FCC Test Report

Report No.: AGC01125180410FE02

FCC ID	:	2AO93PI0NN100C1100
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	NLN100C-1
BRAND NAME	:	Nebulae
MODEL NAME	:	PI0NN100C1100
APPLICANT	:	System Level Solutions (India) Pvt. Ltd.
DATE OF ISSUE	:	Jun. 23, 2020
STANDARD(S)	:	FCC Part 15.247
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun. 23, 2020	Valid	Initial Release

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TABLE OF CONTENTS

1. VERIFICATION OF COMPLIANCE 5
2.GENERAL INFORMATION 6
2.1PRODUCT DESCRIPTION 6
2.2. TABLE OF CARRIER FREQUENCYS 6
2.3 RELATED SUBMITTAL(S)/GRANT(S) 7
2.4TEST METHODOLOGY 7
2.5 SPECIAL ACCESSORIES 7
2.6 EQUIPMENT MODIFICATIONS 7
2.7 ANTENNA REQUIREMENT 7
3. MEASUREMENT UNCERTAINTY 8
4. DESCRIPTION OF TEST MODES 9
5. SYSTEM TEST CONFIGURATION 10
5.1 CONFIGURATION OF TESTED SYSTEM 10
5.2 EQUIPMENT USED IN TESTED SYSTEM 10
5.3. SUMMARY OF TEST RESULTS 10
6. TEST FACILITY 11
7. PEAK OUTPUT POWER 12
7.1. MEASUREMENT PROCEDURE 12
7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 12
7.3. LIMITS AND MEASUREMENT RESULT 13
8. 6 DB BANDWIDTH 15
8.1. MEASUREMENT PROCEDURE 15
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 15
8.3. LIMITS AND MEASUREMENT RESULTS 15
9. CONDUCTED SPURIOUS EMISSION 17
9.1. MEASUREMENT PROCEDURE 17
9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 17
9.3. MEASUREMENT EQUIPMENT USED 17
9.4. LIMITS AND MEASUREMENT RESULT 17
10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY 22
10.1 MEASUREMENT PROCEDURE 22
10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 22
10.3 MEASUREMENT EQUIPMENT USED 22
10.4 LIMITS AND MEASUREMENT RESULT 22

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11. RADIATED EMISSION 24
11.1. MEASUREMENT PROCEDURE 24
11.2. TEST SETUP 25
11.3. LIMITS AND MEASUREMENT RESULT 26
11.4. TEST RESULT 26
12. FCC LINE CONDUCTED EMISSION TEST 36
12.1. LIMITS OF LINE CONDUCTED EMISSION TEST 36
12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST 36
12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST 37
12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST 37
12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST 38
APPENDIX A: PHOTOGRAPHS OF TEST SETUP 40
APPENDIX B: PHOTOGRAPHS OF EUT 42

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1. VERIFICATION OF COMPLIANCE

Applicant	System Level Solutions (India) Pvt. Ltd.
Address	Plot#32, Zone-D/4, Phase-1, GIDC Estate, V.U. Nagar -388 121, Gujarat, India
Manufacturer	System Level Solutions (India) Pvt. Ltd.
Address	Plot#32, Zone-D/4, Phase-1, GIDC Estate, V.U. Nagar -388 121, Gujarat, India
Factory	System Level Solutions (India) Pvt. Ltd.
Address	Plot#32, Zone-D/4, Phase-1, GIDC Estate, V.U. Nagar -388 121, Gujarat, India
Product Designation	NLN100C-1
Brand Name	Nebulae
Test Model	PI0NN100C1100
Date of test	May 10, 2020 to Jun. 22, 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	Calvin Project Engineer	Jun. 22, 2020
Reviewed By	Max Zhang Reviewer	Jun. 22, 2020
Approved By	Forrest Lei Authorized Officer	Jun. 22, 2020

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2.GENERAL INFORMATION

2.1PRODUCT DESCRIPTION

The EUT is designed as a “NLN100C-1”. It is designed by way of utilizing the O-QPSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.405 GHz to 2.480GHz
RF Output Power	9.095dBm
Modulation	O-QPSK
Number of channels	3 Channel
Antenna Designation	External Antenna(Comply with requirements of the FCC part 15.203)
Antenna Gain	1.5dBi
Hardware Version	V1B
Software Version	V1.0
Power Supply	DC 3V by Dry cell.

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2400~2483.5MHZ	0	2405MHZ
	1	2440MHZ
	2	2480MHZ

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2.3 RELATED SUBMITTAL(S)/GRANT(S)

This submittal(s) (test report) is intended for **FCC ID:** 2AO93PI0NN100C1100 filing to comply with the FCC Part 15.247 requirements.

2.4TEST 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 2.2.

2.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.7 ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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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 = ±3.1 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±4.0 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted, Uc = ±0.8dB
- Uncertainty of RF power density, conducted, Uc = ±2.6dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %

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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 EUT enters Control via serial command software (**Tera Term**)Test mode.

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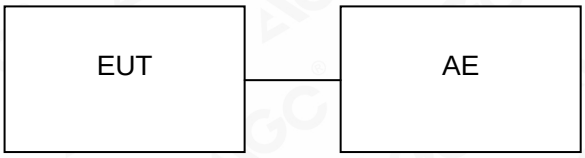
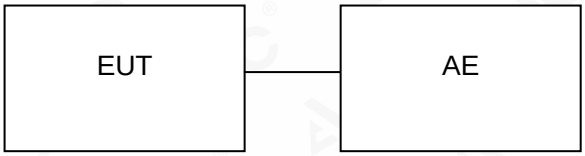
5. SYSTEM TEST CONFIGURATION

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	NLN100C-1	PI0NN100C1100	2AO93PI0NN100C1100	EUT

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247 (b)(3)	Peak Output Power	Compliant
15.247 (a)(2)	6 dB Bandwidth	Compliant
15.247 (d)	Conducted Spurious Emission	Compliant
15.247 (e)	Maximum Conducted Output Power Density	Compliant
15.209	Radiated Emission	Compliant
15.207	Conducted Emission	Compliant

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6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun. 12, 2019	Jun. 26, 2020
TEST RECEIVER	R&S	ESPI	10096	Jun. 10, 2020	Jun. 09, 2021
LISN	R&S	ESH2-Z5	100086	Aug. 24, 2020	Aug. 23, 2021
Test software	R&S	ES-K1(Ver.V1.71)	N/A	N/A	N/A
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4GHz Fliter	EM Electronics	2400-2500MHz	N/A	Mar, 25, 2019	Mar, 24, 2020
2.4GHz Fliter	EM Electronics	2400-2500MHz	N/A	Mar, 23, 2020	Mar. 22, 2021
Attenuator	ZHINAN	E-002	N/A	Aug. 26, 2019	Aug. 25, 2020
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 09, 2019	Sep. 08, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 24, 2018	May 23, 2020
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. 14, 2020
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 09, 2019	Jan. 08, 2021
Test software	FARA	EZ-EMC (Ver RA-03A)	N/A	N/A	N/A

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7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

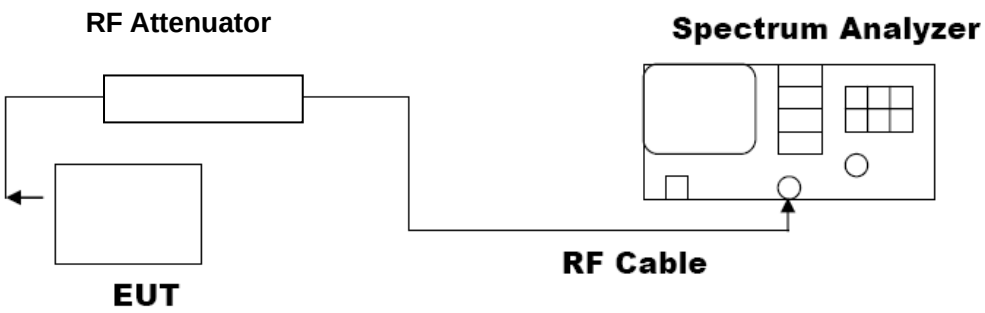
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. RBW⩾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



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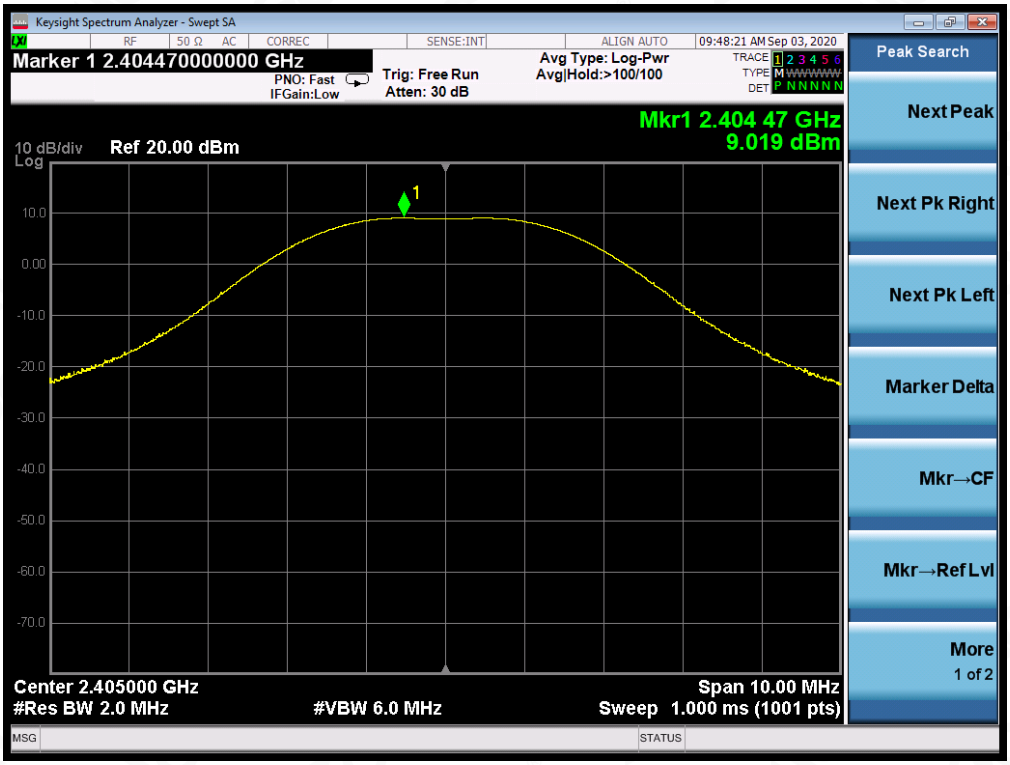
7.3. LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.405	9.019	30	Pass
2.440	9.042	30	Pass
2.480	-6.248	30	Pass

CH0



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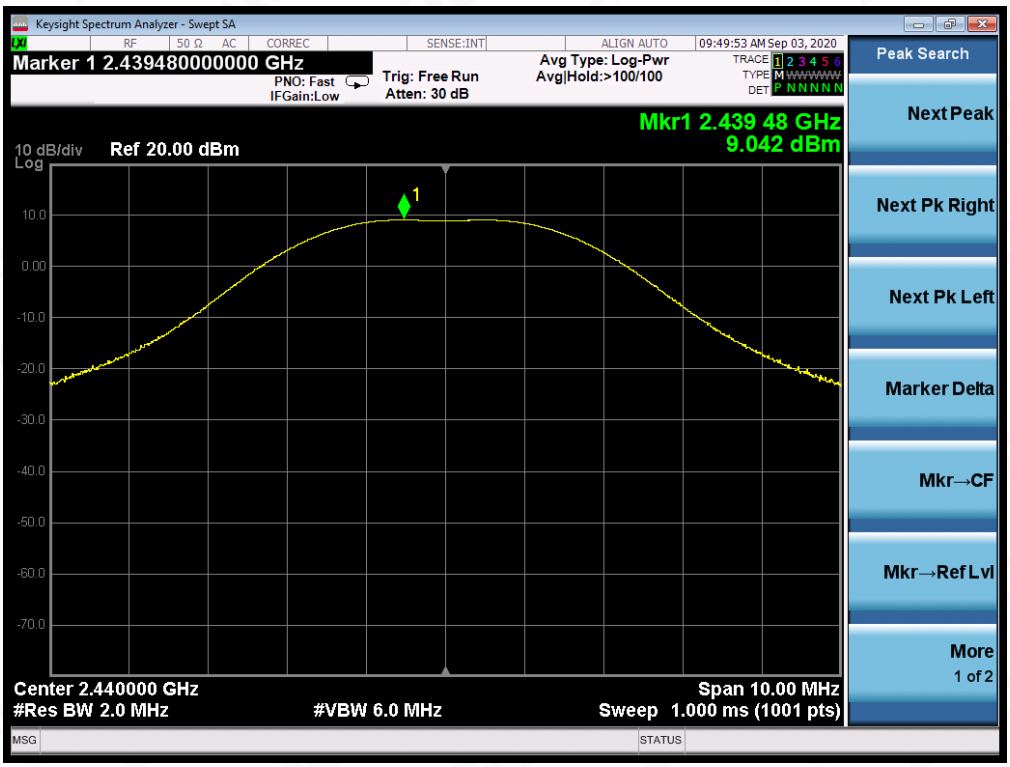
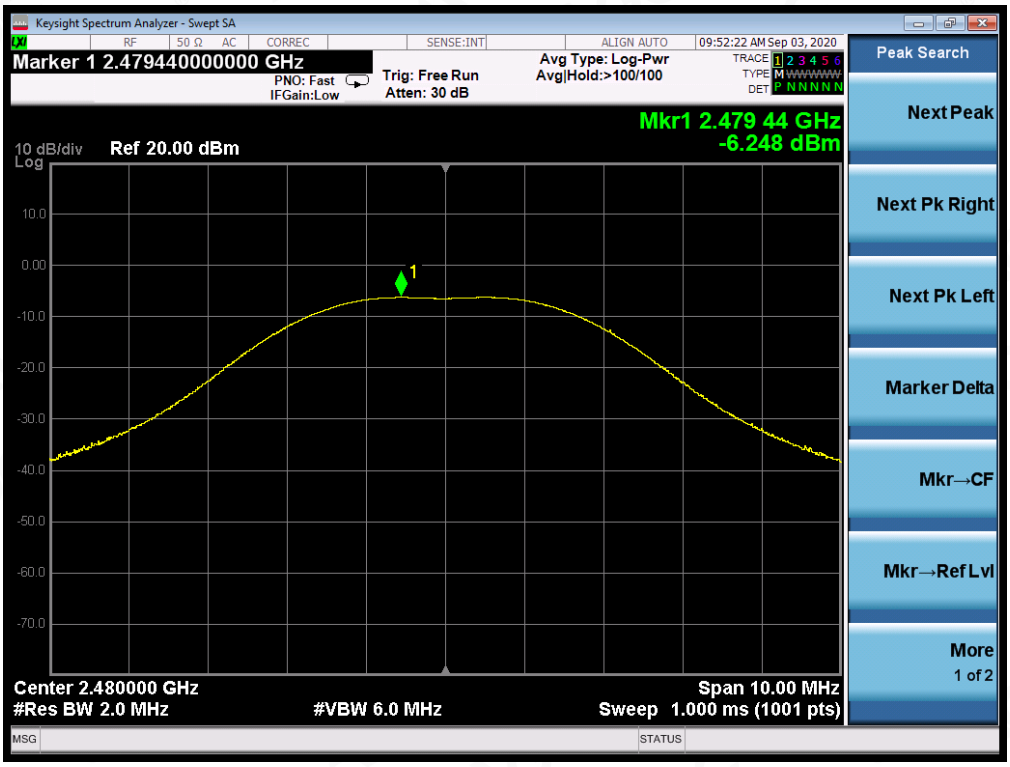
CH1



CH2



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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.

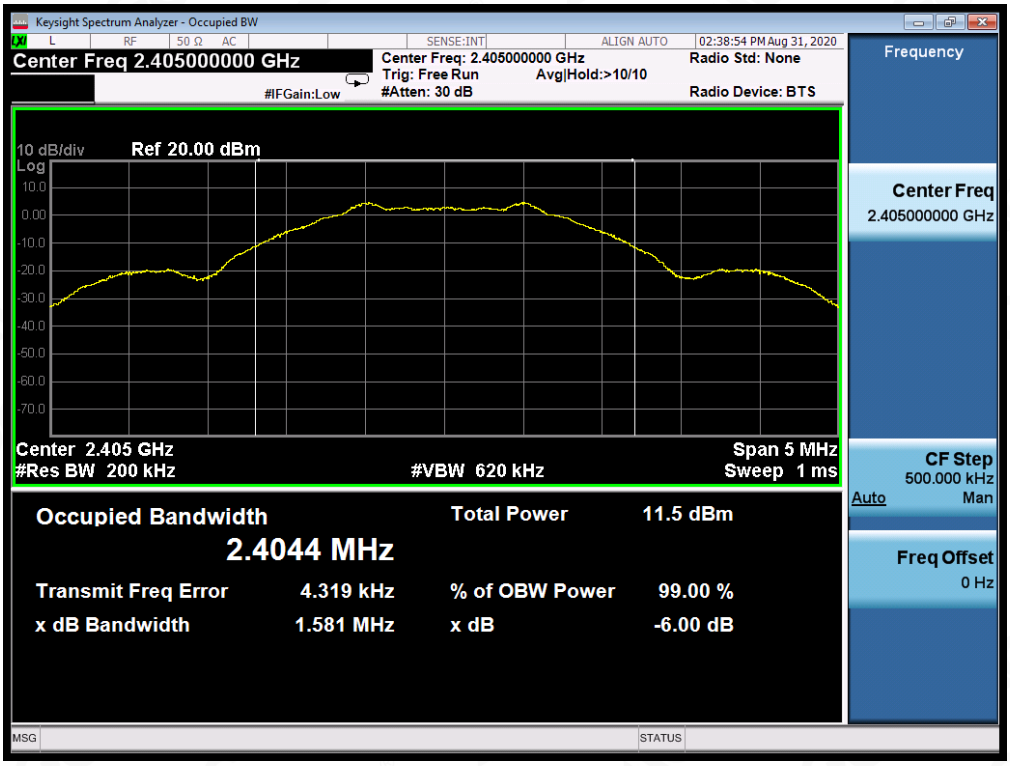
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

8.3. LIMITS AND MEASUREMENT RESULTS

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Applicable Limits		
	Test Data (kHz)		Criteria
>500KHZ	Low Channel	1581	PASS
	Middle Channel	1589	PASS
	High Channel	1568	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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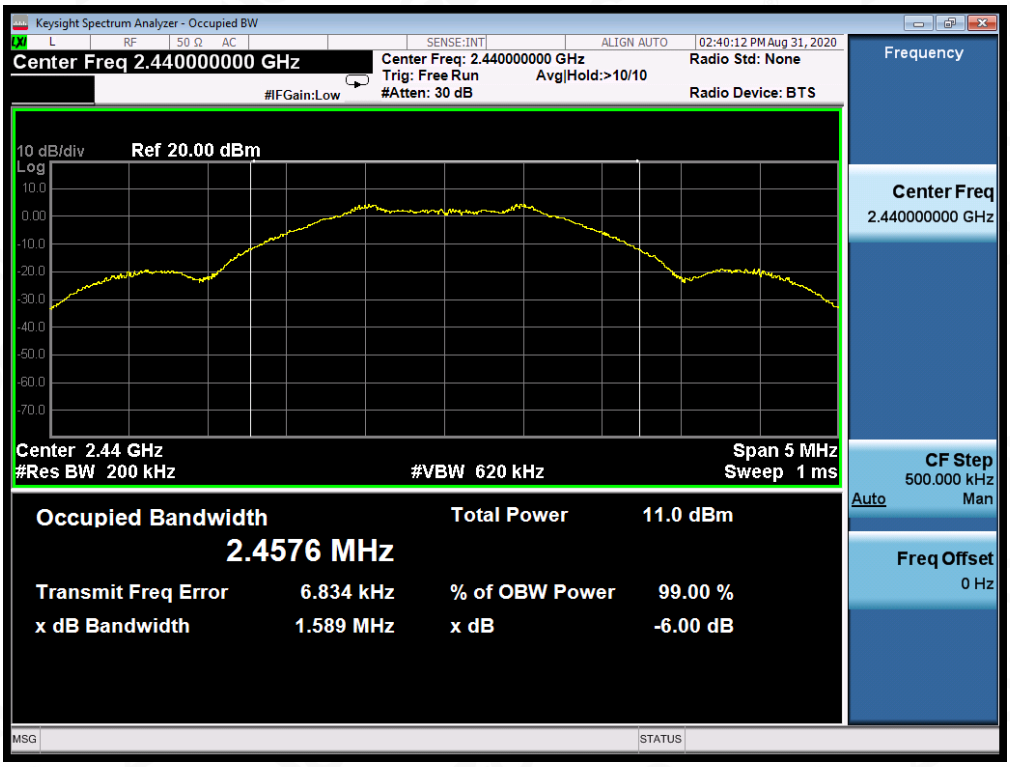
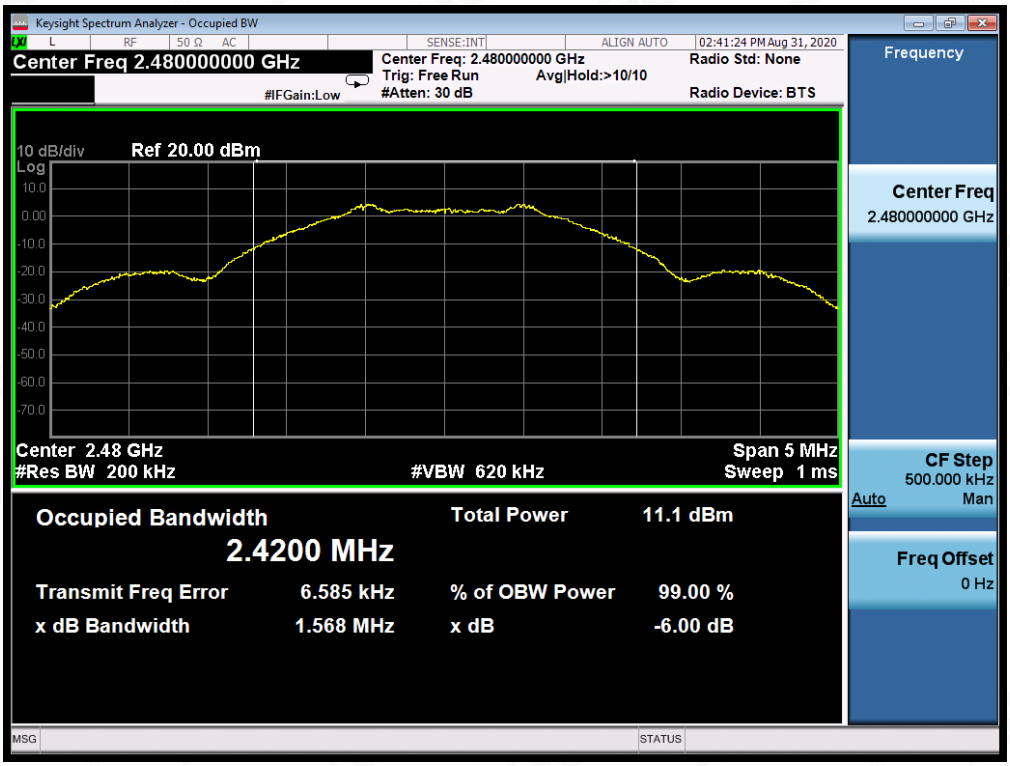
TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

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

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

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

The same as described in section 7.2.

9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

9.4. LIMITS AND MEASUREMENT RESULT

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

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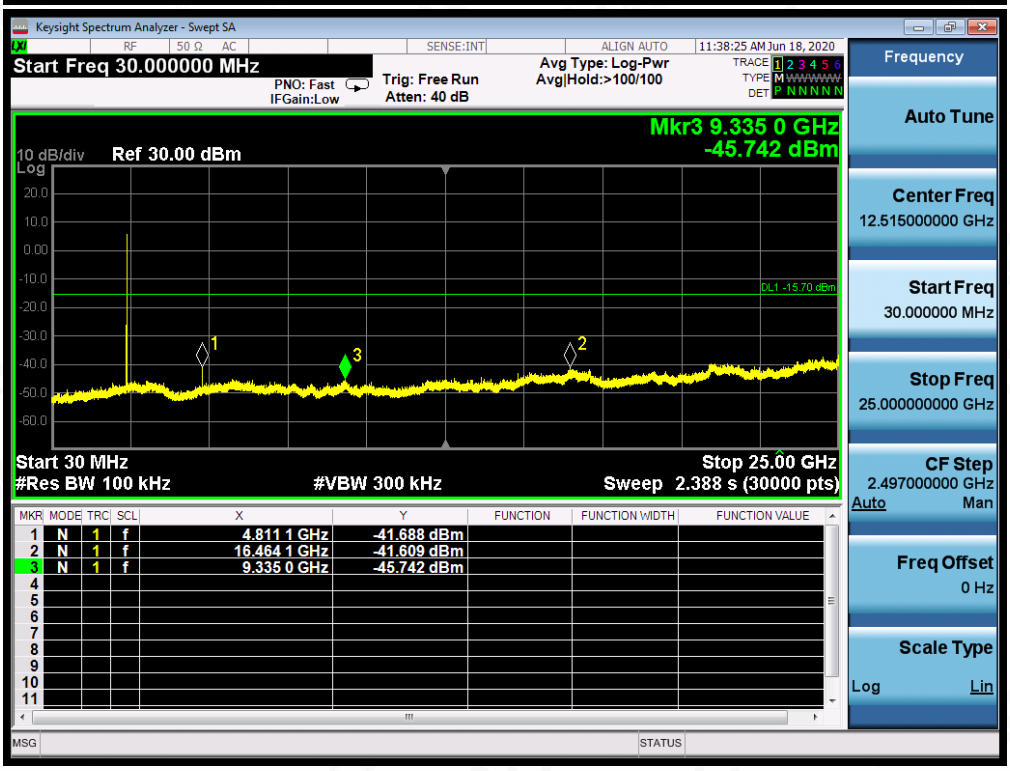
TEST RESULT FOR ENTIRE FREQUENCY RANGE

GFSK MODULATION IN LOW CHANNEL



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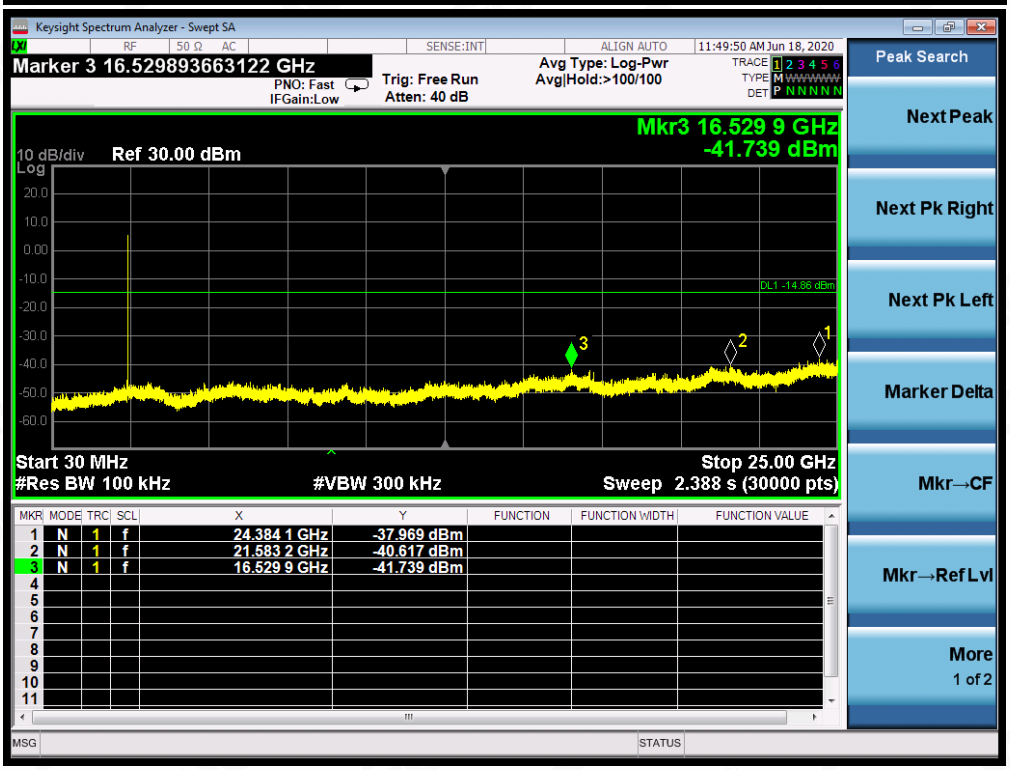
GFSK MODULATION IN MIDDLE CHANNEL



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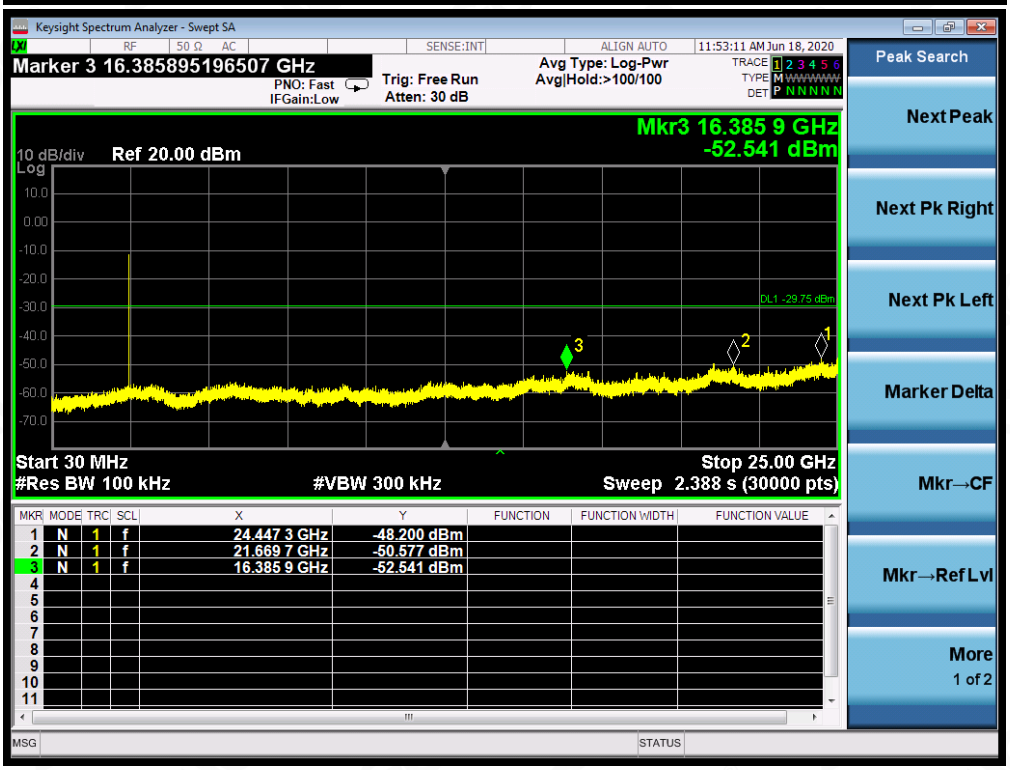
GFSK MODULATION IN HIGH CHANNEL



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

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TEST RESULT FOR BAND EDGE

GFSK MODULATION IN LOW CHANNEL

GFSK MODULATION IN HIGH CHANNEL

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10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

10.1 MEASUREMENT PROCEDURE

(1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
(2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
(3). Set 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.

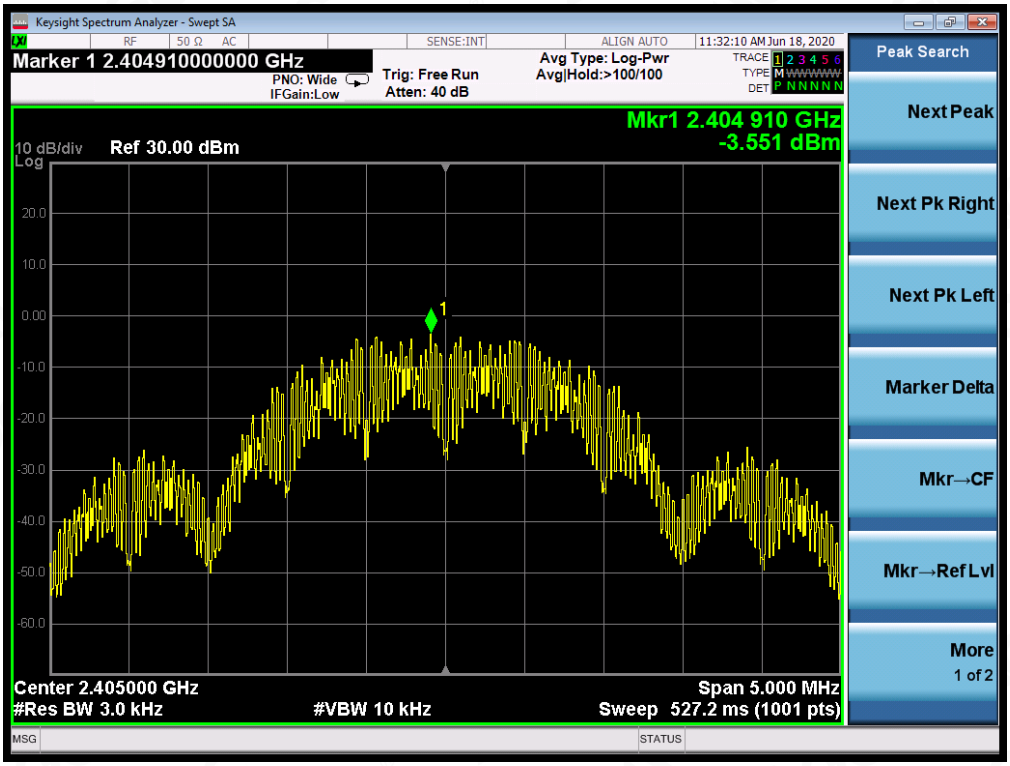
10.3 MEASUREMENT EQUIPMENT USED

Refer To Section 6.

10.4 LIMITS AND MEASUREMENT RESULT

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-3.551	8	Pass
Middle Channel	-4.111	8	Pass
High Channel	-19.198	8	Pass

TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



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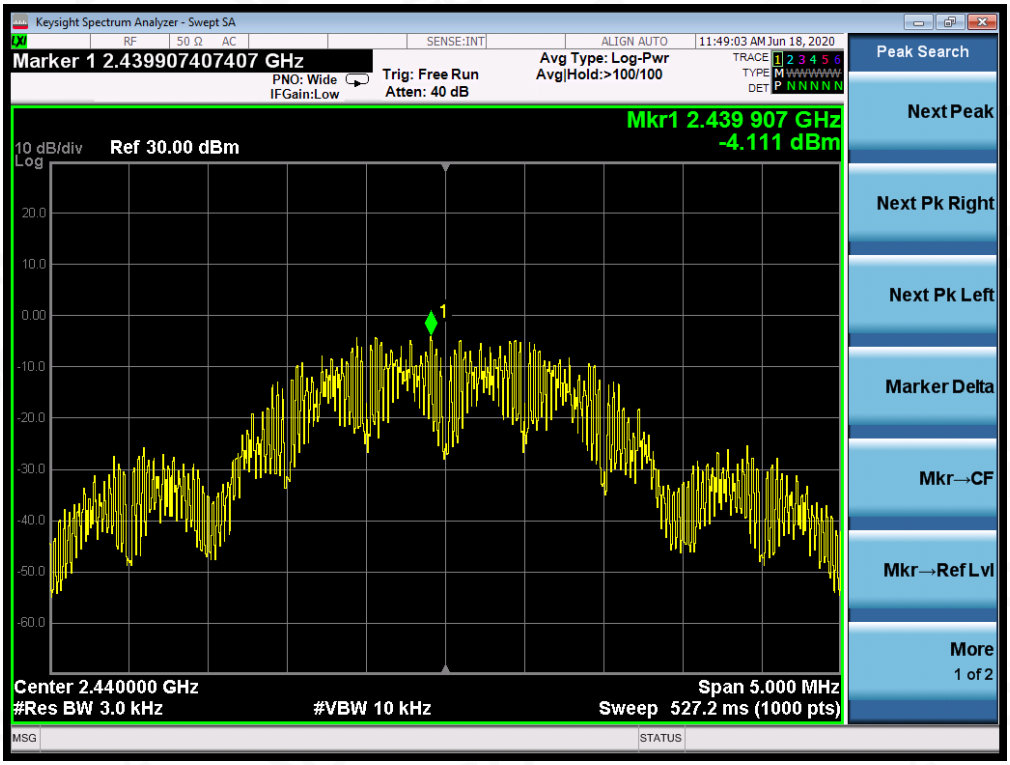
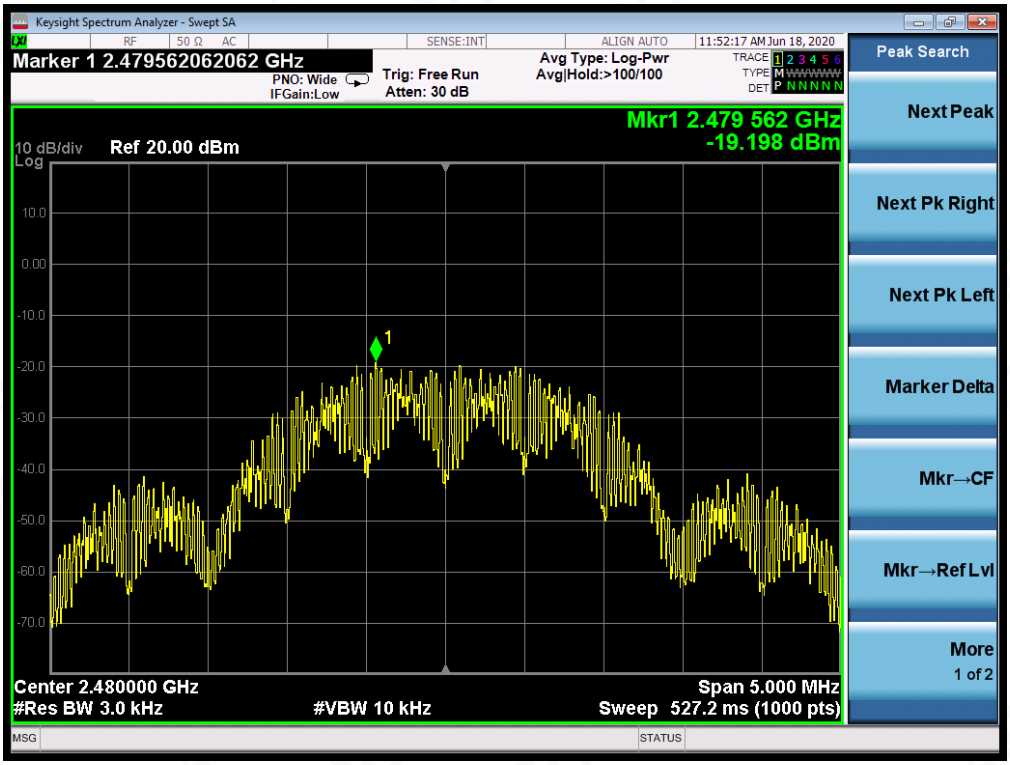
TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



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11. RADIATED EMISSION

11.1. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, 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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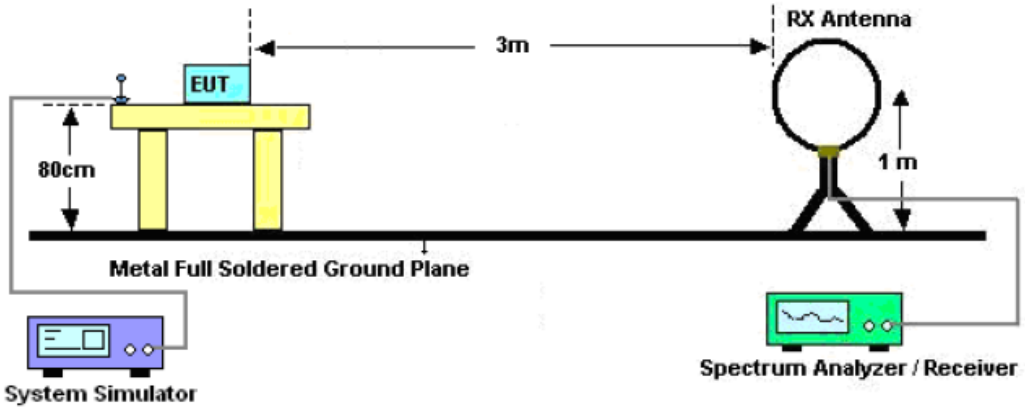
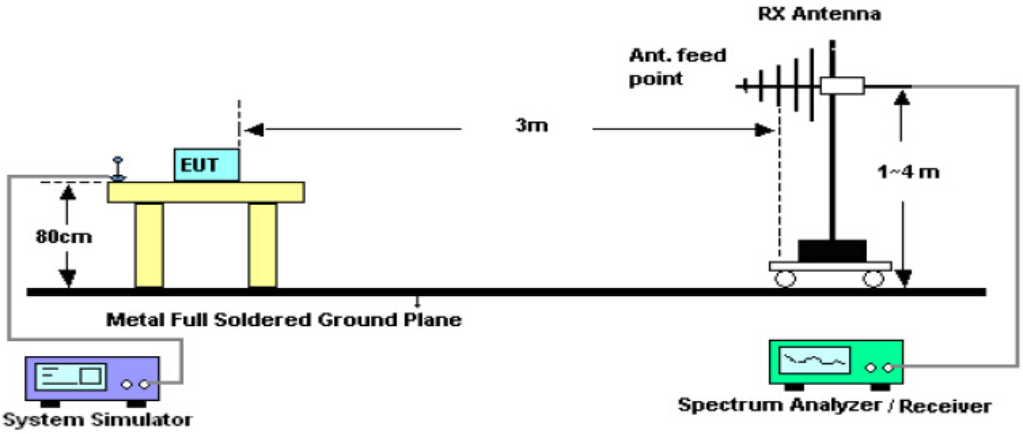
11.2. TEST SETUP

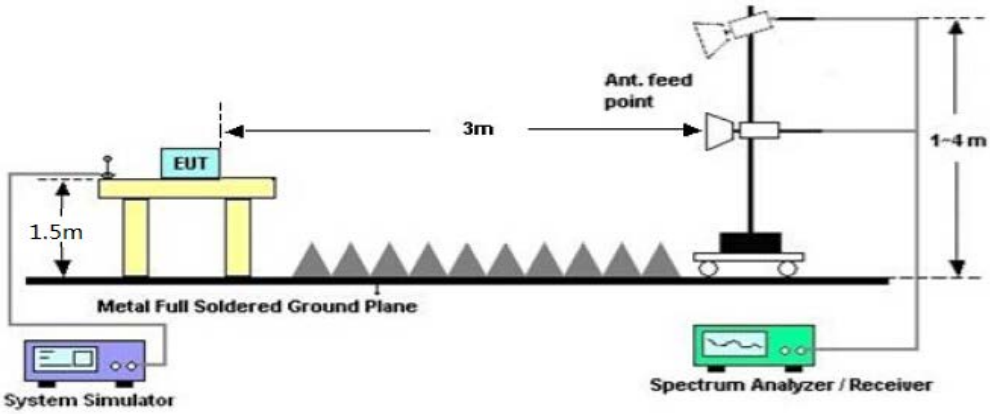
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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11.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

Frequencies (MHz)	Field Strength (micorvolts/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

No emission found between lowest internal used/generated frequencies to 30MHz.

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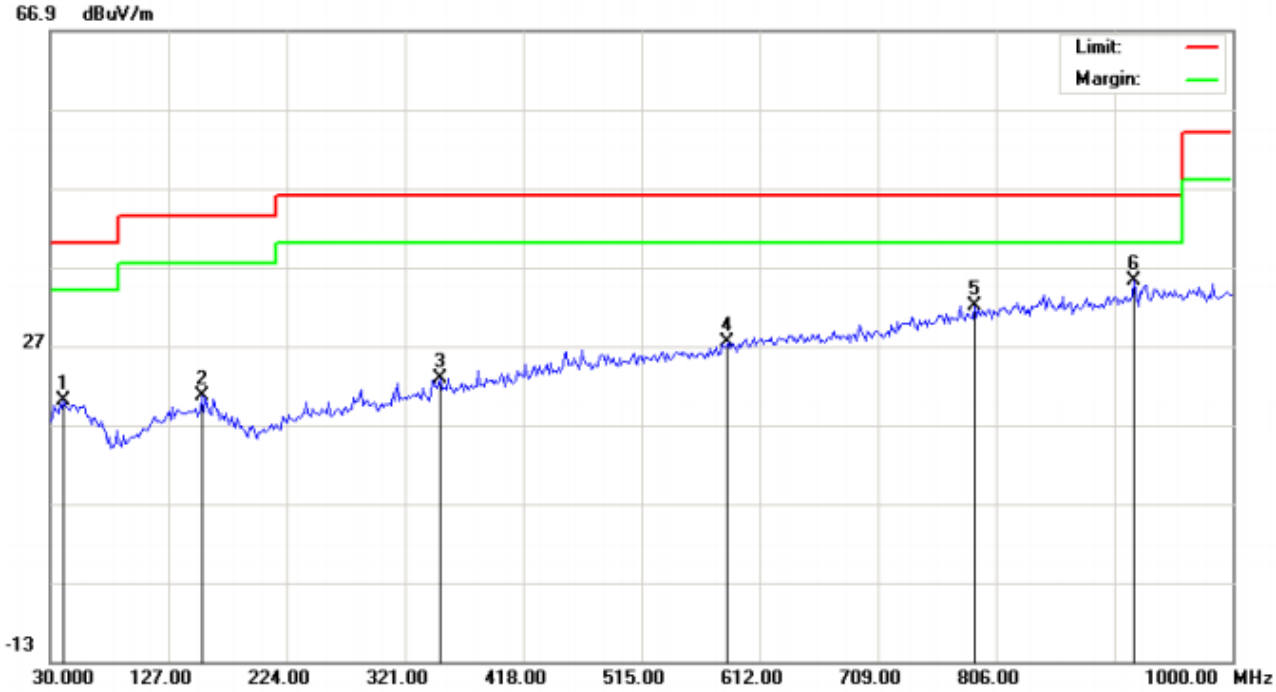
RADIATED EMISSION BELOW 1GHZ

EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 1	**Antenna**	Horizontal



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1		41.3167	-0.12	20.04	19.92	40.00	-20.08	peak
2		154.4832	1.31	19.20	20.51	43.50	-22.99	peak
3		350.1000	1.66	21.23	22.89	46.00	-23.11	peak
4		586.1332	0.66	26.68	27.34	46.00	-18.66	peak
5		788.2167	1.87	30.14	32.01	46.00	-13.99	peak
6	*	919.1667	3.33	31.86	35.19	46.00	-10.81	peak

RESULT: PASS

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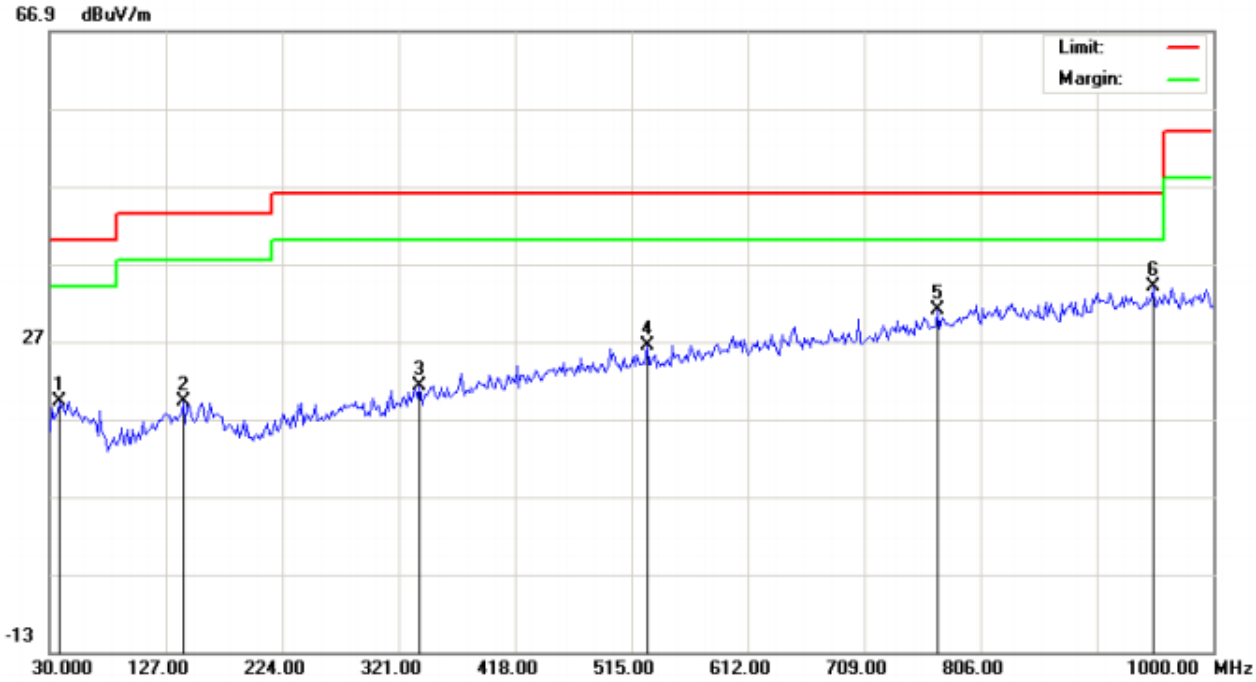
Tel: +86-755 2523 4088 E-mail: agc@agc-cert.com Web: http://cn.agc-cert.com/

EUT	NLN100C-1	Model Name	PI0NN100C1100
Temperature	26° C	Relative Humidity	56%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1		38.0833	-0.18	19.41	19.23	40.00	-20.77	peak
2		141.5500	0.02	19.23	19.25	43.50	-24.25	peak
3		338.7833	0.34	20.83	21.17	46.00	-24.83	peak
4		527.9333	0.83	25.54	26.37	46.00	-19.63	peak
5		770.4333	1.26	29.74	31.00	46.00	-15.00	peak
6	*	949.8833	1.87	32.13	34.00	46.00	-12.00	peak

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.

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RADIATED EMISSION ABOVE 1GHZ

EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
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	48.25	0.08	48.33	74	-25.67	peak
4804.000	38.88	0.08	38.96	54	-15.04	AVG
7206.000	47.58	2.21	49.79	74	-24.21	peak
7206.000	36.54	2.21	38.75	54	-15.25	AVG

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

EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
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	48.96	0.08	49.04	74	-24.96	peak
4804.000	39.12	0.08	39.2	54	-14.8	AVG
7206.000	48.21	2.21	50.42	74	-23.58	peak
7206.000	37.41	2.21	39.62	54	-14.38	AVG

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

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EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
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
4852.000	49.11	0.14	49.25	74	-24.75	peak
4852.000	39.15	0.14	39.29	54	-14.71	AVG
7278.000	48.31	2.36	50.67	74	-23.33	peak
7278.000	37.12	2.36	39.48	54	-14.52	AVG

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

EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
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
4852.000	49.58	0.14	49.72	74	-24.28	peak
4852.000	38.12	0.14	38.26	54	-15.74	AVG
7278.000	48.25	2.36	50.61	74	-23.39	peak
7278.000	35.42	2.36	37.78	54	-16.22	AVG

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

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EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
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	48.57	0.22	48.79	74	-25.21	peak
4960.000	37.11	0.22	37.33	54	-16.67	AVG
7440.000	45.63	2.64	48.27	74	-25.73	peak
7440.000	36.61	2.64	39.25	54	-14.75	AVG

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

EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
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	48.63	0.22	48.85	74	-25.15	peak
4960.000	37.11	0.22	37.33	54	-16.67	AVG
7440.000	46.33	2.64	48.97	74	-25.03	peak
7440.000	34.52	2.64	37.16	54	-16.84	AVG

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

RESULT: PASS

Note: Other emissions from 1G to 25 GHz are considered as ambient noise. No recording in the test report.
Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.
The "Factor" value can be calculated automatically by software of measurement system.

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TEST RESULT FOR RESTRICTED BANDS REQUIREMENTS

EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 1	**Antenna**	Horizontal

PK

AV

RESULT: PASS

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EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 1	**Antenna**	Vertical

PK

AV

RESULT: PASS

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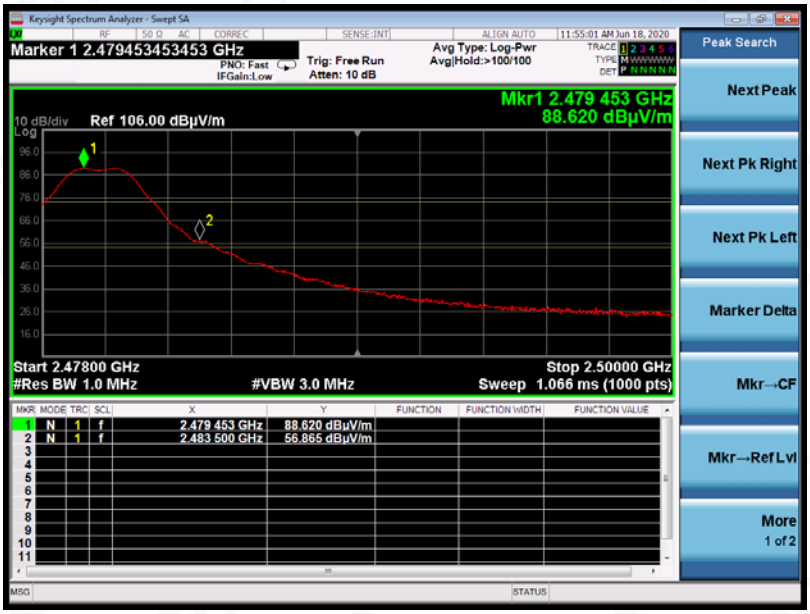
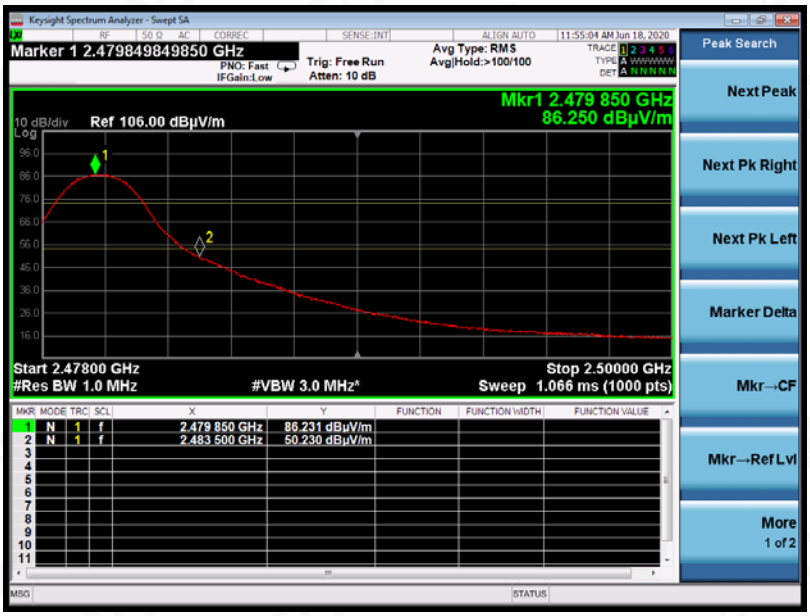
EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 3	**Antenna**	Horizontal

PK



AV



RESULT: PASS

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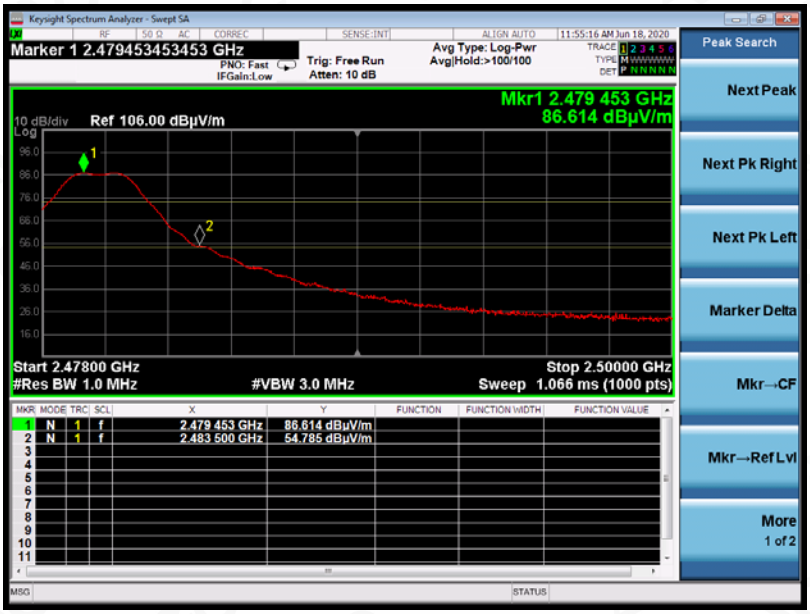
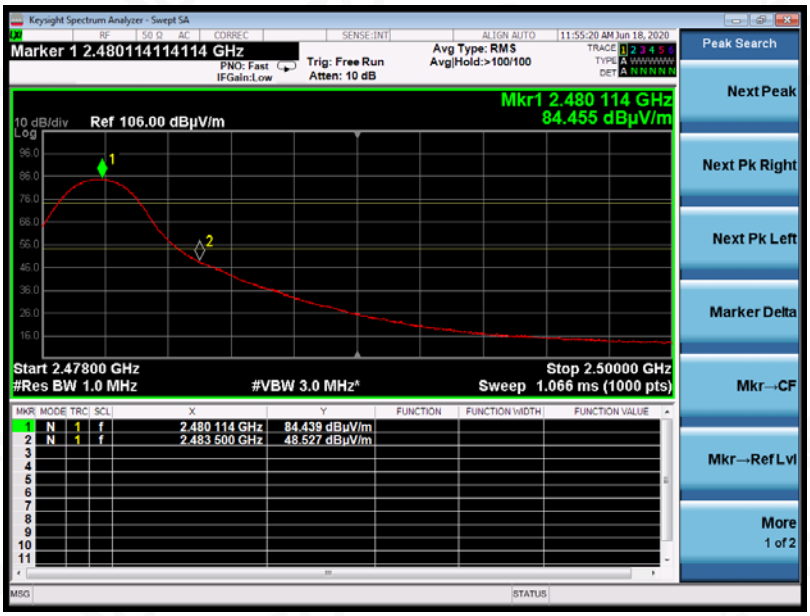
EUT	NLN100C-1	**Model Name**	PI0NN100C1100
Temperature	26° C	**Relative Humidity**	56%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 3	**Antenna**	Vertical

PK



AV



RESULT: PASS

Note: The factor had been edited in the "Input Correction" of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB(µV) to represent the Amplitude. Use the F dB(µV/m) to represent the Field Strength. So A=F.

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12. FCC LINE CONDUCTED EMISSION TEST

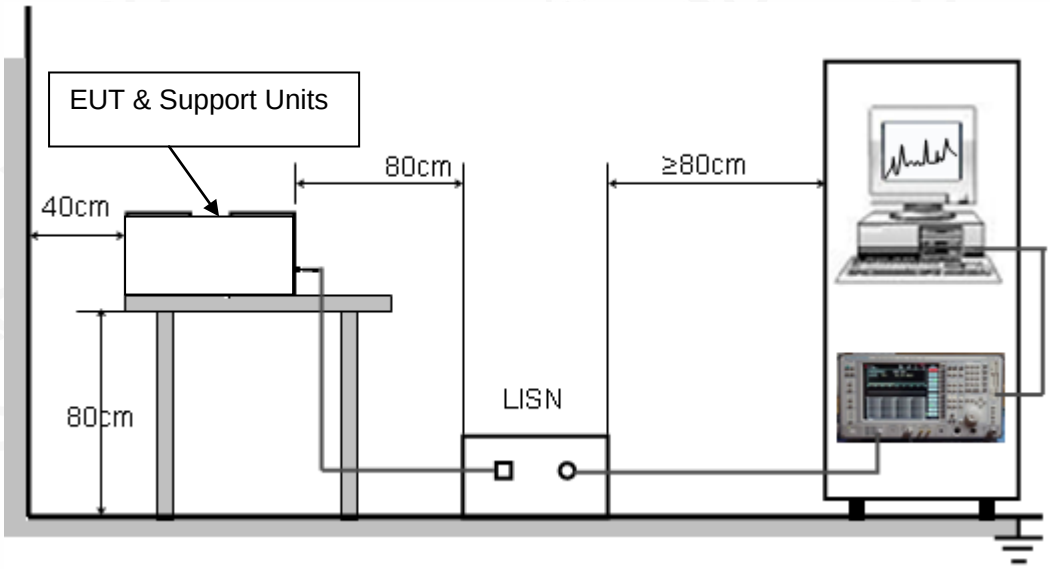
12.1. LIMITS OF LINE CONDUCTED EMISSION TEST

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

Note:

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

12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



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12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a Smartway L2 op 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 equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 3.8V power from adapter which received AC120V/60Hz power from a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

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

12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

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

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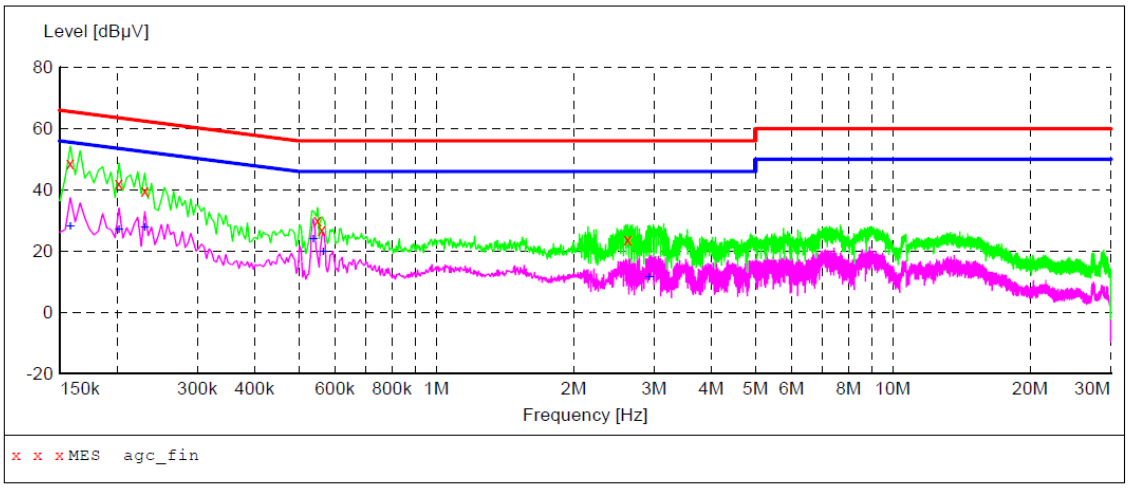
12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



MEASUREMENT RESULT: "agc_fin"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.158000	48.70	11.3	66	16.9	QP	L1
0.202000	42.00	11.3	64	21.5	QP	L1
0.230000	39.60	11.3	62	22.8	QP	L1
0.550000	30.00	11.3	56	26.0	QP	L1
0.562000	27.00	11.3	56	29.0	QP	L1
2.630000	23.90	11.4	56	32.1	QP	L1

MEASUREMENT :

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.158000	28.10	11.3	56	27.5	AV	L1
0.202000	27.10	11.3	54	26.4	AV	L1
0.230000	27.60	11.3	52	24.8	AV	L1
0.538000	23.90	11.3	46	22.1	AV	L1
0.566000	19.70	11.3	46	26.3	AV	L1
2.926000	11.50	11.4	46	34.5	AV	L1

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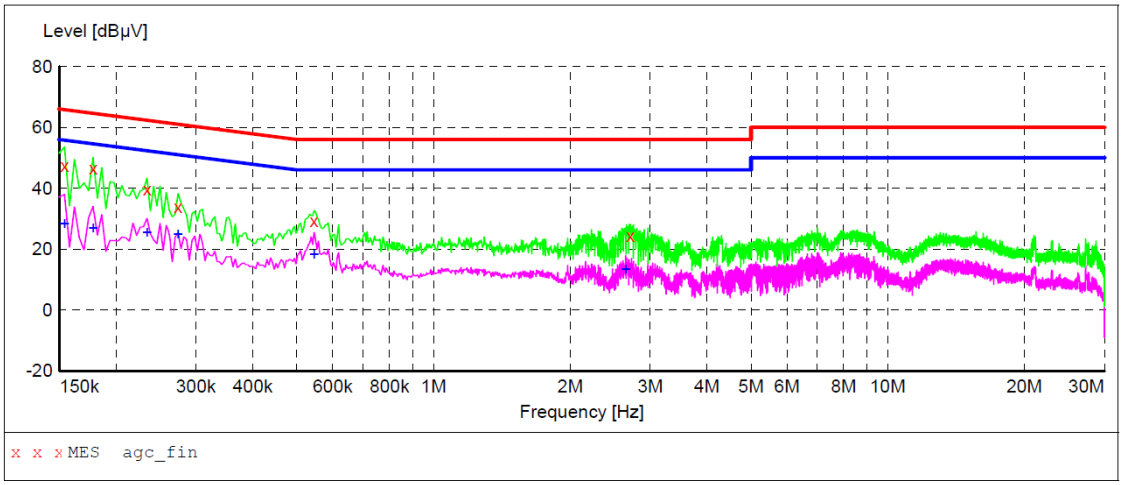
Line Conducted Emission Test Line 2-N



MEASUREMENT RESULT: "agc_fin"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.154000	47.30	11.3	66	18.5	QP	N
0.178000	46.60	11.3	65	18.0	QP	N
0.234000	39.70	11.3	62	22.6	QP	N
0.274000	34.00	11.3	61	27.0	QP	N
0.546000	29.30	11.3	56	26.7	QP	N
2.714000	24.40	11.4	56	31.6	QP	N

MEASUREMENT RESULT: "agc_fin2"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.154000	28.50	11.3	56	27.3	AV	N
0.178000	27.00	11.3	55	27.6	AV	N
0.234000	25.40	11.3	52	26.9	AV	N
0.274000	25.00	11.3	51	26.0	AV	N
0.546000	18.20	11.3	46	27.8	AV	N
2.650000	13.50	11.4	46	32.5	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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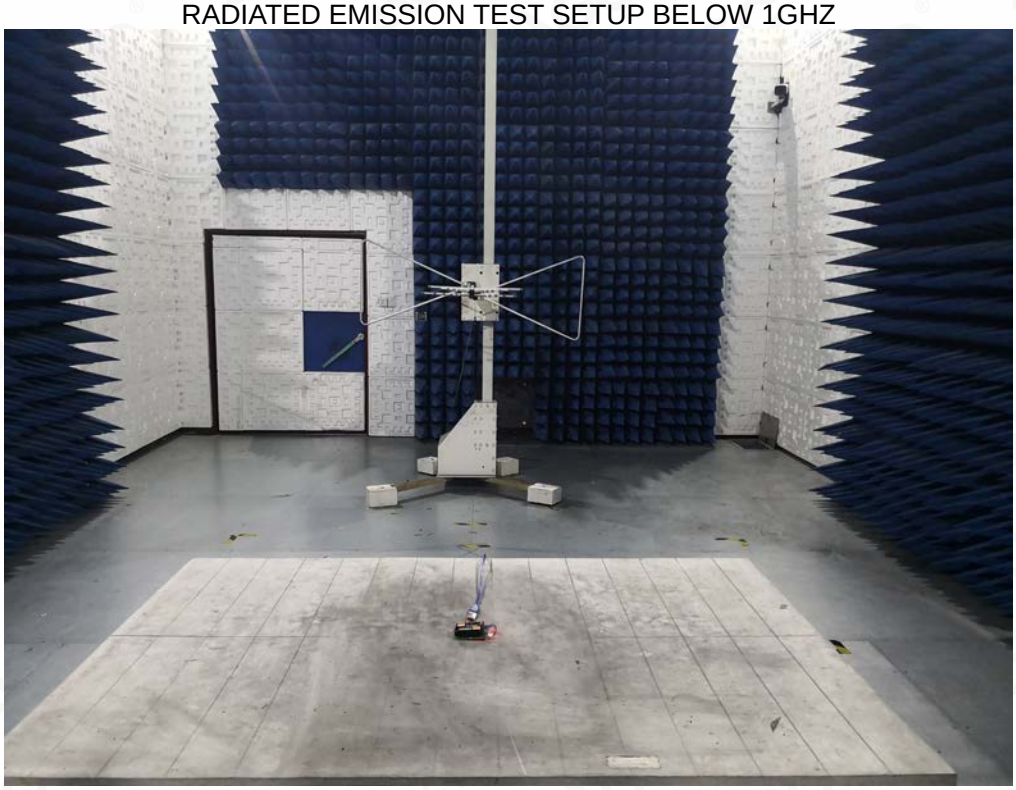
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 1GHZ



RADIATED EMISSION TEST SETUP ABOVE 1GHZ

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CONDUCTED EMISSION TEST SETUP

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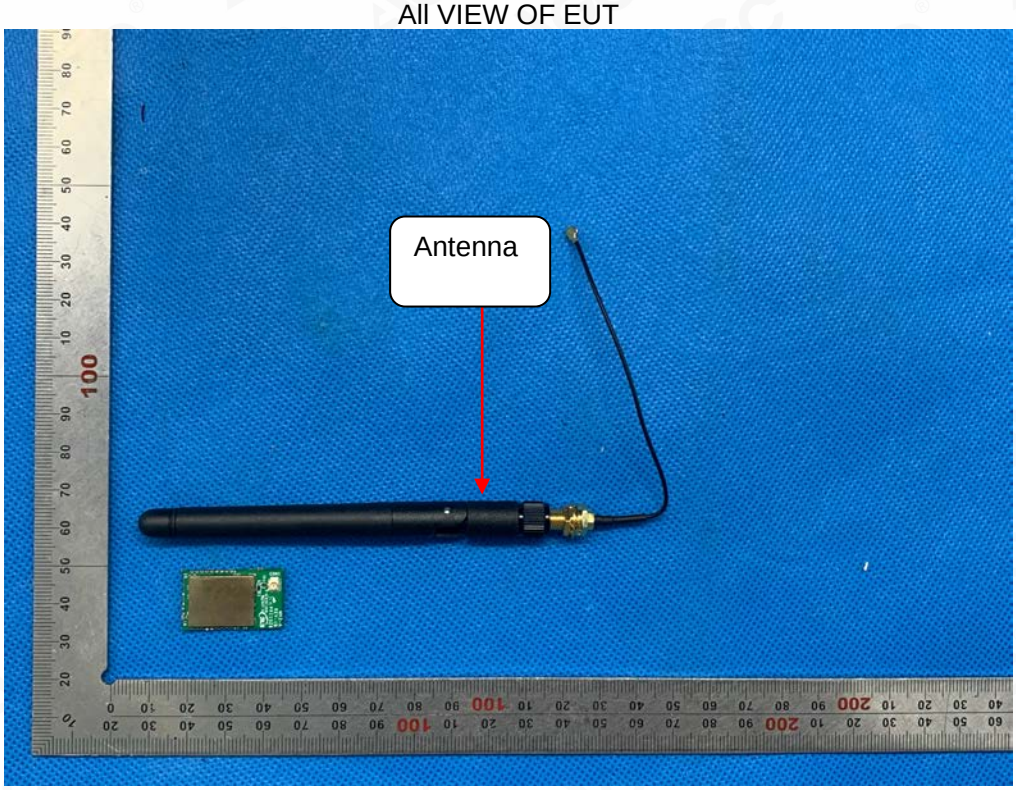
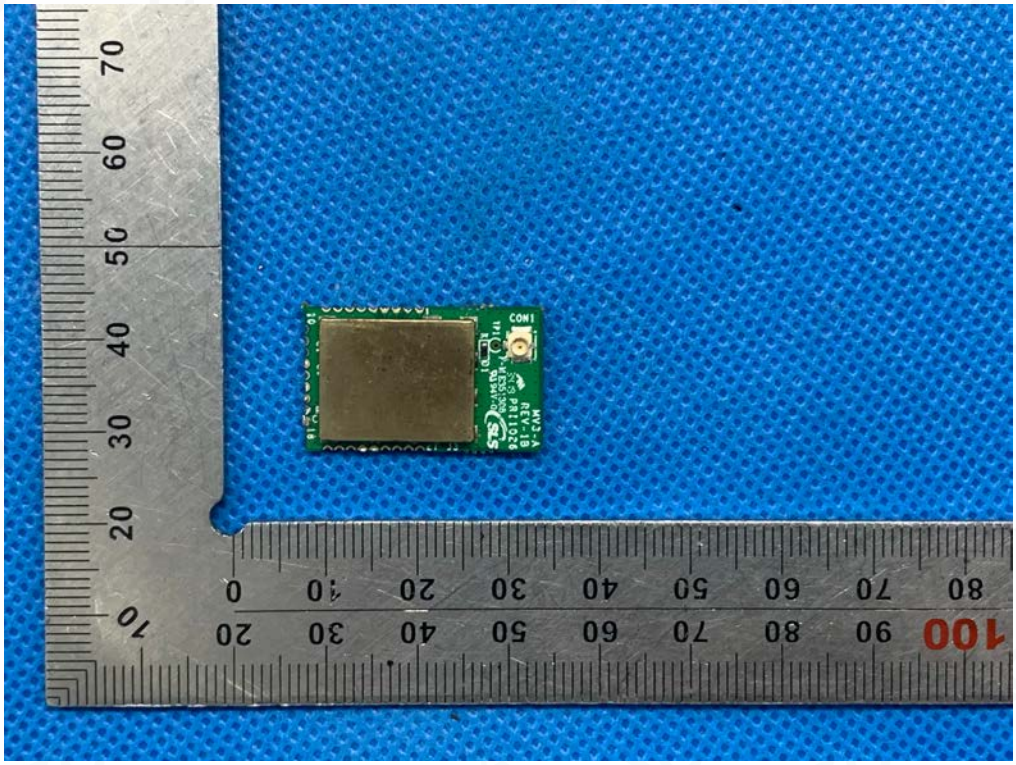
APPENDIX B: PHOTOGRAPHS OF EUT

All VIEW OF EUT



FRONT VIEW OF EUT



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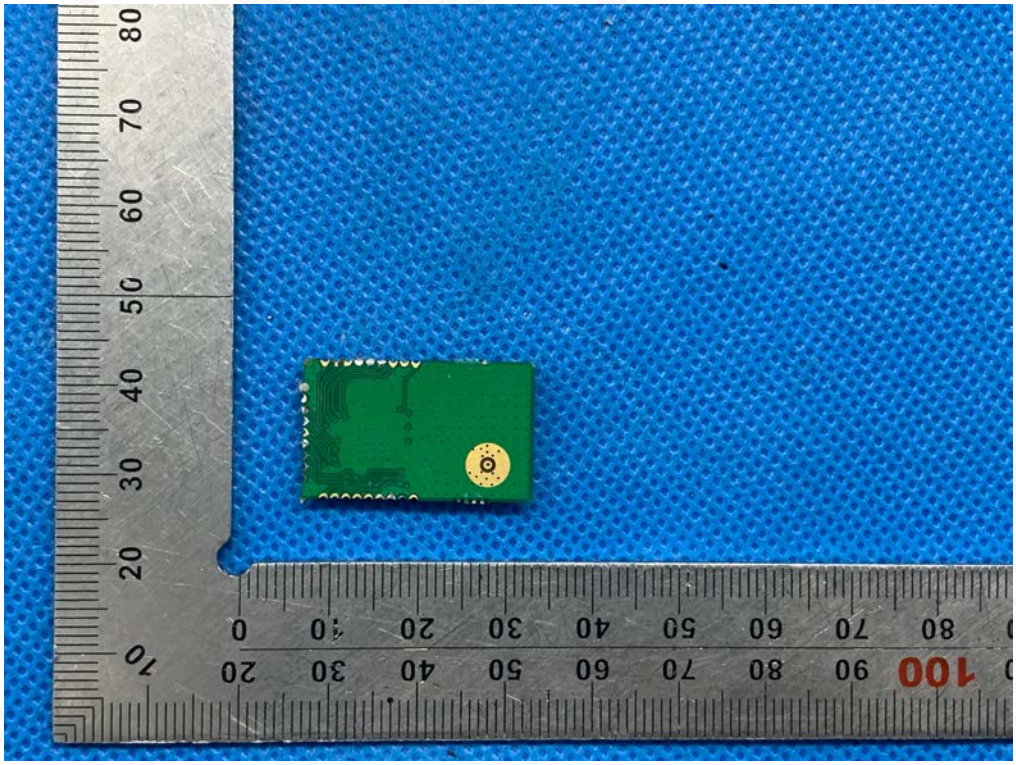
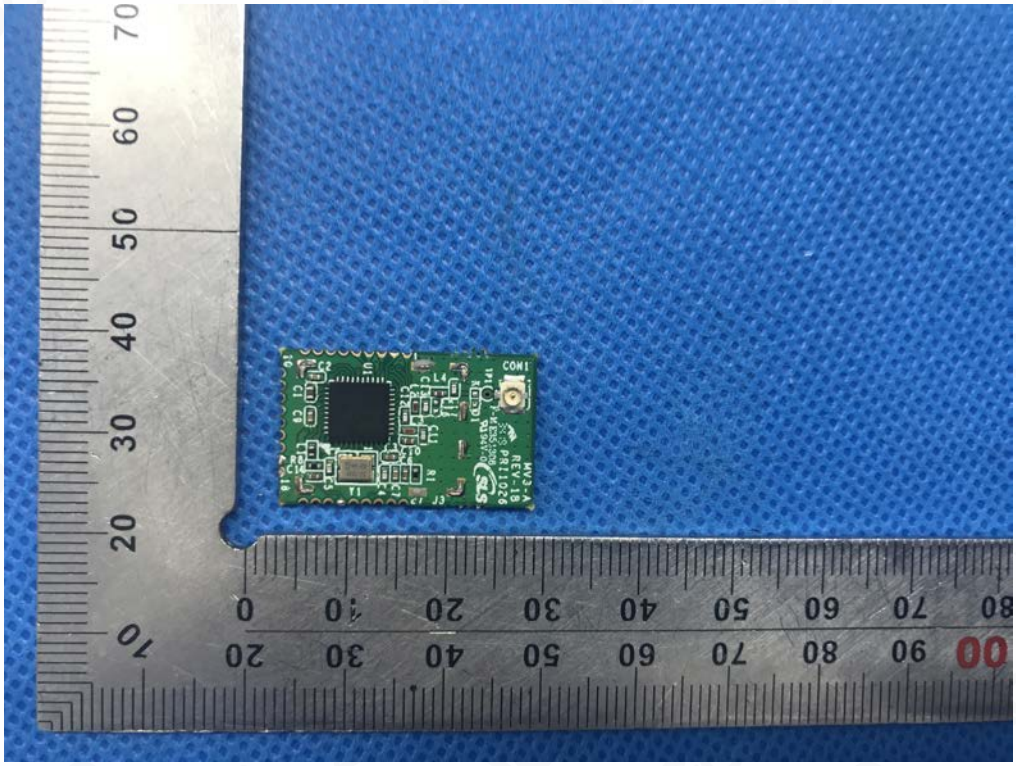
BACK VIEW OF EUT



INTERNAL VIEW OF EUT(FIGURE 1)



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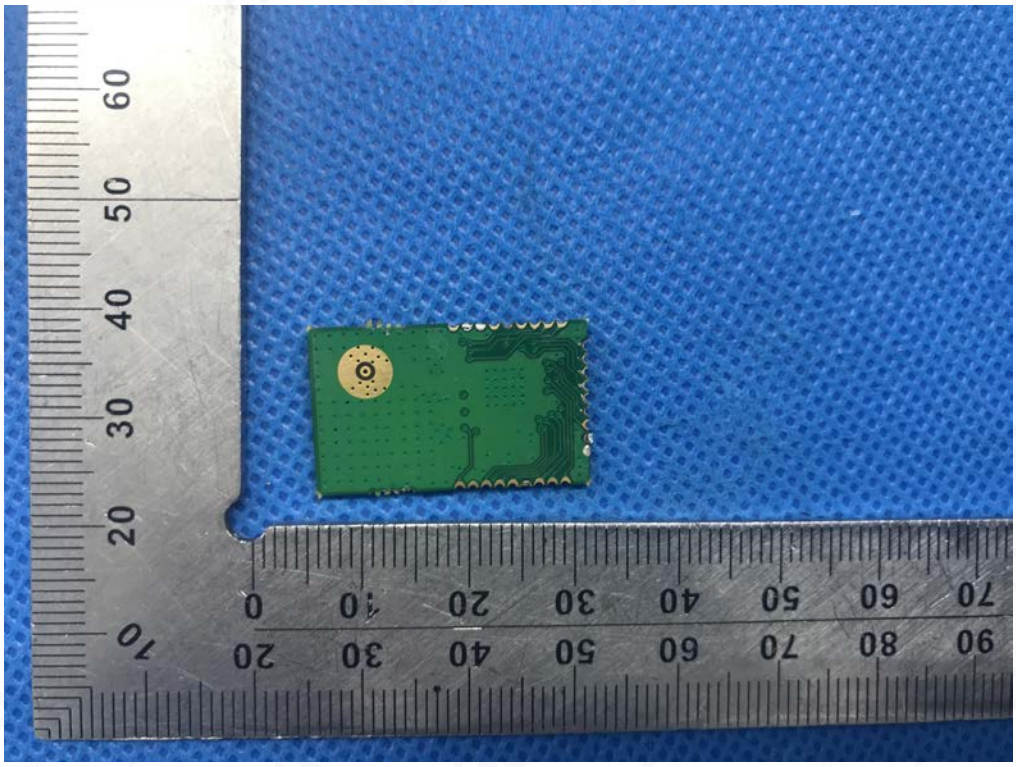
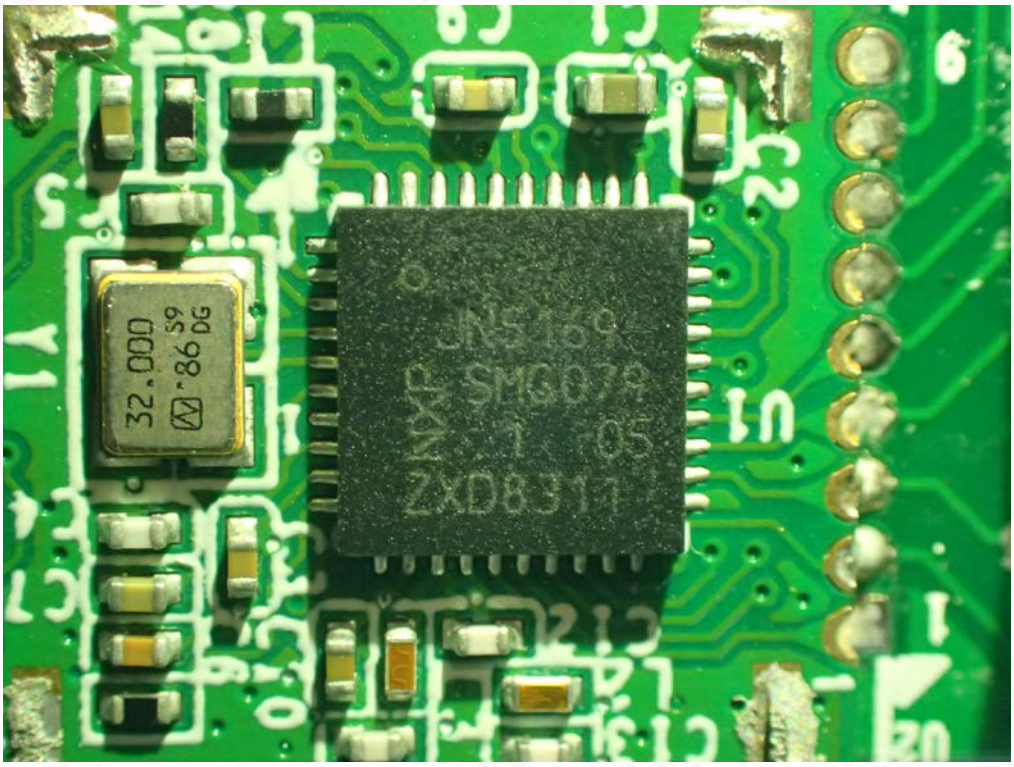
INTERNAL VIEW OF EUT(FIGURE 2)



INTERNAL VIEW OF EUT(FIGURE 6)



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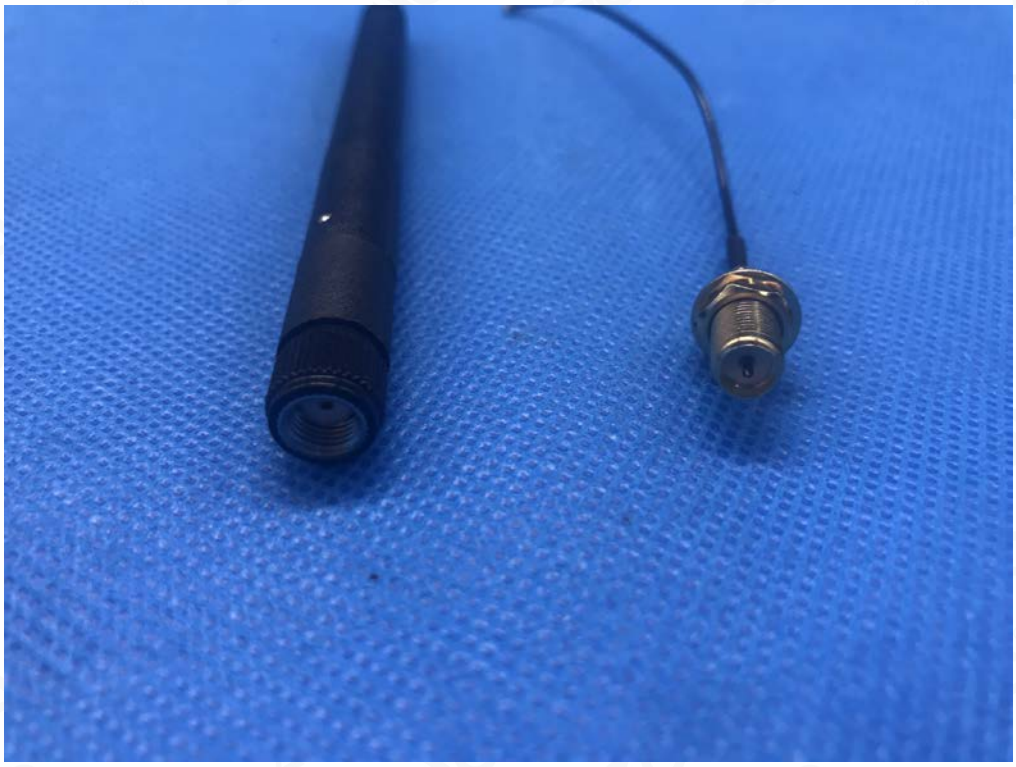
ANTENNA CONNECTOR



----END OF REPORT----

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Conditions of Issuance of Test Reports

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

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

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

4. The non-CMA report issued by AGC is only permitted to be used by the client as internal reference use and shall not be used for public demonstration purpose.

5. 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.

6. 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.

7. 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.

8.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.

9. 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.

10. 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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