FCC Test Report

Report No.: AGC00174220703FE02

FCC ID	:	XPYNORAB12
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	NORA-B12
BRAND NAME	:	u-blox
MODEL NAME	:	NORA-B120, NORA-B121, NORA-B126
APPLICANT	:	u-blox AG
DATE OF ISSUE	:	Oct. 28, 2022
STANDARD(S)	:	FCC Part 15.247
REPORT VERSION	:	V1.0

*A*ttestation of *G*lobal *C*ompliance (Shenzhen) Co., Ltd

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Oct. 28, 2022	Valid	Initial Release

TABLE OF CONTENTS

1. VERIFICATION OF COMPLIANCE

Applicant	u-blox AG
Address	Zuercherstrasse 68, Thalwil Ch-8800, Switzerland
Manufacturer	u-blox AG
Address	Zurcherstrasse 68, Thawil, Switzerland, Ch-8800
Factory	Flextronics International GmbH
Address	Friesacher Strasse 3, A-9330, Althofen, Austria
Product Designation	NORA-B12
Brand Name	u-blox
Test Model	NORA-B120
Series Model	NORA-B121, NORA-B126
Declaration of Difference	All the same except for the model name and antenna type NORA-B120:on-module U.FL connector NORA-B121:bottom-side pin pad with host PCB U.FL NORA-B126:internal PCB trace antenna
Date of receipt of test item	Jul. 20, 2022
Date of test	Jul. 20, 2022 to Oct. 23, 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	Cool Cheng (Project Engineer)	Oct. 28, 2022
Reviewed By	Calvin Liu (Reviewer)	Oct. 28, 2022
Approved By	Max Zhang (Authorized Officer)	Oct. 28, 2022

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as a “NORA-B12”. 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	BLE 1M:12.916dBm (Max) BLE 2M:12.826dBm (Max)
Bluetooth Version	V5.2
Modulation	BR☐GFSK, EDR☐π /4-DQPSK, ☐8DPSK BLE☒GFSK 1Mbps ☒GFSK 2Mbps
Number of channels	40 Channels
Antenna Designation	See section 2.8 and 2.9 of the report (Comply with requirements of the FCC part 15.203)
Antenna Gain	Antenna 1:2.33dBi(Pulse W1030) Antenna 2:5.3dBi(Molex 214415011) Antenna 3:0.89dBi(Taoglas WCM.01.0111) Antenna 4:-0.1dBi(Taoglas FXP72.07.0053A) Antenna 5:0.9dBi(Taoglas PC17.07.0070A) Antenna 6:3.7dBi(Taoglas FXP73.07.0100A) Antenna 7:2dBi(NORA-B126)
Hardware Version	A
Software Version	v1
Power Supply	DC 3.3V by test board
Note: The EUT has Seven root antenna, Only antenna 2 the data of the worst case would be record in this test report.	

2.2. TABLE OF CARRIER FREQUENCYS

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

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

This submittal(s) (test report) is intended for **FCC ID: XPYNORAB12** 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.

2.8. DESCRIPTION OF AVAILABLE ANTENNAS

Dedicated Antenna				
Model Name		NOR A-B120	NOR A-B121	NOR A-B126
No.	Antenna Type	Max Peak Gain (dBi)	Max Peak Gain (dBi)	Max Peak Gain (dBi)
1	Rod antenna	2.33	2.33	--
2	Rod antenna	5.3	5.3	--
3	Button antenna	0.89	0.89	--
4	Flex PCB antenna	-0.1	-0.1	--
5	Ultra Miniature PCB antenna	0.9	0.9	--
6	Flex PCB Chip antenna	3.7	3.7	--
7	internal antenna	--	--	2

2.9. DESCRIPTION OF ANTENNA RF PORT

Antenna RF Port		
Model Name		
NOR A-B120 (on-module U.FL connector)	NOR A-B121 (bottom-side pin pad with host PCB U.FL)	NOR A-B126 (internal PCB trace antenna)
		

3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±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 = ±2.9 dB
Uncertainty of Radiated Emission below 1GHz	U_c = ±3.8 dB
Uncertainty of Radiated Emission above 1GHz	U_c = ±4.9 dB
Uncertainty of total RF power, conducted	U_c = ±0.8 dB
Uncertainty of RF power density, conducted	U_c = ±2.6 dB
Uncertainty of spurious emissions, conducted	U_c = ±2.7 %
Uncertainty of Occupied Channel Bandwidth	U_c = ±2 %

4. DESCRIPTION OF TEST MODES

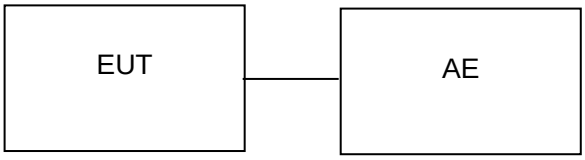
NO.	TEST MODE DESCRIPTION
1	Low channel TX_2402MHz_GFSK_1Mbps
2	Middle channel TX_2440MHz_GFSK_1Mbps
3	High channel TX_2480MHz_GFSK_1Mbps
4	Low channel TX_2402MHz_GFSK_2Mbps
5	Middle channel TX_2440MHz_GFSK_2Mbps
6	High channel TX_2480MHz_GFSK_2Mbps

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.
4. The EUT adjusts the frequency through the button.

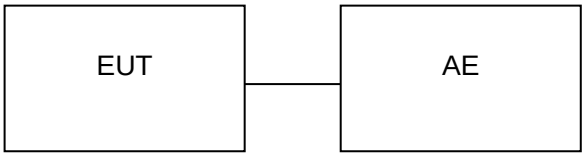
5. SYSTEM TEST CONFIGURATION

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	NORA-B12	NORA-B120	XPYNORAB12	EUT
2	Test board	N/A	N/A	AE
3	PC	D15	N/A	AE
4	PC Adapter	HW-200325CP0	2.2m unshielded	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

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

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESPI	101206	Mar. 28, 2022	Mar. 27, 2023
Artificial power network	R&S	ESH2-Z5	100086	Jun. 08, 2022	Jun. 07, 2023
Test Software	FARA	EZ-EMC(Ver. AGC-CON03A1)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST

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
Signal Analyzer	Aglient	N9020A	MY52090123	Aug. 04, 2022	Aug. 03, 2023
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
Attenuator	ZHINAN	E-002	N/A	Aug. 04, 2022	Aug. 03, 2024
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
Preamplifier Assembly	ETS	3117PA	00225134	Sep. 01, 2022	Sep. 02, 2024
Wideband Antenna	SCHWARZBECK	VULB9168	VULB9168-494	Jan. 08, 2021	Jan. 07, 2023
Test Software	FARA	EZ-EMC	Ver.RA-03A	N/A	N/A

7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

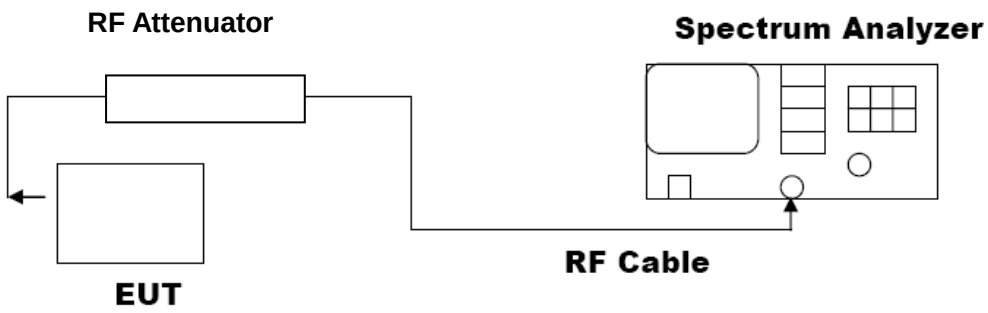
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. RBW≥DTS bandwidth
3. VBW≥3*RBW.
4. SPAN≥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)

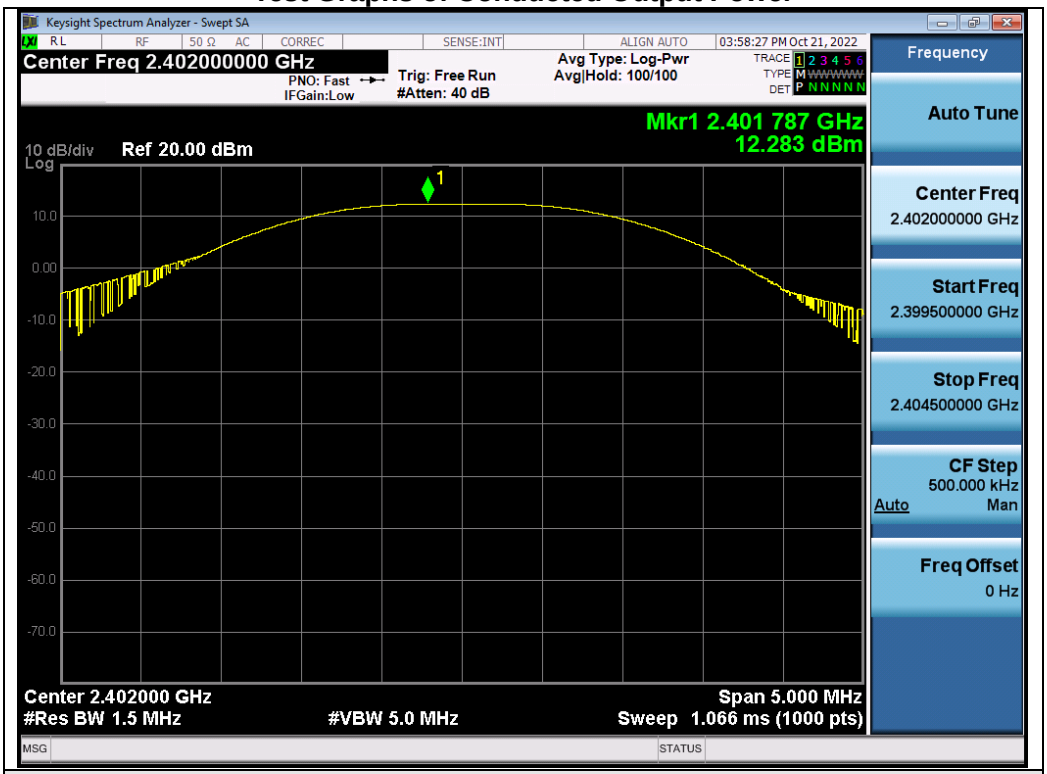
PEAK POWER TEST SETUP



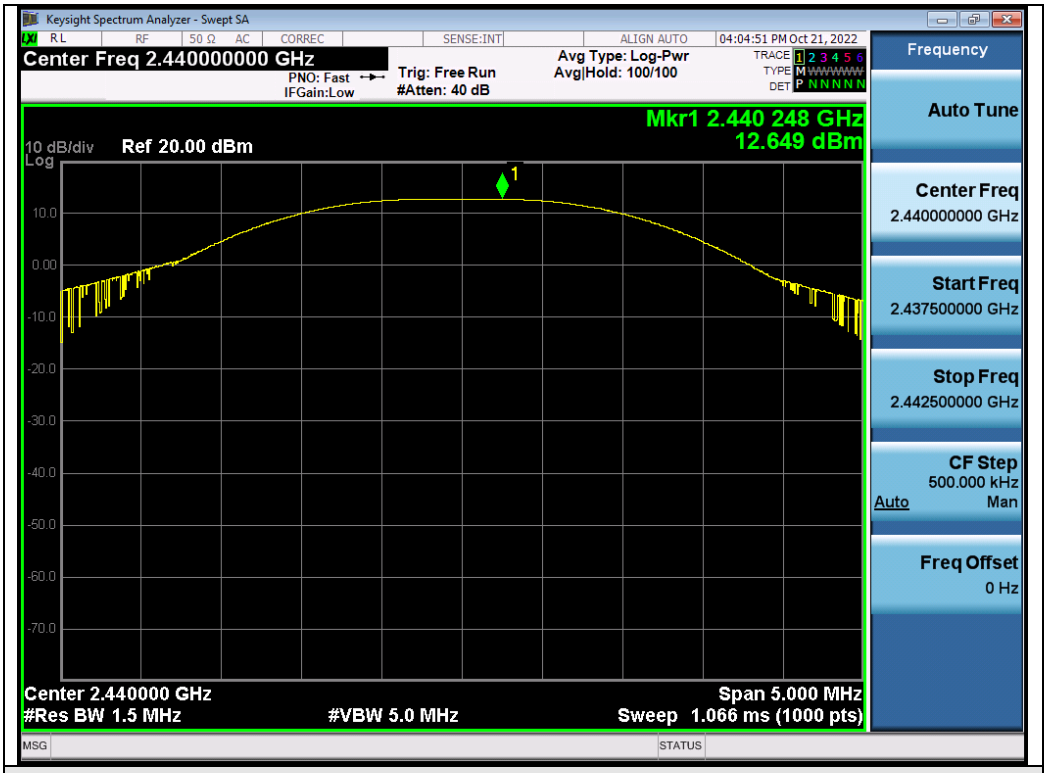
7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power				
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
GFSK 1M	2402	12.283	≤30	Pass
	2440	12.649	≤30	Pass
	2480	12.916	≤30	Pass
GFSK 2M	2402	12.299	≤30	Pass
	2440	12.595	≤30	Pass
	2480	12.826	≤30	Pass

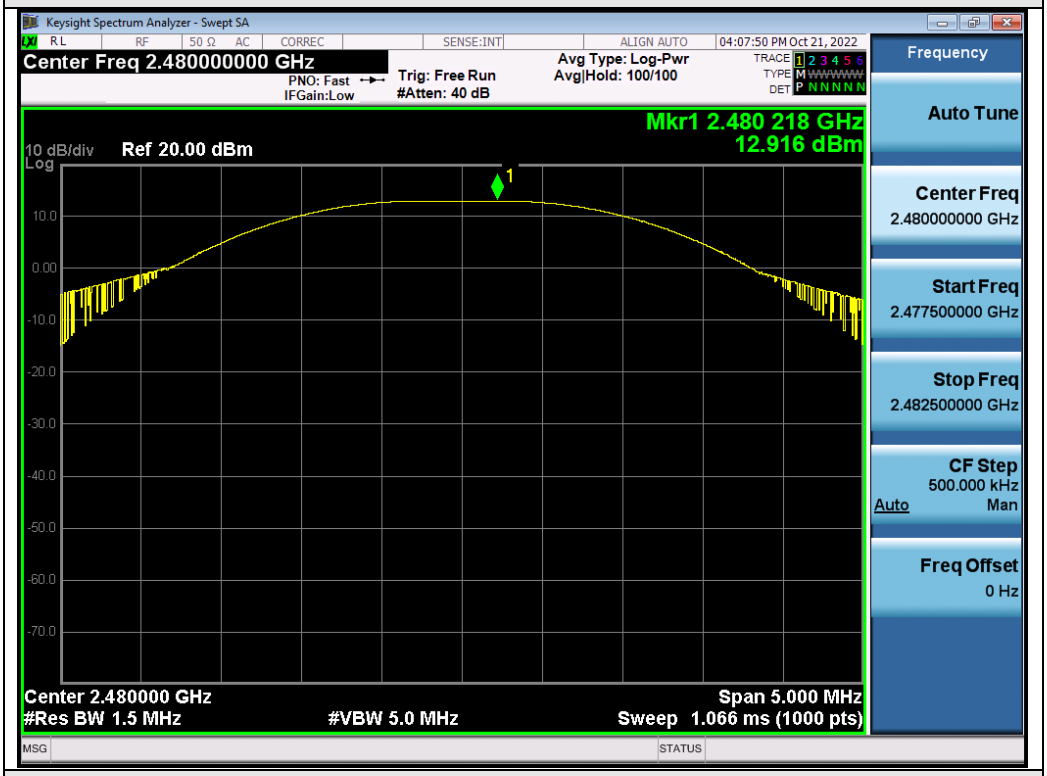
Test Graphs of Conducted Output Power



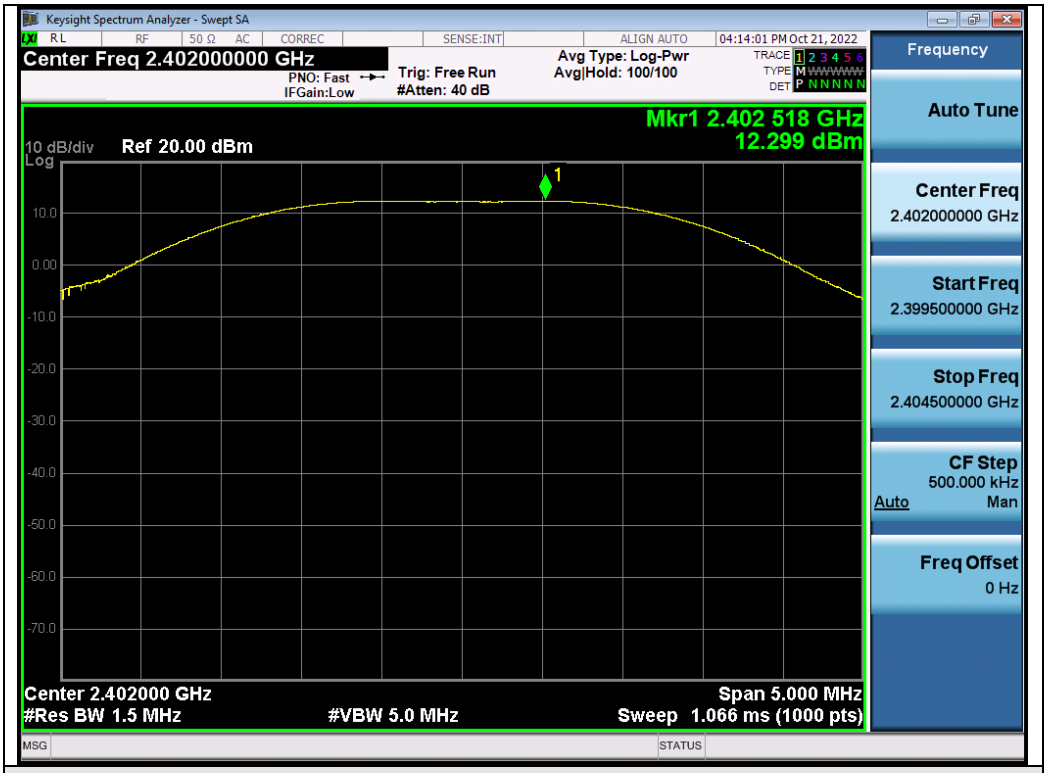
Test_Graph_LE1M_ANT1_2402_1Mbps_Peak Power



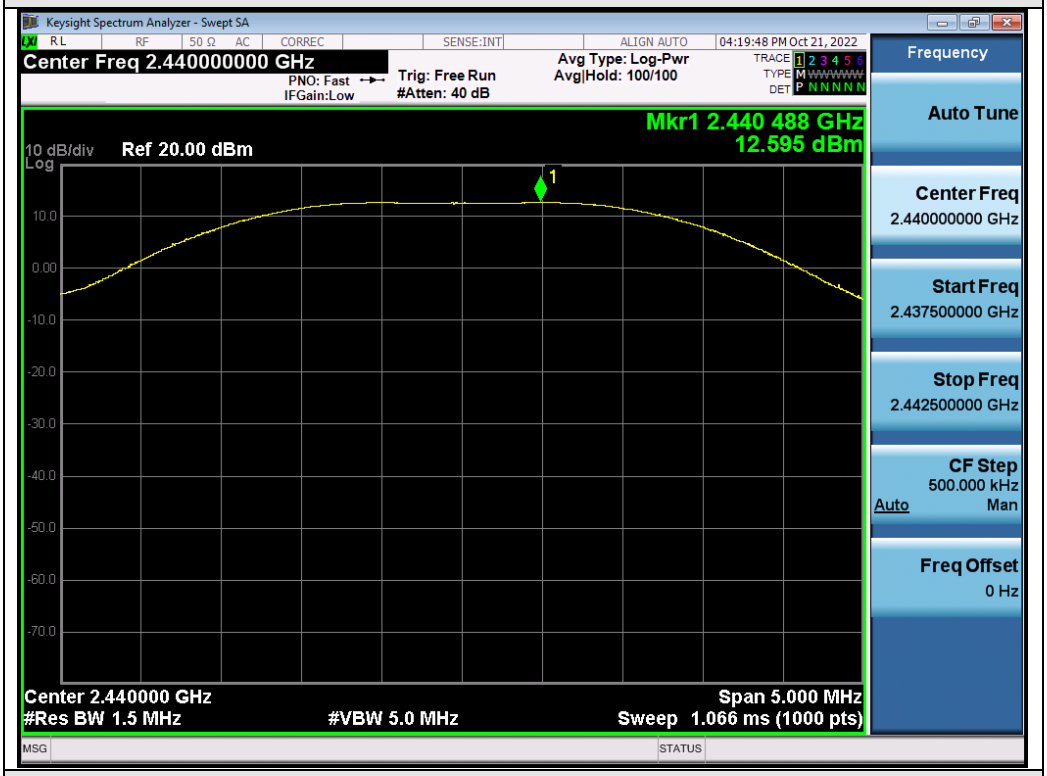
Test_Graph_LE1M_ANT1_2440_1Mbps_Peak Power



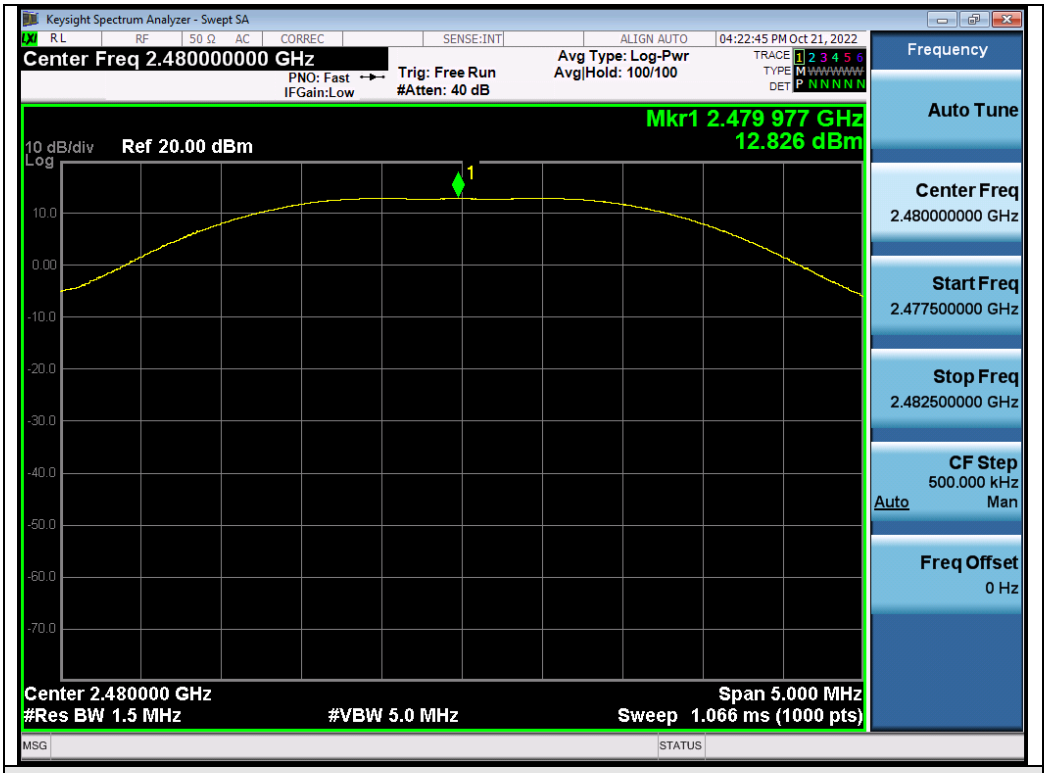
Test_Graph_LE1M_ANT1_2480_1Mbps_Peak Power



Test_Graph_LE2M_ANT1_2402_2Mbps_Peak Power



Test_Graph_LE2M_ANT1_2440_2Mbps_Peak Power



Test_Graph_LE2M_ANT1_2480_2Mbps_Peak Power

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≥3×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.

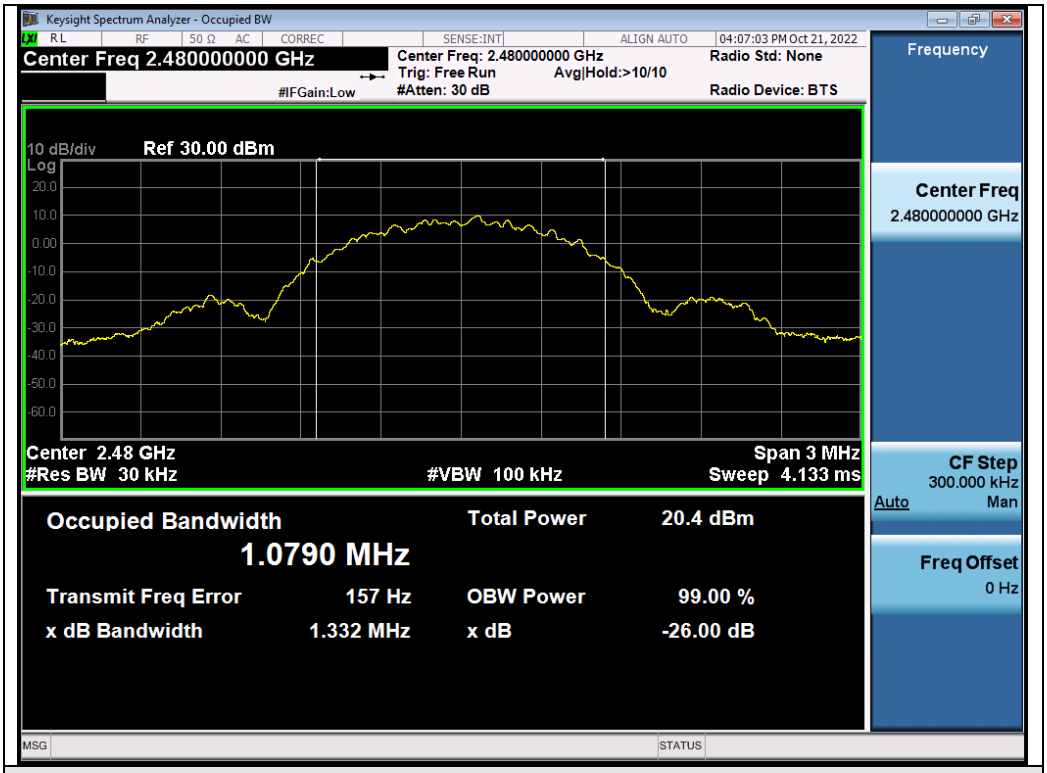
8.3. LIMITS AND MEASUREMENT RESULTS

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	1.085	0.742	≥0.5	Pass
	2440	1.086	0.722	≥0.5	Pass
	2480	1.079	0.720	≥0.5	Pass
GFSK 2M	2402	2.173	1.283	≥0.5	Pass
	2440	2.161	1.267	≥0.5	Pass
	2480	2.186	1.369	≥0.5	Pass

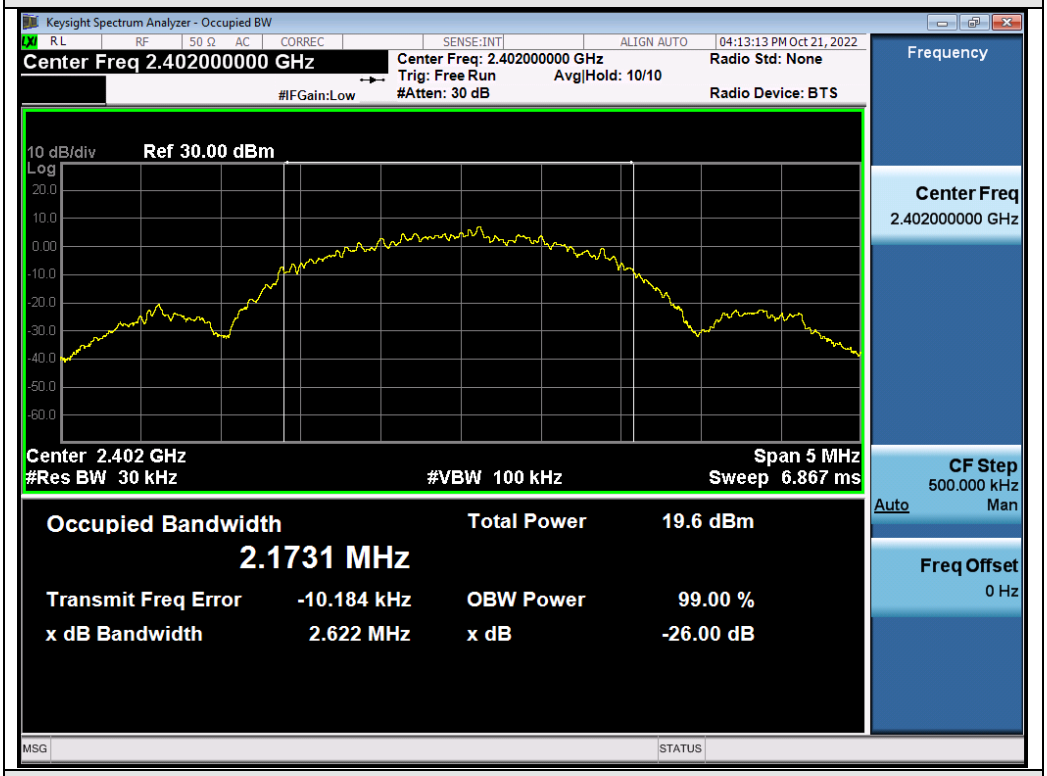
Test Graphs of Occupied Bandwidth

Test_Graph_LE1M_ANT1_2402_1Mbps_OBW

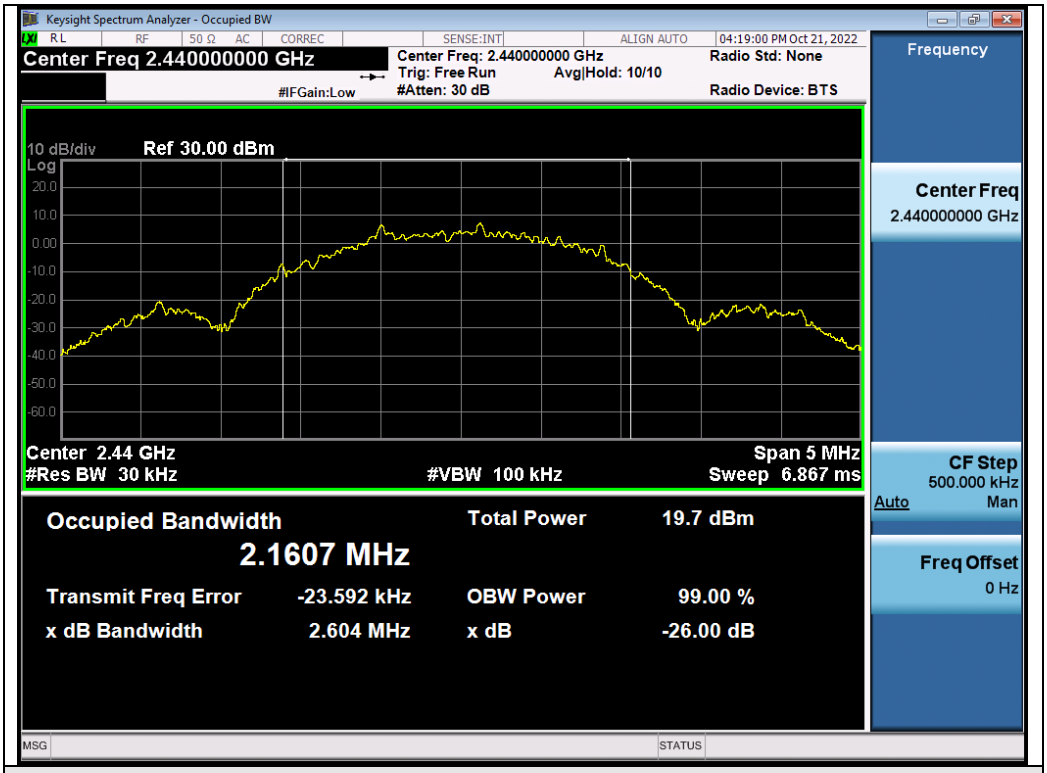
Test_Graph_LE1M_ANT1_2440_1Mbps_OBW



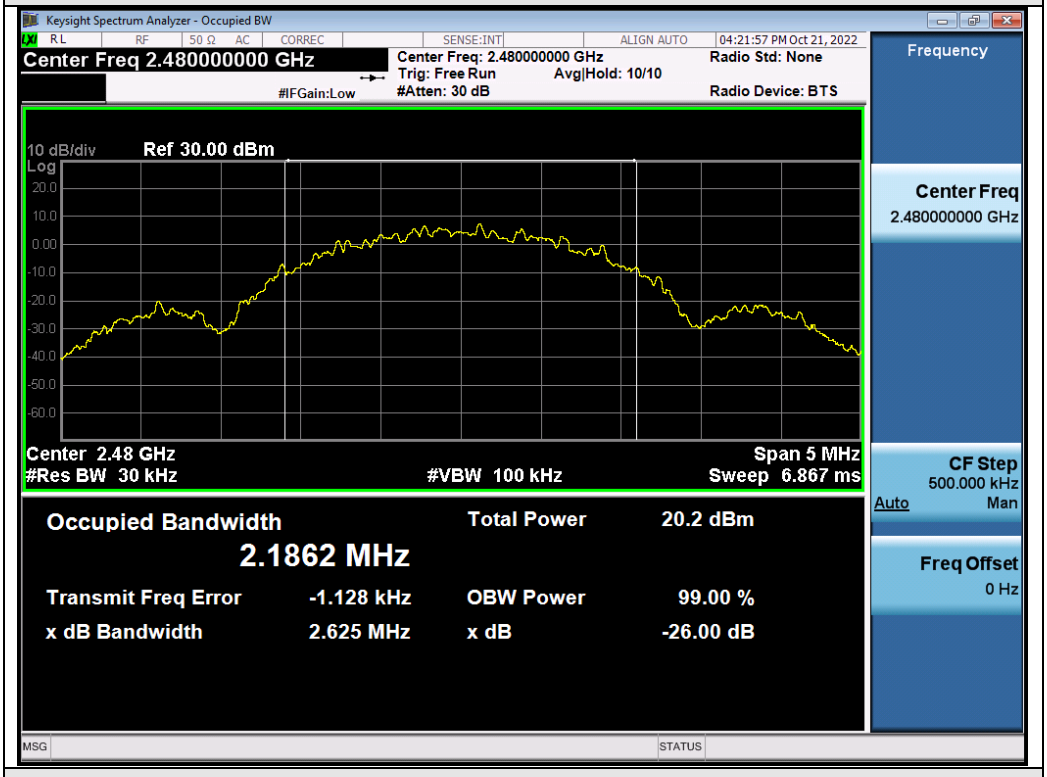
Test_Graph_LE1M_ANT1_2480_1Mbps_OBW



Test_Graph_LE2M_ANT1_2402_2Mbps_OBW

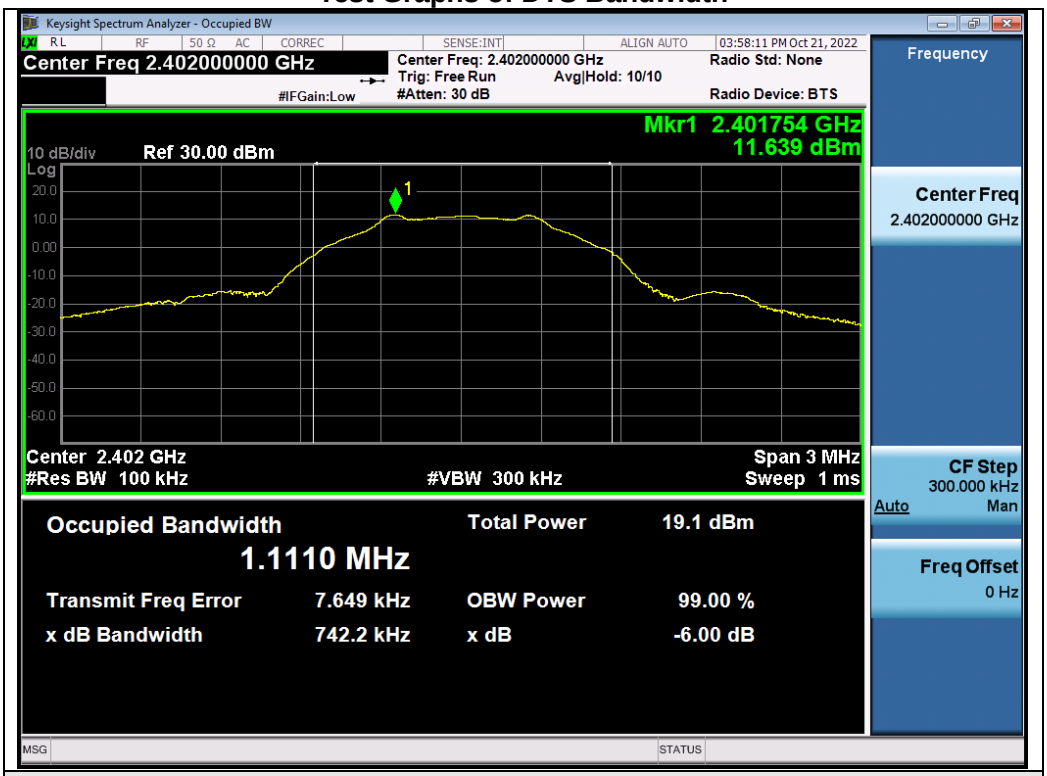


Test_Graph_LE2M_ANT1_2440_2Mbps_OBW

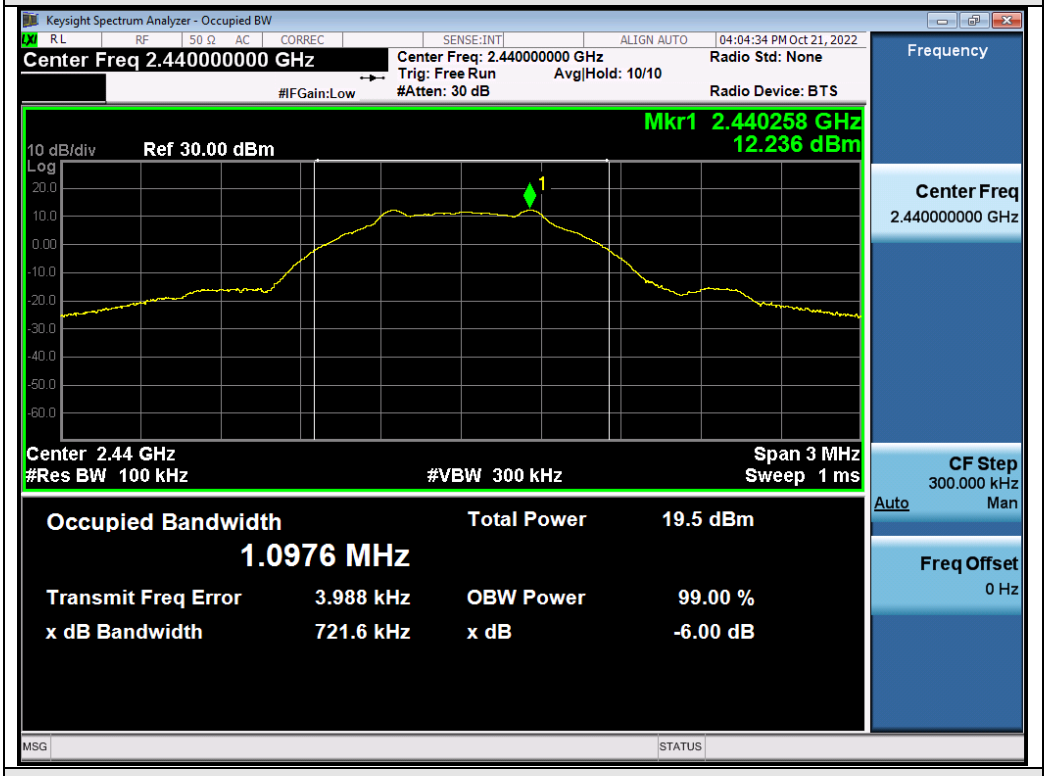


Test_Graph_LE2M_ANT1_2480_2Mbps_OBW

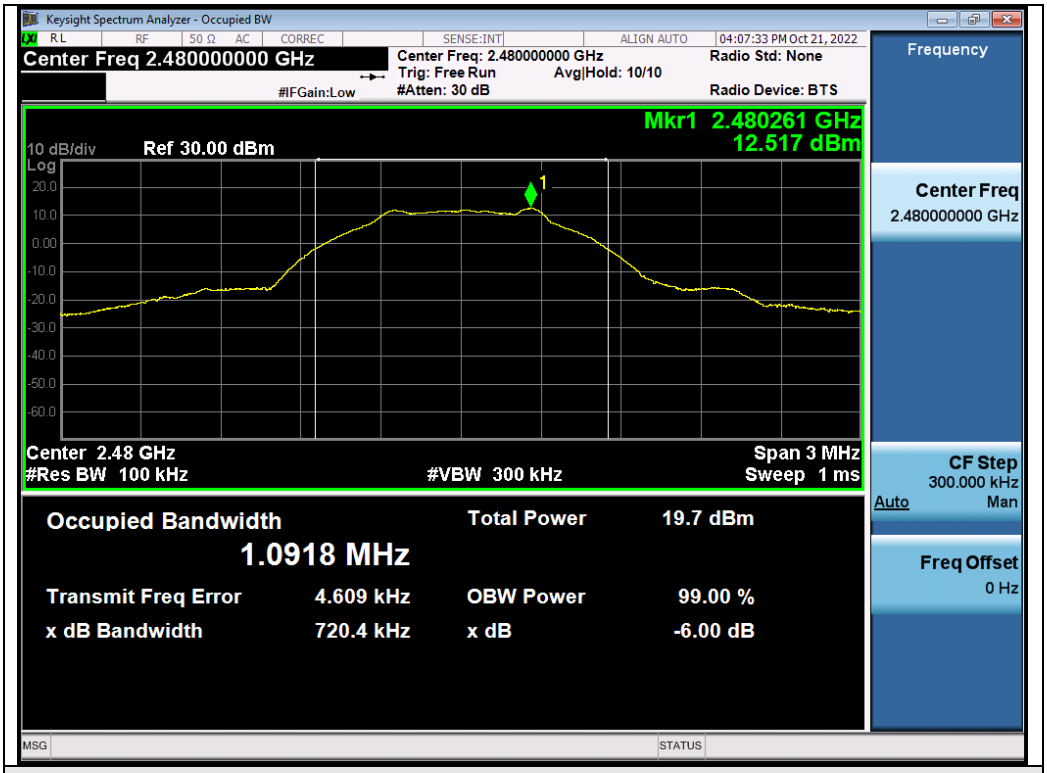
Test Graphs of DTS Bandwidth



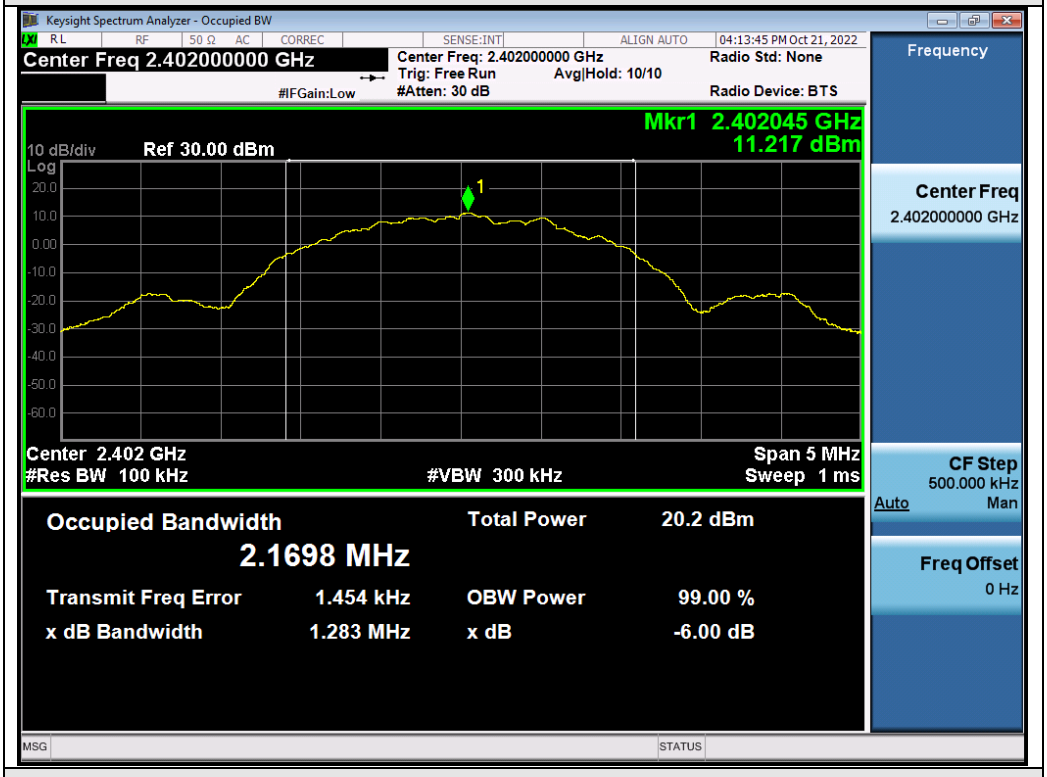
Test_Graph_LE1M_ANT1_2402_1Mbps_DTSBW



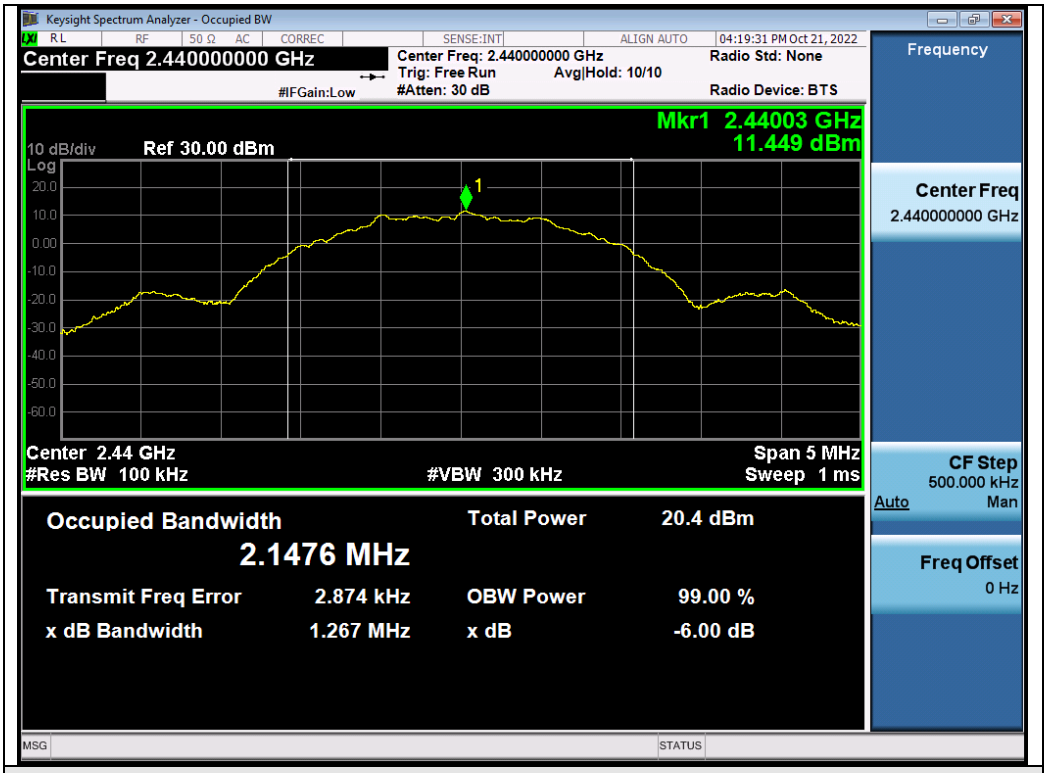
Test_Graph_LE1M_ANT1_2440_1Mbps_DTSBW



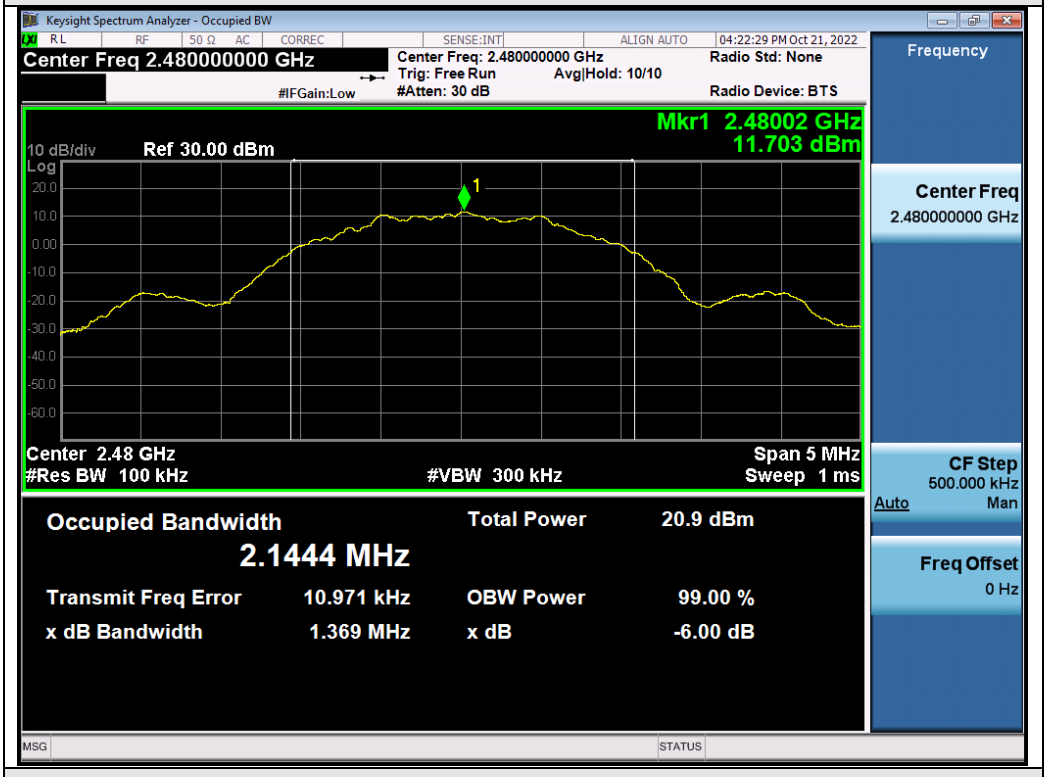
Test_Graph_LE1M_ANT1_2480_1Mbps_DTSBW



Test_Graph_LE2M_ANT1_2402_2Mbps_DTSBW



Test_Graph_LE2M_ANT1_2440_2Mbps_DTSBW



Test_Graph_LE2M_ANT1_2480_2Mbps_DTSBW

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

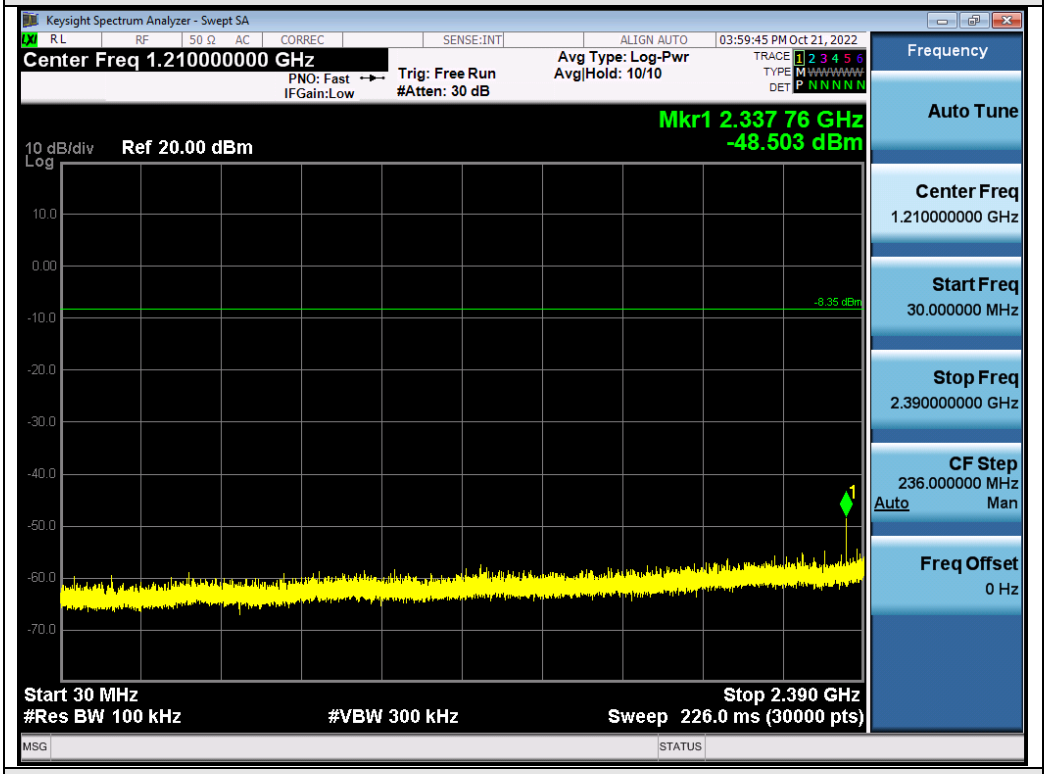
The same as described in section 6.

9.4. LIMITS AND MEASUREMENT RESULT

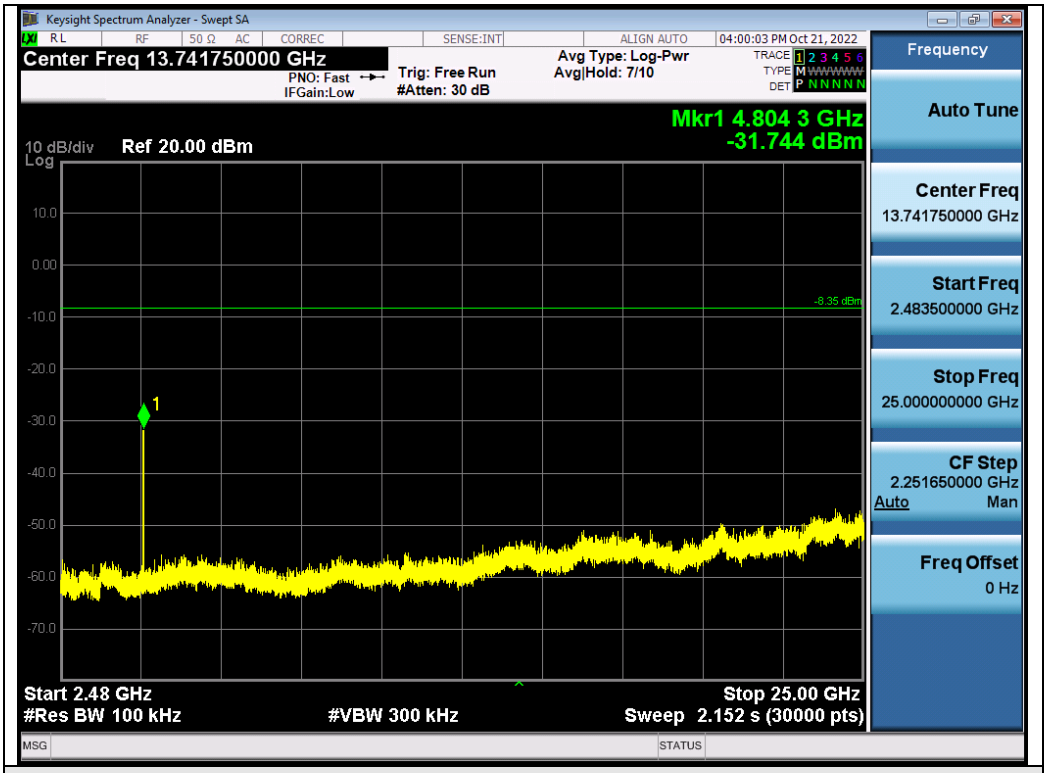
LIMITS AND MEASUREMENT RESULT		
Applicable Limits	**Measurement Result**	
	Test Data	**Criteria**
In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 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

Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands

Test_Graph_LE1M_ANT1_2402_1Mbps_Reference Level

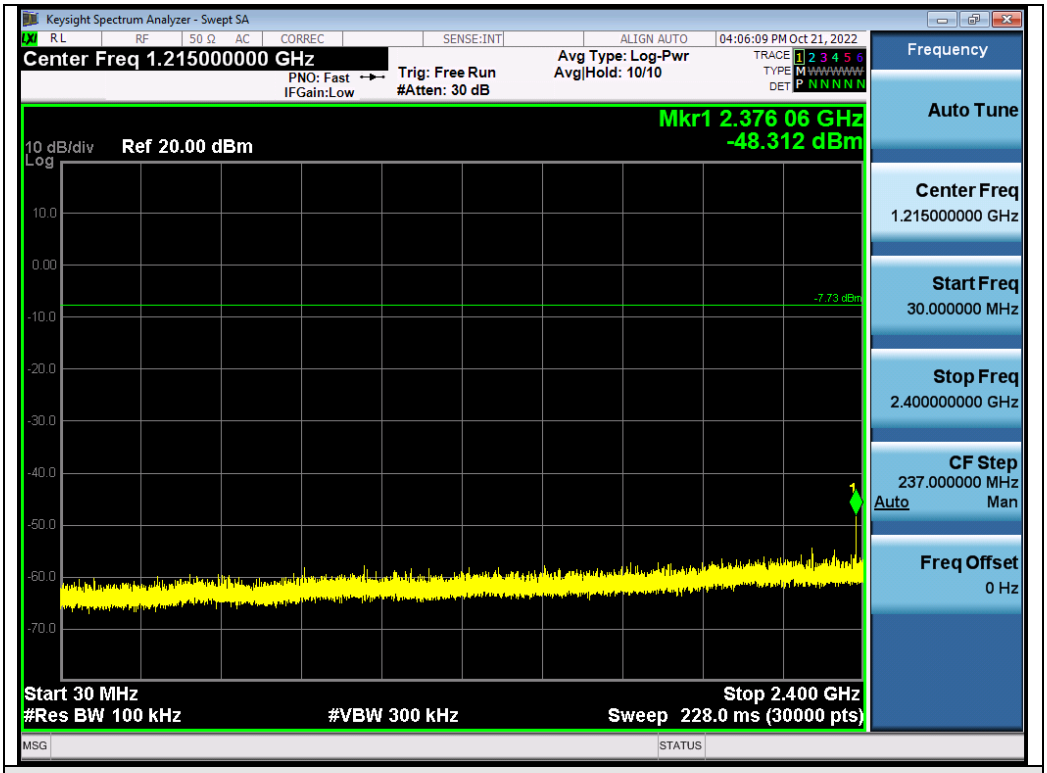


Test_Graph_LE1M_ANT1_2402_1Mbps_Lower Band Emissions



Test_Graph_LE1M_ANT1_2402_1Mbps_Higher Band Emissions

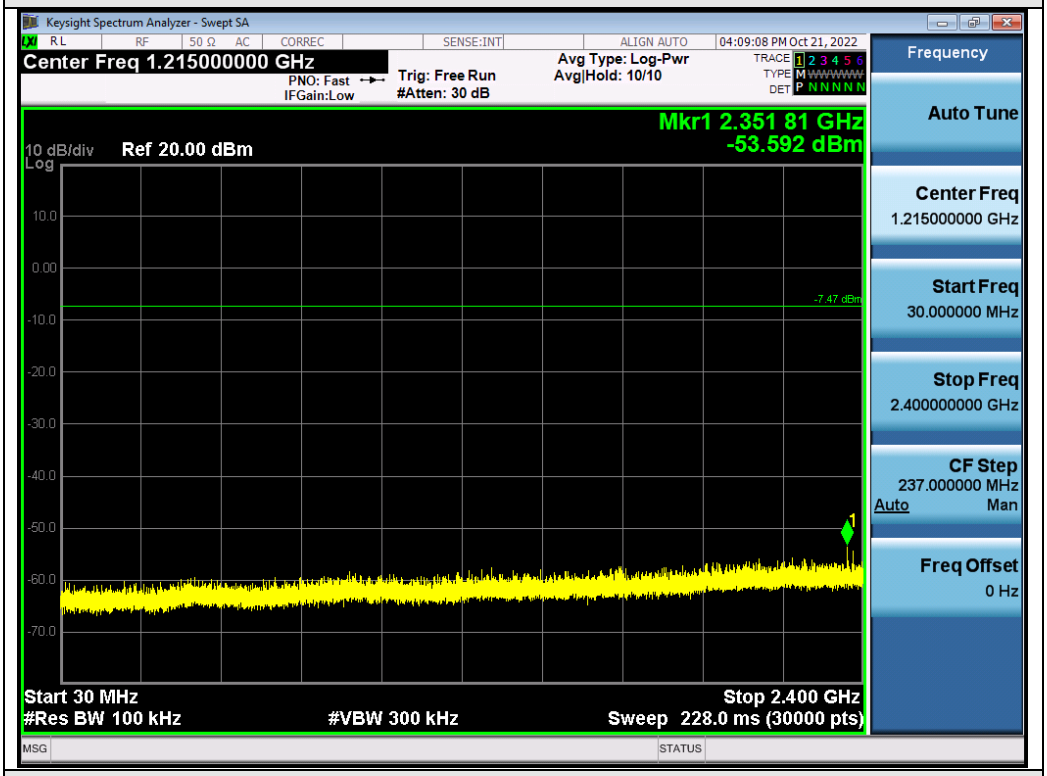
Test_Graph_LE1M_ANT1_2440_1Mbps_Reference Level



Test_Graph_LE1M_ANT1_2440_1Mbps_Lower Band Emissions

Test_Graph_LE1M_ANT1_2440_1Mbps_Higher Band Emissions

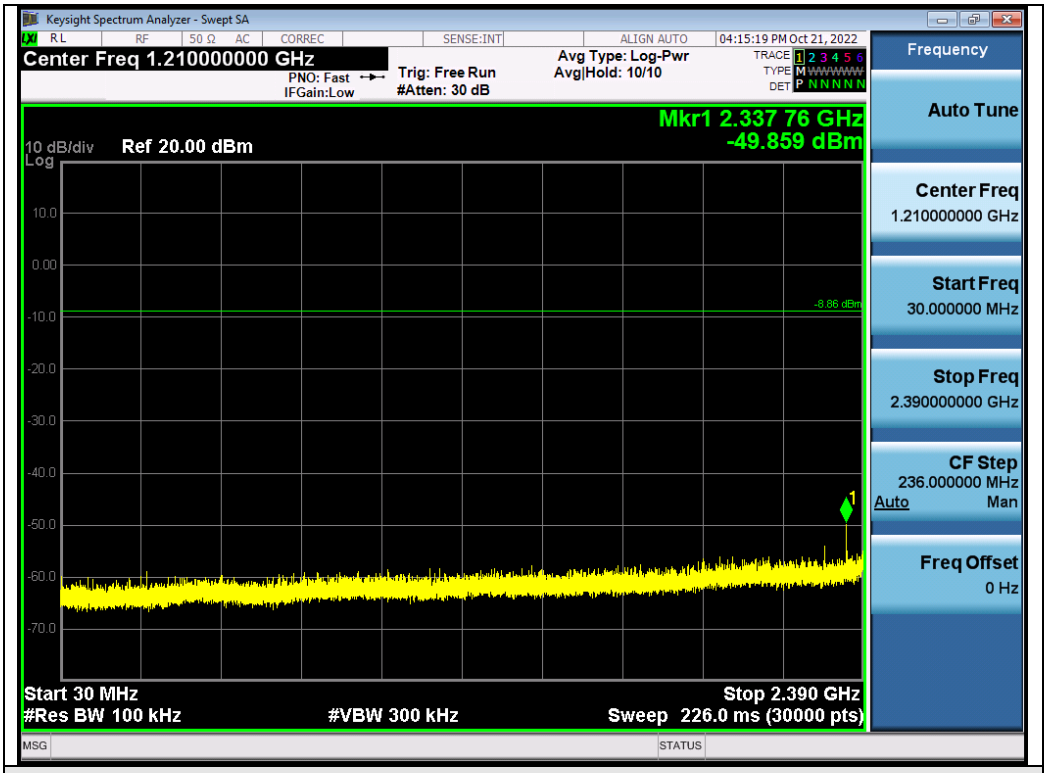
Test_Graph_LE1M_ANT1_2480_1Mbps_Reference Level



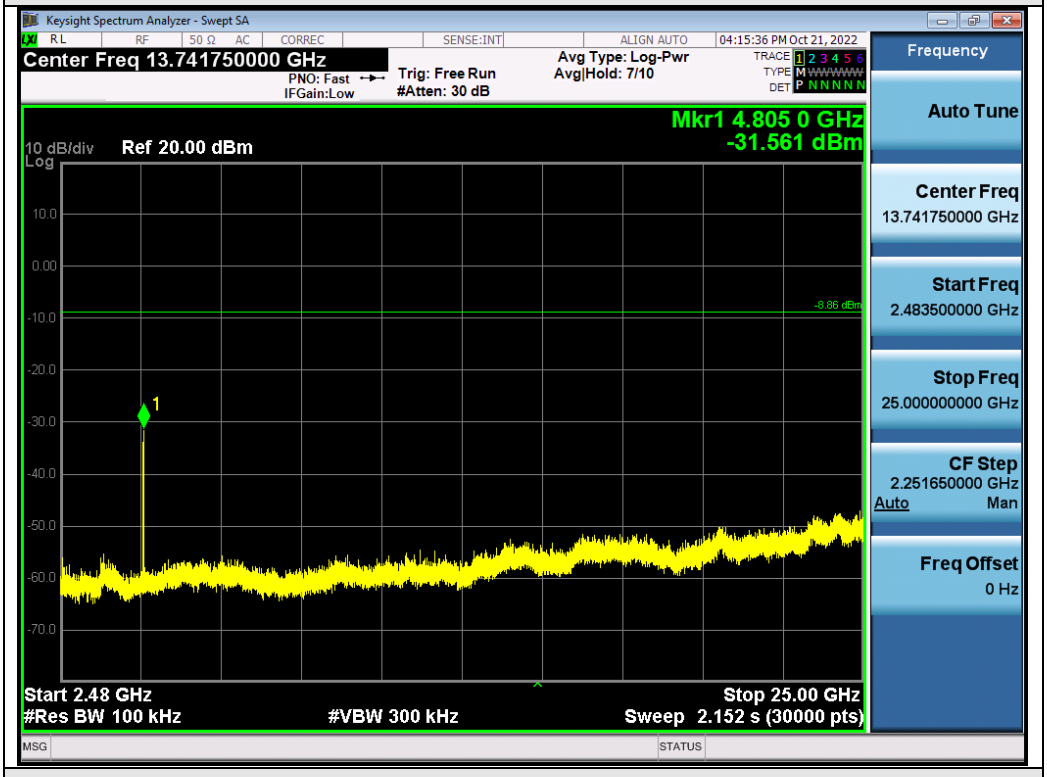
Test_Graph_LE1M_ANT1_2480_1Mbps_Lower Band Emissions

Test_Graph_LE1M_ANT1_2480_1Mbps_Higher Band Emissions

Test_Graph_LE2M_ANT1_2402_2Mbps_Reference Level

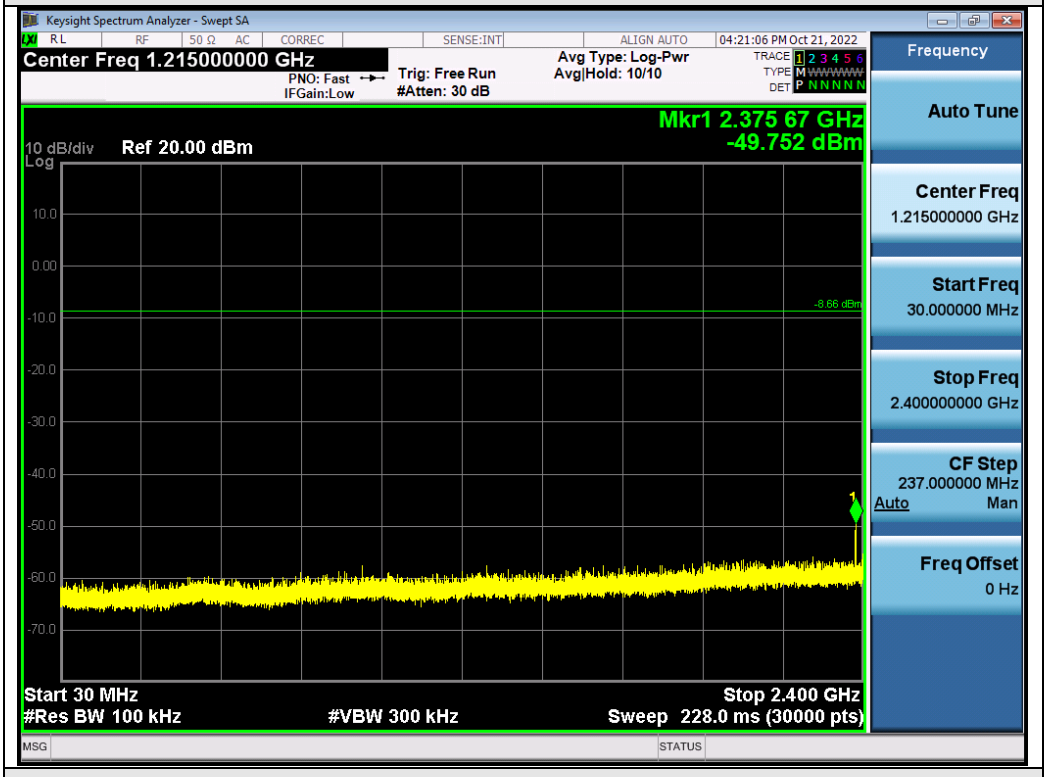


Test_Graph_LE2M_ANT1_2402_2Mbps_Lower Band Emissions

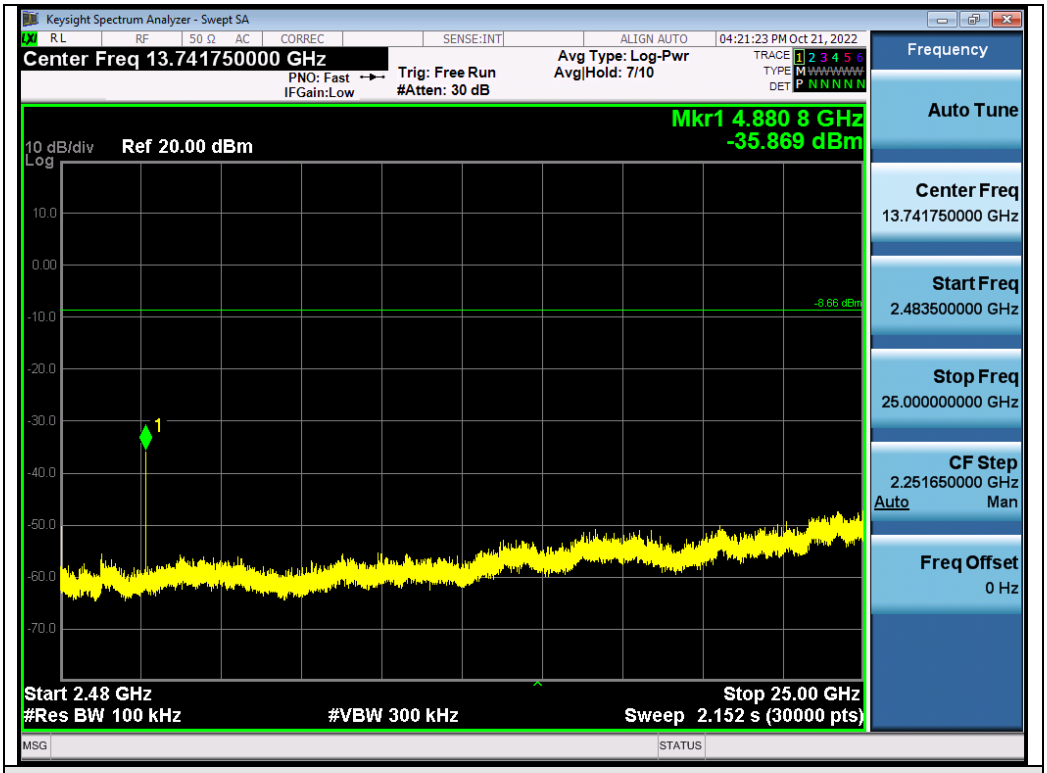


Test_Graph_LE2M_ANT1_2402_2Mbps_Higher Band Emissions

Test_Graph_LE2M_ANT1_2440_2Mbps_Reference Level

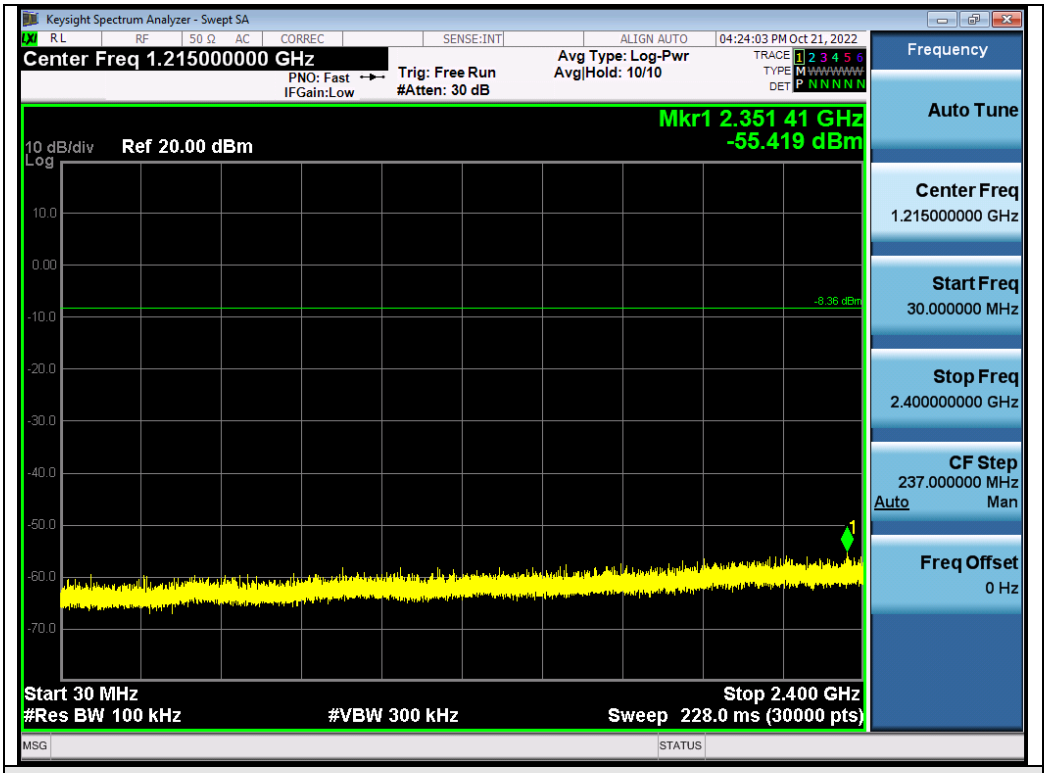


Test_Graph_LE2M_ANT1_2440_2Mbps_Lower Band Emissions

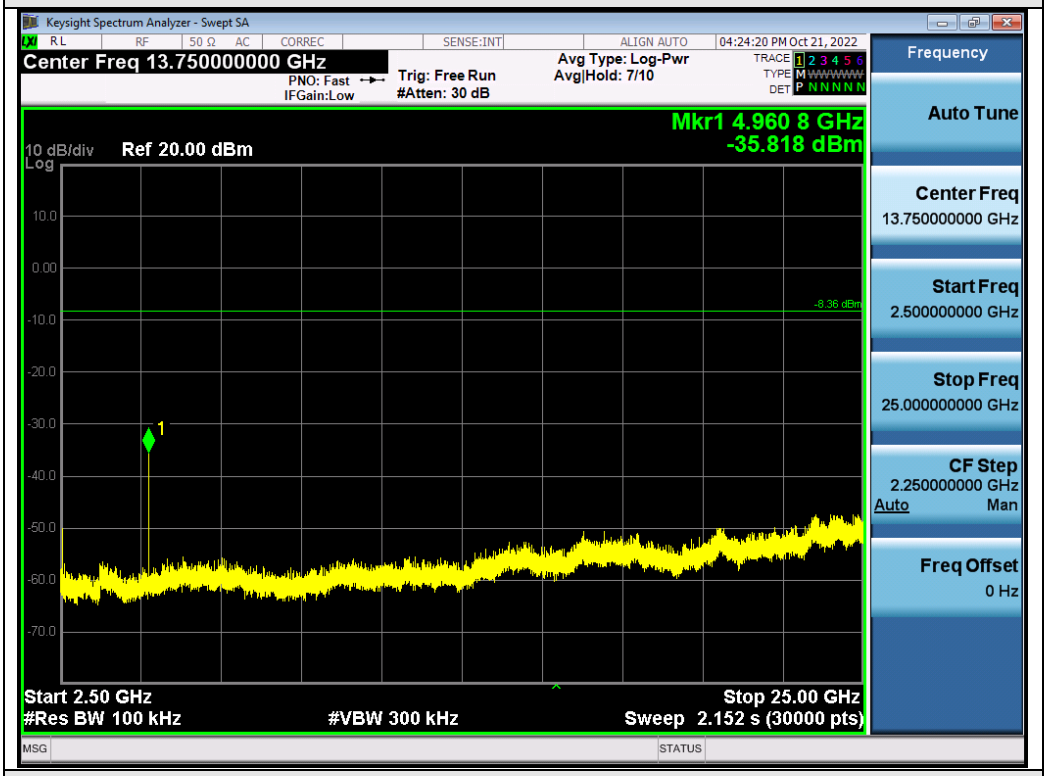


Test_Graph_LE2M_ANT1_2440_2Mbps_Higher Band Emissions

Test_Graph_LE2M_ANT1_2480_2Mbps_Reference Level

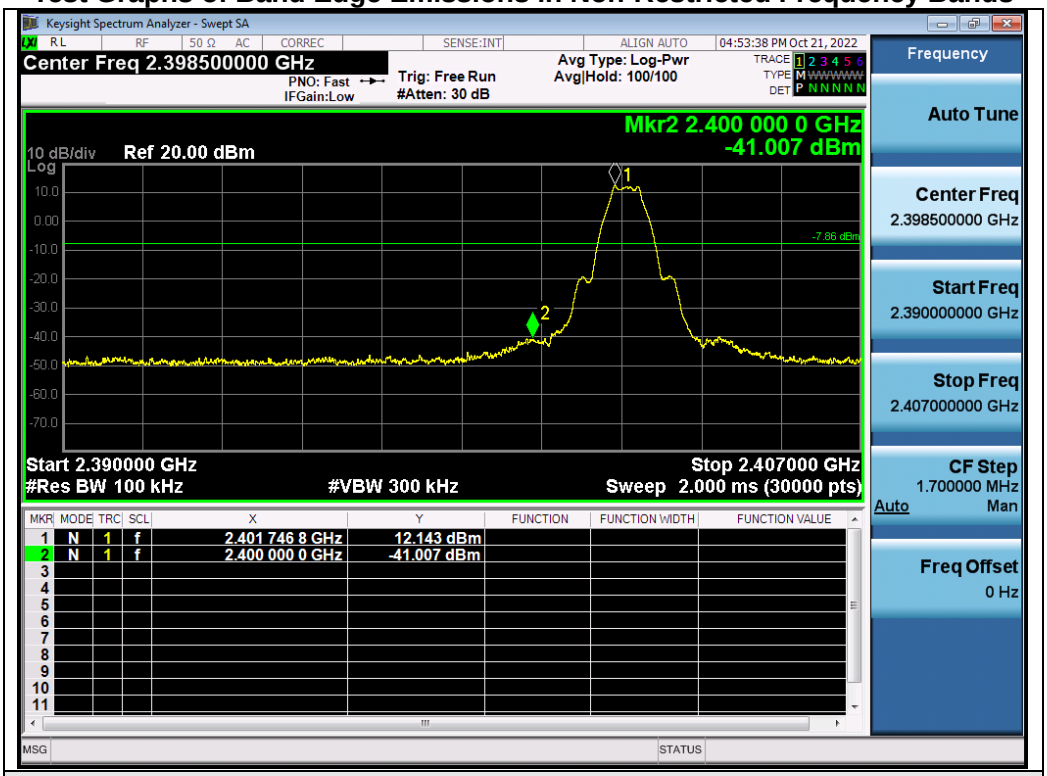


Test_Graph_LE2M_ANT1_2480_2Mbps_Lower Band Emissions

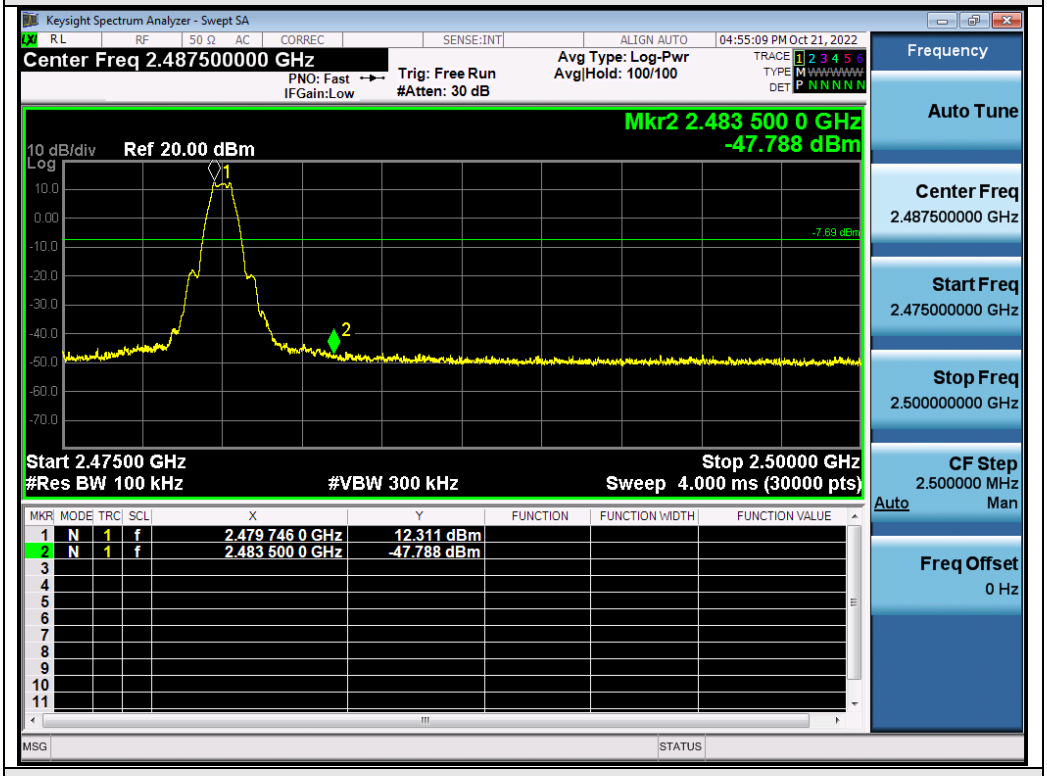


Test_Graph_LE2M_ANT1_2480_2Mbps_Higher Band Emissions

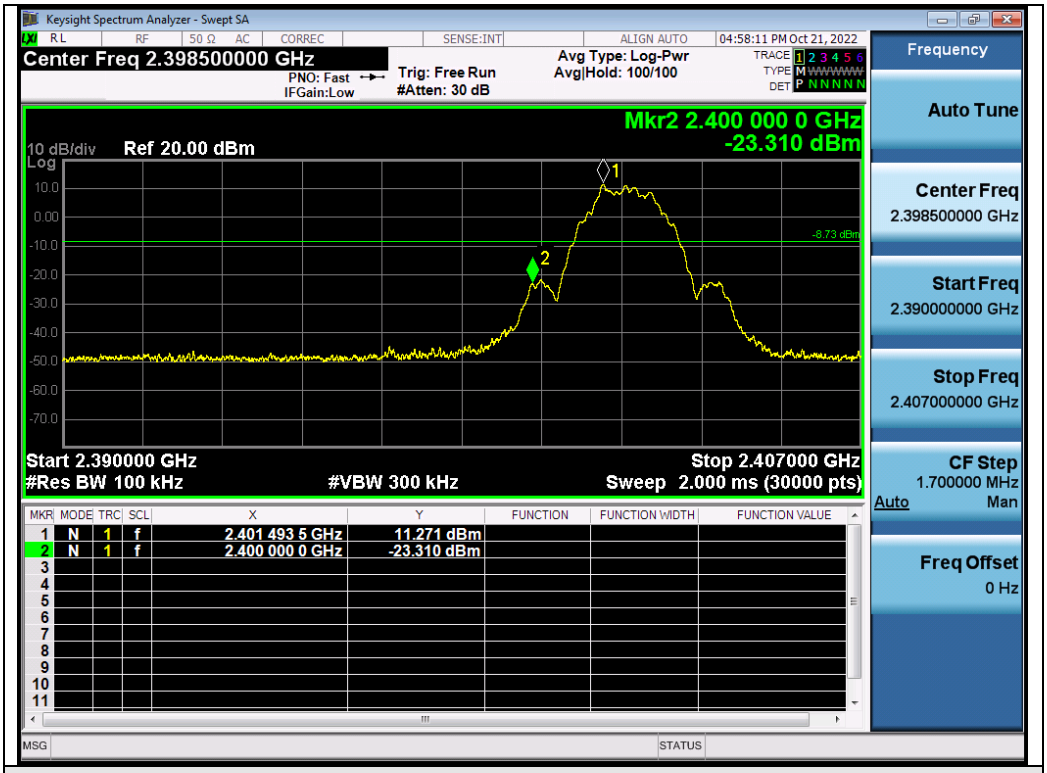
Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands



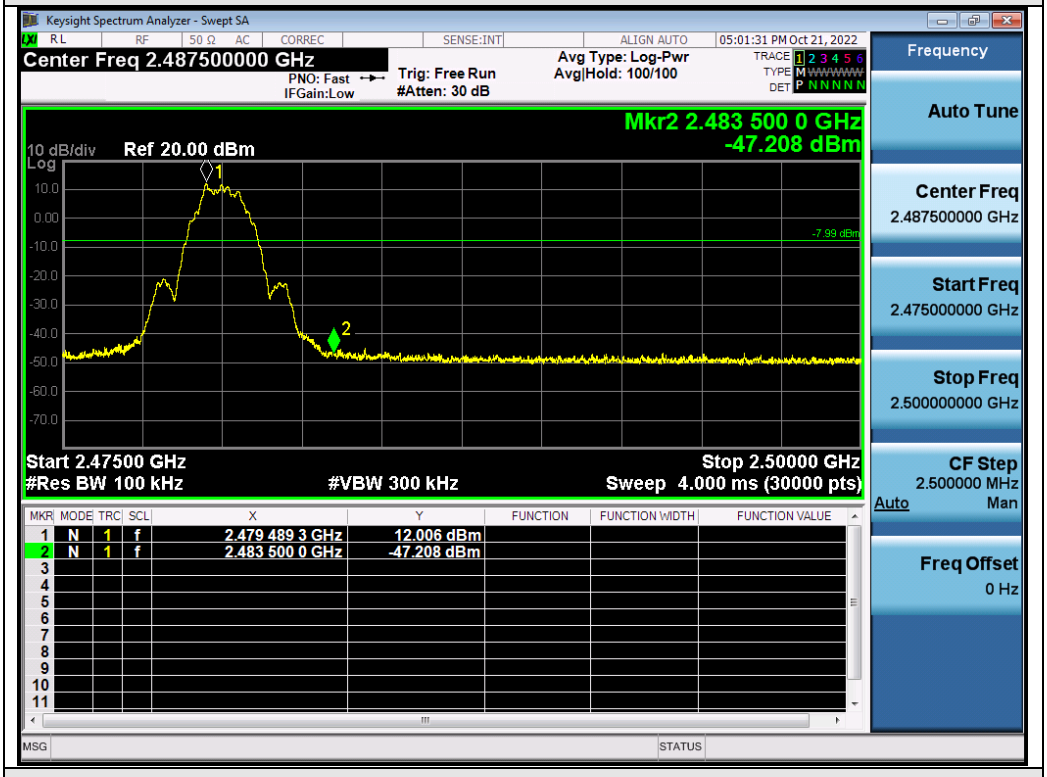
Test_Graph_LE1M_ANT1_2402_1Mbps_Lower Band Edge Emissions



Test_Graph_LE1M_ANT1_2480_1Mbps_Higher Band Edge Emissions



Test_Graph_LE2M_ANT1_2402_2Mbps_Lower Band Edge Emissions



Test_Graph_LE2M_ANT1_2480_2Mbps_Higher Band Edge Emissions

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

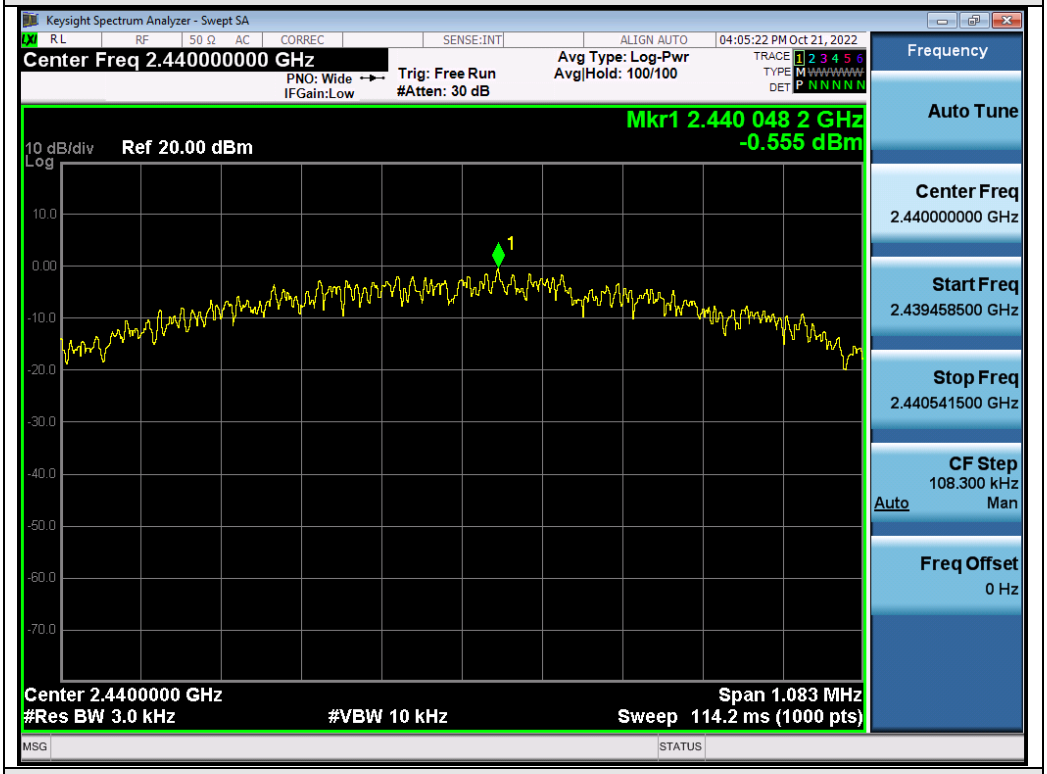
Refer to Section 6.

10.4. LIMITS AND MEASUREMENT RESULT

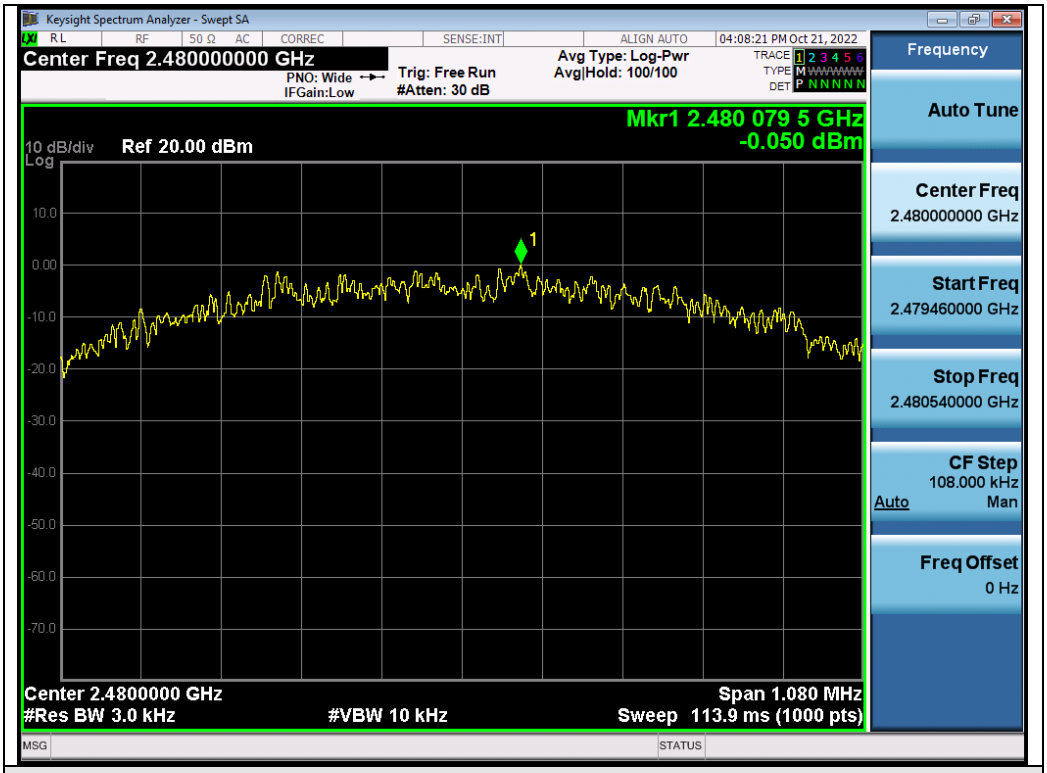
Test Data of Conducted Output Power Spectral Density				
Test Mode	Test Channel (MHz)	Power density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail
GFSK 1M	2402	0.275	≤8	Pass
	2440	-0.555	≤8	Pass
	2480	-0.050	≤8	Pass
GFSK 2M	2402	-4.340	≤8	Pass
	2440	-3.777	≤8	Pass
	2480	-3.750	≤8	Pass

Test Graphs of Conducted Output Power Spectral Density

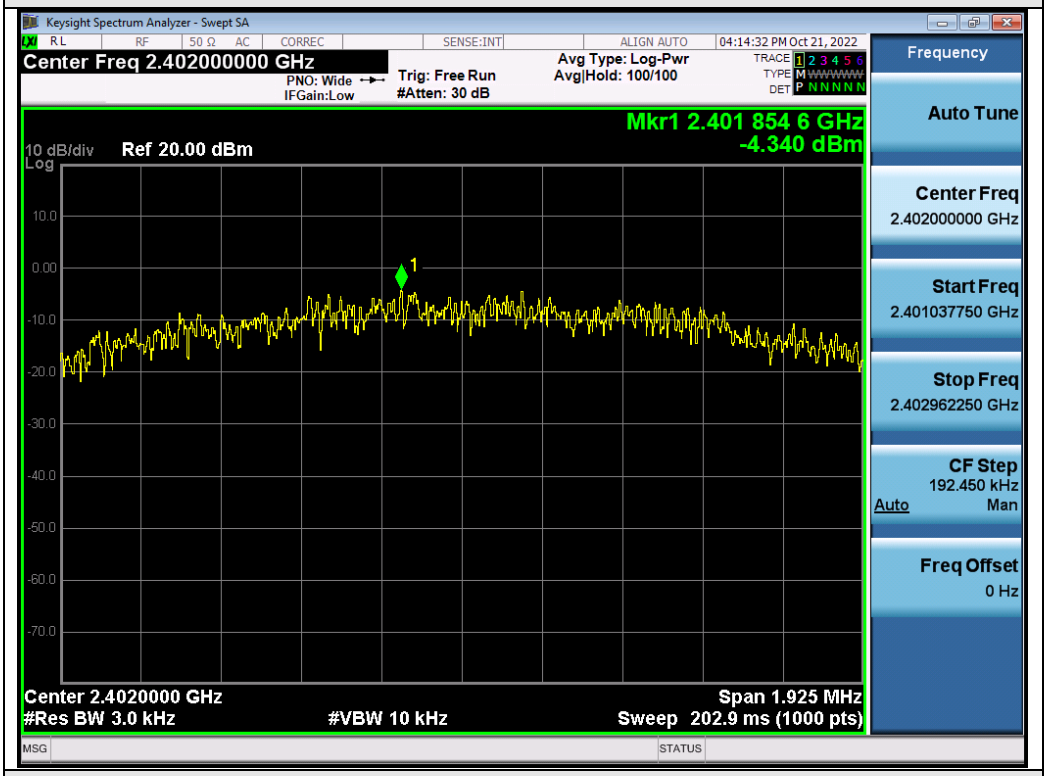
Test_Graph_LE1M_ANT1_2402_1Mbps_PSD



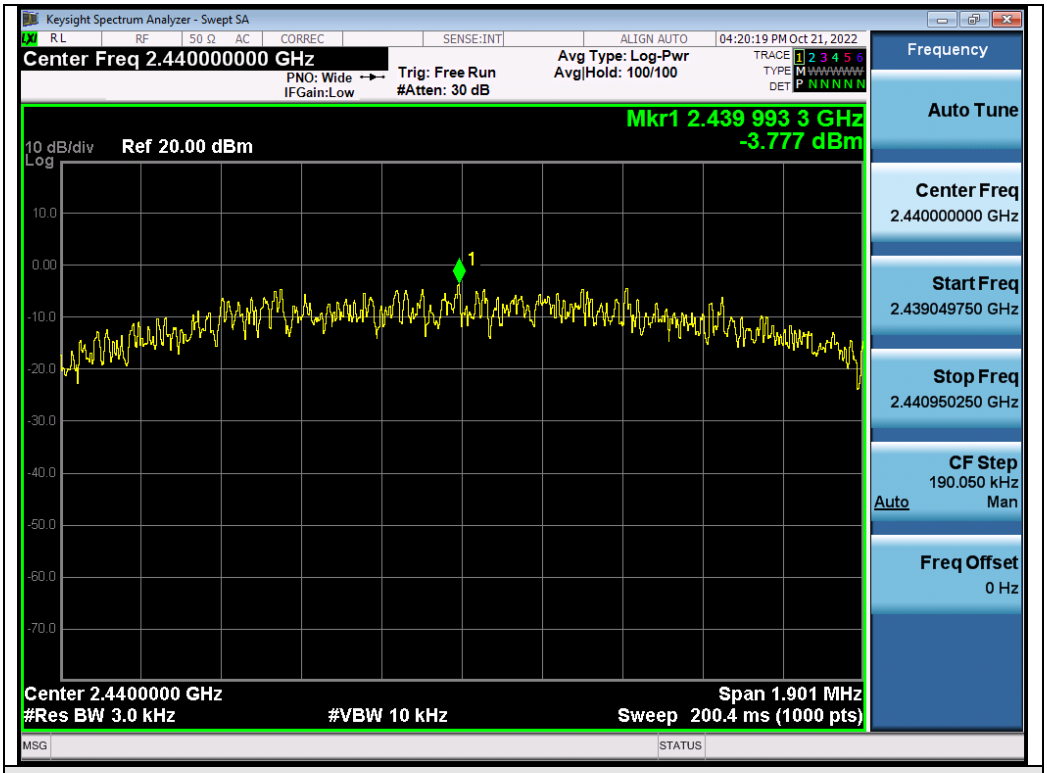
Test_Graph_LE1M_ANT1_2440_1Mbps_PSD



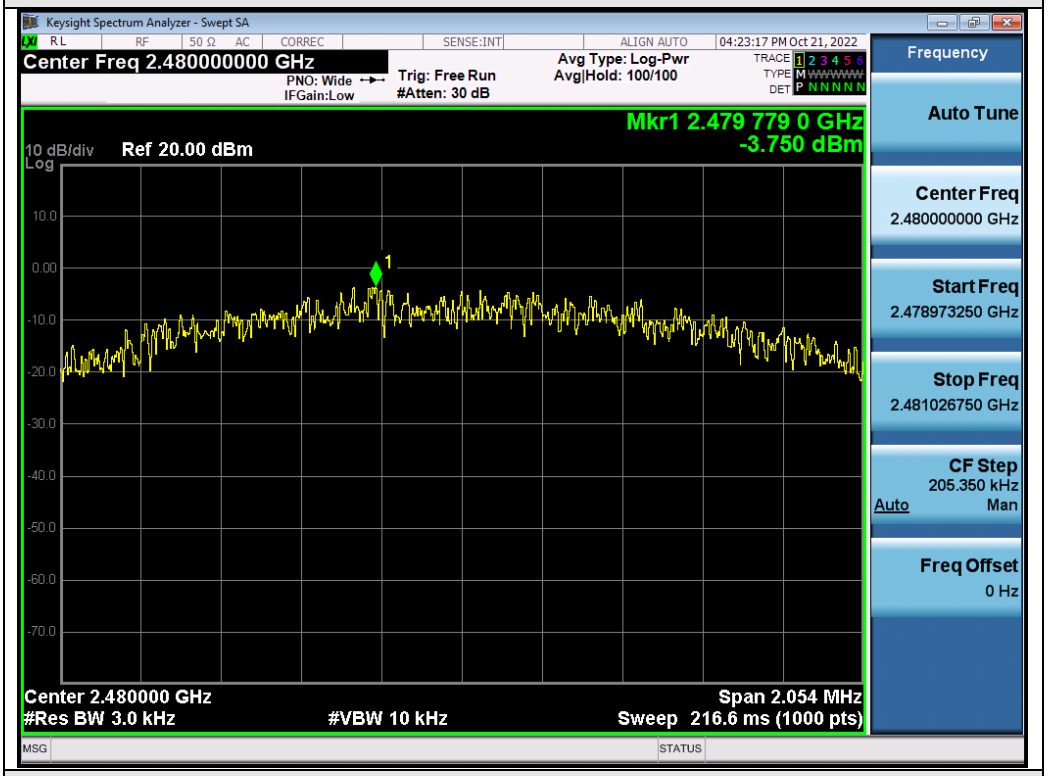
Test_Graph_LE1M_ANT1_2480_1Mbps_PSD



Test_Graph_LE2M_ANT1_2402_2Mbps_PSD



Test_Graph_LE2M_ANT1_2440_2Mbps_PSD



Test_Graph_LE2M_ANT1_2480_2Mbps_PSD

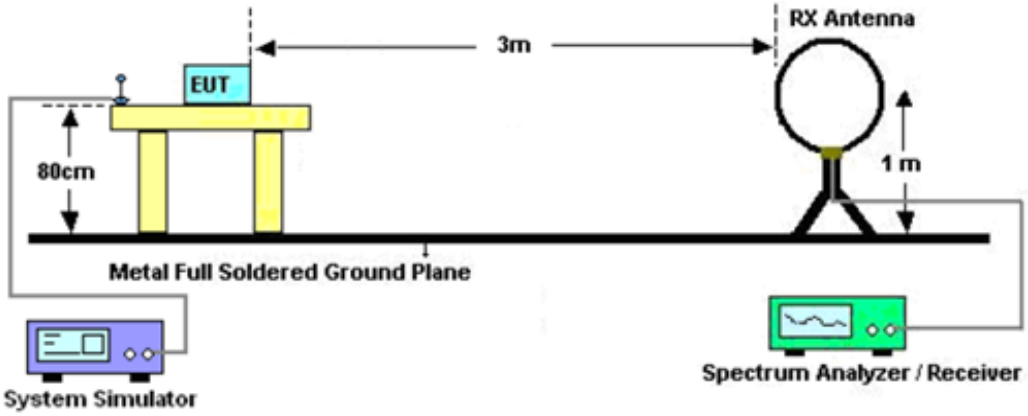
11. RADIATED EMISSION

11.1. MEASUREMENT PROCEDURE

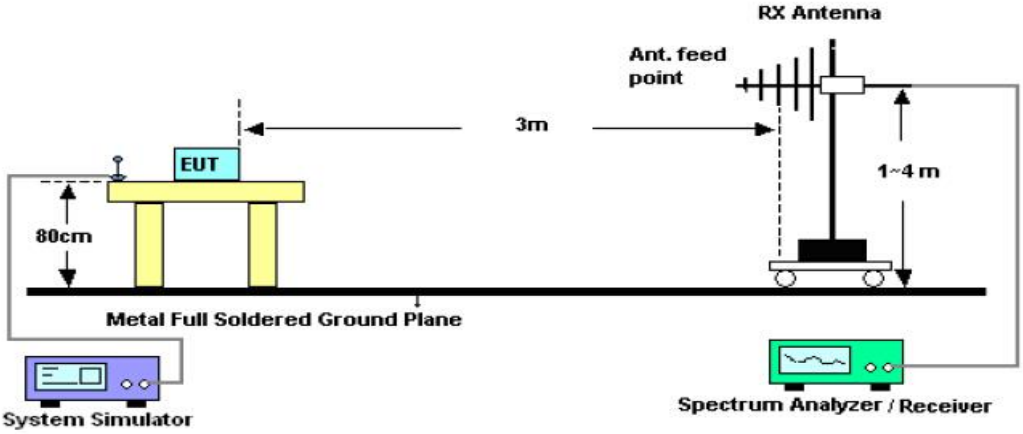
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated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

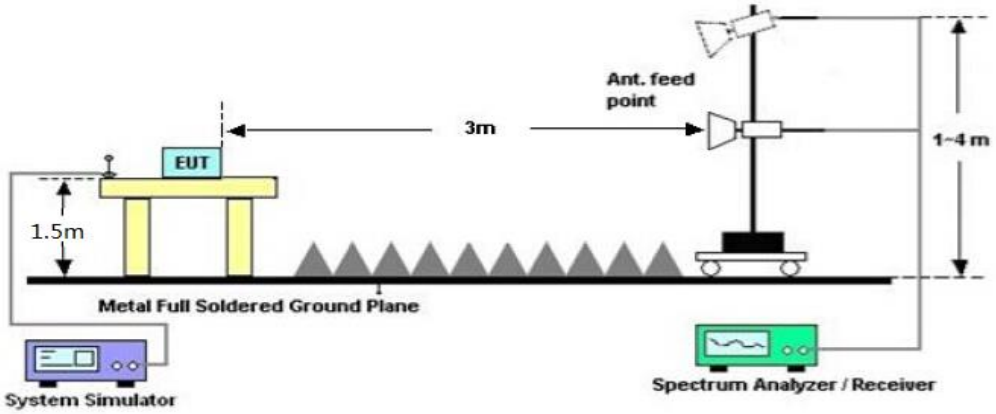
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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.

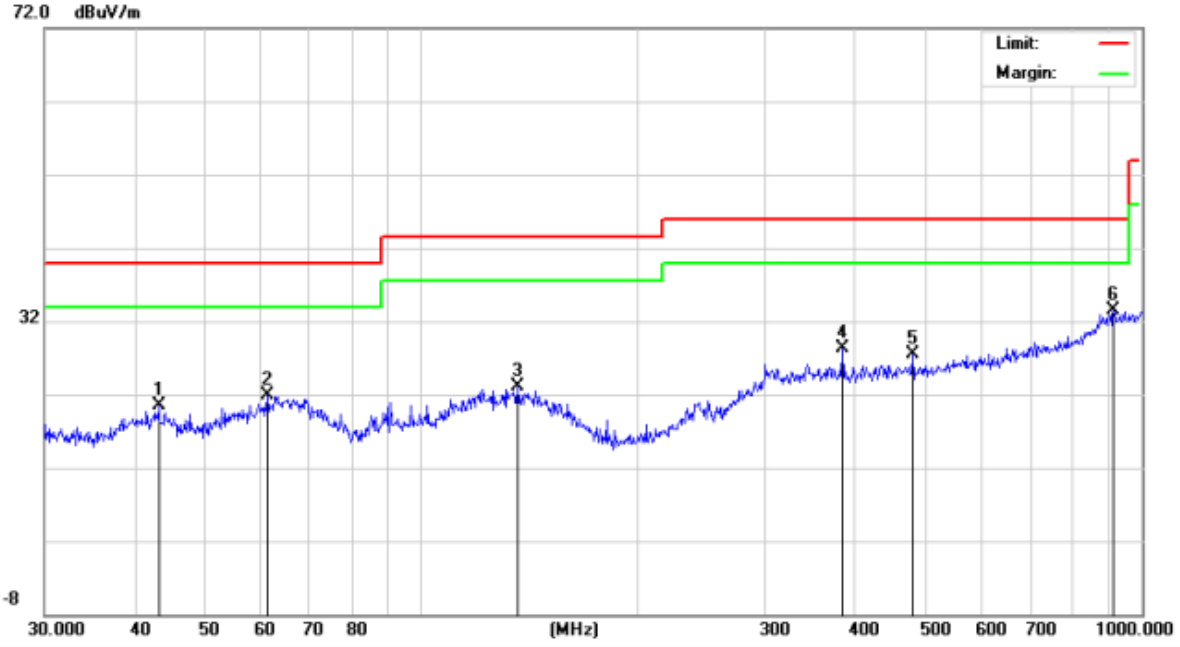
11.4. TEST RESULT

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.

Radiated emission from 30MHz to 1000MHz

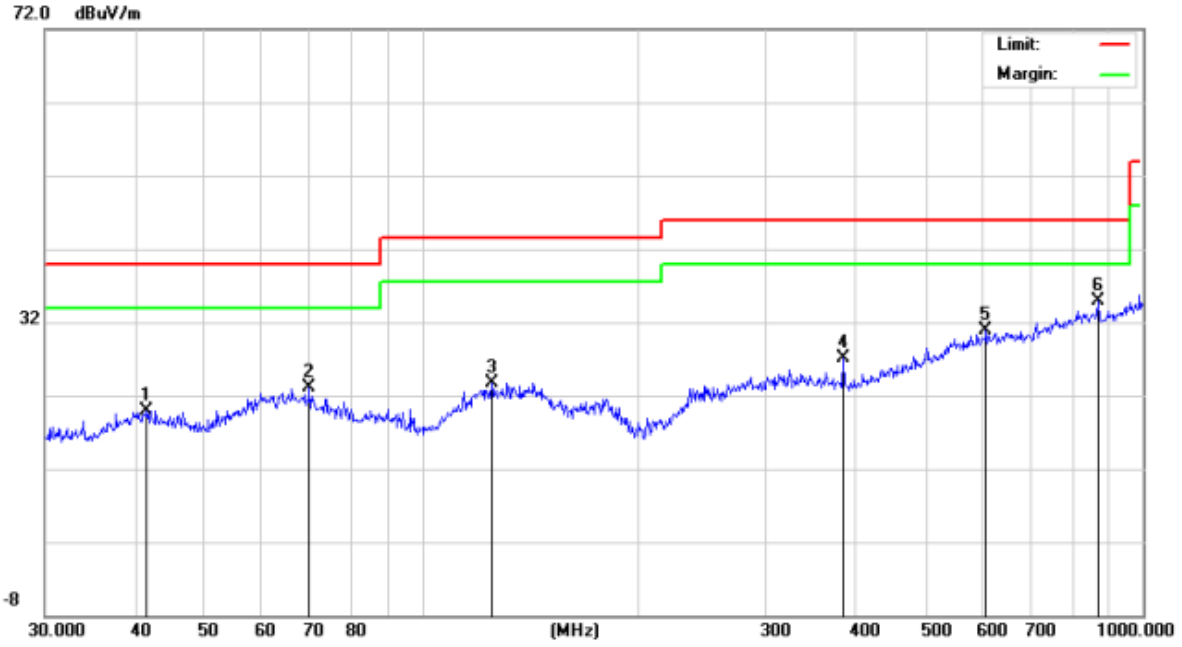
EUT	NORA-B12	**Model Name**	NORA-B120
Temperature	22°C	**Relative Humidity**	54%
Pressure	985hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 3	**Antenna**	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		43.2017	5.80	14.65	20.45	40.00	-19.55	peak
2		61.1316	5.32	16.55	21.87	40.00	-18.13	peak
3		135.9822	5.48	17.71	23.19	43.50	-20.31	peak
4		383.9318	7.66	20.64	28.30	46.00	-17.70	peak
5		480.5276	6.65	20.95	27.60	46.00	-18.40	peak
6	*	912.8620	5.57	27.88	33.45	46.00	-12.55	peak

RESULT: PASS

EUT	NORA-B12	Model Name	NORA-B120
Temperature	22°C	Relative Humidity	54%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		41.5670	5.17	14.82	19.99	40.00	-20.01	peak
2		69.8449	5.96	17.11	23.07	40.00	-16.93	peak
3		125.0066	5.68	18.03	23.71	43.50	-19.79	peak
4		383.9318	8.03	19.06	27.09	46.00	-18.91	peak
5		605.6592	5.95	24.96	30.91	46.00	-15.09	peak
6	*	866.0878	7.29	27.56	34.85	46.00	-11.15	peak

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Over=Measurement-Limit.

2. All test modes had been tested. The BLE 1Mpbs mode 3 is the worst case and recorded in the report.

Radiated emission above 1GHz

EUT	NORA-B12	**Model Name**	NORA-B120
Temperature	22°C	**Relative Humidity**	54%
Pressure	985hPa	**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	48.63	0.08	48.71	74	-25.29	peak
4804.000	37.46	0.08	37.54	54	-16.46	AVG
7206.000	42.14	2.21	44.35	74	-29.65	peak
7206.000	31.65	2.21	33.86	54	-20.14	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	NORA-B12	**Model Name**	NORA-B120
Temperature	22°C	**Relative Humidity**	54%
Pressure	985hPa	**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	49.75	0.08	49.83	74	-24.17	peak
4804.000	39.25	0.08	39.33	54	-14.67	AVG
7206.000	42.14	2.21	44.35	74	-29.65	peak
7206.000	32.76	2.21	34.97	54	-19.03	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	NORA-B12	Model Name	NORA-B120
Temperature	22°C	Relative Humidity	54%
Pressure	985hPa	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	47.35	0.14	47.49	74	-26.51	peak
4880.000	37.42	0.14	37.56	54	-16.44	AVG
7320.000	42.95	2.36	45.31	74	-28.69	peak
7320.000	31.75	2.36	34.11	54	-19.89	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	NORA-B12	Model Name	NORA-B120
Temperature	22°C	Relative Humidity	54%
Pressure	985hPa	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	49.67	0.14	49.81	74	-24.19	peak
4880.000	39.54	0.14	39.68	54	-14.32	AVG
7320.000	43.78	2.36	46.14	74	-27.86	peak
7320.000	33.07	2.36	35.43	54	-18.57	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	NORA-B12	Model Name	NORA-B120
Temperature	22°C	Relative Humidity	54%
Pressure	985hPa	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	49.67	0.22	49.89	74	-24.11	peak
4960.000	38.49	0.22	38.71	54	-15.29	AVG
7440.000	42.85	2.64	45.49	74	-28.51	peak
7440.000	31.27	2.64	33.91	54	-20.09	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	NORA-B12	Model Name	NORA-B120
Temperature	22°C	Relative Humidity	54%
Pressure	985hPa	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	50.67	0.22	50.89	74	-23.11	peak
4960.000	40.52	0.22	40.74	54	-13.26	AVG
7440.000	44.55	2.64	47.19	74	-26.81	peak
7440.000	34.97	2.64	37.61	54	-16.39	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.

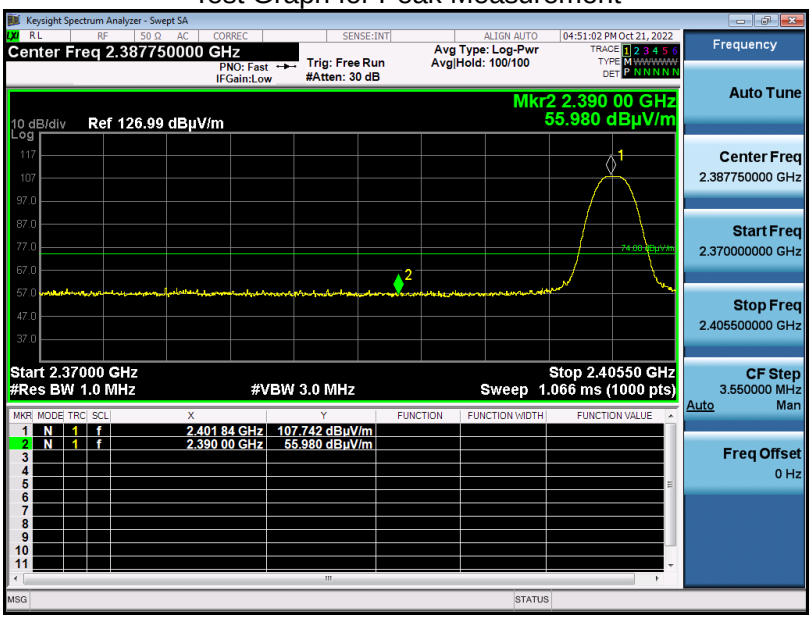
The “Factor” value can be calculated automatically by software of measurement system.

All test modes had been tested, The BLE 1Mpbs modulation is the worst case and recorded in the report.

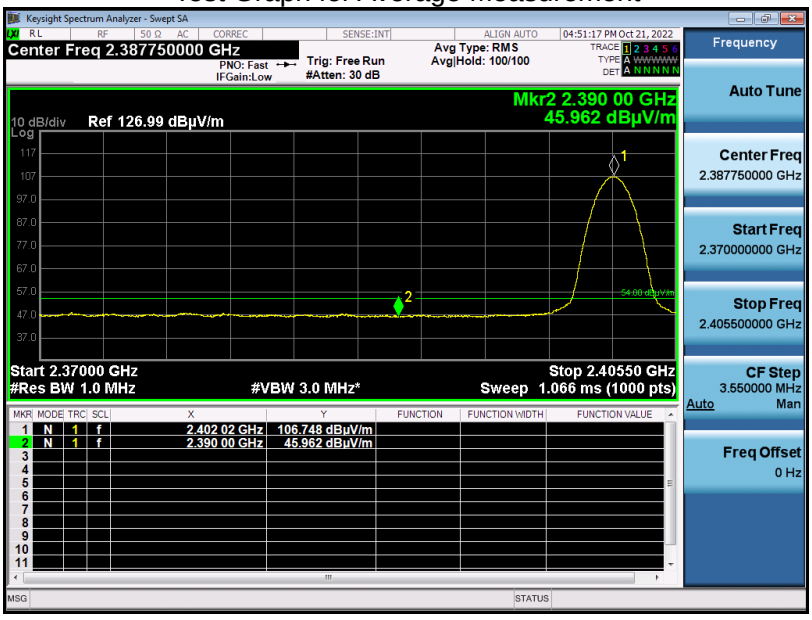
Test result for band edge emission at restricted bands (BLE 1M)

EUT	NORA-B12	Model Name	NORA-B120
Temperature	24°C	Relative Humidity	56%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Test Graph for Peak Measurement



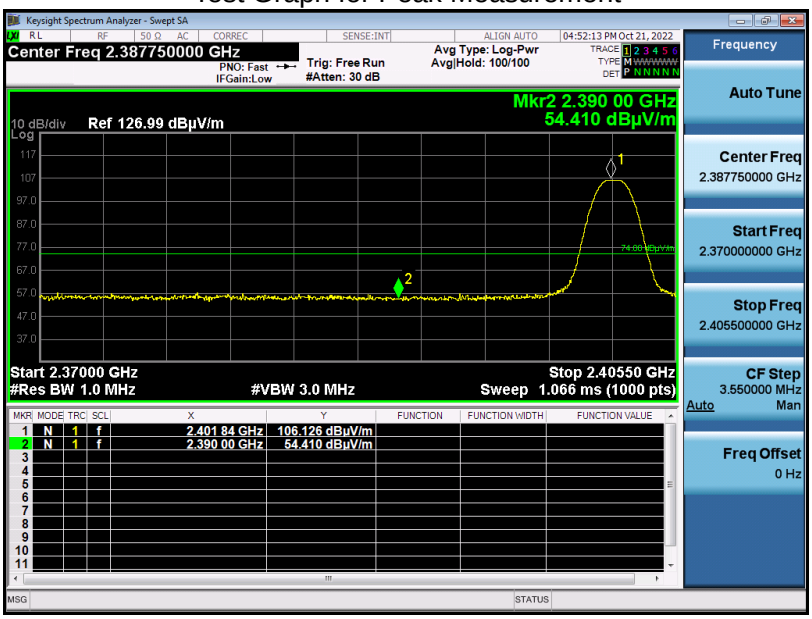
Test Graph for Average Measurement



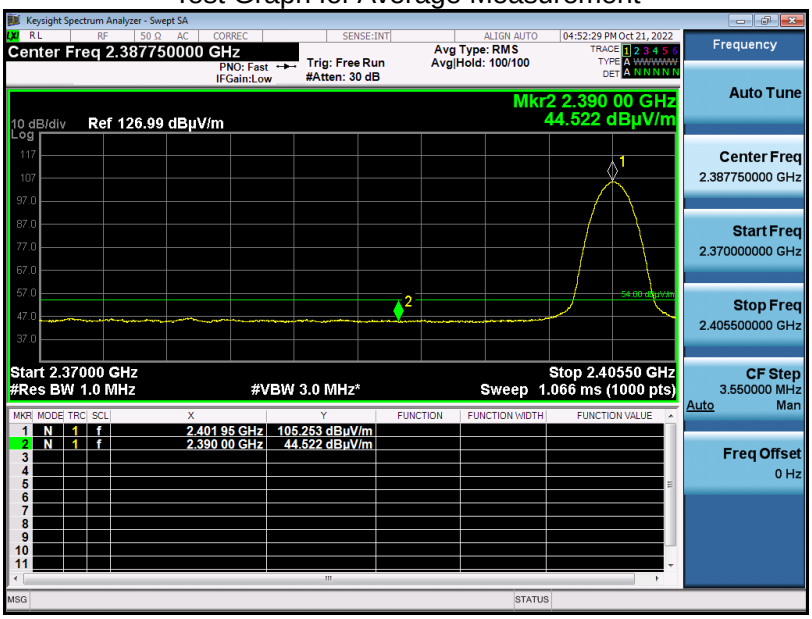
RESULT: PASS

EUT	NORA-B12	Model Name	NORA-B120
Temperature	24°C	Relative Humidity	56%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Test Graph for Peak Measurement



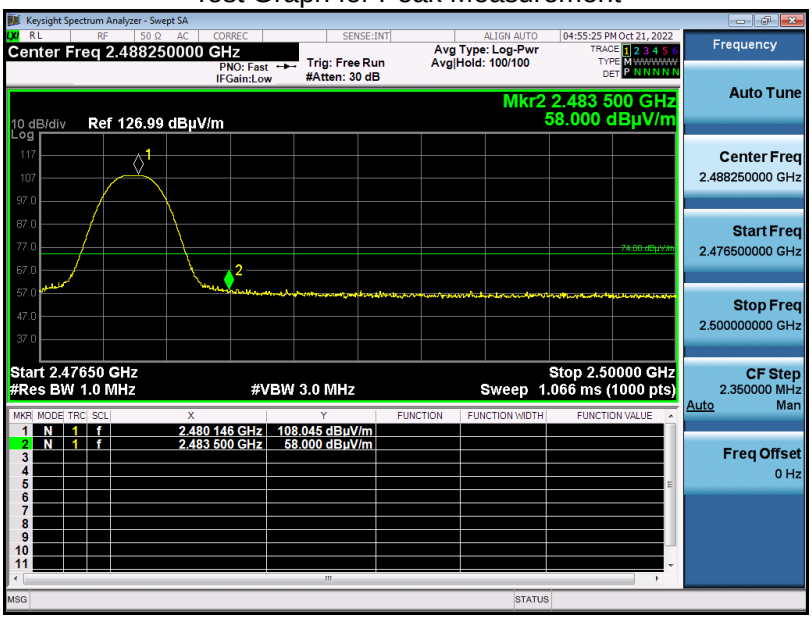
Test Graph for Average Measurement



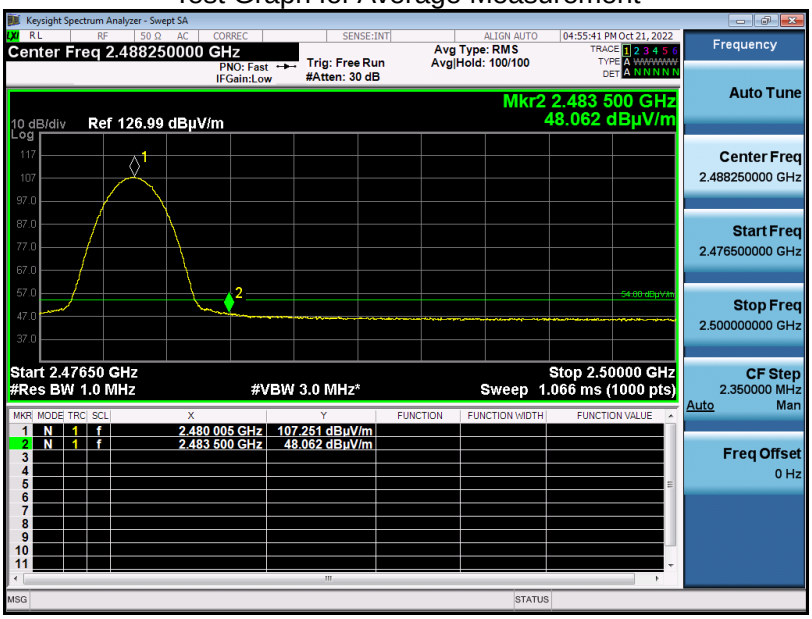
RESULT: PASS

EUT	NORA-B12	Model Name	NORA-B120
Temperature	24°C	Relative Humidity	56%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Test Graph for Peak Measurement



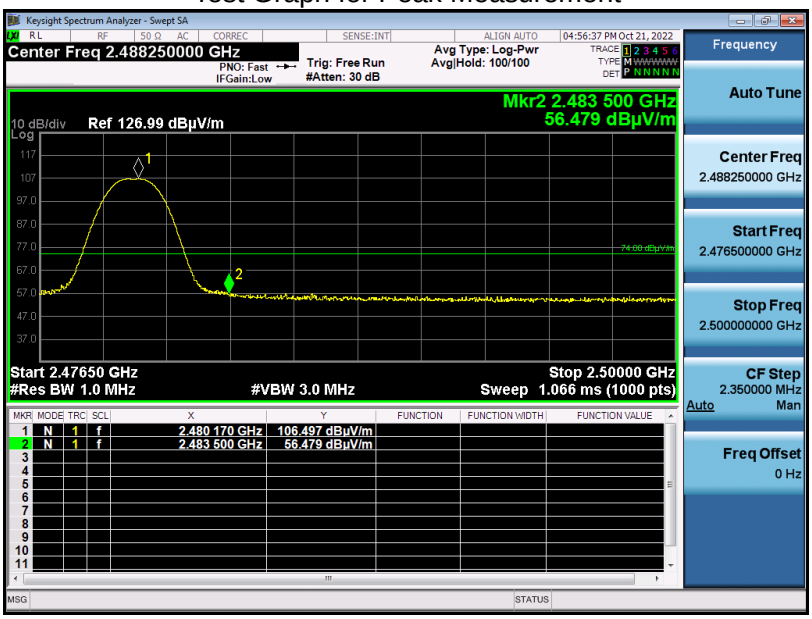
Test Graph for Average Measurement



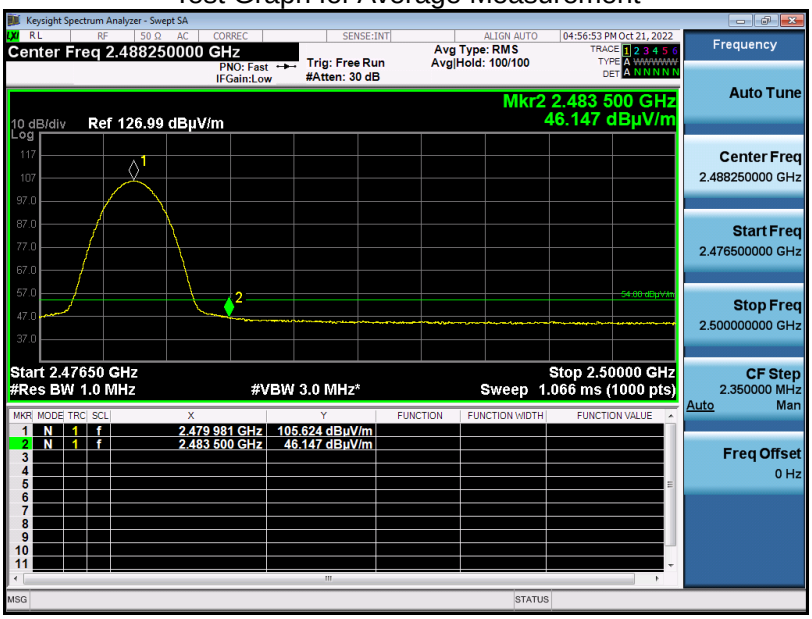
RESULT: PASS

EUT	NORA-B12	Model Name	NORA-B120
Temperature	24°C	Relative Humidity	56%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Test Graph for Peak Measurement



Test Graph for Average Measurement



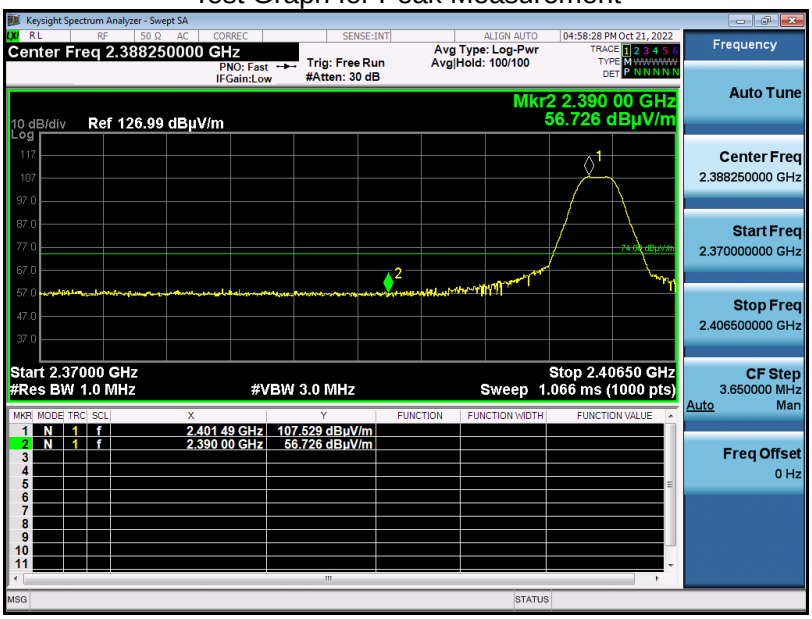
RESULT: PASS

Note: The factor had been edited in the “Input Correction” of the Spectrum Analyzer.

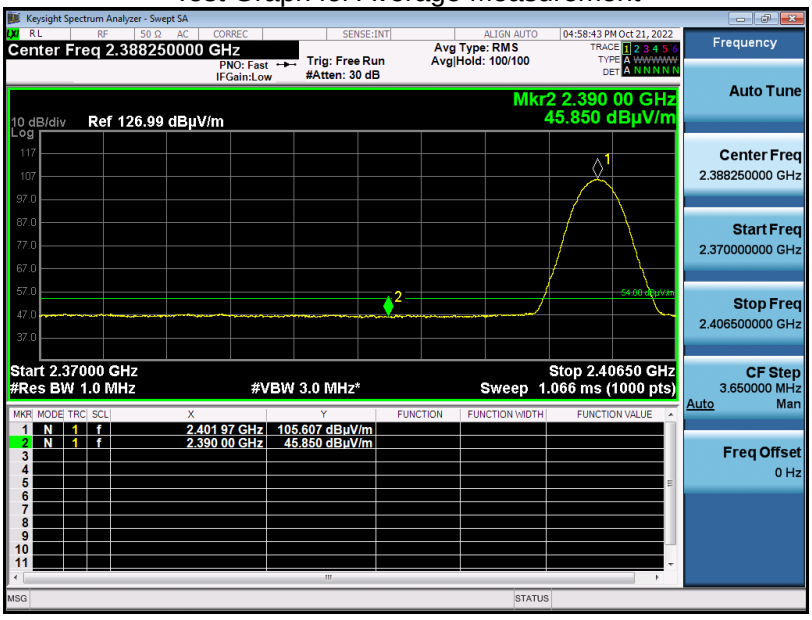
Test result for band edge emission at restricted bands (BLE 2M)

EUT	NORA-B12	Model Name	NORA-B120
Temperature	24°C	Relative Humidity	56%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Horizontal

Test Graph for Peak Measurement



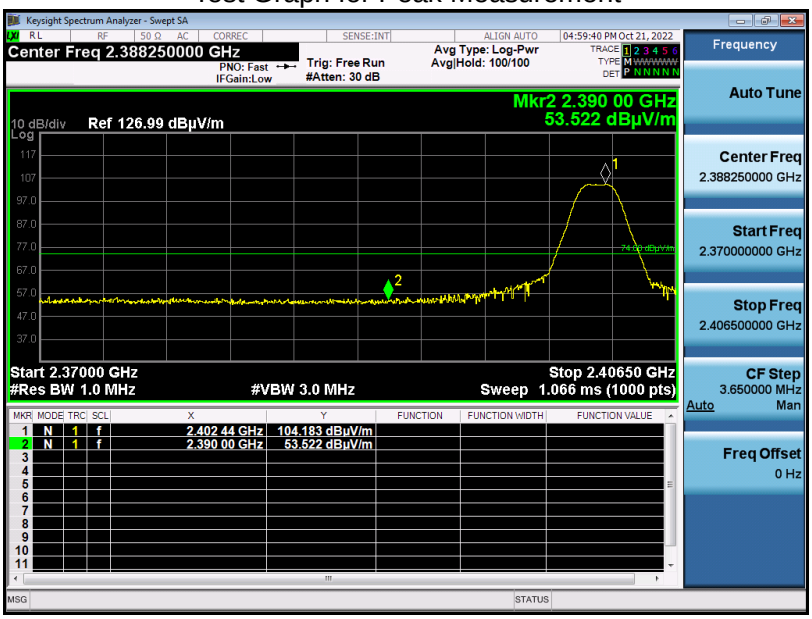
Test Graph for Average Measurement



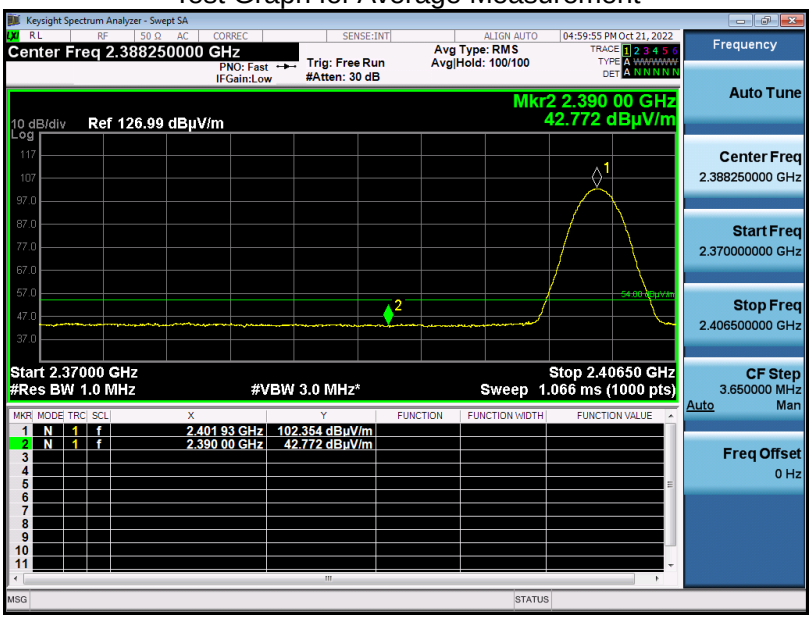
RESULT: PASS

EUT	NORA-B12	Model Name	NORA-B120
Temperature	24°C	Relative Humidity	56%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Vertical

Test Graph for Peak Measurement



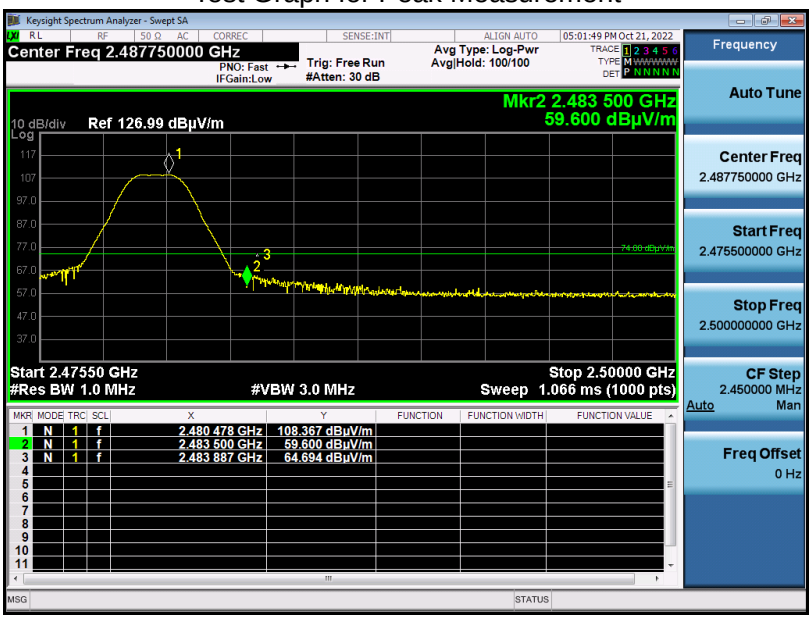
Test Graph for Average Measurement



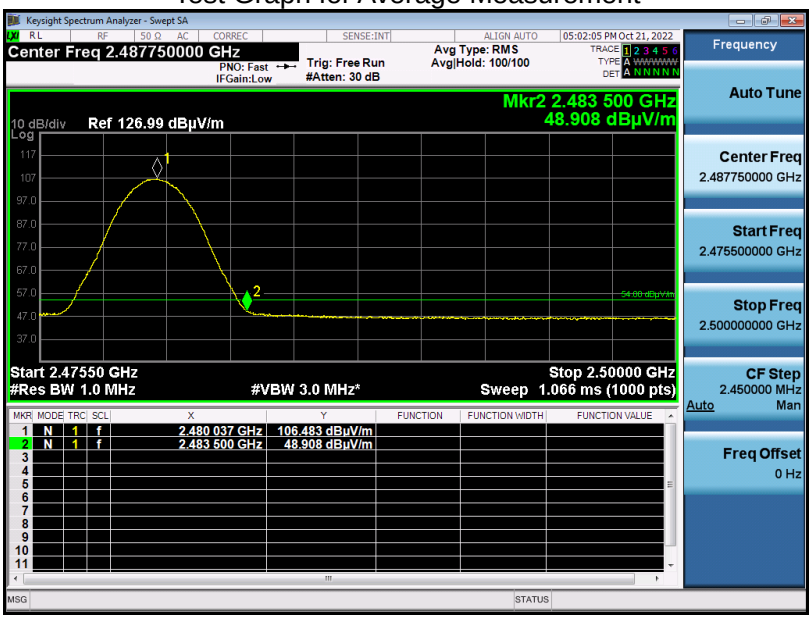
RESULT: PASS

EUT	NORA-B12	Model Name	NORA-B120
Temperature	24°C	Relative Humidity	56%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 6	Antenna	Horizontal

Test Graph for Peak Measurement



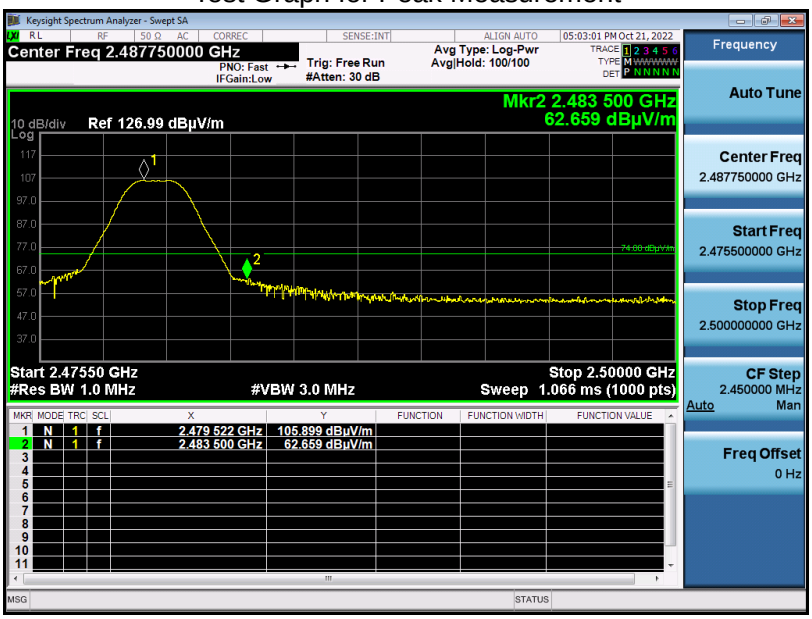
Test Graph for Average Measurement



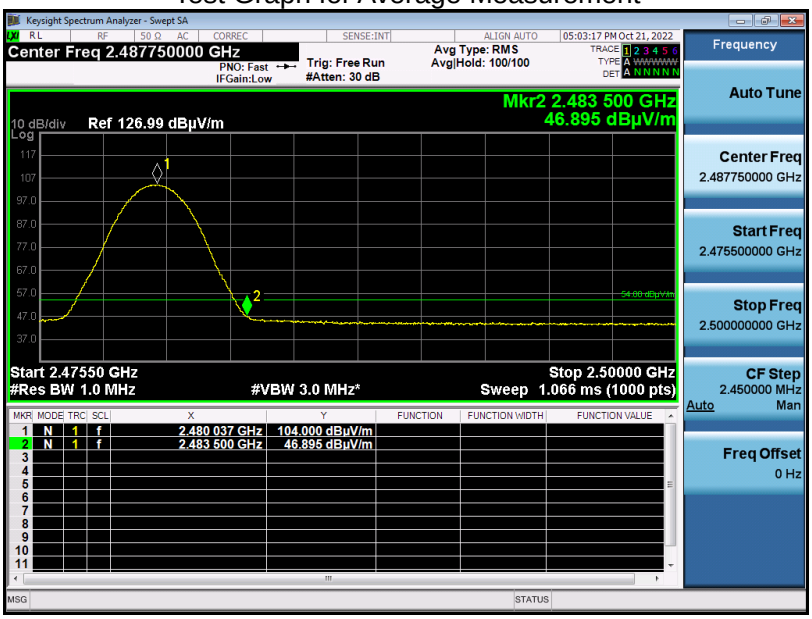
RESULT: PASS

EUT	NORA-B12	Model Name	NORA-B120
Temperature	24°C	Relative Humidity	56%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 6	Antenna	Vertical

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

Note: The factor had been edited in the “Input Correction” of the Spectrum Analyzer.

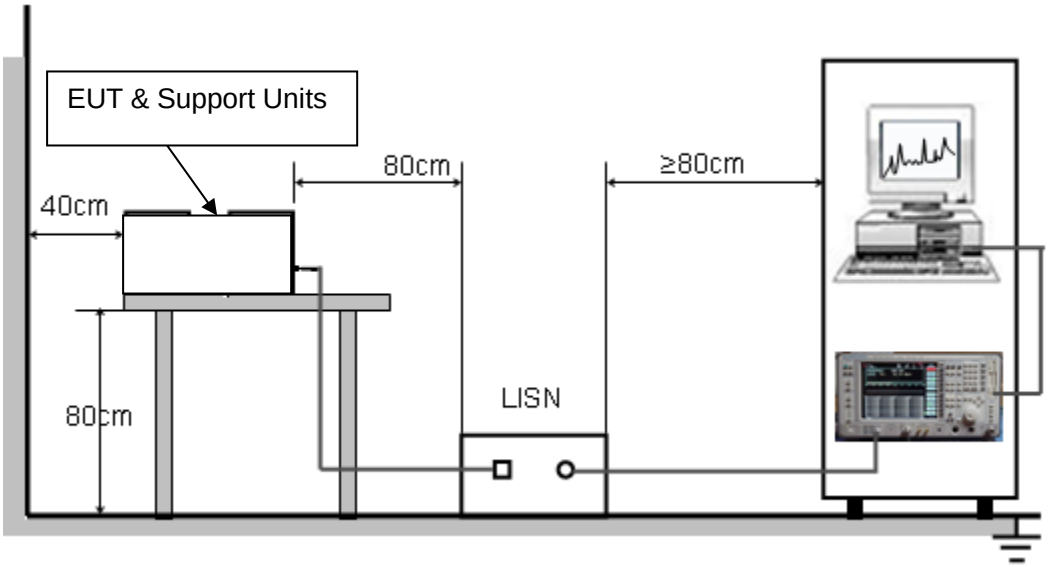
12. LINE CONDUCTED EMISSION TEST

12.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

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

12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipment received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

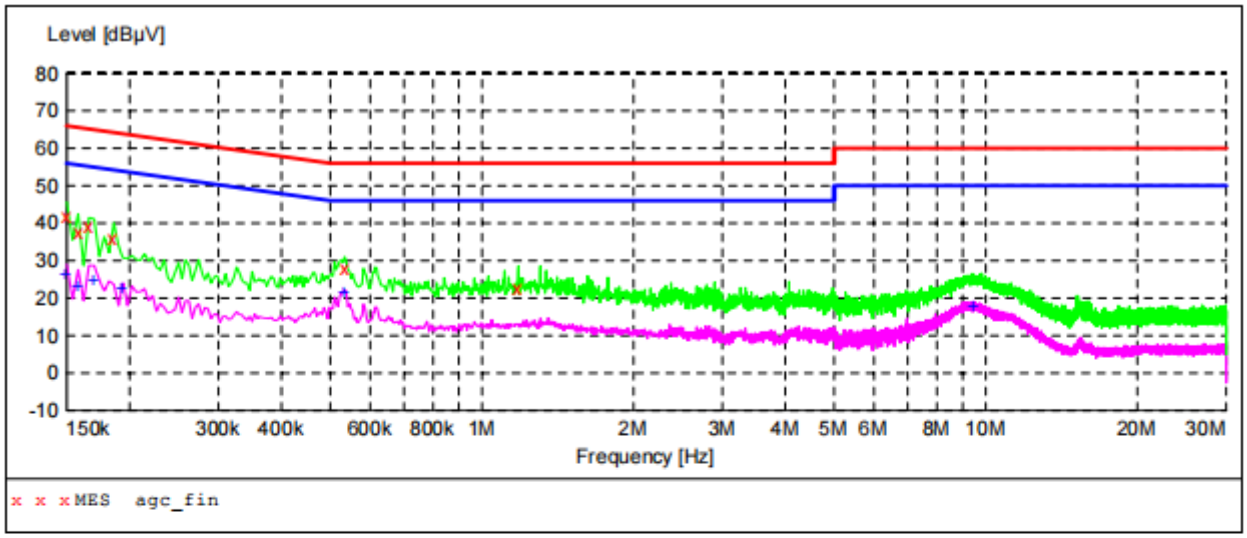
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

LINE CONDUCTED EMISSION TEST-L1



MEASUREMENT RESULT: "agc_fin"

2022/7/29 21:29

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	42.00	6.9	66	24.0	QP	L1	GND
0.158000	37.70	6.8	66	27.9	QP	L1	GND
0.166000	39.20	6.8	65	26.0	QP	L1	GND
0.186000	36.00	6.6	64	28.2	QP	L1	GND
0.534000	27.70	5.4	56	28.3	QP	L1	GND
1.182000	22.80	5.7	56	33.2	QP	L1	GND

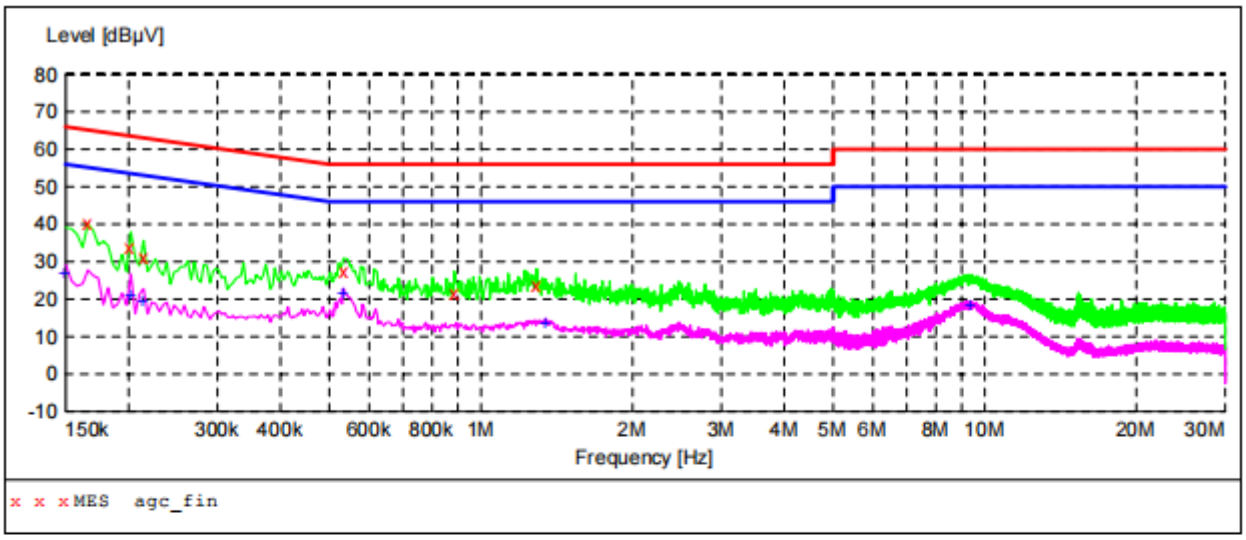
MEASUREMENT RESULT: "agc_fin2"

2022/7/29 21:28

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	26.60	6.9	56	29.4	AV	L1	GND
0.158000	23.40	6.8	56	32.2	AV	L1	GND
0.170000	25.00	6.8	55	30.0	AV	L1	GND
0.194000	22.80	6.6	54	31.1	AV	L1	GND
0.534000	21.40	5.4	46	24.6	AV	L1	GND
9.486000	18.00	6.8	50	32.0	AV	L1	GND

RESULT: PASS

LINE CONDUCTED EMISSION TEST-N



MEASUREMENT RESULT: "agc_fin"

2022/7/29 21:20

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.166000	40.10	6.8	65	25.1	QP	N	GND
0.202000	33.90	6.5	64	29.6	QP	N	GND
0.214000	31.30	6.5	63	31.7	QP	N	GND
0.534000	27.40	5.4	56	28.6	QP	N	GND
0.886000	21.70	5.4	56	34.3	QP	N	GND
1.290000	23.80	5.8	56	32.2	QP	N	GND

MEASUREMENT RESULT: "agc_fin2"

2022/7/29 21:20

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	27.10	6.9	56	28.9	AV	N	GND
0.202000	21.10	6.5	54	32.4	AV	N	GND
0.214000	19.60	6.5	53	33.4	AV	N	GND
0.534000	21.40	5.4	46	24.6	AV	N	GND
1.346000	13.60	5.9	46	32.4	AV	N	GND
9.350000	18.40	6.8	50	31.6	AV	N	GND

RESULT: PASS

Note: All the test modes had been tested, the Mode 3 was the worst case. Only the data of the worst case would be record in this test report.

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

Refer to the Report No.: AGC00174220703AP02

APPENDIX B: PHOTOGRAPHS OF EUT

Refer to the Report No.: AGC00174220703AP03

----END OF REPORT----

Conditions of Issuance of Test Reports

1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").

2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.

3.The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.

4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.

5. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

6. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.

7.Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.

9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.