

FCC TEST REPORT
FOR
Chauvet & Sons LLC.
Wireless transmission module
Test Model: CC2500MPA2.4-LY

Prepared for	:	Chauvet & Sons LLC.
Address	:	5200 NW 108th Avenue Sunrise, FL 33351 Sunrise Florida United States
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	:	December 10, 2019
Number of tested samples	:	1
Sample number	:	Prototype
Date of Test	:	December 10, 2019~ January 08, 2020
Date of Report	:	January 08, 2020

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

Report Reference No. : LCS191210048AEA

Date of Issue..... : January 08, 2020

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 : Chauvet & Sons LLC.

**Address..... : 5200 NW 108th Avenue Sunrise, FL 33351 Sunrise Florida United
States**

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

Shenzhen LCS Compliance Testing Laboratory Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen LCS Compliance Testing Laboratory Ltd. is acknowledged as copyright owner and source of the material. Shenzhen LCS Compliance Testing Laboratory Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test Item Description..... : Wireless transmission module

Trade Mark : CHAUVET

Test Model..... : CC2500MPA2.4-LY

Ratings..... : DC 2.4-3.6V

Result : Positive

Compiled by:

Marry Chen

Marry Chen /Administrators

Supervised by:

Aking Jin

Aking Jin /Technique principal

Approved by:

Gavin Liang

Gavin Liang/ Manager

FCC -- TEST REPORT**Test Report No. : LCS191210048AEA**January 08, 2020

Date of issue

Test Model..... : CC2500MPA2.4-LY

EUT..... : Wireless transmission module

Applicant..... : Chauvet & Sons LLC.

Address..... : 5200 NW 108th Avenue Sunrise, FL 33351 Sunrise Florida United States

Telephone..... : /

Fax..... : /

Manufacturer..... : Chauvet & Sons LLC.

Address..... : 5200 NW 108th Avenue Sunrise, FL 33351 Sunrise Florida United States

Telephone..... : /

Fax..... : /

Factory..... : Chauvet & Sons LLC.

Address..... : 5200 NW 108th Avenue Sunrise, FL 33351 Sunrise Florida United States

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	January 08, 2020	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION	6
1.1. Description of Device (EUT)	6
1.2. Support Equipment List	6
1.3. External I/O.....	6
1.4. Description of Test Facility	6
1.5. Statement of the Measurement Uncertainty.....	7
1.6. Measurement Uncertainty	7
1.7. Description of Test Modes	7
1.8. Channel List and Frequency	8
2. TEST METHODOLOGY	9
2.1 EUT Configuration	9
2.2. EUT Exercise.....	9
2.3. General Test Procedures.....	9
3. SYSTEM TEST CONFIGURATION	10
3.1. Justification	10
3.2. EUT Exercise Software	10
3.3. Special Accessories.....	10
3.4. Block Diagram/Schematics	10
3.5. Equipment Modifications.....	10
3.6. Test Setup	10
4. SUMMARY OF TEST RESULTS.....	11
5. TEST RESULT.....	12
5.1. Radiated Emission Measurement.....	12
5.2. Power Line Conducted Emissions.....	21
5.3. Band-edge Measurement	24
5.4. 99% Occupied Bandwidth and 20 dB Bandwidth Measurement	26
5.5. ANTENNA REQUIREMENT.....	28
6. LIST OF MEASURING EQUIPMENT	29
7. TEST SETUP PHOTOGRAPHS OF EUT	30
8. EXTERIOR PHOTOGRAPHS OF EUT	30
9. INTERIOR PHOTOGRAPHS OF EUT.....	30

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	: Wireless transmission module
Test Model	: CC2500MPA2.4-LY
Power Supply	: DC 2.4-3.6V
Hardware version	: 24TRGC5-V4
Software version	: V1.8
2.4G Operation frequency	2433-2481MHz (2433MHz, 2436MHz, 2439MHz, 2443MHz, 2446MHz, 2449MHz, 2452MHz, 2455MHz, 2459MHz, 2462MHz, 2465MHz, 2468MHz, 2471MHz, 2475MHz, 2478MHz, 2481MHz)
Channel Number	: 16 channels
Modulation Type	: GFSK
Antenna Description	: Internal Antenna, 2.5dBi

1.2. Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate
--	--	--	--	--

1.3. External I/O

I/O Port Description	Quantity	Cable
USB Port	1	---

1.4. Description of Test Facility

FCC Registration Number. is 254912.
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 operates in the unlicensed ISM band at 2.4GHz. 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.

It was pre-tested on the positioned of each 3 axis. The worst case was found positioned on X-plane.

Mode of Operations	Transmitting Frequency (MHz)
GFSK	2433
	2455
	2481
For Conducted Emission	
Test Mode	TX Mode
For Radiated Emission	
Test Mode	TX Mode

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-2433MHz.

***Note: Using a temporary antenna connector for the EUT when the conducted measurements are performed.

1.8.Channel List and Frequency

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2433	9	2459
2	2436	10	2462
3	2439	11	2465
4	2443	12	2468
5	2446	13	2471
6	2449	14	2475
7	2452	15	2478
8	2455	16	2481

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

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 transmit condition.

Using four samples to test, each sample was set up separately for a single transmitter frequency point, which was automatically launched

3.2. EUT Exercise Software

N/A

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
§15.203	Antenna Requirements	Compliant
§15.207(a)	Power Line Conducted Emissions	Compliant
§15.205(a), §15.209(a), §15.249(a), §15.249(c)	Radiated Emissions Measurement	Compliant
§15.205, §15.249(d)	Band Edges Measurement	Compliant
§15.249, §15.215	20 dB Bandwidth	Compliant

5. TEST RESULT

5.1. Radiated Emission Measurement

5.1.1. Standard Applicable

1). According to §15.249 (d) and RSS-210 B.10 (b): 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) and RSS-210 B.10 (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.

5.1.2. Measuring Instruments and Setting

Please refer to equipment's 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 / 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

5.1.3. 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 ($\pm 45^\circ$) 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 ($\pm 45^\circ$) 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.

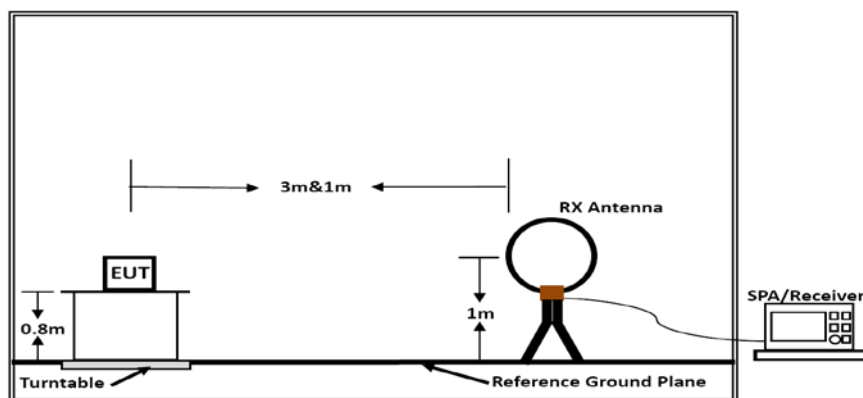
Premeasurement:

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

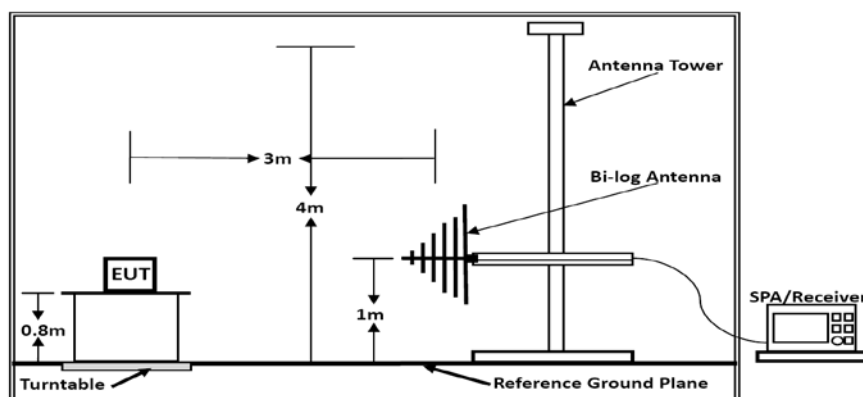
Final measurement:

- 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.

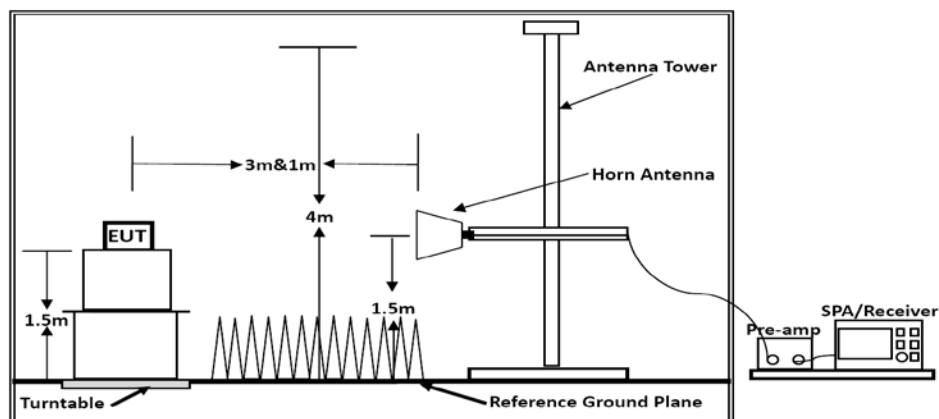
5.1.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

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

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1.5m]})$ (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	24.5°C	Humidity	53.8%
Test Engineer	Scent Hu	Configurations	TX

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dB)	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.

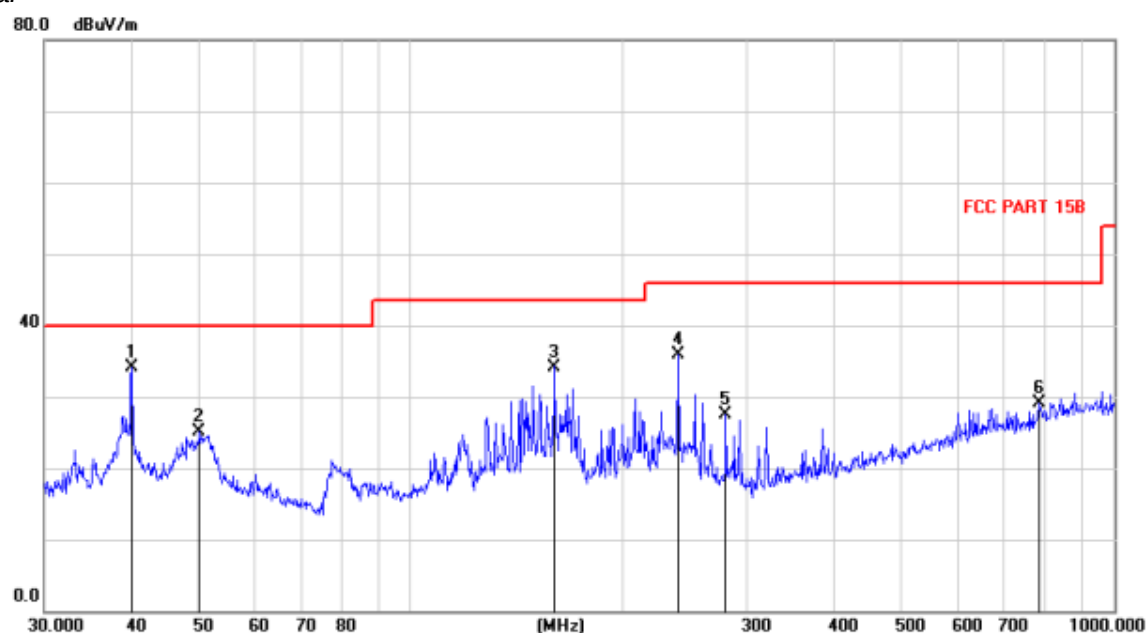
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

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

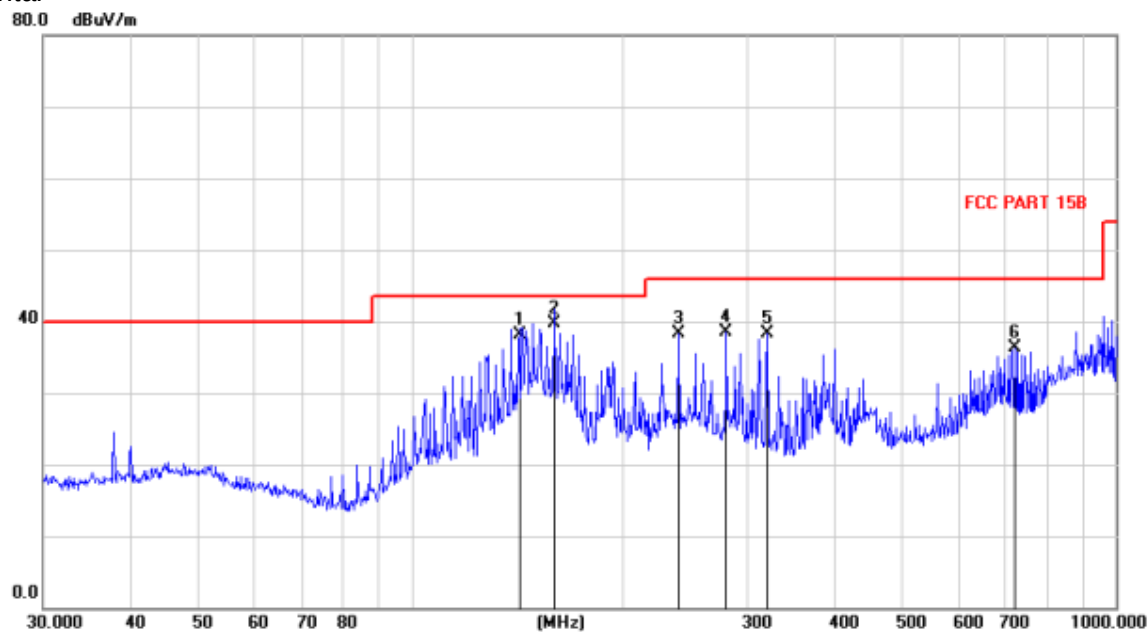
Temperature	24.5°C	Humidity	53.8%
Test Engineer	Scent Hu	Configurations	TX

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Margin dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	40.0118	20.48	13.56	34.04	40.00	-5.96	QP			
2		49.9689	10.67	14.50	25.17	40.00	-14.83	QP			
3		159.9947	24.32	9.88	34.20	43.50	-9.30	QP			
4		239.9873	23.42	12.52	35.94	46.00	-10.06	QP			
5		280.0237	14.18	13.26	27.44	46.00	-18.56	QP			
6		784.4055	7.53	21.56	29.09	46.00	-16.91	QP			

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	cm	degree	Comment
1		142.3243	28.36	9.80	38.16	43.50	-5.34	QP		
2	*	159.9947	29.86	9.88	39.74	43.50	-3.76	QP		
3		239.9873	25.76	12.52	38.28	46.00	-7.72	QP		
4		280.0237	25.22	13.26	38.48	46.00	-7.52	QP		
5		320.0772	24.07	14.31	38.38	46.00	-7.62	QP		
6		720.1458	15.98	20.26	36.24	46.00	-9.76	QP		

Note:

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

5.1.8. Results for Radiated Emissions (Above 1GHz)

Field Strength of Fundamental (TX-2433MHz)						
Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Result
2433	H	83.05	71.92	114.00	94.00	Pass
2433	V	80.93	70.74	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.
4866.00	49.62	33.06	35.04	3.94	51.58	74.00	-22.42	Peak	Horizontal
4866.00	34.05	33.06	35.04	3.94	36.01	54.00	-17.99	Average	Horizontal
4866.00	48.66	33.06	35.04	3.94	50.62	74.00	-23.38	Peak	Vertical
4866.00	32.32	33.06	35.04	3.94	34.28	54.00	-19.72	Average	Vertical

Field Strength of Fundamental (TX-2455MHz)						
Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Result
2455	H	82.86	72.18	114.00	94.00	Pass
2455	V	80.74	70.91	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.
4910.00	48.79	33.16	35.15	3.93	50.76	74.00	-23.24	Peak	Horizontal
4910.00	30.55	33.16	35.15	3.93	32.52	54.00	-21.48	Average	Horizontal
4910.00	48.19	33.16	35.15	3.93	50.16	74.00	-23.84	Peak	Vertical
4910.00	33.16	33.16	35.15	3.93	35.13	54.00	-18.87	Average	Vertical

Field Strength of Fundamental (TX-2481MHz)						
Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Result
2481	H	81.93	72.04	114.00	94.00	Pass
2481	V	80.86	70.41	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.
4962.00	48.19	33.26	35.14	3.98	50.29	74.00	-23.71	Peak	Horizontal
4962.00	33.42	33.26	35.14	3.98	35.52	54.00	-18.48	Average	Horizontal
4962.00	52.55	33.26	35.14	3.98	54.65	74.00	-19.35	Peak	Vertical
4962.00	35.55	33.26	35.14	3.98	37.65	54.00	-16.35	Average	Vertical

Notes:

1. Measuring frequencies from 9 KHz~10th harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30MHz.
2. Radiated emissions measured in frequency range from 9 KHz~10th harmonic (ex. 26GHz) were made with an instrument using Peak detector mode.
3. No emission was be recorded above 18GHz means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5.2. Power Line Conducted Emissions

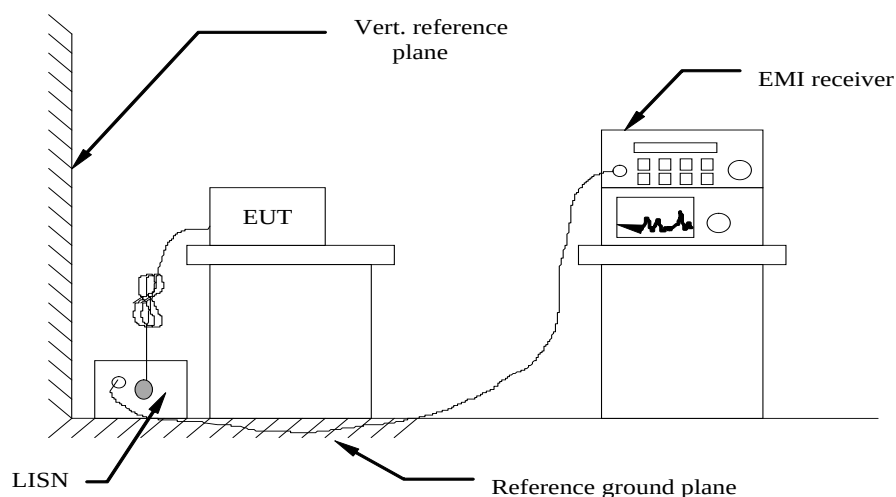
5.2.1. Standard Applicable

According to §15.207 (a) & RSS-Gen § 8.8: 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 (dB μ V)	
	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

5.2.2. Block Diagram of Test Setup



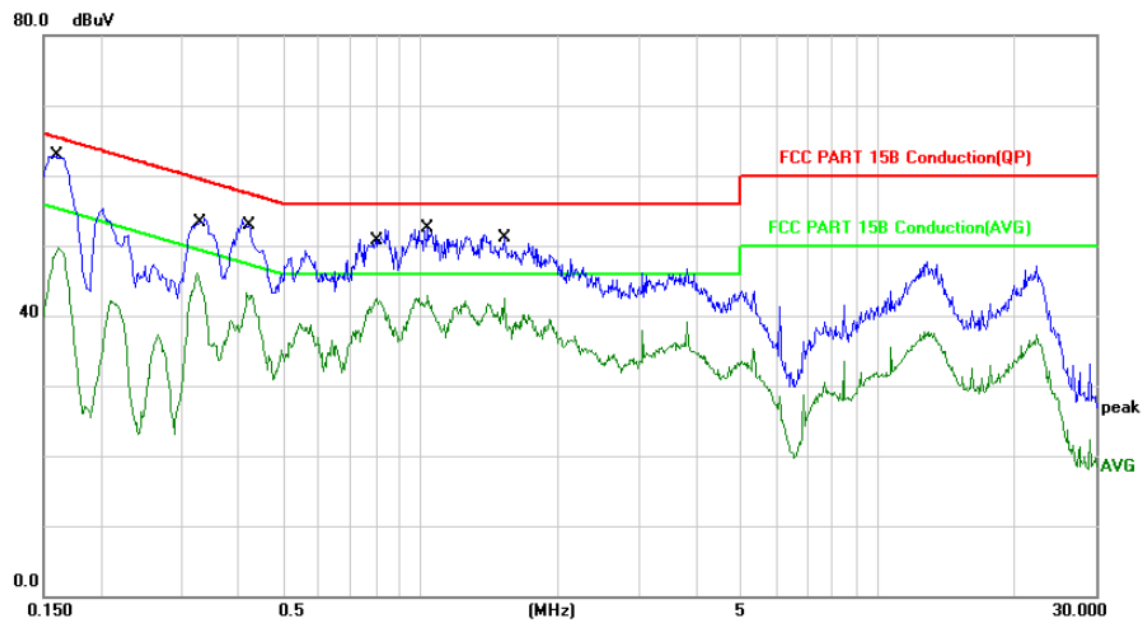
5.2.3. Test Results

PASS.

The test data please refer to following page.

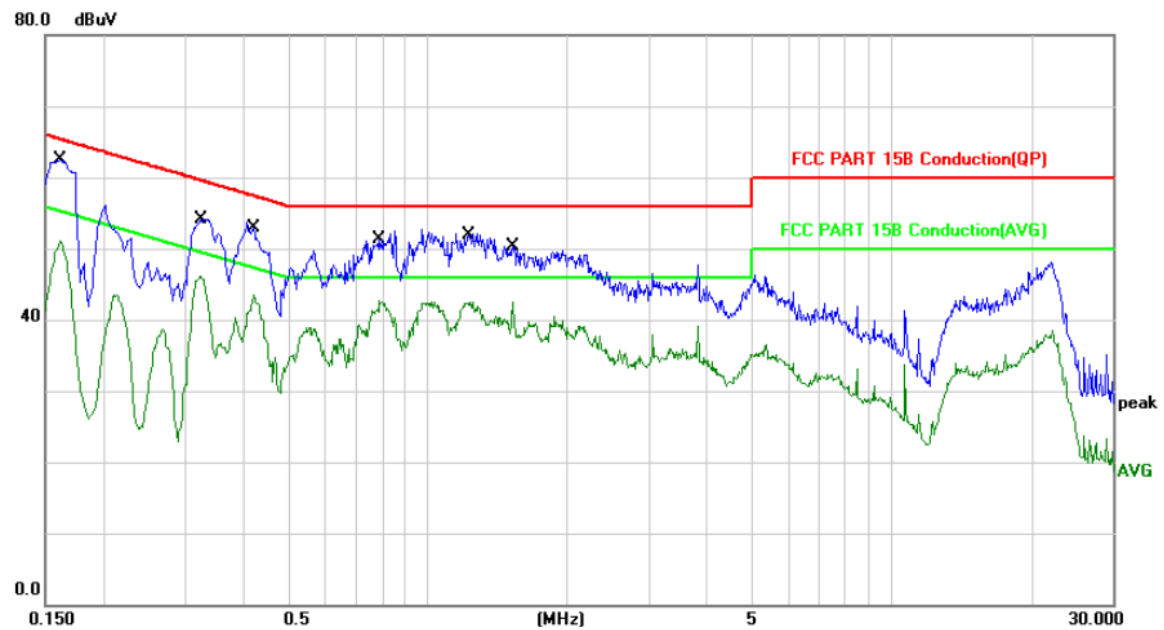
AC Conducted Emission of charge from Charge PC mode @ AC 120V/60Hz (worst case)

Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1620	50.32	10.23	60.55	65.36	-4.81	QP	
2		0.1620	39.42	10.23	49.65	55.36	-5.71	AVG	
3		0.3260	41.14	10.20	51.34	59.55	-8.21	QP	
4		0.3260	35.91	10.20	46.11	49.55	-3.44	AVG	
5		0.4178	40.44	10.20	50.64	57.49	-6.85	QP	
6		0.4178	33.02	10.20	43.22	47.49	-4.27	AVG	
7		0.8020	38.52	10.20	48.72	56.00	-7.28	QP	
8		0.8020	32.38	10.20	42.58	46.00	-3.42	AVG	
9		1.0420	40.35	10.20	50.55	56.00	-5.45	QP	
10	*	1.0420	32.67	10.20	42.87	46.00	-3.13	AVG	
11		1.5300	38.95	10.20	49.15	56.00	-6.85	QP	
12		1.5300	32.37	10.20	42.57	46.00	-3.43	AVG	

Neutral



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1620	50.18	10.23	60.41	65.36	-4.95	QP	
2		0.1620	40.79	10.23	51.02	55.36	-4.34	AVG	
3		0.3260	41.87	10.20	52.07	59.55	-7.48	QP	
4		0.3260	36.00	10.20	46.20	49.55	-3.35	AVG	
5		0.4218	40.75	10.20	50.95	57.41	-6.46	QP	
6		0.4218	33.29	10.20	43.49	47.41	-3.92	AVG	
7		0.7900	39.17	10.20	49.37	56.00	-6.63	QP	
8	*	0.7900	32.52	10.20	42.72	46.00	-3.28	AVG	
9		1.2379	39.51	10.20	49.71	56.00	-6.29	QP	
10		1.2379	32.26	10.20	42.46	46.00	-3.54	AVG	
11		1.5339	38.05	10.20	48.25	56.00	-7.75	QP	
12		1.5339	32.39	10.20	42.59	46.00	-3.41	AVG	

***Note: Pre-scan all modes and recorded the worst case results in this report

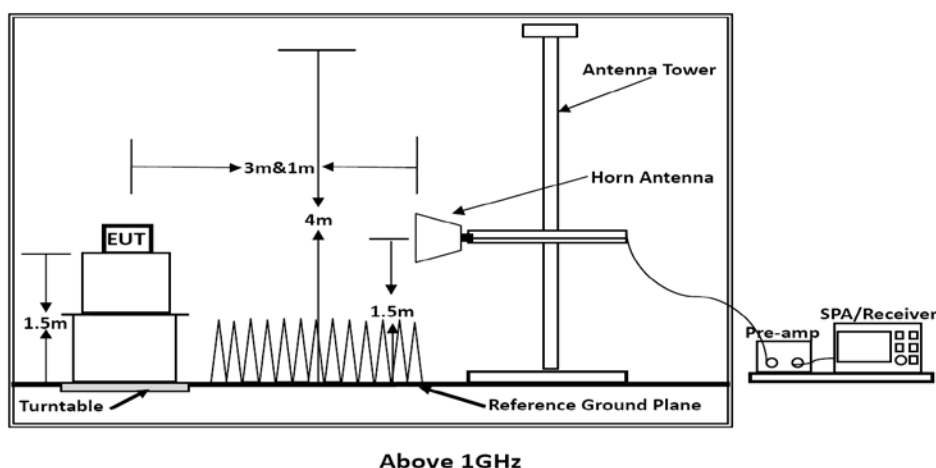
5.3. Band-edge Measurement

5.3.1 Standard Applicable

According to FCC §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.

According to RSS-210 B.10 (b): Emissions radiated outside of the specified frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

5.3.2. Test Setup Layout



5.3.3. Measuring Instruments and Setting

Please refer to equipment list in this report.

5.3.4. Test Procedures

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 ($\pm 45^\circ$) 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.

5.3.5. Measuring Instruments and Setting

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.
2310.00	54.59	33.11	35.16	3.74	56.28	74.00	-17.72	Peak	Horizontal
2310.00	40.32	33.11	35.16	3.74	42.01	54.00	-11.99	Average	Horizontal
2390.00	48.13	33.11	35.16	3.75	49.83	74.00	-24.17	Peak	Vertical
2390.00	38.15	33.11	35.16	3.75	39.85	54.00	-14.15	Average	Vertical
2483.50	56.74	33.11	35.21	3.79	58.43	74.00	-15.57	Peak	Horizontal
2483.50	47.17	33.11	35.21	3.79	48.86	54.00	-5.14	Average	Horizontal
2500.00	50.98	33.11	35.21	3.79	52.67	74.00	-21.33	Peak	Vertical
2500.00	38.25	33.11	35.21	3.79	39.94	54.00	-14.06	Average	Vertical

***Note:

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

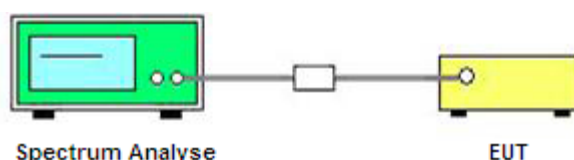
5.4. 99% Occupied Bandwidth and 20 dB Bandwidth Measurement

5.4.1. Standard Applicable

According to § 2.1049 and RSS-Gen section 6.7 “The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.”

In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

5.4.2. Block Diagram of Test Setup



5.4.3. Test Procedure

Use the following spectrum analyzer settings:

Span = 3MHz

RBW = 30 KHz

VBW = 100 KHz

Sweep = auto

Detector function = peak

Trace = max hold

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 Results

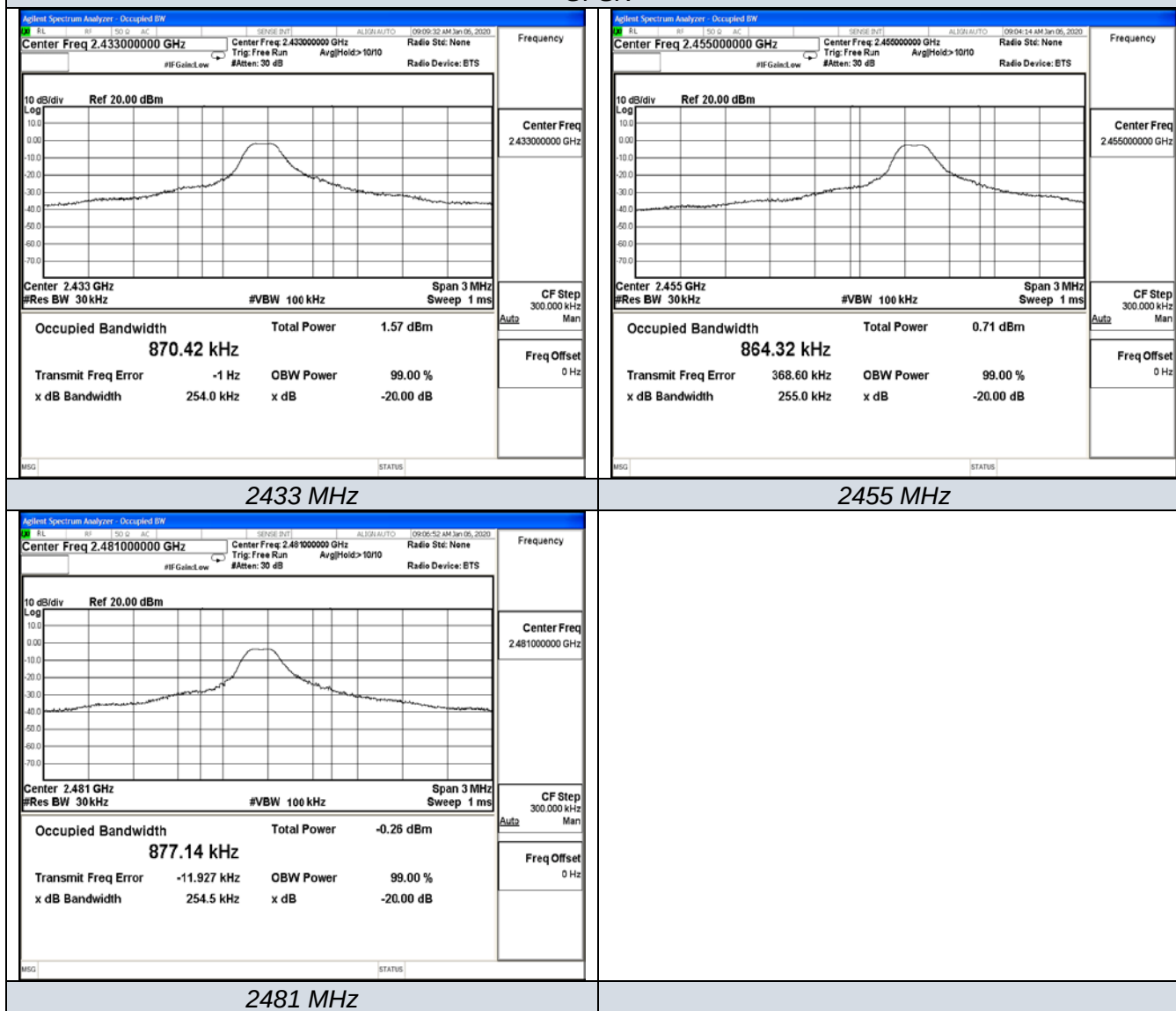
Test Result of 99% and 20dB Bandwidth Measurement			
Test Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)
2433	0.2540	0.87042	Non-Specified
2455	0.2550	0.86432	Non-Specified
2481	0.2545	0.87714	Non-Specified

Remark:

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

20dB Bandwidth and 99% Bandwidth

GFSK



5.5. ANTENNA REQUIREMENT

5.5.1. Standard Applicable

According to § 15.203 and RSS-Gen, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

5.5.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is 2.5.dBi, and the antenna is an Internal antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.5.3 Result

Compliance.

6. List of Measuring Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2019-06-11	2020-06-10
2	Power Sensor	R&S	NRV-Z81	100458	2019-06-11	2020-06-10
3	Power Sensor	R&S	NRV-Z32	10057	2019-06-11	2020-06-10
4	Test Software	Tonscend	JS1120-2	/	N/A	N/A
5	RF Control Unit	Tonscend	JS0806-2	N/A	2019-06-11	2020-06-10
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2019-06-11	2020-06-10
7	DC Power Supply	Agilent	E3642A	N/A	2019-11-15	2020-11-14
8	EMI Test Software	AUDIX	E3	/	N/A	N/A
9	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2019-06-12	2020-06-11
10	Positioning Controller	MF	MF-7082	N/A	2019-06-12	2020-06-11
11	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2019-07-26	2020-07-25
12	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2019-07-26	2020-07-25
13	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2019-07-01	2020-06-30
14	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2019-09-20	2020-09-19
15	Broadband Preamplifier	SCHWARZBECK	BBV 9719	9719-025	2019-09-20	2020-09-19
16	EMI Test Receiver	R&S	ESR 7	101181	2019-06-12	2020-06-11
17	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2019-11-15	2020-11-14
18	AMPLIFIER	QuieTek	QTK	CHM/0809065	2019-11-15	2020-11-14
19	RF Cable-R03m	Jye Bao	RG142	CB021	2019-06-12	2020-06-11
20	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2019-06-12	2020-06-11
21	6dB Attenuator	/	100W/6dB	1172040	2019-06-11	2020-06-10
22	3dB Attenuator	/	2N-3dB	/	2019-06-11	2020-06-10
23	EMI Test Receiver	R&S	ESPI	101840	2019-06-11	2020-06-10
24	Artificial Mains	R&S	ENV216	101288	2019-06-12	2020-06-11
25	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2019-06-11	2020-06-10

Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD.

7. TEST SETUP PHOTOGRAPHS OF EUT

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

8. EXTERIOR PHOTOGRAPHS OF EUT

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

9. INTERIOR PHOTOGRAPHS OF EUT

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

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