

# **FCC Test Report**

Report No.: AGC00689200701FE02

**FCC ID** : Q5EKBT-200

**APPLICATION PURPOSE**: Original Equipment

**PRODUCT DESIGNATION**: BLE Beacon

BRAND NAME : Kirisun

MODEL NAME : KBT-200

APPLICANT : Kirisun Communication Co., Ltd.

**DATE OF ISSUE** : July 31, 2020

**STANDARD(S)** : FCC Part 15.247

**REPORT VERSION**: V1.0

# Attestation of Global Compliance (Shenzhen) Co., Ltd

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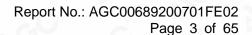


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#### REPORT REVISE RECORD

Report Version Revise Time		Issued Date	Valid Version	Notes
V1.0		July 31, 2020	Valid	Initial Release

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#### 1. VERIFICATION OF COMPLIANCE

Applicant	Kirisun Communication Co., Ltd.	
Address	3rd Floor, Building A, Tongfang Information Habour, No.11 Langshan Road, Nanshan District, Shenzhen 518057, P.R.China	
Manufacturer Kirisun Communication Co., Ltd.		
Address	3rd Floor, Building A, Tongfang Information Habour, No.11 Langshan Road, Nanshan District, Shenzhen 518057, P.R.China	
Factory	Kirisun Communication Co., Ltd.	
Address 3rd Floor, Building A, Tongfang Information Habour, No.11 Langshan F Nanshan District, Shenzhen 518057, P.R.China		
Product Designation BLE Beacon		
Brand Name Kirisun		
Test Model KBT-200		
Date of test	July 23, 2020 to July 31, 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	Then Huony	
	Thea Huang Project Engineer	July 31, 2020
Reviewed By	Max 2 hang	
No.	Max Zhang Reviewer	July 31, 2020
Approved By	Formercies	
_	Forrest Lei Authorized Officer	July 31, 2020

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#### 2. GENERAL INFORMATION

#### 2.1. PRODUCT DESCRIPTION

The EUT is designed as a "BLE Beacon". 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	2.402GHz to 2.480GHz		
RF Output Power	-0.295dBm(Max) for 1Mbps -0.400dBm(Max) for 2Mbps		
Bluetooth Version	V4.2		
Modulation	BR □GFSK, EDR □π /4-DQPSK, □8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps		
Number of Channels 40 Channels			
Antenna Designation	PCB Antenna(Comply with requirements of the FCC part 15.203)		
Antenna Gain	2dBi		
Hardware Version	2.0		
Software Version	B0322V1.06		
Power Supply DC 3.6V by battery			

#### 2.2.TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency	
100	0	2402MHZ	
8	1 0	2404MHZ	
2400~2483.5MHZ			
	38	2478 MHZ	
CC C	39	2480 MHZ	

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

This submittal(s) (test report) is intended for **FCC ID**: Q5EKBT-200 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 2.2.

#### 2.6. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

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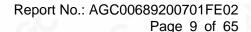
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#### 3. MEASUREMENT UNCERTAINTY

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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/Inspection The test results

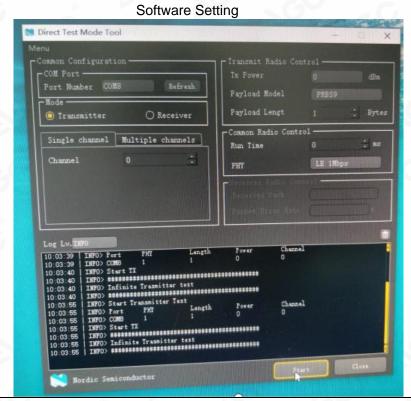


#### 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION			
1	Low channel TX 1Mbps			
2	Middle channel TX 1Mbps			
3	High channel TX 1Mbps			
4	Low channel TX 2Mbps			
5	Middle channel TX 2Mbps			
6	High channel TX 2Mbps			

Note: 1. Only the result of the worst case was recorded in the report, if no other cases.

- 2. For Conducted Test method, a temporary antenna connector is provided by the manufacture.
- 3. For Radiated Emission, 3axis were chosen for testing for each applicable mode.



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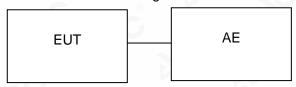
#### 5. SYSTEM TEST CONFIGURATION

#### **5.1 CONFIGURATION OF TESTED SYSTEM**

Radiated Emission Configure:



Conducted Emission Configure:



Note: For battery operated equipment, the equipment tests are performed using a new battery.

#### **5.2. EQUIPMENT USED IN TESTED SYSTEM**

Ite	tem Equipment Model No.		Model No.	ID or Specification	Remark
1	1	BLE Beacon	KBT-200	Q5EKBT-200	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)	5.247 (d) Conducted Spurious Emission		
15.247 (e) Maximum Conducted Output Power Density		Compliant	
15.209	Radiated Emission	Compliant	
15.207	Conducted Emission	N/A	

Note: 1. N/A means not applicable in this report.

2. The EUT is powered by battery.

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#### 6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd			
Location	Location  1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Communit 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	May 15, 2020	May 14, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4GHz Fliter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 09, 2019	Sep. 08, 2020
Horn antenna	SCHWARZBE CK	BBHA 9170	#768	Sep. 09, 2019	Sep. 08, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May 17, 2019	May 16, 2021
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 15, 2019	Oct. 16, 2020
ANTENNA	SCHWARZBE CK	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

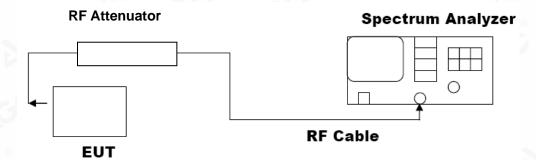
#### 7.1. MEASUREMENT PROCEDURE

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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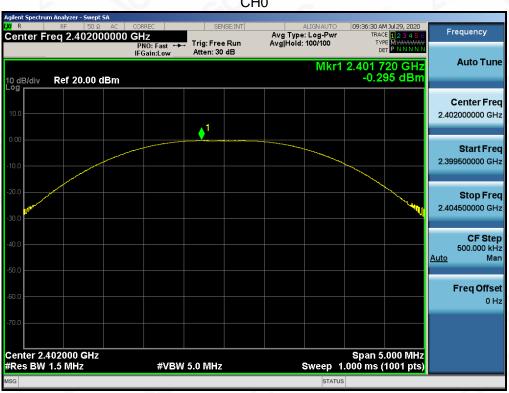
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g/Inspection The test results he test report.

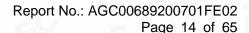
#### 7.3. LIMITS AND MEASUREMENT RESULT

	PEAK OUTPUT POWER MEA	SUREMENT RESULT	
	FOR GFSK MOUD	DULATION	
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	-0.295	30	Pass
2.440	-0.554	30	Pass
2.480	-0.607	30	Pass

CH<sub>0</sub>



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#### **CH39**



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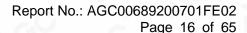
#### **2M**

	PEAK OUTPUT POWER MEA FOR GFSK MOUD		
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	-0.400	30	Pass
2.440	-0.654	30	Pass
2.480	-0.686	30	Pass

CH<sub>0</sub>



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**CH19** 







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#### 8. 6 DB BANDWIDTH

#### **8.1. MEASUREMENT PROCEDURE**

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW ≥ 3×RBW.
- 4. Set SPA Trace 1 Max hold, then View.

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

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

The same as described in section 7.2.

#### **8.3. LIMITS AND MEASUREMENT RESULTS**

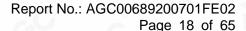
#### 1M

LIMITS AND MEASUREMENT RESULT			
Applicable Limite	Applicable Limits  Applicable Limits  Test Data (kHz)  Criteria		
Applicable Limits			
100	Low Channel	684.5	PASS
>500KHZ	Middle Channel	691.2	PASS
20 2°	High Channel	683.9	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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/Inspection The test results

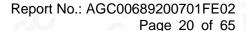
#### 2M

	LIMITS AND MEASUR	REMENT RESULT		
Applicable Limite		Applicable Limits		
Applicable Limits	Test Data (MHz)		Criteria	
	Low Channel	1.178	PASS	
>500KHZ	Middle Channel	1.184	PASS	
	High Channel	1.182	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.

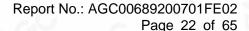
#### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

#### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT			
A marilla adala di Smitha	Measurement Result		
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 PASS	

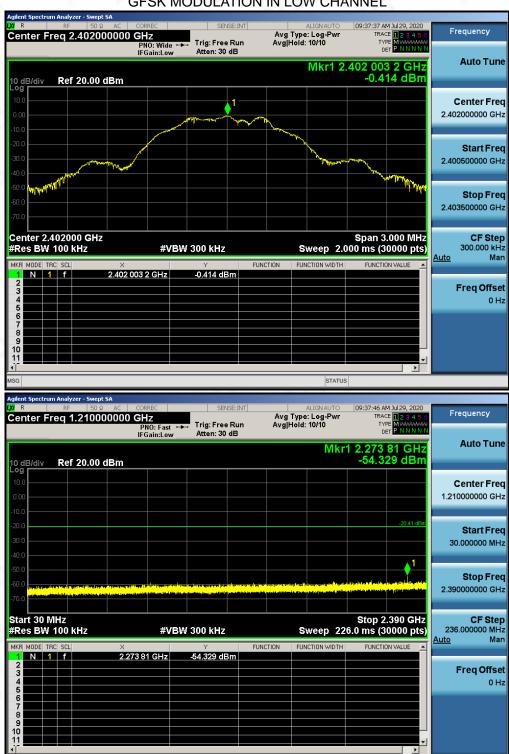
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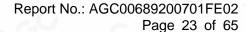


#### **TEST RESULT FOR ENTIRE FREQUENCY RANGE (1M)**

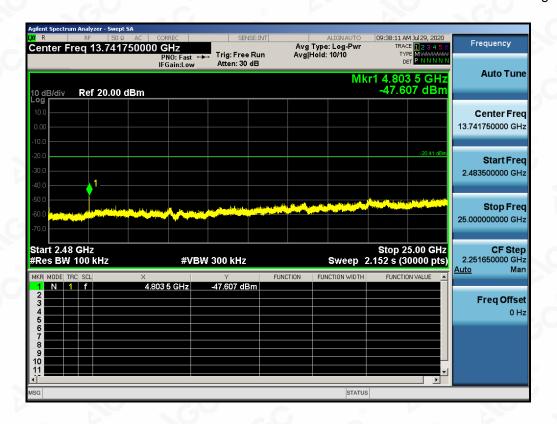
GFSK MODULATION IN LOW CHANNEL



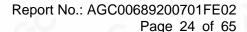
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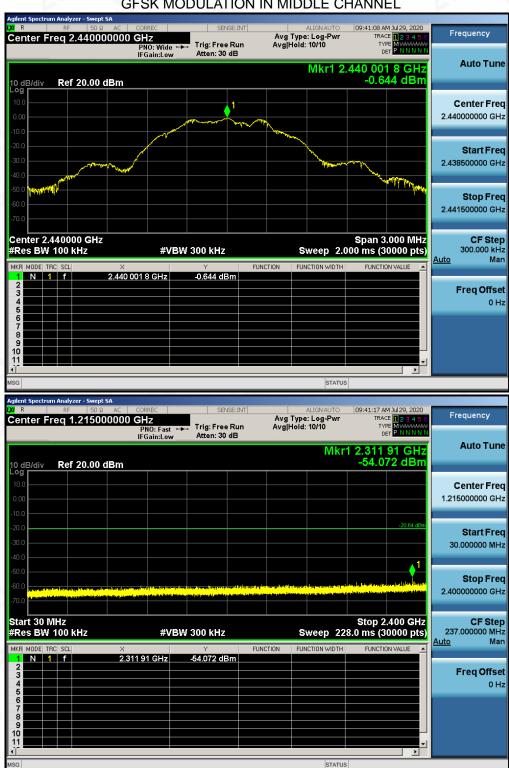


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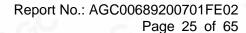




#### GFSK MODULATION IN MIDDLE CHANNEL



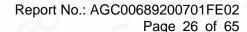
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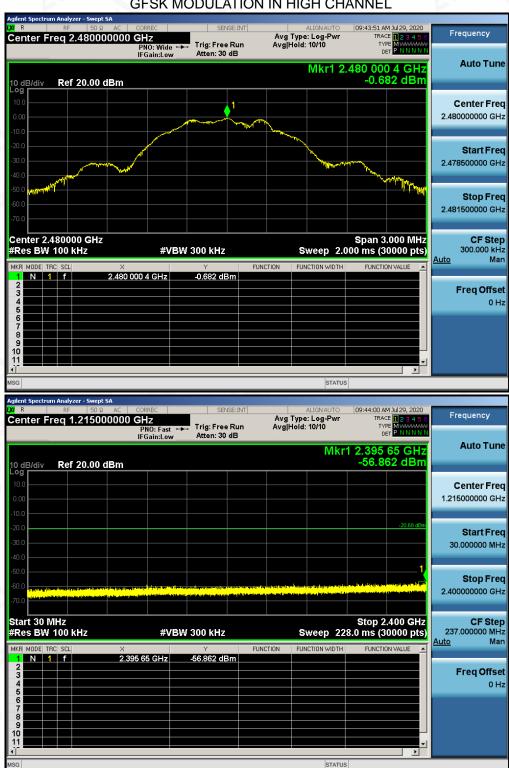


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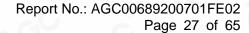




#### GFSK MODULATION IN HIGH CHANNEL



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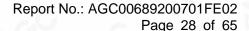






Note: The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit.

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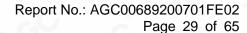


### **TEST RESULT FOR ENTIRE FREQUENCY RANGE (2M)**

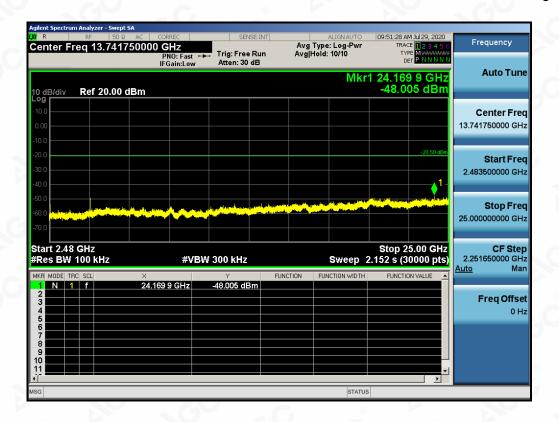
GFSK MODULATION IN LOW CHANNEL



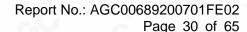
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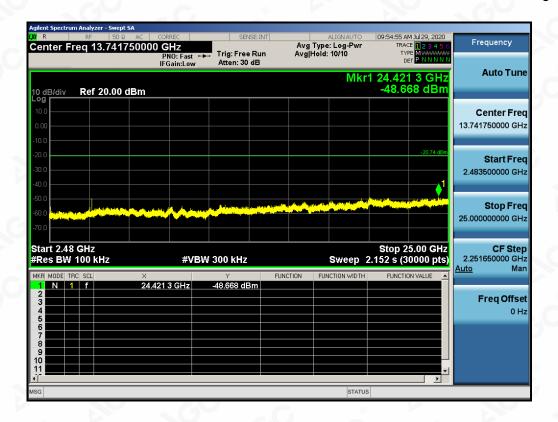
#### GFSK MODULATION IN MIDDLE CHANNEL



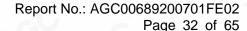
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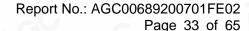




#### GFSK MODULATION IN HIGH CHANNEL



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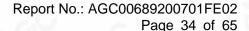






Note: The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit.

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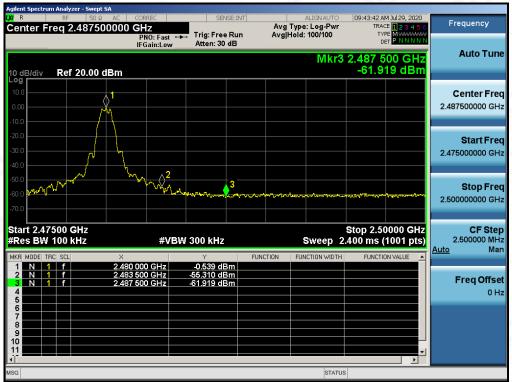


## **TEST RESULT FOR BAND EDGE (1M)**

GFSK MODULATION IN LOW CHANNEL



#### GFSK MODULATION IN HIGH CHANNEL



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## **TEST RESULT FOR BAND EDGE (2M)**

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

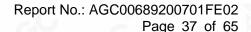
#### 1M

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-17.648	8	Pass
Middle Channel	-17.937	8	Pass
High Channel	-18.077	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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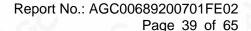
#### **2M**

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-19.980	8	Pass
Middle Channel	-20.208	8	Pass
High Channel	-20.237	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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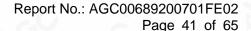
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#### 11. RADIATED EMISSION

#### 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.
- 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.

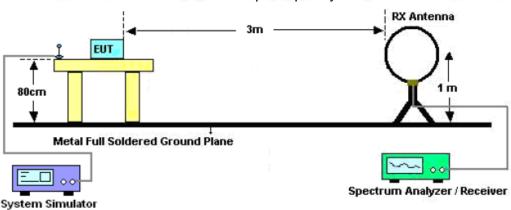
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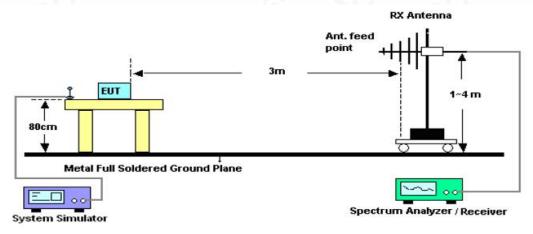


#### 11.2. TEST SETUP

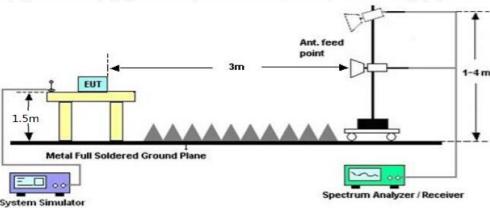
#### Radiated Emission Test-Setup Frequency Below 30MHz



#### 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**

Emissions are attenuated more than 20 dB below the permissible value.

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