FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....:	**LCS1511070542E-01**
FCC ID.....:	**WXLRAMV**
Date of Issue. .....:	**Nov 09, 2015**
Testing Laboratory Name .....:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address .....:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Applicant's name.....:	**Capricorn Electronics Ltd**
Address .....:	SUITE 1011, 10/FL., METRO CENTRE 1, 32 LAM HING STREET KOWLOON BAY, KOWLOON, HONG KONG
Test specification .....**:**	
Standard .....:	**FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**
Test Report Form No .....:	LCSEMC-1.0
TRF Originator.....:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....:	Dated 2011-03

Test item description .....:	**RAMV CELLULAR GATEWAY**
Trade Mark .....:	N/A
Manufacturer.....:	**Capricorn Electronics Ltd**
Model/Type reference.....:	RAMV
Listed Models .....:	/
Modulation Type .....:	GFSK
Operation Frequency.....:	From 910MHz to 924.7MHz
Rating .....:	DC 3.70V/DC 12V from Battery
Hardware version .....:	RAM-HV-FCC-V001
Software version .....:	RAM-SV-FCC-V001
Result.....:	**PASS**

Compiled by:	**Supervised by:**	**Approved by:**
		
Kyle Yin/ File administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

TEST REPORT

Test Report No. :	LCS1511070542E-01	Nov 09, 2015 Date of issue

Equipment under Test	:	**RAMV CELLULAR GATEWAY**
Model /Type	:	RAMV
Listed Models	:	/
Applicant	:	**Capricorn Electronics Ltd**
Address	:	SUITE 1011, 10/FL., METRO CENTRE 1, 32 LAM HING STREET KOWLOON BAY, KOWLOON, HONG KONG
Manufacturer	:	**Capricorn Electronics Ltd**
Address	:	SUITE 1011, 10/FL., METRO CENTRE 1, 32 LAM HING STREET KOWLOON BAY, KOWLOON, HONG KONG

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.

Revison History

Revision	Issue Date	Revisions	Revised By
00	2015-11-09	Initial Issue	Gavin Liang

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 of Procedures for Compliance Testing of Unlicensed Wireless Devices

DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Oct 29, 2015
Testing commenced on	:	Oct 29,2015
Testing concluded on	:	Nov 09 ,2015

2.2. Product Description

The **Capricorn Electronics Ltd's** Model: RAMV or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	RAMV CELLULAR GATEWAY
FCC ID	WXLRAMV Contains FCC ID:R5Q-LISAC200A
Model number	RAMV
Modilation type	GFSK
Antenna type	Internal and maximum antenna gain is 0dBi for HFSS modular
Hardware version	RAM-HV-FCC-V001
Software version	RAM-SV-FCC-V001
Power supply	DC 3.70V / DC 12.0V from battery

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3.70V / DC 12.0V from Battery

2.4. Short description of the Equipment under Test (EUT)

2.4.1 General Description
RAM-V is RAMV CELLULAR GATEWAY with CDMA modular (FCC ID: R5Q-LISAC200A) and 910-924.7MHz Frequency Hopping transmit modular, RAM-V can connect PC to update software by USB port.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

2.5. EUT operation mode

The EUT has been tested under engineer mode control by software (software name: CP210x_VCP_Win7 or win8) provided by application to control hopping frequency modular stay in continuous transmitting and receiving mode for testing. The EUT supports 50 channels and channel separation is 300 KHz, test carried out at the lowest channel, middle channel and highest channel.

Test frequency list

Test Channel	Lowest	Middle	Highest
Frequency (MHz)	910	917.5	924.7

2.6. Related Submittal(s) / Grant (s)

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

2.7. Modifications

No modifications were implemented to meet testing criteria.

2.8. Note

1. The EUT with 910-924.7MHz hopping frequency transmitter modular and CDMA modular (FCC ID: R5Q-LISAC200A), the functions of the EUT listed as below:

	Test Standards	Reference Report
910-924.7MHz Hopping Frequency	FCC Part 15 C 15.247	LCS1511070542E-01
USB Port	FCC Part 15 B	LCS1511070542E-02
MPE	FCC Part 2.1091(d)	LCS1511070542E-03

3. TEST ENVIRONMENT

3.1. Test Facility

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

CNAS Registration Number. is L4595.
FCC Registration Number. is 899208.
Industry Canada Registration Number. is 9642A-1.
VCCI Registration Number. is C-4260 and R-3804.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001

3.2. Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.3. Test Conditions

Test Case	Test Conditions	
	Configuration	Description
20dB Emission Bandwidth (EBW)	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	Lowest, Middle, Highest
Carrier Frequency Separation	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	Hopping
Number of Hopping Channel	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	Hopping
Time of Occupancy (Dwell Time)	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	Lowest, Middle, Highest
Maximum Peak Conducted Output Power	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	Lowest, Middle, Highest
Bandedge spurious emission (Conducted)	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	Lowest, Highest Hopping
Conducted RF Spurious Emission	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	Lowest, Middle, Highest
Radiated Emissions in the Restricted Bands	Meas. Method	DA 00-705 30 MHz to 1 GHz: Pre: RBW=100kHz; VBW=300kHz; Det. = Peak. Final: RBW=120kHz; Det. = CISPR Quasi-Peak. 1 GHz to 10GHz: Average: RBW=1 MHz; VBW= 10Hz; Det. = Peak; Sweep-time= Auto; Trace = Single. Peak: RBW=1 MHz; VBW= 3 MHz; Det. = Peak; Sweep-time= Auto; Trace≥ MaxHold * 100.
	Test Environment	NTNV

	EUT Conf.	30 MHz-1GHz Middle (Worst Conf.).
		1-10 GHz: Lowest, Middle, Highest

Note:
1. For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

3.4. Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(e)	Power spectral density	-/-	-/-	-/-	-/-	☐	☐	☒	☐	Not applicable for FHSS!
§15.247(a)(1)	Carrier Frequency separation	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(a)(1)	Number of Hopping channels	GFSK	☒ Full (hopping)	GFSK	☒ Full	☒	☐	☐	☐	complies
§15.247(a)(1)	Time of Occupancy (dwell time)	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Middle	☒	☐	☐	☐	complies
§15.247(a)(1)	Spectrum bandwidth of a FHSS system 20dB bandwidth	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(b)(1)	Maximum output power	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(d)	Band edge compliance conducted	GFSK	☒ Lowest ☒ Highest ☒ Hopping	GFSK	☒ Lowest ☒ Highest ☒ Hopping	☒	☐	☐	☐	complies
§15.205	Band edge compliance radiated	GFSK	☒ Lowest ☒ Highest ☒ Hopping	GFSK	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions conducted	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions radiated	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	GFSK	-/-	GFSK	-/-	☒	☐	☐	☐	complies
§15.207	Conducted Emissions < 30 MHz	GFSK	-/-	GFSK	-/-	☐	☐	☒	☐	complies

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed
3. We tested all test mode and recorded worst case in report

3.5. 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 ETSI TR 100 028 " Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics" and is documented in the Shenzhen LCS Compliance Testing Laboratory 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 LCS Compliance Testing Laboratory Ltd. is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.10 dB	(1)
Radiated Emission	1~18GHz	3.80 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	1.63 dB	(1)
Conducted Power	9KHz~18GHz	0.61 dB	(1)
Spurious RF Conducted Emission	9KHz~40GHz	1.22 dB	(1)
Band Edge Compliance of RF Emission	9KHz~40GHz	1.22 dB	(1)
Occuiped Bandwidth	9KHz~40GHz	-	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

3.6. Equipment Used during the Test

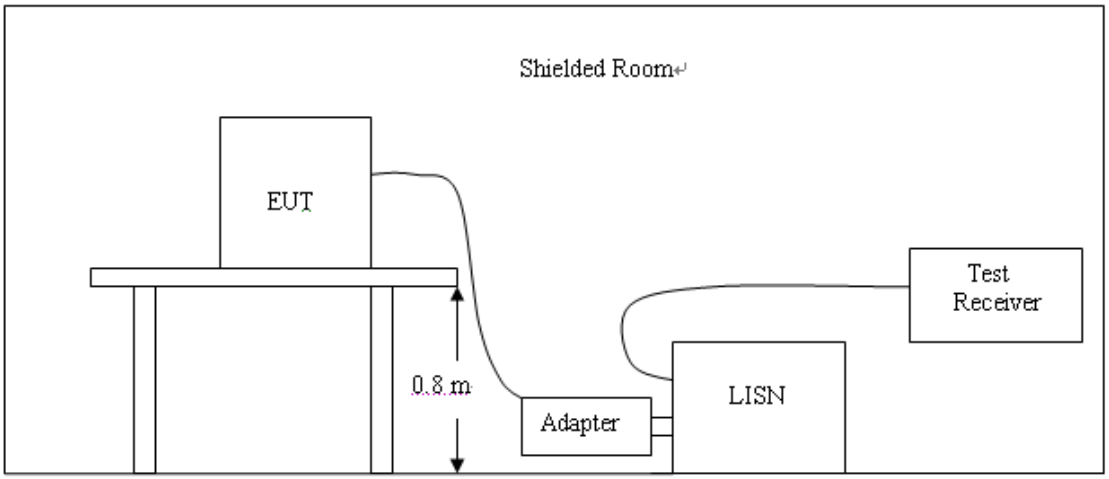
Radiated Emission & Radiated Bandedge Emission						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date	Cal. Interval
1	EMC Receiver	Rohde&Schwarz	ESPI7	100174	2015/06/18	1 year
2	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2015/06/18	3 year
3	Loop Antenna	Rohde&Schwarz	HFH2-Z2	860004/001	2015/06/18	3 year
4	Horn Antenna	EMCO	3115	6741	2015/06/10	3 year
5	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2015/06/10	3 year
6	Signal Analyzer	Agilent	N9020A	MY50510140	2015/10/22	1 year
7	RF Cable-R03m	Jye Bao	RG142	CB021	2015/06/18	3 year
8	RF Cable-HIGH	HUBER+SUHNER	/	03CH03-HY	2015/06/18	3 year
9	Amplifier	Agilent	8449B	3008A02120	2015/07/16	1 year
10	EMC Test Software	Audix	E3	/	/	/

Maximum Peak Output Power / 20dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date	Cal. Interval
1	Spectrum Analyzer	Rohde&Schwarz	FSU26	103710	2015/06/02	1 year
2	Coaxial Cables	HUBER+SUHNER	N/A	N/A	2015/06/02	3 year
3	Antenna connector	MMCX	N/A	N/A	2015/06/02	3 year

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission (Not Applicable)

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 C63.0-2013;
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013;
4. The EUT received DC5V power from the adapter, the adapter received AC120V/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 (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

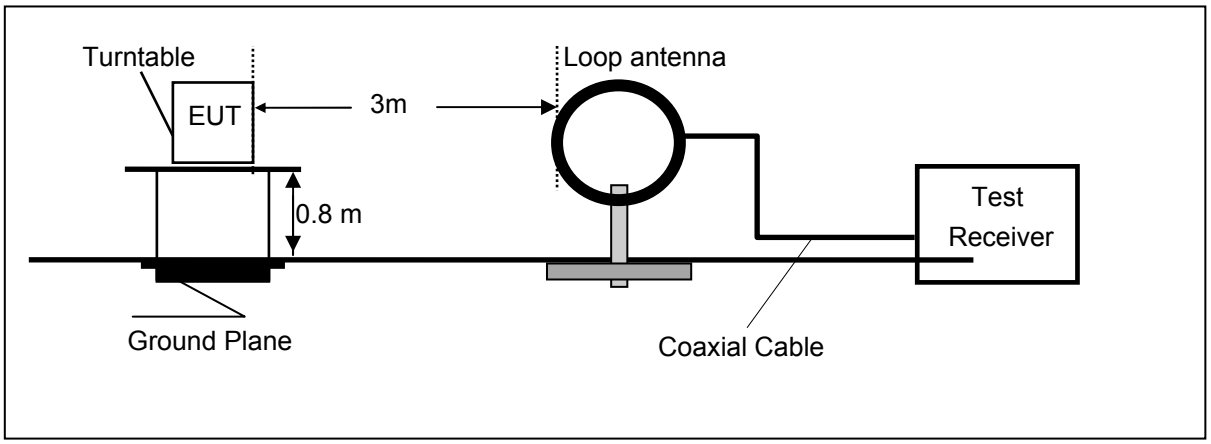
TEST RESULTS

Not Applicable (The sample powered by DC battery)

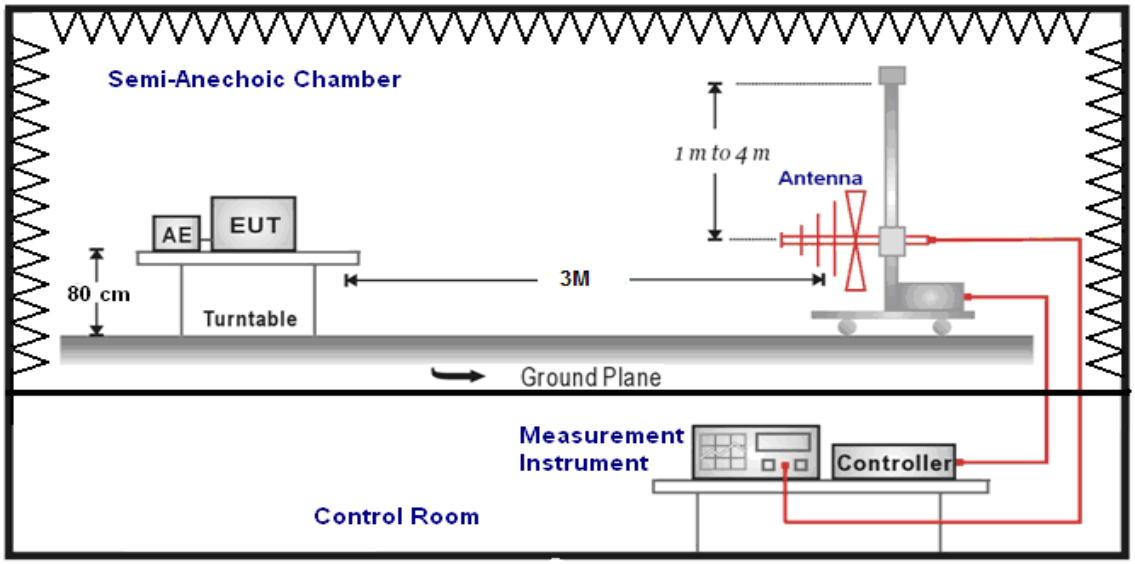
4.2. Radiated Emission and Band Edge

TEST CONFIGURATION

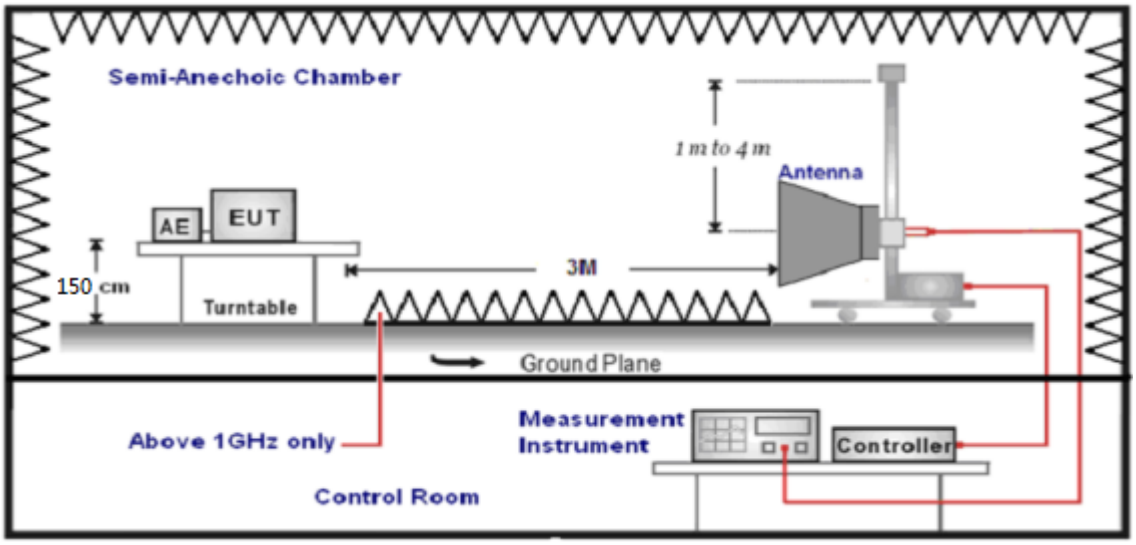
Frequency range 9 KHz – 30MHz



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.
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. For the radiated emission test above 1GHz:
   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.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measurements have been completed.
6. The EUT maximum operation frequency was 924.7MHz.so radiated emission test frequency band from 9 KHz to 10GHz.
7. 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-10GHz	Double Ridged Horn Antenna	3

8. 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
1GHz10GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak
	Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

9. More descrition of radiated emission as:

a. Sequence of testing 9 kHz to 30 MHz

Setup:

---The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

---If the EUT is a tabletop system, a rotatable table with 0.8m height is used.

---If the EUT is a floor standing device, it is placed on the ground.

---Auxiliary equipment and cables were positioned to simulate normal operation conditions.

---The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

---The measurement distance is 3 meter.

---The EUT was set into operation.

Premeasurement:

---The turntable rotates from 0° to 315° using 45° steps.

---The antenna height is 0.8meter.

---At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

---Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

---The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

---The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

b. Sequence of testing 30 MHz to 1 GHz

Setup:

---The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

---If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

---If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

---Auxiliary equipment and cables were positioned to simulate normal operation conditions

---The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

---The measurement distance is 3 meter.

---The EUT was set into operation.

Premeasurement:

---The turntable rotates from 0° to 315° using 45° steps.
---The antenna is polarized vertical and horizontal.
---The antenna height changes from 1 to 3 meter.
---At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

---The final measurement will be performed with minimum the six highest peaks.
---According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.
---The final measurement will be done with QP detector with an EMI receiver.
---The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

c. Sequence of testing 1 GHz to 10 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna is polarized vertical and horizontal.
--- The antenna height scan range is 1 meter to 2.5 meter.
--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.
--- Meausure three axis (X, Y and Z) position of EUT.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.
--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

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	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

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.

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 conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	300	20log(2400/F(KHz))+80	2400/F(KHz)
0.49-1.705	30	20log(24000/F(KHz))+40	24000/F(KHz)
1.705-30	30	20log(30)+40	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. The radiated measurement are performed the each channel (lowest/middle/highest), recorded lowest, middle and highest from 9KHz to 10GHz.
2. Test Mode: Continuously transmitting
3. "---" means not recorded as emission levels lower than limit.
4. Margin= Level - Limit
5. The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Margin (dB)	Detector	Result
24.00	35.78	69.54	-33.76	QP	PASS
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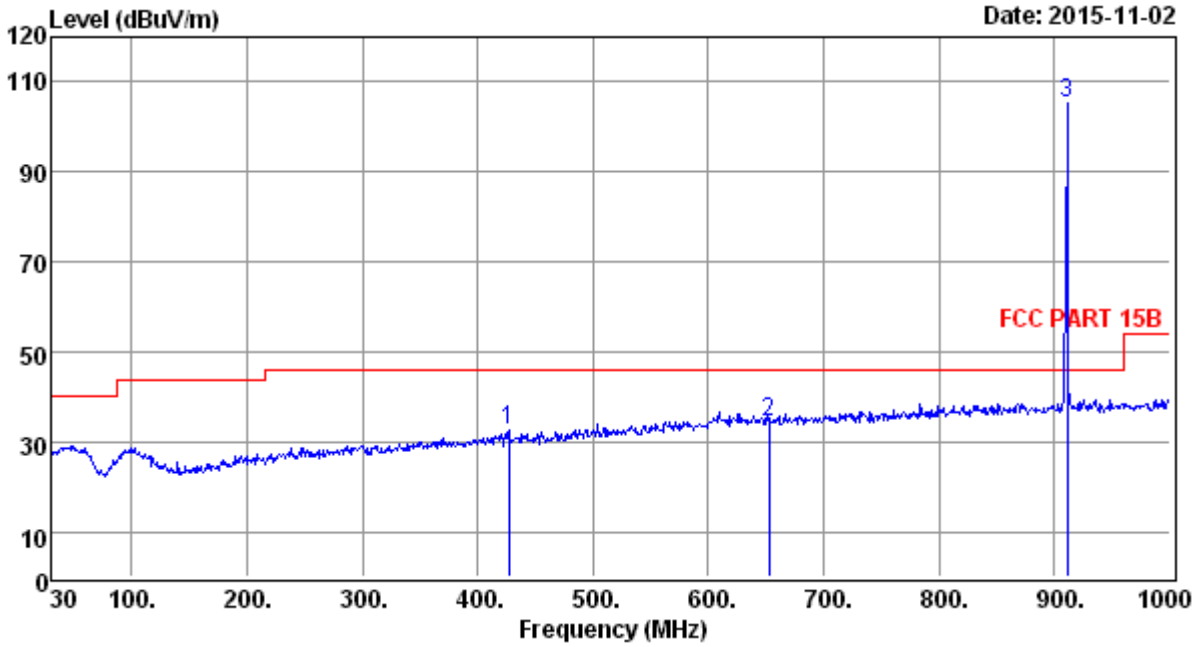
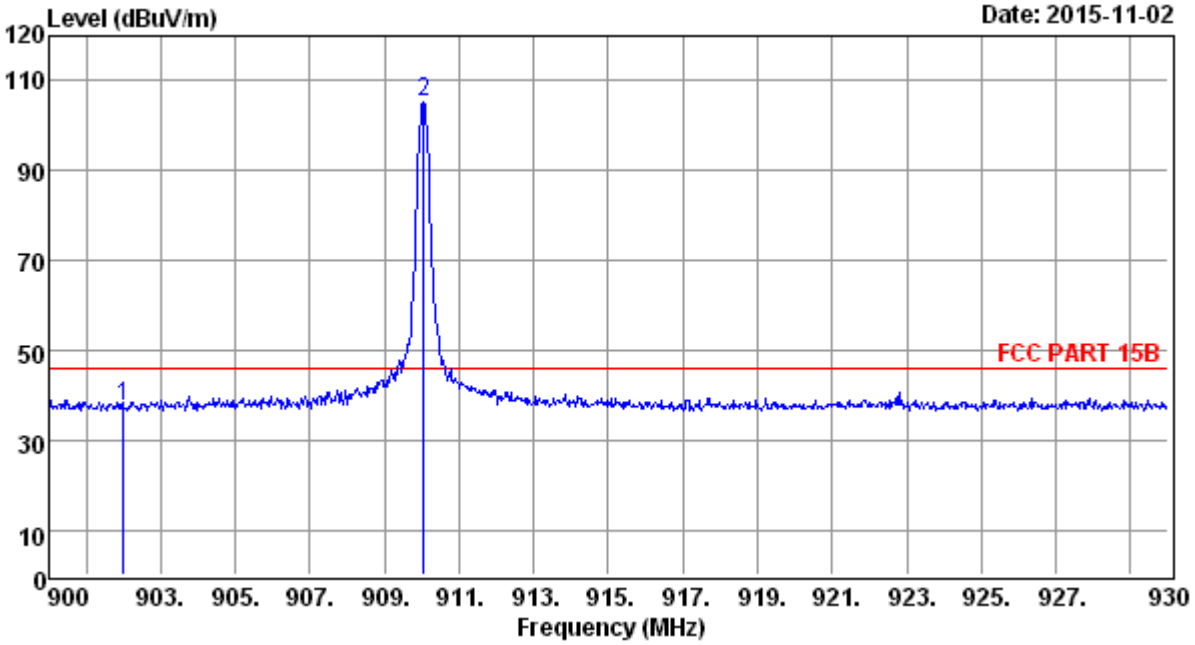
For 30MHz to 10GHz

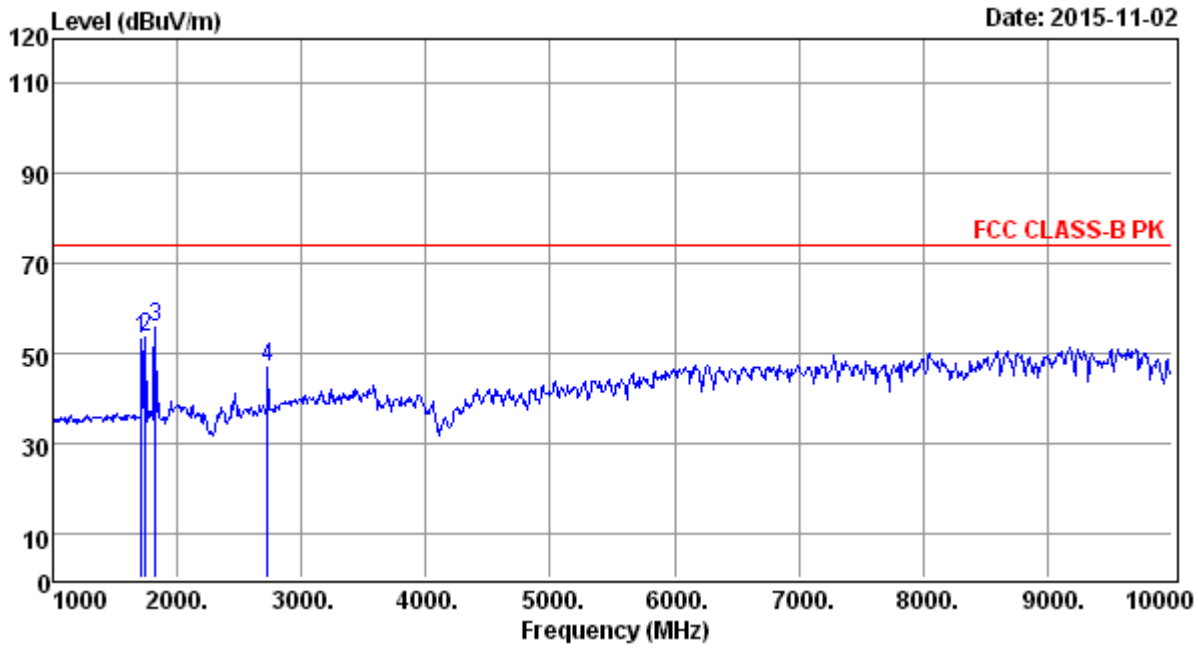
Lowest Channel



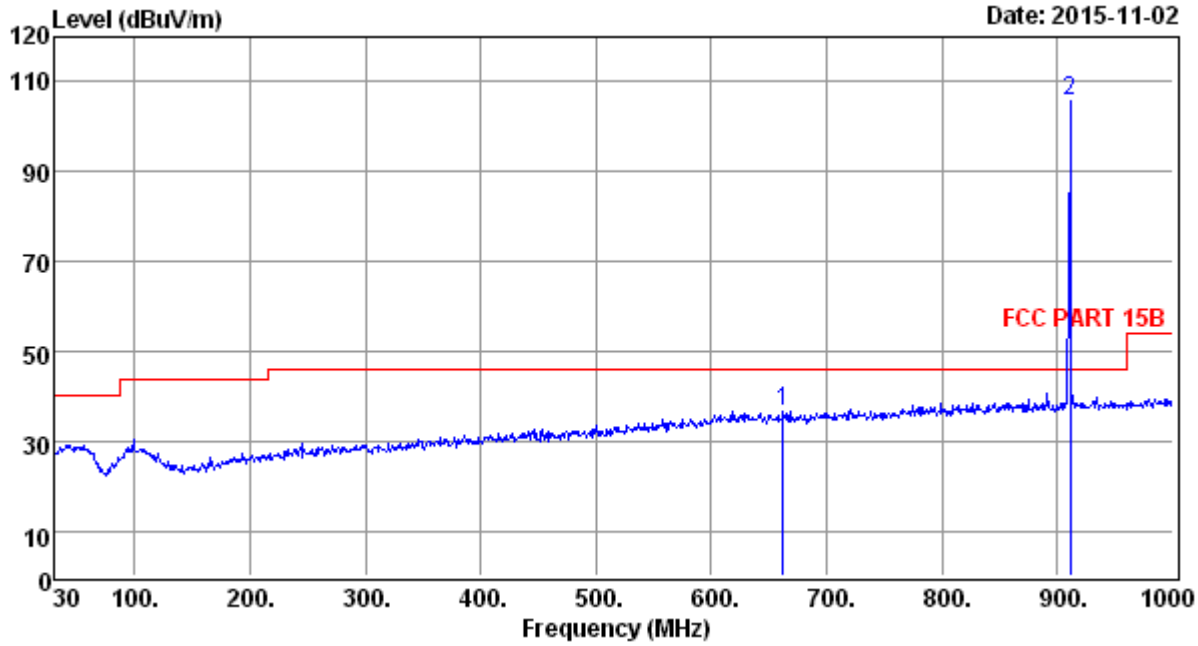
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	426.73	15.27	1.39	15.10	31.76	46.00	-14.24	QP	V
2	652.74	13.28	1.69	18.64	33.61	46.00	-12.39	QP	V
3	910.76	82.04	1.86	21.16	105.06	46.00	59.06	QP	V



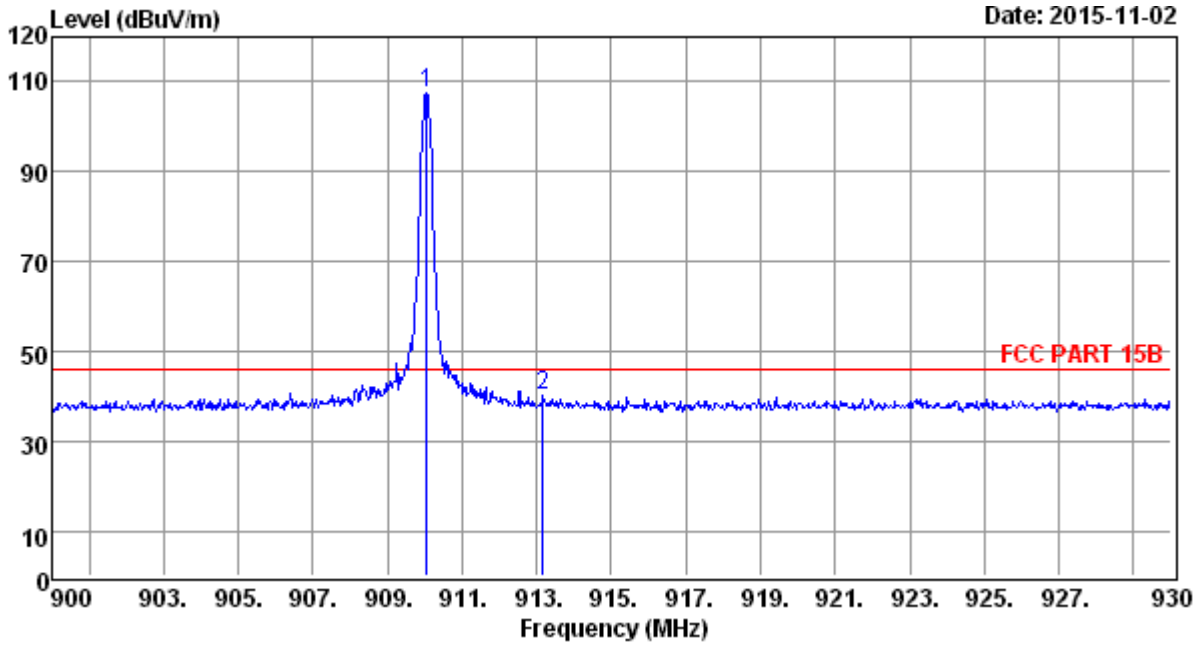
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	902.01	13.96	1.87	21.10	36.93	46.00	-9.07	QP	V
2	910.05	82.07	1.88	21.16	105.11	46.00	59.11	QP	V



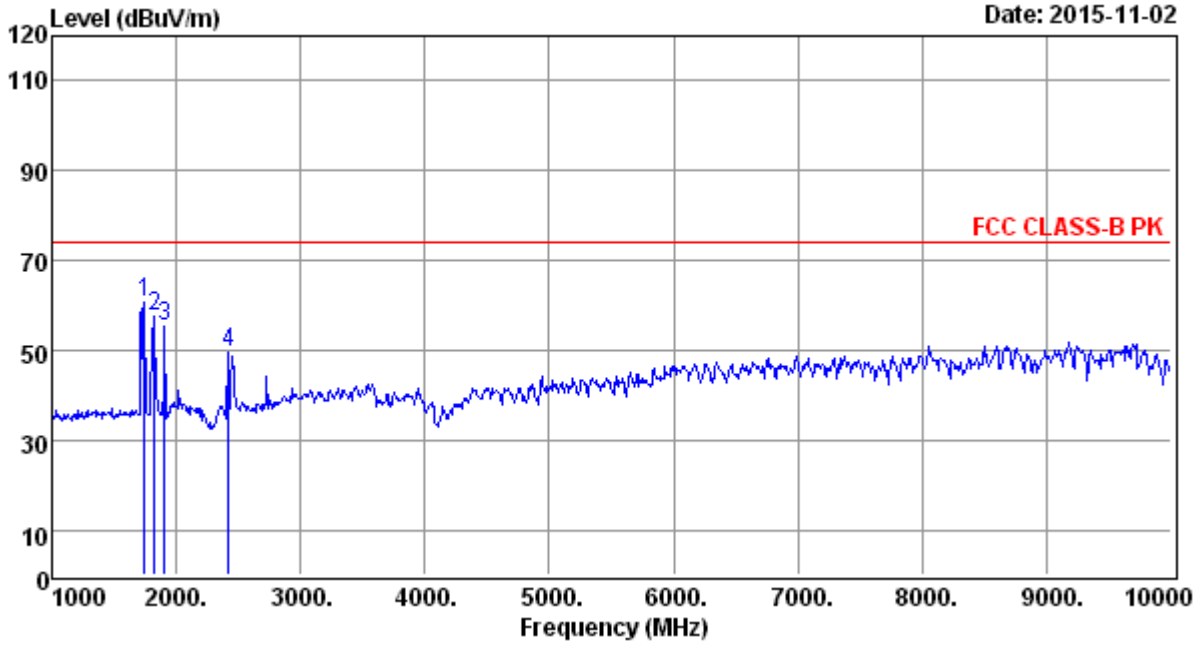
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Amplifer Gain dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	1711.00	59.32	4.44	26.41	37.00	53.17	74.00	-20.83	Peak	V
1	1711.07	43.28	4.44	26.41	37.00	37.13	54.00	-16.87	AV	V
2	1747.00	59.66	4.45	26.42	37.01	53.52	74.00	-20.48	Peak	V
2	1747.11	43.87	4.45	26.42	37.01	37.73	54.00	-10.13	AV	V
3	1828.00	61.86	4.47	26.42	36.99	55.76	74.00	-18.24	Peak	V
3	1828.00	46.02	4.47	26.42	36.99	39.92	54.00	-14.08	AV	V
4	2728.00	49.91	5.52	28.36	37.08	46.71	74.00	-27.29	Peak	V



	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	662.44	15.64	1.67	18.67	35.98	46.00	-10.02	QP	H
2	910.76	82.00	1.86	21.16	105.02	46.00	59.02	QP	H

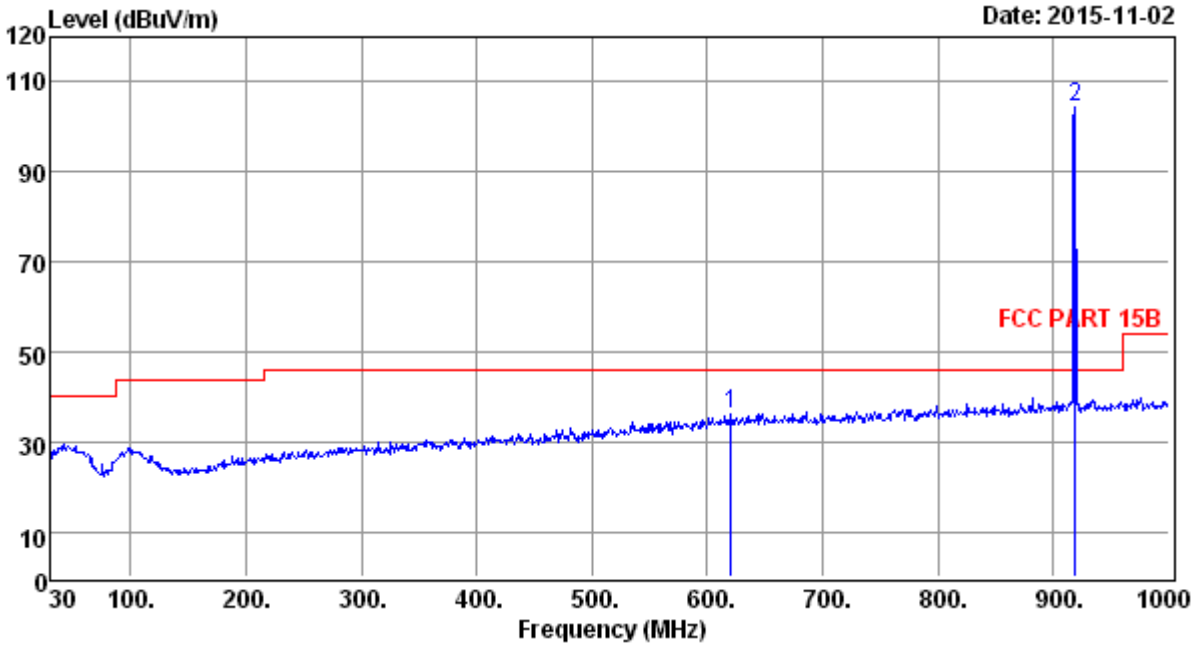


	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	910.05	84.37	1.88	21.16	107.41	46.00	61.41	QP	H
2	913.17	14.81	1.86	21.18	37.85	46.00	-8.15	QP	H

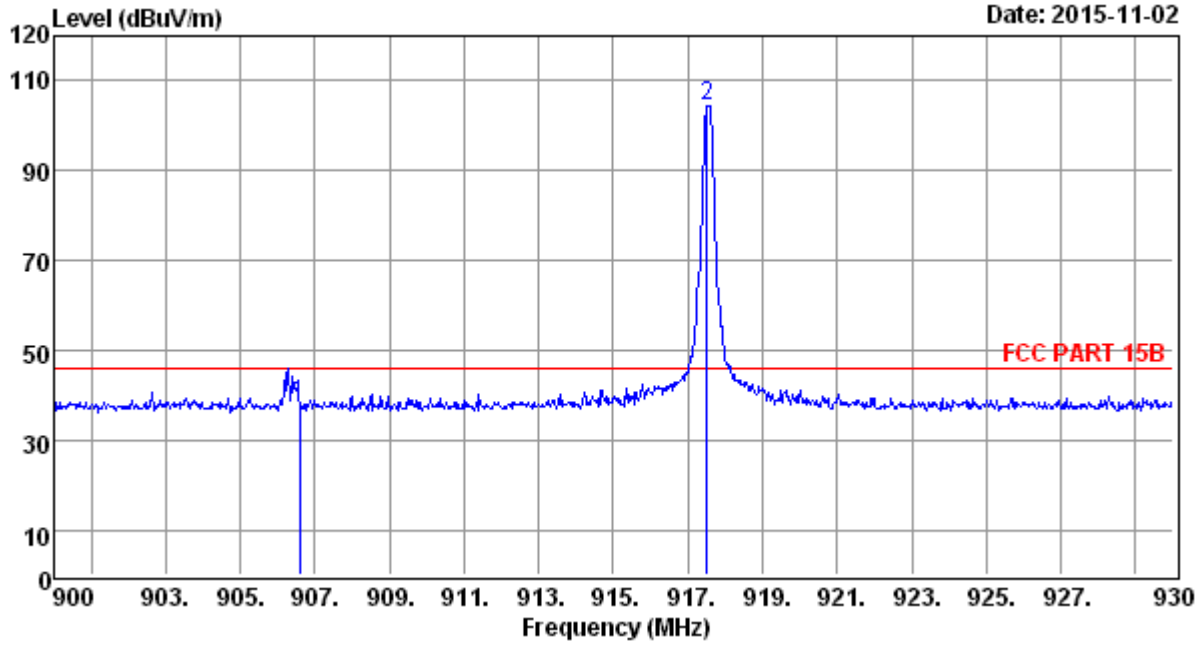


	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Amplifer Gain dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	1747.00	66.61	4.45	26.42	37.01	60.47	74.00	-13.53	Peak	H
1	1747.73	46.25	4.45	26.42	37.01	40.11	54.00	-13.89	AV	H
2	1828.00	63.61	4.47	26.46	36.83	57.71	74.00	-16.29	Peak	H
2	1828.00	45.78	4.47	26.46	36.83	39.88	54.00	-14.12	AV	H
3	1909.00	61.16	4.48	26.73	37.04	55.33	74.00	-18.67	Peak	H
3	1909.00	47.00	4.48	26.73	37.04	41.17	54.00	-12.83	AV	H
4	2422.00	53.88	5.09	27.83	37.10	49.70	74.00	-24.30	Peak	H

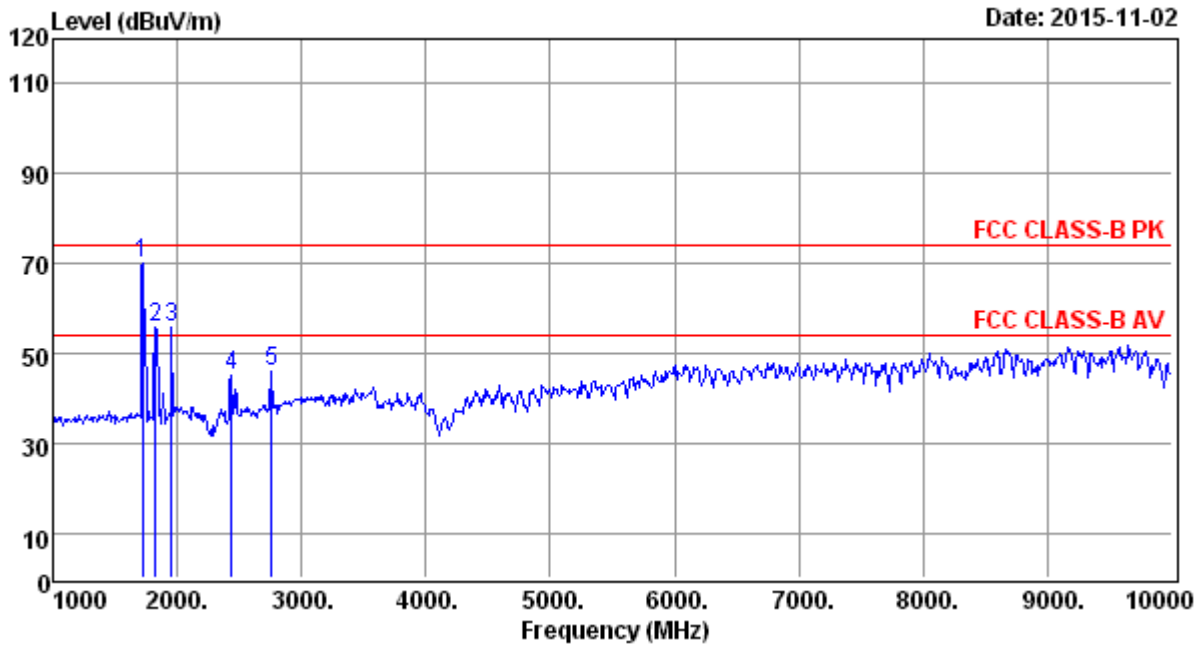
Middle Channel



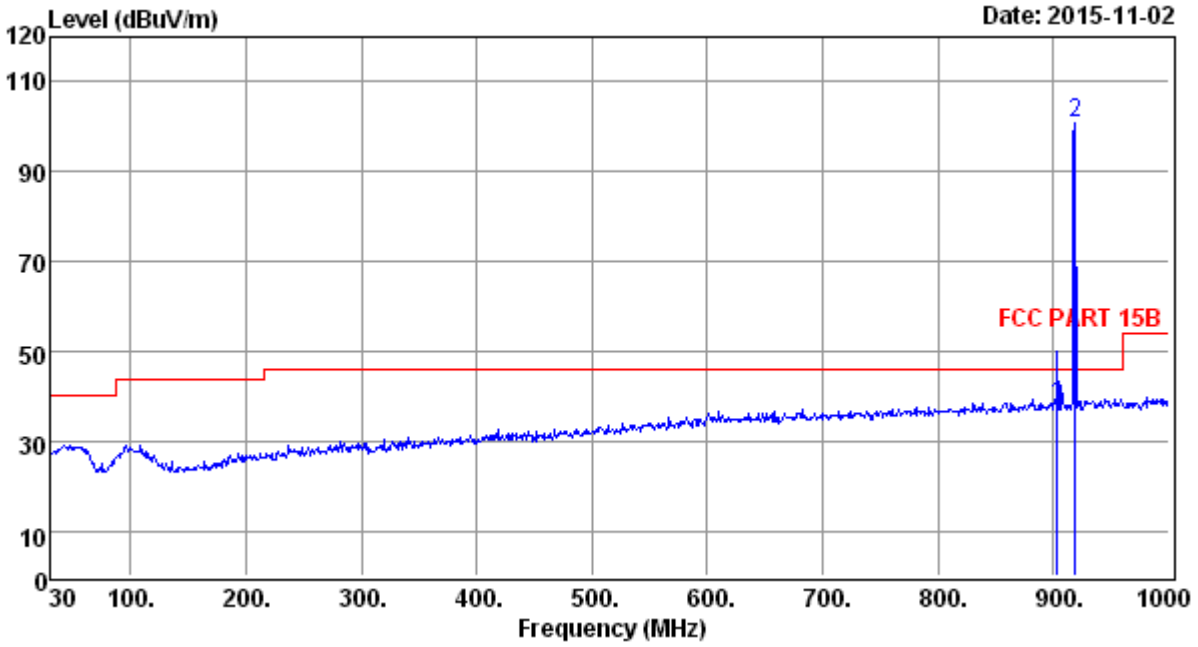
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	620.73	14.53	1.62	18.52	34.67	46.00	-11.33	QP	V
2	918.52	81.07	1.85	21.21	104.13	46.00	58.13	QP	V



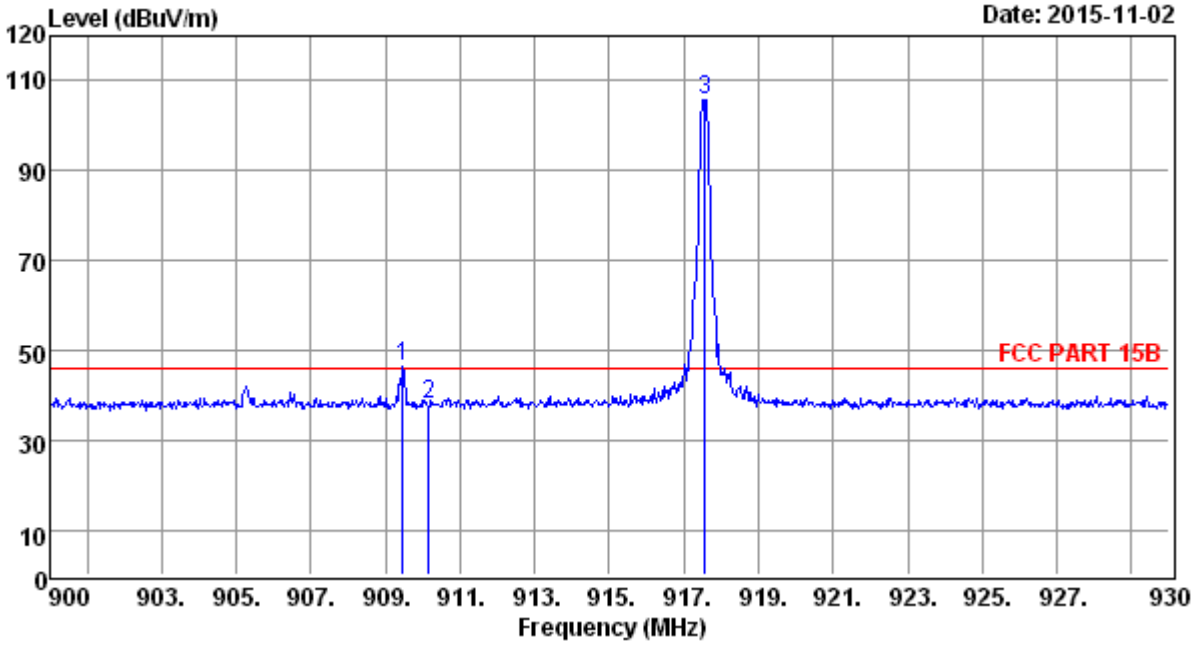
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	906.02	16.71	2.03	21.13	39.87	46.00	-6.13	QP	V
2	917.52	81.08	1.85	21.20	104.13	46.00	58.13	QP	V



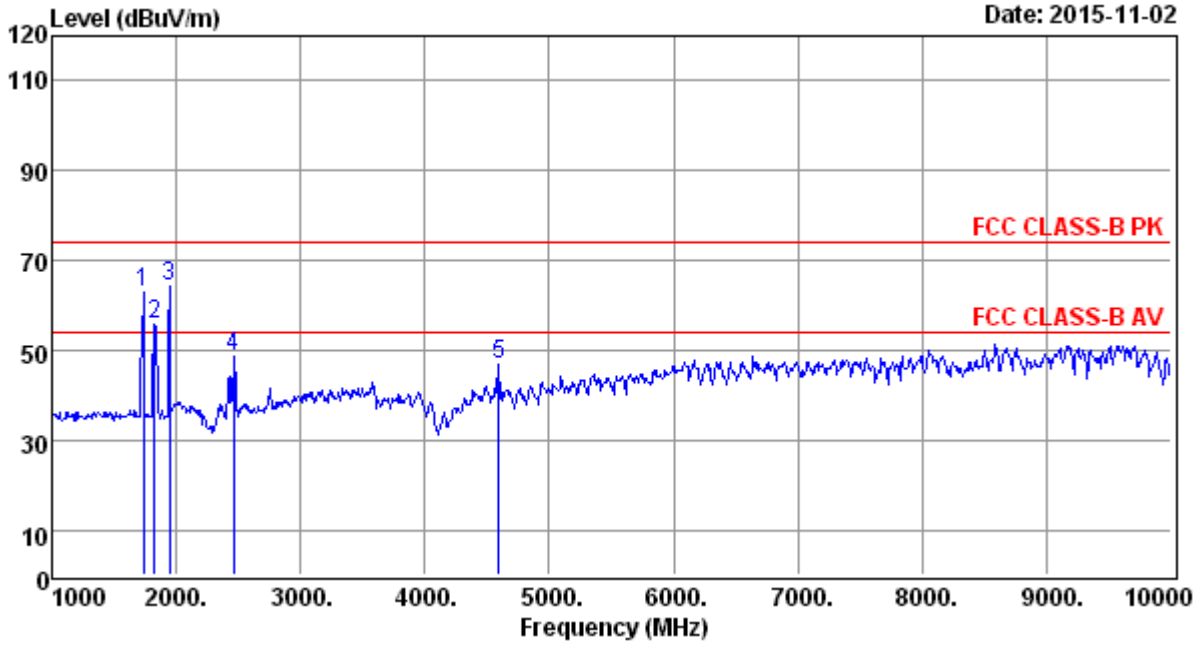
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Amplifer Gain dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	1720.00	75.99	4.44	26.41	37.00	69.84	74.00	-4.16	Peak	V
1	1720.00	47.38	4.44	26.41	37.00	41.23	54.00	-12.77	AV	V
2	1828.00	61.71	4.47	26.42	36.99	55.61	74.00	-18.39	Peak	V
2	1828.00	46.00	4.47	26.42	36.99	39.90	54.00	-14.10	AV	V
3	1954.00	60.39	4.49	27.90	37.05	55.73	74.00	-18.27	Peak	V
3	1954.00	44.73	4.49	27.90	37.05	40.07	54.00	-13.93	AV	V
4	2440.00	49.04	5.12	27.78	37.10	44.84	74.00	-29.16	Peak	V
5	2755.00	49.07	5.56	28.45	37.07	46.01	74.00	-27.99	Peak	V



	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	903.40	12.78	1.87	21.11	35.76	46.00	-10.24	QP	H
2	918.52	77.37	1.85	21.21	100.43	46.00	54.43	QP	H

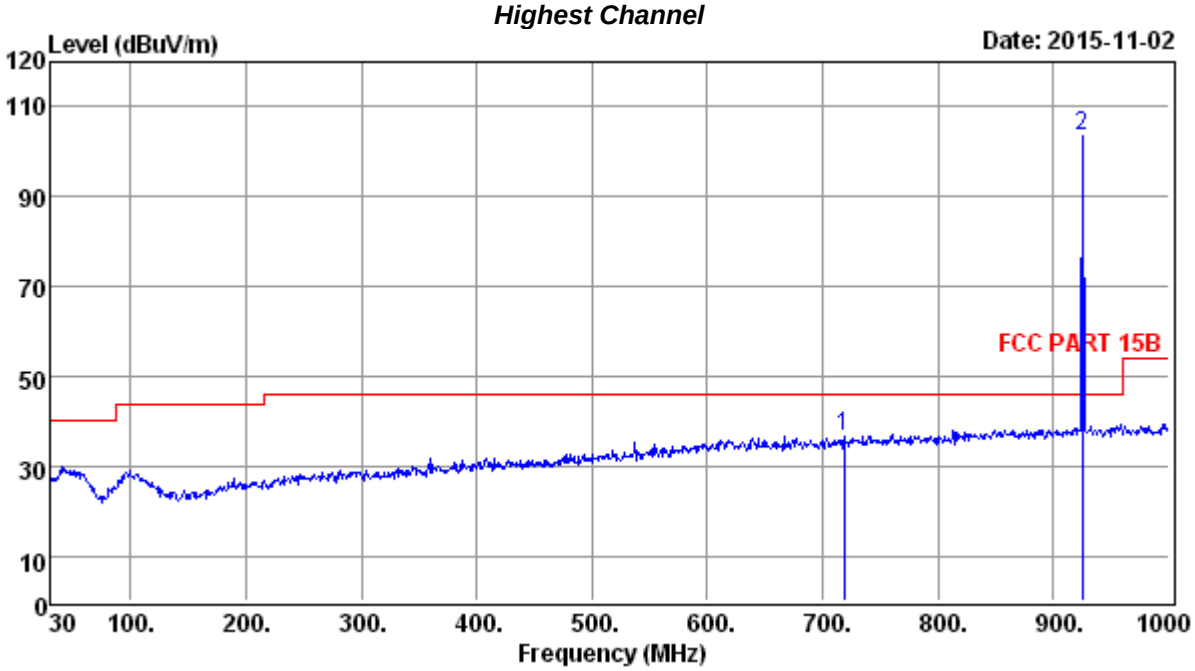


	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	909.45	15.90	1.88	21.15	38.93	46.00	-7.07	QP	H
2	917.55	82.10	1.85	21.20	105.15	46.00	59.15	QP	H

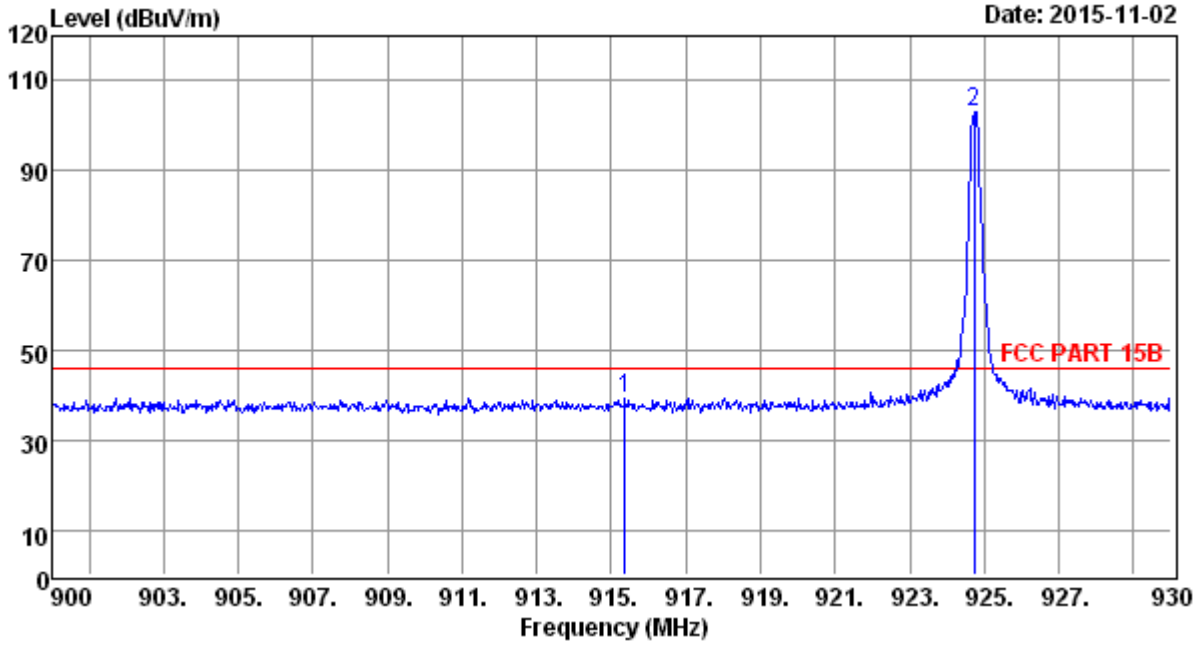


	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Amplifer Gain dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	1738.00	69.20	4.45	26.42	37.01	63.06	74.00	-10.94	Peak	H
1	1738.00	45.79	4.45	26.42	37.01	39.65	54.00	-14.35	AV	H
2	1828.00	61.87	4.47	26.46	36.83	55.77	74.00	-18.23	Peak	H
2	1828.00	37.90	4.47	26.46	36.83	40.12	54.00	-13.88	AV	H
3	1945.00	68.98	4.49	27.67	37.05	64.09	74.00	-9.91	Peak	H
3	1945.00	46.38	4.49	27.67	37.05	41.49	54.00	-12.51	AV	H
4	2458.00	52.75	5.14	27.73	37.10	48.52	74.00	-25.48	Peak	H
5	4591.00	42.85	7.55	32.78	36.49	46.69	74.00	-27.31	Peak	H

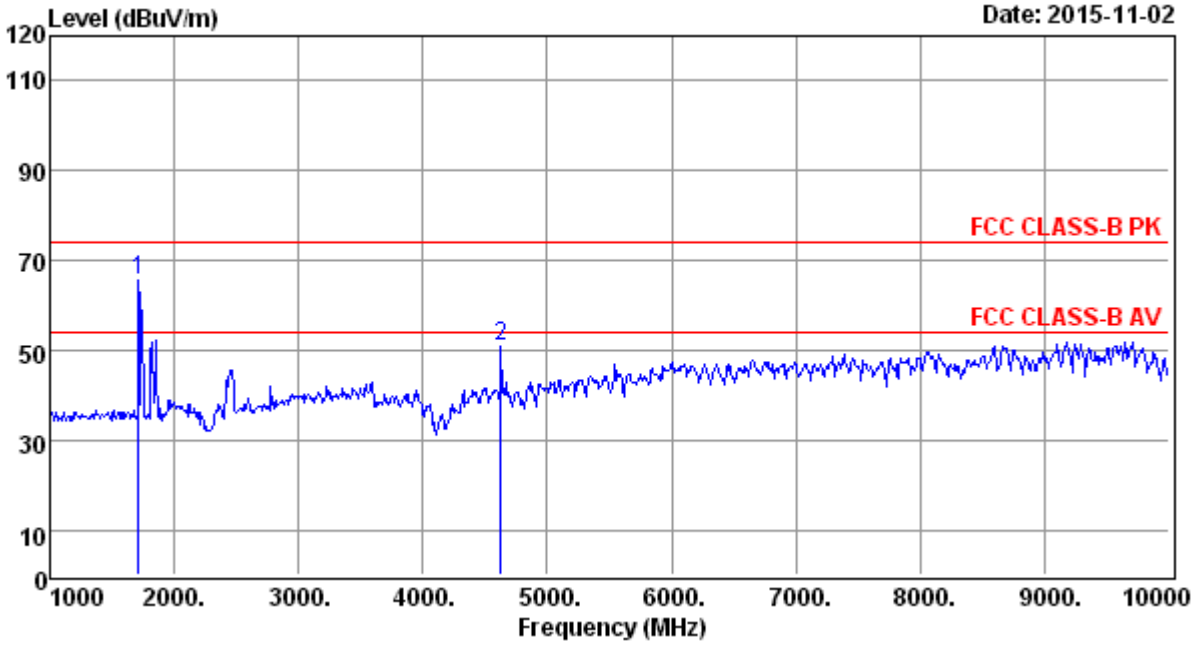
Highest Channel



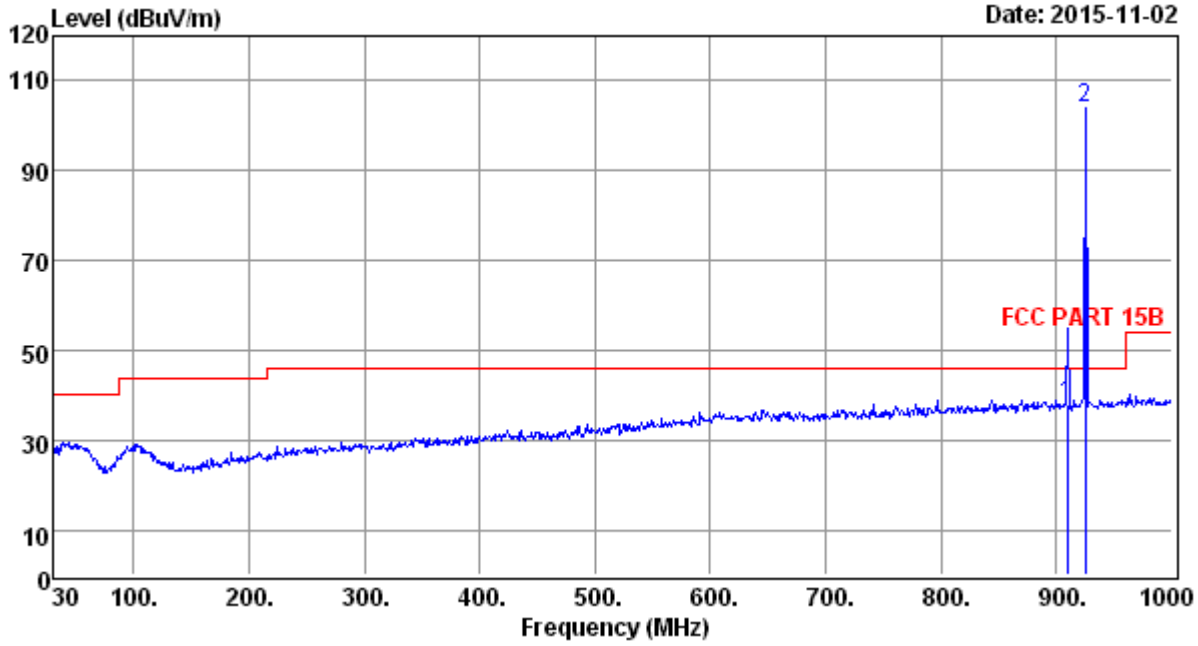
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	718.70	14.35	1.75	19.04	35.14	46.00	-10.86	QP	V
2	925.31	79.74	1.99	21.25	102.98	46.00	56.98	QP	V



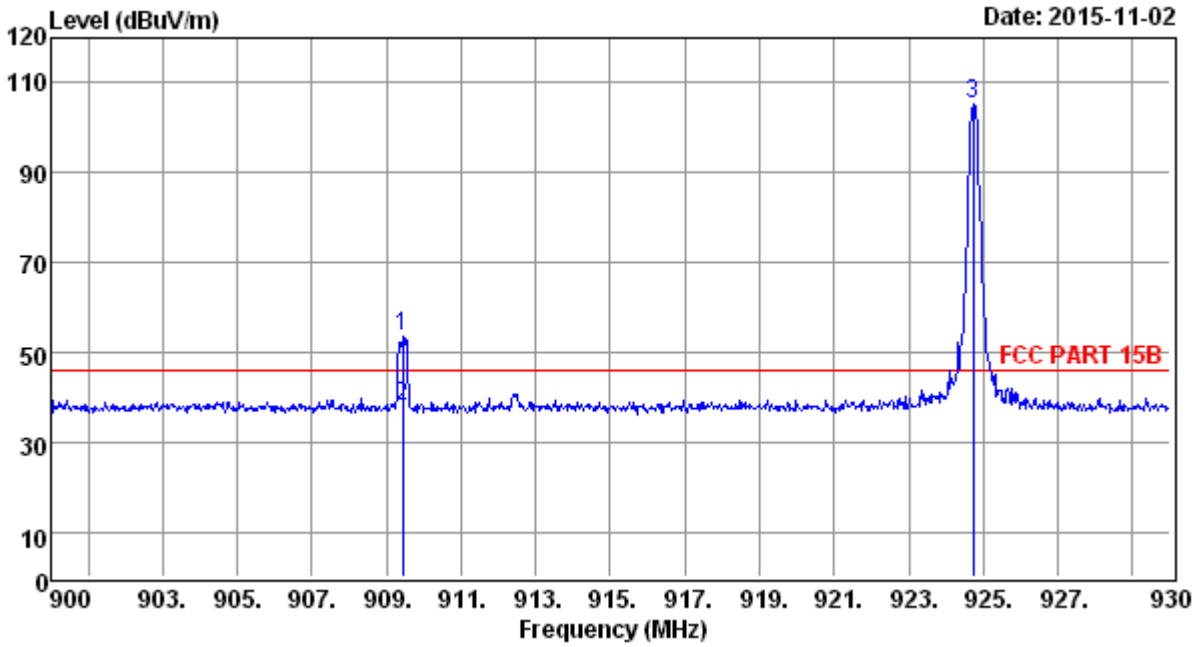
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	915.36	14.79	2.04	21.19	38.02	46.00	-7.98	QP	V
2	924.72	79.81	1.99	21.25	103.05	46.00	57.05	QP	V



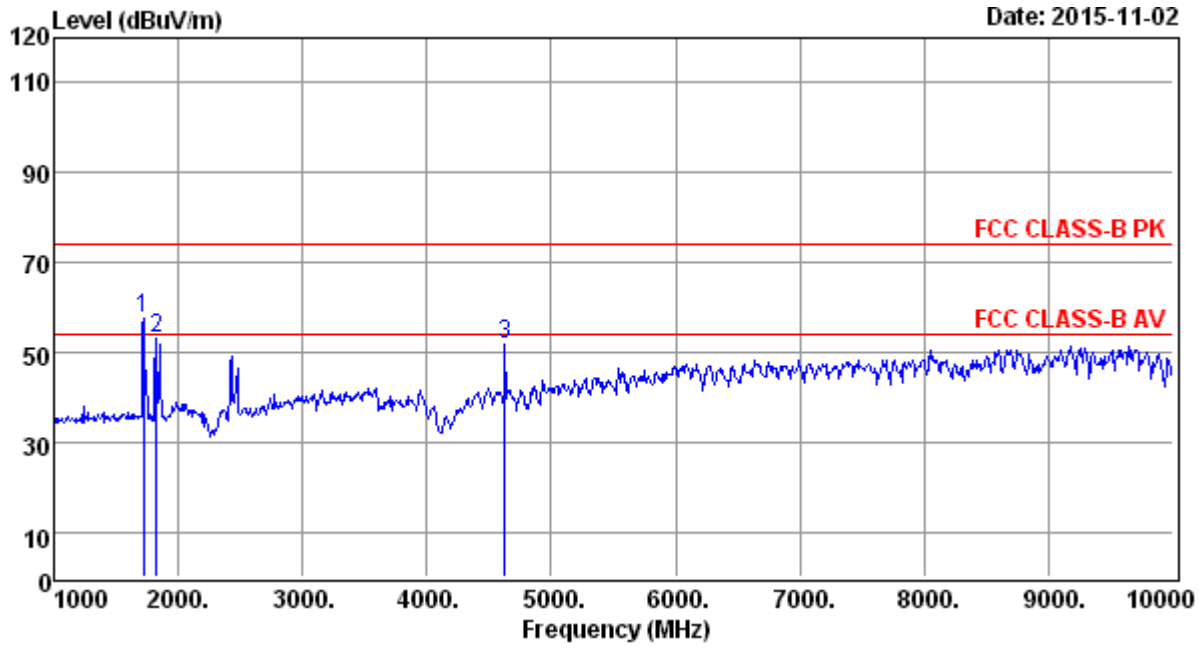
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Amplifer Gain dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	1711.00	78.71	4.44	26.41	37.00	65.66	74.00	-8.34	Peak	V
1	1711.07	51.22	4.44	26.41	37.00	38.17	54.00	-15.83	AV	V
4	4627.00	46.72	7.58	32.87	36.48	50.69	74.00	-23.31	Peak	V



	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	909.44	12.79	1.88	21.15	35.82	46.00	-10.18	QP	H
2	925.31	80.32	1.99	21.25	103.56	46.00	57.56	QP	H



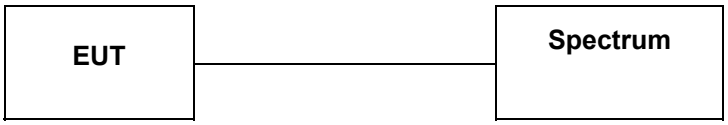
	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	909.42	14.75	1.88	21.15	37.78	46.00	-8.22	QP	H
2	924.72	82.07	1.99	21.25	105.31	46.00	59.31	QP	H



	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Amplifer Gain dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	1720.00	63.52	4.44	26.41	37.00	57.37	74.00	-16.63	Peak	H
1	1720.00	47.06	4.44	26.41	37.00	40.91	54.00	-13.09	AV	H
2	1828.00	59.41	4.47	26.42	36.99	53.31	74.00	-20.69	Peak	H
2	1828.00	45.52	4.47	26.42	36.99	39.42	54.00	-14.58	AV	H
3	4627.00	47.75	7.58	32.87	36.48	51.72	74.00	-22.28	Peak	H

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10:2013 7.8.5 Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices; this is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:
1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
2) RBW > 20 dB bandwidth of the emission being measured.
3) VBW ≥ RBW.
4) Sweep: Auto.
5) Detector function: Peak.
6) Trace: Max hold.
b) Allow trace to stabilize.
c) Use the marker-to-peak function to set the marker to the peak of the emission.
d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

LIMIT

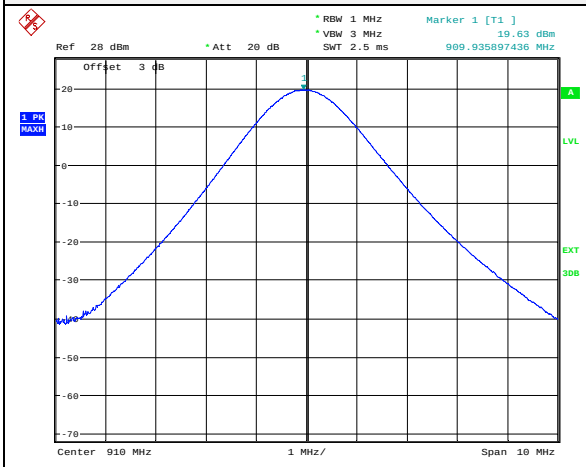
For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

TEST RESULTS

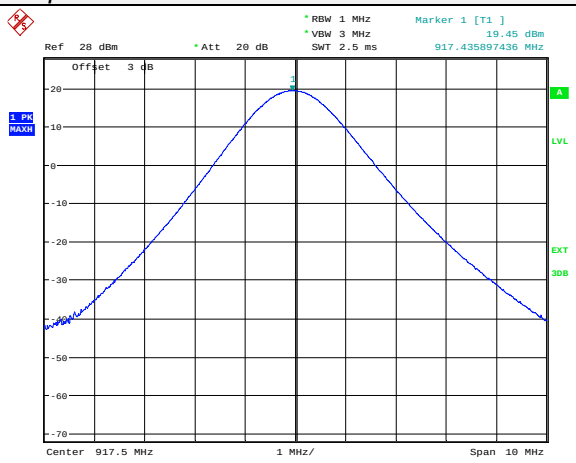
Test Mode	Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
GFSK	Lowest	910.0	19.63	30	PASS
	Middle	917.5	19.45		
	Highest	924.7	19.30		

Remark:
1. Test results including cable loss;
2. please refer to following plots;

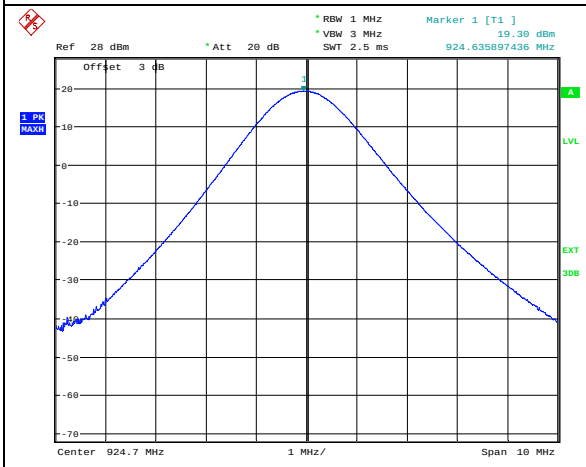
Maximum Peak Output Power



910.0 MHz



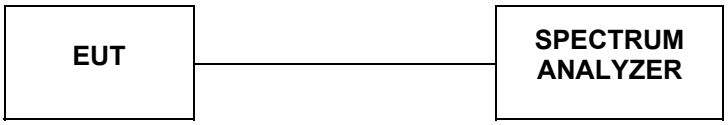
917.5 MHz



924.7 MHz

4.4. 20dB Bandwidth

TEST CONFIGURATION



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 RBW=30 KHz and VBW=100KHz.
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

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; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

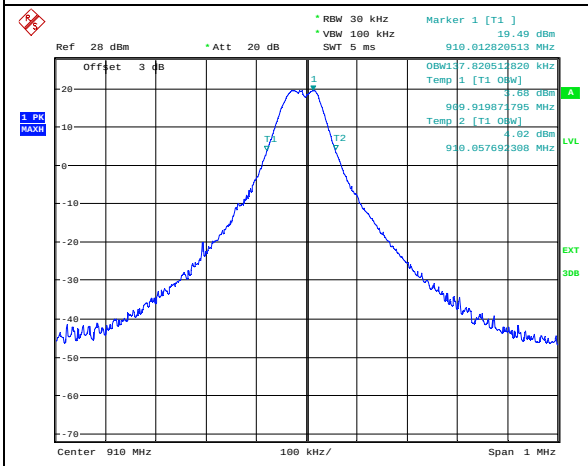
TEST RESULTS

Channel	Frequency (MHz)	Measured Bandwidth (KHz)		Limits (KHz)	Verdict
		20dBc	99%		
Lowest	910.0	161.86	137.82	250.00	PASS
Middle	917.5	161.86	136.22	250.00	PASS
Highest	924.7	160.26	136.22	250.00	PASS

Remark:
1.The test results including the cable lose.
2. Test Plots for next page

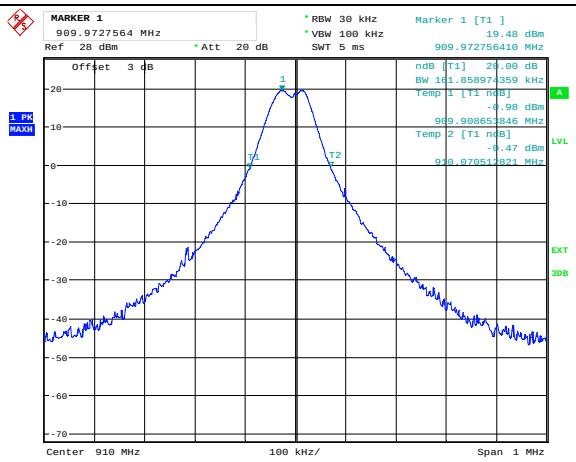
Mesured Bandwidth

99%



Date: 29.OCT.2015 10:28:55

-20dBc



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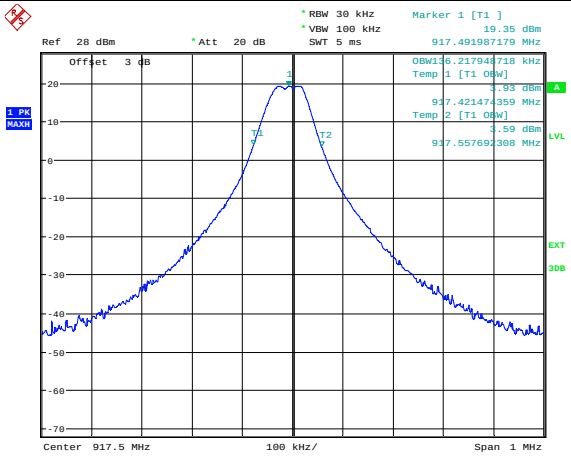
910.0 MHz



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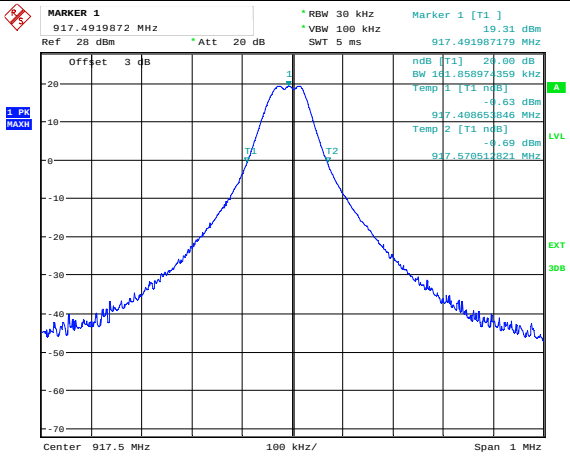
910.0 MHz



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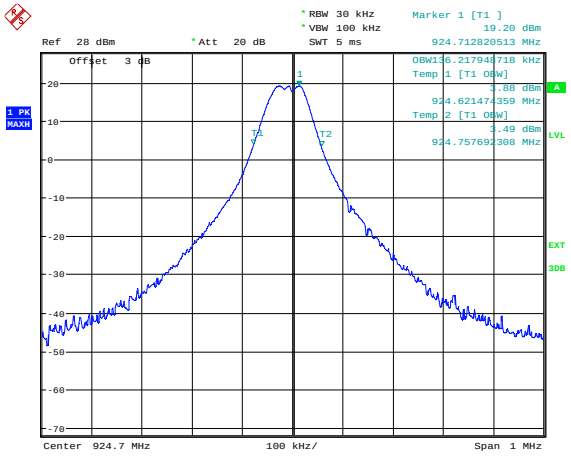
917.5 MHz



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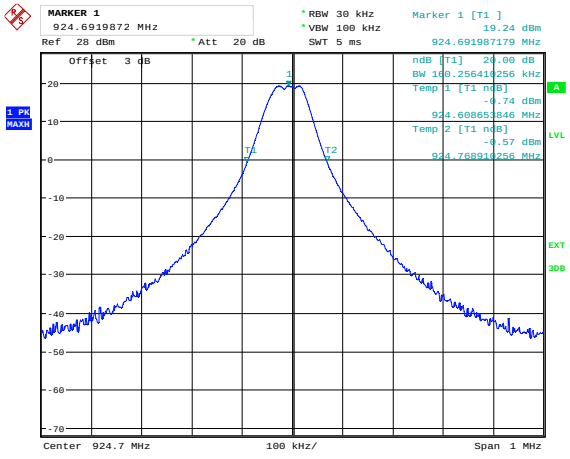
917.5 MHz



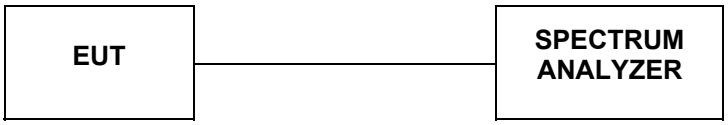
Date: 29.OCT.2015 11:15:05

924.7 MHz

924.7 MHz

4.5. Carrier Frequency Separation

TEST CONFIGURATION



TEST PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
a) Span: Wide enough to capture the peaks of two adjacent channels.
b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
c) Video (or average) bandwidth (VBW) ≥ RBW.
d) Sweep: Auto.
e) Detector function: Peak.
f) Trace: Max hold.
g) Allow the trace to stabilize.

LIMIT

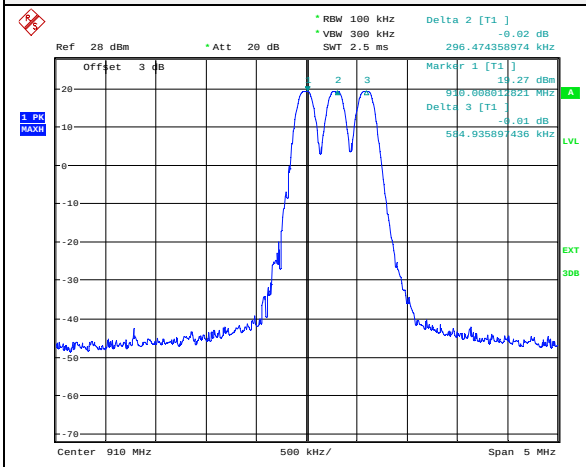
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Carrier Frequency Separation (KHz)	Limits (KHz)	Verdict
GFSK	Lowest	910.0	296.47	≥161.86	PASS
	Middle	917.5	296.47	≥161.86	
	Highest	924.7	296.47	≥160.26	

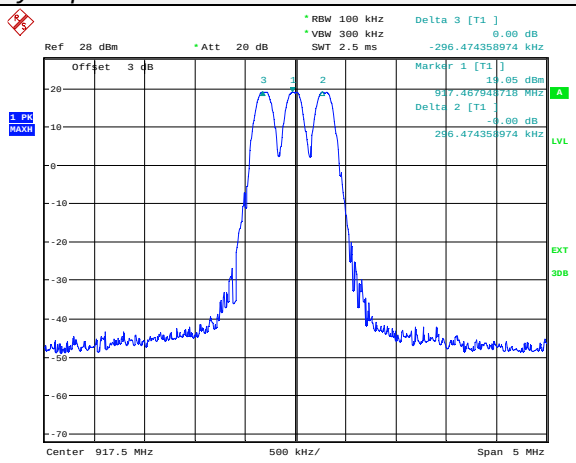
Remark:
1.The test results including the cable lose.
2. Test Plots for next page

Carrier Frequency Separation



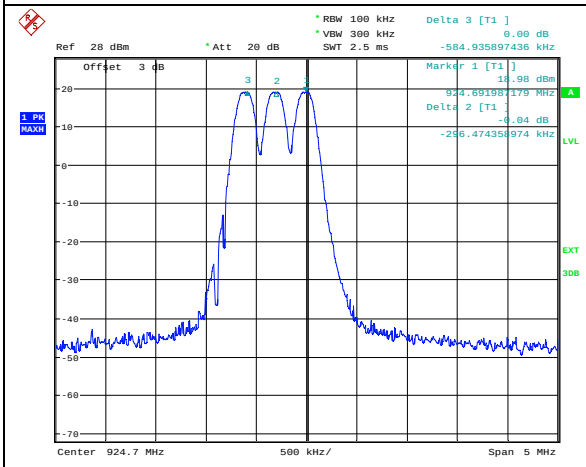
Date: 29.OCT.2015 10:30:20

910.0 MHz



Date: 29.OCT.2015 10:31:09

917.5 MHz

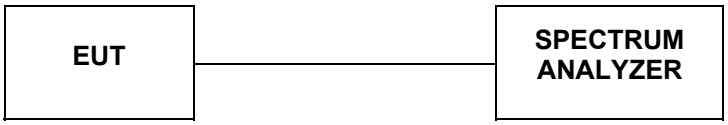


Date: 29.OCT.2015 11:18:34

924.7 MHz

4.6. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth;
c) VBW ≥ RBW.
d) Sweep: Auto.
e) Detector function: Peak.
f) Trace: Max hold.
g) Allow the trace to stabilize.

LIMIT

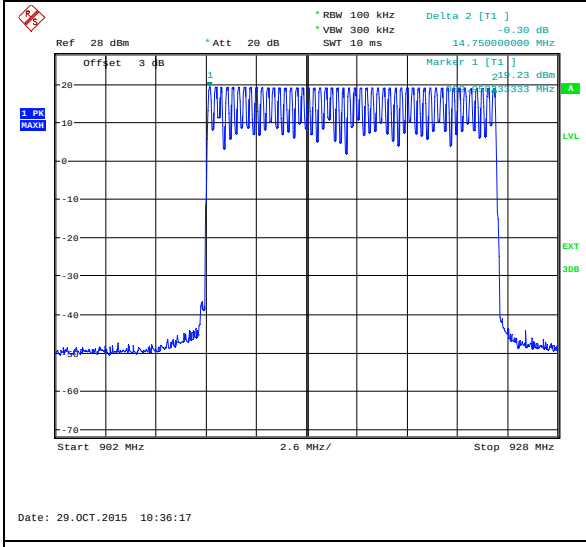
For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Numbers of Channel	Limits	Verdict
GFSK	Full (hopping)	910-927.4	50	50	PASS

Remark:
1.The test results including the cable lose.
2. Test Plots for page

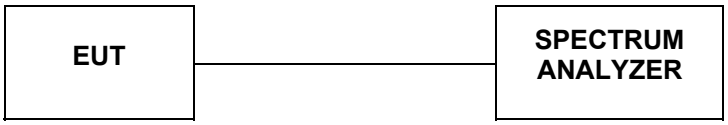
Number of hopping frequencies



910-927.4 MHz

4.7. Time of Occupancy (Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
a) Span: Zero span, centered on a hopping channel.
b) RBW shall be ≥ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
d) Detector function: Peak.
e) Trace: Max hold.

LIMIT

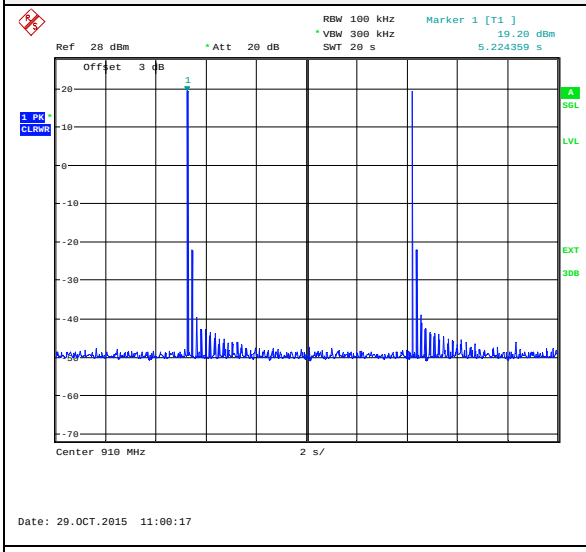
For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

TEST RESULTS

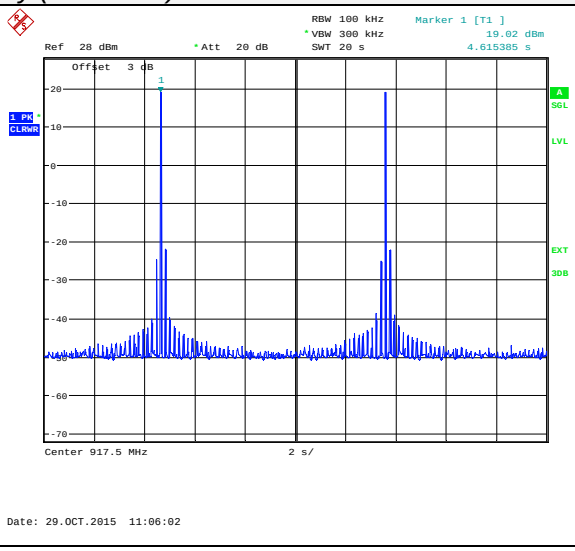
Test Mode	Channel	Frequency (MHz)	Time of occupancy (dwell time) (s)	Limits (s)	Verdict
GFSK	Lowest	910.0	0.057692	0.4	PASS
	Middle	917.5	0.056090	0.4	
	Highest	924.7	0.056090	0.4	

Remark:
1.The test results including the cable lose.
2. Test Plots for next page

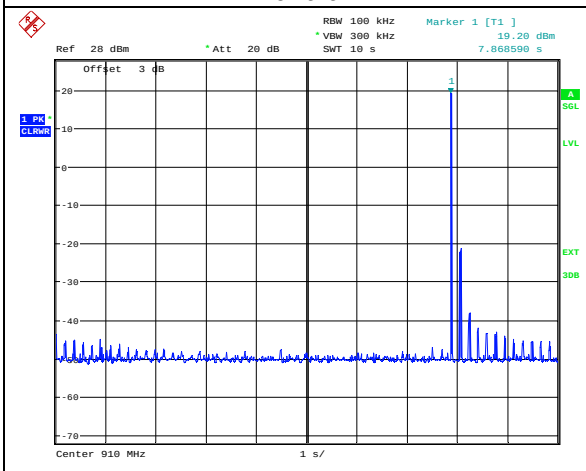
Time of occupancy (dwell time)



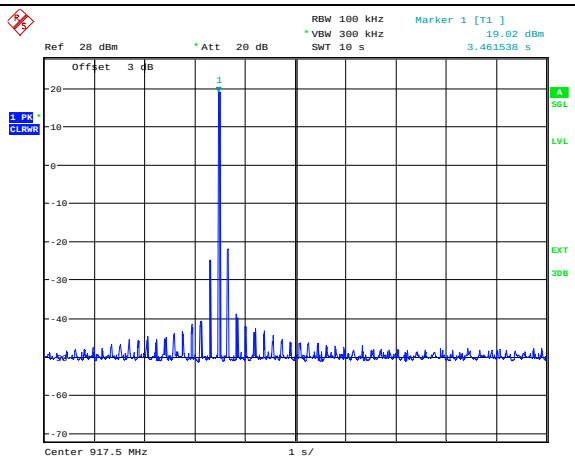
910.0 MHz



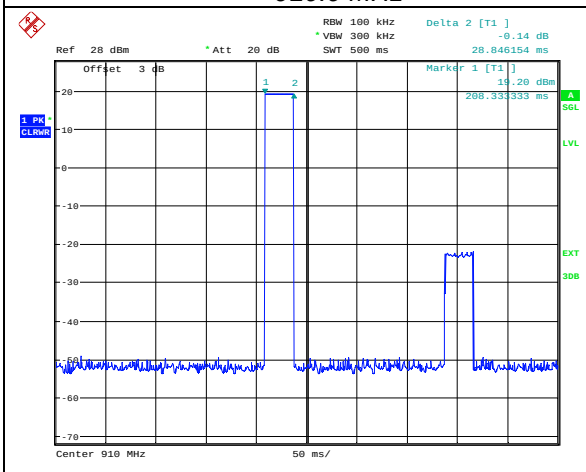
917.5 MHz



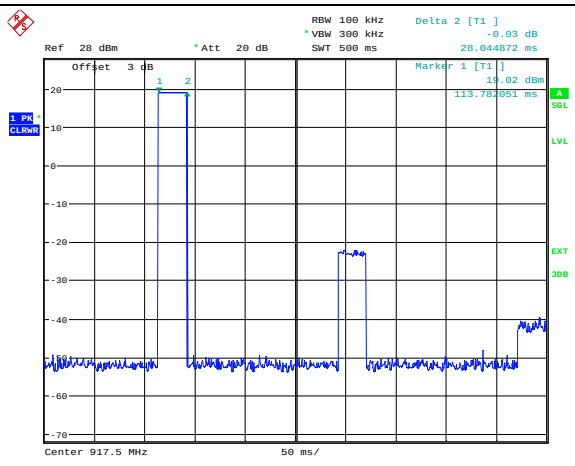
910.0 MHz



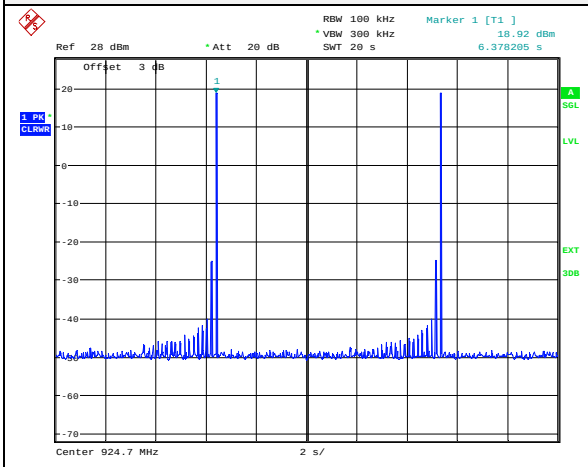
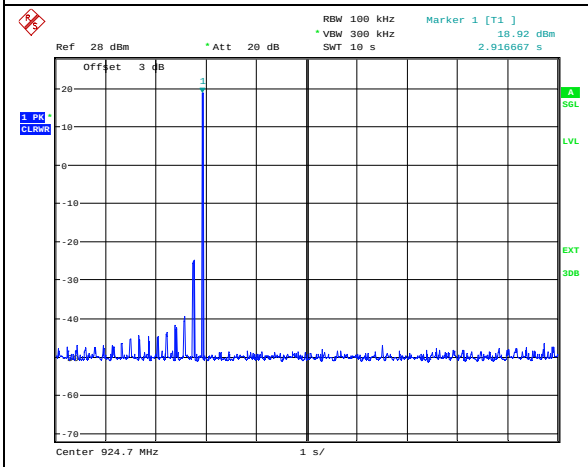
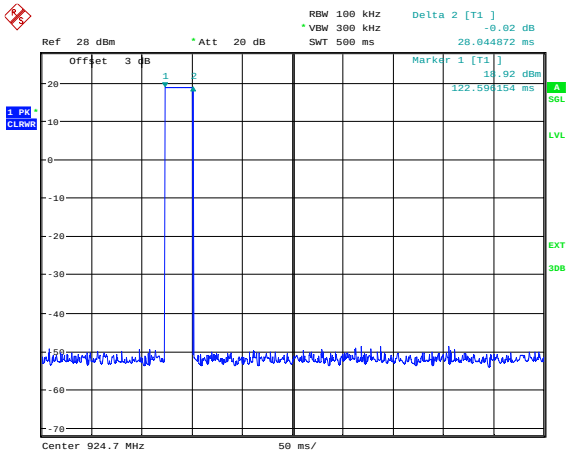
917.5 MHz



910.0 MHz

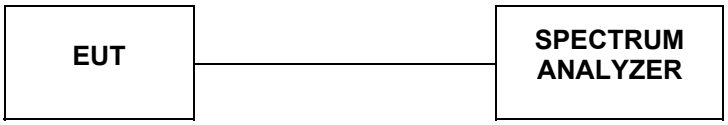


917.5 MHz

Time of occupancy (dwell time)	
	
Date: 29.OCT.2015 11:11:20	
924.7 MHz	
	
Date: 29.OCT.2015 11:11:44	
924.7 MHz	
	
Date: 29.OCT.2015 11:12:39	
924.7 MHz	

4.8. Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength , and measurement frequency range from 9KHz to 10GHz.

LIMIT

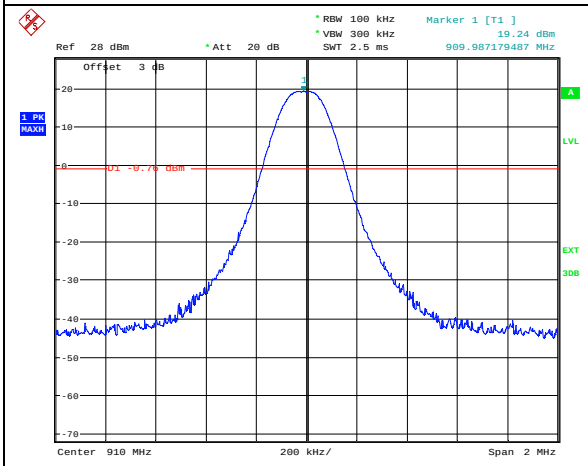
1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

TEST RESULTS

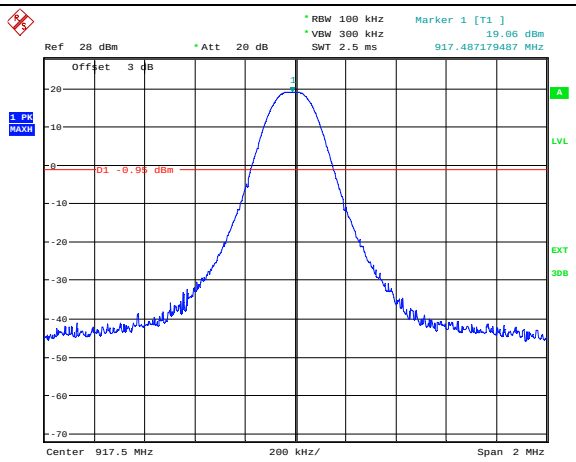
Remark:
1.The test results including the cable lose.
2. Test Plots for next page

Spurious RF Conducted Emission

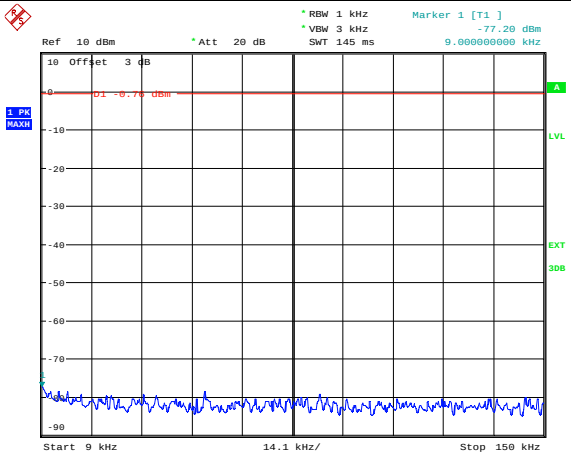
910.0 MHz



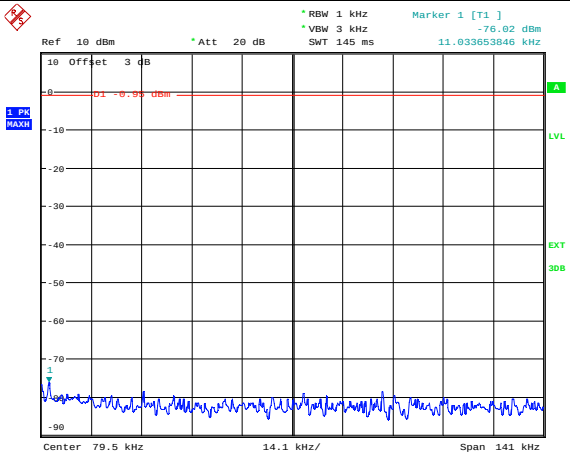
917.5 MHz



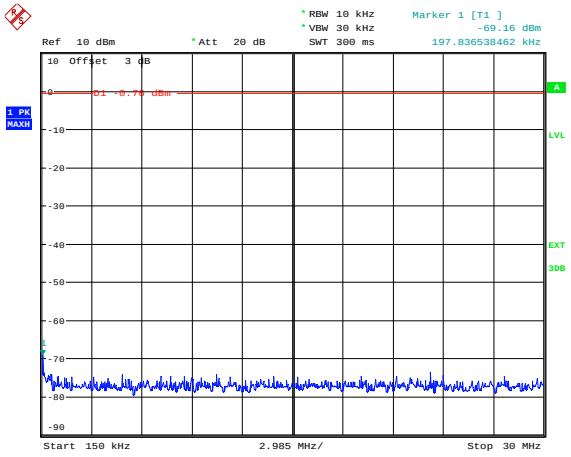
909 MHz – 911 MHz



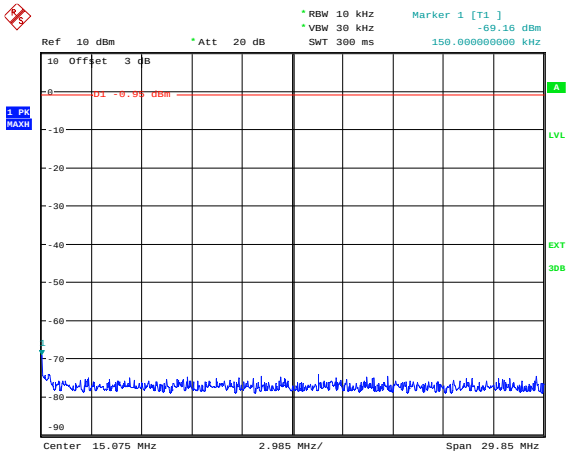
916.5 MHz – 917.5 MHz



9 KHz – 150 KHz



9 KHz – 150 KHz

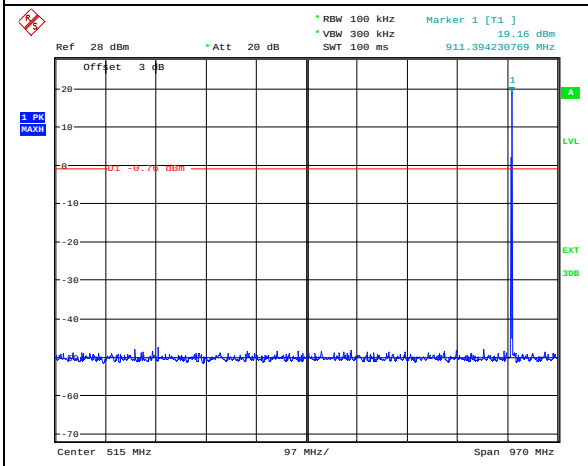


150 KHz – 30 MHz

150 KHz – 30 MHz

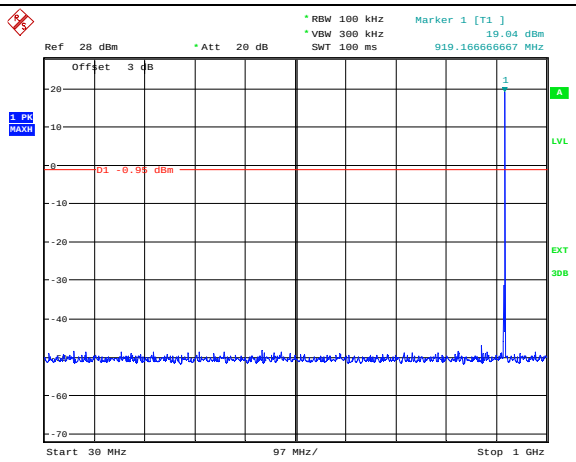
Spurious RF Conducted Emission

910.0 MHz



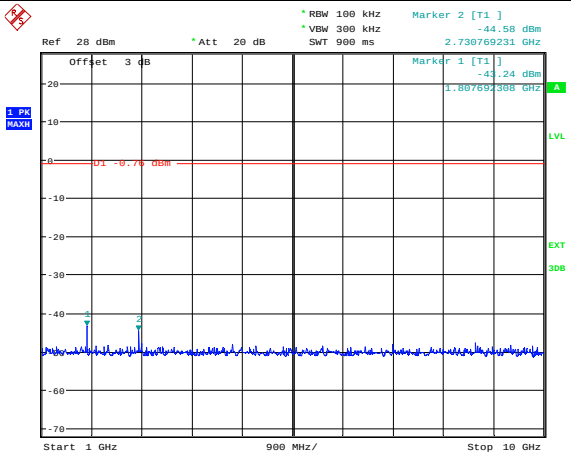
Date: 29.OCT.2015 10:39:05

917.5 MHz



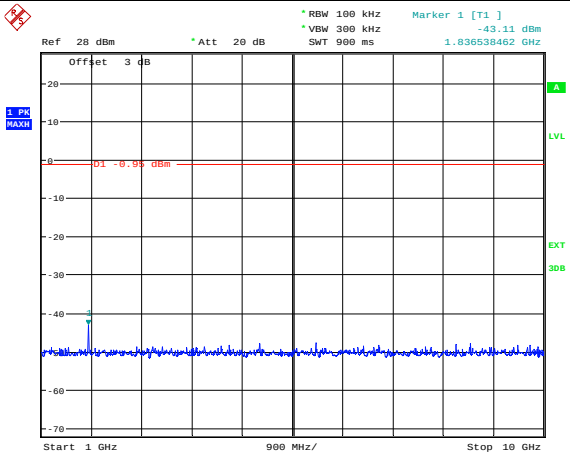
Date: 29.OCT.2015 10:41:42

30 MHz – 1000 MHz



Date: 29.OCT.2015 10:39:28

30 MHz – 1000 MHz



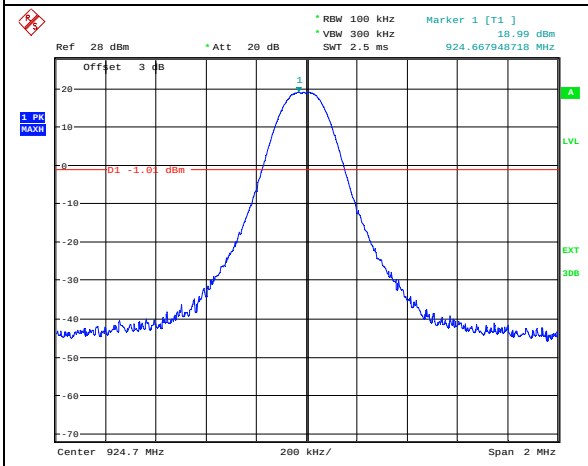
Date: 29.OCT.2015 10:42:16

1GHz – 10 GHz

1GHz – 10 GHz

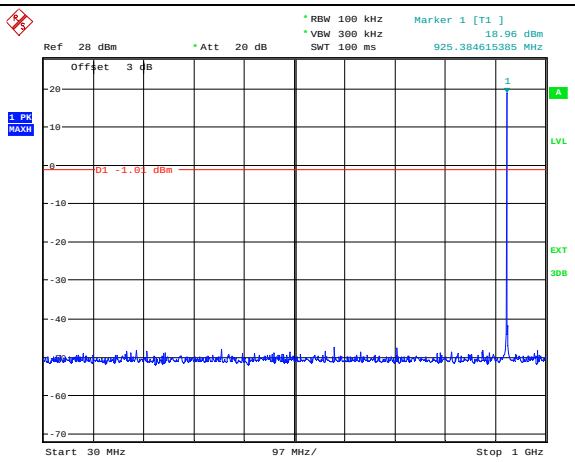
Spurious RF Conducted Emission

924.7 MHz



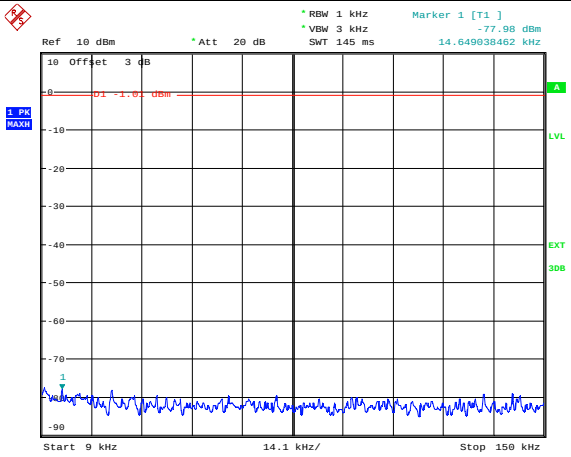
Date: 29.OCT.2015 11:19:48

924.7 MHz



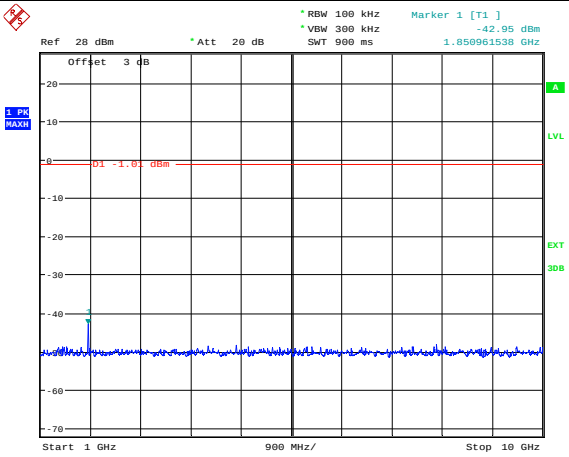
Date: 29.OCT.2015 11:21:22

909 MHz – 911 MHz



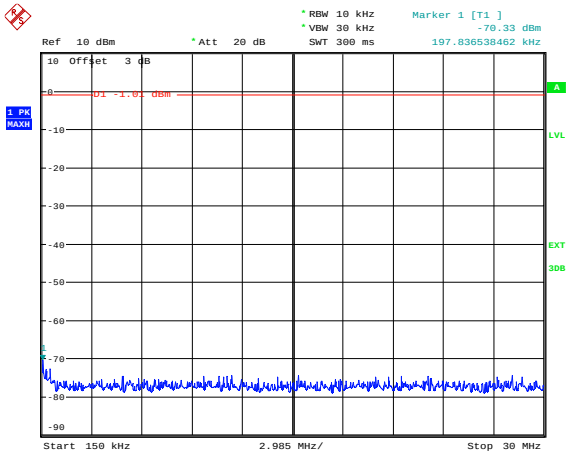
Date: 29.OCT.2015 11:20:19

30 MHz – 1000 MHz



Date: 29.OCT.2015 11:21:58

9 KHz – 150 KHz



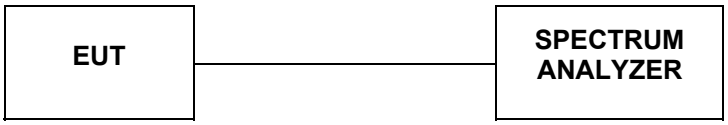
Date: 29.OCT.2015 11:20:44

1GHz – 10 GHz

150 KHz – 30 MHz

4.9. Band-edge measurements for RF conducted emissions

TEST CONFIGURATION



TEST PROCEDURE

Band-edge measurements shall be tested both on single channels, and with the EUT hopping. Use the following spectrum analyzer settings:
a) Span: The frequency band of operation. It can see band frequency clearly;
b) RBW: 100 KHz;
c) VBW: 300 KHz.
d) Sweep: Auto.
e) Detector function: Peak.
f) Trace: Max hold.
g) Allow the trace to stabilize.

LIMIT

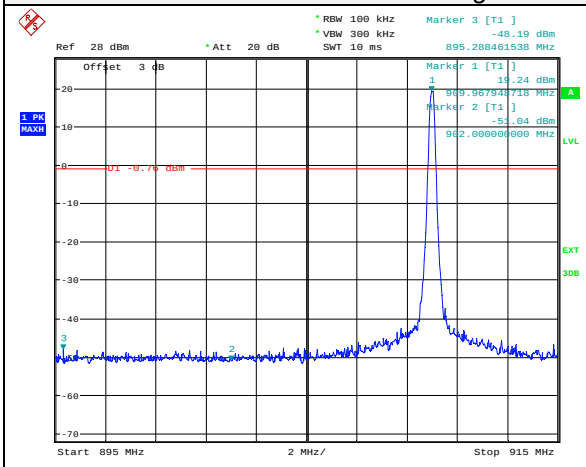
1. Below -20dB of the highest emission level in operating band.

TEST RESULTS

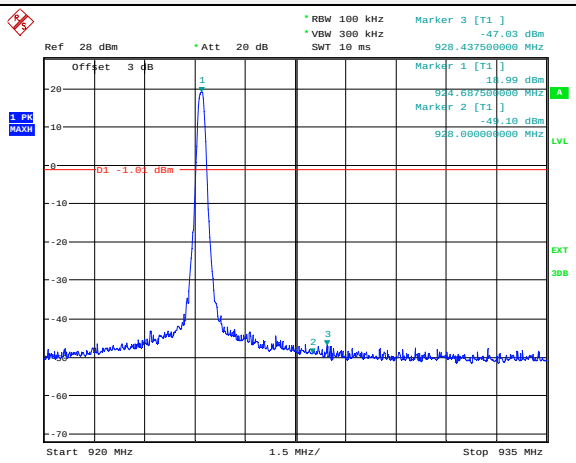
Test Mode	Channel	Frequency (MHz)	Conductd Band-edge Emission (dBc)	Limits (dBc)	Verdict
GFSK	Lowest	910.0	<-20dBc	-20	PASS
	Highest	924.7	<-20dBc	-20	
	Hopping	910-924.7	<-20dBc	-20	

Remark:
1.The test results including the cable lose.
2. Test Plots for next page
3. Please refer to Section 4.2 of This report for Raidated Band-edge emission

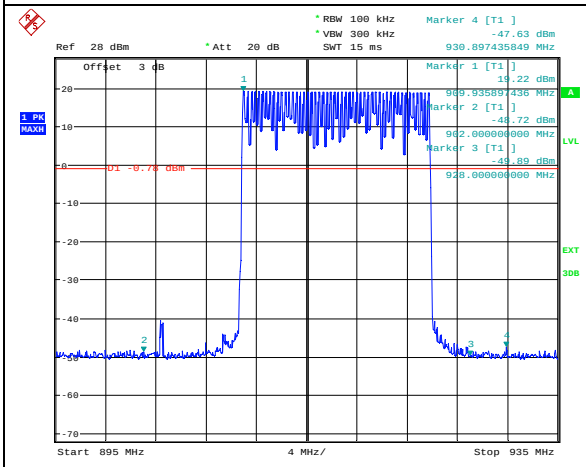
Band-edge measurements for Conducted Emission



910.0 MHz



924.7 MHz



Hopping (910.0 MHz – 924.7 MHz)

4.10. Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section

TEST RESULTS

The sample meet Pseudorandom Frequency Hopping Sequence requirement, please refer to Operation Description for Pseudorandom Frequency Hopping Sequence of the sample.

4.11. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The maximum gain of Hopping Frequency Modular antenna was 0 dBi. it is a PCB Antenna.

Measurement Method

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Conducted power refer ANSI C63.10 :2013 Section 7.8.5 Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices
Radiated power refer to ANSI C63.10 :2013 Section 6.6.4 Radiated emissions tests.

Measurement parameters

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

Limits

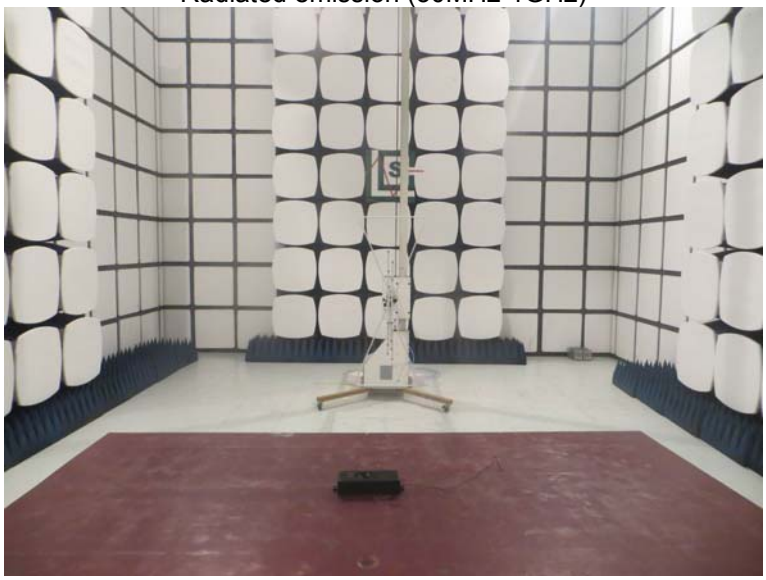
FCC	IC
Antenna Gain	
6 dBi	

Results

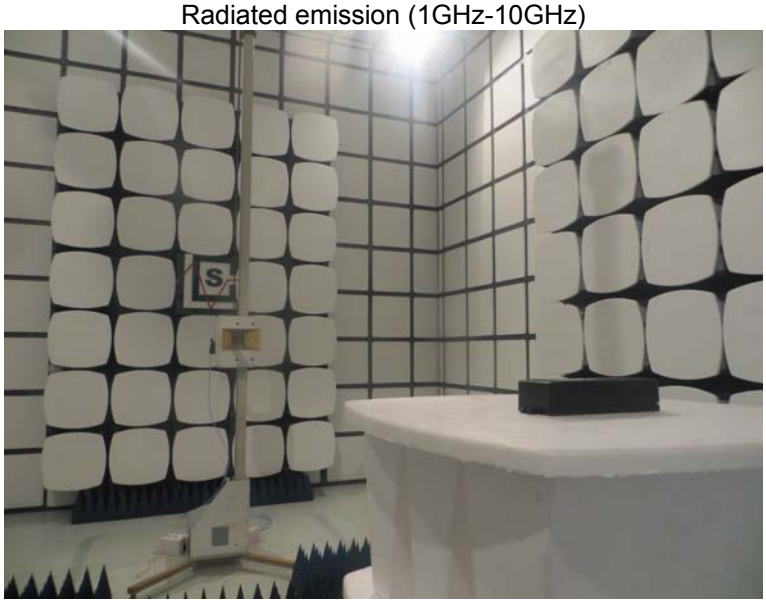
T_{nom}	V_{nom}	Lowest Channel 910.0 MHz	Middle Channel 917.5 MHz	Highest Channel 924.7 MHz
Conducted power [dBm] Measured with GFSK modulation		19.63	19.45	19.30
Radiated power [dBm] Measured with GFSK modulation		18.39	18.81	18.02
Gain [dBi] Calculated		-1.24	-0.64	-1.28
Measurement uncertainty		± 0.61 dB (cond.) / ± 1.22 dB (rad.)		

5. Test Setup Photos of the EUT

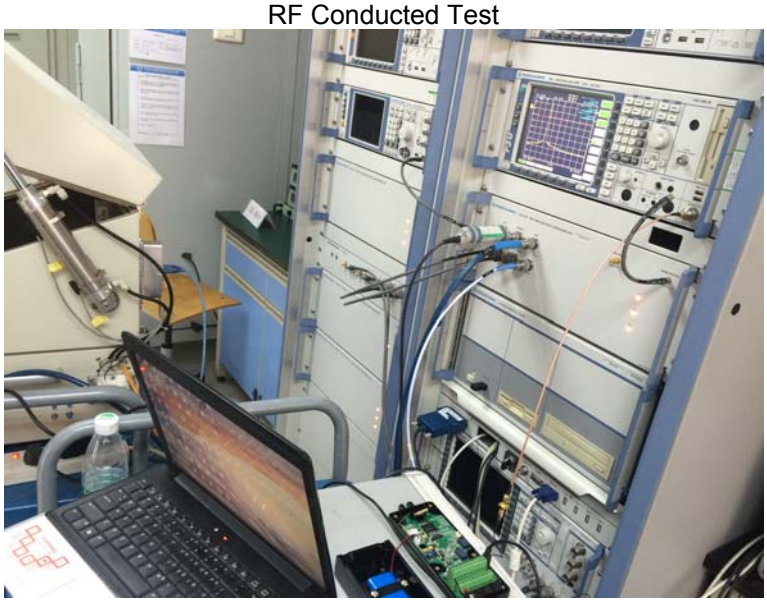
Radiated emission (30MHz-1GHz)



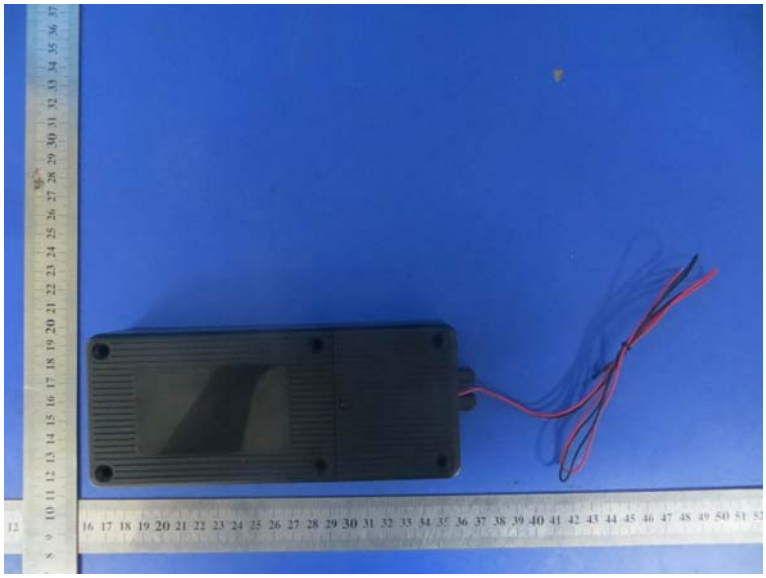
Radiated emission (1GHz-10GHz)

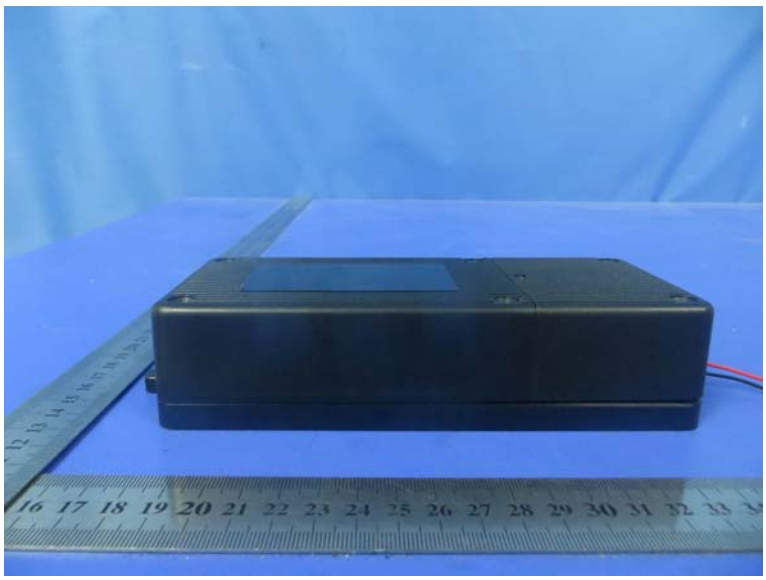


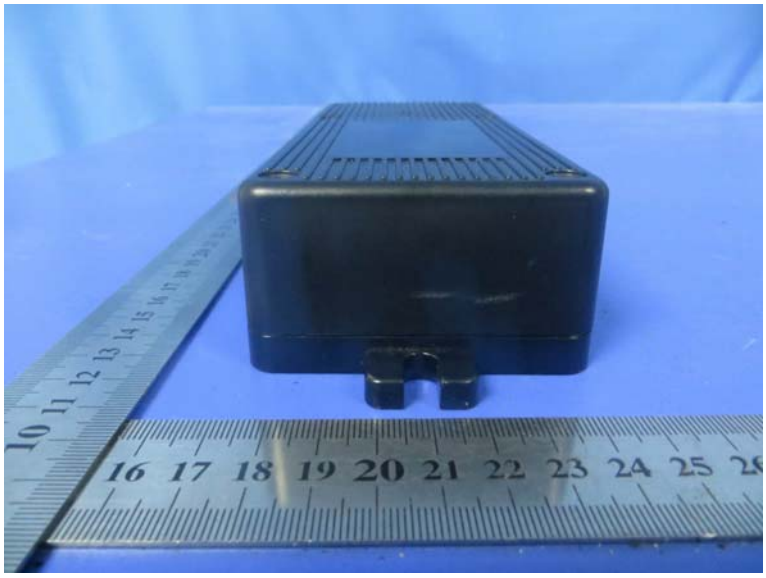
RF Conducted Test

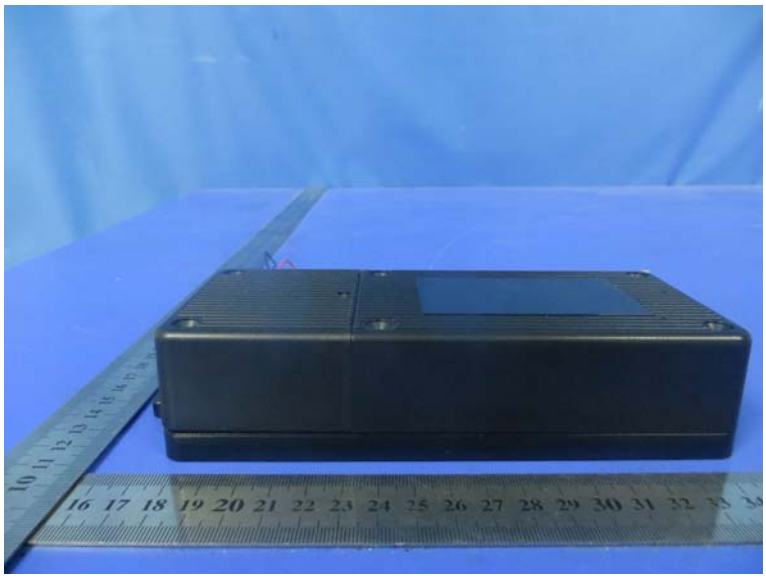


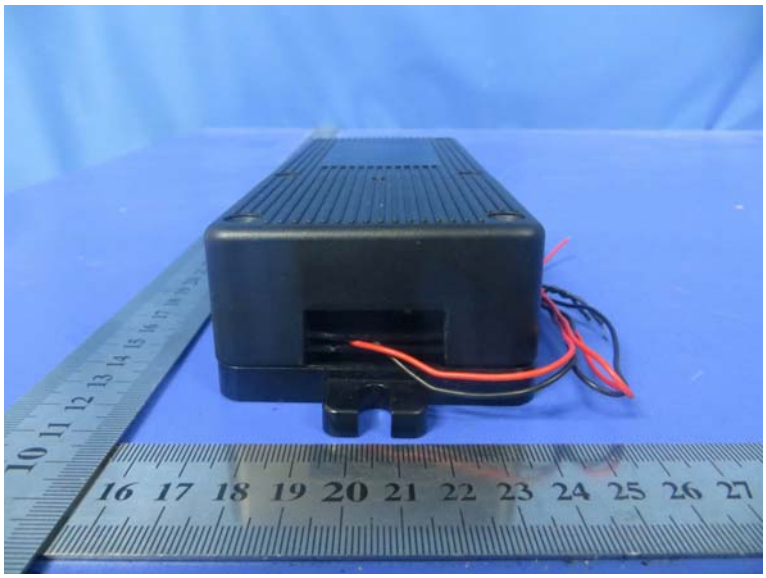
6. External Photos of the EUT



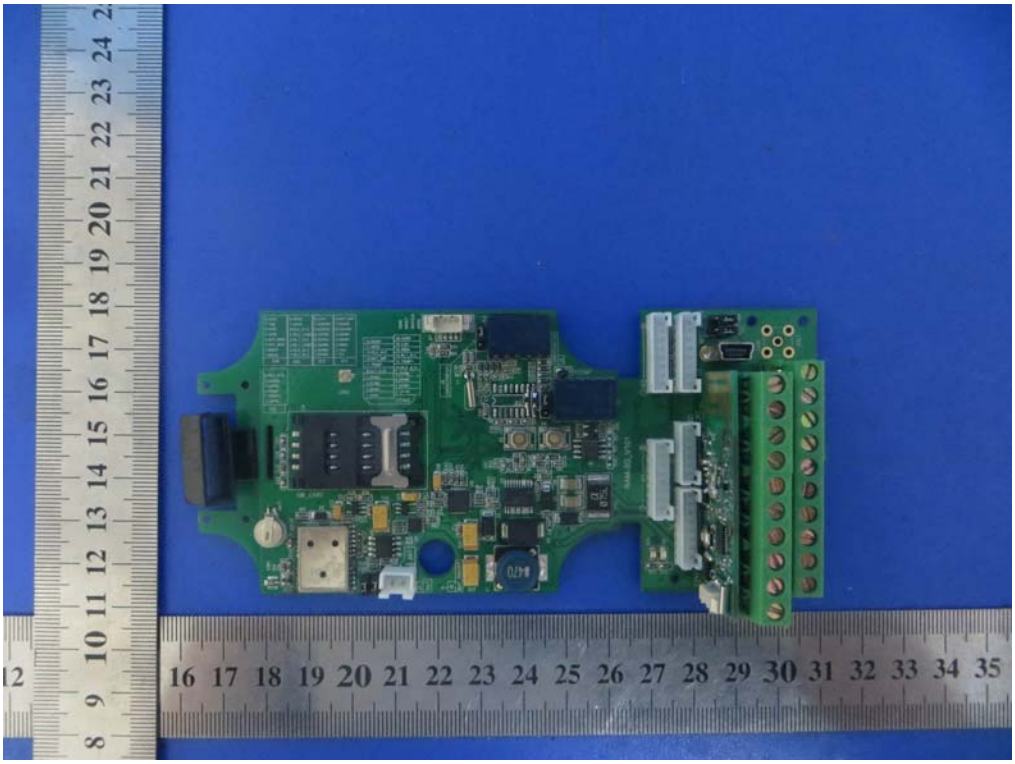


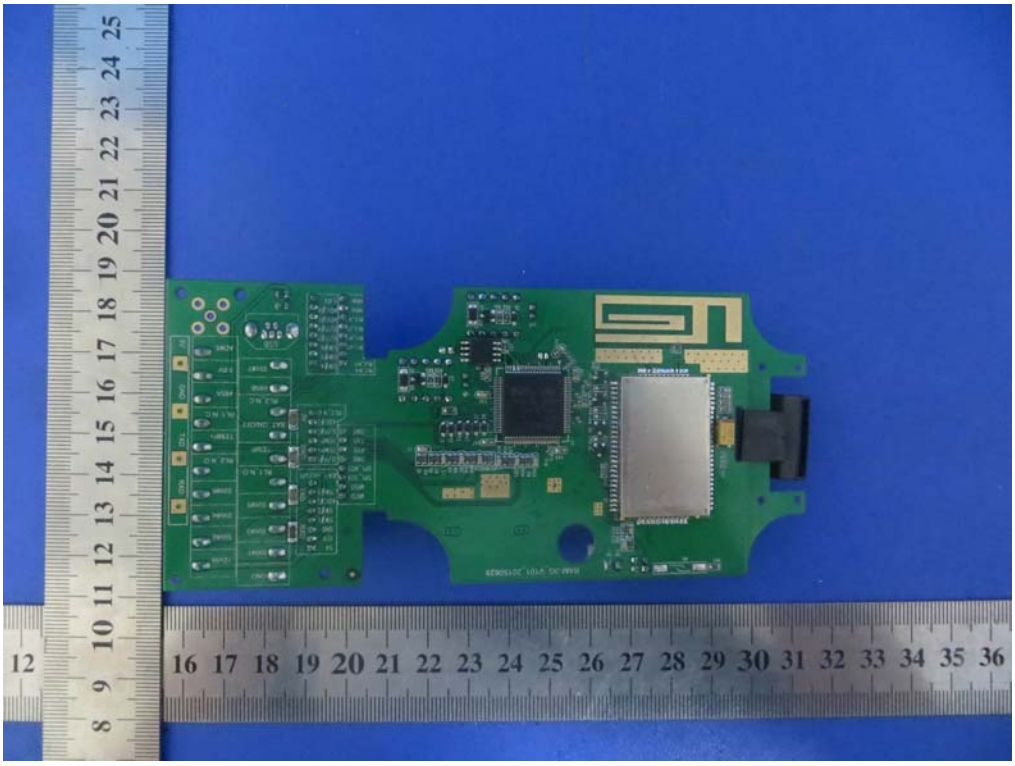


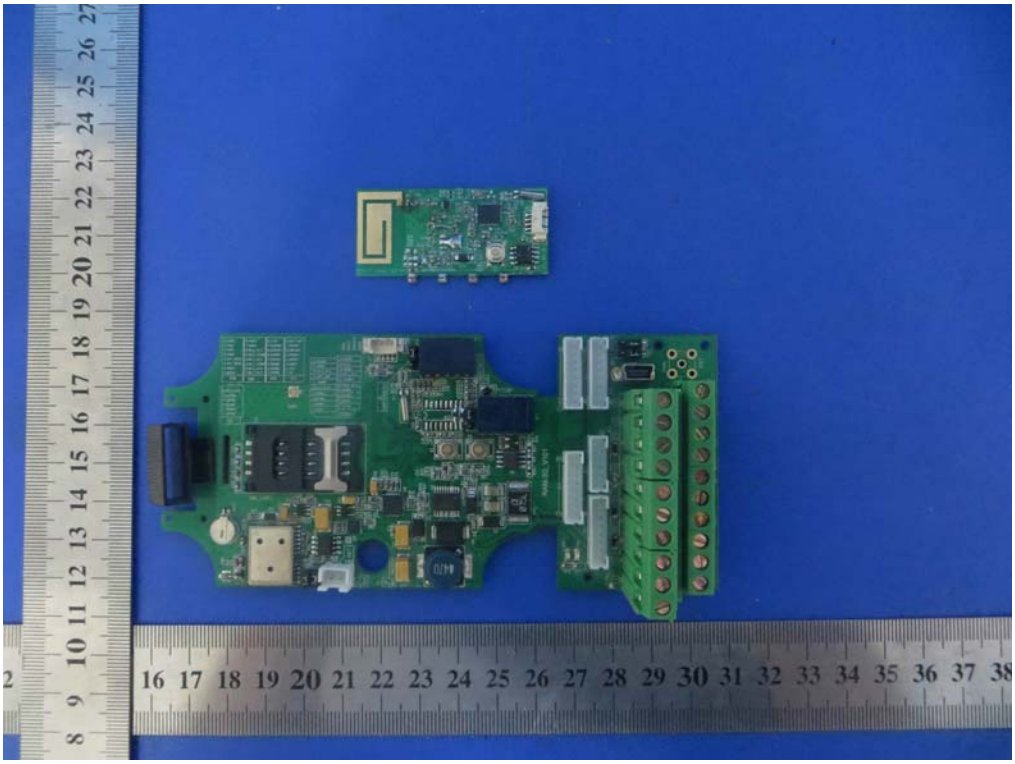


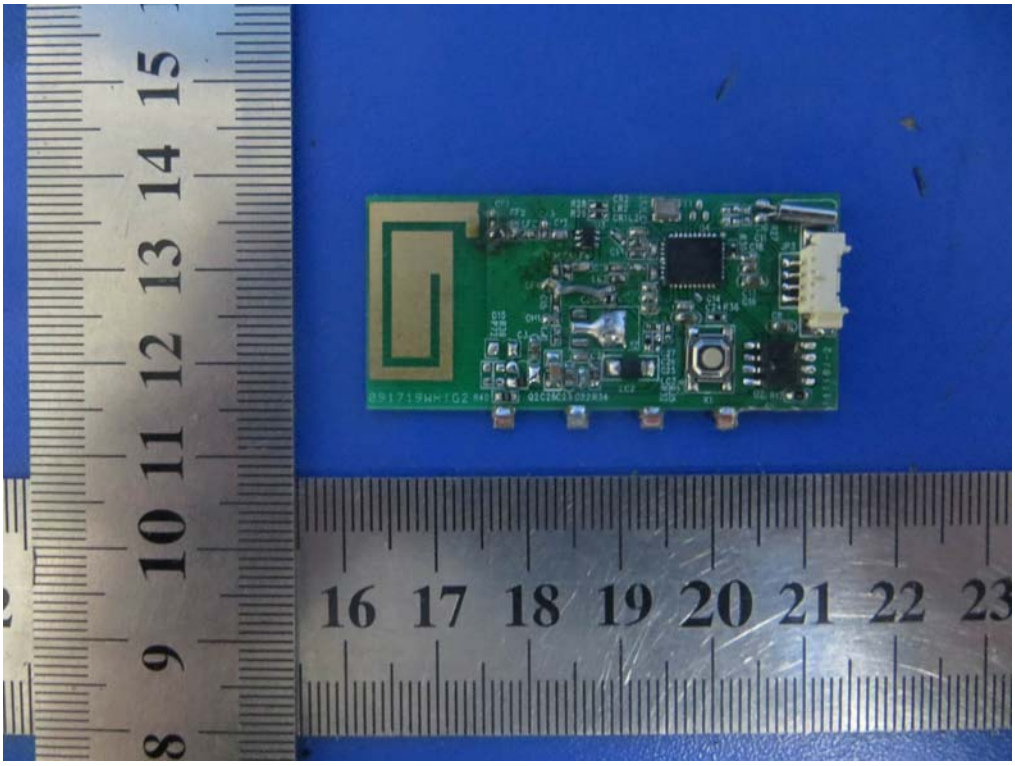


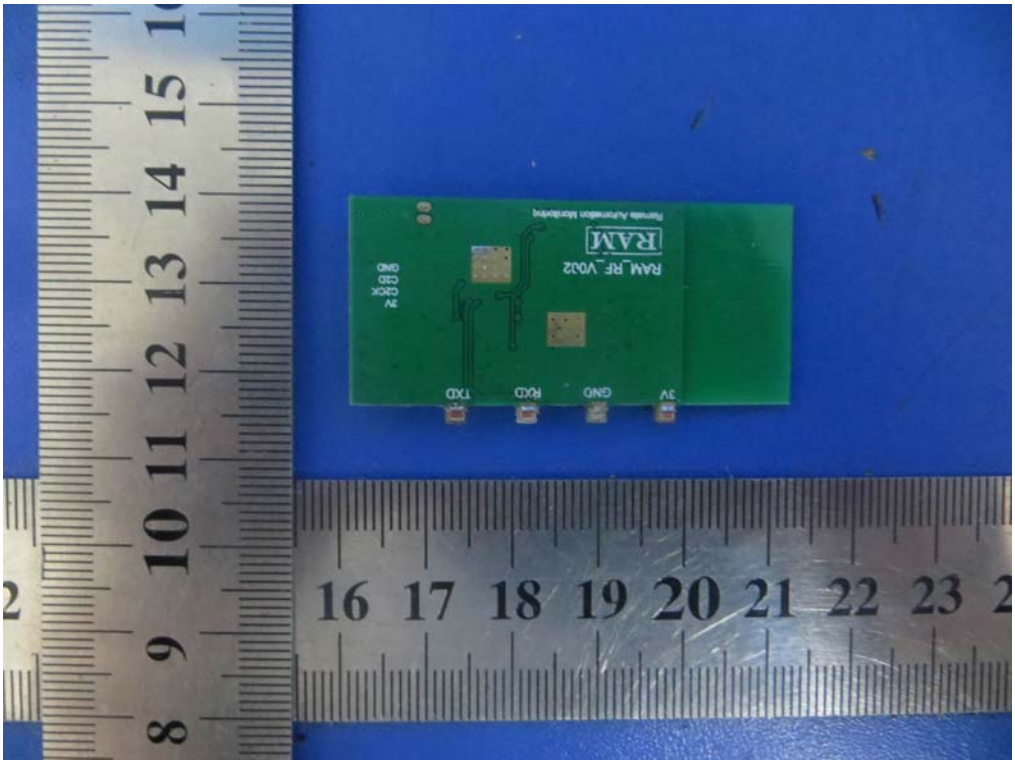
7. Internal Photos of the EUT











.....End of Report.....