FCC Test Report

Report No.: AGC14499230609FE03

FCC ID	:	2APPZ-AP6221
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	IP Phone
BRAND NAME	:	Fanvil
MODEL NAME	:	X305
APPLICANT	:	Fanvil Technology Co., Ltd.
DATE OF ISSUE	:	Jul. 19, 2023
STANDARD(S)	:	FCC Part 15.247
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jul. 19, 2023	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	Fanvil Technology Co., Ltd.
Address	10/F Block A, Dualshine Global Science Innovation, Honglang North 2nd Road, Bao'an District, Shenzhen, China
Manufacturer	Fanvil Technology Co., Ltd.
Address	10/F Block A, Dualshine Global Science Innovation, Honglang North 2nd Road, Bao'an District, Shenzhen, China
Factory	Fanvil Technology Co., Ltd.
Address	10/F Block A, Dualshine Global Science Innovation, Honglang North 2nd Road, Bao'an District, Shenzhen, China
Product Designation	IP Phone
Brand Name	Fanvil
Test Model	X305
Date of receipt of test item	Jun. 30, 2023
Date of Test	Jun. 30, 2023~Jul. 19, 2023
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BR/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	Bibo Zhang (Project Engineer)	Jul. 19, 2023
Reviewed By	Calvin Liu (Reviewer)	Jul. 19, 2023
Approved By	Max Zhang Authorized Officer	Jul. 19, 2023

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as “IP Phone”. It is designed by way of utilizing the GFSK, Pi/4 DQPSK and 8DPSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480 GHz
RF Output Power	0.934dBm (Max)
Bluetooth Version	V5.0
Modulation	BR ☒GFSK, EDR ☒π /4-DQPSK, ☒8DPSK BLE ☐GFSK 1Mbps ☐GFSK 2Mbps
Number of channels	79
Hardware Version	V1.0
Software Version	T2.12.0.11
Antenna Designation	PIFA Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	4.2dBi
Power Supply	DC 5V by adapter or DC 48V by PoE

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2402~2480MHz	0	2402 MHz
	1	2403 MHz
	:	:
	38	2440 MHz
	39	2441 MHz
	40	2442 MHz
	:	:
	77	2479 MHz
	78	2480 MHz

2.3. RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHz, in every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally, the type of connection (e.g. single of multi slot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also, the slave of the connection will use these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a hopping sequence in data mode:
40, 21, 44, 23, 04, 15, 66, 56, 19, 78, 07, 28, 69, 55,
36, 45, 05, 13, 43, 74, 57, 35, 67, 76, 02, 34, 54, 63,
42, 11, 30, 06, 64, 25, 75, 48, 17, 33, 58, 01, 29, 14,
51, 72, 03, 31, 50, 61, 77, 18, 10, 47, 12, 68, 08, 49,
20, 00, 73, 09, 16, 60, 71, 41, 24, 53, 38, 26, 46, 37,
65, 32, 70, 52, 27, 59, 22, 62, 39

2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values:

1. LAP/UAP of the master of the connection.
2. Internal master clock.

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24MSB's of the 48BD_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For behavior action with other units only offset is used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us. The clock has a cycle of about one day(23h30).

In most case it is implemented as 28 bits counter. For the deriving of the hopping sequence the entire. LAP (24 bits),4LSB's(4bits) (Input 1) and the 27MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behavior:

The first connection between the two devices is established, a hopping sequence was generated. For Transmitting the wanted data the complete hopping sequence was not used. The connection ended.

The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmission is longer (and it Cannot be shorter) than the minimum resolution of the clock(312.5us). The hopping sequence will always differ from the first one.

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

This submittal(s) (test report) is intended for **FCC ID: 2APPZ-AP6221** filing to comply with the FCC PART 15.247 requirements.

2.7. 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.

2.8. SPECIAL ACCESSORIES

Refer to section 5.2.

2.9. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.10. 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 ±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 = ±3.1 dB
Uncertainty of Radiated Emission below 1GHz	U_c = ±4.0 dB
Uncertainty of Radiated Emission above 1GHz	U_c = ±4.8 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 = ±2.7dB
Uncertainty of Occupied Channel Bandwidth	U_c = ±2 %

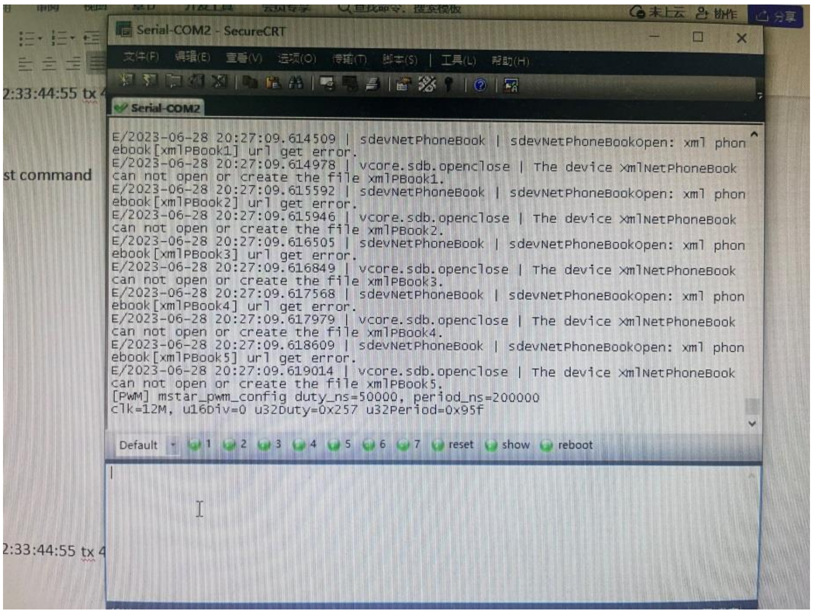
4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel GFSK by DC 5V adapter
2	Middle channel GFSK by DC 5V adapter
3	High channel GFSK by DC 5V adapter
4	Low channel π/4-DQPSK by DC 5V adapter
5	Middle channel π/4-DQPSK by DC 5V adapter
6	High channel π/4-DQPSK by DC 5V adapter
7	Low channel 8DPSK by DC 5V adapter
8	Middle channel 8DPSK by DC 5V adapter
9	High channel 8DPSK by DC 5V adapter
10	Hopping mode GFSK by DC 5V adapter
11	Hopping mode π/4-DQPSK by DC 5V adapter
12	Hopping mode 8DPSK by DC 5V adapter
13	Low channel GFSK by DC 48V PoE
14	Middle channel GFSK by DC 48V PoE
15	High channel GFSK by DC 48V PoE
16	Low channel π/4-DQPSK by DC 48V PoE
17	Middle channel π/4-DQPSK by DC 48V PoE
18	High channel π/4-DQPSK by DC 48V PoE
19	Low channel 8DPSK by DC 48V PoE
20	Middle channel 8DPSK by DC 48V PoE
21	High channel 8DPSK by DC 48V PoE
22	Hopping mode GFSK by DC 48V PoE
23	Hopping mode π/4-DQPSK by DC 48V PoE
24	Hopping mode 8DPSK by DC 48V PoE

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.

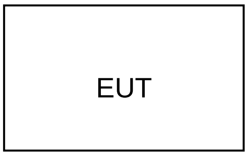
Software Setting



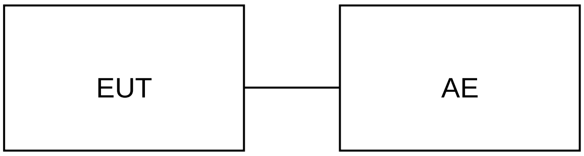
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Radiated Emission Configure:



Conducted Emission Configure:



5.2. EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	IP Phone	X305	FCC ID: 2APPZ-AP6221	EUT
2	Adapter	GQ12-050200-AU	Input: AC 100-240V 50/60Hz, 0.4A Output: DC 5.0V 2A	AE
3	Ethernet Cable	N/A	N/A	AE
4	Handset Wire	N/A	1.5m Unshielded	AE
5	Handset	N/A	N/A	AE
6	Wall Stand	N/A	N/A	AE
7	Stand	N/A	N/A	AE
8	PoE	ADS-120HK-48-1 520120E	DC 12V 1A (IEEE 802.3af)	AE

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247 (b)(1)	Peak Output Power	Compliant
15.247 (a)(1)	20 dB Bandwidth	Compliant
15.247 (d)	Conducted Spurious Emission	Compliant
15.209	Radiated Emission	Compliant
15.247 (a)(1)(iii)	Number of Hopping Frequency	Compliant
15.247 (a)(1)(iii)	Time of Occupancy	Compliant
15.247 (a)(1)	Frequency Separation	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	Jun. 03, 2023	Jun. 02, 2024
LISN	R&S	ESH2-Z5	100086	Jun. 03, 2023	Jun. 02, 2024
Test software	R&S	ES-K1 (Ver.V1.71)	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	Feb. 18, 2023	Feb. 17, 2024
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Jun. 01, 2023	May 31, 2024
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	N/A	N/A
Attenuator	ZHINAN	E-002	N/A	Sep. 01, 2022	Aug. 31, 2023
Horn antenna	SCHWARZBECK	BBHA 9170	#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 LINDGREN	3117	00034609	Mar. 03, 2023	Mar. 02, 2024
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	N/A	N/A
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 05, 2023	Jan. 04, 2025
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

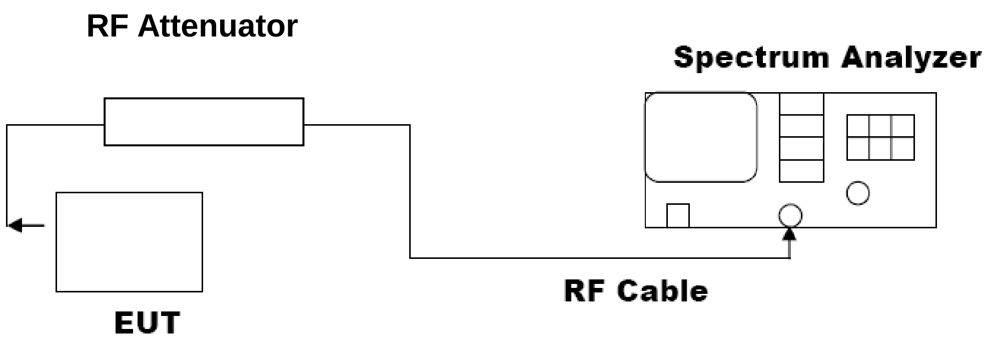
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
3. RBW > 20 dB bandwidth of the emission being measured.
4. VBW ≥RBW.
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)

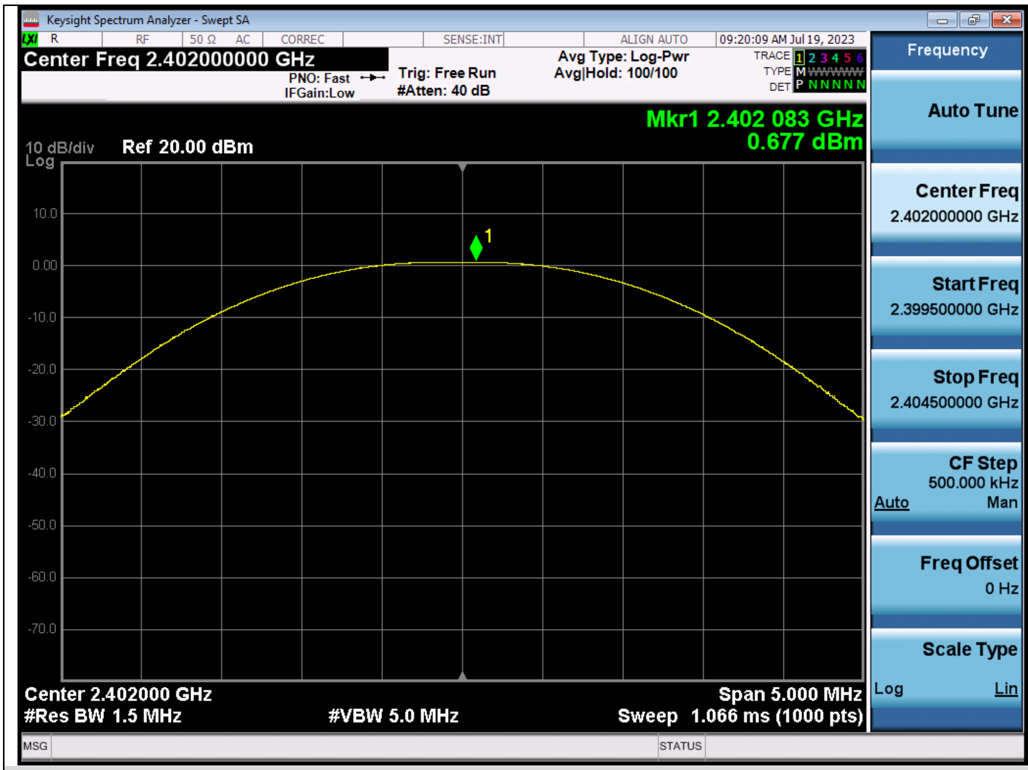
PEAK POWER TEST SETUP



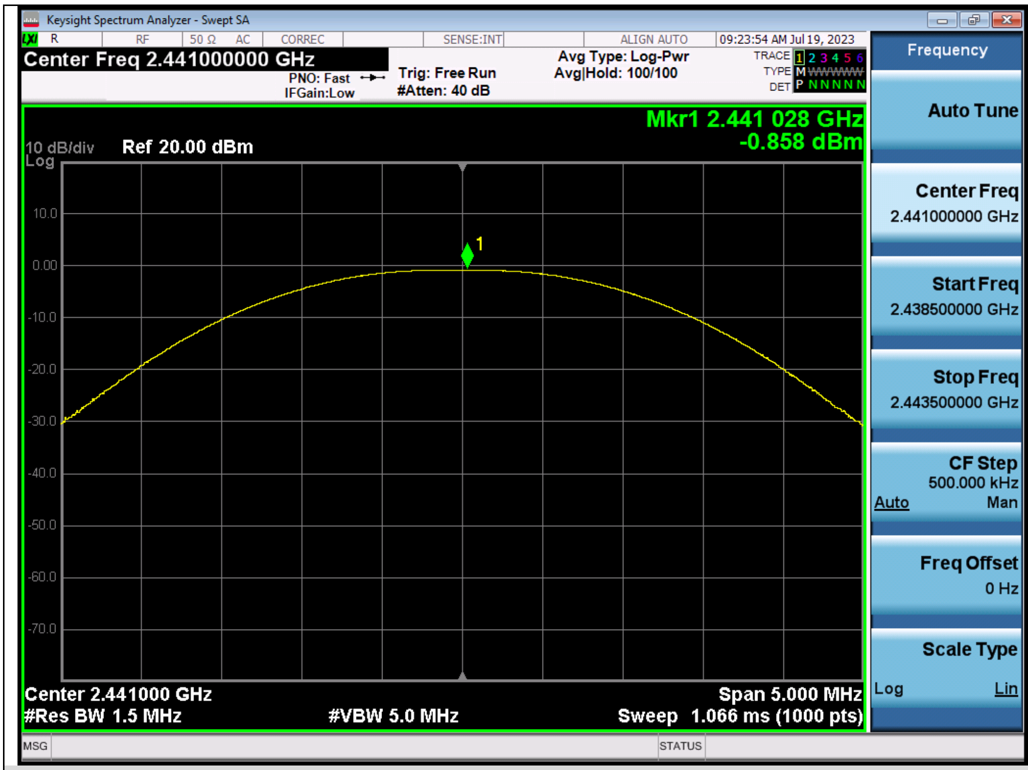
7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power				
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
GFSK	2402	0.677	≤21	Pass
	2441	-0.858	≤21	Pass
	2480	-1.268	≤21	Pass
π /4-DQPSK	2402	0.698	≤21	Pass
	2441	-0.805	≤21	Pass
	2480	-1.271	≤21	Pass
8DPSK	2402	0.934	≤21	Pass
	2441	-0.575	≤21	Pass
	2480	-1.079	≤21	Pass

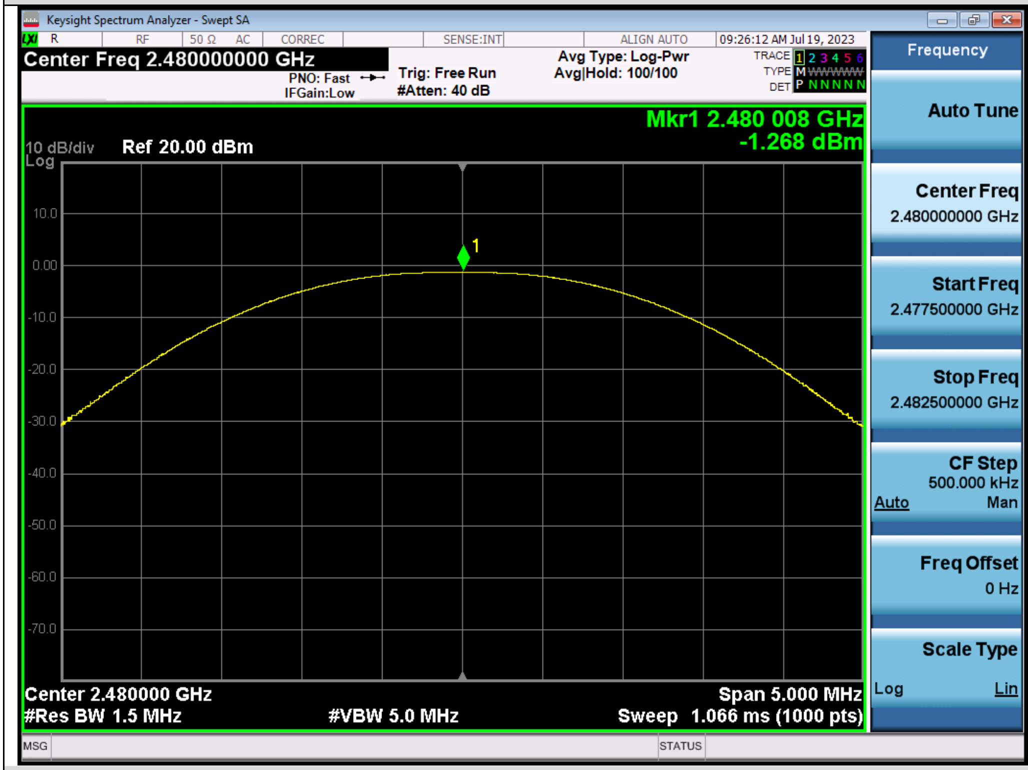
Test Graphs of Conducted Output Power



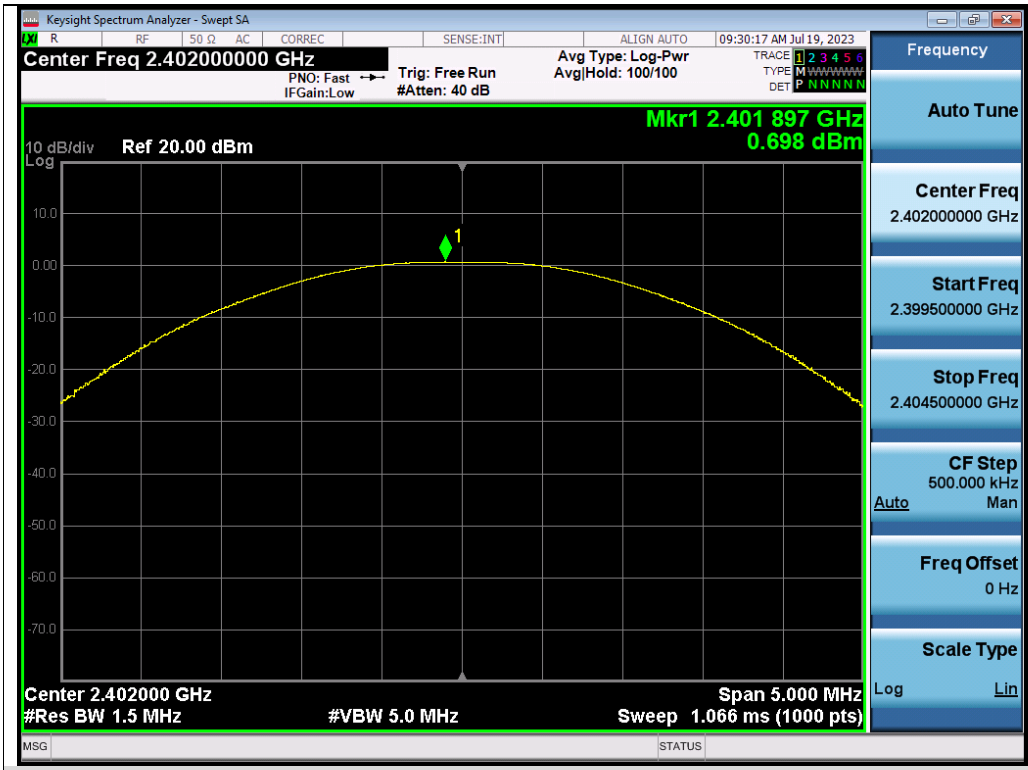
Test_Graph_BR_ANT1_2402_1Mbps_Peak Power



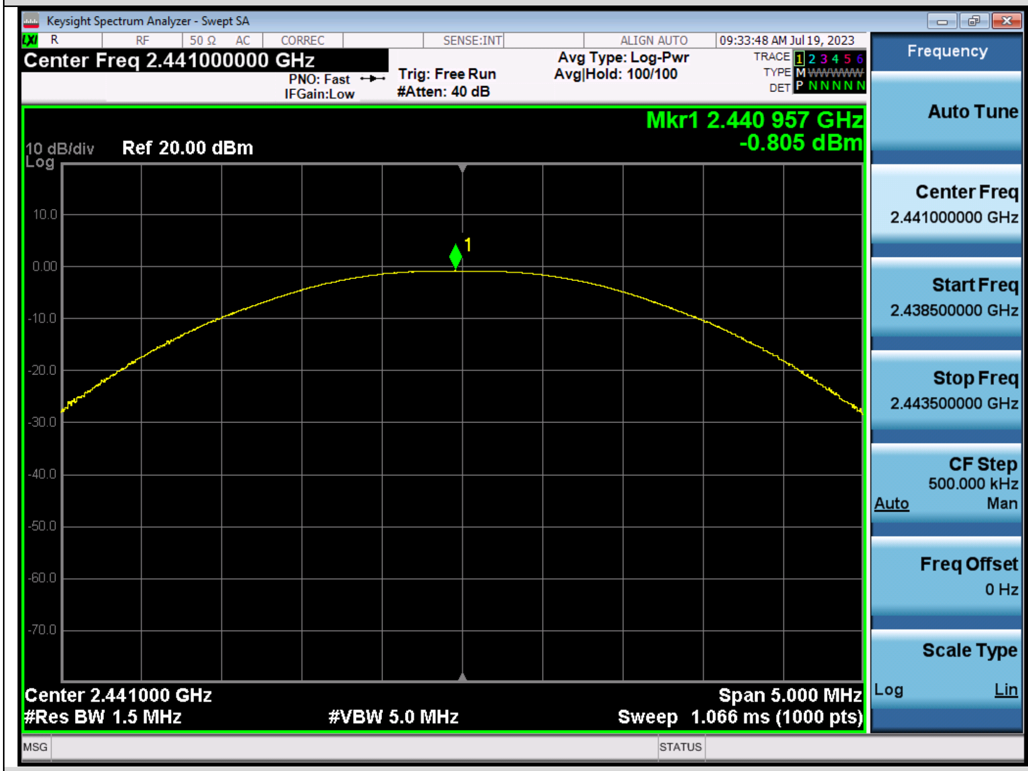
Test_Graph_BR_ANT1_2441_1Mbps_Peak Power



Test_Graph_BR_ANT1_2480_1Mbps_Peak Power

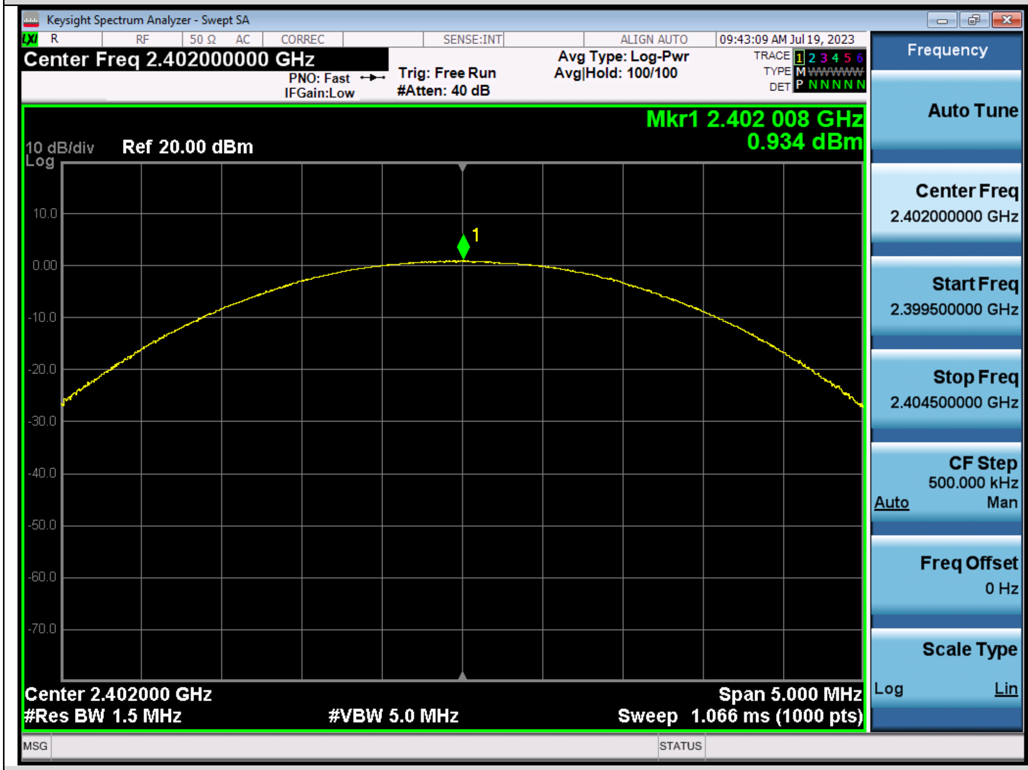


Test_Graph_EDR_ANT1_2402_2Mbps_Peak Power

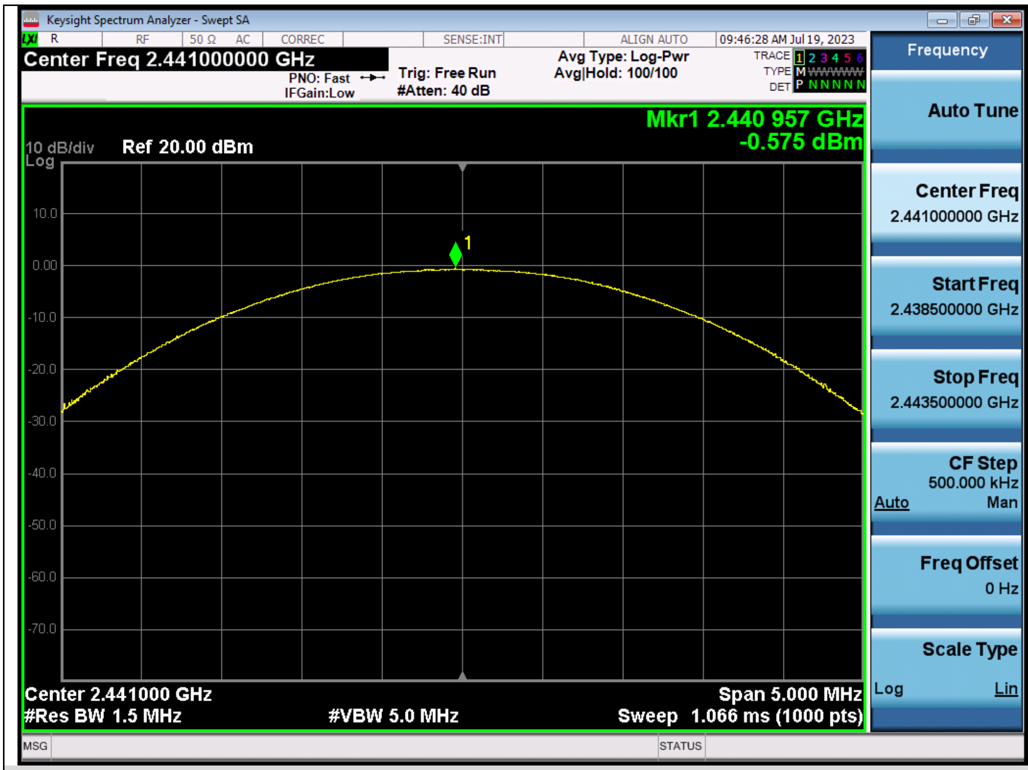


Test_Graph_EDR_ANT1_2441_2Mbps_Peak Power

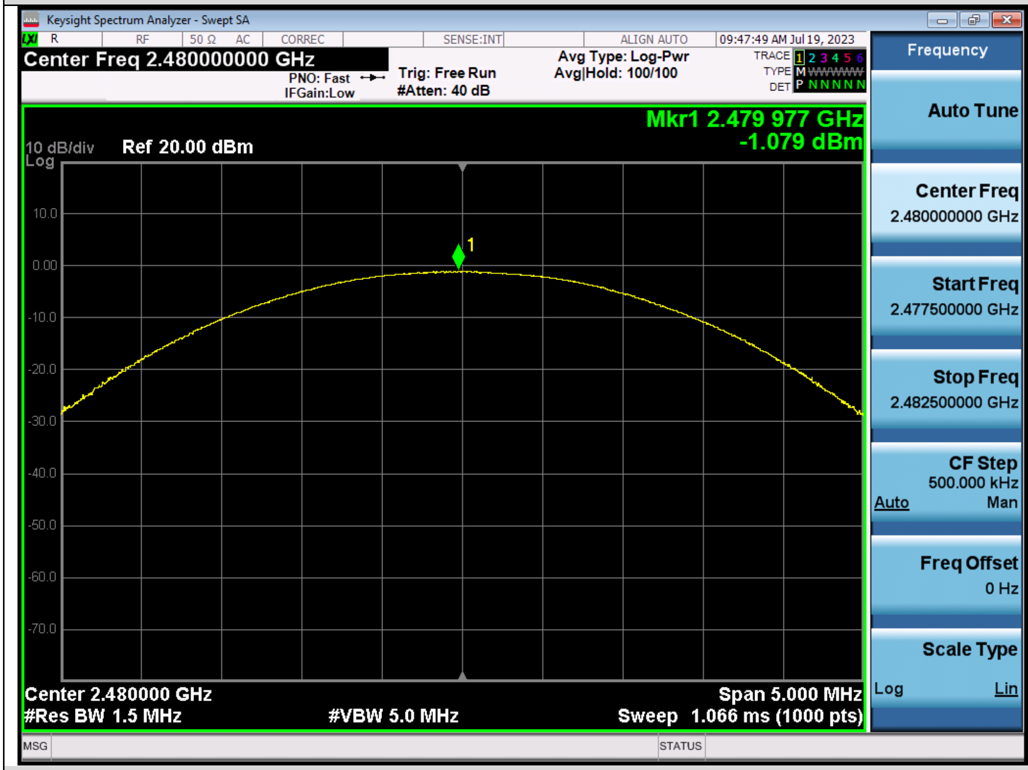
Test_Graph_EDR_ANT1_2480_2Mbps_Peak Power



Test_Graph_EDR_ANT1_2402_3Mbps_Peak Power



Test_Graph_EDR_ANT1_2441_3Mbps_Peak Power



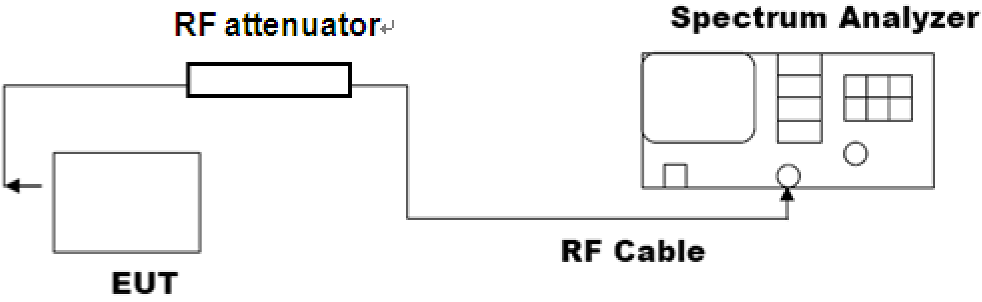
Test_Graph_EDR_ANT1_2480_3Mbps_Peak Power

8. 20DB 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 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.

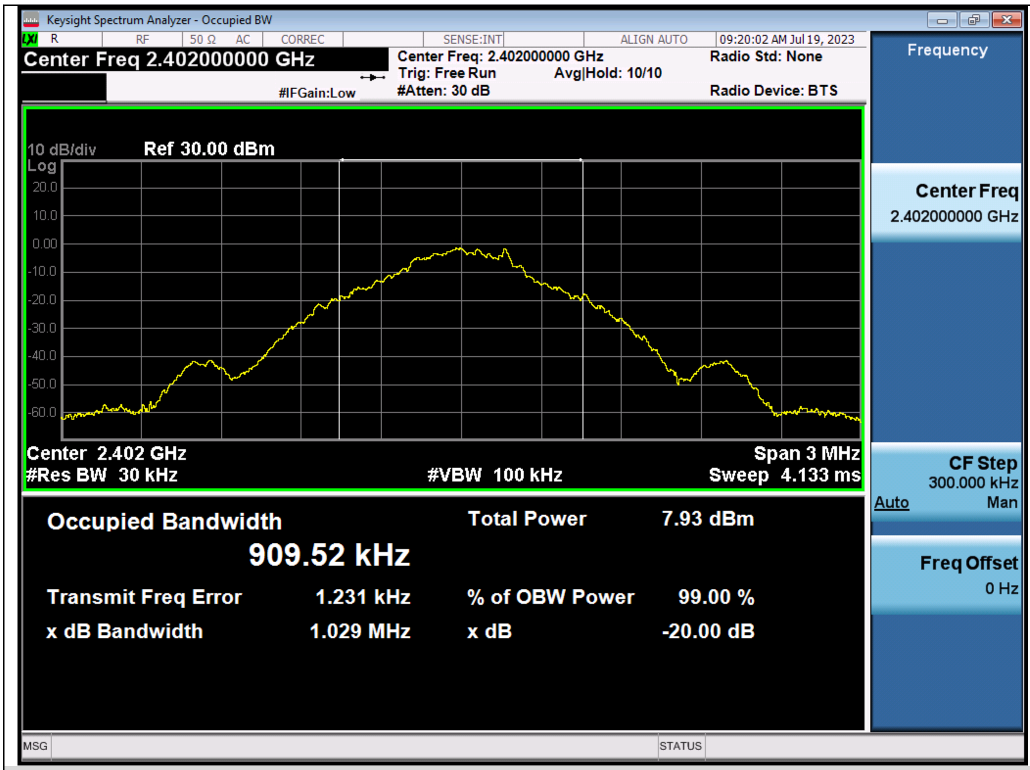
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



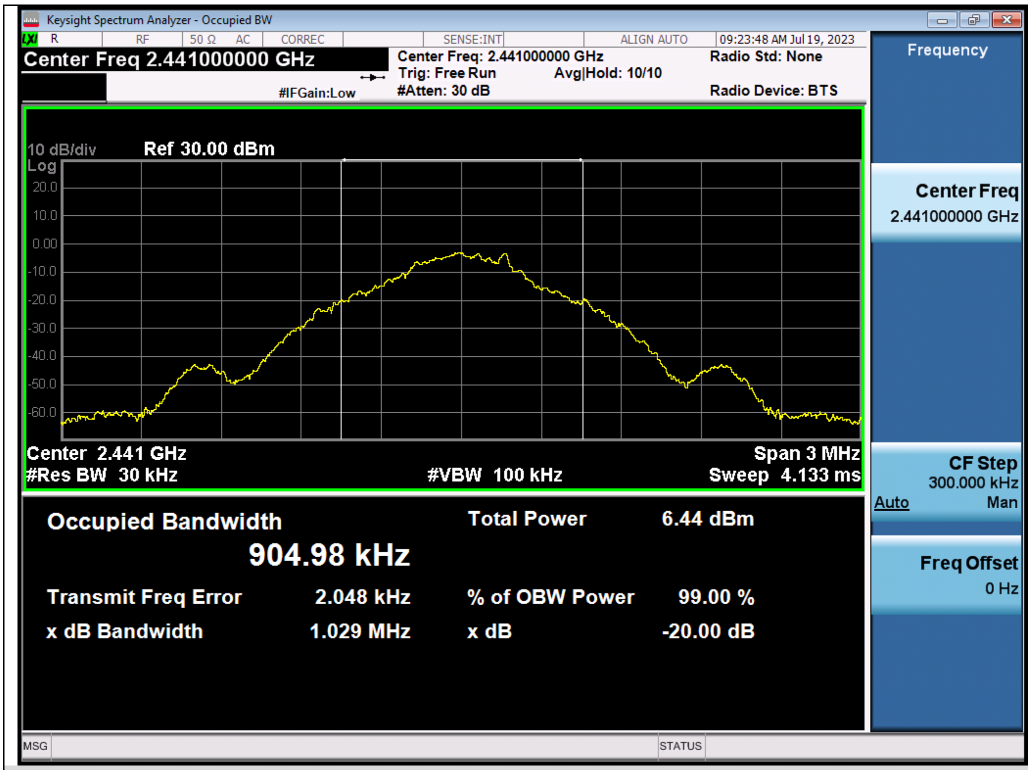
8.3. LIMITS AND MEASUREMENT RESULTS

Test Data of Occupied Bandwidth and -20dB Bandwidth					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-20dB Bandwidth (MHz)	Limits	Pass or Fail
GFSK	2402	0.910	1.029	N/A	Pass
	2441	0.905	1.029	N/A	Pass
	2480	0.909	0.988	N/A	Pass
π /4-DQPSK	2402	1.169	1.273	N/A	Pass
	2441	1.164	1.280	N/A	Pass
	2480	1.166	1.270	N/A	Pass
8DPSK	2402	1.152	1.247	N/A	Pass
	2441	1.157	1.249	N/A	Pass
	2480	1.155	1.244	N/A	Pass

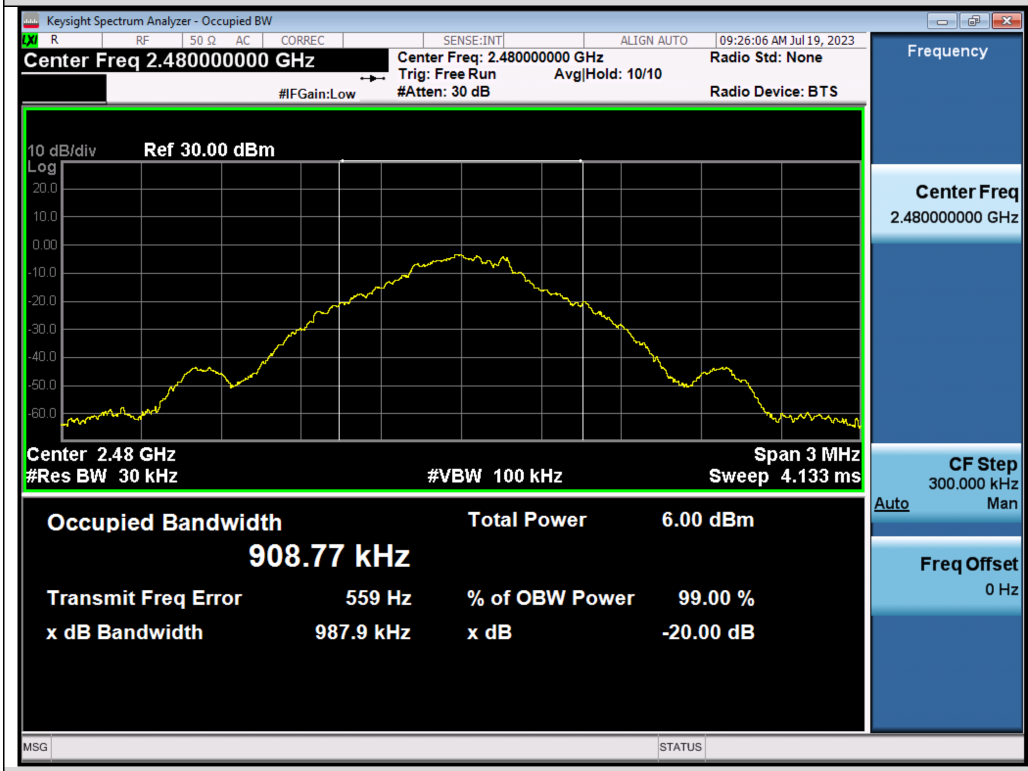
Test Graphs of Occupied Bandwidth and -20 Bandwidth



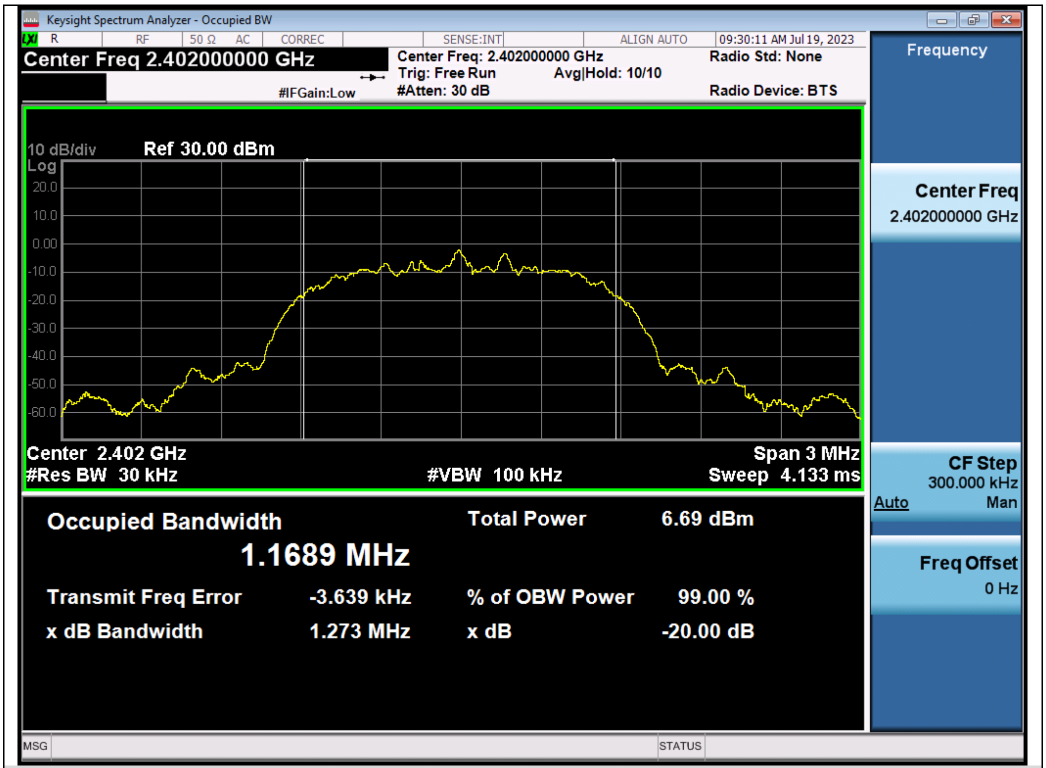
Test_Graph_BR_ANT1_2402_1Mbps_OBW



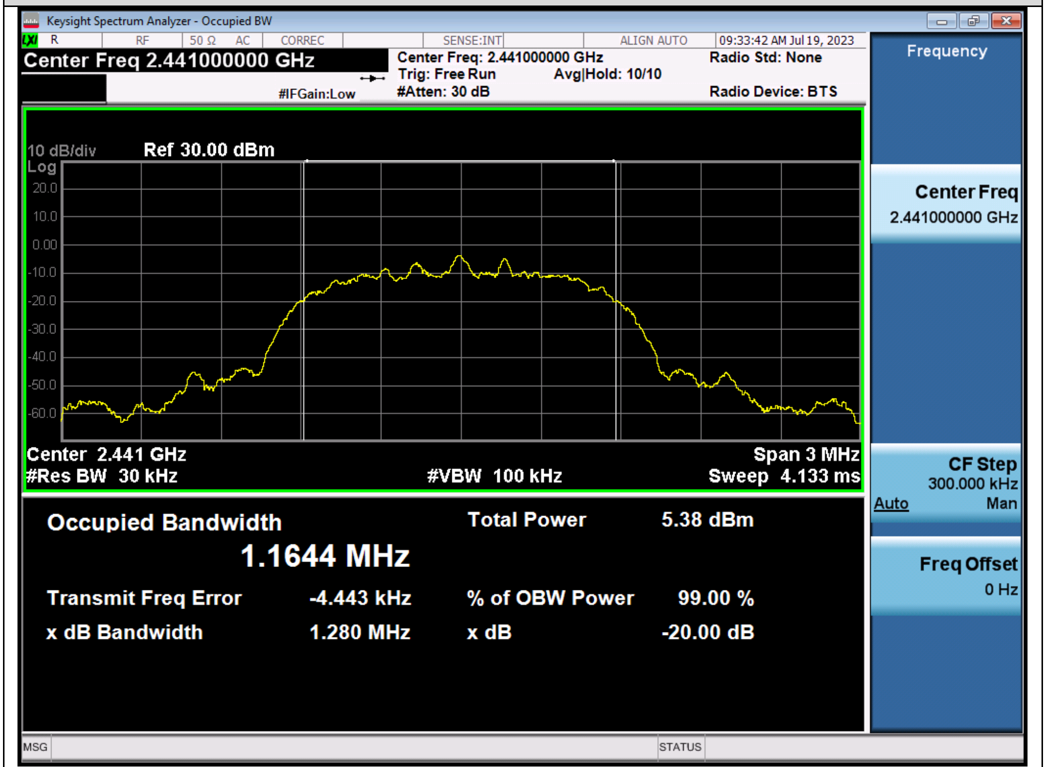
Test_Graph_BR_ANT1_2441_1Mbps_OBW



Test_Graph_BR_ANT1_2480_1Mbps_OBW



Test_Graph_EDR_ANT1_2402_2Mbps_OBW

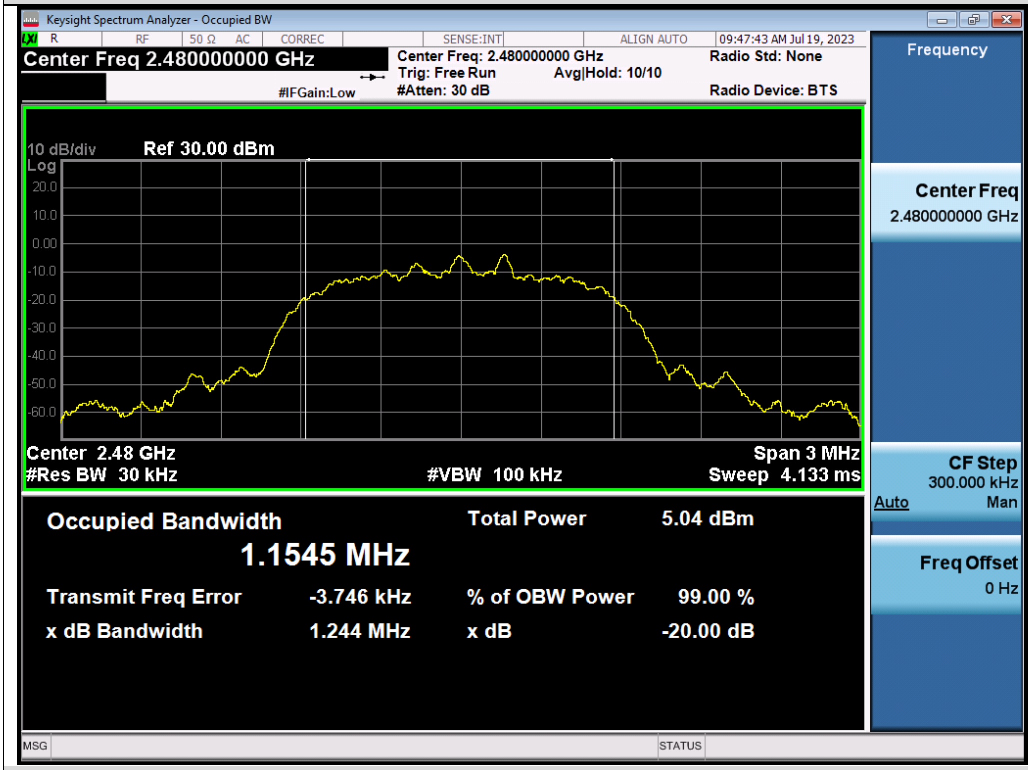


Test_Graph_EDR_ANT1_2441_2Mbps_OBW

Test_Graph_EDR_ANT1_2480_2Mbps_OBW

Test_Graph_EDR_ANT1_2402_3Mbps_OBW

Test_Graph_EDR_ANT1_2441_3Mbps_OBW



Test_Graph_EDR_ANT1_2480_3Mbps_OBW

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 the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
   RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
4. Set SPA Trace 1 Max hold, then View.

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

The same as described in section 8.2

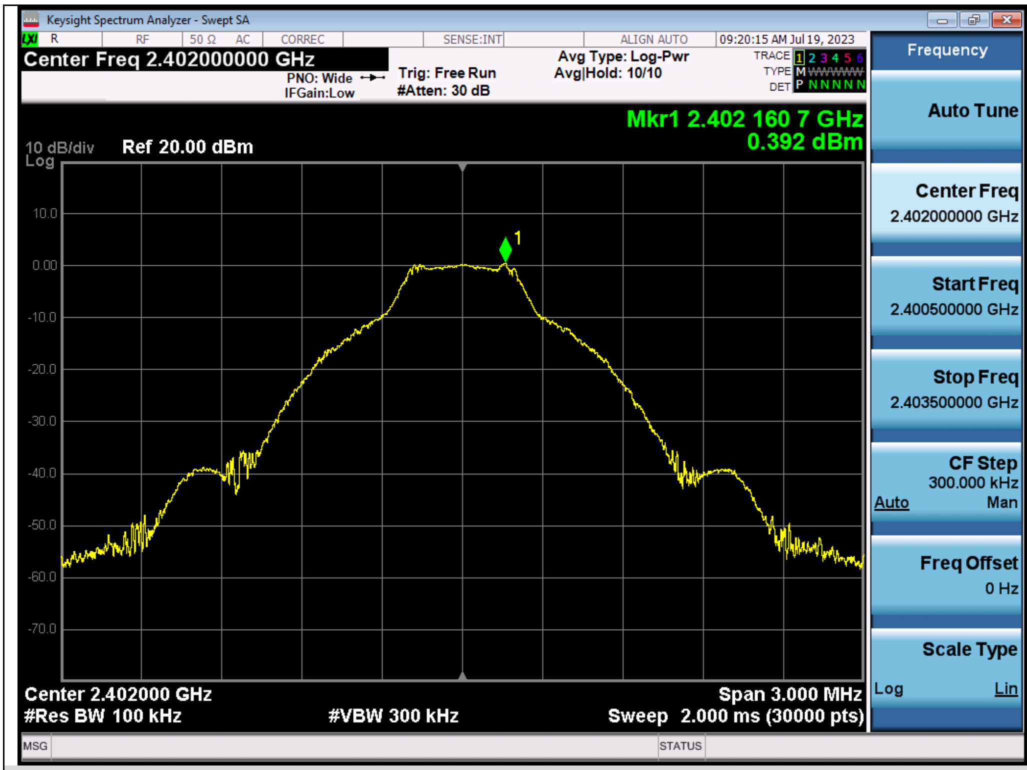
9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

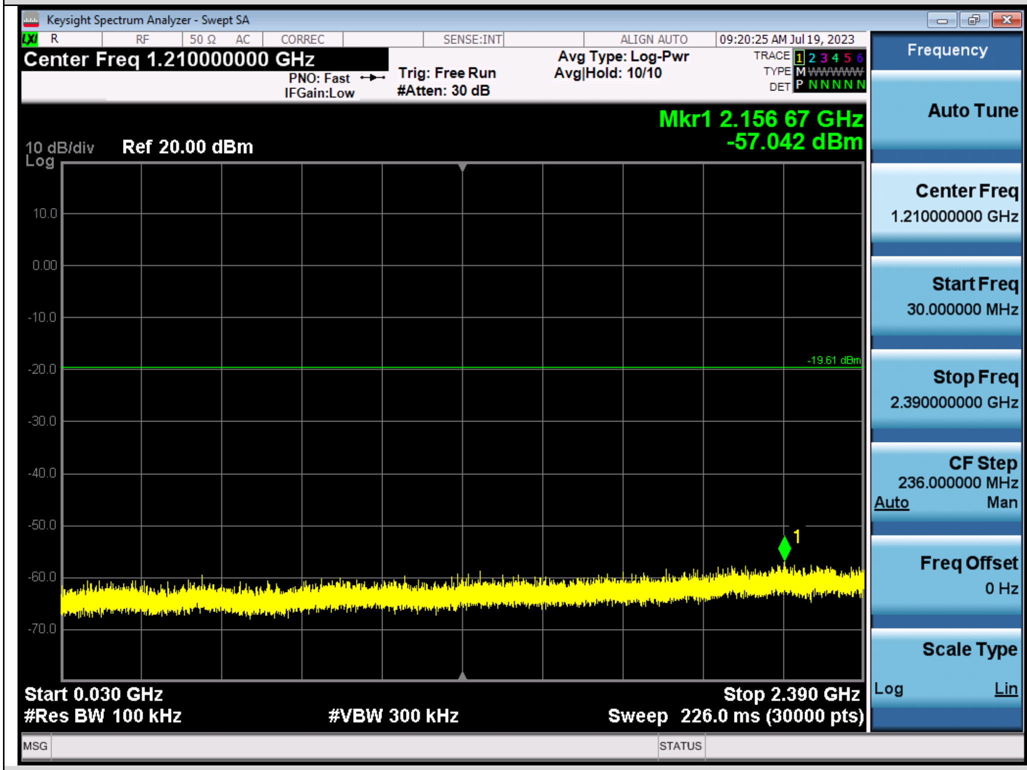
9.4. LIMITS AND MEASUREMENT RESULT

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. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
	At least -20dBc than the limit Specified on the TOP Channel	PASS

Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands



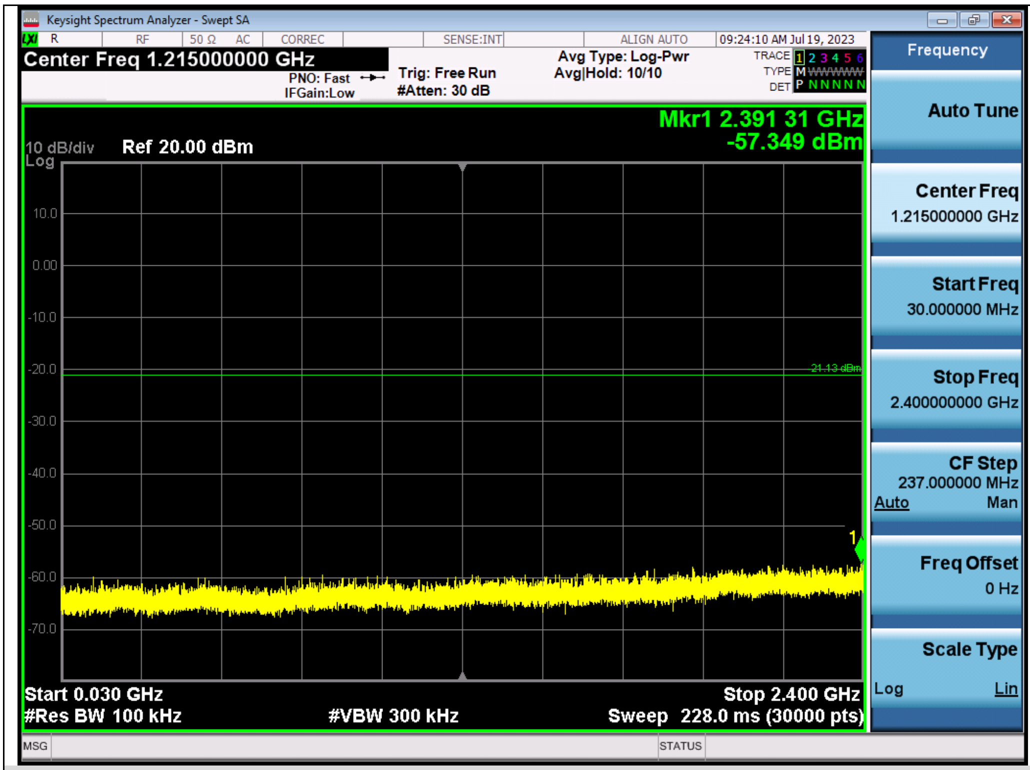
Test_Graph_BR_ANT1_2402_1Mbps_Reference Level



Test_Graph_BR_ANT1_2402_1Mbps_Lower Band Emissions

Test_Graph_BR_ANT1_2402_1Mbps_Higher Band Emissions

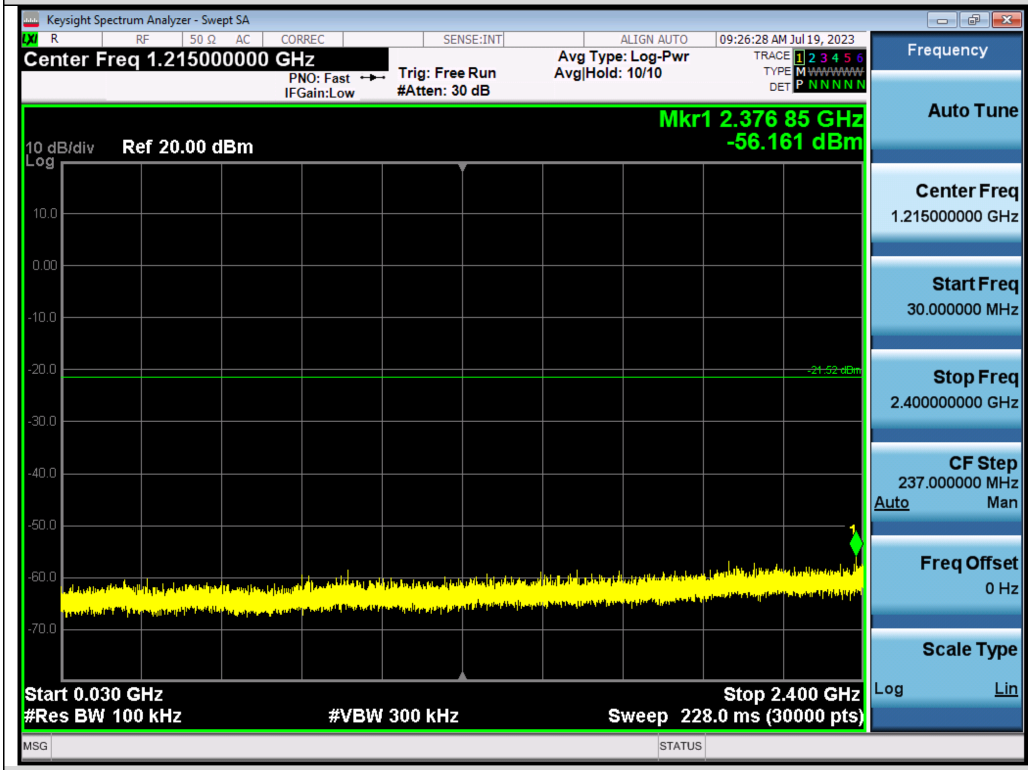
Test_Graph_BR_ANT1_2441_1Mbps_Reference Level



Test_Graph_BR_ANT1_2441_1Mbps_Lower Band Emissions

Test_Graph_BR_ANT1_2441_1Mbps_Higher Band Emissions

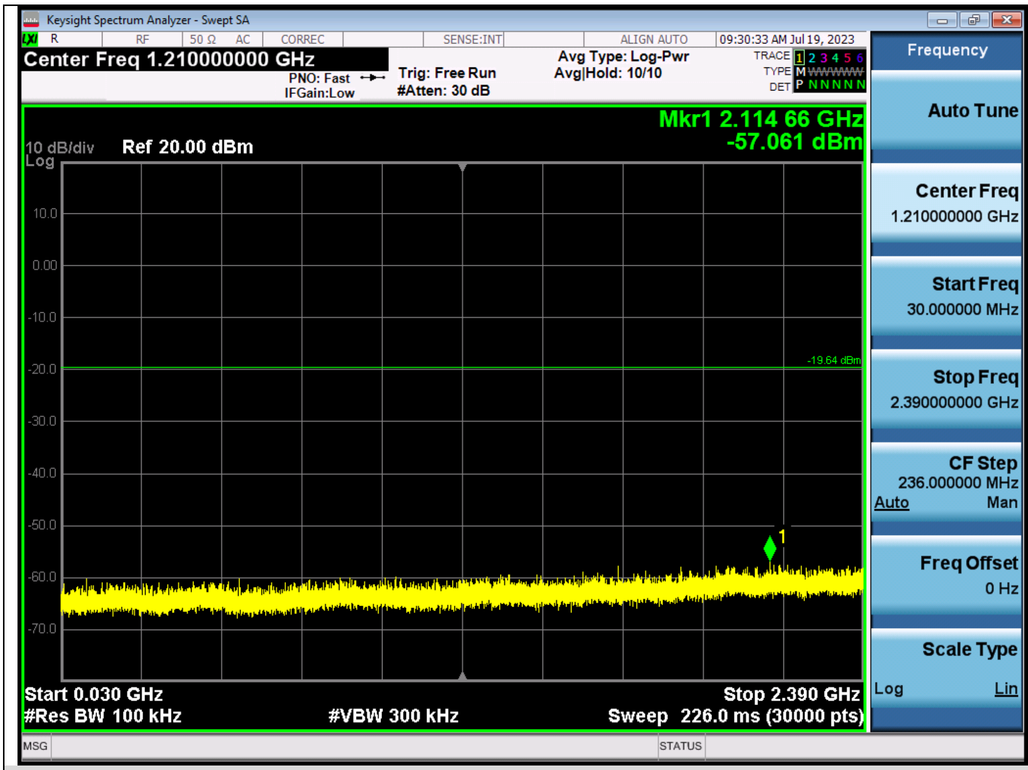
Test_Graph_BR_ANT1_2480_1Mbps_Reference Level



Test_Graph_BR_ANT1_2480_1Mbps_Lower Band Emissions

Test_Graph_BR_ANT1_2480_1Mbps_Higher Band Emissions

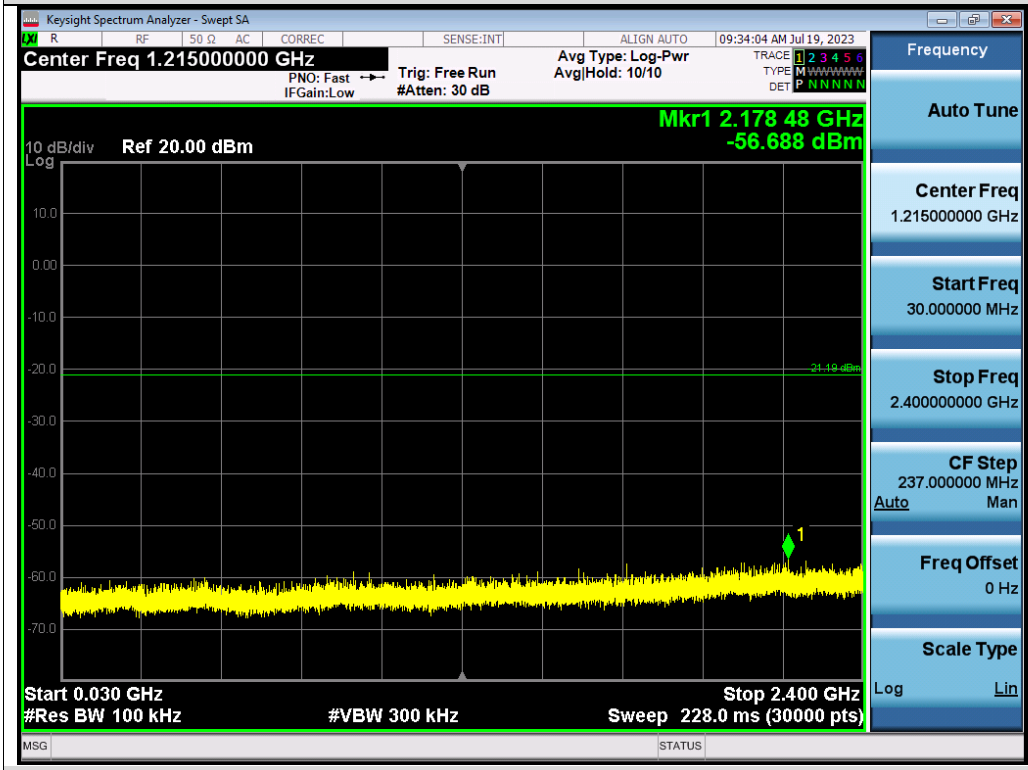
Test_Graph_EDR_ANT1_2402_2Mbps_Reference Level



Test_Graph_EDR_ANT1_2402_2Mbps_Lower Band Emissions

Test_Graph_EDR_ANT1_2402_2Mbps_Higher Band Emissions

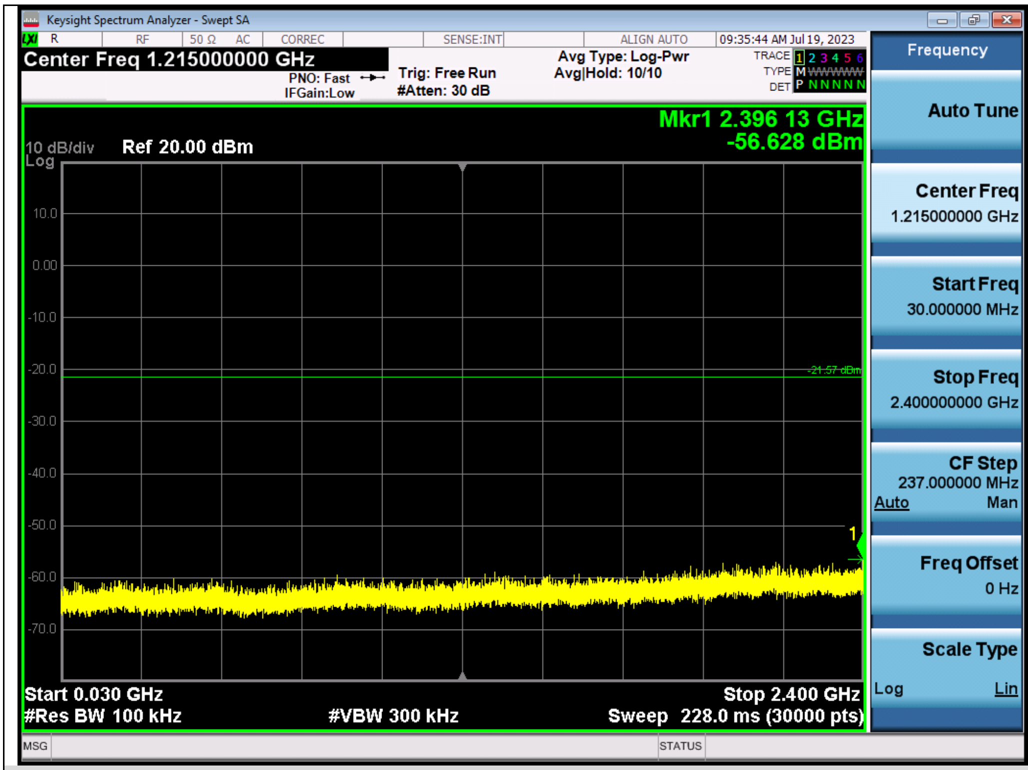
Test_Graph_EDR_ANT1_2441_2Mbps_Reference Level



Test_Graph_EDR_ANT1_2441_2Mbps_Lower Band Emissions

Test_Graph_EDR_ANT1_2441_2Mbps_Higher Band Emissions

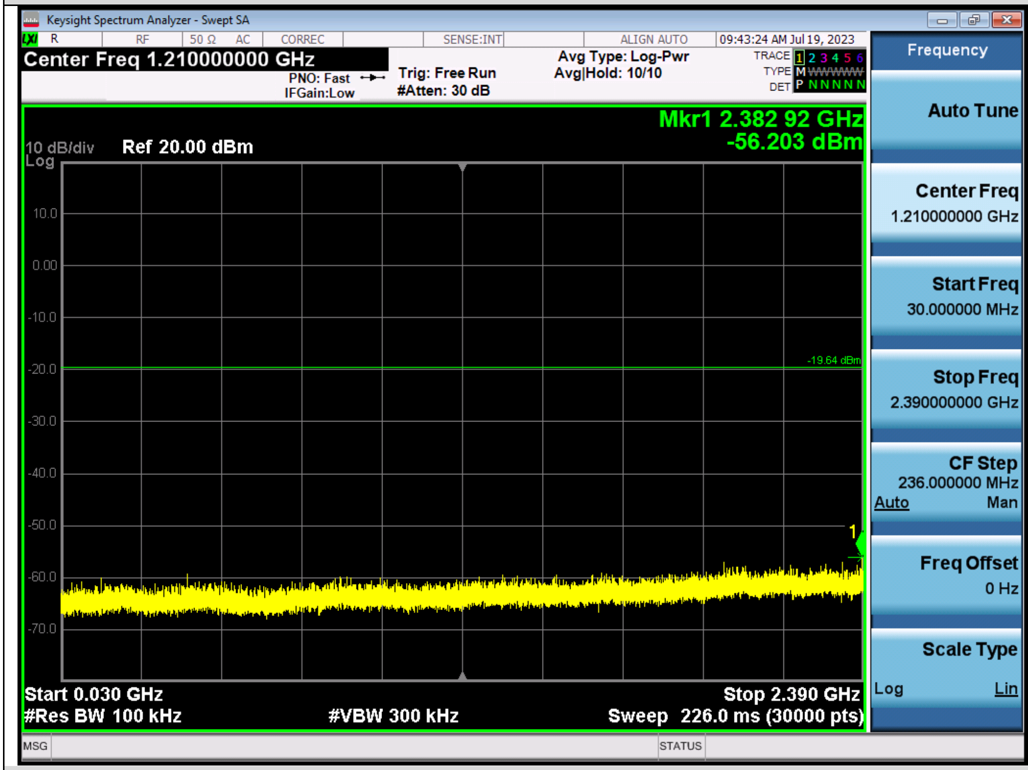
Test_Graph_EDR_ANT1_2480_2Mbps_Reference Level



Test_Graph_EDR_ANT1_2480_2Mbps_Lower Band Emissions

Test_Graph_EDR_ANT1_2480_2Mbps_Higher Band Emissions

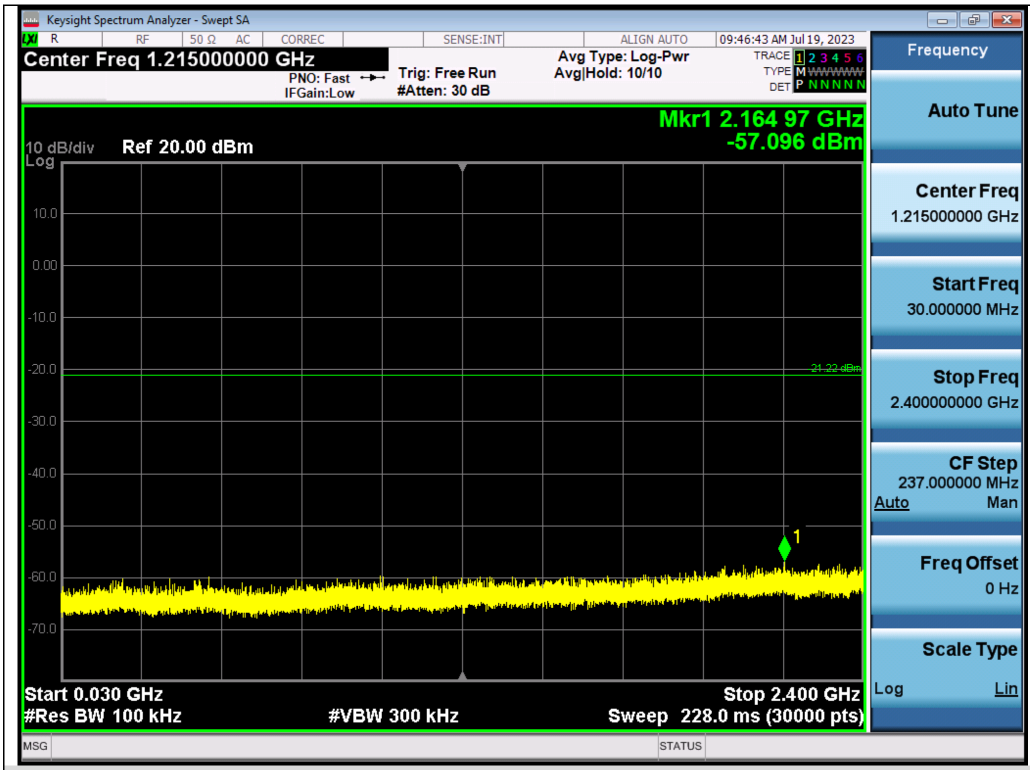
Test_Graph_EDR_ANT1_2402_3Mbps_Reference Level



Test_Graph_EDR_ANT1_2402_3Mbps_Lower Band Emissions

Test_Graph_EDR_ANT1_2402_3Mbps_Higher Band Emissions

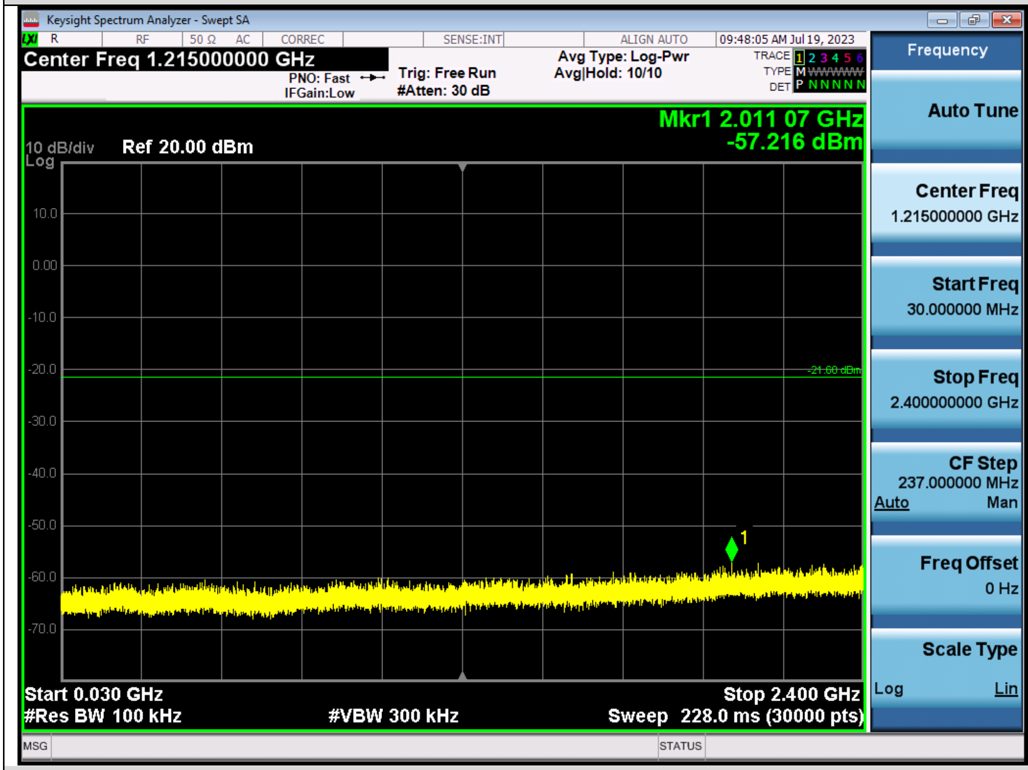
Test_Graph_EDR_ANT1_2441_3Mbps_Reference Level



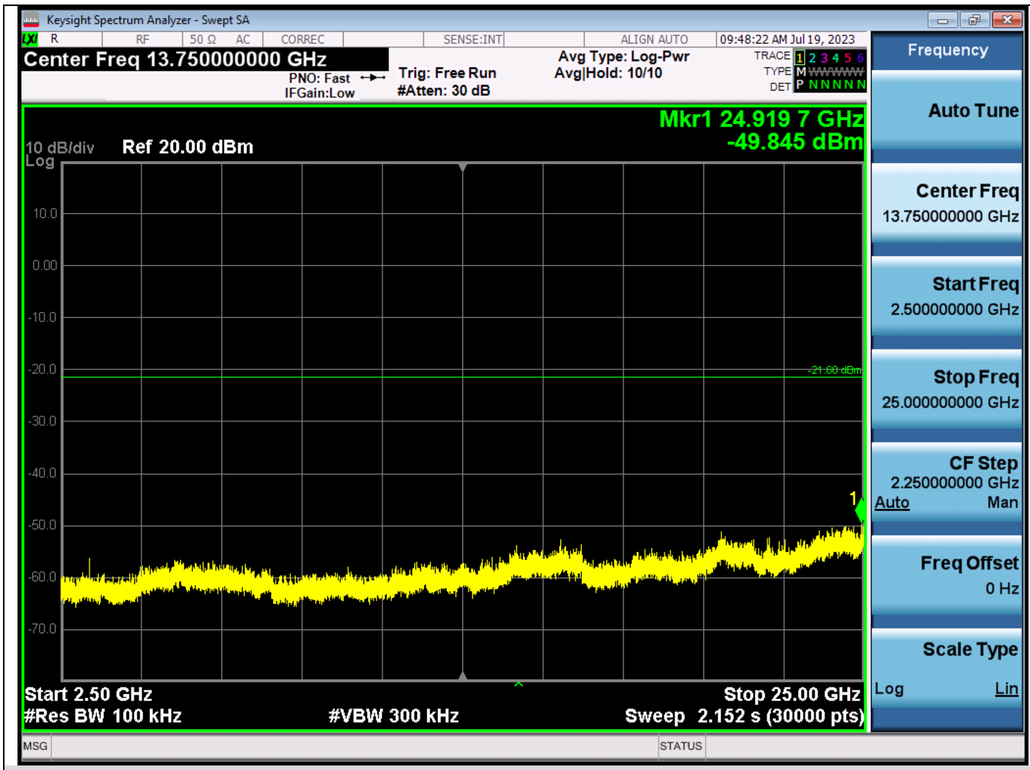
Test_Graph_EDR_ANT1_2441_3Mbps_Lower Band Emissions

Test_Graph_EDR_ANT1_2441_3Mbps_Higher Band Emissions

Test_Graph_EDR_ANT1_2480_3Mbps_Reference Level

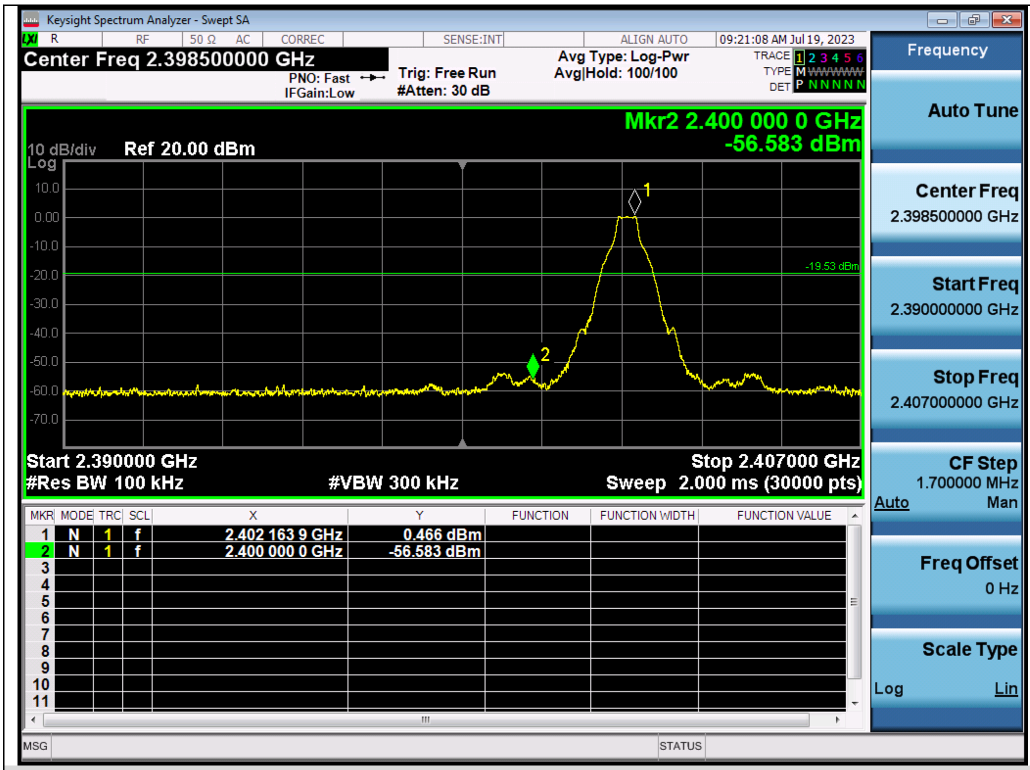


Test_Graph_EDR_ANT1_2480_3Mbps_Lower Band Emissions

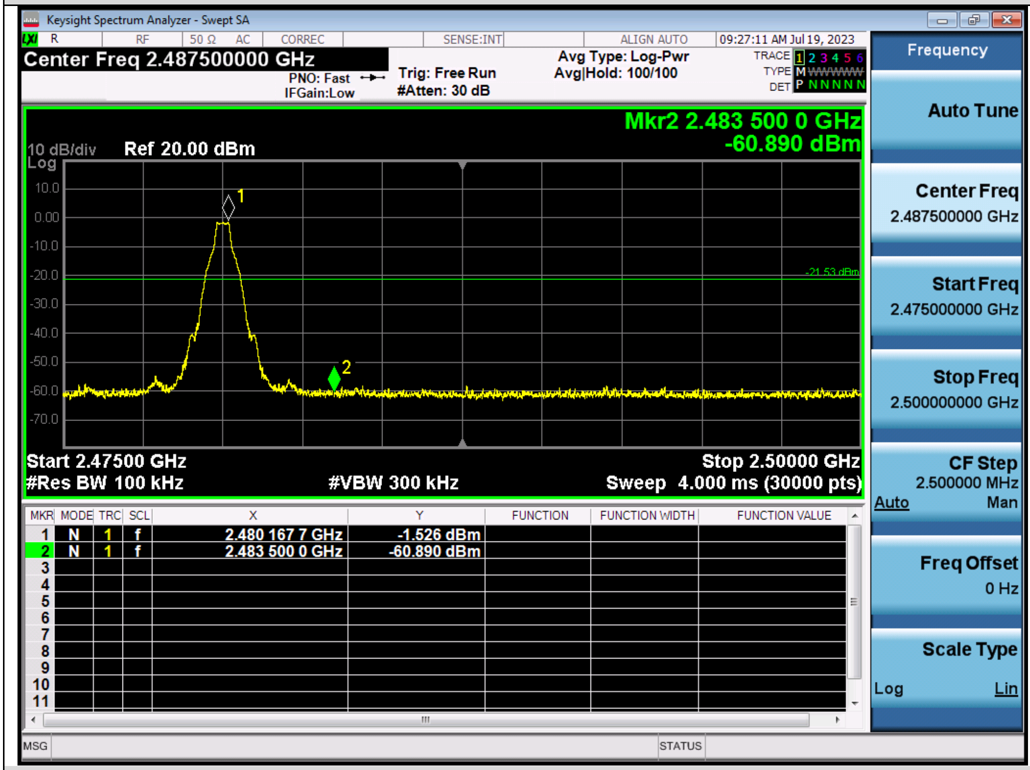


Test_Graph_EDR_ANT1_2480_3Mbps_Higher Band Emissions

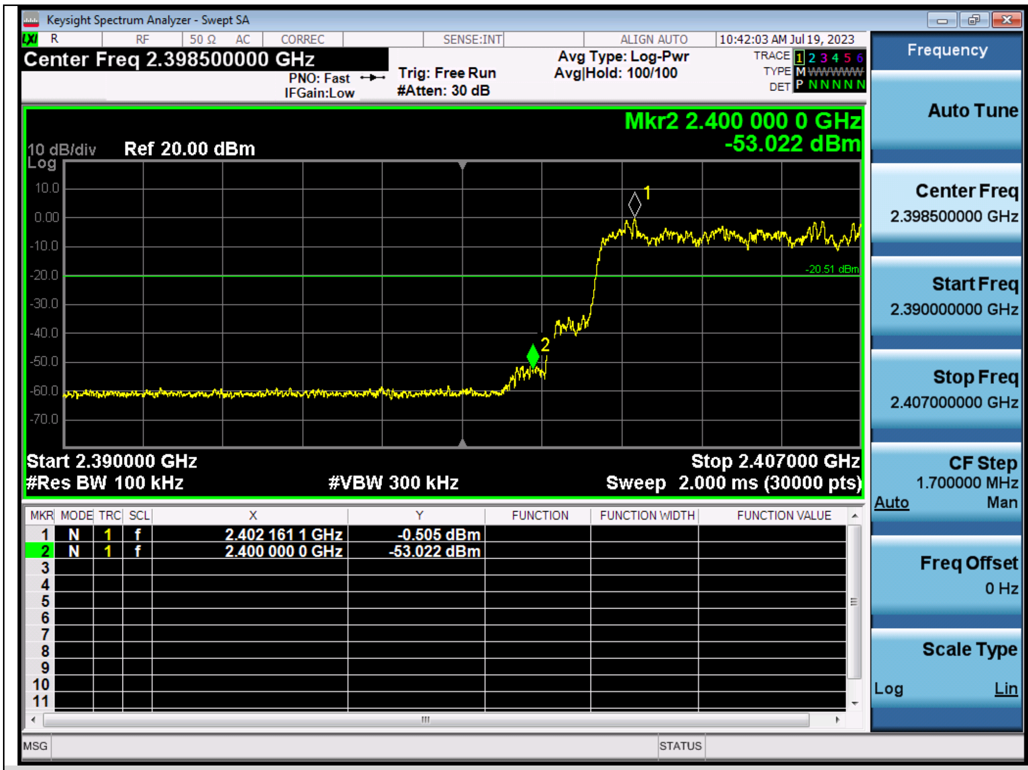
Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands



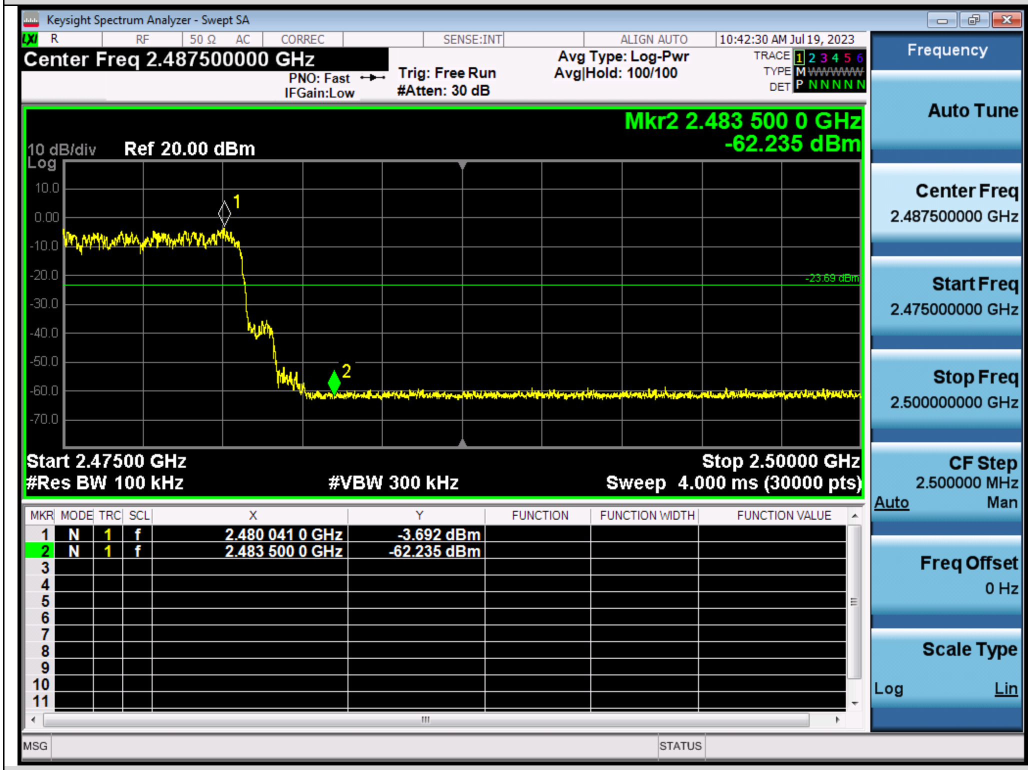
Test_Graph_BR_ANT1_2402_1Mbps_Lower Band Edge Emissions



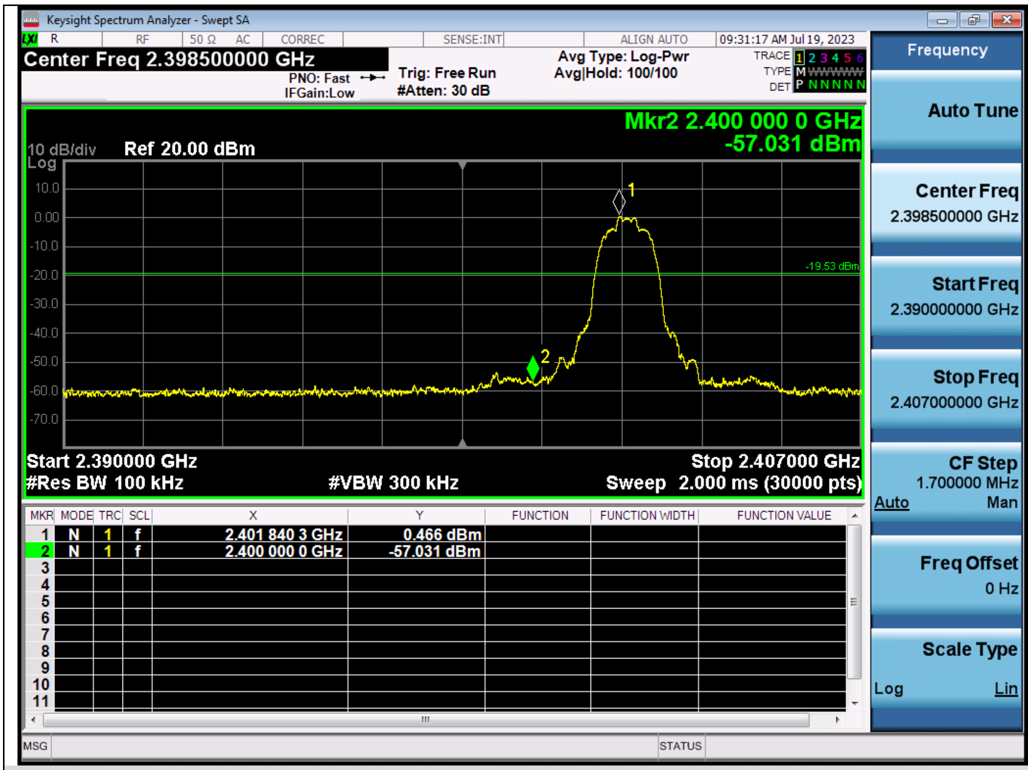
Test_Graph_BR_ANT1_2480_1Mbps_Higher Band Edge Emissions



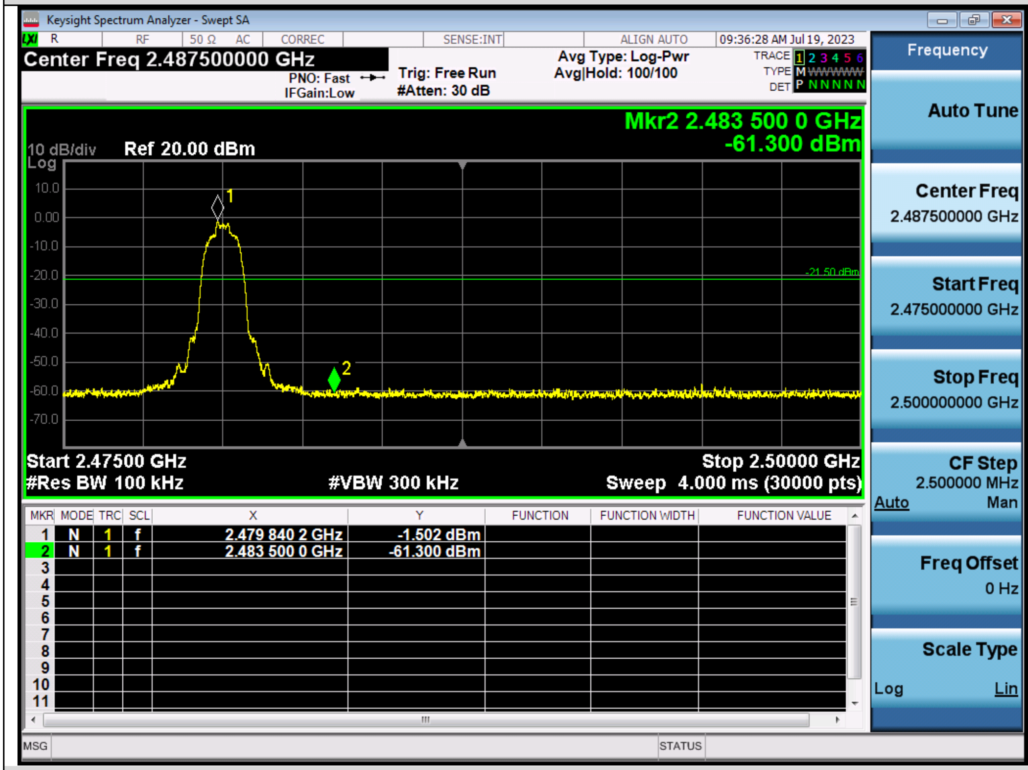
Test_Graph_BR_HOP_ANT1_NA_1Mbps_Lower Band Edge Emissions



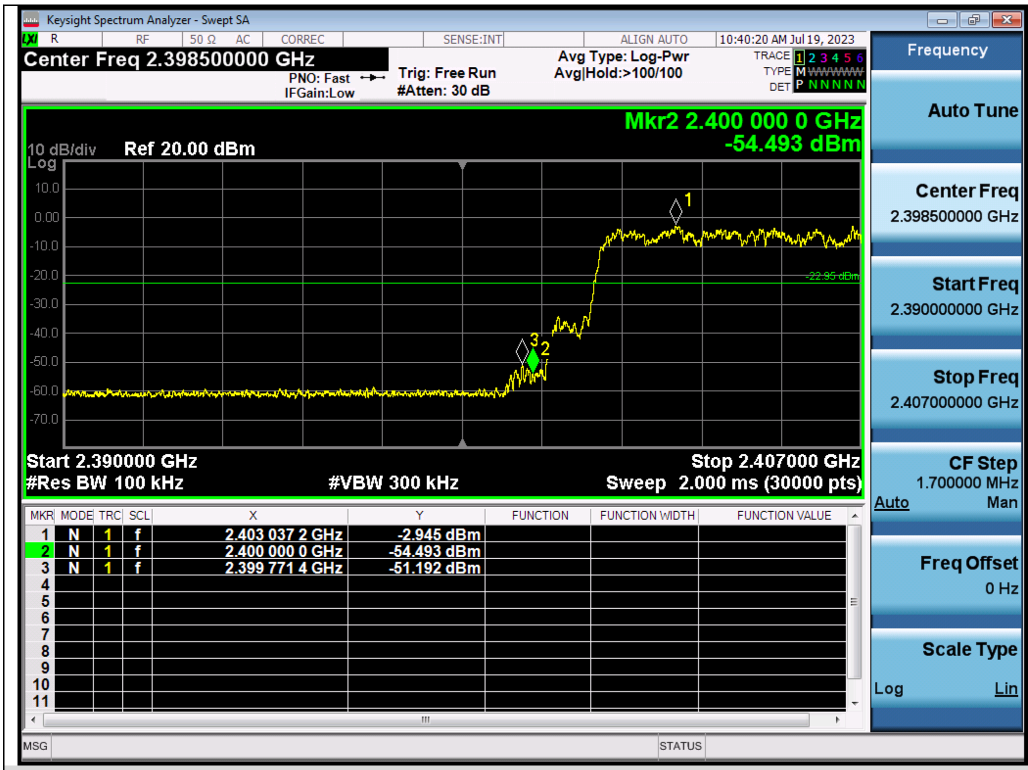
Test_Graph_BR_HOP_ANT1_NA_1Mbps_Higher Band Edge Emissions



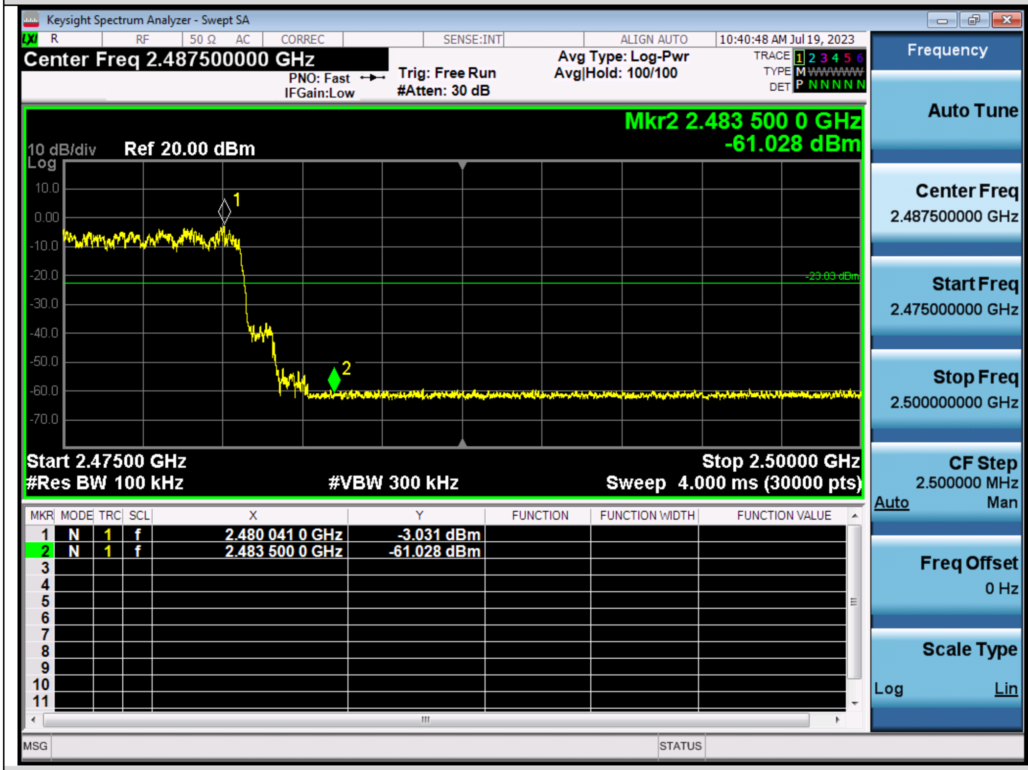
Test_Graph_EDR_ANT1_2402_2Mbps_Lower Band Edge Emissions



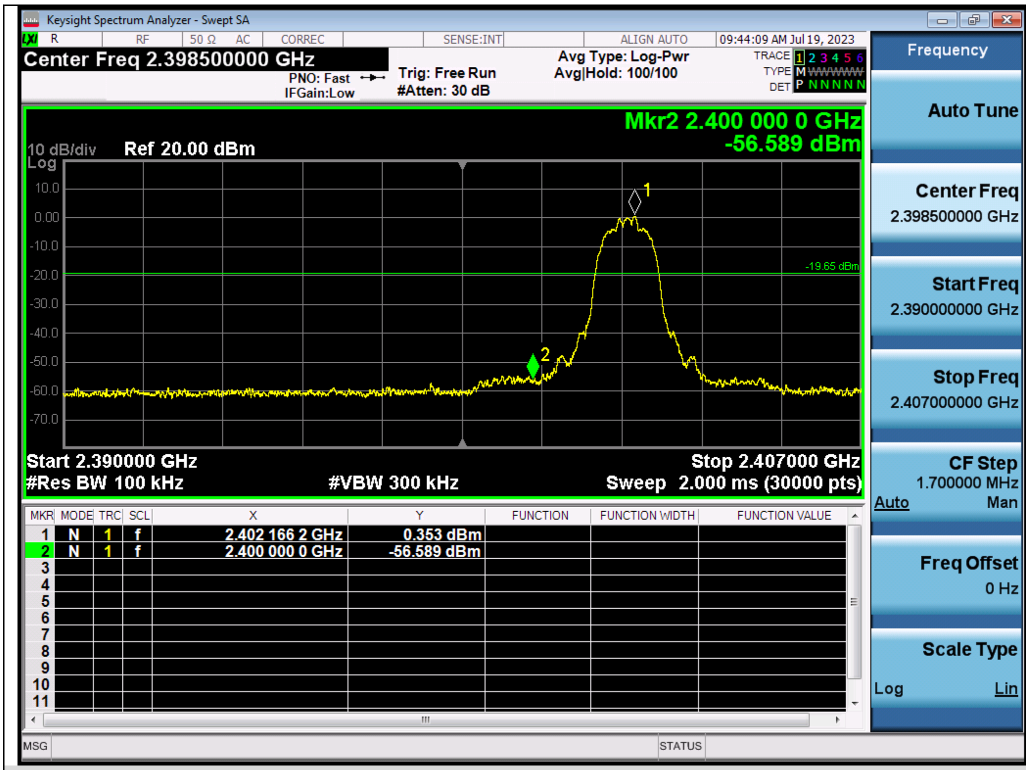
Test_Graph_EDR_ANT1_2480_2Mbps_Higher Band Edge Emissions



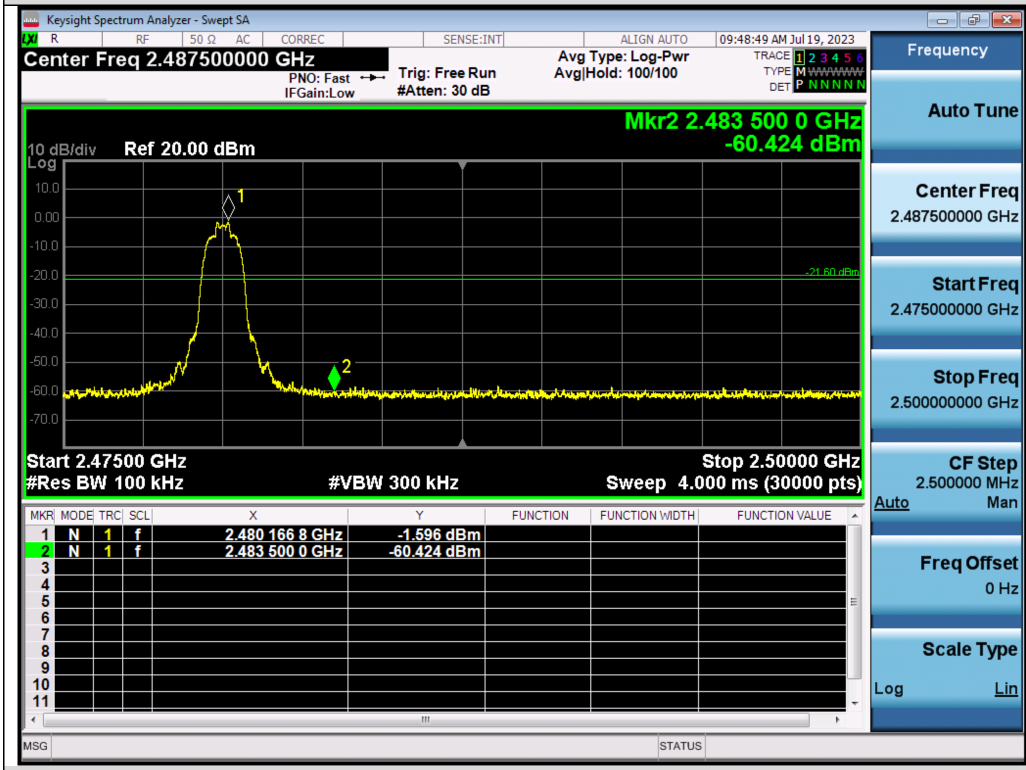
Test_Graph_EDR_HOP_ANT1_NA_2Mbps_Lower Band Edge Emissions



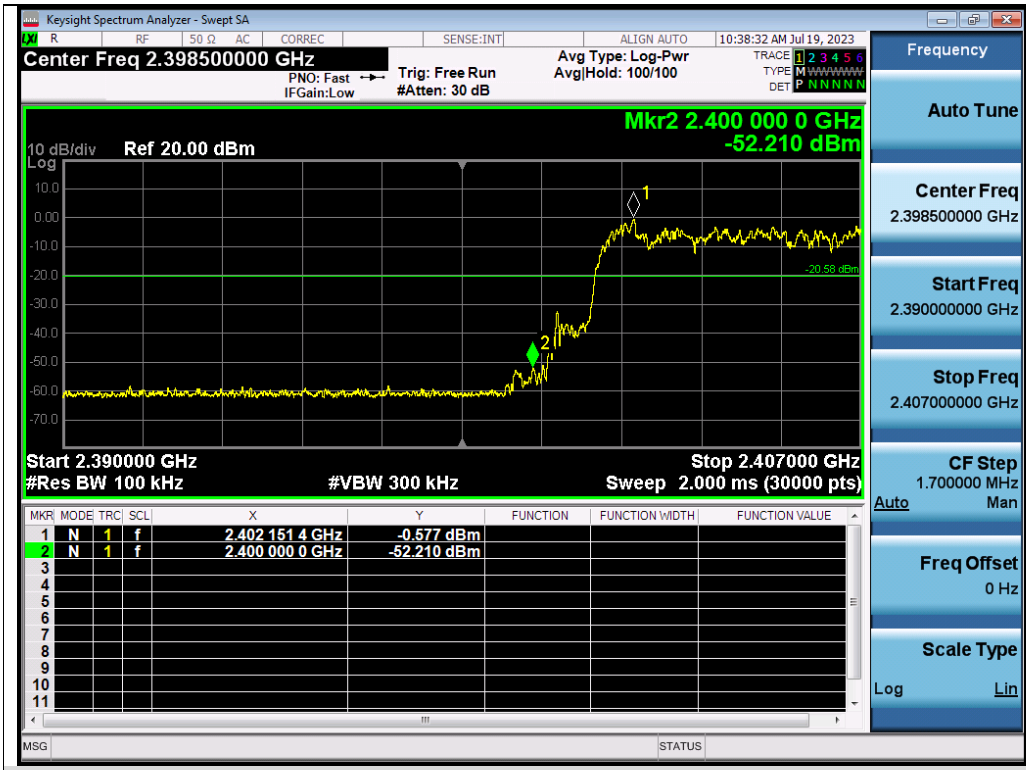
Test_Graph_EDR_HOP_ANT1_NA_2Mbps_Higher Band Edge Emissions



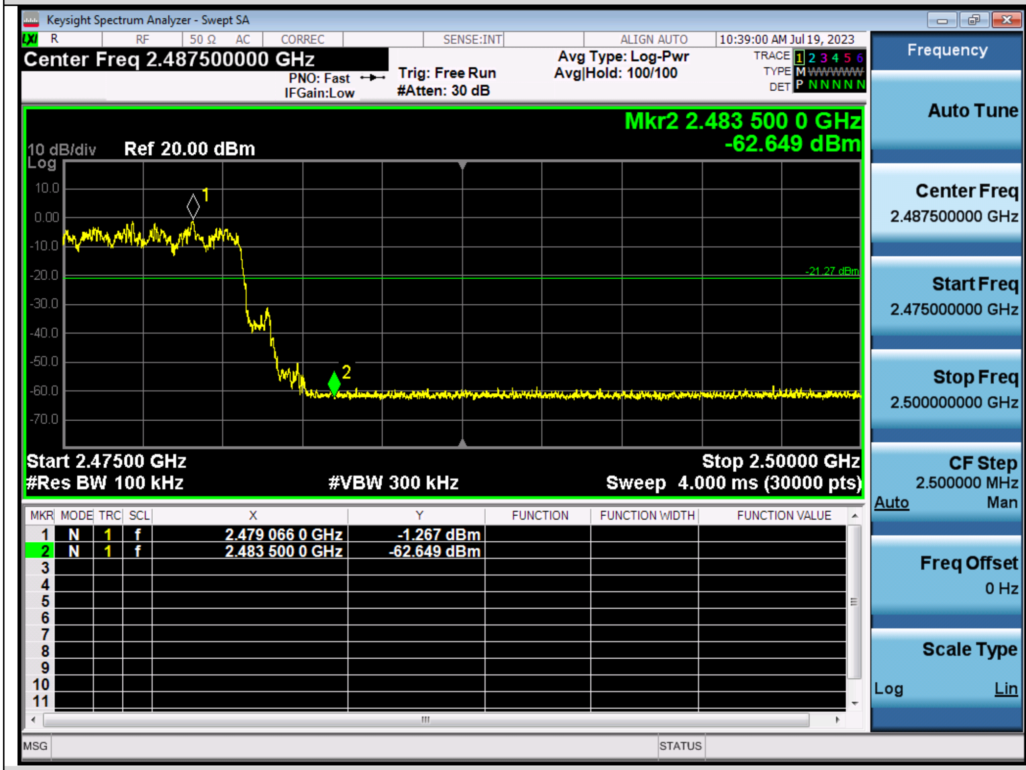
Test_Graph_EDR_ANT1_2402_3Mbps_Lower Band Edge Emissions



Test_Graph_EDR_ANT1_2480_3Mbps_Higher Band Edge Emissions



Test_Graph_EDR_HOP_ANT1_NA_3Mbps_Lower Band Edge Emissions



Test_Graph_EDR_HOP_ANT1_NA_3Mbps_Higher Band Edge Emissions

10. RADIATED EMISSION

10.1. 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.

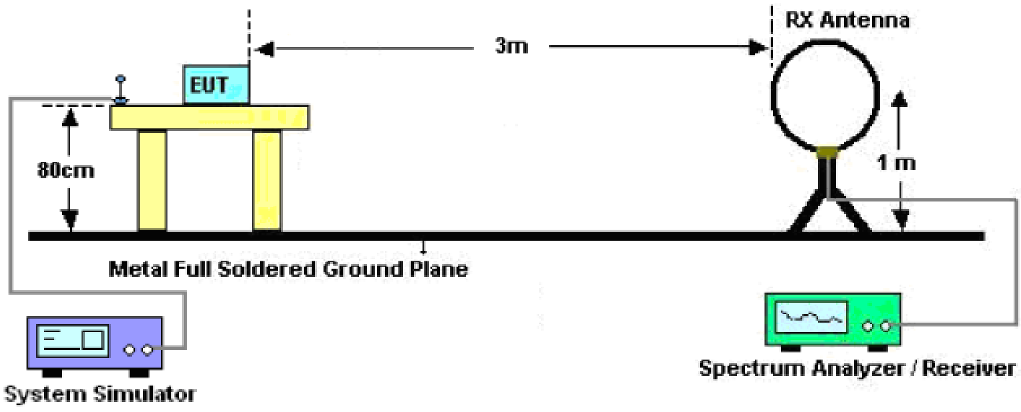
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/3MHz for Peak, 1MHz/3MHz for Average

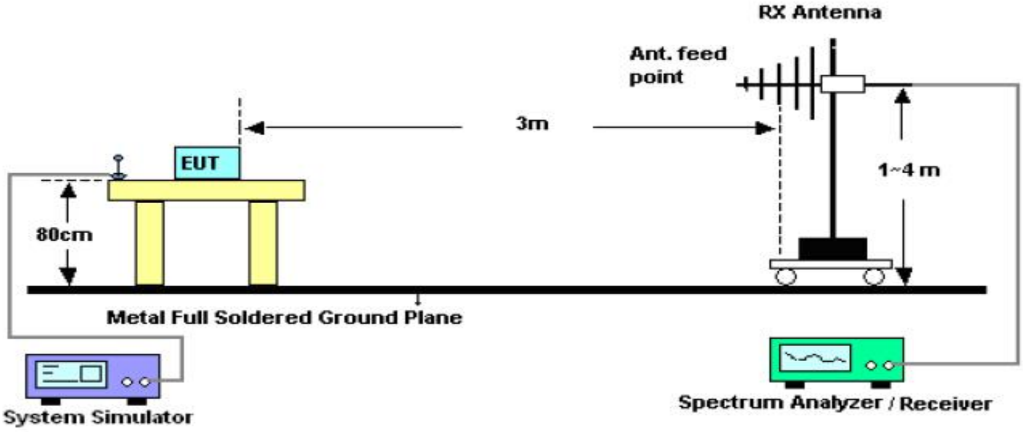
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

10.2. TEST SETUP

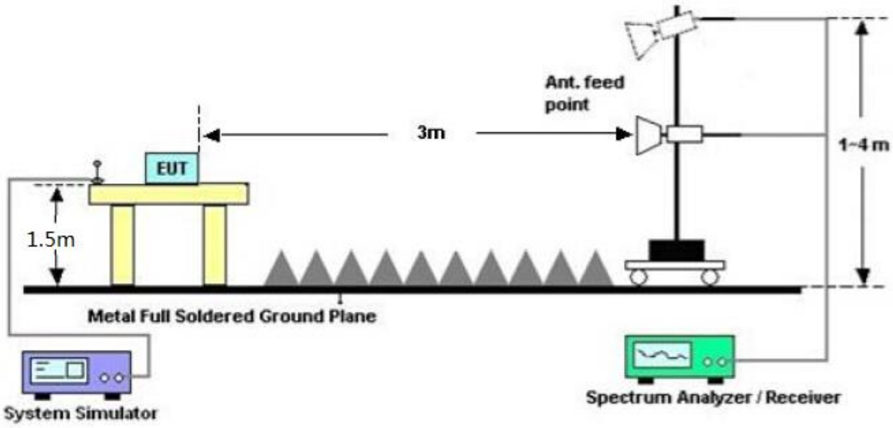
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



10.3. 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.

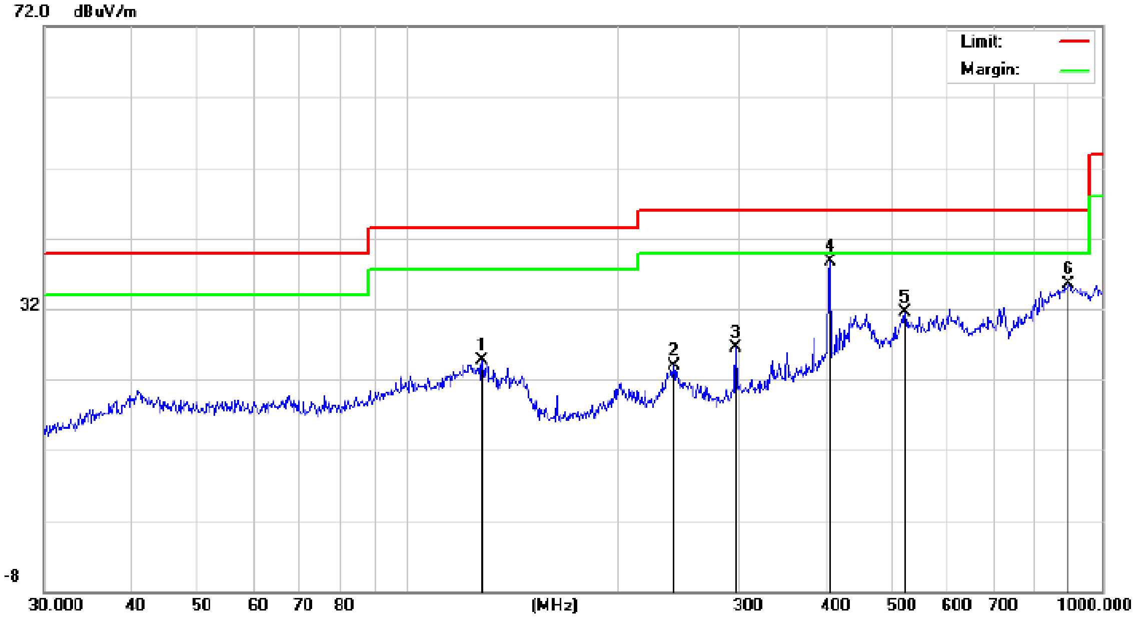
10.4. TEST RESULT

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

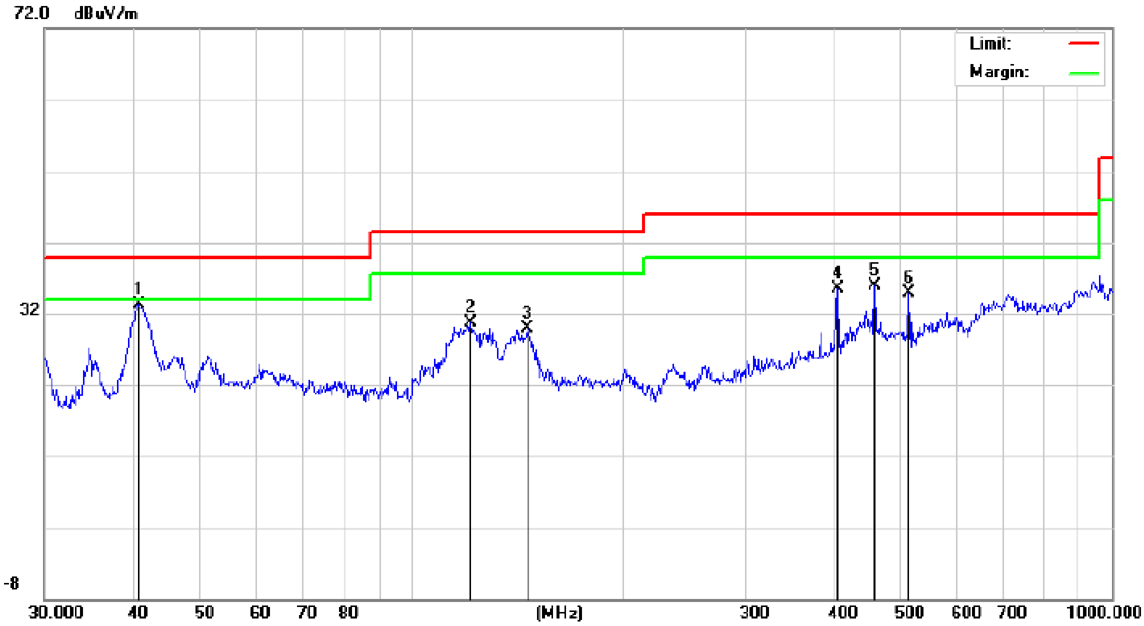
EUT	IP Phone	**Model Name**	X305
Temperature	23.5°C	**Relative Humidity**	60.7%
Pressure	960hPa	**Test Voltage**	DC 5V
Test Mode	Mode 3	**Antenna**	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		128.1130	8.79	15.91	24.70	43.50	-18.80	peak
2		241.6763	8.57	15.35	23.92	46.00	-22.08	peak
3		297.2241	11.18	15.28	26.46	46.00	-19.54	peak
4	*	406.0880	18.16	20.52	38.68	46.00	-7.32	peak
5		520.8882	6.43	25.14	31.57	46.00	-14.43	peak
6		896.9964	4.13	31.42	35.55	46.00	-10.45	peak

RESULT: PASS

EUT	IP Phone	Model Name	X305
Temperature	23.5°C	Relative Humidity	60.7%
Pressure	960hPa	Test Voltage	DC 5V
Test Mode	Mode 3	Antenna	Vertical



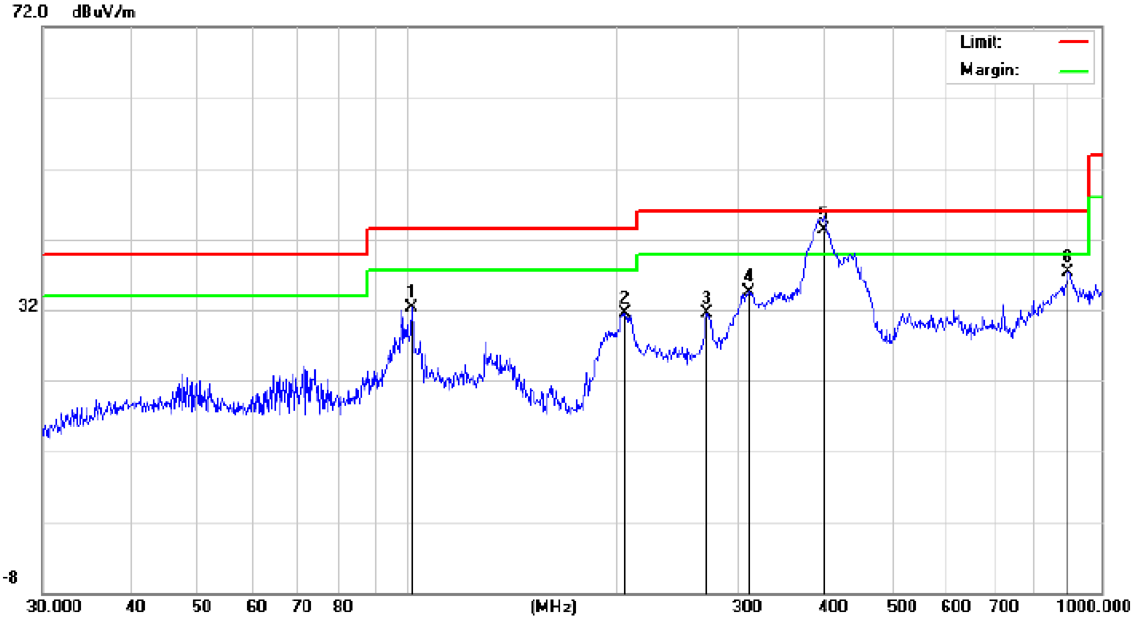
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	40.9881	16.39	16.91	33.30	40.00	-6.70	peak
2		121.5486	12.87	17.74	30.61	43.50	-12.89	peak
3		146.8877	11.76	18.20	29.96	43.50	-13.54	peak
4		406.0880	13.14	22.41	35.55	46.00	-10.45	peak
5		459.1144	10.60	25.24	35.84	46.00	-10.16	peak
6		513.6331	11.40	23.49	34.89	46.00	-11.11	peak

RESULT: PASS

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

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

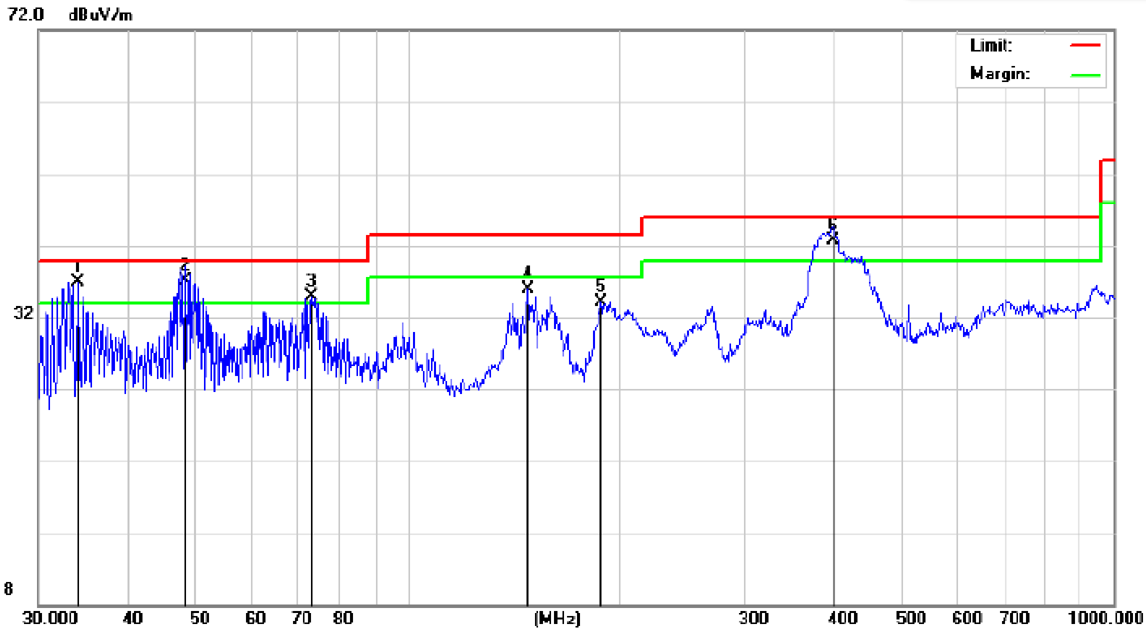
EUT	IP Phone	Model Name	X305
Temperature	23.5°C	Relative Humidity	60.7%
Pressure	960hPa	Test Voltage	DC 48V
Test Mode	Mode 15	Antenna	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		102.0014	16.02	16.22	32.24	43.50	-11.26	peak
2		206.3976	17.01	14.47	31.48	43.50	-12.02	peak
3		270.3748	17.21	14.33	31.54	46.00	-14.46	peak
4		311.0867	19.10	15.50	34.60	46.00	-11.40	peak
5	*	399.0302	22.43	20.29	42.72	46.00	-3.28	QP
6		896.9965	5.82	31.42	37.24	46.00	-8.76	peak

RESULT: PASS

EUT	IP Phone	Model Name	X305
Temperature	23.5°C	Relative Humidity	60.7%
Pressure	960hPa	Test Voltage	DC 48V
Test Mode	Mode 15	Antenna	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	34.1561	21.41	14.97	36.38	40.00	-3.62	peak
2	*	48.3318	19.64	16.98	36.62	40.00	-3.38	QP
3	!	73.1025	17.94	16.97	34.91	40.00	-5.09	peak
4		147.9214	17.71	18.20	35.91	43.50	-7.59	peak
5		187.7530	15.89	18.27	34.16	43.50	-9.34	peak
6	!	400.4319	20.43	22.21	42.64	46.00	-3.36	QP

RESULT: PASS

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

2. All test modes had been pre-tested. The mode 15 is the worst case and recorded in the report.

Radiated emission above 1GHz

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 5V
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	50.25	0.08	50.33	74.00	-23.67	peak
4804.000	41.33	0.08	41.41	54.00	-12.59	AVG
7206.000	48.74	2.21	50.95	74.00	-23.05	peak
7206.000	40.31	2.21	42.52	54.00	-11.48	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 5V
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	49.36	0.08	49.44	74.00	-24.56	peak
4804.000	43.36	0.08	43.44	54.00	-10.56	AVG
7206.000	48.36	2.21	50.57	74.00	-23.43	peak
7206.000	41.36	2.21	43.57	54.00	-10.43	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 5V
Test Mode	Mode 2	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.000	53.05	0.14	53.19	74.00	-20.81	peak
4882.000	40.12	0.14	40.26	54.00	-13.74	AVG
7323.000	50.21	2.36	52.57	74.00	-21.43	peak
7323.000	37.12	2.36	39.48	54.00	-14.52	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 5V
Test Mode	Mode 2	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.000	52.36	0.14	52.50	74.00	-21.50	peak
4882.000	39.77	0.14	39.91	54.00	-14.09	AVG
7323.000	49.25	2.36	51.61	74.00	-22.39	peak
7323.000	36.17	2.36	38.53	54.00	-15.47	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	**Model Name**	X305
Temperature	25°C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	DC 5V
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	51.36	0.22	51.58	74.00	-22.42	peak
4960.000	40.39	0.22	40.61	54.00	-13.39	AVG
7440.000	48.11	2.64	50.75	74.00	-23.25	peak
7440.000	37.21	2.64	39.85	54.00	-14.15	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	**Model Name**	X305
Temperature	25°C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	DC 5V
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	49.78	0.22	50.00	74.00	-24.00	peak
4960.000	39.77	0.22	39.99	54.00	-14.01	AVG
7440.000	47.62	2.64	50.26	74.00	-23.74	peak
7440.000	36.15	2.64	38.79	54.00	-15.21	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 48V
Test Mode	Mode 13	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
4804.000	48.33	0.08	48.41	74.00	-25.59	peak
4804.000	41.13	0.08	41.21	54.00	-12.79	AVG
7206.000	47.89	2.21	50.10	74.00	-23.90	peak
7206.000	41.31	2.21	43.52	54.00	-10.48	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 48V
Test Mode	Mode 13	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
4804.000	47.96	0.08	48.04	74.00	-25.96	peak
4804.000	40.61	0.08	40.69	54.00	-13.31	AVG
7206.000	48.23	2.21	50.44	74.00	-23.56	peak
7206.000	40.35	2.21	42.56	54.00	-11.44	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 48V
Test Mode	Mode 14	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.000	51.69	0.14	51.83	74.00	-22.17	peak
4882.000	38.41	0.14	38.55	54.00	-15.45	AVG
7323.000	51.36	2.36	53.72	74.00	-20.28	peak
7323.000	37.53	2.36	39.89	54.00	-14.11	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 48V
Test Mode	Mode 14	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.000	52.05	0.14	52.19	74.00	-21.81	peak
4882.000	39.44	0.14	39.58	54.00	-14.42	AVG
7323.000	52.48	2.36	54.84	74.00	-19.16	peak
7323.000	38.12	2.36	40.48	54.00	-13.52	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 48V
Test Mode	Mode 15	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	49.85	0.22	50.07	74.00	-23.93	peak
4960.000	42.51	0.22	42.73	54.00	-11.27	AVG
7440.000	46.69	2.64	49.33	74.00	-24.67	peak
7440.000	39.44	2.64	42.08	54.00	-11.92	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 48V
Test Mode	Mode 15	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	48.58	0.22	48.80	74.00	-25.20	peak
4960.000	43.71	0.22	43.93	54.00	-10.07	AVG
7440.000	45.31	2.64	47.95	74.00	-26.05	peak
7440.000	38.65	2.64	41.29	54.00	-12.71	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, Over=Measure-Limit.

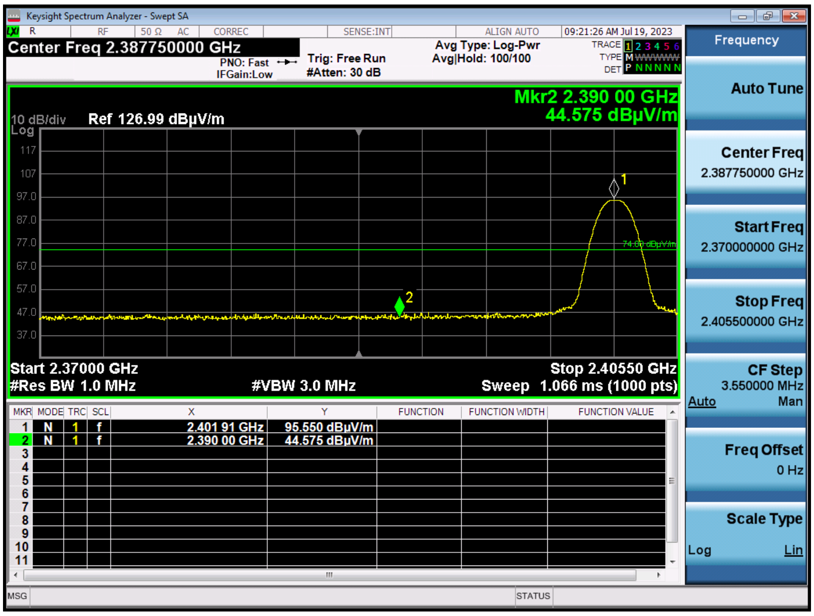
The “Factor” value can be calculated automatically by software of measurement system.

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

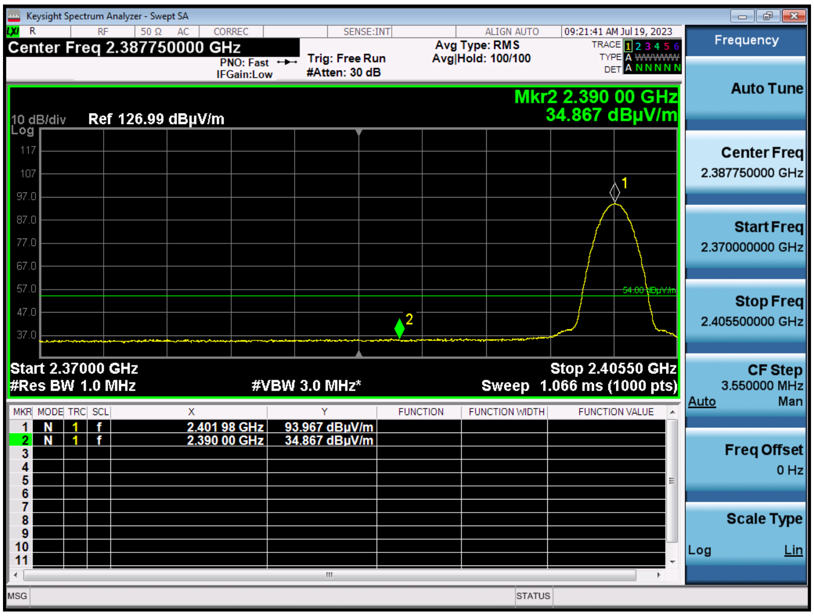
Test result for band edge emission at restricted bands

EUT	IP Phone	**Model Name**	X305
Temperature	25°C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	DC 5V
Test Mode	Mode 1	**Antenna**	Horizontal

Test Graph for Peak Measurement



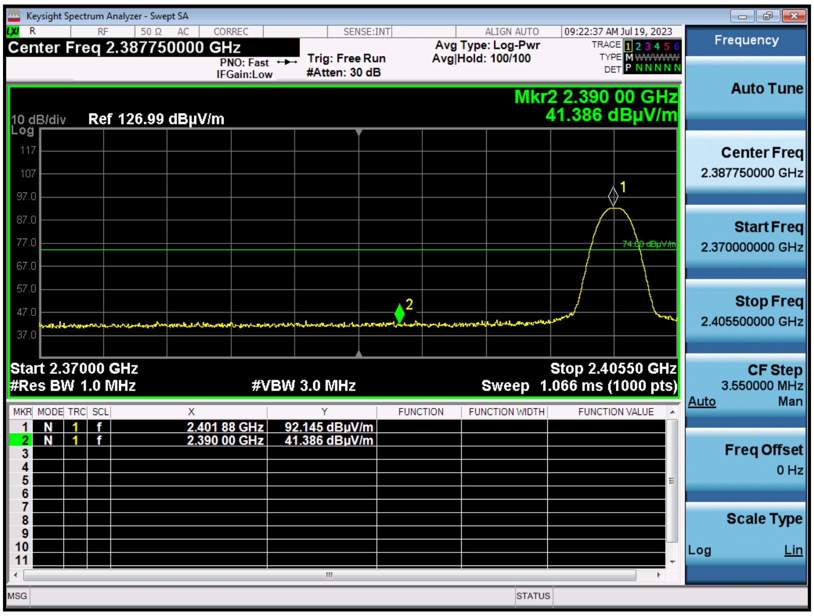
Test Graph for Average Measurement



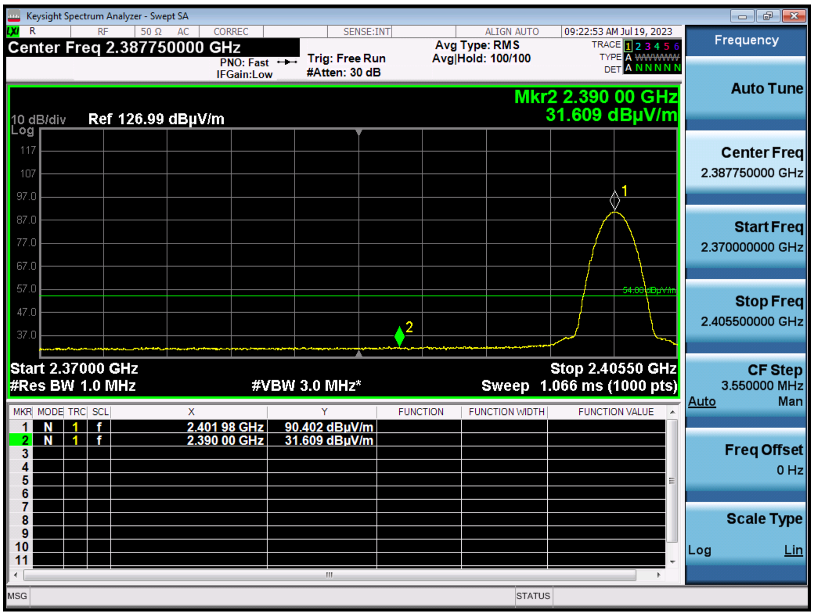
RESULT: PASS

EUT	IP Phone	**Model Name**	X305
Temperature	25°C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	DC 5V
Test Mode	Mode 1	**Antenna**	Vertical

Test Graph for Peak Measurement



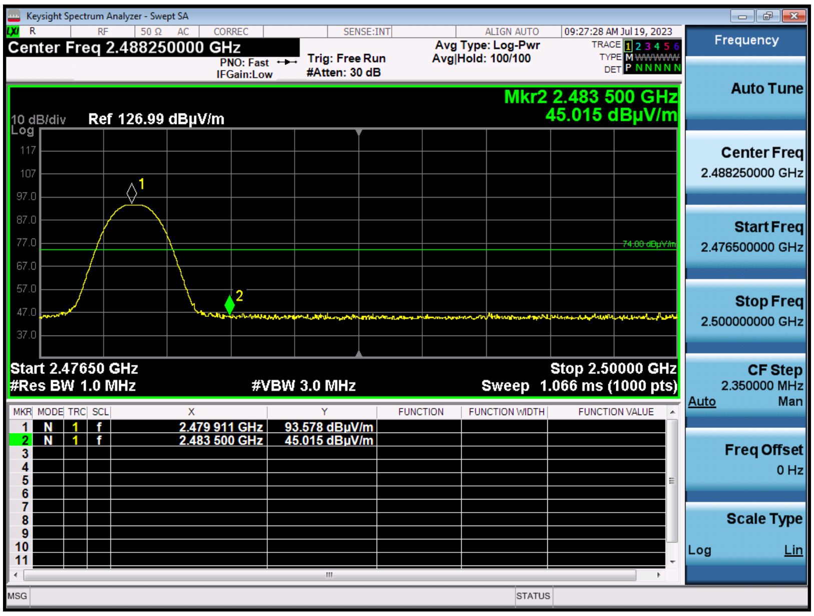
Test Graph for Average Measurement



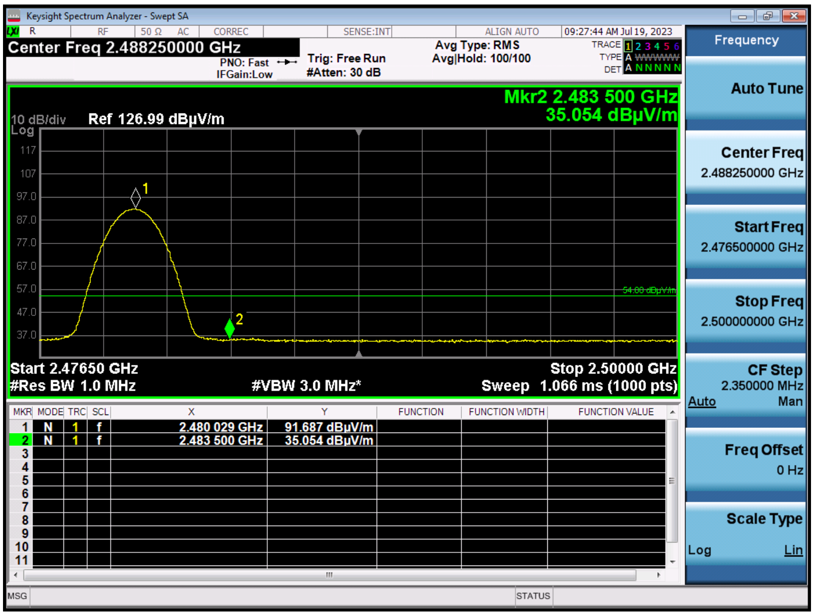
RESULT: PASS

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 5V
Test Mode	Mode 3	Antenna	Horizontal

Test Graph for Peak Measurement



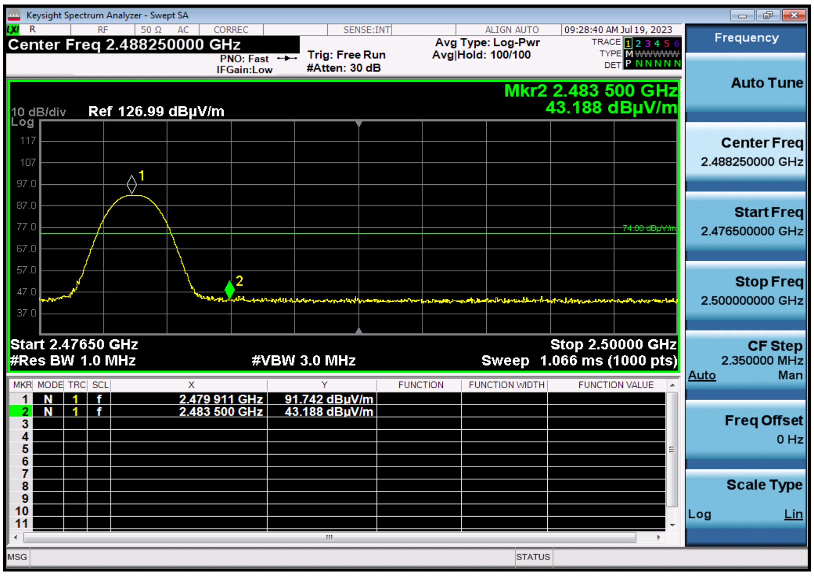
Test Graph for Average Measurement



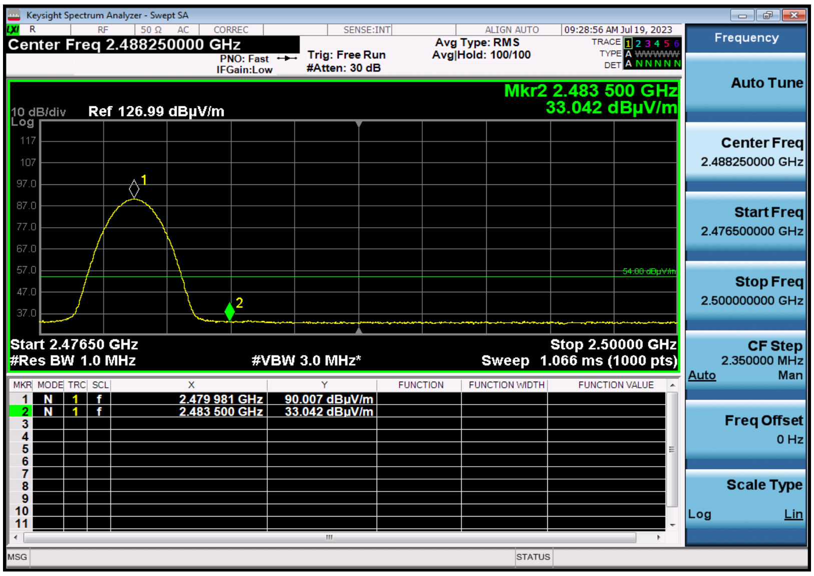
RESULT: PASS

EUT	IP Phone	Model Name	X305
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC 5V
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. The GFSK modulation is the worst case and recorded in the report.
2. All voltages are tested. The test data of the worst case (DC 5V) was reported on the Summary Data page.

11. NUMBER OF HOPPING FREQUENCY

11.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW ≥ RBW. Sweep: Auto. Detector function: Peak. Trace: Max hold.
4. Allow the trace to stabilize.

11.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

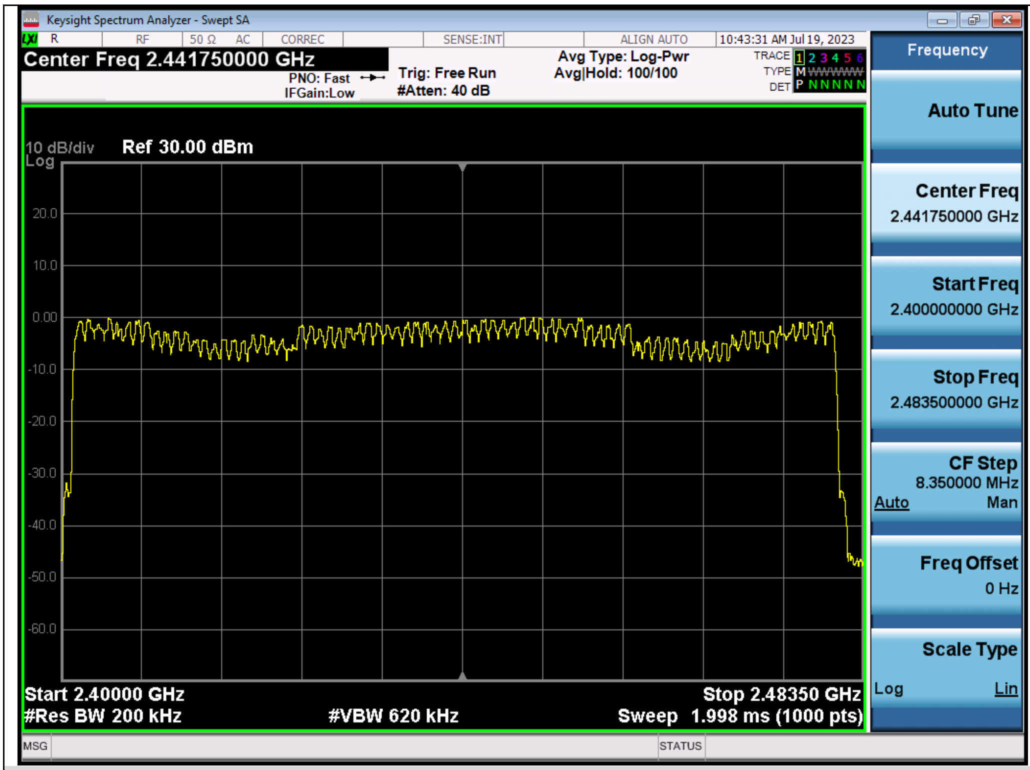
11.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

11.4. LIMITS AND MEASUREMENT RESULT

Test Data of Number of Hopping Frequency			
Test Mode	Number of Hopping Frequency	Limits	Pass or Fail
GFSK Hopping	79	>=15	Pass

Test Graphs of Number of Hopping Frequency



Test_Graph_BR_HOP_ANT1_NA_1Mbps_Number of Hopping

Note: The GFSK modulation is the worst case and recorded in the report.

12. TIME OF OCCUPANCY (DWELL TIME)

12.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
1. Span: Zero span, centered on a hopping channel.
2. RBW shall be≤channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
4. Detector function: Peak. Trace: Max hold.
5. Use the marker-delta function to determine the transmit time per hop.
6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:
(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)
7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

12.3. MEASUREMENT EQUIPMENT USED

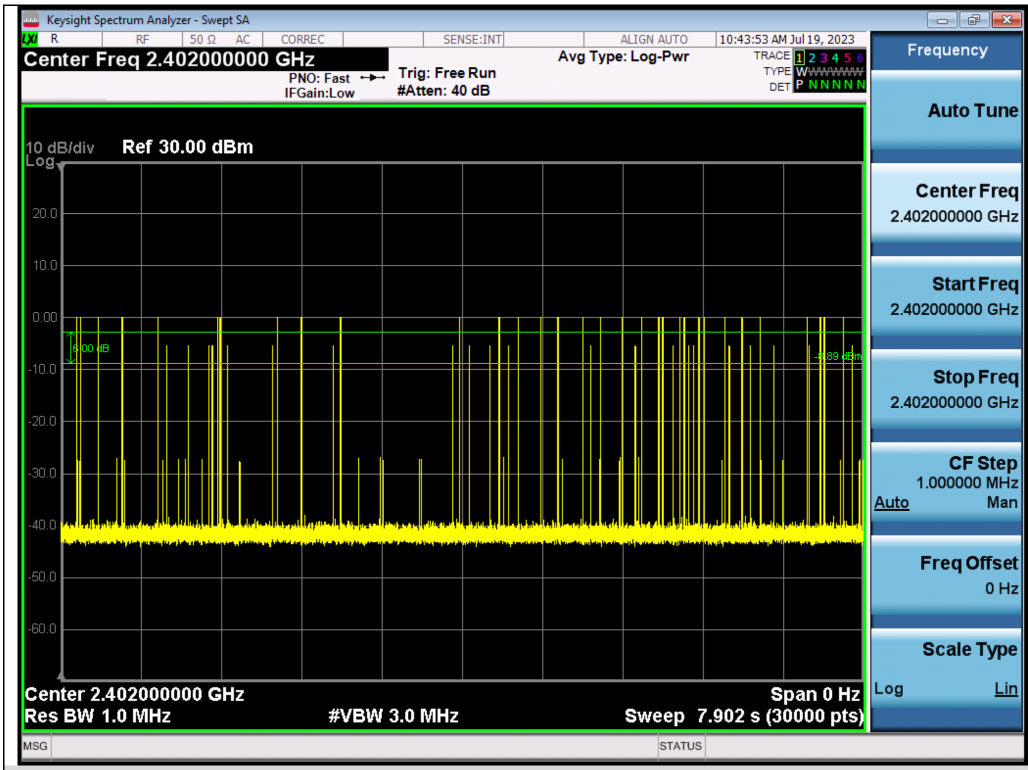
The same as described in section 6

12.4. LIMITS AND MEASUREMENT RESULT

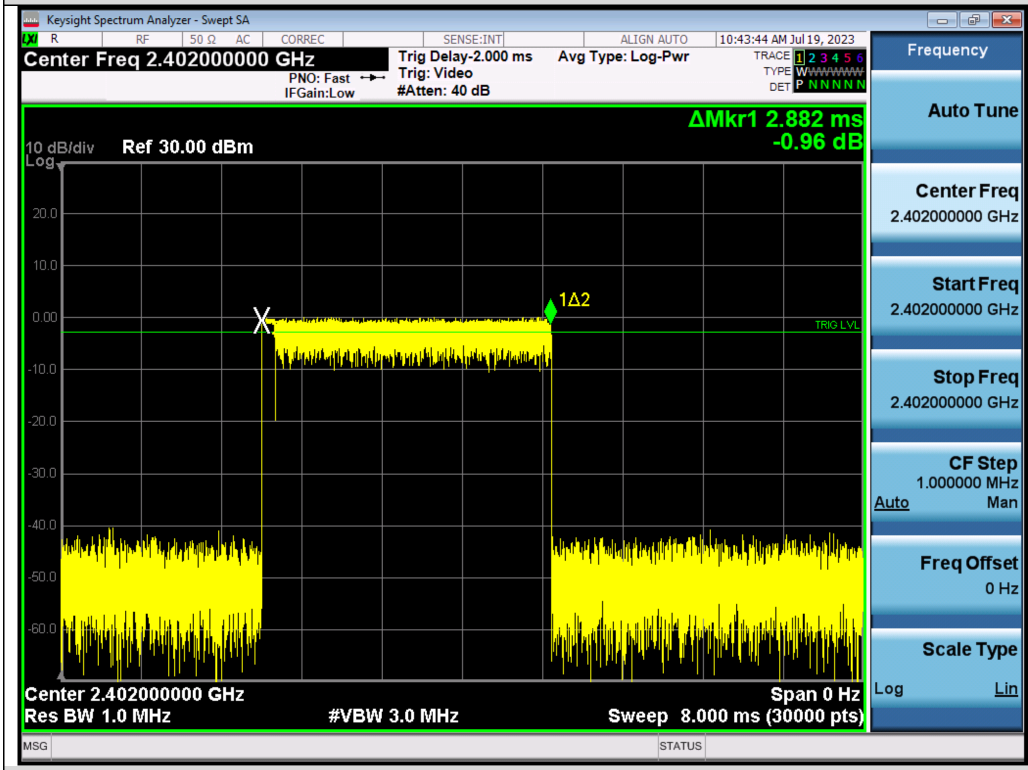
Test Data of Dwell Time					
Channel	Time of Pulse for DH5 (ms)	Number of hops in the period specified in the requirements	Sweep Time (ms)	Limit (ms)	Pass or Fail
2402	2.882	32.0*4	368.896	400	Pass
2441	2.883	25.0*4	288.300	400	Pass
2480	2.882	24.0*4	276.672	400	Pass

Note: The GFSK modulation is the worst case and recorded in the report.

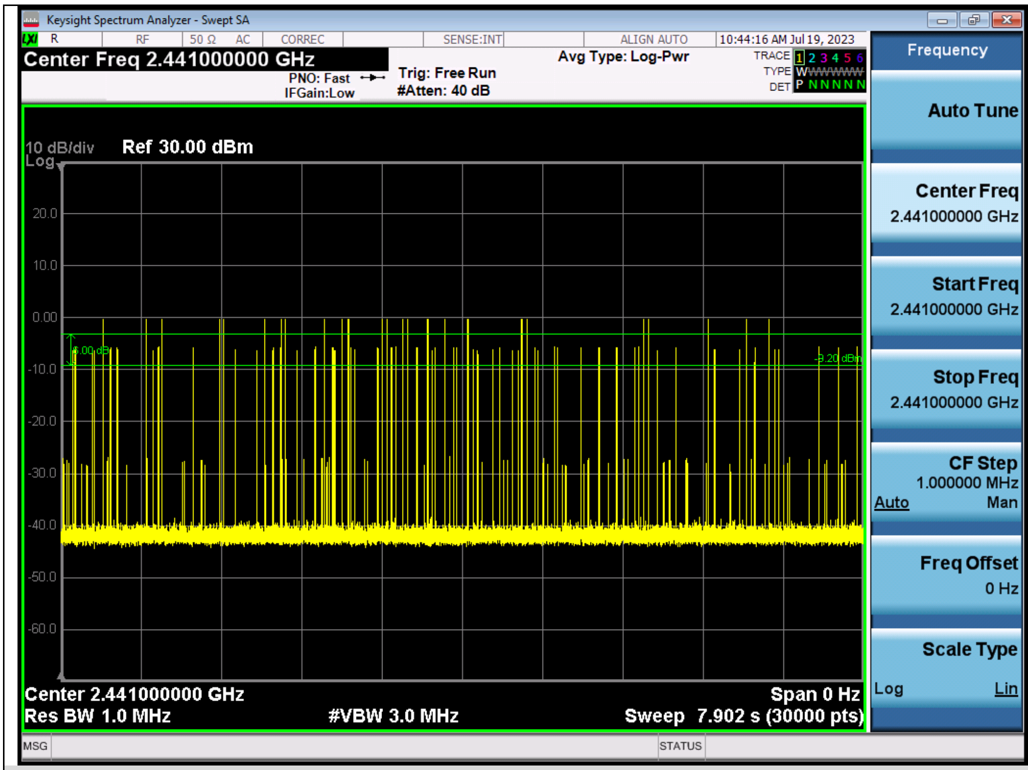
Test Graphs of Dwell Time



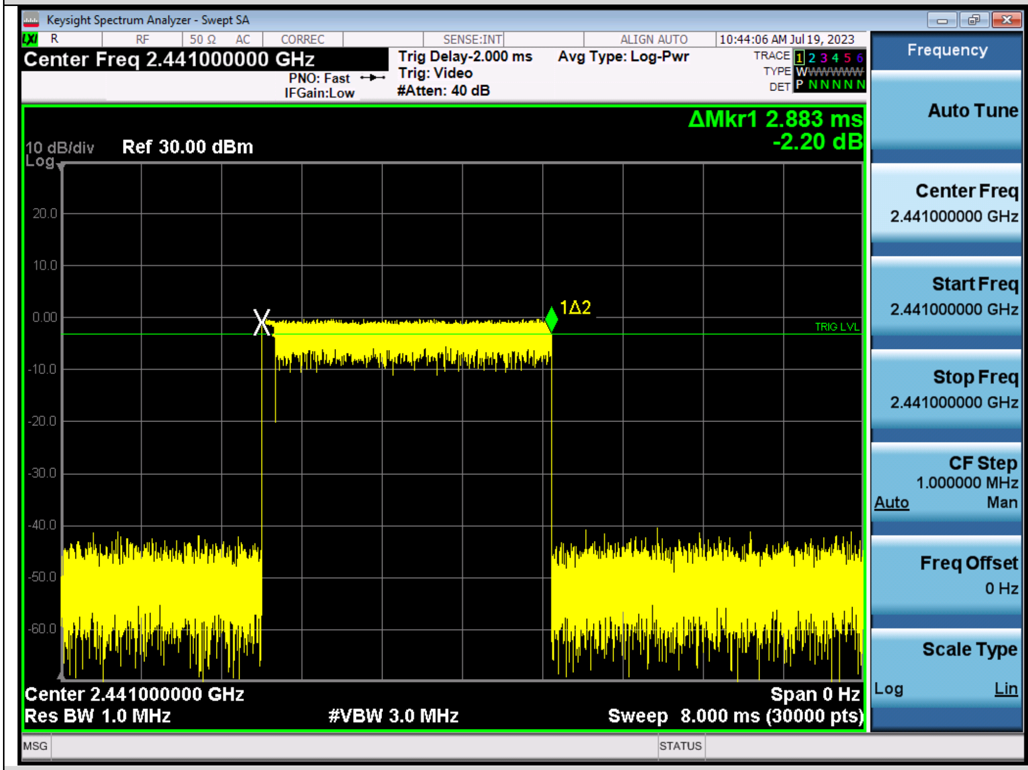
Test_Graph_BR_HOP_ANT1_NA_1Mbps_2402_Number of Busrt



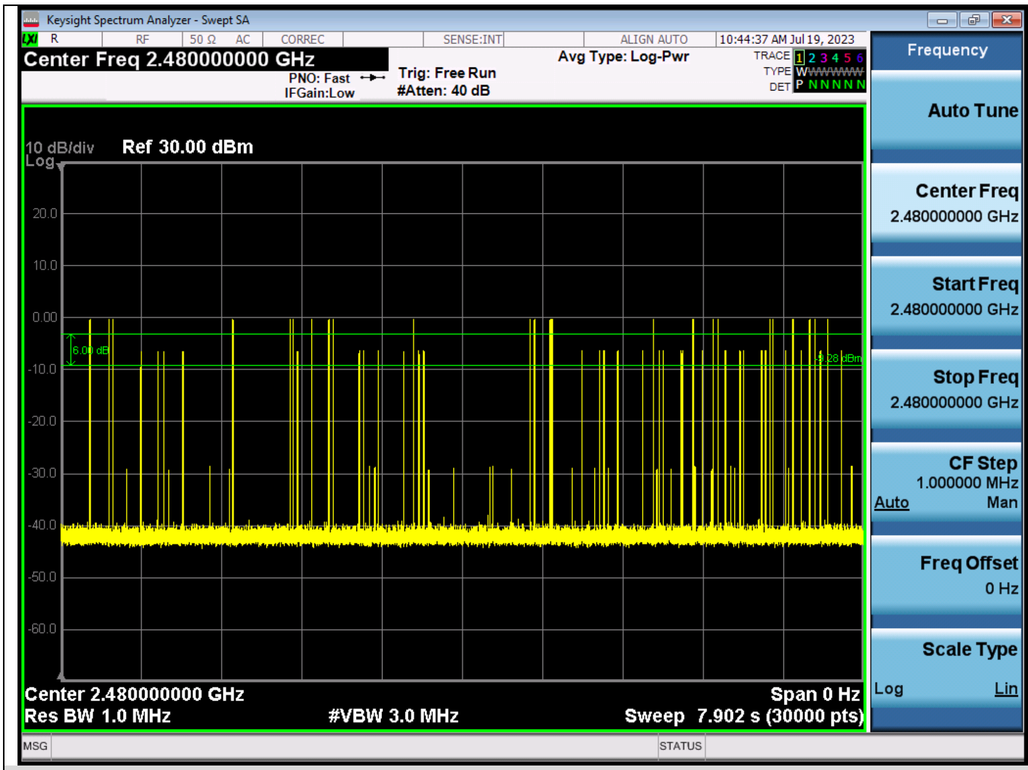
Test_Graph_BR_HOP_ANT1_NA_1Mbps_2402_Time per Burst



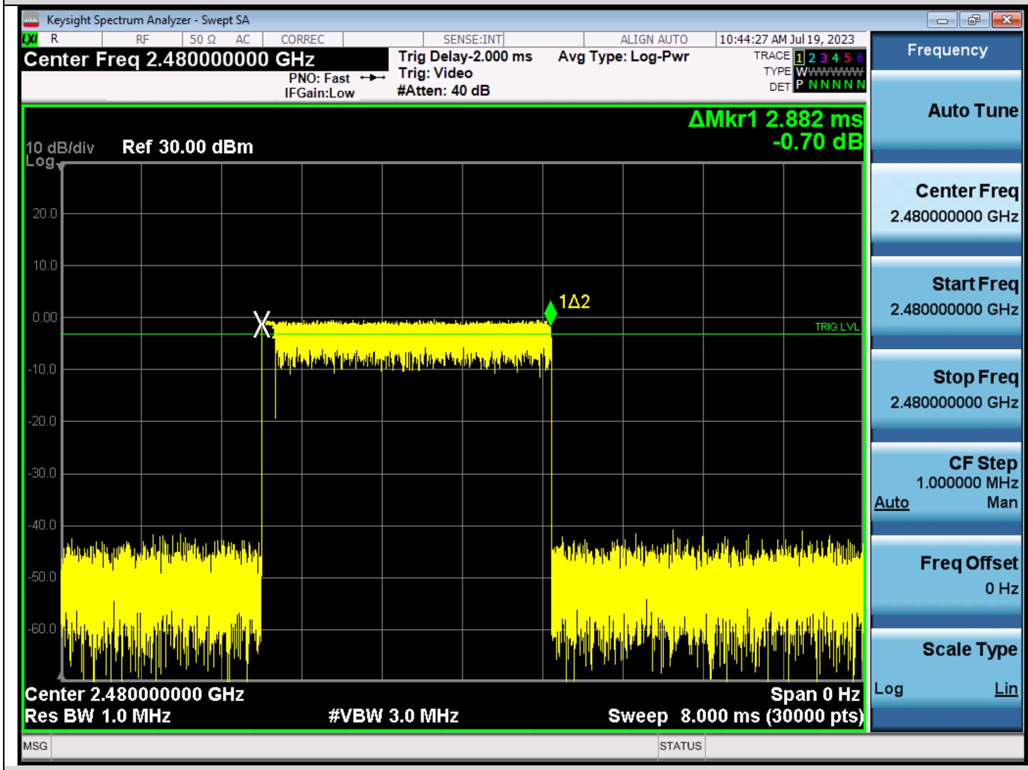
Test_Graph_BR_HOP_ANT1_NA_1Mbps_2441_Number of Busrt



Test_Graph_BR_HOP_ANT1_NA_1Mbps_2441_Time per Burst



Test_Graph_BR_HOP_ANT1_NA_1Mbps_2480_Number of Busrt



Test_Graph_BR_HOP_ANT1_NA_1Mbps_2480_Time per Burst

13. FREQUENCY SEPARATION

13.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.
2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. Video (or average) bandwidth (VBW) ⩾ RBW.
4. Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2

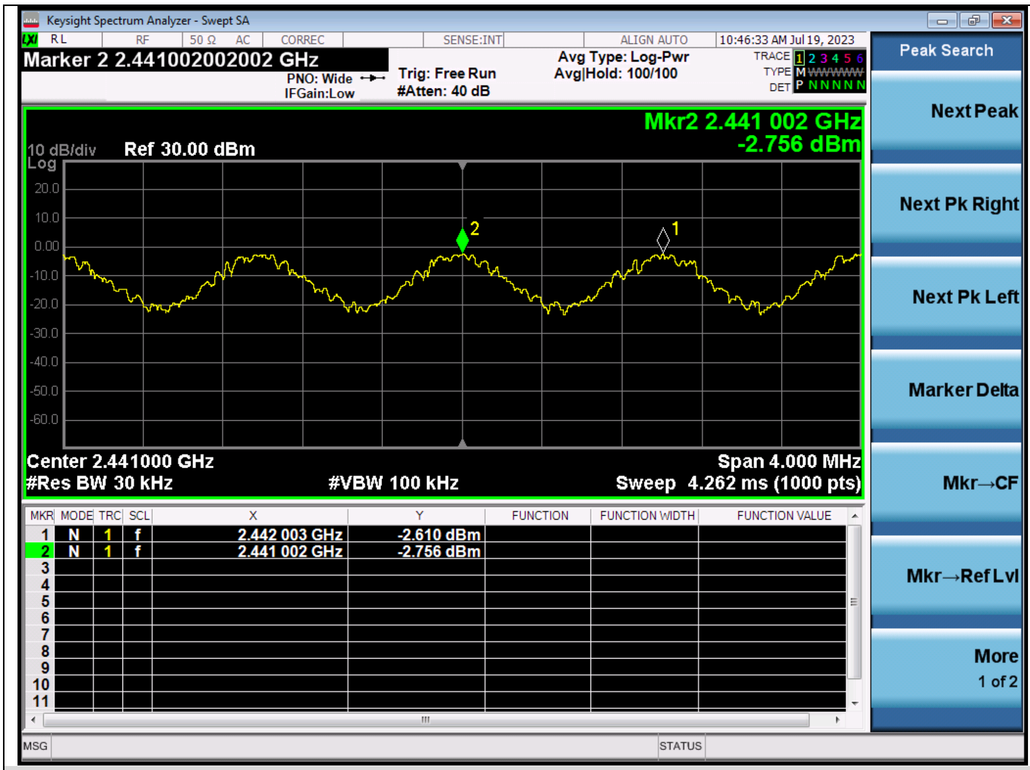
13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.3

13.4. LIMITS AND MEASUREMENT RESULT

Test Data of Frequency Separation			
Test Mode	Channel Separation (MHz)	Limits	Pass or Fail
GFSK Hopping	1.001	>= 2/3 -20dB BW	Pass

Test Graphs of Number of Hopping Frequency



Test_Graph_BR_HOP_ANT1_NA_1Mbps_Hopping Separation

Note: The GFSK modulation is the worst case and recorded in the report.