
FCC Test Report

Report No.: AGC00174211202FE04

FCC ID : XPYANNAB4

APPLICATION PURPOSE : Original Equipment

PRODUCT DESIGNATION : ANNA-B4

BRAND NAME : u-blox

MODEL NAME : ANNA-B402, ANNA-B412

APPLICANT : u-blox AG

DATE OF ISSUE : Mar. 11, 2022

STANDARD(S) : FCC Part 15.247

REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Mar. 11, 2022	Valid	Initial Release

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1. VERIFICATION OF COMPLIANCE

Applicant	u-blox AG
Address	Zuercherstrasse 68, Thalwil 8800, Switzerland
Manufacturer	u-blox AG
Address	Zuercherstrasse 68, Thalwil 8800, Switzerland
Product Designation	ANNA-B4
Brand Name	u-blox
Test Model	ANNA-B402
Series Model	ANNA-B412
Difference description	All the same except for the model names and use. (Compared to ANNA-B402, there is an additional SWD protection circuit on ANNA-B412. This SWD protection circuit will NOT affect radio characteristics.)
Date of test	Jan. 05, 2022 to Mar. 11, 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)	Mar. 11, 2022
Reviewed By		
	Calvin Liu (Reviewer)	Mar. 11, 2022
Approved By		
	Max Zhang (Authorized Officer)	Mar. 11, 2022

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as a “ANNA-B4”. It is designed by way of utilizing the O-QPSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.405GHz to 2.475GHz
RF Output Power	7.335dBm (Max)
Modulation	O-QPSK
Number of channels	15 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: 5dBi(FXP72.07.0053A) Antenna 2: 4dBi(FXP74.07.0100A) Antenna 3: 2.5dBi(FXP75.07.0045B) Antenna 4: 0.9dBi(PC17.07.0070A) Antenna 5: 0.5dBi(AT1608-A2R4NAA)
Hardware Version	A
Software Version	V1.0
Power Supply	DC 3.3V by control board

Note:

1. All antenna have been tested, and antenna 1 has the worst test data so it is recorded in this report.
2. All the models would be marketed with the CRYSTAL A(EPSON FA-118T) or the CRYSTAL B(Taisaw TZ 3124CIW-B4017). Both of them have the same size and radio parameters. The version of the CRYSTAL A had been tested with all the items and the version of the CRYSTAL B only had been tested with bandwidth test and RF output power test for the difference.

2.2. TABLE OF CARRIER FREQUENCIES

Channel Number	Frequency(MHz)	Channel Number	Frequency(MHz)
1	2405	9	2445
2	2410	10	2450
3	2415	11	2455
4	2420	12	2460
5	2425	13	2465
6	2430	14	2470
7	2435	15	2475
8	2440		

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

This submittal(s) (test report) is intended for **FCC ID: XPYANNAB4** 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 No	ANNA-B402		ANNA-B412	
Antenna Type	Frequency Band (GHz)	Max Peak Gain (dBi)	Frequency Band (GHz)	Max Peak Gain (dBi)
FPC antenna	2400~2483.5	5	2400~2483.5	5
FPC antenna	2400~2483.5	4	2400~2483.5	4
FPC antenna	2400~2483.5	2.5	2400~2483.5	2.5
FPC antenna	2400~2483.5	0.9	2400~2483.5	0.9
Multilayer Chip antenna	2400~2483.5	0.5	2400~2483.5	0.5

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2.9. DESCRIPTION OF ANTENNA RF PORT

Antenna RF Port		
Model No	ANNA-B402	ANNA-B412
ANNA-B4 two model versions series use	Version tailored for OEMs	Pre-flashed u-blox Connectivity Software version





☐ EVK-ANNA-B402U/B412U
☐ ANNA-B4 module
☐ Reference design for module with U.FL connector

☐ EVK-ANNA-B402C/B412C
☐ ANNA-B4 module
☐ Antenna reference design for module being mounted at the corner of the board

☐ EVK-ANNA-B402E/B412E
☐ ANNA-B4 module
☐ Antenna reference design for module being mounted on edge of the board

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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%.

- Uncertainty of Conducted Emission, $U_c = \pm 2.9$ dB
- Uncertainty of Radiated Emission below 1GHz, $U_c = \pm 3.8$ dB
- Uncertainty of Radiated Emission above 1GHz, $U_c = \pm 4.4$ dB
- Uncertainty of total RF power, conducted, $U_c = \pm 0.8$ dB
- Uncertainty of RF power density, conducted, $U_c = \pm 2.6$ dB
- Uncertainty of spurious emissions, conducted, $U_c = \pm 2.7$ dB
- Uncertainty of Occupied Channel Bandwidth: $U_c = \pm 2$ %

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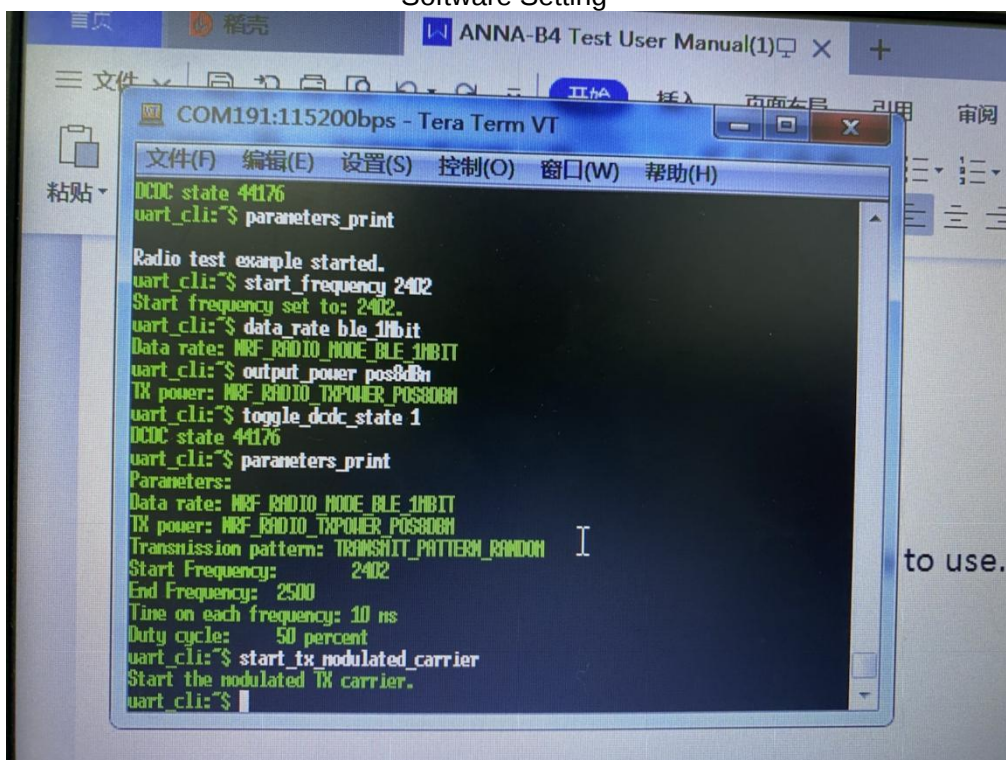
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4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX (2405MHz)
2	Middle channel TX (2440MHz)
3	High channel TX (2475MHz)

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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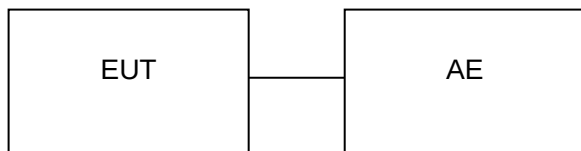
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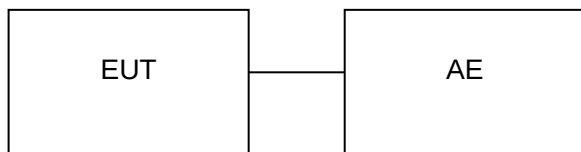
5. SYSTEM TEST CONFIGURATION

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	ANNA-B4	ANNA-B402	XPYANNAB4	EUT
2	Mobile phone	Mate 30	N/A	AE
3	PC	N/A	N/A	AE
4	PC adapter	HW-059200CHQ	1.5m 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

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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

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

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESCI	100034	Sep. 06, 2021	Sep. 05, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Nov. 17, 2021	Nov. 16, 2022
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn Antenna	SCHWARZBECK	BBHA9170	768	Oct. 31, 2021	Oct. 30, 2023
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
preamplifier	ChengYi	EMC184045SE	980508	Oct. 29, 2021	Oct. 28, 2023
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00154520	Sep. 06, 2021	Sep. 05, 2023
Preamplifier Assembly	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
Wideband Antenna	SCHWARZBECK	VULB9168	494	Jan. 08, 2021	Jan. 07, 2023
Test Software	FARA	EZ-EMC(Ver.RA-03A)	N/A	N/A	N/A

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7. PEAK OUTPUT POWER

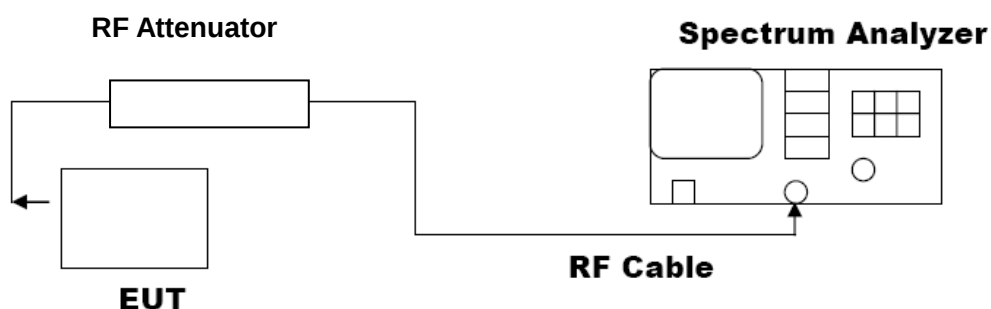
7.1. MEASUREMENT PROCEDURE

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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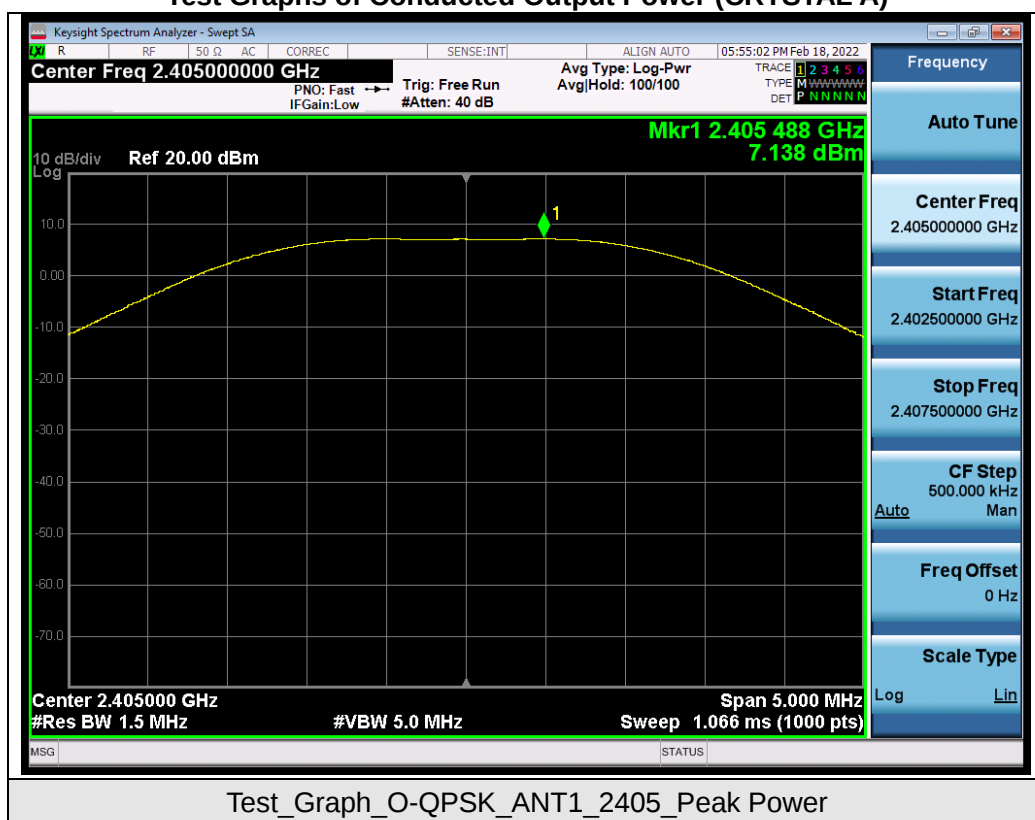
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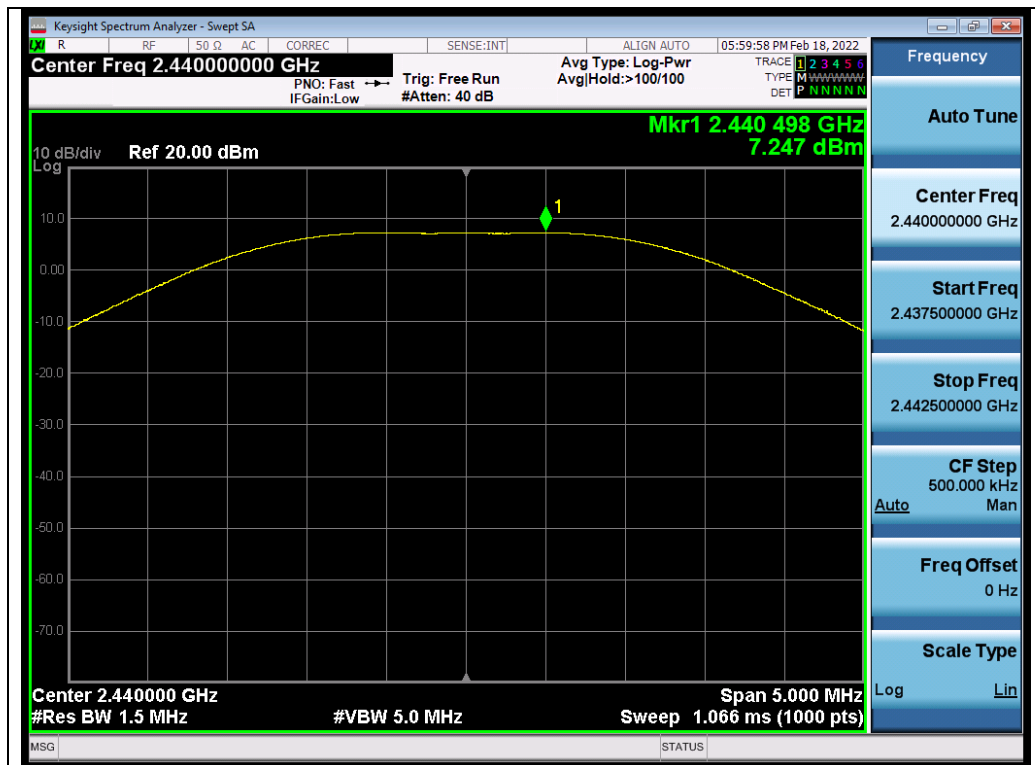
7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power (CRYSTAL A)				
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
O-QPSK	2405	7.138	≤ 30	Pass
	2440	7.247	≤ 30	Pass
	2475	7.335	≤ 30	Pass
Test Data of Conducted Output Power (CRYSTAL B)				
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
O-QPSK	2405	7.078	≤ 30	Pass
	2440	7.198	≤ 30	Pass
	2475	7.126	≤ 30	Pass

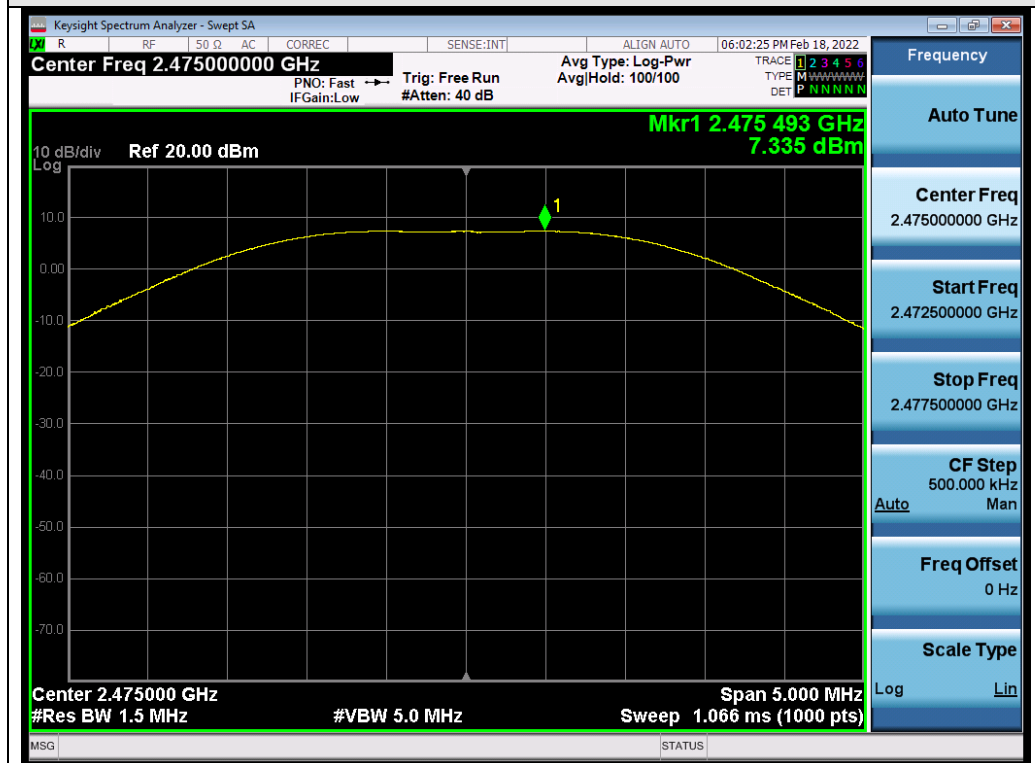
Test Graphs of Conducted Output Power (CRYSTAL A)



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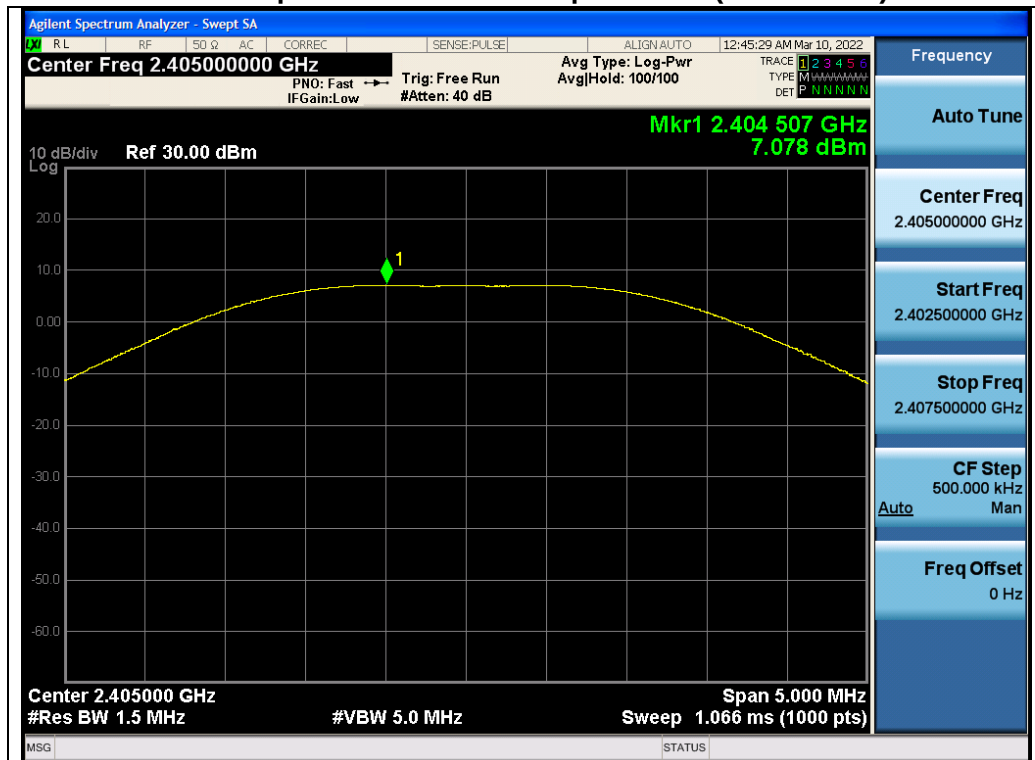
Test_Graph_O-QPSK_ANT1_2440_Peak Power



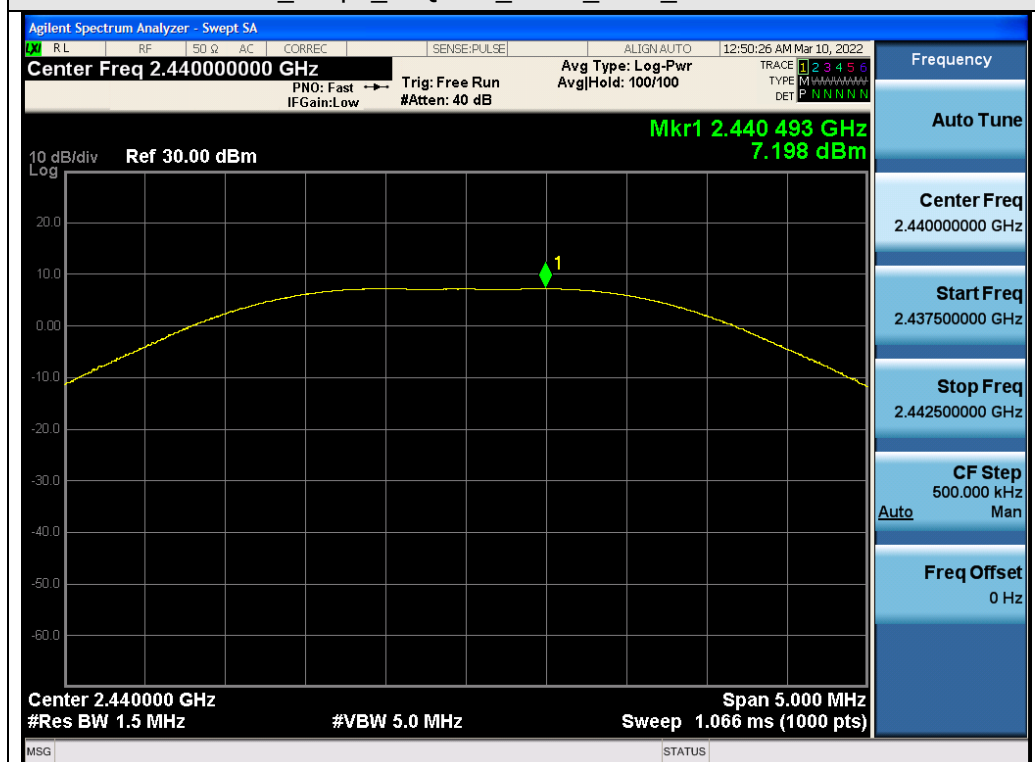
Test_Graph_O-QPSK_ANT1_2475_Peak Power

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Test Graphs of Conducted Output Power (CRYSTAL B)



Test_Graph_O-QPSK_ANT1_2405_Peak Power



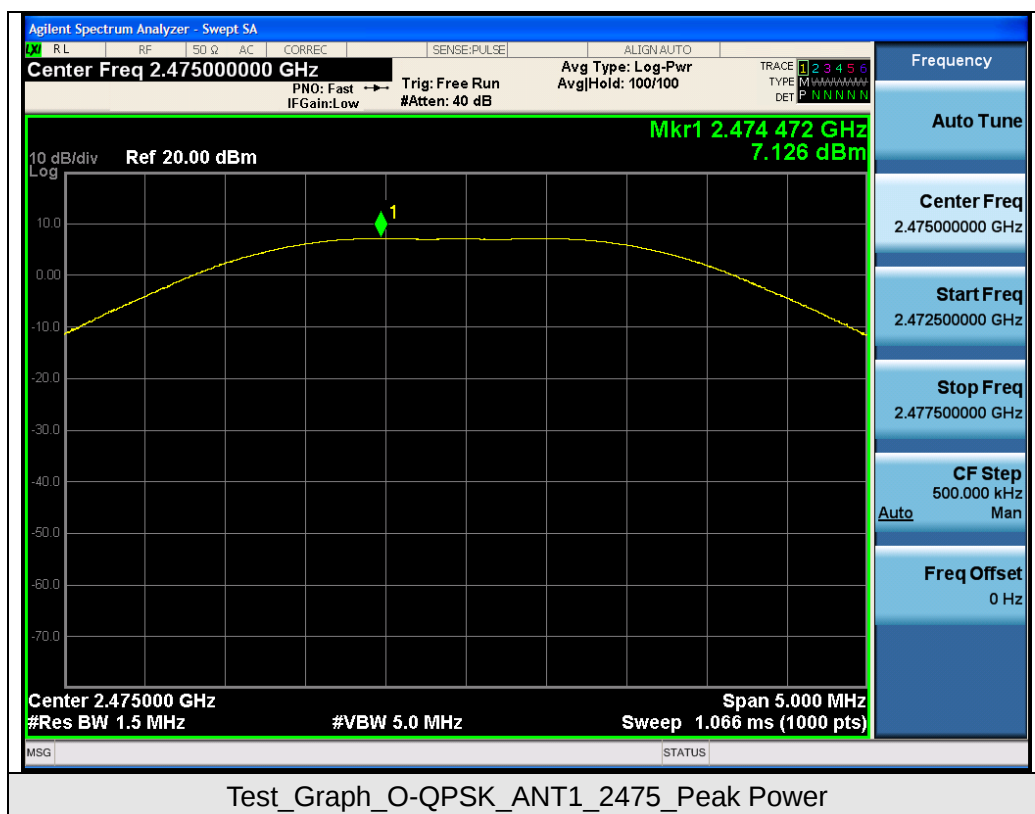
Test_Graph_O-QPSK_ANT1_2440_Peak Power

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8. 6 DB BANDWIDTH

8.1. 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 Centre Frequency = Operation Frequency, RBW= 100 kHz, VBW $\geq$ 3 $\times$ RBW.
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 (CRYSTAL A)					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
O-QPSK	2405	2.219	1.211	≥ 0.5	Pass
	2440	2.232	1.143	≥ 0.5	Pass
	2475	2.231	1.204	≥ 0.5	Pass
Test Data of Occupied Bandwidth and DTS Bandwidth (CRYSTAL B)					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
O-QPSK	2405	2.237	1.183	≥ 0.5	Pass
	2440	2.226	1.157	≥ 0.5	Pass
	2475	2.236	1.193	≥ 0.5	Pass

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Test Graphs of Occupied Bandwidth (CRYSTAL A)



Test_Graph_O-QPSK_ANT1_2405_OBW



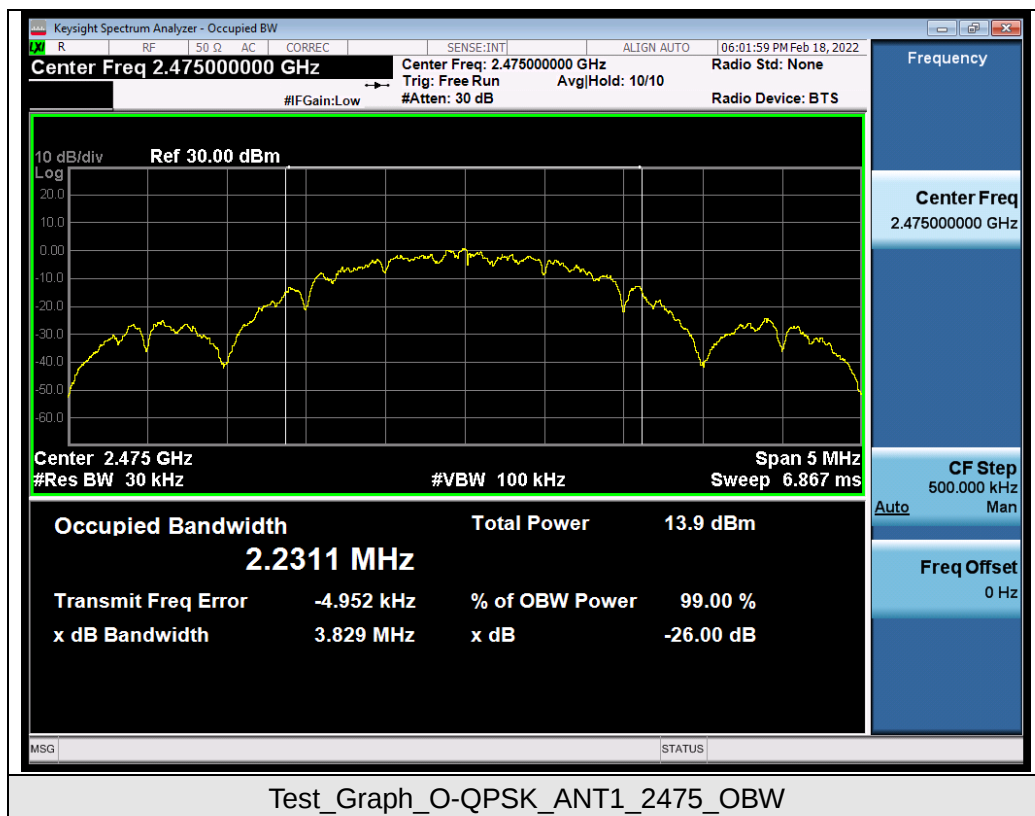
Test_Graph_O-QPSK_ANT1_2440_OBW

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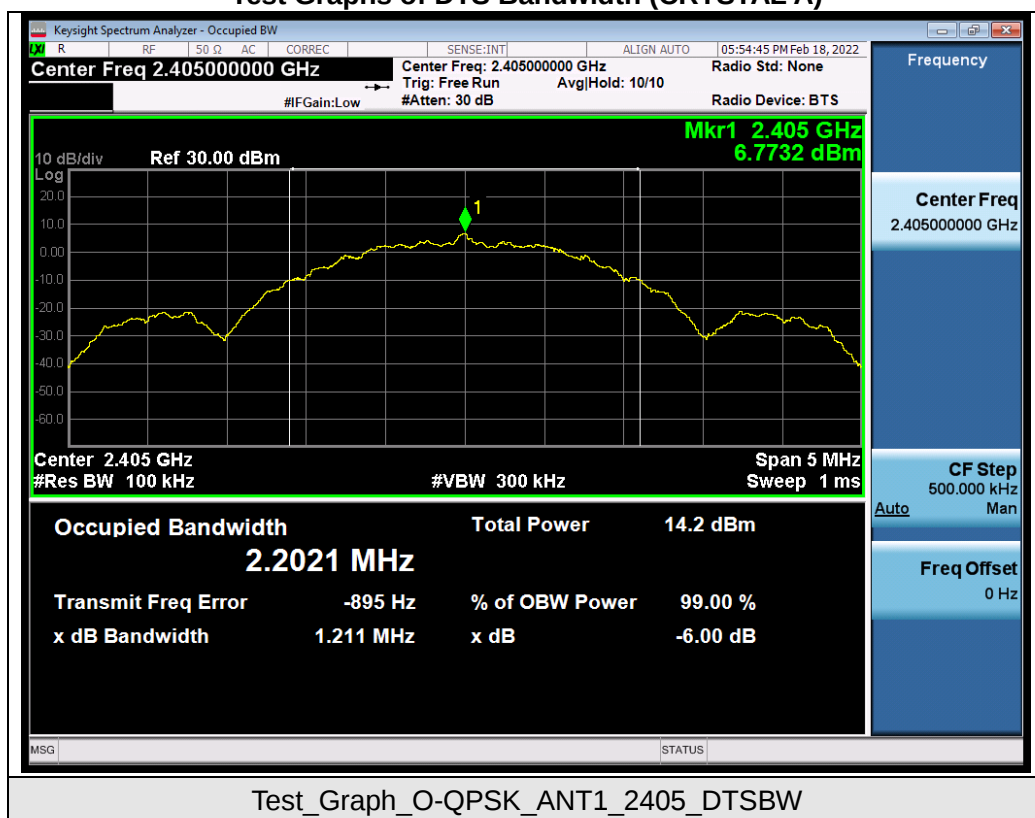
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Test Graphs of DTS Bandwidth (CRYSTAL A)



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Test_Graph_O-QPSK_ANT1_2440_DTSBW



Test_Graph_O-QPSK_ANT1_2475_DTSBW

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Test Graphs of Occupied Bandwidth (CRYSTAL B)

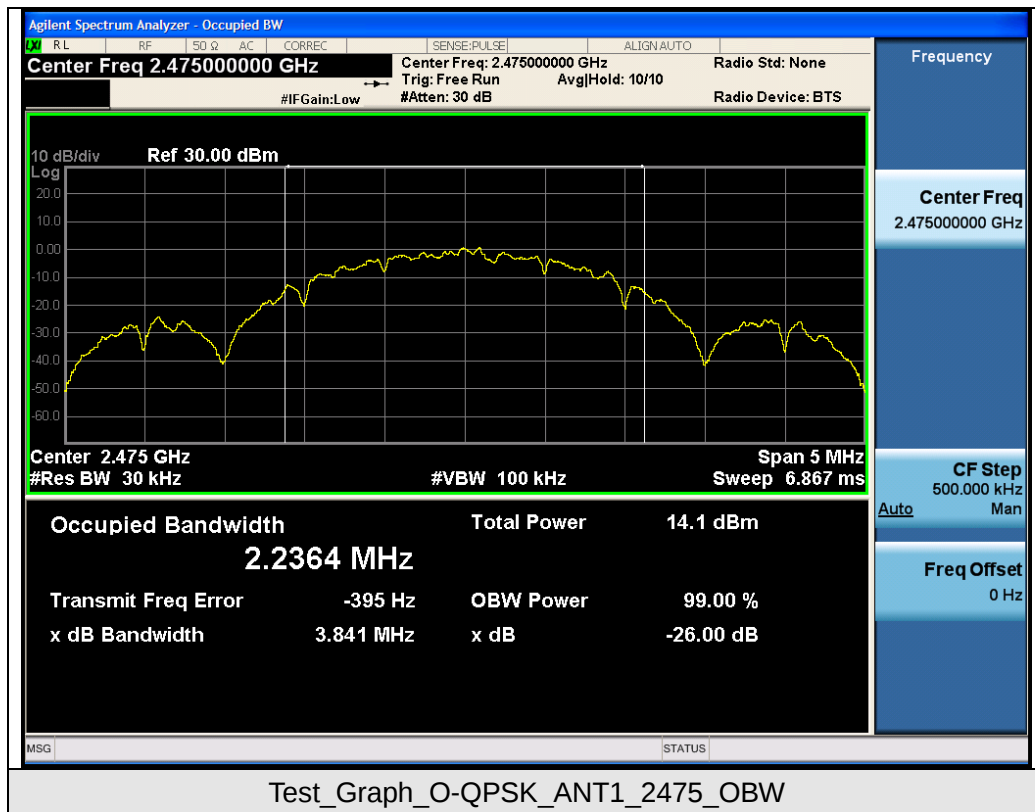


Test_Graph_O-QPSK_ANT1_2405_OBW

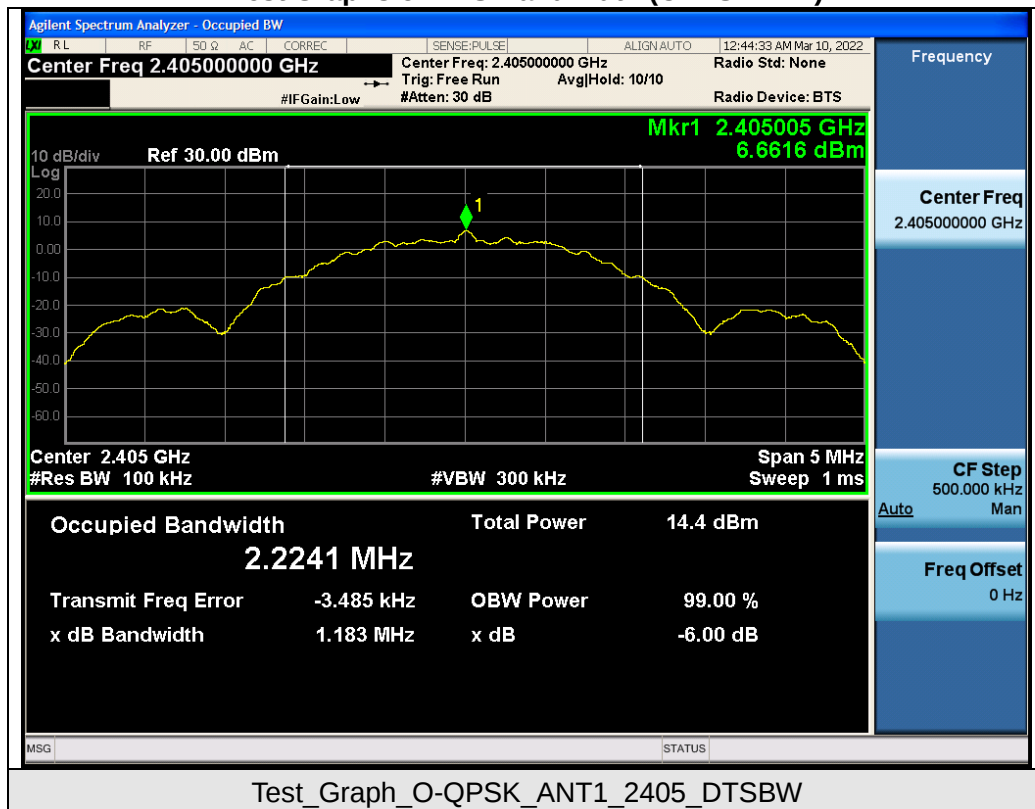


Test_Graph_O-QPSK_ANT1_2440_OBW

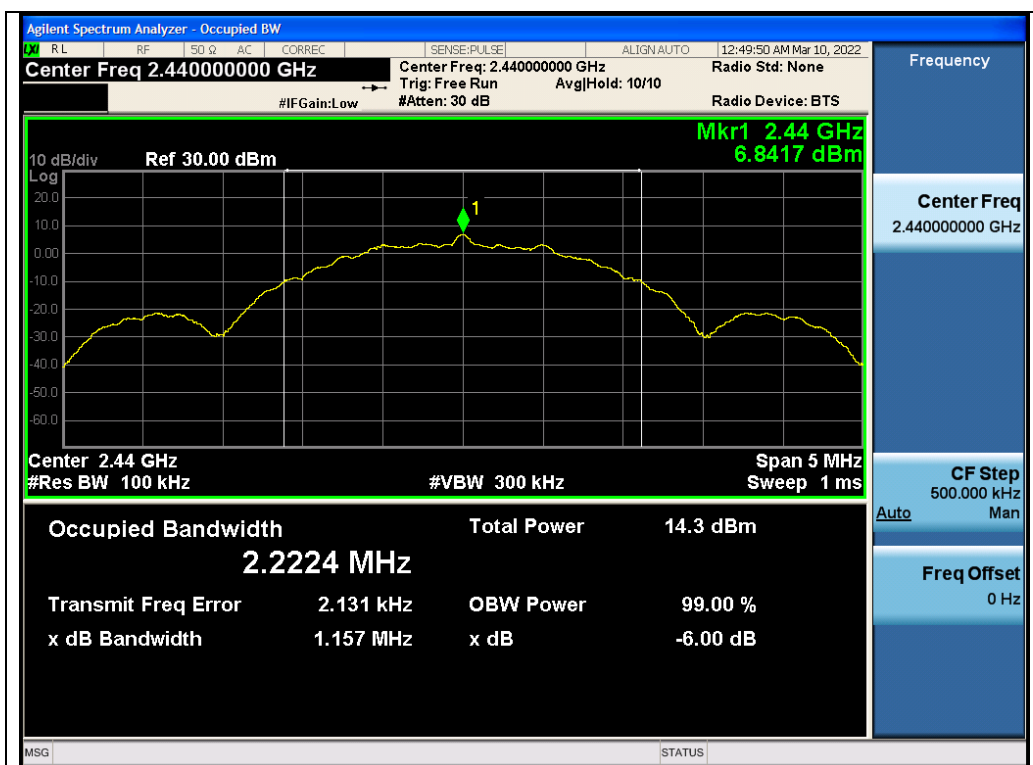
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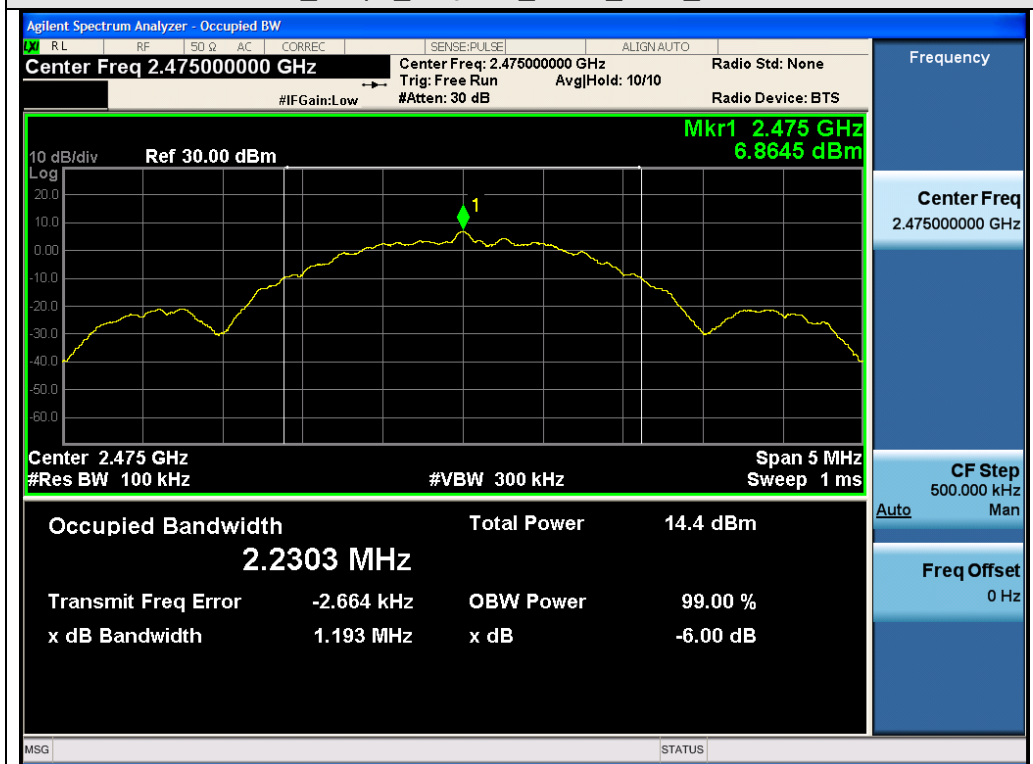
Test Graphs of DTS Bandwidth (CRYSTAL B)



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Test_Graph_O-QPSK_ANT1_2440_DTSBW



Test_Graph_O-QPSK_ANT1_2475_DTSBW

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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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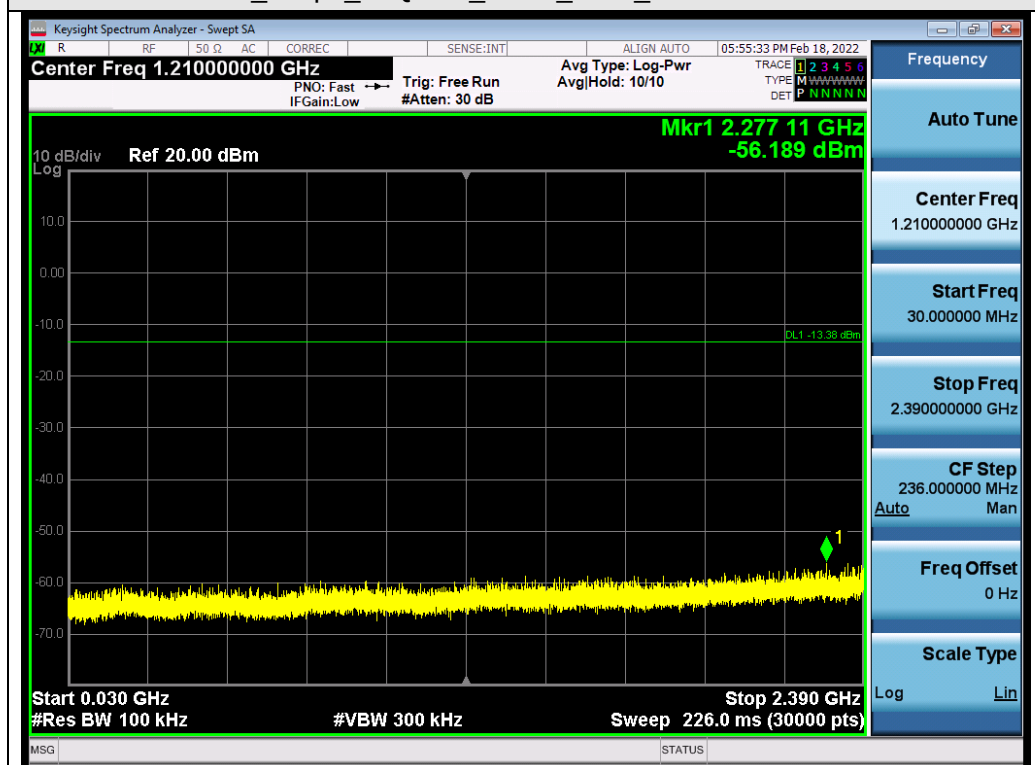
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Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands

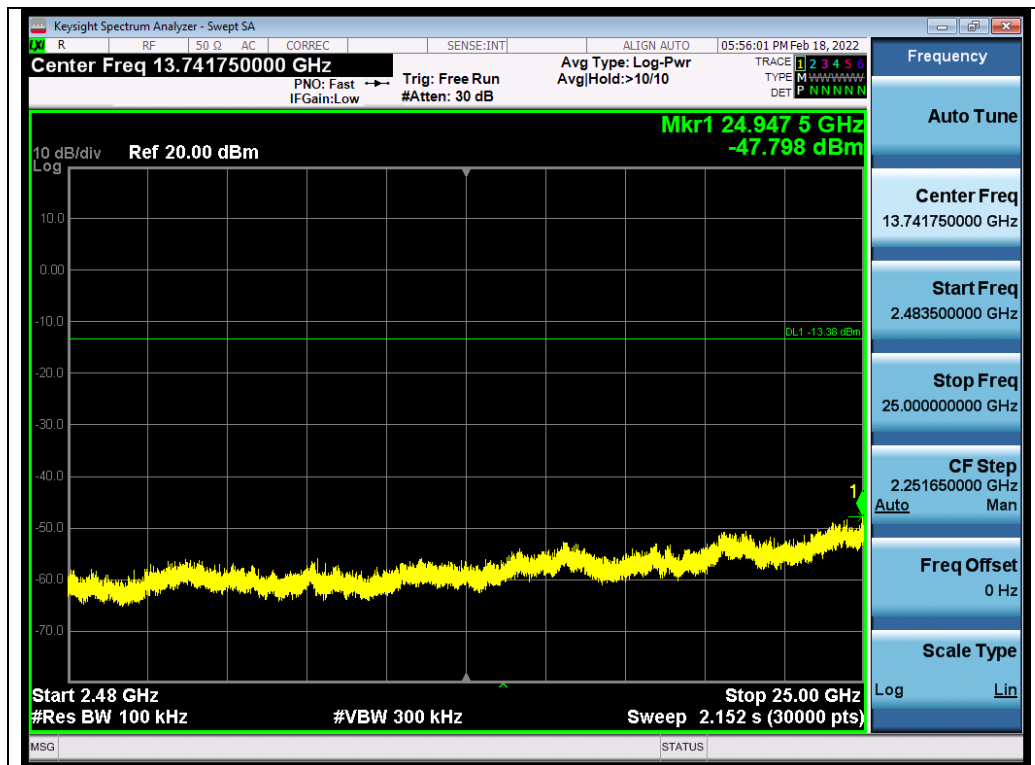


Test_Graph_O-QPSK_ANT1_2405_Reference Level



Test_Graph_O-QPSK_ANT1_2405_Lower Band Emissions

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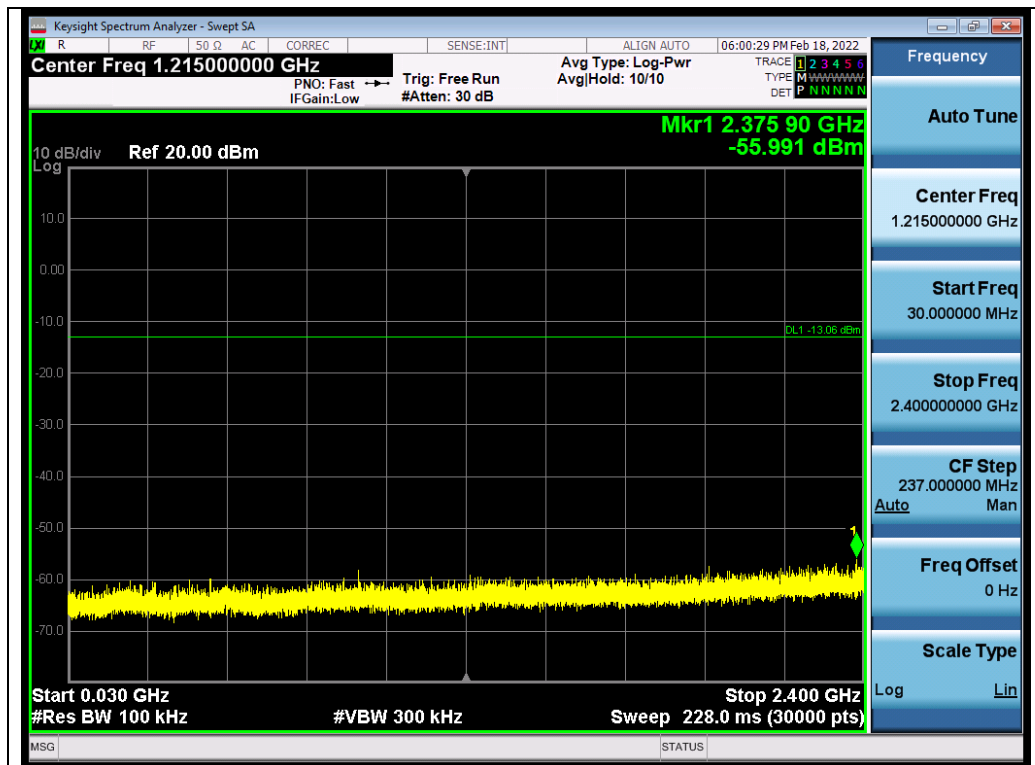
Test_Graph_O-QPSK_ANT1_2405_Higher Band Emissions



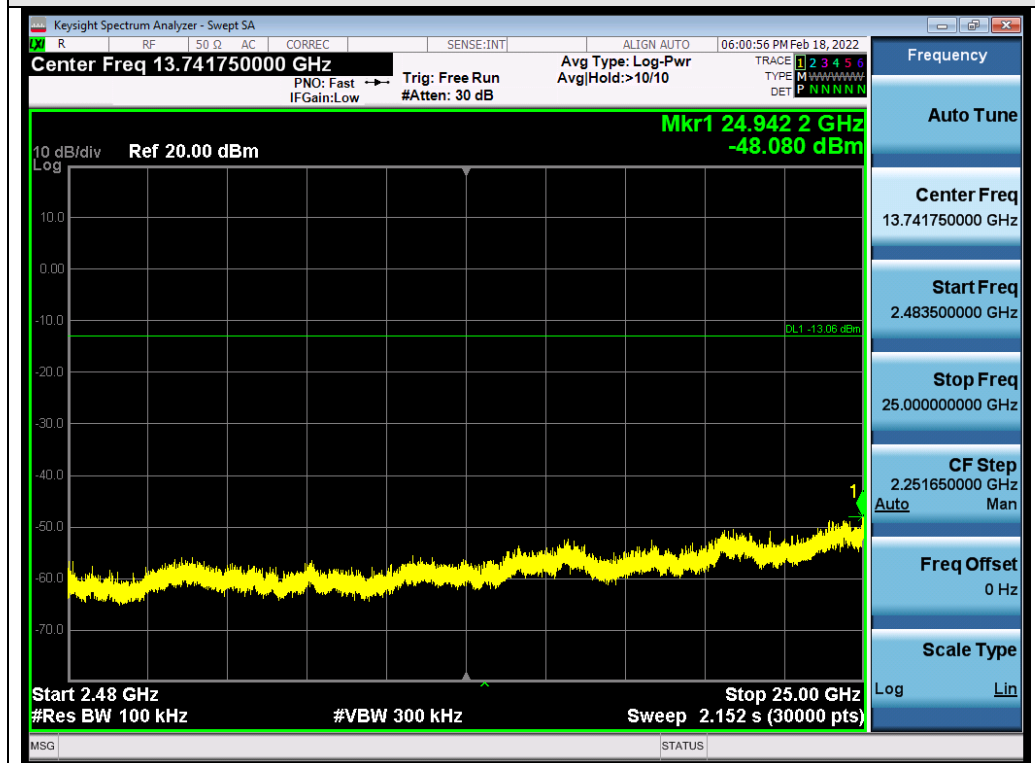
Test_Graph_O-QPSK_ANT1_2440_Reference Level

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Test_Graph_O-QPSK_ANT1_2440_Lower Band Emissions

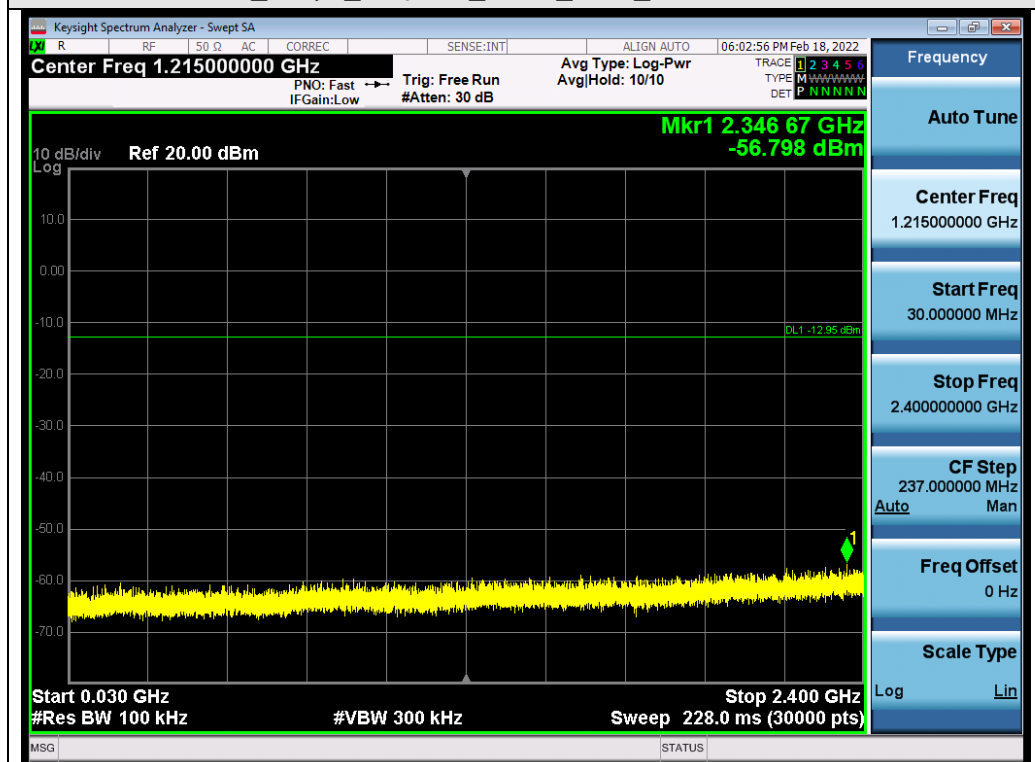


Test_Graph_O-QPSK_ANT1_2440_Higher Band Emissions

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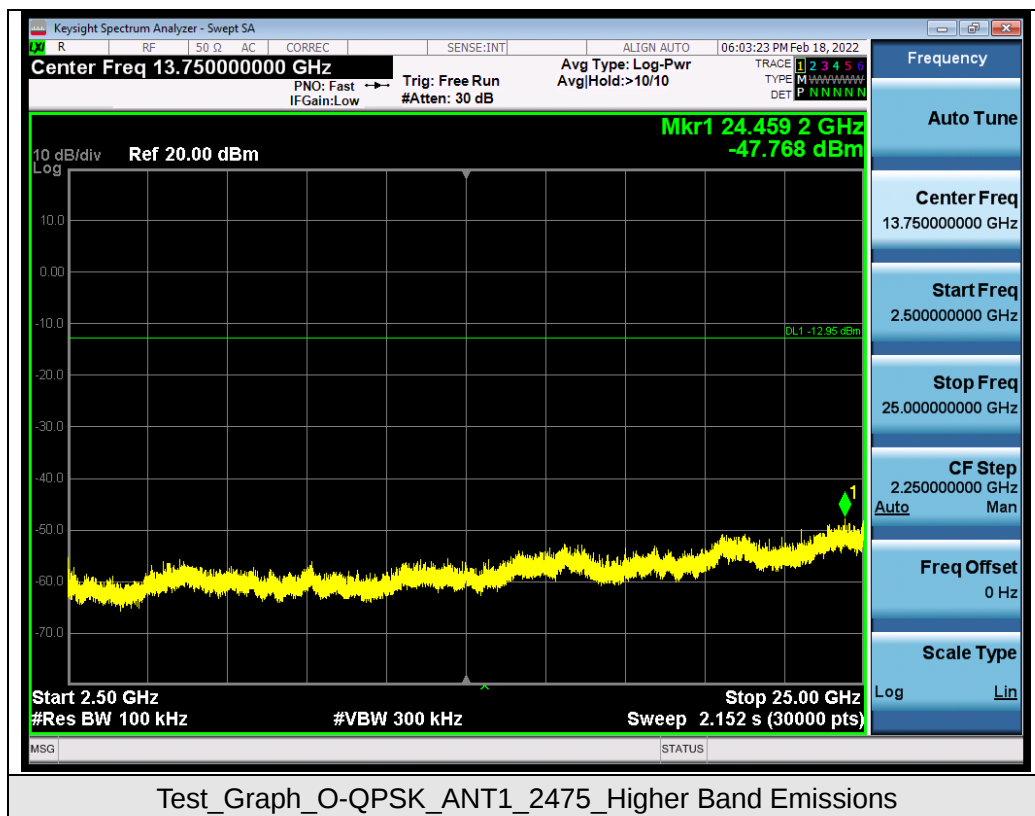


Test_Graph_O-QPSK_ANT1_2475_Reference Level



Test_Graph_O-QPSK_ANT1_2475_Lower Band Emissions

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Note: The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit.

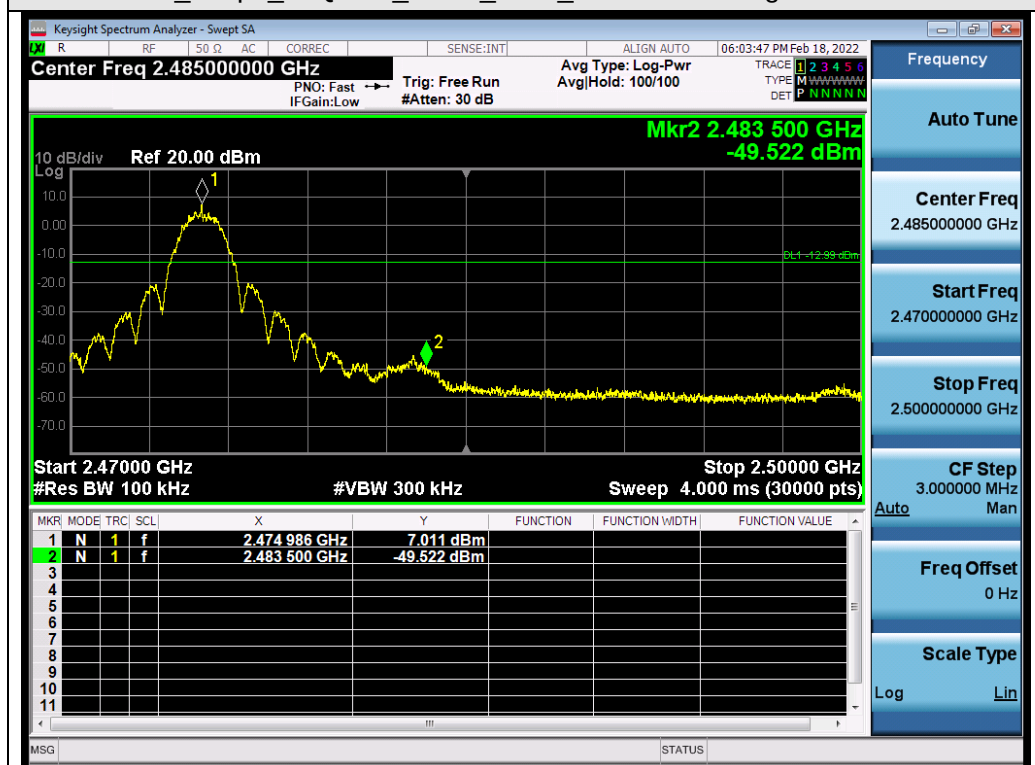
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Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands



Test_Graph_O-QPSK_ANT1_2405_Lower Band Edge Emissions



Test_Graph_O-QPSK_ANT1_2475_Higher Band Edge Emissions

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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 10.2 was used in this testing.

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

Refer to Section 7.2.

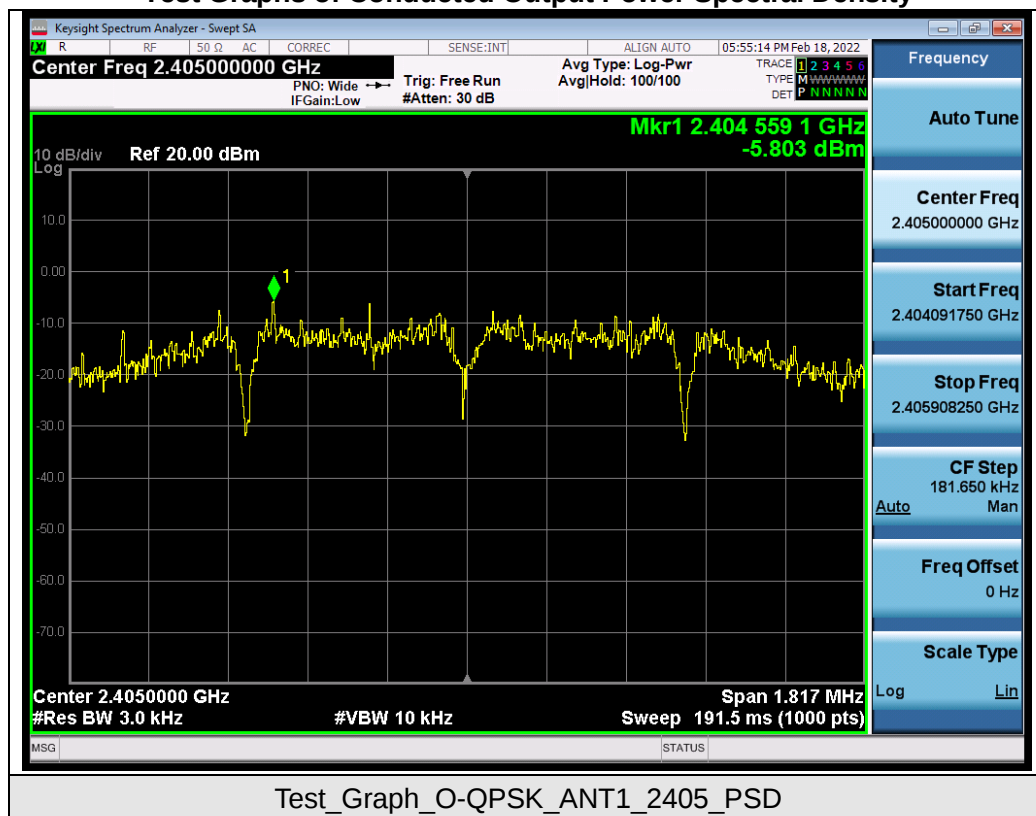
10.3. MEASUREMENT EQUIPMENT USED

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
O-QPSK	2405	-5.803	≤ 8	Pass
	2440	-5.591	≤ 8	Pass
	2475	-5.409	≤ 8	Pass

Test Graphs of Conducted Output Power Spectral Density

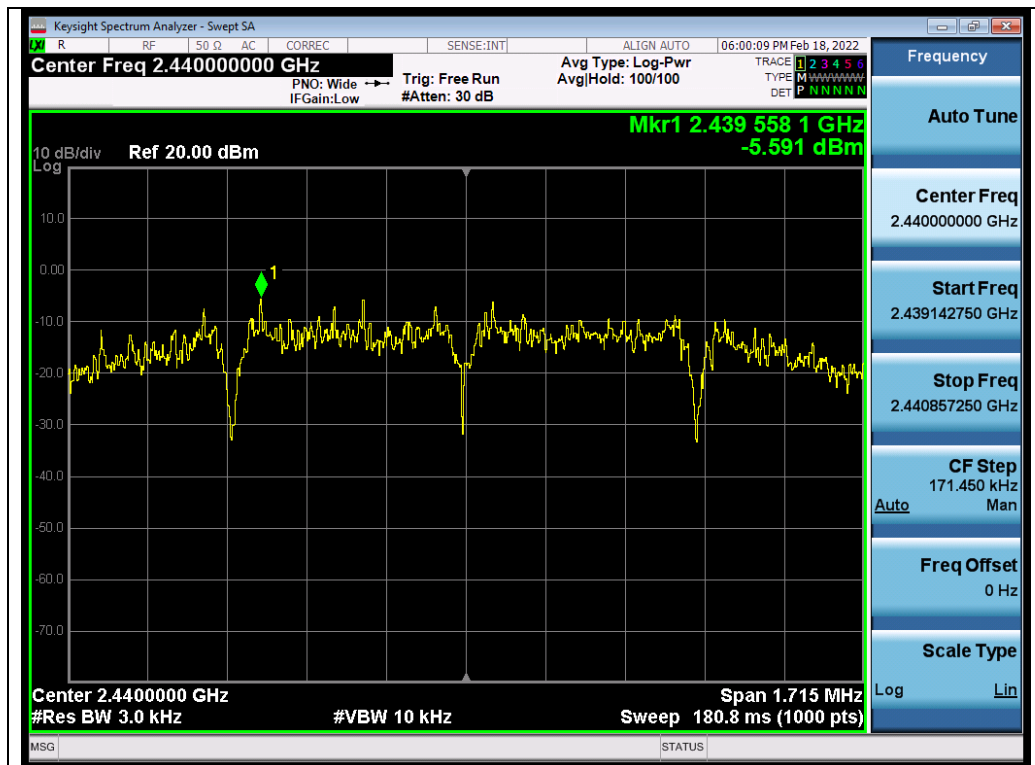


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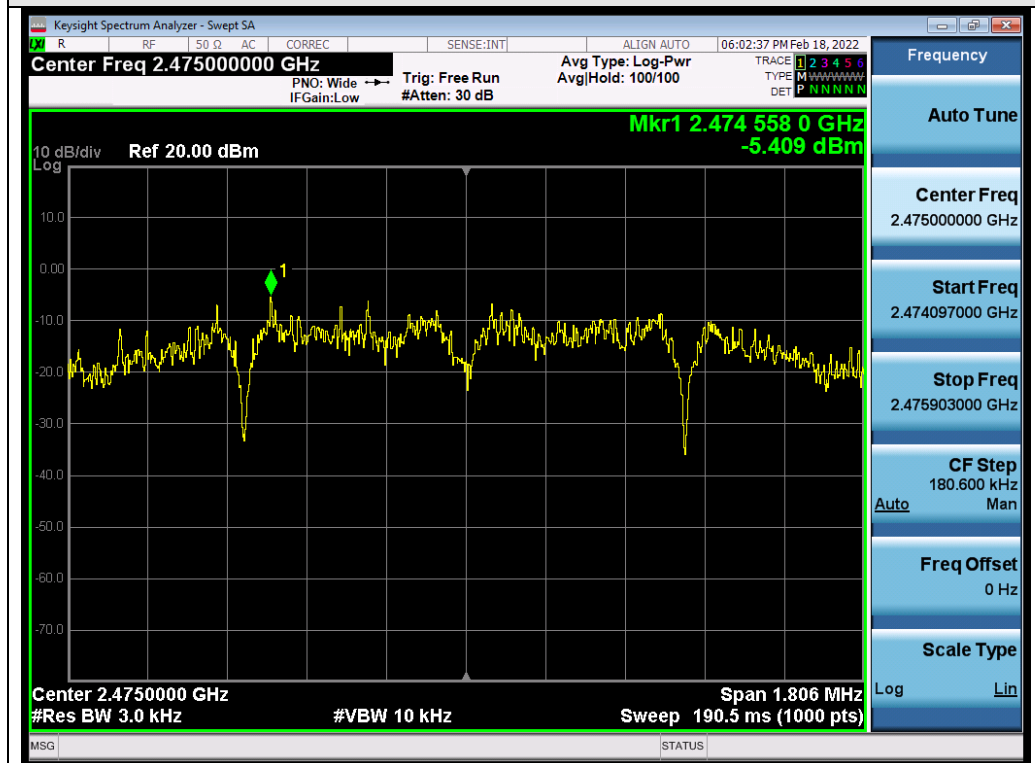
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Test_Graph_O-QPSK_ANT1_2440_PSD



Test_Graph_O-QPSK_ANT1_2475_PSD

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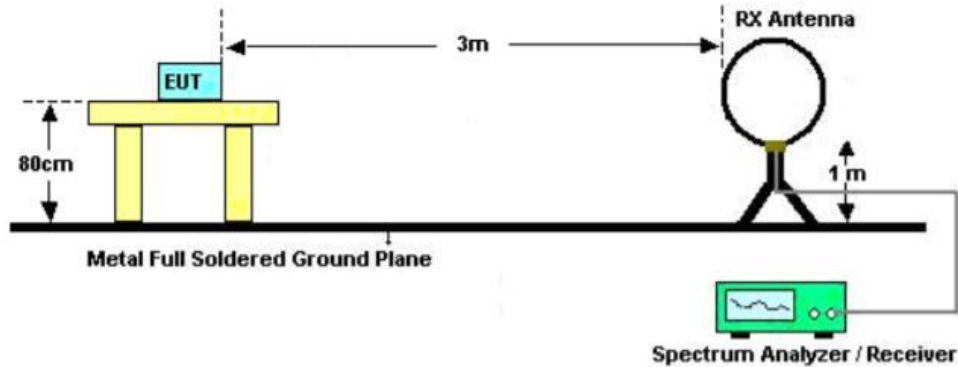
11. RADIATED EMISSION

11.1. MEASUREMENT PROCEDURE

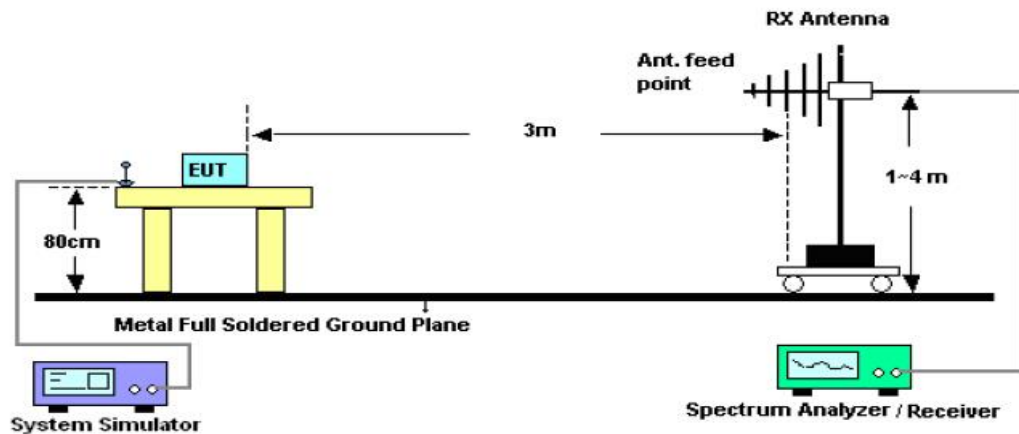
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated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

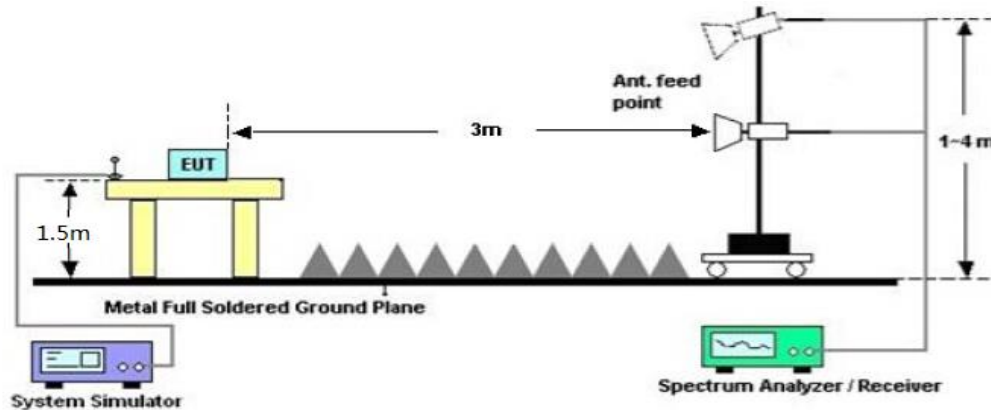
Radiated Emission Test-Setup Frequency Below 30MHz



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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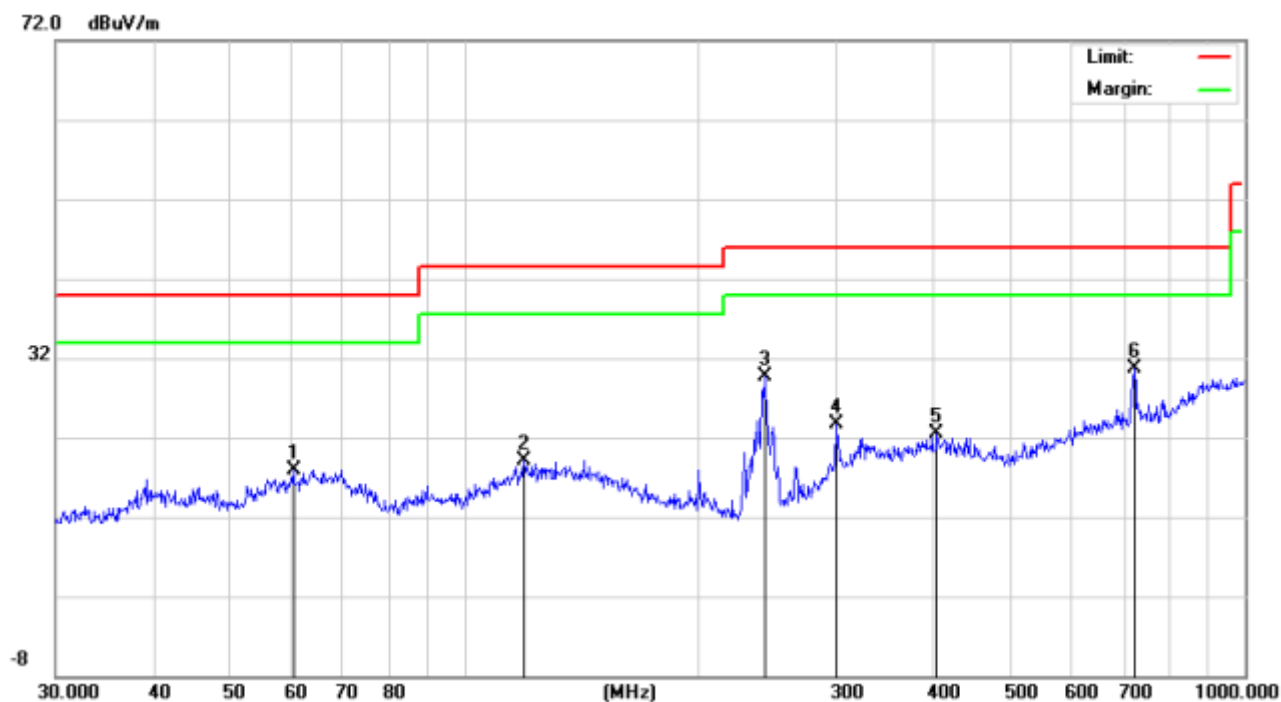
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RADIATED EMISSION BELOW 1GHZ

EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	21.8°C	Relative Humidity	58%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		60.4919	6.44	11.51	17.95	40.00	-22.05	peak
2		119.4361	6.17	12.88	19.05	43.50	-24.45	peak
3		242.5253	21.00	8.62	29.62	46.00	-16.38	peak
4		299.3158	10.40	13.32	23.72	46.00	-22.28	peak
5		403.2500	6.88	15.63	22.51	46.00	-23.49	peak
6	*	721.7259	12.21	18.42	30.63	46.00	-15.37	peak

RESULT: PASS

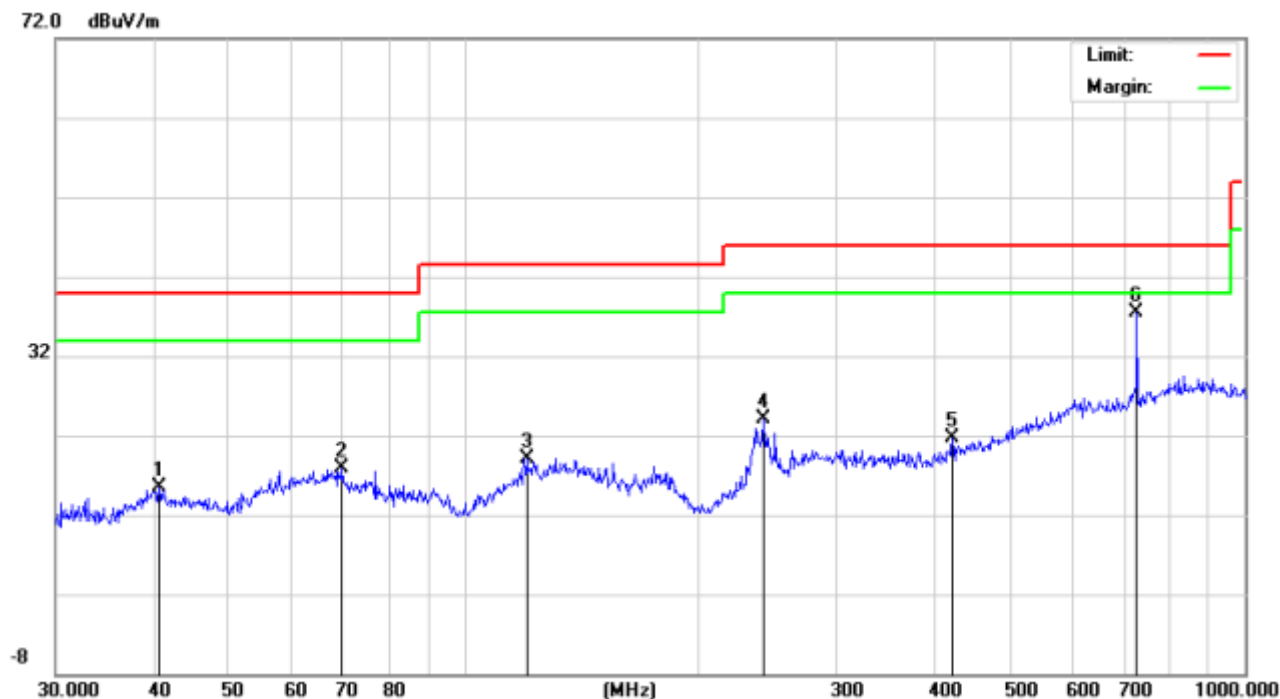
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EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	21.8°C	Relative Humidity	58%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		40.7016	5.61	9.97	15.58	40.00	-24.42	peak
2		69.8450	5.85	12.11	17.96	40.00	-22.04	peak
3		120.2766	6.19	12.97	19.16	43.50	-24.34	peak
4		241.6763	10.43	13.63	24.06	46.00	-21.94	peak
5		422.0577	7.01	14.64	21.65	46.00	-24.35	peak
6	*	726.8052	16.69	20.76	37.45	46.00	-8.55	peak

RESULT: PASS

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

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

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RADIATED EMISSION ABOVE 1GHZ

EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	60%
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
4810.000	47.65	0.08	47.73	74	-26.27	peak
4810.000	35.21	0.08	35.29	54	-18.71	AVG
7215.000	42.07	2.21	44.28	74	-29.72	peak
7215.000	30.76	2.21	32.97	54	-21.03	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	60%
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
4810.000	46.03	0.08	46.11	74	-27.89	peak
4810.000	36.47	0.08	36.55	54	-17.45	AVG
7215.000	41.64	2.21	43.85	74	-30.15	peak
7215.000	32.88	2.21	35.09	54	-18.91	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	60%
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	48.78	0.14	48.92	74	-25.08	peak
4882.000	35.47	0.14	35.61	54	-18.39	AVG
7320.000	43.19	2.36	45.55	74	-28.45	peak
7320.000	30.47	2.36	32.83	54	-21.17	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	60%
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	47.51	0.14	47.65	74	-26.35	peak
4882.000	36.57	0.14	36.71	54	-17.29	AVG
7320.000	43.37	2.36	45.73	74	-28.27	peak
7320.000	31.78	2.36	34.14	54	-19.86	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	60%
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
4950.000	48.96	0.22	49.18	74	-24.82	peak
4950.000	35.61	0.22	35.83	54	-18.17	AVG
7425.000	43.18	2.64	45.82	74	-28.18	peak
7425.000	30.07	2.64	32.71	54	-21.29	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	60%
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
4950.000	48.53	0.22	48.75	74	-25.25	peak
4950.000	37.12	0.22	37.34	54	-16.66	AVG
7425.000	44.47	2.64	47.11	74	-26.89	peak
7425.000	33.08	2.64	35.72	54	-18.28	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note:

1. 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.
2. Factor = Antenna Factor + Cable loss - Amplifier gain, Margin=Emission Level-Limit.
3. The “Factor” value can be calculated automatically by software of measurement system.

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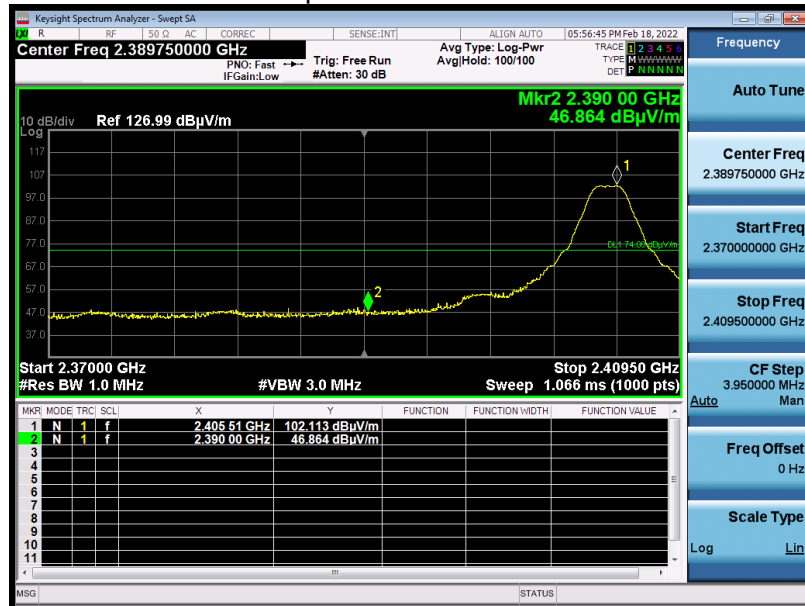
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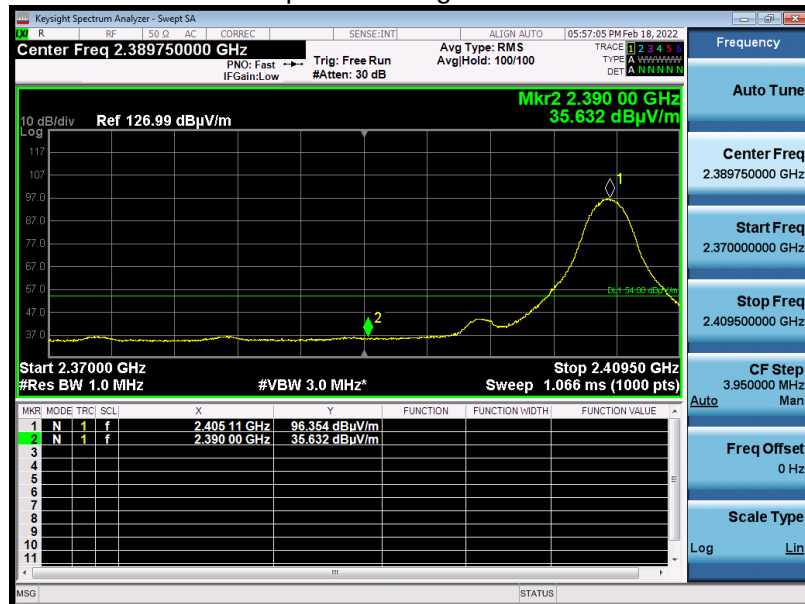
TEST RESULT FOR RESTRICTED BANDS REQUIREMENTS

EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	55%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

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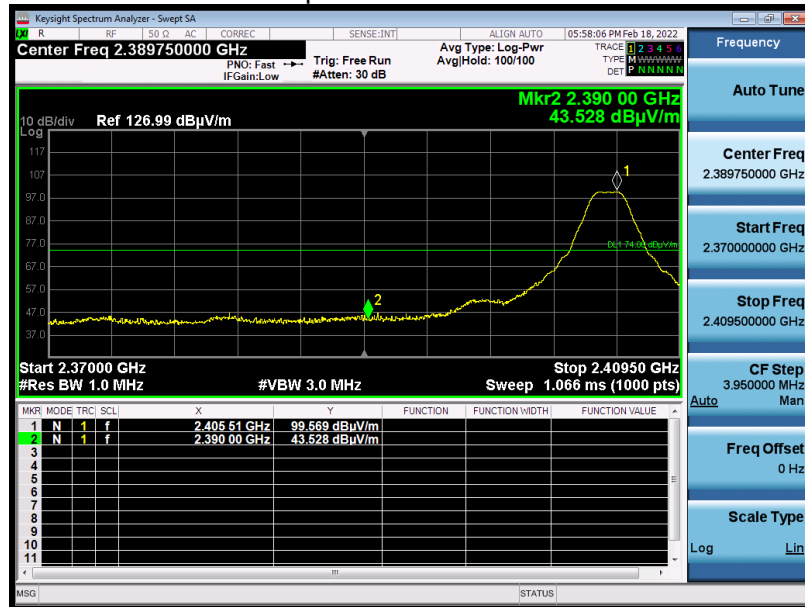
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EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	55%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

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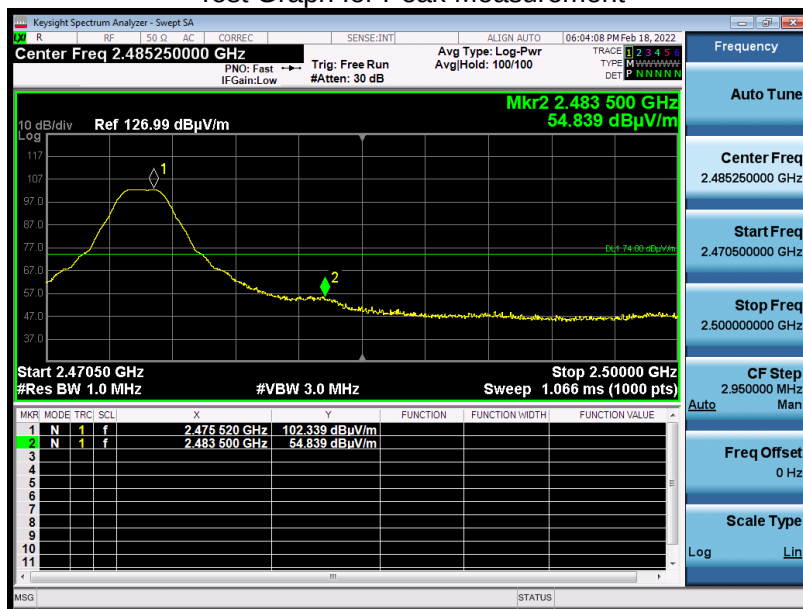
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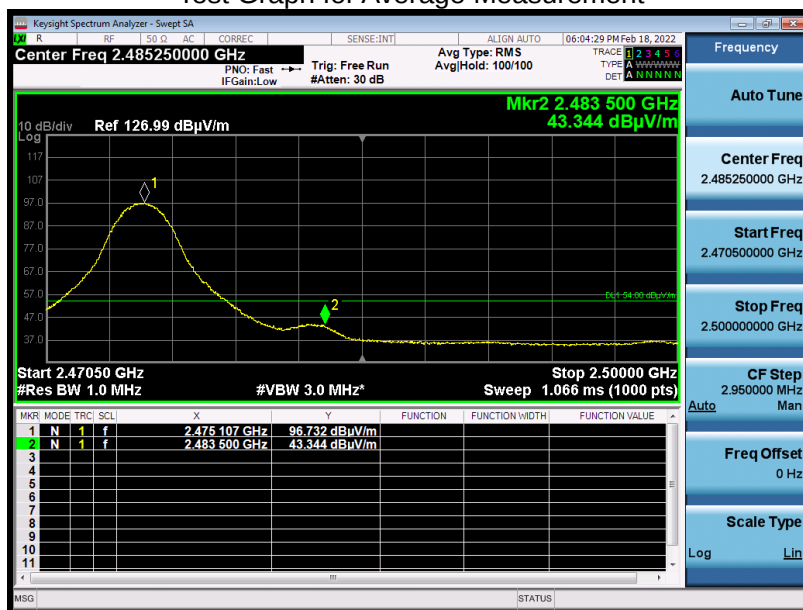
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EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	55%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

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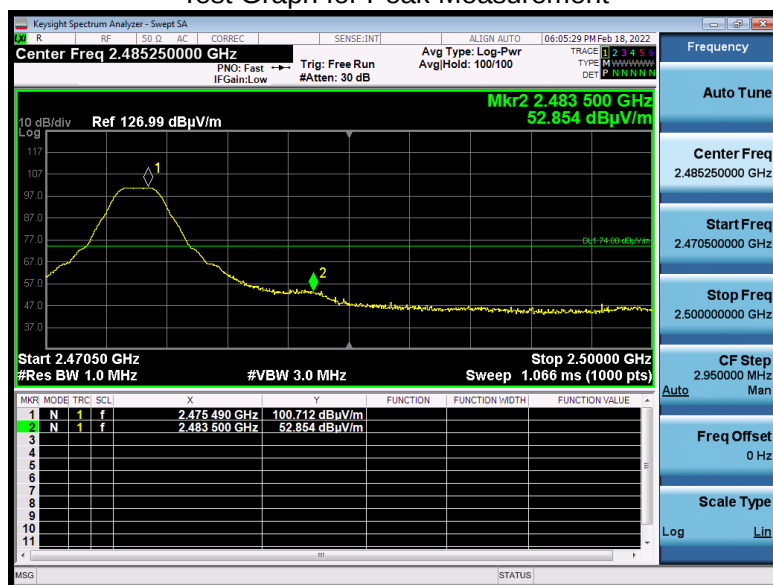
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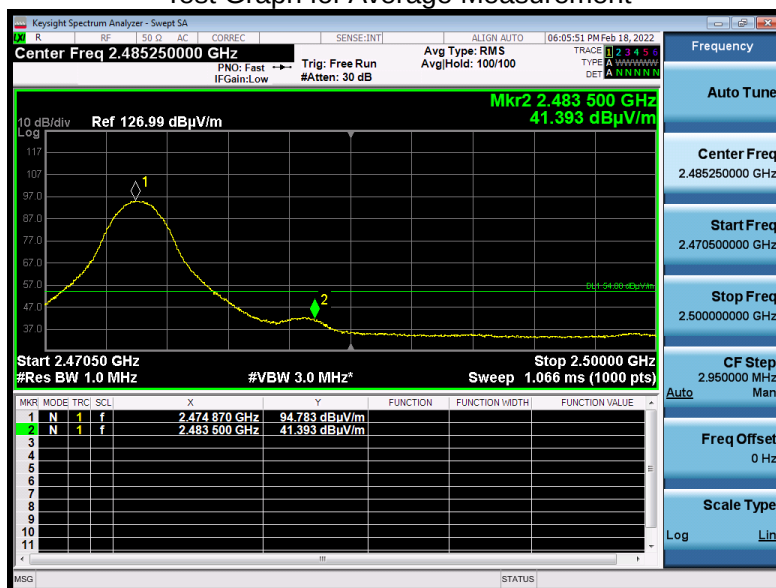
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EUT	ANNA-B4	Model Name	ANNA-B402
Temperature	25°C	Relative Humidity	55%
Pressure	985hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

Note: 1. The factor had been edited in the "Input Correction" of the Spectrum Analyzer.

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12. FCC LINE CONDUCTED EMISSION TEST

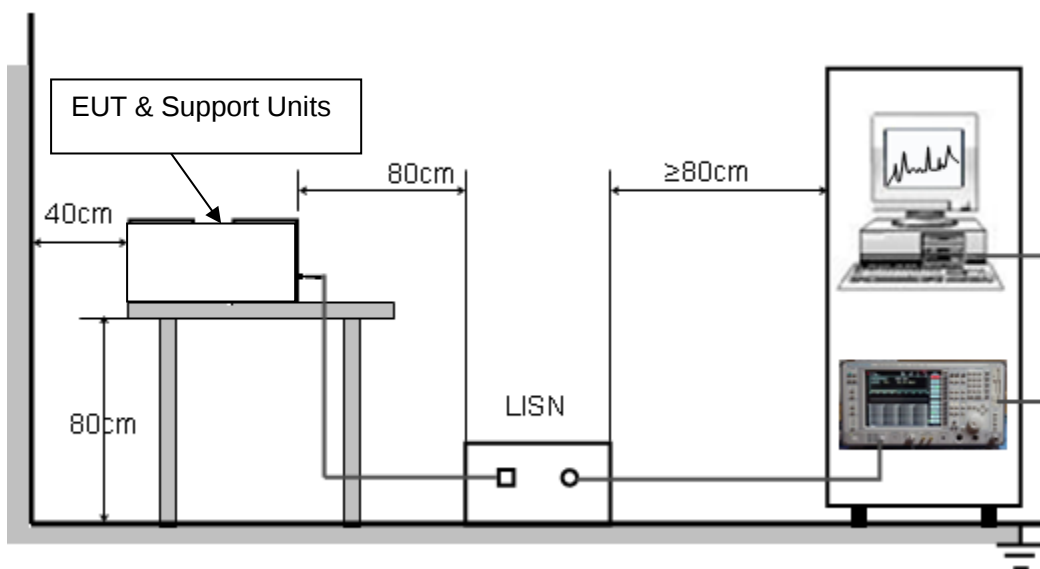
12.1. LIMITS OF LINE CONDUCTED EMISSION TEST

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



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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 3.3V power from control board 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.

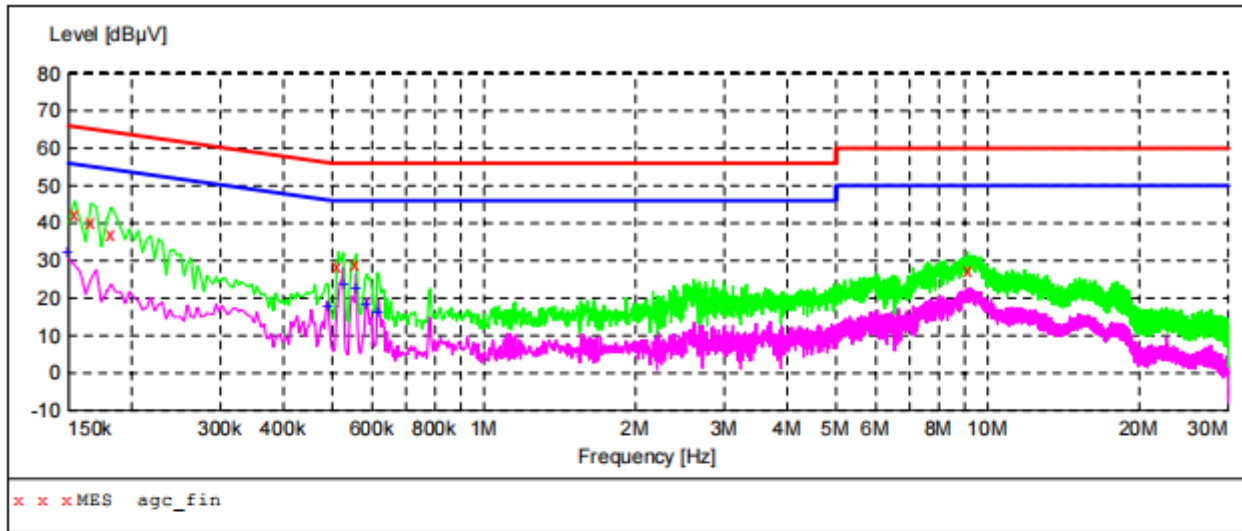
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

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 Line 1-L



MEASUREMENT RESULT: "agc_fin"

2022/1/11 9:13

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.154000	42.60	6.9	66	23.2	QP	L1	GND
0.166000	40.20	6.8	65	25.0	QP	L1	GND
0.182000	37.20	6.7	64	27.2	QP	L1	GND
0.514000	28.70	5.4	56	27.3	QP	L1	GND
0.558000	29.00	5.4	56	27.0	QP	L1	GND
9.126000	27.40	6.8	60	32.6	QP	L1	GND

MEASUREMENT RESULT: "agc_fin2"

2022/1/11 9:13

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	32.00	6.9	56	24.0	AV	L1	GND
0.490000	17.60	5.4	46	28.6	AV	L1	GND
0.526000	23.60	5.4	46	22.4	AV	L1	GND
0.558000	22.60	5.4	46	23.4	AV	L1	GND
0.586000	18.30	5.4	46	27.7	AV	L1	GND
0.618000	16.30	5.4	46	29.7	AV	L1	GND

RESULT: PASS

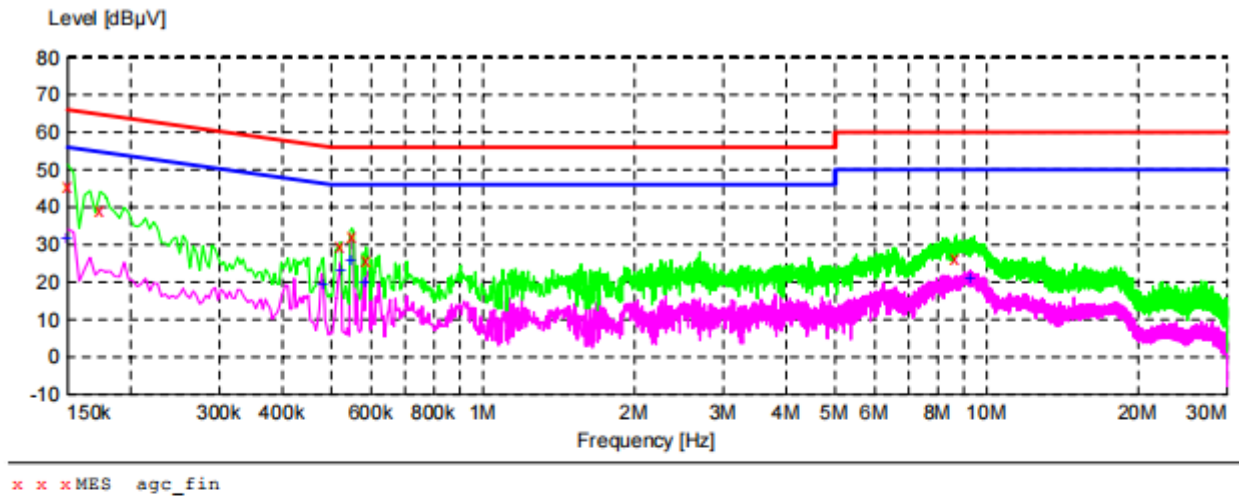
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Line Conducted Emission Test Line 2-N



MEASUREMENT RESULT: "agc_fin"

2022/1/11 9:17

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	45.70	6.9	66	20.3	QP	N	GND
0.174000	39.20	6.7	65	25.6	QP	N	GND
0.522000	29.80	5.4	56	26.2	QP	N	GND
0.550000	32.30	5.4	56	23.7	QP	N	GND
0.586000	25.90	5.4	56	30.1	QP	N	GND
8.698000	26.30	6.8	60	33.7	QP	N	GND

MEASUREMENT RESULT: "agc_fin2"

2022/1/11 9:17

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	31.80	6.9	56	24.2	AV	N	GND
0.482000	19.60	5.4	46	26.7	AV	N	GND
0.522000	23.00	5.4	46	23.0	AV	N	GND
0.546000	25.90	5.4	46	20.1	AV	N	GND
0.586000	20.10	5.4	46	25.9	AV	N	GND
9.274000	21.20	6.8	50	28.8	AV	N	GND

RESULT: PASS

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APPENDIX A: PHOTOGRAPHS OF TEST SETUP

Refer to the Report No.: AGC00174211202AP02

APPENDIX B: PHOTOGRAPHS OF EUT

Refer to the Report No.: AGC00174211202AP03

----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.

Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the “Dedicated Testing/Inspection Stamp” is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

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