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# FCC Test Report

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Report No.: AGC09881200501FE02D

**FCC ID** : XPYNINAB4  
**APPLICATION PURPOSE** : Class II Equipment  
**PRODUCT DESIGNATION** : NINA-B411  
**BRAND NAME** : u-blox  
**MODEL NAME** : NINA-B411  
**APPLICANT** : u-blox AG  
**DATE OF ISSUE** : Feb. 02, 2024  
**STANDARD(S)** : FCC Part 15.247  
**REPORT VERSION** : V1.0

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### REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Feb. 02, 2024	Valid	Initial Release

**Note:** The original test report AGC09881200501FE02B (dated Oct. 19, 2021 and tested from Oct. 12, 2021 to Oct. 19, 2021) was modified on Feb. 02, 2024, including the following changes and additions:

- Change the product designation;
- Change the test model;
- Removed series model;
- Added the name and address of the factory;
- Changed antenna type and antenna gain;
- Shield 2.4G wireless technology by software;

For the above described change(s), the Radiated Emission, Band Edge Emission, conducted emission had been tested for the Class II device.

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**APPENDIX A: PHOTOGRAPHS OF TEST SETUP ..... 31**

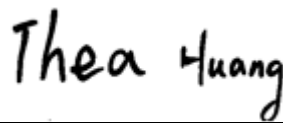
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### 1. VERIFICATION OF COMPLIANCE

<b>Applicant</b>	u-blox AG
<b>Address</b>	Zuercherstrasse 68, Ch-8800 Thalwil, Switzerland
<b>Manufacturer</b>	u-blox AG
<b>Address</b>	Zuercherstrasse 68, Ch-8800 Thalwil, Switzerland
<b>Factory</b>	u-blox AG
<b>Address</b>	Zuercherstrasse 68, Ch-8800 Thalwil, Switzerland
<b>Product Designation</b>	NINA-B411
<b>Brand Name</b>	u-blox
<b>Test Model</b>	NINA-B411
<b>Series Model</b>	N/A
<b>Difference Description</b>	N/A
<b>Date of receipt of test item</b>	Jan. 18, 2024
<b>Date of test</b>	Jan. 18, 2024 to Feb. 02, 2024
<b>Deviation</b>	No any deviation from the test method
<b>Condition of Test Sample</b>	Normal
<b>Test Result</b>	Pass
<b>Report Template</b>	AGCRT-US-BLE/RF

Note: The test results of this report relate only to the tested sample identified in this report.

Prepared By   
 \_\_\_\_\_  
 Thea Huang  
 (Project Engineer) Feb. 02, 2024

Reviewed By   
 \_\_\_\_\_  
 Calvin Liu  
 (Reviewer) Feb. 02, 2024

Approved By   
 \_\_\_\_\_  
 Max Zhang  
 (Authorized Officer) Feb. 02, 2024

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## 2. GENERAL INFORMATION

### 2.1. PRODUCT DESCRIPTION

The EUT is designed as a “NINA-B411”. 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

<b>Operation Frequency</b>	2.402 GHz to 2.480GHz
<b>RF Output Power</b>	5.817dBm (Max)
<b>Bluetooth Version</b>	V 5.1
<b>Modulation</b>	BR <input type="checkbox"/> GFSK, EDR <input type="checkbox"/> π/4-DQPSK, <input type="checkbox"/> 8DPSK BLE <input checked="" type="checkbox"/> GFSK 1Mbps <input type="checkbox"/> GFSK 2Mbps
<b>Number of channels</b>	40 Channels
<b>Antenna Designation</b>	Patch Antenna(Comply with requirements of the FCC part 15.203)
<b>Antenna Gain</b>	Antenna 1:-3.8dBi Antenna 2:-4.6dBi Antenna 3:-4.2dBi
<b>Hardware Version</b>	A
<b>Software Version</b>	V1.0
<b>Power Supply</b>	DC 3.3V
<b>Note:</b>	
<p>1. The EUT has 3 antennas. Due to the maximum antenna gain of antenna 1, only the worst-case test data for antenna 1 was recorded in the test report.</p> <p>2. “ANT-B11” is an antenna designed to be used for Bluetooth Direction Finding with the Bluetooth LE module NINA-B411. The antenna element of ANT-B11 is connected to the RF-port of NINA-B411 via printed board microstrip trace layout thus NINA-B411 is soldered onto the ANT-B11 When operating together with ANT-B11 NINA-B411 uses GFSK 1 Mbps and 2 Mbps Bluetooth LE modes.</p>	

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**2.2. TABLE OF CARRIER FREQUENCIES**

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

**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 radiator 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  $y \pm U$ , 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,  $U_c = \pm 3.2$  dB
- Uncertainty of Radiated Emission below 1GHz,  $U_c = \pm 3.9$  dB
- Uncertainty of Radiated Emission above 1GHz,  $U_c = \pm 4.8$  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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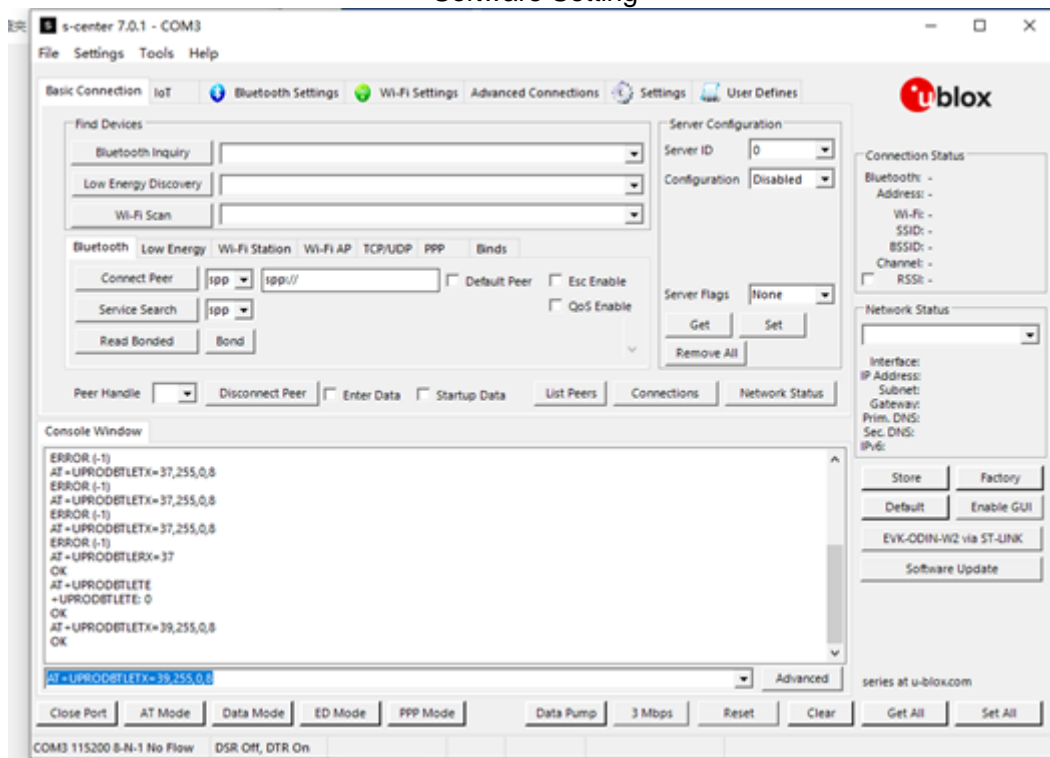
#### 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX_2402MHz_GFSK_1Mbps
2	Middle channel TX_2440MHz_GFSK_1Mbps
3	High channel TX_2480MHz_GFSK_1Mbps

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.

#### Software Setting



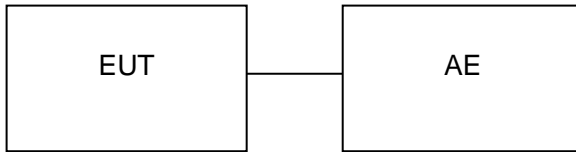
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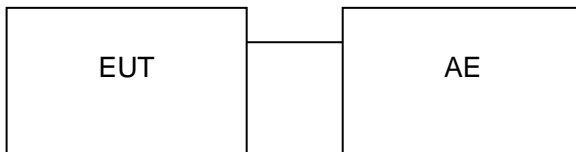
## 5. SYSTEM TEST CONFIGURATION

### 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	NINA-B411	NINA-B411	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
15.209	Radiated Emission	Compliant
15.207	Conducted Emission	Compliant

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## 6. TEST FACILITY

<b>Test Site</b>	Attestation of Global Compliance (Shenzhen) Co., Ltd
<b>Location</b>	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
<b>Designation Number</b>	CN1259
<b>FCC Test Firm Registration Number</b>	975832
<b>A2LA Cert. No.</b>	5054.02
<b>Description</b>	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	2400-2500	N/A	Mar. 22, 2022	Mar. 21, 2024
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 24, 2023	Sep. 23, 2025
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Mar. 12, 2022	Mar. 11, 2024
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Mar. 23, 2023	Mar. 22, 2024
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 02, 2022	Sep. 01, 2024
Wideband Antenna	SCHWARZBECK	VULB9168	D69250	May 11, 2023	May 10, 2025
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

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## 7. RADIATED EMISSION

### 7.1. 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.

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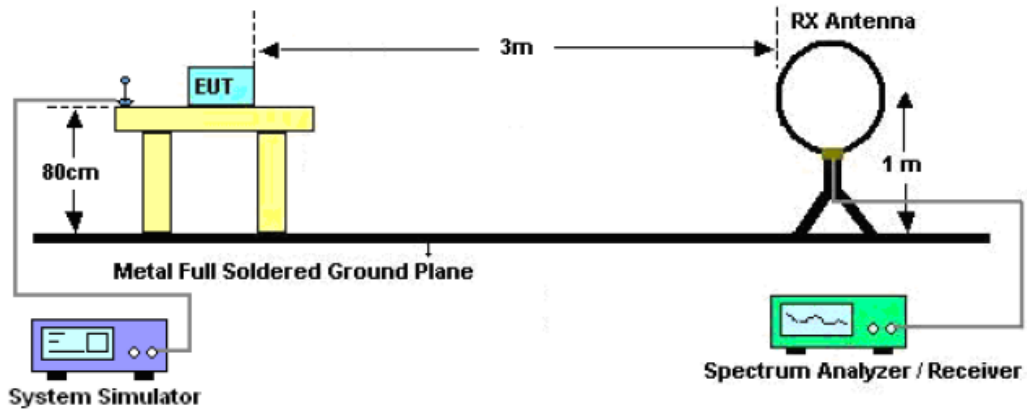
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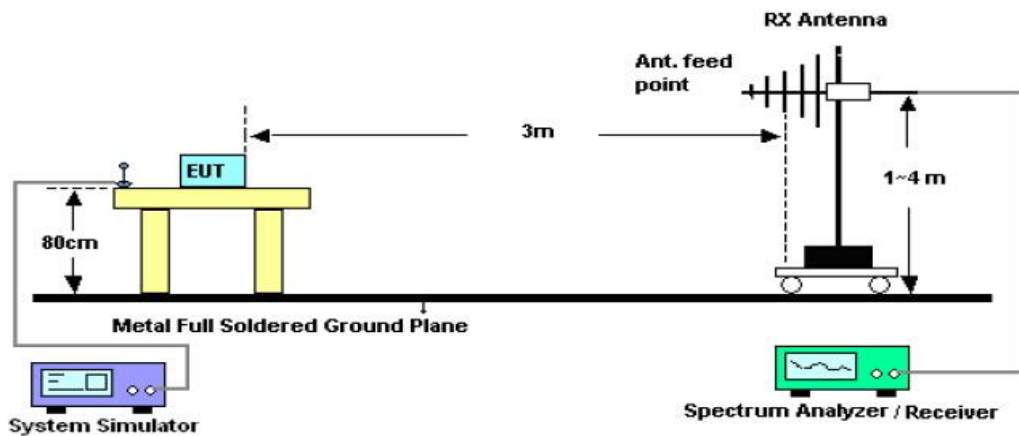
Tel: +86-755 2523 4088 E-mail: [agc@agccert.com](mailto:agc@agccert.com) Web: <http://www.agccert.com/>

## 7.2. TEST SETUP

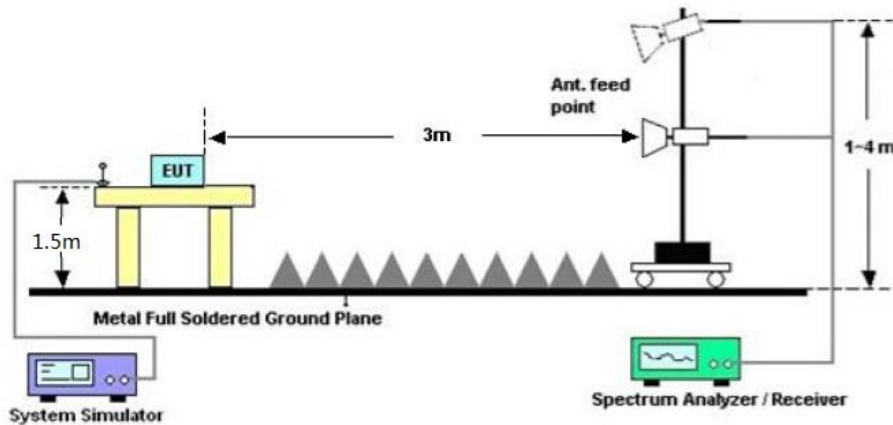
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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### 7.3. 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.

### 7.4. TEST RESULT

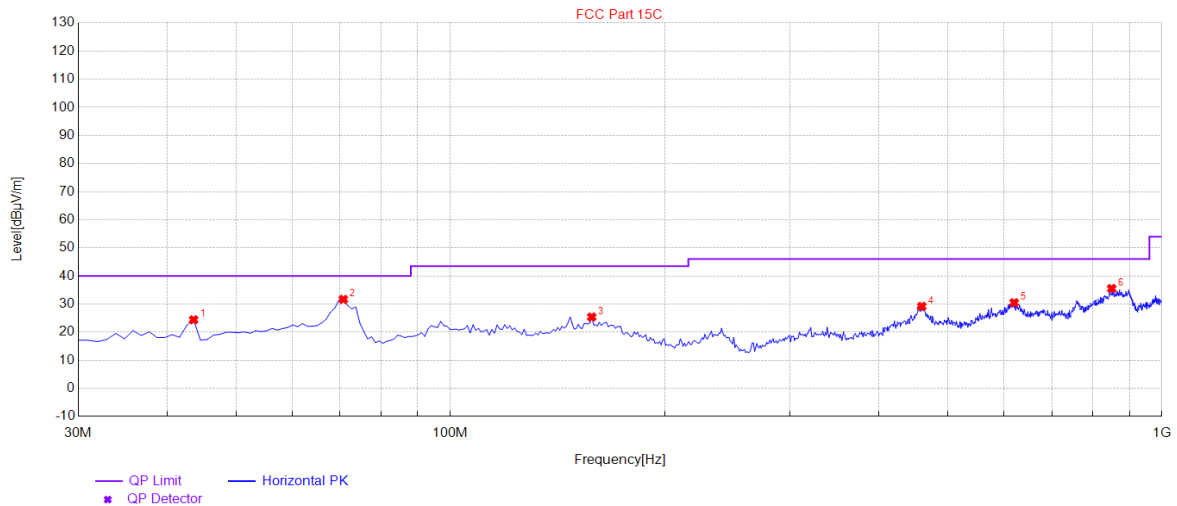
#### RADIATED EMISSION BELOW 30MHz

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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**RADIATED EMISSION BELOW 1GHZ**

<b>EUT</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Horizontal



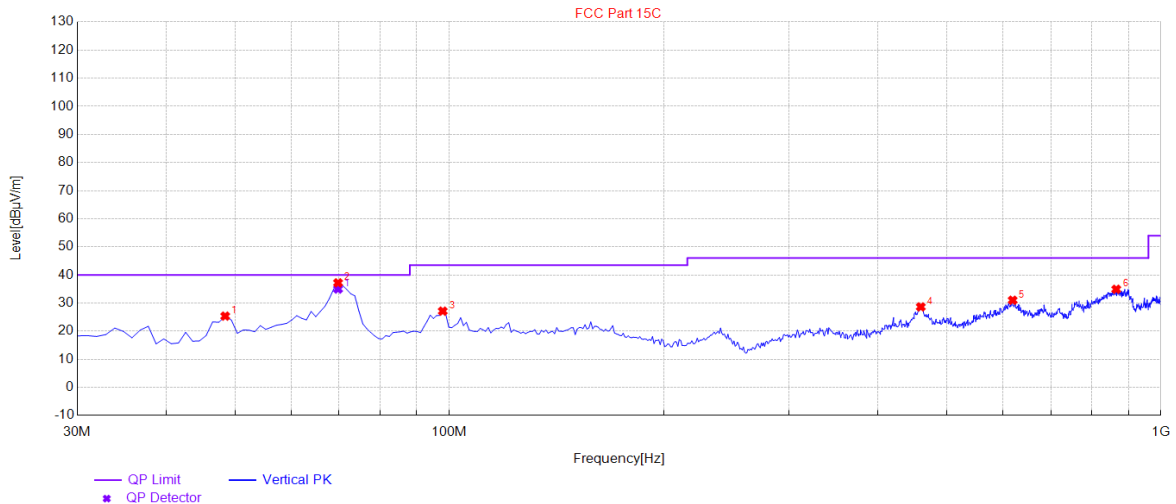
Final Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	43.58	24.41	12.03	40.00	15.59	100	300	Horizontal
2	70.74	31.66	14.45	40.00	8.34	100	150	Horizontal
3	158.04	25.41	17.69	43.50	18.09	100	30	Horizontal
4	459.71	29.19	24.69	46.00	16.81	100	230	Horizontal
5	619.76	30.50	25.90	46.00	15.50	100	250	Horizontal
6	849.65	35.53	29.68	46.00	10.47	100	260	Horizontal

**RESULT: PASS**

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<b>EUT</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Vertical



Peak Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	48.43	25.36	14.44	40.00	14.64	100	130	Vertical
2	69.77	37.20	14.73	40.00	2.80	100	230	Vertical
3	97.9	27.13	16.44	43.50	16.37	100	190	Vertical
4	459.71	28.64	24.69	46.00	17.36	100	100	Vertical
5	618.79	31.01	25.79	46.00	14.99	100	190	Vertical
6	865.17	34.91	29.84	46.00	11.09	100	250	Vertical

Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	69.77	14.73	34.99	40.00	5.01	100	230	Vertical

**RESULT: PASS**

**Note:**

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

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**RADIATED EMISSION ABOVE 1GHZ**

<b>EUT</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	45.89	0.08	45.97	74	-28.03	peak
4804.000	35.62	0.08	35.7	54	-18.3	AVG
7206.000	40.71	2.21	42.92	74	-31.08	peak
7206.000	30.85	2.21	33.06	54	-20.94	AVG

Remark:

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

<b>EUT</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	45.45	0.08	45.53	74	-28.47	peak
4804.000	35.69	0.08	35.77	54	-18.23	AVG
7206.000	40.92	2.21	43.13	74	-30.87	peak
7206.000	30.71	2.21	32.92	54	-21.08	AVG

Remark:

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

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<b>EUT</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 2	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	45.28	0.14	45.42	74	-28.58	peak
4880.000	36.89	0.14	37.03	54	-16.97	AVG
7320.000	41.54	2.36	43.9	74	-30.1	peak
7320.000	31.82	2.36	34.18	54	-19.82	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

<b>EUT</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 2	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4880.000	45.44	0.14	45.58	74	-28.42	peak
4880.000	36.67	0.14	36.81	54	-17.19	AVG
7320.000	41.59	2.36	43.95	74	-30.05	peak
7320.000	31.33	2.36	33.69	54	-20.31	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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<b>EUT</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 3	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	46.52	0.22	46.74	74	-27.26	peak
4960.000	35.76	0.22	35.98	54	-18.02	AVG
7440.000	41.54	2.64	44.18	74	-29.82	peak
7440.000	30.41	2.64	33.05	54	-20.95	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

<b>EUT</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 3	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	46.38	0.22	46.6	74	-27.4	peak
4960.000	35.45	0.22	35.67	54	-18.33	AVG
7440.000	41.69	2.64	44.33	74	-29.67	peak
7440.000	30.17	2.64	32.81	54	-21.19	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

**RESULT: PASS**

**Note:**

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

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

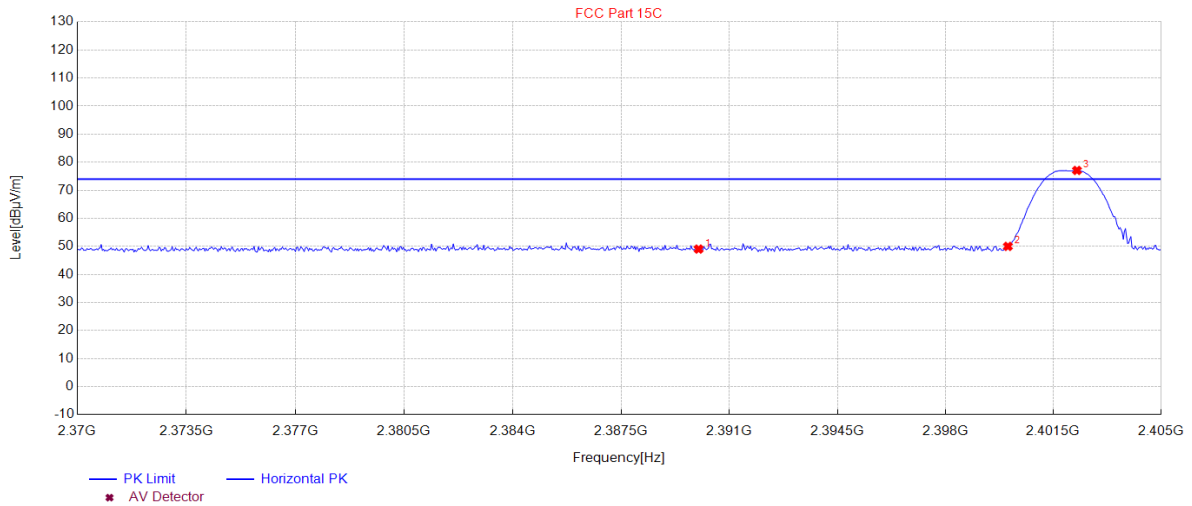
The “Factor” value can be calculated automatically by software of measurement system.

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### Band Edge Emission Test Results for Restricted Bands

<b>EUT Name</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna Polarity</b>	Horizontal

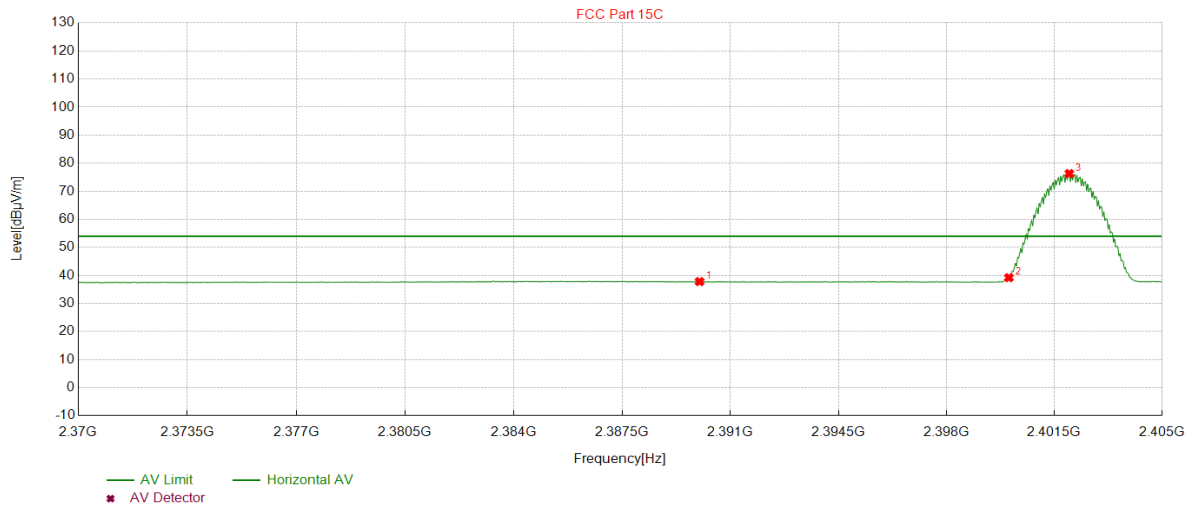
Test Graph for Peak Measurement



PK Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2390.005	49.04	34.40	74.00	24.96	150	350	Horizontal
2	2400.025	50.00	34.43	/	/	150	179	Horizontal
3	2402.2673	77.08	34.44	/	/	150	191	Horizontal

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### Test Graph for Average Measurement



PK Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2390.005	37.80	34.40	54.00	16.20	150	125	Horizontal
2	2400.025	39.21	34.43	/	/	150	171	Horizontal
3	2401.987	76.29	34.44	/	/	150	191	Horizontal

**RESULT: Pass**

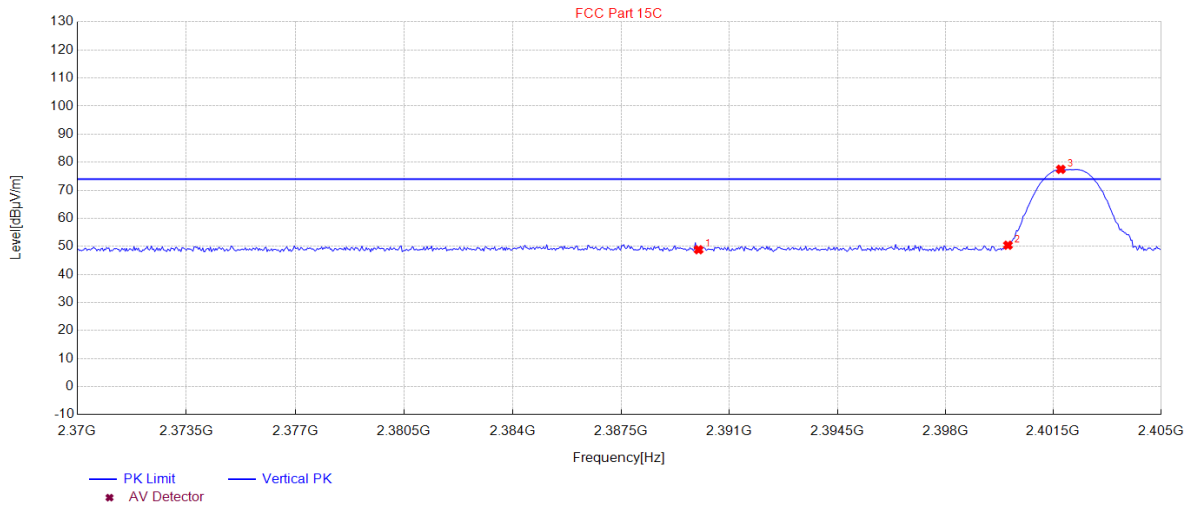
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**Band Edge Emission Test Results for Restricted Bands**

<b>EUT Name</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna Polarity</b>	Vertical

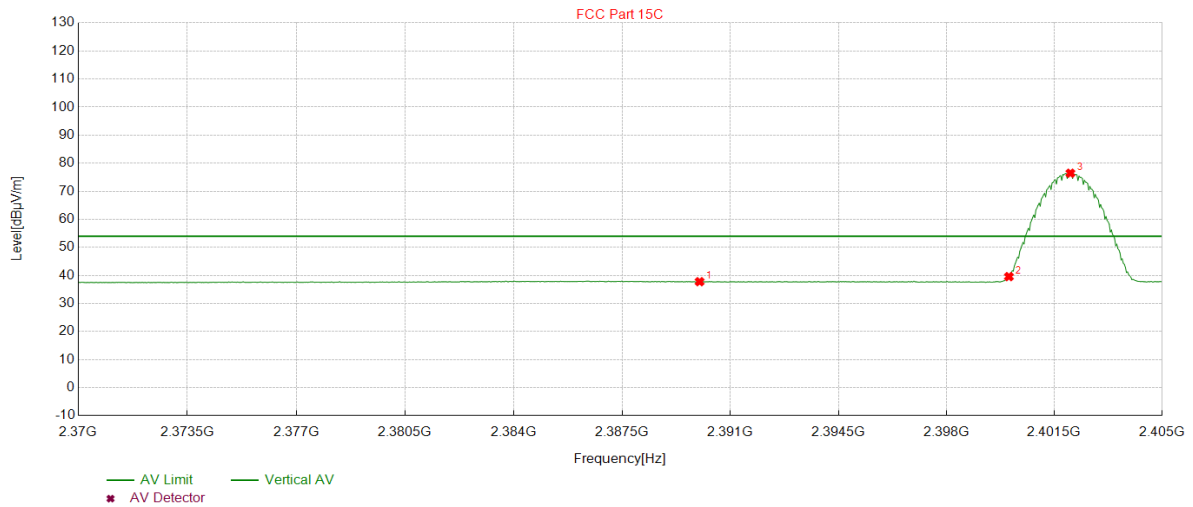
Test Graph for Peak Measurement



PK Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2390.005	48.81	34.40	74.00	25.19	150	260	Vertical
2	2400.025	50.41	34.43	/	/	150	152	Vertical
3	2401.7417	77.47	34.43	/	/	150	160	Vertical

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Test Graph for Average Measurement



PK Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2390.005	37.77	34.40	54.00	16.23	150	0	Vertical
2	2400.025	39.58	34.43	/	/	150	162	Vertical
3	2402.022	76.44	34.44	/	/	150	162	Vertical

**RESULT: Pass**

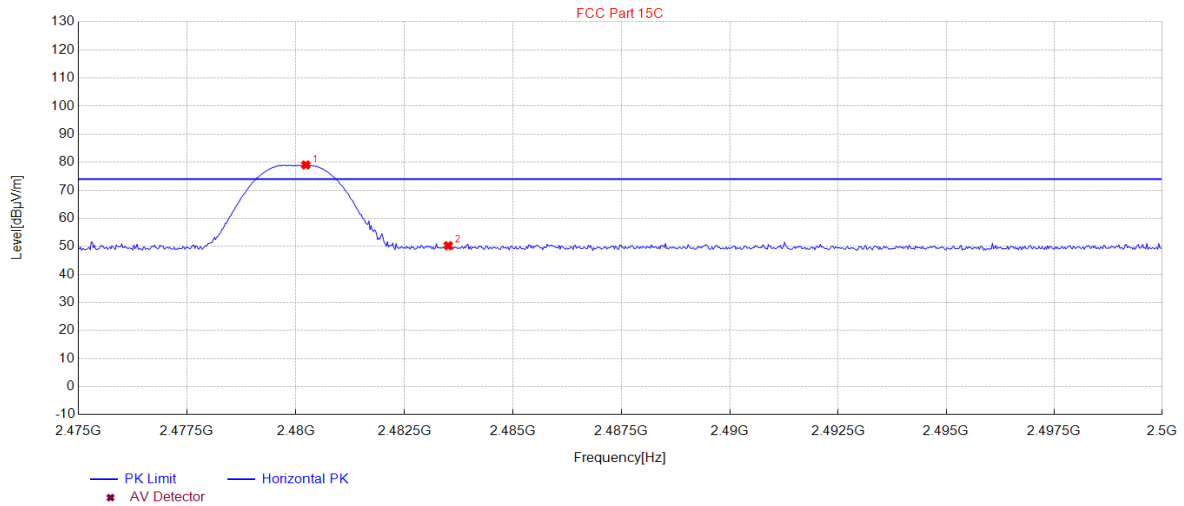
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### Band Edge Emission Test Results for Restricted Bands

<b>EUT Name</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 3	<b>Antenna Polarity</b>	Horizontal

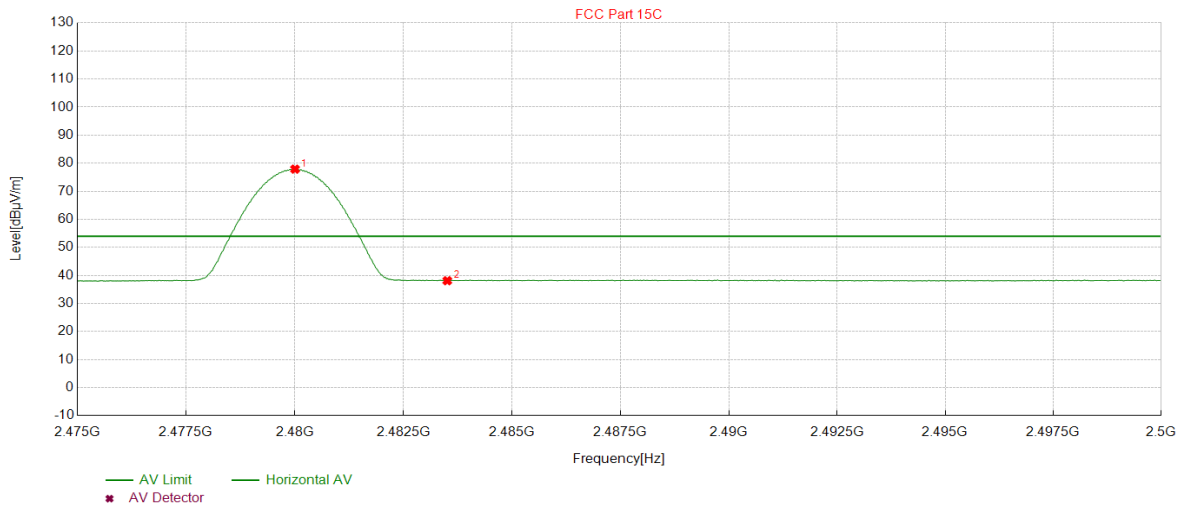
Test Graph for Peak Measurement



PK Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.2302	79.03	34.65	/	/	150	159	Horizontal
2	2483.5085	50.25	34.66	74.00	23.75	150	80	Horizontal

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### Test Graph for Average Measurement



PK Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.005	77.89	34.65	/	/	150	156	Horizontal
2	2483.5085	38.12	34.66	54.00	15.88	150	330	Horizontal

**RESULT: Pass**

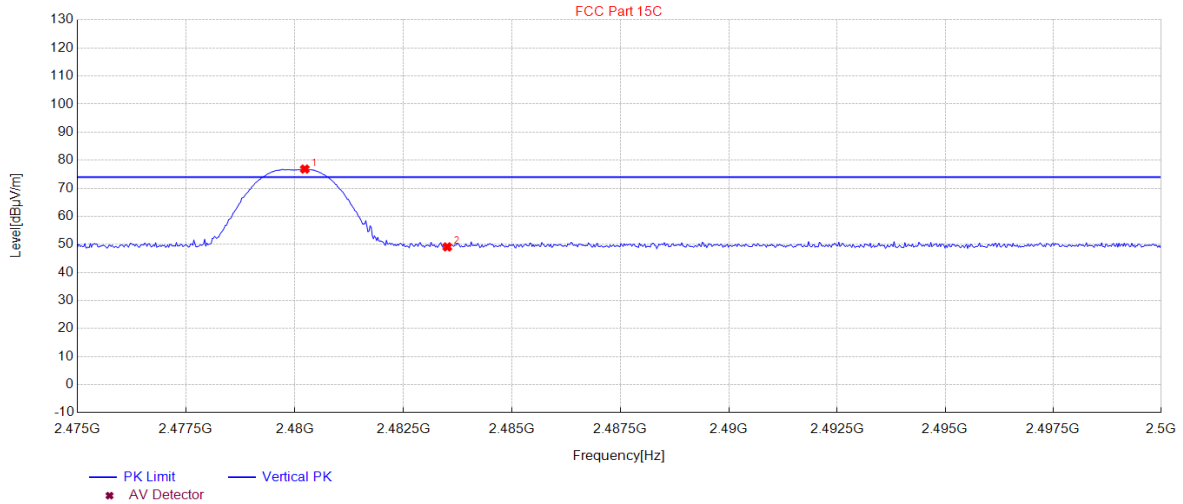
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**Band Edge Emission Test Results for Restricted Bands**

<b>EUT Name</b>	NINA-B411	<b>Model Name</b>	NINA-B411
<b>Temperature</b>	25° C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 3	<b>Antenna Polarity</b>	Vertical

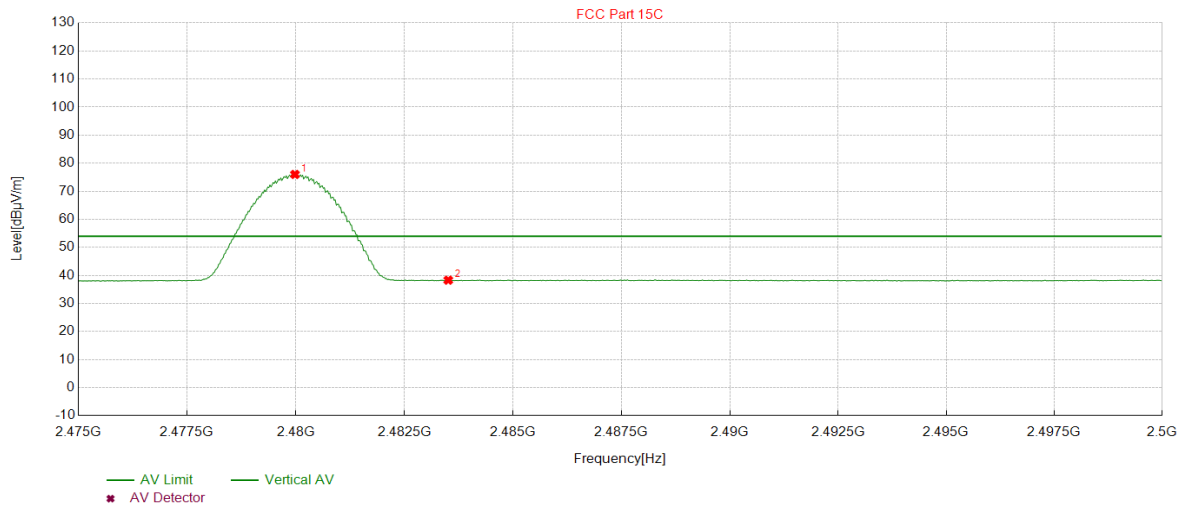
Test Graph for Peak Measurement



PK Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.2302	76.84	34.65	/	/	150	139	Vertical
2	2483.5085	49.10	34.66	74.00	24.90	150	14	Vertical

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### Test Graph for Average Measurement



PK Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2479.98	76.01	34.65	/	/	150	138	Vertical
2	2483.5085	38.31	34.66	54.00	15.69	150	359	Vertical

**RESULT: Pass**

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

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## 8. FCC LINE CONDUCTED EMISSION TEST

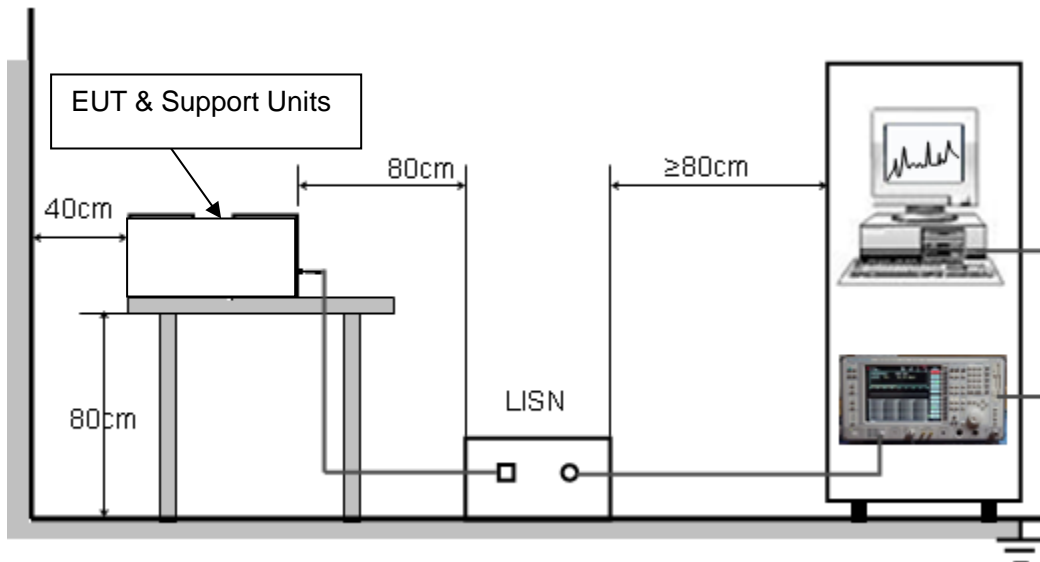
### 8.1. LIMITS OF LINE CONDUCTED EMISSION TEST

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.

### 8.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



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### 8.3. 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.

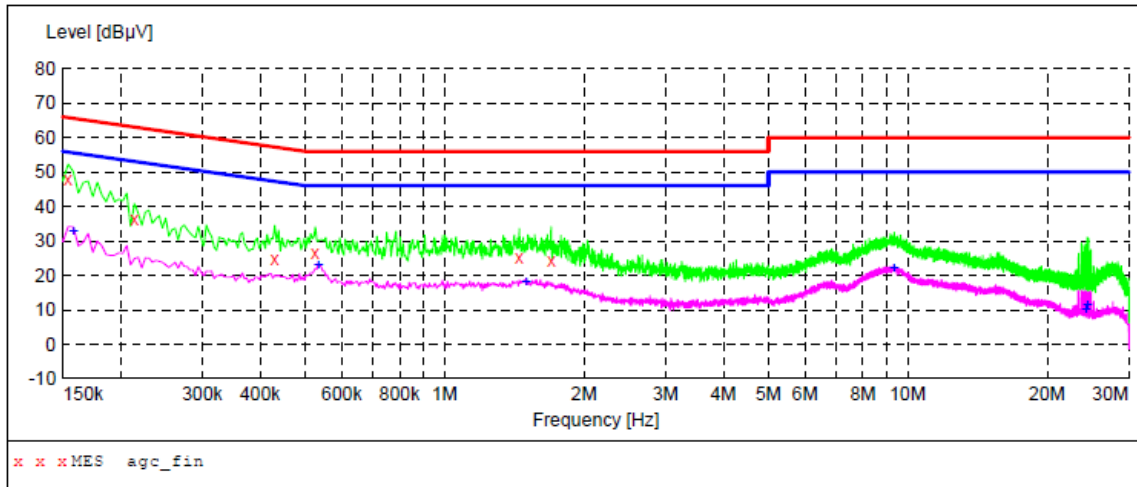
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

### 8.4. 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.

### 8.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



**MEASUREMENT RESULT: "agc\_fin"**

2024/1/24 9:42

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.154000	47.80	6.1	66	18.0	QP	L1
0.214000	36.50	6.1	63	26.5	QP	L1
0.430000	24.80	6.1	57	32.5	QP	L1
0.526000	26.70	6.2	56	29.3	QP	L1
1.450000	25.20	6.2	56	30.8	QP	L1
1.698000	24.40	6.2	56	31.6	QP	L1

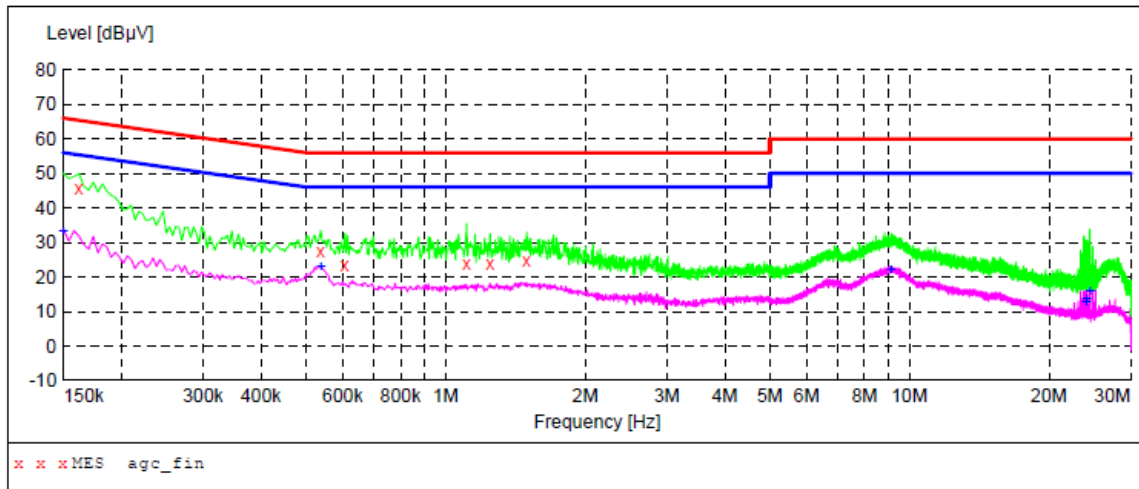
**MEASUREMENT RESULT: "agc\_fin2"**

2024/1/24 9:42

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.158000	32.70	6.1	56	22.9	AV	L1
0.534000	22.90	6.2	46	23.1	AV	L1
1.502000	18.10	6.2	46	27.9	AV	L1
9.338000	21.90	6.6	50	28.1	AV	L1
24.174000	10.10	7.8	50	39.9	AV	L1
24.398000	11.40	7.9	50	38.6	AV	L1

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Line Conducted Emission Test Line 2-N



**MEASUREMENT RESULT: "agc\_fin"**

2024/1/24 9:39

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.162000	45.70	6.1	65	19.7	QP	N
0.538000	27.60	6.2	56	28.4	QP	N
0.606000	23.30	6.2	56	32.7	QP	N
1.110000	23.90	6.2	56	32.1	QP	N
1.246000	23.90	6.2	56	32.1	QP	N
1.494000	24.90	6.2	56	31.1	QP	N

**MEASUREMENT RESULT: "agc\_fin2"**

2024/1/24 9:39

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.150000	33.40	6.1	56	22.6	AV	N
0.538000	23.00	6.2	46	23.0	AV	N
9.114000	22.00	6.6	50	28.0	AV	N
24.062000	12.80	7.8	50	37.2	AV	N
24.110000	13.70	7.8	50	36.3	AV	N
24.486000	15.70	7.9	50	34.3	AV	N

**RESULT: PASS**

Note: All the test modes had been tested, the mode 1 was the worst case. Only the data of the worst case would be record in this test report.

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## **APPENDIX A: PHOTOGRAPHS OF TEST SETUP**

Refer to the Report No.: AGC09881200501AP02D

## **APPENDIX B: PHOTOGRAPHS OF EUT**

Refer to the Report No.: AGC09881200501AP03D

**----END OF REPORT----**

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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.

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