FCC PART 15.247

TEST REPORT

For

Hobbico, Inc.

2904 Research Road, Champaign, Illinois, United States, 61821

FCC ID: IYFJ2020

Report Type:	**Product Name:**
Original Report	J2020 6-Channel Transmitter

Report Number:	RDG171031005-00A
Report Date:	2018-01-10
Reviewed By:	Jerry Zhang EMC Manager Jerry Zhang
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Hobbico, Inc.*** 's product, model number: ***RISJ2020 (FCC ID: IYFJ2020)*** (the "EUT") in this report was a ***J2020 6-Channel Transmitter ,*** which was measured approximately: 23.5 cm (L) x 16 cm (W) x 10.5 cm (H), rated input voltage: DC4.5V from battery.

All measurement and test data in this report was gathered from production sample serial number: 171031005 (Assigned by BACL). The EUT was received on 2017-10-31.

Objective

This report is prepared on behalf of ***Hobbico, Inc.*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules

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

Related Submittal(s)/Grant(s)

Part of system submissions with FCC ID: IYF0300.

Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Unwanted Emissions , conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218,the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode. 16 channels are provided:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2414	9	2435
2	2417	10	2438
3	2420	11	2440
4	2423	12	2442
5	2425	13	2444
6	2428	14	2446
7	2430	15	2448
8	2433	16	2450

Channel 1, 8, 16 were selected to test.

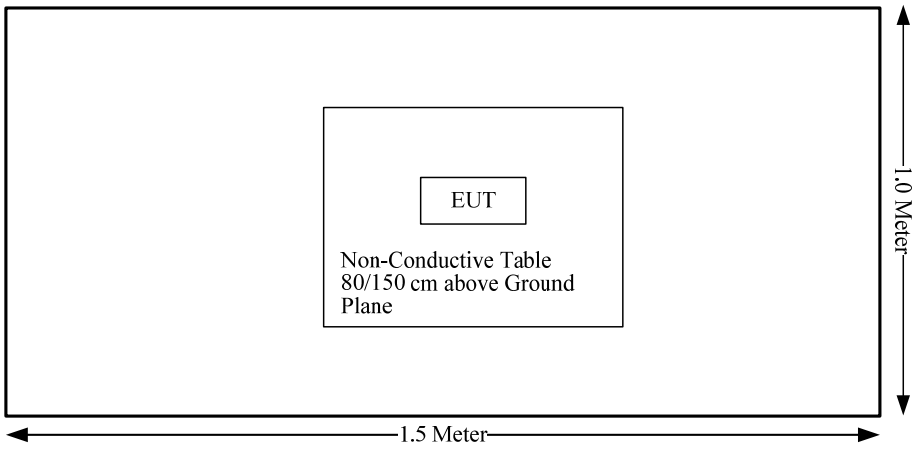
EUT Exercise Software

No Software was used in test, the maximum power was configured as default setting by system.

Equipment Modifications

No modification was made to the EUT.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	No Applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(1)	20 dB Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band Edges	Compliance

No Applicable: the device was powered by battery.

FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE

Applicable Standard

According to§15.247(i) and §1.1310, 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:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(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, where

- 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
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Measurement Result

The max conducted power including tune-up tolerance is 9.8 dBm (9.55 mW).
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
= 9.55/5*(√2.450) = 3.0≤ 3.0

So the stand-alone SAR evaluation is not necessary.

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 one internal antenna arrangement, and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

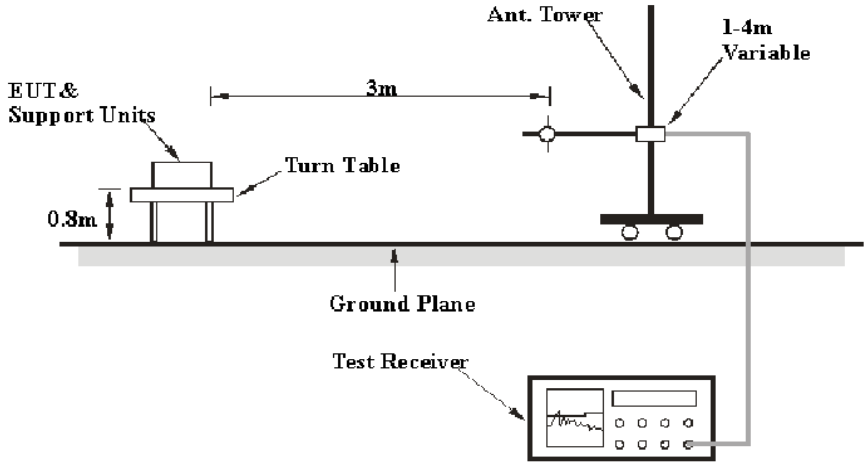
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

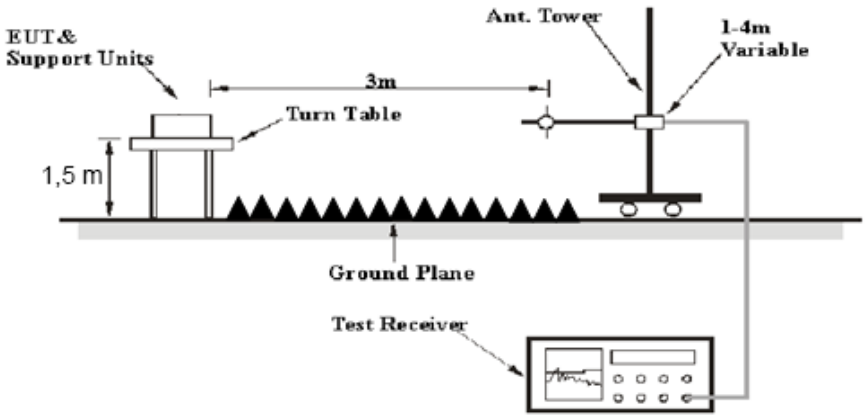
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site, above 1GHz tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

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 & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz - 1 GHz, peak and average detection modes for frequencies above 1 GHz.

All emissions under the noise floor have not been recoded.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2016-12-08	2017-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-05
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-02 1304	2017-06-16	2020-06-15
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Unknown	Coaxial Cable	Chamber A-1	4m	2017-09-01	2018-09-01
Unknown	Coaxial Cable	Chamber B-1	0.75m	2017-09-01	2018-09-01
Unknown	Coaxial Cable	Chamber A-2	10m	2017-09-01	2018-09-01
Unknown	Coaxial Cable	Chamber B-2	8m	2017-09-01	2018-09-01
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

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

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 Data

Environmental Conditions

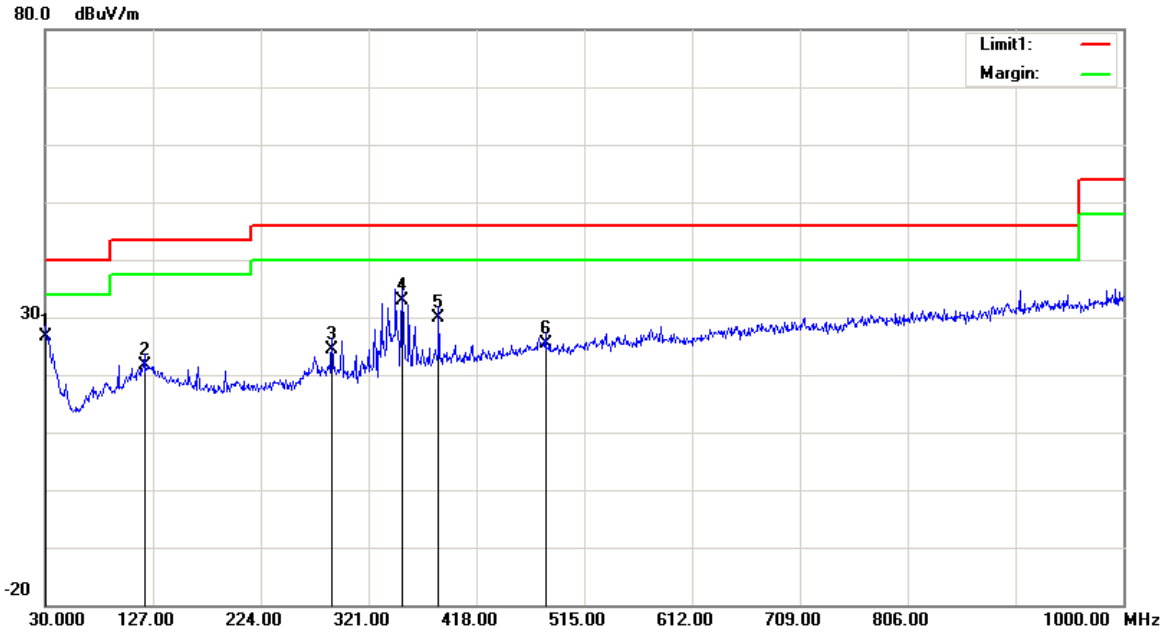
Temperature:	24.7 °C
Relative Humidity:	33 %
ATM Pressure:	101.9 kPa

** The testing was performed by Blake Yang on 2017-11-02.*

Test Mode: Transmitting

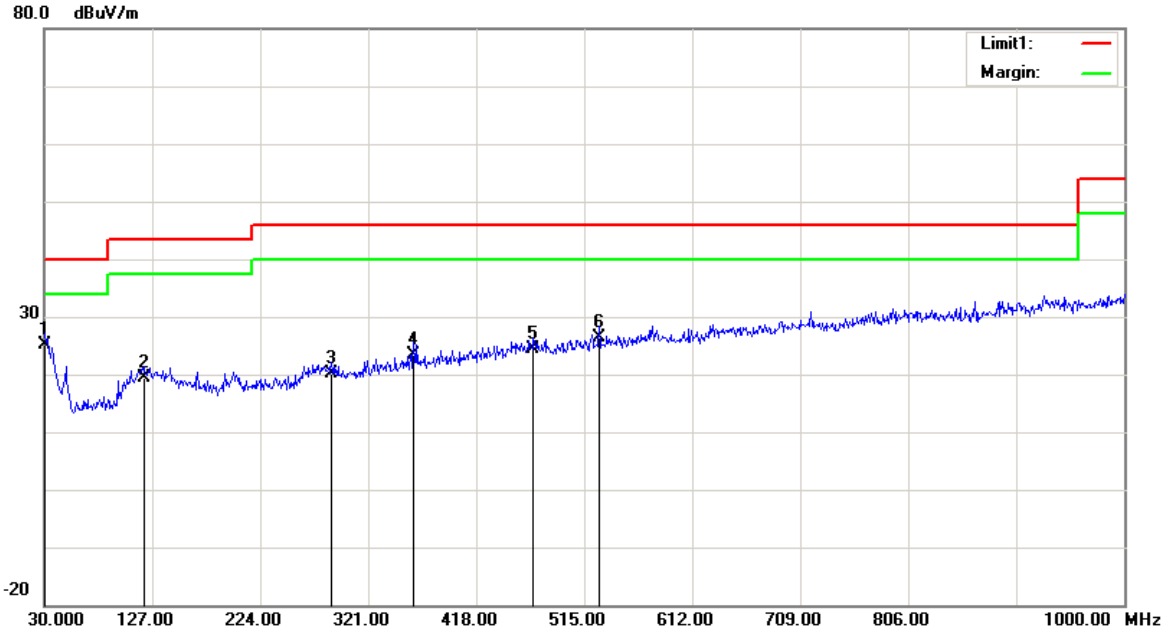
1) 30MHz-1GHz(Low channel was the worst)

Horizontal:



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.0000	25.52	QP	1.08	26.60	40.00	13.40
119.2400	26.53	QP	-4.93	21.60	43.50	21.90
288.0200	28.32	QP	-3.92	24.40	46.00	21.60
351.0700	35.93	QP	-3.13	32.80	46.00	13.20
384.0500	32.50	QP	-2.60	29.90	46.00	16.10
480.0800	26.31	QP	-1.01	25.30	46.00	20.70

Vertical:

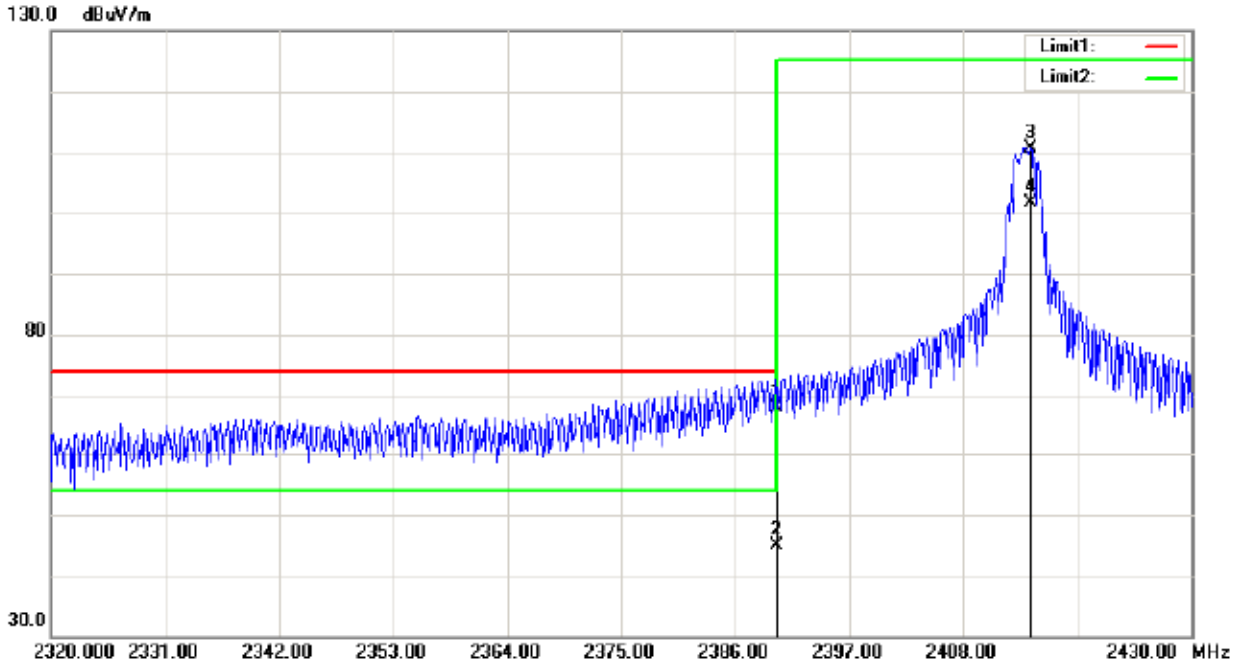


Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.9700	24.75	QP	0.35	25.10	40.00	14.90
119.2400	24.23	QP	-4.93	19.30	43.50	24.20
288.0200	24.02	QP	-3.92	20.10	46.00	25.90
361.7400	26.40	QP	-2.90	23.50	46.00	22.50
469.4100	25.17	QP	-0.87	24.30	46.00	21.70
528.5800	26.77	QP	-0.27	26.50	46.00	19.50

2)1GHz-25GHz:

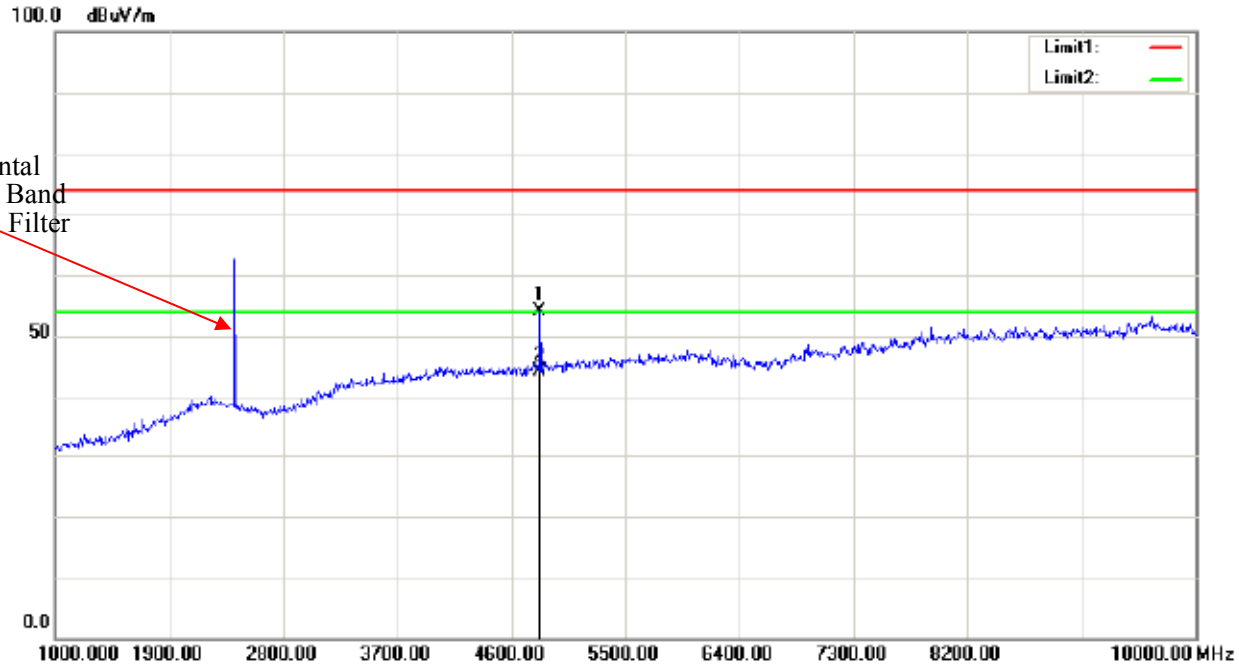
Low Channel:

Horizontal:

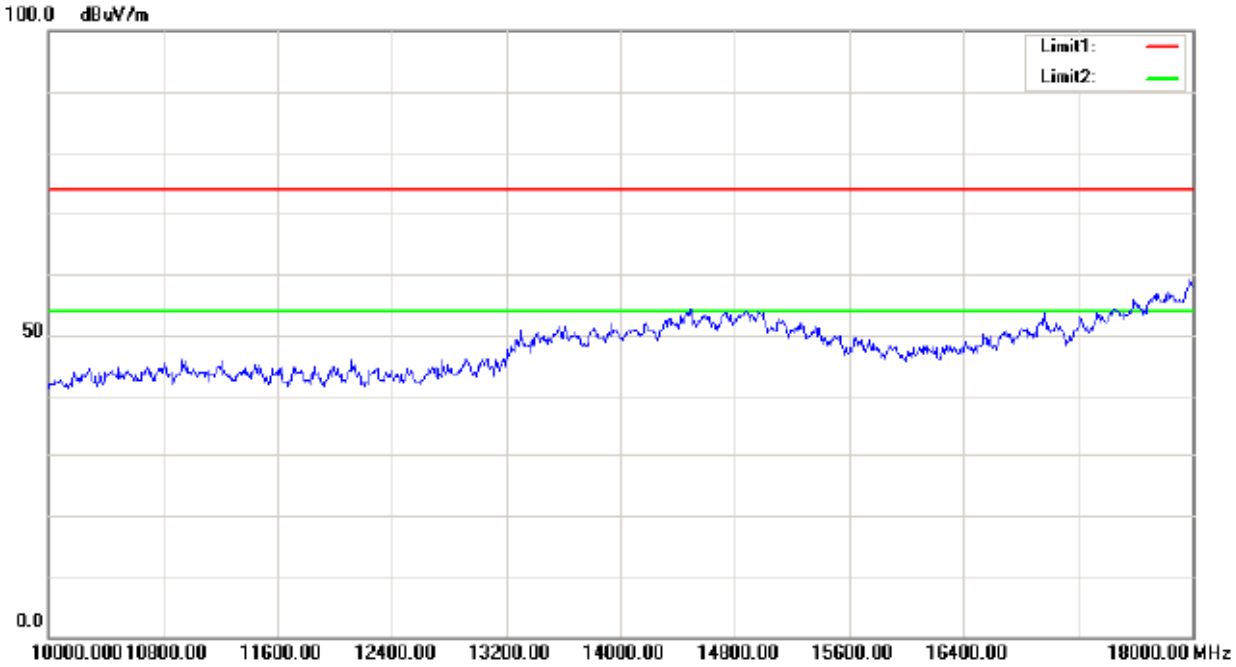


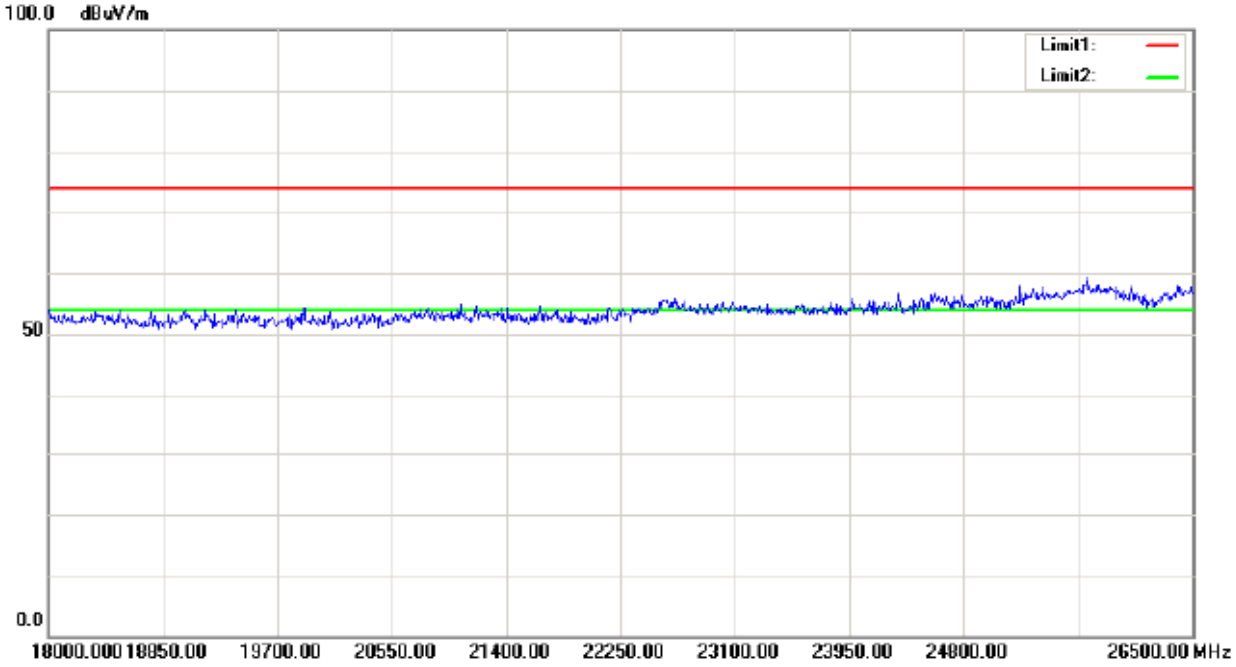
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	1	2390.000	38.10	peak	29.87	67.97	74.00	148	227	6.03	
	2	2390.000	14.92	AVG	29.87	44.79	54.00	148	227	9.21	
	3	2414.545	80.77	peak	29.94	110.71	125.20	148	227	14.49	Fundamental
	4	2414.545	71.59	AVG	29.94	101.53	125.20	148	227	23.67	Fundamental

Fundamental Test with Band Rejection Filter

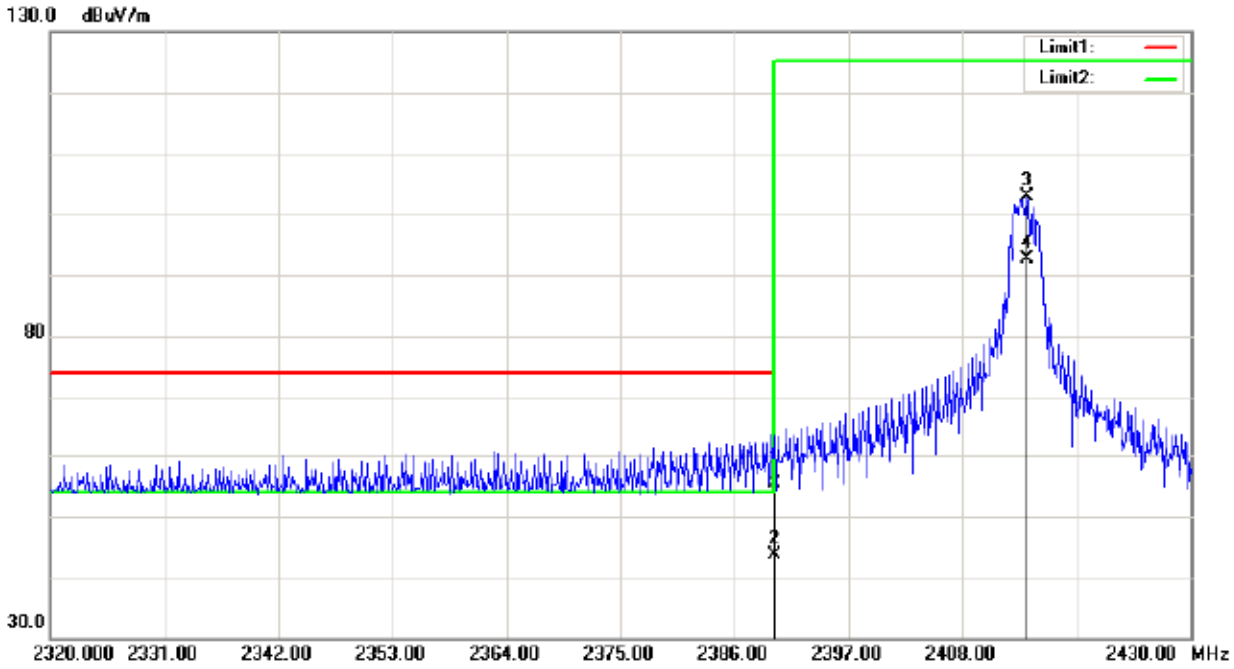


Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4829.500	55.25	peak	-1.04	54.21	74.00	152	334	19.79	
*	2	4829.500	45.16	AVG	-1.04	44.12	54.00	152	334	9.88	


100.0 dBuV/m
Limit1:
Limit2:
50
0.0
10000.000 10800.00 11600.00 12400.00 13200.00 14000.00 14800.00 15600.00 16400.00 18000.00 MHz

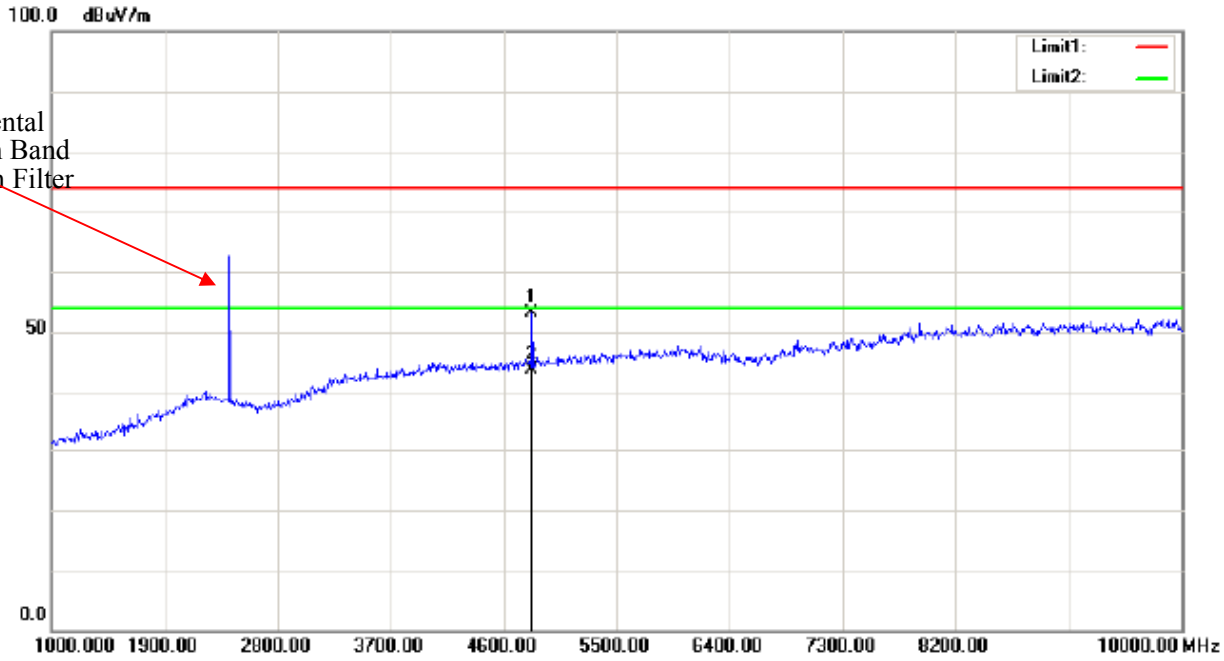

100.0 dBuV/m
Limit1:
Limit2:
50
0.0
18000.000 18850.00 19700.00 20550.00 21400.00 22250.00 23100.00 23950.00 24800.00 26500.00 MHz

Vertical

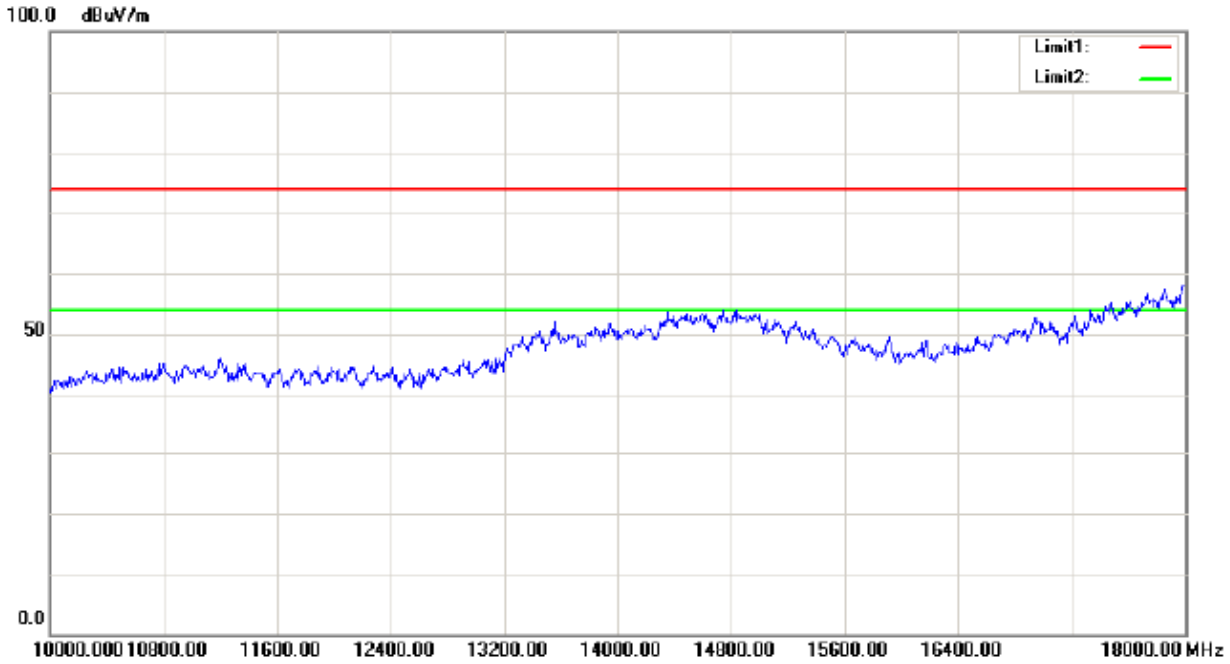


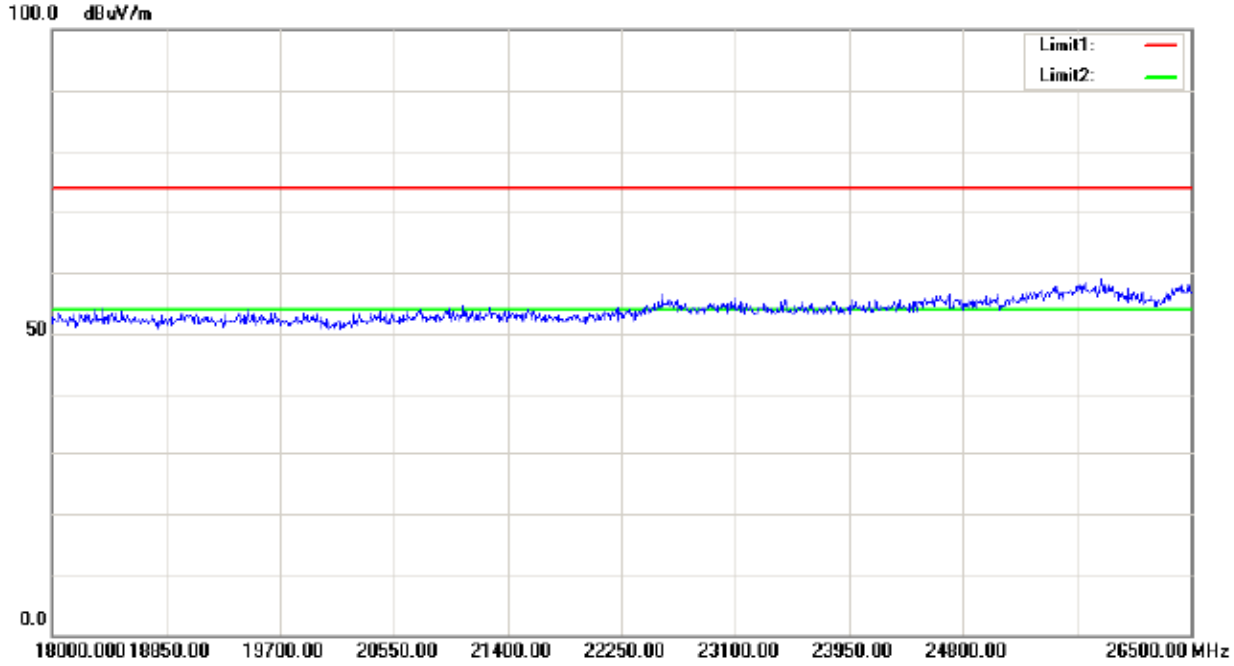
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2390.000	25.52	peak	29.87	55.39	74.00	154	228	18.61	
*	2	2390.000	13.85	AVG	29.87	43.72	54.00	154	228	10.28	
	3	2414.160	72.92	peak	29.94	102.86	125.20	154	228	22.34	Fundamental
	4	2414.160	62.57	AVG	29.94	92.51	125.20	154	228	32.69	Fundamental

Fundamental
Test with Band
Rejection Filter



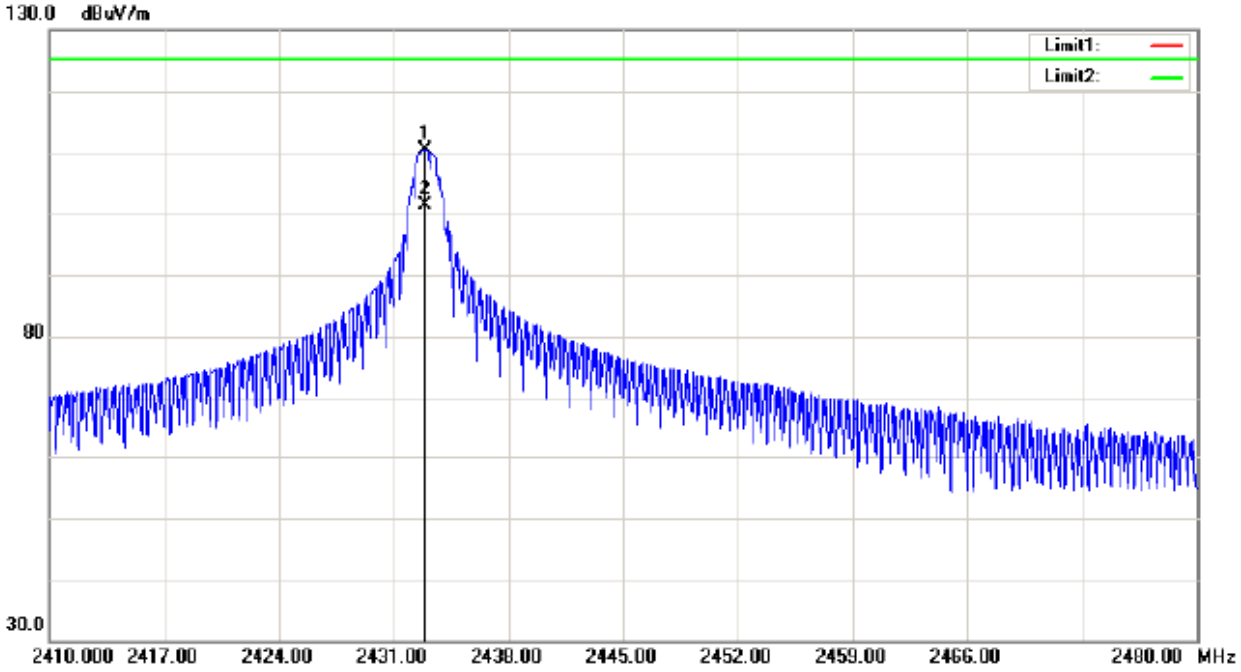
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4829.500	54.25	peak	-1.04	53.21	74.00	158	96	20.79	
*	2	4829.500	44.71	AVG	-1.04	43.67	54.00	158	96	10.33	


100.0 dBuV/m
Limit1:
Limit2:
50
0.0
10000.000 10800.00 11600.00 12400.00 13200.00 14000.00 14800.00 15600.00 16400.00 18000.00 MHz

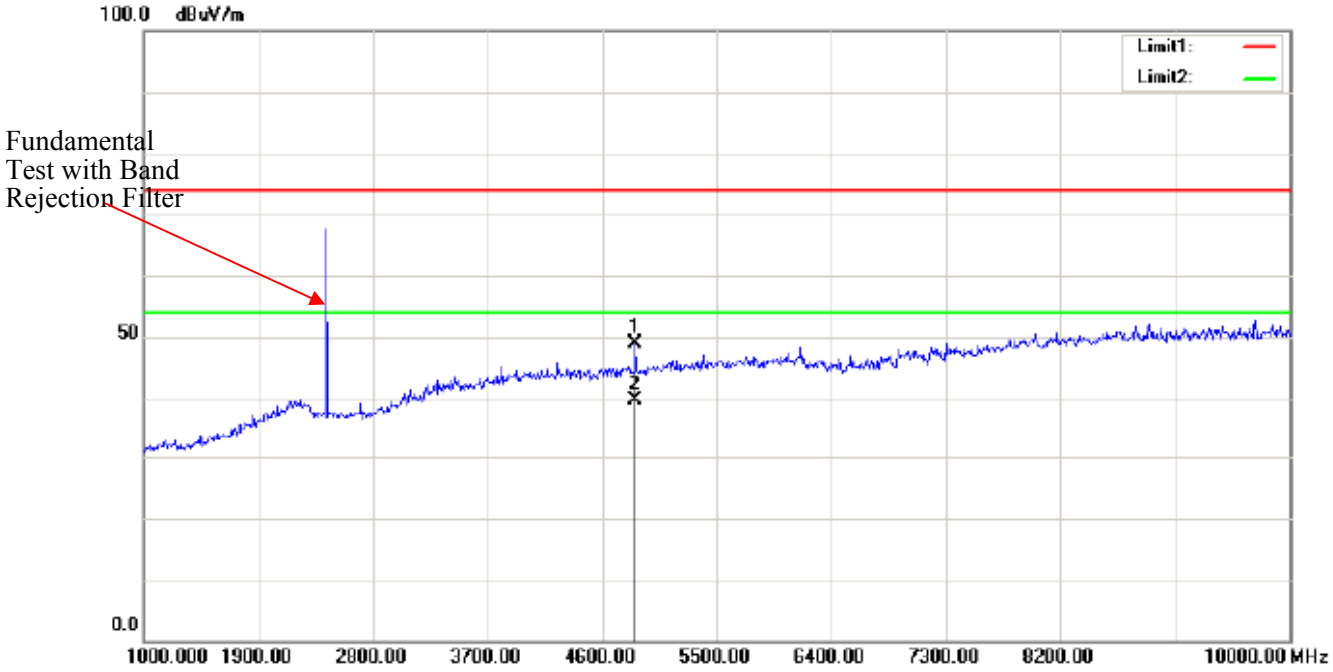

100.0 dBuV/m
Limit1:
Limit2:
50
0.0
18000.000 18850.00 19700.00 20550.00 21400.00 22250.00 23100.00 23950.00 24800.00 26500.00 MHz

Middle Channel:

Horizontal:



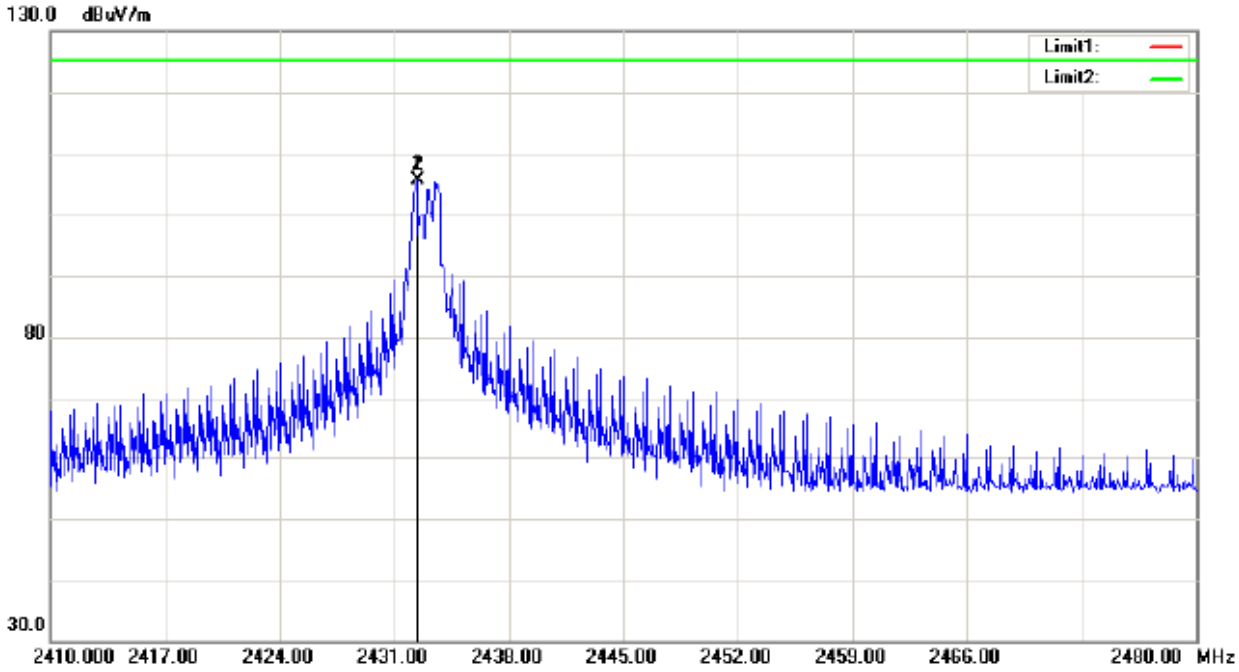
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	1	2432.925	80.45	peak	29.99	110.44	125.20	154	223	14.76	Fundamental
	2	2432.925	71.38	AVG	29.99	101.37	125.20	154	223	23.83	Fundamental



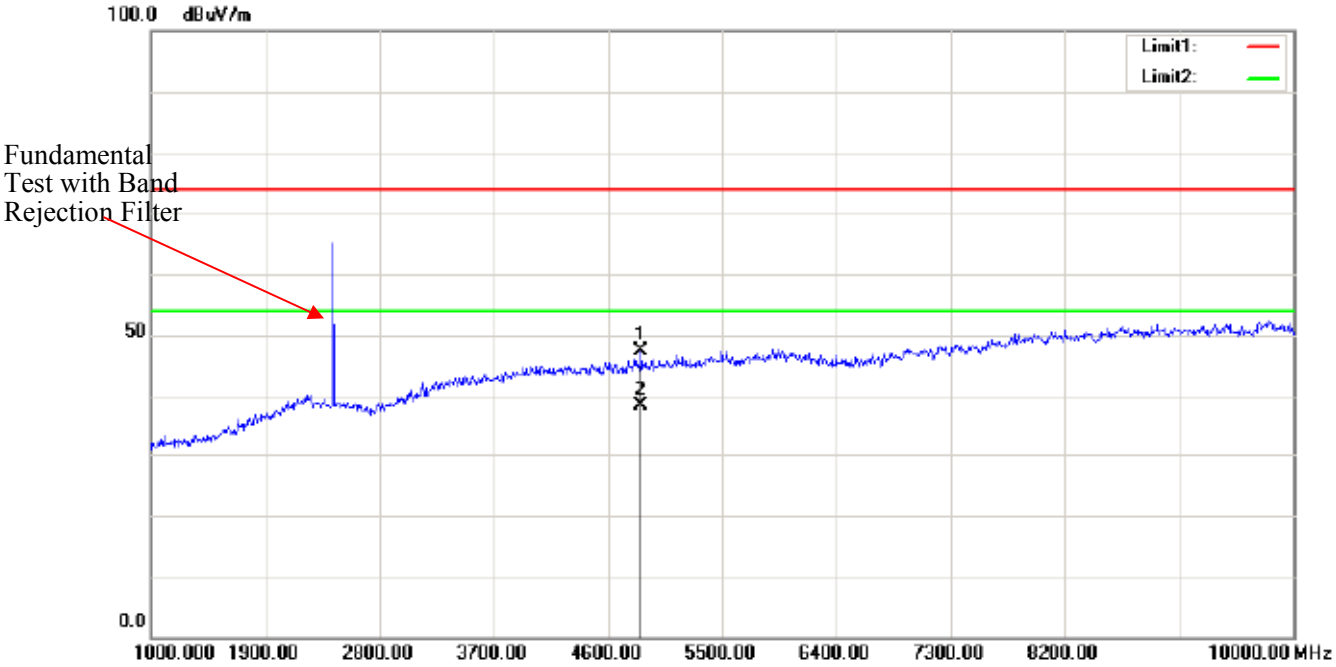
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4865.500	49.79	peak	-0.93	48.86	74.00	138	55	25.14	
*	2	4865.500	40.58	AVG	-0.93	39.65	54.00	138	55	14.35	

Note: No emission was detected in the range 10-25GHz.

Vertical:



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	1	2432.400	75.72	peak	29.98	105.70	125.20			19.50	Fundamental
*	2	2432.400	75.72	peak	29.98	105.70	125.20			19.50	Fundamental

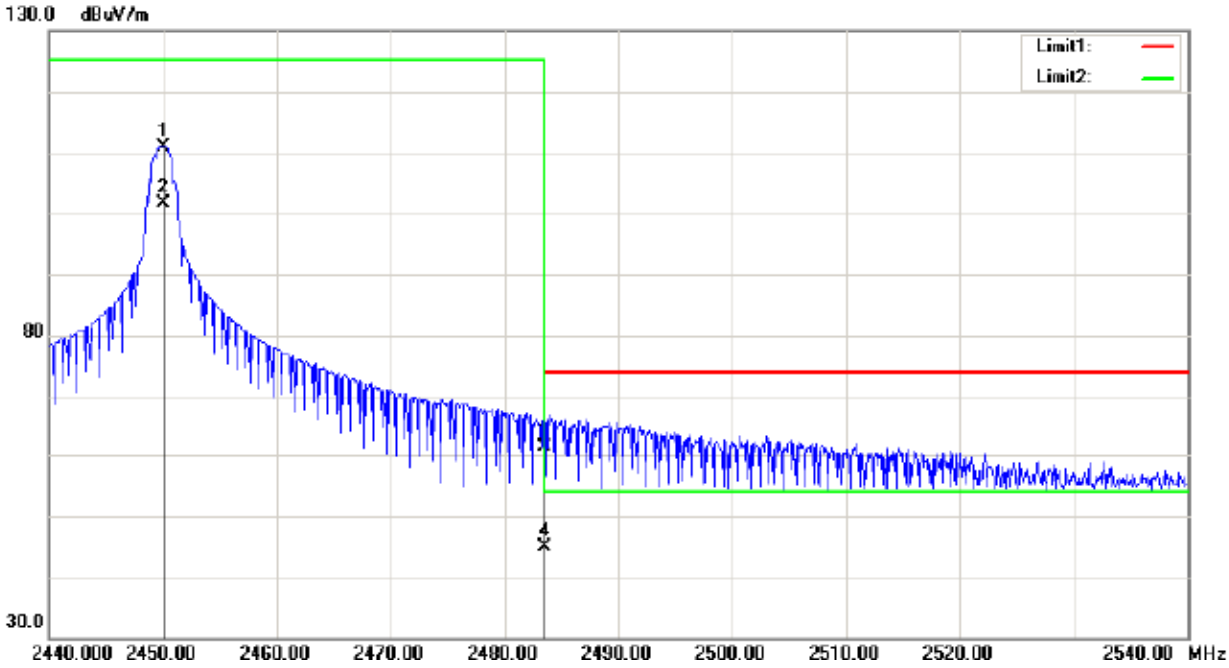


Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4865.500	48.35	peak	-0.93	47.42	74.00	136	49	26.58	
*	2	4865.500	39.24	AVG	-0.93	38.31	54.00	136	49	15.69	

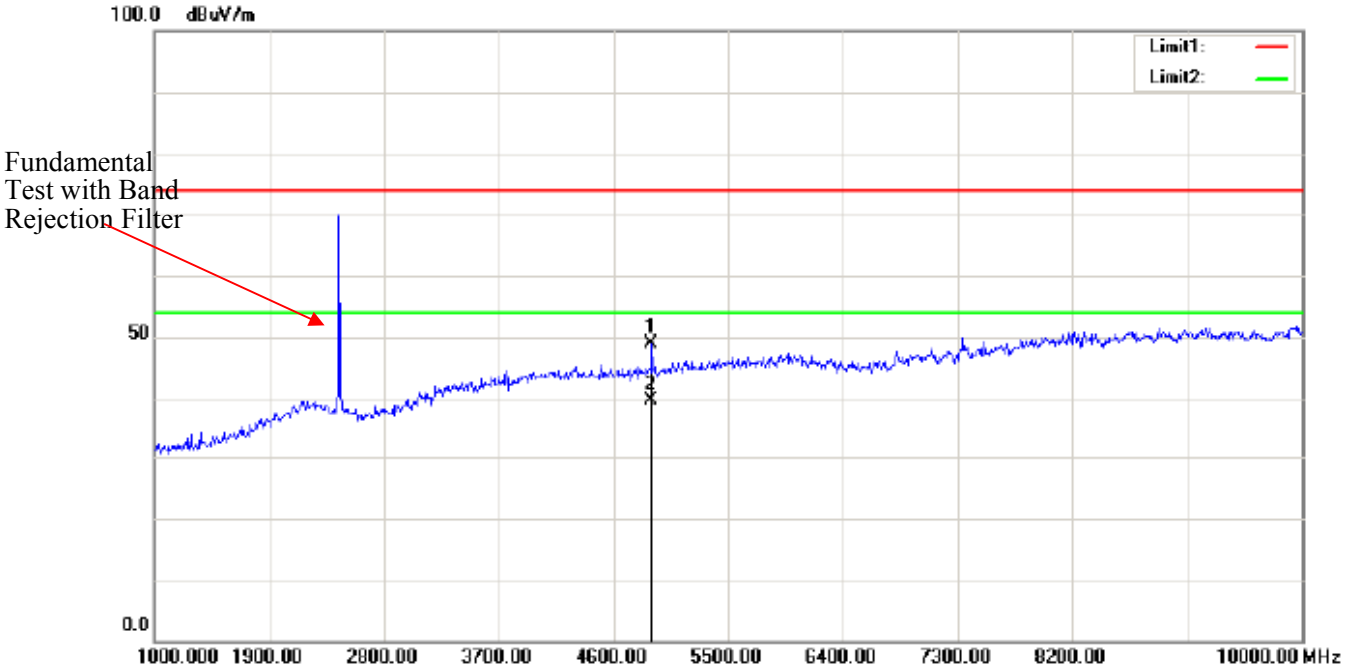
Note: No emission was detected in the range 10-25GHz.

High Channel:

Horizontal:



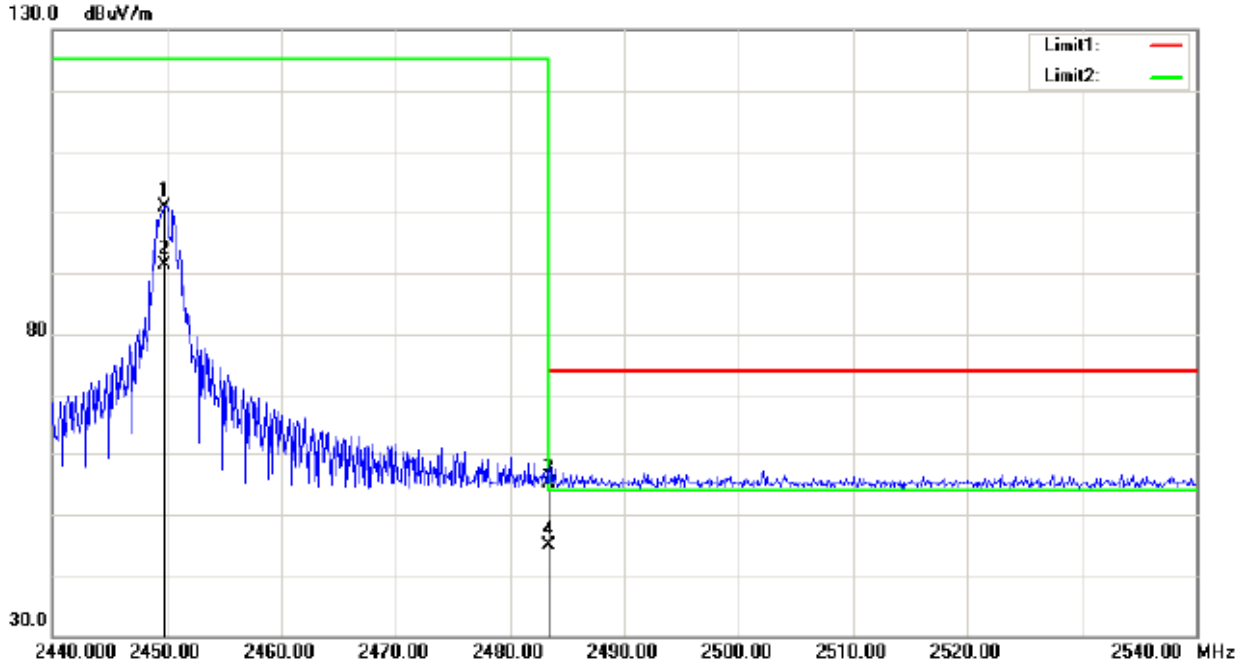
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2450.100	80.88	peak	30.03	110.91	125.20	136	22	14.29	Fundamental
	2	2450.100	71.57	AVG	30.03	101.60	125.20	136	22	23.60	Fundamental
	3	2483.500	31.40	peak	30.11	61.51	74.00	136	22	12.49	
*	4	2483.500	14.65	AVG	30.11	44.76	54.00	136	22	9.24	



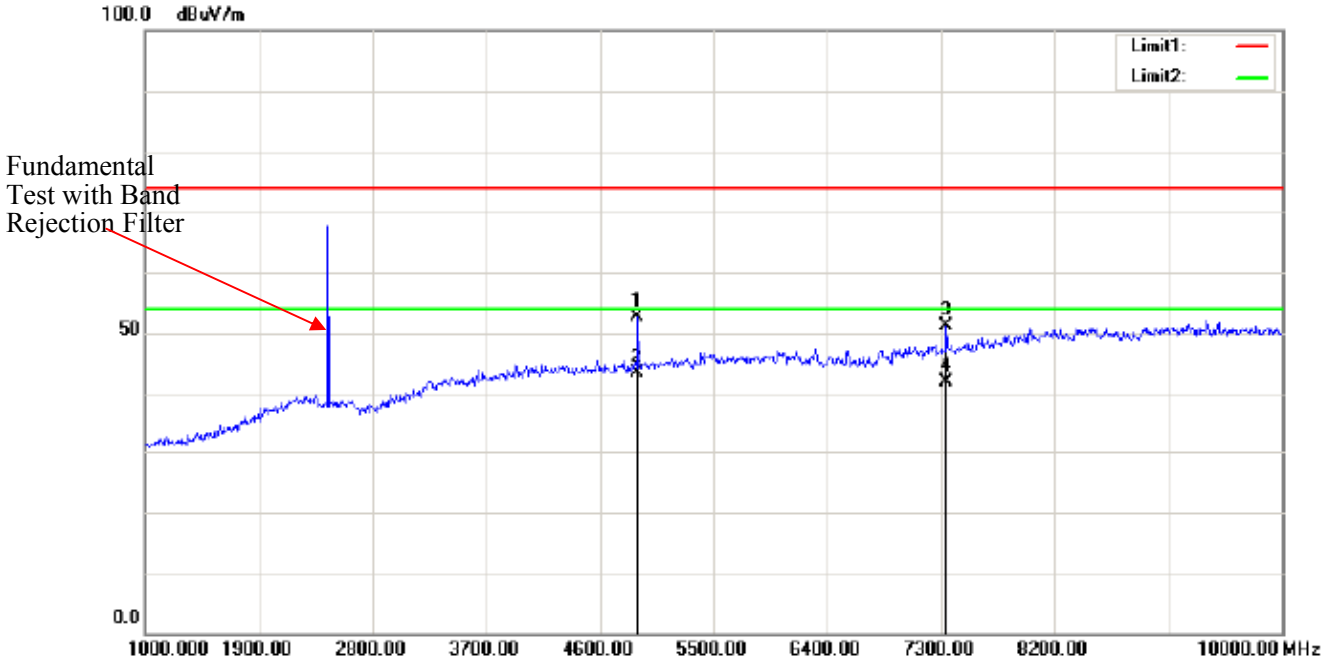
Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4901.500	49.80	peak	-0.81	48.99	74.00	144	153	25.01	
*	2	4901.500	40.52	AVG	-0.81	39.71	54.00	144	153	14.29	

Note: No emission was detected in the range 10-25GHz.

Vertical:



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	2449.800	70.79	peak	30.02	100.81	125.20	138	59	24.39	Fundamental
	2	2449.800	61.25	AVG	30.02	91.27	125.20	138	59	33.93	Fundamental
	3	2483.500	24.94	peak	30.11	55.05	74.00	138	59	18.95	
*	4	2483.500	14.82	AVG	30.11	44.93	54.00	138	59	9.07	



Mk.	No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	1	4901.500	53.53	peak	-0.81	52.72	74.00	143	225	21.28	
*	2	4901.500	44.28	AVG	-0.81	43.47	54.00	143	225	10.53	
	3	7349.500	47.76	peak	3.27	51.03	74.00	143	225	22.97	
	4	7349.500	38.69	AVG	3.27	41.96	54.00	143	225	12.04	

Note: No emission was detected in the range 10-25GHz.

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 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 30 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace.
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	101.1 kPa

** The testing was performed by Kira Liu on 2017-11-08.*

Test Result: Compliance.

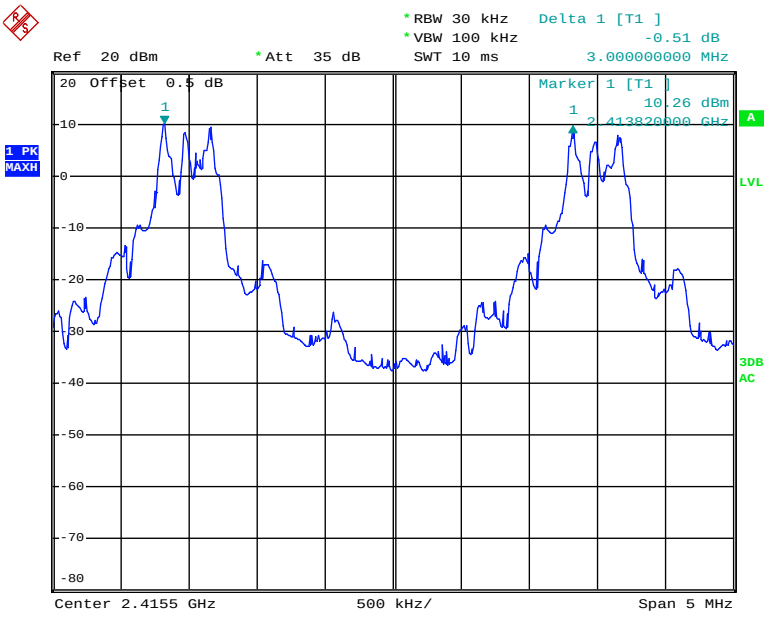
Please refer to following tables and plots

Test Mode: Transmitting

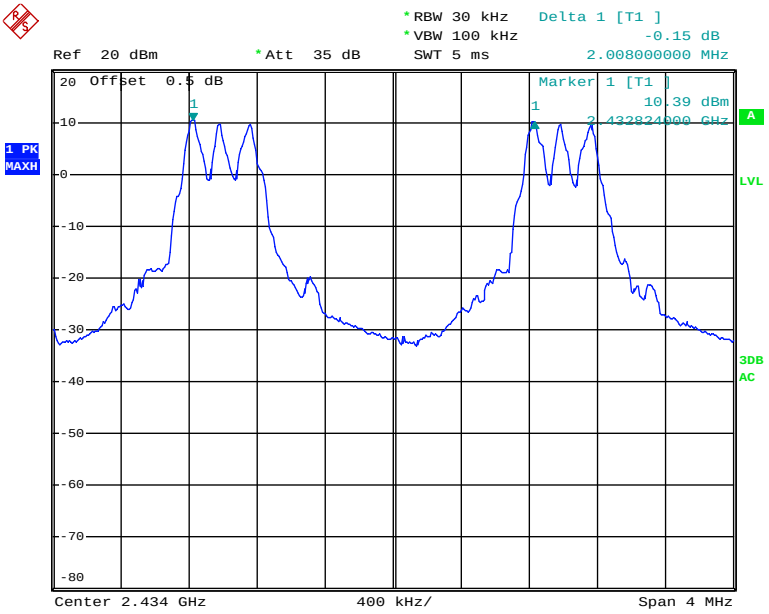
Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
Low	2414	3.00	0.35
Middle	2433	2.01	0.36
High	2450	2.01	0.37

Note: Limit= (2/3) × 20dB bandwidth

Low Channel

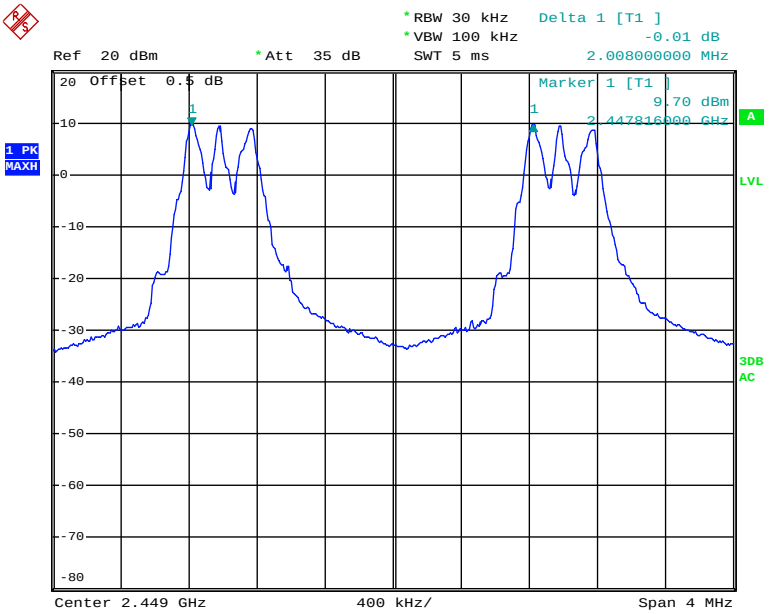


Middle Channel



Date: 8.NOV.2017 15:18:47

High Channel



Date: 8.NOV.2017 15:14:36

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

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 on the test table without connection to measurement instrument. Turn on the EUT. 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	101.6 kPa

** The testing was performed by Kira Liu on 2017-11-07.*

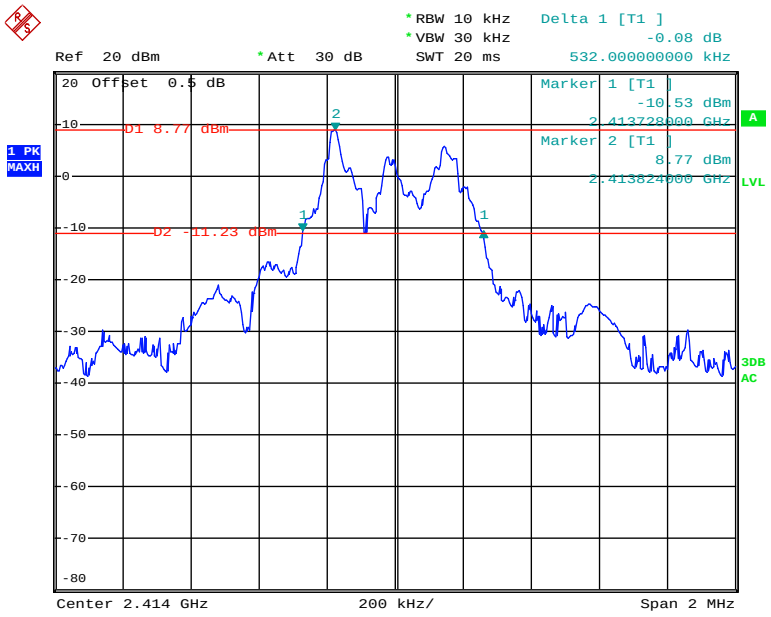
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

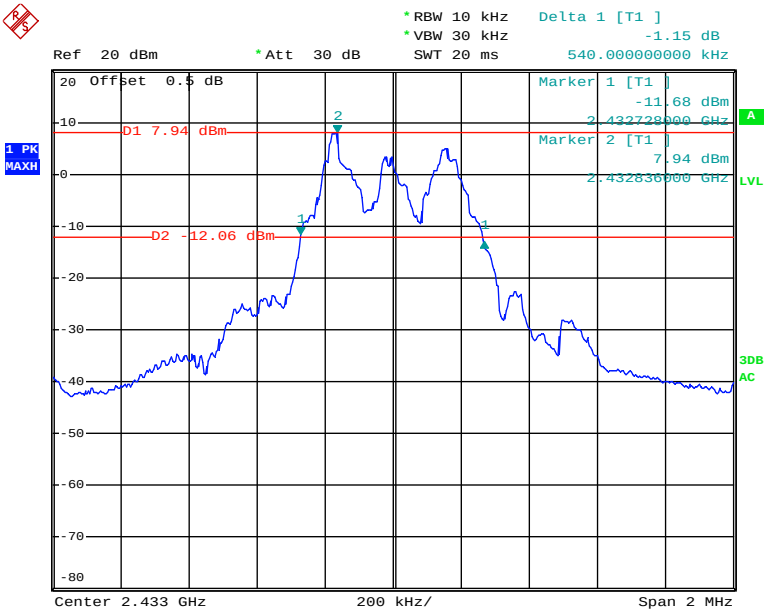
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2414	0.532
Middle	2433	0.540
High	2450	0.548

Low Channel



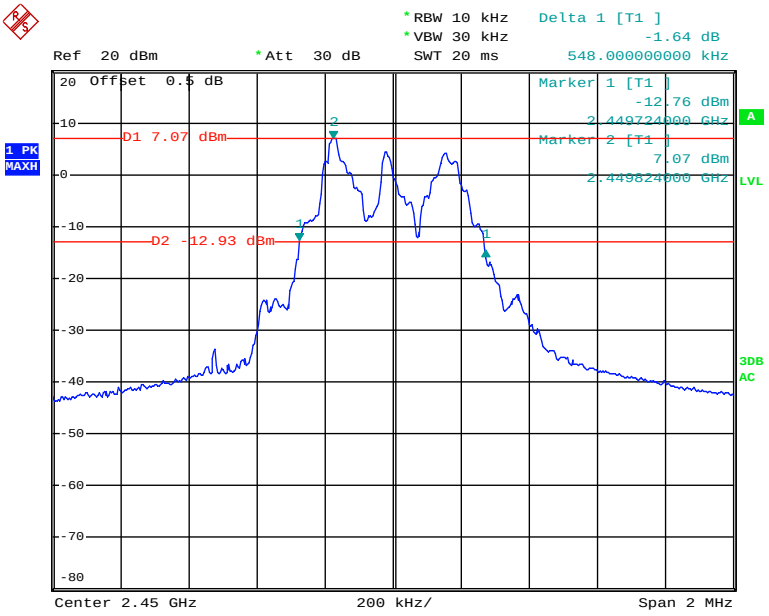
Date: 7.NOV.2017 16:38:14

Middle Channel



Date: 7.NOV.2017 16:55:36

High Channel



Date: 7.NOV.2017 17:05:07

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	101.6 kPa

** The testing was performed by Kira Liu on 2017-11-07.*

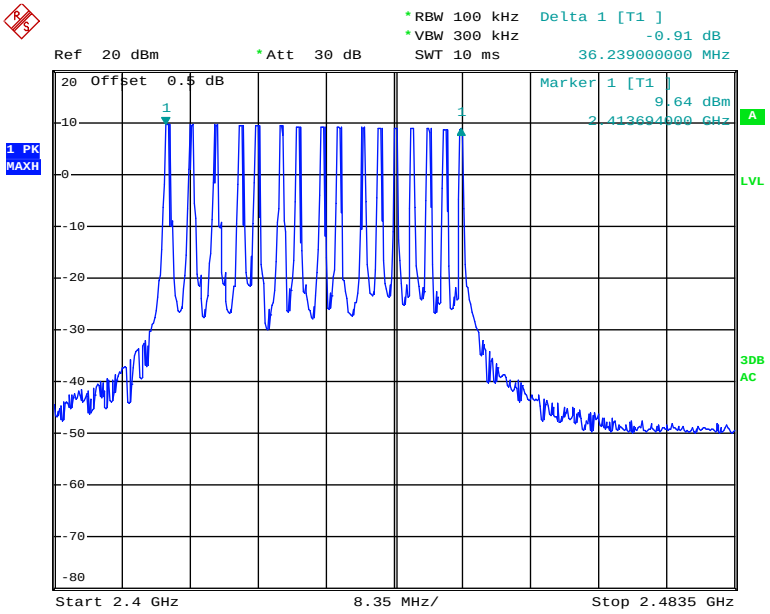
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	16	≥15

Number of Hopping Channels



Date: 7.NOV.2017 17:16:51

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; the time of single pulses was tested.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	100.9 kPa

** The testing was performed by Kira Liu on 2017-11-10.*

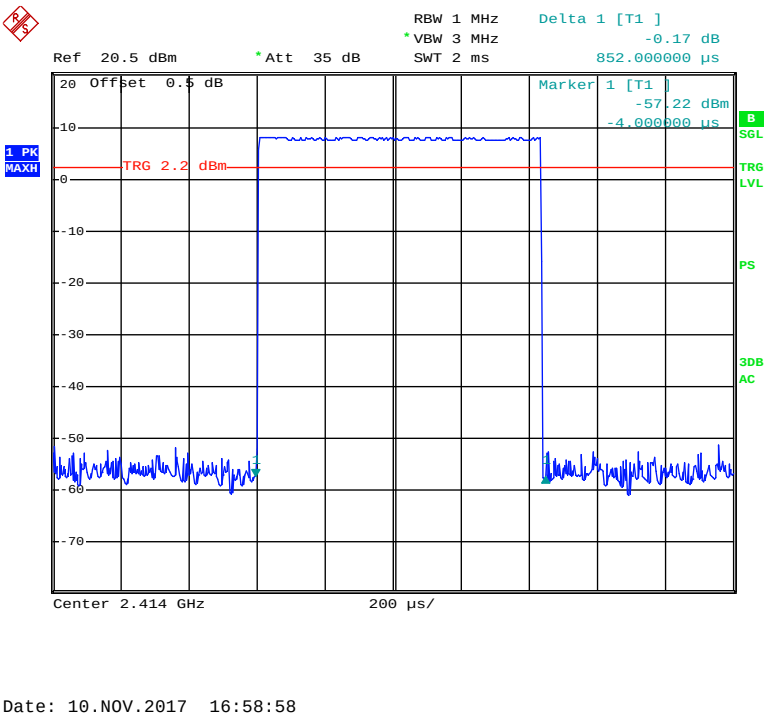
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Channel	Occupancy Time For Single Hop (ms)	Hops in Observed 1s	Hops in Observed Period	Dwell time (s)	Limit (s)	Result
Low	0.852	11	70	0.0596	0.4	Compliance
Middle	0.852	11	70	0.0596	0.4	Compliance
High	0.852	10	64	0.0545	0.4	Compliance
Dwell time=Pulse time (ms) × hopping number per channel in Observed Period Observed Period=0.4 ×hopping numbers=0.4*16=6.4s Hops in Observed Period= Hops in Observed 1s* Observed Period						

Low Channel



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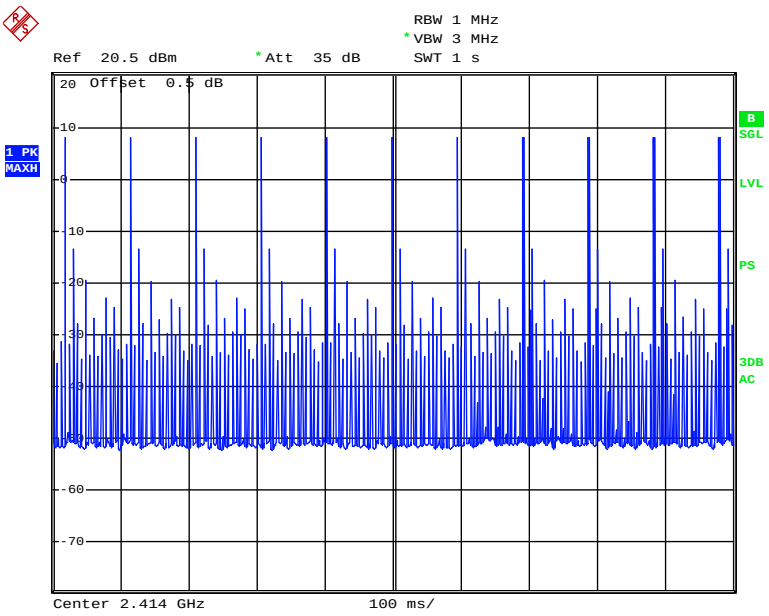
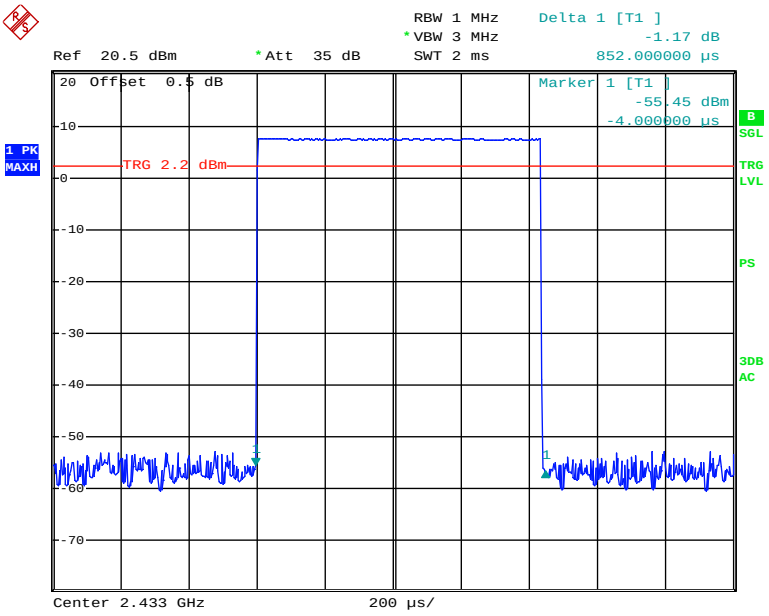


Date: 10.NOV.2017 17:01:24

Middle Channel



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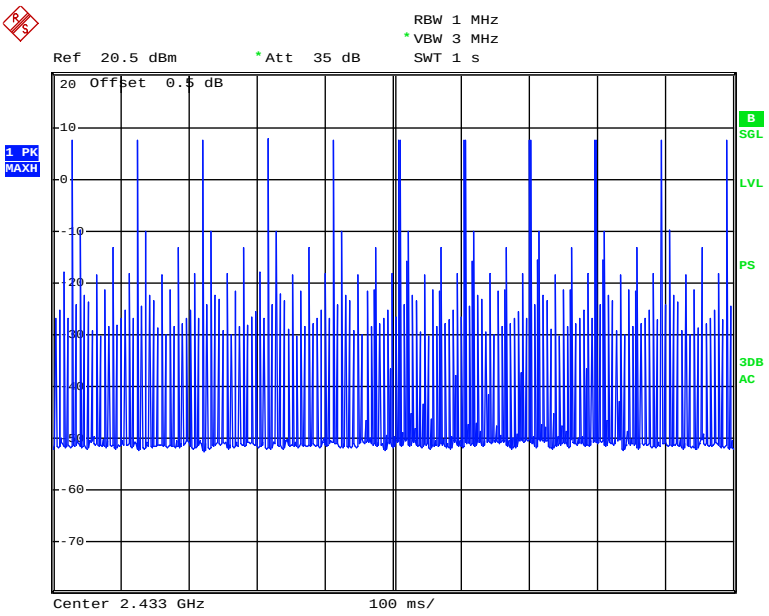
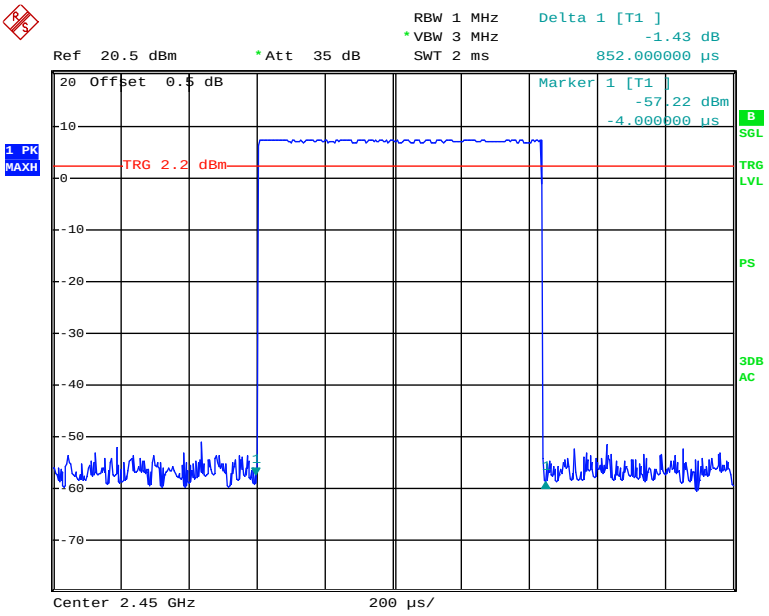
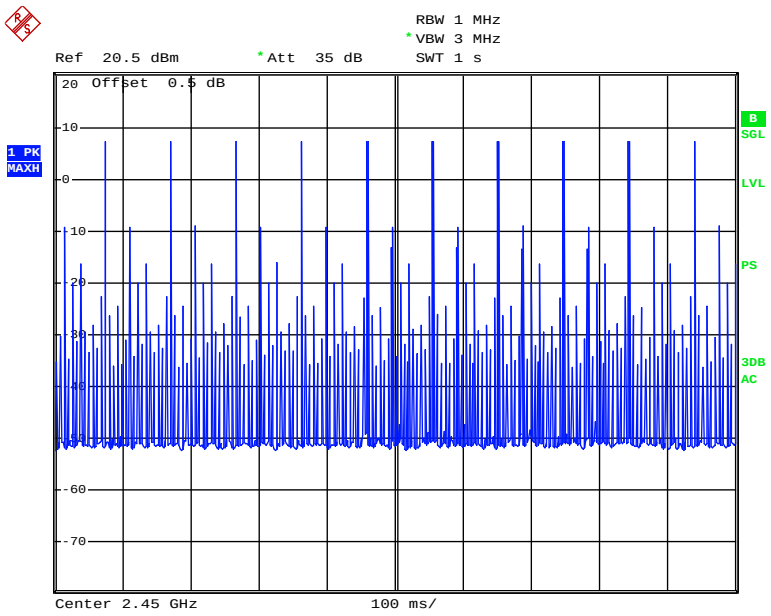


Date: 10.NOV.2017 17:02:06

High Channel



Date: 10.NOV.2017 16:59:31



Date: 10.NOV.2017 16:59:59

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. 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	101.6 kPa

** The testing was performed by Kira Liu on 2017-11-07.*

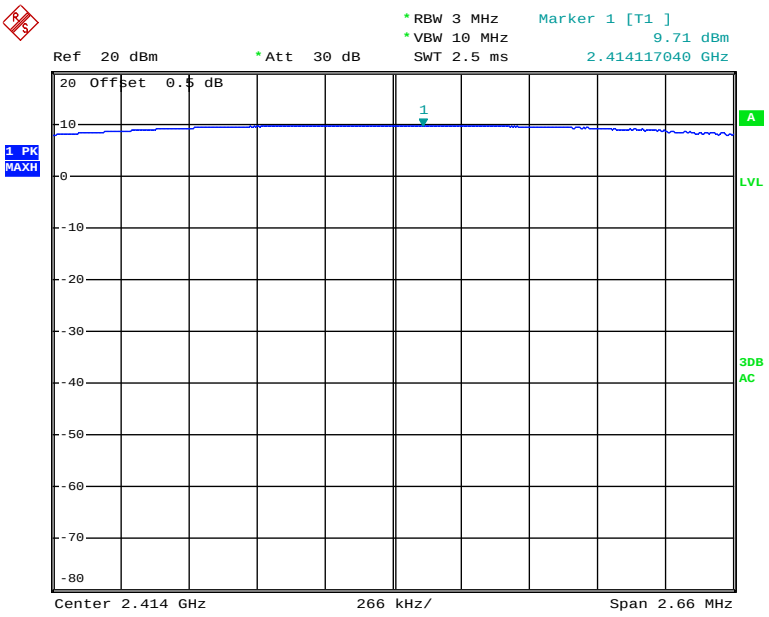
Test Result: Compliance.

Test Mode: Transmitting

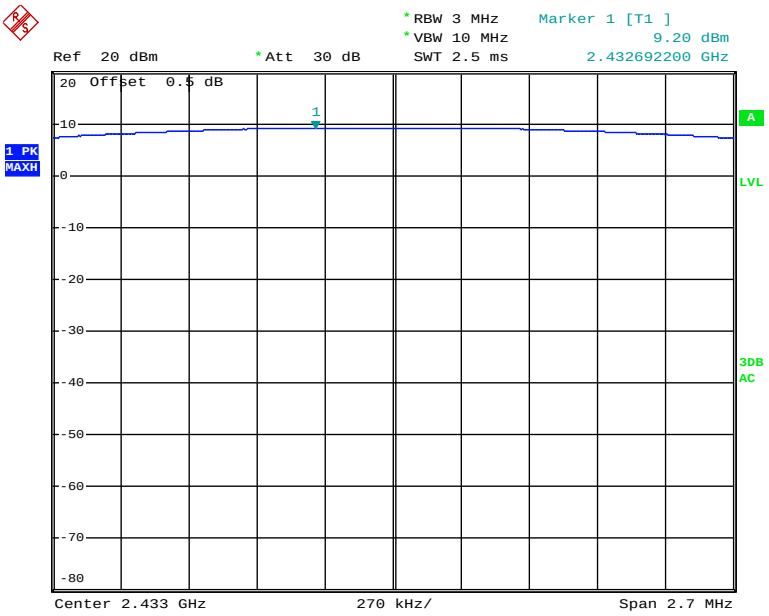
Channel	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
Low	2414	9.71	21
Middle	2433	9.2	21
High	2450	8.8	21

Note: The data above was tested in conducted mode.

Low Channel

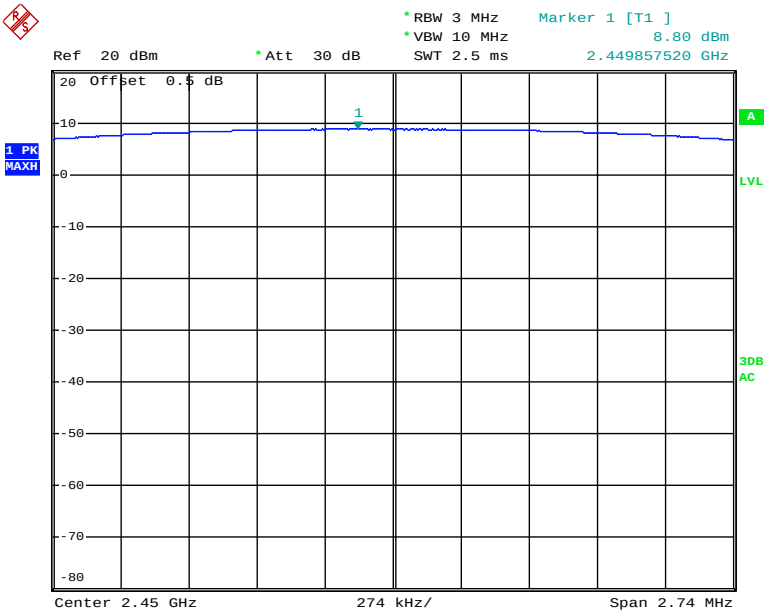


Middle Channel



Date: 7.NOV.2017 16:57:18

High Channel



Date: 7.NOV.2017 17:07:30

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/ VBW of spectrum analyzer to 100/300 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receive	ESCI	101121	2017-03-02	2018-03-02
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data

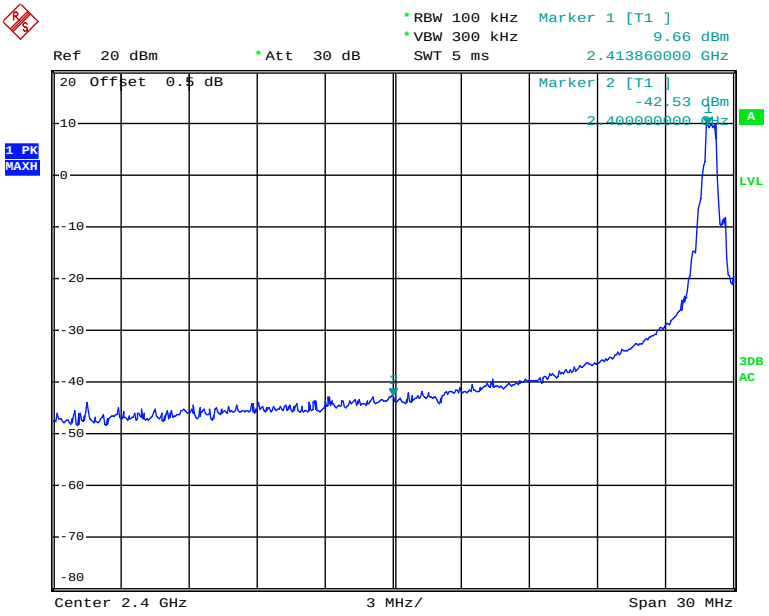
Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	53 %
ATM Pressure:	101.6kPa

** The testing was performed by Kira Liu on 2017-11-07.*

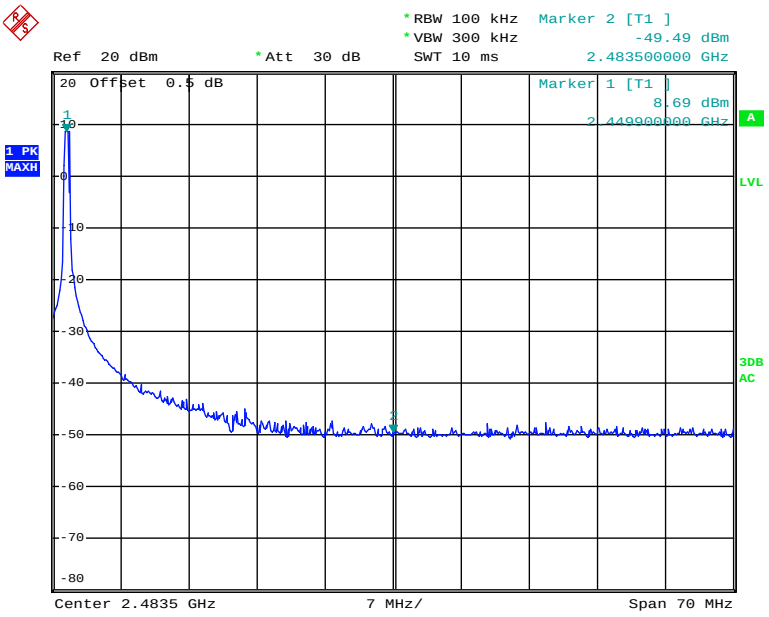
Test Result: Compliance

Band Edge, Left Side



Date: 7.NOV.2017 16:45:27

Band Edge, Right Side



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