
FCC Test Report

Report No.: AGC02390210801FE02

FCC ID : 2ABRU-BLEM215

APPLICATION PURPOSE : Original Equipment

PRODUCT DESIGNATION : BDE Bluetooth 5.2 Low Energy Module

BRAND NAME : BDE

MODEL NAME : BDE-BLEM215

APPLICANT : Guangzhou BDE Technology Inc.

DATE OF ISSUE : Aug. 02, 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	/	Aug. 02, 2022	Valid	Initial Release

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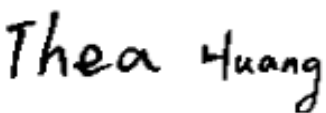


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1. VERIFICATION OF COMPLIANCE

Applicant	Guangzhou BDE Technology Inc.
Address	B2-403, ChuangYi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Manufacturer	Guangzhou BDE Technology Inc.
Address	B2-403, ChuangYi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Factory	Guangzhou BDE Technology Inc.
Address	B2-403, ChuangYi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Product Designation	BDE Bluetooth 5.2 Low Energy Module
Brand Name	BDE
Test Model	BDE-BLEM215
Date of test	Aug. 27, 2021 to Sep. 13, 2021 and Jul. 20, 2022 to Jul. 25, 2022
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	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)	Aug. 02, 2022
Reviewed By		
	Calvin Liu (Reviewer)	Aug. 02, 2022
Approved By		
	Max Zhang (Authorized Officer)	Aug. 02, 2022

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as a “BDE Bluetooth 5.2 Low Energy Module”. 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

Operation Frequency	2.402GHz to 2.480GHz
RF Output Power	GFSK 1Mbps: 3.123dBm (Max) GFSK 2Mbps: 3.128dBm (Max) GFSK 125kbps: 3.104dBm (Max) GFSK 500kbps: 3.023dBm (Max)
Bluetooth Version	V5.2
Modulation	BLE☒GFSK 1Mbps ☒GFSK 2Mbps ☒GFSK 500Kbps ☒GFSK 125Kbps
Number of channels	40 Channels
Antenna Designation	Antenna 1: Rob Antenna (Comply with requirements of the FCC part 15.203) Antenna 2: FPC Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	Antenna 1: 2.87dBi Antenna 2: 3.7dBi
Hardware Version	1.0
Software Version	1.0
Power Supply	DC 3.3V
Note: EUT has two antennas, antenna 1 (Rob) and antenna 2 (FPC). The edge emission of the restricted band of each antenna has been tested and recorded in the report. Among other test items, antenna 2 has been tested and recorded in this report because of the high antenna gain.	

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: 2ABRU-BLEM215** 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.

3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded 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	$U_c = \pm 3.1 \text{ dB}$
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 4.0 \text{ dB}$
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.8 \text{ dB}$
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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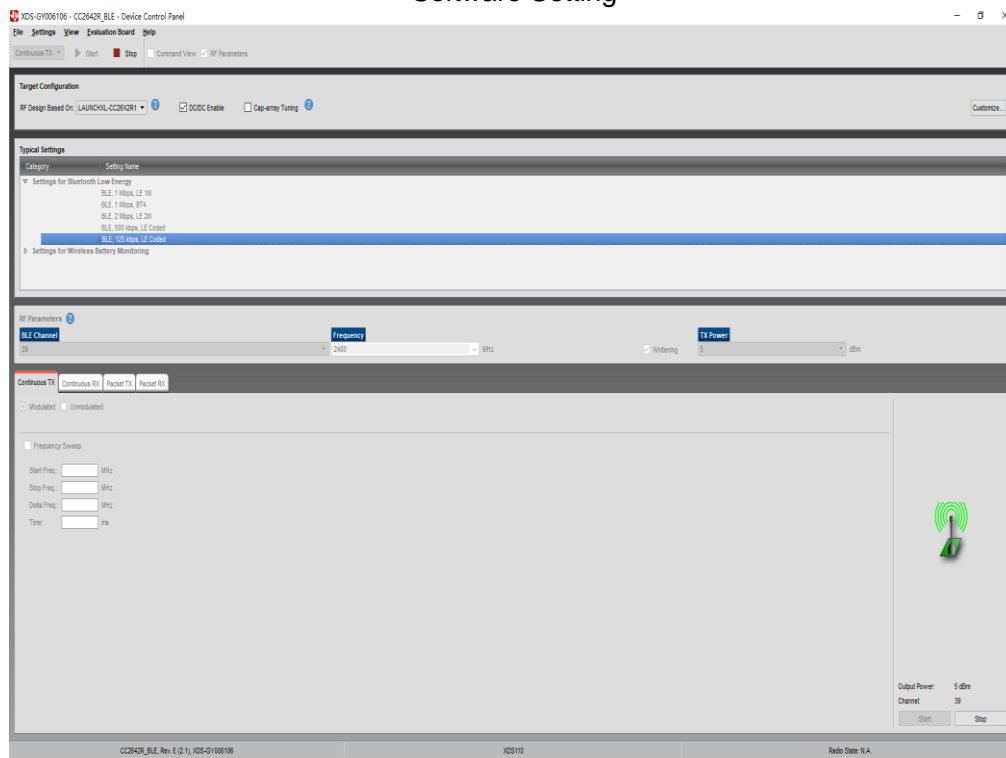
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4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel LE1M_TX_1Mbps
2	Middle channel LE1M_TX_1Mbps
3	High channel LE1M_TX_1Mbps
4	Low channel LE2M_TX_2Mbps
5	Middle channel LE2M_TX_2Mbps
6	High channel LE2M_TX_2Mbps
7	Low channel LE1M_TX_125kbps
8	Middle channel LE1M_TX_125kbps
9	High channel LE1M_TX_125kbps
10	Low channel LE1M_TX_500kbps
11	Middle channel LE1M_TX_500kbps
12	High channel LE1M_TX_500kbps

- 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 manufacture.

Software Setting



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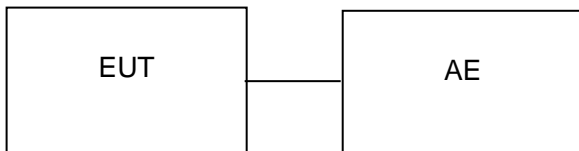
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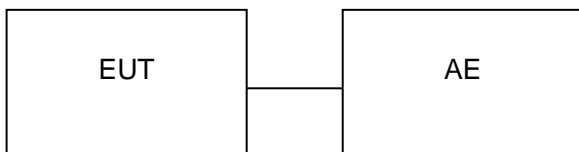
5. SYSTEM TEST CONFIGURATION

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	BDE Bluetooth 5.2 Low Energy Module	BDE-BLEM215	2ABRU-BLEM215	EUT
2	Control Box	USB-TTL	N/A	AE
3	PC Adapter	ADC6501TM	1.5m unshielded	AE
4	PC	16301-01	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	Compliant

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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 CONDUCTED EMISSION TEST (Aug. 27, 2021 to Sep. 13, 2021)

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESPI	101206	May 11, 2021	May 10, 2022
Artificial power network	R&S	ESH2-Z5	100086	Jun. 09, 2021	Jun. 08, 2022
Test Software	FARA	EZ-EMC(Ver. AGC-CON03A1)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST (Aug. 27, 2021 to Sep. 13, 2021)

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESCI	10096	Apr. 14, 2021	Apr. 13, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 07, 2020	Dec. 06, 2021
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.09, 2019	Oct. 08, 2021
Active 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 LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
Wideband Antenna	SCHWARZBECK	VULB9168	VULB9168-494	Jan. 08, 2021	Jan. 07, 2023
Test Software	Tonscend	JS32-RE(Ver.2.5)	N/A	N/A	N/A

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TEST EQUIPMENT OF RADIATED EMISSION TEST (Jul. 20, 2022 to Jul. 25, 2022)

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESCI	10096	Mar. 28, 2022	Mar. 27, 2023
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Nov. 17, 2021	Nov. 16, 2022
Signal Analyzer	Aglient	N9020A	MY52090123	Sep. 06, 2021	Sep. 05, 2022
2.4GHz Filter	EM Electronics	N/A	N/A	Mar. 18, 2022	Mar. 19, 2024
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn Antenna	SCHWARZBEC	BBHA9170	768	Oct. 31, 2021	Oct. 30, 2023
Active Loop Antenna (9K-30Mhz)	ZHINAN	ZN30900C	18051	Mar. 12, 2022	Mar. 11, 2024
Double-Ridged Waveguide Horn	ETS	3117	00034609	Apr. 23, 2021	Apr. 22, 2023
Preamplifier Assembly	ETS	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
Wideband Antenna	SCHWARZBECK	VULB9168	VULB9168-494	Jan. 08, 2021	Jan. 07, 2023
Test Software	Tonscend	JS32-RE(Ver.2.5)	N/A	N/A	N/A

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7. PEAK OUTPUT POWER

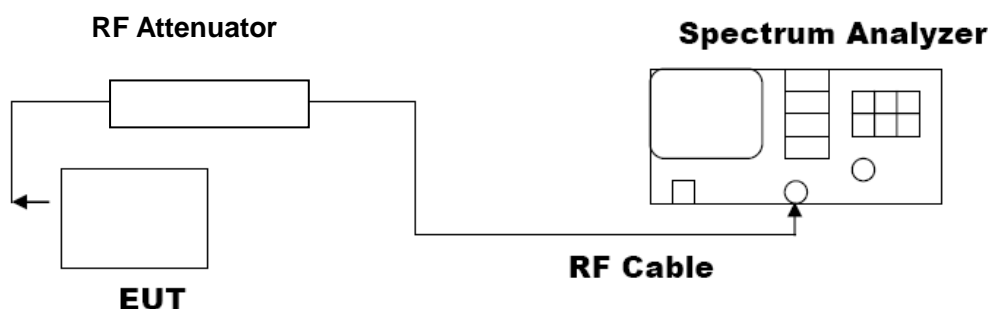
7.1. MEASUREMENT PROCEDURE

For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. $RBW \geq DTS$ bandwidth.
3. $VBW \geq 3 * RBW$.
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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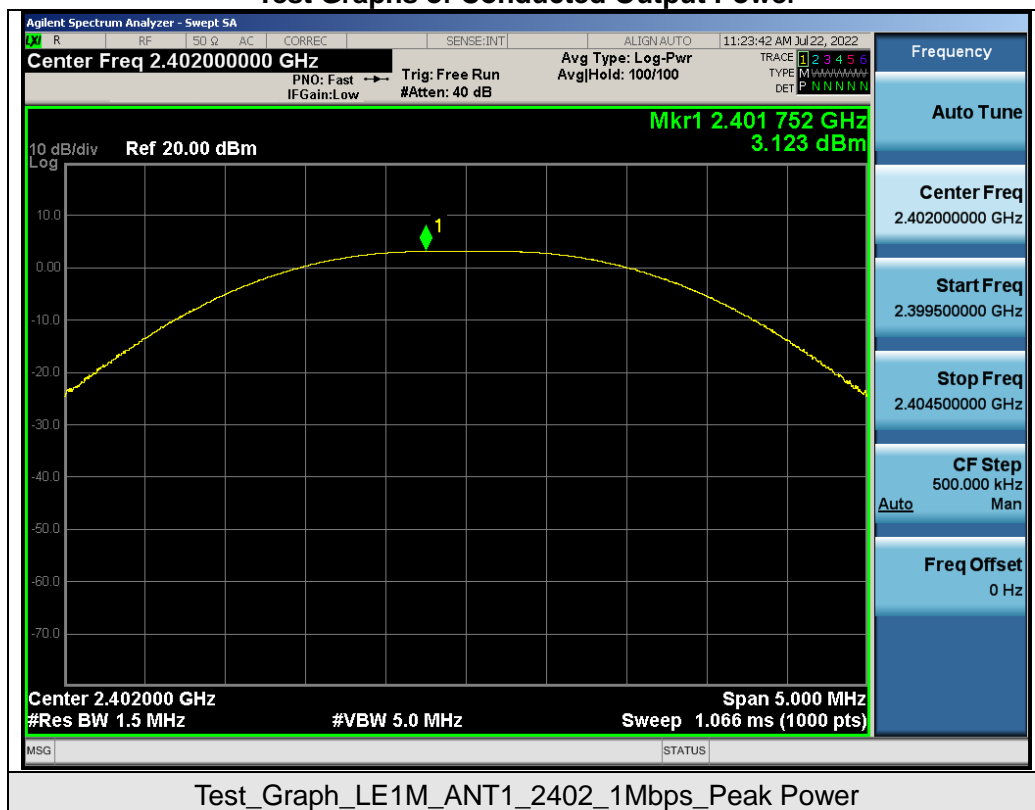
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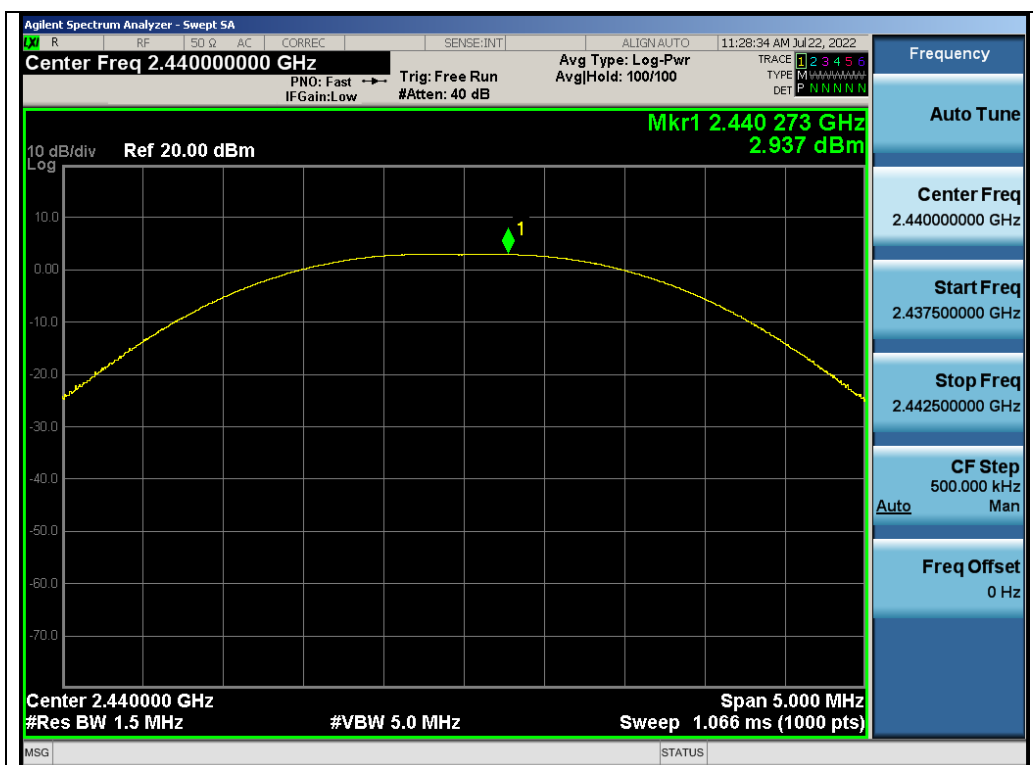
7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power				
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
GFSK 1Mbps	2402	3.123	≤ 30	Pass
	2440	2.937	≤ 30	Pass
	2480	2.610	≤ 30	Pass
GFSK 2Mbps	2402	3.128	≤ 30	Pass
	2440	2.942	≤ 30	Pass
	2480	2.616	≤ 30	Pass
GFSK 125kbps	2402	3.014	≤ 30	Pass
	2440	2.886	≤ 30	Pass
	2480	2.553	≤ 30	Pass
GFSK 500kbps	2402	3.023	≤ 30	Pass
	2440	2.804	≤ 30	Pass
	2480	2.478	≤ 30	Pass

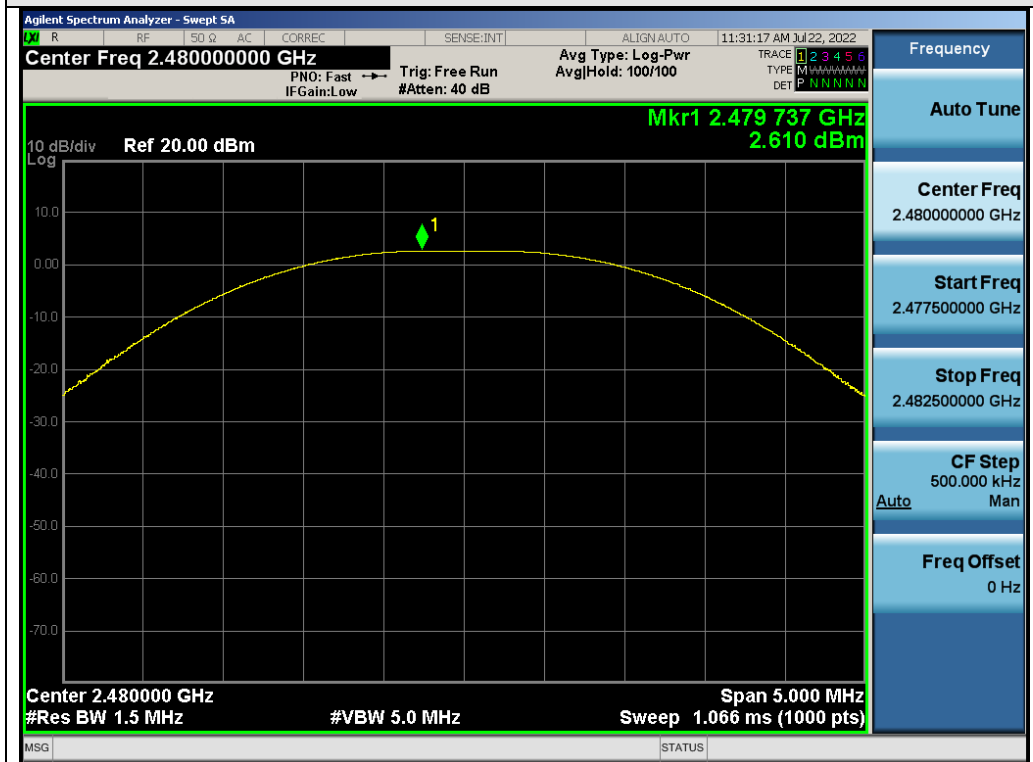
Test Graphs of Conducted Output Power



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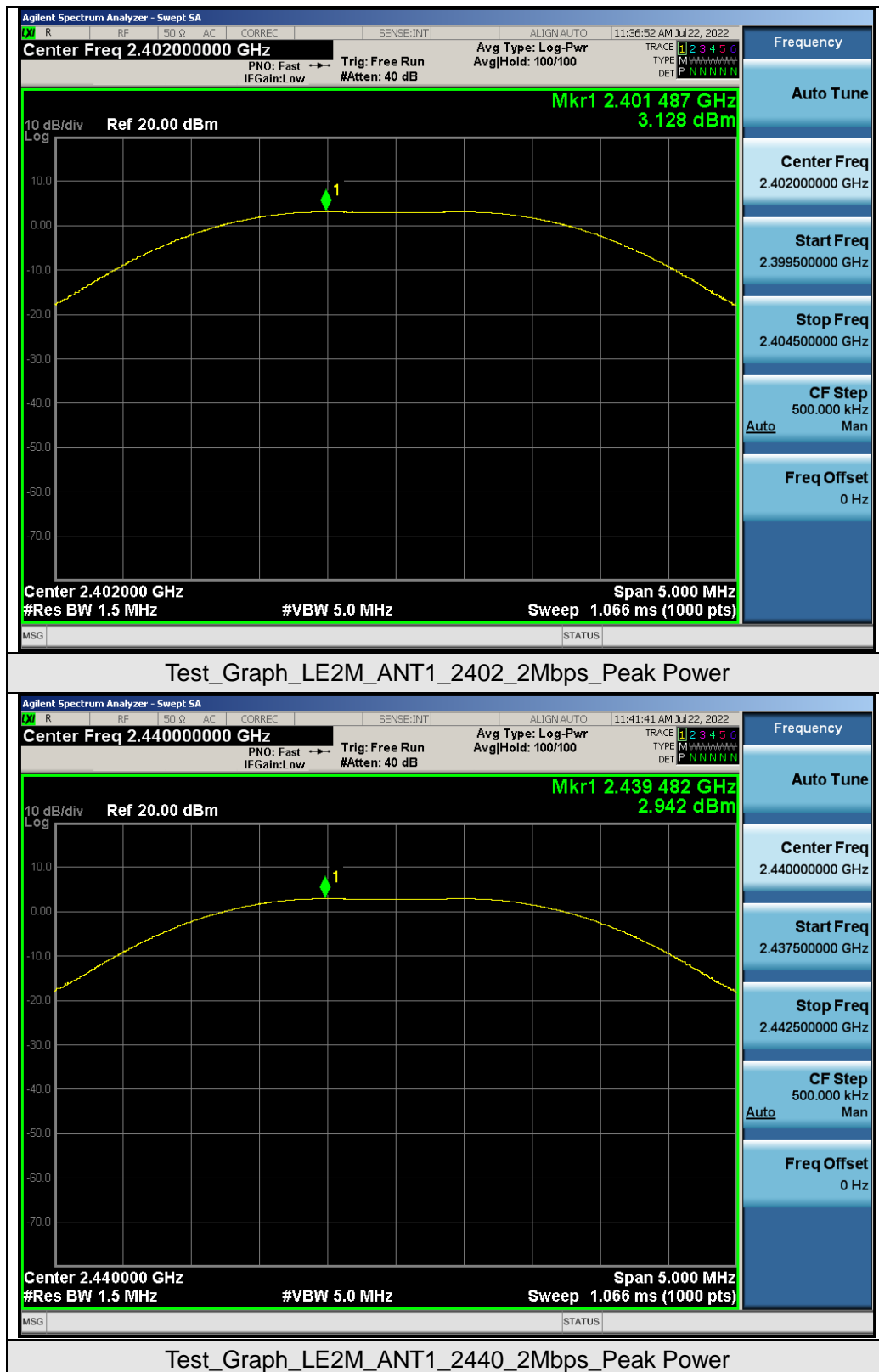


Test_Graph_LE1M_ANT1_2440_1Mbps_Peak Power

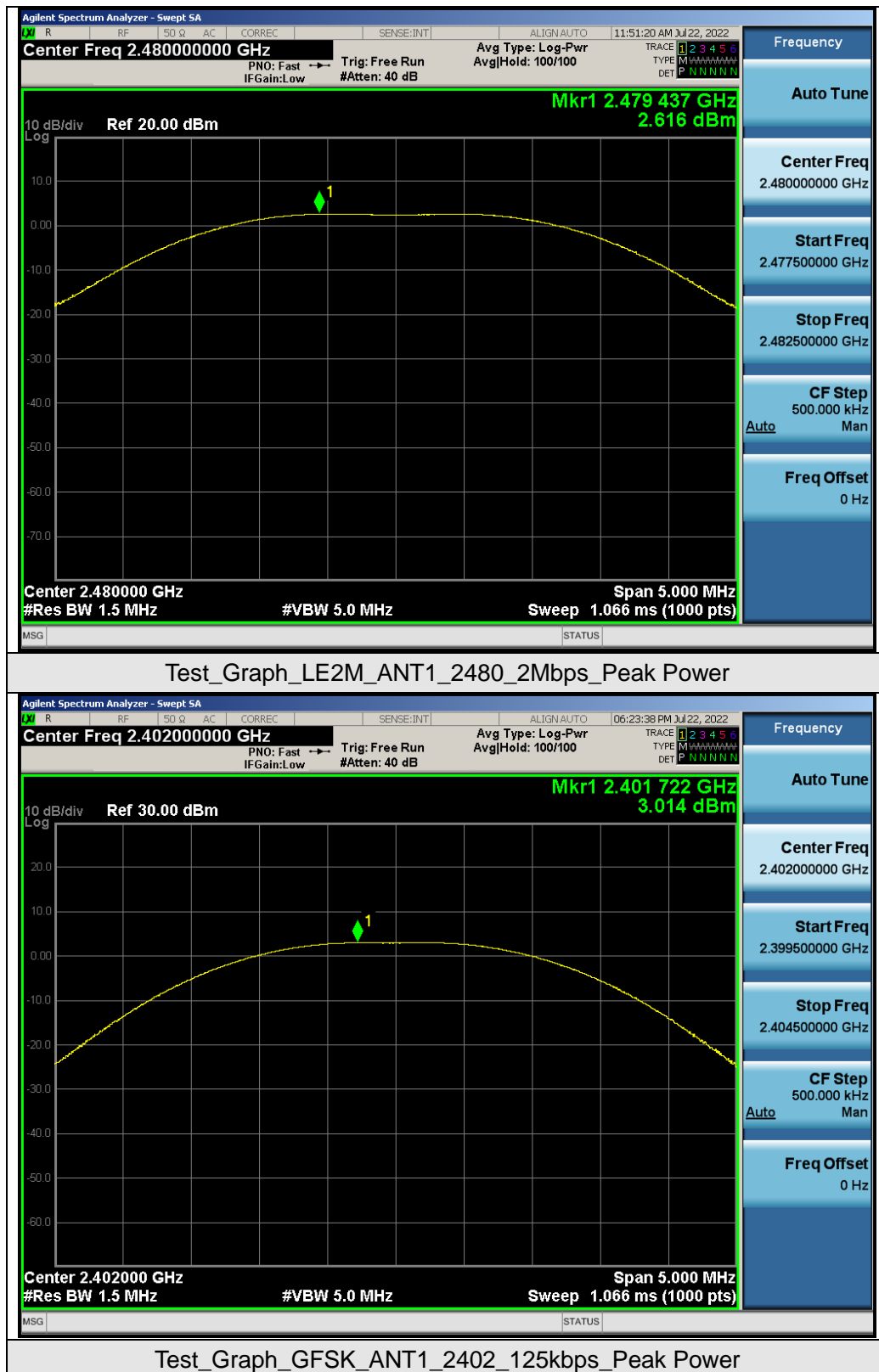


Test_Graph_LE1M_ANT1_2480_1Mbps_Peak Power

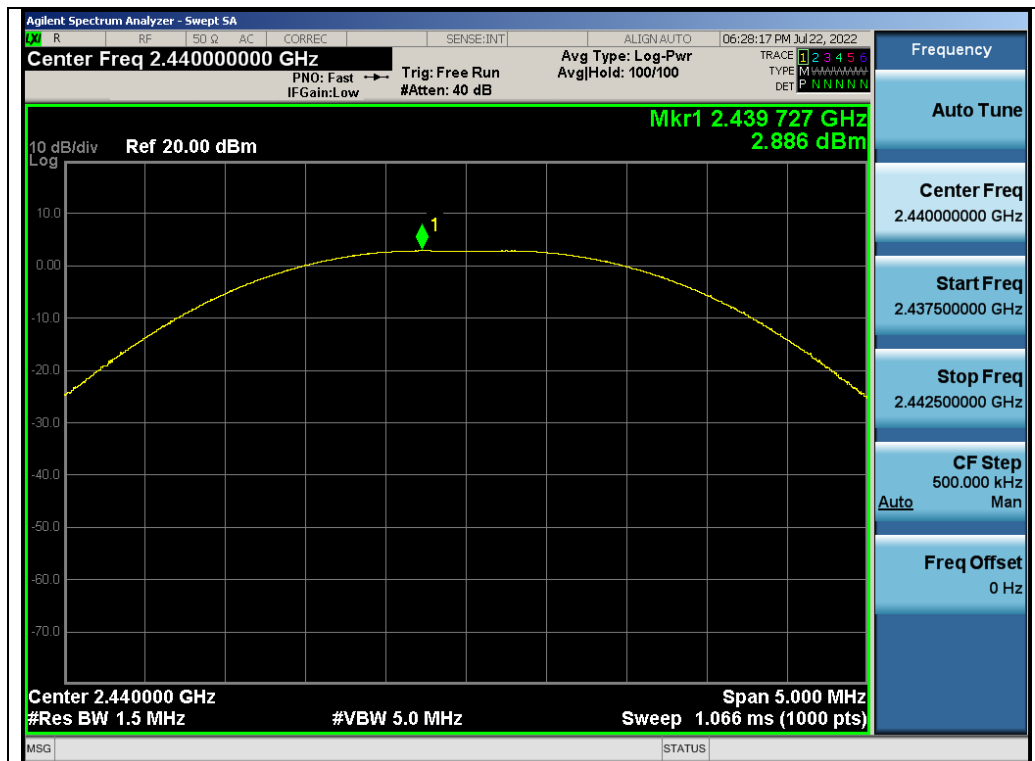
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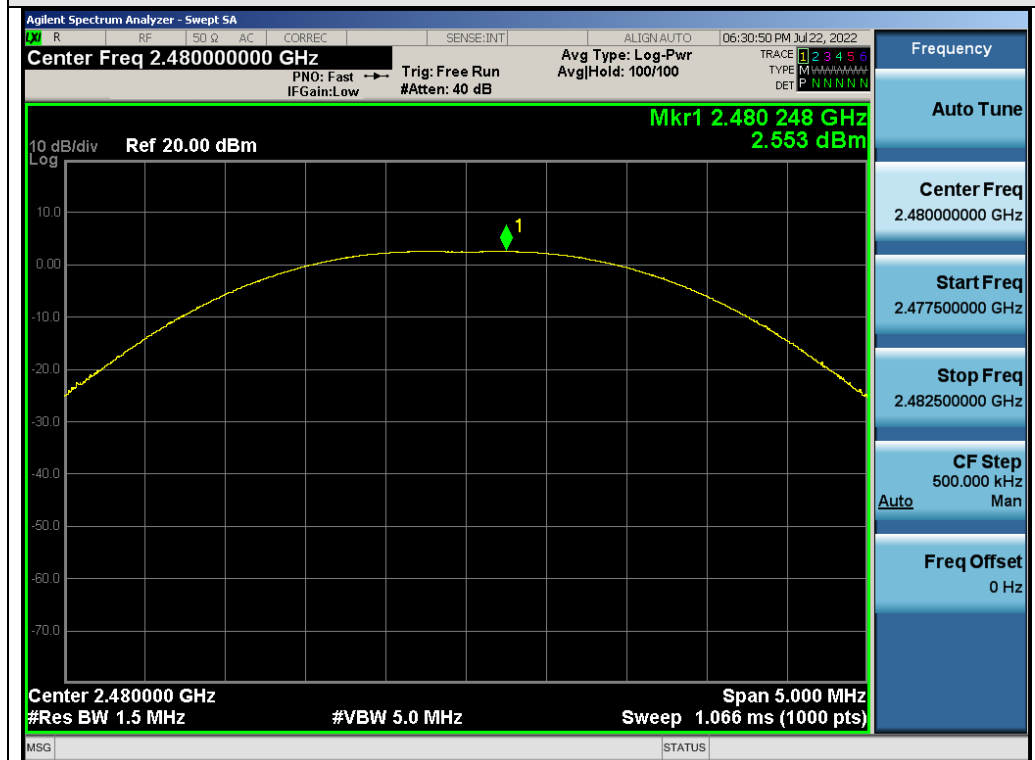
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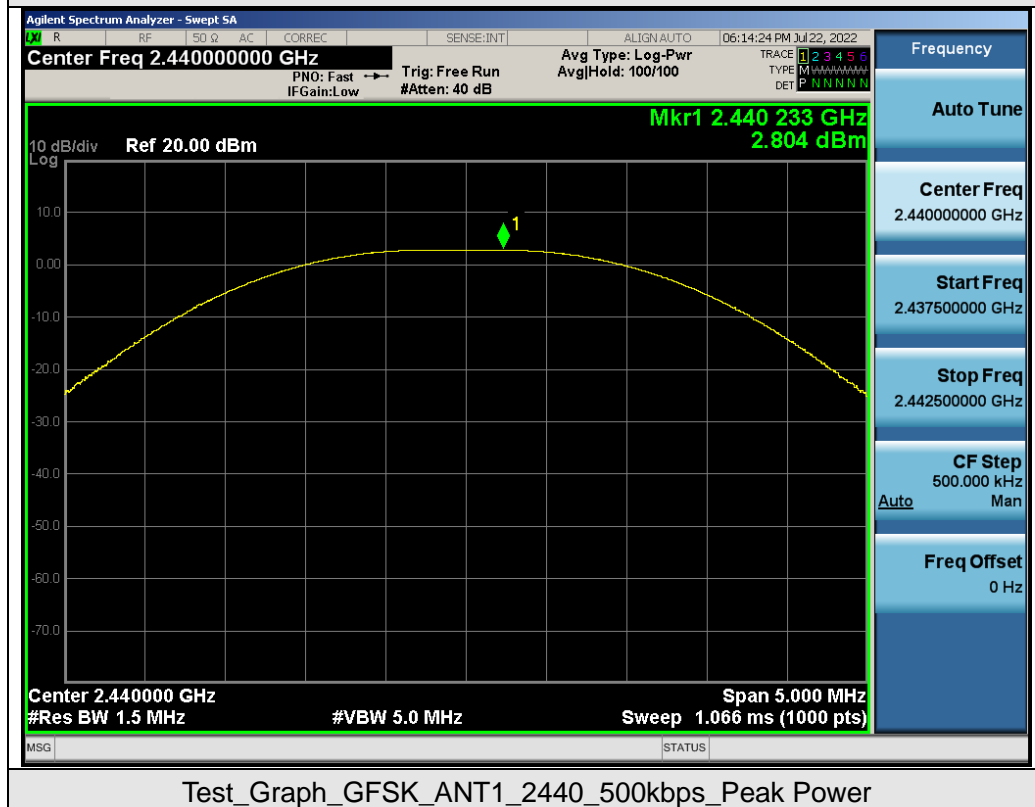
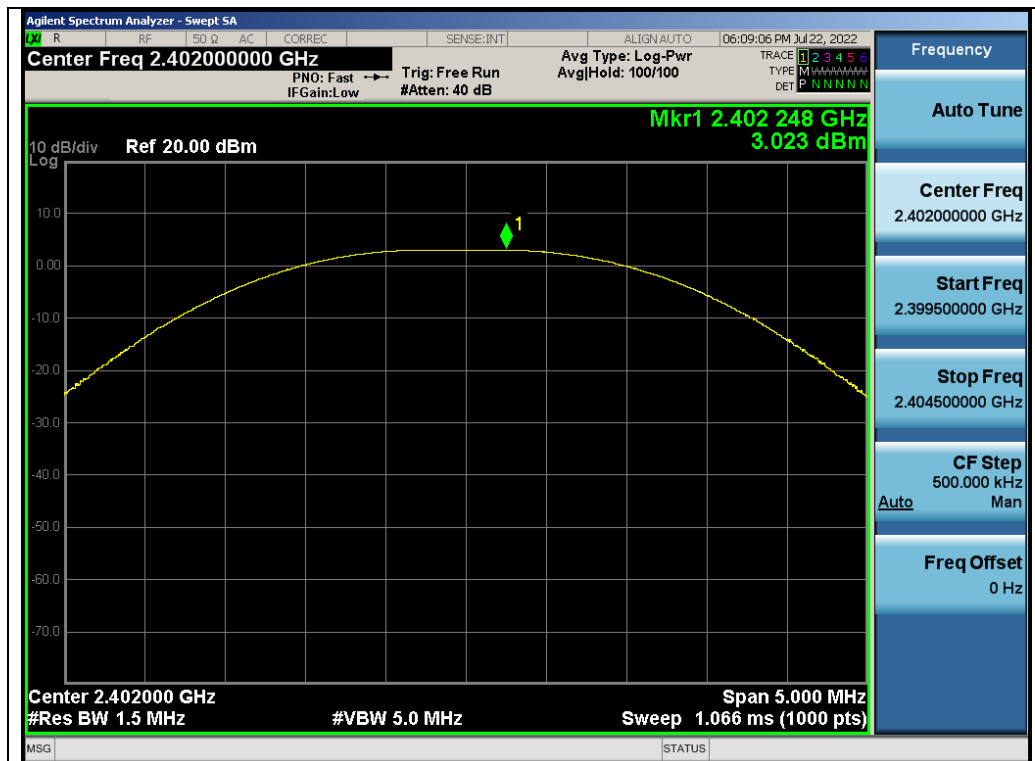


Test_Graph_GFSK_ANT1_2440_125kbps_Peak Power

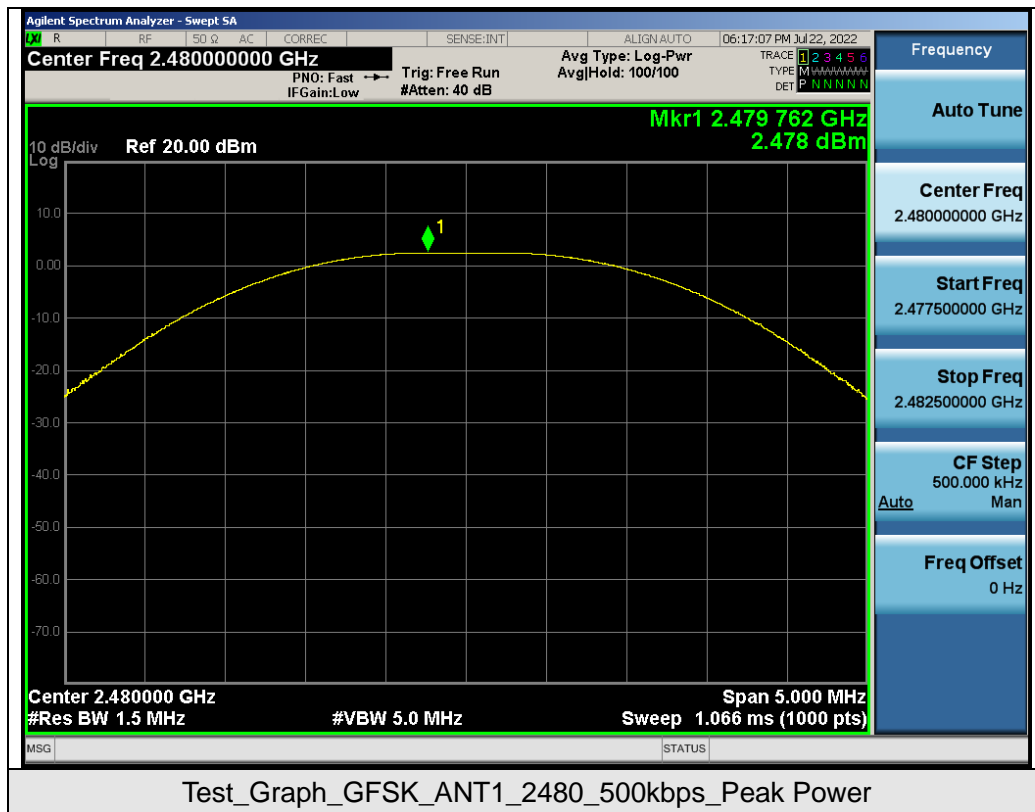


Test_Graph_GFSK_ANT1_2480_125kbps_Peak Power

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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 hopping 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 1Mbps	2402	1.092	0.705	≥ 0.5	Pass
	2440	1.092	0.712	≥ 0.5	Pass
	2480	1.084	0.694	≥ 0.5	Pass
GFSK 2Mbps	2402	2.049	1.401	≥ 0.5	Pass
	2440	2.073	1.237	≥ 0.5	Pass
	2480	2.063	1.354	≥ 0.5	Pass
GFSK 125kbps	2402	1.107	0.728	≥ 0.5	Pass
	2440	1.106	0.732	≥ 0.5	Pass
	2480	1.097	0.706	≥ 0.5	Pass
GFSK 500kbps	2402	1.067	0.674	≥ 0.5	Pass
	2440	1.094	0.708	≥ 0.5	Pass
	2480	1.081	0.681	≥ 0.5	Pass

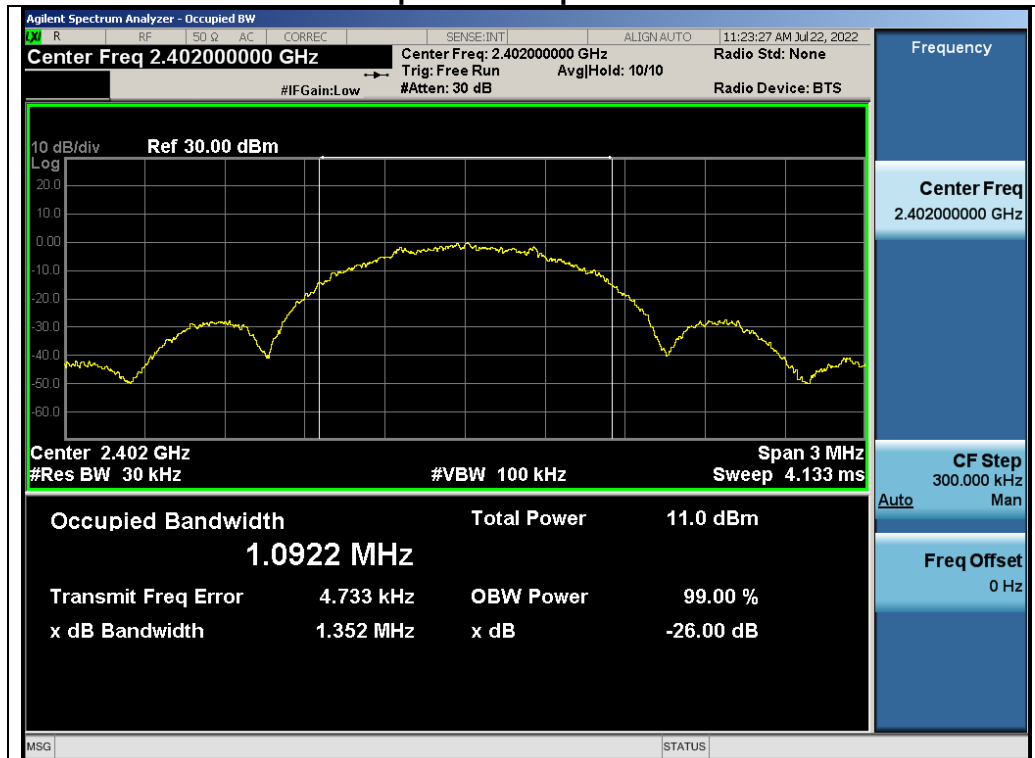
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Test Graphs of Occupied Bandwidth



Test_Graph_LE1M_ANT1_2402_1Mbps_OBW

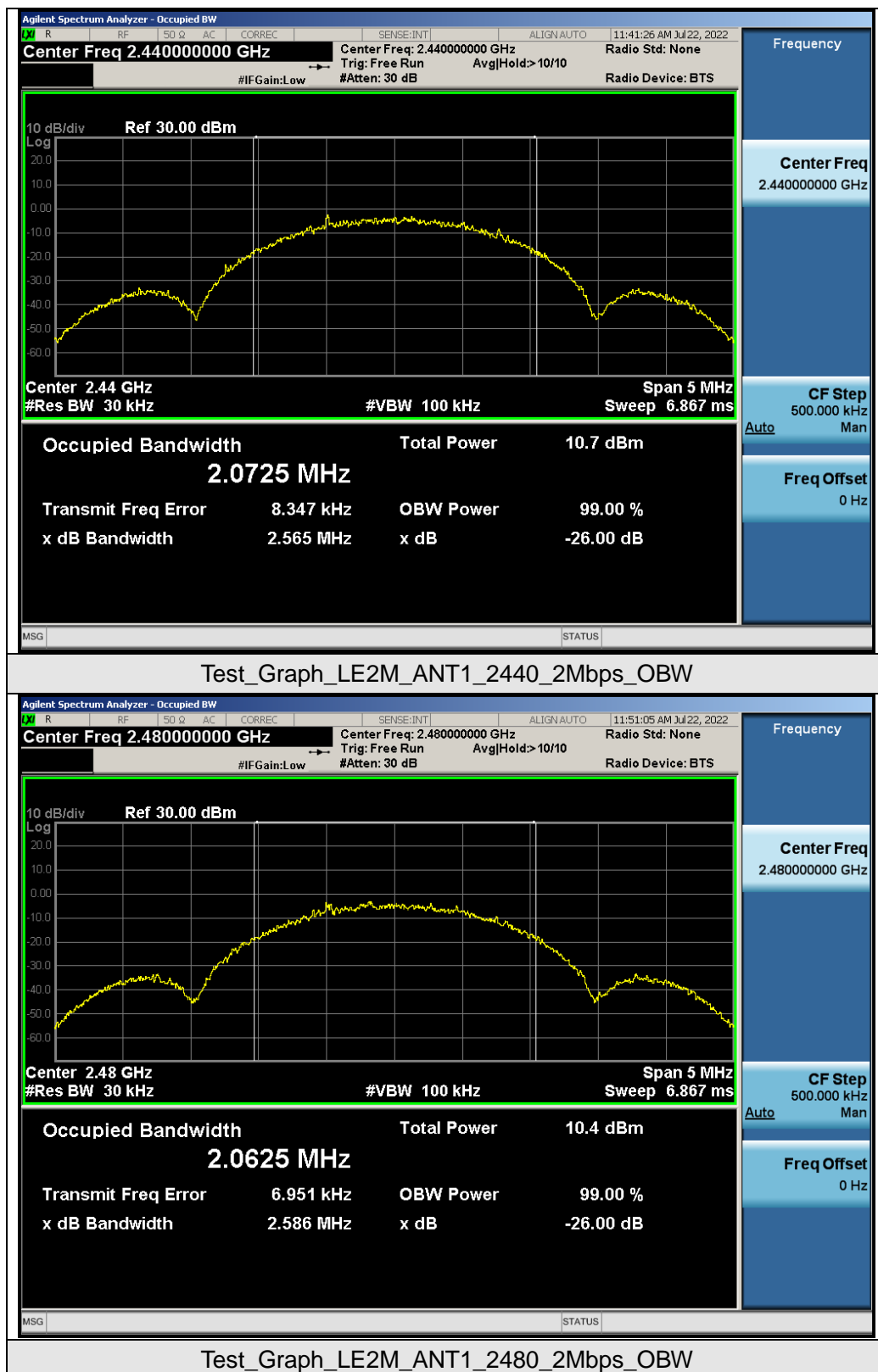


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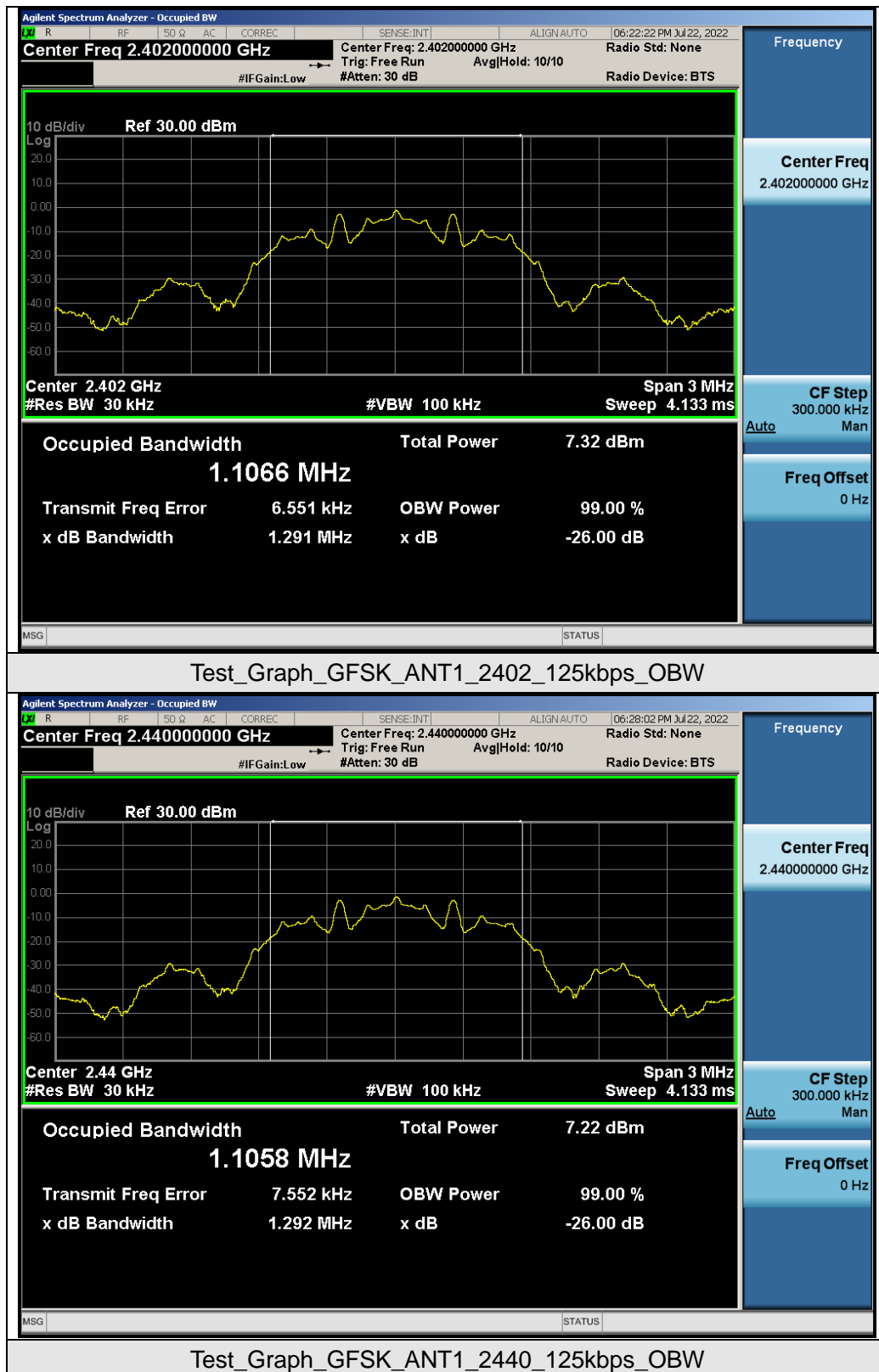
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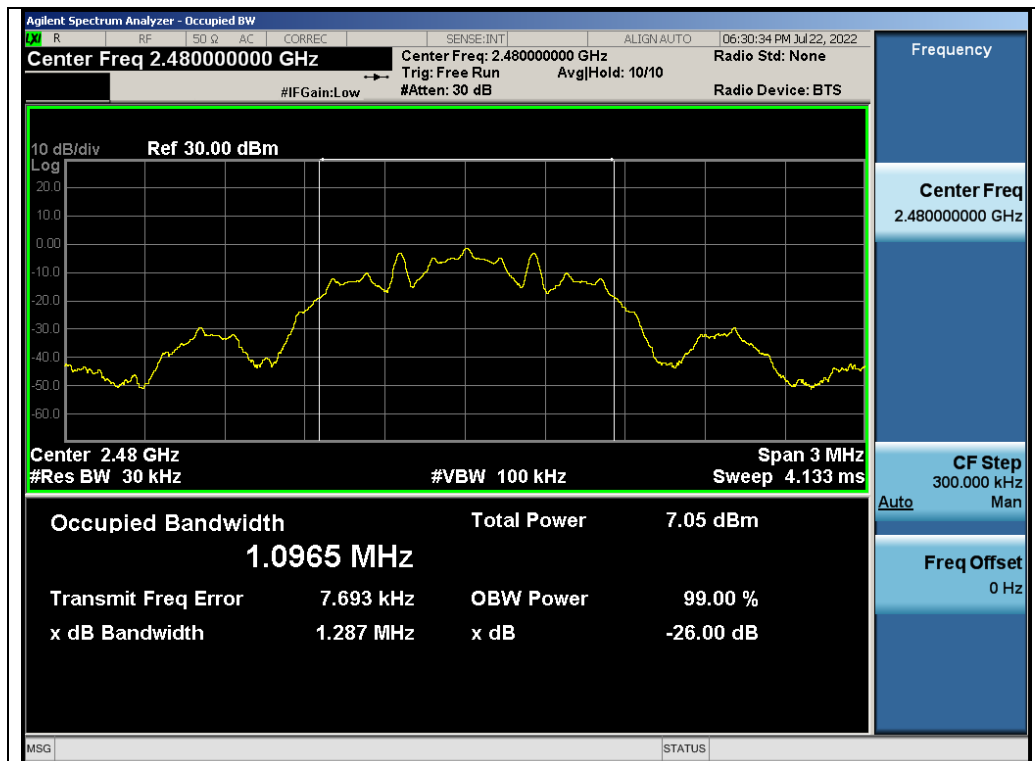
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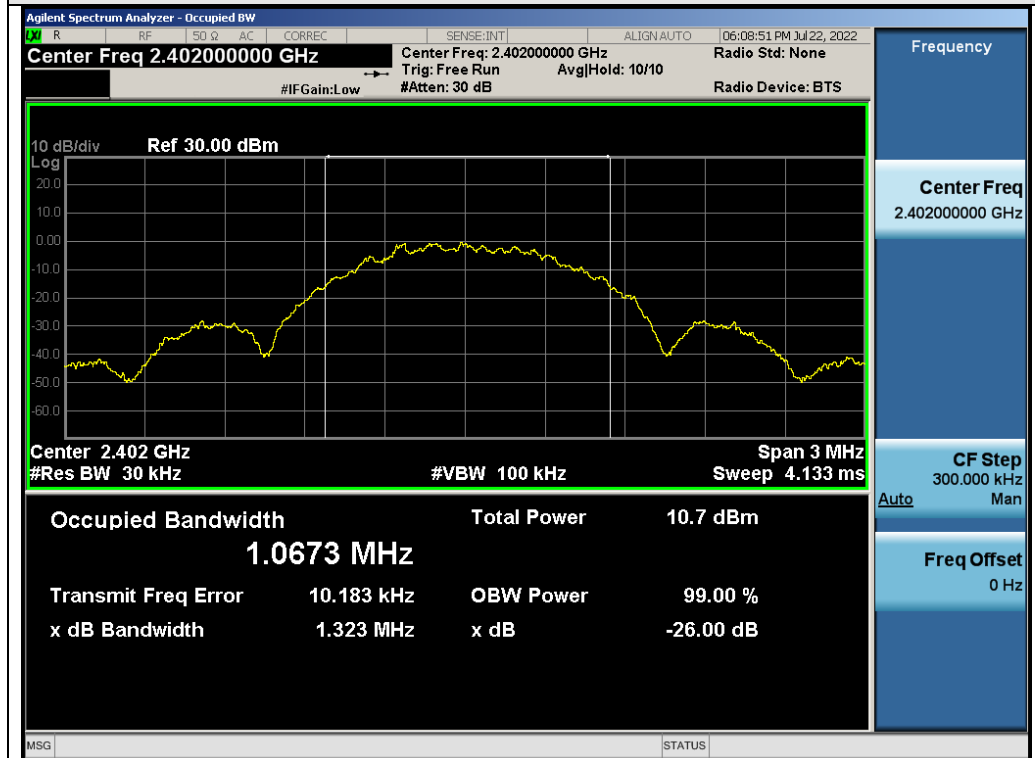
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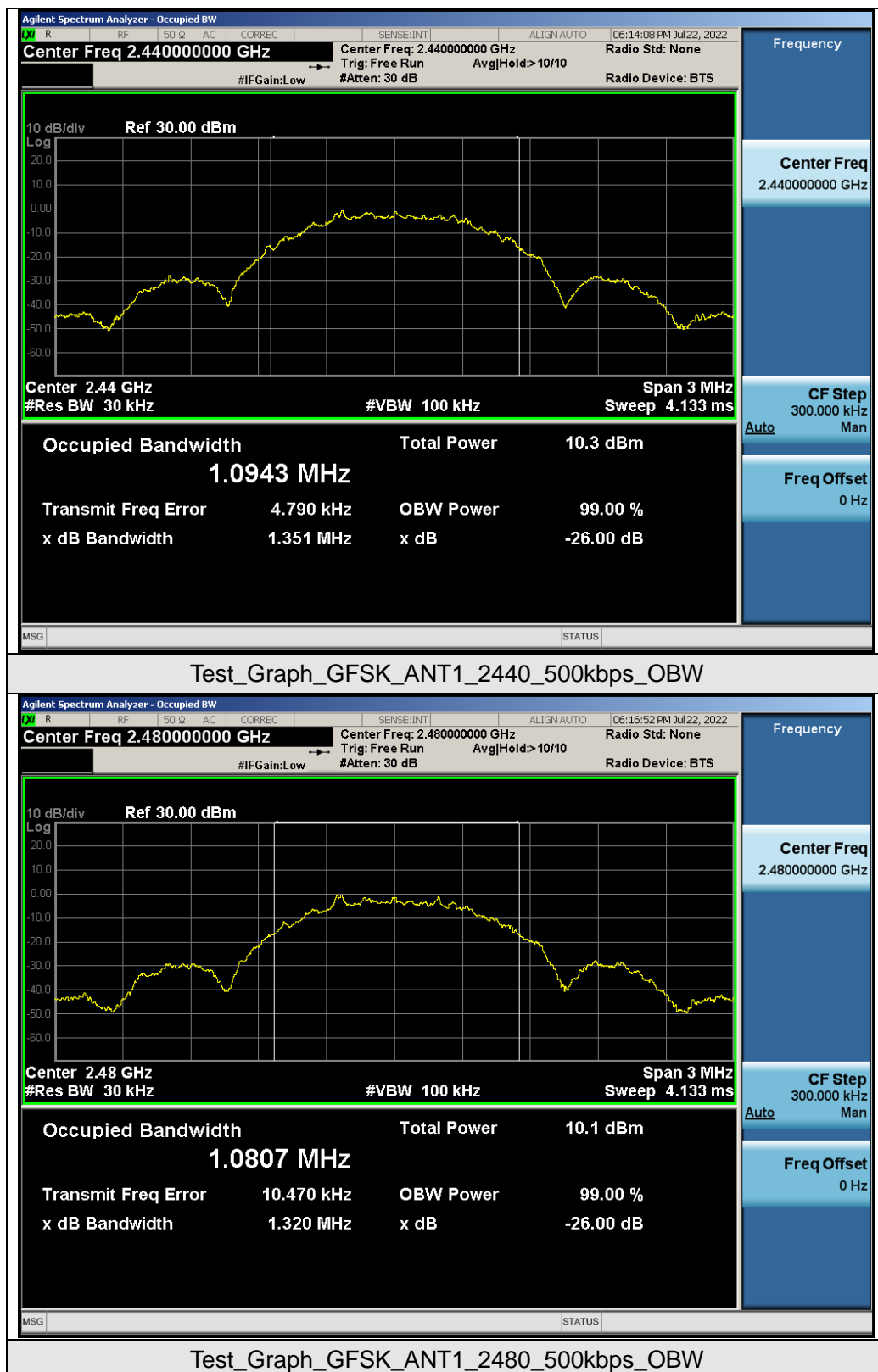


Test_Graph_GFSK_ANT1_2480_125kbps_OBW



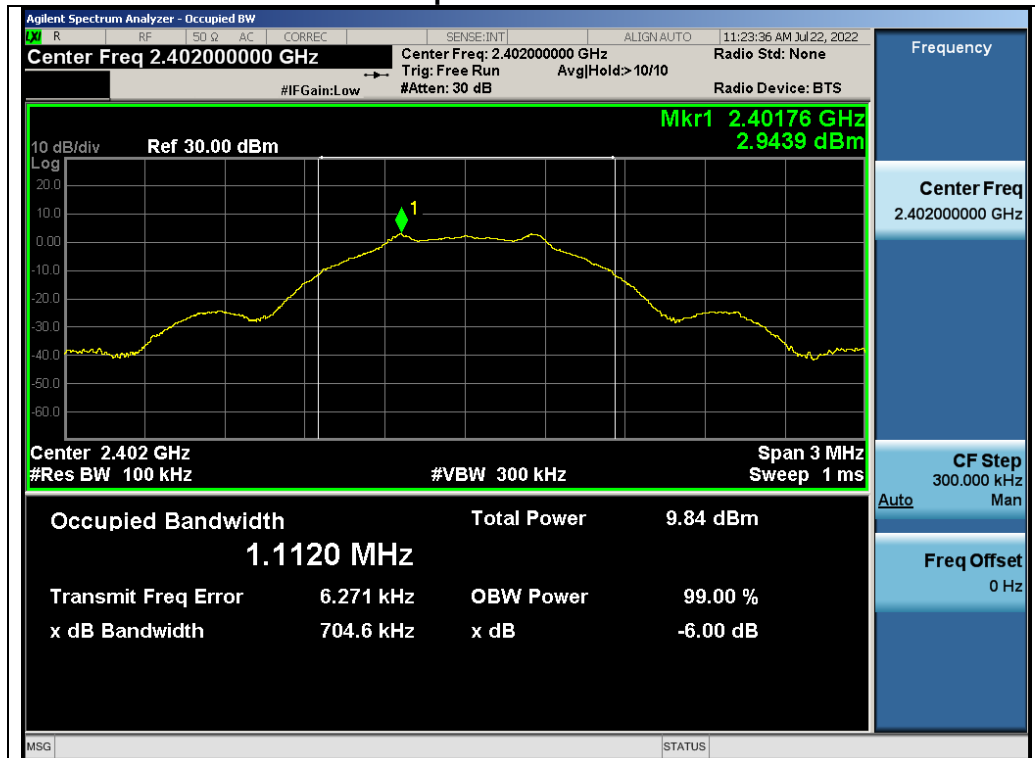
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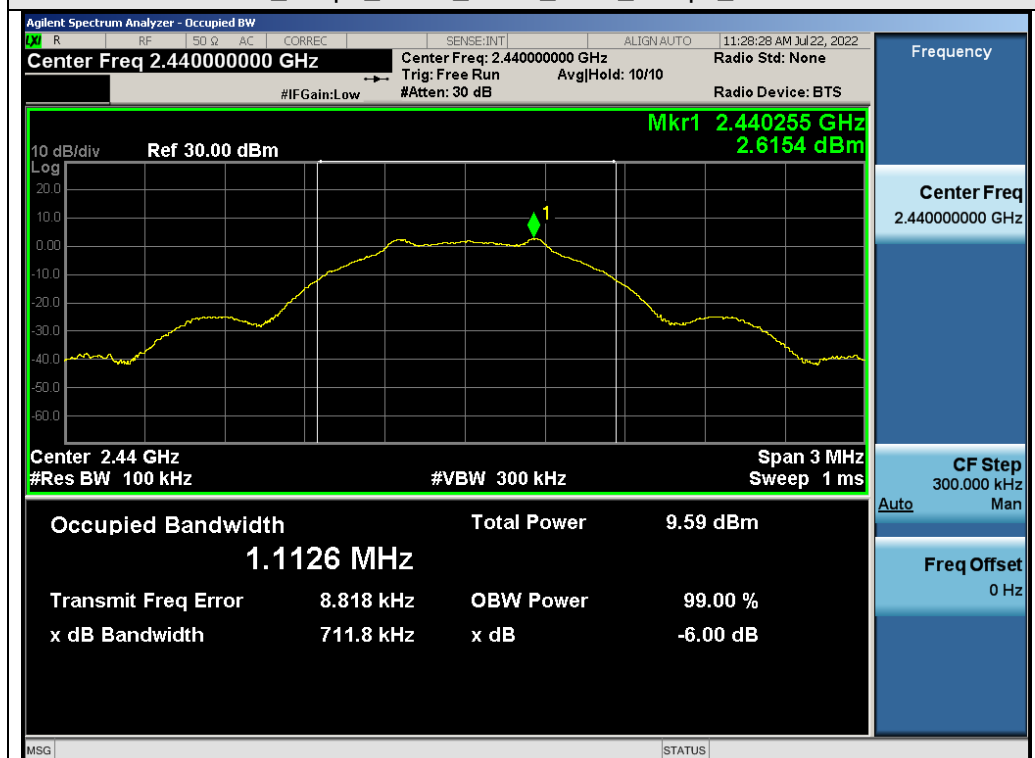


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Test Graphs of DTS Bandwidth



Test_Graph_LE1M_ANT1_2402_1Mbps_DTSBW



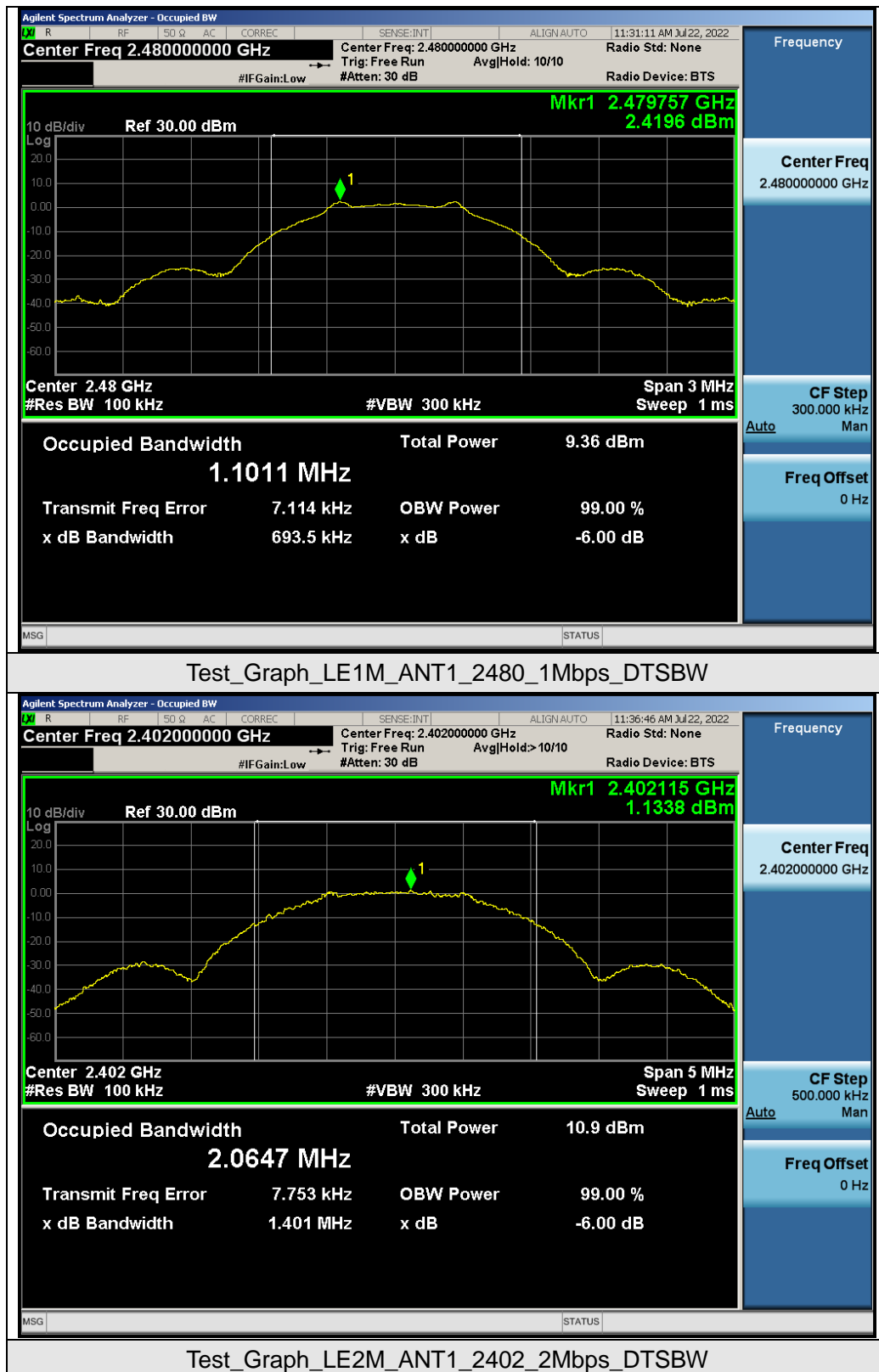
Test_Graph_LE1M_ANT1_2440_1Mbps_DTSBW

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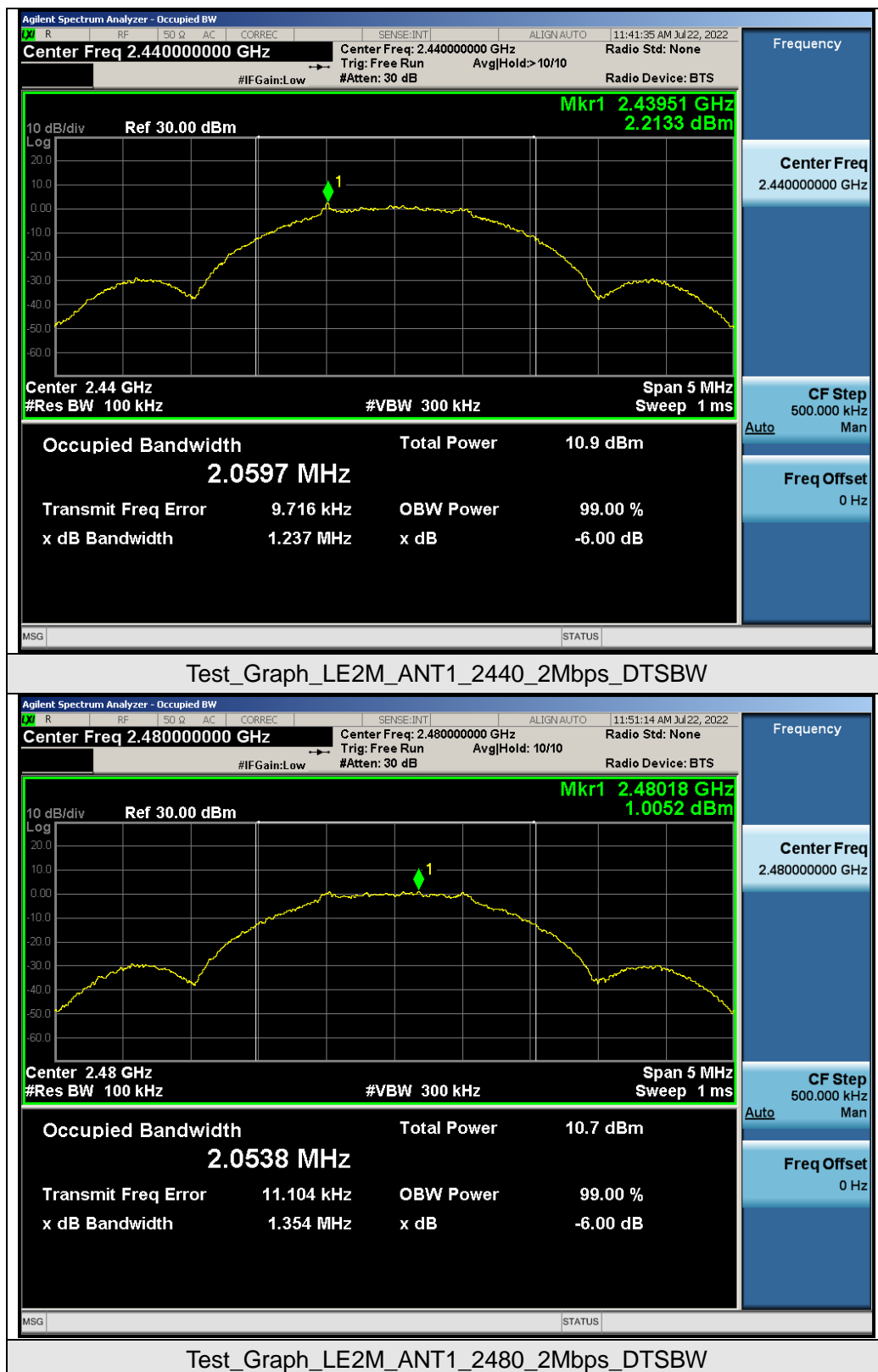
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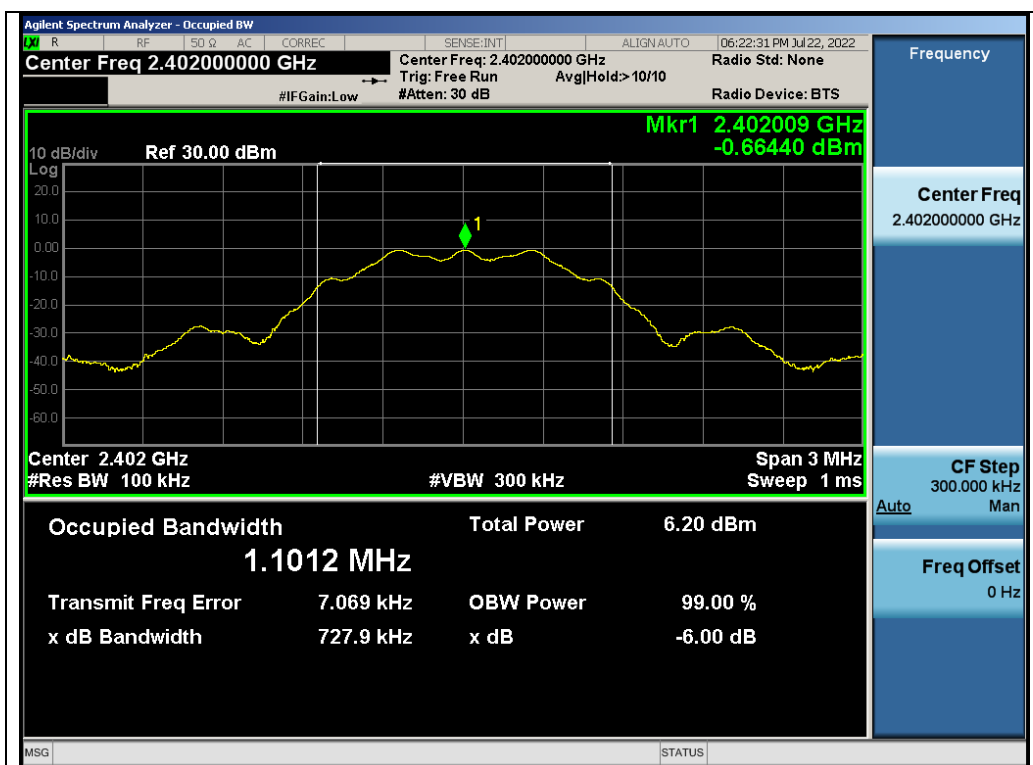
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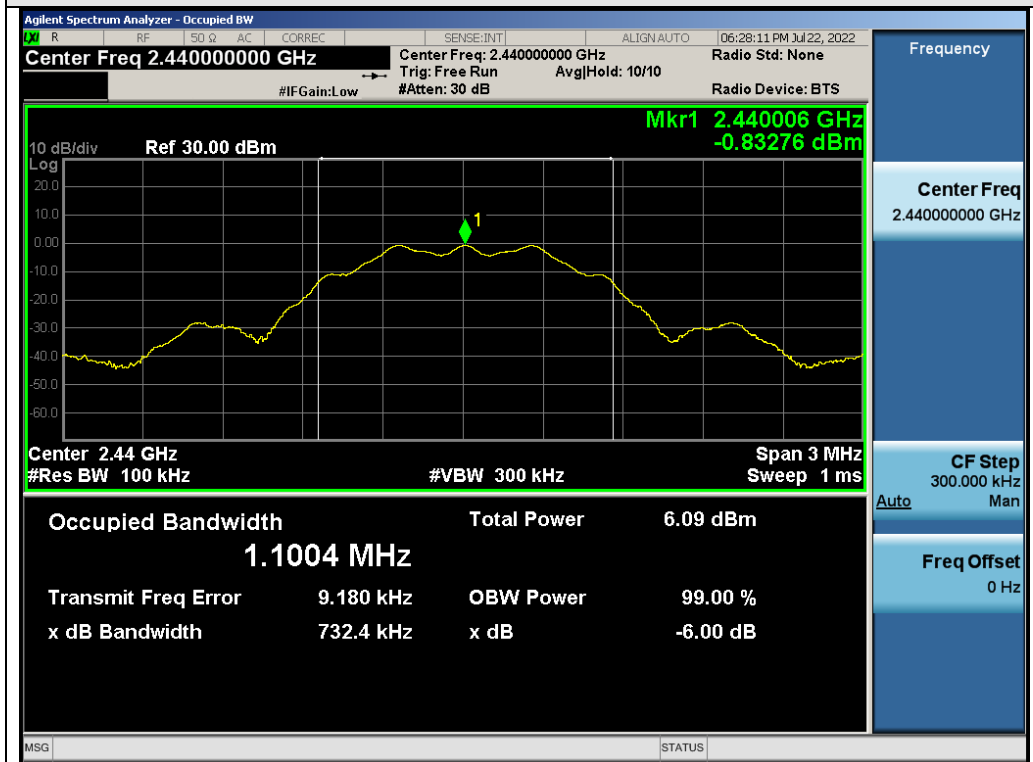
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Test_Graph_GFSK_ANT1_2402_125kbps_DTSBW



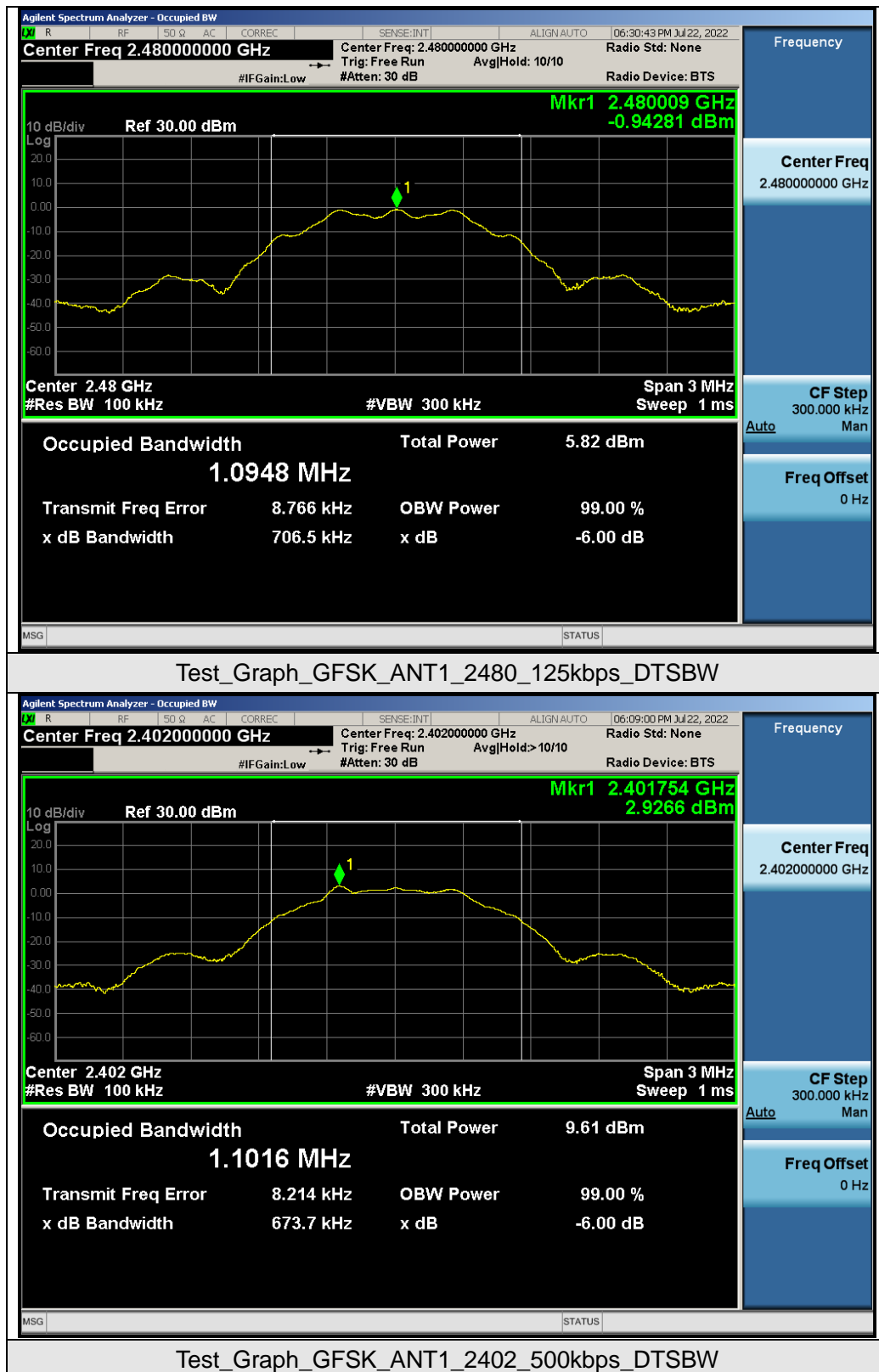
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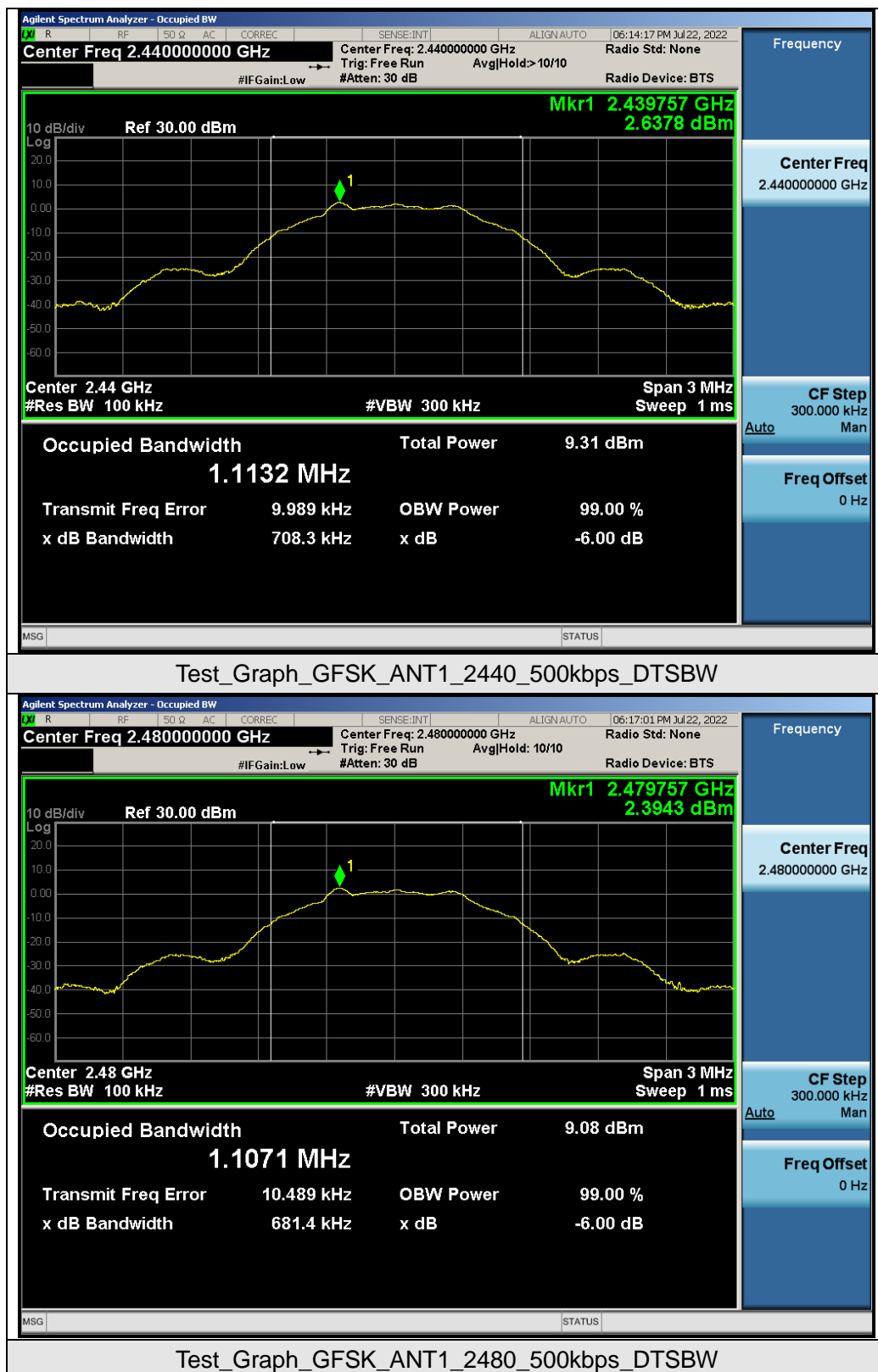
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9. CONDUCTED SPURIOUS EMISSION

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

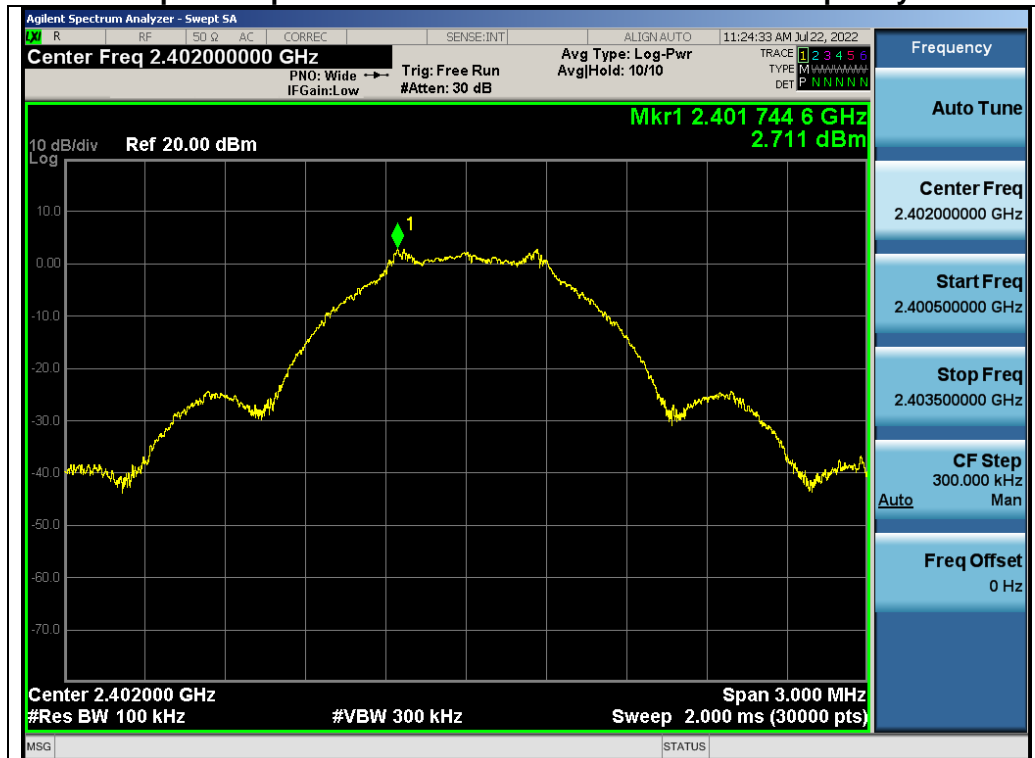
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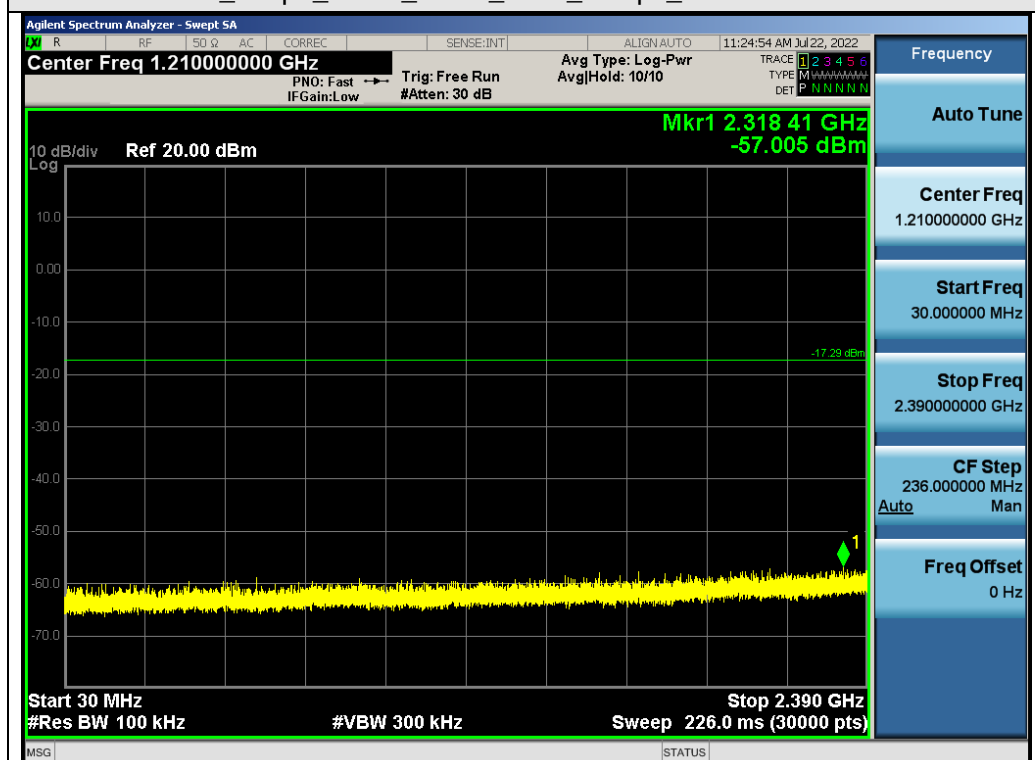
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Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands

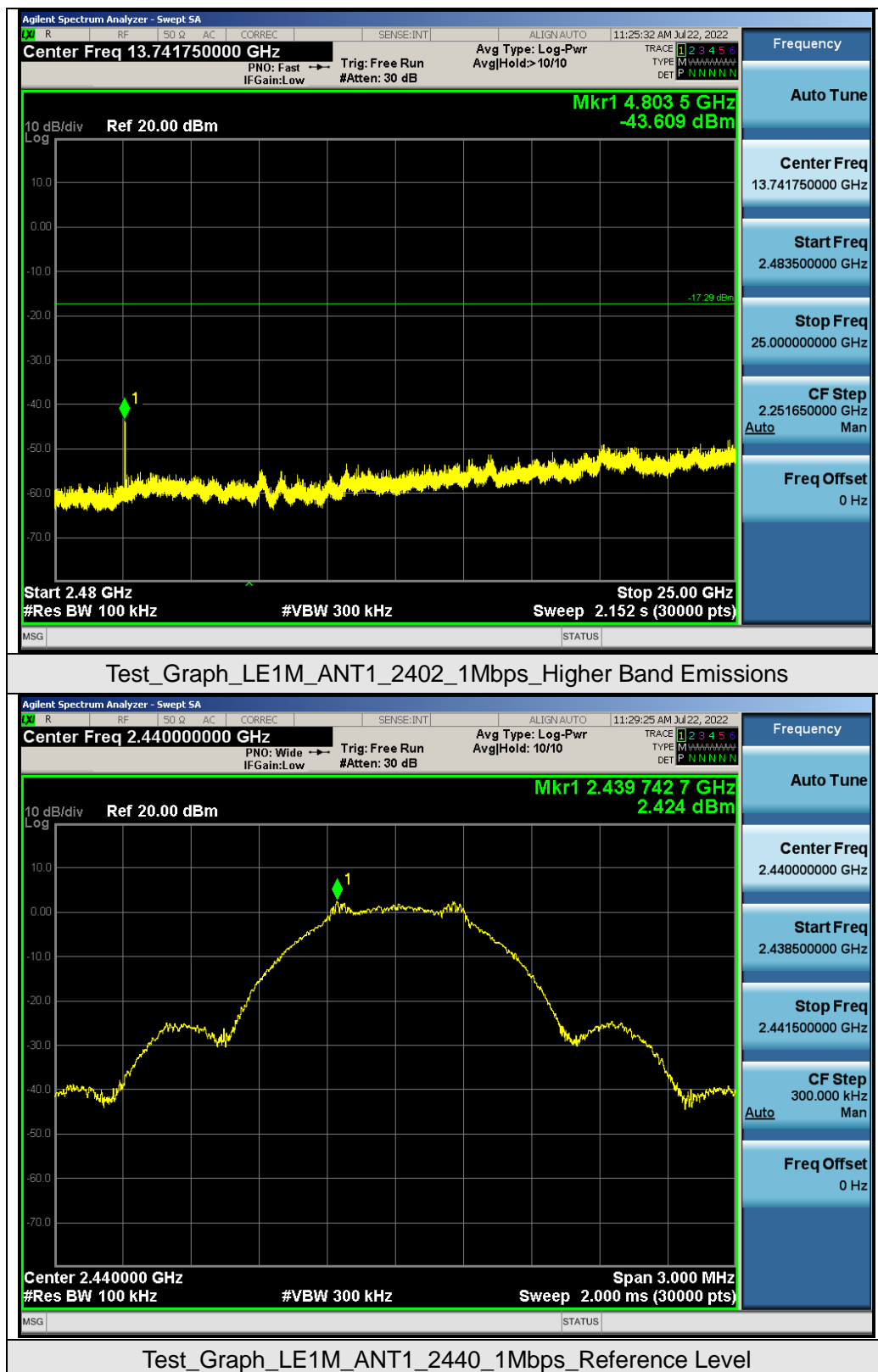


Test_Graph_LE1M_ANT1_2402_1Mbps_Reference Level

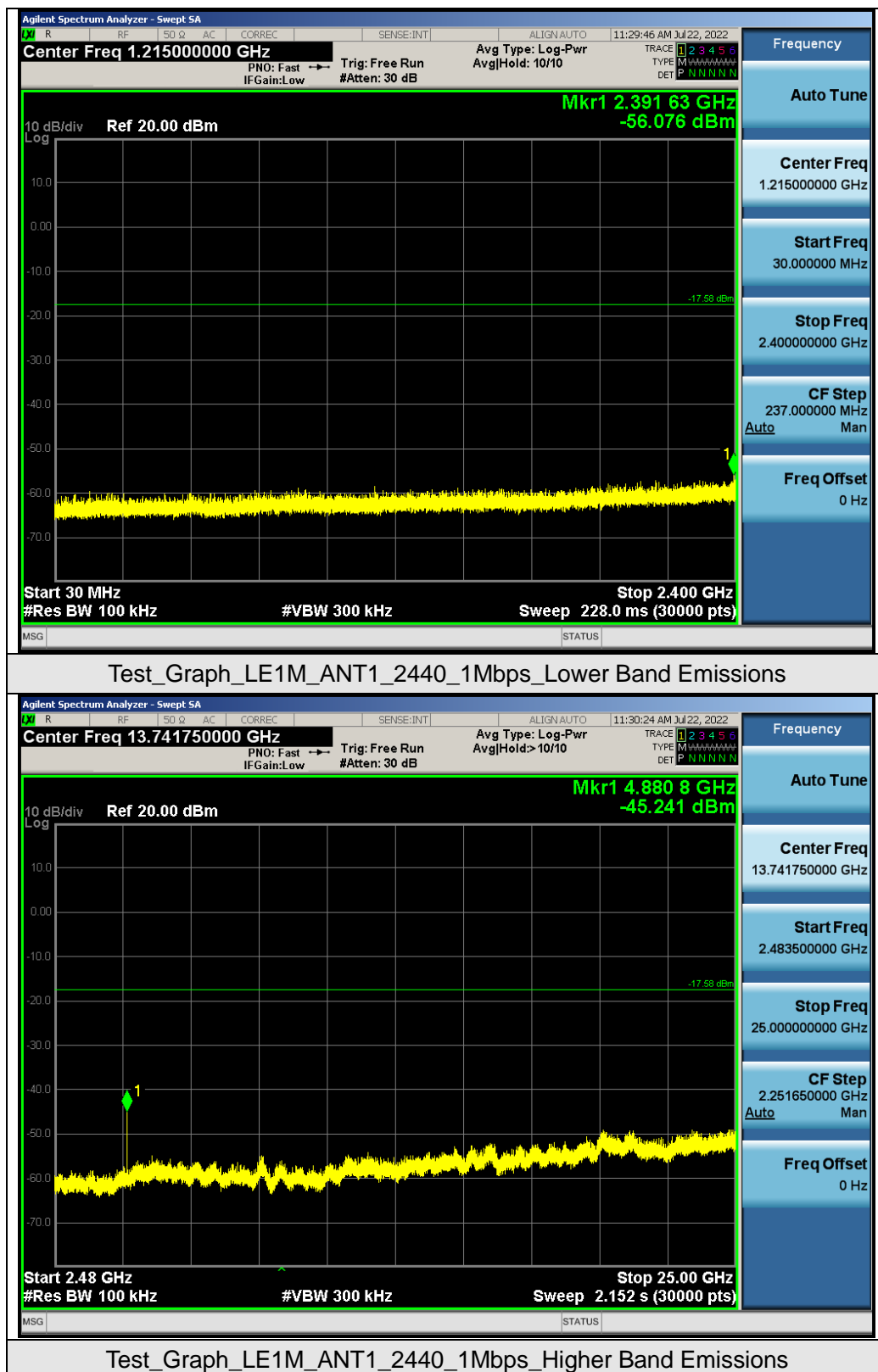


Test_Graph_LE1M_ANT1_2402_1Mbps_Lower Band Emissions

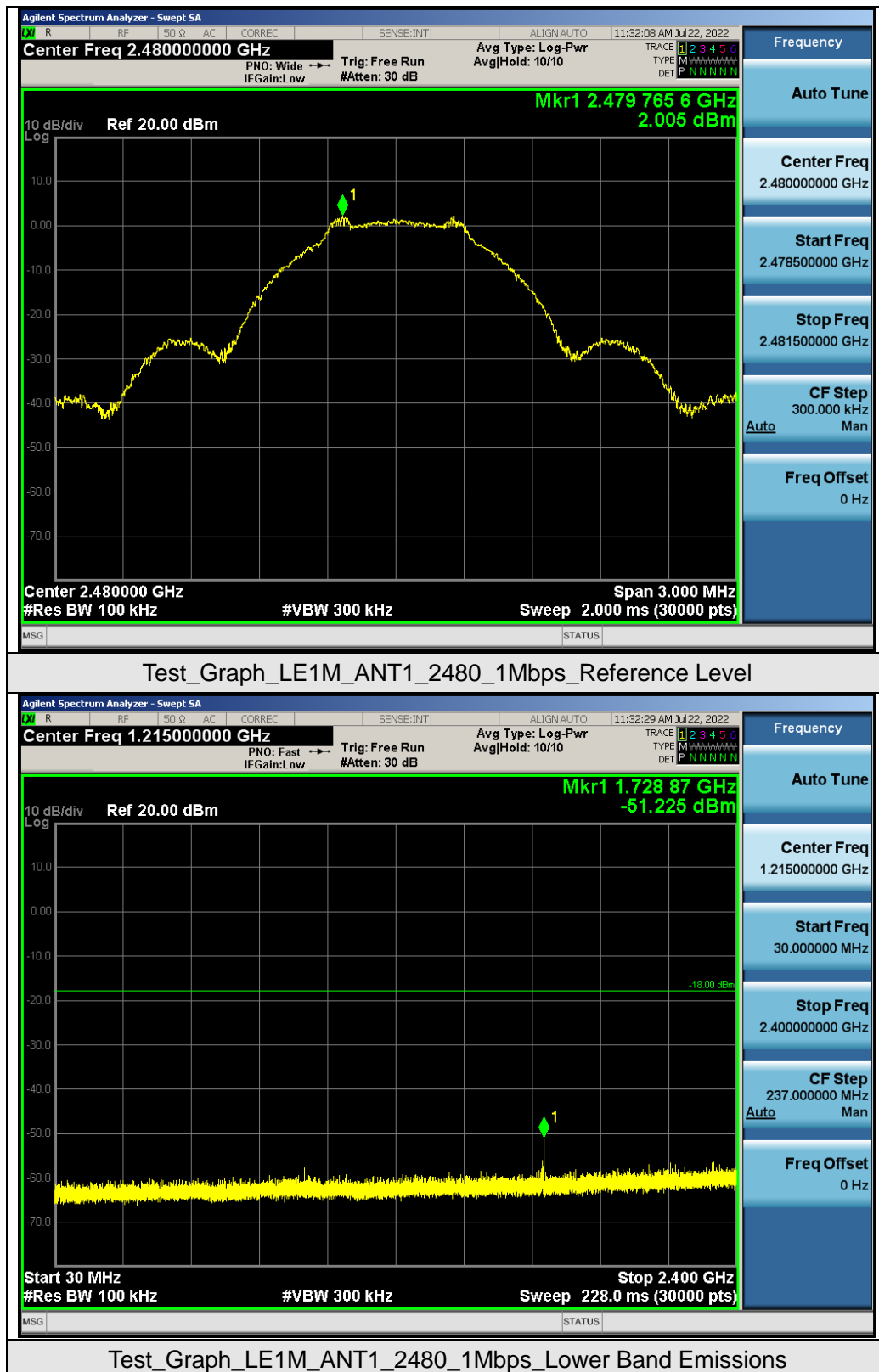
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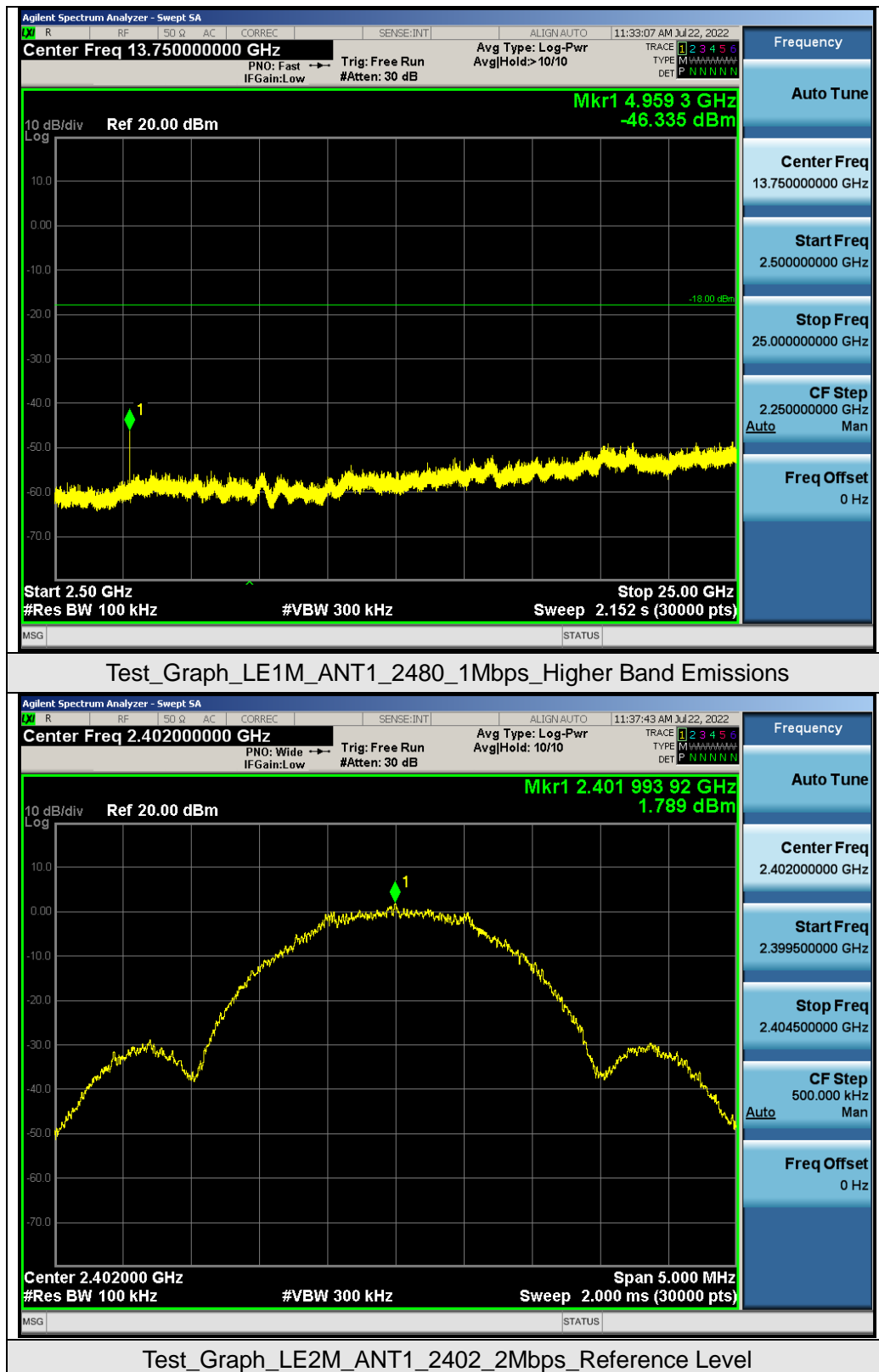
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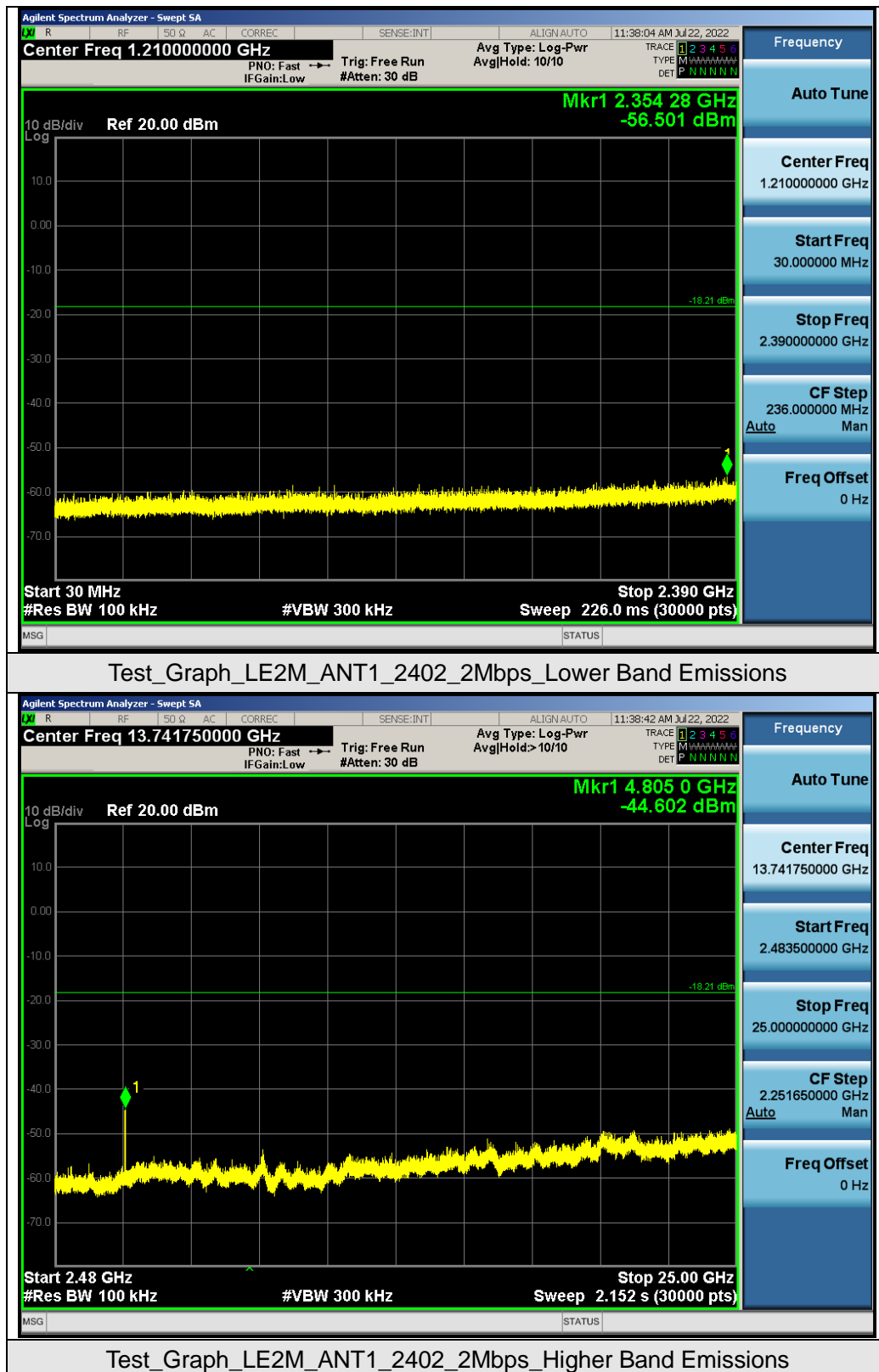
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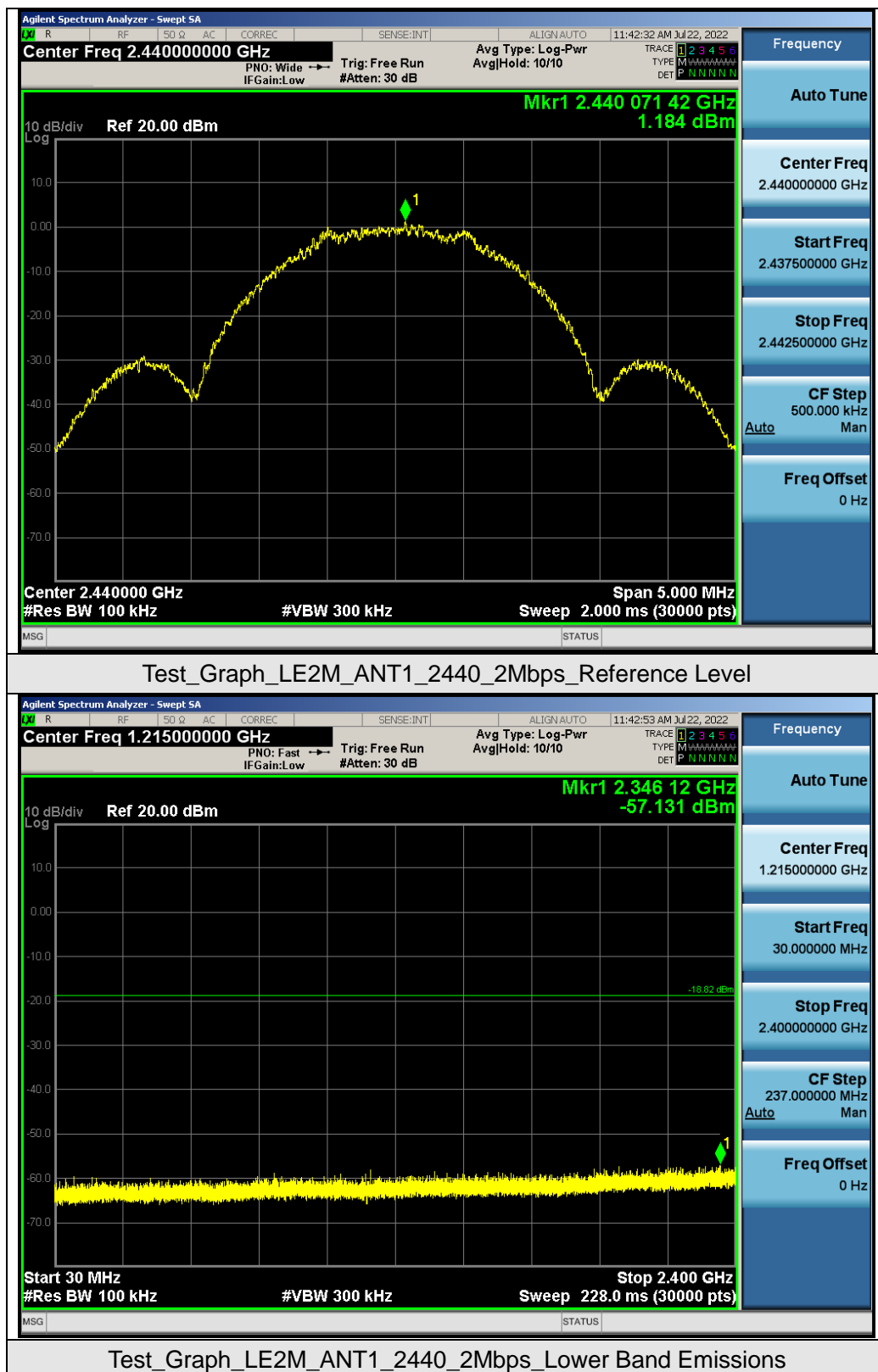
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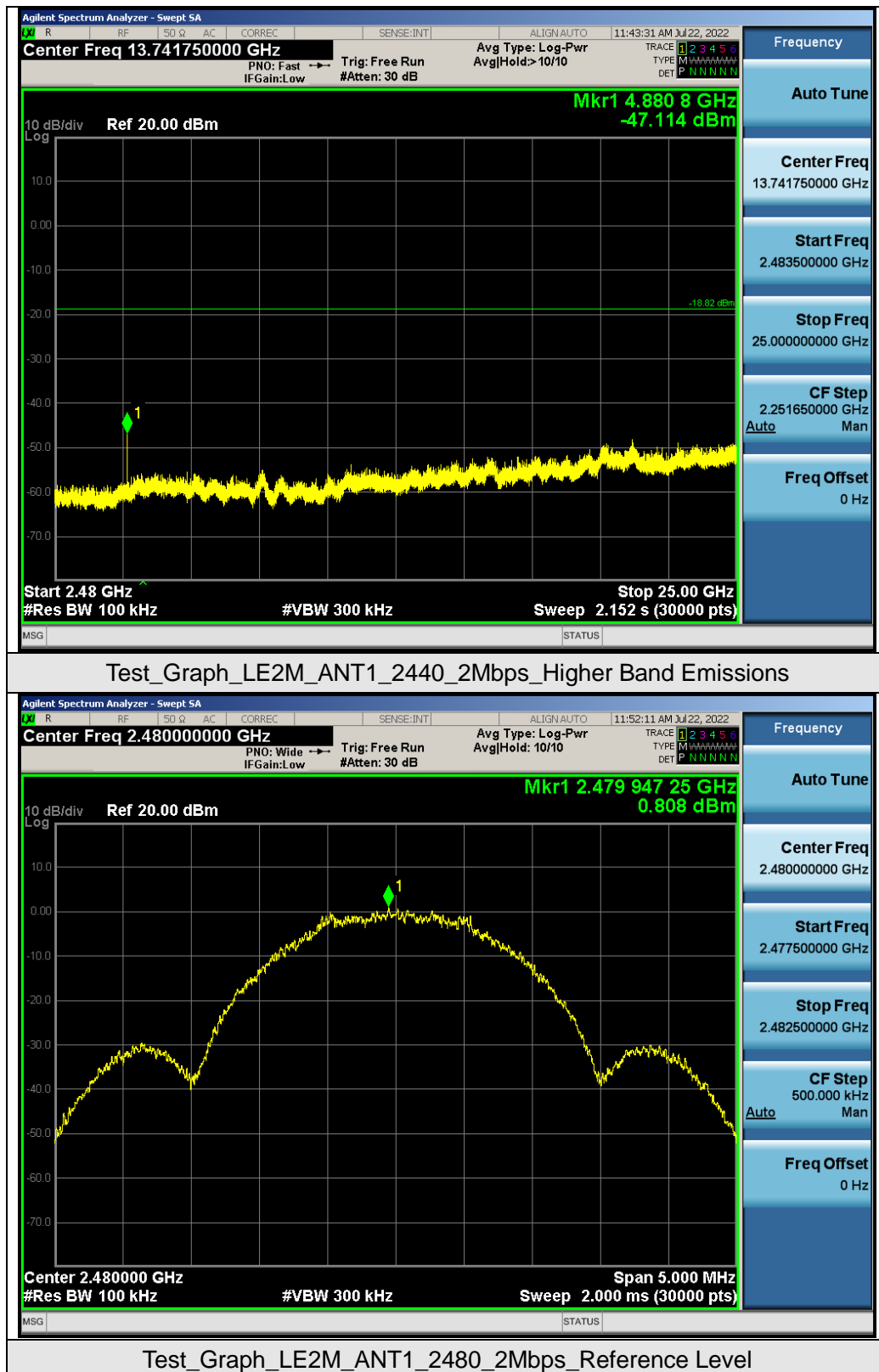
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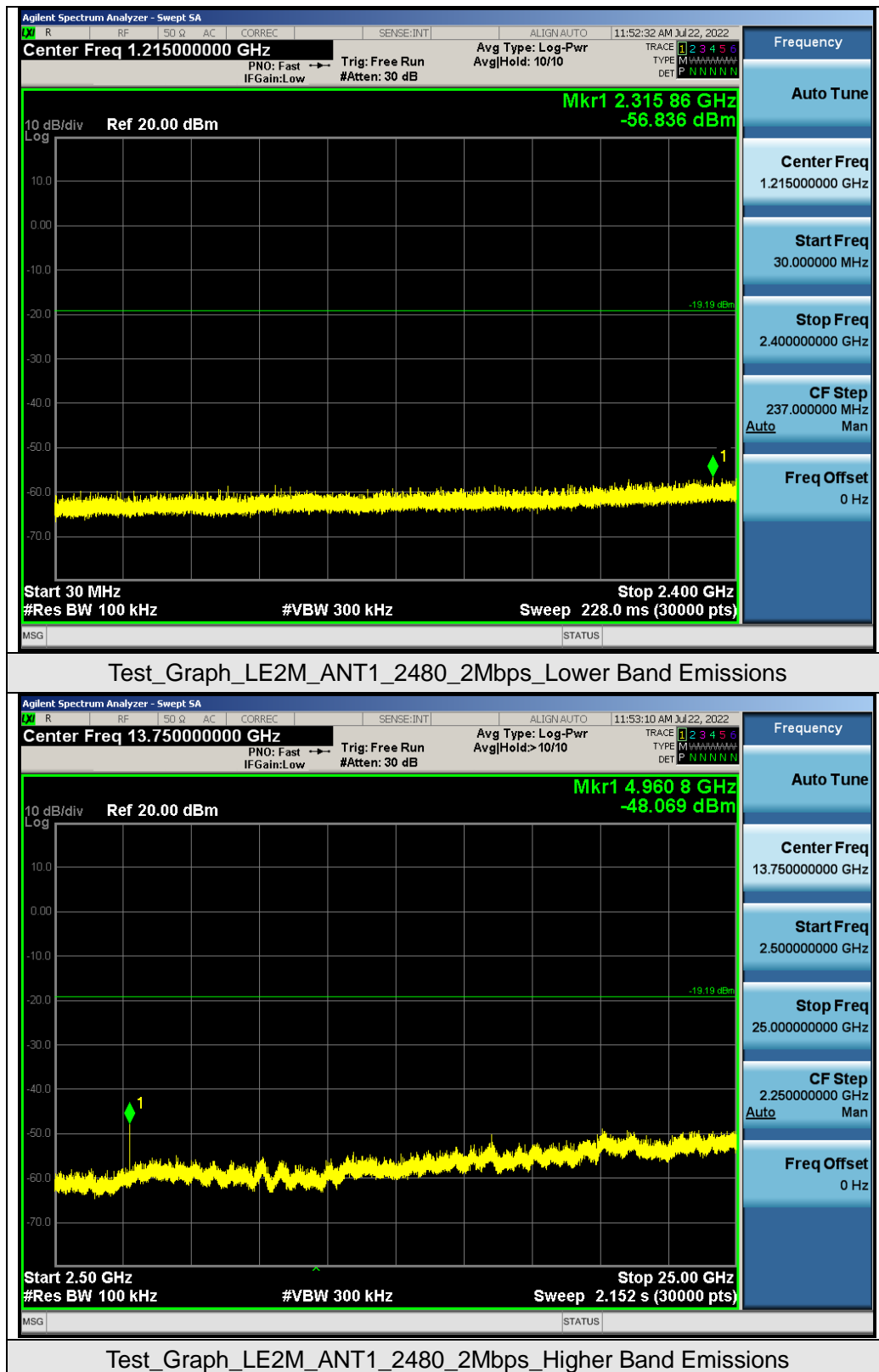
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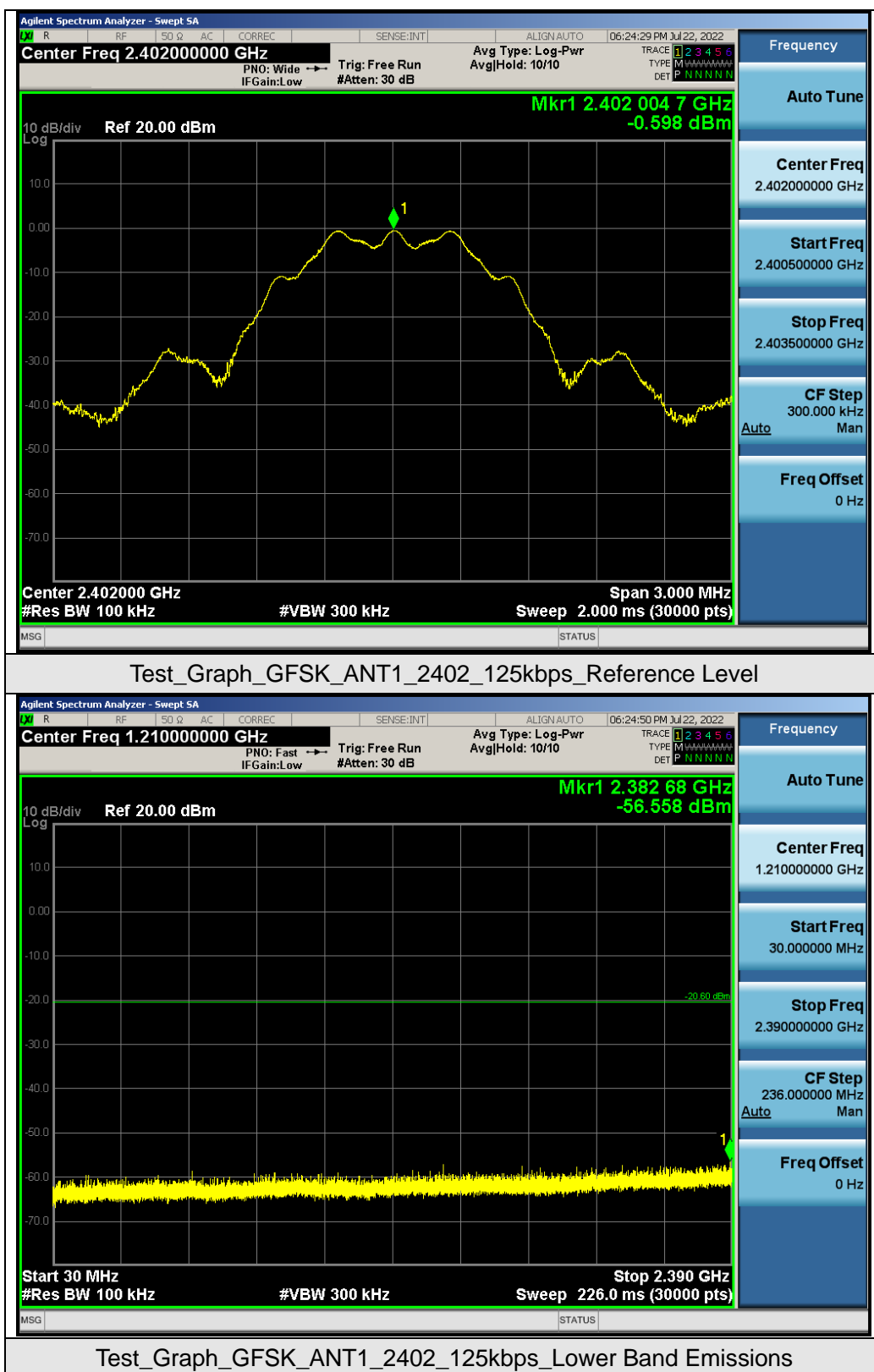
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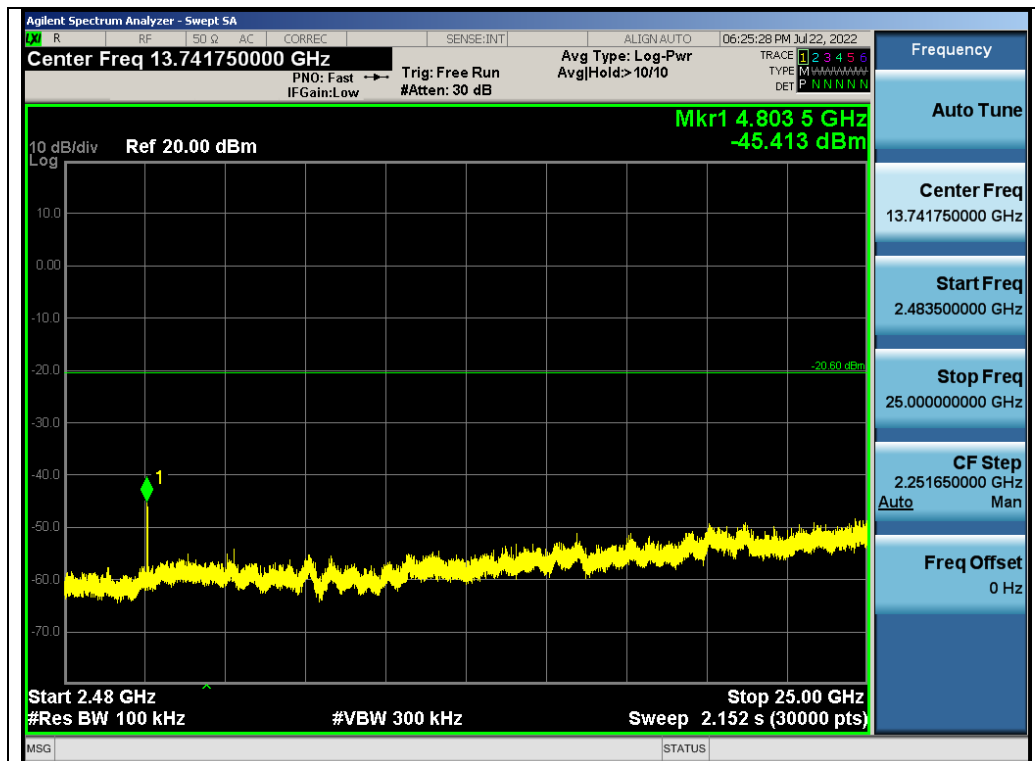
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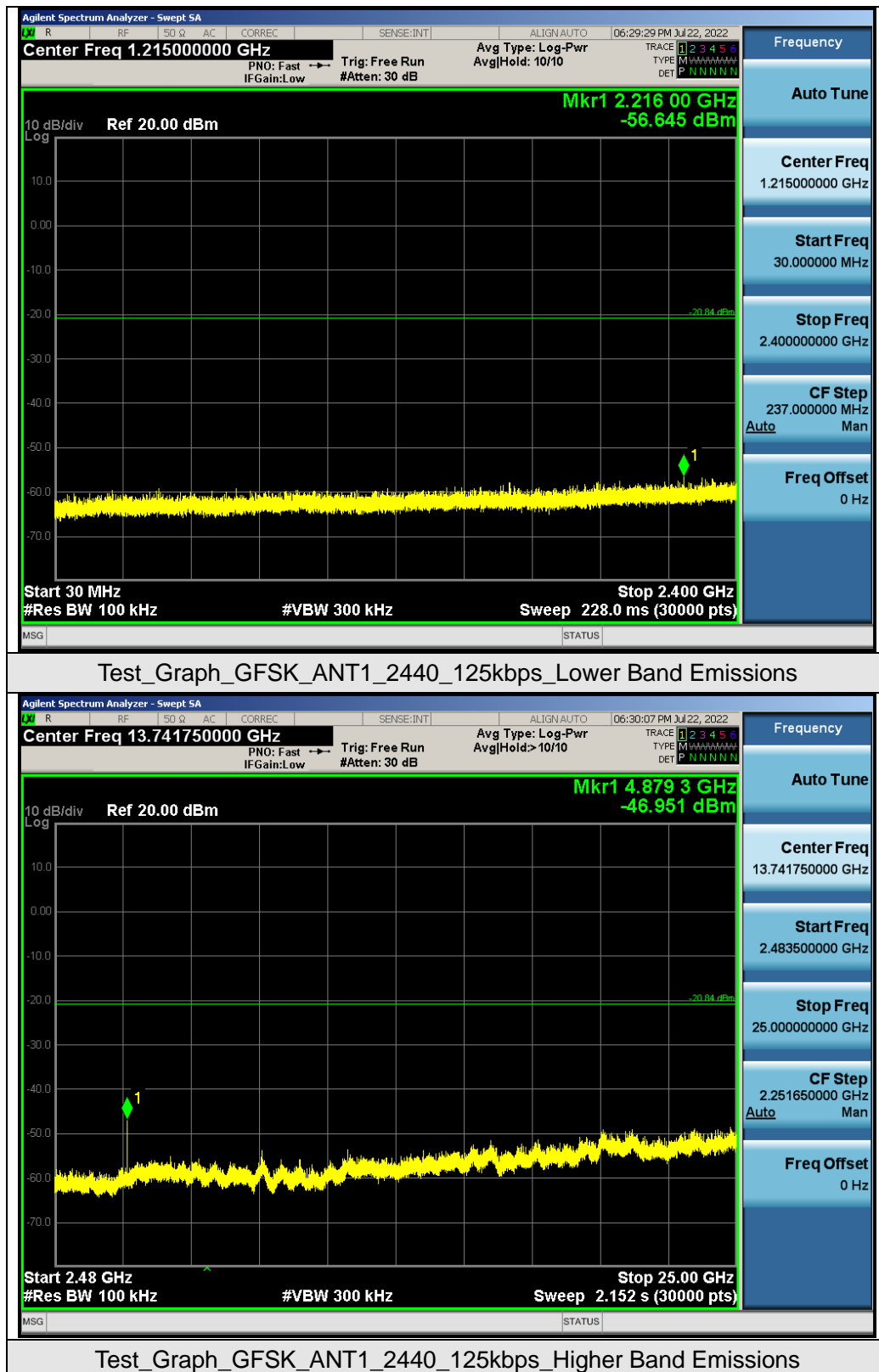


Test_Graph_GFSK_ANT1_2402_125kbps_Higher Band Emissions

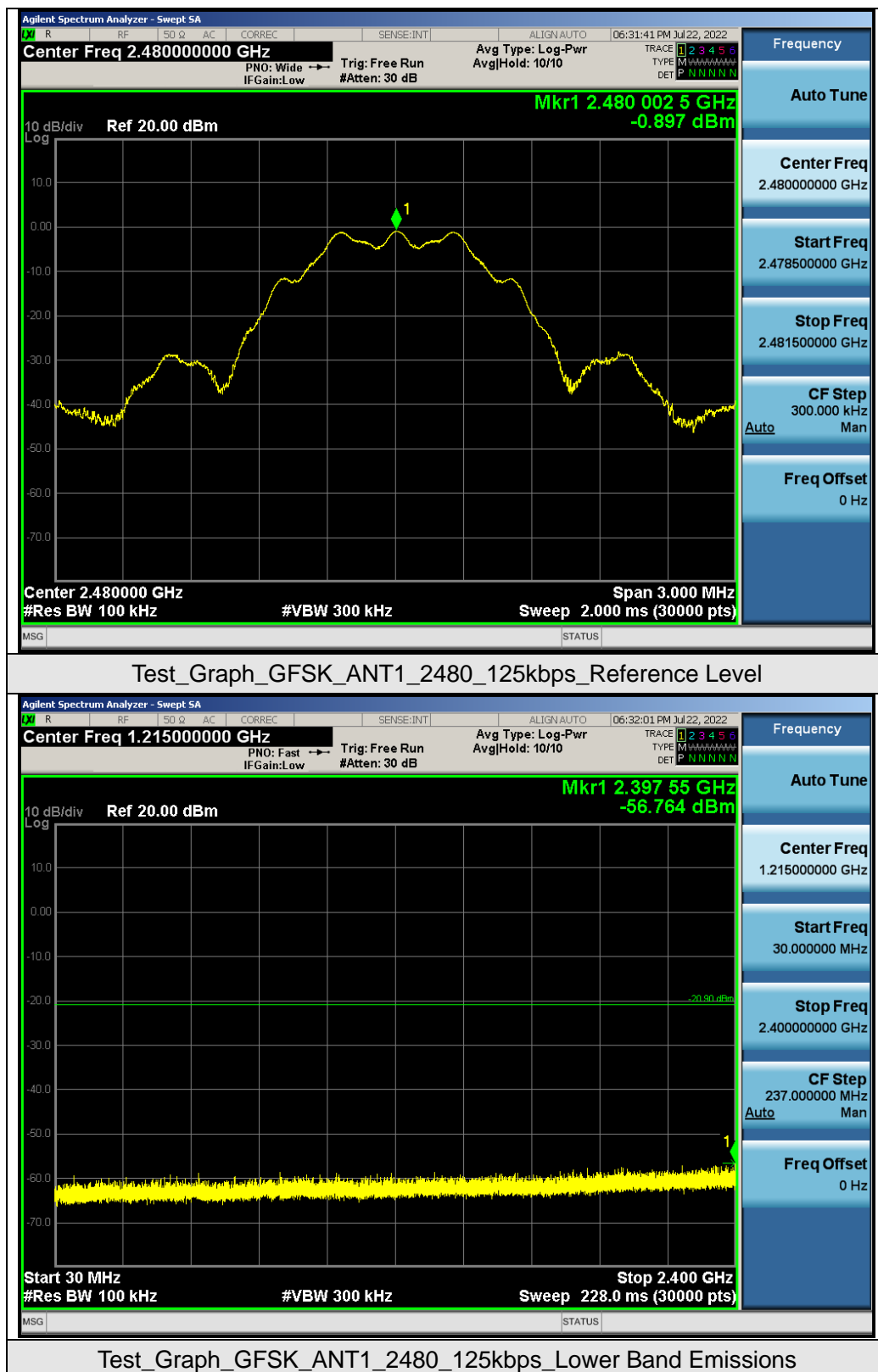


Test_Graph_GFSK_ANT1_2440_125kbps_Reference Level

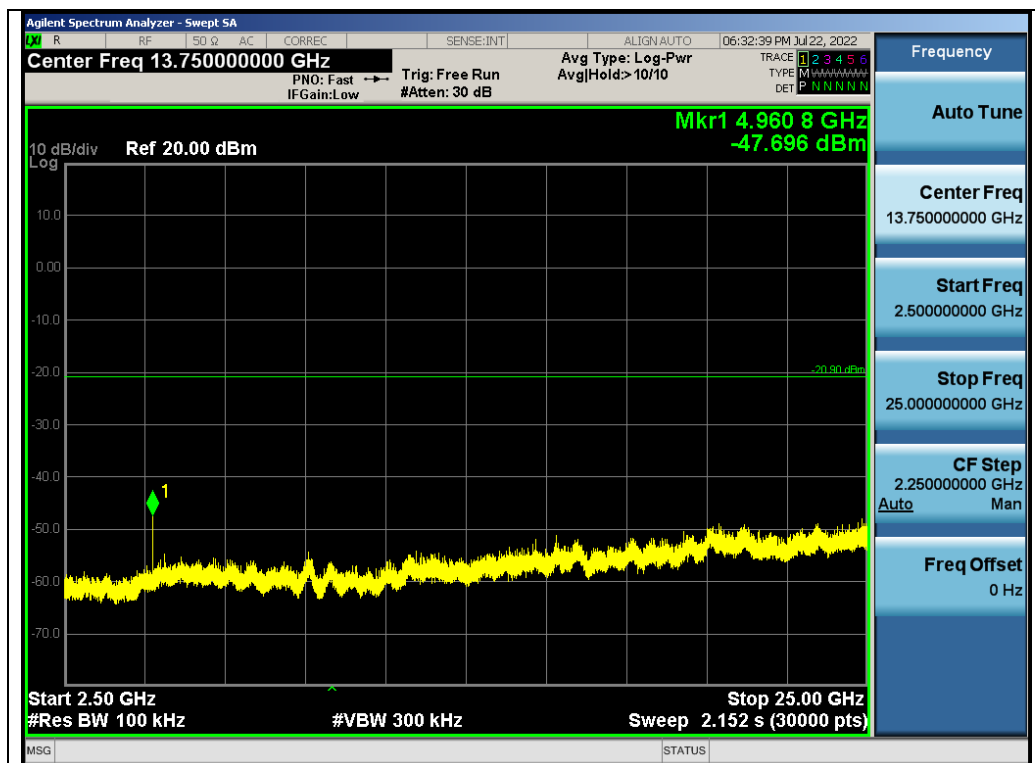
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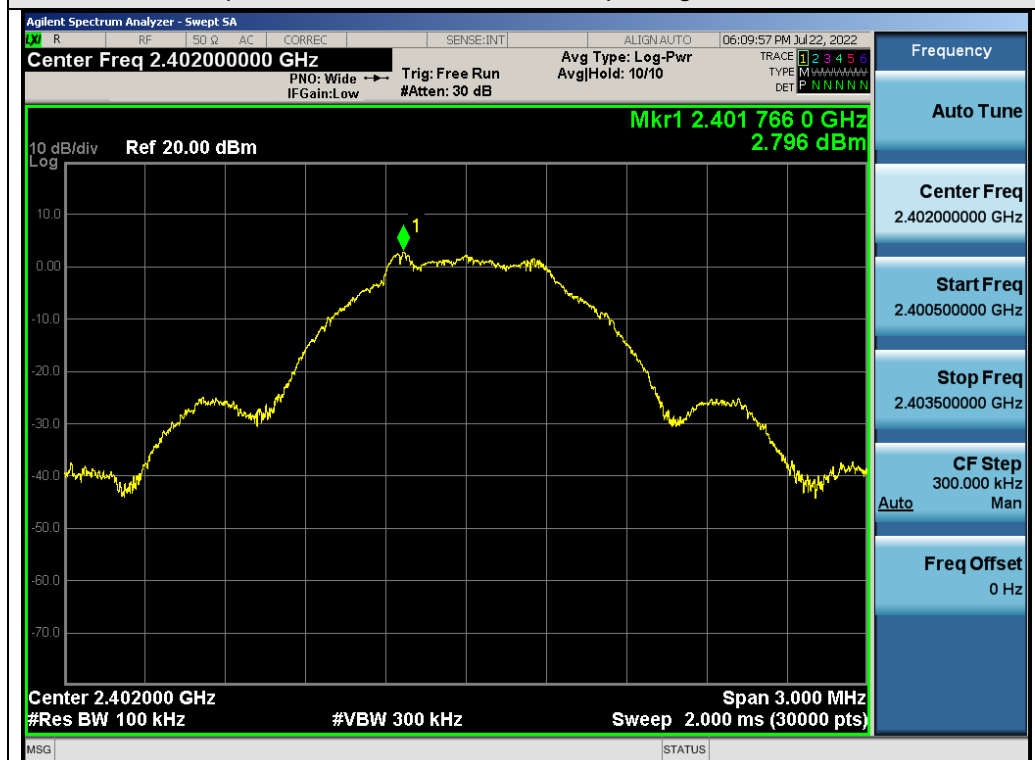
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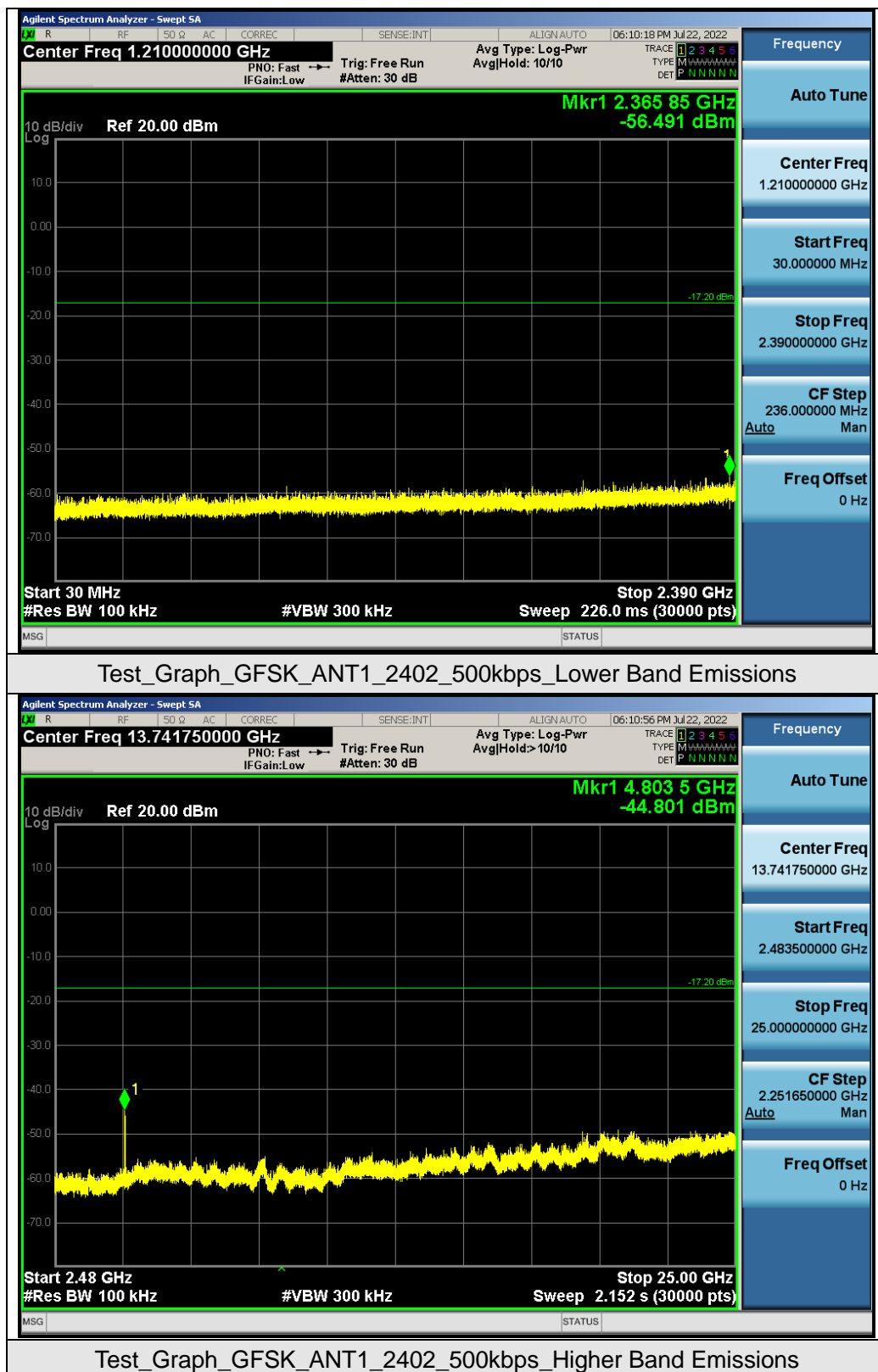
Test_Graph_GFSK_ANT1_2480_125kbps_Higher Band Emissions



Test_Graph_GFSK_ANT1_2402_500kbps_Reference Level

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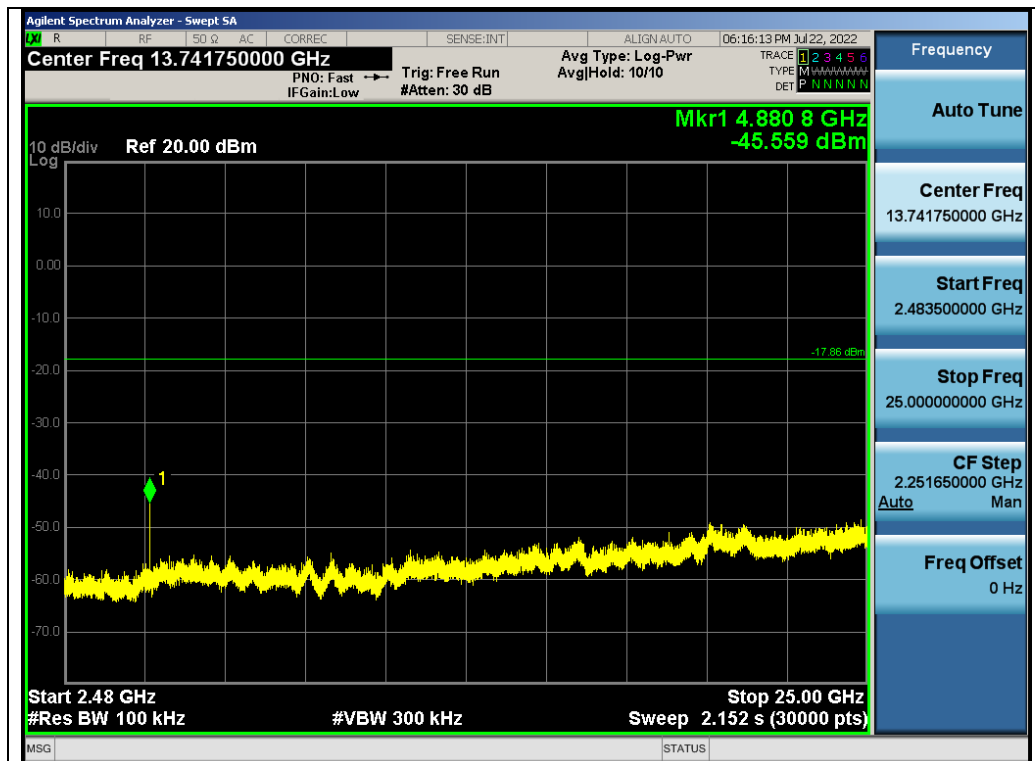
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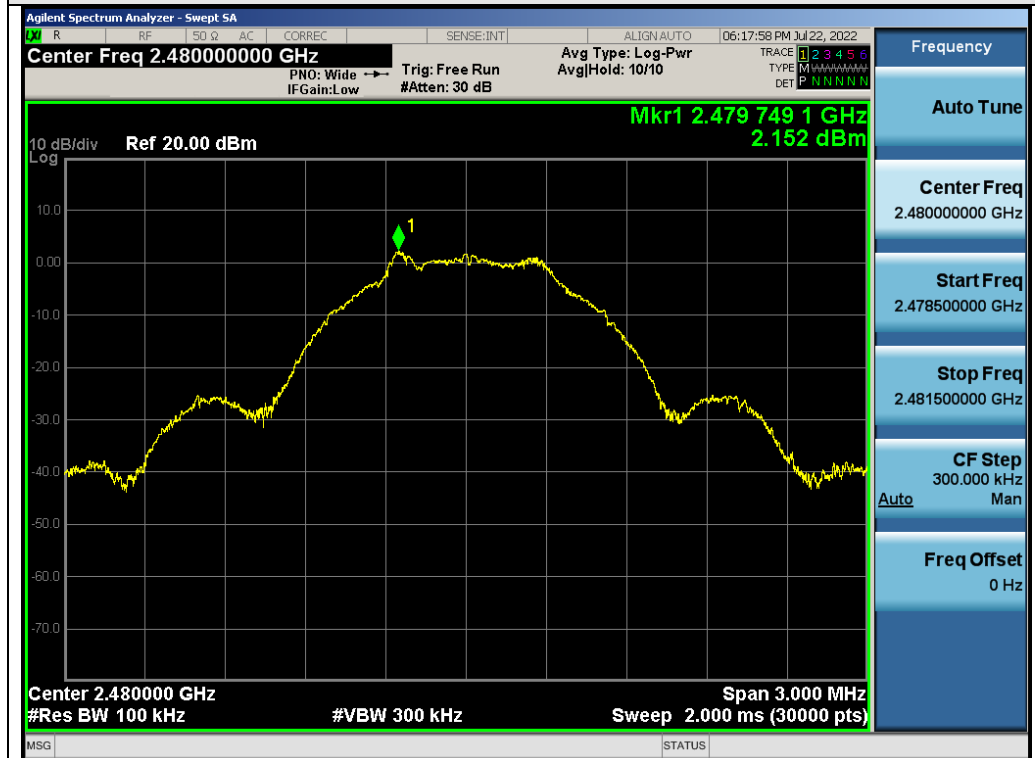
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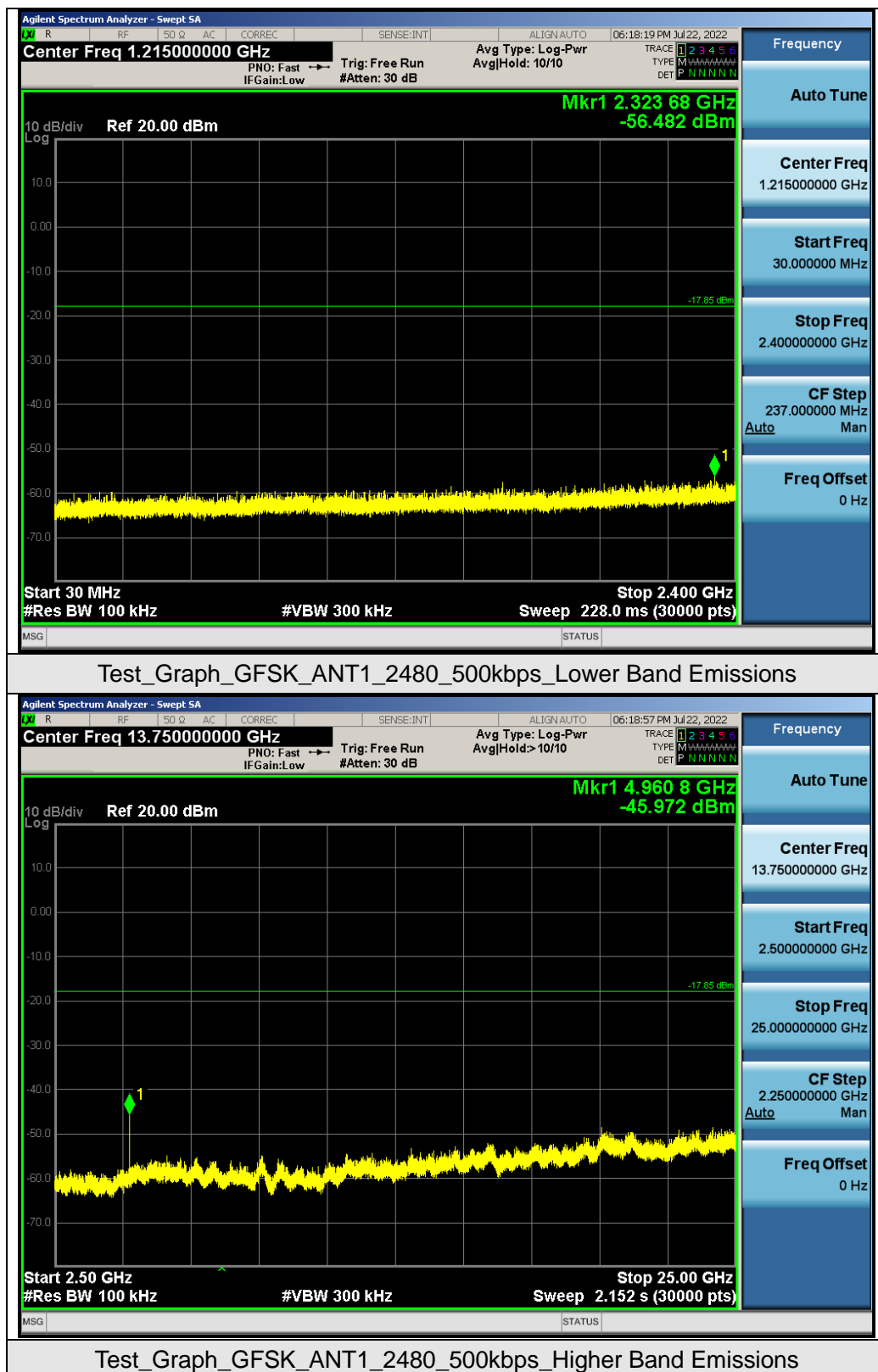
Test_Graph_GFSK_ANT1_2440_500kpbs_Higher Band Emissions



Test_Graph_GFSK_ANT1_2480_500kpbs_Reference Level

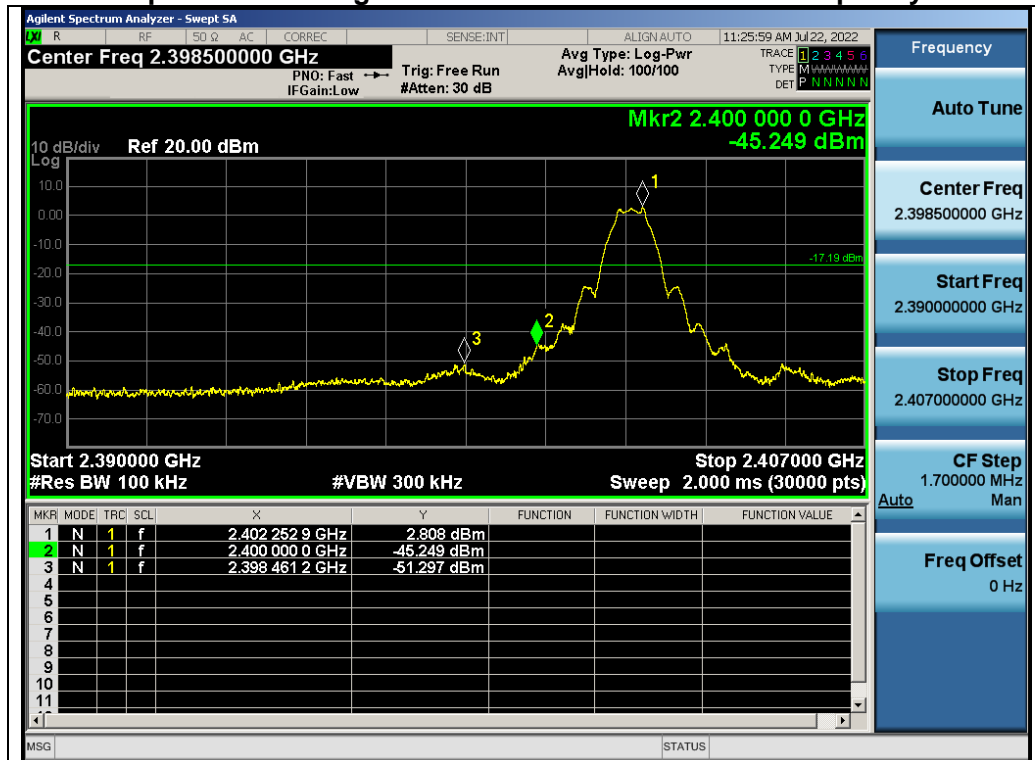
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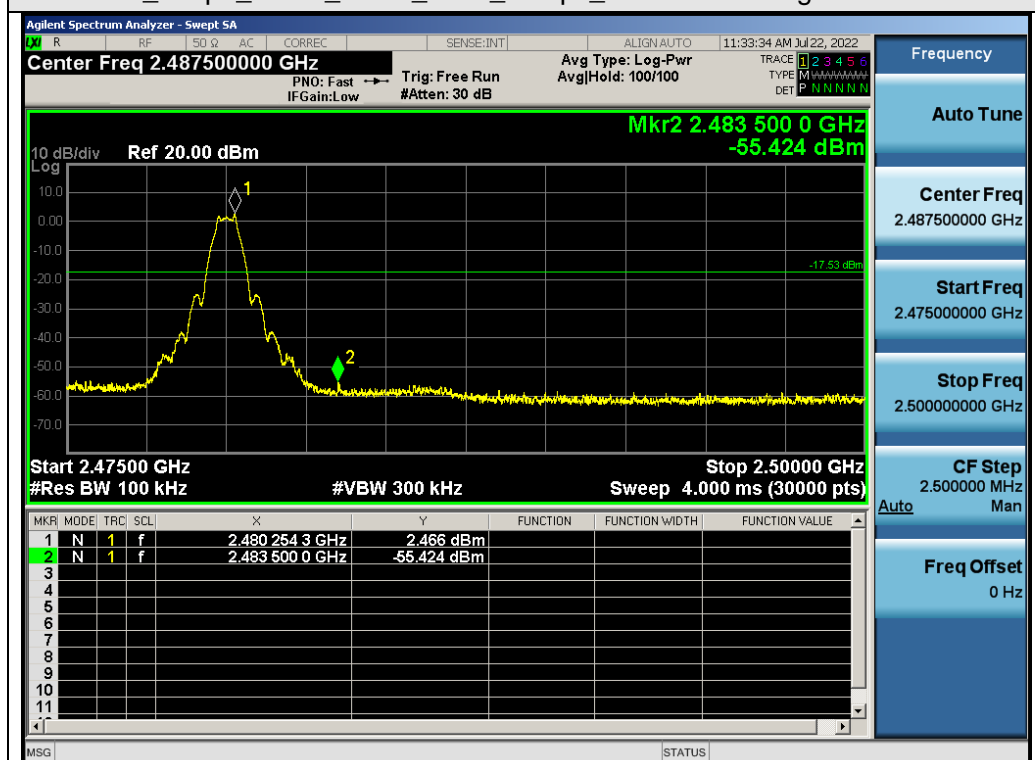


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Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands



Test_Graph_LE1M_ANT1_2402_1Mbps_Lower Band Edge Emissions



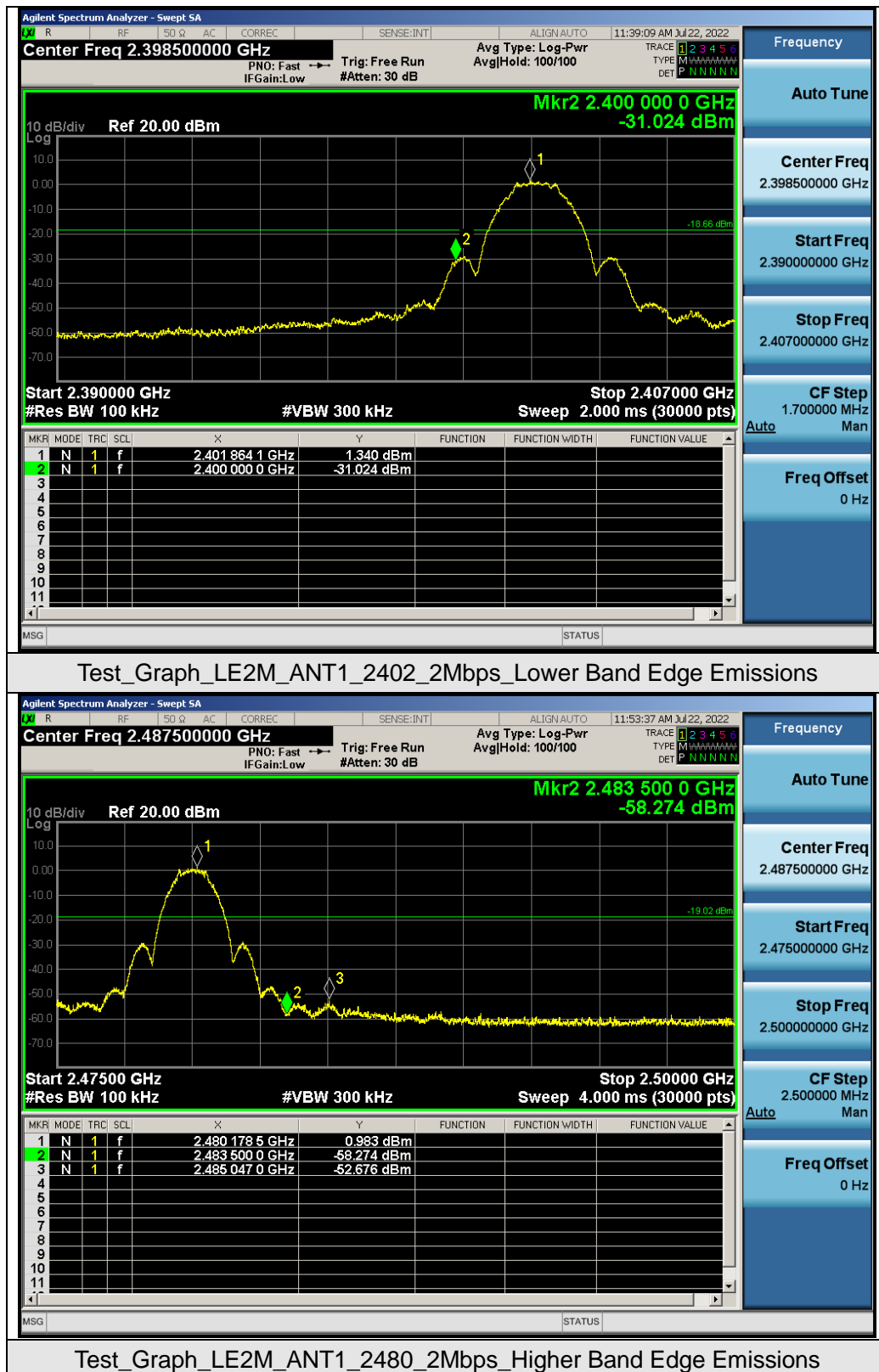
Test_Graph_LE1M_ANT1_2480_1Mbps_Higher Band Edge Emissions

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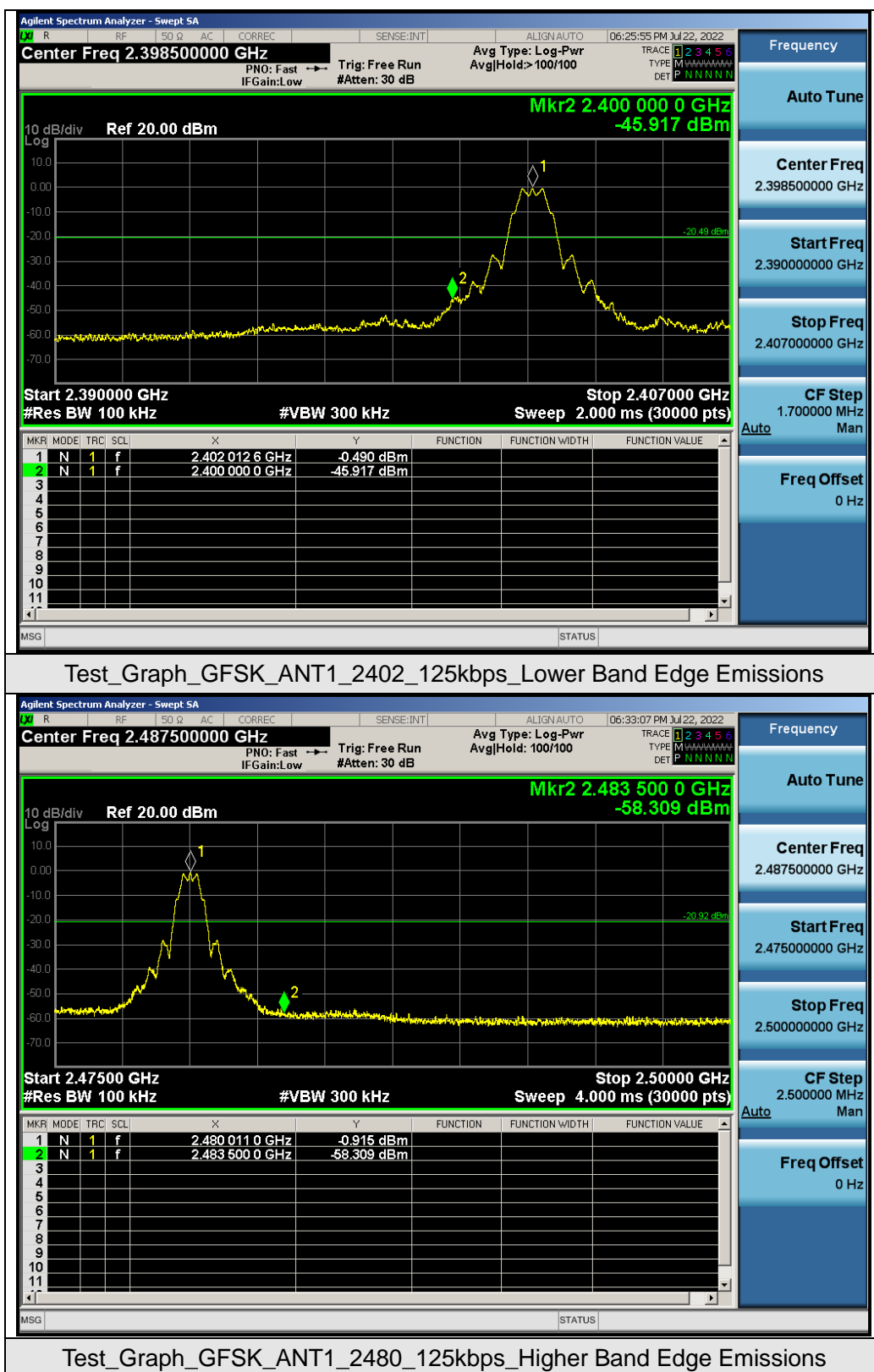
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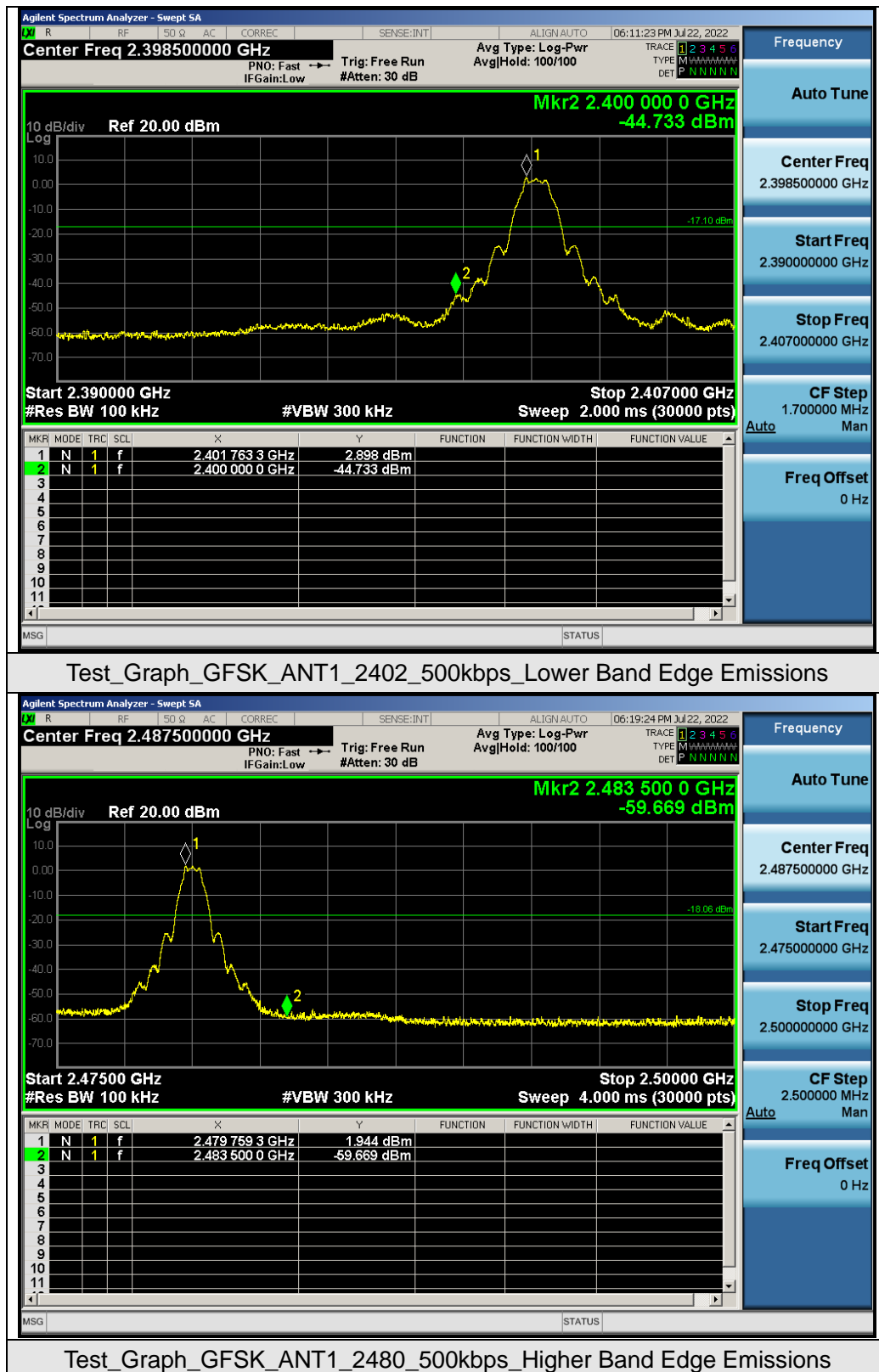


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10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

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 1Mbps	2402	-5.461	≤ 8	Pass
	2440	-7.275	≤ 8	Pass
	2480	-7.195	≤ 8	Pass
GFSK 2Mbps	2402	-11.292	≤ 8	Pass
	2440	-11.069	≤ 8	Pass
	2480	-10.621	≤ 8	Pass
GFSK 125kbps	2402	-2.963	≤ 8	Pass
	2440	-3.084	≤ 8	Pass
	2480	-3.379	≤ 8	Pass
GFSK 500kbps	2402	-8.647	≤ 8	Pass
	2440	-9.665	≤ 8	Pass
	2480	-9.783	≤ 8	Pass

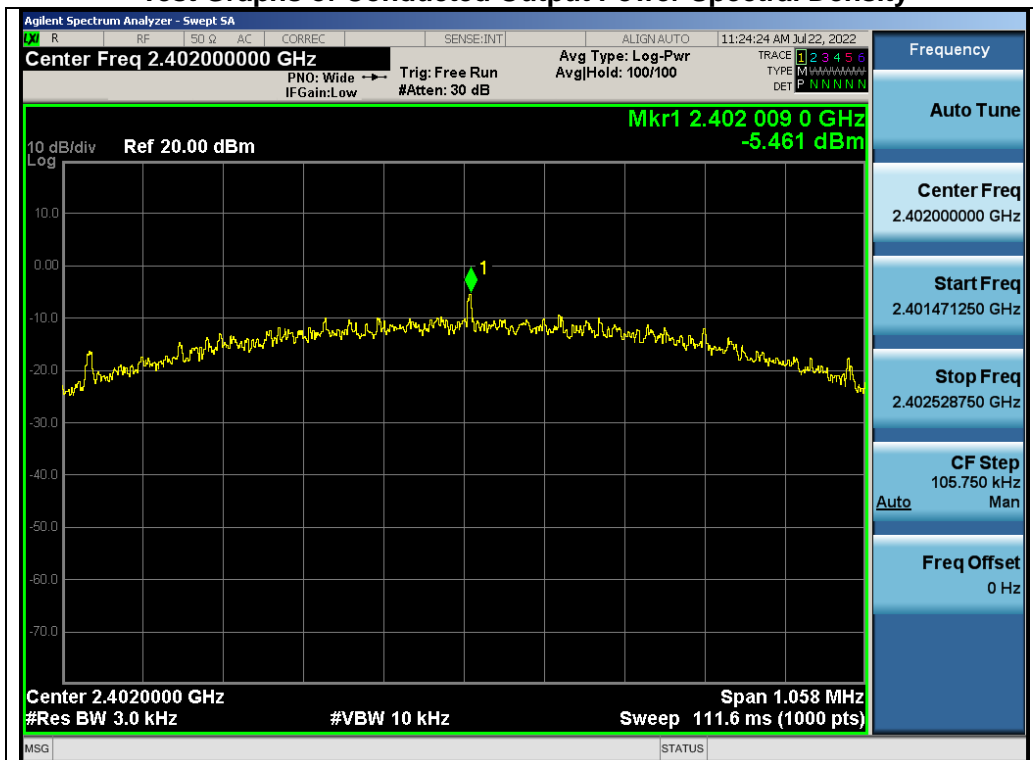
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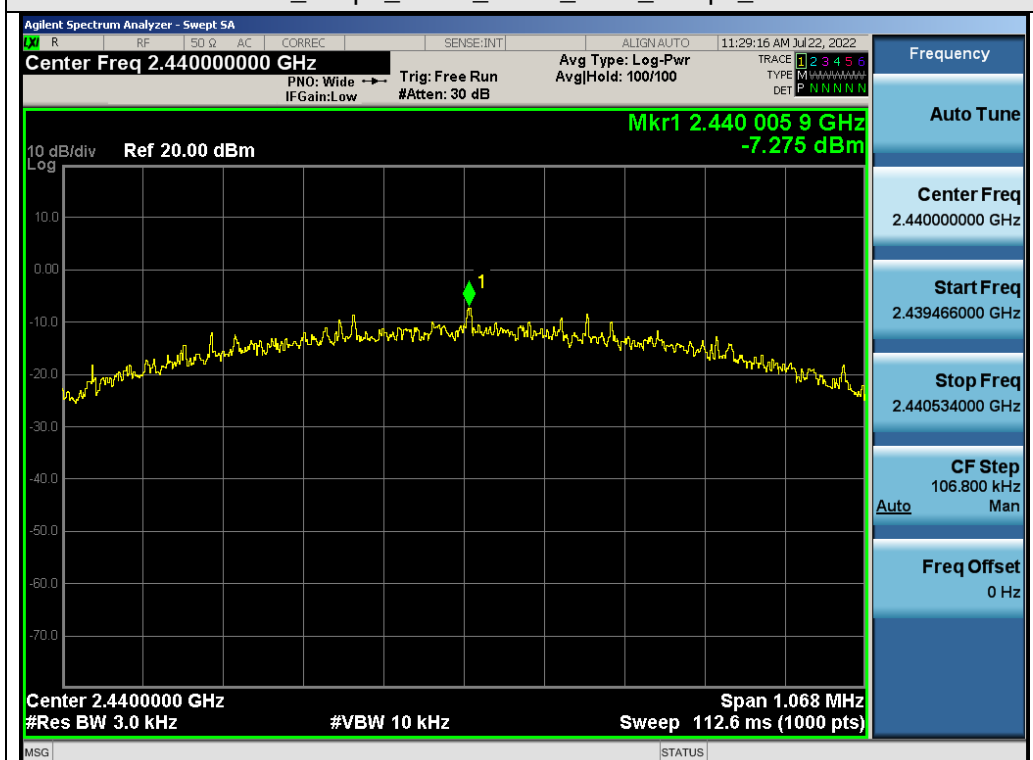
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Test Graphs of Conducted Output Power Spectral Density



Test_Graph_LE1M_ANT1_2402_1Mbps_PSD



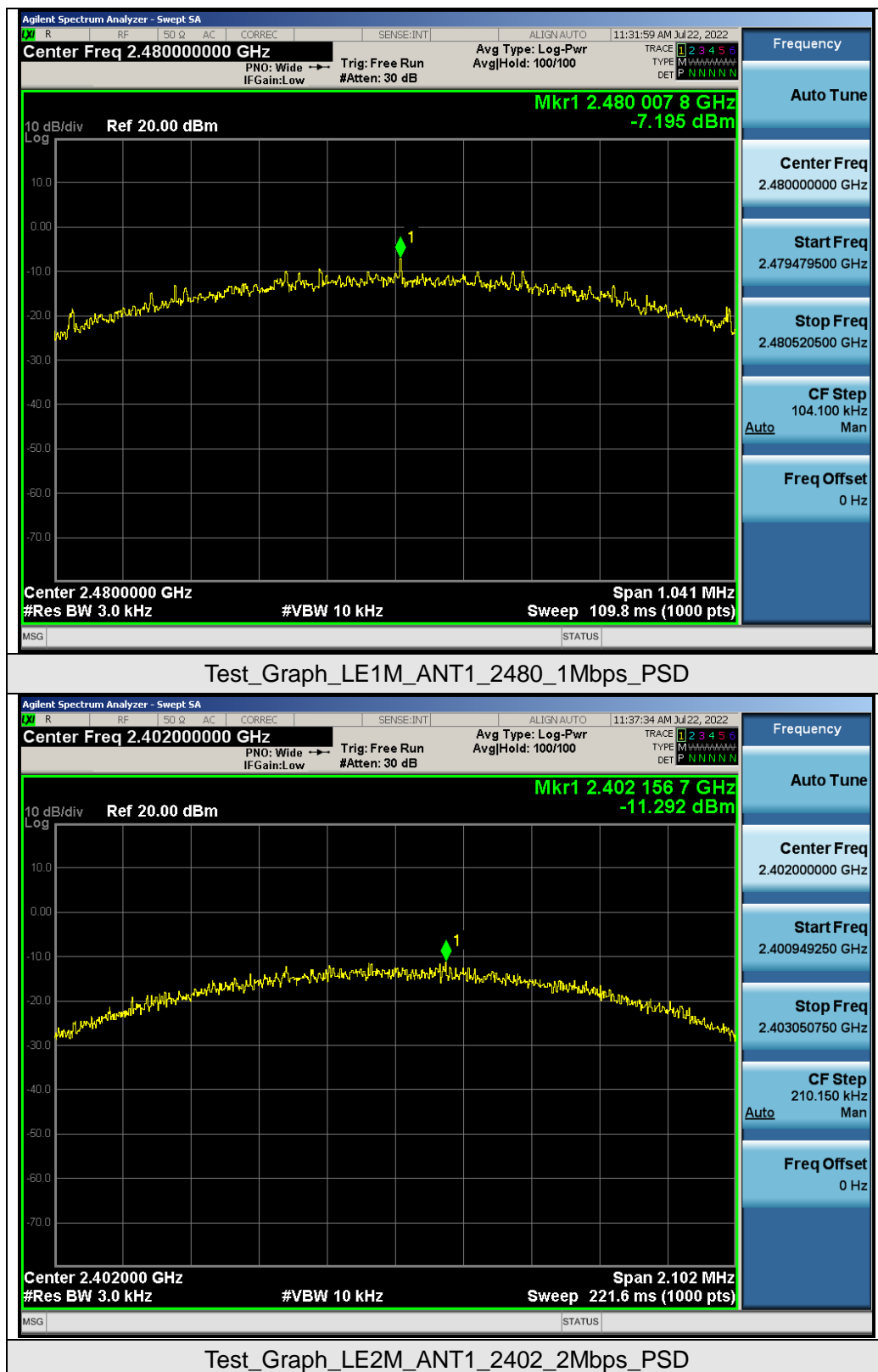
Test_Graph_LE1M_ANT1_2440_1Mbps_PSD

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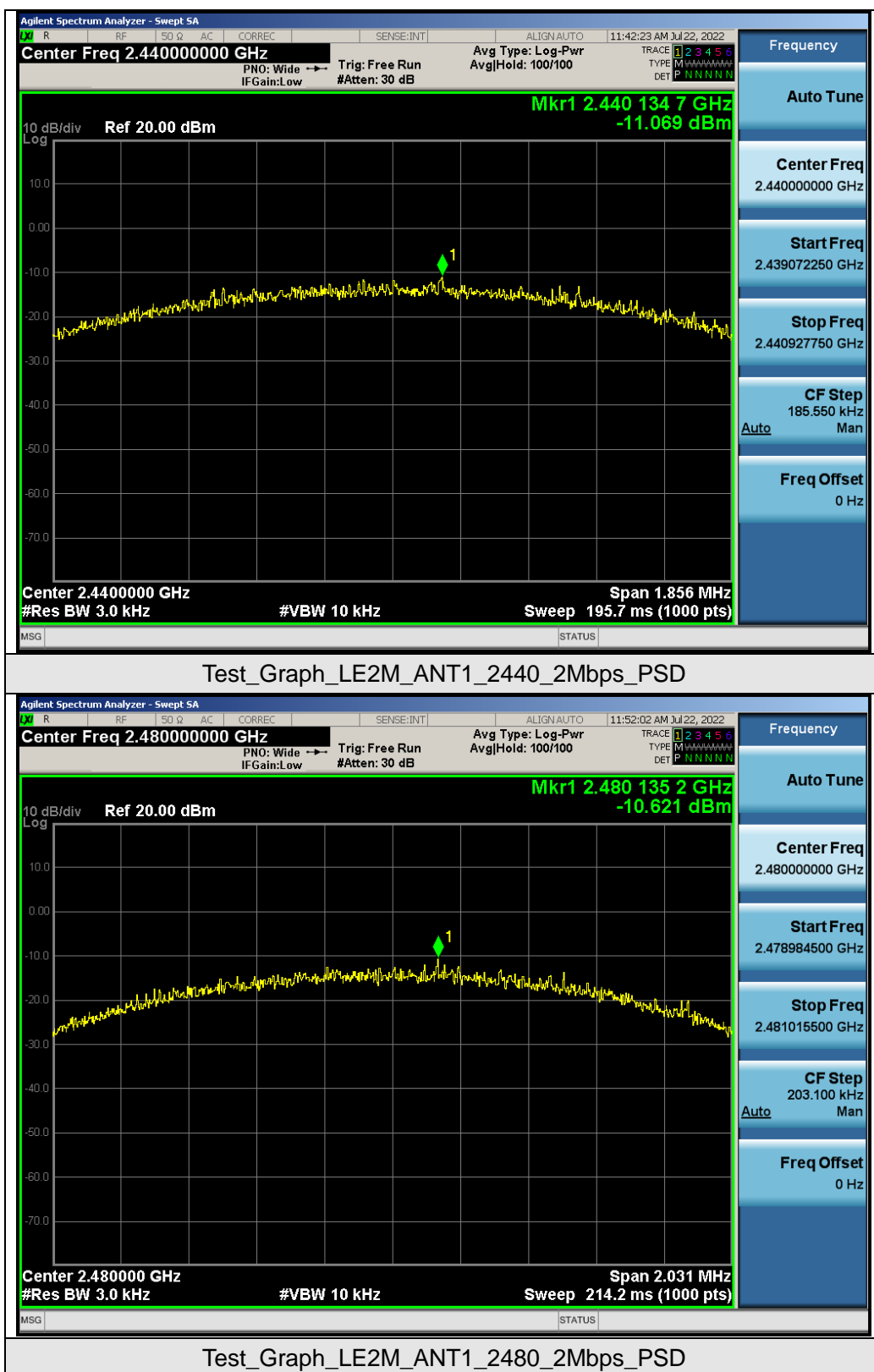
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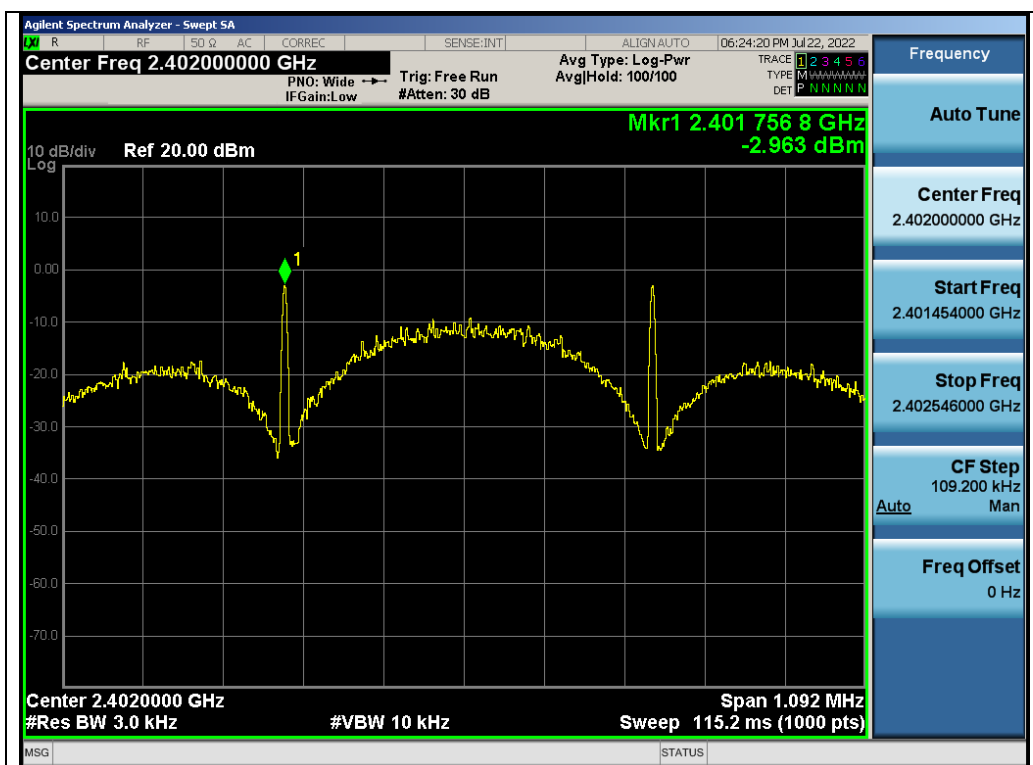
Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/



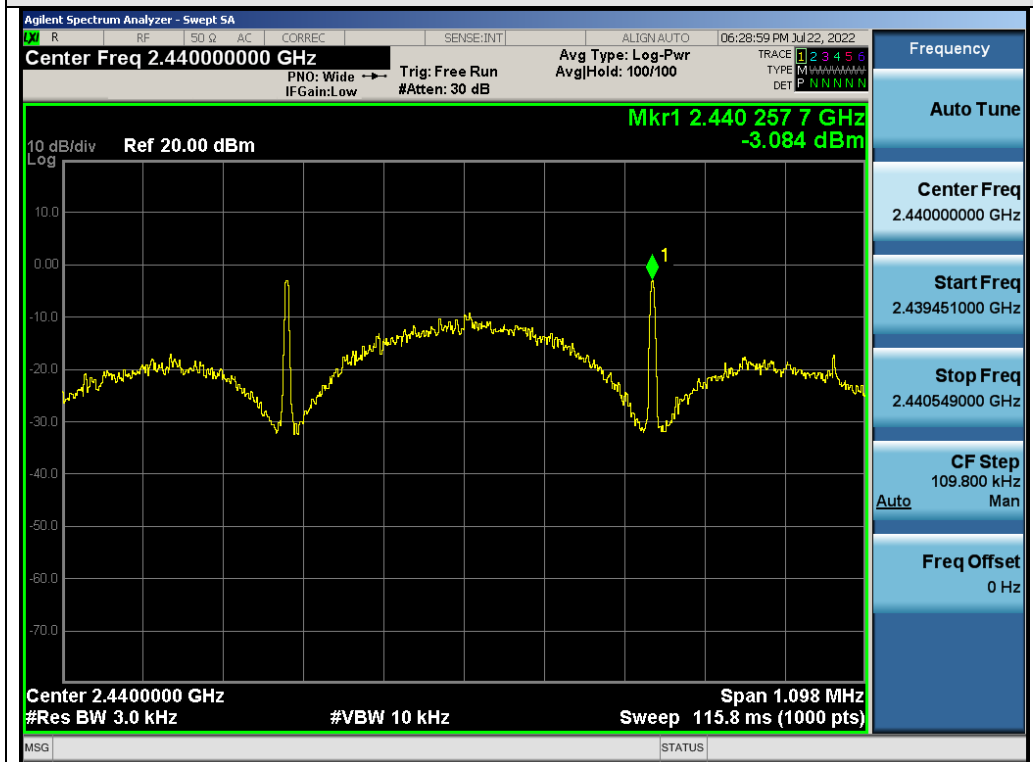
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Test_Graph_GFSK_ANT1_2402_125kbps_PSD



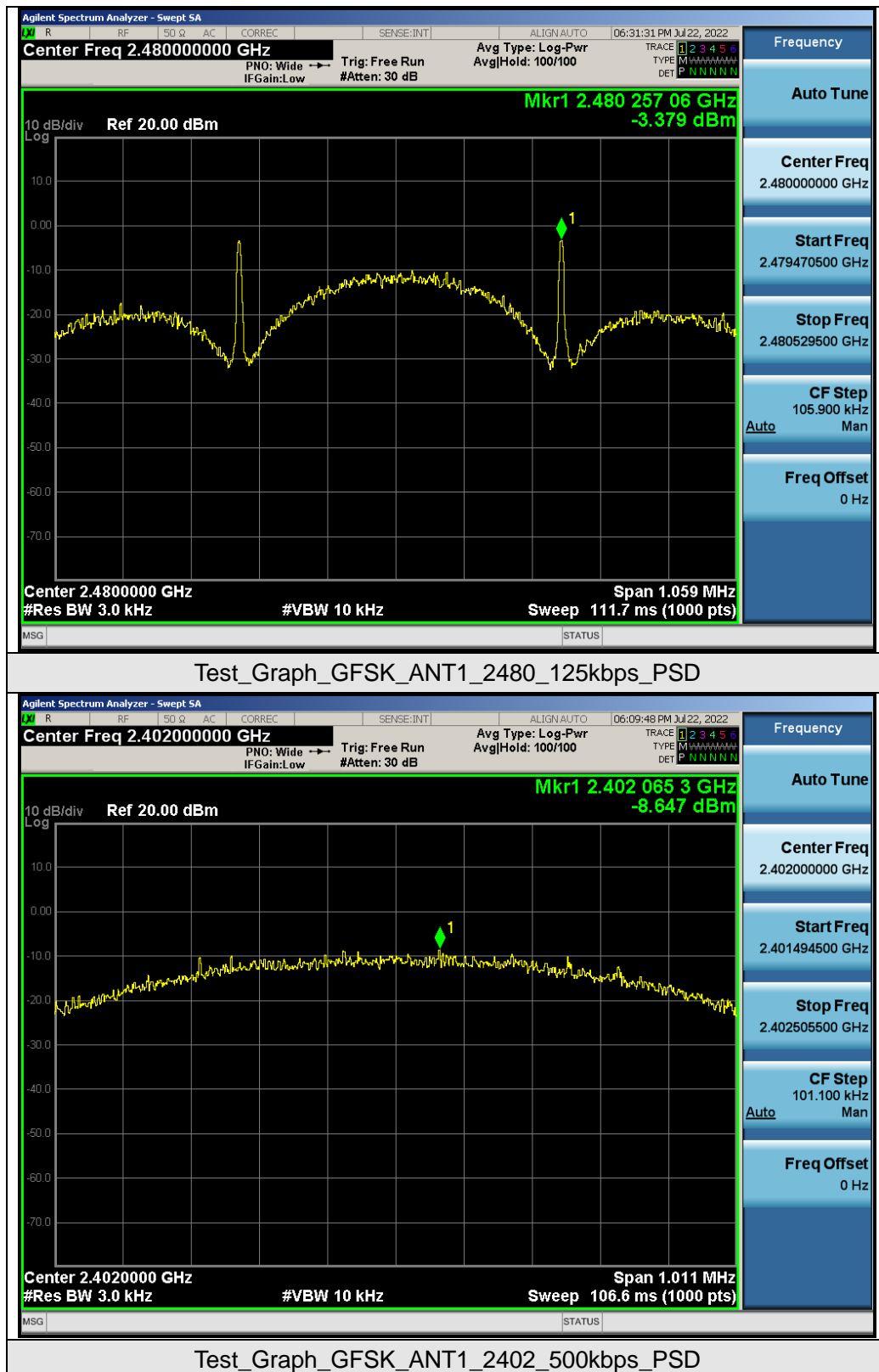
Test_Graph_GFSK_ANT1_2440_125kbps_PSD

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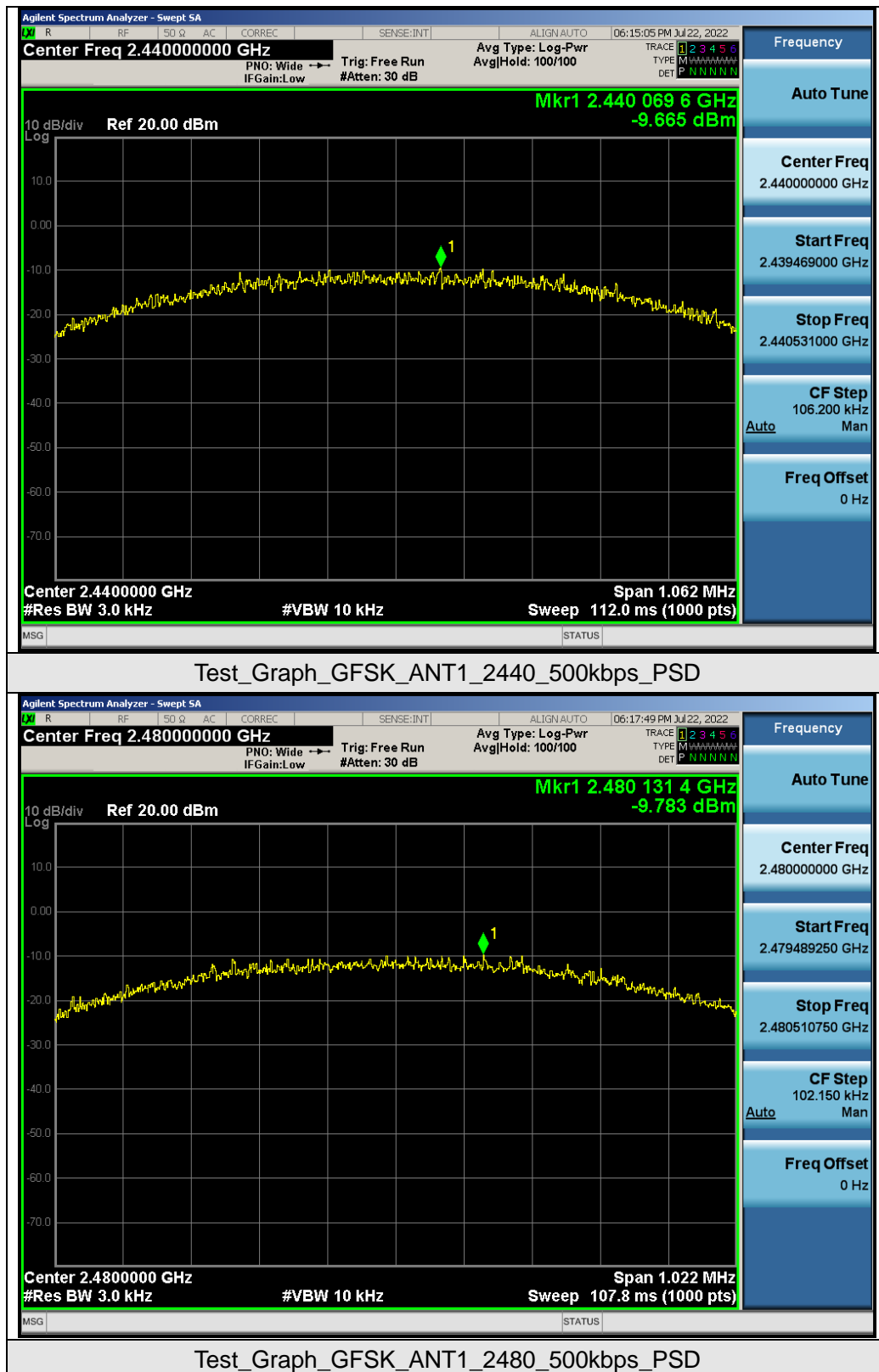
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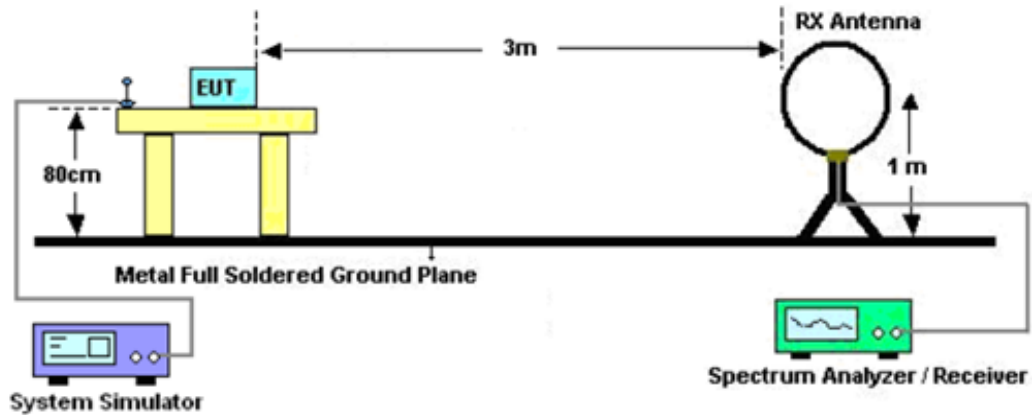
11. RADIATED EMISSION

11.1. MEASUREMENT PROCEDURE

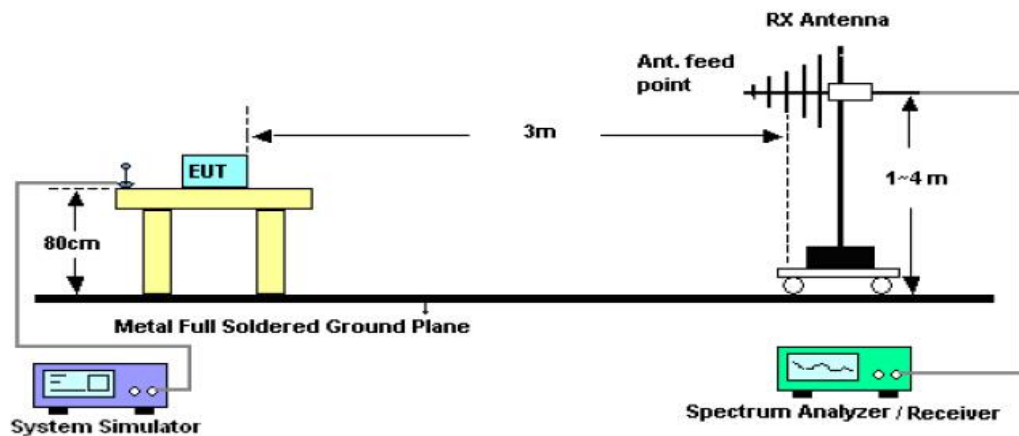
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated 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.

11.2. TEST SETUP

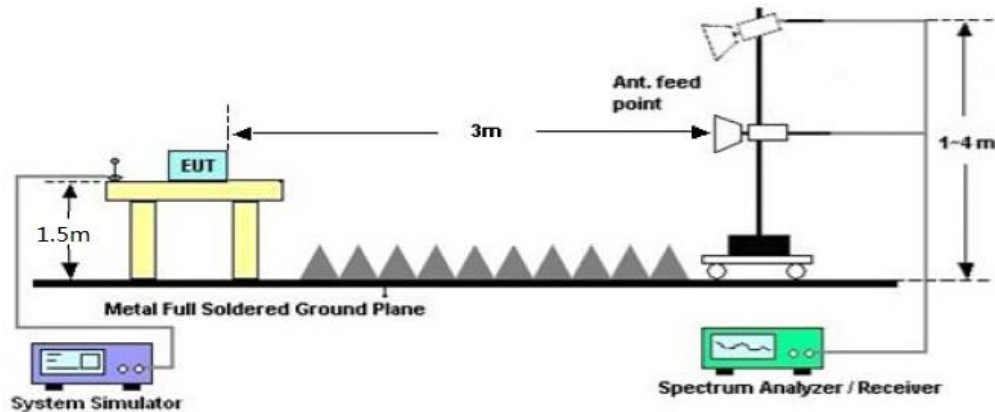
Radiated Emission Test-Setup Frequency Below 30MHz



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

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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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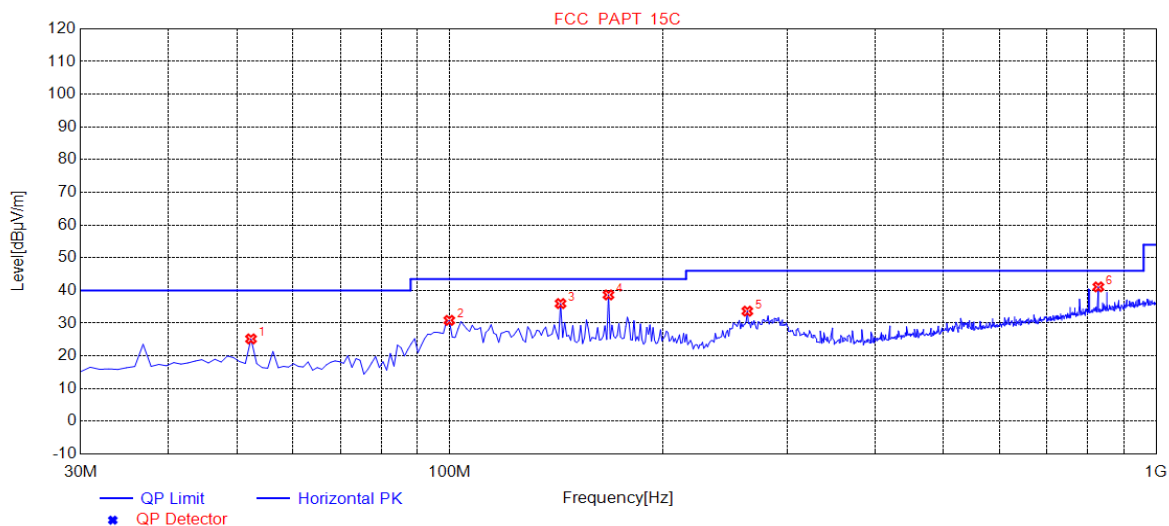
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Radiated emission from 30MHz to 1000MHz (Antenna 1)

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.3100	25.20	11.49	40.00	14.80	200	153	Horizontal
2	99.8400	30.87	11.30	43.50	12.63	200	283	Horizontal
3	143.4900	36.00	14.88	43.50	7.50	200	186	Horizontal
4	167.7400	38.66	14.17	43.50	4.84	200	356	Horizontal
5	263.7700	33.68	14.88	46.00	12.32	100	195	Horizontal
6	828.3100	41.10	28.93	46.00	4.90	200	246	Horizontal

RESULT: PASS

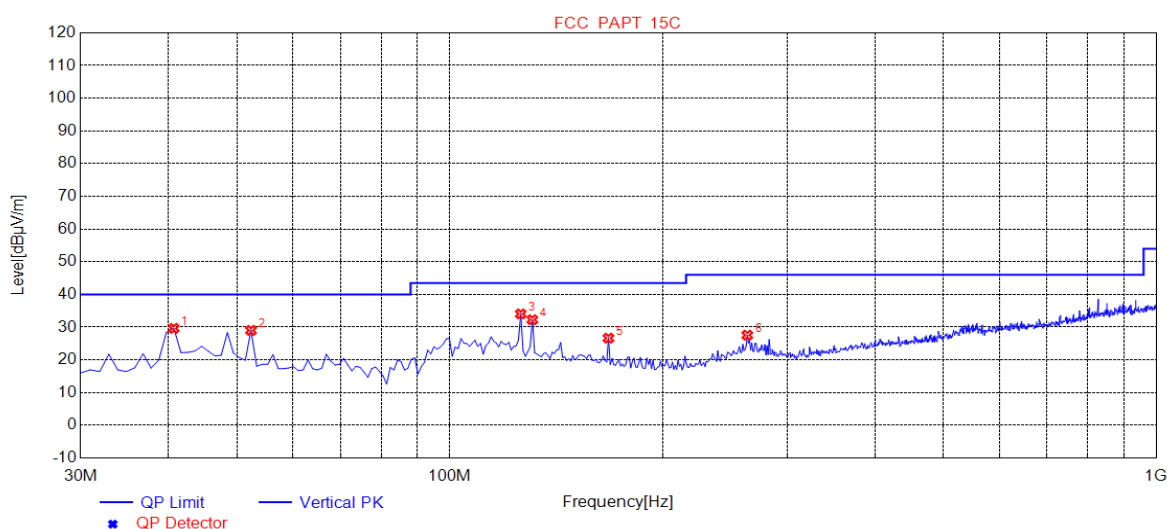
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EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical



NO.	Freq. [MHz]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	40.6700	29.64	11.91	40.00	10.36	100	104	Vertical
2	52.3100	29.02	11.49	40.00	10.98	100	121	Vertical
3	126.0300	34.06	13.88	43.50	9.44	100	151	Vertical
4	130.8800	32.29	14.21	43.50	11.21	100	214	Vertical
5	167.7400	26.65	14.17	43.50	16.85	100	314	Vertical
6	263.7700	27.56	14.88	46.00	18.44	100	224	Vertical

RESULT: PASS

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

2. All test modes had been tested. The mode 1 is the worst case and recorded in the report.

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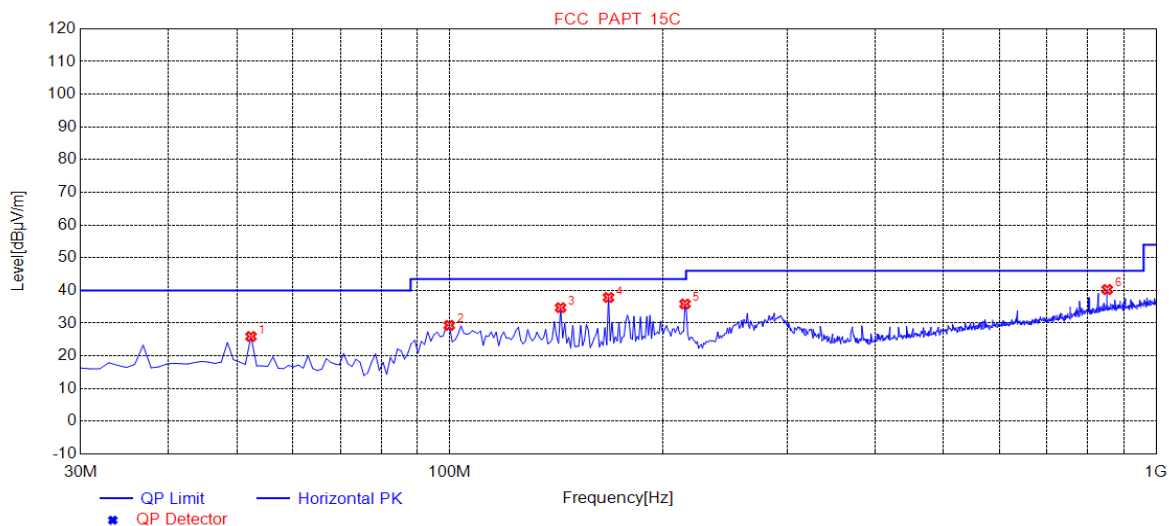
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Radiated emission from 30MHz to 1000MHz (Antenna 2)

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.3100	25.94	11.49	40.00	14.06	200	359	Horizontal
2	99.8400	29.35	11.30	43.50	14.15	200	307	Horizontal
3	143.4900	34.75	14.88	43.50	8.75	200	199	Horizontal
4	167.7400	37.86	14.17	43.50	5.64	200	196	Horizontal
5	215.2700	35.88	12.98	43.50	7.62	100	234	Horizontal
6	852.5600	40.30	29.38	46.00	5.70	100	241	Horizontal

RESULT: PASS

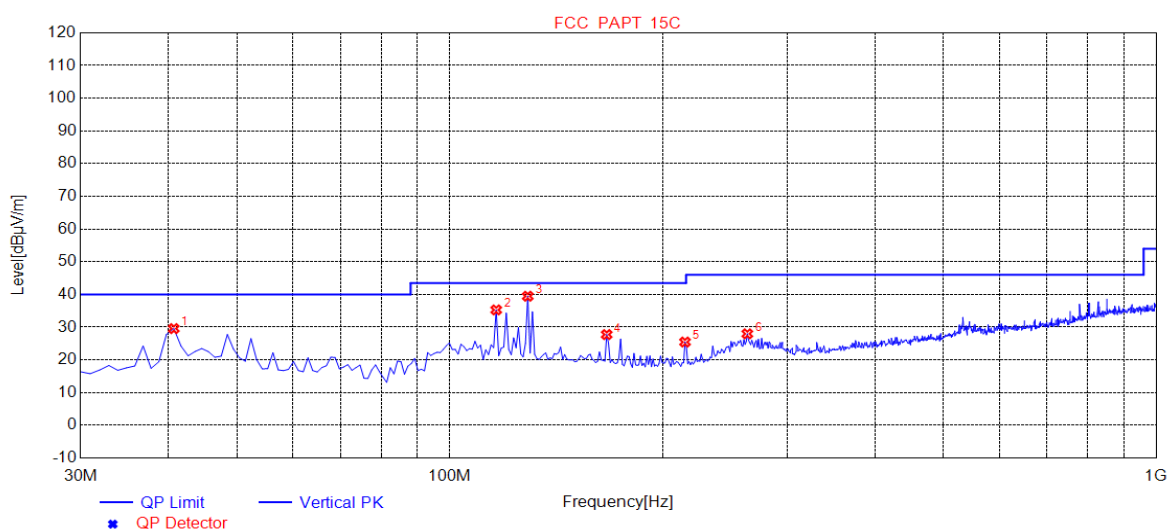
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EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical



NO.	Freq. [MHz]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	40.6700	29.57	11.91	40.00	10.43	100	1	Vertical
2	116.3300	35.29	13.09	43.50	8.21	100	55	Vertical
3	128.9400	39.47	14.08	43.50	4.03	100	353	Vertical
4	166.7700	27.75	14.26	43.50	15.75	100	327	Vertical
5	215.2700	25.46	12.98	43.50	18.04	100	0	Vertical
6	263.7700	27.98	14.88	46.00	18.02	100	3	Vertical

RESULT: PASS

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

2. All test modes had been tested. The mode 1 is the worst case and recorded in the report.

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Radiated emission above 1GHz (Antenna 1)

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	49.72	0.08	49.8	74	-24.2	peak
4804.000	37.29	0.08	37.37	54	-16.63	AVG
7206.000	47.21	2.21	49.42	74	-24.58	peak
7206.000	34.56	2.21	36.77	54	-17.23	AVG

Remark:

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

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	50.46	0.08	50.54	74	-23.46	peak
4804.000	36.72	0.08	36.8	54	-17.2	AVG
7206.000	47.63	2.21	49.84	74	-24.16	peak
7206.000	33.72	2.21	35.93	54	-18.07	AVG

Remark:

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

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EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	50.46	0.14	50.6	74	-23.4	peak
4880.000	38.46	0.14	38.6	54	-15.4	AVG
7320.000	47.51	2.36	49.87	74	-24.13	peak
7320.000	35.46	2.36	37.82	54	-16.18	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	50.98	0.14	51.12	74	-22.88	peak
4880.000	37.62	0.14	37.76	54	-16.24	AVG
7320.000	48.46	2.36	50.82	74	-23.18	peak
7320.000	35.46	2.36	37.82	54	-16.18	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	51.63	0.22	51.85	74	-22.15	peak
4960.000	39.76	0.22	39.98	54	-14.02	AVG
7440.000	48.32	2.64	50.96	74	-23.04	peak
7440.000	36.78	2.64	39.42	54	-14.58	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	52.01	0.22	52.23	74	-21.77	peak
4960.000	39.77	0.22	39.99	54	-14.01	AVG
7440.000	48.76	2.64	51.4	74	-22.6	peak
7440.000	36.89	2.64	39.53	54	-14.47	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note:

The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.

Factor = Antenna Factor + Cable loss - Amplifier gain, Margin=Emission Level-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

Radiated emission above 1GHz (Antenna 2)

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	48.98	0.08	49.06	74	-24.94	peak
4804.000	36.78	0.08	36.86	54	-17.14	AVG
7206.000	46.37	2.21	48.58	74	-25.42	peak
7206.000	33.57	2.21	35.78	54	-18.22	AVG

Remark:

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

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	49.62	0.08	49.7	74	-24.3	peak
4804.000	37.24	0.08	37.32	54	-16.68	AVG
7206.000	47.24	2.21	49.45	74	-24.55	peak
7206.000	34.26	2.21	36.47	54	-17.53	AVG

Remark:

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

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EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	49.73	0.14	49.87	74	-24.13	peak
4880.000	37.52	0.14	37.66	54	-16.34	AVG
7320.000	47.19	2.36	49.55	74	-24.45	peak
7320.000	34.59	2.36	36.95	54	-17.05	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	50.34	0.14	50.48	74	-23.52	peak
4880.000	38.69	0.14	38.83	54	-15.17	AVG
7320.000	48.72	2.36	51.08	74	-22.92	peak
7320.000	36.11	2.36	38.47	54	-15.53	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	50.44	0.22	50.66	74	-23.34	peak
4960.000	38.27	0.22	38.49	54	-15.51	AVG
7440.000	48.73	2.64	51.37	74	-22.63	peak
7440.000	37.53	2.64	40.17	54	-13.83	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	BDE Bluetooth 5.2 Low Energy Module	Model Name	BDE-BLEM215
Temperature	25°C	Relative Humidity	60%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	51.34	0.22	51.56	74	-22.44	peak
4960.000	39.24	0.22	39.46	54	-14.54	AVG
7440.000	49.25	2.64	51.89	74	-22.11	peak
7440.000	38.27	2.64	40.91	54	-13.09	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note:

The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.

Factor = Antenna Factor + Cable loss - Amplifier gain, Margin=Emission Level-Limit.

The "Factor" value can be calculated automatically by software of measurement system.