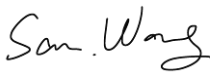
Shenzhen GUOREN Certification Technology Service Co., Ltd.

101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

FCC PART 15 SUBPART C TEST REPORT
FCC PART 15.247

Report Reference No..... :	**GRCTR210802007-01**	
FCC ID..... :	**2ABHWBN-HH-G**	
Compiled by (position+printed name+signature).. :	Testing Engineer Jimmy Wang	
Supervised by (position+printed name+signature).. :	Project Engineer Kelley Zhang	
Approved by (position+printed name+signature).. :	Manager Sam Wang	
Date of issue..... :	Sep. 03, 2021	

Testing Laboratory Name.....:	**Shenzhen GUOREN Certification Technology Service Co., Ltd.**
Address..... :	101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

Applicant's name..... :	**BayNexus Inc**
Address..... :	B307, 530 Building TaiHu International Science park, Wu Xi,China

Test specification..... **:**	
Standard..... :	**FCC Part 15.247**

Test item description.....:	**Smart terminal**
Trade Mark..... :	N/A
Manufacturer..... :	BayNexus Inc
Model/Type reference..... :	BN-HH-G
Listed Models ..... :	BN-HH-G04, BN-HH-G04E, BN-HH-G04S, BN-HH-G05, BN-HH-G05E, BN-HH-G05S
Modulation ..... :	GFSK
Frequency.....	From 902.75MHz to 927.25MHz
Rating..... :	DC 3.80V from battery and DC 5V From External circuit
Result..... :	**PASS**

T E S T R E P O R T

Equipment under Test	:	Smart terminal
Model /Type	:	BN-HH-G
Listed Models	:	BN-HH-G04, BN-HH-G04E, BN-HH-G04S, BN-HH-G05, BN-HH-G05E, BN-HH-G05S
Applicant	:	BayNexus Inc
Address	:	B307, 530 Building TaiHu International Science park, Wu Xi,China
Manufacturer	:	BayNexus Inc
Address	:	B307, 530 Building TaiHu International Science park, Wu Xi,China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Aug. 04, 2021
Testing commenced on	:	Aug. 04, 2021
Testing concluded on	:	Sep. 03, 2021

2.2 Product Description

Product Name:	Smart terminal
Model/Type reference:	BN-HH-G
Listed Model:	BN-HH-G04, BN-HH-G04E, BN-HH-G04S, BN-HH-G05, BN-HH-G05E, BN-HH-G05S
Power supply:	DC 3.80V from battery and DC 5V From External circuit
Adapter information (Auxiliary test supplied by test Lab）:	Model:EP-TA20CBC Input:AC100-240V-50/60Hz,0.5A Output:DC 5V,2A
Testing sample ID:	GRCTR210802007-01-1# (Engineer sample), GRCTR210802007-01-2# (Normal sample)
Software version:	V1.0
Hardware version:	V1.0
RF ID	
Modulation:	GFSK
Operation frequency:	902.75MHz to 927.25MHz
Channel number:	50
Channel separation:	0.5MHz
Antenna type:	Internal Antenna
Antenna gain*（Supplied by the customer）:	2dBi
Remark:1. The products are identical in interior structure, electrical circuits and components, just model names and color are different, so no additional models were tested. 2. *When the information provided by the customer was used to calculate test results, if the information provided by the customer is not accurate, shenzhen GUOREN Certification Technology Service Co., Ltd. does not assume any responsibility.	

2.3 Short description of the Equipment under Test (EUT)

This is a Smart terminal.
For more details, refer to the user's manual of the EUT.

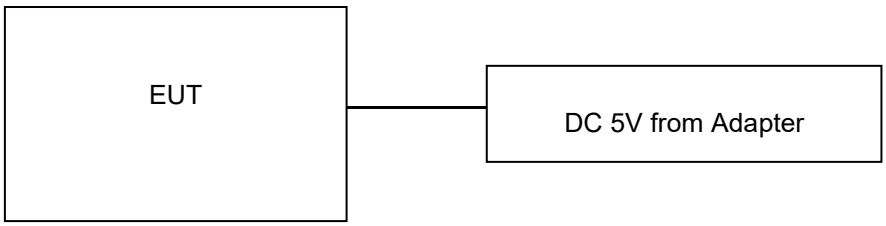
2.4 EUT operation mode

The Applicant provides communication tools software(Engineer mode) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 50 channels provided to the EUT and Channel 01/24/50 were selected to test.

Operation Frequency：

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	**902.75MHz**	16	910.25MHz	31	917.75MHz	46	925.25MHz
2	903.25MHz	17	910.75MHz	32	918.25MHz	47	925.75MHz
3	903.75MHz	18	911.25MHz	33	918.75MHz	48	926.25MHz
4	904.25MHz	19	911.75MHz	34	919.25MHz	49	926.75MHz
5	904.75MHz	20	912.25MHz	35	919.75MHz	**50**	**927.25MHz**
6	905.25MHz	21	912.75MHz	36	920.25MHz		
7	905.75MHz	22	913.25MHz	37	920.75MHz		
8	906.25MHz	23	913.75MHz	38	921.25MHz		
9	906.75MHz	**24**	**914.25MHz**	39	921.75MHz		
10	907.25MHz	25	914.75MHz	40	922.25MHz		
11	907.75MHz	26	915.25MHz	41	922.75MHz		
12	908.25MHz	27	915.75MHz	42	923.25MHz		
13	908.75MHz	28	916.25MHz	43	923.75MHz		
14	909.25MHz	29	916.75MHz	44	924.25MHz		
15	909.75MHz	30	917.25MHz	45	924.75MHz		

2.5 Block Diagram of Test Setup



2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the device filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen GUOREN Certification Technology Service Co., Ltd.
101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 920798 Designation Number: CN1304

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6202.01

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

ISED#: 27264 CAB identifier: CN0115
Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	15-35 ℃
Lative Humidity	30-60 %
Air Pressure	950-1050mbar

3.4 Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Test result
§15.247(a)(1)	Carrier Frequency separation	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Middle	Compliant
§15.247(a)(1)	Number of Hopping channels	GFSK	☒ Full	GFSK	☒ Full	Compliant
§15.247(a)(1)	Time of Occupancy (dwell time)	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Middle	Compliant
§15.247(a)(1)	Spectrum bandwidth of a FHSS system 20dB bandwidth	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	Compliant
§15.247(b)(1)	Maximum Peak Output Power	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	Compliant
§15.247(d)	Band edge compliance conducted	GFSK	☒ Lowest ☒ Highest	GFSK	☒ Lowest ☒ Highest	Compliant

§15.205	Band edge compliance radiated	GFSK	☒ Lowest ☒ Highest	GFSK	☒ Lowest ☒ Highest	Compliant
§15.247(d)	TX spurious emissions conducted	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	Compliant
§ 15.209(a) §15.247(d)	TX spurious emissions radiated	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	Compliant
§15.209(a)	TX spurious Emissions radiated Below 1GHz	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Middle	Compliant
§15.107(a) §15.207	Conducted Emissions 9KHz-30 MHz	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Middle	Compliant

Remark:
1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report

3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen GUOREN Certification Technology Service Co., Ltd.quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GUOREN Certification Technology Service Co., Ltd.:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.06 dB	(1)
Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

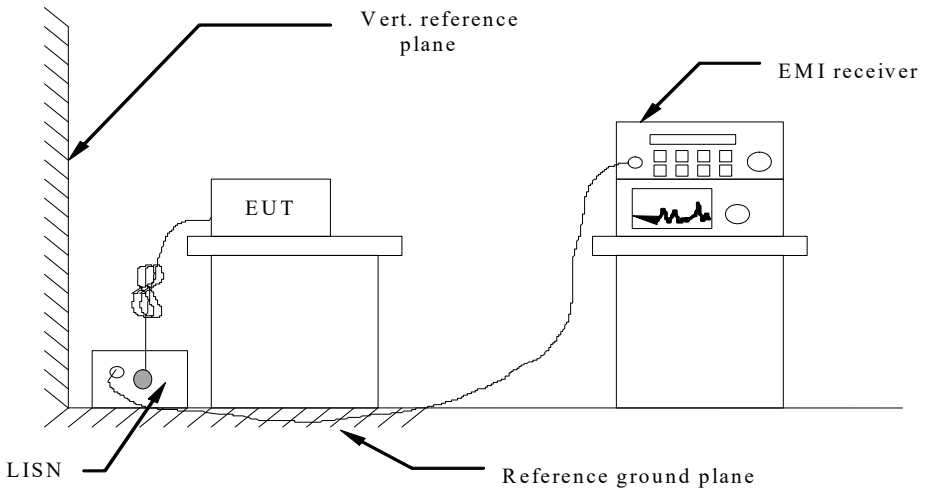
3.6 Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	GRCTEE009	2020/11/3	2021/11/2
LISN	R&S	ENV216	GRCTEE010	2020/11/3	2021/11/2
EMI Test Receiver	R&S	ESPI	GRCTEE017	2020/11/3	2021/11/2
EMI Test Receiver	R&S	ESCI	GRCTEE008	2020/11/3	2021/11/2
Spectrum Analyzer	Agilent	N9020A	GRCTEE002	2020/11/3	2021/11/2
Spectrum Analyzer	R&S	FSP	GRCTEE003	2020/11/19	2021/11/18
Vector Signal generator	Agilent	N5181A	GRCTEE007	2020/11/3	2021/11/2
Analog Signal Generator	R&S	SML03	GRCTEE006	2020/11/3	2021/11/2
Universal Radio Communication	CMW500	R&S	GRCTEE001	2020/11/3	2021/11/2
Climate Chamber	QIYA	LCD-9530	GRCTES016	2020/11/1	2021/10/31
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	GRCTEE018	2020/10/25	2023/10/24
Horn Antenna	Schwarzbeck	BBHA 9120D	GRCTEE019	2020/10/25	2023/10/24
Loop Antenna	Zhinan	ZN30900C	GRCTEE020	2020/10/25	2023/10/24
Horn Antenna	Beijing Hangwei Dayang	OBH100400	GRCTEE049	2021/1/18	2024/1/17
Amplifier	Schwarzbeck	BBV 9745	GRCTEE021	2021/1/18	2022/1/17
Amplifier	Taiwan chengyi	EMC051845B	GRCTEE022	2020/11/19	2021/11/18
Temperature/Humidity Meter	Huaguan	HG-308	GRCTES037	2020/11/1	2021/10/31
Directional coupler	NARDA	4226-10	GRCTEE004	2020/11/3	2021/11/2
Band elimination filter	XingBo	XBLBQ-DZA05	GRCTEE057	2020/11/3	2021/11/2
High-Pass Filter	XingBo	XBLBQ-GTA18	GRCTEE053	2020/11/3	2021/11/2
High-Pass Filter	XingBo	XBLBQ-GTA27	GRCTEE054	2020/11/3	2021/11/2
Automated filter bank	Tonscend	JS0806-F	GRCTEE055	2020/11/3	2021/11/2
EMI Test Software	ROHDE & SCHWARZ	ESK1-V1.71	GRCTEE060	N/A	N/A
EMI Test Software	Fera	EZ-EMC	GRCTEE061	N/A	N/A

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. 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 C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received DC power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT 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.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

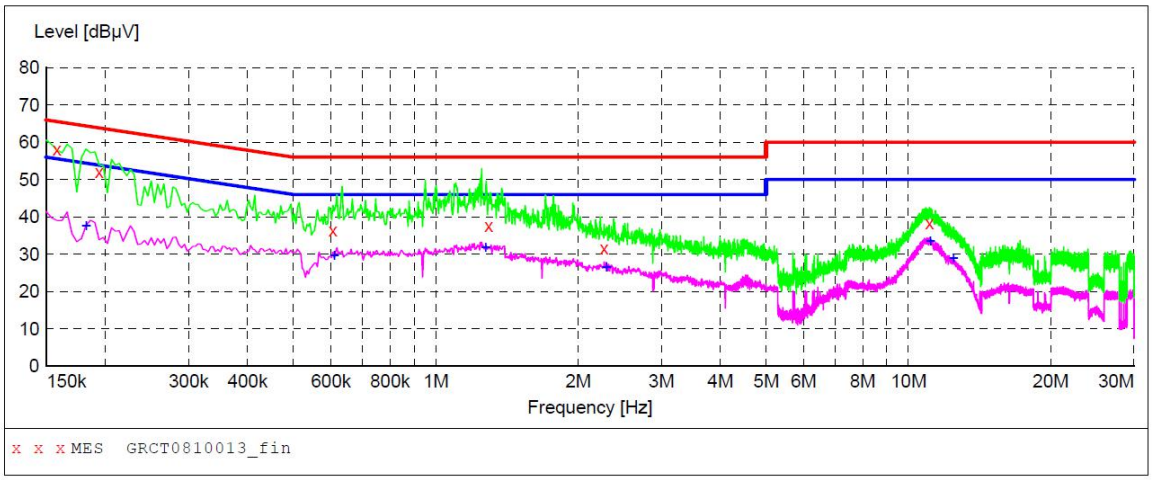
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

TEST RESULTS

Remark:

1. All modes of GFSK were test at Low, Middle, and High channel; only the worst result of GFSK Middle Channel was reported as below:
2. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below

Power supply:	DC 5V from Adapter AC 120V/60Hz	Polarization	L



MEASUREMENT RESULT: "GRCT0810013_fin"

8/10/2021 6:45PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.158000	58.20	10.3	66	7.4	QP	L1	GND
0.194000	52.10	10.3	64	11.8	QP	L1	GND
0.606000	36.50	10.3	56	19.5	QP	L1	GND
1.294000	37.70	10.4	56	18.3	QP	L1	GND
2.270000	31.70	10.5	56	24.3	QP	L1	GND
11.086000	38.40	10.7	60	21.6	QP	L1	GND

MEASUREMENT RESULT: "GRCT0810013_fin2"

8/10/2021 6:45PM

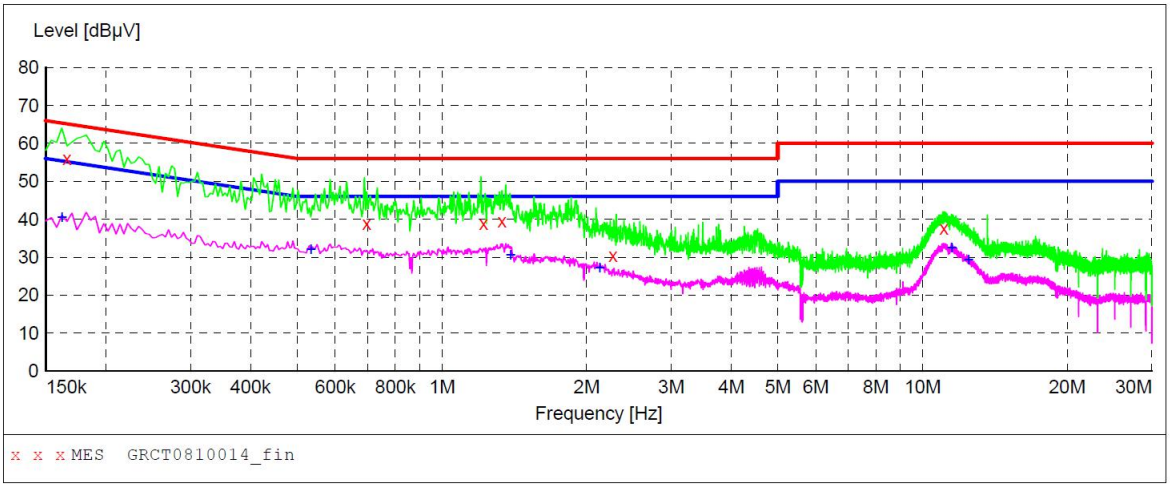
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.182000	37.60	10.3	54	16.8	AV	L1	GND
0.610000	29.80	10.3	46	16.2	AV	L1	GND
1.274000	31.90	10.4	46	14.1	AV	L1	GND
2.294000	26.70	10.5	46	19.3	AV	L1	GND
11.122000	33.50	10.7	50	16.5	AV	L1	GND
12.438000	29.00	10.7	50	21.0	AV	L1	GND

Note:1).Level (dBµV)= Reading (dBµV)+ Transducer (dB)

2). Transducer (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). Margin(dB) = Limit (dBµV) - Level (dBµV)

Power supply:	DC 5V from Adapter AC 120V/60Hz	Polarization	N



MEASUREMENT RESULT: "GRCT0810014_fin"

8/10/2021 6:49PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.166000	56.00	10.3	65	9.2	QP	N	GND
0.698000	38.80	10.3	56	17.2	QP	N	GND
1.222000	38.80	10.4	56	17.2	QP	N	GND
1.334000	39.50	10.4	56	16.5	QP	N	GND
2.270000	30.50	10.5	56	25.5	QP	N	GND
11.078000	37.70	10.7	60	22.3	QP	N	GND

MEASUREMENT RESULT: "GRCT0810014_fin2"

8/10/2021 6:49PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.162000	40.50	10.3	55	14.9	AV	N	GND
0.534000	32.20	10.3	46	13.8	AV	N	GND
1.390000	30.60	10.4	46	15.4	AV	N	GND
2.130000	27.20	10.5	46	18.8	AV	N	GND
11.502000	32.60	10.7	50	17.4	AV	N	GND
12.462000	29.40	10.7	50	20.6	AV	N	GND

Note:1).Level (dBµV)= Reading (dBµV)+ Transducer (dB)

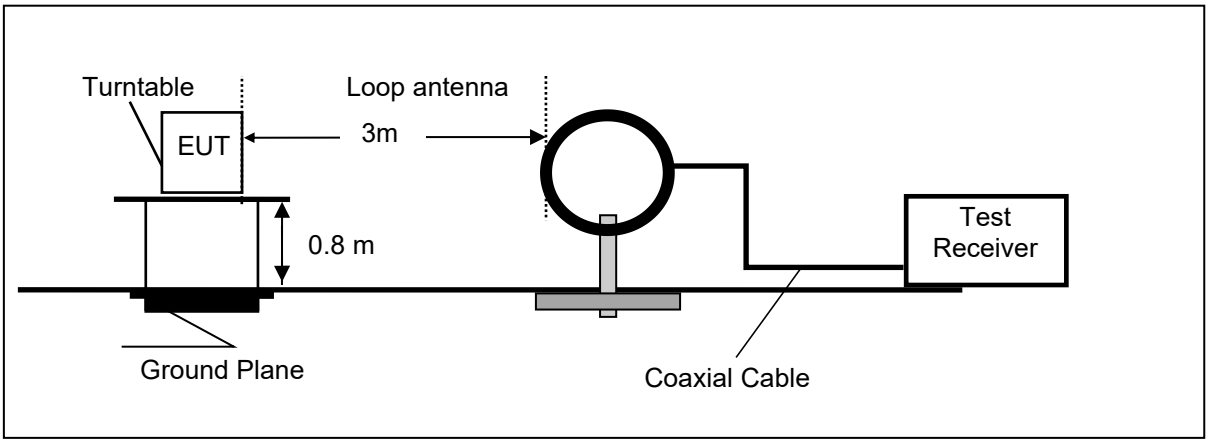
2). Transducer (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). Margin(dB) = Limit (dBµV) - Level (dBµV)

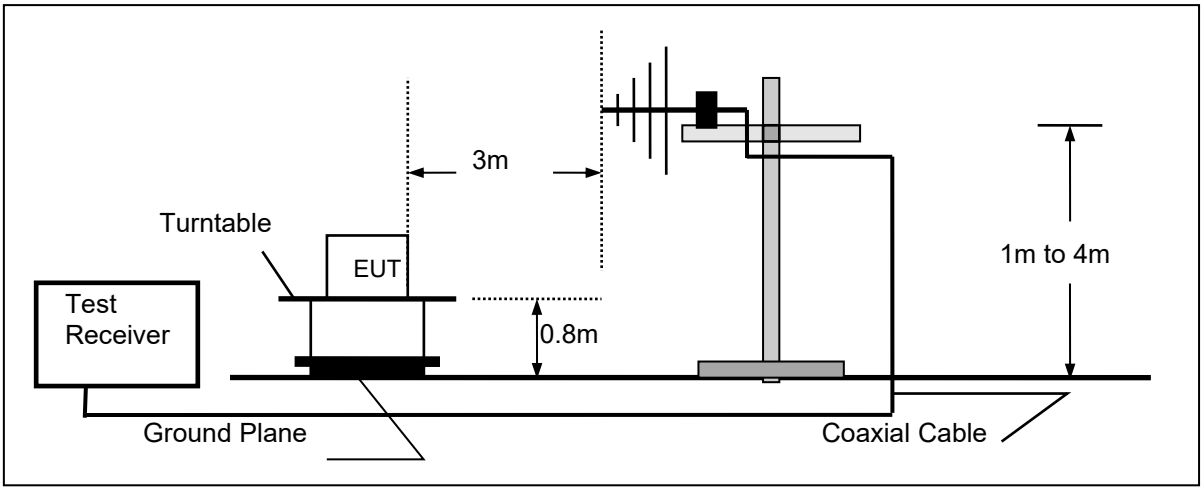
4.2 Radiated Emission

TEST CONFIGURATION

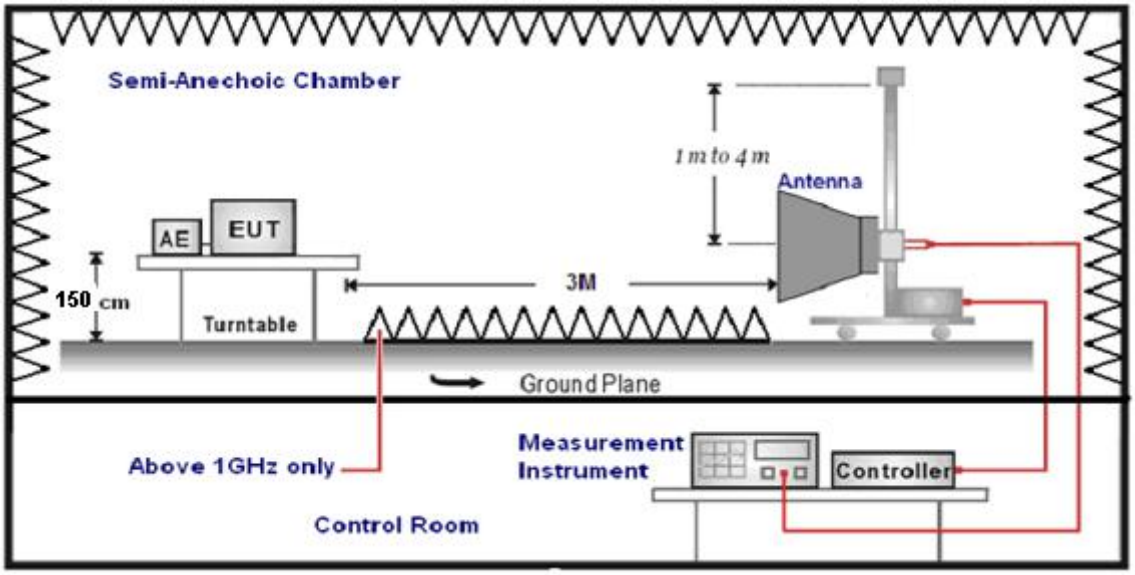
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

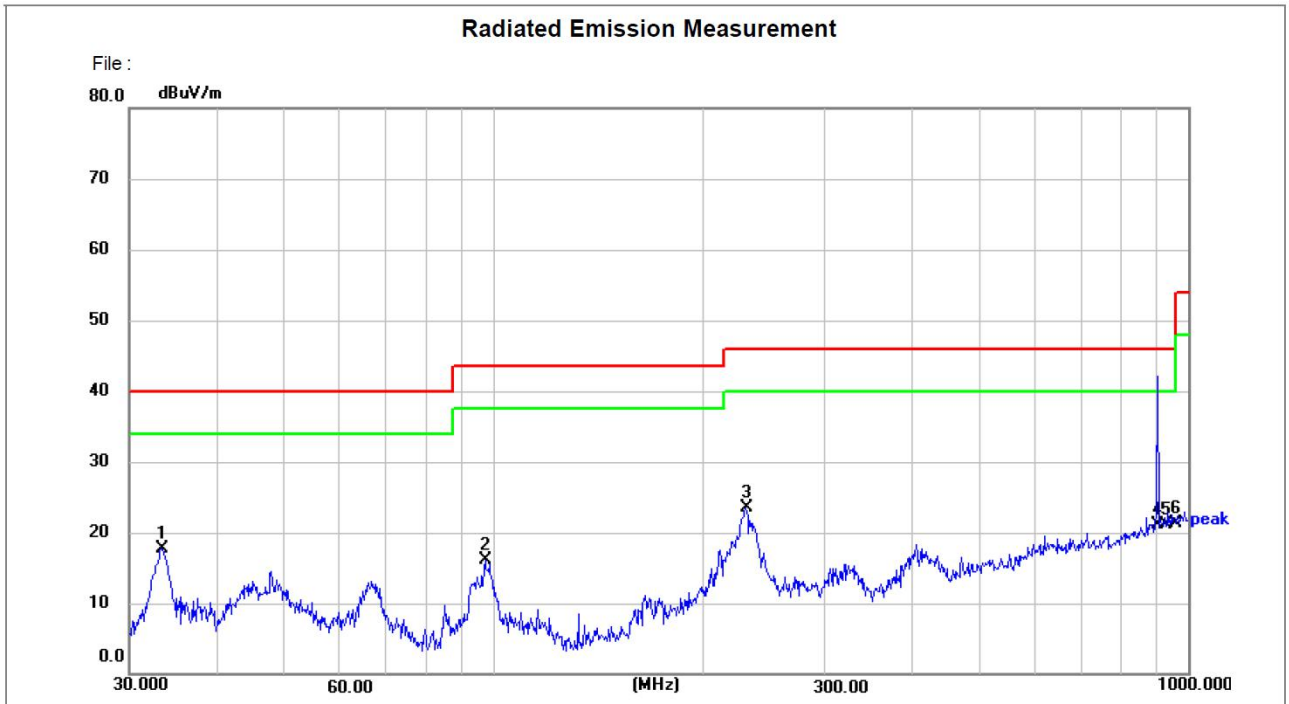
Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. For below 1GHz testing recorded worst at GFSK middle channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz

For 902.75MHz

Horizontal



Site LAB
Limit: FCC Part15 RE-Class B_30-1000MHz
EUT:
M/N: 902.75MHz
Mode:
Note:

Polarization: ***Horizontal***
Power: AC120/60Hz
Distance: 3m

Temperature: 24.5(C)
Humidity: 48 %

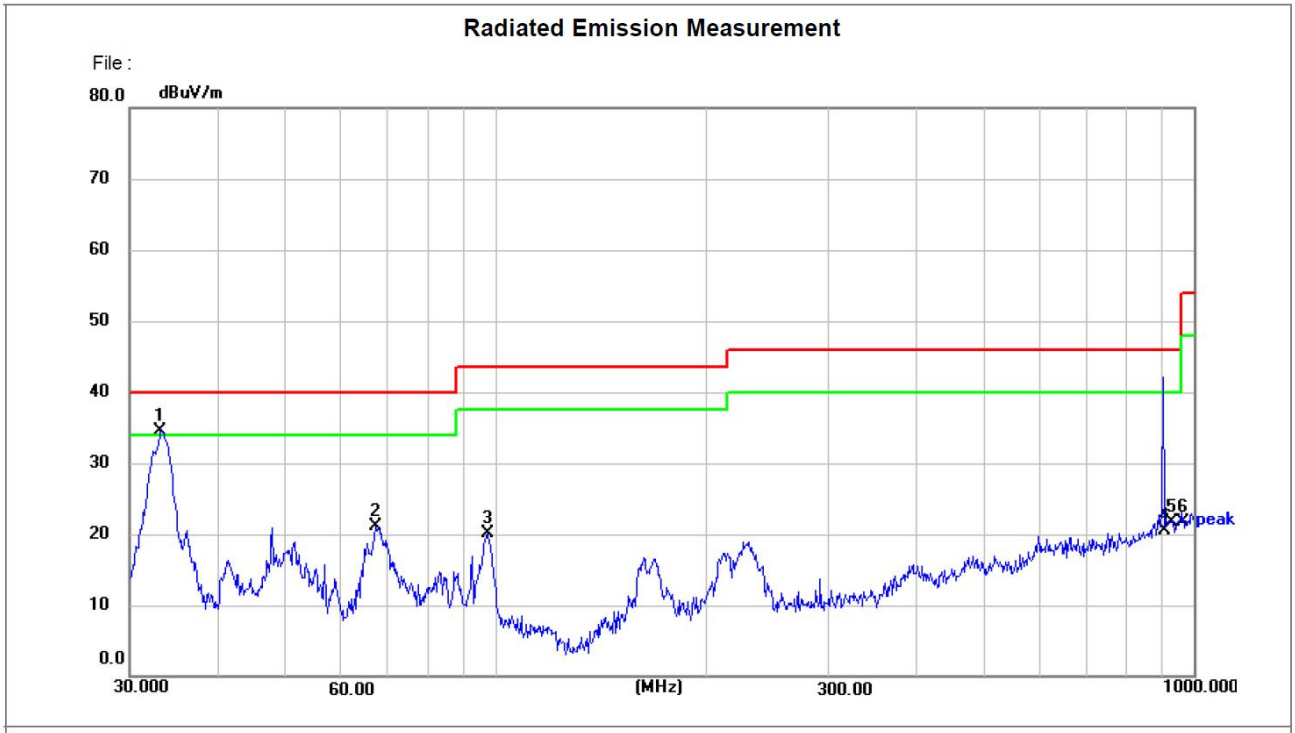
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	33.3279	37.70	-19.94	17.76	40.00	-22.24	peak	100	227	P	
2	97.7983	35.42	-19.35	16.07	43.50	-27.43	peak	100	179	P	
3	230.9068	42.00	-18.54	23.46	46.00	-22.54	peak	100	40	P	
4	902.0000	28.32	-7.15	21.17	46.00	-24.83	peak	100	34	P	
5	928.0000	28.09	-6.94	21.15	46.00	-24.85	peak	100	264	P	
6	960.0000	27.89	-6.60	21.29	46.00	-24.71	peak	100	227	P	

Note:1).Level (dBμV/m)= Reading (dBμV/m)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



Site LAB
Limit: FCC Part15 RE-Class B_30-1000MHz
EUT:
M/N: 902.75MHz
Mode:
Note:

Polarization: *Vertical*
Power: AC120/60Hz
Distance: 3m

Temperature: 24.5(C)
Humidity: 48 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	33.2112	54.40	-19.95	34.45	40.00	-5.55	peak	100	118	P	
2	67.4382	41.75	-20.57	21.18	40.00	-18.82	peak	100	25	P	
3	97.4560	39.47	-19.41	20.06	43.50	-23.44	peak	100	1	P	
4	902.0000	27.67	-7.15	20.52	46.00	-25.48	peak	100	227	P	
5	928.0000	28.75	-6.94	21.81	46.00	-24.21	peak	100	336	P	
6	960.0000	28.20	-6.60	21.60	54.00	-32.36	peak	100	141	P	

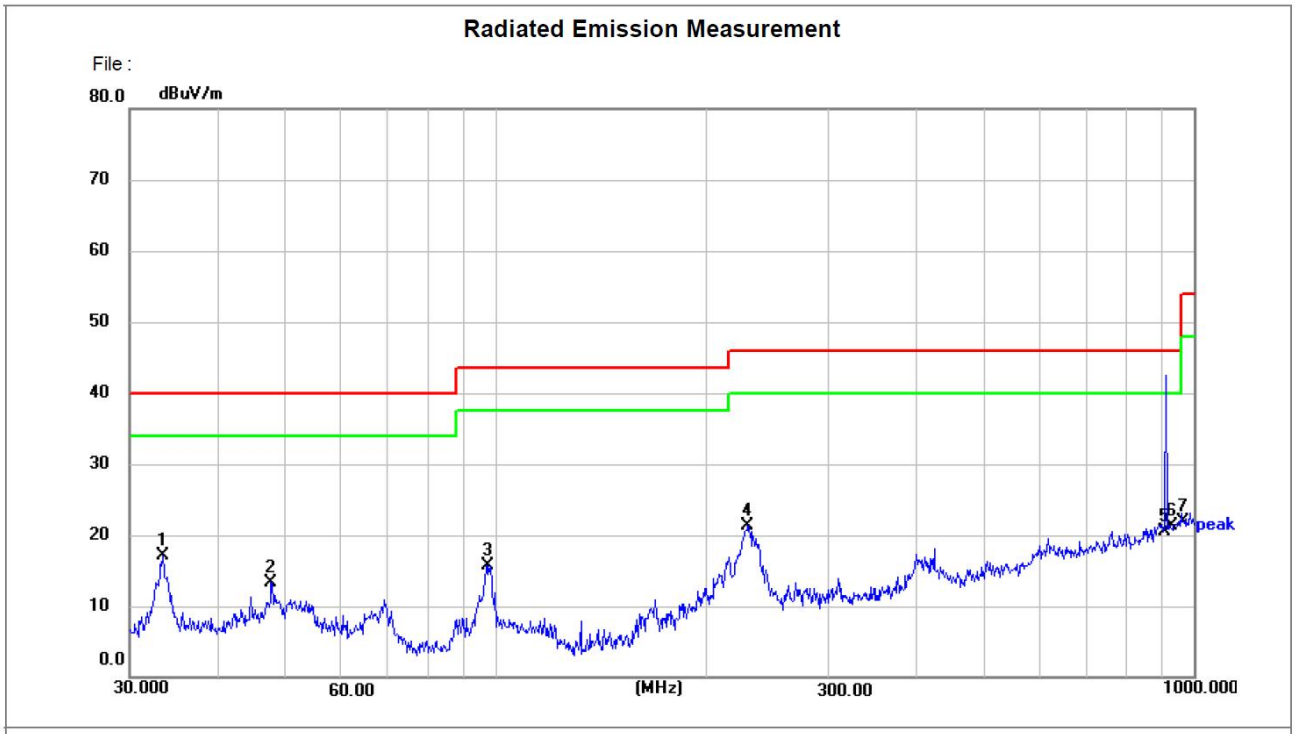
Note:1).Level (dBμV/m)= Reading (dBμV/m)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

For 914.25MHz

Horizontal



Site LAB
Limit: FCC Part15 RE-Class B_30-1000MHz
EUT:
M/N: 914.25MHz
Mode:
Note:

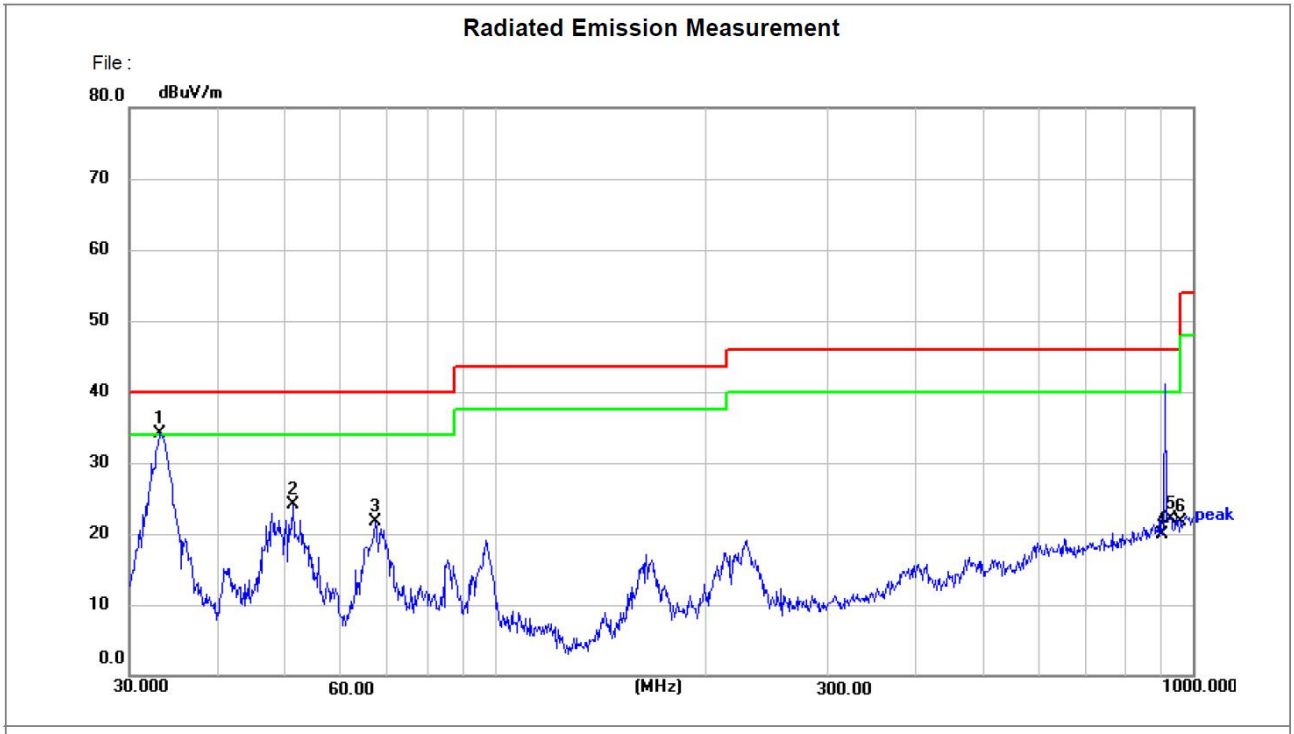
Polarization: ***Horizontal***
Power: AC120/60Hz
Distance: 3m

Temperature: 24.5(C)
Humidity: 48 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	33.4449	36.98	-19.93	17.05	40.00	-22.95	peak	100	87	P	
2	47.8260	31.09	-17.80	13.29	40.00	-26.71	peak	100	202	P	
3	97.6270	35.15	-19.38	15.77	43.50	-27.73	peak	100	6	P	
4	230.0985	39.93	-18.55	21.38	46.00	-24.62	peak	100	264	P	
5	902.0000	27.61	-7.15	20.46	46.00	-25.54	peak	100	139	P	
6	928.0000	28.32	-6.94	21.38	46.00	-24.64	peak	100	188	P	
7	960.0000	28.44	-6.60	21.84	54.00	-32.12	peak	100	11	P	

Note:1).Level (dBμV/m)= Reading (dBμV/m)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



Site LAB
Limit: FCC Part15 RE-Class B_30-1000MHz
EUT:
M/N: 914.25MHz
Mode:
Note:

Polarization: ***Vertical***
Power: AC120/60Hz
Distance: 3m

Temperature: 24.5(C)
Humidity: 48 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	33.0950	54.10	-19.95	34.15	40.00	-5.85	peak	100	48	P	
2	51.4807	41.90	-17.85	24.05	40.00	-15.95	peak	100	329	P	
3	67.4382	42.32	-20.57	21.75	40.00	-18.25	peak	100	127	P	
4	902.0000	27.03	-7.15	19.88	46.00	-26.12	peak	100	88	P	
5	928.0000	28.96	-6.94	22.02	46.00	-23.98	peak	100	329	P	
6	960.0000	28.40	-6.60	21.80	46.00	-24.20	peak	100	259	P	

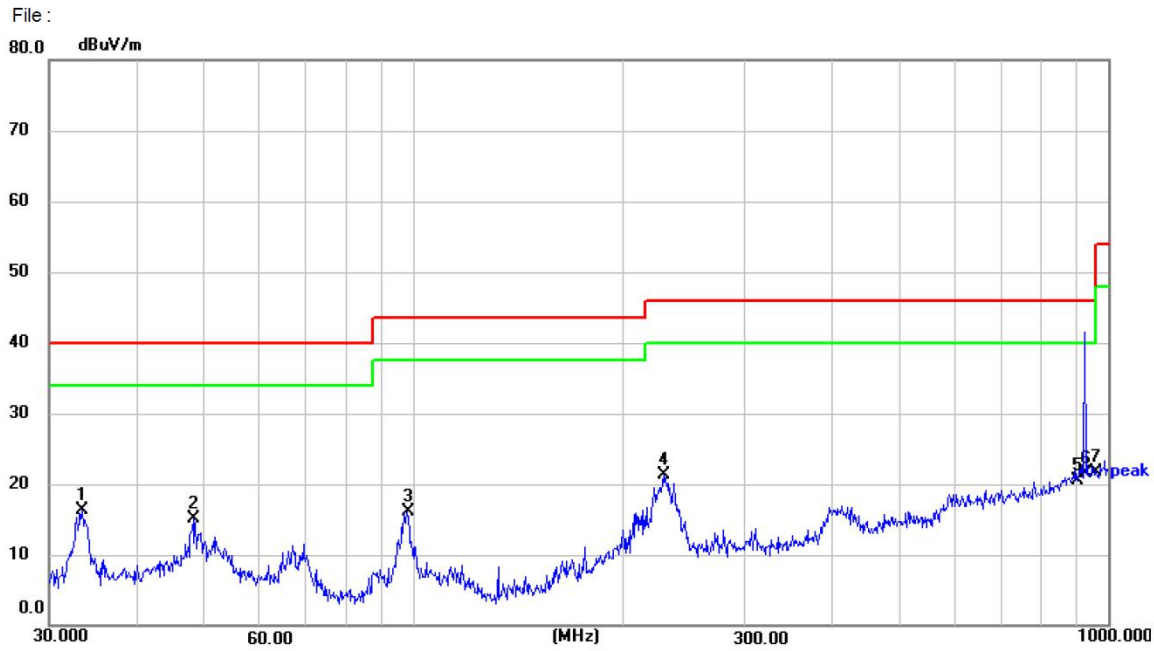
Note:1).Level (dBμV/m)= Reading (dBμV/m)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

For 927.25MHz

Horizontal



Site LAB
Limit: FCC Part15 RE-Class B_30-1000MHz
EUT:
M/N: 927.25MHz
Mode:
Note:

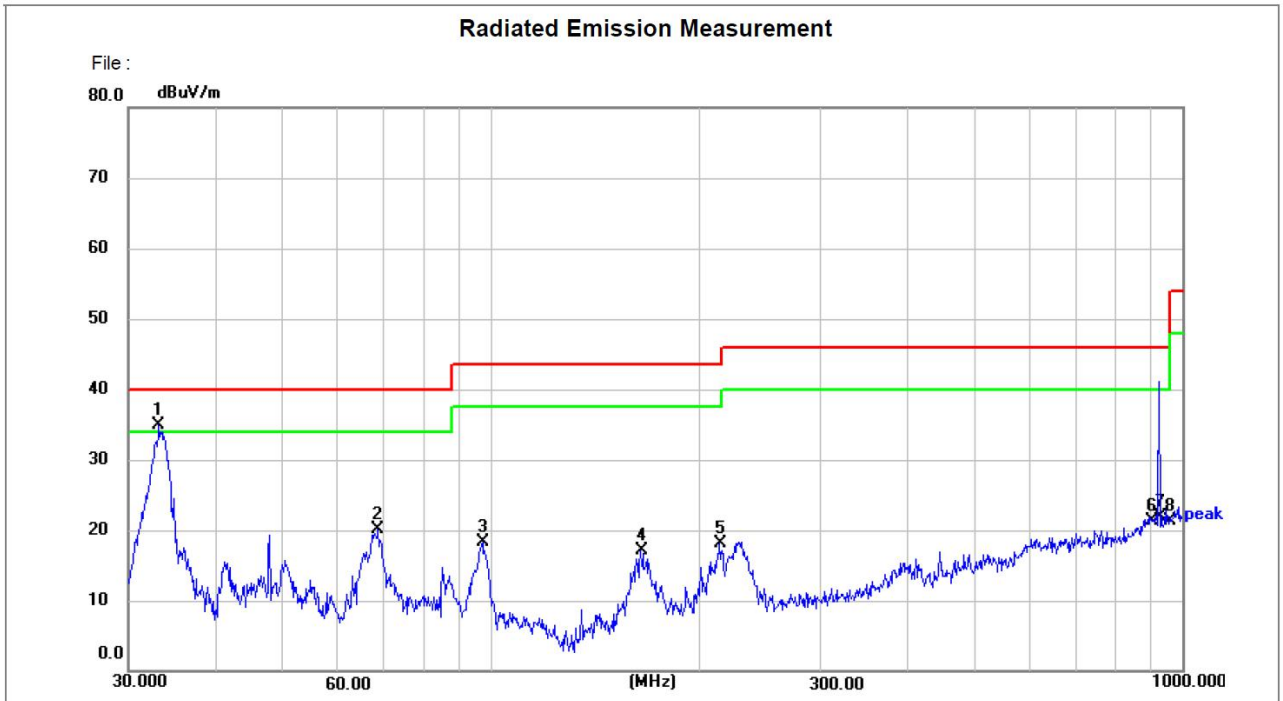
Polarization: ***Horizontal***
Power: AC120/60Hz
Distance: 3m

Temperature: 24.5(C)
Humidity: 48 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	33.4449	36.31	-19.93	16.38	40.00	-23.62	peak	100	173	P	
2	48.3318	32.84	-17.80	15.04	40.00	-24.96	peak	100	203	P	
3	98.1419	35.30	-19.28	16.02	43.50	-27.48	peak	100	18	P	
4	229.2931	39.85	-18.56	21.29	46.00	-24.71	peak	100	257	P	
5	902.0000	27.70	-7.15	20.55	46.00	-25.45	peak	100	118	P	
6	928.0000	28.47	-6.94	21.53	46.00	-24.47	peak	100	72	P	
7	960.0000	28.34	-6.60	21.74	46.00	-24.26	peak	100	211	P	

Note:1).Level (dBμV/m)= Reading (dBμV/m)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



Site LAB
Limit: FCC Part15 RE-Class B_30-1000MHz
EUT:
M/N: 927.25MHz
Mode:
Note:

Polarization: ***Vertical***
Power: AC120/60Hz
Distance: 3m

Temperature: 24.5(C)
Humidity: 48 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	33.2112	54.80	-19.95	34.85	40.00	-5.15	peak	100	141	P	
2	68.8721	40.85	-20.73	20.12	40.00	-19.88	peak	100	180	P	
3	97.4560	37.63	-19.41	18.22	43.50	-25.28	peak	100	87	P	
4	164.9075	38.67	-21.56	17.11	43.50	-26.39	peak	100	172	P	
5	214.5143	36.96	-18.77	18.19	43.50	-25.31	peak	100	111	P	
6	902.0000	28.38	-7.15	21.23	46.00	-24.77	peak	100	180	P	
7	928.0000	28.93	-6.94	21.99	46.00	-24.01	peak	100	319	P	
8	960.0000	27.81	-6.60	21.21	46.00	-24.79	peak	100	351	P	

Note:1).Level (dBμV/m)= Reading (dBμV/m)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

For 1GHz to 25GHz

GFSK (above 1GHz)

Frequency(MHz):			902.75		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1805.50	50.32	PK	74	23.68	75.76	25.54	3.47	54.45	-25.44
1805.50	42.54	AV	54	11.46	67.98	25.54	3.47	54.45	-25.44
2708.25	51.45	PK	74	22.55	74.91	26.23	4.95	54.64	-23.46
2708.25	43.72	AV	54	10.28	67.18	26.23	4.95	54.64	-23.46

Frequency(MHz):			902.75		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1805.50	51.45	PK	74	22.55	76.89	25.54	3.47	54.45	-25.44
1805.50	44.63	AV	54	9.37	70.07	25.54	3.47	54.45	-25.44
2708.25	52.36	PK	74	21.64	75.82	26.23	4.95	54.64	-23.46
2708.25	44.85	AV	54	9.15	68.31	26.23	4.95	54.64	-23.46

Frequency(MHz):			914.25		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1828.50	52.63	PK	74	21.37	78.03	25.56	3.56	54.52	-25.40
1828.50	43.58	AV	54	10.42	68.98	25.56	3.56	54.52	-25.40
2742.75	51.26	PK	74	22.74	74.61	26.28	5.08	54.71	-23.35
2742.75	43.02	AV	54	10.98	66.37	26.28	5.08	54.71	-23.35

Frequency(MHz):			914.25		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1828.50	52.14	PK	74	21.86	77.54	25.56	3.56	54.52	-25.40
1828.50	43.36	AV	54	10.64	68.76	25.56	3.56	54.52	-25.40
2742.75	52.75	PK	74	21.25	76.10	26.28	5.08	54.71	-23.35
2742.75	44.82	AV	54	9.18	68.17	26.28	5.08	54.71	-23.35

Frequency(MHz):			927.25		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1854.50	52.54	PK	74	21.46	77.80	25.59	3.72	54.57	-25.26
1854.50	44.35	AV	54	9.65	69.61	25.59	3.72	54.57	-25.26
2781.75	51.16	PK	74	22.84	74.43	26.31	5.17	54.75	-23.27
2781.75	43.67	PK	54	10.33	66.94	26.31	5.17	54.75	-23.27

Frequency(MHz):			927.25		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1854.50	52.28	PK	74	21.72	77.54	25.59	3.72	54.57	-25.26
1854.50	43.53	AV	54	10.47	68.79	25.59	3.72	54.57	-25.26
2781.75	52.52	PK	74	21.48	75.79	26.31	5.17	54.75	-23.27
2781.75	43.84	PK	54	10.16	67.11	26.31	5.17	54.75	-23.27

REMARKS:
1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

4.3 Maximum Peak Output Power

Limit

The Maximum Peak Output Power Measurement is 125mW (20.97).

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the powersensor.

Test Configuration

Test Results

Type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK	01	9.717	20.97	Pass
	24	9.503		
	50	9.690		

Note: The test results including the cable lose.

4.4 20dB Bandwidth

Limit

For frequency hopping systems operating in the 902MHz-928MHz no limit for 20dB bandwidth.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

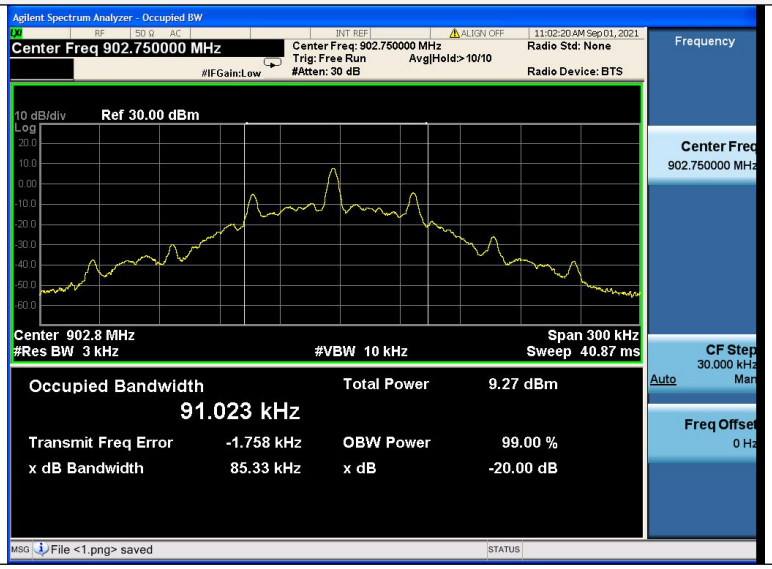
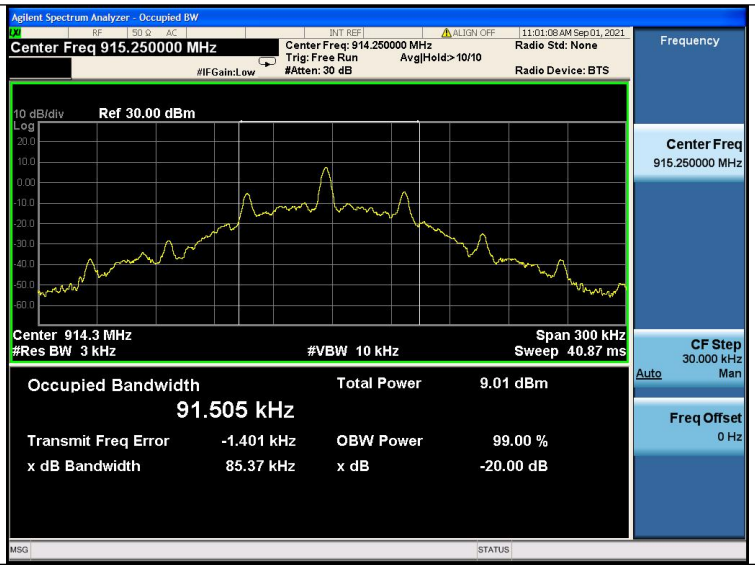
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

Test Configuration

Test Results

Modulation	Channel	20dB bandwidth (MHz)	Result
GFSK	01	0.08533	Pass
	24	0.08537	
	50	0.08543	

Test plot as follows:

GFSK Modulation

CH01

CH24

CH50

4.5 Frequency Separation

LIMIT

According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with100 KHz RBW and 300 KHz VBW.

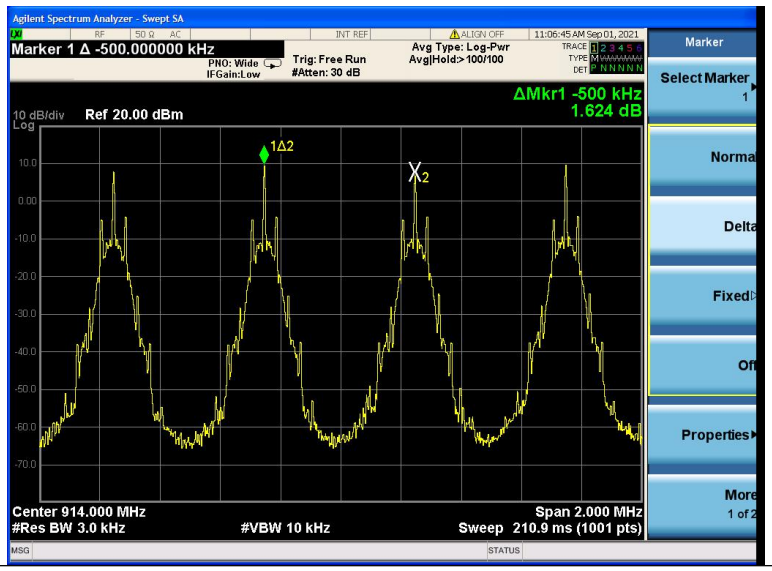
TEST CONFIGURATION

TEST RESULTS

Modulation	Channel	Channel Separation (KHz)	Limit(MHz)	Result
GFSK	CH24	500	25KHz or 2/3*20dB bandwidth	Pass
	CH25			

Note:
We have tested all mode at high, middle and low channel, and recorded worst case at middle

Test plot as follows:



GFSK

4.6 Number of hopping frequency

Limit

Frequency hopping systems in the 902–928 MHz band shall use at least 50 channels.

Test Procedure

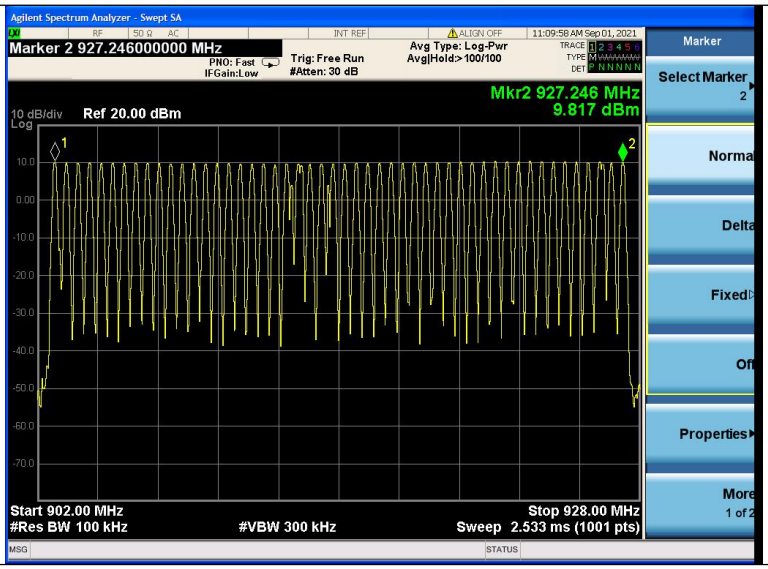
The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 902MHz to 928MHz with 100 KHz RBW and 300 KHz VBW.

Test Configuration

Test Results

Modulation	Number of Hopping Channel	Limit	Result
GFSK	50	≥50	Pass

Test plot as follows:



GFSK Modulation

4.7 Time of Occupancy (Dwell Time)

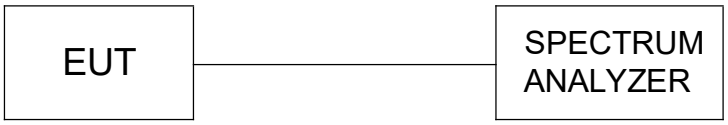
Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 1MHz VBW, Span 0Hz.

Test Configuration



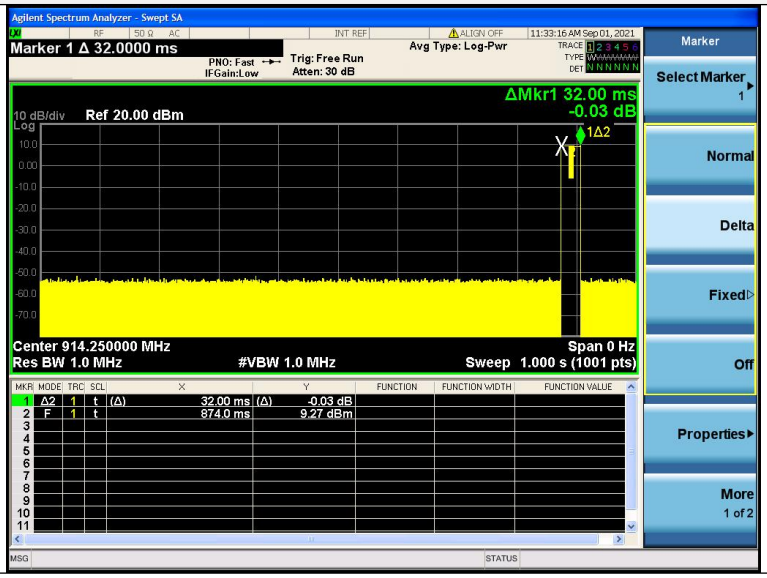
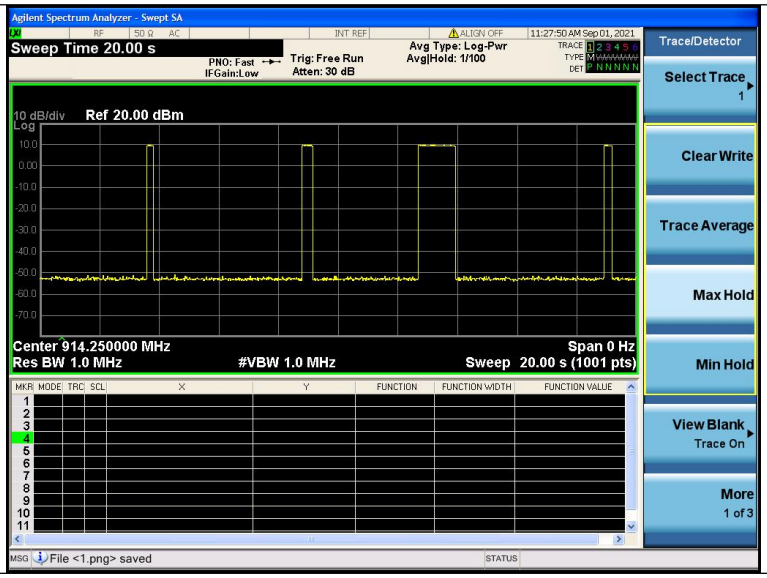
Test Results

Frequency(MHz)	Dwell time Per Hop (s)	Number of hopping channels in 20s	Dwell time (s)	Limit (s)
914.25	0.032	4	0.128	0.4

Note: For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

Dwell Time = Number of hopping channels in 20s * Pulse Width

Test plot as follows:

GFSK Modulation

Ton

Ton times in 20s

4.8 Out-of-band Emissions

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Procedure

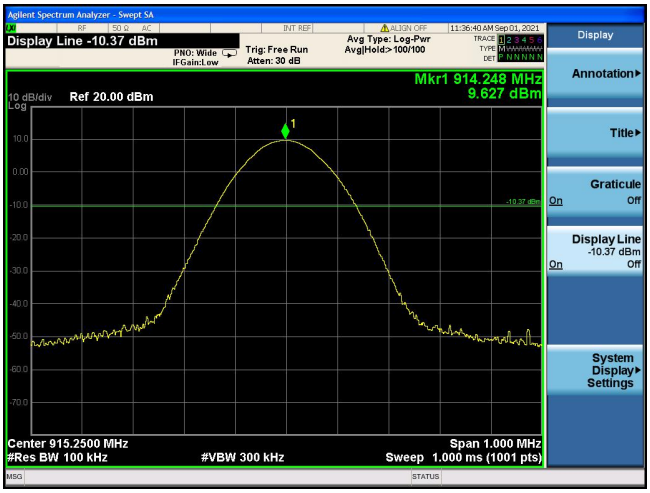
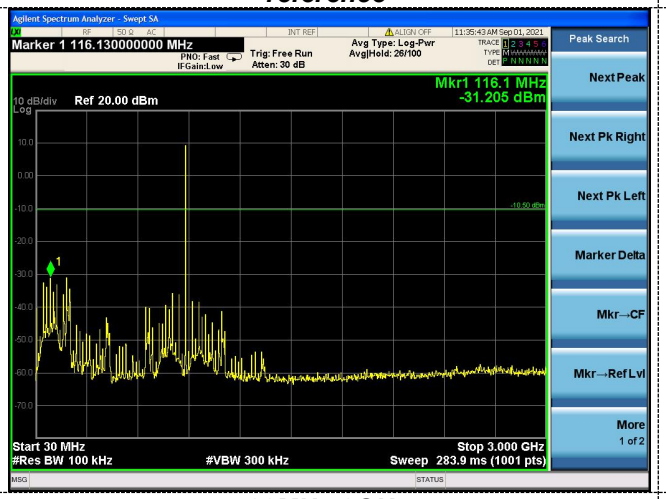
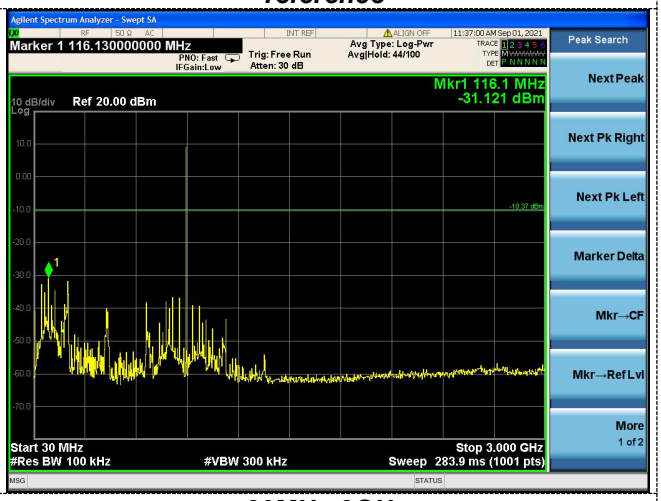
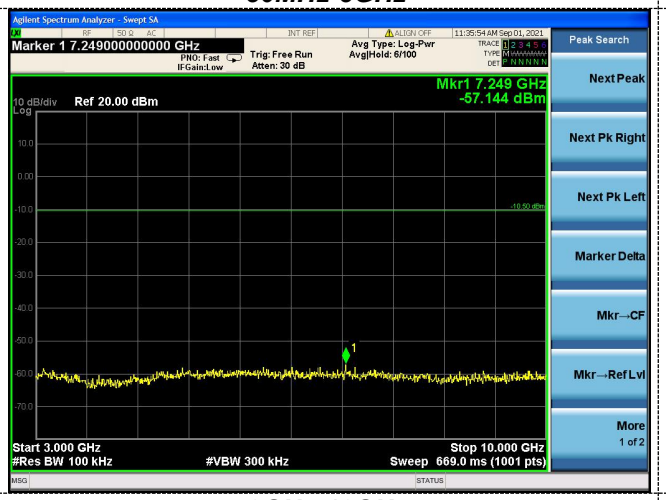
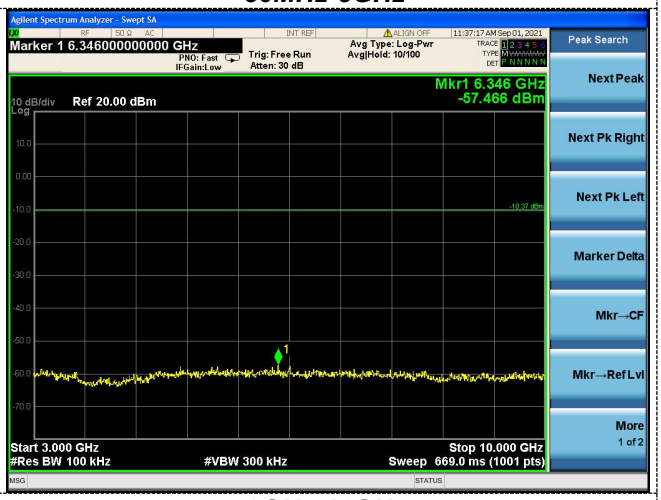
Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector , and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

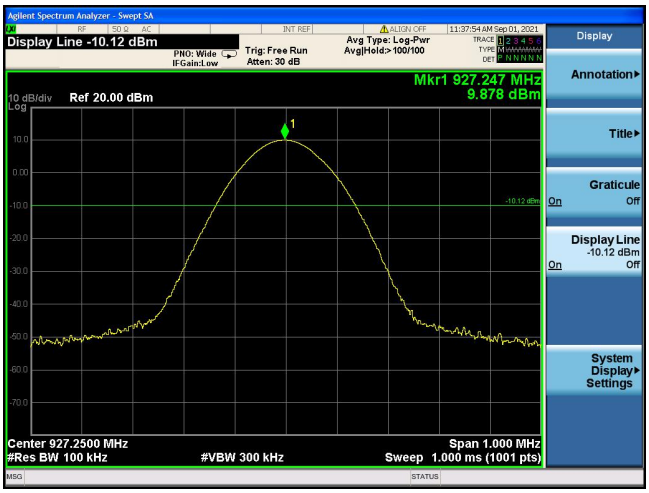
Test Configuration

Test Results

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

Test plot as follows:

GFSK(CH01)	GFSK(CH24)
	
reference	reference
	
30MHz-3GHz	30MHz-3GHz
	
3GHz-10GHz	3GHz-10GHz

GFSK(CH50)	
	
reference	
	
30MHz-3GHz	
	
3GHz-10GHz	