FCC TEST REPORT

FOR

Apogee Inc.

Bluetooth Keyboard

Test Model: K166-1126

Additional Model No.: K166-1126-KR, K166-1126-NDF

Prepared for	:	Apogee Inc.
Address	:	1405 Pioneer Street, Brea CA 92821 USA.
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	Aug 23, 2017
Number of tested samples	:	1
Sample number	:	Prototype
Date of Test	:	Oct. 09, 2017~Oct. 10, 2017
Date of Report	:	Oct. 10, 2017

FCC TEST REPORT FCC CFR 47 PART 15 C(15.249)	
Report Reference No. ..... :	LCS170529003AE
Date of Issue..... :	Oct. 10, 2017
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
Testing Location/ Procedure ..... :	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name ..... :	**Shenzhen Hangshi Technology Co.,Ltd.**
Address..... :	Hangshi Technology Park,Democracy West Industry Area,Shajing Town,Bao'an District,Shenzhen,China.
Test Specification	
Standard..... :	FCC CFR 47 PART 15 C(15.249) / ANSI C63.10: 2013
Test Report Form No..... :	LCSEMC-1.0
TRF Originator..... :	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF ..... :	Dated 2011-03

Test Item Description..... :	**Bluetooth Keyboard**
Trade Mark..... :	Kanex
Test Model..... :	K166-1126
Ratings..... :	DC 3.70V by battery
Result ..... :	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Ada Liang/ Administrators	Dick Su/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS170529003AE	Oct. 10, 2017 Date of issue

Test Model.....	: K166-1126
EUT.....	: Bluetooth Keyboard
Applicant.....	**: Apogee Inc.**
Address.....	: 1405 Pioneer Street, Brea CA 92821 USA
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Shenzhen Hangshi Technology Co.,Ltd.**
Address.....	: Hangshi Technology Park,Democracy West Industry Area,Shajing Town,Bao'an District,Shenzhen,China.
Telephone.....	: /
Fax.....	: /
Factory.....	: **Shenzhen Hangshi Technology Co.,Ltd.**
Address.....	: Hangshi Technology Park,Democracy West Industry Area,Shajing Town,Bao'an District,Shenzhen,China.
Telephone.....	: /
Fax.....	: /

Test Result	Positive

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.

Revision History

Revision	Issue Date	Revisions	Revised By
000	Oct. 10, 2017	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT : Bluetooth Keyboard
Model Number : K166-1126
Additional Model No. : K166-1126-KR, K166-1126-NDF
Model Declaration : N/A
Power Supply : DC 3.70V by battery
Bluetooth Technology
Operation frequency : 2402MHz-2480MHz
Modulation Type : GFSK
Bluetooth Version : 3.0
Channel Number : 79 Channels
Channel Spacing : 1Mbps
Antenna Type : PCB Antenna
Antenna Gain : 1.87dBi (Max.)
Extreme temp. Tolerance : 10°C to +55°C

1.2 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	PC	Ideapad	A131101550	DOC
Lenovo	Power adapter	CPA-A090	36200414	DOC

1.3 External I/O

I/O Port Description	Quantity	Cable
Micro USB Port	1	N/A
AUX Input Port	1	N/A

1.4 Description of Test Facility

CNAS Registration Number is L4595.

FCC Registration Number is 899208.

Industry Canada Registration Number is 9642A-1.

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

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5 Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS 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.

1.6 Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
		200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	3.80dB	(1)
		26.5GHz~40GHz	3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

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

1.7 List of Measuring Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Sensor	R&S	NRV-Z81	100458	2017-06-17	2018-06-16
2	Power Sensor	R&S	NRV-Z32	10057	2017-06-17	2018-06-16
3	Power Meter	R&S	NRVS	100444	2017-06-17	2018-06-16
4	DC Filter	MPE	23872C	N/A	2017-06-17	2018-06-16
5	RF Cable	Harbour Industries	1452	N/A	2017-06-17	2018-06-16
6	SMA Connector	Harbour Industries	9625	N/A	2017-06-17	2018-06-16
7	Spectrum Analyzer	Agilent	N9020A	MY50510140	2016-10-27	2017-10-26
8	Signal analyzer	R&S	FSP	100503	2017-06-17	2018-06-16
9	RF Cable	Harbour Industries	Sucoflex104	FP2RX2	2017-06-17	2018-06-16
10	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2017-06-17	2018-06-16
11	Amplifier	SCHAFFNER	COA9231A	18667	2017-06-17	2018-06-16
12	Amplifier	Agilent	8449B	3008A02120	2017-06-15	2018-06-14
13	Amplifier	MITEQ	AMF-6F-260400	9121372	2017-06-15	2018-06-14
14	Loop Antenna	R&S	HFH2-Z2	860004/001	2017-06-17	2018-06-16
15	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2017-06-09	2018-06-08
16	Horn Antenna	EMCO	3115	6741	2017-06-09	2018-06-08
17	Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	2017-06-09	2018-06-08
18	RF Cable-R03m	Jye Bao	RG142	CB021	2017-06-17	2018-06-16
19	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2017-06-17	2018-06-16
20	EMI Test Receiver	R&S	ESCI	101142	2017-06-17	2018-06-16
21	Artificial Mains	R&S	ENV216	101288	2017-06-17	2018-06-16
22	EMI Test Software	R&S	E3	N/A	2017-06-17	2018-06-16

1.8 Description of Test Modes

The following operating modes were applied for the related test items.
All test modes were tested, only the result of the worst case was recorded in the report.

Mode of Operations	Frequency Range (MHz)
GFSK	2402
	2441
	2480
For Conducted Emission	
Test Mode	TX Mode
For Radiated Emission	
Test Mode	TX Mode

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be TX.

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be TX(High Channel).

Pre-test AC conducted emission at charge from PC mode, recorded worst case.

Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/60Hz, recorded worst case.

1.9. Frequency of Channels

Bluetooth V3.0

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2402	41	2442
2	2403	---	---
3	2404	---	---
---	---	77	2478
---	---	78	2479
39	2440	79	2480
40	2441		

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013, FCC CFR PART 15C 15.207, 15.209, 15.249.

2.1 EUT Configuration

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

2.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.249 under the FCC Rules Part 15 Subpart C.

2.3 General Test Procedures

2.3.1 Conducted Emissions

According to the requirements in Section 6.2 of ANSI C63.10: 2013, AC power-line conducted emissions shall be measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table and the turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10: 2013.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a continuous transmits condition.

3.2 EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (EMI test.exe) provided by application.

3.3 Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	PC	B470	--	DOC
Lenovo	AC/DC ADAPTER	ADP-90DDB	--	DOC

3.4 Block Diagram/Schematics

Please refer to the related document.

3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6 Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C		
FCC Rules	**Description of Test**	**Result**
§15.205(a), §15.209(a), §15.249(a), §15.249(c)	Radiated Emissions Measurement	Compliant
§15.205, §15.249(d)	Emissions at Restricted Band	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant
§15.203	Antenna Requirements	Compliant

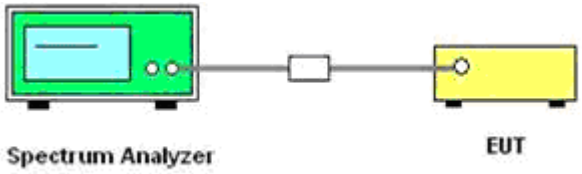
5. ANTENNA PORT MEASUREMENT

5.1 20 dB Bandwidth

5.1.1 Limit

No limits

5.2.2 Block Diagram of Test Setup



5.2.3 Test Procedure

A. Place the EUT on the table and set it in transmitting mode.
B. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
C. Set to the maximum power setting and enable the EUT transmit continuously.
D. For 20dB bandwidth measurement, use the following spectrum analyzer settings: Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW/VBW=30 KHz/ 100KHz; Sweep = auto; Detector function = peak; Trace = max hold.

5.2.4 Test Results

NA, as there is no change on RF circuits.

6. RADIATED MEASUREMENT

6.1 Standard Applicable

1. According to §15.249 (d): Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Frequencies(MHz)	Field Strength(microvolts/meter)	Measurement Distance(meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

2. According to §15.249 (a): Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	millivolts/meter	dBuV/m	microvolts/meter	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth

6.2 Instruments Setting

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/Average
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/Average
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

6.3 Test Procedures

1) **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 0.8 m 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 0.8 meter.

--- 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.

2) **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.

3) **Sequence of testing 1 GHz to 18 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.

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.

4) **Sequence of testing above 18 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 1 meter.

--- The EUT was set into operation.

Premeasurement:

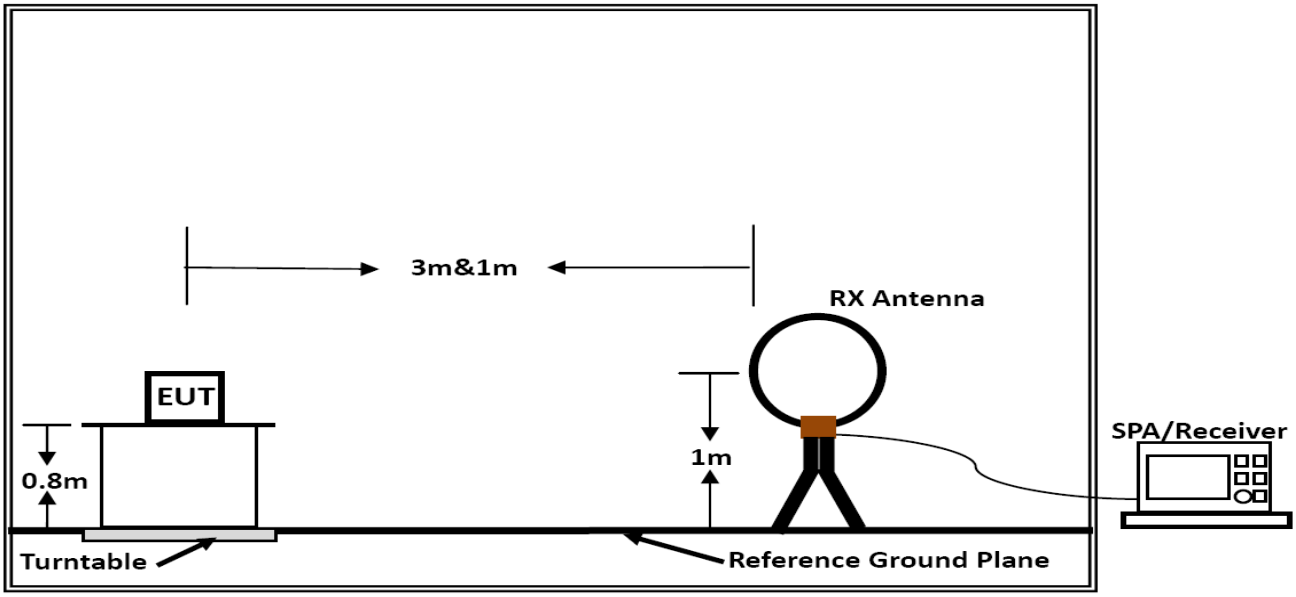
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

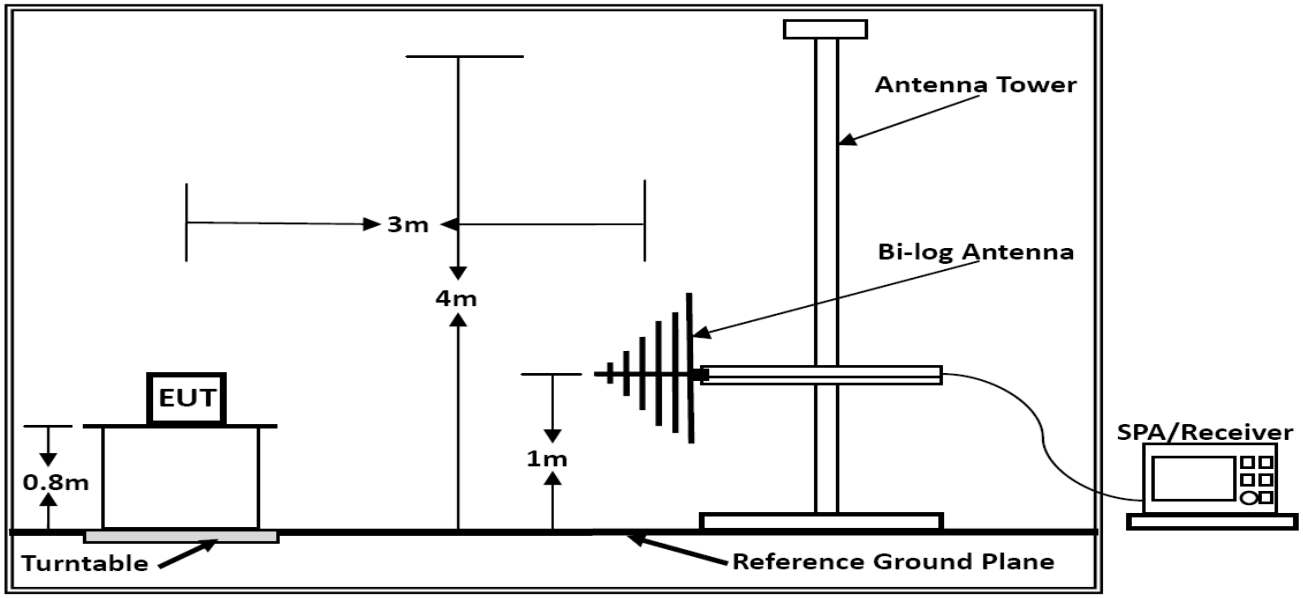
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, 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.

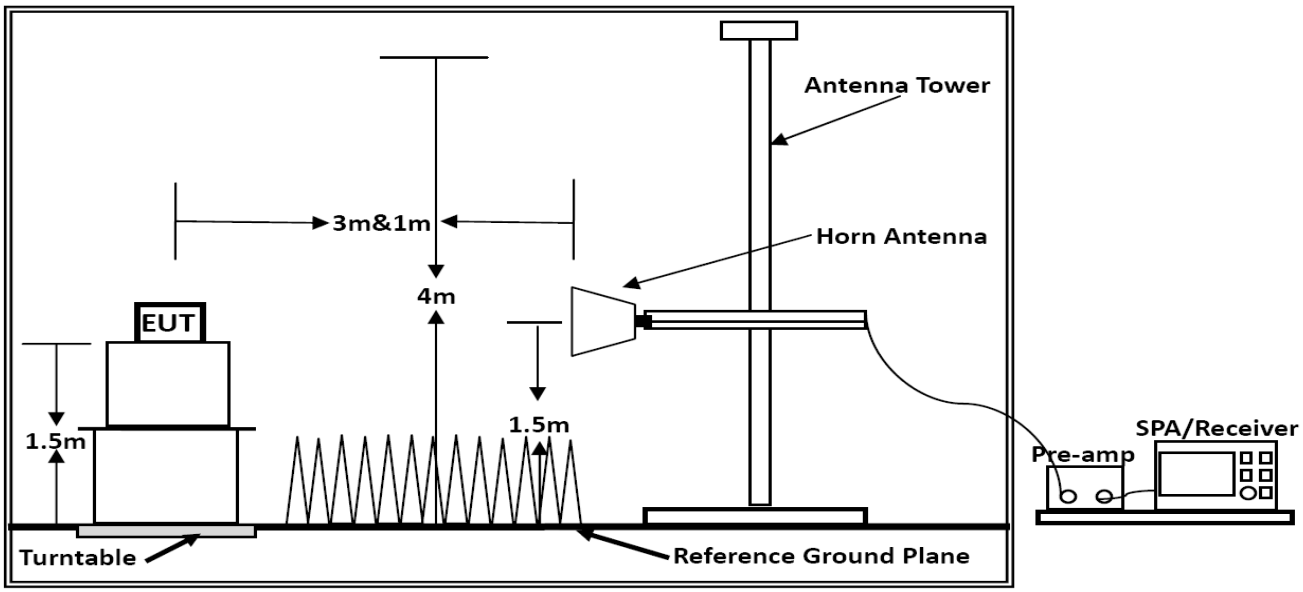
6.4 Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

6.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.6 Results for Radiated Emissions

PASS.

Only record the worst test result in this report.

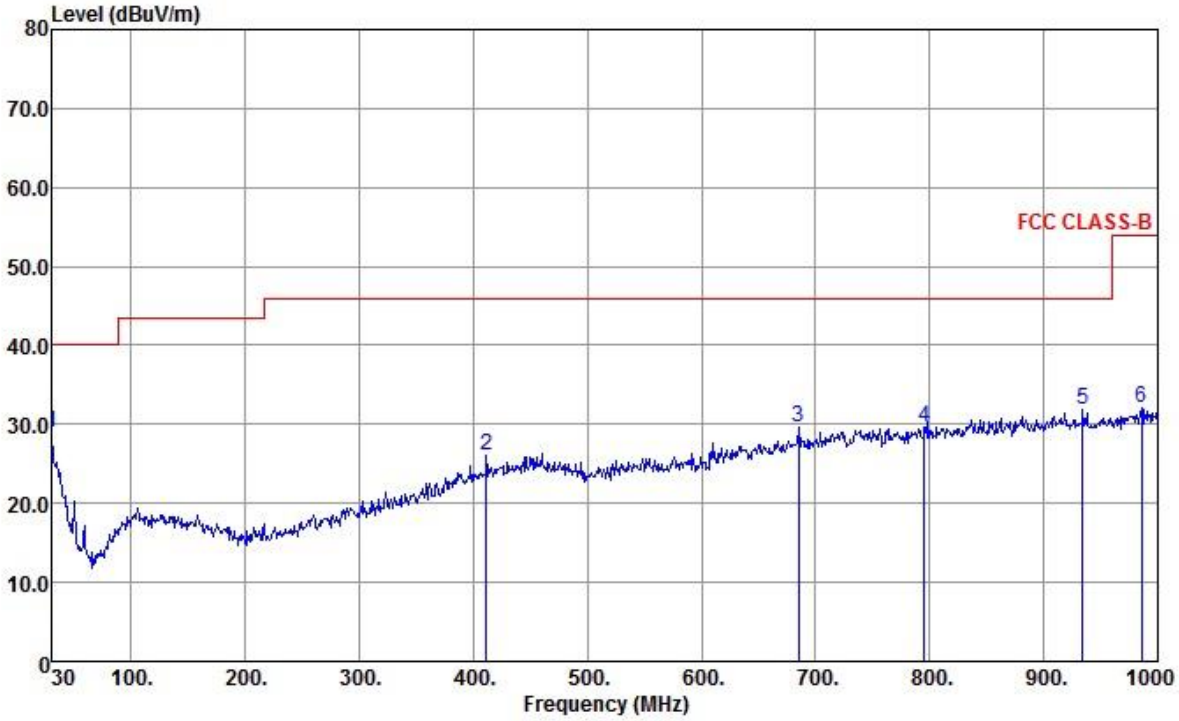
The radiated emissions from 9 kHz to 30MHz are at least 20dB below the official limit and no need to report.

The test data please refer to following page:

Below 1GHz

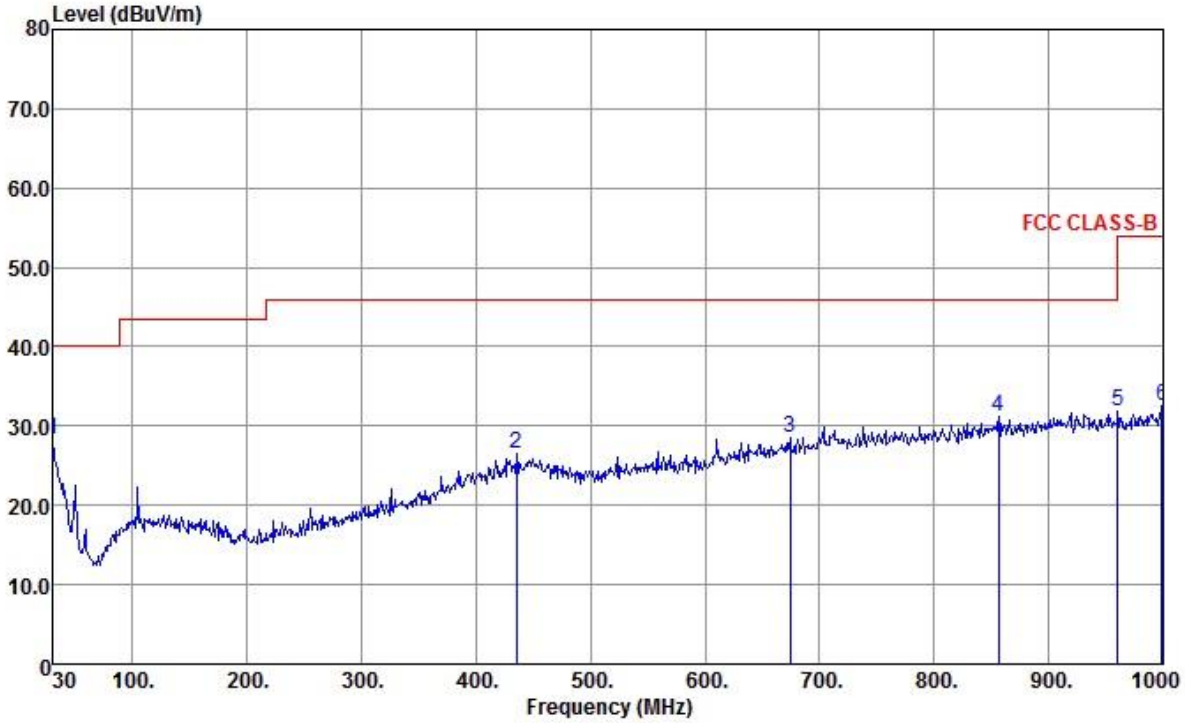
Temperature	25℃	Humidity	60%
Test Engineer	Riordon Yang	Configurations	TX-High Channel

Horizontal:



Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Preamp Factor dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector
30.00	37.05	17.28	0.65	26.07	28.91	40.00	-11.09	Peak
411.21	33.49	16.72	1.67	25.87	26.01	46.00	-19.99	Peak
684.75	34.33	19.62	2.05	26.38	29.62	46.00	-16.38	Peak
795.33	33.18	20.43	2.20	26.18	29.63	46.00	-16.37	Peak
934.04	33.33	21.73	2.41	25.61	31.86	46.00	-14.14	Peak
985.45	32.49	22.24	2.47	25.22	31.98	54.00	-22.02	Peak

Vertical:



Freq (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	Preamp Factor dB	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector
30.00	36.50	17.28	0.65	26.07	28.36	40.00	-11.64	Peak
435.46	33.79	16.99	1.67	26.00	26.45	46.00	-19.55	Peak
674.08	33.42	19.49	2.05	26.39	28.57	46.00	-17.43	Peak
856.44	33.81	20.99	2.30	26.00	31.10	46.00	-14.90	Peak
960.23	32.93	21.99	2.41	25.41	31.92	54.00	-22.08	Peak
999.03	32.96	22.29	2.47	25.12	32.60	54.00	-21.40	Peak

****Note:*
Pre-scan all modes and recorded the worst case results in this report (TX-Low Channel).
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Above 1GHz

Field Strength Of Fundamental (TX-2402MHz)						
Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Result
2402	H	90.01	82.78	114	94	Pass
2402	V	90.15	83.25	114	94	Pass

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4804.00	46.83	33.06	35.04	3.94	48.79	74	-25.21	Peak	Horizontal
4804.00	30.24	33.06	35.04	3.94	32.2	54	-21.8	Average	Horizontal
4804.00	48.18	33.06	35.04	3.94	50.14	74	-23.86	Peak	Vertical
4804.00	34.48	33.06	35.04	3.94	36.44	54	-17.56	Average	Vertical

Field Strength Of Fundamental (TX-2441MHz)						
Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Result
2441	H	91.34	82.99	114	94	Pass
2441	V	91.55	83.65	114	94	Pass

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4882.00	49.68	33.16	35.15	3.96	51.65	74	-22.35	Peak	Horizontal
4882.00	35.2	33.16	35.15	3.96	37.17	54	-16.83	Average	Horizontal
4882.00	49.73	33.16	35.15	3.96	51.7	74	-22.3	Peak	Vertical
4882.00	35.53	33.16	35.15	3.96	37.5	54	-16.5	Average	Vertical

Field Strength Of Fundamental (TX-2480MHz)						
Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Result
2480	H	91.58	82.95	114	94	Pass
2480	V	91.03	82.32	114	94	Pass

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4960.00	49.38	33.26	35.14	3.98	51.48	74	-22.52	Peak	Horizontal
4960.00	34.66	33.26	35.14	3.98	36.76	54	-17.24	Average	Horizontal
4960.00	50.37	33.26	35.14	3.98	52.47	74	-21.53	Peak	Vertical
4960.00	35.35	33.26	35.14	3.98	37.45	54	-16.55	Average	Vertical

Notes:

1. *Measuring frequencies from 9k~10th harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30MHz.*
2. *Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 26GHz) were made with an instrument using Peak detector mode.*
3. *18~25GHz at least have 20dB margin. No recording in the test report.*

6.7 Results for Band edge Testing (Radiated)

Note: Only recorded the worst test result.

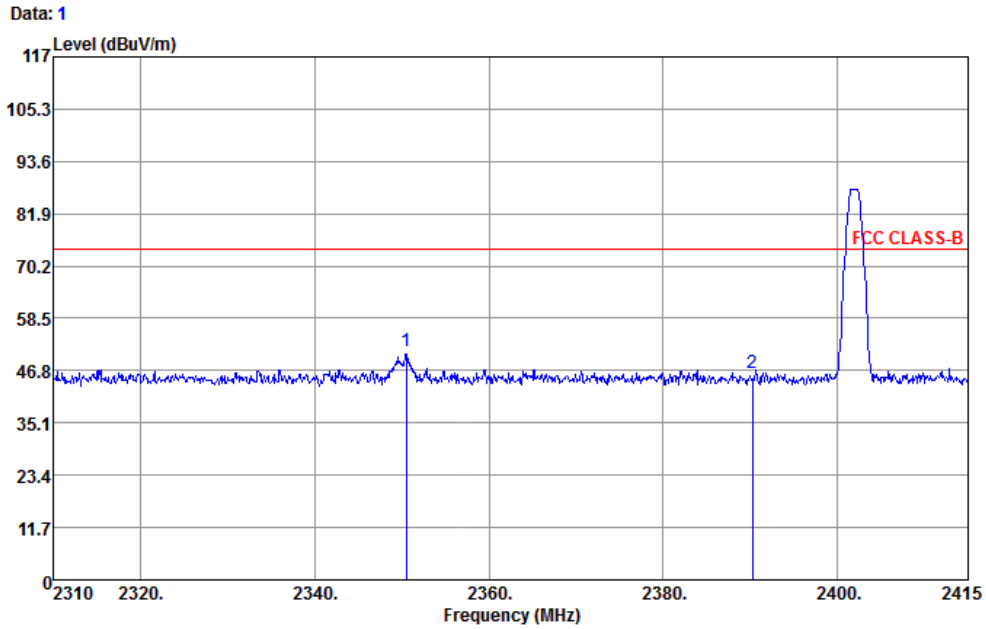
TX-2402MHz

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2352.17	47.63	33.06	35.18	3.6	49.11	74	-24.89	Peak	Horizontal
2352.17	34.73	33.08	35.18	3.6	36.23	54	-17.77	Average	Horizontal
2390.00	44.77	33.08	35.18	3.62	46.29	74	-27.71	Peak	Horizontal
2390.00	37.56	33.08	35.18	3.62	39.08	54	-14.92	Average	Horizontal
2352.17	43.95	33.08	35.18	3.62	45.47	74	-28.53	Peak	Vertical
2352.17	34.79	33.08	35.18	3.62	36.31	54	-17.69	Average	Vertical
2390.00	46.08	33.06	35.18	3.6	47.56	74	-26.44	Peak	Vertical
2390.00	36.02	33.08	35.18	3.6	37.52	54	-16.48	Average	Vertical

TX-2480MHz

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2483.50	47.9	33.06	35.18	3.6	49.38	74	-24.62	Peak	Horizontal
2483.50	35.55	33.08	35.18	3.6	37.05	54	-16.95	Average	Horizontal
2488.53	43.79	33.08	35.18	3.62	45.31	74	-28.69	Peak	Horizontal
2488.53	34.34	33.08	35.18	3.62	35.86	54	-18.14	Average	Horizontal
2483.50	45.35	33.06	35.18	3.6	46.83	74	-27.17	Peak	Vertical
2483.50	36.24	33.08	35.18	3.6	37.74	54	-16.26	Average	Vertical
2488.53	42.85	33.08	35.18	3.62	44.37	74	-29.63	Peak	Vertical
2488.53	35.03	33.08	35.18	3.62	36.55	54	-17.45	Average	Vertical

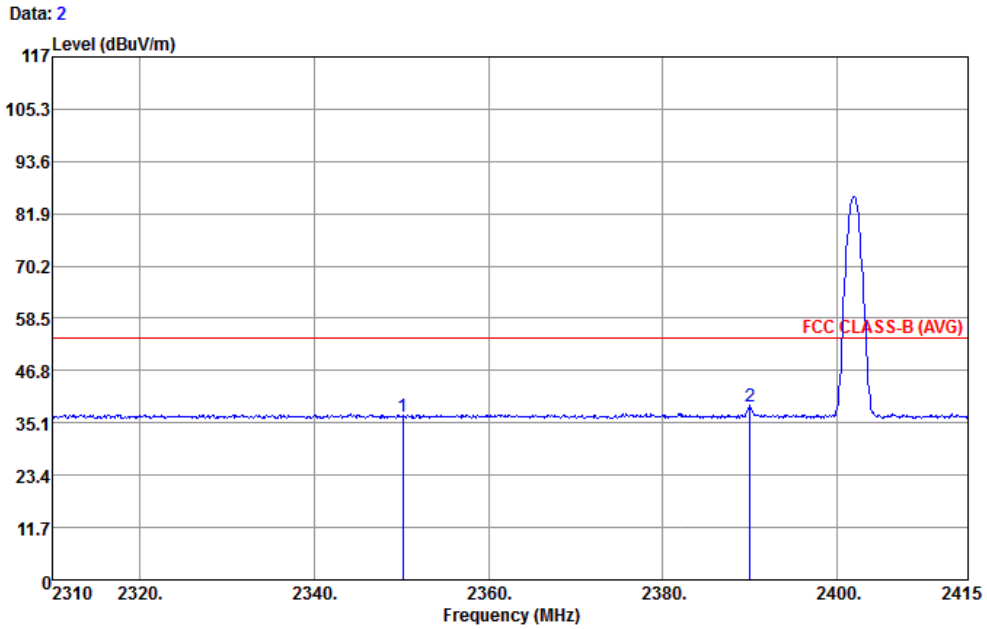
Please see following test plot for Band edge Testing



Condition : FCC CLASS-B 3m HF_ANT_160507 HORIZONTAL

Detector : Peak

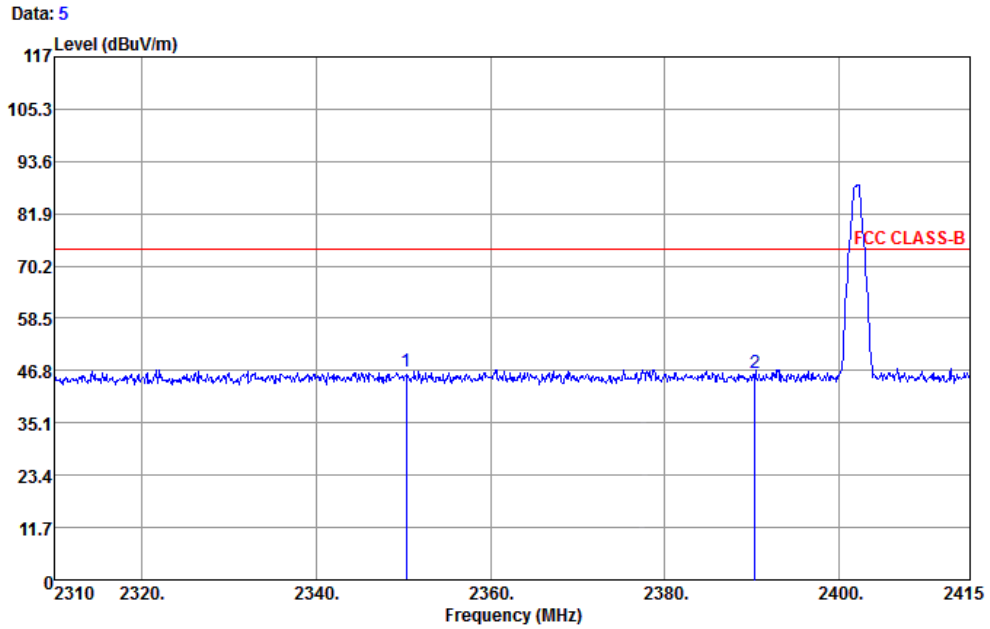
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2352.17	49.11	-24.89	74.00	47.63	33.06	3.60	35.18	250	298	Peak
2	2390.00	46.29	-27.71	74.00	44.77	33.08	3.62	35.18	250	298	Peak



Condition : FCC CLASS-B (AVG) 3m HF_ANT_160507 HORIZONTAL

Detector : AVG

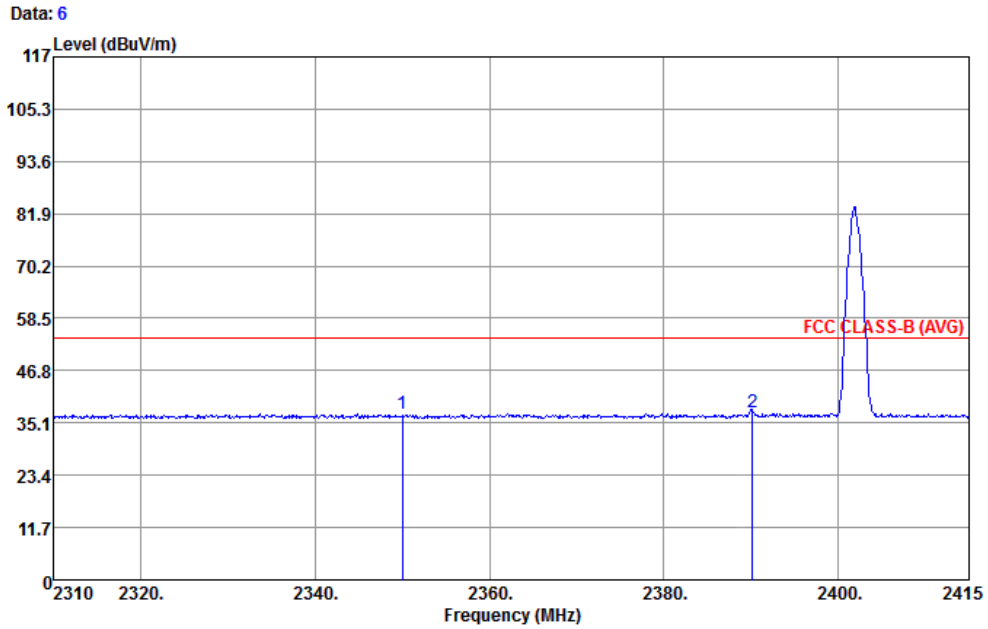
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2352.17	36.23	-17.77	54.00	34.73	33.08	3.60	35.18	250	298	Average
2	2390.00	39.08	-14.92	54.00	37.56	33.08	3.62	35.18	250	298	Average



Condition : FCC CLASS-B 3m HF_ANT_160507 VERTICAL

Detector : Peak

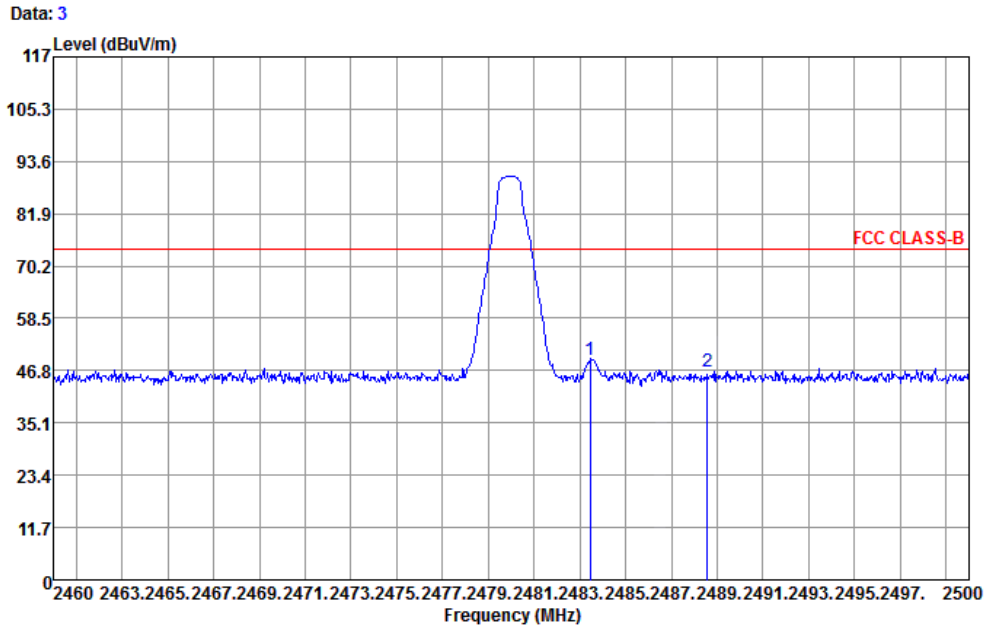
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2352.17	45.47	-28.53	74.00	43.95	33.08	3.62	35.18	150	285	Peak
2	2390.00	47.56	-26.44	74.00	46.08	33.06	3.60	35.18	150	285	Peak



Condition : FCC CLASS-B (AVG) 3m HF_ANT_160507 VERTICAL

Detector : AVG

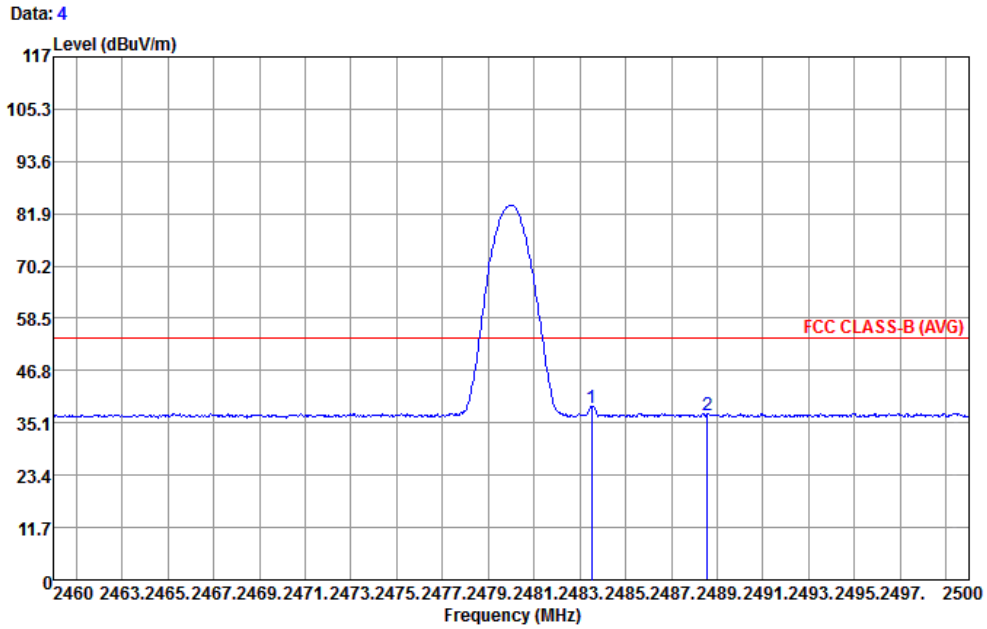
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2352.17	36.31	-17.69	54.00	34.79	33.08	3.62	35.18	150	285	Average
2	2390.00	37.52	-16.48	54.00	36.02	33.08	3.60	35.18	150	285	Average



Condition : FCC CLASS-B 3m HF_ANT_160507 HORIZONTAL

Detector : Peak

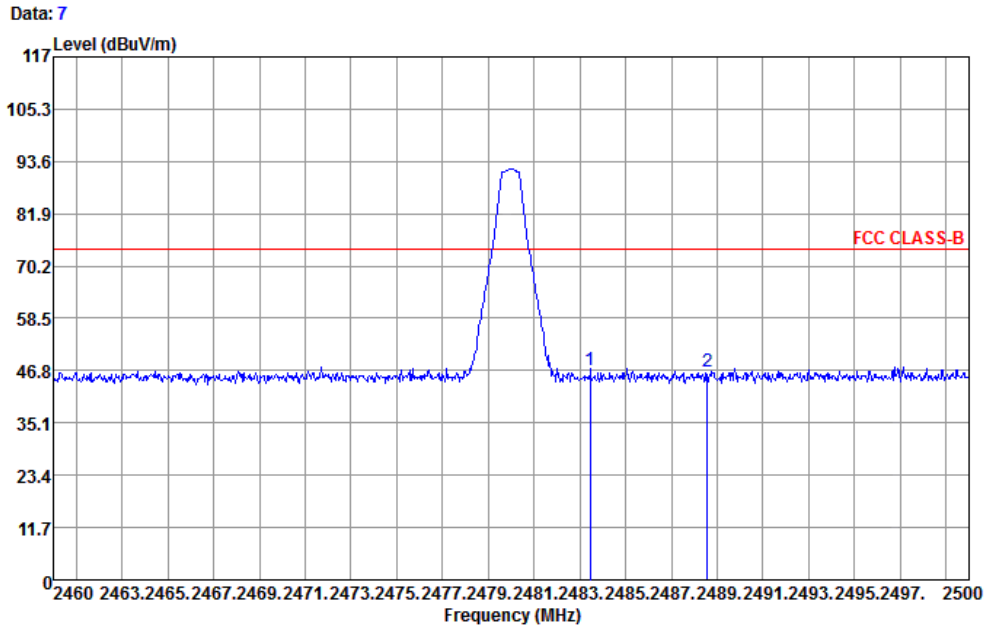
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2483.50	49.38	-24.62	74.00	47.90	33.06	3.60	35.18	150	295	Peak
2	2488.53	45.31	-28.69	74.00	43.79	33.08	3.62	35.18	150	295	Peak



Condition : FCC CLASS-B (AVG) 3m HF ANT 160507 HORIZONTAL

Detector : AVG

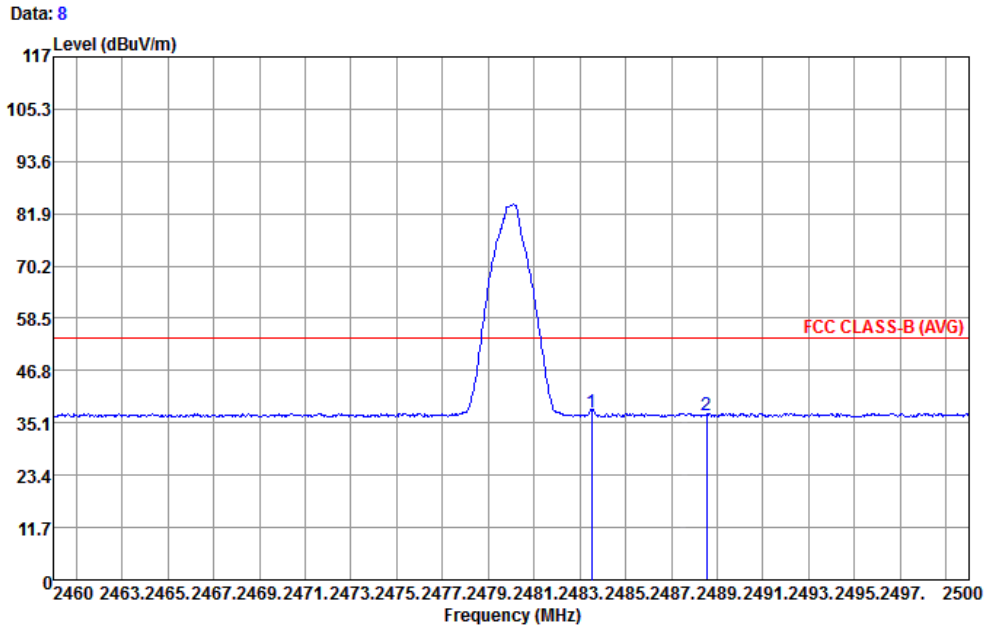
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2483.50	37.05	-16.95	54.00	35.55	33.08	3.60	35.18	150	295	Average
2	2488.53	35.86	-18.14	54.00	34.34	33.08	3.62	35.18	150	295	Average



Condition : FCC CLASS-B 3m HF ANT 160507 VERTICAL

Detector : Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2483.50	46.83	-27.17	74.00	45.35	33.06	3.60	35.18	150	295	Peak
2	2488.53	44.37	-29.63	74.00	42.85	33.08	3.62	35.18	150	295	Peak



Condition : FCC CLASS-B (AVG) 3m HF_ANT_160507 VERTICAL

Detector : AVG

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2483.50	37.74	-16.26	54.00	36.24	33.08	3.60	35.18	150	295	Average
2	2488.53	36.55	-17.45	54.00	35.03	33.08	3.62	35.18	150	295	Average

7. LINE CONDUCTED EMISSIONS

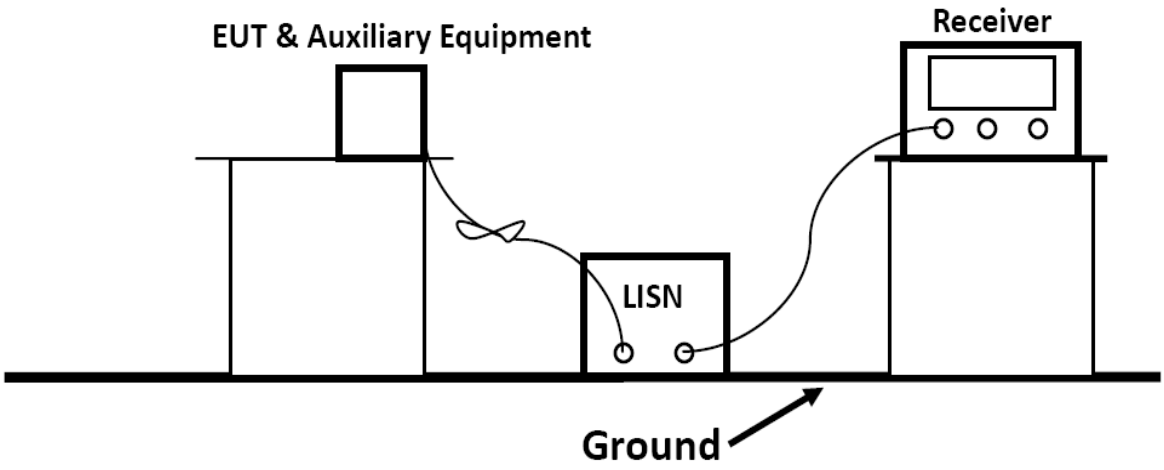
7.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

7.2 Block Diagram of Test Setup

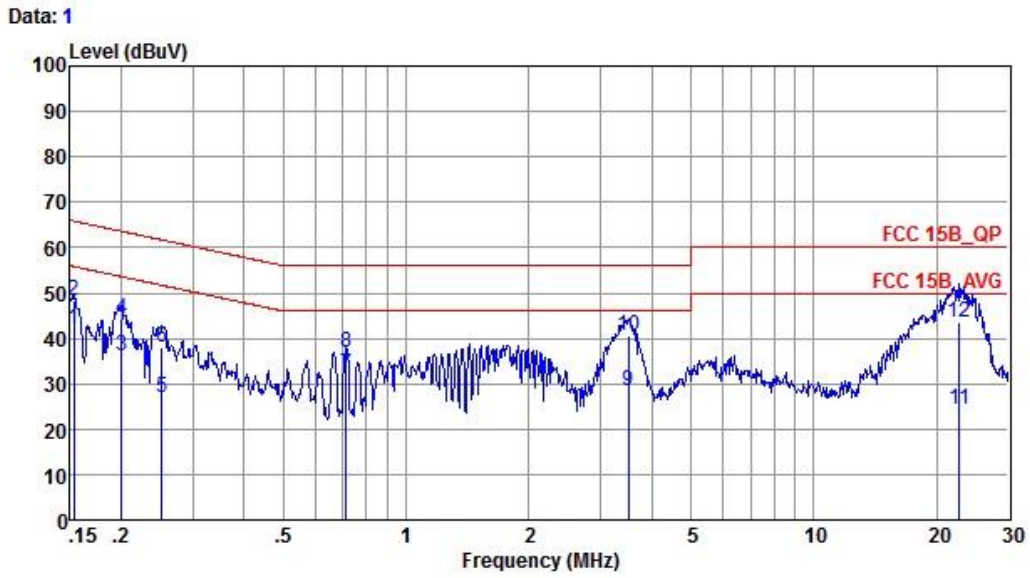


7.3 Test Results

The test data please refer to following page.

Test Results for AC 120V/60Hz @ GFSK (worst case)

Line

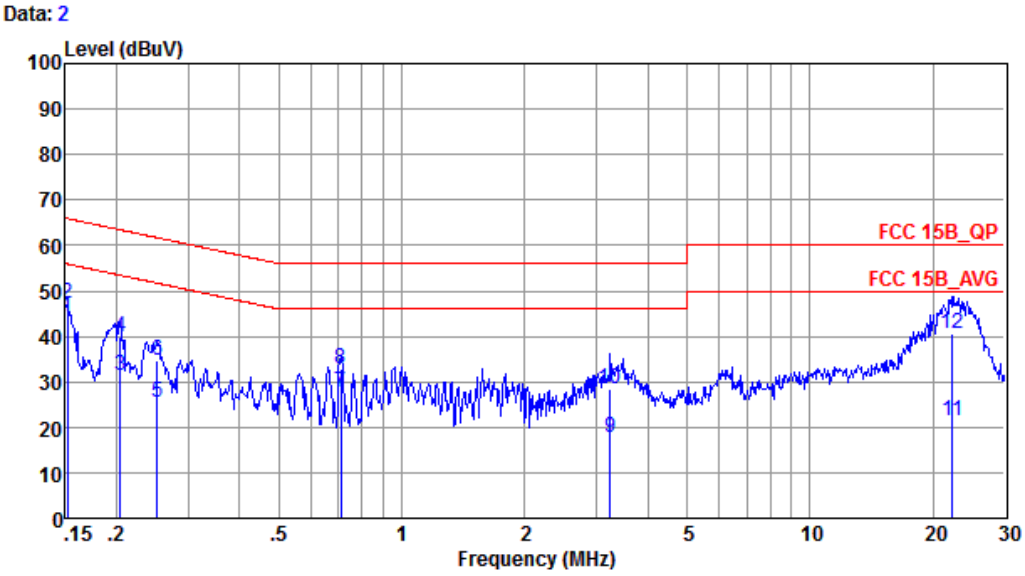


		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	*	0.15	42.13	-13.69	55.82	31.40	0.14	10.59	Average
2		0.15	48.33	-17.49	65.82	37.60	0.14	10.59	QP
3		0.20	36.01	-17.57	53.58	25.40	0.11	10.50	Average
4		0.20	44.31	-19.27	63.58	33.70	0.11	10.50	QP
5		0.25	27.06	-24.63	51.69	16.50	0.11	10.45	Average
6		0.25	38.16	-23.53	61.69	27.60	0.11	10.45	QP
7		0.71	32.07	-13.93	46.00	21.80	0.11	10.16	Average
8		0.71	36.97	-19.03	56.00	26.70	0.11	10.16	QP
9		3.51	28.34	-17.66	46.00	18.00	0.13	10.21	Average
10		3.51	40.44	-15.56	56.00	30.10	0.13	10.21	QP
11		22.78	24.34	-25.66	50.00	13.30	0.46	10.58	Average
12		22.78	43.44	-16.56	60.00	32.40	0.46	10.58	QP

Remarks: 1. Measured = Reading + Lisn Factor + Cable Loss.

1. *The emission levels that are 20dB below the official limit are not reported.*
2. *Pre-scan all modes and recorded the worst case results in this report;*

Neutral



		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	*	0.15	44.14	-11.77	55.91	33.40	0.14	10.60	Average
2		0.15	47.34	-18.57	65.91	36.60	0.14	10.60	QP
3		0.20	31.31	-22.14	53.45	20.70	0.11	10.50	Average
4		0.20	39.71	-23.74	63.45	29.10	0.11	10.50	QP
5		0.25	25.56	-26.13	51.69	15.00	0.11	10.45	Average
6		0.25	34.76	-26.93	61.69	24.20	0.11	10.45	QP
7		0.71	27.77	-18.23	46.00	17.50	0.11	10.16	Average
8		0.71	32.87	-23.13	56.00	22.60	0.11	10.16	QP
9		3.24	17.63	-28.37	46.00	7.31	0.12	10.20	Average
10		3.24	28.43	-27.57	56.00	18.11	0.12	10.20	QP
11		22.30	21.24	-28.76	50.00	10.20	0.45	10.59	Average
12		22.30	40.64	-19.36	60.00	29.60	0.45	10.59	QP

Remarks: 1. Measured = Reading + Lisn Factor + Cable Loss.

2. The emission levels that are 20dB below the official limit are not reported.

3. Pre-scan all modes and recorded the worst case results in this report;

8. ANTENNA REQUIREMENT

8.1 Standard Applicable

According to antenna requirement of §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 re-placed 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 Sections 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 Section 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.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

8.2 Antenna Connected Construction

8.2.1. Standard Applicable

According to § 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.

8.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 1dBi, and the antenna is PCB antenna and no consideration of replacement. Please see EUT photo for details.

8.2.3. Results: Compliance.

9. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

10. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

11. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF REPORT----------