TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 15.247
TEST REPORT

For

Zhejiang Feishen Vehicle Co., LTD.

North Lake Road Hardware Science And Technology In ZheJiang Province, Yong Kang, 321300 China

FCC ID: A6E-GT15

Report Type:	Product Type:
Original Report	Remote Controller

Test Engineer:	Chris Wang
Report Number:	RSHD200327002-00A
Report Date:	2020-05-11
Reviewed By:	Oscar Ye EMC Manager
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)

Applicant:	Zhejiang Feishen Vehicle Co., LTD.
Tested Model:	GT15
Series Model:	511946, 511948, 511949
Model Difference	See Declaration Letter
Product Type:	Remote Controller
Power Supply:	DC 6.0V from batteries or DC5.5V charing for rechargeable battery by adapter
RF Function:	SRD
Operating Band/Frequency:	2405~2478MHz
Total Channel Number:	147
Hopping Channel Number	16
Minimum Hopping Channel Separation:	1.0 MHz
Modulation Type	FSK
Antenna Type:	Dipole Antenna
Maximum Antenna Gain:	2.0 dBi

**All measurement and test data in this report was gathered from production sample serial number: 20200327002. (Assigned by the BACL. The EUT supplied by the applicant was received on 2020-03-27)*

Objective

This test report is prepared on behalf of *Zhejiang Feishen Vehicle Co., LTD*. in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207 , 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliant Testing of Unlicensed Wireless Devices and FCC 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Bay Area Compliant 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		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

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.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Channel list for FHSS (FSK) Modulation:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2405	74	2441.5
2	2405.5	75	2442
…	…	…	…
…	…	…	…
73	2441	147	2478

For Transmittting mode: EUT was tested with Channel 1, 73, 147.
For Hopping mode: 16 random frequency hopping channels was test.

The 16 random hopping channels selected form 147channels, the formula as follow:

F= Next_ch*0.5MHz+2400MHz

Next_ch should be odd or even at the same time

The Minimum Hopping Channel seaparation should be 1MHz.

EUT Exercise Software

The EUT was tested in the engineering mode; EUT can be setup for fixed channel mode and hopping mode.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

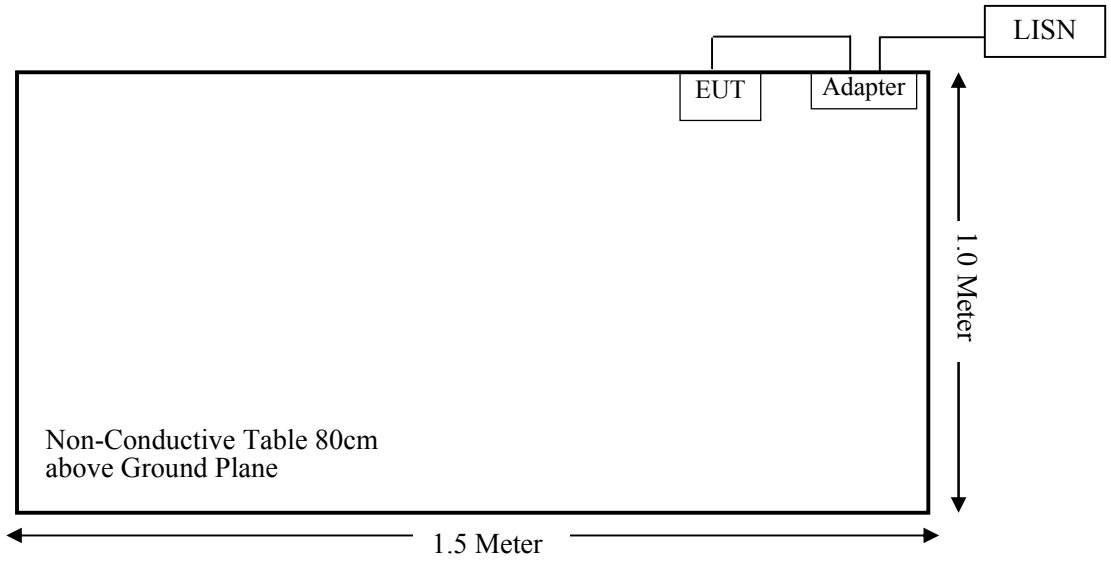
Manufacturer	Description	Model	Serial Number
/	Adapter	/	/

External I/O Cable

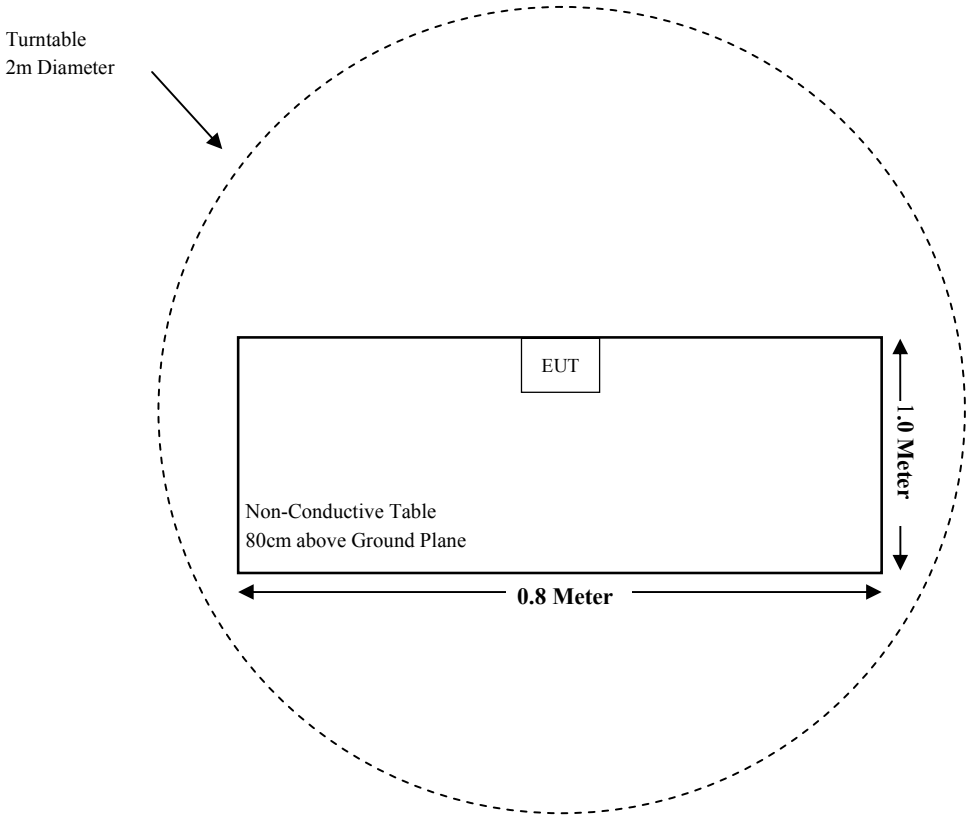
Cable Description	Length (m)	From Port	To
Power Cable	1.0	EUT	Adapter
Power Cable	1.0	Adapter	LISN

Block Diagram of Test Setup

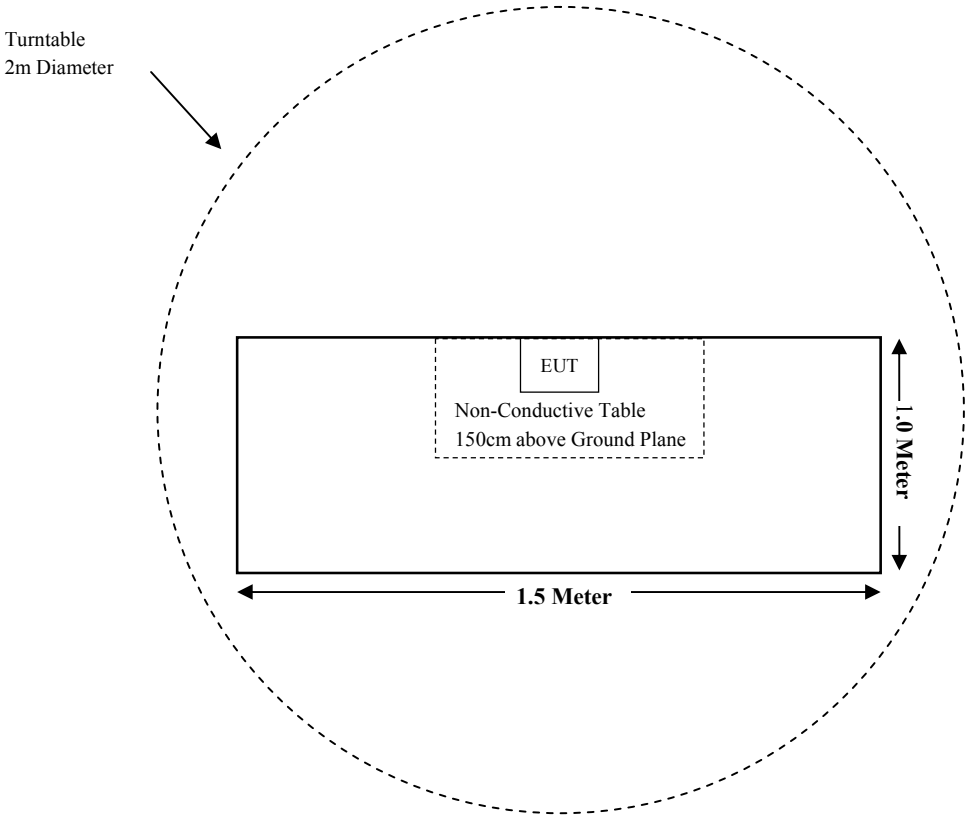
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i)§1.1310 & §2.1093	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliant
§15.247(a)(1)	20 dB Emission Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2019-11-30	2020-11-29
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2019-12-26	2022-12-25
Sonoma Instrunent	Pre-amplifier	310N	171205	2019-08-14	2020-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2019-05-30	2020-05-29
ETS-LINDGREN	Horn Antenna	3115	6229	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3116	00084159	2019-12-12	2022-12-12
Mini-Circuits	Amplifier	2641-1	491	2020-02-20	2021-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2020-03-22	2021-03-21
MICRO-TRONICS	Notch filter	BRM50702	G024	2019-08-05	2020-08-04
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2019-11-30	2020-11-29
Narda	Attenuator/2dB	2dB	002	2019-08-15	2020-08-14
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Zhejiang Feishen	RF Cable	Zhejiang Feishen C01	C01	Each Time	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-08-05	2020-08-04
Rohde & Schwarz	LISN	ENV216	3560655016	2019-11-30	2020-11-29
Audix	Test Software	e3	V9	N/A	N/A
Rohde & Schwarz	Pulse limiter	ESH3-Z2	0357.8810.54	2020-01-10	2021-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2019-08-15	2020-08-14

*** 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§15.247 (i), §1.1310 &§2.1093 – RF EXPOSURE

Applicable Standard

According to§2.1093and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

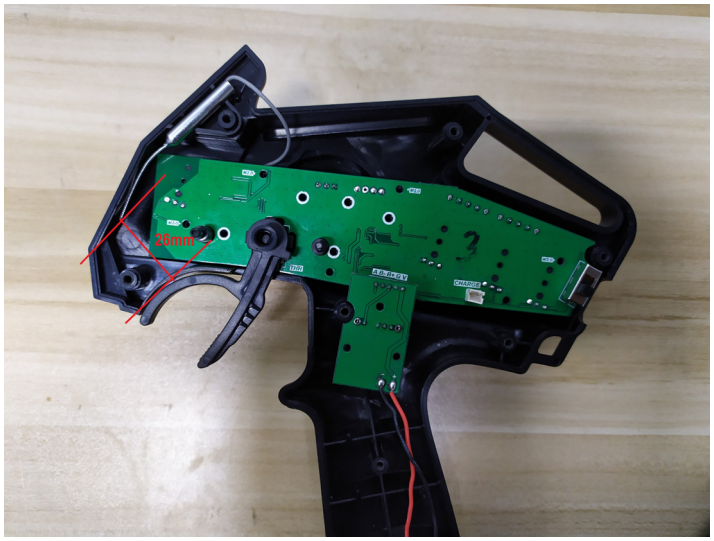
For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:
[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Measurement Result

Frequency Range (MHz)	Max Tune-up Conducted Power		Calculated Distance (mm)	Calculated Value	Threshold (10-g extremity SAR)	SAR Test Exclusion
	(dBm)	(mW)				
2405-2478	16.00	39.81	26	2.4	7.5	Yes

Note: The EUT is a handheld device.



Result: No SAR test is required.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

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

Antenna Connector Construction

The EUT has a Dipole antenna for SRD which was permanently attached and the antenna gain is 2.0dBi; fulfill the requirement of this section. Please refer to the EUT photos.

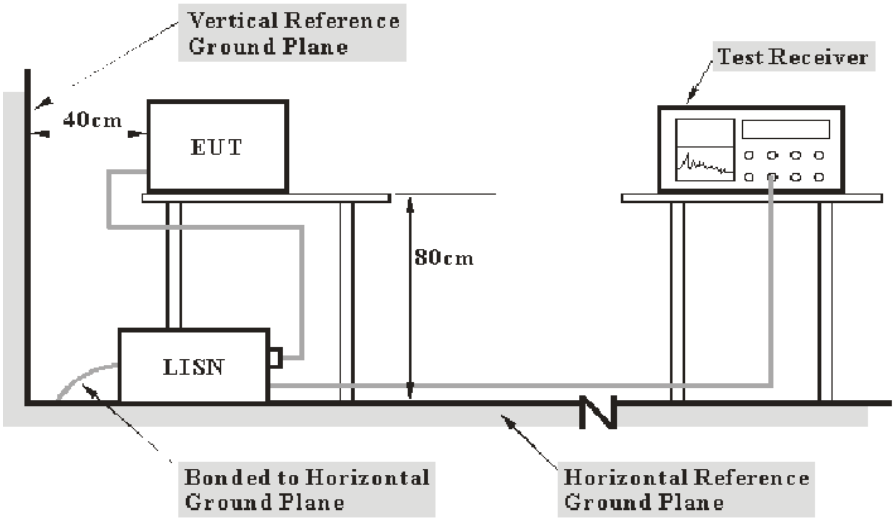
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

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 measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

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

ANSI C63.10-2013 clause 6.2

During the conducted emission test, the adapter was connected to the outlet of the LISN.

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.

Factor & Over Limit Calculation

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

Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

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

Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, FCC Part 15.207.

Test Data

Environmental Conditions

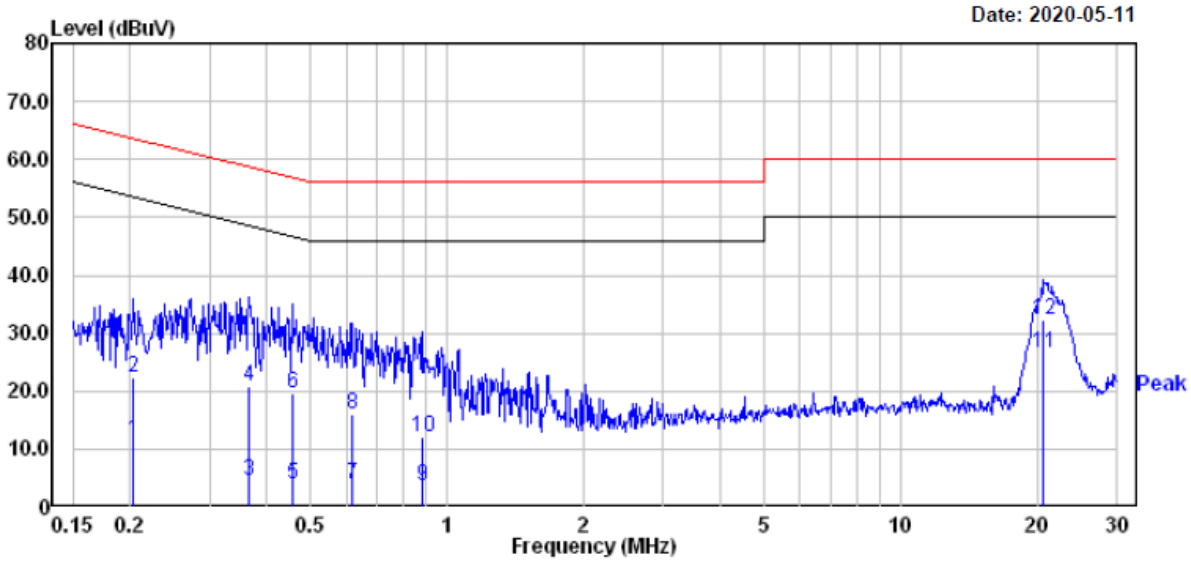
Temperature:	20.2 ℃
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Chris Wang on 2020-05-11.

Test Result: Compliant.

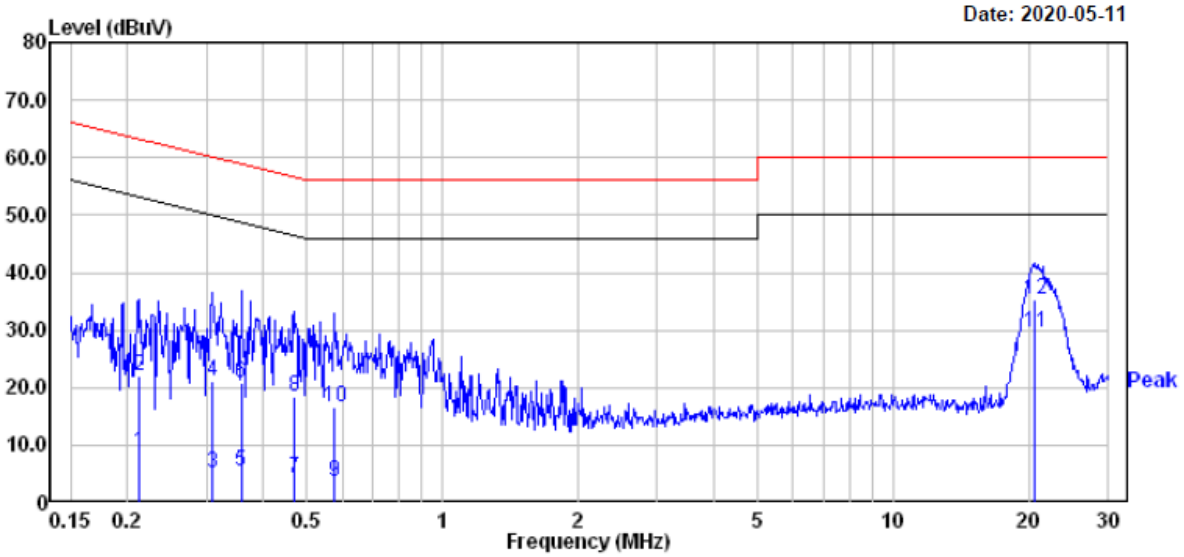
EUT operation mode: Charging

AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.204	-8.20	19.82	11.62	53.45	-41.83	Average
2	0.204	2.40	19.82	22.22	63.45	-41.23	QP
3	0.367	-15.20	19.78	4.58	48.56	-43.98	Average
4	0.367	1.10	19.78	20.88	58.56	-37.68	QP
5	0.456	-15.70	19.75	4.05	46.76	-42.71	Average
6	0.456	-0.20	19.75	19.55	56.76	-37.21	QP
7	0.617	-15.70	19.75	4.05	46.00	-41.95	Average
8	0.617	-3.80	19.75	15.95	56.00	-40.05	QP
9	0.880	-16.11	19.73	3.62	46.00	-42.38	Average
10	0.880	-7.51	19.73	12.22	56.00	-43.78	QP
11	20.704	6.61	19.91	26.52	50.00	-23.48	Average
12	20.704	12.41	19.91	32.32	60.00	-27.68	QP

AC 120V/60 Hz, Neutral



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.212	-11.10	19.82	8.72	53.14	-44.42	Average
2	0.212	2.20	19.82	22.02	63.14	-41.12	QP
3	0.310	-14.81	19.83	5.02	49.97	-44.95	Average
4	0.310	1.19	19.83	21.02	59.97	-38.95	QP
5	0.358	-14.50	19.80	5.30	48.78	-43.48	Average
6	0.358	1.00	19.80	20.80	58.78	-37.98	QP
7	0.469	-15.49	19.75	4.26	46.54	-42.28	Average
8	0.469	-1.19	19.75	18.56	56.54	-37.98	QP
9	0.576	-16.00	19.75	3.75	46.00	-42.25	Average
10	0.576	-3.10	19.75	16.65	56.00	-39.35	QP
11	20.704	9.71	19.91	29.62	50.00	-20.38	Average
12	20.704	15.51	19.91	35.42	60.00	-24.58	QP

Note:

1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Over Limit (dB) = Read level (dBµV) + Factor (dB) - Limit (dBµV)

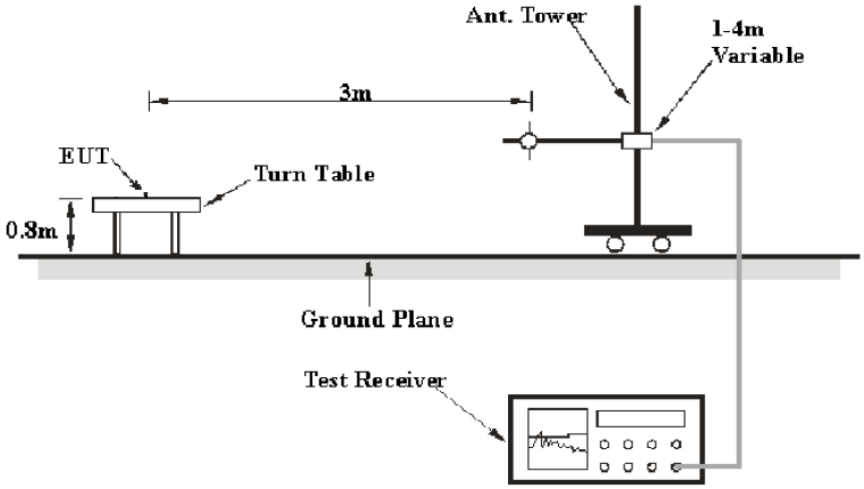
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

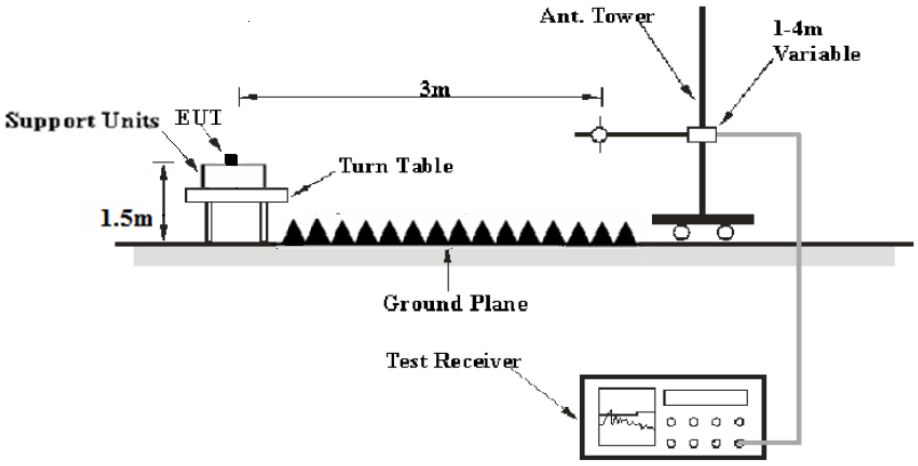
FCC §15.205; §15.209; §15.247(d)

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz - 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1GHz	1MHz	3 MHz	/	PK
	1MHz	3 MHz	/	Ave

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

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

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB 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 Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Note： If the maximized peak measured value complies with under QP limit more the 6dB,then it is Unnecessary to perform QP measurement.

Test Data

Environmental Conditions

Temperature:	24.2 ℃~24.3℃
Relative Humidity:	50%~51%
ATM Pressure:	101.2 kPa~101.3kPa

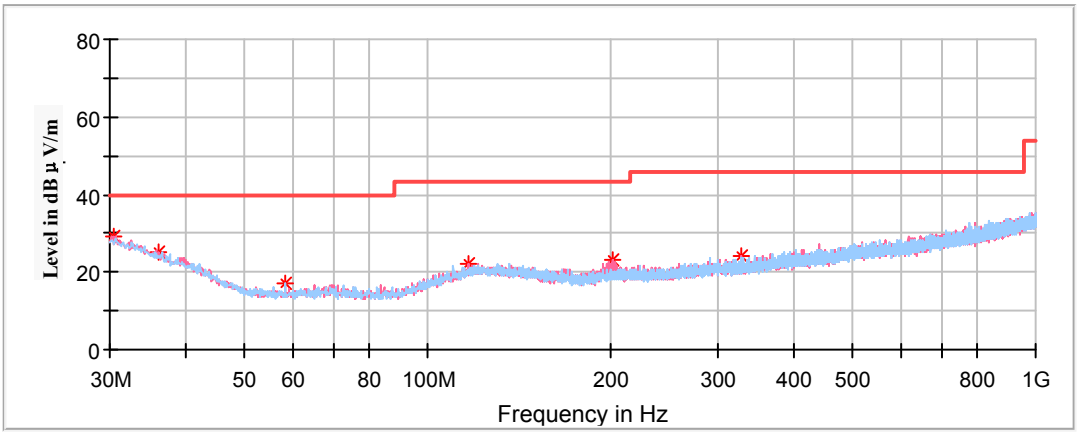
The testing was performed by Chris Wang from 2020-04-07 to 2020-04-13.

EUT operation mode: Transmitting

Spurious Emission Test:

30MHz-1GHz:

Pre-Scan with low, middle and high channels in the X,Y and Z axes of orientation, the worst case ***high channel in X-axis of orientation*** *was recorded*



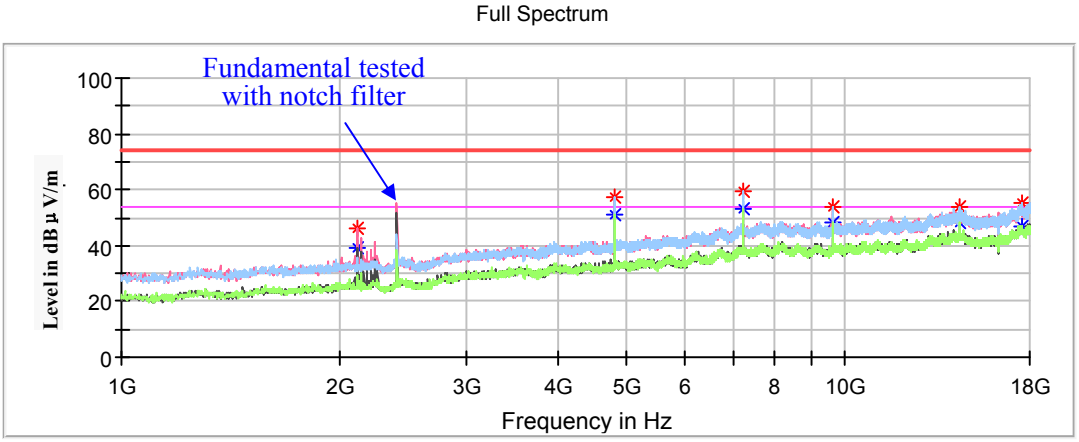
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Height (cm)	Polar (H/V)				
30.363750	29.37	200.0	V	52.0	-4.2	40.00	10.63
36.183750	25.31	200.0	V	220.0	-8.1	40.00	14.69
58.372500	16.87	100.0	H	239.0	-17.9	40.00	23.13
116.815000	22.22	200.0	V	46.0	-11.8	43.50	21.28
201.326250	23.37	100.0	V	99.0	-12.3	43.50	20.13
327.305000	24.04	100.0	V	288.0	-9.9	46.00	21.96

1GHz-18GHz:

*Pre-Scan in the X,Y and Z axes of orientation, the worst case **in X-axis of orientation** was recorded*

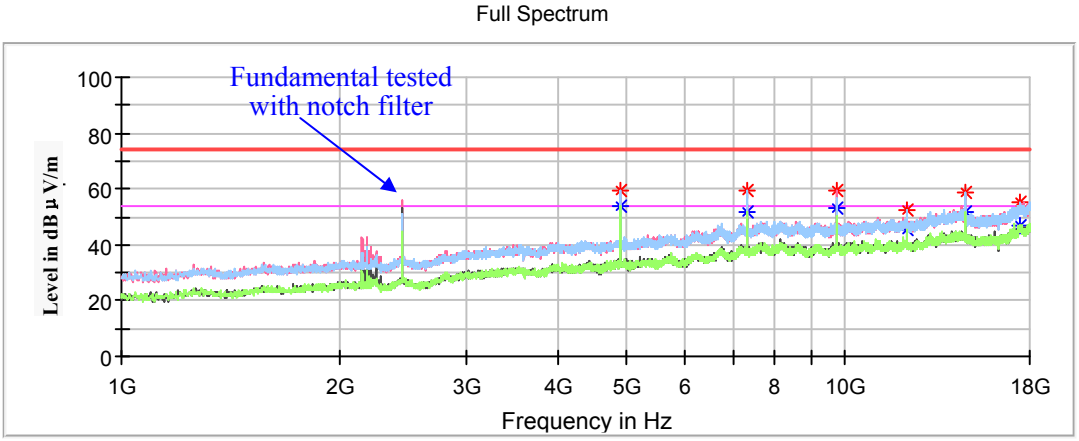
Note:
1. This test was performed with the 2.4-2.5 GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Low Channel: 2405MHz



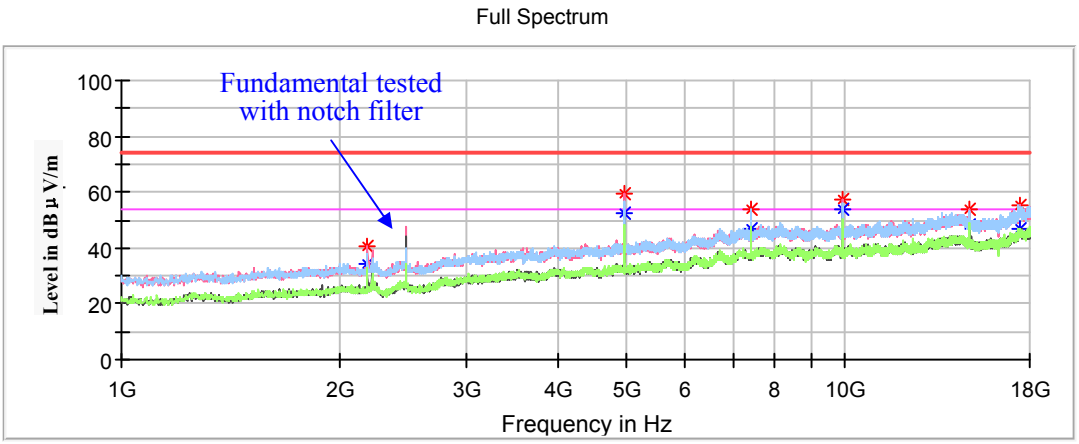
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
2115.20	---	38.84	150.0	V	32.0	-14.0	54.00	15.16
2115.20	45.97	---	150.0	V	32.0	-14.0	74.00	28.03
4810.00	---	51.40	200.0	H	159.0	-5.6	54.00	2.60
4810.00	57.31	---	200.0	H	159.0	-5.6	74.00	16.69
7215.00	---	53.14	200.0	H	159.0	0.4	54.00	0.86
7215.00	59.56	---	200.0	H	159.0	0.4	74.00	14.44
9620.70	---	48.19	150.0	H	196.0	2.1	54.00	5.81
9620.70	53.99	---	150.0	H	196.0	2.1	74.00	20.01
14431.70	---	48.48	150.0	H	139.0	6.5	54.00	5.52
14431.70	54.02	---	150.0	H	139.0	6.5	74.00	19.98
17524.00	54.99	---	200.0	H	30.0	8.9	74.00	19.01
17525.70	---	46.77	200.0	H	234.0	8.9	54.00	7.23

Middle Channel: 2441MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
4882.00	---	53.94	100.0	H	351.0	-5.4	54.00	0.06
4882.00	59.27	---	100.0	H	351.0	-5.4	74.00	14.73
7323.00	59.38	---	150.0	H	127.0	0.6	74.00	14.62
7323.00	---	52.07	150.0	H	127.0	0.6	54.00	1.93
9763.50	---	53.09	200.0	V	161.0	2.0	54.00	0.91
9763.50	59.38	---	200.0	V	161.0	2.0	74.00	14.62
12203.00	52.48	---	200.0	H	136.0	3.5	74.00	21.52
12203.00	---	45.27	200.0	H	136.0	3.5	54.00	8.73
14644.20	58.75	---	100.0	H	126.0	6.1	74.00	15.25
14644.20	---	52.07	100.0	H	126.0	6.1	54.00	1.93
17503.60	---	46.64	200.0	V	53.0	8.9	54.00	7.36
17503.60	55.39	---	200.0	V	53.0	8.9	74.00	18.61

High Channel: 2478MHz

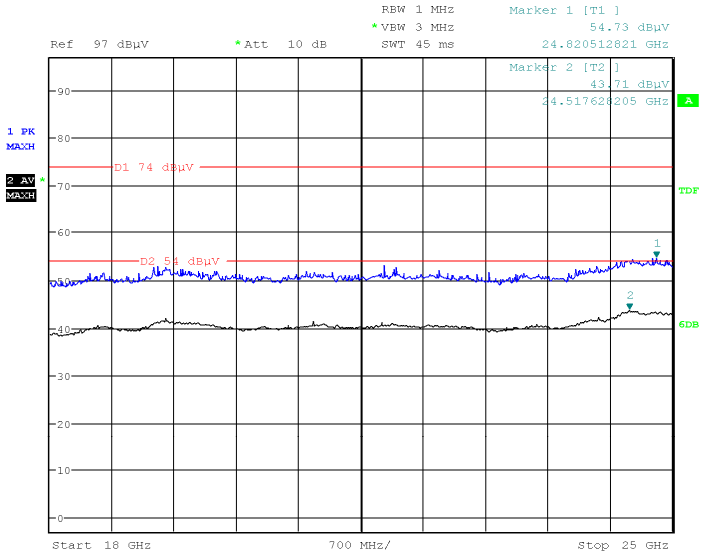


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
2188.30	---	34.38	150.0	V	96.0	-13.7	54.00	19.62
2188.30	40.36	---	150.0	V	96.0	-13.7	74.00	33.64
4956.00	59.79	---	150.0	V	165.0	-5.3	74.00	14.21
4956.00	---	52.74	150.0	V	165.0	-5.3	54.00	1.26
7432.80	53.73	---	200.0	H	205.0	0.9	74.00	20.27
7432.80	---	46.89	200.0	H	205.0	0.9	54.00	7.11
9911.40	57.48	---	200.0	V	153.0	1.9	74.00	16.52
9911.40	---	53.74	200.0	V	153.0	1.9	54.00	0.26
14866.90	---	48.06	150.0	V	195.0	5.5	54.00	5.94
14866.90	53.98	---	150.0	V	195.0	5.5	74.00	20.02
17467.90	---	46.84	150.0	V	268.0	8.8	54.00	7.16
17467.90	55.12	---	150.0	V	268.0	8.8	74.00	18.88

18GHz-25GHz:

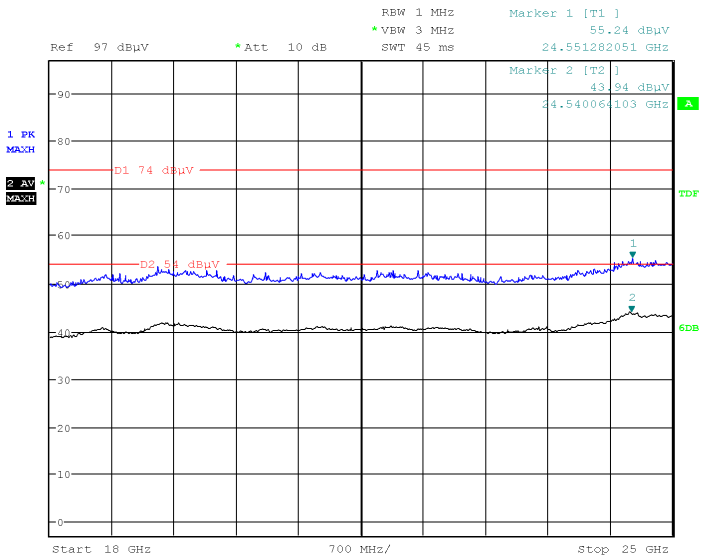
Pre-Scan with low, middle and high channels in the X,Y and Z axes of orientation, the worst case ***high channel in X-axis of orientation*** *was recorded*

Horizontal



Date: 13.APR.2020 18:15:29

Vertical



Date: 13.APR.2020 18:14:17

Restricted Bands Emissions:

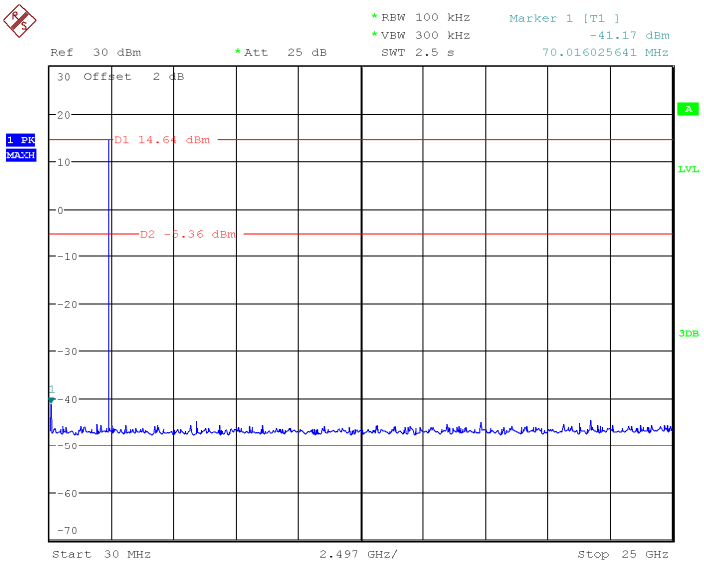
*Pre-Scan in the X,Y and Z axes of orientation, the worst case **in X-axis of orientation** was recorded*

Note:
1. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
Low Channel: 2405MHz								
2390.00	---	51.52	200.0	V	52.0	-2.9	54.00	2.48
2390.00	55.65	---	200.0	V	52.0	-2.9	74.00	18.35
High Channel: 2478MHz								
2483.50	---	53.72	150.0	V	178.0	-2.4	54.00	0.28
2483.50	56.99	---	150.0	V	178.0	-2.4	74.00	17.01

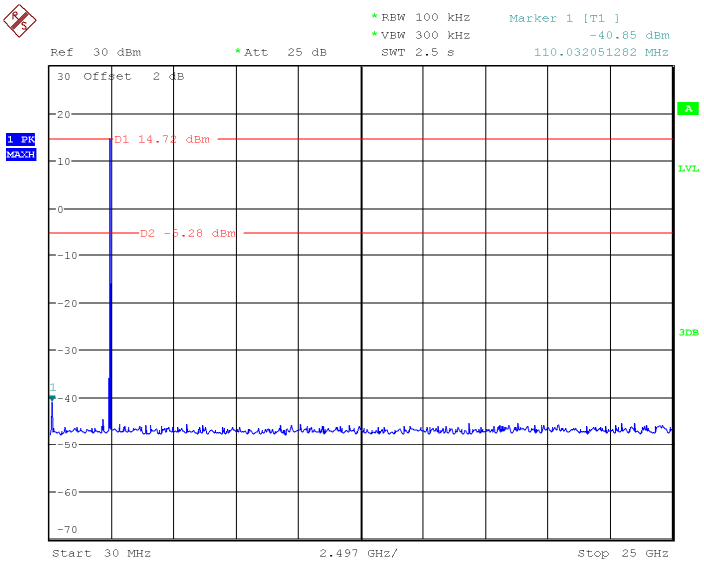
Conducted Spurious Emissions at Antenna Port:

Low Channel



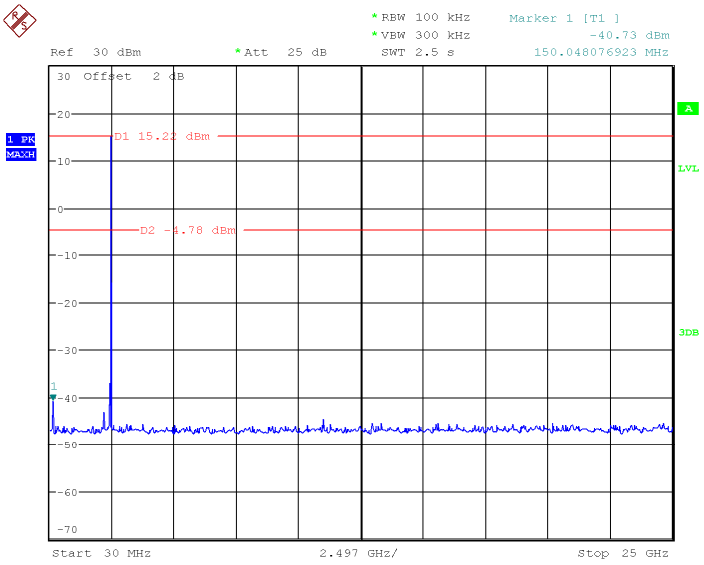
Date: 7.APR.2020 11:46:57

Middle Channel



Date: 7.APR.2020 11:49:20

High Channel



Date: 7.APR.2020 11:56:18

FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Procedure

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	24.2 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

The testing was performed by Chris Wang on 2020-04-14.

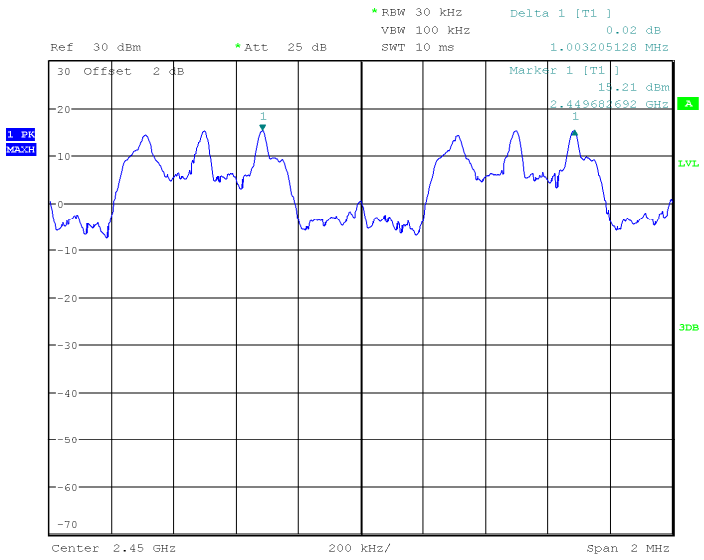
EUT operation mode: Hopping

Test Result: Compliant.

Modulation	Channel	Frequency (MHz)	Channel Separation (kHz)	Limit (kHz)	Result
FSK	Low	2449.5	1003	695.3	Pass
	Adjacent	2450.5			

The limit = 20dB Bandwidth*2/3

Low Channel



FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH

Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

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.
4. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

Temperature:	24.2 ℃
Relative Humidity:	50%
ATM Pressure:	101.2 kPa

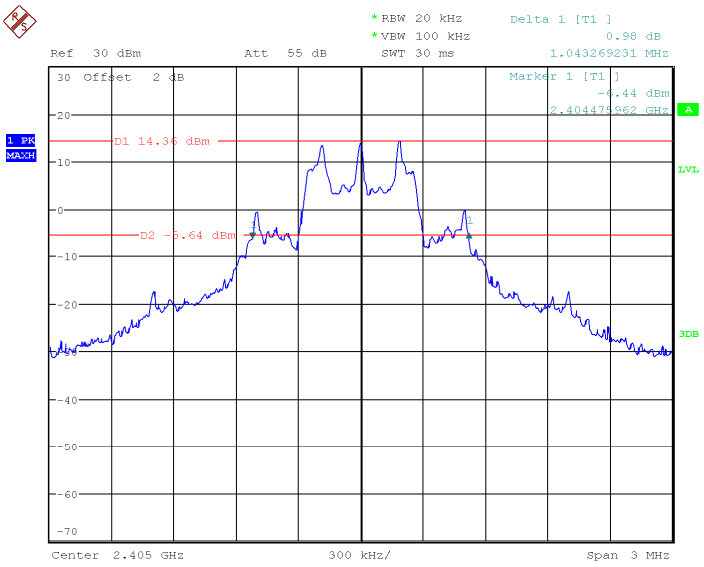
The testing was performed by Chris Wang on 2020-04-07.

EUT operation mode: Transmitting

Test Result: Compliant.

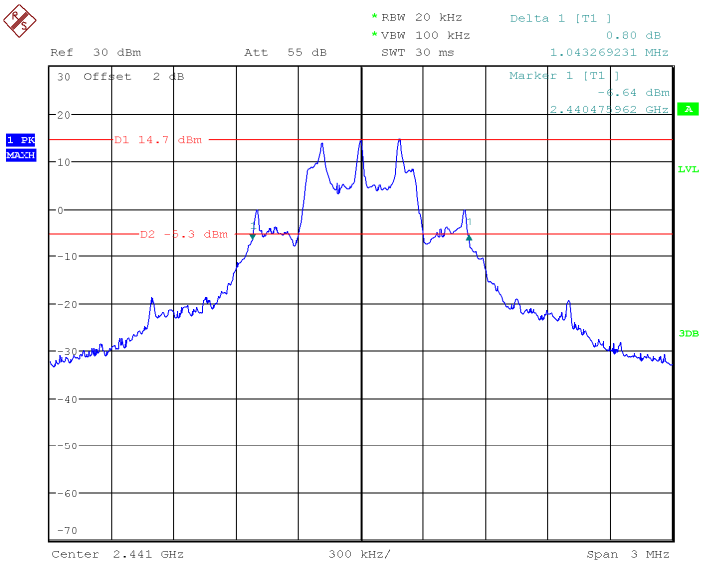
Modulation	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
FSK	Low	2405	1.043
	Middle	2441	1.043
	High	2478	1.034

Low Channel



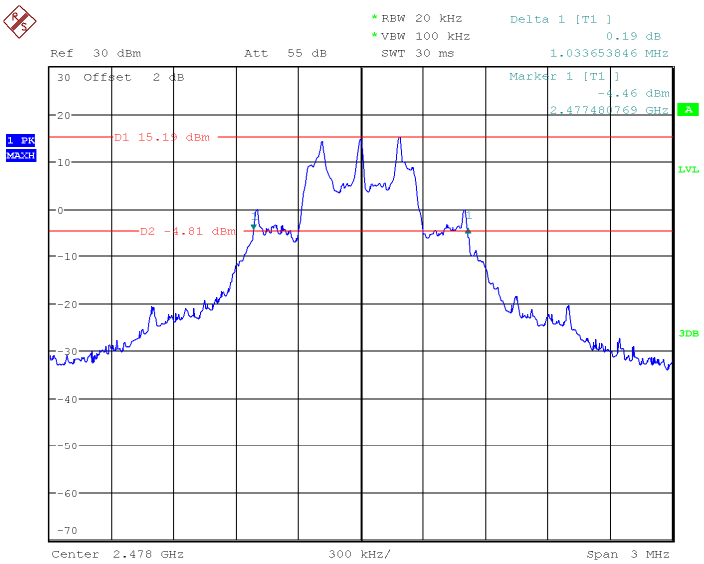
Date: 7.APR.2020 10:59:21

Middle Channel



Date: 7.APR.2020 11:04:19

High Channel



Date: 7.APR.2020 11:06:50

FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the max-hold function record the quantity of the channel.

Test Data

Environmental Conditions

Temperature:	24.2 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

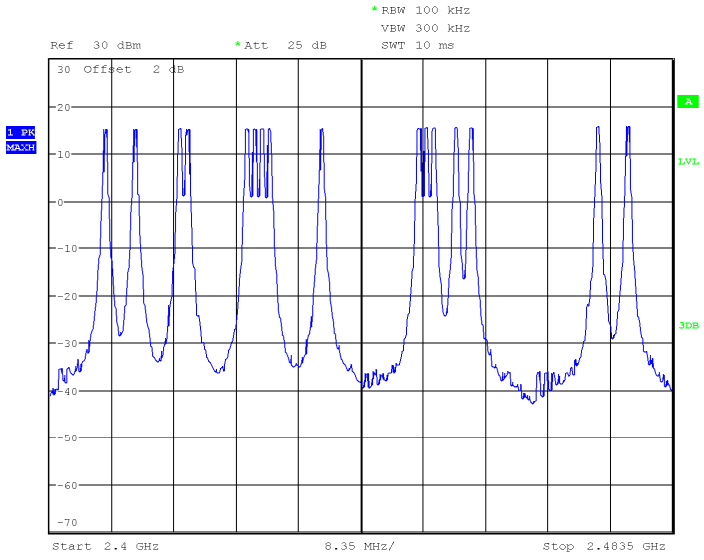
The testing was performed by Chris Wang on 2020-04-14.

EUT operation mode: Hopping

Test Result: Compliant.

Modulation	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
FSK	2400-2483.5	16	⩾15

Number of Hopping Channels



FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 X channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Test Data

Environmental Conditions

Temperature:	24.2 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

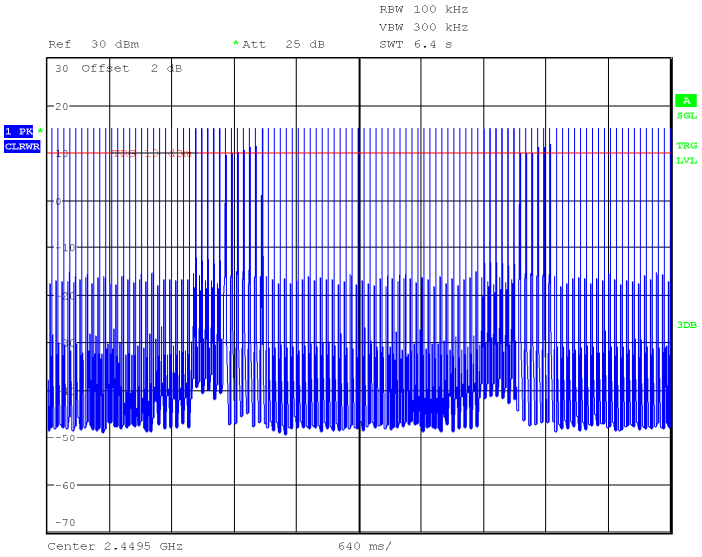
The testing was performed by Chris Wang on 2020-04-14.

EUT operation mode: Hopping

Test Result: Compliant.

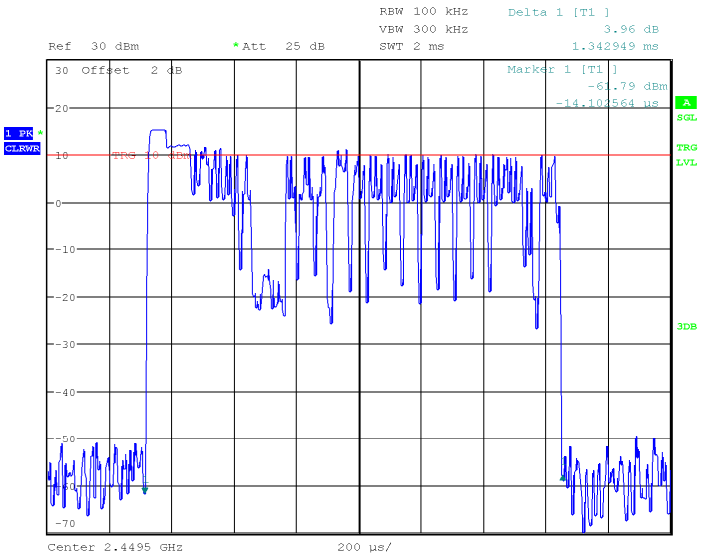
Modulation	Pulse Width	Pulse Number	Dwell Time	Limit	Result
	(ms)		(s)	(s)	
FSK	1.343	104	0.140	≤0.4	Pass
	Note:Dwell time = Pulse time*N Observed time = 0.4s* hopping number= 0.4s*16=6.4s				

Number of Pulses



Date: 14.APR.2020 21:34:53

Single Pulse



Date: 14.APR.2020 21:40:40

FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

Test Data

Environmental Conditions

Temperature:	24.2 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

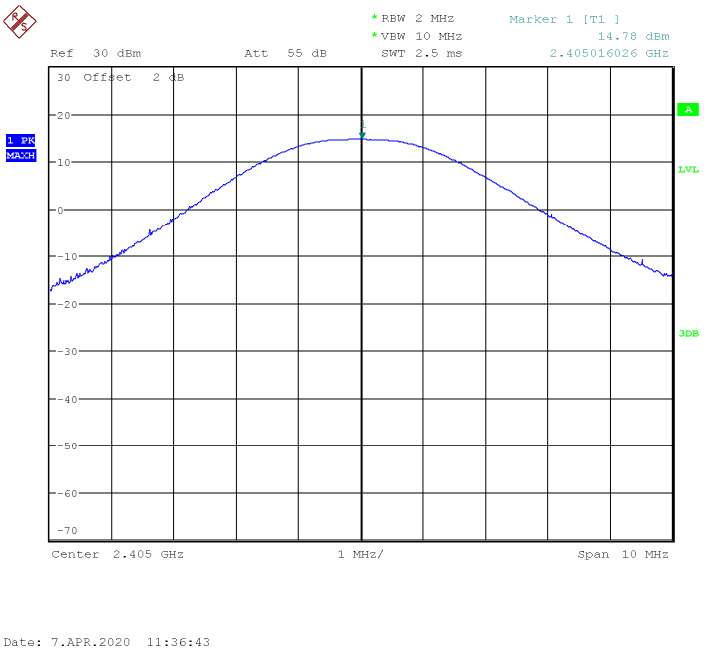
The testing was performed by Chris Wang on 2020-04-07.

EUT operation mode: Transmitting

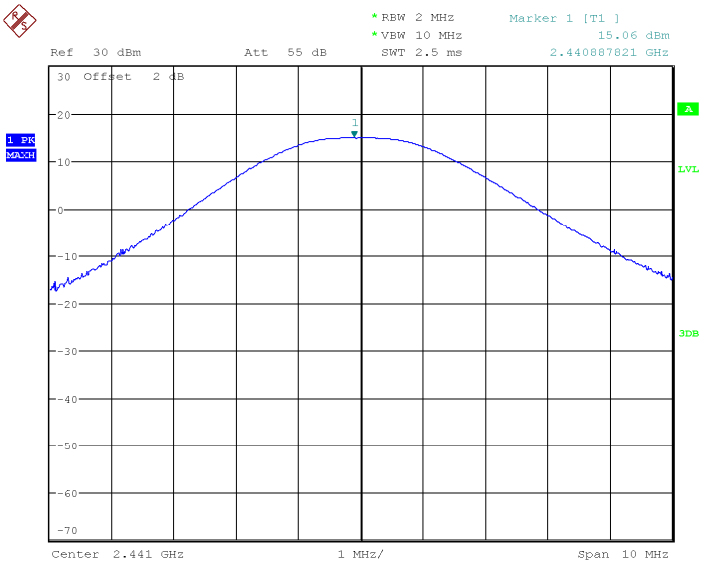
Test Result: Compliant.

Modulation	Channel	Frequency (MHz)	Output Power		Limit (mW)
			(dBm)	(mW)	
FSK	Low	2405	14.78	30.06	125
	Middle	2441	15.06	32.06	125
	High	2478	15.54	35.81	125

Low Channel

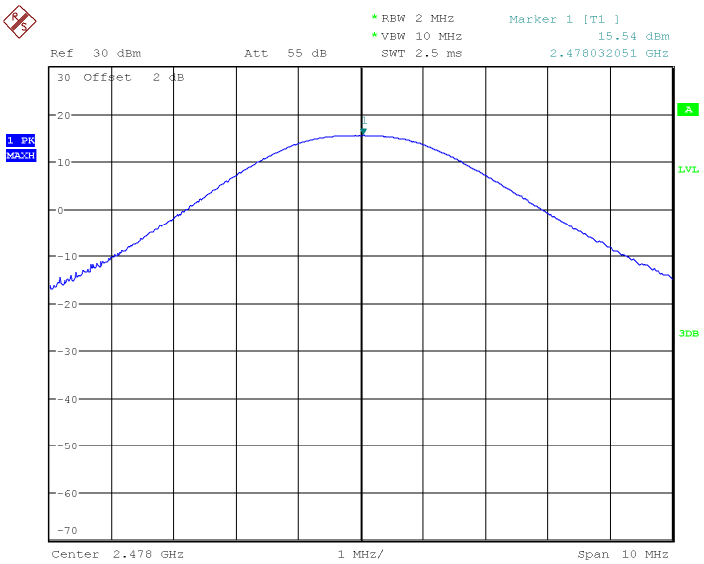


Middle Channel



Date: 7.APR.2020 11:38:02

High Channel



Date: 7.APR.2020 11:40:03

FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

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 a 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 RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
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.

Test Data

Environmental Conditions

Temperature:	24.2~25.0 ℃
Relative Humidity:	48~50%
ATM Pressure:	101.1~10.1.2 kPa

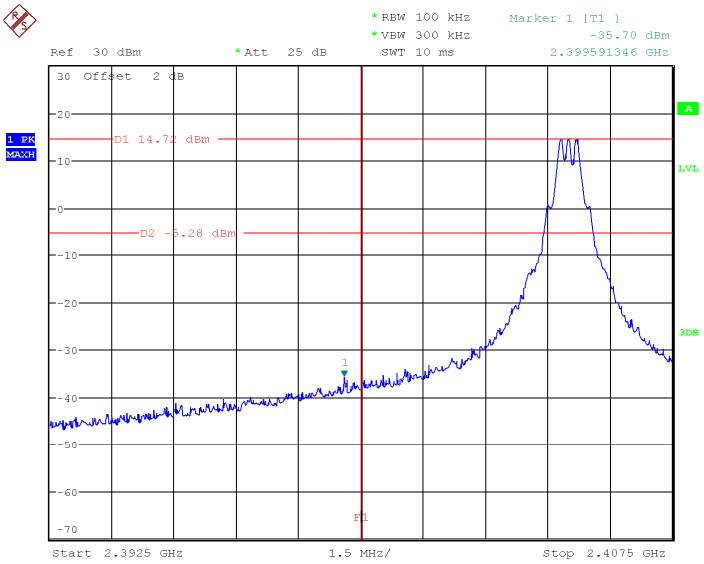
The testing was performed by Chris Wang from 2020-04-07 to 2020-04-08.

EUT operation mode: Transmitting&Hopping

Test Result: Compliant.

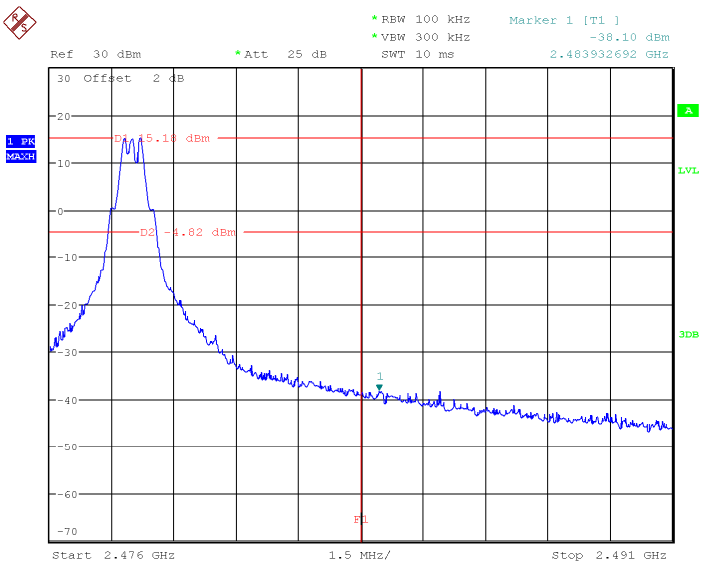
Band Edge

Left Side



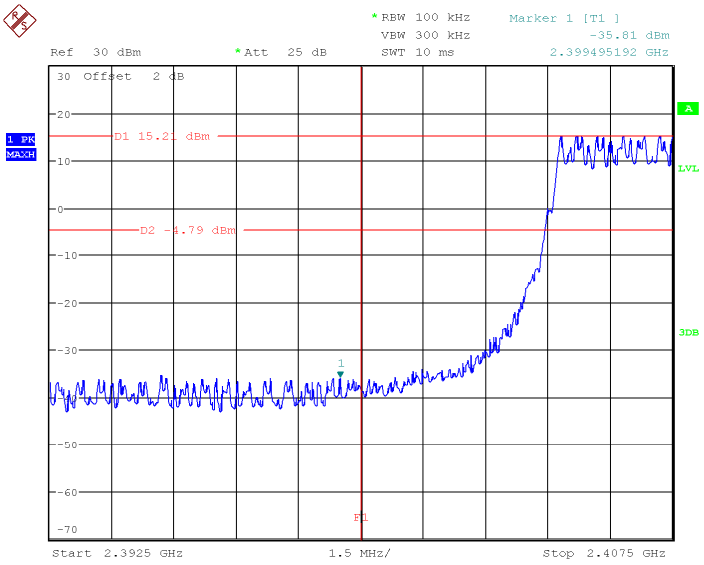
Date: 7.APR.2020 12:09:17

Right Side



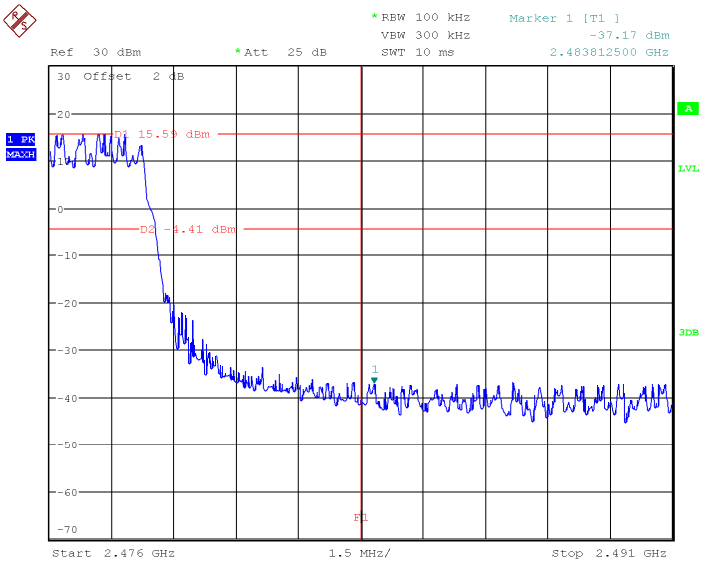
Date: 7.APR.2020 12:11:13

Left Side-Hopping



Date: 8.APR.2020 18:17:45

Right Side-Hopping



Date: 8.APR.2020 18:20:33

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