FCC Test Report

Report No.: AGC09881200501FE03

FCC ID	:	XPYNINAB4
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	NINA-B4
BRAND NAME	:	u-blox
MODEL NAME	:	NINA-B400, NINA-B410, NINA-B406, NINA-B416
APPLICANT	:	u-blox AG
DATE OF ISSUE	:	Dec. 10, 2020
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	/	Dec. 10, 2020	Valid	Initial Release

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1. VERIFICATION OF COMPLIANCE

Applicant	u-blox AG
Address	Zuercherstrasse 68, Ch-8800 Thalwil, Switzerland
Manufacturer	u-blox AG
Address	Zuercherstrasse 68, Ch-8800 Thalwil, Switzerland
Product Designation	NINA-B4
Brand Name	u-blox
Test Model	NINA-B400, NINA-B406
Series Model	NINA-B410, NINA-B406, NINA-B416
Difference Description	See the NINA-B4_Operational Description_r1
Date of test	Jul. 24, 2020 to Dec. 10, 2020
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	Erik Yang (Project Engineer)	Dec. 10, 2020
Reviewed By	Max Zhang (Reviewer)	Dec. 10, 2020
Approved By	Forrest Lei (Authorized Officer)	Dec. 10, 2020

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

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

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480GHz
RF Output Power	9.109dBm (Max)
Bluetooth Version	V 5.1
Modulation	BR ☐GFSK, EDR ☐π /4-DQPSK, ☐8DPSK BLE ☐GFSK 1Mbps ☒GFSK 2Mbps
Number of channels	40 Channel
Antenna Designation	NINA-B400:External Antenna(Comply with requirements of the FCC part 15.203) NINA-B406: Integral Antenna(Added at manufacturer's request)
Antenna Gain	External Antenna : Antenna 1: FlatWhip-2400-SMA-RPSMA :3dBi Antenna 2: Ex-IT 2400-RP-SMA 28-001:-MHF 28-001 :3dBi Antenna 3: Ex-IT 2400-RP-SMA 70-002 :3dBi Antenna 4: InSide-2400: 3dBi Integral Antenna : u-blox PCB Trace Antenna:3dBi
Hardware Version	A
Software Version	V1.0
Power Supply	DC 3.3V

Note:

1.All the models would be marketed with the CRYSTAL A (EPSON FA-118T) or the CRYSTAL B (Taisaw TZ31 24CIW-B4017). Both of them have the same size and radio parameters. The version of the CRYSTAL A had b een 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.Please refer to NINA-B4_Certification_AppNote_(UBX-20037320) for the specifications of various antennas.

2.2. TABLE OF CARRIER FREQUENCYS

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

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

This submittal(s) (test report) is intended for **FCC ID: XPYNINAB4** 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.
The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional rad iator shall be considered sufficient to comply with the provisions of this section.
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%.

- Uncertainty of Conducted Emission, Uc = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted, Uc = ±0.8 dB
- Uncertainty of RF power density, conducted, Uc = ±2.6 dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7 dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %

4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX
2	Middle channel TX
3	High channel TX

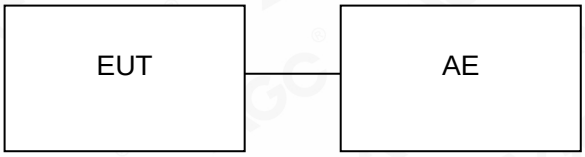
Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. For Conducted Test method, a temporary antenna connector is provided by the manufacture.
4.The test software is the Putty which can set the EUT into the individual test modes.

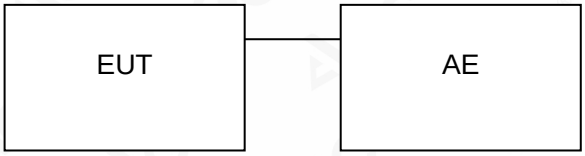
5. SYSTEM TEST CONFIGURATION

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	NINA-B4	NINA-B400/ NINA-B406	XPYNINAB4	EUT
2	PC	Nbl-WAQ9R	DC 5V	AE
3	PC Adapter	HW-200200CP1	DC 5V	AE
4	control board	EPS-35-3.3	DC 3.3V	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

Note: The NINA-B400 model for all test items. The NINA-B406 model for Radiated Emission and Conducted Emission test.

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 15, 2020	May 14, 2021
LISN	R&S	ESH2-Z5	100086	Aug. 26, 2019	Aug. 25, 2020
LISN	R&S	ESH2-Z5	100086	Jul. 03,2020	Jul. 02,2021
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	May 15, 2020	May 14, 2021
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Aug. 26, 2019	Aug. 25, 2020
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 09, 2019	Sep. 08, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May 17, 2019	May 16, 2021
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 15, 2019	Oct. 16, 2020
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 09, 2019	Jan. 08, 2021
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

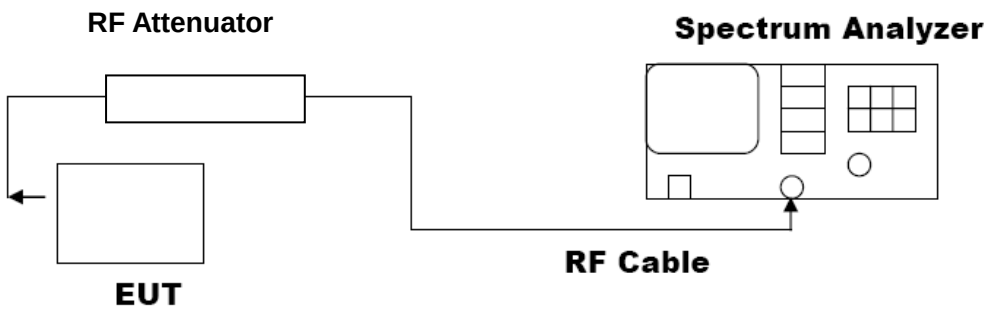
For peak power test:

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

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

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

PEAK POWER TEST SETUP

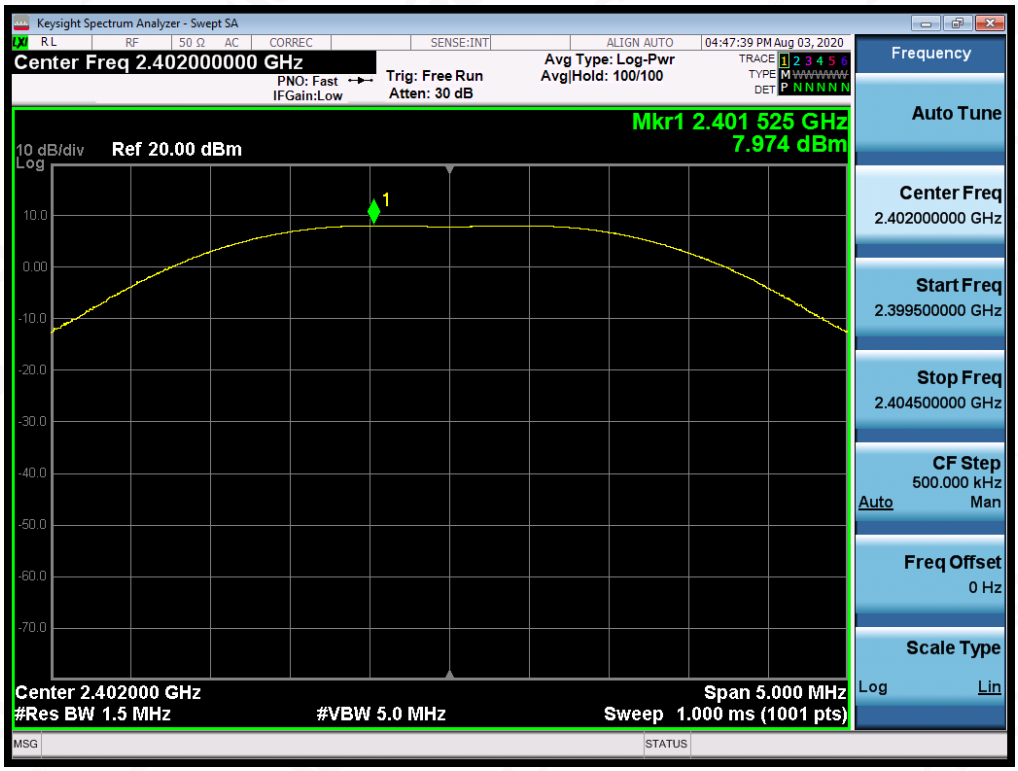


7.3. LIMITS AND MEASUREMENT RESULT

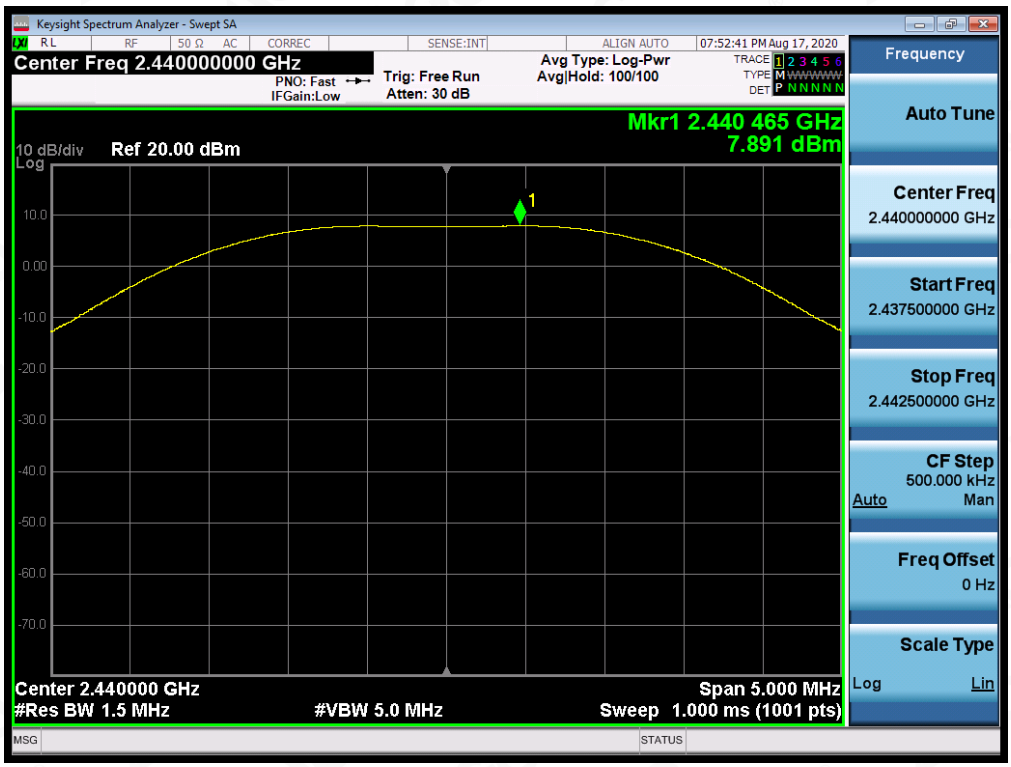
CRYSTAL A

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	7.974	30	Pass
2.440	7.891	30	Pass
2.480	8.123	30	Pass

CH0



CH19

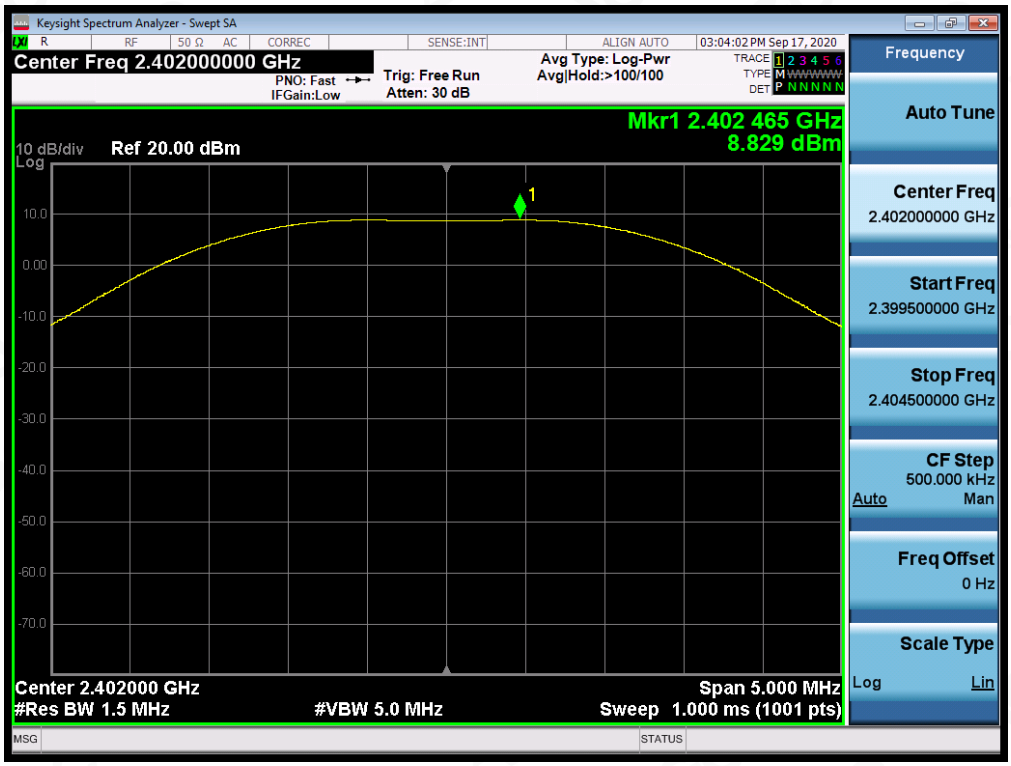


CH39

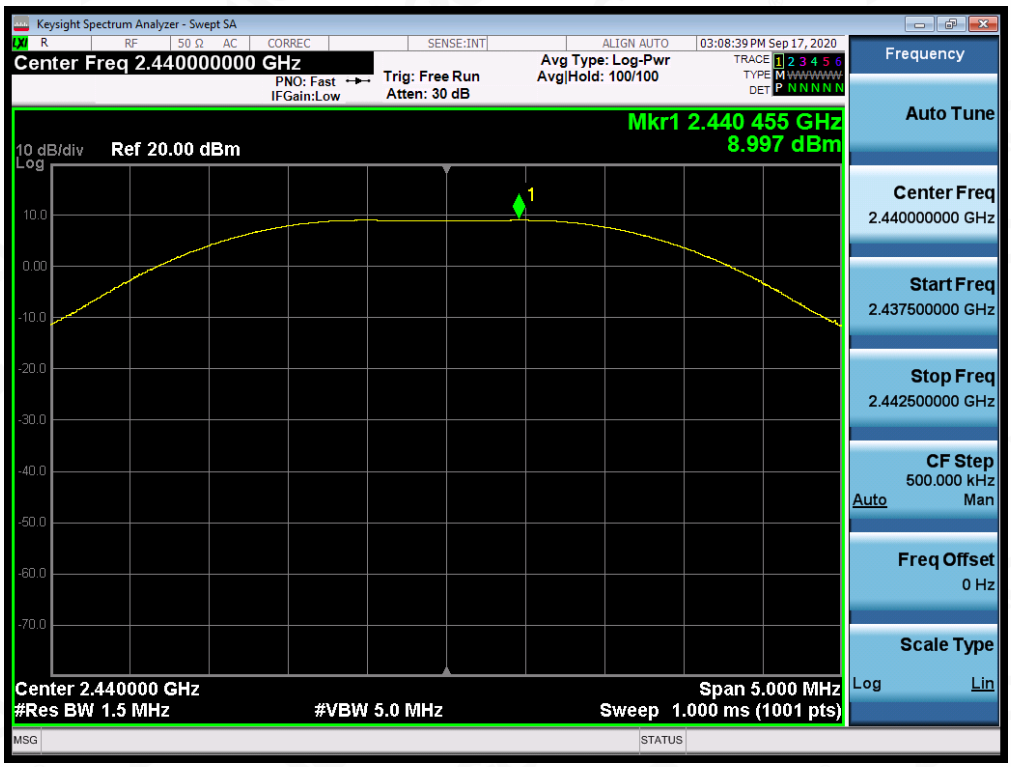
CRYSTAL B

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	8.829	30	Pass
2.440	8.997	30	Pass
2.480	9.109	30	Pass

CH0



CH19



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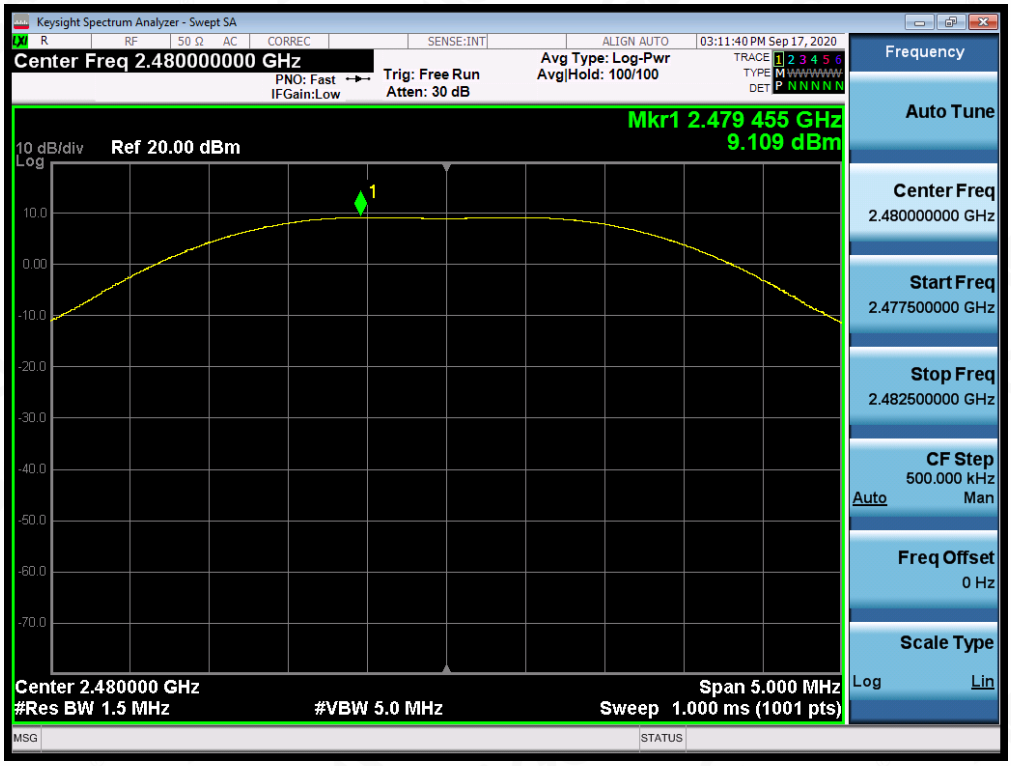


8. 6 DB BANDWIDTH

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≥3×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)

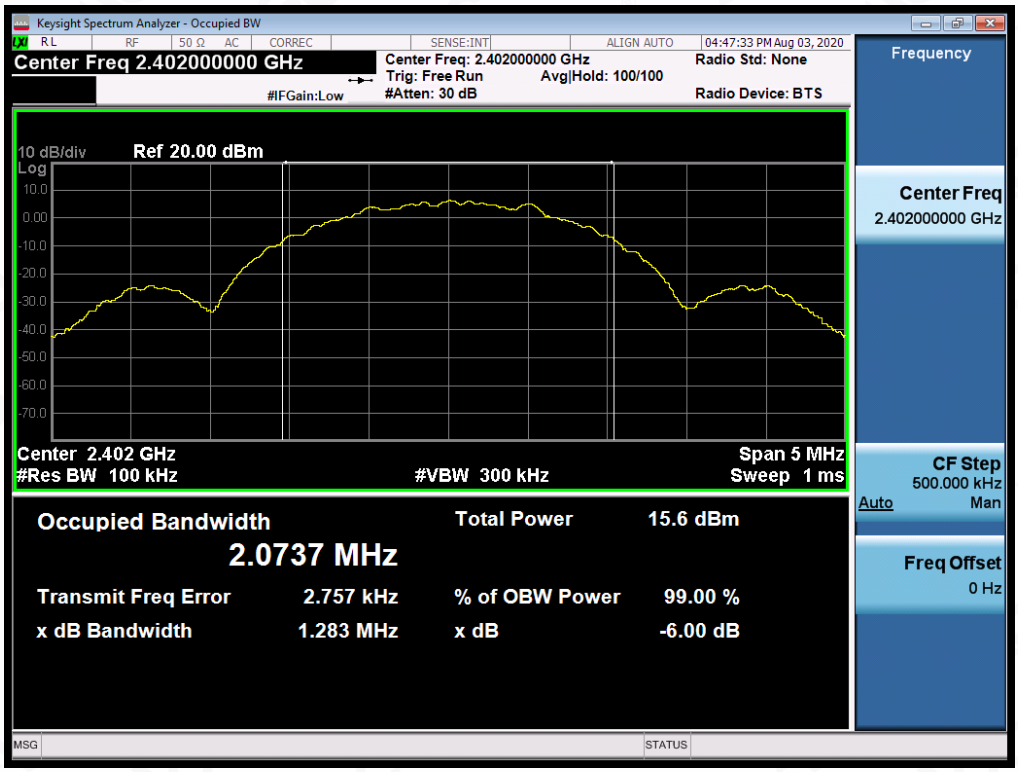
The same as described in section 7.2.

8.3. LIMITS AND MEASUREMENT RESULTS

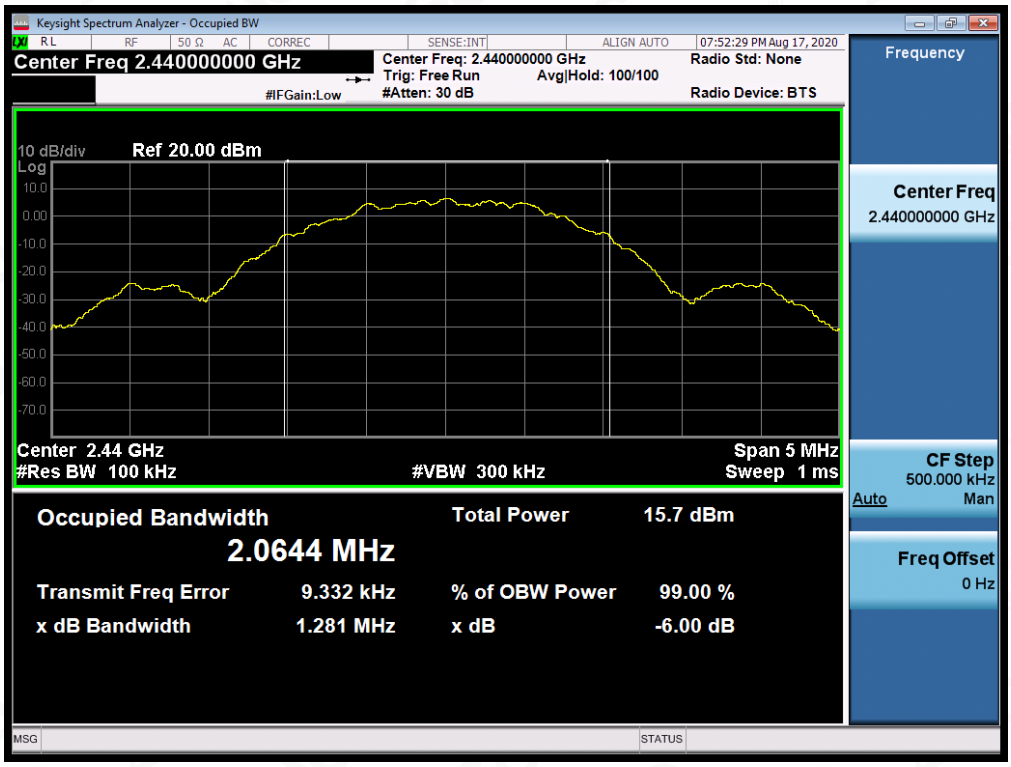
CRYSTAL A

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Applicable Limits		
	Test Data (MHz)		Criteria
>500KHZ	Low Channel	1.283	PASS
	Middle Channel	1.281	PASS
	High Channel	1.378	PASS

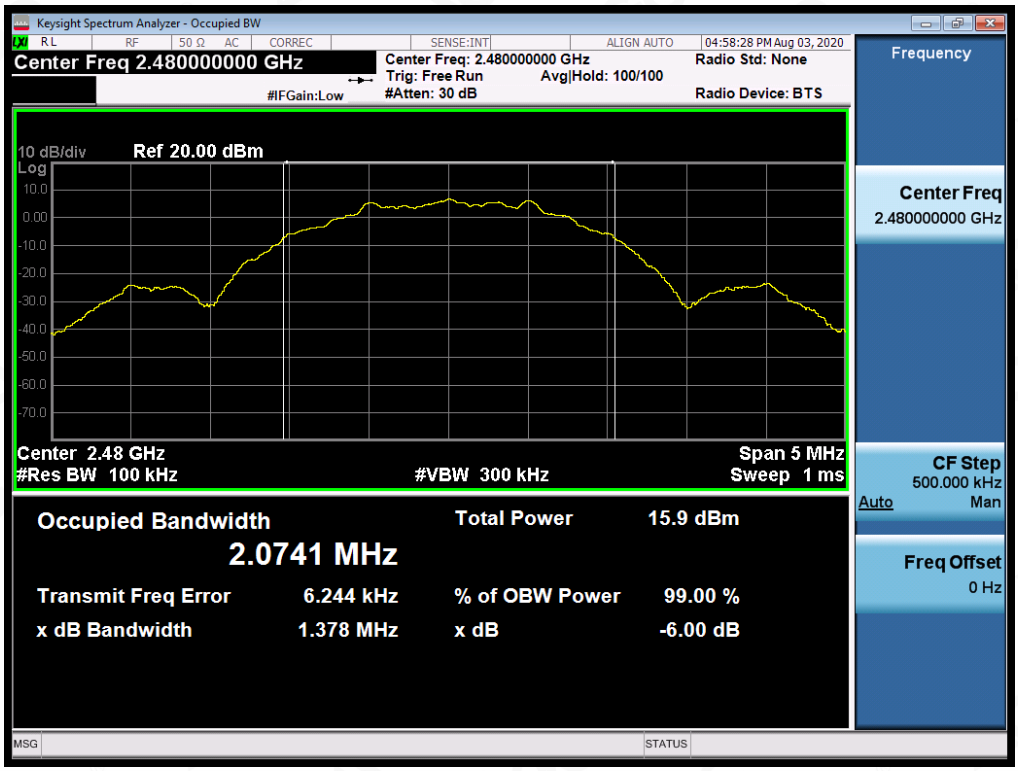
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



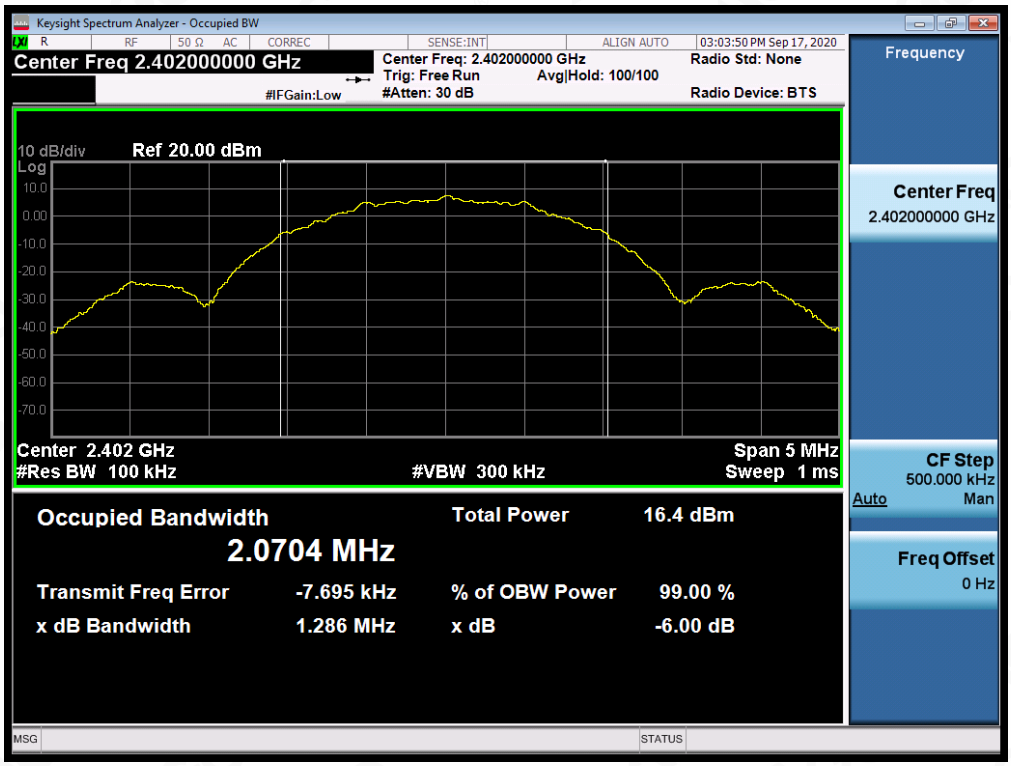
TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



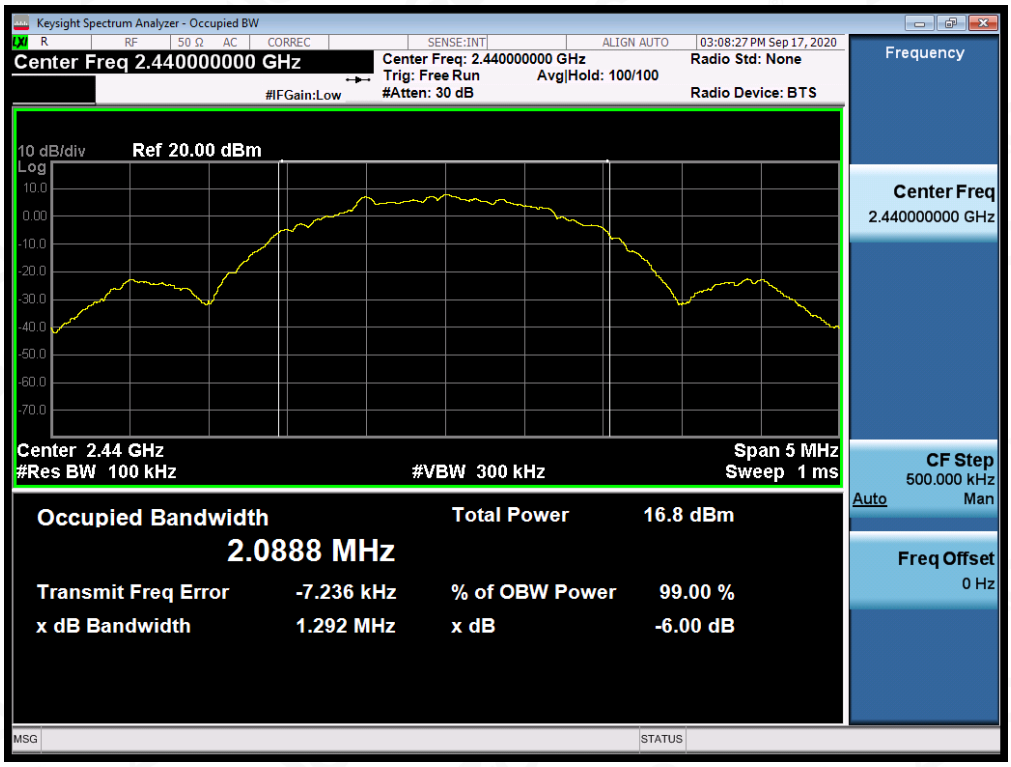
CRYSTAL B

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	**Applicable Limits**		
	Test Data (MHz)		**Criteria**
>500KHZ	Low Channel	1.286	PASS
	Middle Channel	1.292	PASS
	High Channel	1.458	PASS

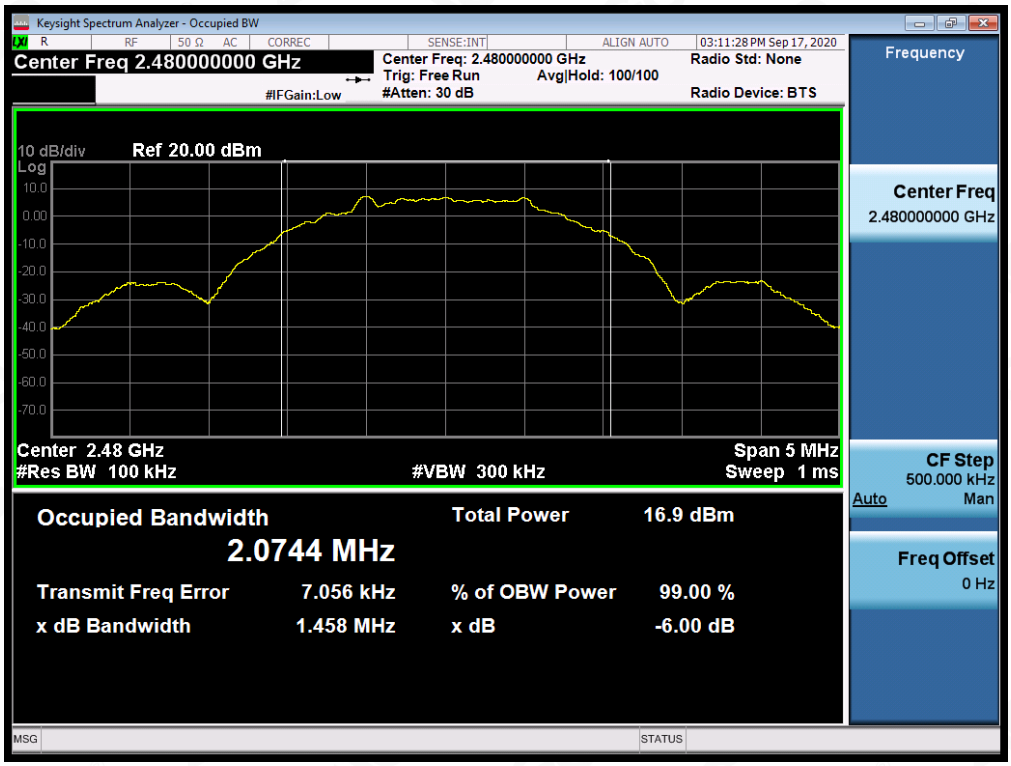
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

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

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

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

The same as described in section 7.2.

9.3. MEASUREMENT EQUIPMENT USED

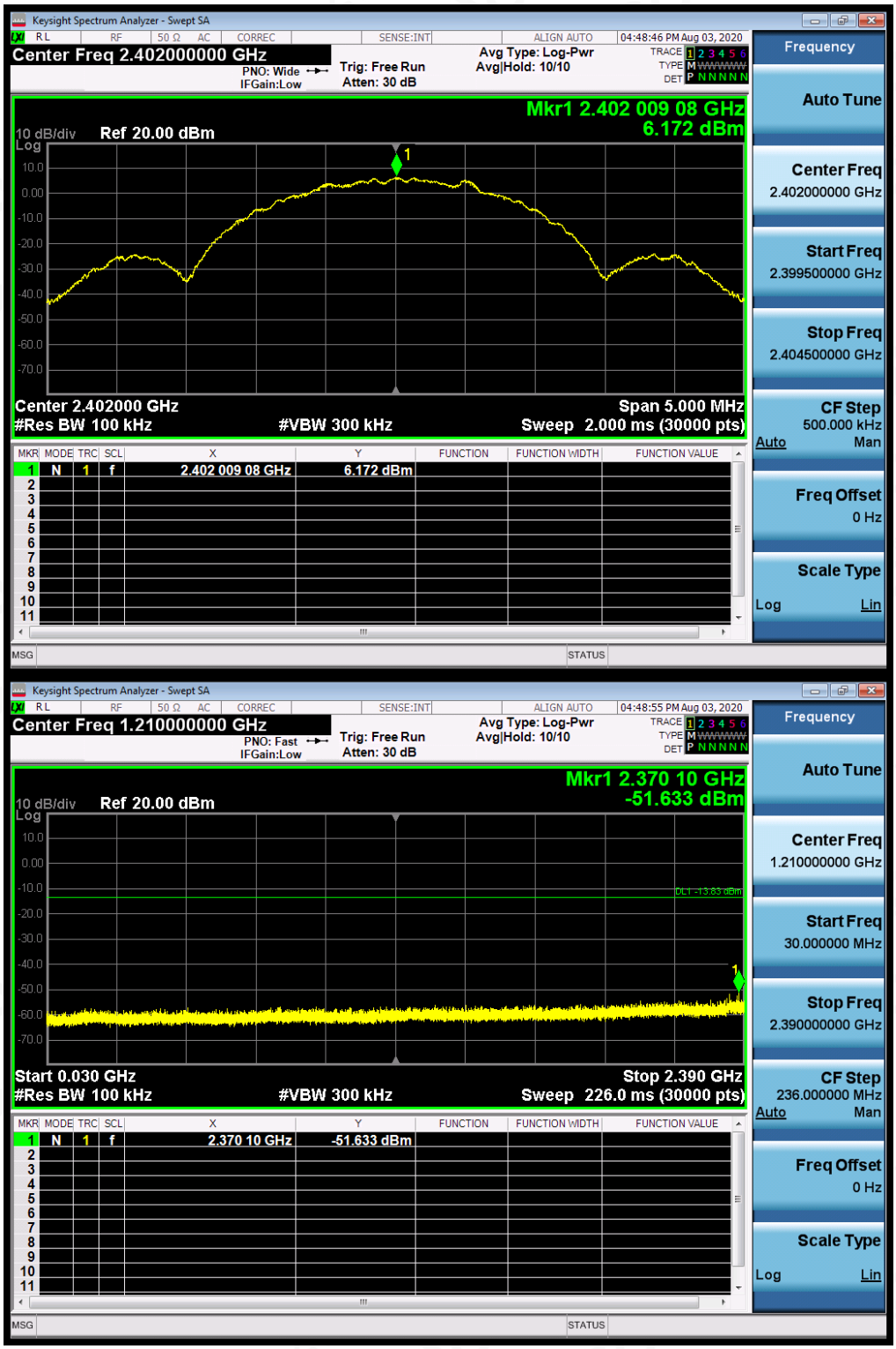
The same as described in section 6.

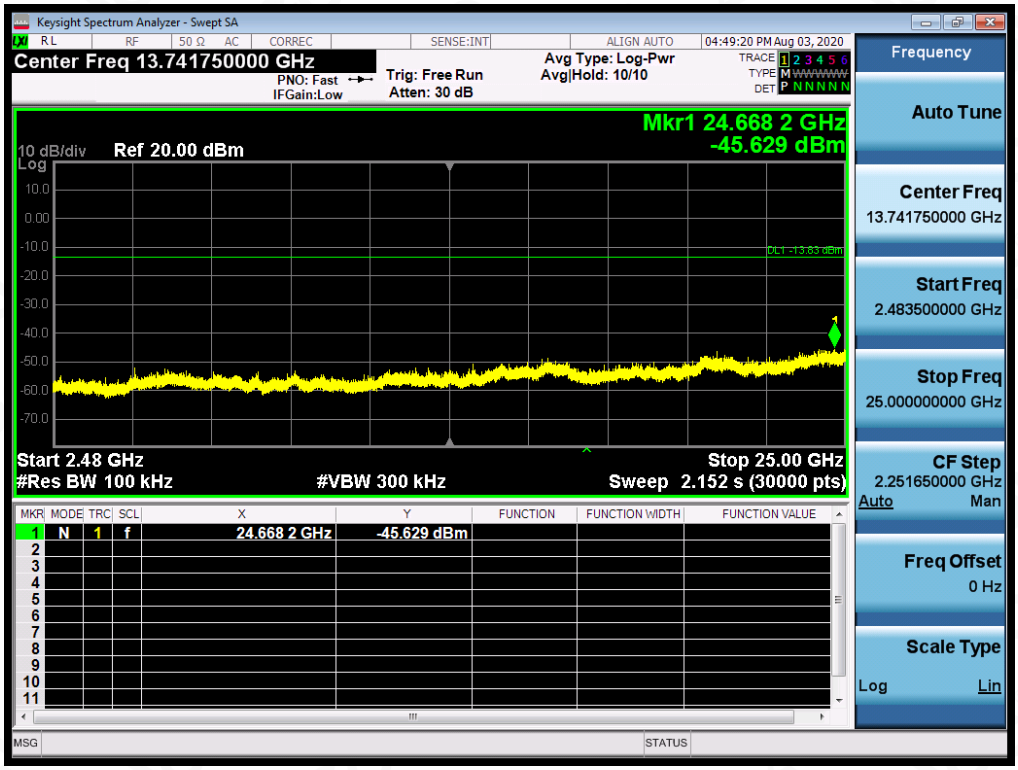
9.4. LIMITS AND MEASUREMENT RESULT

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

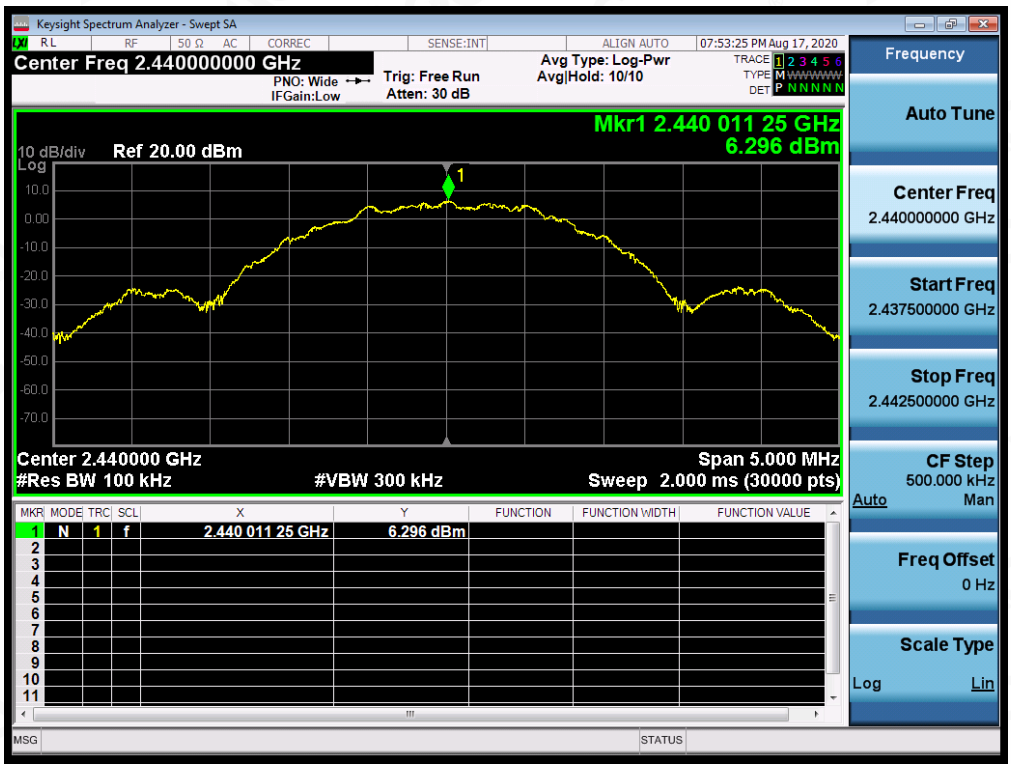
TEST RESULT FOR ENTIRE FREQUENCY RANGE

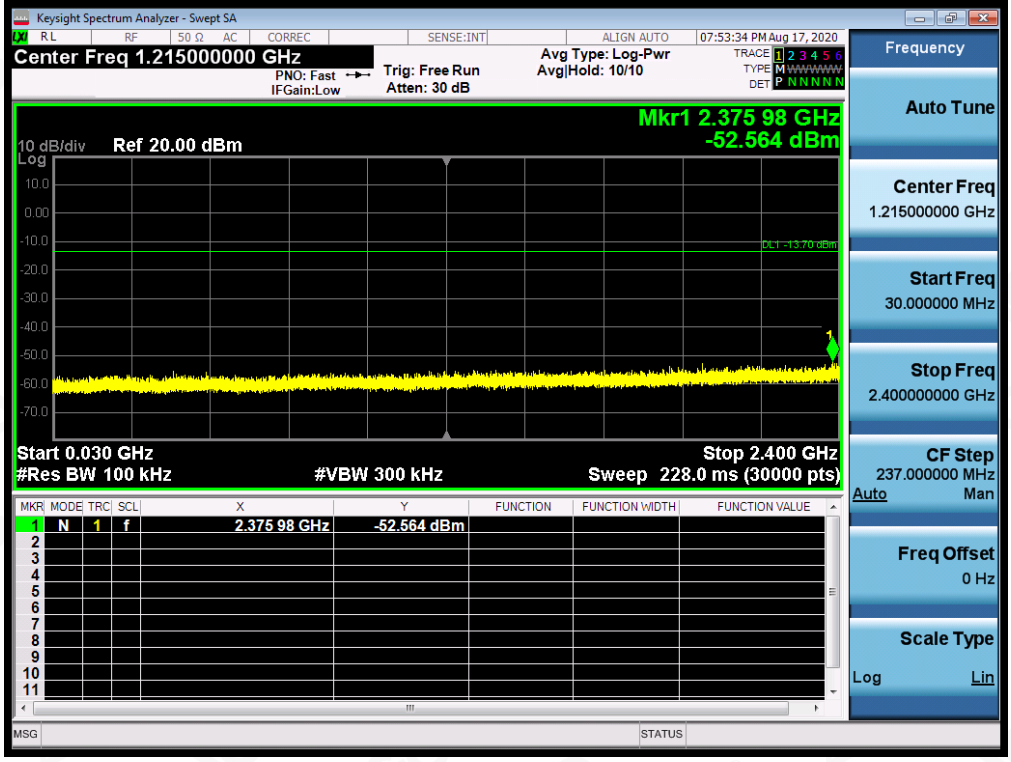
GFSK MODULATION IN LOW CHANNEL

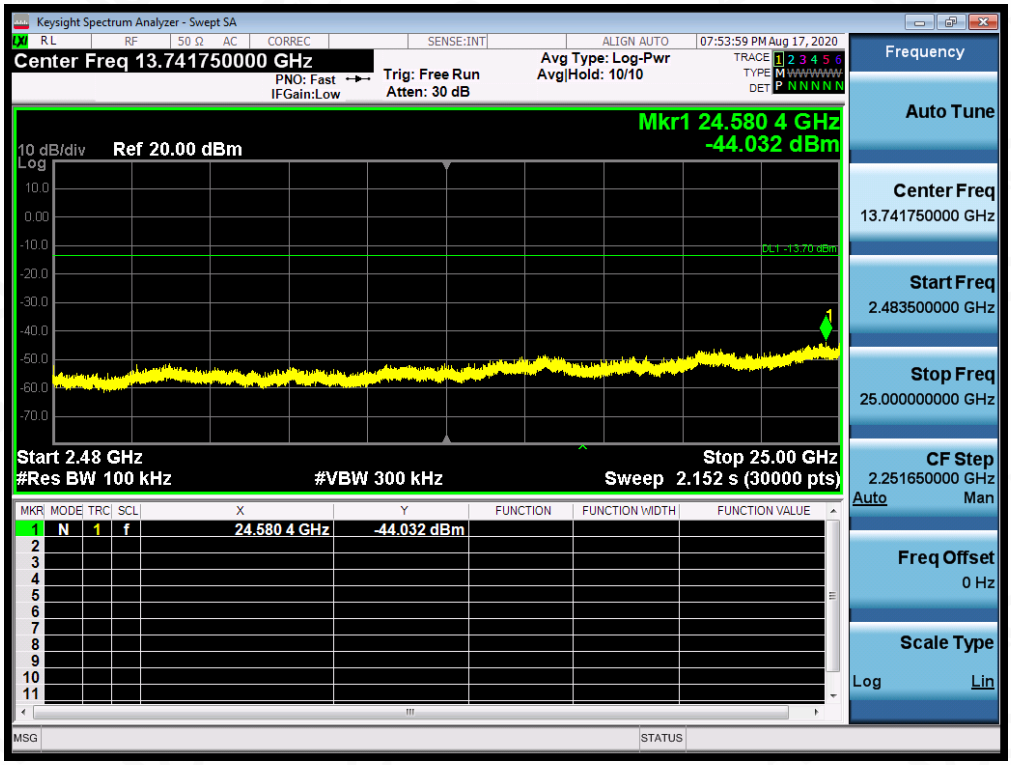




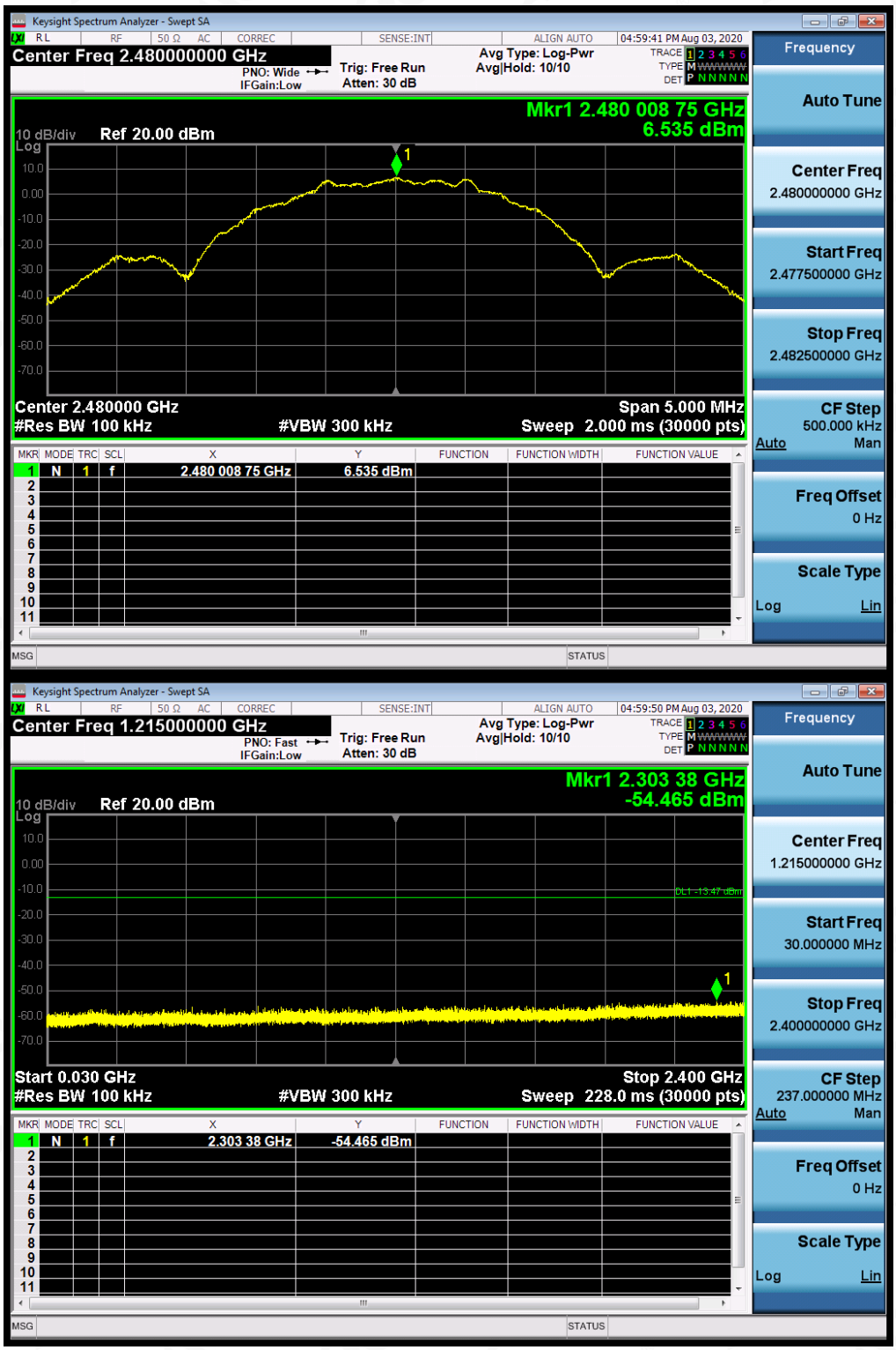
GFSK MODULATION IN MIDDLE CHANNEL

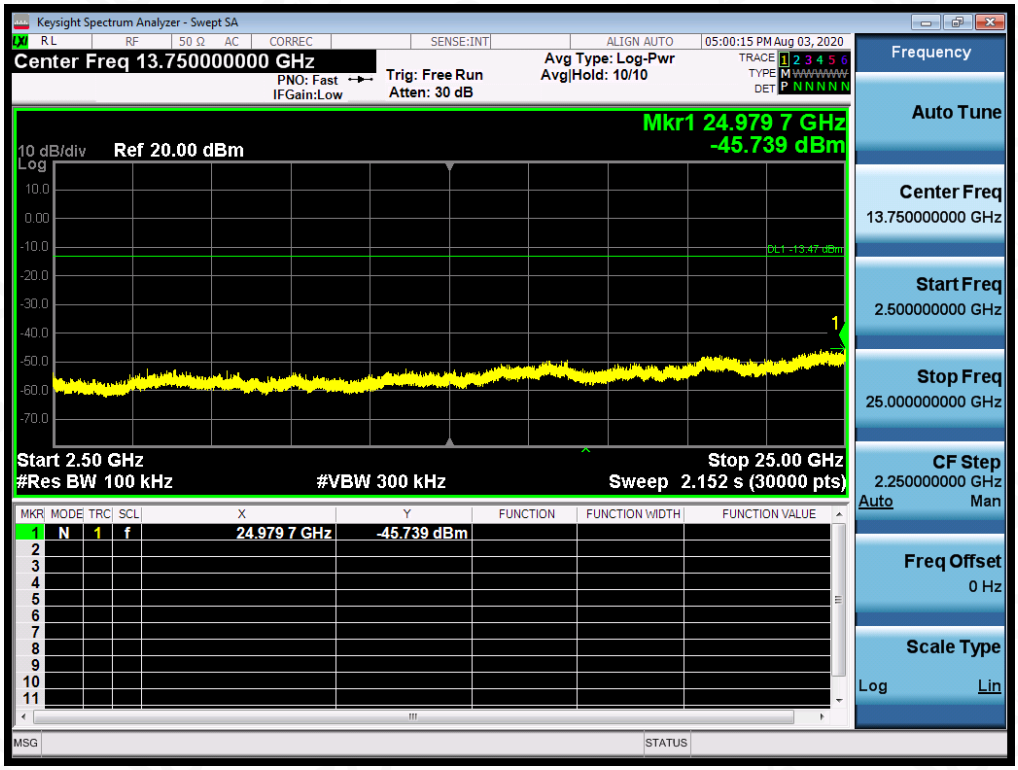






GFSK MODULATION IN HIGH CHANNEL

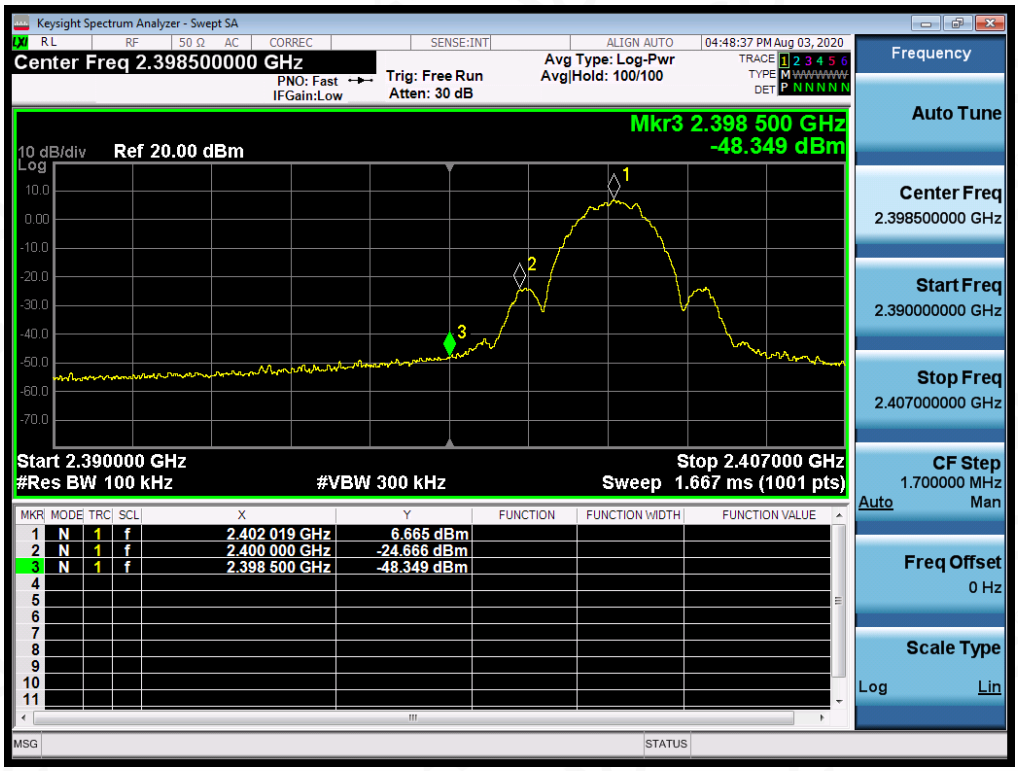




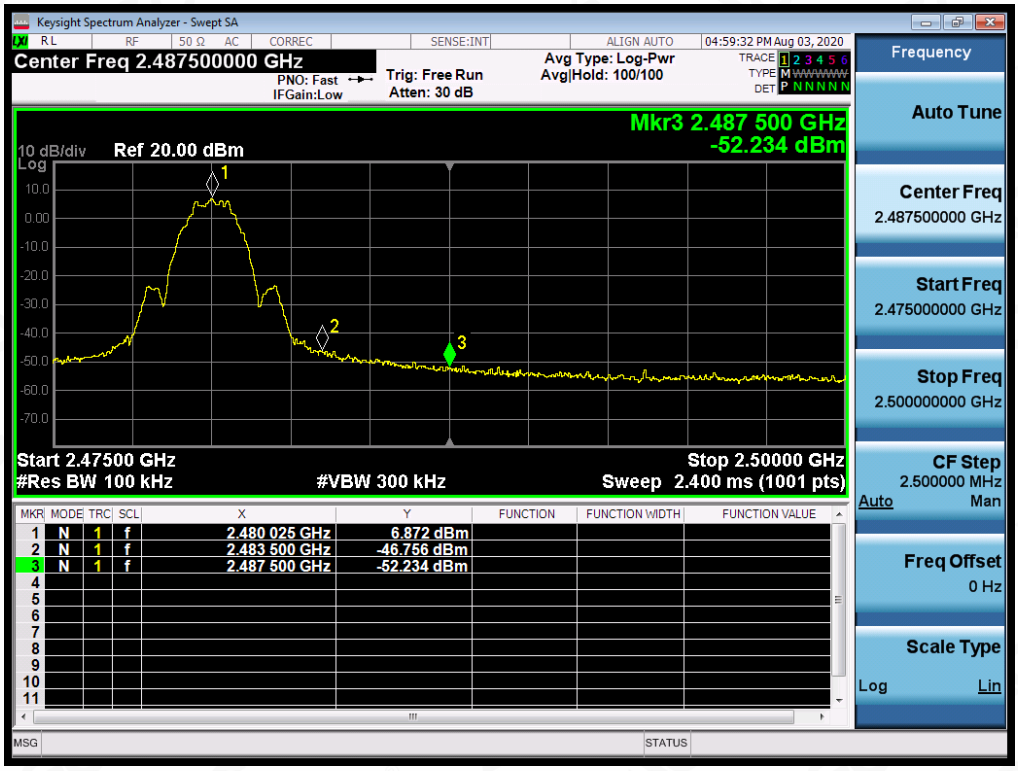
Note: The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit.

TEST RESULT FOR BAND EDGE

GFSK MODULATION IN LOW CHANNEL



GFSK MODULATION IN HIGH CHANNEL



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.

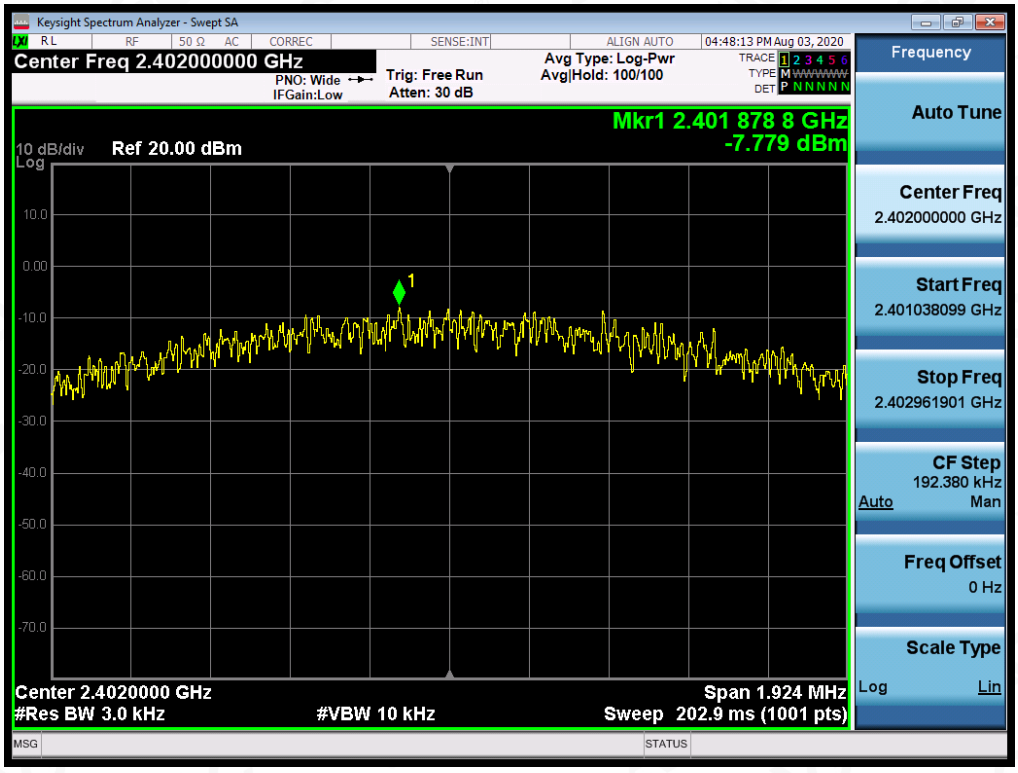
10.3. MEASUREMENT EQUIPMENT USED

Refer to Section 6.

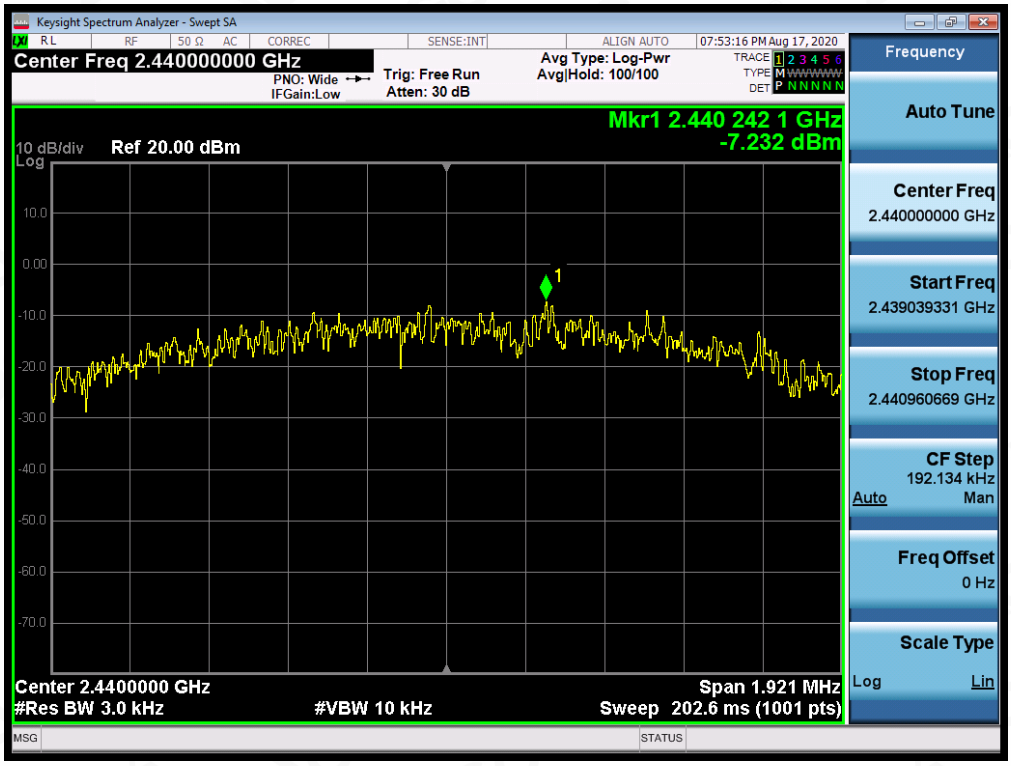
10.4. LIMITS AND MEASUREMENT RESULT

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-7.779	8	Pass
Middle Channel	-7.231	8	Pass
High Channel	-7.153	8	Pass

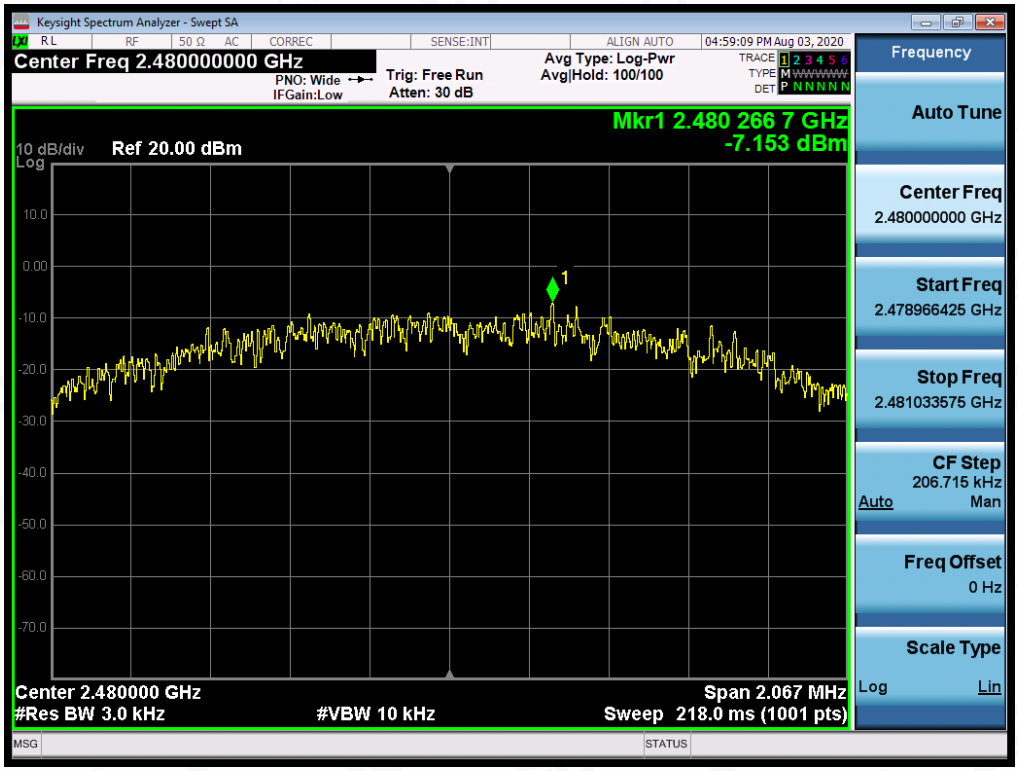
TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



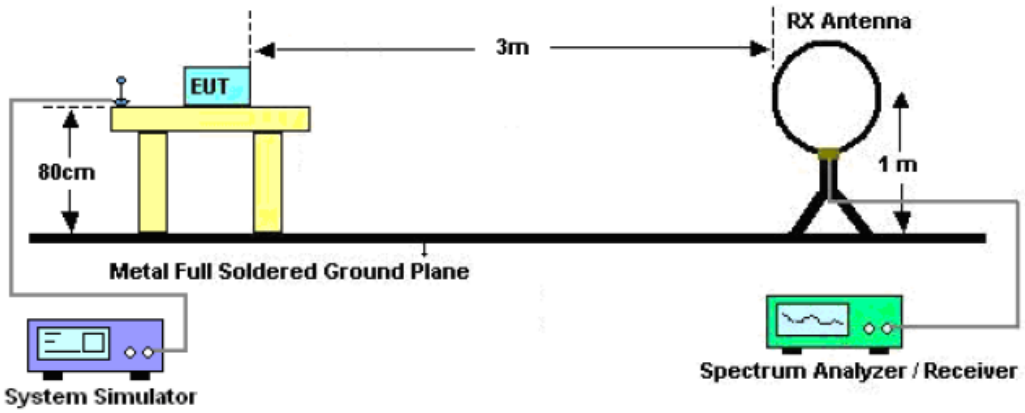
11. RADIATED EMISSION

11.1. MEASUREMENT PROCEDURE

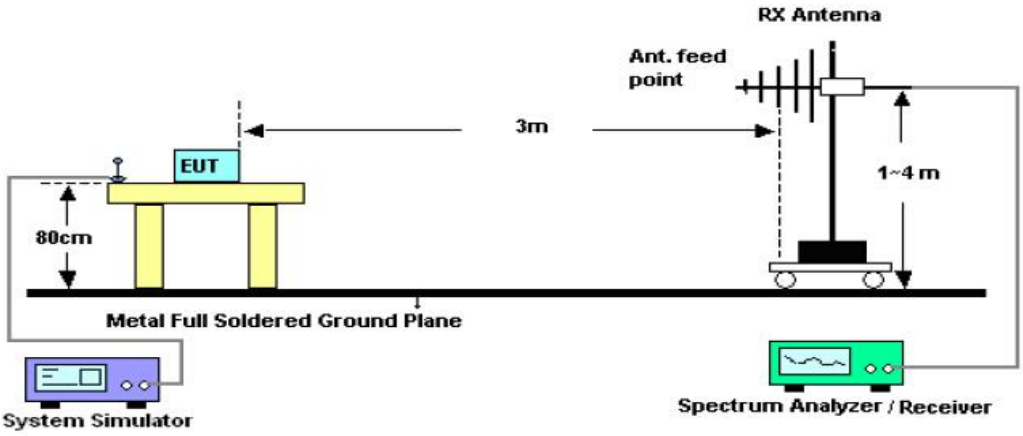
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated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

11.2. TEST SETUP

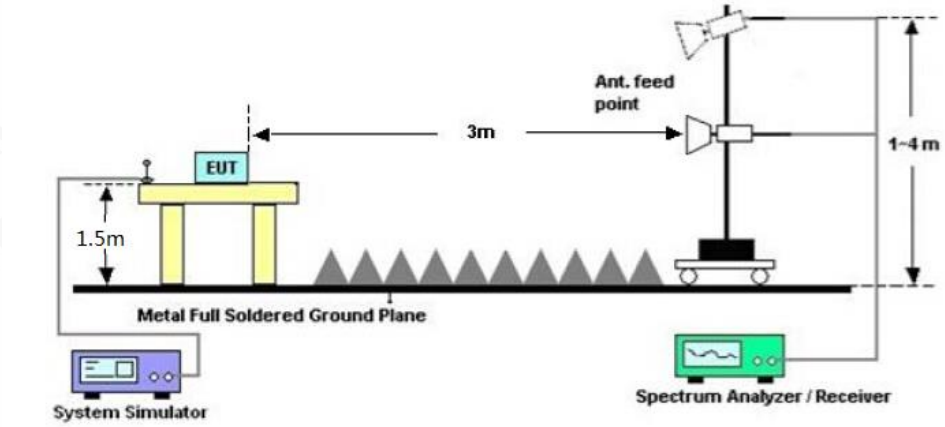
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



11.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

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

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

11.4. TEST RESULT

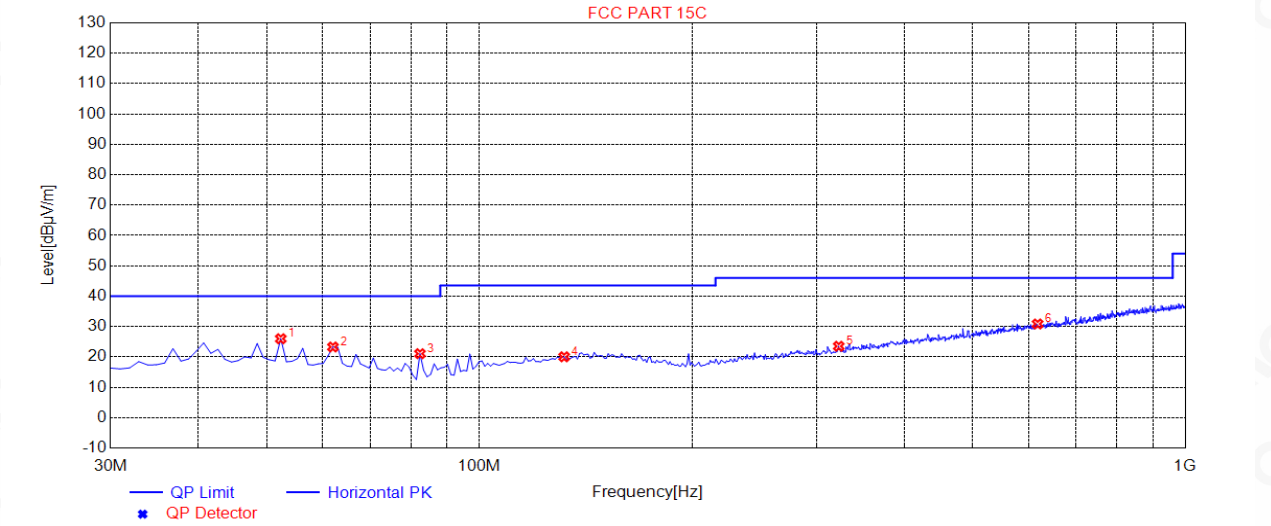
RADIATED EMISSION BELOW 30MHz

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

RADIATED EMISSION BELOW 1GHZ

Antenna 1

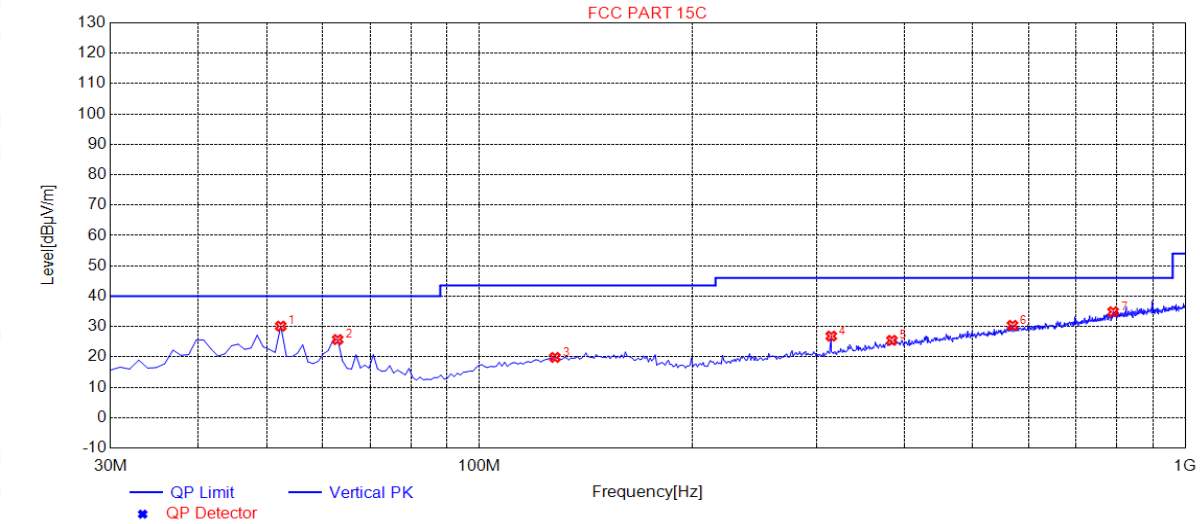
EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.3100	25.99	11.49	40.00	14.01	200	196	Horizontal
2	62.0100	23.27	10.58	40.00	16.73	100	3	Horizontal
3	82.3800	21.06	7.17	40.00	18.94	200	0	Horizontal
4	131.8500	20.04	14.28	43.50	23.46	200	263	Horizontal
5	322.9400	23.51	16.80	46.00	22.49	200	88	Horizontal
6	617.8200	30.85	24.60	46.00	15.15	100	208	Horizontal

RESULT: PASS

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

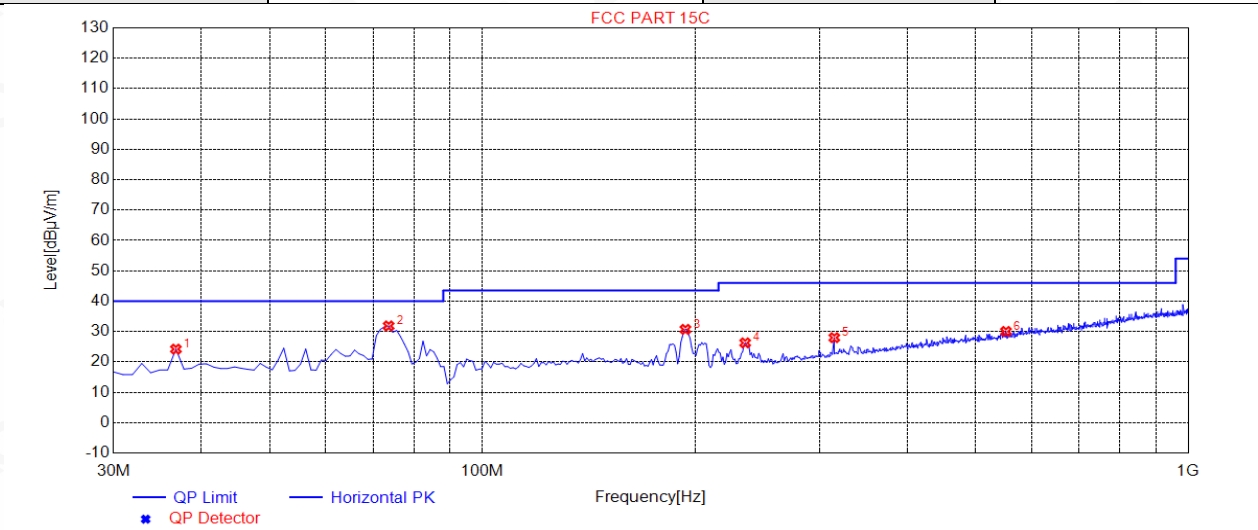


NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.3100	30.13	11.49	40.00	9.87	100	87	Vertical
2	62.9800	25.71	10.42	40.00	14.29	100	360	Vertical
3	127.9700	19.83	14.01	43.50	23.67	100	259	Vertical
4	315.1800	26.85	16.48	46.00	19.15	100	244	Vertical
5	384.0500	25.46	19.23	46.00	20.54	100	161	Vertical
6	569.3200	30.39	23.67	46.00	15.61	100	291	Vertical
7	790.4800	34.88	28.26	46.00	11.12	100	124	Vertical

RESULT: PASS

Antenna 2

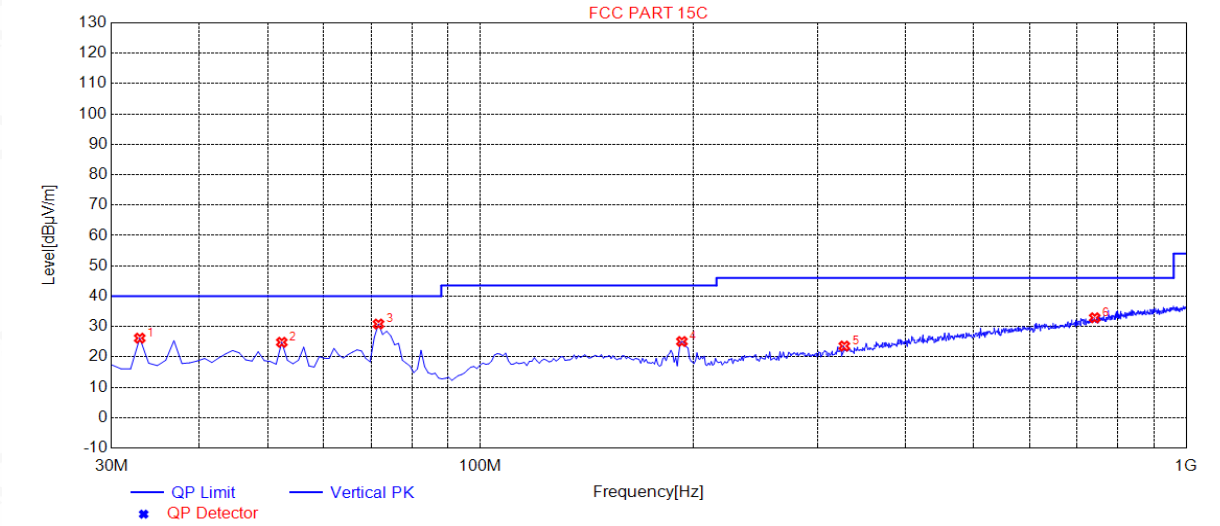
EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7900	24.21	11.16	40.00	15.79	200	68	Horizontal
2	73.6500	31.85	8.47	40.00	8.15	200	191	Horizontal
3	193.9300	30.71	12.34	43.50	12.79	100	74	Horizontal
4	235.6400	26.28	14.48	46.00	19.72	100	296	Horizontal
5	315.1800	27.98	16.48	46.00	18.02	200	78	Horizontal
6	551.8600	30.03	23.29	46.00	15.97	200	1	Horizontal

RESULT: PASS

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

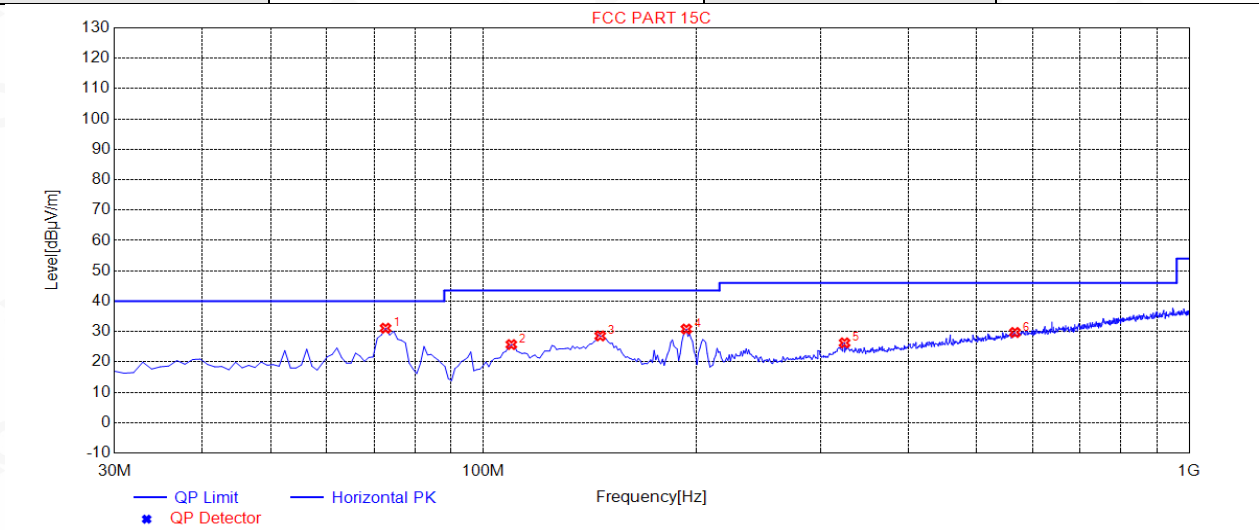


NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	32.9100	26.18	10.36	40.00	13.82	100	0	Vertical
2	52.3100	24.81	11.49	40.00	15.19	100	6	Vertical
3	71.7100	30.83	8.87	40.00	9.17	100	253	Vertical
4	192.9600	25.08	12.38	43.50	18.42	100	146	Vertical
5	327.7900	23.58	16.99	46.00	22.42	100	351	Vertical
6	741.9800	32.88	27.02	46.00	13.12	100	359	Vertical

RESULT: PASS

Antenna 3

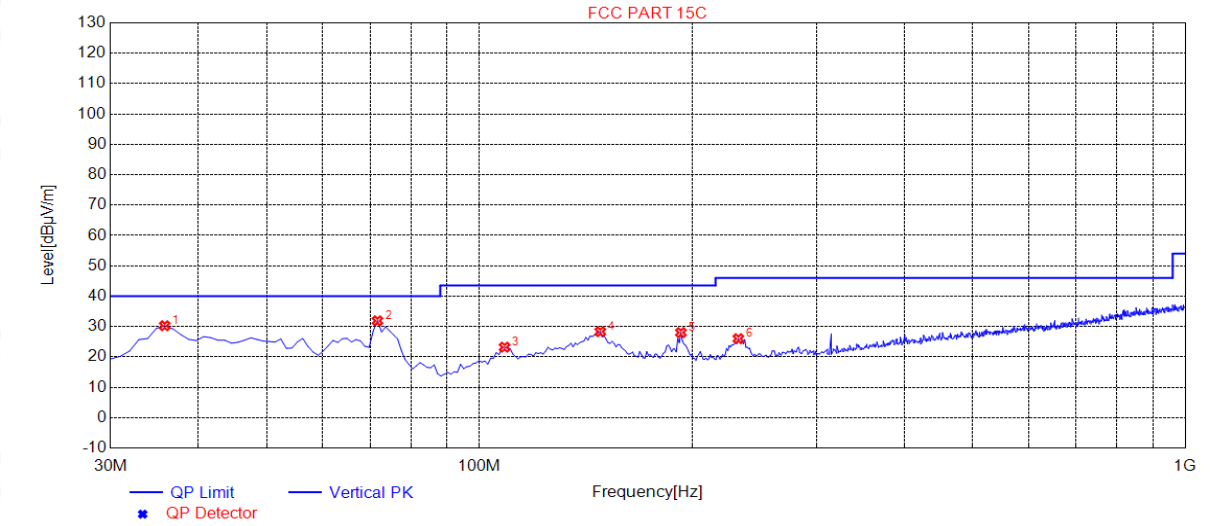
EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	72.6800	31.10	8.67	40.00	8.90	200	339	Horizontal
2	109.5400	25.72	12.37	43.50	17.78	200	273	Horizontal
3	146.4000	28.56	14.88	43.50	14.94	200	222	Horizontal
4	193.9300	30.82	12.34	43.50	12.68	100	333	Horizontal
5	324.8800	26.27	16.88	46.00	19.73	100	75	Horizontal
6	566.4100	29.69	23.59	46.00	16.31	100	176	Horizontal

RESULT: PASS

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

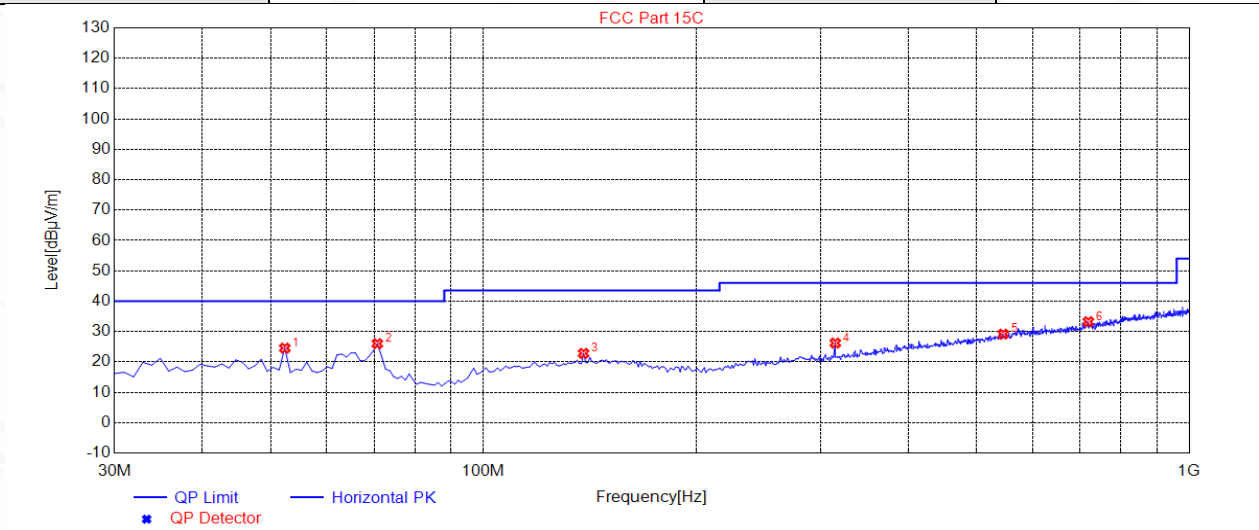


NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	35.8200	30.26	10.93	40.00	9.74	100	181	Vertical
2	71.7100	31.89	8.87	40.00	8.11	100	205	Vertical
3	108.5700	23.21	12.27	43.50	20.29	100	282	Vertical
4	148.3400	28.31	14.88	43.50	15.19	100	299	Vertical
5	192.9600	28.02	12.38	43.50	15.48	100	195	Vertical
6	232.7300	26.02	14.25	46.00	19.98	100	222	Vertical

RESULT: PASS

Antenna 4

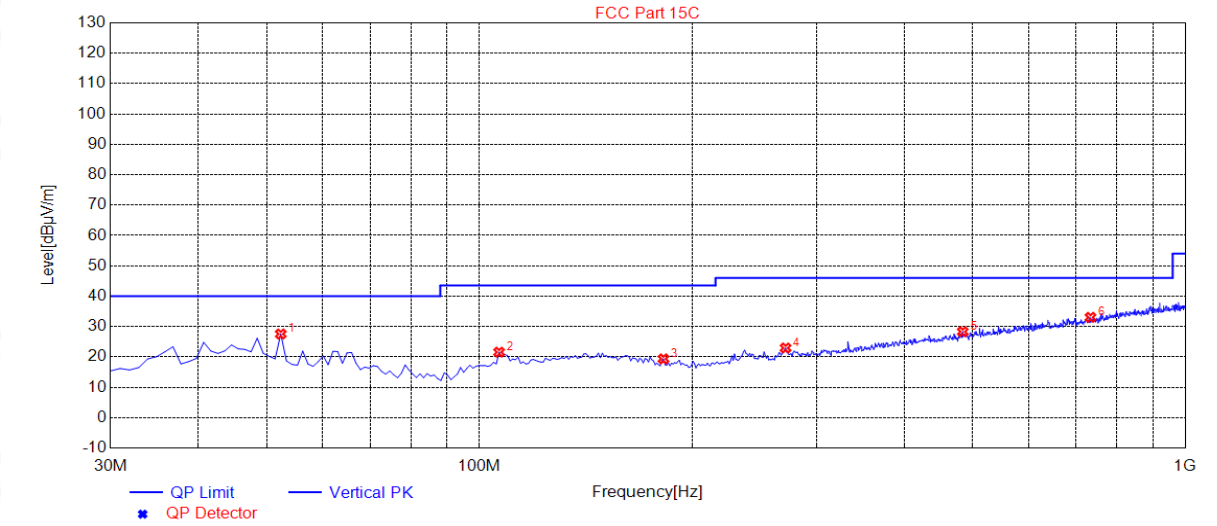
EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.3100	24.53	11.49	40.00	15.47	100	42	Horizontal
2	70.7400	26.02	9.07	40.00	13.98	100	360	Horizontal
3	138.6400	22.82	14.78	43.50	20.68	100	69	Horizontal
4	315.1800	26.22	16.48	46.00	19.78	100	61	Horizontal
5	545.0700	29.16	23.17	46.00	16.84	100	66	Horizontal
6	719.6700	33.26	26.45	46.00	12.74	100	53	Horizontal

RESULT: PASS

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical



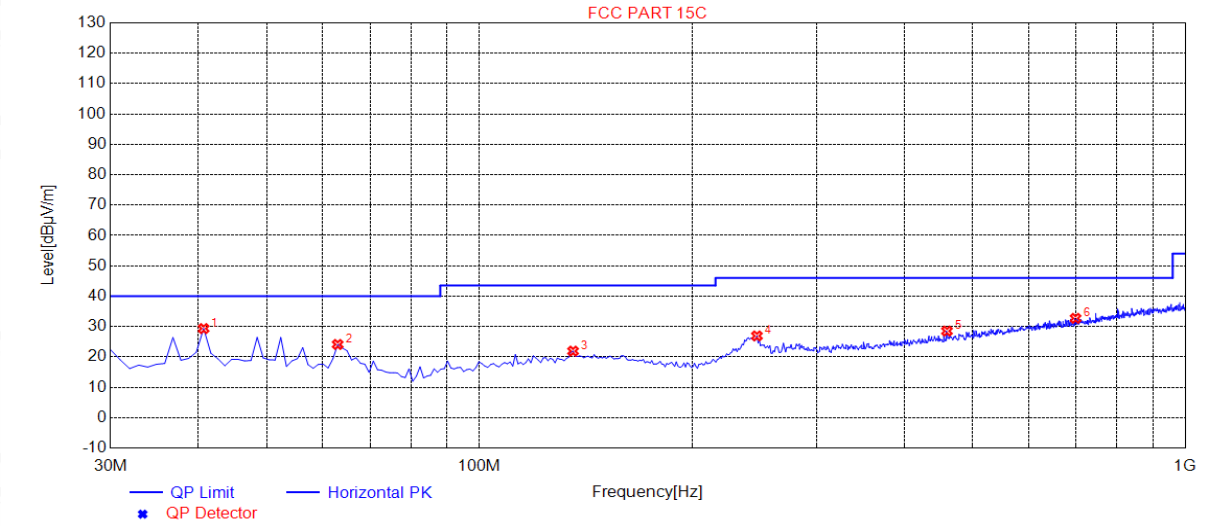
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.3100	27.55	11.49	40.00	12.45	100	297	Vertical
2	106.6300	21.57	12.07	43.50	21.93	100	86	Vertical
3	182.2900	19.35	12.88	43.50	24.15	100	238	Vertical
4	271.5300	22.94	15.55	46.00	23.06	100	206	Vertical
5	483.9600	28.31	21.81	46.00	17.69	100	46	Vertical
6	734.2200	33.03	26.83	46.00	12.97	100	344	Vertical

RESULT: PASS

Note:

1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.
2. All test modes had been tested. The mode 1 is the worst case and recorded in the report.

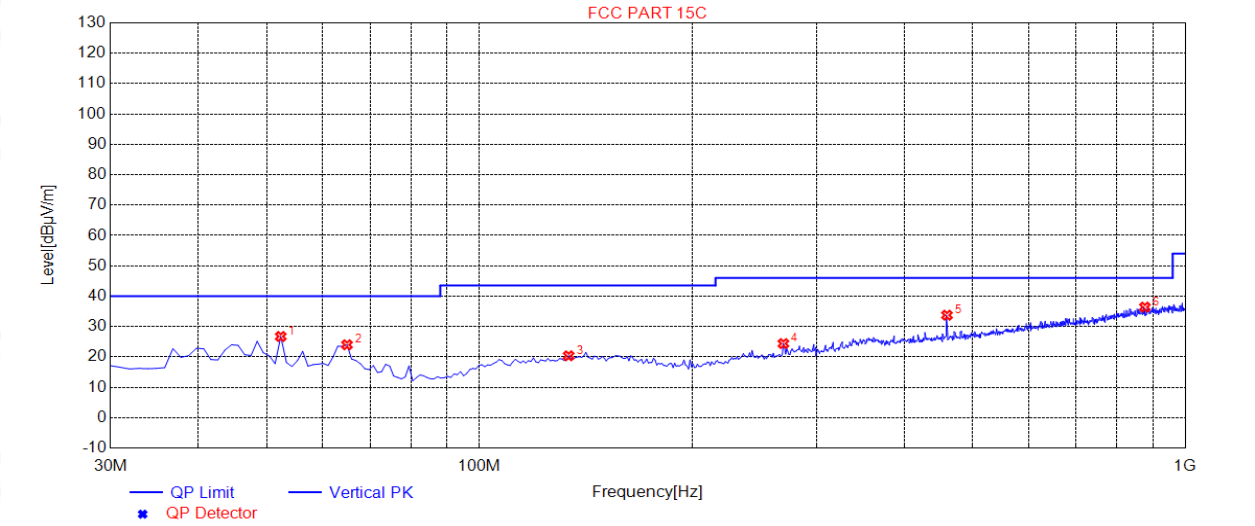
EUT	u-blox	Model Name	NINA-B406
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	40.6700	29.33	11.91	40.00	10.67	150	354	Horizontal
2	62.9800	24.11	10.42	40.00	15.89	150	280	Horizontal
3	135.7300	21.92	14.56	43.50	21.58	150	345	Horizontal
4	247.2800	26.92	14.73	46.00	19.08	150	250	Horizontal
5	459.7100	28.52	21.18	46.00	17.48	150	311	Horizontal
6	699.3000	32.70	25.95	46.00	13.30	150	1	Horizontal

RESULT: PASS

EUT	u-blox	Model Name	NINA-B406
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.3100	26.73	11.49	40.00	13.27	150	319	Vertical
2	64.9200	24.00	10.09	40.00	16.00	150	340	Vertical
3	133.7900	20.37	14.42	43.50	23.13	150	104	Vertical
4	269.5900	24.39	15.38	46.00	21.61	150	349	Vertical
5	459.7100	33.74	21.18	46.00	12.26	150	6	Vertical
6	876.8100	36.40	29.69	46.00	9.60	150	343	Vertical

RESULT: PASS

Note:

1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.
2. All test modes had been tested. The mode 1 is the worst case and recorded in the report.

RADIATED EMISSION ABOVE 1GHZ

Antenna 1

EUT	u-blox	**Model Name**	NINA-B400
Temperature	25° C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 1	**Antenna**	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	46.18	0.08	46.26	74	-27.74	peak
4804.000	35.37	0.08	35.45	54	-18.55	AVG
7206.000	41.09	2.21	43.3	74	-30.7	peak
7206.000	32.57	2.21	34.78	54	-19.22	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	**Model Name**	NINA-B400
Temperature	25° C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 1	**Antenna**	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	45.19	0.08	45.27	74	-28.73	peak
4804.000	35.47	0.08	35.55	54	-18.45	AVG
7206.000	39.46	2.21	41.67	74	-32.33	peak
7206.000	30.58	2.21	32.79	54	-21.21	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	44.68	0.14	44.82	74	-29.18	peak
4880.000	35.79	0.14	35.93	54	-18.07	AVG
7320.000	39.48	2.36	41.84	74	-32.16	peak
7320.000	30.25	2.36	32.61	54	-21.39	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	47.15	0.14	47.29	74	-26.71	peak
4880.000	38.64	0.14	38.78	54	-15.22	AVG
7320.000	41.84	2.36	44.2	74	-29.8	peak
7320.000	32.51	2.36	34.87	54	-19.13	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	46.49	0.22	46.71	74	-27.29	peak
4960.000	35.18	0.22	35.4	54	-18.6	AVG
7440.000	40.56	2.64	43.2	74	-30.8	peak
7440.000	25.49	2.64	28.13	54	-25.87	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	43.59	0.22	43.81	74	-30.19	peak
4960.000	35.16	0.22	35.38	54	-18.62	AVG
7440.000	39.97	2.64	42.61	74	-31.39	peak
7440.000	30.23	2.64	32.87	54	-21.13	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Antenna 2

EUT	u-blox	**Model Name**	NINA-B400
Temperature	25° C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 1	**Antenna**	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	47.46	0.08	47.54	74	-26.46	peak
4804.000	36.48	0.08	36.56	54	-17.44	AVG
7206.000	42.13	2.21	44.34	74	-29.66	peak
7206.000	32.19	2.21	34.4	54	-19.6	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	**Model Name**	NINA-B400
Temperature	25° C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 1	**Antenna**	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	46.23	0.08	46.31	74	-27.69	peak
4804.000	35.18	0.08	35.26	54	-18.74	AVG
7206.000	40.18	2.21	42.39	74	-31.61	peak
7206.000	30.47	2.21	32.68	54	-21.32	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	46.19	0.14	46.33	74	-27.67	peak
4880.000	35.18	0.14	35.32	54	-18.68	AVG
7320.000	39.47	2.36	41.83	74	-32.17	peak
7320.000	30.16	2.36	32.52	54	-21.48	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	48.94	0.14	49.08	74	-24.92	peak
4880.000	38.43	0.14	38.57	54	-15.43	AVG
7320.000	41.47	2.36	43.83	74	-30.17	peak
7320.000	31.06	2.36	33.42	54	-20.58	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	46.59	0.22	46.81	74	-27.19	peak
4960.000	35.17	0.22	35.39	54	-18.61	AVG
7440.000	40.17	2.64	42.81	74	-31.19	peak
7440.000	30.34	2.64	32.98	54	-21.02	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	Model Name	NINA-B400
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	43.59	0.22	43.81	74	-30.19	peak
4960.000	34.27	0.22	34.49	54	-19.51	AVG
7440.000	38.47	2.64	41.11	74	-32.89	peak
7440.000	28.46	2.64	31.1	54	-22.9	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Antenna 3

EUT	u-blox	**Model Name**	NINA-B400
Temperature	25° C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 1	**Antenna**	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	46.94	0.08	47.02	74	-26.98	peak
4804.000	35.67	0.08	35.75	54	-18.25	AVG
7206.000	42.18	2.21	44.39	74	-29.61	peak
7206.000	31.27	2.21	33.48	54	-20.52	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	u-blox	**Model Name**	NINA-B400
Temperature	25° C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 1	**Antenna**	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	46.19	0.08	46.27	74	-27.73	peak
4804.000	35.18	0.08	35.26	54	-18.74	AVG
7206.000	39.47	2.21	41.68	74	-32.32	peak
7206.000	30.48	2.21	32.69	54	-21.31	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						