

FCC Test Report

Report No.: AGC00174210102FE02

FCC ID : XPYNORAB1

APPLICATION PURPOSE : Original Equipment

PRODUCT DESIGNATION: NORA-B1

BRAND NAME : u-blox

MODEL NAME: NORA-B100, NORA-B101, NORA-B106

APPLICANT : u-blox AG

DATE OF ISSUE : Jun. 09, 2021

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. 09, 2021	Valid	Initial Release

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1. VERIFICATION OF COMPLIANCE

Applicant	u-blox AG	
Address	Zuercherstrasse 68,Thalwil 8800, Switzerland	
Manufacturer	ı-blox AG	
Address	Zuercherstrasse 68,Thalwil 8800, Switzerland	
Product Designation	NORA-B1	
Brand Name	u-blox	
Test Model	NORA-B100	
Series Model	NORA-B101, NORA-B106	
Difference description	All the series models are the same as the test model except for the model names and antenna type. NORA-B100 - u.FL connector; NORA-B101 - Antenna pin; NORA-B106 - PCB Trace antenna.	
Date of test	Feb. 23, 2021 to Jun. 09, 2021	
Deviation	No any deviation from the test method	
Condition of Test Sample	ple 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	John Zerry	
NGC V	John Zeng (Project Engineer)	Jun. 09, 2021
Reviewed By	Max Zhang	
No Foc	Max Zhang (Reviewer)	Jun. 09, 2021
Approved By	Formestico	
	Forrest Lei (Authorized Officer)	Jun. 09, 2021

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as a "NORA-B1". 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	2.924dBm (Max) For BLE 1M 2.915dBm (Max) For BLE 2M		
Bluetooth Version	V5.2		
Modulation	BR □GFSK, EDR □π /4-DQPSK, □8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps		
Number of channels	40 Channels		
Antenna Designation	See section 2.9 of the report (Comply with requirements of the FCC part 15.203)		
Antenna Gain	See section 2.8 of the report		
Hardware Version	A		
Software Version	V1.0		
Power Supply DC 3.3V			
Note: 1. The EUT doesn't support BR/EDR. 2. All of the models are tested and the main model test data recorded in this report.			

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
c.C 2	0	2402 MHz
200	0 1	2404 MHz
2400~2483.5MHz		
60	38	2478 MHz
100	39	2480 MHz

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

This submittal(s) (test report) is intended for **FCC ID: XPYNORAB1** filing to comply with the FCC Part 15.247 requirements.

2.4. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

2.5. SPECIAL ACCESSORIES

Refer to section 5.2.

2.6. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.7. ANTENNA REQUIREMENT

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

2.8. DESCRIPTION OF AVAILABLE ANTENNAS

Model No.: NORA-B100

Bluetooth Dedicated Antenna		
Antenna Type	Frequency Band (GHz)	Max Peak Gain (dBi)
Monopole antenna	2400 ~ 2483.5	5.3
FPC antenna	2400 ~ 2483.5	-0.5

Model No.: NORA-B101

Bluetooth Dedicated Antenna		
Antenna Type	Frequency Band (GHz)	Max Peak Gain (dBi)
Monopole antenna	2400 ~ 2483.5	5.3
FPC antenna	2400 ~ 2483.5	-0.5

Model No.: NORA-B106

Bluetooth Internal Antenna		
Antenna Type	Frequency Band (GHz)	Max Peak Gain (dBi)
PCB Antenna	2400 ~ 2483.5	2.0

Note: The manufacturer of NORA-101's module ANT PIN claims that the gain is 0 dBi

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2.9. DESCRIPTION OF ANTENNA RF PORT

		Antenna RF Port	
	Bluetooth (NORA-B100)	Bluetooth (NORA-B101)	Bluetooth (NORA-B106)
Software Control Port	U.FL	ANT PIN+U.FL	As shown below
	P0.20 BR P0.22 P0.22 P0.24 P0.24 P0.29 C15 P0.29 C15 P0.31 C19 P0.29 C15 RxD C19 P0.29 C15 RxD C19 P0.29 C15 P0.31 C19 P0.31	. 🤗	P0.18 RED: P0.28 RED: P0.29 RED: P0.29

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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 = ±0.8 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 %

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4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX(2402MHz)
2	Middle channel TX(2440MHz)
3	High channel TX(2480MHz)

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 the fixed frequency state through the pressing Button 1 (increment mode) and Button 2 (dec rement mode) on the control board.

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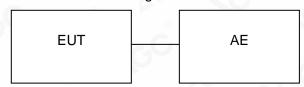


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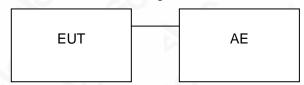
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF TESTED SYSTEM

Radiated Emission Configure:



Conducted Emission Configure:



5.2. EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	NORA-B1	NORA-B100	XPYNORAB1	EUT
2	Mobile phone	TCL	J326T	AE
3	PC	HUAWEI	DC 5V	AE
4	Control board	C3	DC 3.3V	AE

5.3. SUMMARY OF TEST RESULTS

DESCRIPTION OF TEST	RESULT
Peak Output Power	Compliant
6 dB Bandwidth	Compliant
Conducted Spurious Emission	Compliant
Maximum Conducted Output Power Density	Compliant
Radiated Emission	Compliant
Conducted Emission	Compliant
	Peak Output Power 6 dB Bandwidth Conducted Spurious Emission Maximum Conducted Output Power Density Radiated Emission

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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 Com 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
TEST RECEIVER	R&S	ESPI	101206	May 15, 2021	May 14, 2022
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
TEST RECEIVER	R&S	ESCI	10096	May 15, 2021	May 14, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 07, 2020	Dec. 06, 2021
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 21, 2019	Sep. 20, 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
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Apr. 23, 2021	Apr. 22, 2022
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
ANTENNA	SCHWARZBECK	VULB9168	494	Sep. 20, 2019	Sep. 19, 2021
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

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7. PEAK OUTPUT POWER

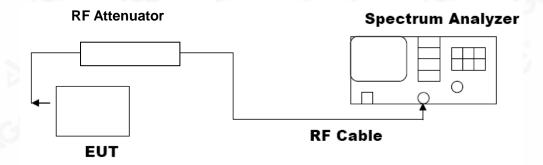
7.1. MEASUREMENT PROCEDURE

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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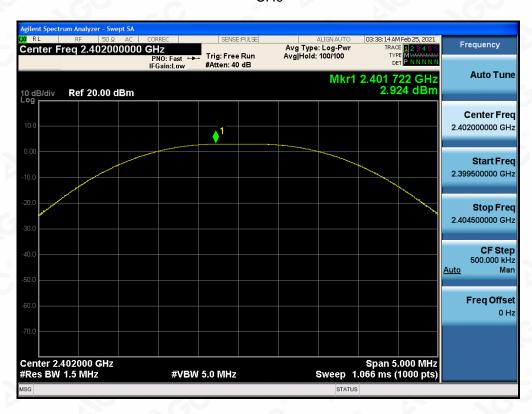
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he test results the test report.

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		
2.402	2.924	30	Pass		
2.440	2.780	30	Pass		
2.480	2.639	30	Pass		

CH₀



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CH19



CH39



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2M

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION				
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail	
2.402	2.915	30	Pass	
2.440	2.771	30	Pass	
2.480	2.625	30	Pass	

CH₀



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CH19



CH39



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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

1M

LIMITS AND MEASUREMENT RESULT					
Accellant to the Contra	Applicable Limits				
Applicable Limits	Test Data	Criteria			
100	Low Channel	688.0	PASS		
>500KHZ	Middle Channel	703.2	PASS		
20 2 F	High Channel	722.5	PASS		

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



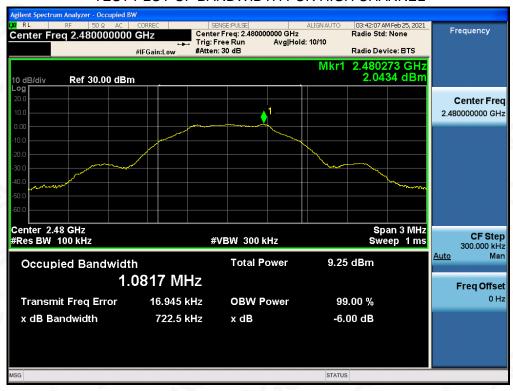
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TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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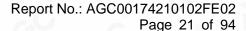
2M

LIMITS AND MEASUREMENT RESULT					
Applicable Limite	Applicable Limits				
Applicable Limits	Test Data	a (kHz)	Criteria		
100	Low Channel	1240	PASS		
>500KHZ	Middle Channel	1355	PASS		
GC C	High Channel	1191	PASS		

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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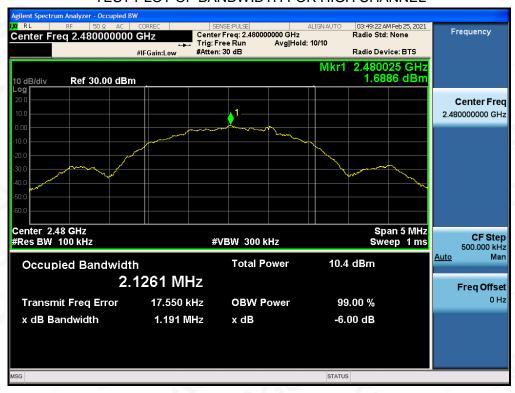




TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



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				
Annilla alda I limita	Measurement Re	sult		
Applicable Limits	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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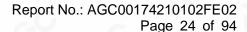


TEST RESULT FOR ENTIRE FREQUENCY RANGE 1M

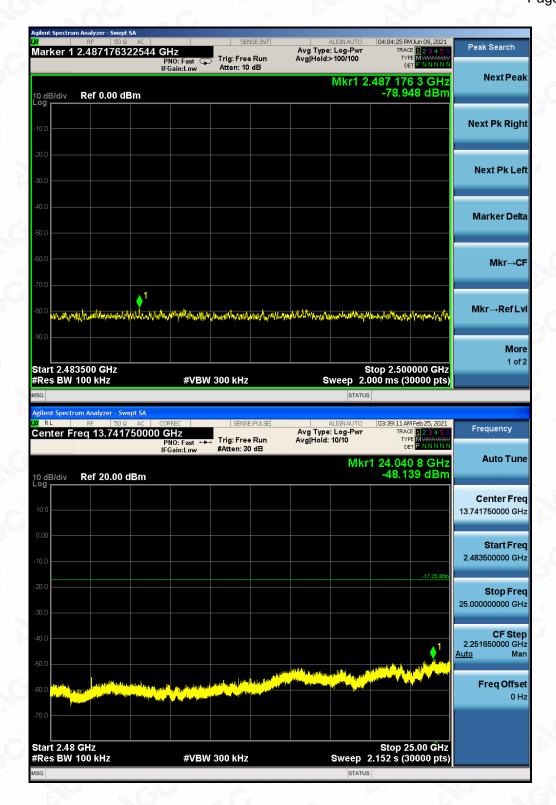
GFSK MODULATION IN LOW CHANNEL



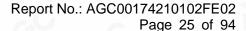
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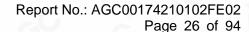




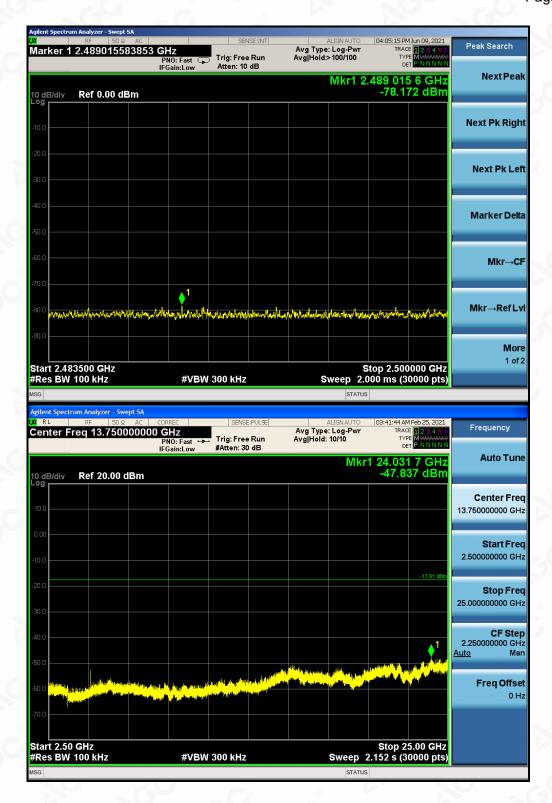
GFSK MODULATION IN MIDDLE CHANNEL



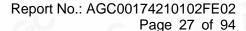
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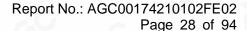




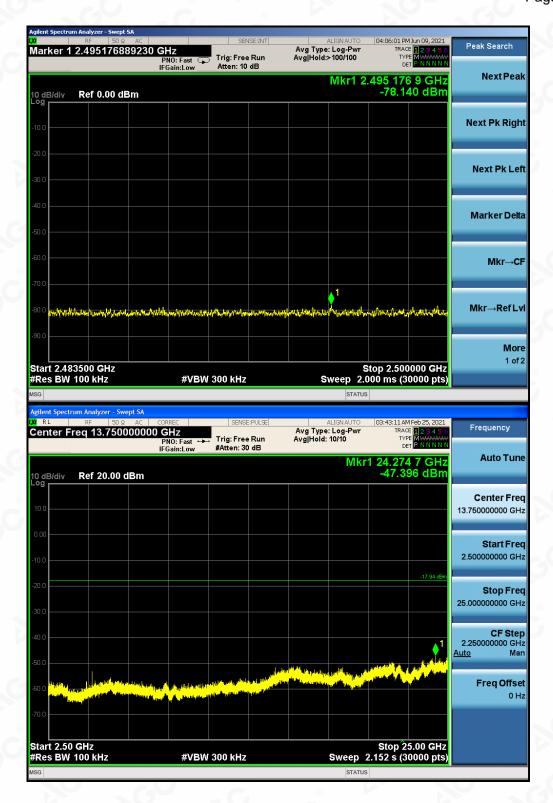
GFSK MODULATION IN HIGH CHANNEL



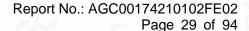
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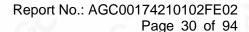




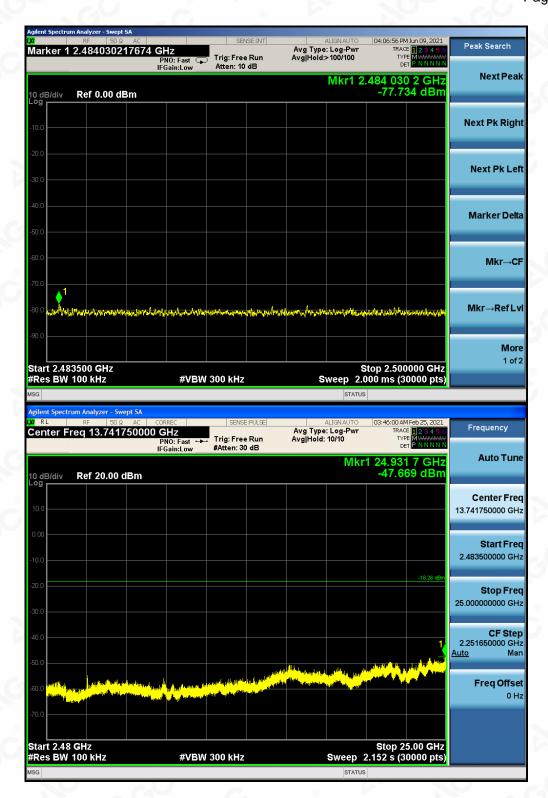
2MGFSK MODULATION IN LOW CHANNEL



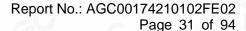
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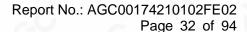




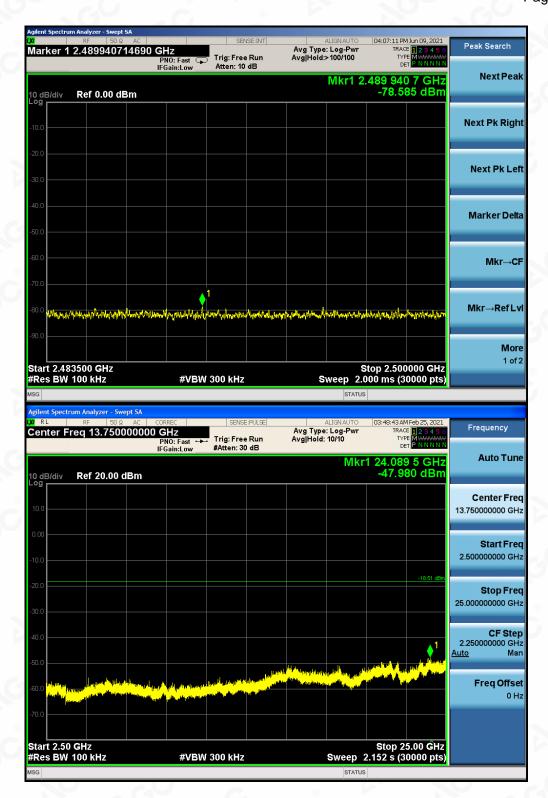
GFSK MODULATION IN MIDDLE CHANNEL



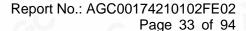
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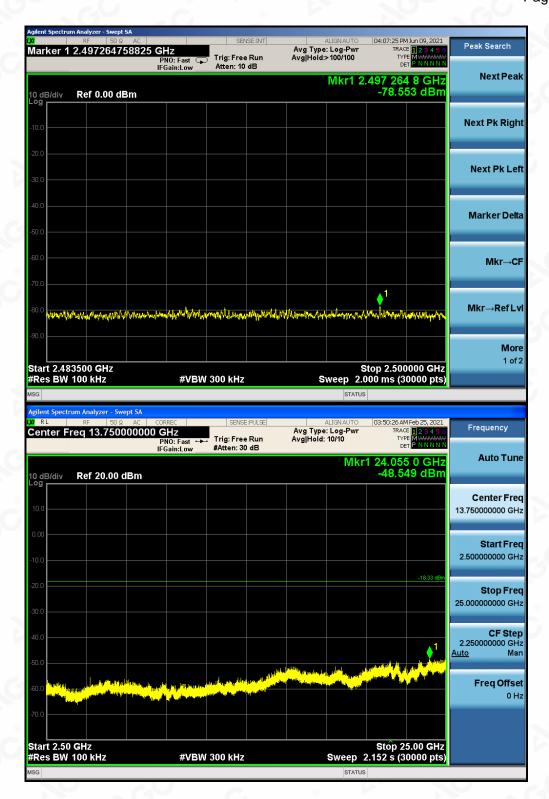


GFSK MODULATION IN HIGH CHANNEL



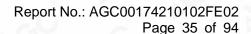
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Note: The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit.

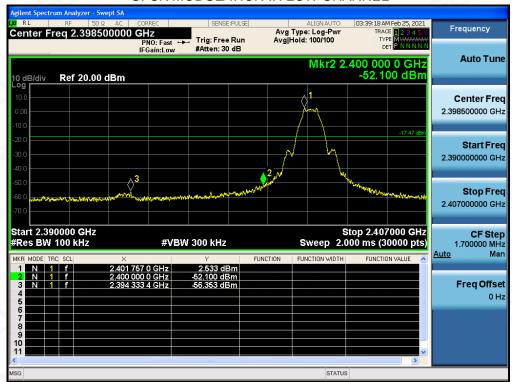
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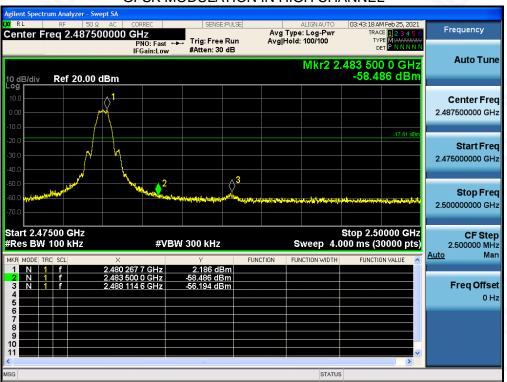


TEST RESULT FOR BAND EDGE

GFSK MODULATION IN LOW CHANNEL



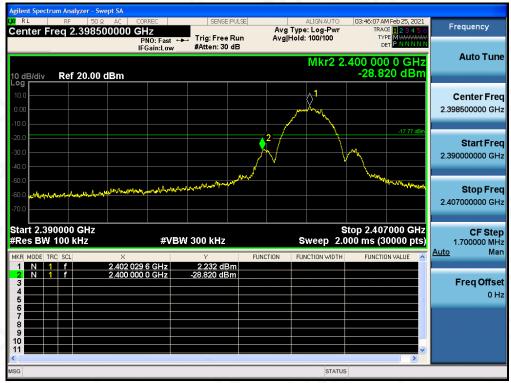
GFSK MODULATION IN HIGH CHANNEL



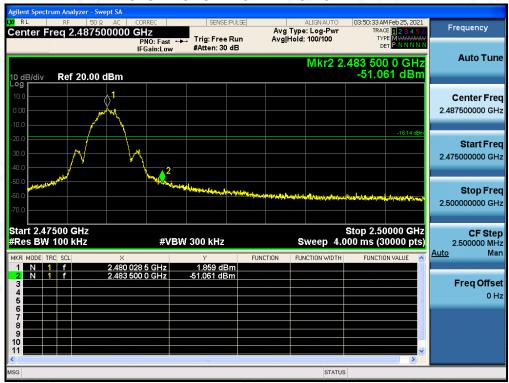
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2MGFSK MODULATION IN LOW CHANNEL



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 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

1M

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-8.883	8	Pass
Middle Channel	-10.497	8	Pass
High Channel	-10.385	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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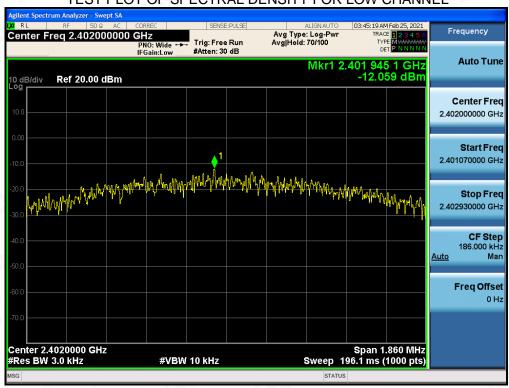


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2M

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-12.059	8	Pass
Middle Channel	-12.733	8	Pass
High Channel	-12.455	8	Pass

TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



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