

# FCC Test Report

Report No.: AGC08506211201FE02

**FCC ID** : 2A3WX-ONE

**APPLICATION PURPOSE** : Original Equipment

**PRODUCT DESIGNATION** : Truly Wireless Earbuds

**BRAND NAME** : Arktis

**MODEL NAME** : One

**APPLICANT** : Arktis Inc.

**DATE OF ISSUE** : Jan. 25, 2022

**STANDARD(S)** : FCC Part 15.247

**REPORT VERSION** : V1.0



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**REPORT REVISE RECORD**

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jan. 25, 2022	Valid	Initial Release

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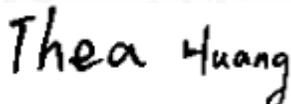
**1. VERIFICATION OF COMPLIANCE**

<b>Applicant</b>	Arktis Inc.
<b>Address</b>	10F-5, No. 8, Ziqiang S. Rd., Zhubei City, Hsinchu County 302, Taiwan
<b>Manufacturer</b>	Shenzhen Grandsun Electronic Co., Ltd.
<b>Address</b>	East Park, Gaoqiao Industry Zone, Pingdi Street, Longgang, Shenzhen City
<b>Factory</b>	Shenzhen Grandsun Electronic Co., Ltd.
<b>Address</b>	East Park, Gaoqiao Industry Zone, Pingdi Street, Longgang, Shenzhen City
<b>Product Designation</b>	Truly Wireless Earbuds
<b>Brand Name</b>	Arktis
<b>Test Model</b>	One
<b>Date of test</b>	Dec. 08, 2021 to Jan. 24, 2022
<b>Deviation</b>	No any deviation from the test method
<b>Condition of Test Sample</b>	Normal
<b>Test Result</b>	Pass
<b>Report Template</b>	AGCRT-US-BLE/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC part 15.247.

Prepared By



Thea Huang  
(Project Engineer)

Jan. 25, 2022

Reviewed By



Calvin Liu  
(Reviewer)

Jan. 25, 2022

Approved By



Max Zhang  
(Authorized Officer)

Jan. 25, 2022

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## 2. GENERAL INFORMATION

### 2.1. PRODUCT DESCRIPTION

The EUT is designed as a “Truly Wireless Earbuds”. It is designed by way of utilizing the GFSK technology to achieve the system operation.

A major technical description of EUT is described as following

<b>Operation Frequency</b>	2.402GHz to 2.480GHz
<b>RF Output Power</b>	GFSK 1Mbps: 4.527dBm (Max) GFSK 2Mbps: 4.507dBm (Max)
<b>Bluetooth Version</b>	V5.1
<b>Modulation</b>	BR <input type="checkbox"/> GFSK, EDR <input type="checkbox"/> π /4-DQPSK, <input type="checkbox"/> 8DPSK BLE <input checked="" type="checkbox"/> GFSK 1Mbps <input checked="" type="checkbox"/> GFSK 2Mbps
<b>Number of channels</b>	40 Channels
<b>Antenna Designation</b>	FPC Antenna (Comply with requirements of the FCC part 15.203)
<b>Antenna Gain</b>	3dBi
<b>Hardware Version</b>	V05A
<b>Software Version</b>	V3.1.8
<b>Power Supply</b>	DC 3.7V by battery

### 2.2. TABLE OF CARRIER FREQUENCIES

Frequency Band	Channel Number	Frequency
2400~2483.5MHz	0	2402 MHz
	1	2404 MHz
	:	:
	38	2478 MHz
	39	2480 MHz

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### **2.3. RELATED SUBMITTAL(S)/GRANT(S)**

This submittal(s) (test report) is intended for **FCC ID: 2A3WX-ONE** filing to comply with the FCC Part 15.247 requirements.

### **2.4. TEST METHODOLOGY**

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

### **2.5. SPECIAL ACCESSORIES**

Refer to section 5.2.

### **2.6. EQUIPMENT MODIFICATIONS**

Not available for this EUT intended for grant.

### **2.7. ANTENNA REQUIREMENT**

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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### 3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

Item	Measurement Uncertainty
Uncertainty of Conducted Emission for AC Port	$U_c = \pm 2.9 \text{ dB}$
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 4.9 \text{ dB}$
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.4 \text{ dB}$
Uncertainty of total RF power, conducted	$U_c = \pm 0.8 \text{ dB}$
Uncertainty of RF power density, conducted	$U_c = \pm 2.6 \text{ dB}$
Uncertainty of spurious emissions, conducted	$U_c = \pm 2 \%$
Uncertainty of Occupied Channel Bandwidth	$U_c = \pm 2 \%$

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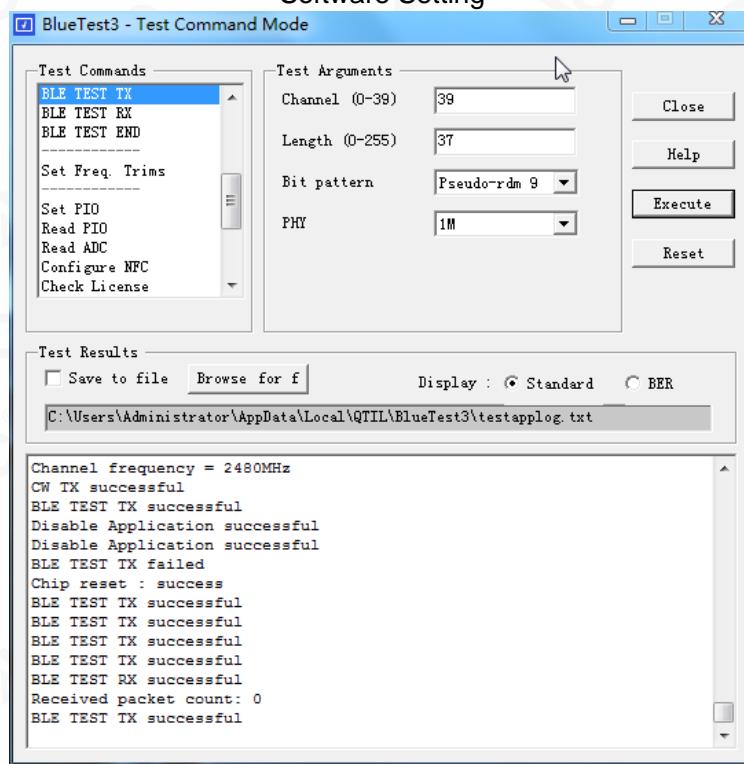


#### 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX (1M)
2	Middle channel TX (1M)
3	High channel TX (1M)
4	Low channel TX (2M)
5	Middle channel TX (2M)
6	High channel TX (2M)

Note: 1. Only the result of the worst case was recorded in the report, if no other cases.  
 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.  
 3. For Conducted Test method, a temporary antenna connector is provided by the manufacturer.

#### Software Setting



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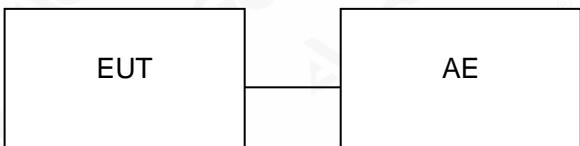
## 5. SYSTEM TEST CONFIGURATION

### 5.1. CONFIGURATION OF TESTED SYSTEM

Radiated Emission Configure:



Conducted Emission Configure:



### 5.2. EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Truly Wireless Earbuds	One	2A3WX-ONE	EUT
2	Control Box	USB-TTL	N/A	AE

### 5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247 (b)(3)	Peak Output Power	Compliant
15.247 (a)(2)	6 dB Bandwidth	Compliant
15.247 (d)	Conducted Spurious Emission	Compliant
15.247 (e)	Maximum Conducted Output Power Density	Compliant
15.209	Radiated Emission	Compliant
15.207	Conducted Emission	Not applicable

Note: The BT function cannot transmit when charging.

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## 6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance (Shenzhen) Co., Ltd is accredited by A2LA

## TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESCI	10096	Apr. 14, 2021	Apr. 13, 2022
Spectrum Analyzer	Aglient	N9010A	MY53470504	Nov. 17, 2021	Nov. 16, 2022
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn Antenna	SCHWARZBECK	BBHA9170	768	Oct. 31, 2021	Oct. 30, 2023
Loop Antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS	3117	00034609	Apr. 23, 2021	Apr. 22, 2023
Preamplifier Assembly	ETS	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
Signal analyzer	Agilent	N9020A	MY52090123	Aug. 18, 2021	Aug. 17, 2022
Wideband Antenna	SCHWARZBECK	VULB9168	VULB9168-49 4	Jan. 08, 2021	Jan. 07, 2023
Temperature and humidity box	ESPEC	SH-242	93008290	Sep. 03, 2020	Sep. 02, 2022
Test Software	Tonscend	JS32-RE(Ver.2.5)	N/A	N/A	N/A

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## 7. PEAK OUTPUT POWER

### 7.1. MEASUREMENT PROCEDURE

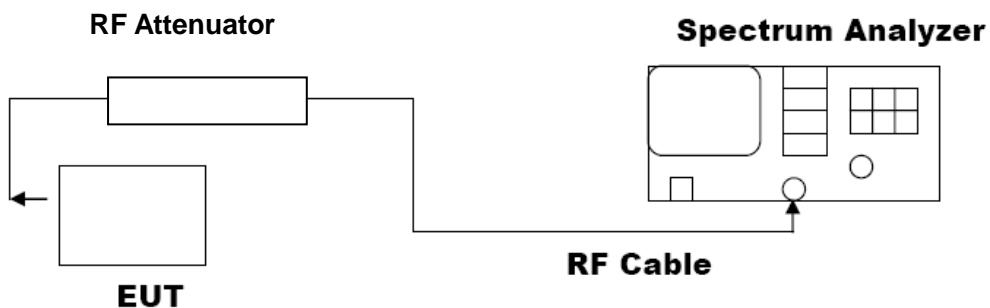
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2.  $RBW \geq DTS$  bandwidth.
3.  $VBW \geq 3 \times RBW$ .
4.  $SPAN \geq VBW$ .
5. Sweep: Auto.
6. Detector function: Peak.
7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

### 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

#### PEAK POWER TEST SETUP



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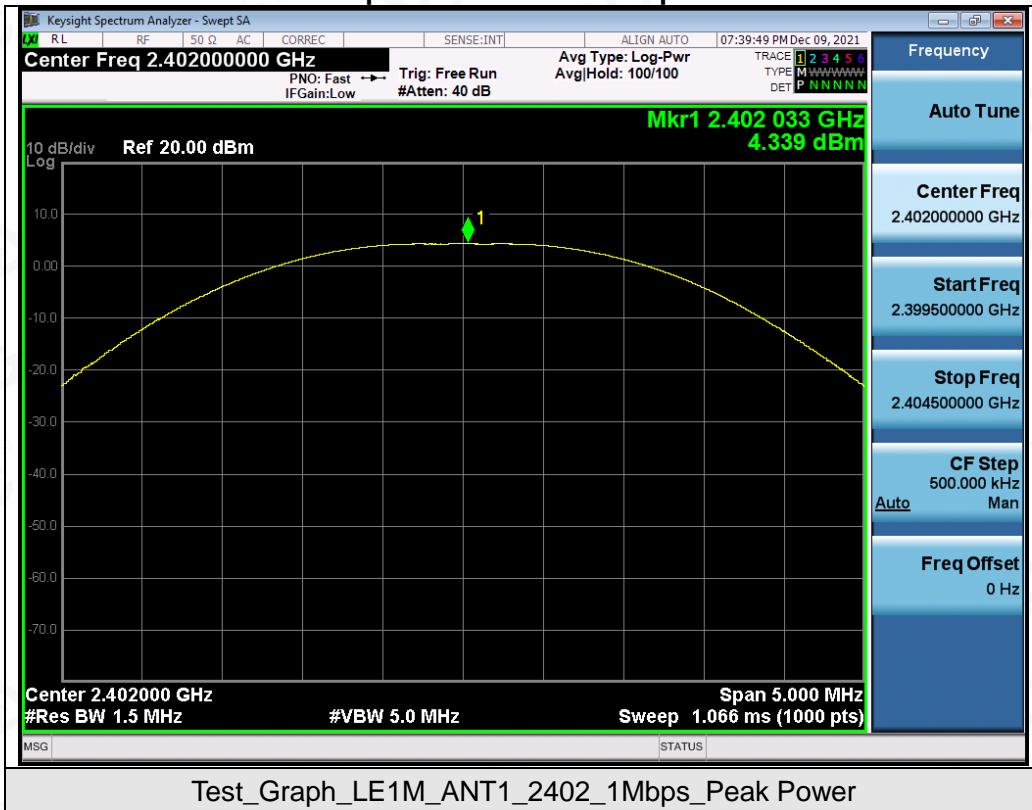
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### 7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power				
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
GFSK 1M	2402	4.339	≤30	Pass
	2440	4.527	≤30	Pass
	2480	4.233	≤30	Pass
GFSK 2M	2402	4.286	≤30	Pass
	2440	4.507	≤30	Pass
	2480	4.229	≤30	Pass

### Test Graphs of Conducted Output Power



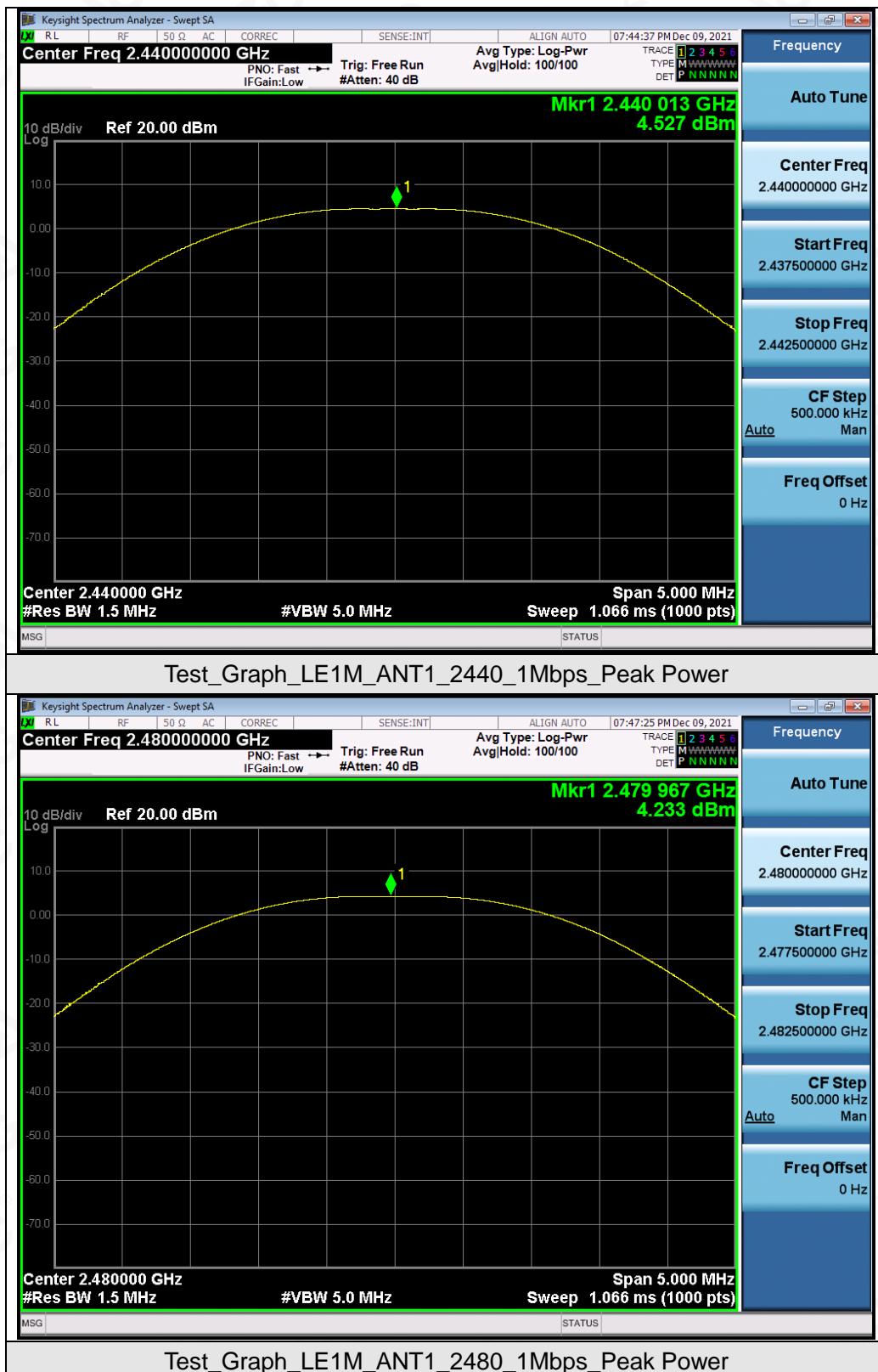
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## 8. BANDWIDTH

### 8.1. MEASUREMENT PROCEDURE

6dB bandwidth:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 kHz, VBW $\geq 3 \times$  RBW.
4. Set SPA Trace 1 Max hold, then View.

Occupied bandwidth:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel  
The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

**Note:** The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

### 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

### 8.3. LIMITS AND MEASUREMENT RESULTS

Test Data of Occupied Bandwidth and DTS Bandwidth					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
GFSK 1M	2402	1.045	0.715	$\geq 0.5$	Pass
	2440	1.044	0.706	$\geq 0.5$	Pass
	2480	1.043	0.711	$\geq 0.5$	Pass
GFSK 2M	2402	2.059	1.213	$\geq 0.5$	Pass
	2440	2.058	1.259	$\geq 0.5$	Pass
	2480	2.056	1.253	$\geq 0.5$	Pass

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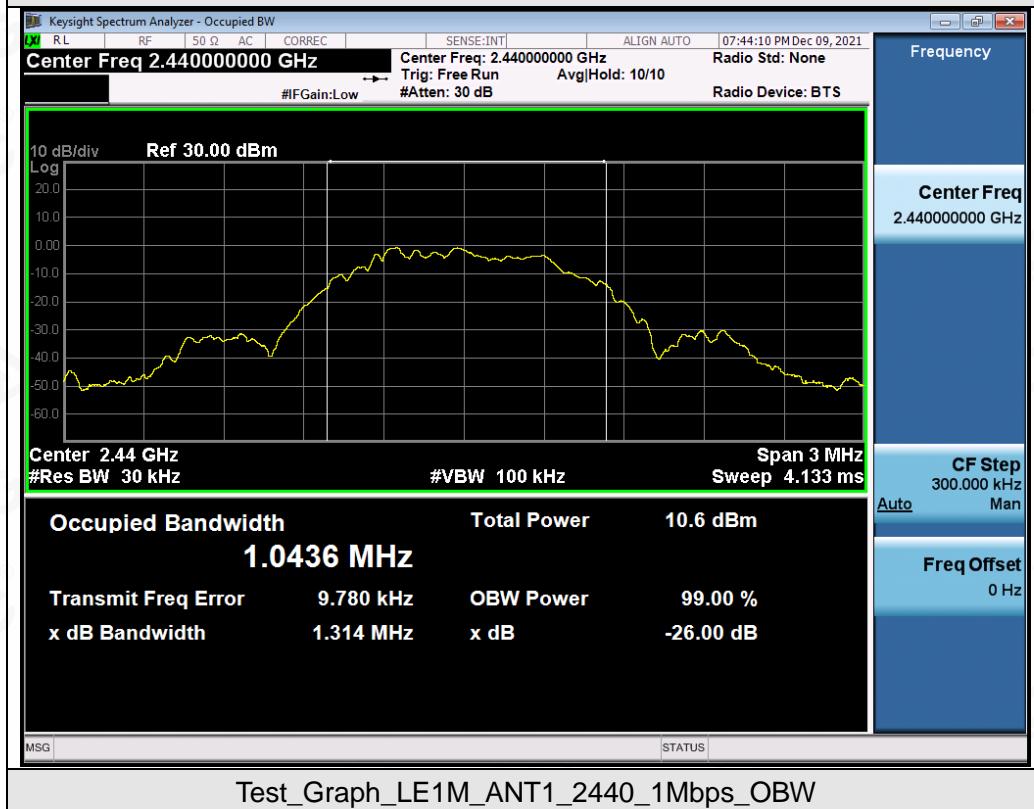
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## Test Graphs of Occupied Bandwidth



Test\_Graph\_LE1M\_ANT1\_2402\_1Mbps\_OBW



Test\_Graph\_LE1M\_ANT1\_2440\_1Mbps\_OBW

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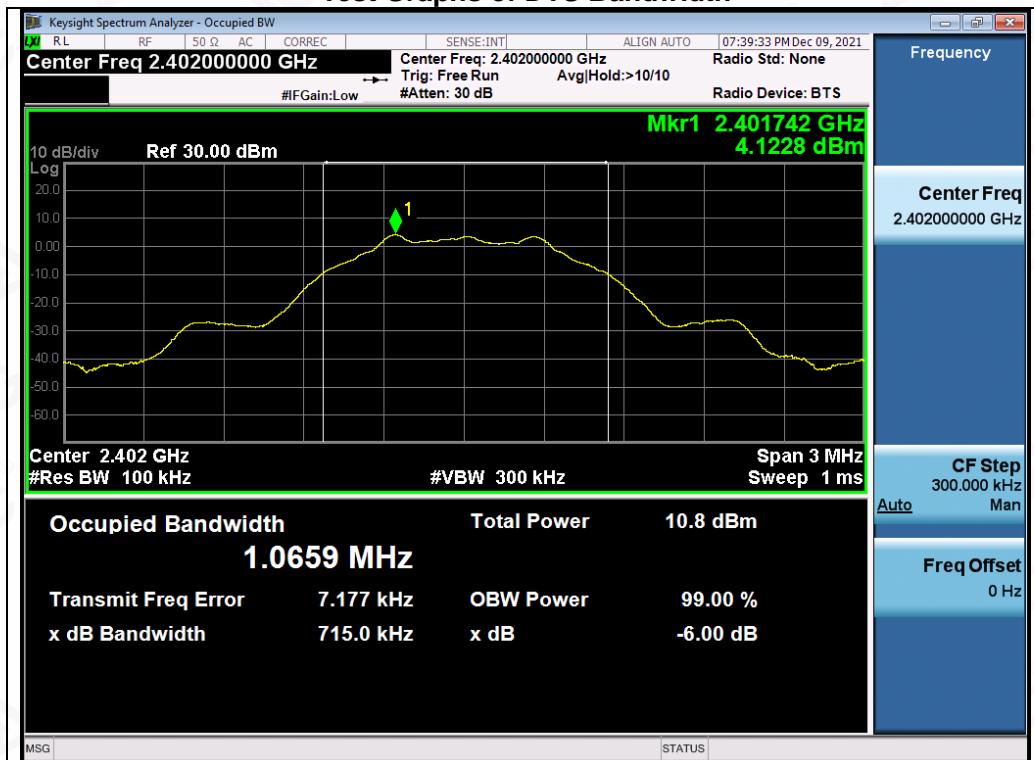
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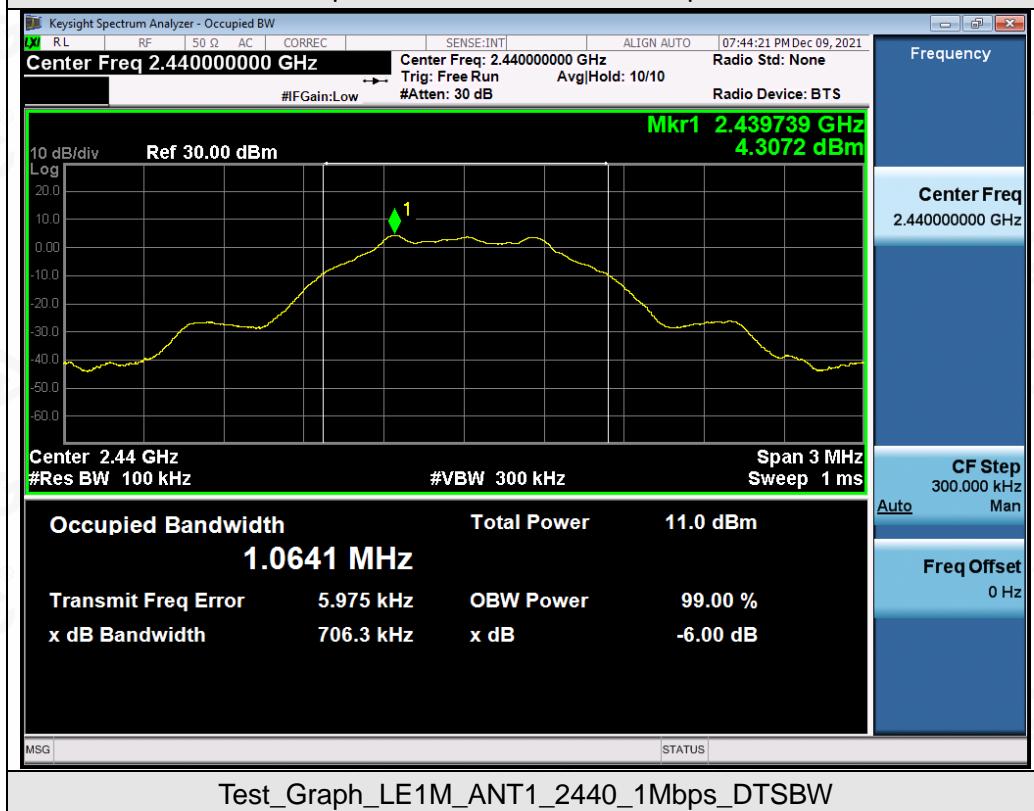
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## Test Graphs of DTS Bandwidth



## Test\_Graph\_LE1M\_ANT1\_2402\_1Mbps\_DTSBW



## Test\_Graph\_LE1M\_ANT1\_2440\_1Mbps\_DTSBW

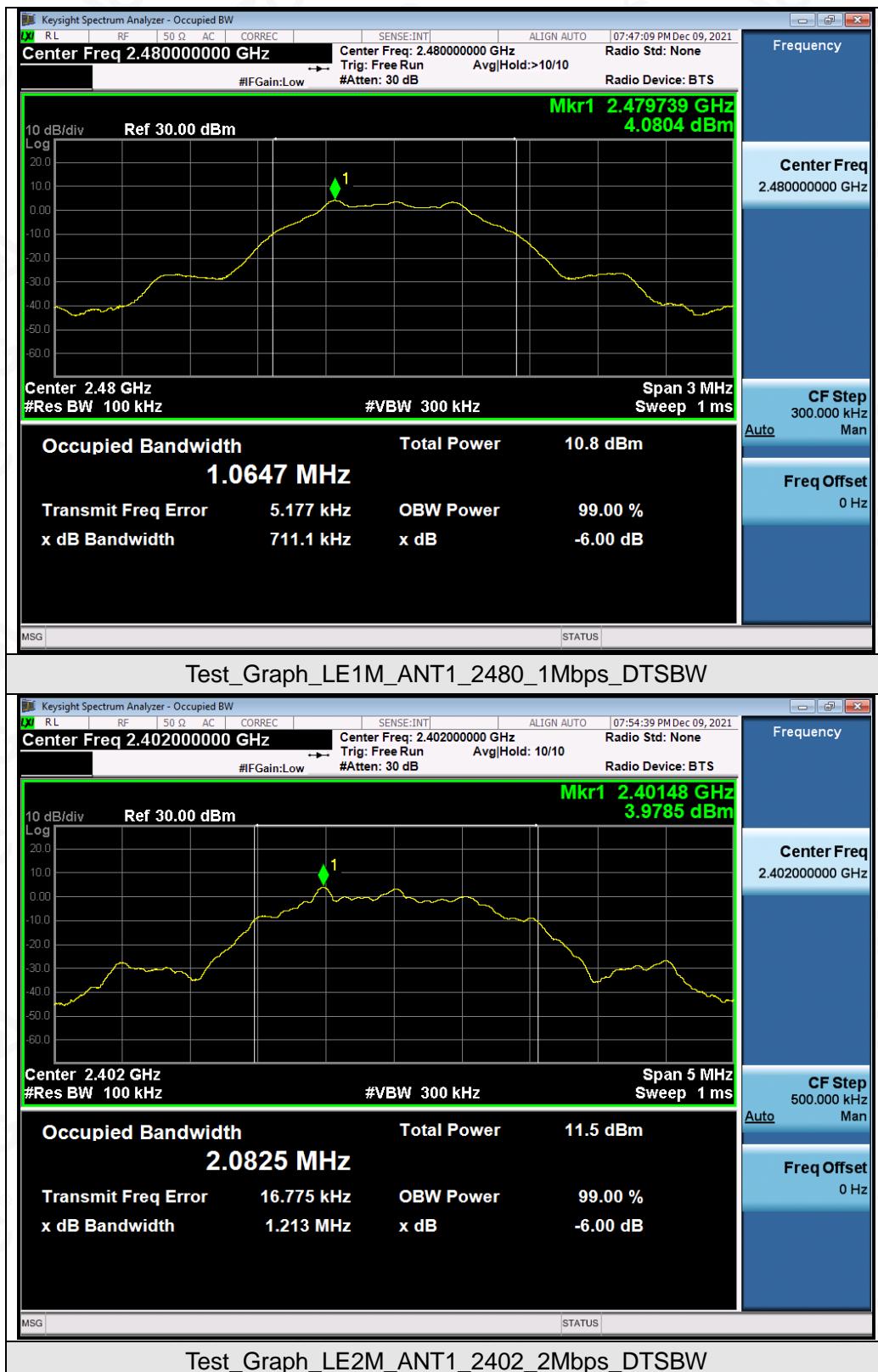
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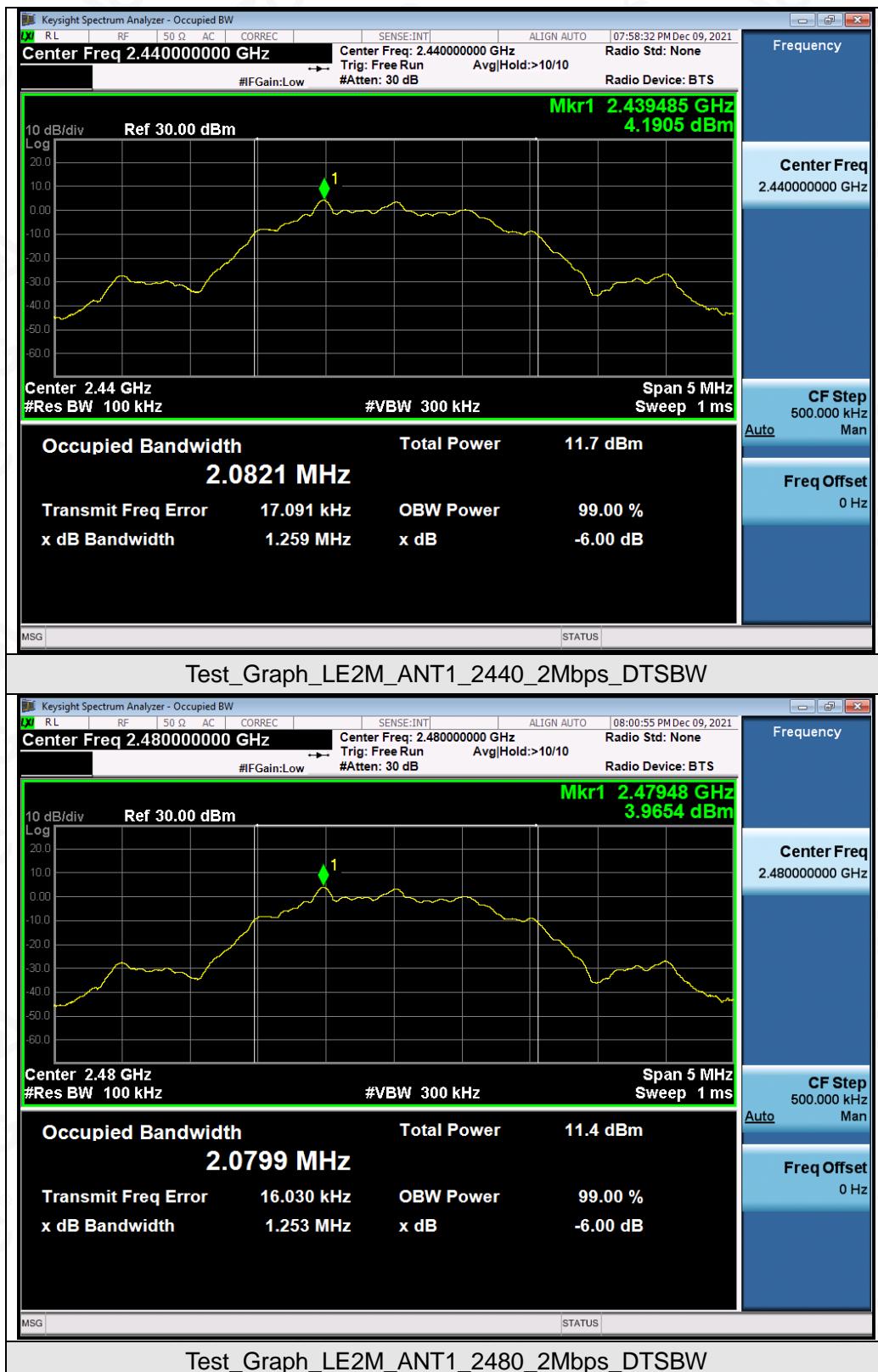
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## 9. CONDUCTED SPURIOUS EMISSION

### 9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Trace 1 Max hold, then View.

**Note:** The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

### 9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the reference level	PASS

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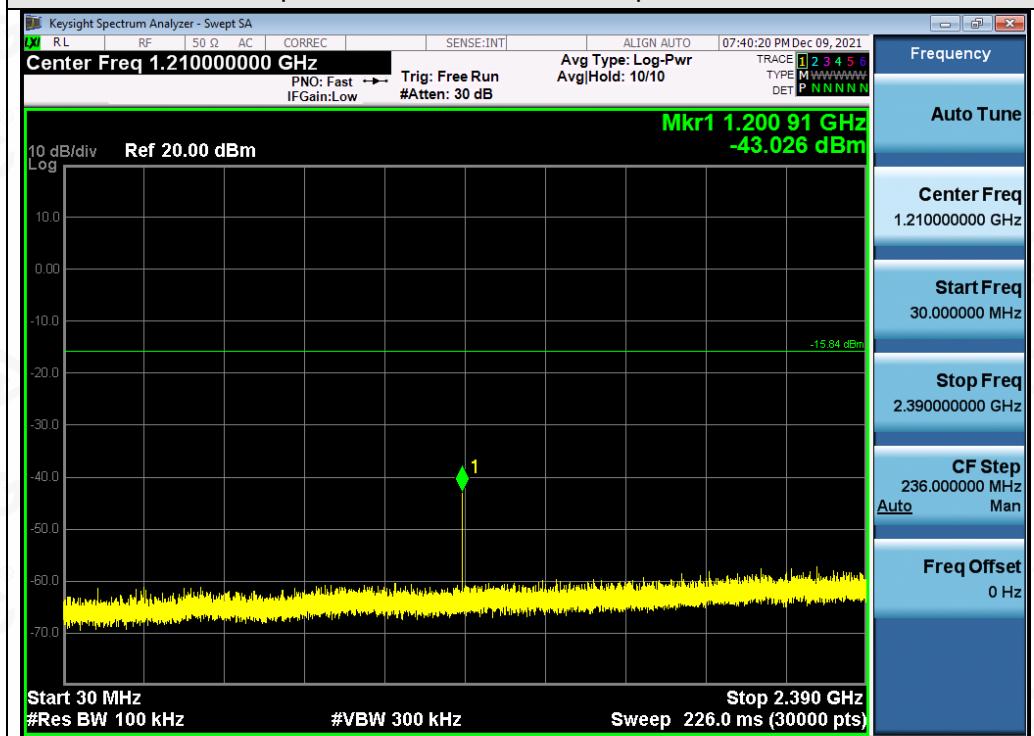
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**Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands**

**Test\_Graph\_LE1M\_ANT1\_2402\_1Mbps\_Reference Level**

**Test\_Graph\_LE1M\_ANT1\_2402\_1Mbps\_Lower Band Emissions**

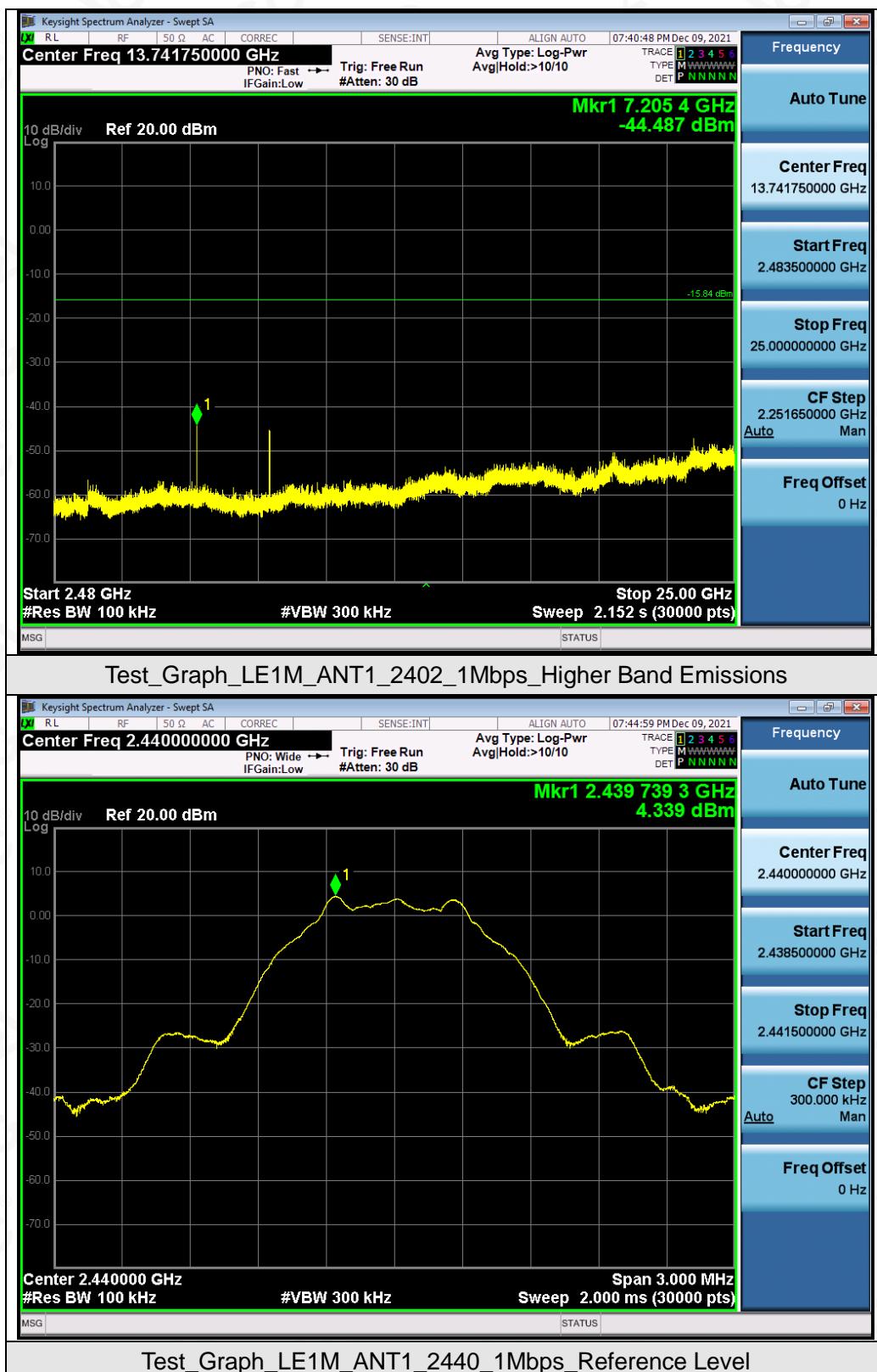
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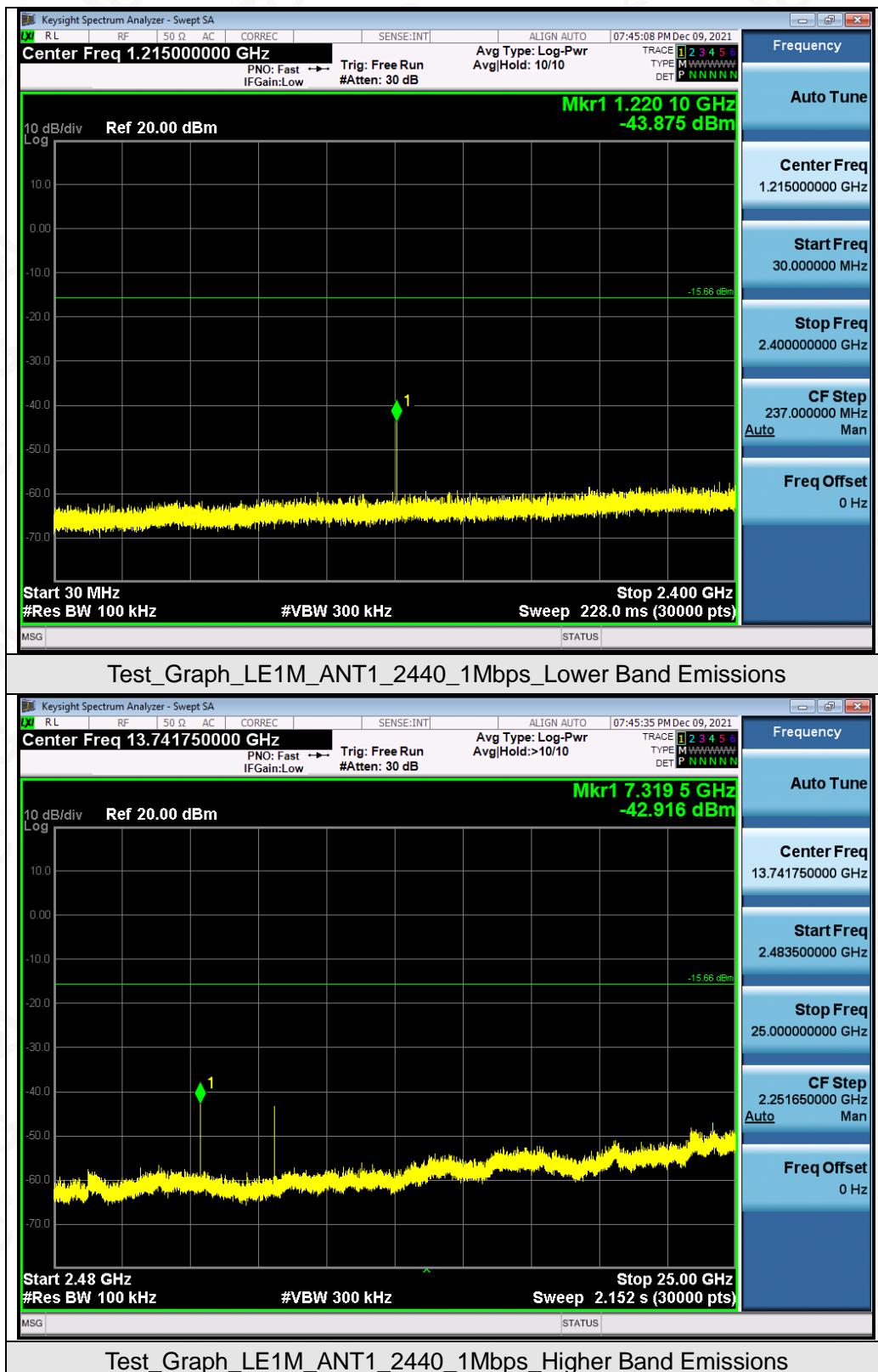
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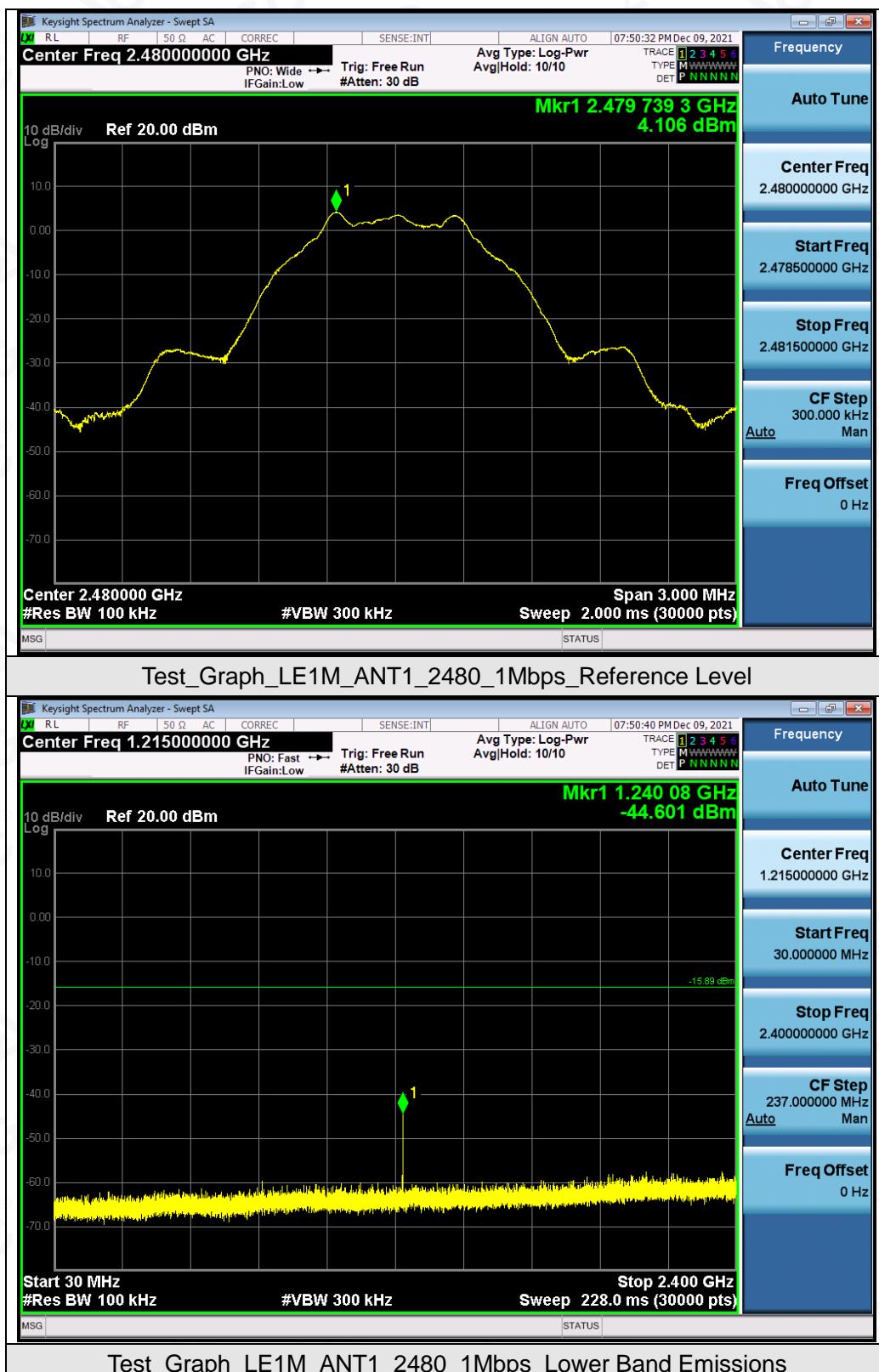
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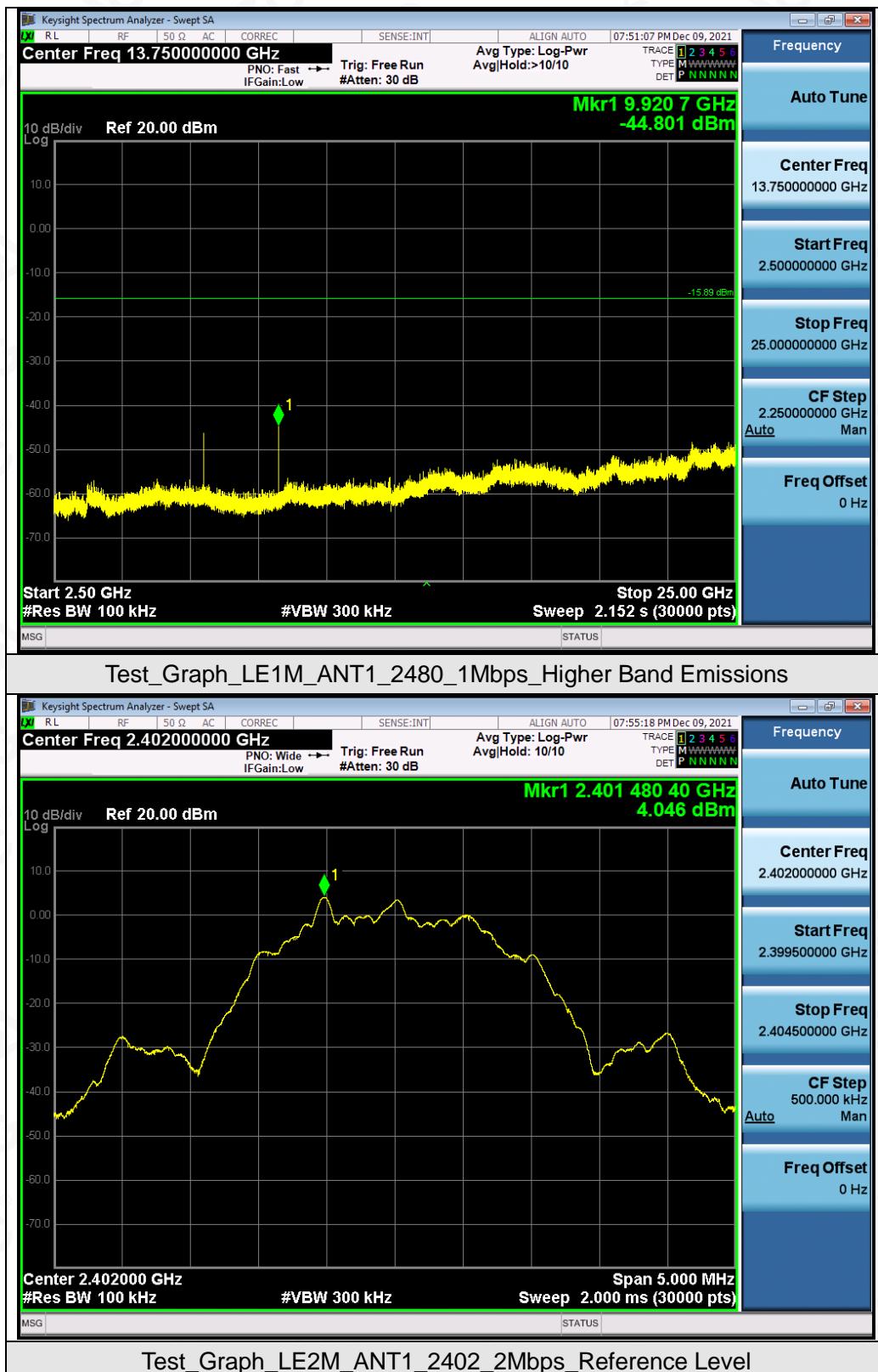
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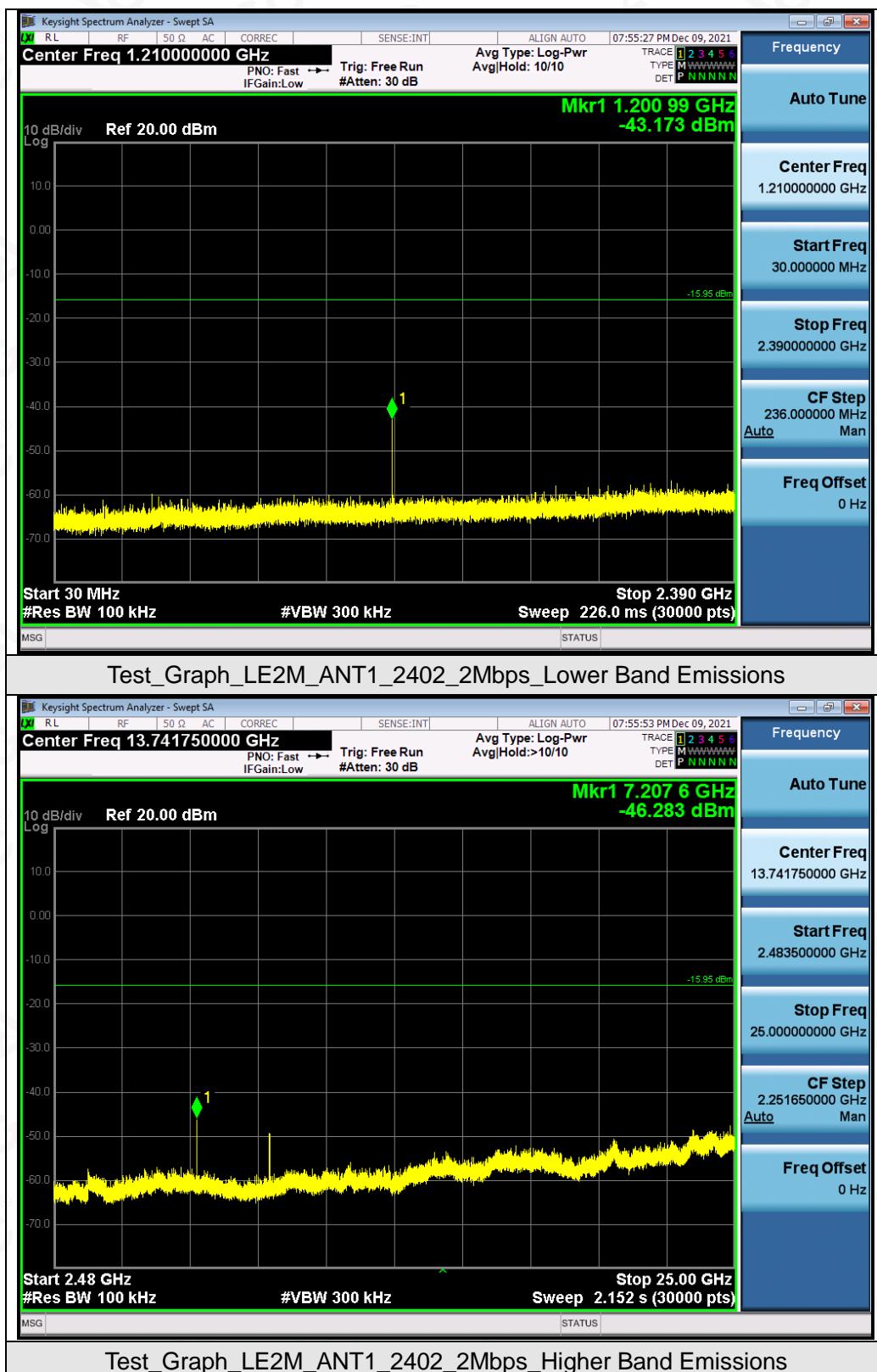
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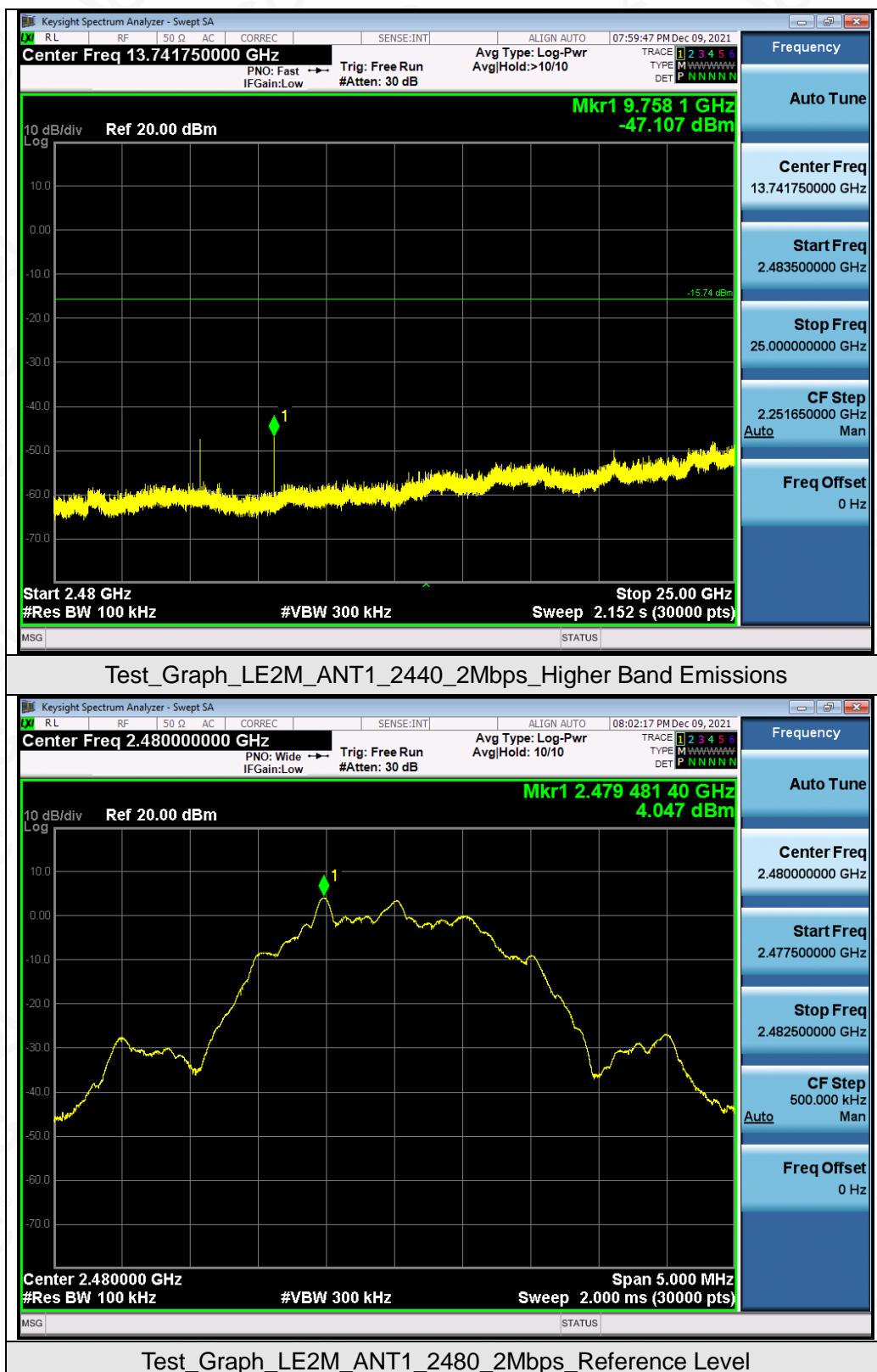
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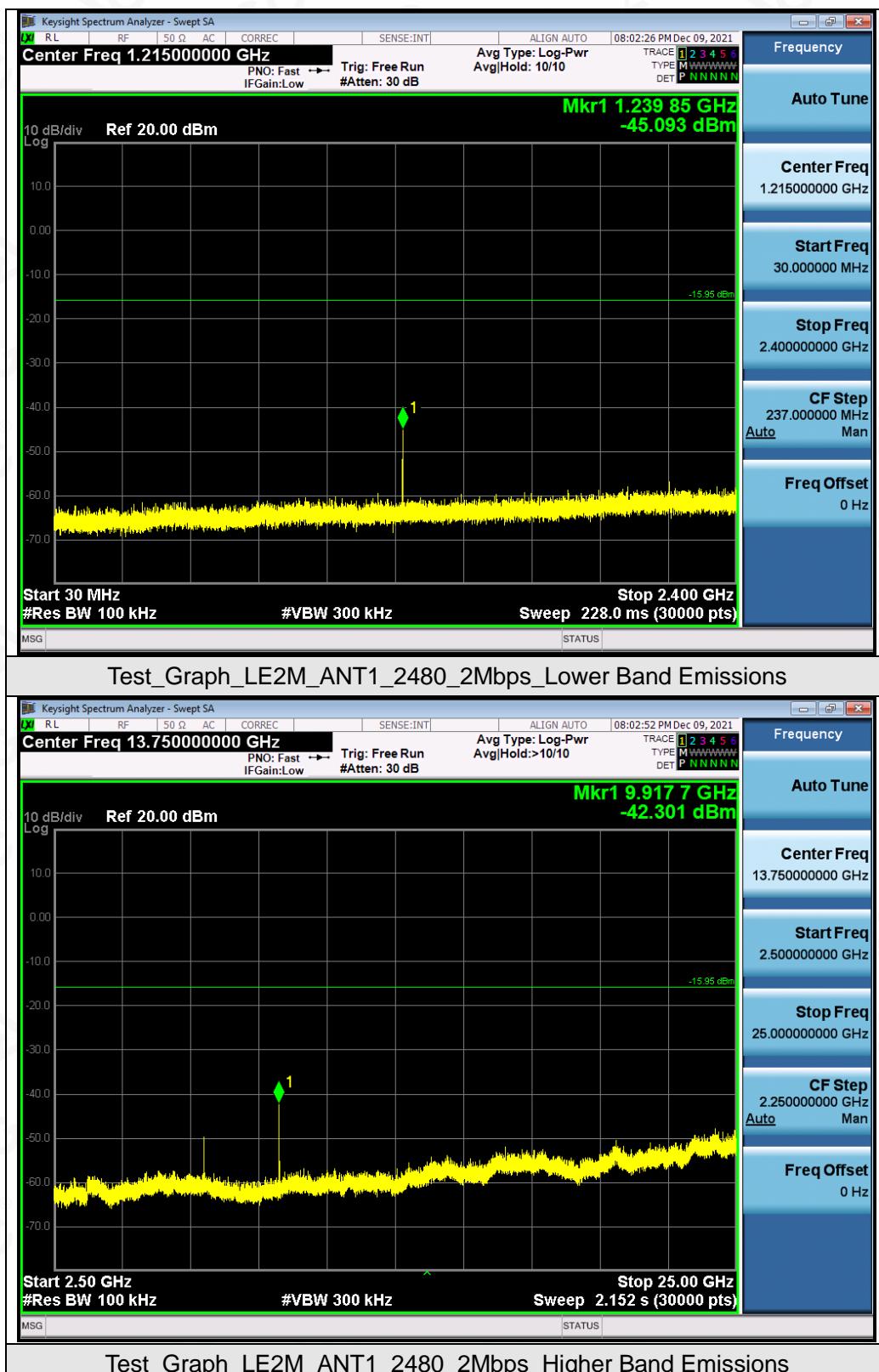
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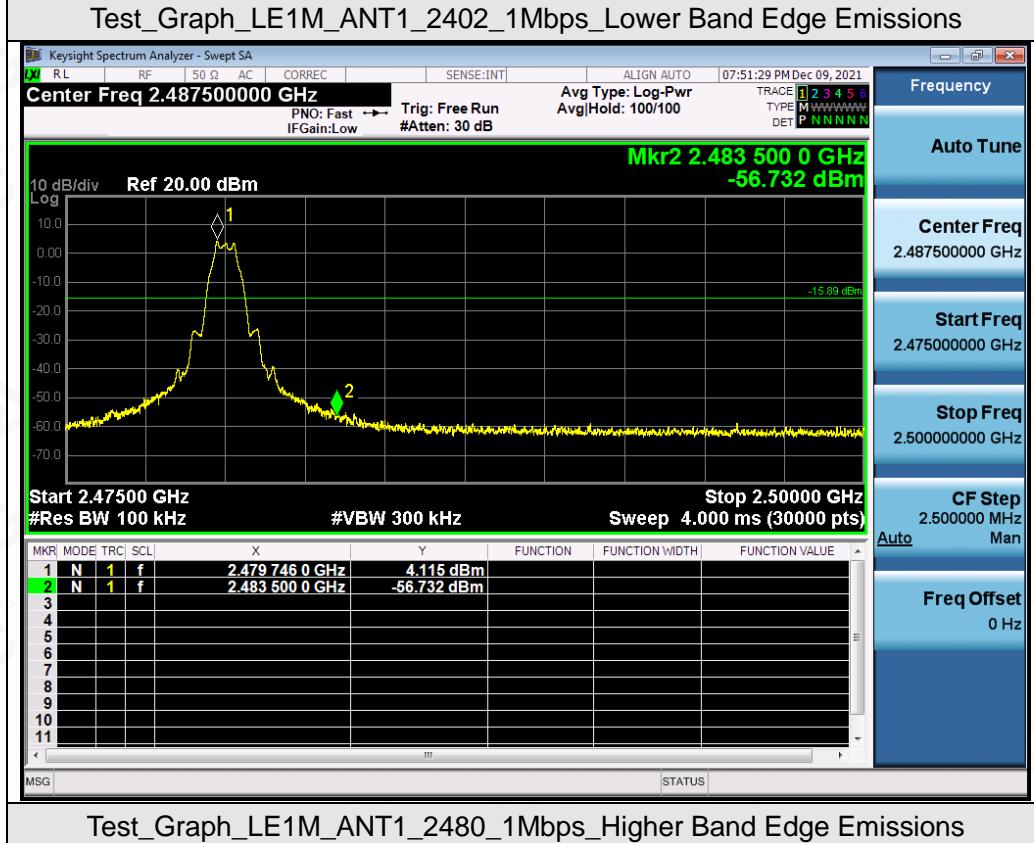
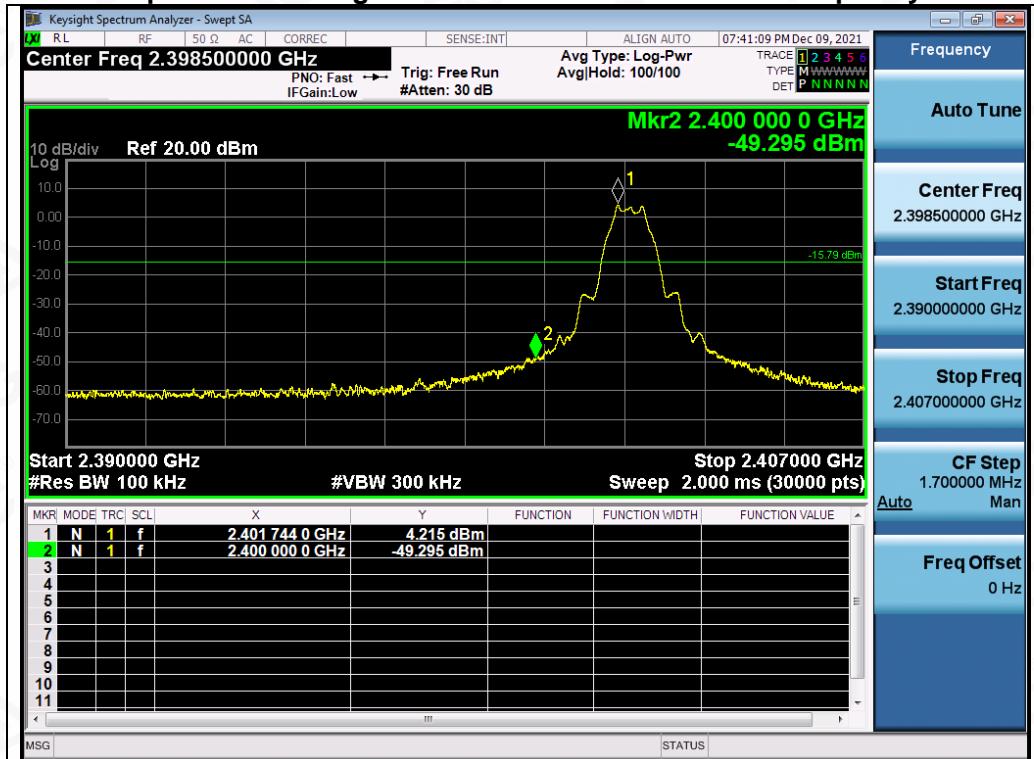
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## Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands



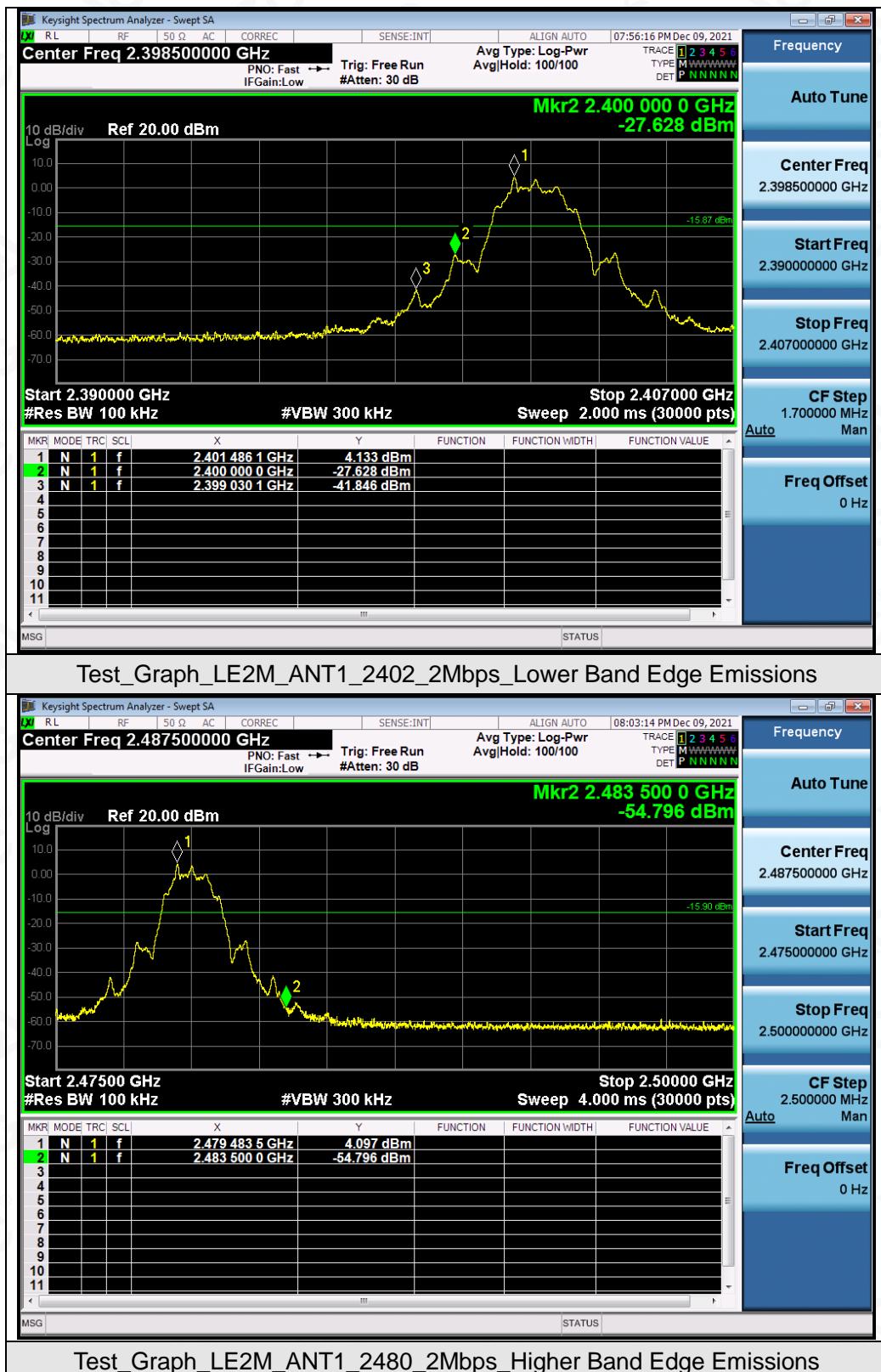
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## 10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

### 10.1. MEASUREMENT PROCEDURE

- (1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (3). Set the SPA Trace 1 Max hold, then View.

Note: The method of PKPSD in the KDB 558074 item 8.4 was used in this testing.

### 10.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 7.2.

### 10.3. MEASUREMENT EQUIPMENT USED

Refer to Section 6.

### 10.4. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power Spectral Density				
Test Mode	Test Channel (MHz)	Power density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail
GFSK 1M	2402	-11.225	≤8	Pass
	2440	-11.040	≤8	Pass
	2480	-11.275	≤8	Pass
GFSK 2M	2402	-14.813	≤8	Pass
	2440	-14.634	≤8	Pass
	2480	-14.977	≤8	Pass

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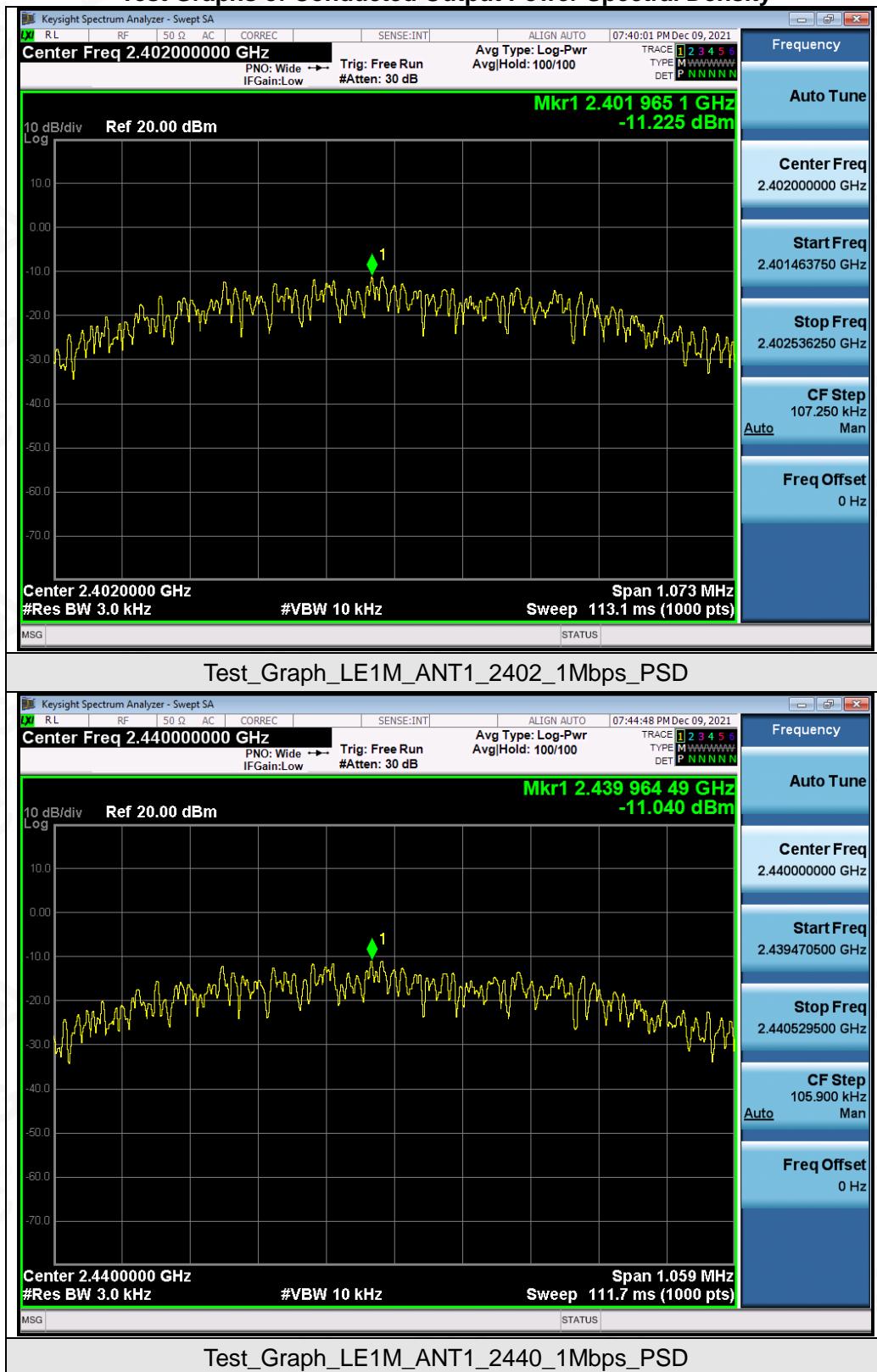
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## Test Graphs of Conducted Output Power Spectral Density



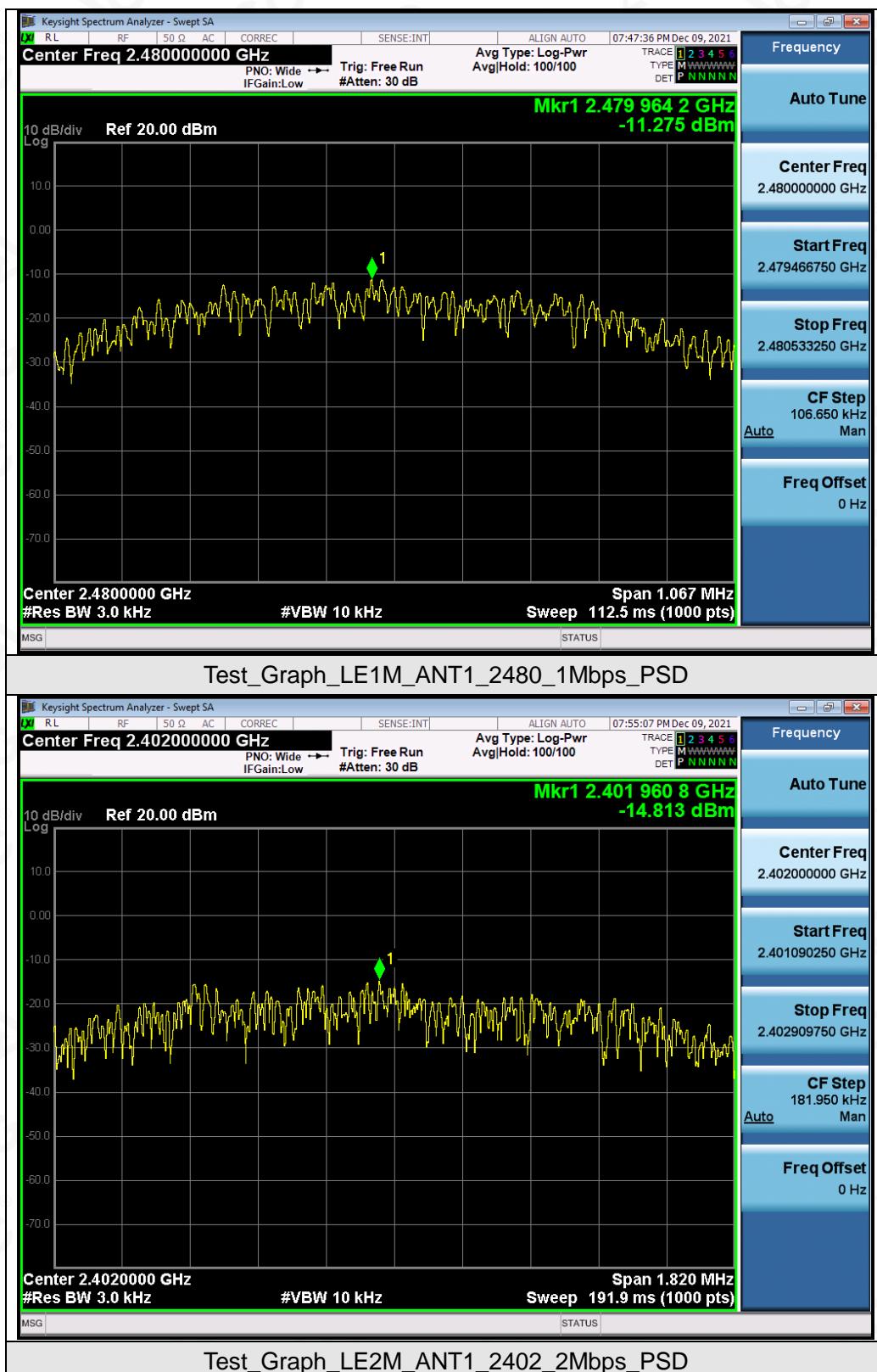
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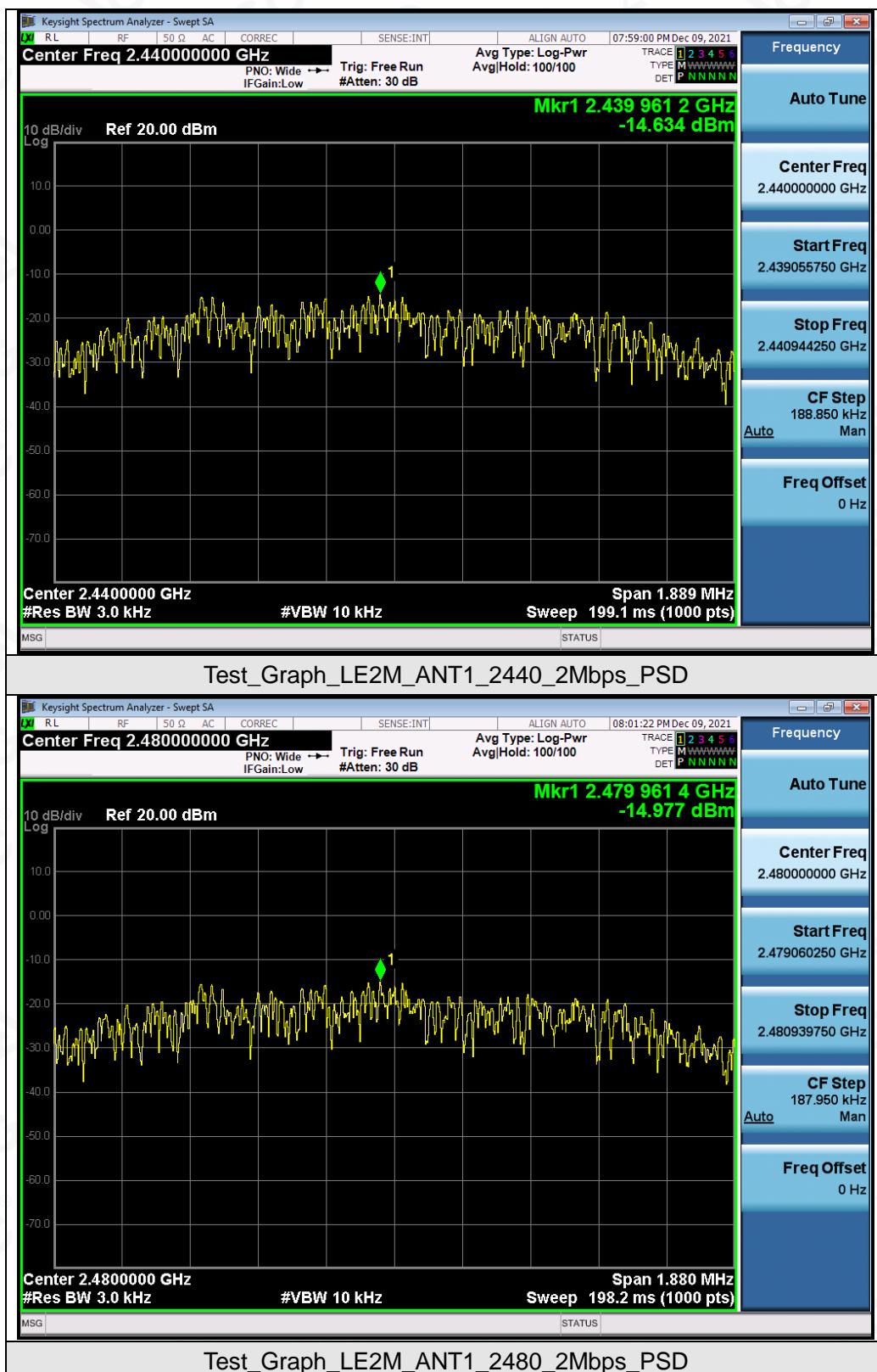
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## 11. RADIATED EMISSION

### 11.1. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

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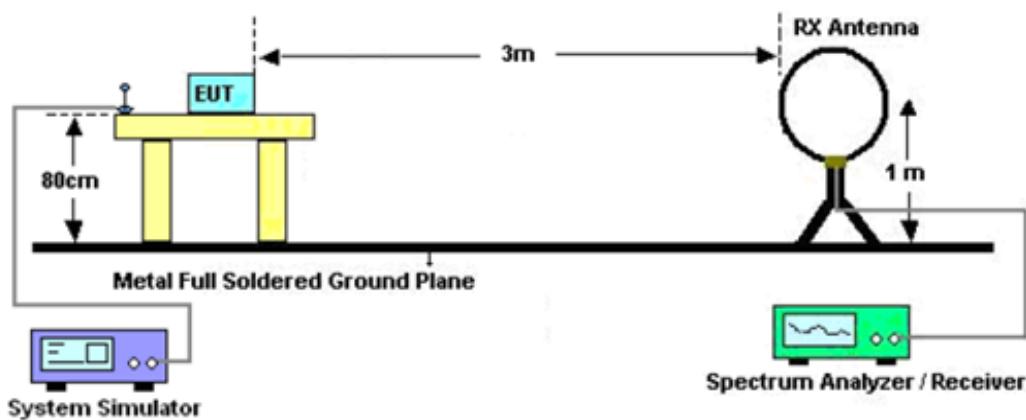
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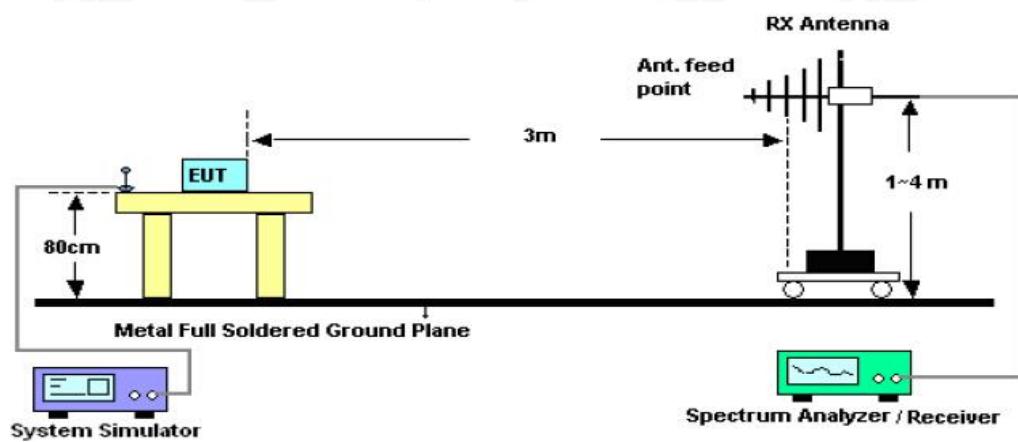


## 11.2. TEST SETUP

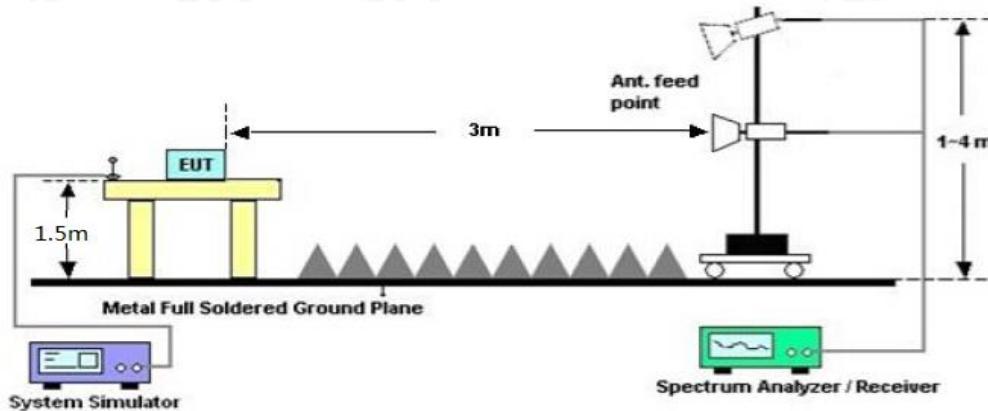
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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**11.3. LIMITS AND MEASUREMENT RESULT**

15.209 Limit in the below table has to be followed

<b>Frequencies (MHz)</b>	<b>Field Strength (microvolts/meter)</b>	<b>Measurement Distance (meters)</b>
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

**11.4. TEST RESULT****Radiated emission below 30MHz**

The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

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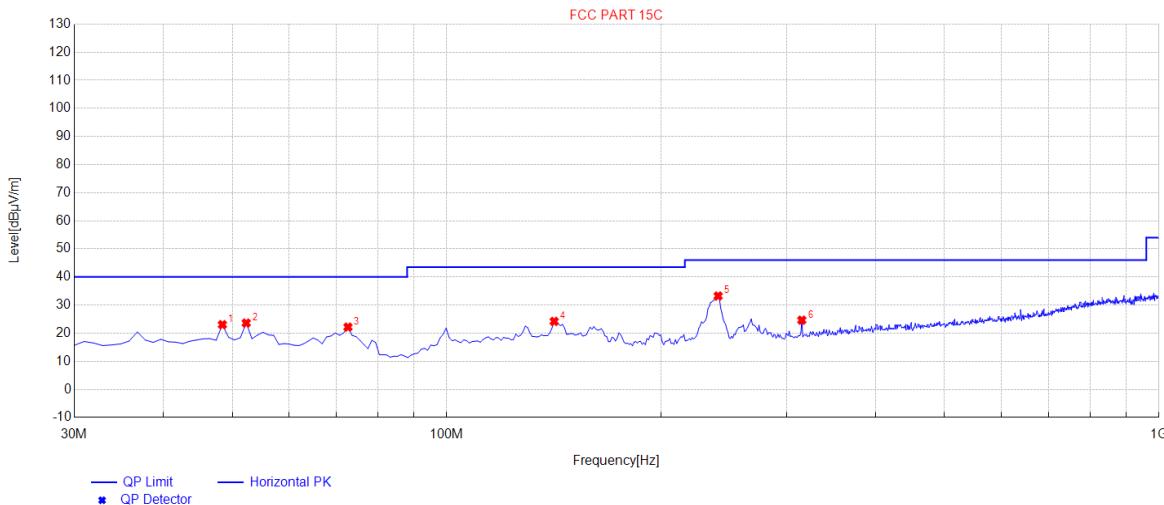
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## Radiated emission from 30MHz to 1000MHz

<b>EUT</b>	Truly Wireless Earbuds	<b>Model Name</b>	One
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	60%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 2	<b>Antenna</b>	Horizontal



NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	48.43	23.03	11.53	40.00	16.97	100	354	Horizontal
2	52.31	23.61	11.49	40.00	16.39	100	215	Horizontal
3	72.68	22.16	8.67	40.00	17.84	100	166	Horizontal
4	141.55	24.19	14.88	43.50	19.31	100	358	Horizontal
5	240.49	33.23	13.67	46.00	12.77	100	283	Horizontal
6	315.18	24.63	15.09	46.00	21.37	100	84	Horizontal

RESULT: PASS

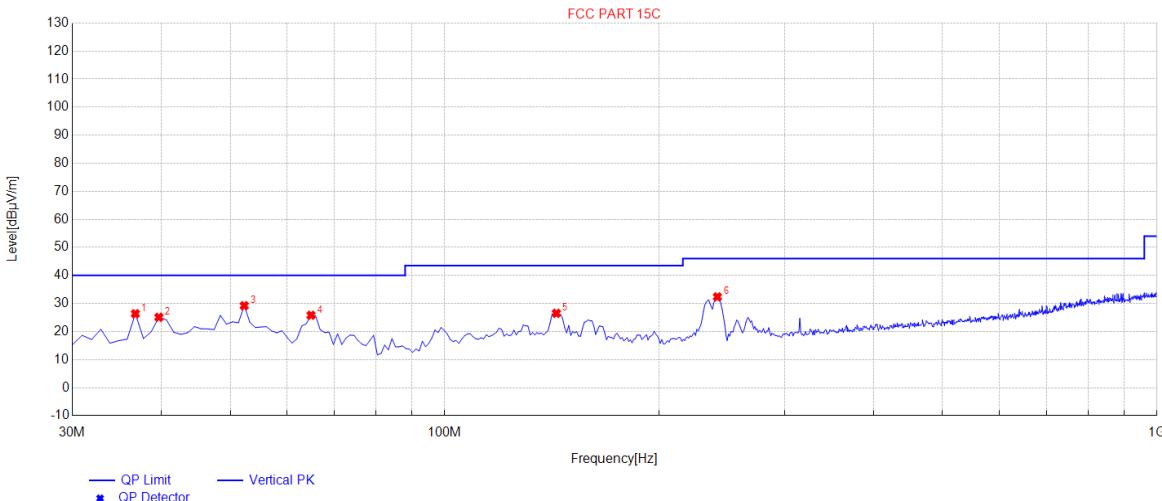
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<b>EUT</b>	Truly Wireless Earbuds	<b>Model Name</b>	One
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	60%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 2	<b>Antenna</b>	Vertical



NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.79	26.35	10.73	40.00	13.65	100	139	Vertical
2	39.7	25.09	10.73	40.00	14.91	100	358	Vertical
3	52.31	29.21	11.49	40.00	10.79	100	309	Vertical
4	64.92	25.80	10.09	40.00	14.20	100	119	Vertical
5	143.49	26.50	14.88	43.50	17.00	100	37	Vertical
6	241.46	32.37	13.71	46.00	13.63	100	6	Vertical

**RESULT: PASS**

**Note:** 1. Factor=Antenna Factor + Cable loss, Margin=Level-Limit.

2. All test modes had been tested. The mode 2 is the worst case and recorded in the report.

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## Radiated emission above 1GHz

<b>EUT</b>	Truly Wireless Earbuds	<b>Model Name</b>	One
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	60%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Value Type
4804.000	45.67	0.08	45.75	74	-28.25	peak
4804.000	35.18	0.08	35.26	54	-18.74	Avg
7206.000	41.91	2.21	44.12	74	-29.88	peak
7206.000	31.54	2.21	33.75	54	-20.25	Avg

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

<b>EUT</b>	Truly Wireless Earbuds	<b>Model Name</b>	One
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	60%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Value Type
4804.000	44.27	0.08	44.35	74	-29.65	peak
4804.000	34.74	0.08	34.82	54	-19.18	Avg
7206.000	40.73	2.21	42.94	74	-31.06	peak
7206.000	30.46	2.21	32.67	54	-21.33	Avg

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

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