FCC TEST REPORT

For

Shenzhen Vitalitim Technology Co., Ltd

Portable Wireless Presenter

Model No.: V06

Additional Model No.: /

Prepared for	:	Shenzhen Vitalitim Technology Co., Ltd
Address	:	RM301,Xindongxing Business building, Xinan Avenue, Baoan District,Shenzhen, China
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Tel	:	(+86)755-82591330
Fax	:	(+86)755-82591332
Web	:	www.LCS-cert.com
Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	June 16, 2017
Number of tested samples	:	1
Serial number	:	A170522022
Date of Test	:	June 16, 2017- July 11, 2017
Date of Report	:	July 11, 2017

FCC TEST REPORT
FCC CFR 47 PART 15 C(15.249): 2016

Report Reference No. ..... :		**LCS170628035AE**
Date of Issue	:	July 11, 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 Vitalitim Technology Co., Ltd**
Address	:	RM301,Xindongxing Business building, Xinan Avenue, Baoan District, Shenzhen, China
Test Specification		
Standard	:	FCC CFR 47 PART 15 C(15.249): 2016
Test Report Form No. ..... :		LCSEMC-1.0
TRF Originator	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2011-03

EUT Description. ..... :		**Portable Wireless Presenter**
Trade Mark	:	N/A
Model/ Type reference	:	V06
Ratings	:	DC 3.7V by lithium battery (160mAh)
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Chaz Liu	Dick Su	Gavin Liang
Chaz Liu / File administrators	Dick Su/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : **LCS170628035AE**	July 11, 2017 Date of issue

EUT.....	: V06
Type / Model.....	: Portable Wireless Presenter
Applicant.....	**: Shenzhen Vitalitim Technology Co., Ltd**
Address.....	: RM301,Xindongxing Business building, Xinan Avenue, Baoan District,Shenzhen, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Shenzhen Vitalitim Technology Co., Ltd**
Address.....	: RM301,Xindongxing Business building, Xinan Avenue, Baoan District,Shenzhen, China
Telephone.....	: /
Fax.....	: /
Factory.....	**: Shenzhen Vitalitim Technology Co., Ltd**
Address.....	: RM301,Xindongxing Business building, Xinan Avenue, Baoan 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
00	July 11, 2017	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Portable Wireless Presenter
Model Number	:	V06
Hardware version	:	V.1
Software version	:	2.4G_Pen_Crc_3B69B51A
Power Supply	:	DC 3.70V by lithium battery (160mAh)

2.4G

Frequency Range	2402-2480MHz
Channel Spacing	1M
Channel Number	79 channels
Modulation Type	GFSK
Antenna Description	PCB Antenna, -1.2dBi (Max.)

1.2. Host System Configuration List and Details

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

1.3. External I/O Cable

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

1.4. Description of Test Facility

CNAS Registration Number. is L4595.
FCC Registration Number. is CN5024.
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.
NVLAP Registration Code is 600167-0.

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. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was the mode and channel with the highest power level, which was determined to be GFSK mode (Low Channel).

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

AC conducted emission pre-test at both at AC 120V/60Hz and AC 240V/50Hz modes, recorded worst case;

AC conducted emission pre-test at power charge from PC modes, recorded worst case;

All test modes were tested, only the result of the worst case was recorded in the report.

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

1.8. Frequency of Channels

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
2402~2480MHz	0	2402	39	2441
	1	2403	40	2442
	2	2404	41	2443
	---	---	---	---
	---	---	---	---
	---	---	78	2480

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

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 15.203, 15.205, 15.207, 15.209 and 15.249 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT 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, which is 0.8 m above ground plane. 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 transmit condition.

3.2. EUT Exercise Software

Powered on the EUT and press the front four buttons for 2 seconds into the fixed frequency mode. Then press the front four buttons to switch the next channel.

3.3. Special Accessories

N/A

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 15.249 Subpart C		
FCC Rules	Description of Test	Result
§15.203	Antenna Requirements	Compliant
§15.207(a)	AC Mains Conducted Emissions	Compliant
§15.205(a), §15.209(a), §15.249(a), §15.249(c)	Radiated Emissions Measurement	Compliant
§15.205(a), §15.209(a), §15.249(a), §15.249(c)	Band Edges Measurement	Compliant
§15.249, §15.215	20 dB Bandwidth	Compliant

5. TEST RESULT

5.1. AC Power line conducted emissions

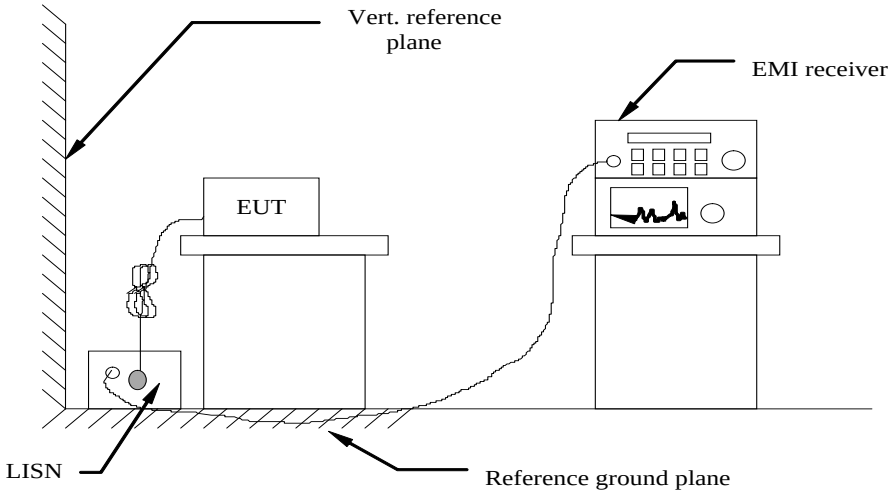
5.1.1 Standard Applicable

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 are 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

5.1.2 Block Diagram of Test Setup



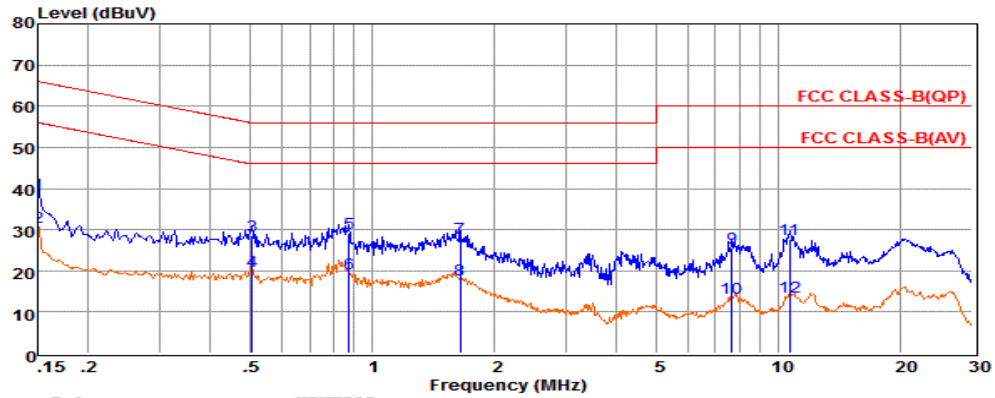
5.1.3 Test Results

PASS.

The test data please refer to following page.

AC Conducted Emission @ Charge from PC @ 120V/60Hz @ GFSK (worst case)

Neutral

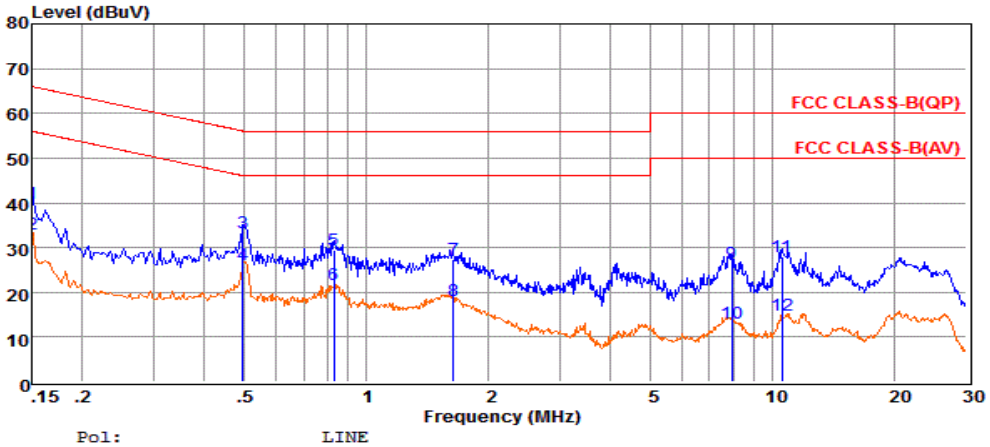


Pol: NEUTRAL

	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.15	18.92	9.70	0.02	10.00	38.64	66.00	-27.36	QP
2	0.15	10.77	9.70	0.02	10.00	30.49	55.99	-25.50	Average
3	0.50	9.00	9.62	0.04	10.00	28.66	56.00	-27.34	QP
4	0.50	0.37	9.62	0.04	10.00	20.03	46.00	-25.97	Average
5	0.88	9.56	9.63	0.04	10.00	29.23	56.00	-26.77	QP
6	0.88	-0.40	9.63	0.04	10.00	19.27	46.00	-26.73	Average
7	1.64	8.14	9.63	0.05	10.00	27.82	56.00	-28.18	QP
8	1.65	-1.88	9.63	0.05	10.00	17.80	46.00	-28.20	Average
9	7.69	5.68	9.70	0.07	10.00	25.45	60.00	-34.55	QP
10	7.69	-6.27	9.70	0.07	10.00	13.50	50.00	-36.50	Average
11	10.68	7.99	9.72	0.08	10.00	27.79	60.00	-32.21	QP
12	10.68	-6.03	9.72	0.08	10.00	13.77	50.00	-36.23	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

Line



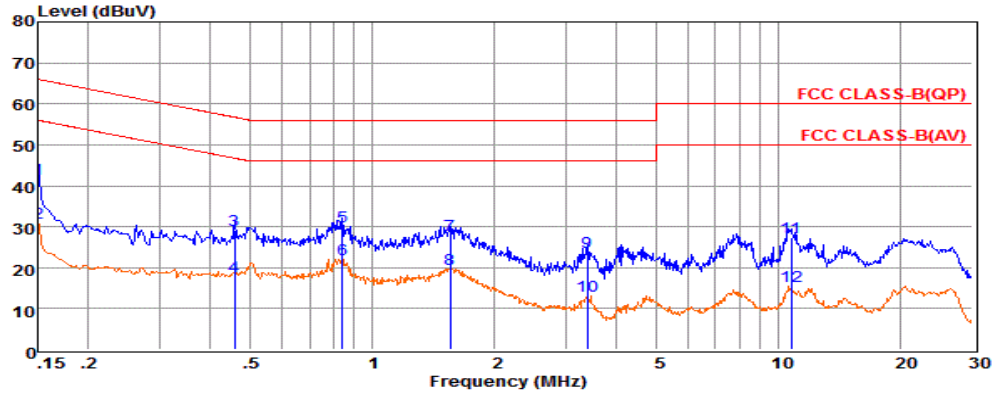
Pol: LINE

	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.15	20.36	9.57	0.02	10.00	39.95	66.00	-26.05	QP
2	0.15	13.31	9.57	0.02	10.00	32.90	55.99	-23.09	Average
3	0.50	13.52	9.62	0.04	10.00	33.18	56.05	-22.87	QP
4	0.50	6.60	9.62	0.04	10.00	26.26	46.05	-19.79	Average
5	0.83	9.83	9.64	0.04	10.00	29.51	56.00	-26.49	QP
6	0.83	1.99	9.64	0.04	10.00	21.67	46.00	-24.33	Average
7	1.64	7.67	9.64	0.05	10.00	27.36	56.00	-28.64	QP
8	1.64	-1.52	9.64	0.05	10.00	18.17	46.00	-27.83	Average
9	7.94	6.59	9.68	0.07	10.00	26.34	60.00	-33.66	QP
10	7.94	-6.53	9.68	0.07	10.00	13.22	50.00	-36.78	Average
11	10.56	8.05	9.69	0.08	10.00	27.82	60.00	-32.18	QP
12	10.56	-4.96	9.69	0.08	10.00	14.81	50.00	-35.19	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

AC Conducted Emission @ Charge from PC @ 240V/50Hz @ GFSK (worst case)

Line

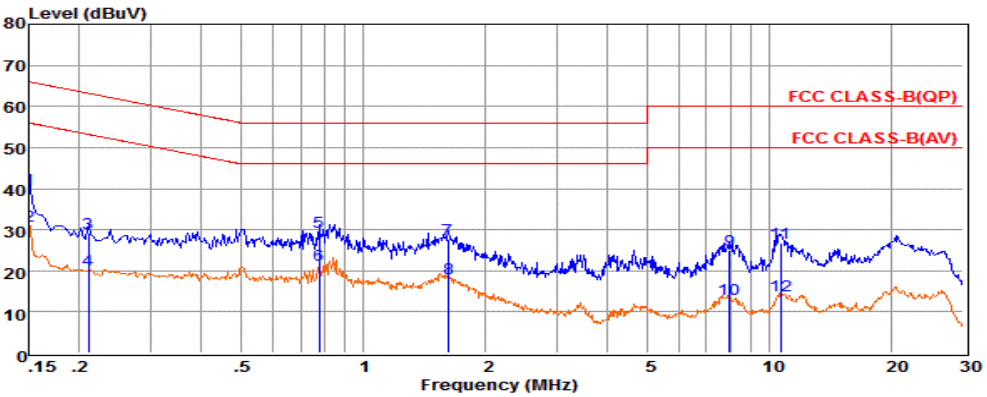


Pol: LINE

	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.15	21.98	9.57	0.02	10.00	41.57	66.00	-24.43	QP
2	0.15	11.22	9.57	0.02	10.00	30.81	55.99	-25.18	Average
3	0.46	9.57	9.62	0.04	10.00	29.23	56.71	-27.48	QP
4	0.46	-1.87	9.62	0.04	10.00	17.79	46.71	-28.92	Average
5	0.84	10.50	9.63	0.04	10.00	30.17	56.00	-25.83	QP
6	0.84	2.24	9.63	0.04	10.00	21.91	46.00	-24.09	Average
7	1.55	8.39	9.64	0.05	10.00	28.08	56.00	-27.92	QP
8	1.55	-0.19	9.64	0.05	10.00	19.50	46.00	-26.50	Average
9	3.38	3.95	9.65	0.06	10.00	23.66	56.00	-32.34	QP
10	3.38	-6.77	9.65	0.06	10.00	12.94	46.00	-33.06	Average
11	10.73	7.71	9.69	0.08	10.00	27.48	60.00	-32.52	QP
12	10.73	-4.27	9.69	0.08	10.00	15.50	50.00	-34.50	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

Neutral



Pol: NEUTRAL

	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.15	20.08	9.70	0.02	10.00	39.80	66.00	-26.20	QP
2	0.15	11.35	9.70	0.02	10.00	31.07	55.99	-24.92	Average
3	0.21	9.58	9.59	0.03	10.00	29.20	63.18	-33.98	QP
4	0.21	0.51	9.59	0.03	10.00	20.13	53.18	-33.05	Average
5	0.78	9.69	9.63	0.04	10.00	29.36	56.00	-26.64	QP
6	0.78	1.72	9.63	0.04	10.00	21.39	46.00	-24.61	Average
7	1.62	8.01	9.63	0.05	10.00	27.69	56.00	-28.31	QP
8	1.62	-1.62	9.63	0.05	10.00	18.06	46.00	-27.94	Average
9	7.98	5.33	9.70	0.07	10.00	25.10	60.00	-34.90	QP
10	7.98	-6.66	9.70	0.07	10.00	13.11	50.00	-36.89	Average
11	10.68	7.03	9.72	0.08	10.00	26.83	60.00	-33.17	QP
12	10.68	-5.82	9.72	0.08	10.00	13.98	50.00	-36.02	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

****Note: Pre-scan all modes and recorded the worst case results in this report (TX-2402MHz).*

5.2. 20dB Bandwidth Measurement

5.2.1. Standard Applicable

No Limit

5.4.2. Measuring Instruments and Setting

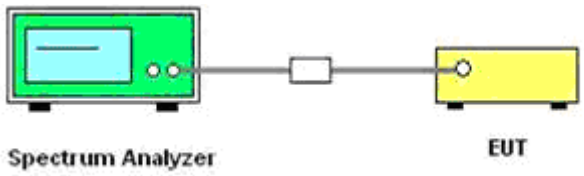
Please refer to equipment's list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RBW	30 KHz
VBW	100 KHz
Span Frequency	3 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.4.3. Test Procedures

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

5.4.4. Test Setup Layout



5.4.5. EUT Operation during Test

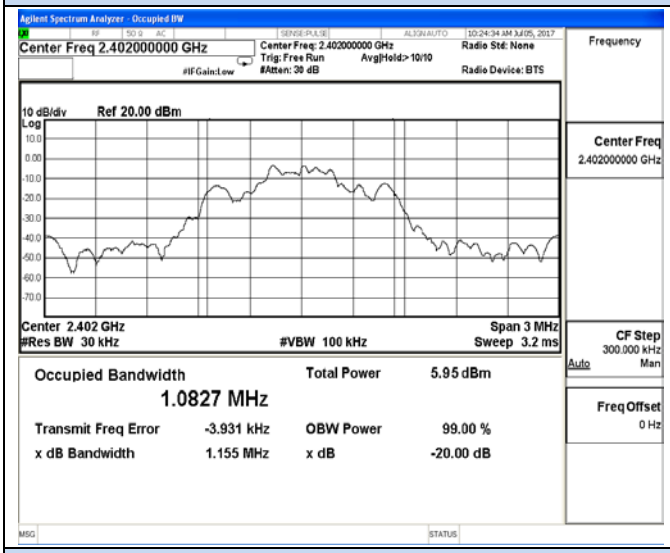
The EUT was programmed to be in continuously transmitting mode.

5.4.6. Test Result of 20dB Spectrum Bandwidth

Test Mode	Channel	Frequency (MHz)	20dB Bandwidth Measurement (KHz)	Limits (MHz)	Verdict
GFSK	0	2402	1.0827	No Limit	PASS
	39	2441	1.0839		
	78	2480	1.0805		

Remark:

1. *Test results including cable loss;*
2. *Please refer to following plots;*

20dB Bandwidth	
GFSK	
	
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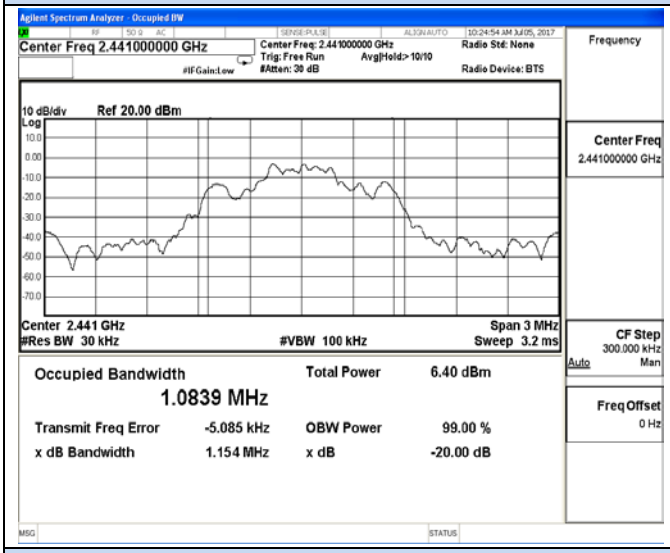
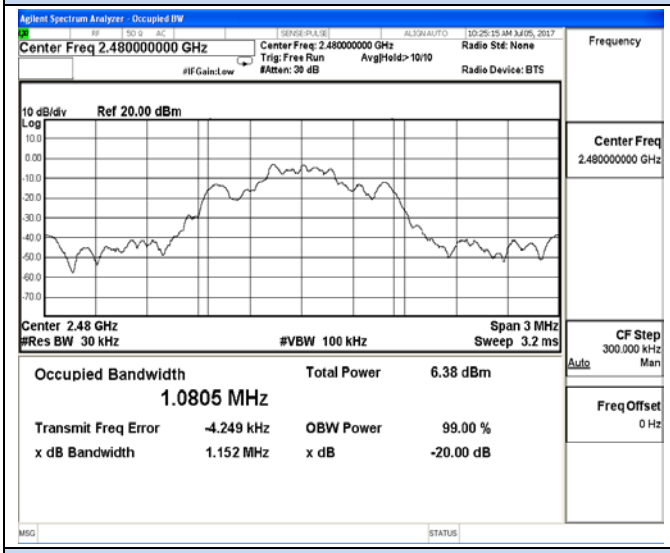
	
Channel 39 / 2441 MHz	
	
Channel 78 / 2480 MHz	

5.3. Radiated Emissions Measurement

5.3.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	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	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	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			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

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 (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

* Field strength limits are specified at a distance of 3 meters.

* 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.

* 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.

5.3.2. Measuring Instruments and Setting

Please refer to equipment list in this report. 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 / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

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

5.3.3. 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:

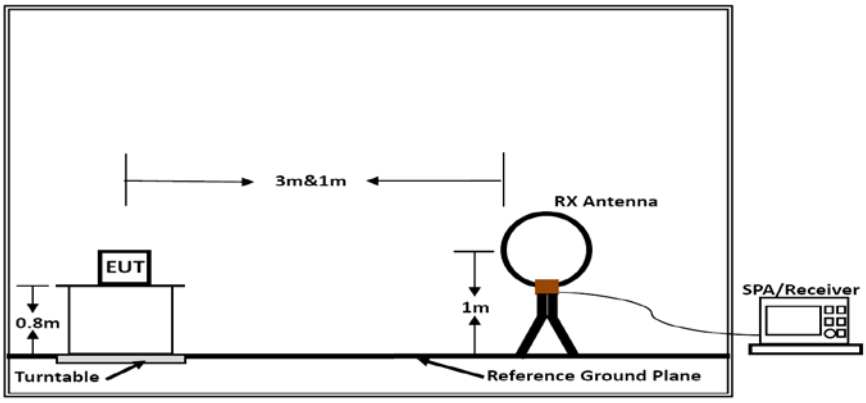
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

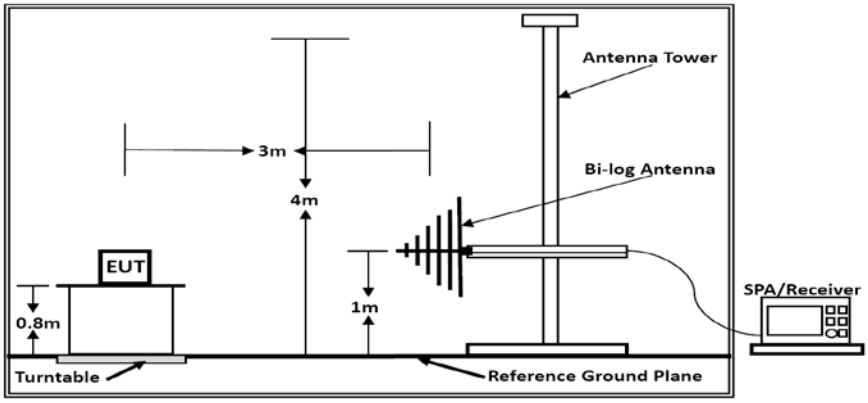
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- 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.

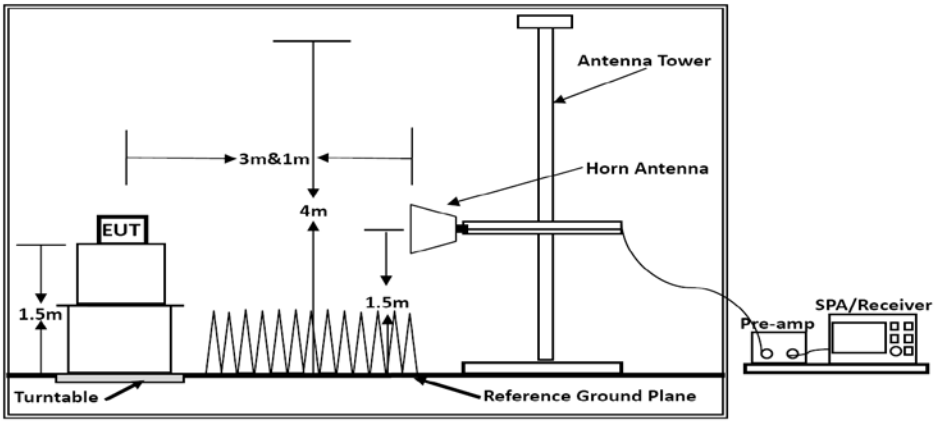
5.3.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1m]) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.3.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.3.6. Results of Radiated Emissions (9 KHz~30MHz)

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

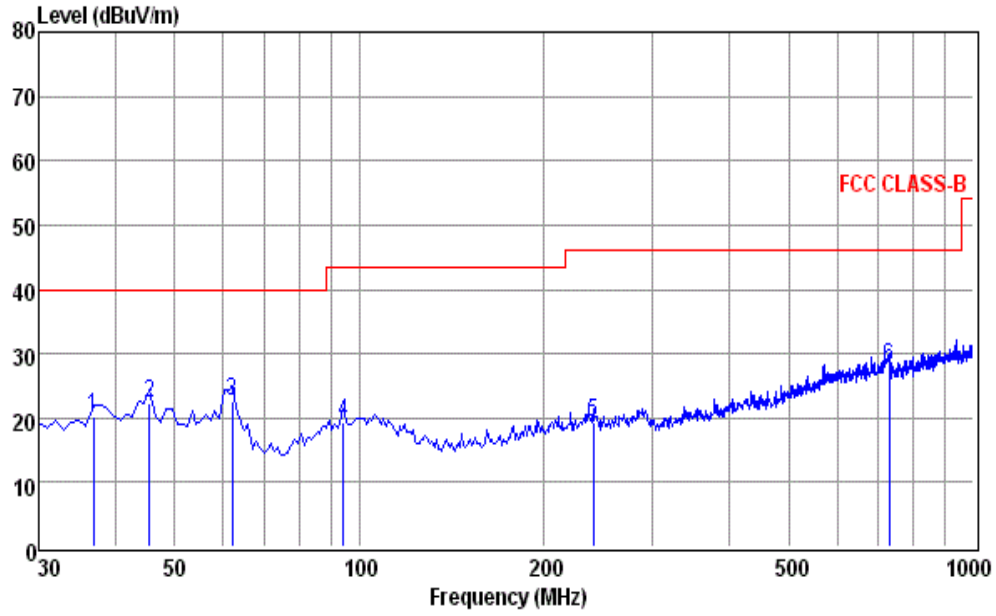
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

5.3.7. Results of Radiated Emissions (30MHz~1GHz)

Temperature	25 ℃	Humidity	60%
Test Engineer	Aking Jin	Configurations	GFSK (Low CH)

*** *Note: Pre-scan all modes and recorded the worst case results in this report (TX-2402MHz).*

Vertical

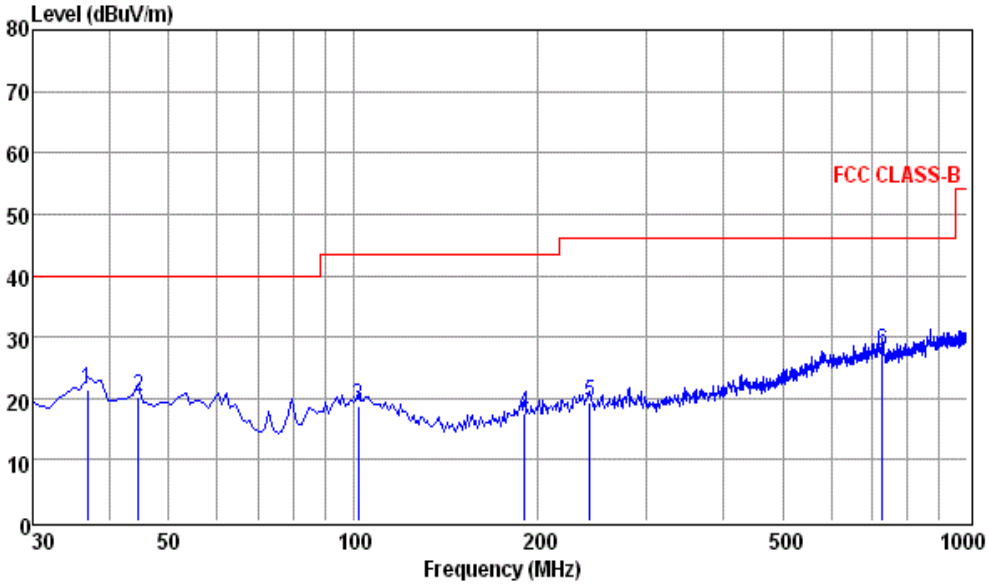


pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	36.79	6.95	0.41	12.76	20.12	40.00	-19.88	QP
2	45.52	8.35	0.41	13.52	22.28	40.00	-17.72	QP
3	62.01	10.31	0.48	11.89	22.68	40.00	-17.32	QP
4	94.02	6.22	0.58	12.66	19.46	43.50	-24.04	QP
5	240.49	6.22	1.01	12.09	19.32	46.00	-26.68	QP
6	729.37	7.15	1.70	19.18	28.03	46.00	-17.97	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Horizontal



pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	36.79	8.26	0.41	12.76	21.43	40.00	-18.57	QP
2	44.55	6.32	0.41	13.55	20.28	40.00	-19.72	QP
3	101.78	5.17	0.60	13.00	18.77	43.50	-24.73	QP
4	190.05	6.14	0.86	10.56	17.56	43.50	-25.94	QP
5	242.43	6.27	0.90	12.09	19.26	46.00	-26.74	QP
6	726.46	6.76	1.72	19.14	27.62	46.00	-18.38	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Note:

Pre-scan all modes and recorded the worst case results in this report (GFSK (Low Channel)).

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

5.3.8. Results for Radiated Emissions (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	83.51	72.41	114.00	94.00	PASS
2402	V	82.42	71.29	114.00	94.00	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	48.37	33.06	35.04	3.94	50.33	74.00	-23.67	Peak	Horizontal
4804.00	32.99	33.06	35.04	3.94	34.95	54.00	-19.05	Average	Horizontal
4804.00	48.01	33.06	35.04	3.94	49.97	74.00	-24.03	Peak	Vertical
4804.00	34.11	33.06	35.04	3.94	36.07	54.00	-17.93	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	84.02	73.27	114.00	94.00	PASS
2441	V	83.72	72.04	114.00	94.00	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	47.08	33.16	35.15	3.96	49.05	74.00	-24.95	Peak	Horizontal
4882.00	32.54	33.16	35.15	3.96	34.51	54.00	-19.49	Average	Horizontal
4882.00	49.99	33.16	35.15	3.96	51.96	74.00	-22.04	Peak	Vertical
4882.00	34.03	33.16	35.15	3.96	36.00	54.00	-18.00	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	83.39	73.45	114.00	94.00	PASS
2480	V	82.10	73.01	114.00	94.00	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	49.34	33.26	35.14	3.98	51.44	74.00	-22.56	Peak	Horizontal
4960.00	32.66	33.26	35.14	3.98	34.76	54.00	-19.24	Average	Horizontal
4960.00	50.96	33.26	35.14	3.98	53.06	74.00	-20.94	Peak	Vertical
4960.00	35.38	33.26	35.14	3.98	37.48	54.00	-16.52	Average	Vertical

Notes:

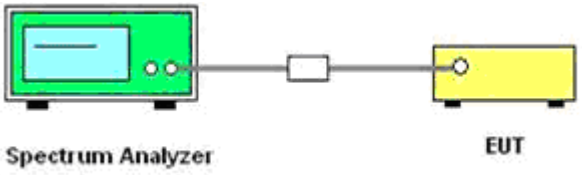
1. *Measuring frequencies from 9 KHz~10th harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.*
2. *Radiated emissions measured in frequency range from 9 KHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.*
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.*

5.4. Band-edge measurements for radiated emissions

5.4.1 Standard Applicable

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.

5.4.2. Test Setup Layout



5.4.3. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of Spectrum Analyzer.

5.4.4. Test Procedures

According to KDB 412172 section 1.1 Field Strength Approach (linear terms):
$eirp = p_t \times g_t = (E \times d)^2/30$
Where:
p_t = transmitter output power in watts,
g_t = numeric gain of the transmitting antenna (unitless),
E = electric field strength in V/m,
d = measurement distance in meters (m).
$erp = eirp/1.64 = (E \times d)^2/(30 \times 1.64)$

Where all terms are as previously defined.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to an EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=1/B for Peak detector.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.
6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
7. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8. Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
9. For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10. Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.
11. Compare the resultant electric field strength level to the applicable regulatory limit.

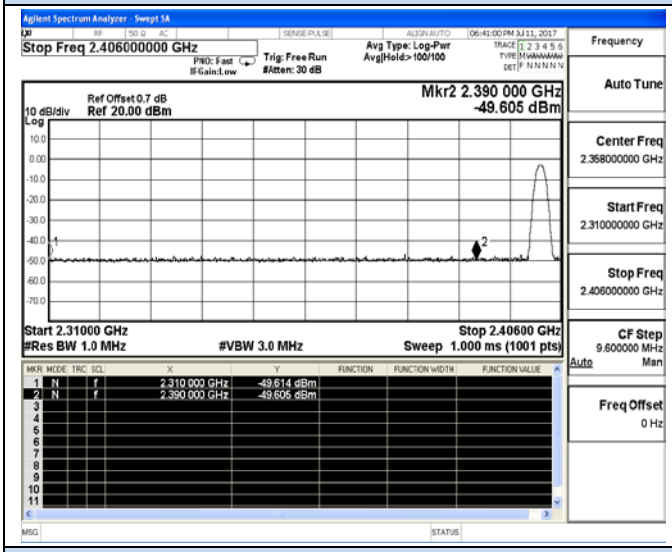
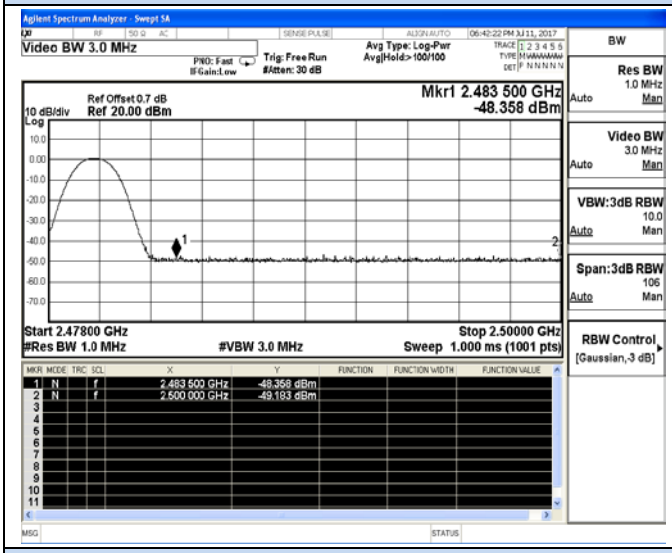
12. Perform radiated spurious emission test duress until all measured frequencies were complete.

5.4.5 Test Results

GFSK							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Ground Reflection Factor (dB)	Covert Radiated E Level At 3m (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
2310.000	-49.614	2.000	0.000	47.614	Peak	74.00	PASS
2390.000	-49.605	2.000	0.000	47.623	Peak	74.00	PASS
2483.500	-48.358	2.000	0.000	48.870	Peak	74.00	PASS
2500.000	-49.183	2.000	0.000	48.045	Peak	74.00	PASS

Remark:

1. *Test results including cable loss;*
2. *"---"means that the fundamental frequency not for 15.209 limits requirement.*
3. *The average measurement was not performed when the peak measured data under the limit of average detection.*
4. *Please refer to following plots;*

Band-edge measurements for radiated emissions	
IEEE 802.11b	
	
Channel 0 / 2402 MHz – Peak	
	
Channel 78 / 2480 MHz – Peak	

5.5. Antenna Requirements

5.5.1 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.

5.5.2 Antenna Connected Construction

5.5.2.1. 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.

5.5.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is -1.20dBi, and the antenna is an integral antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.5.2.3. Results: Compliance.

6. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Cal Date	Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	June 18, 2016	June 17, 2017
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	July 16, 2016	July 15, 2017
Signal analyzer	Agilent	N9020A	MY50510140	9kHz~26.5GHz	October 27, 2016	October 27, 2017
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	June 18, 2016	June 17, 2017
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	June 18, 2016	June 17, 2017
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	June 18, 2016	June 17, 2017
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	June 18, 2016	June 17, 2017
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-40GHz	June 18, 2016	June 17, 2017
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHzz	June 18, 2016	June 17, 2017
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	July 16, 2016	July 15, 2017
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16, 2016	July 15, 2017
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	June 18, 2016	June 17, 2017
By-log Antenna	SCHWARZBECK	VULB9163	9163-470	30MHz-1GHz	June 10, 2017	June 09, 2018
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	June 10, 2017	June 09, 2018
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz-40GHz	June 10, 2017	June 09, 2018
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	June 18, 2016	June 17, 2017
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	June 18, 2016	June 17, 2017
Power Meter	R&S	NRVS	100444	DC-40GHz	June 18, 2016	June 17, 2017
Power Sensor	R&S	NRV-Z81	100458	DC-18GHz	June 18, 2016	June 17, 2017
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	June 18, 2016	June 17, 2017
AC Power Source	HPC	HPA-500E	HPA-9100024	AC 0~300V	June 18, 2016	June 17, 2017
DC power source	GW	GPC-6030D	C671845	DC 1V-60V	June 18, 2016	June 17, 2017
Temp. and Humidify Chamber	Giant Force	GTH-225-20-S	MAB0103-00	N/A	June 18, 2016	June 17, 2017
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	June 18, 2016	June 17, 2017
RF CABLE-2m	JYE Bao	RG142	CB)35-2m	20MHz-1GHz	June 18, 2016	June 17, 2017
EMC Test Software	Audix	E3	N/A	N/A	N/A	N/A
Note: All equipment through GRGT EST calibration						

7. TEST SETUP PHOTOGRAPHS OF EUT

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

8. EXTERIOR PHOTOGRAPHS OF THE EUT

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

9. INTERIOR PHOTOGRAPHS OF THE EUT

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

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