FCC PART 15.225

TEST REPORT

For

Hytera Communications Corporation Limited

Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, 518057 China

FCC ID: YAMPDC760UXB1

Report Type:	**Product Type:**
Original Report	Multi-mode Advanced Radio

Report Number:	RDG170313007-00F
Report Date:	2017-05-16
Reviewed By:	Oscar Ye Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hytera Communications Corporation Limited's* product, model number: *PDC760 UxB1 (FCC ID: YAMPDC760UXB1)* in this report is a *Multi-mode Advanced Radio* which was measured approximately: 24 cm (L) * 7.0 cm (W) * 2.5 cm (H), rated with input voltage: DC 7.4 V battery or DC 12.0V from adapter.

Adapter Information:
Model: S024WM1200200
Input: AC 100-240V, 50/60Hz, 600 mA
Output: DC 12.0V, 2000mA

Notes: This series products model: PDC760 U1B1, PDC760 U2B1 and PDC760 UxB1 are identical; they have the identical schematics, only named and frequency differently. Model PDC760 UxB1 was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.

** All measurement and test data in this report was gathered from production sample serial number: 170313007 (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2017-03-13.*

Objective

This Type approval report is prepared on behalf of *Hytera Communications Corporation Limited* in accordance with Part 2- Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The objective is to determine the compliance of the EUT with FCC rules, sec 15.203, 15.205, 15.207, 15.209 and 15.225.

Related Submittal(s)/Grant(s)

Part 15.247 DSS/DTS, Part 22&74&80&90 TNF and Part 22H &24E&27&90 PCE submissions with FCC ID: YAMPDC760UXB1.

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.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		±3.26 dB
RF conducted test with spectrum		±0.9dB
RF Output Power with Power meter		±0.5dB
Radiated emission	9 kHz~30 MHz	±6.1dB
	30MHz~1GHz	±5.91dB
Occupied Bandwidth		±0.5kHz
Temperature		±1.0℃
Humidity		±6%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

EUT Exercise Software

No exercise software was used.

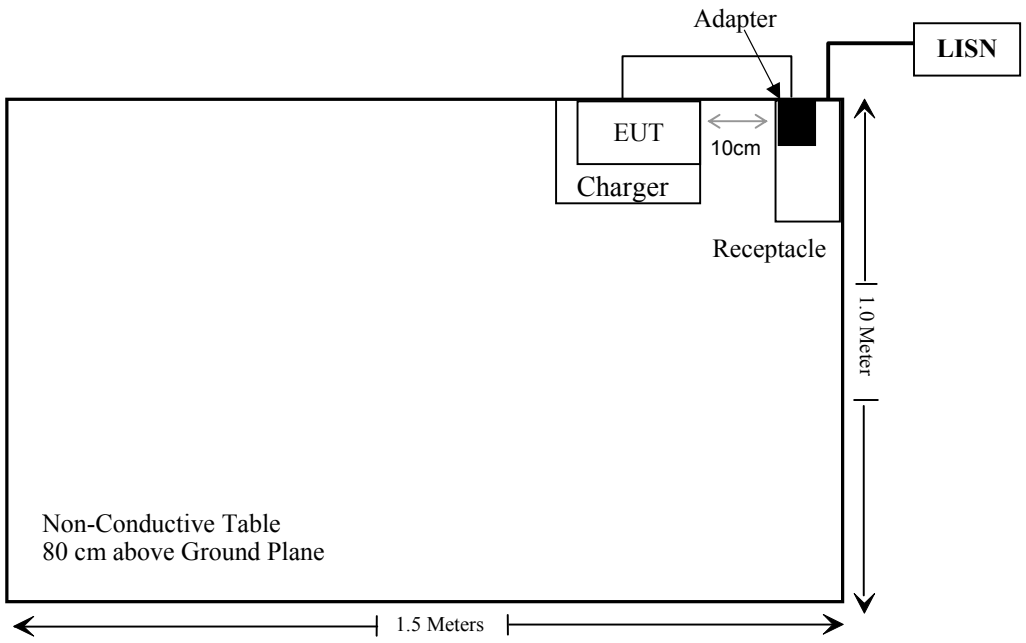
Equipment Modifications

No modification on the EUT.

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Detachable USB Cable	1.5	charger	Adapter

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207	AC Line Conducted Emission	Compliance
§15.225 §15.209 §15.205	Radiated Emission Test	Compliance
§15.225(e)	Frequency Stability	Compliance
§15.215(c)	20dB Emission Bandwidth	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2016-11-25	2017-11-25
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2016-10-10	2017-10-10
Rohde & Schwarz	Pulse limiter	ESH3-Z2	879940/0058	2016-06-18	2017-06-17
MICRO-COAX	Coaxial line	UFB-293B-1-0480-50X50	97F0173	2016-09-08	2017-09-08
Rohde & Schwarz	CE Test software	EMC 32	V 09.10.0	NCR	NCR
Radiation test					
Sonoma Instrunent	Amplifier	330	171377	2016-12-12	2017-12-12
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-25
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-09-08	2017-09-08
ETS-LINDGREN	PASSIVE LOOP	6512	108100	2016-01-09	2019-01-08
R&S	Auto test Software	EMC32	V 09.10.0	NCR	NCR
haojintech	Coaxial Cable	Cable-1	001	2016-12-12	2017-12-12
haojintech	Coaxial Cable	Cable-2	002	2016-12-12	2017-12-12
haojintech	Coaxial Cable	Cable-3	003	2016-12-12	2017-12-12
Yishite	DC Power Supply	MCH-303D-II	14070562	2016-12-29	2017-12-29

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.

Antenna Connected Construction

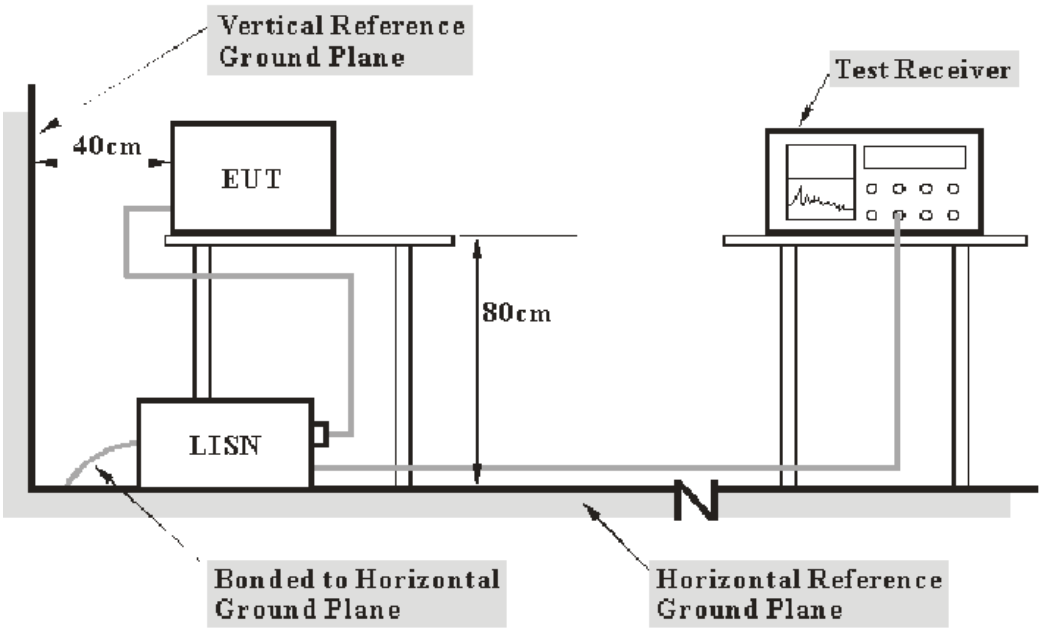
The EUT has an internal antenna arrangement which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

FCC §15.207 – AC LINE CONDUCTED EMISSION

Applicable Standard

FCC§15.207

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

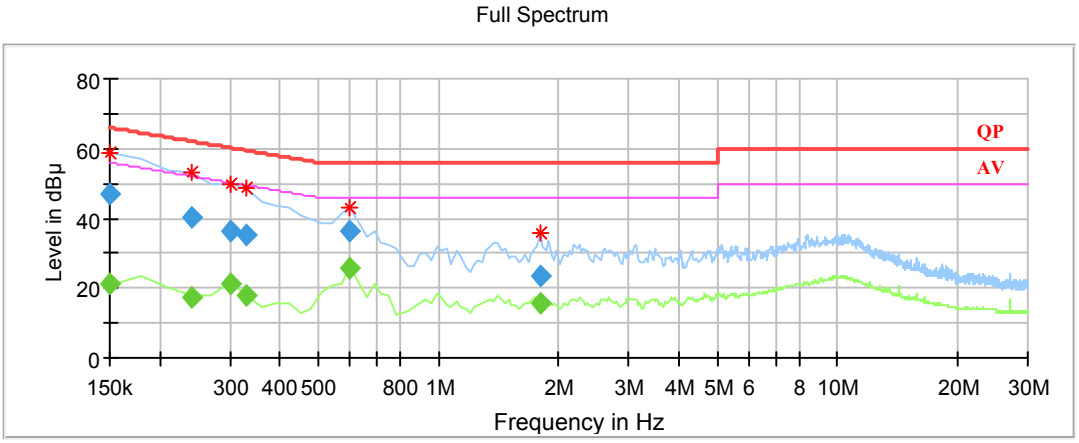
Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Layne Li on 2017-05-01.

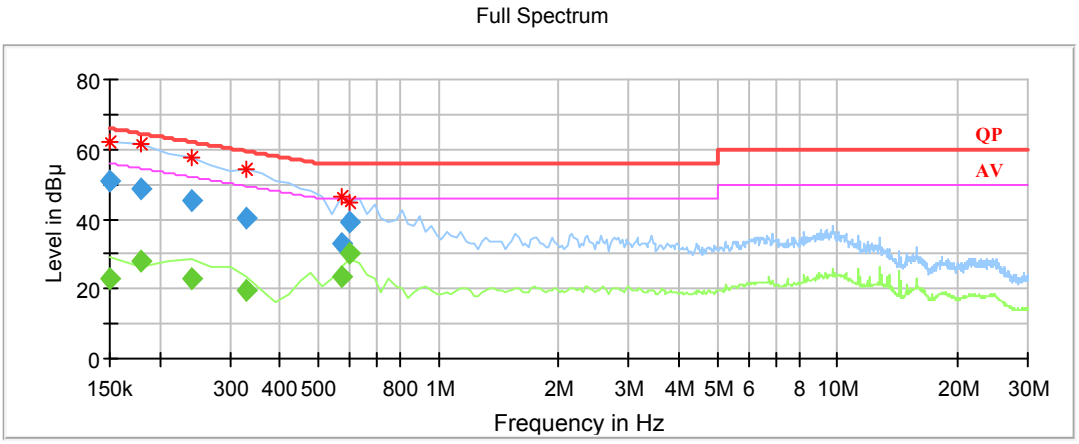
EUT operation mode: Reading Card

AC 120 V/60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	---	21.05	9.000	L1	10.1	34.95	56.00	Compliance
0.150000	47.08	---	9.000	L1	10.1	18.92	66.00	Compliance
0.240000	---	17.45	9.000	L1	10.0	34.65	52.10	Compliance
0.240000	40.13	---	9.000	L1	10.0	21.97	62.10	Compliance
0.300000	---	21.09	9.000	L1	10.0	29.15	50.24	Compliance
0.300000	36.58	---	9.000	L1	10.0	23.66	60.24	Compliance
0.330000	---	17.72	9.000	L1	10.0	31.73	49.45	Compliance
0.330000	35.00	---	9.000	L1	10.0	24.45	59.45	Compliance
0.600000	---	25.72	9.000	L1	10.0	20.28	46.00	Compliance
0.600000	36.42	---	9.000	L1	10.0	19.58	56.00	Compliance
1.800000	---	15.83	9.000	L1	9.9	30.17	46.00	Compliance
1.800000	23.23	---	9.000	L1	9.9	32.77	56.00	Compliance

AC 120V/60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	---	22.90	9.000	N	10.1	33.10	56.00	Compliance
0.150000	51.13	---	9.000	N	10.1	14.87	66.00	Compliance
0.180000	---	27.79	9.000	N	10.1	26.70	54.49	Compliance
0.180000	48.66	---	9.000	N	10.1	15.83	64.49	Compliance
0.240000	---	23.19	9.000	N	10.1	28.91	52.10	Compliance
0.240000	45.41	---	9.000	N	10.1	16.69	62.10	Compliance
0.330000	---	19.53	9.000	N	10.1	29.92	49.45	Compliance
0.330000	40.51	---	9.000	N	10.1	18.94	59.45	Compliance
0.570000	---	23.25	9.000	N	10.1	22.75	46.00	Compliance
0.570000	33.18	---	9.000	N	10.1	22.82	56.00	Compliance
0.600000	---	30.19	9.000	N	10.0	15.81	46.00	Compliance
0.600000	39.05	---	9.000	N	10.0	16.95	56.00	Compliance

Note:
1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
2) Corrected Amplitude = Reading + Correction Factor
3) Margin = Limit – Corrected Amplitude

FCC§15.225, §15.205 & §15.209 - RADIATED EMISSIONS TEST

Applicable Standard

As per FCC Part 15.225

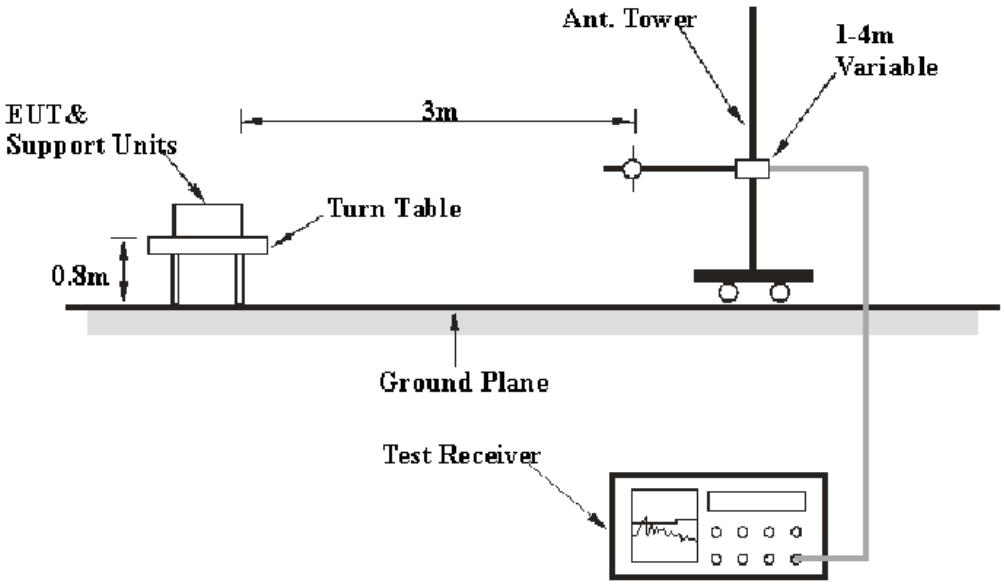
(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

EUT Setup



The radiated emission tests were performed in the 3-meter chamber a test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part Subpart C limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

According to FCC Rules, 47 CFR 15.33, the EUT emissions were investigated up to 1000 MHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
9 kHz – 150 kHz	300 Hz	1 kHz	200Hz	QP
150 kHz –30 MHz	10 kHz	30 kHz	9kHz	QP
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Factor = Antenna Factor + Cable Loss- Amplifier Gain
Corrected Amplitude = Meter Reading + Corrected Factor

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.209.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Layne Li on 2017-05-01.

Test mode: Transmitting

1) Spurious Emissions (9 kHz~30 MHz):

Indicated		Table Angle Degree	Antenna Height (m)	Detector PK/QP/Ave.	Correction Factor			Corrected Amplitude (dBμV/m) @3m	FCC Part 15.225	
Frequency (MHz)	Maximum Reading (dBμV) @3m				Ant. Factor (dB)	Cable Loss (dB)	Pre-Amp. Gain (dB)		Limit (dBμV/m) @3m	Result
0.163	3.25	0	1.1	QP	60.8	0.1	0	64.15	103.36	Pass
27.59	4.26	0	1.1	QP	34.2	0.25	0	38.71	69.54	Pass

2) Spurious Emissions (30 MHz ~1 GHz):

Frequency (MHz)	Corrected Amplitude (dBμV/m)	Detector PK/QP/Ave.	Antenna Height (m)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBμV/m)	Margin (dB)
120.92	27.96	QP	1.8	H	199	-14.70	43.5	15.54
320.6	29.1	QP	1	H	195	-10.37	46	16.9
451.45	29.22	QP	1	V	228	-7.21	46	16.78
700.18	30.87	QP	1.1	H	136	-2.45	46	15.13

FCC§15.225(a) (b) (c) – FIELD STRENGTH OF RADIATED EMISSIONS

Applicable Standard

As per FCC Part 15.225

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

EUT Setup

The field strength of radiated emissions tests were performed in the 3-meter chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part Subpart C limits.

Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Phil Zhu on 2017-03-22.

Test Mode: Transmitting

Test Result: Pass

Indicated			Table Angle Degree	Antenna Height (m)	Detector PK/QP/Ave.	Correction Factor			Corrected Amplitude (dBµV/m) @3m	FCC Part 15.225	
Frequency Range (MHz)	Mark point (MHz)	Maximum Reading (dBµV) @3m				Ant. Factor (dB)	Cable Loss (dB)	Pre-Amp. Gain (dB)		Limit (dBµV/m) @3m	Result
13.110-13.410	13.398	10.02	0	1.2	QP	35.2	0.2	0	45.42	80.5	Pass
13.410-13.553	13.552	16.85	0	1.3	QP	35.2	0.2	0	52.25	90.5	Pass
13.553-13.567	13.560	30.54	0	1.4	QP	35.2	0.2	0	65.94	124	Pass
13.567-13.710	13.567	16.2	0	1.2	QP	35.2	0.2	0	51.6	90.5	Pass
13.710-14.010	13.869	8.02	0	1.1	QP	35.2	0.2	0	43.42	80.5	Pass

FCC§15.225(e) - FREQUENCY STABILITY

Applicable Standard

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to DC power source, then an inductive antenna was connected to a Spectrum Analyzer. The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Phil Zhu on 2017-03-22.

Test Mode: Transmitting

Test Result: Pass

operating frequency is 13.56 MHz				
Power Supply (V_{DC})	**Temperature (℃)**	**Measured Frequency (MHz)**	**Frequency Error (%)**	**Part 15.225 Limit**
7.4V	-20	13.560032	0.00024%	±0.01%
	-10	13.560019	0.00014%	±0.01%
	0	13.560030	0.00022%	±0.01%
	10	13.560035	0.00026%	±0.01%
	20	13.560028	0.00021%	±0.01%
	30	13.560033	0.00024%	±0.01%
	40	13.560045	0.00033%	±0.01%
	50	13.560039	0.00029%	±0.01%
6.3V	20	13.560032	0.00013%	±0.01%

FCC§15.215(c) - 20dB EMISSION BANDWIDTH

Requirement

Per 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

Test Data

Environmental Conditions

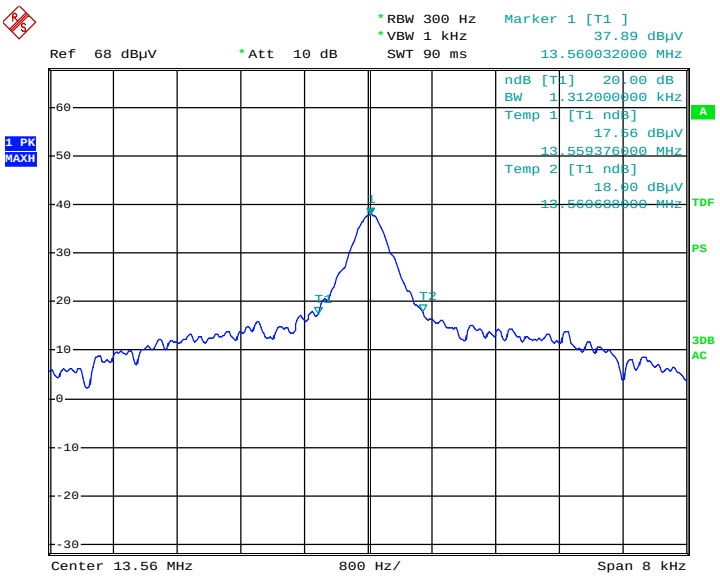
Temperature:	23 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Phil Zhu on 2017-04-01.

Test Mode: Transmitting

Test Result: Pass

20 dB Emission Bandwidth



EUT

Date: 28.MAR.2017 05:06:22

******* END OF REPORT *******