FCC Test Report

Product Name	Wireless Intersection Module
Model No	FCU-RC01
FCC ID.	2ANXXFCU-RC01

Applicant	Yazaki Kako Corporation
Address	2-24-1 Oshika Suruga-ku , Shizuoka 422-8519, Japan

Date of Receipt	Nov 14, 2017
Issue Date	Apr. 16, 2018
Report No.	17B0209R-RFUSP24V00
Report Version	V1.0

Testing Laboratory
3023

The test results relate only to the samples tested.
The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.
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Test Report

Issue Date: Apr. 16, 2018
Report No.: 17B0209R-RFUSP24V00

Product Name	Wireless Intersection Module
Applicant	Yazaki Kako Corporation
Address	2-24-1 Oshika Suruga-ku , Shizuoka 422-8519, Japan
Manufacturer	Yazaki Kako Corporation
Model No.	FCU-RC01
EUT Rated Voltage	DC 24V
EUT Test Voltage	DC 24V
Trade Name	Yazaki
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v04
Test Result	Complied

Documented By : Anita Chou

(Senior Engineering Adm. Specialist / Anita Chou)

Tested By : Yun Che Chen

(Engineer / Yunche Chen)

Approved By :

(Director / Vincent Lin)

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless Intersection Module
Trade Name	Yazaki
Model No.	FCU-RC01
FCC ID.	2ANXXFCU-RC01
Frequency Range	2405~2475MHz
Channel Separation	5 MHz
Channel Number	15
Type of Modulation	OQPSK
Antenna Type	Pencil type antenna
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	Arrow 7	ARN-AP03	2.14dBi for 2.4 GHz

Note: The antenna of EUT is conform to FCC 15.203

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2405MHz	Channel 02:	2410MHz	Channel 03:	2415 MHz	Channel 04:	2420 MHz
Channel 05:	2425MHz	Channel 06:	2430MHz	Channel 07:	2435 MHz	Channel 08:	2440 MHz
Channel 09:	2445 MHz	Channel 10:	2450 MHz	Channel 11:	2455 MHz	Channel 12:	2460 MHz
Channel 13:	2465MHz	Channel 14:	2470 MHz	Channel 15:	2475 MHz		

Note:

1. The EUT is a Wireless Intersection Module.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests are conducted on a sample for the purpose of demonstrating compliance of 2.4GHz transmitter with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode:	Mode 1: Transmit

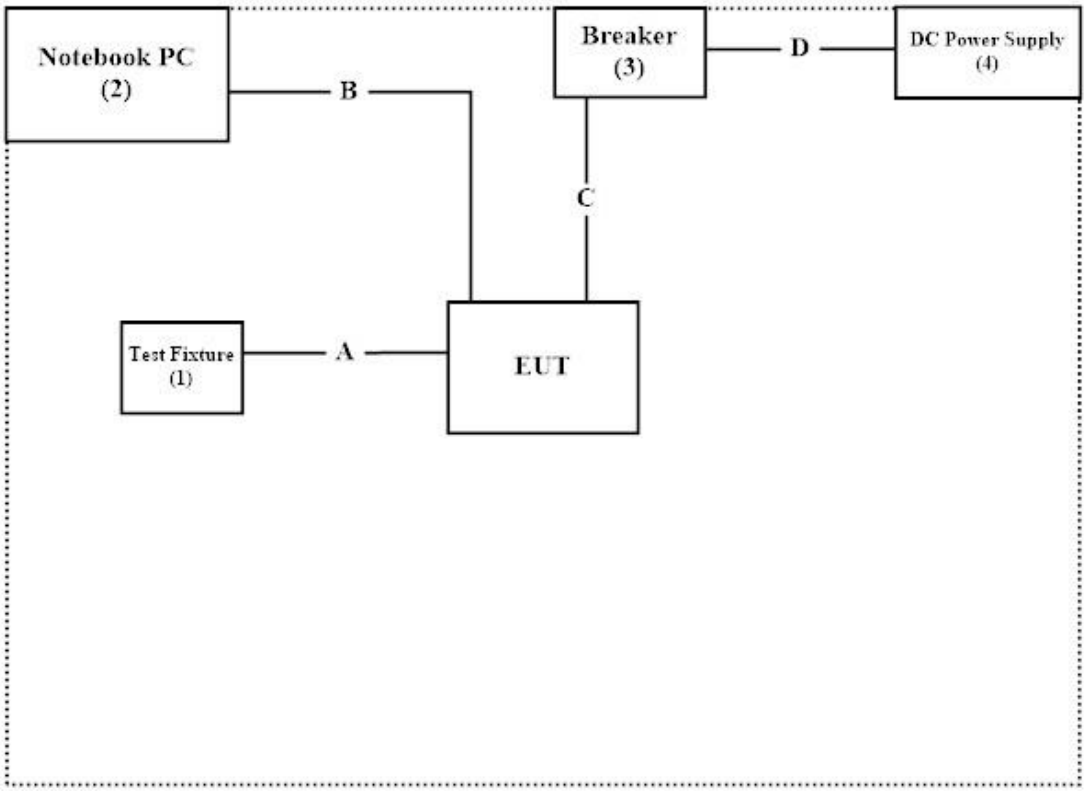
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Test Fixture	Yazaki	N/A	N/A	N/A
2	Notebook PC	DELL	Latitude E5440	74BTK32	Non-Shielded, 0.8m
3	Breaker	Yazaki	N/A	N/A	N/A
4	DC Power Supply	Topward	6303D	743450	N/A

Signal Cable Type		Signal cable Description
A	Fixture Cable	Non-shielded, 0.6m
B	Signal Cable	Non-shielded, 2.2m
C	Power Cable	Non-shielded, 1m
D	Power Cable	Non-shielded, 0.4m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

(1) Setup the EUT as shown in section 1.4.
(2) Rotate the button of the EUT.
(3) Configure the test mode, the test channel to start the continuous transmit
(4) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:
http://www.dekra.com.tw/english/about/certificates.aspx?bval=5
The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en.aspx

Site Description: Accredited by TAF
Accredited Number: 3023

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E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2018/2/12	2019/2/11
X	Spectrum Analyzer	Agilent	N9010A	MY48030495	2017/10/13	2018/10/12
X	Power Meter	Anritsu	ML2495A	6K00003357	2017/8/7	2018/8/6
X	Pulse power sensor	Anritsu	MA2411B	0846193	2017/8/7	2018/8/6
X	EMI Test Receiver	R&S	ESCS 30	100369	2017/11/7	2018/11/6
X	LISN	R&S	ESH3-Z5	836679/017	2018/2/9	2019/2/8
X	LISN	R&S	ENV216	100097	2018/2/9	2019/2/8
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2017/6/22	2018/6/21

For Radiated measurements /Site3/CB8

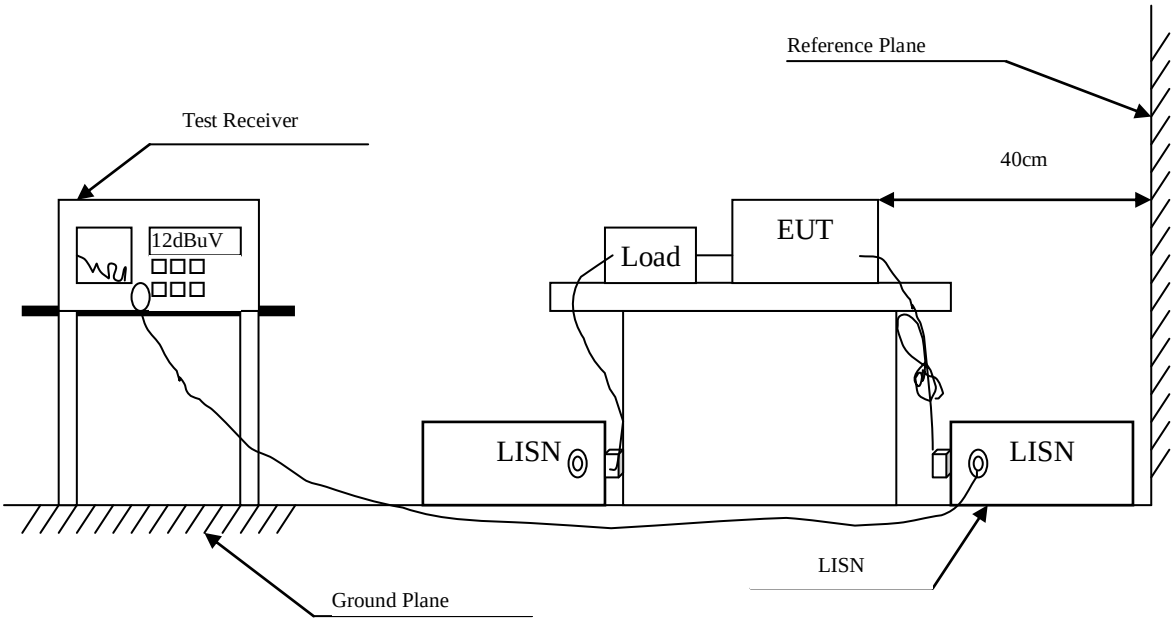
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2018/3/12	2019/3/11
	Loop Antenna	Teseq	HLA6121	37133	2017/10/13	2018/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2017/06/25	2018/06/24
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2017/06/15	2018/06/14
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330010	2017/07/19	2018/07/18
X	Horn Antenna	ETS-Lindgren	3117	00135205	2017/04/28	2018/04/27
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2018/02/24	2019/02/23
X	Coaxial Cable	QuieTek	SF-106	LC035/37/41-SF LC038-SF , LC037-SF	2017/6/21	2018/6/20
	Horn Antenna	ETS-Lindgren	3117	00135205	2017/04/28	2018/04/27
	Pre-Amplifier	EMCI	EMC012630SE	980210	2018/02/24	2019/02/23
	Amplifier + Cable	EMCI	EMC184045SE	980370	2018/03/21	2019/03/20
	Horn Antenna	Com-Power	AH-840	101043	2018/01/09	2019/01/08
X	Filter	MicroTRON	BRM50701	019	2017/11/21	2018/11/20
	Filter	Microwave Circuits	N0257881	36681	2018/1/22	2019/1/21

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version :QuieTek EMI 2.0 V2.1.113.

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AVG
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.
Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product	:	Wireless Intersection Module
Test Item	:	Conducted Emission Test
Power Line	:	Line 1
Test Date	:	2018/03/29
Test Mode	:	Mode 1: Transmit

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 1					
Quasi-Peak					
0.177	9.675	29.420	39.095	-26.134	65.229
0.447	9.688	34.440	44.128	-13.386	57.514
0.931	9.729	22.760	32.489	-23.511	56.000
1.392	9.758	31.640	41.398	-14.602	56.000
1.853	9.787	27.760	37.547	-18.453	56.000
3.580	9.861	24.840	34.701	-21.299	56.000
Average					
0.177	9.675	17.820	27.495	-27.734	55.229
0.447	9.688	24.950	34.638	-12.876	47.514
0.931	9.729	17.440	27.169	-18.831	46.000
1.392	9.758	26.690	36.448	-9.552	46.000
1.853	9.787	20.270	30.057	-15.943	46.000
3.580	9.861	13.150	23.011	-22.989	46.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product	:	Wireless Intersection Module
Test Item	:	Conducted Emission Test
Power Line	:	Line 2
Test Date	:	2018/03/29
Test Mode	:	Mode 1: Transmit

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 2					
Quasi-Peak					
0.185	9.671	27.280	36.951	-28.049	65.000
0.447	9.678	34.240	43.918	-13.596	57.514
0.927	9.718	22.460	32.178	-23.822	56.000
1.392	9.748	31.240	40.988	-15.012	56.000
1.857	9.788	29.200	38.988	-17.012	56.000
2.791	9.823	27.600	37.423	-18.577	56.000
Average					
0.185	9.671	14.250	23.921	-31.079	55.000
0.447	9.678	24.700	34.378	-13.136	47.514
0.927	9.718	17.860	27.578	-18.422	46.000
1.392	9.748	26.080	35.828	-10.172	46.000
1.857	9.788	23.650	33.438	-12.562	46.000
2.791	9.823	20.990	30.813	-15.187	46.000

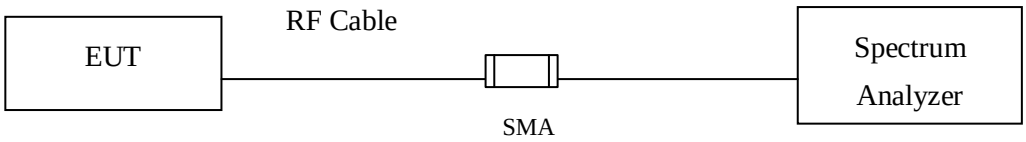
Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Peak Power Output

3.1. Test Setup

Conducted Measurement



3.2. Limits

The maximum peak power shall be less 1 Watt.

3.3. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method.

3.4. Uncertainty

± 1.19 dB

3.5. Test Result of Peak Power Output

Product : Wireless Intersection Module
Test Item : Peak Power Output Data
Test Site : No.3 OATS
Test Date : 2018/03/28
Test Mode : Mode 1: Transmit

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
01	2405.00	9.68	<30dBm	Pass
08	2440.00	9.12	<30dBm	Pass
15	2475.00	8.35	<30dBm	Pass

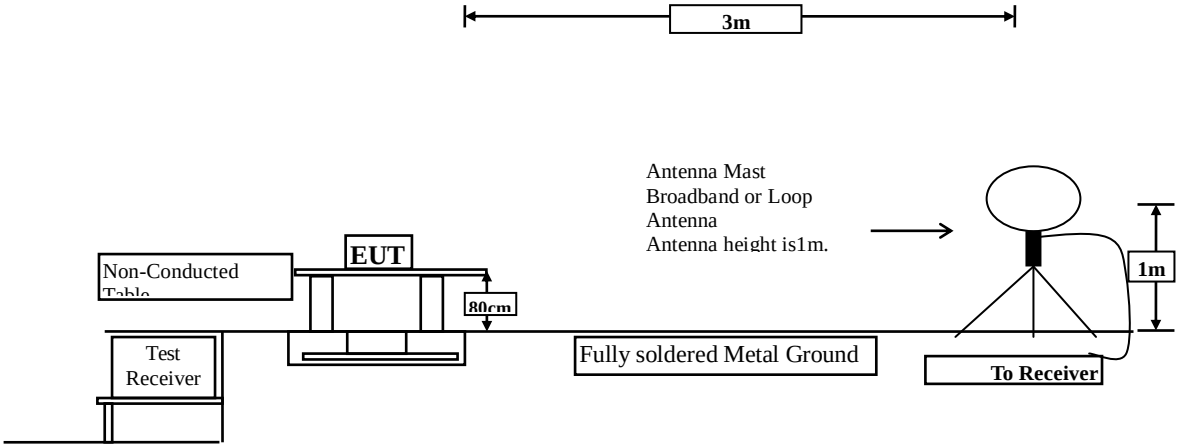
Note:

1. Peak Power Output Value =Reading value on power meter + cable loss

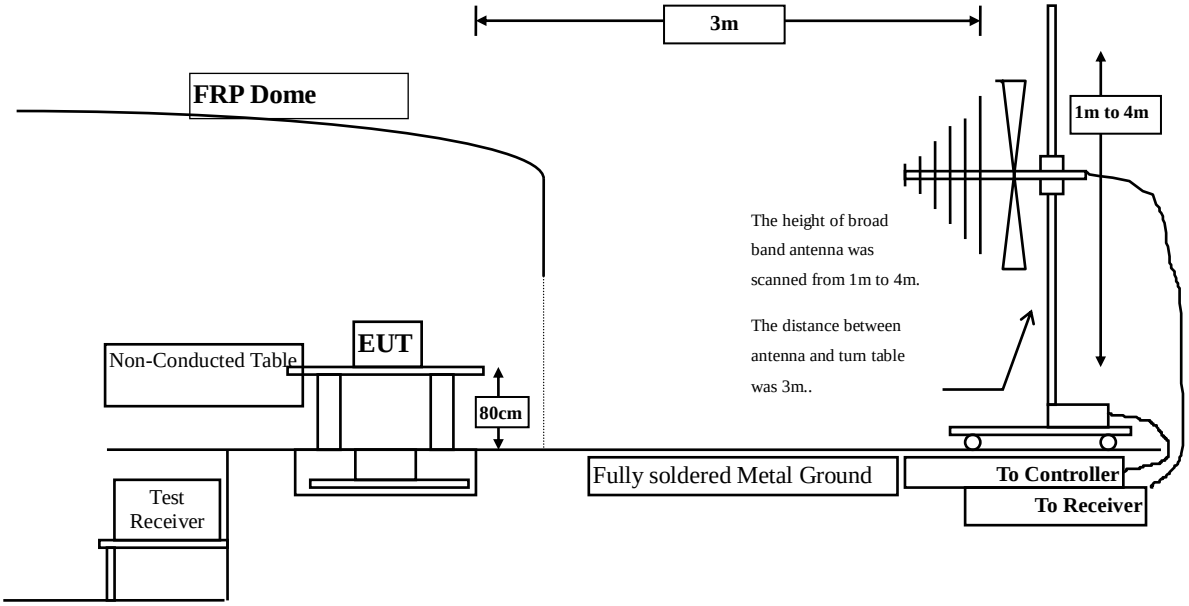
4. Radiated Emission

4.1. Test Setup

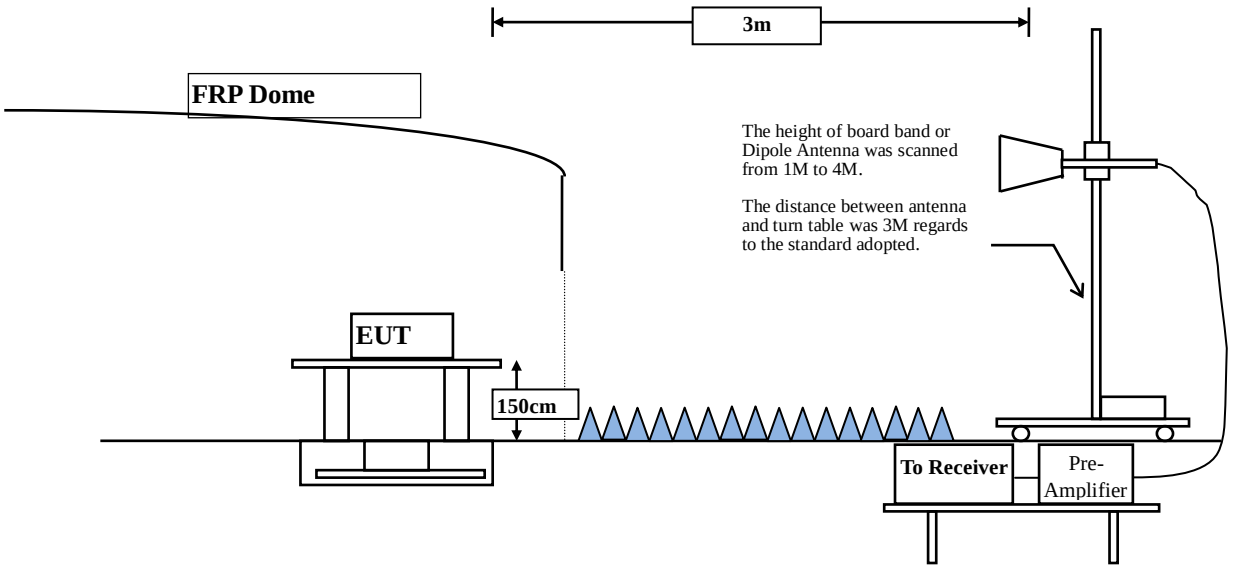
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.2. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks:E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.
Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.
The turn table is rotated 360 degrees to determine the position of the maximum emission level.
The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.
Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.
The measurement is divided into the Preliminary Measurement and the Final Measurement.
The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.
The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

VBW ≥ 3 x RBW.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle ≥ 98 %

VBW ≥ 1/T, when duty cycle < 98 %

(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
2405-2475	100	--	--	10

Note: Duty Cycle Refer to Section 9.

4.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

Product : Wireless Intersection Module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Date : 2018/03/29
Test Mode : Mode 1: Transmit (2405 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4810.000	-9.898	68.450	58.551	-15.449	74.000
7215.000	-4.902	54.130	49.229	-24.771	74.000
9620.000	-1.581	55.270	53.690	-20.310	74.000
Average Detector:					
4810.000	-9.898	59.620	49.721	-4.279	54.000
Vertical					
Peak Detector:					
4810.000	-6.630	67.890	61.260	-12.740	74.000
7215.000	-4.040	55.570	51.531	-22.469	74.000
9620.000	-1.162	53.950	52.789	-21.211	74.000
Average Detector:					
4810.000	-6.630	58.780	52.150	-1.850	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless Intersection Module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Date : 2018/03/29
Test Mode : Mode 1: Transmit (2440 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4880.000	-10.307	69.690	59.383	-14.617	74.000
7320.000	-3.857	55.370	51.513	-22.487	74.000
9760.000	-2.579	57.620	55.042	-18.958	74.000
Average Detector:					
4880.000	-10.307	61.040	50.733	-3.267	54.000
9760.000	-2.579	44.940	42.362	-11.638	54.000
Vertical					
Peak Detector:					
4880.000	-7.579	65.730	58.151	-15.849	74.000
7320.000	-2.987	57.450	54.463	-19.537	74.000
9760.000	-2.107	55.480	53.373	-20.627	74.000
Average Detector:					
4880.000	-7.579	56.890	49.311	-4.689	54.000
7320.000	-2.987	45.550	42.563	-11.437	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	:	Wireless Intersection Module
Test Item	:	Harmonic Radiated Emission Data
Test Site	:	No.3 OATS
Test Date	:	2018/03/29
Test Mode	:	Mode 1: Transmit (2475 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4950.000	-10.623	64.440	53.817	-20.183	74.000
7425.000	-3.726	48.580	44.854	-29.146	74.000
9900.000	-2.409	48.030	45.621	-28.379	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4950.000	-7.863	57.940	50.076	-23.924	74.000
7425.000	-2.746	51.170	48.424	-25.576	74.000
9900.000	-1.816	47.280	45.464	-28.536	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless Intersection Module
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Date : 2018/04/12
Test Mode : Mode 1: Transmit (2440 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
40.670	-4.780	39.078	34.298	-5.702	40.000
99.840	-9.873	47.225	37.352	-6.148	43.500
245.340	-6.478	41.325	34.847	-11.153	46.000
350.100	-1.298	37.100	35.802	-10.198	46.000
842.860	6.248	31.136	37.384	-8.616	46.000
997.090	8.467	28.428	36.895	-17.105	54.000
Vertical					
99.840	-6.063	42.432	36.369	-7.131	43.500
210.420	-5.657	32.225	26.568	-16.932	43.500
480.080	-3.390	29.948	26.558	-19.442	46.000
620.730	0.356	26.325	26.681	-19.319	46.000
832.190	1.883	30.693	32.576	-13.424	46.000
926.280	3.342	25.231	28.573	-17.427	46.000

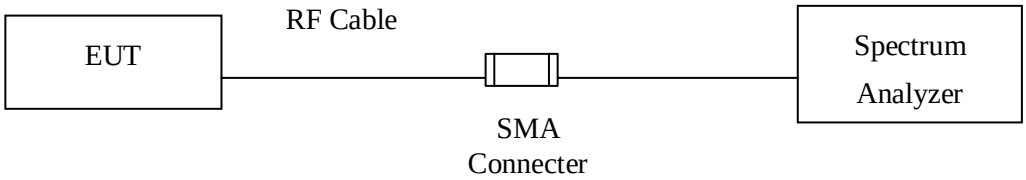
Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

5. RF antenna conducted test

5.1. Test Setup

RF antenna Conducted Measurement:



5.2. Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

5.3. Test Procedure

The EUT was tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
Set RBW = 100 kHz, Set VBW> RBW, scan up through 10th harmonic.

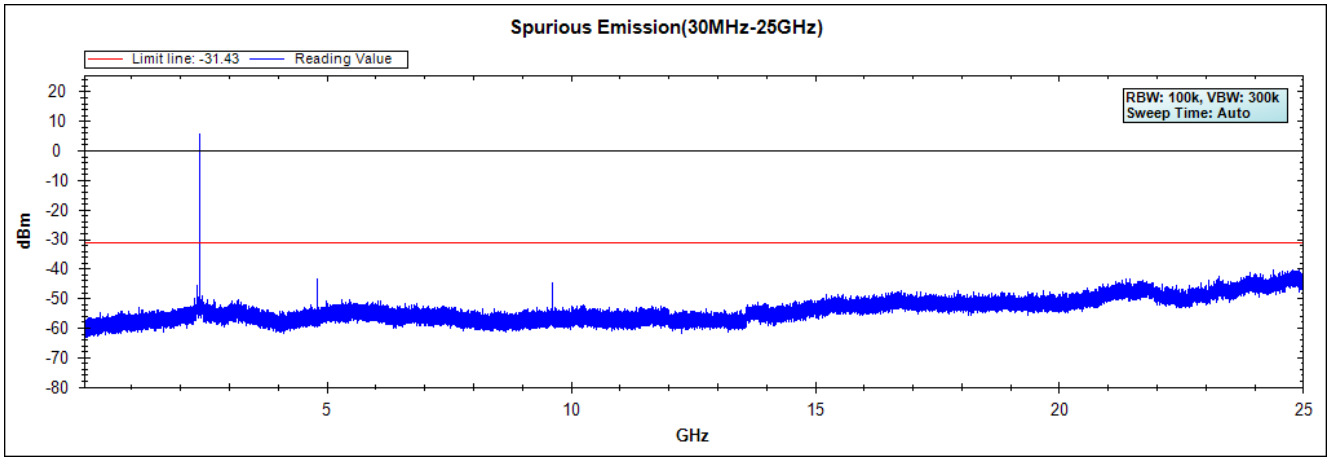
5.4. Uncertainty

The measurement uncertainty
Conducted is defined as ± 1.20dB

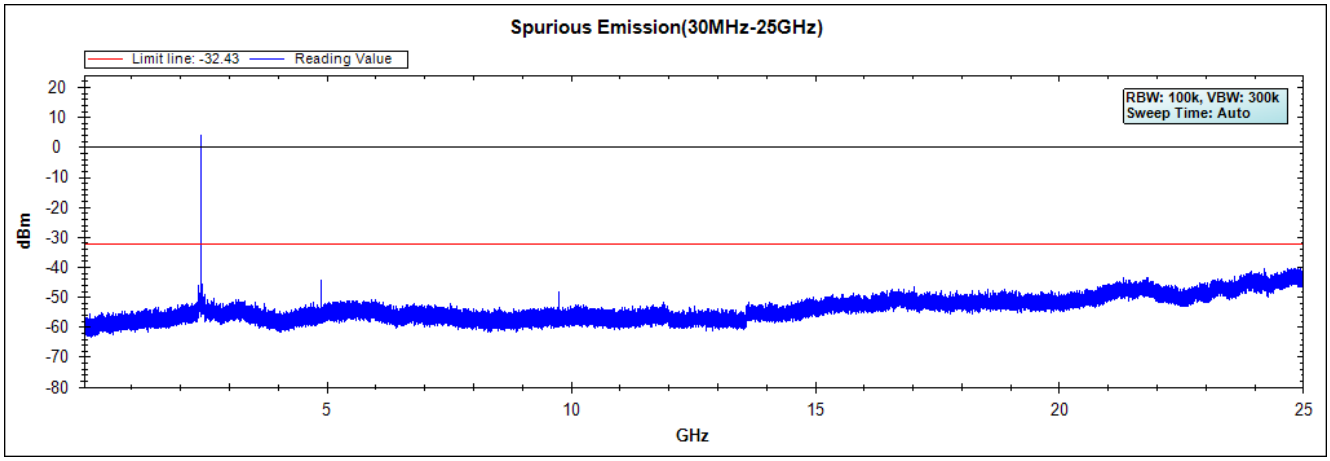
5.5. Test Result of RF antenna conducted test

Product	:	Wireless Intersection Module
Test Item	:	RF antenna conducted test
Test Site	:	No.3 OATS
Test Date	:	2018/03/28
Test Mode	:	Mode 1: Transmit

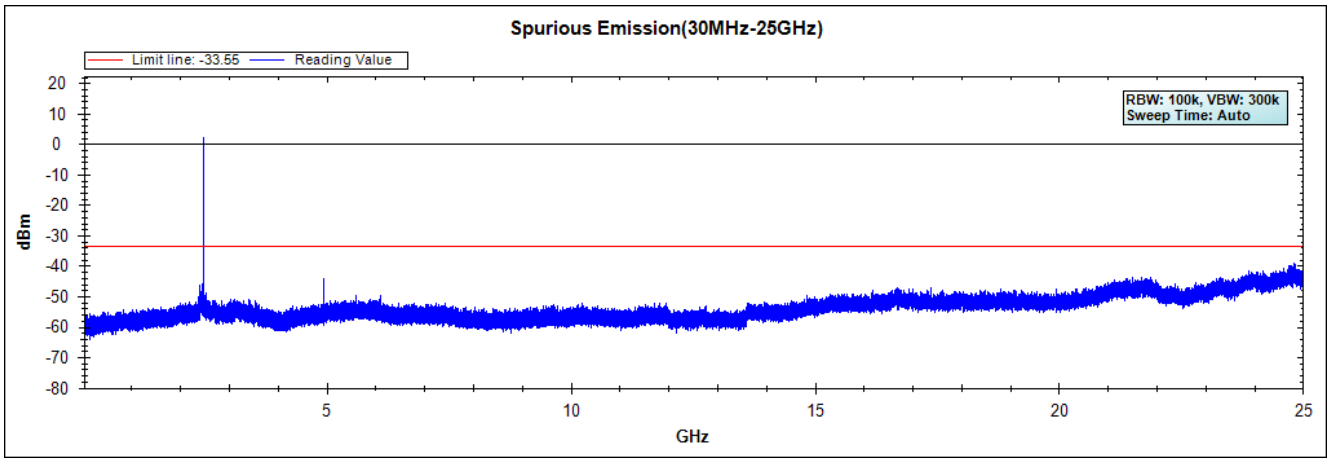
Channel 01(2405 MHz)



Channel 08 (2440 MHz)



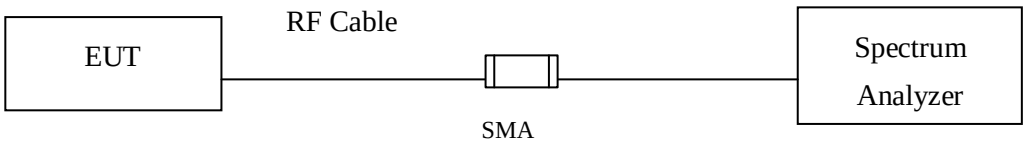
Channel 15 (2475 MHz)



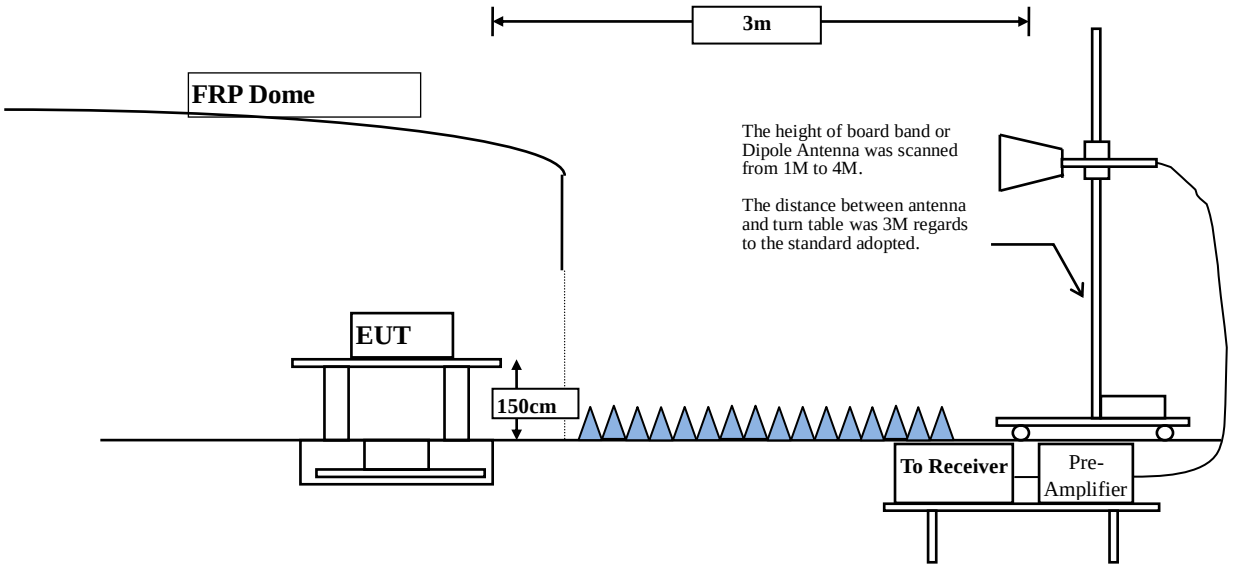
6. Band Edge

6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:



6.2. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

6.3. Test Procedure

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

VBW ≥ 3 x RBW.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle ≥ 98 %

VBW ≥ 1/T, when duty cycle < 98 %

(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
2405-2475	100	--	--	10

Note: Duty Cycle Refer to Section 9.

6.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

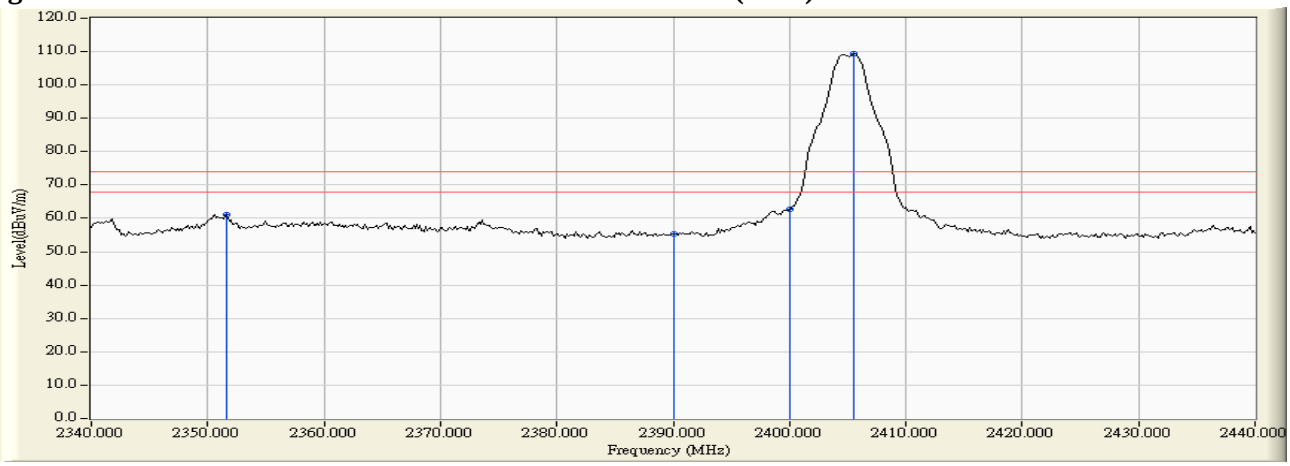
6.5. Test Result of Band Edge

Product : Wireless Intersection Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Date : 2018/03/29
Test Mode : Mode 1: Transmit (2405 MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Result
01 (Peak)	2351.594	6.304	54.760	61.064	-12.936	74.000	Pass
01 (Peak)	2390.000	6.474	48.801	55.276	-18.724	74.000	Pass
01 (Peak)	2400.000	6.528	56.098	62.626	--	--	--
01 (Peak)	2405.507	6.562	102.735	109.297	--	--	--

Figure Channel 01: Horizontal (Peak)

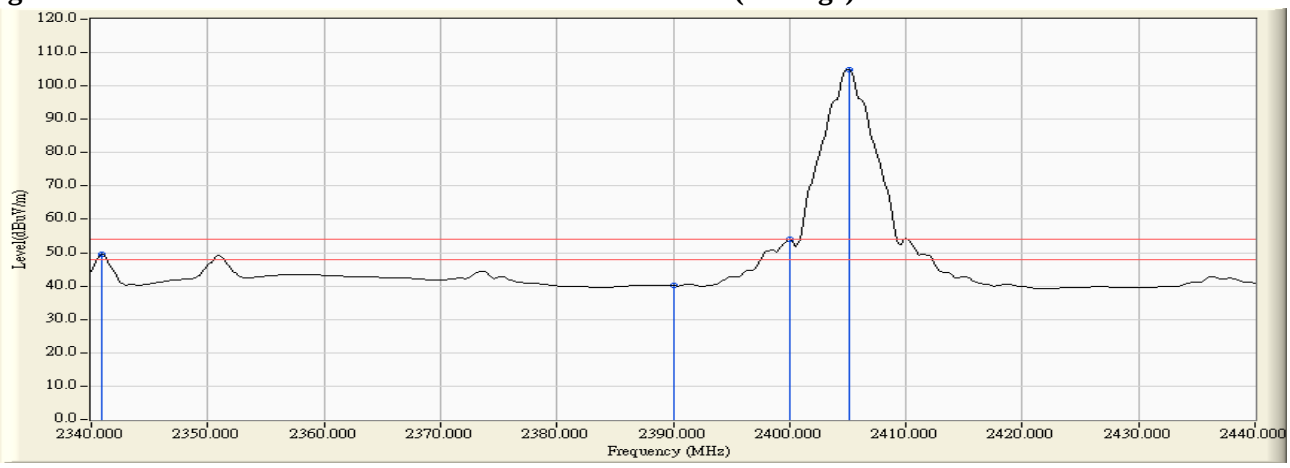


Product : Wireless Intersection Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Date : 2018/03/29
Test Mode : Mode 1: Transmit (2405 MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Result
01 (Average)	2340.870	6.257	43.262	49.519	-4.481	54.000	Pass
01 (Average)	2390.000	6.474	33.645	40.120	-13.880	54.000	Pass
01 (Average)	2400.000	6.528	47.527	54.055	--	--	--
01 (Average)	2405.072	6.559	98.384	104.943	--	--	--

Figure Channel 01: Horizontal (Average)

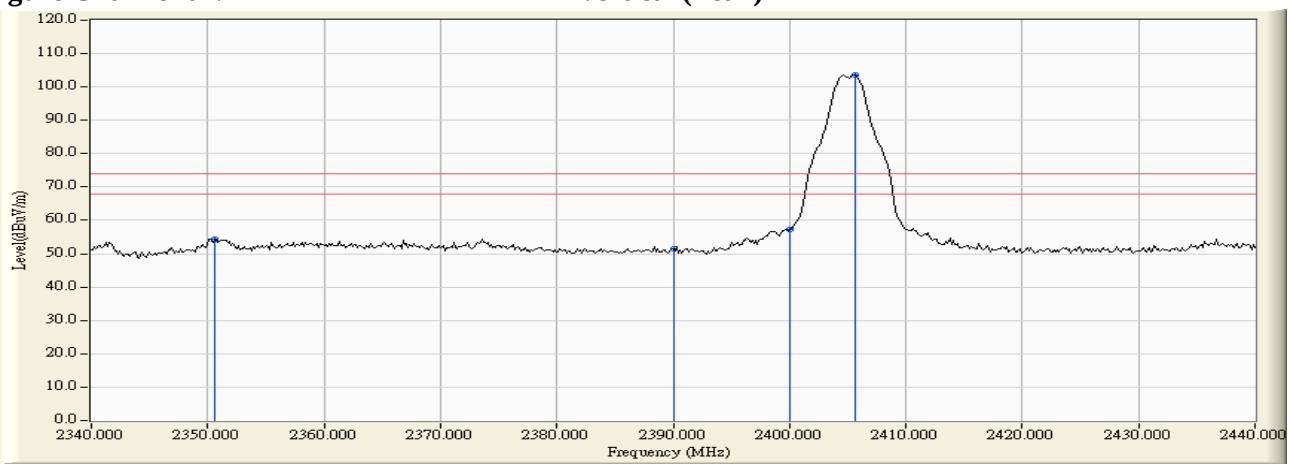


Product : Wireless Intersection Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Date : 2018/03/29
Test Mode : Mode 1: Transmit (2405 MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Result
01 (Peak)	2350.580	6.043	48.302	54.345	-19.655	74.000	Pass
01 (Peak)	2390.000	5.880	45.447	51.328	-22.672	74.000	Pass
01 (Peak)	2400.000	5.879	51.412	57.291	--	--	--
01 (Peak)	2405.652	5.893	97.723	103.617	--	--	--

Figure Channel 01: Vertical (Peak)

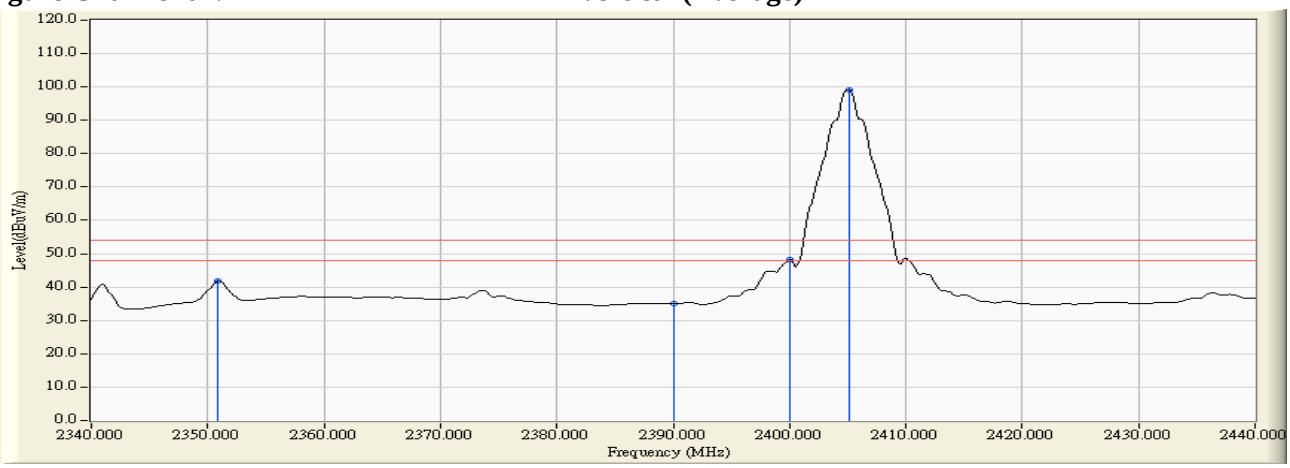


Product : Wireless Intersection Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Date : 2018/03/29
Test Mode : Mode 1: Transmit (2405 MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Result
01 (Average)	2350.870	6.042	35.824	41.866	-12.134	54.000	Pass
01 (Average)	2390.000	5.880	29.106	34.987	-19.013	54.000	Pass
01 (Average)	2400.000	5.879	42.350	48.229	--	--	--
01 (Average)	2405.072	5.892	93.303	99.195	--	--	--

Figure Channel 01: Vertical (Average)

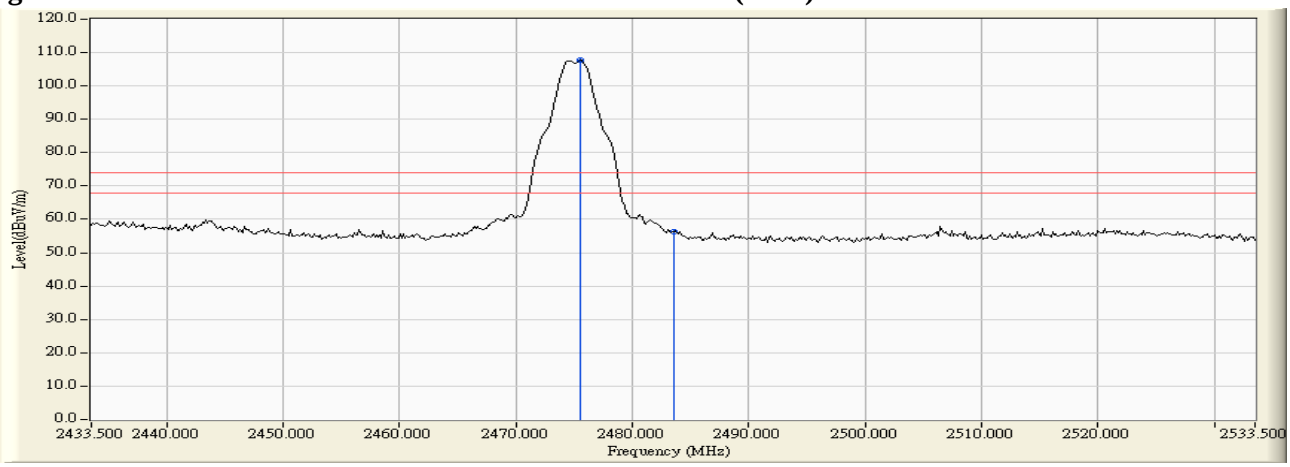


Product	:	Wireless Intersection Module
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Date	:	2018/03/29
Test Mode	:	Mode 1: Transmit (2475 MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Result
15 (Peak)	2475.529	7.054	100.604	107.658	--	--	--
15 (Peak)	2483.500	7.110	49.123	56.233	-17.767	74.000	Pass

Figure Channel 15: Horizontal (Peak)

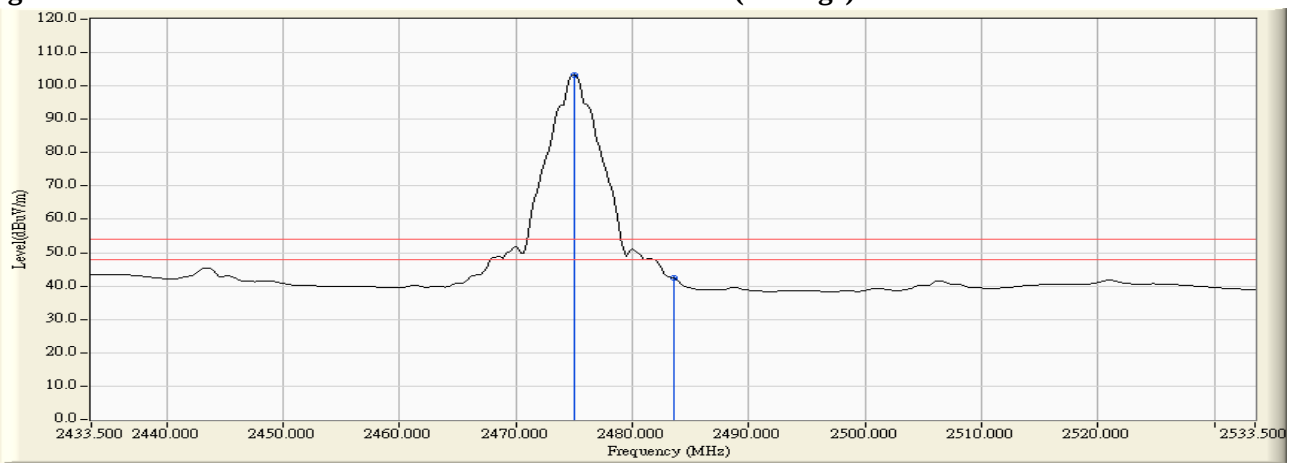


Product : Wireless Intersection Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Date : 2018/03/29
Test Mode : Mode 1: Transmit (2475 MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Result
15 (Average)	2474.949	7.050	96.281	103.330	--	--	--
15 (Average)	2483.500	7.110	35.329	42.439	-11.561	54.000	Pass

Figure Channel 15: Horizontal (Average)

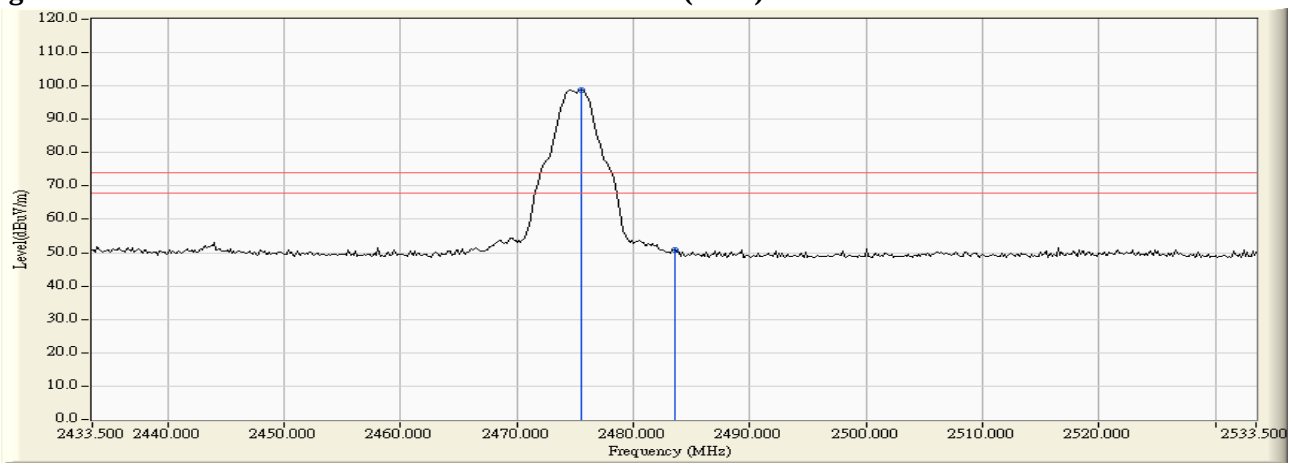


Product : Wireless Intersection Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Date : 2018/03/29
Test Mode : Mode 1: Transmit (2475 MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Result
15 (Peak)	2475.529	6.313	92.513	98.826	--	--	--
15 (Peak)	2483.500	6.363	44.324	50.687	-23.313	74.000	Pass

Figure Channel 78: Vertical (Peak)

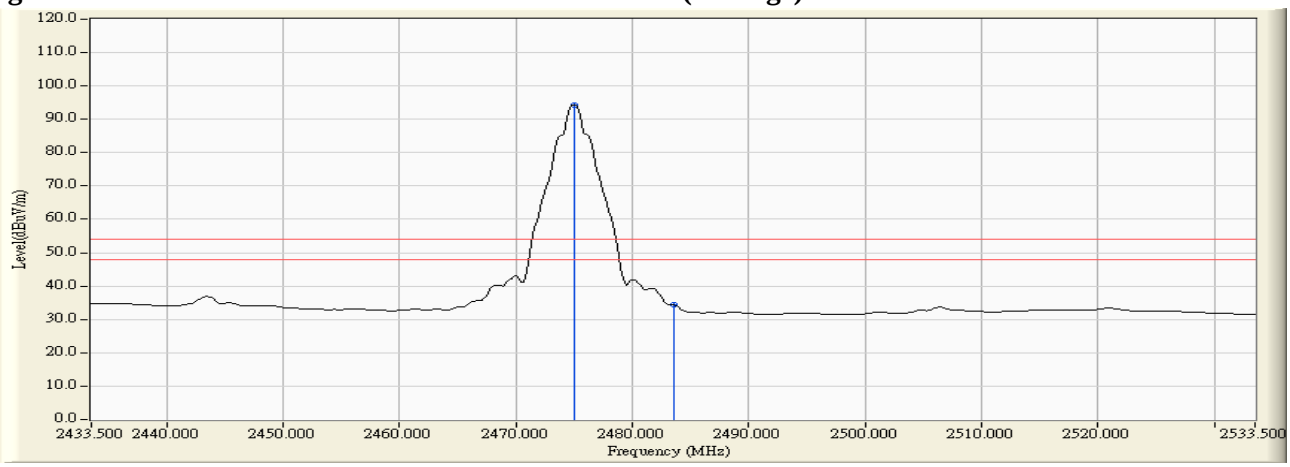


Product : Wireless Intersection Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Date : 2018/03/29
Test Mode : Mode 1: Transmit (2475 MHz)

RF Radiated Measurement (Vertical):

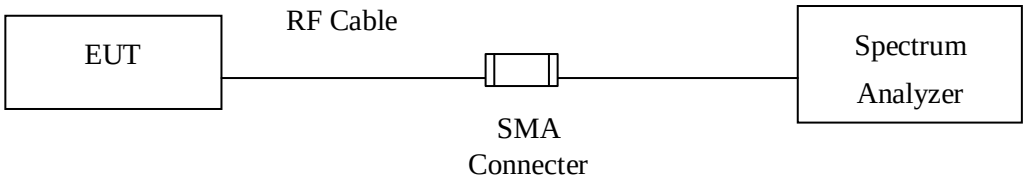
Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Result
15 (Average)	2474.949	6.310	88.090	94.400	--	--	--
15 (Average)	2483.500	6.363	27.996	34.359	-19.641	54.000	Pass

Figure Channel 78: Vertical (Average)



7. 6dB Bandwidth

7.1. Test Setup



7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

7.3. Test Procedure

The EUT was setup according to ANSI C63.4, 2014; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

7.4. Uncertainty

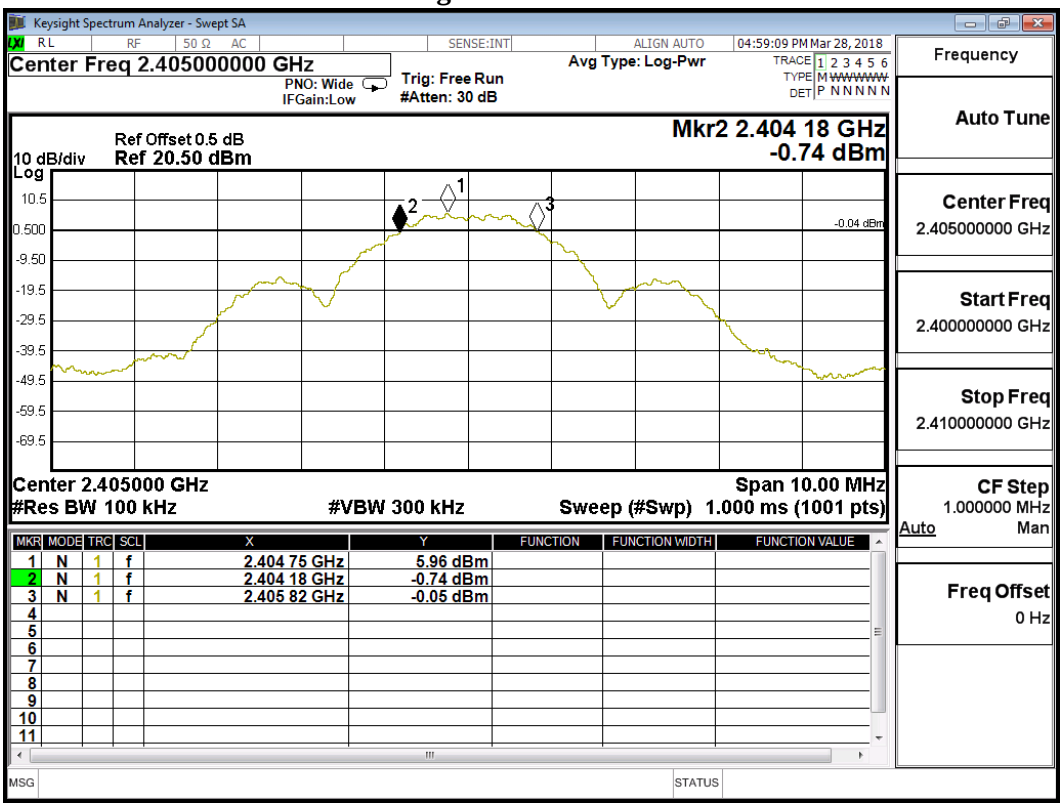
± 283Hz

7.5. Test Result of 6dB Bandwidth

Product : Wireless Intersection Module
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Date : 2018/03/28
Test Mode : Mode 1: Transmit (2405 MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2405.00	1640	>500	Pass

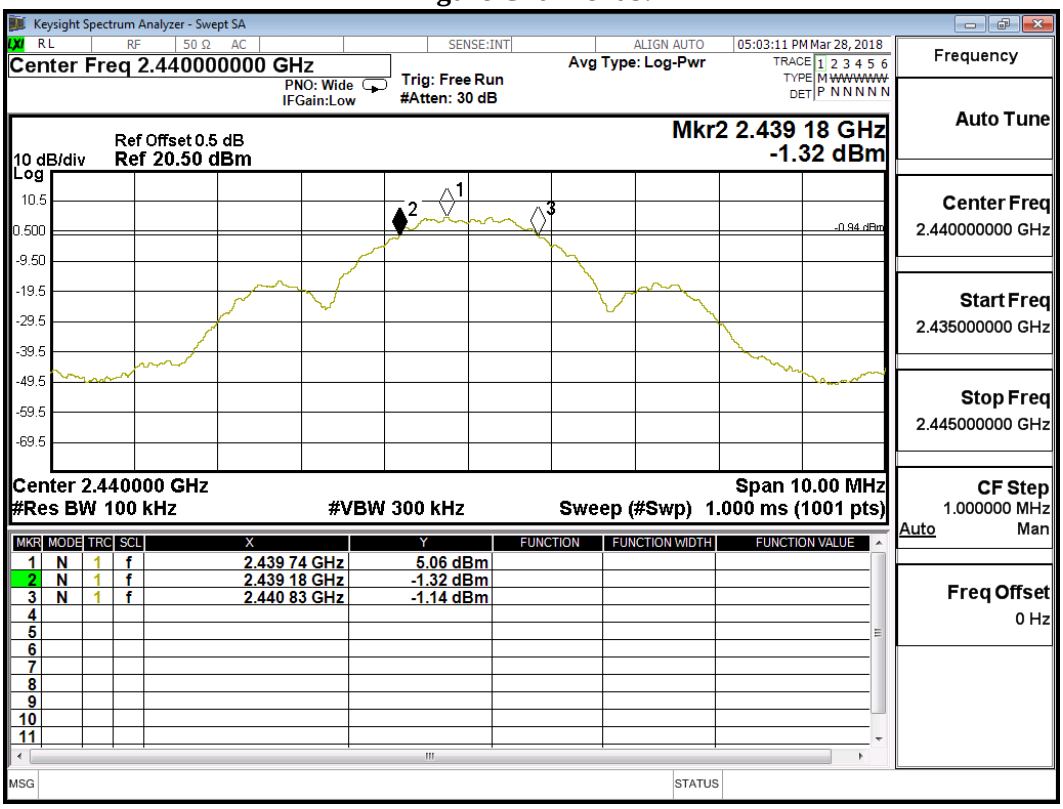
Figure Channel 01:



Product : Wireless Intersection Module
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Date : 2018/03/28
Test Mode : Mode 1: Transmit (2440 MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
08	2440.00	1650	>500	Pass

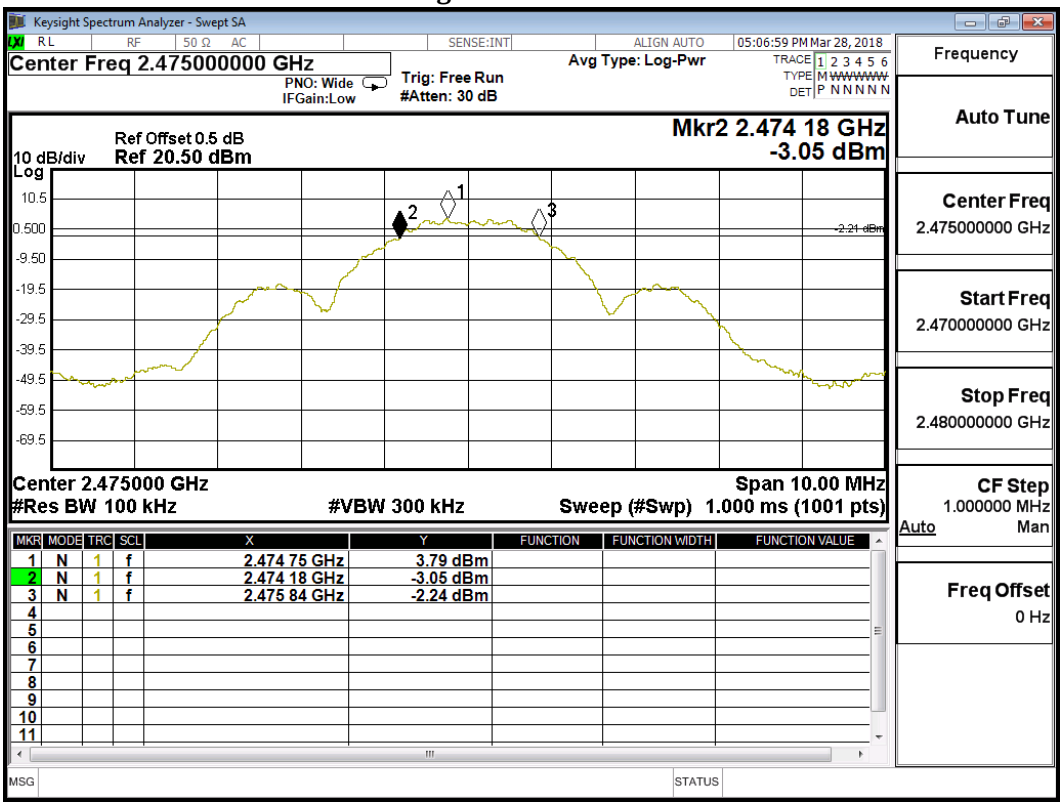
Figure Channel 08:



Product : Wireless Intersection Module
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Date : 2018/03/28
Test Mode : Mode 1: Transmit (2475 MHz)

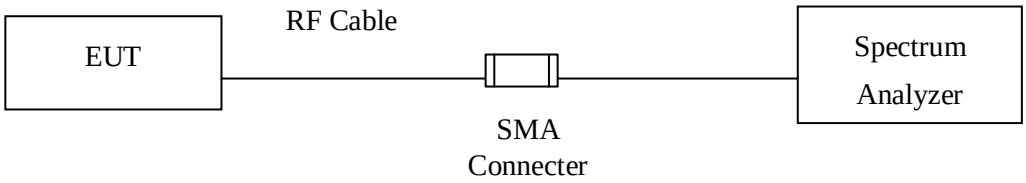
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
15	2475.00	1660	>500	Pass

Figure Channel 15:



8. Power Density

8.1. Test Setup



8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

8.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013; tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

The maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

8.4. Uncertainty

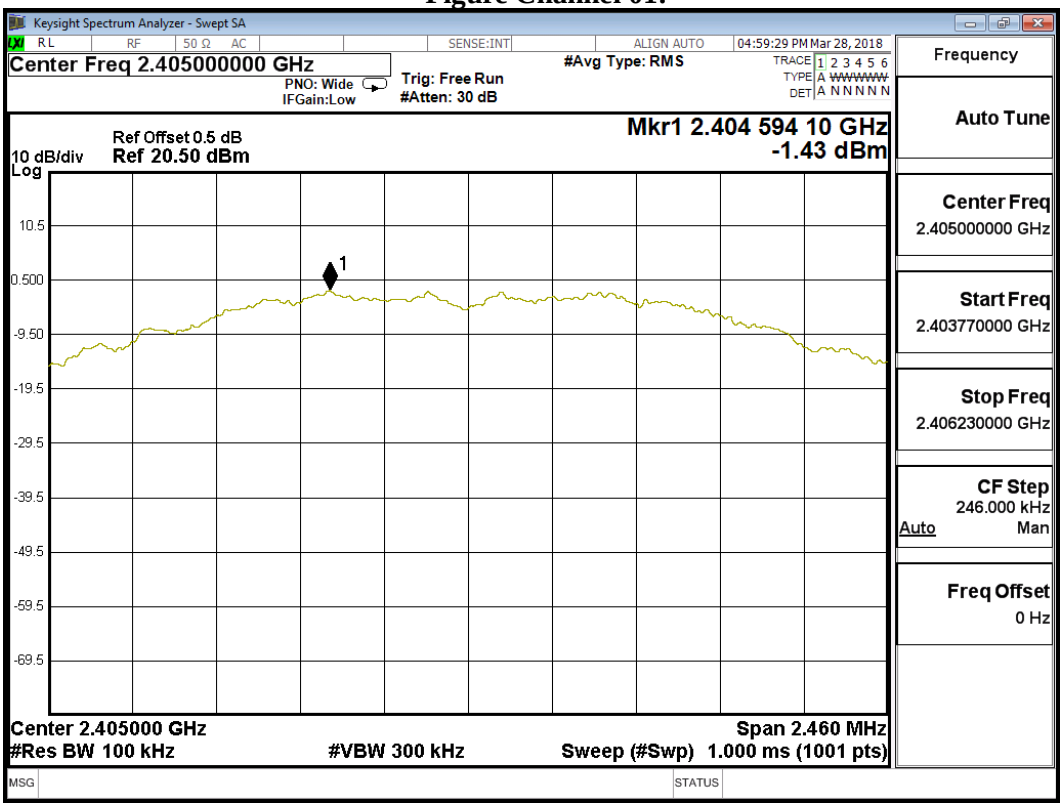
± 1.20 dB

8.5. Test Result of Power Density

Product : Wireless Intersection Module
Test Item : Power Density Data
Test Site : No.3 OATS
Test Date : 2018/03/28
Test Mode : Mode 1: Transmit (2405 MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
01	2405.00	-1.43	≦8dBm	Pass

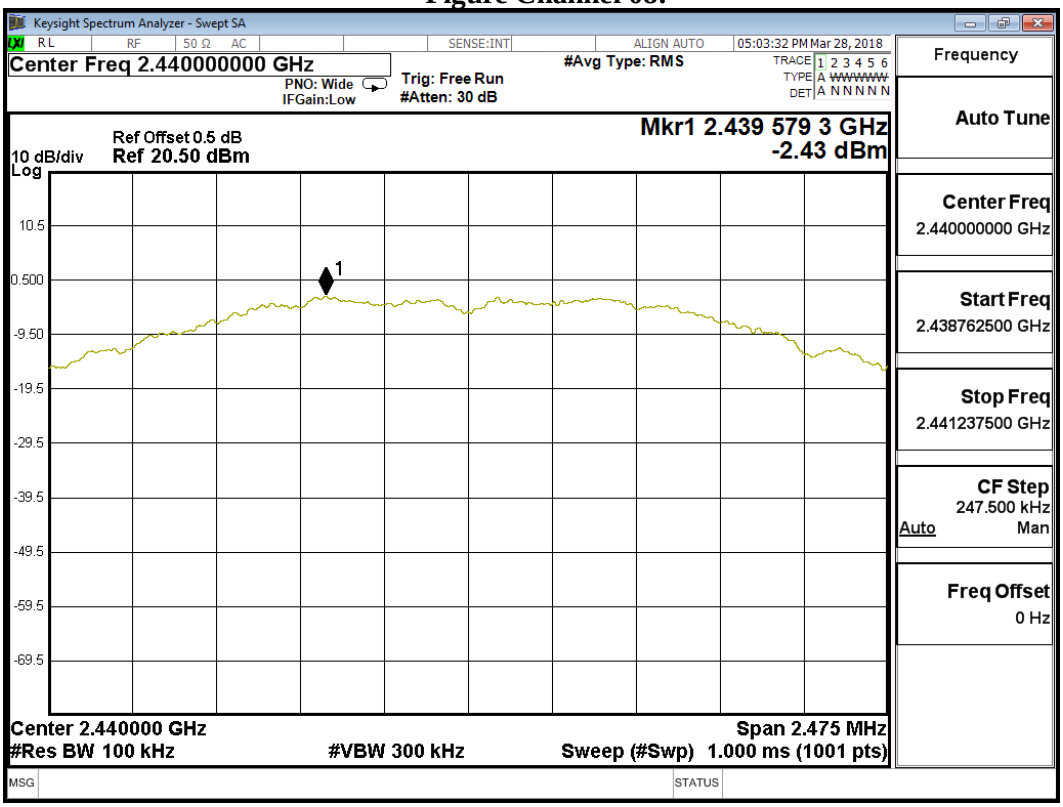
Figure Channel 01:



Product : Wireless Intersection Module
Test Item : Power Density Data
Test Site : No.3OATS
Test Date : 2018/03/28
Test Mode : Mode 1: Transmit (2440 MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
08	2440.00	-2.43	≦8dBm	Pass

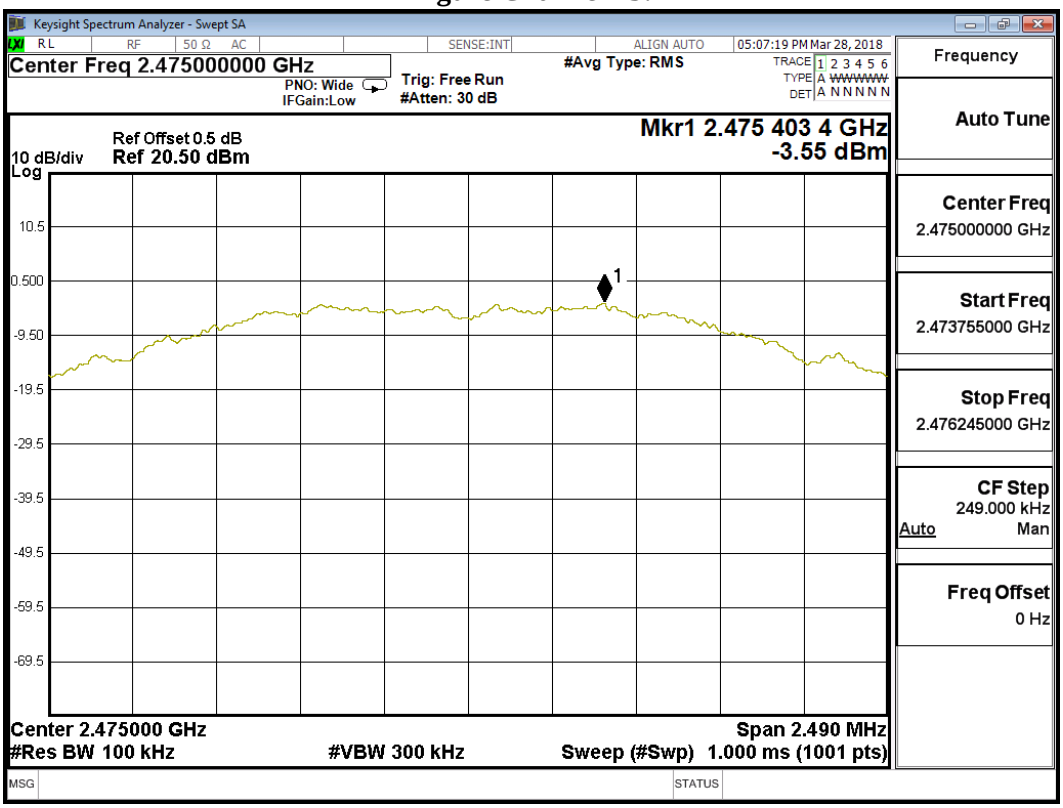
Figure Channel 08:



Product : Wireless Intersection Module
Test Item : Power Density Data
Test Site : No.3 OATS
Test Date : 2018/03/28
Test Mode : Mode 1: Transmit (2475 MHz)

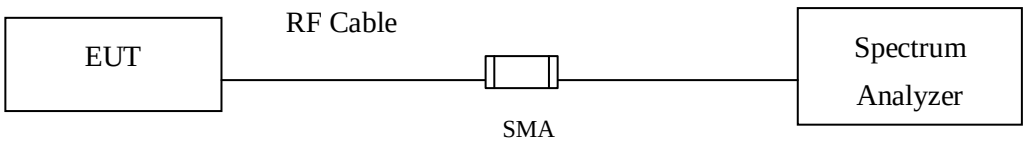
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
15	2475.00	-3.55	≦8dBm	Pass

Figure Channel 15:



9. Duty Cycle

9.1. Test Setup



9.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

9.3. Uncertainty

± 2.31msec

9.4. Test Result of Duty Cycle

Product : Wireless Intersection Module
Test Item : Duty Cycle
Test Date : 2018/03/21
Test Mode : Mode 1: Transmit

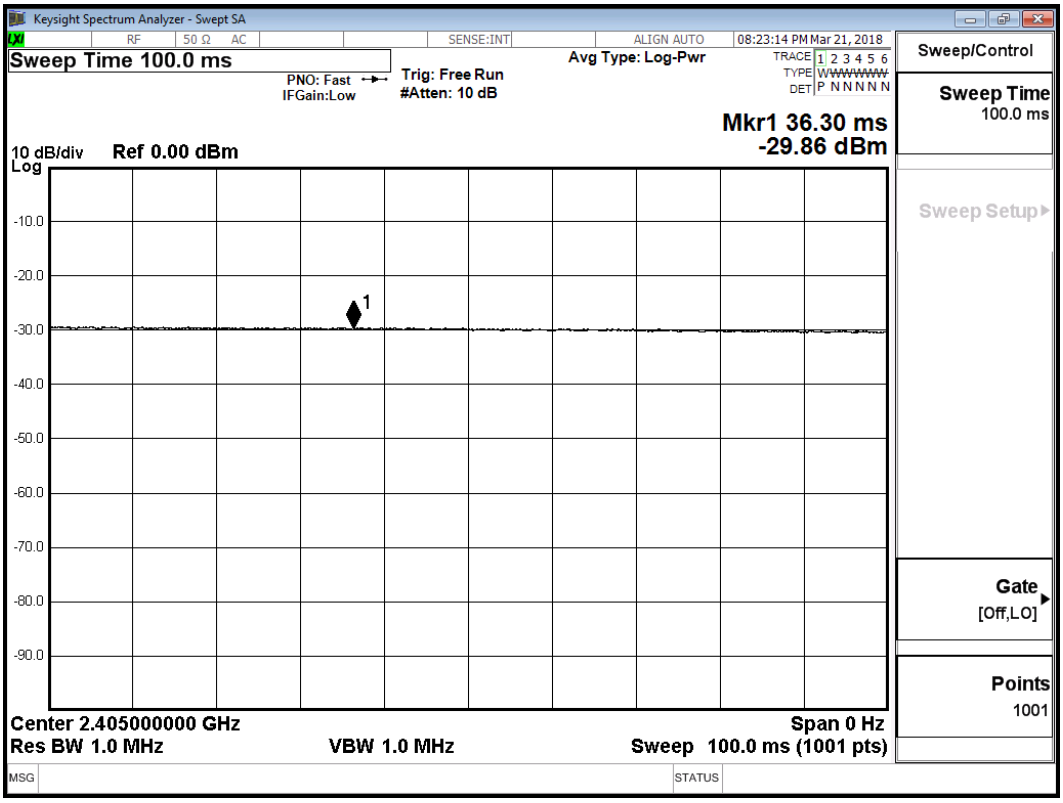
Duty Cycle Formula:

Duty Cycle = Ton / (Ton + Toff)

Duty Factor = 10 Log (1/Duty Cycle)

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
2405	--	--	100	0



10. EMI Reduction Method During Compliance Testing

No modification was made during testing.