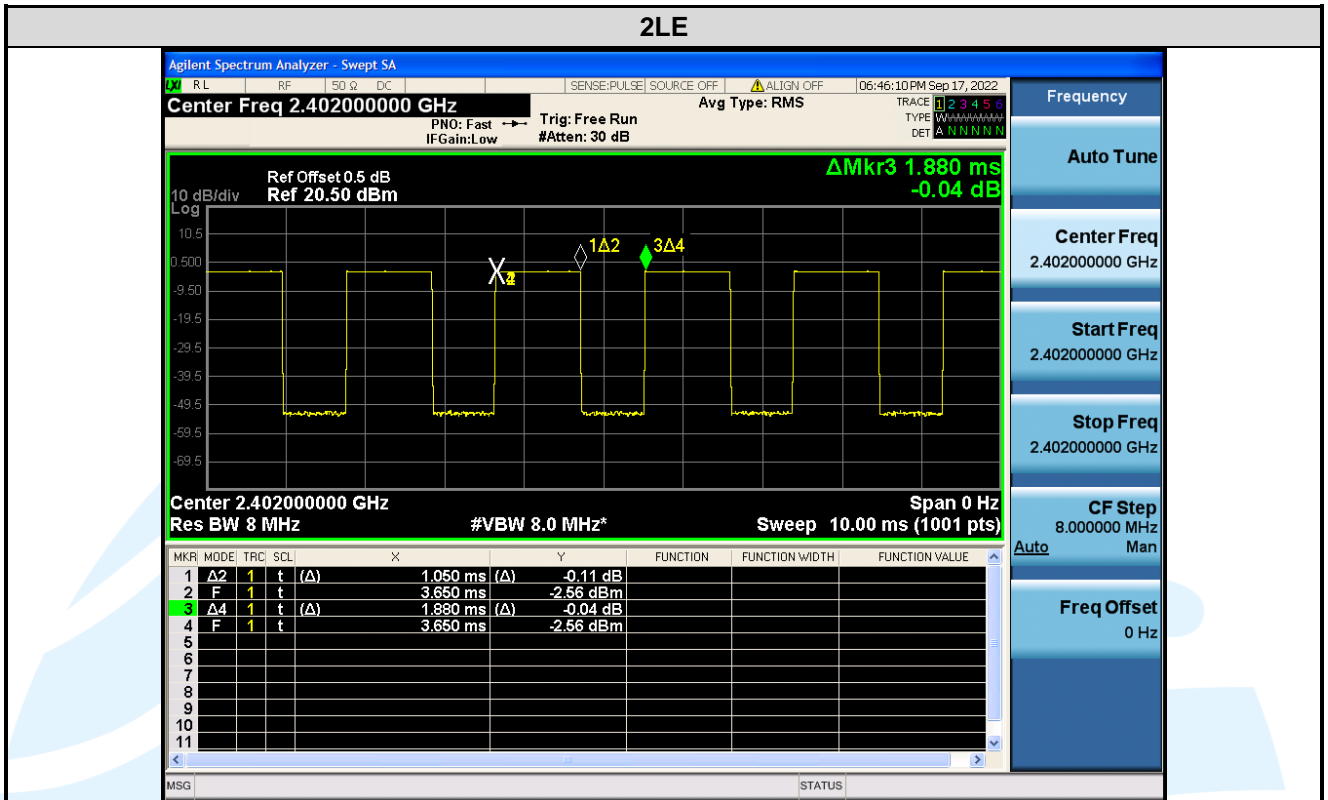
Mode	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/T Minimum VBW (kHz)
LE	2.110	2.500	0.84	84.40	0.74	0.47
2LE	1.050	1.880	0.56	55.85	2.53	0.95
LE Code (S=2)	4.520	5.000	0.90	90.40	0.44	0.22
LE Code (S=8)	16.700	17.500	0.95	95.43	0.20	0.06

Remark:

- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = 10 * log(1/ Duty cycle);

The test plot as follows





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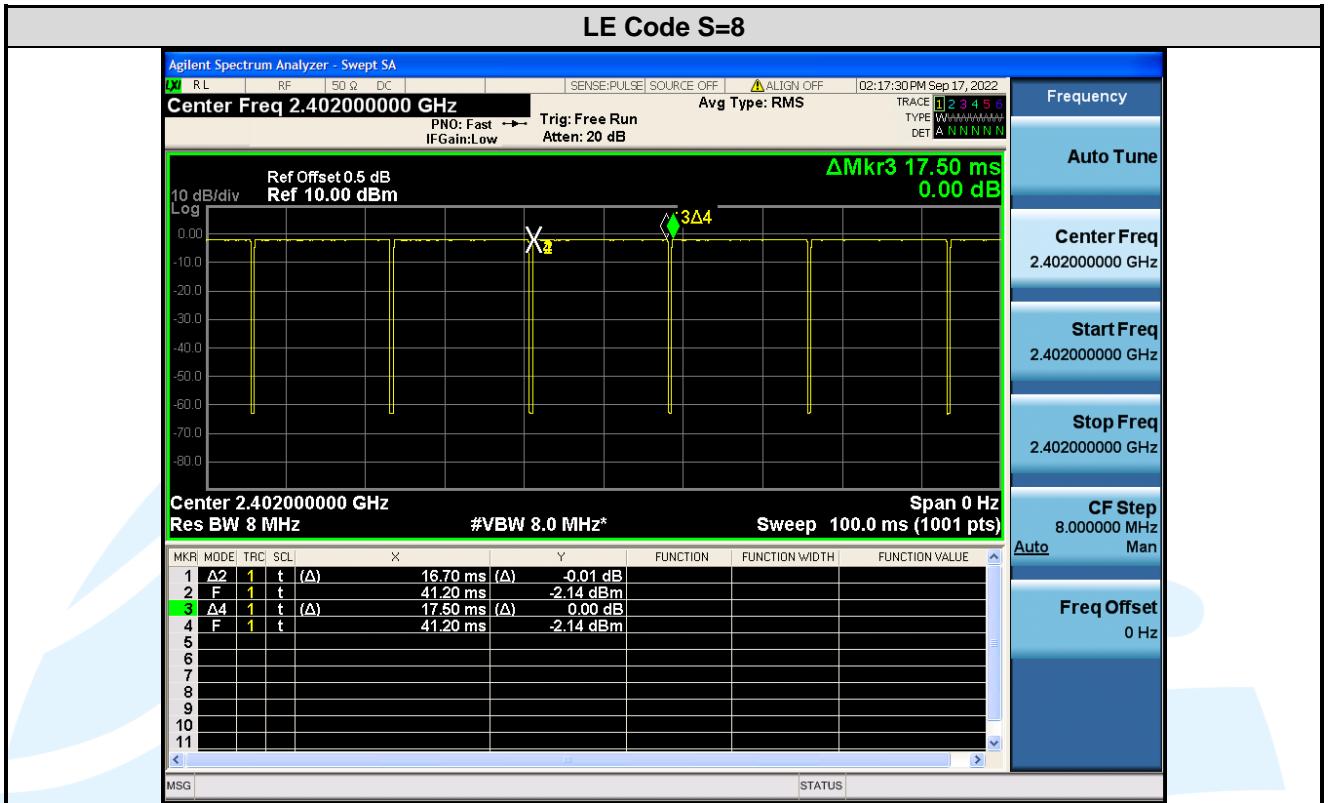
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5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

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	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
4	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
<p>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.</p>
<p>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.</p>
<p>EUT Antenna: Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 1.69 dBi.</p>

5.3 CONDUCTED PEAK OUTPUT POWER

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(3)

Test Method: ANSI C63.10-2013 Clause 11.9.1.3

Limit: For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

- 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	Channel	Frequency	Max. Peak Power		Peak Power Limit	Max. Avg. Power	Result
		(MHz)	(dBm)	(W)	(dBm)	(dBm)	
LE	0	2402	-2.19	0.00060	30	-3.06	Pass
	19	2440	-1.53	0.00070	30	-2.45	Pass
	39	2480	-1.07	0.00078	30	-2.00	Pass
2LE	0	2402	-2.15	0.00061	30	-4.81	Pass
	19	2440	-1.52	0.00070	30	-4.18	Pass
	39	2480	-1.08	0.00078	30	-3.73	Pass
LE Code (S=2)	0	2402	-1.84	0.00065	30	-2.44	Pass
	19	2440	-1.28	0.00074	30	-1.87	Pass
	39	2480	-0.97	0.00080	30	-1.56	Pass
LE Code (S=8)	0	2402	-1.91	0.00064	30	-2.16	Pass
	19	2440	-1.35	0.00073	30	-1.61	Pass
	39	2480	-0.68	0.00086	30	-0.93	Pass

Note: The antenna gain of 1.69 dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.

5.46 DB BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(2)

Test Method: ANSI C63.10-2013 Clause 11.8.1

Limit: For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

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 RBW = 100 kHz.

b) Set the video bandwidth (VBW) $\geq 3 \times$ 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.

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

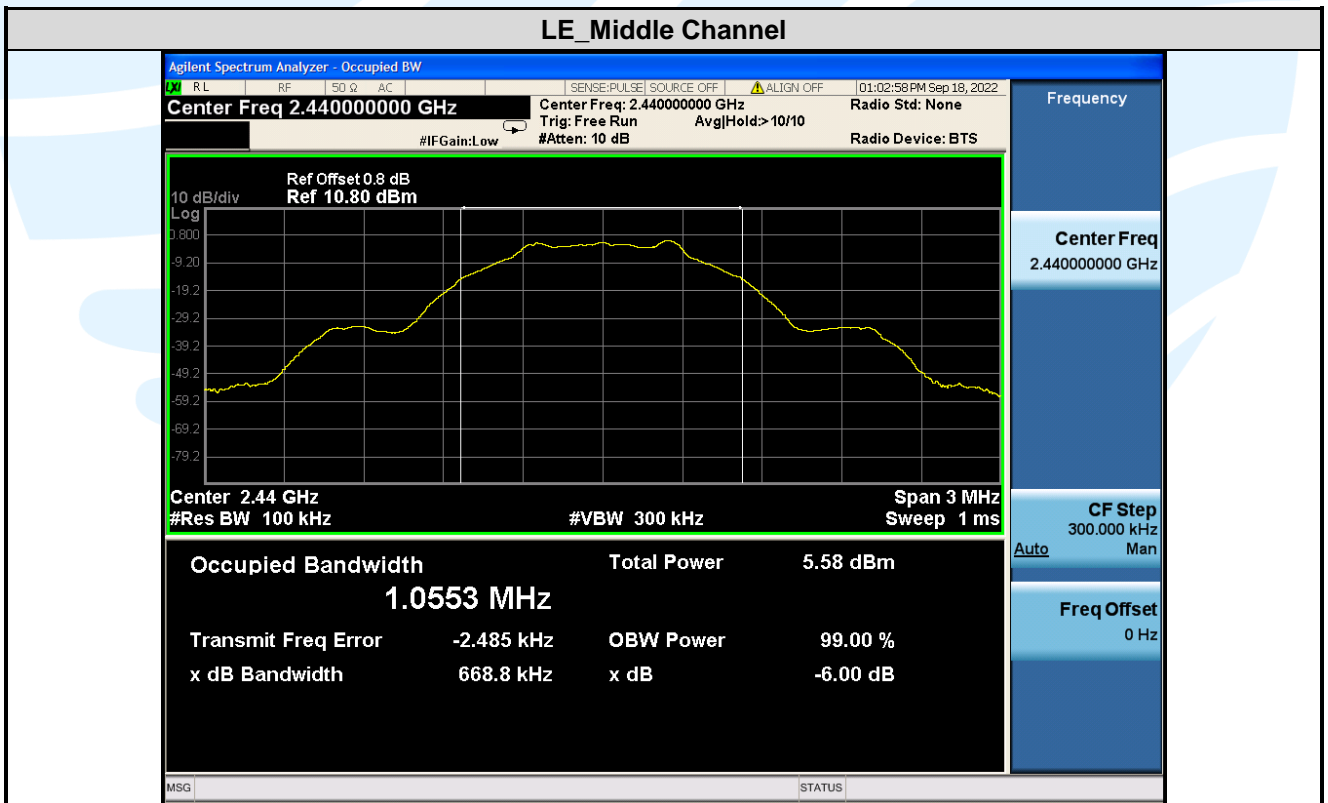
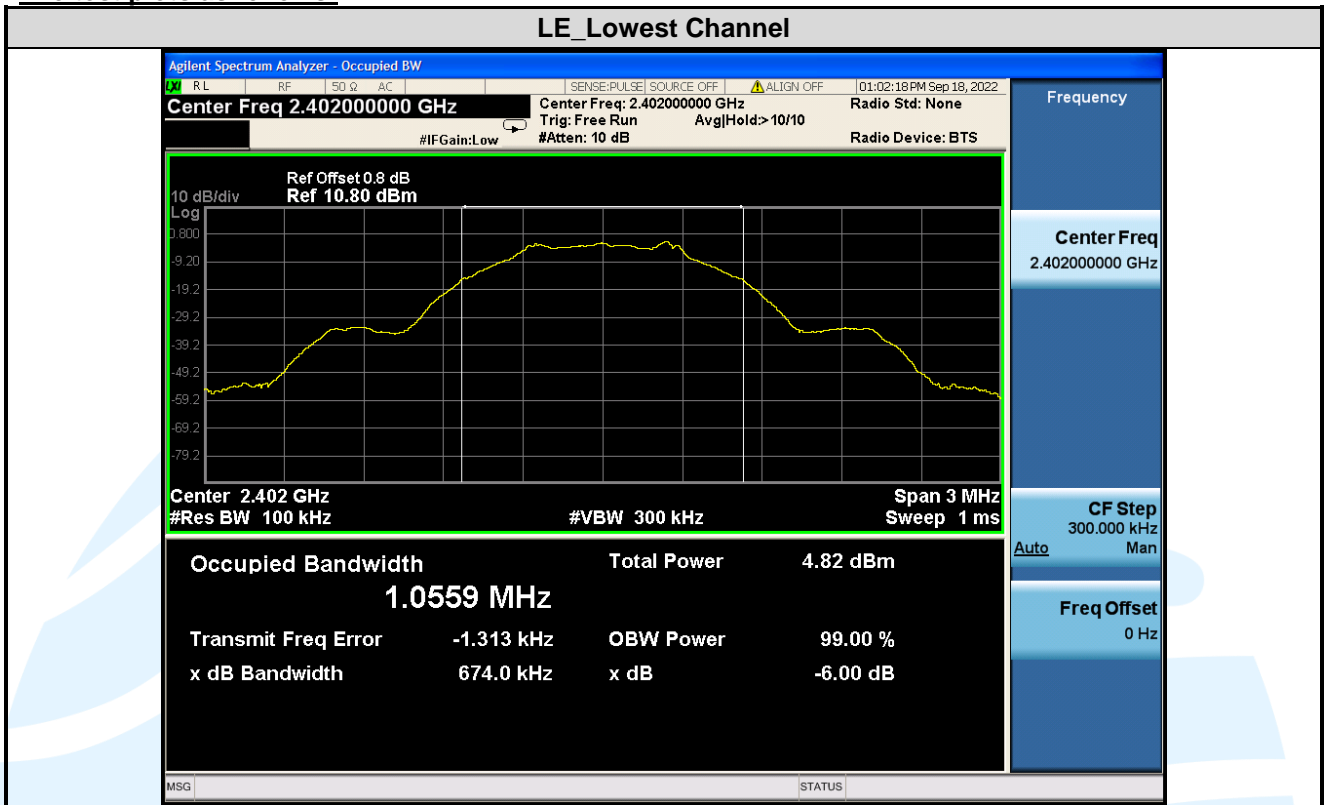
Test Setup: Refer to section 4.4.3 for details.

Instruments Used: Refer to section 3 for details

Test Results:

Type of Modulation	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Limit	Result
LE	0	2402	0.6740	> 500 kHz	Pass
	19	2440	0.6688	> 500 kHz	Pass
	39	2480	0.6710	> 500 kHz	Pass
2LE	0	2402	1.173	> 500 kHz	Pass
	19	2440	1.179	> 500 kHz	Pass
	39	2480	1.171	> 500 kHz	Pass
LE Code (S=2)	0	2402	0.6689	> 500 kHz	Pass
	19	2440	0.6679	> 500 kHz	Pass
	39	2480	0.6711	> 500 kHz	Pass
LE Code (S=8)	0	2402	0.6877	> 500 kHz	Pass
	19	2440	0.6874	> 500 kHz	Pass
	39	2480	0.6872	> 500 kHz	Pass

The test plots as follows:



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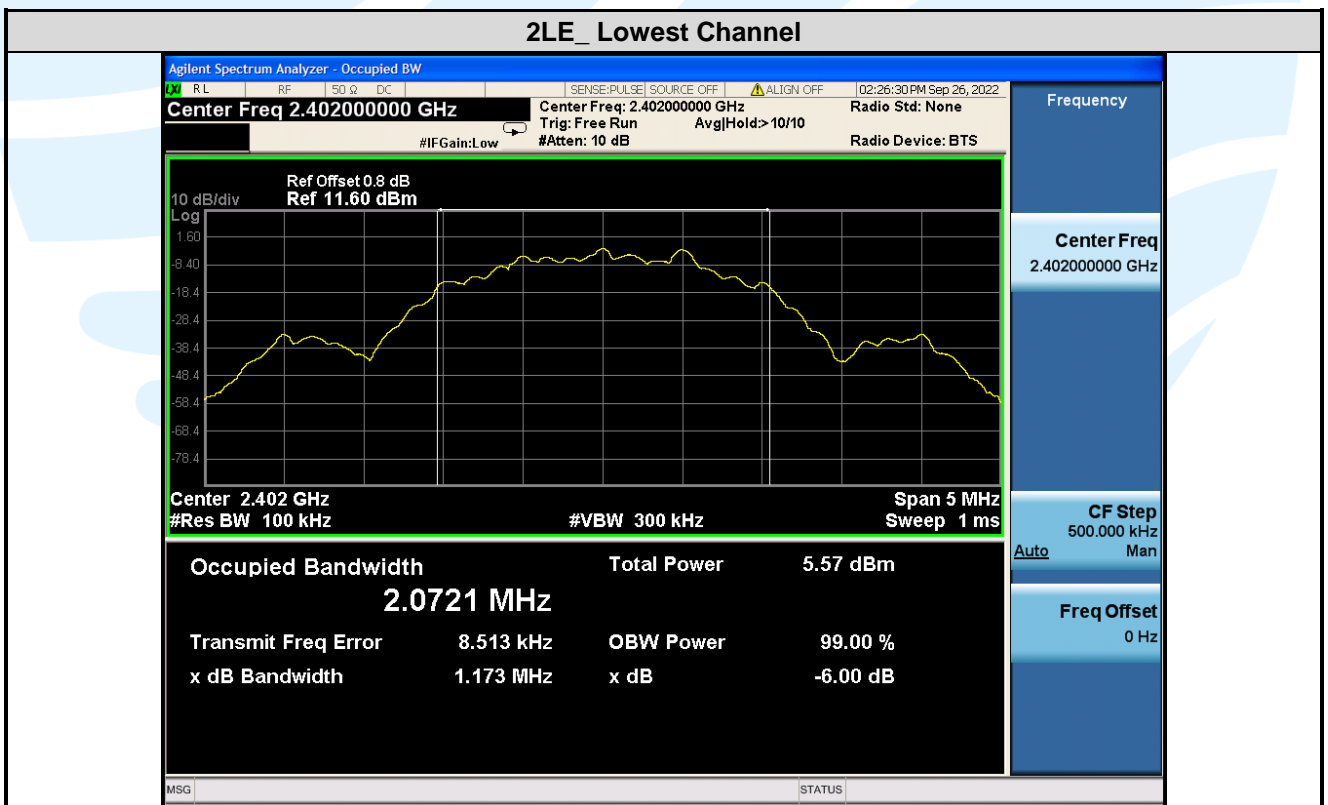
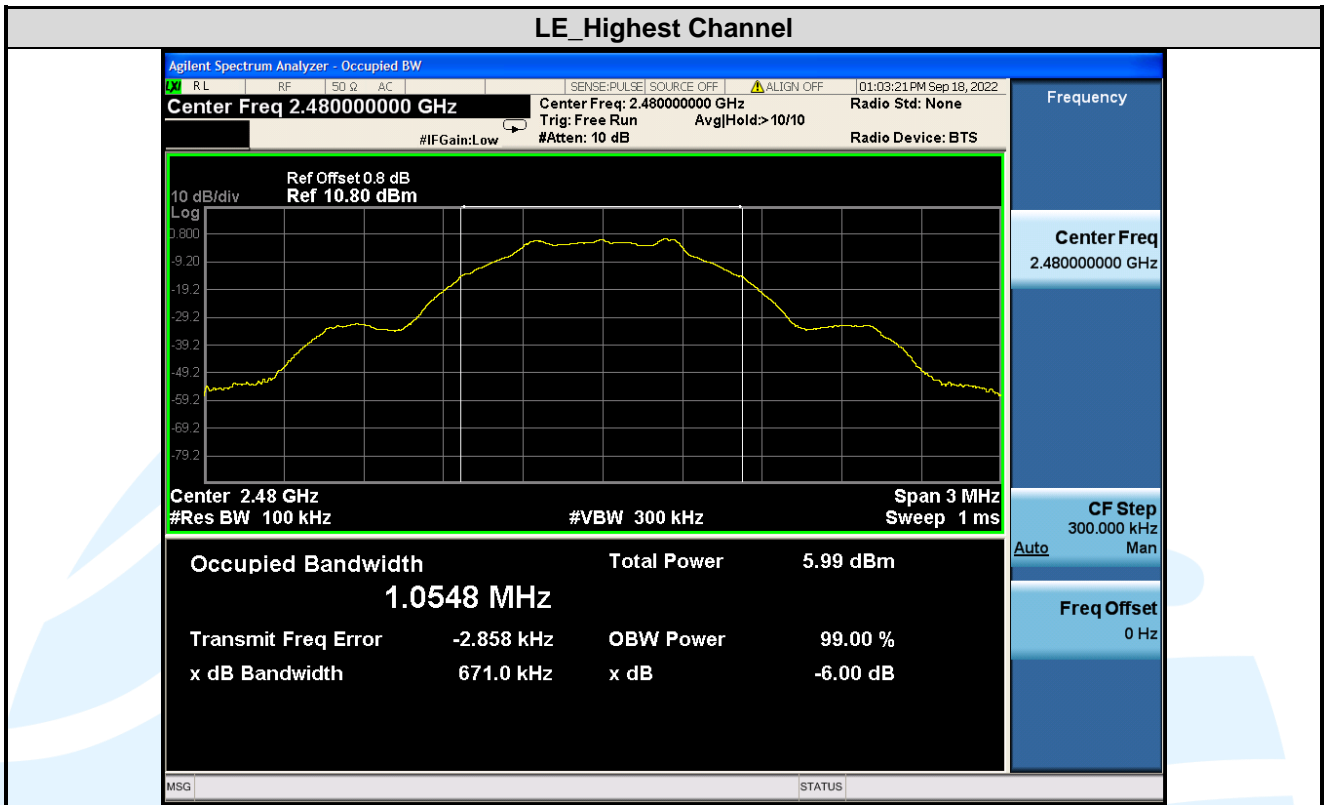
Tel: +86-755-28230888

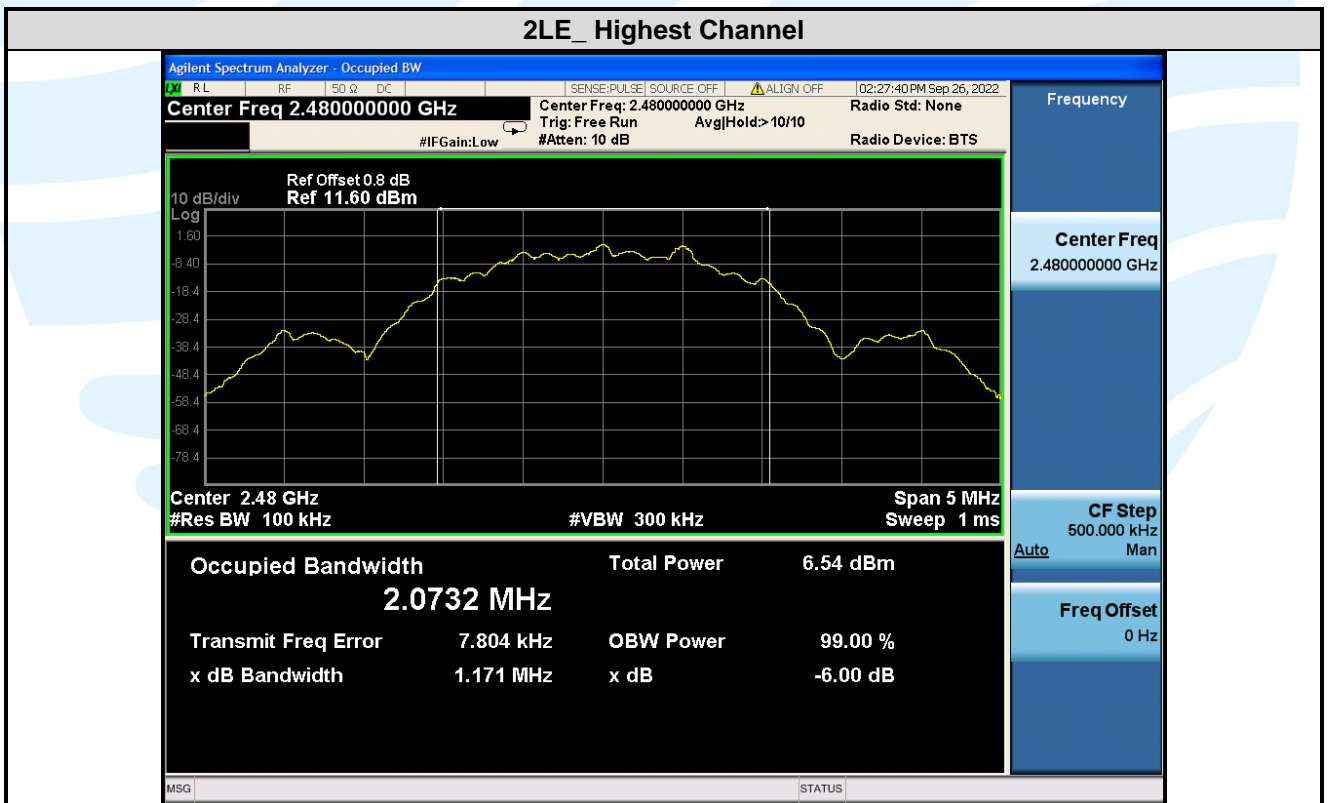
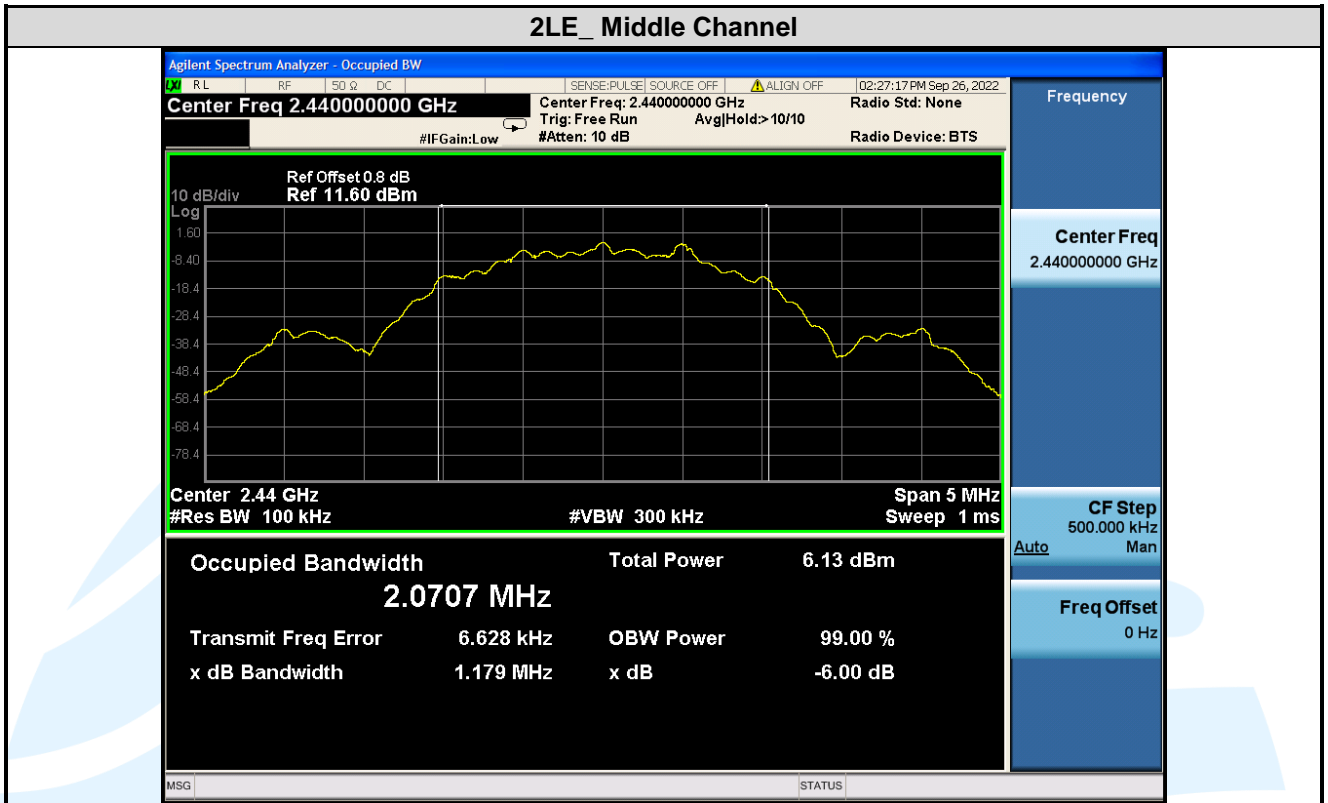
Fax: +86-755-28230886

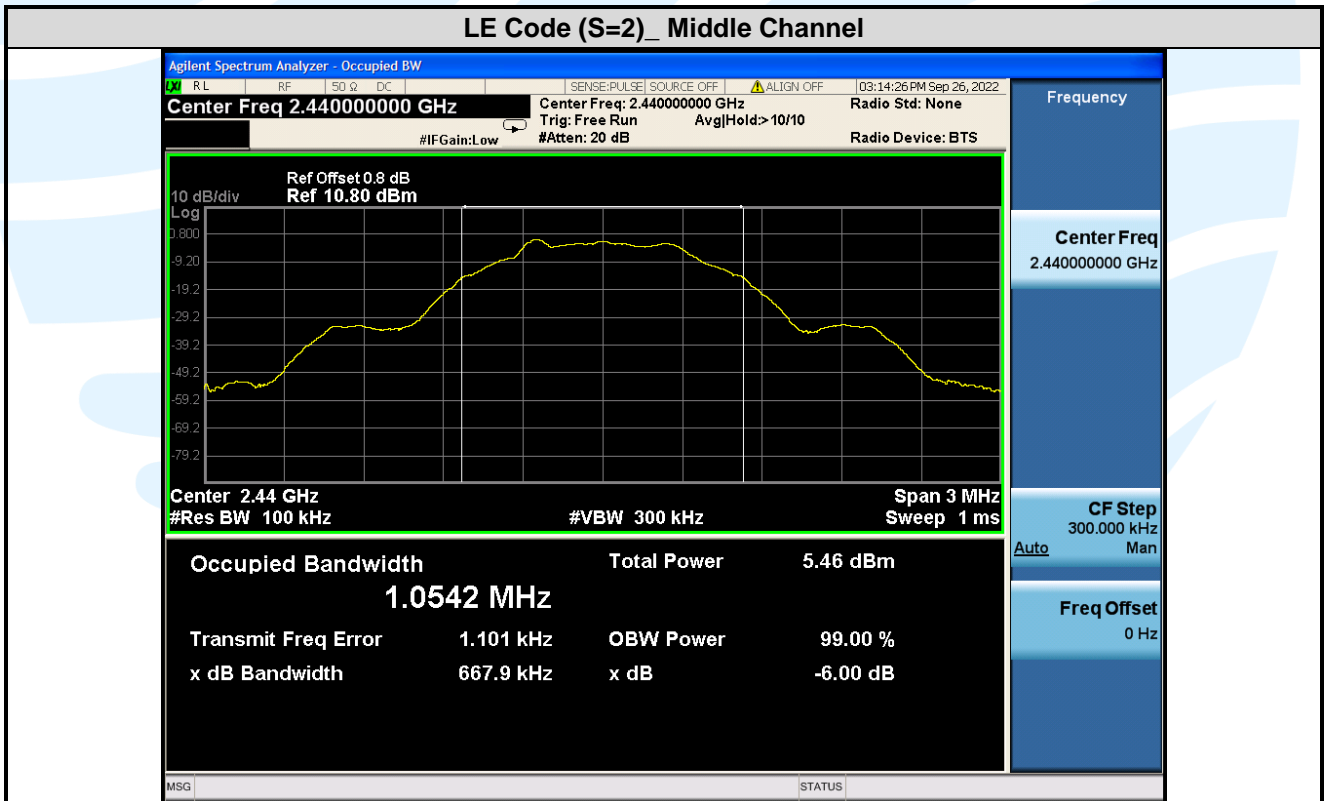
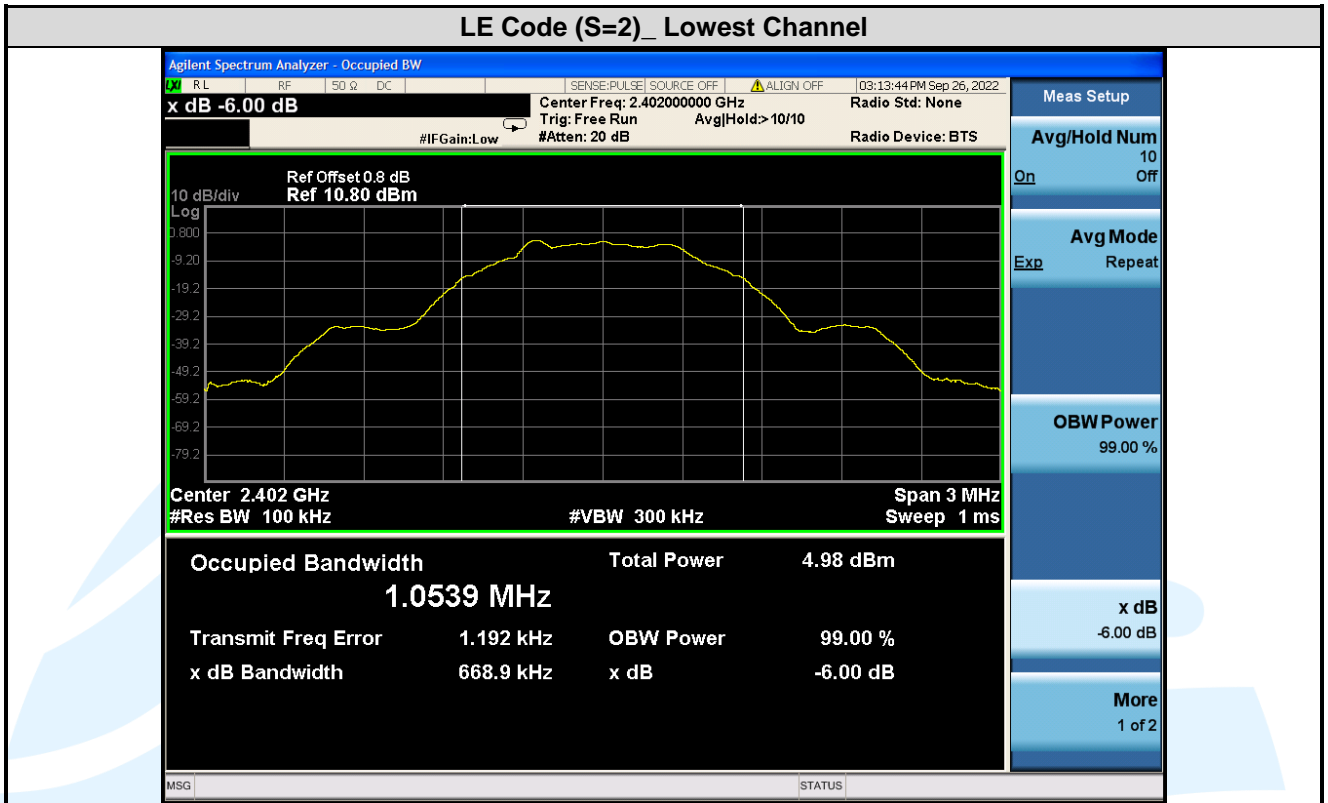
E-mail: info@uttlab.com

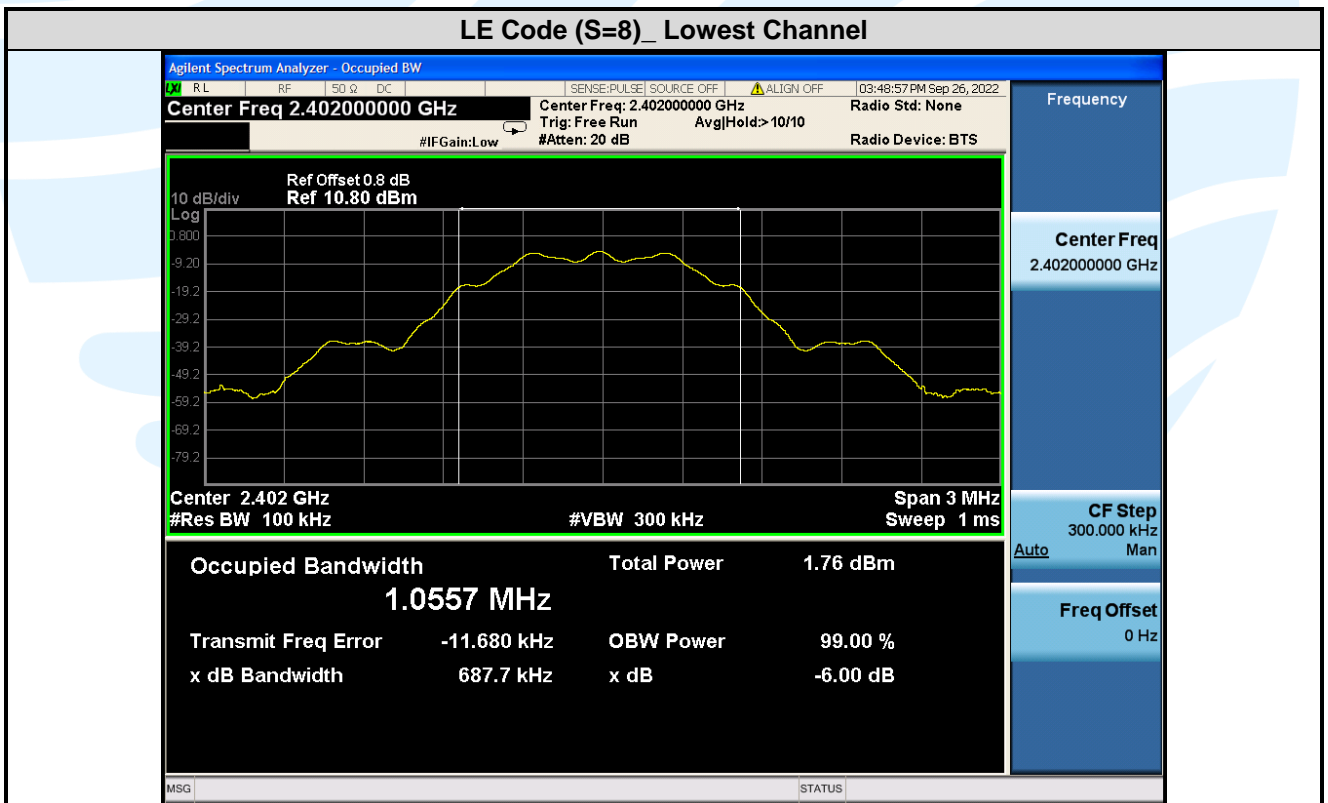
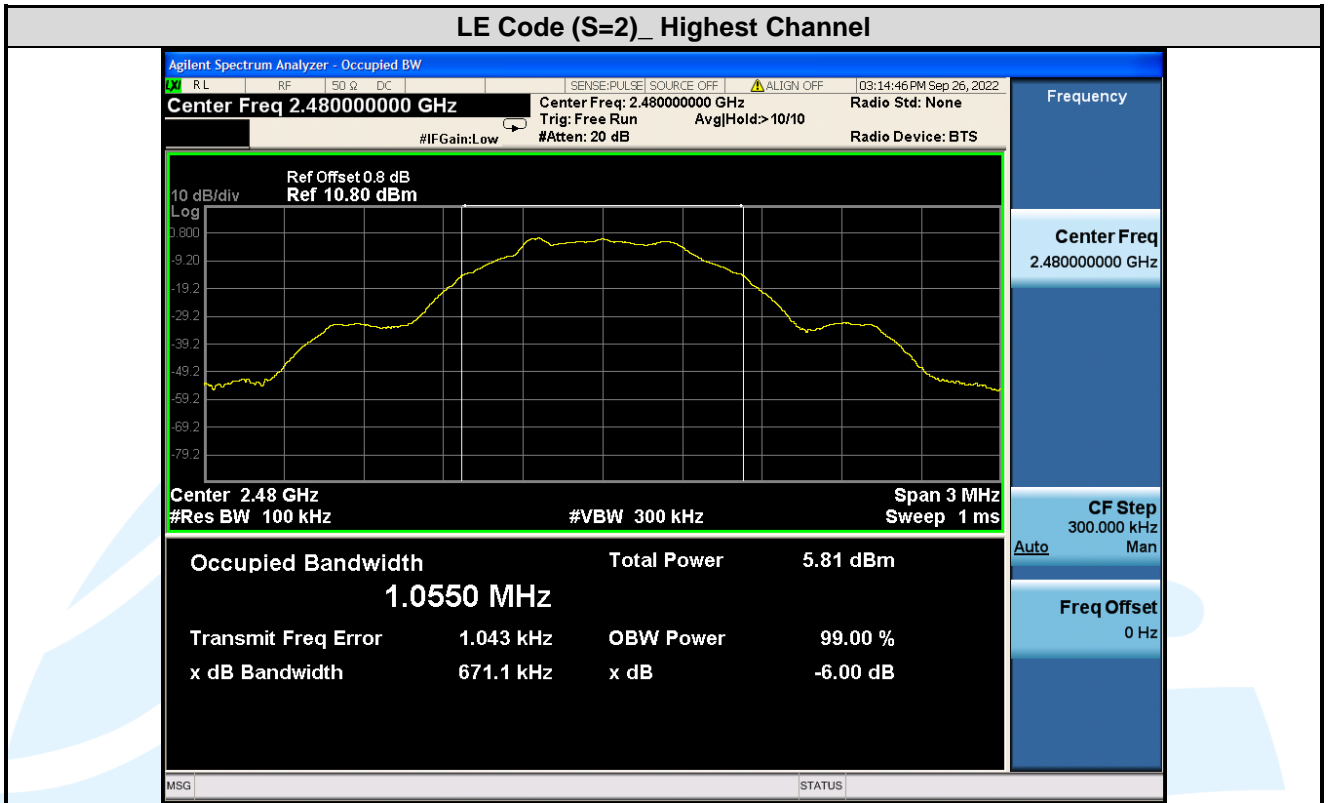
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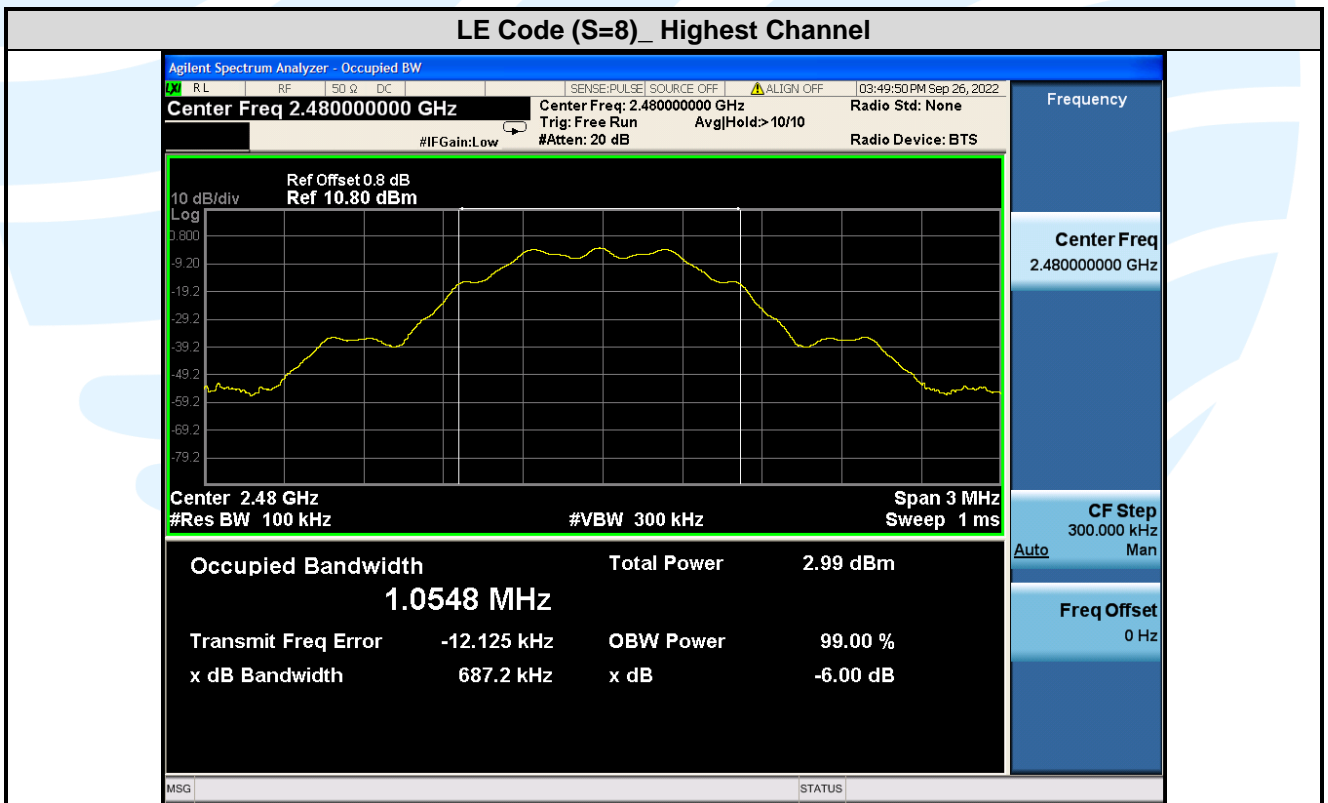
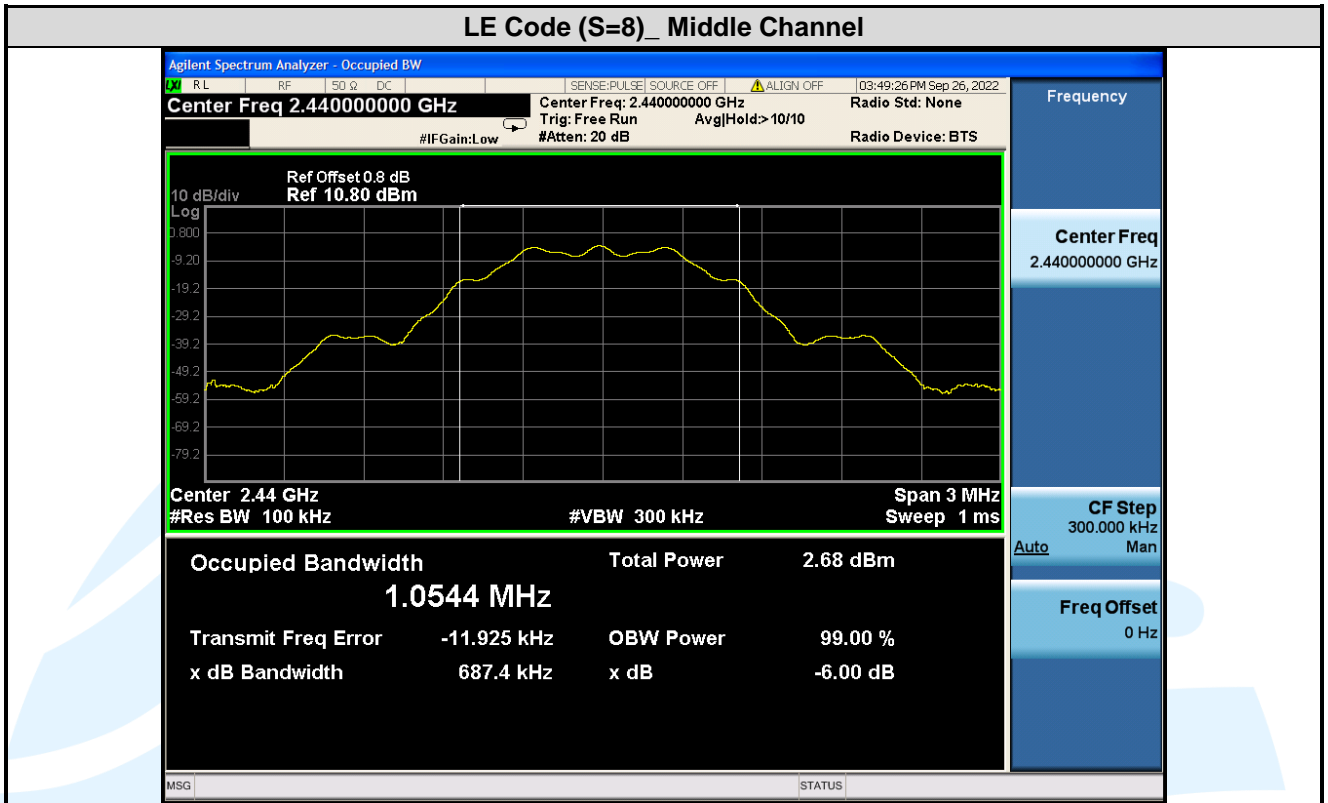
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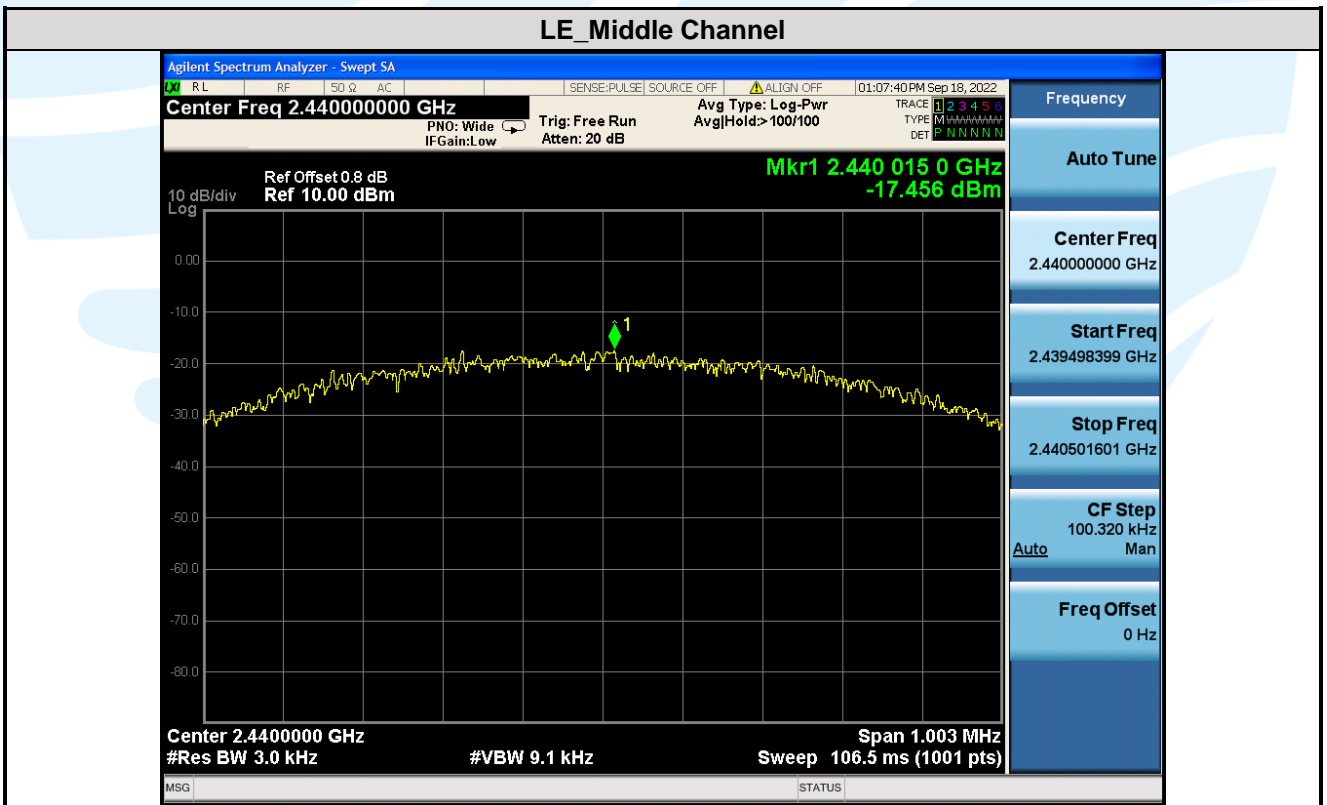
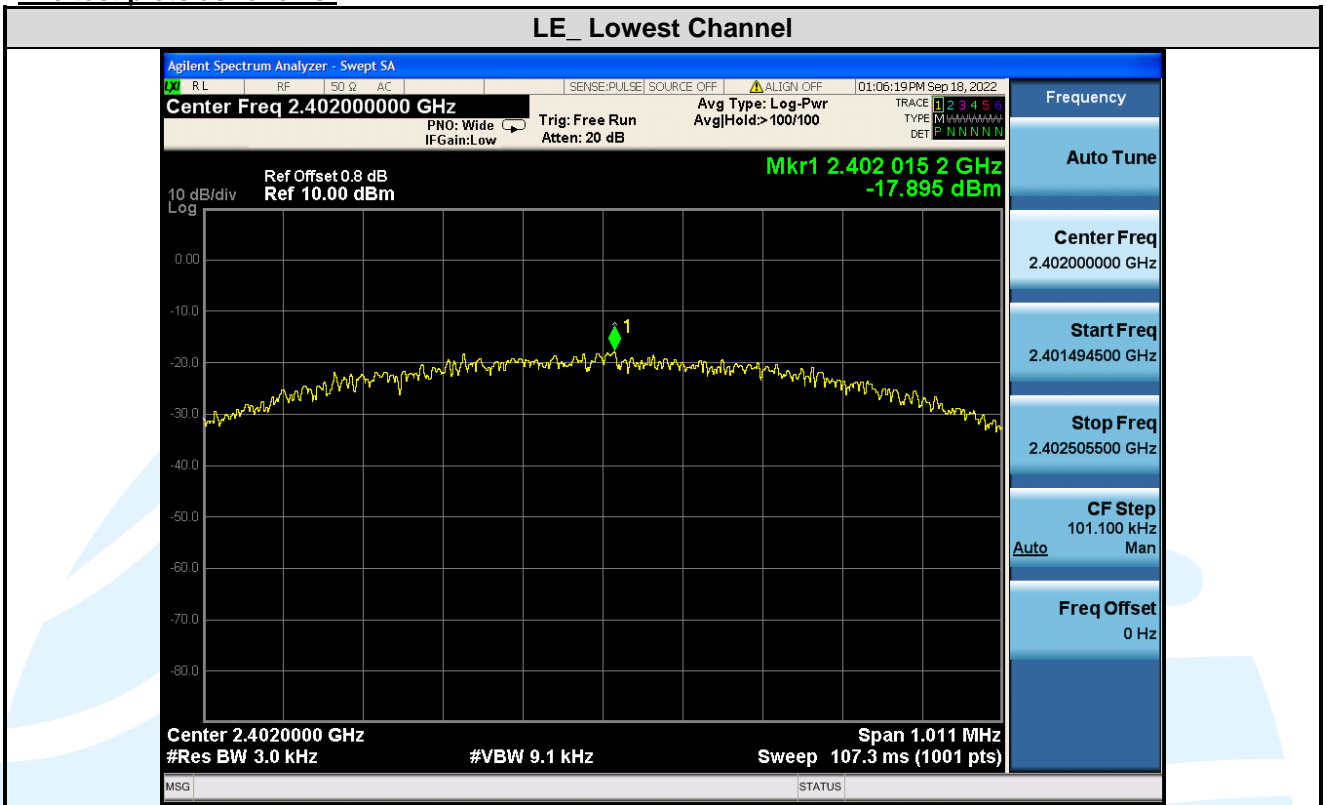


5.5 POWER SPECTRAL DENSITY

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.247 (e)
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: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
 d) Set the VBW $\geq 3 \times \text{RBW}$.
 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 Results: Pass

Type of Modulation	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result (Pass / Fail)
LE	0	2402	-17.895	8	Pass
	19	2440	-17.456	8	Pass
	39	2480	-17.189	8	Pass
2LE	0	2402	-20.288	8	Pass
	19	2440	-19.781	8	Pass
	39	2480	-19.395	8	Pass
LE Code (S=2)	0	2402	-6.840	8	Pass
	19	2440	-7.218	8	Pass
	39	2480	-6.870	8	Pass
LE Code (S=8)	0	2402	-7.254	8	Pass
	19	2440	-6.774	8	Pass
	39	2480	-6.471	8	Pass

The test plots as follows:



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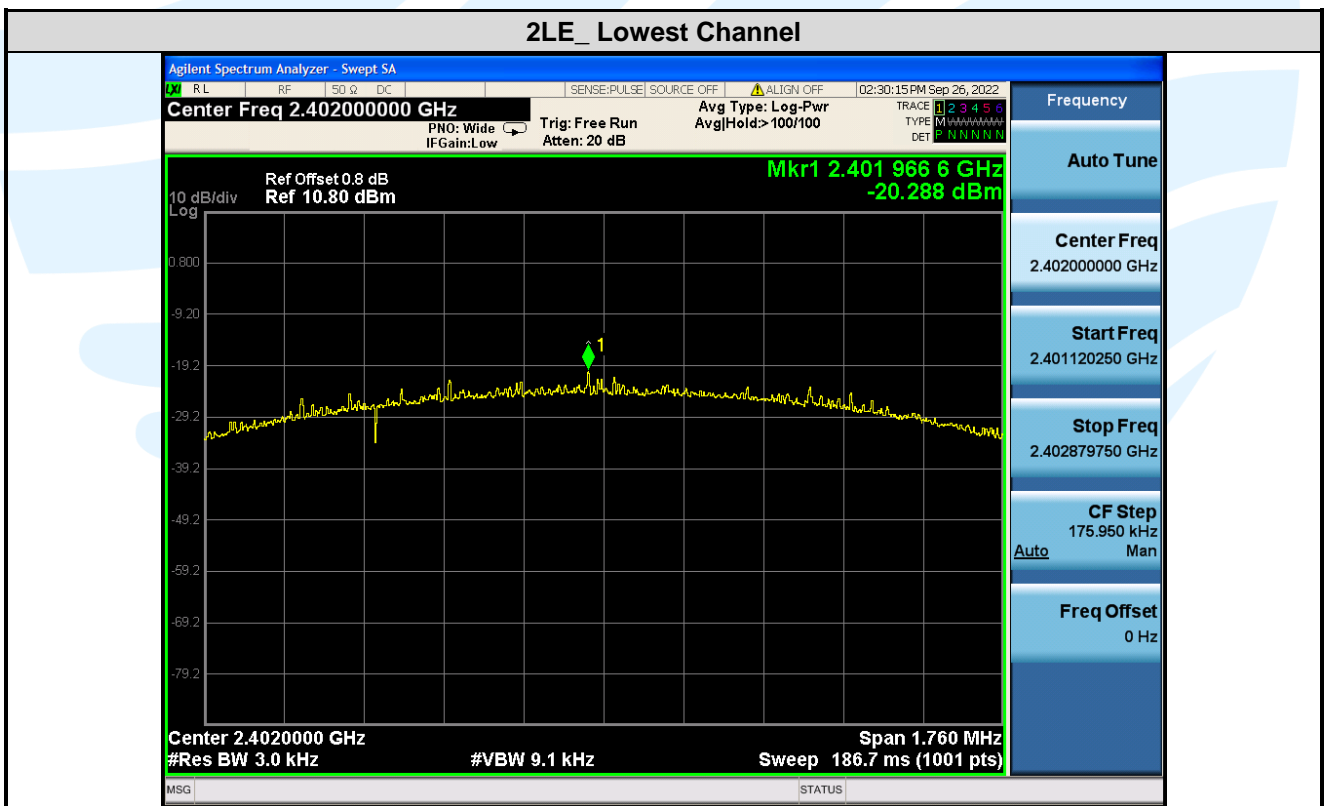
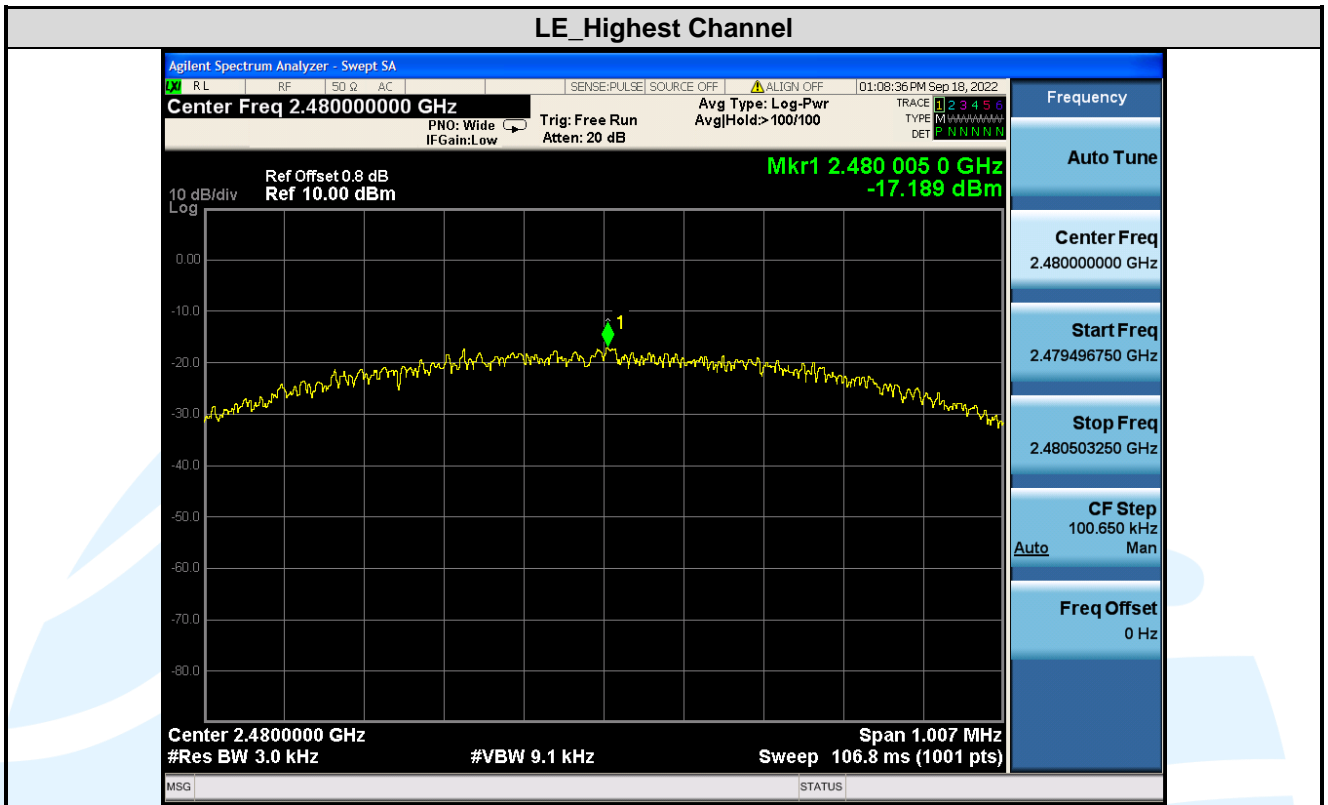
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