

**FCC 47 CFR PART 15 SUBPART C &
INDUSTRY CANADA RSS-247 ISSUE 1 May 2015**

CERTIFICATION TEST REPORT

For

Product name: WellIntel Radio

MODEL No.: RM0608

FCC ID: 2AEOD-1400004B00101

IC: 20139-1400004B001



Trade Mark: WellIntel

REPORT NO: ES150319200E1

ISSUE DATE: July 15, 2015

Prepared for

**WellIntel, Inc.
4230 N. Oakland Avenue #202 Shorewood US 53211 USA**

Prepared by

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1 TEST RESULT CERTIFICATION

Applicant: WellIntel, Inc.
4230 N. Oakland Avenue #202 Shorewood US 53211 USA

Manufacturer: Peak Gain Wireless LLC
N69W25055 Indiangrass Ln, Unit J, Sussex, WI, USA

EUT Description: Wireless Module

Model Number: RM0608

File Number: ES150319200E1

Date of Test: March 19, 2015 to July 15, 2015

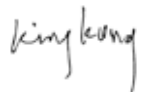
Measurement Procedure Used:

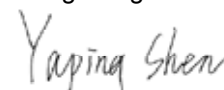
APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C IC RSS-GEN, Issue 4, Nov 2014 IC RSS-247 Issue 1, May 2015.	PASS

The above equipment was tested by SHENZHEN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2 ,Part 15.247, RSS-247 ISSUE 1, RSS-GEN ISSUE 4.

The test results of this report relate only to the tested sample identified in this report.

Date of Test : March 19, 2015 to July 15, 2015

tested by : 
King Kong/Tester

Prepared by : 
Yaping Shen/Editor

Approve & Authorized Signer : 
Lisa Wang/Manager

2 EUT TECHNICAL DESCRIPTION

EUT Description	BW (kHz)	Start frequency (MHz)	End frequency (MHz)	Spacing (kHz)	Number of Channels
Channel Bandwidth 1: 7.8KHz DSS	7.8125	902.018750	927.968750	25	1039
Channel Bandwidth 2: 10.4KHz DSS	10.4167	902.025000	927.950000	25	1038
Channel Bandwidth 3: 15.6KHz DSS	15.625	902.037500	927.962500	25	1038
Channel Bandwidth 4: 20.8KHz DSS	20.8333	902.050	927.950	25	1037
Channel Bandwidth 5: 31.25KHz DSS	31.25	902.075	927.875	50	517
Channel Bandwidth 6: 41.7KHz DSS	41.6667	902.100	927.850	50	516
Channel Bandwidth 7: 62.5KHz DSS	62.5	902.150	927.850	100	258
Channel Bandwidth 8: 125KHz DSS	125	902.300	927.700	200	128
Channel Bandwidth 9: 250KHz DSS	250	902.600	927.000	400	62
Channel Bandwidth 10: 500KHz DTS	500	903.200	926.400	800	30

Transmit Power Max	27.638 dBm for DSS for antenna A 5.75 dBm for DSS for antenna B 27.315 dBm for DTS for antenna A -0.214 dBm for DTS for antenna B
Antenna Type	Antenna A: Dipole antenna(The antenna is connected via an reverse polarity SMA type connection) Antenna B: Matel antenna or Spiral antenna
Antenna Gain	2.5 dBi for Dipole antenna, 1.8 dBi for Matel antenna, 1.8 dBi for Spiral antenna
Modulation	FSK
Power supply:	DC 1.8V-3.7V
Temperature Range	-20°C ~ +55°C
Product HW/SW version	HW: PGW-007 RevA SW: xxx kHz(FCC test rev3). srec
Radio HW/SW version	HW: PGW-007 RevA SW: xxx kHz(FCC test rev3). srec
Test SW Version	STM32 ST-LINK Utility
RF power setting in TEST SW	28 dBm for antenna A& 6 dBm for antenna B

3 SUMMARY OF TEST RESULT

FCC Part Clause	IC Part Clause	Test Parameter	Verdict	Remark
15.247(a)(2)	RSS-247.5.2(1)	DTS (6dB) Bandwidth	PASS	
15.247(b)(3)	RSS-247.5.4(4)	Maximum Peak Conducted Output Power	PASS	
15.247(e)	RSS-247, 5.2(2)	Maximum Power Spectral Density Level	PASS	
15.247(d)	RSS-247, 5.5	Unwanted Emission Into Non-Restricted Frequency Bands	PASS	
15.247(d) 15.209	RSS-247, 5.5	Unwanted Emission Into Restricted Frequency Bands (conducted)	PASS	
15.247(d) 15.209	RSS-Gen.6.13	Radiated Spurious Emission	PASS	
15.207	RSS-Gen 8.8	Conducted Emission Test	PASS	
15.247(b)	RSS-Gen.6.7	Antenna Application	PASS	
	RSS-Gen.6.6	99% Occupied Bandwidth	PASS	
NOTE1: N/A (Not Applicable) NOTE2: According to FCC OET KDB 558074, the report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.				

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2AEOD-1400004B00101 and IC: 20139-1400004B001 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules, RSS-247 ISSUE 1, RSS-GEN ISSUE 4.

4 TEST METHODOLOGY

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

FCC 47 CFR Part 2, Subpart J

FCC 47 CFR Part 15, Subpart C

FCC KDB 558074 D01 DTS Meas Guidance v03r02

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

FCC KDB 662911 D02 MIMO With Cross Polarized Antenna V01

4.2 MEASUREMENT EQUIPMENT USED

4.2.1 Conducted Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	Due CAL.
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/16/2015	05/15/2016
L.I.S.N.	Schwarzbeck	NNLK8129	8129203	05/16/2015	05/15/2016
50Ω Coaxial Switch	Anritsu	MP59B	M20531	N/A	05/15/2016
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	05/16/2015	05/15/2016
Voltage Probe	Rohde & Schwarz	TK9416	N/A	05/16/2015	05/15/2016
I.S.N	Rohde & Schwarz	ENY22	1109.9508.02	05/16/2015	05/15/2016

4.2.2 Radiated Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	Due CAL.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/16/2015	05/15/2016
Pre-Amplifier	HP	8447D	2944A07999	05/16/2015	05/15/2016
Bilog Antenna	Schwarzbeck	VULB9163	142	05/16/2015	05/15/2016
Loop Antenna	ARA	PLA-1030/B	1029	05/16/2015	05/15/2016
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/16/2015	05/15/2016
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/16/2015	05/15/2016
Cable	Schwarzbeck	AK9513	ACRX1	05/16/2015	05/15/2016
Cable	Rosenberger	N/A	FP2RX2	05/16/2015	05/15/2016
Cable	Schwarzbeck	AK9513	CRPX1	05/16/2015	05/15/2016
Cable	Schwarzbeck	AK9513	CRRX2	05/16/2015	05/15/2016

4.2.3 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	Due CAL.
Spectrum Analyzer	Agilent	E4407B	88156318	05/16/2015	05/15/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/16/2015	05/15/2016
Power meter	Anritsu	ML2495A	0824006	05/16/2015	05/15/2016
Power sensor	Anritsu	MA2411B	0738172	05/16/2015	05/15/2016

Remark: Each piece of equipment is scheduled for calibration once a year.

4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list for DTS:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	903.200000	10	911.200000	20	919.200000
1	904.000000	11	912.000000	21	920.000000
2	904.800000	12	912.800000	22	920.800000
3	905.600000	13	913.600000	23	921.600000
4	906.400000	14	914.400000	24	922.400000
5	907.200000	15	915.200000	25	923.200000
6	908.000000	16	916.000000	26	924.000000
7	908.800000	17	916.800000	27	924.800000
8	909.600000	18	917.600000	28	925.600000
9	910.400000	19	918.400000	29	926.400000

4.4 DESCRIPTION OF SUPPORT DEVICE

Adapter : Manufacturer: DYS
M/N: DYS122050200W-1
PN: DYS122-050200-15207
FCC VOC

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

Bldg 69, Majialong Industry Zone District, Nanshan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab.

- : Accredited by CNAS, 2013.10.28
The certificate is valid until 2016.10.29
The Laboratory has been assessed and proved to be in compliance with CNAS-CL01: 2006(identical to ISO/IEC17025: 2005)
The Certificate Registration Number is L229
- : Accredited by TUV Rheinland Shenzhen, 2010.5.25
The Laboratory has been assessed according to the requirements ISO/IEC 17025.
- : Accredited by FCC, April 17, 2014
The Certificate Registration Number is 406365.
- : Accredited by FCC, February 28, 2013
The Certificate Registration Number is 709623.
- : Accredited by Industry Canada, May 24, 2008
The Certificate Registration Number is 4480A-2.

6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

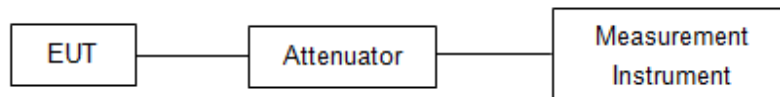
Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Power Density	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

Measurement Uncertainty for a level of Confidence of 95%

7 SETUP OF EQUIPMENT UNDER TEST

7.1 RADIO FREQUENCY TEST SETUP 1

The WLAN component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



7.2 RADIO FREQUENCY TEST SETUP 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz :

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the the specified distance from the EUT.

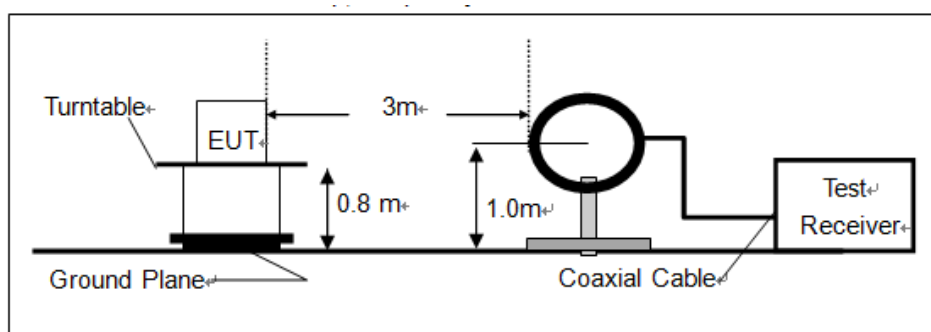
30GHz-1GHz :

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

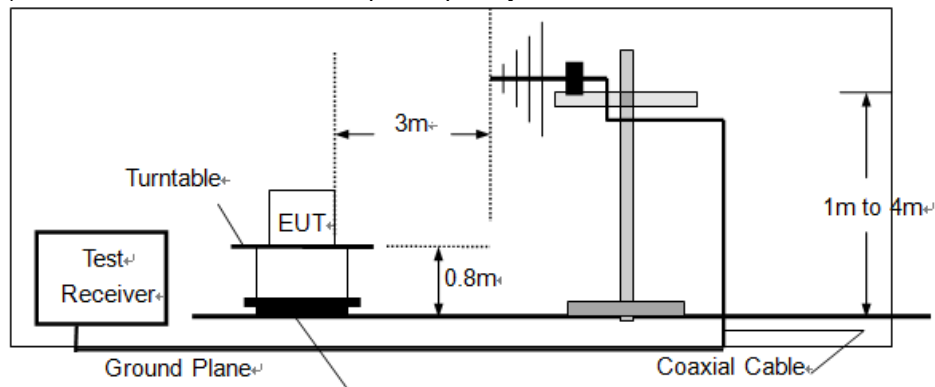
Above 1GHz :

The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

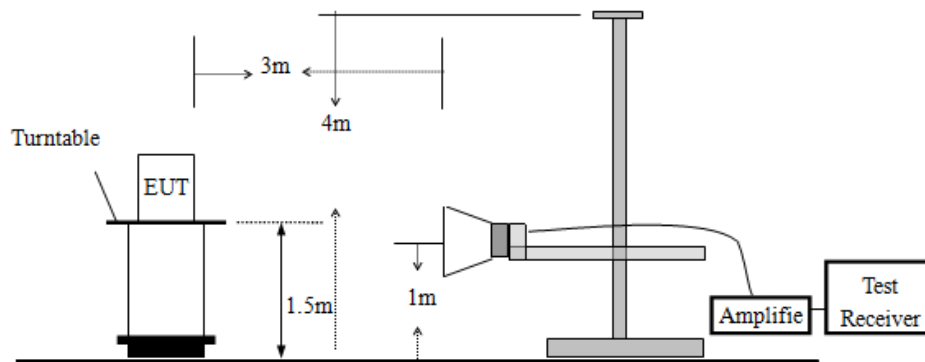
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

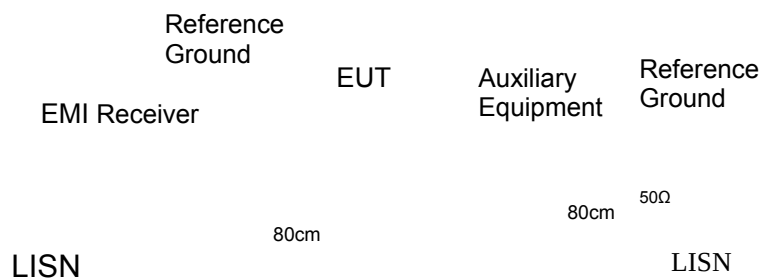


7.3 CONDUCTED EMISSION TEST SETUP

The mains cable of the EUT (Solar Speaker Lantern) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



8 TEST REQUIREMENTS

8.1 DTS (6DB&99%)BANDWIDTH

8.1.1 Applicable Standard

According to FCC Part 15.247(a)(2) and KDB 558074 DTS 01 Meas. Guidance v03r02

8.1.2 Conformance Limit

The minimum -6 dB bandwidth shall be at least 500 kHz.

8.1.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.1.4 Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW = 100 kHz.

Set the video bandwidth (VBW) =300 kHz.

Set Span=2 times OBW

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Allow the trace to stabilize.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Measure and record the results in the test report.

8.1.5 Test Results

Temperature :	26°C	Test Date :	April 27, 2015
Humidity :	60 %	Test By:	King Kong
Antenna	A		

Channel Number	Channel Frequency (MHz)	6dB Bandwidth (KHz)	Limit (kHz)	99% Bandwidth (KHz)	Verdict
0	903.2	585.7	>500	602.03	PASS
15	915.2	591.7	>500	602.04	PASS
29	926.4	597.4	>500	603.67	PASS

Test Model

DTS (6dB&99%) Bandwidth
Channel 0
Antenna A



Test Model

DTS (6dB&99%) Bandwidth
Channel 15
Antenna A



Test Model

DTS (6dB&99%) Bandwidth
Channel 29
Antenna A



Temperature : 26°C
Humidity : 60 %
Antenna B

Test Date :
Test By:

April 27, 2015
King Kong

Channel Number	Channel Frequency (MHz)	6dB Bandwidth (KHz)	Limit (kHz)	99% Bandwidth (KHz)	Verdict
0	903.2	586.2	>500	598.67	PASS
15	915.2	594.0	>500	600.53	PASS
29	926.4	591.1	>500	602.04	PASS

Test Model

DTS (6dB&99%) Bandwidth
Channel 0
Antenna B



Test Model

DTS (6dB&99%) Bandwidth
Channel 15
Antenna B



Test Model

DTS (6dB&99%) Bandwidth
Channel 29
Antenna B



8.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

8.2.1 Applicable Standard

According to FCC Part 15.247(b)(3) and KDB 558074 DTS 01 Meas. Guidance v03r02

8.2.2 Conformance Limit

The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 902-928 MHz bands shall not exceed: 1 Watt (30dBm).

8.2.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.2.4 Test Procedure

■ According to FCC Part 15.247(b)(3)

As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. For smart system, Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Set the RBW $\geq$ DTS bandwidth (about 1MHz). Set VBW = 3*RBW (about 3MHz)

Set the span $\geq$ 3*RBW

Set Sweep time = auto couple.

Set Detector = peak. Set Trace mode = max hold.

Allow trace to fully stabilize. Use peak marker function to determine the peak amplitude level.

■ According to FCC Part 15.247(b)(4):

Conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note: If antenna Gain exceeds 6 dBi, then Output power Limit = 30 - (Gain - 6)

8.2.5 Test Results

Temperature :	26°C	Test Date :	April 27, 2015
Humidity :	60 %	Test By:	King Kong
Antenna	A		

Channel Number	Channel Frequency (MHz)	Measurement Level (dBm)	Limit (dBm)	Verdict
0	903.2	27.147	30	PASS
15	915.2	27.220	30	PASS
29	926.4	27.315	30	PASS

Test Model

Conducted Power
Channel 0
Antenna A



Test Model

Conducted Power
Channel 15
Antenna A



Test Model

Conducted Power
Channel 29
Antenna A



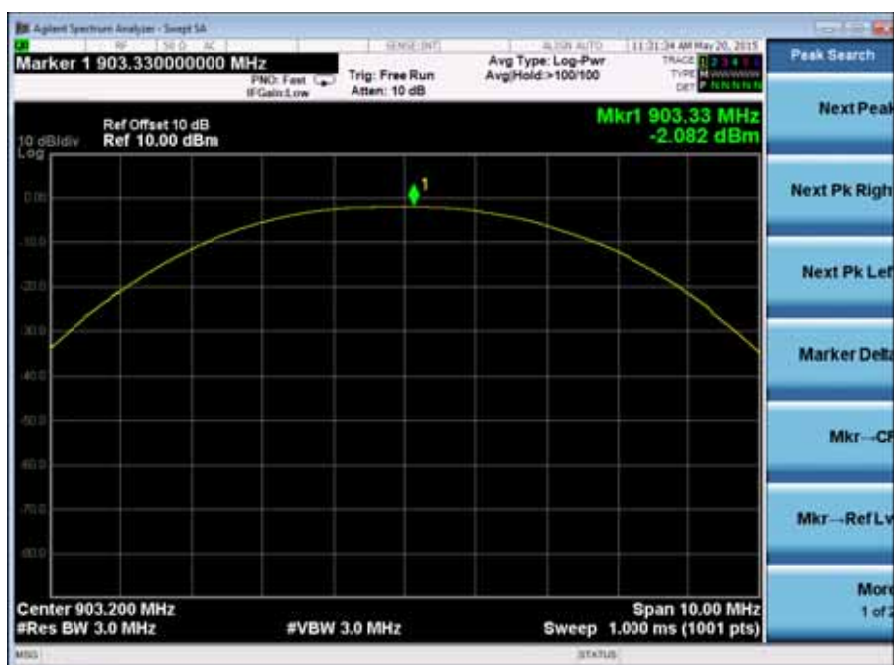
Temperature : 26°C
Humidity : 60 %
Antenna B

Test Date : April 27, 2015
Test By: King Kong

Channel Number	Channel Frequency (MHz)	Measurement Level (dBm)	Limit (dBm)	Verdict
0	903.2	-2.082	30	PASS
15	915.2	-1.097	30	PASS
29	926.4	-0.214	30	PASS

Test Model

Conducted Power
Channel 0
Antenna B



Test Model	Conducted Power Channel 15 Antenna B
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Test Model	Conducted Power Channel 29 Antenna B
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8.3 MAXIMUM POWER SPECTRAL DENSITY

8.3.1 Applicable Standard

According to FCC Part 15.247(e) and KDB 558074 DTS 01 Meas. Guidance v03r02

8.3.2 Conformance Limit

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.3.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.3.4 Test Procedure

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance

The transmitter output (antenna port) was connected to the spectrum analyzer

Set analyzer center frequency to DTS channel center frequency.

Set the span to 1.5 times the DTS bandwidth.

Set the RBW to: 3 kHz

Set the VBW to: 10 kHz.

Set Detector = peak.

Set Sweep time = auto couple.

Set Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

Note: If antenna Gain exceeds 6 dBi, then PSD Limit=8-(Gain - 6)

8.3.5 Test Results

Temperature :	26°C	Test Date :	April 27, 2015
Humidity :	60 %	Test By:	King Kong
Antenna	A		

Channel Number	Channel Frequency (MHz)	Measurement Level (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
0	903.2	0.905	8	PASS
15	915.2	0.686	8	PASS
29	926.4	1.019	8	PASS

Test Model

Power Spectral Density
Channel 0
Antenna A



Test Model

Power Spectral Density
Channel 15
Antenna A



Test Model

Power Spectral Density
Channel 29
Antenna A



Temperature : 26°C
Humidity : 60 %
Antenna B

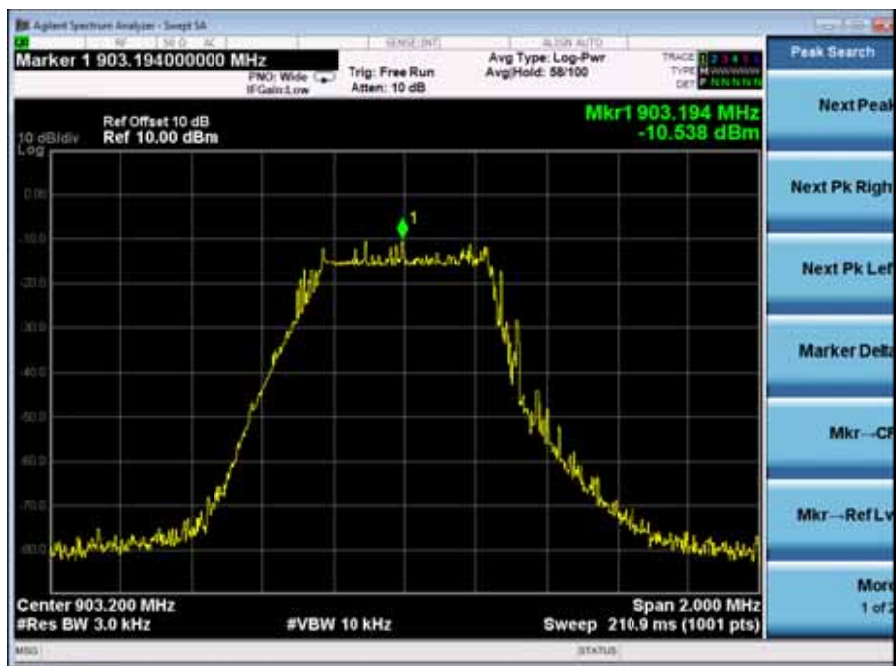
Test Date :
Test By:

April 27, 2015
King Kong

Channel Number	Channel Frequency (MHz)	Measurement Level (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
0	903.2	-10.538	8	PASS
15	915.2	-8.421	8	PASS
29	926.4	-8.554	8	PASS

Test Model

Power Spectral Density
Channel 0
Antenna B



Test Model

Power Spectral Density
Channel 15
Antenna B



Test Model

Power Spectral Density
Channel 29
Antenna B



8.4 BANDS EDGE

8.4.1 Applicable Standard

According to FCC Part 15.247(d) and KDB 558074 DTS 01 Meas. Guidance v03r02

8.4.2 Conformance Limit

According to FCC Part 15.247(d):

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.

8.4.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.4.4 Test Procedure

The transmitter output (antenna port) was connected to the spectrum analyzer

■ Reference level measurement

Establish a reference level by using the following procedure:

Set instrument center frequency to DTS channel center frequency.

Set the span to ≥ 1.5 times the DTS bandwidth.

Set the RBW = 100 kHz.

Set the VBW $\geq 3 \times$ RBW.

Set Detector = peak.

Set Sweep time = auto couple.

Set Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

■ Emission level measurement

Set the center frequency and span to encompass frequency range to be measured.

Set the RBW = 100 kHz.

Set the VBW = 300 kHz.

Set Detector = peak

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

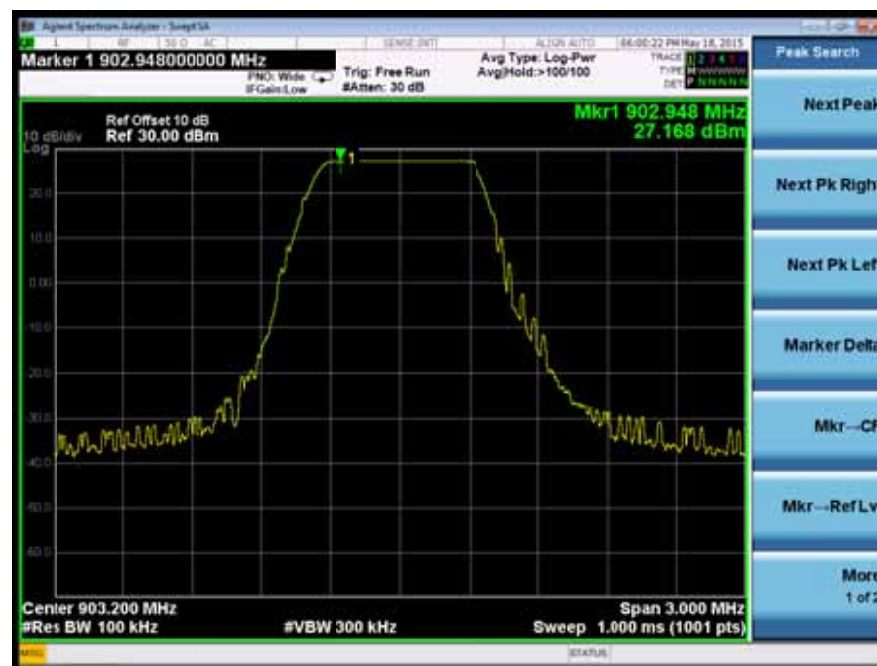
Use the peak marker function to determine the maximum amplitude level.

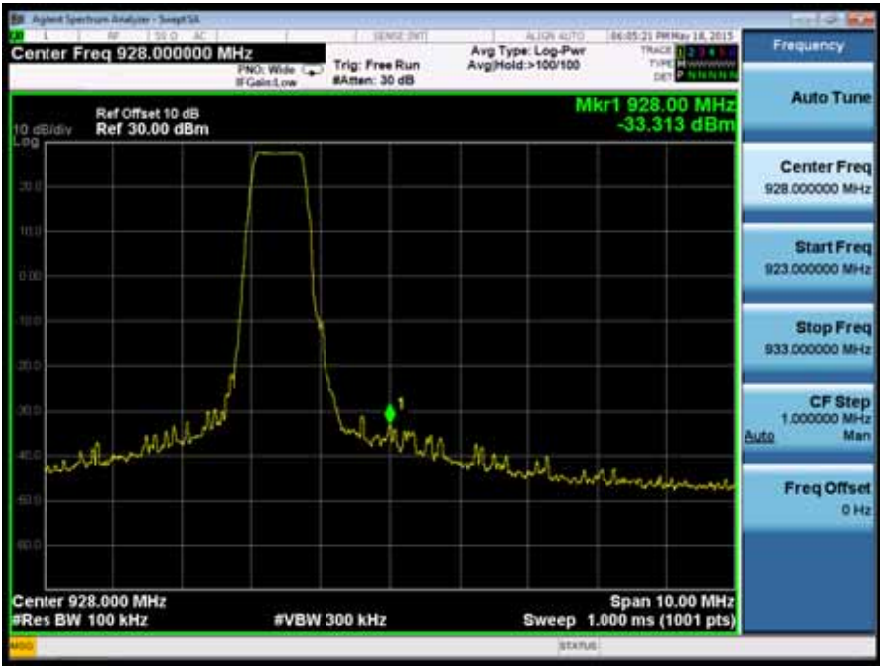
Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements. Report the three highest emissions relative to the limit.

8.4.5 Test Results

Temperature : 26°C Test Date : April 27, 2015
Humidity : 60 % Test By: King Kong
Antenna A

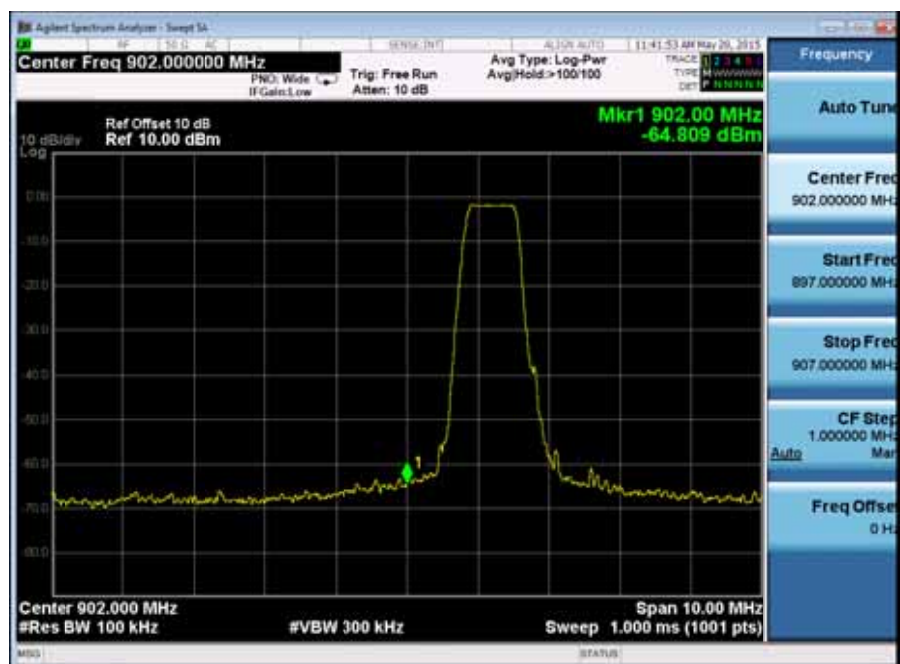
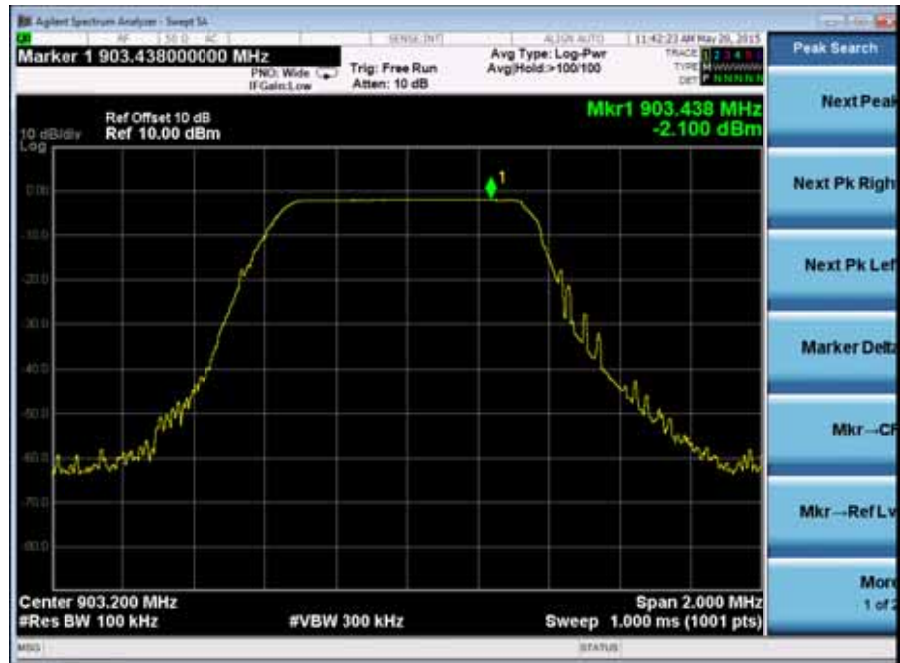
Frequency(MHz)	Band edge Measured Level	Detector	Limit	Result
903.2	-63.946	Peak	-20	Pass
926.2	-60.648	Peak	-20	Pass

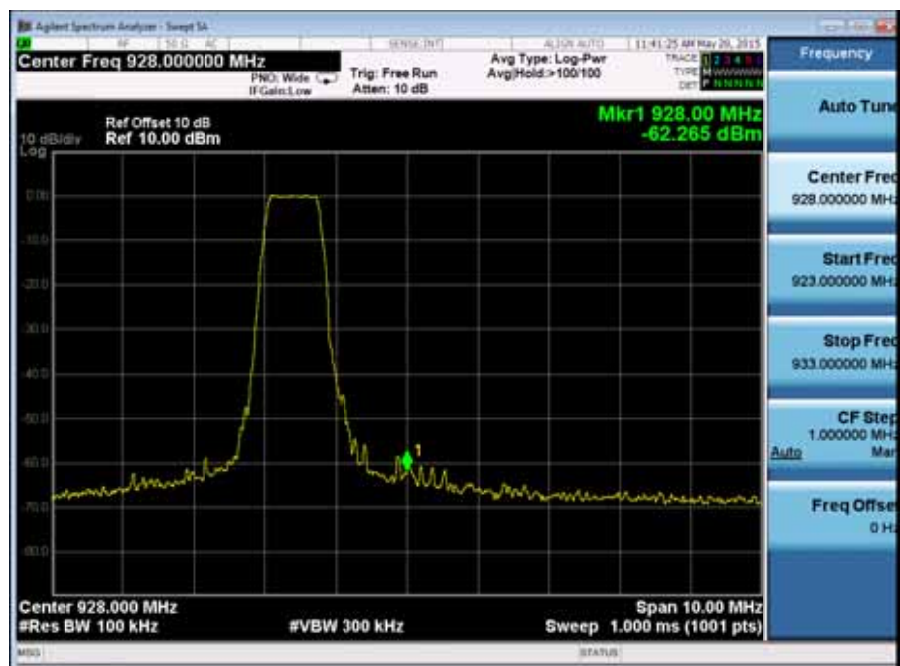




Temperature : 26°C Test Date : April 27, 2015
 Humidity : 60 % Test By: King Kong
 Antenna B

Frequency(MHz)	Band edge Measured Level	Detector	Limit	Result
903.2	-62.709	Peak	-20	Pass
926.2	-62.052	Peak	-20	Pass





8.5 UNWANTED EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS

8.5.1 Applicable Standard

According to FCC Part 15.247(d) and KDB 558074 DTS 01 Meas. Guidance v03r02

8.5.2 Conformance Limit

According to FCC Part 15.247(d):

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.

8.5.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.5.4 Test Procedure

The transmitter output (antenna port) was connected to the spectrum analyzer

■ Reference level measurement

Establish a reference level by using the following procedure:

Set instrument center frequency to DTS channel center frequency.

Set the span to ≥ 1.5 times the DTS bandwidth.

Set the RBW = 100 kHz.

Set the VBW $\geq 3 \times$ RBW.

Set Detector = peak.

Set Sweep time = auto couple.

Set Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

■ Emission level measurement

Set the center frequency and span to encompass frequency range to be measured.

Set the RBW = 100 kHz.

Set the VBW = 300 kHz.

Set Detector = peak

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements. Report the three highest emissions relative to the limit.

8.5.5 Test Results

Temperature :	26°C	Test Date :	April 27, 2015
Humidity :	60 %	Test By:	King Kong
Antenna	A		

Unwanted Emissions In Non-Restricted Frequency Bands

Antenna A Channel 0



Unwanted Emissions In Non-Restricted Frequency Bands

Antenna A Channel 15



Unwanted Emissions In Non-Restricted Frequency Bands

Antenna A Channel 29



Temperature : 26°C
Humidity : 60 %
Antenna B B

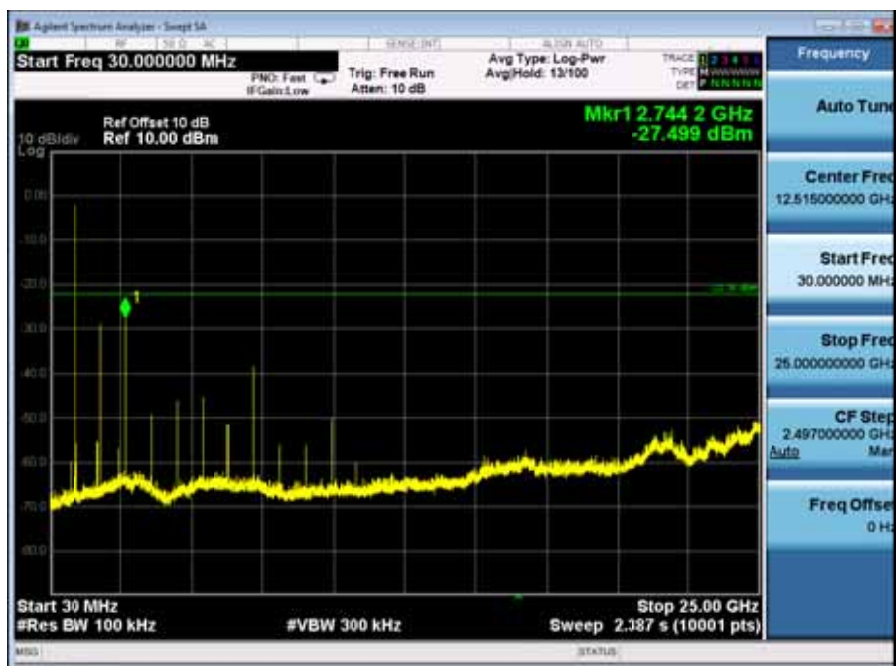
Test Date :
Test By:

April 27, 2015
King Kong

Unwanted Emissions In Non-Restricted Frequency Bands
Antenna B Channel 0

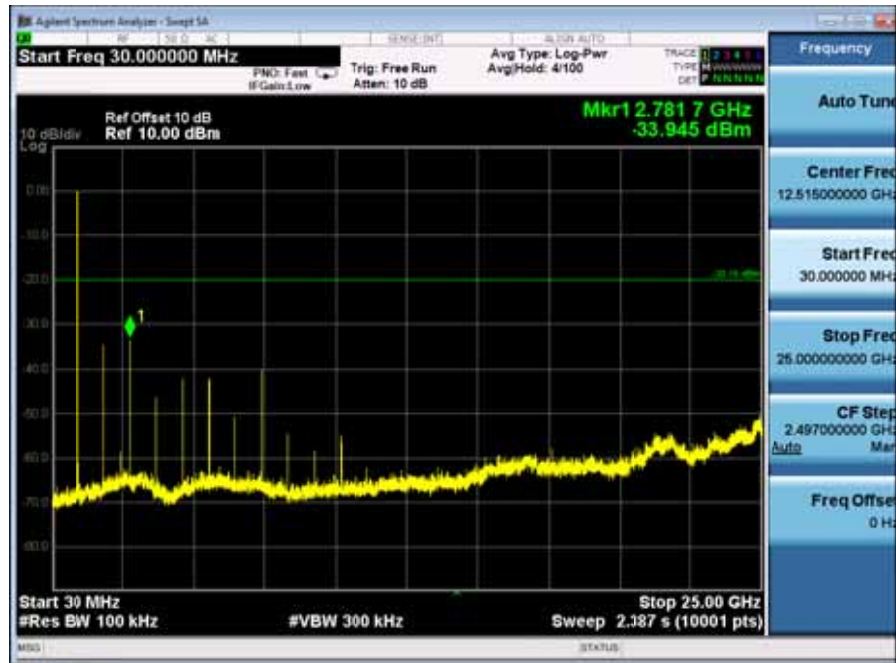


Unwanted Emissions In Non-Restricted Frequency Bands
Antenna B Channel 15



Unwanted Emissions In Non-Restricted Frequency Bands

Antenna B Channel 29



8.6 RADIATED SPURIOUS EMISSION

8.6.1 Applicable Standard

According to FCC Part 15.247(d) and 15.209 and KDB 558074 DTS 01 Meas. Guidance v03r02

8.6.2 Conformance Limit

According to FCC Part 15.247(d): 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)).
According to FCC Part 15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

According to FCC Part 15.205, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	2400/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

8.6.3 Test Configuration

Test according to clause 7.2 radio frequency test setup 2

8.6.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz (1GHz to 25GHz), 100 kHz for $f < 1$ GHz (30MHz to 1GHz), 200Hz for $f < 150$ KHz (9KHz to 150KHz), 9KHz for $f < 30$ MHz (150KHz to 30KHz)

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines 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. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data. Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data. Repeat above procedures until all frequency measured was complete.

8.6.5 Test Results

This device has been evaluated in xyz orientation, The worst result has been recorded in the following page.

■ Spurious Emission below 30MHz (9KHz to 30MHz)

Temperature:	24°C	Test Date:	April 27, 2015
Humidity:	53 %	Test By:	King Kong
Test mode:	TX Mode		

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance}/\text{test distance})$ (dB);

Limit line = Specific limits(dBuV) + distance extrapolation factor

■ Spurious Emission below 1GHz (30MHz to 1GHz)

Temperature : 26°C
Humidity : 60 %
Antenna A

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 0

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) QP	Limit 3m(dBuV/m) QP	Over(dB) QP
288.02	V	29.13	46	-16.87
341.37	V	32.08	46	-13.92
443.22	V	34.45	46	-11.55
345.25	H	26.61	46	-19.39
442.25	H	29.21	46	-16.79
467.47	H	30.20	46	-15.80

Temperature : 26°C
Humidity : 60 %
Antenna A

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 15

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) QP	Limit 3m(dBuV/m) QP	Over(dB) QP
105.66	V	27.61	43.5	-15.89
286.08	V	31.91	46	-14.09
398.60	V	31.20	46	-14.80
45.52	H	28.53	40	-11.47
104.69	H	29.60	43.5	-13.90
294.81	H	32.70	46	-13.30

Temperature : 26°C
Humidity : 60 %
Antenna A

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 29

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) QP	Limit 3m(dBuV/m) QP	Over(dB) QP
417.03	V	27.90	46	-18.10
536.34	V	30.52	46	-15.48
669.23	V	33.18	46	-12.82
41.64	H	29.13	40	-10.87
97.90	H	31.31	43.5	-12.19
280.26	H	31.20	46	-14.80

- Note:** (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Temperature : 26°C
Humidity : 60 %
Antenna B

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 0

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) QP	Limit 3m(dBuV/m) QP	Over(dB) QP
406.36	V	30.41	46	-15.59
529.55	V	31.80	46	-14.20
669.23	V	34.15	46	-11.85
393.75	H	29.05	46	-16.95
525.67	H	30.00	46	-16.00
668.26	H	34.74	46	-11.26

Temperature : 26°C
Humidity : 60 %
Antenna B

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 15

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) QP	Limit 3m(dBuV/m) QP	Over(dB) QP
274.44	V	28.65	46	-17.35
531.49	V	33.90	46	-12.10
668.26	V	31.46	46	-14.54
104.69	H	23.32	43.5	-20.18
291.90	H	27.71	46	-18.29
401.51	H	28.10	46	-17.90

Temperature : 26°C
Humidity : 60 %
Antenna B

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 29

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) QP	Limit 3m(dBuV/m) QP	Over(dB) QP
389.87	V	27.55	46	-18.45
533.43	V	31.50	46	-14.50
661.47	V	28.87	46	-17.13
411.21	H	29.31	46	-16.69
518.88	H	30.46	46	-15.54
645.95	H	35.15	46	-10.85

Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Spurious Emission Above 1GHz (1GHz to 10GHz)

Temperature : 26°C
Humidity : 60 %
Antenna A

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 0

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
1284.94	V	57.97	43.21	74.00	54.00	-16.03	-10.79
2456.41	V	58.17	43.63	74.00	54.00	-15.83	-10.37
4581.41	V	62.9	47.56	74.00	54.00	-11.1	-6.44
1720.84	H	59.38	46.1	74.00	54.00	-14.62	-7.9
3191.99	H	60.9	47.31	74.00	54.00	-13.1	-6.69
3873.08	H	63.2	48.49	74.00	54.00	-10.8	-5.51

Temperature : 26°C
Humidity : 60 %
Antenna A

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 15

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
2850.98	V	63.99	46.79	74.00	54.00	-10.01	-7.21
3477.58	V	63.81	45.98	74.00	54.00	-10.19	-8.02
4403.86	V	64.09	47.92	74.00	54.00	-9.91	-6.08
262.84	H	58.76	42.61	74.00	54.00	-15.24	-11.39
3123.42	H	63.69	46.85	74.00	54.00	-10.31	-7.15
3559.31	H	64.69	48.16	74.00	54.00	-9.31	-5.84

Temperature : 26°C
Humidity : 60 %
Antenna A

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 29

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
1755.51	V	58.93	42.98	74.00	54.00	-15.07	-11.02
3035.96	V	61.84	45.6	74.00	54.00	-12.16	-8.4
4425.38	V	64.69	48.26	74.00	54.00	-9.31	-5.74
3035.96	H	60.69	44.21	74.00	54.00	-13.31	-9.79
3717.05	H	62.99	46.39	74.00	54.00	-11.01	-7.61
4343.65	H	62.81	46.28	74.00	54.00	-11.19	-7.72

Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Temperature : 26°C
Humidity : 60 %
Antenna B

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 0

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
1367.53	V	58.65	43.78	74.00	54.00	-15.35	-10.22
2539.00	V	58.85	44.20	74.00	54.00	-15.15	-9.80
4664.00	V	63.58	48.13	74.00	54.00	-10.42	-5.87
1803.43	H	60.06	46.67	74.00	54.00	-13.94	-7.33
3274.58	H	61.58	47.88	74.00	54.00	-12.42	-6.12
3955.67	H	63.88	49.06	74.00	54.00	-10.12	-4.94

Temperature : 26°C
Humidity : 60 %
Antenna B

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 15

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
2552.31	V	64.67	47.36	74.00	54.00	-9.33	-6.64
3178.91	V	64.49	46.55	74.00	54.00	-9.51	-7.45
4105.19	V	64.77	48.49	74.00	54.00	-9.23	-5.51
2264.17	H	59.44	43.18	74.00	54.00	-14.56	-10.82
2824.75	H	64.37	47.42	74.00	54.00	-9.63	-6.58
3260.64	H	65.37	48.73	74.00	54.00	-8.63	-5.27

Temperature : 26°C
Humidity : 60 %
Antenna B

Test Date : April 27, 2015
Test By: King Kong
Frequency: Channel 29

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
2740.06	V	59.61	43.55	74.00	54.00	-14.39	-10.45
4020.51	V	62.52	46.17	74.00	54.00	-11.48	-7.83
5409.93	V	65.37	48.83	74.00	54.00	-8.63	-5.17
4020.51	H	61.37	44.78	74.00	54.00	-12.63	-9.22
4701.60	H	63.67	46.96	74.00	54.00	-10.33	-7.04
5328.20	H	63.49	46.85	74.00	54.00	-10.51	-7.15

- Note:** (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

8.7 CONDUCTED EMISSIONS TEST

8.7.1 Applicable Standard

According to FCC Part 15.207(a)

8.7.2 Conformance Limit

Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

8.7.3 Test Configuration

Test according to clause 7.3 conducted emission test setup

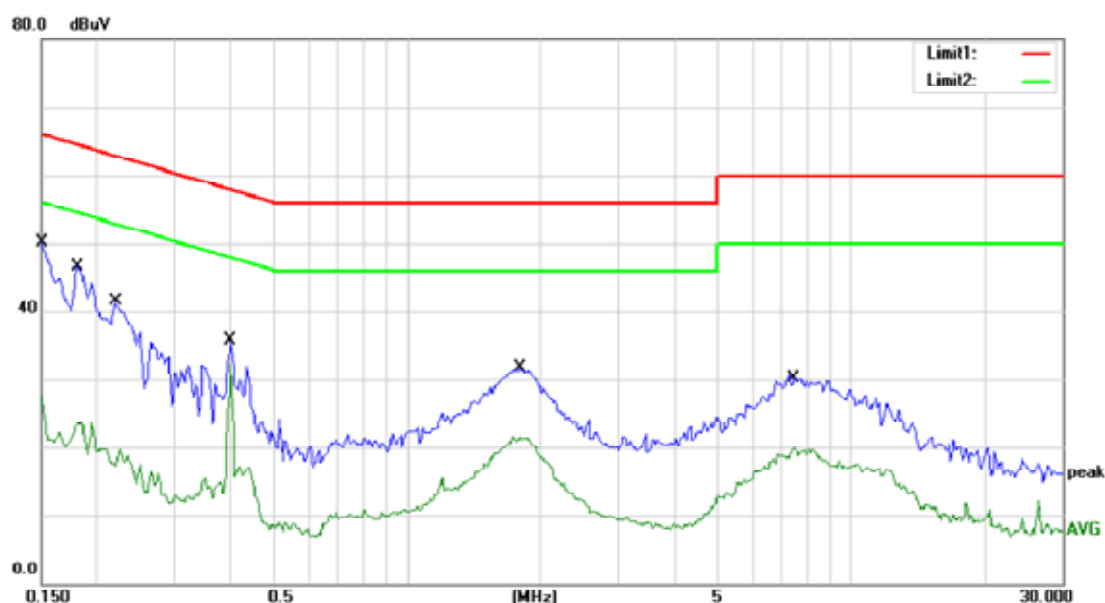
8.7.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Repeat above procedures until all frequency measured were complete.

8.7.5 Test Results



Site Conduction #1

Phase: **L1**

Temperature: 24

Limit: (CE)FCC PART 15 C

Power: AC 120V/60Hz

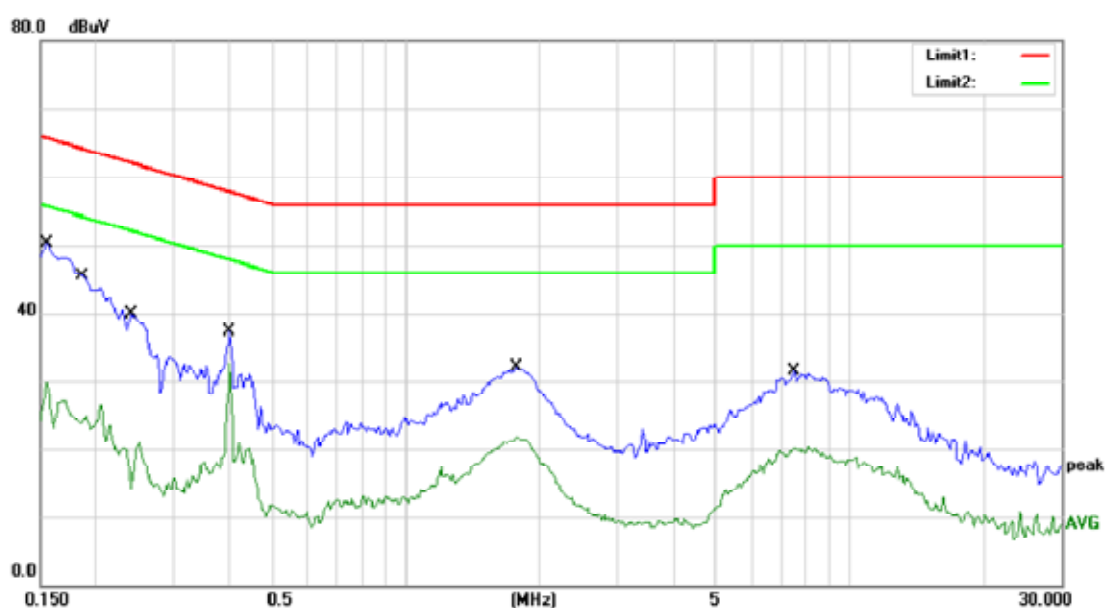
Humidity: 53 %

Mode: ON

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	50.10	0.00	50.10	66.00	-15.90	QP	
2		0.1500	27.79	0.00	27.79	56.00	-28.21	AVG	
3		0.1825	46.20	0.00	46.20	64.37	-18.17	QP	
4		0.1825	23.64	0.00	23.64	54.37	-30.73	AVG	
5		0.2200	41.41	0.00	41.41	62.82	-21.41	QP	
6		0.2200	19.78	0.00	19.78	52.82	-33.04	AVG	
7		0.4000	35.79	0.00	35.79	57.85	-22.06	QP	
8	*	0.4000	32.24	0.00	32.24	47.85	-15.61	AVG	
9		1.8000	31.67	0.00	31.67	56.00	-24.33	QP	
10		1.8000	21.59	0.00	21.59	46.00	-24.41	AVG	
11		7.4700	30.12	0.00	30.12	60.00	-29.88	QP	
12		7.4700	19.96	0.00	19.96	50.00	-30.04	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: GUAN



Site Conduction #1

Limit: (CE)FCC PART 15 C

Mode: ON

Note:

Phase: **N**

Power: AC 120V/60Hz

Temperature: 24

Humidity: 53 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1550	50.28	0.00	50.28	65.73	-15.45	QP	
2		0.1550	29.63	0.00	29.63	55.73	-26.10	AVG	
3		0.1884	45.25	0.00	45.25	64.11	-18.86	QP	
4		0.1884	26.58	0.00	26.58	54.11	-27.53	AVG	
5		0.2400	39.87	0.00	39.87	62.10	-22.23	QP	
6		0.2400	21.11	0.00	21.11	52.10	-30.99	AVG	
7		0.4000	37.39	0.00	37.39	57.85	-20.46	QP	
8	*	0.4000	32.80	0.00	32.80	47.85	-15.05	AVG	
9		1.7750	32.03	0.00	32.03	56.00	-23.97	QP	
10		1.7750	21.86	0.00	21.86	46.00	-24.14	AVG	
11		7.5200	31.46	0.00	31.46	60.00	-28.54	QP	
12		7.5200	20.31	0.00	20.31	50.00	-29.69	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: GUAN

8.8 ANTENNA APPLICATION

8.8.1 Antenna Requirement

Standard	Requirement
FCC CRF Part 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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 (b), 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.

8.8.2 Result

The EUT has two antenna, The antenna A is a Dipole antenna(The antenna is connected via an reverse polarity SMA type connection), The antenna B is a Matel antenna or Spiral antenna, and these antenna can't be replaced by the user which in accordance to section 15.203, please refer to the photos.