FCC Test Report

Product Name	Wireless Remote Control
Model No.	883423
FCC ID.	X96883423

Applicant	COMEUP INDUSTRIES INC.
Address	No.139, Jieyukeng Rd., Ruifang Dist., New Taipei City 22453, Taiwan

Date of Receipt	Apr 25, 2018
Issued Date	Aug 02, 2018
Report No.	1840308R-RFUSP02V00-A
Report Version	V1.0

Testing Laboratory
3023

Test Report

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Applicant	COMEUP INDUSTRIES INC.
Address	No.139, Jieyukeng Rd., Ruifang Dist., New Taipei City 22453, Taiwan
Manufacturer	COMEUP INDUSTRIES INC.
Model No.	883423
FCC ID.	X96883423
EUT Rated Voltage	DC 8-24V
EUT Test Voltage	DC 12V
Trade Name	COMEUP
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 : April Chen

(Senior Adm. Specialist / April Chen)

Tested By : Yun Che Chen

(Engineer / Yunche Chen)

Approved By :

(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless Remote Control
Trade Name	COMEUP
Model No.	883423
FCC ID.	X96883423
Frequency Range	2402 – 2480MHz
Number of Channels	79CH
Type of Modulation	GFSK(1Mbps)
Antenna type	Printed on PCB
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain (dBi)
1	COMEUP	N/A	Printed on PCB	0dBi for 2.4 GHz

Note: The antenna of EUT is conforming to FCC 15.203.

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 2:	2402 MHz	Channel 23:	2423 MHz	Channel 44:	2444 MHz	Channel 65:	2465 MHz
Channel 3:	2403 MHz	Channel 24:	2424 MHz	Channel 45:	2445 MHz	Channel 66:	2466 MHz
Channel 4:	2404 MHz	Channel 25:	2425 MHz	Channel 46:	2446 MHz	Channel 67:	2467 MHz
Channel 5:	2405 MHz	Channel 26:	2426 MHz	Channel 47:	2447 MHz	Channel 68:	2468 MHz
Channel 6:	2406 MHz	Channel 27:	2427 MHz	Channel 48:	2448 MHz	Channel 69:	2469 MHz
Channel 7:	2407 MHz	Channel 28:	2428 MHz	Channel 49:	2449 MHz	Channel 70:	2470 MHz
Channel 8:	2408 MHz	Channel 29:	2429 MHz	Channel 50:	2450 MHz	Channel 71:	2471 MHz
Channel 9:	2409 MHz	Channel 30:	2430 MHz	Channel 51:	2451 MHz	Channel 72:	2472 MHz
Channel 10:	2410 MHz	Channel 31:	2431 MHz	Channel 52:	2452 MHz	Channel 73:	2473 MHz
Channel 11:	2411 MHz	Channel 32:	2432 MHz	Channel 53:	2453 MHz	Channel 74:	2474 MHz
Channel 12:	2412 MHz	Channel 33:	2433 MHz	Channel 54:	2454 MHz	Channel 75:	2475 MHz
Channel 13:	2413 MHz	Channel 34:	2434 MHz	Channel 55:	2455 MHz	Channel 76:	2476 MHz
Channel 14:	2414 MHz	Channel 35:	2435 MHz	Channel 56:	2456 MHz	Channel 77:	2477 MHz
Channel 15:	2415 MHz	Channel 36:	2436 MHz	Channel 57:	2457 MHz	Channel 78:	2478 MHz
Channel 16:	2416 MHz	Channel 37:	2437 MHz	Channel 58:	2458 MHz	Channel 79:	2479 MHz
Channel 17:	2417 MHz	Channel 38:	2438 MHz	Channel 59:	2459 MHz	Channel 80:	2480 MHz
Channel 18:	2418 MHz	Channel 39:	2439 MHz	Channel 60:	2460 MHz		
Channel 19:	2419 MHz	Channel 40:	2440 MHz	Channel 61:	2461 MHz		
Channel 20:	2420 MHz	Channel 41:	2441 MHz	Channel 62:	2462 MHz		
Channel 21:	2421 MHz	Channel 42:	2442 MHz	Channel 63:	2463 MHz		
Channel 22:	2422 MHz	Channel 43:	2443 MHz	Channel 64:	2464 MHz		

Note:

1. The EUT is a Wireless Remote Control with built-in GFSK (2402 – 2480MHz) transceiver.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of GFSK transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
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 - GFSK

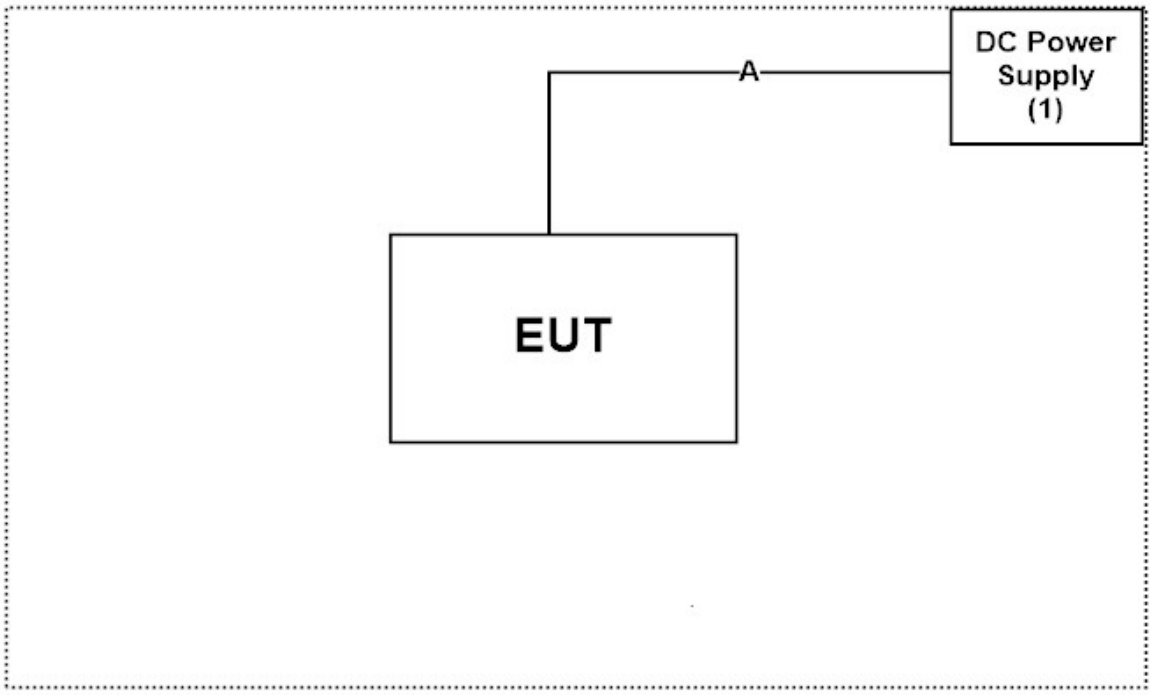
1.3. Tested System Details

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	DC Power Supply	GW	GPC-6030D	D921006	Non-Shielded, 1.8m

Signal Cable Type		Signal cable Description
A	Power Cable	Non-Shielded, 1.8m.

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Provide the DC Power Source.
3. Start transmits continually.
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	30-65
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

Site Name: DEKRA Testing and Certification Co., Ltd
Site Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789
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	Peak Power Analyzer	Keysight	8990B	MY51000410	2018/8/1	2019/7/31
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2018/7/25	2019/7/24
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2018/7/25	2019/7/24
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	2018/6/21	2019/6/20

For Radiated measurements /Site3/CB8

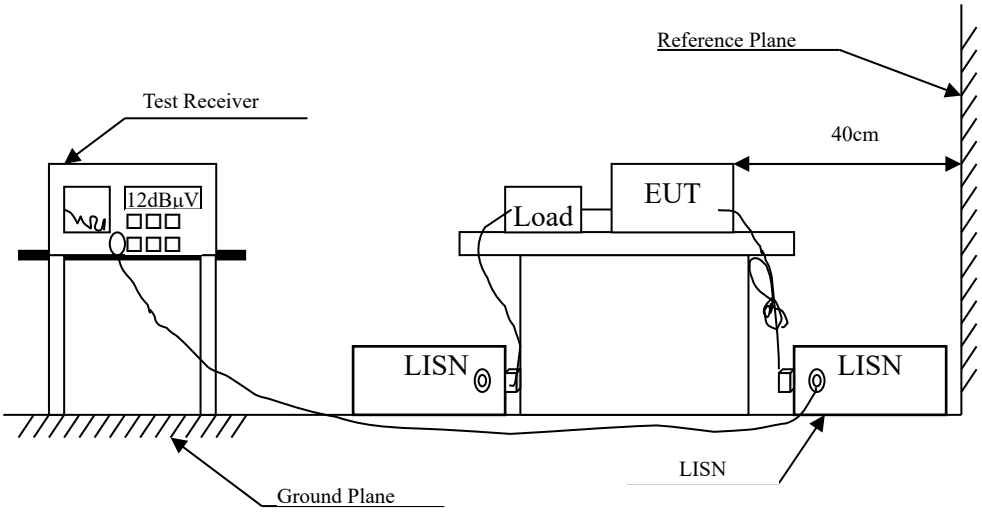
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2018/3/12	2019/3/11
X	Loop Antenna	Teseq	HLA6121	37133	2017/10/13	2018/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2018/6/24	2019/6/23
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2018/6/14	2019/6/13
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330 010	2018/6/14	2019/6/13
X	Horn Antenna	ETS-Lindgren	3117	00135205	2018/05/03	2019/05/02
X	Horn Antenna	SCHWARZBECK	9120D	576	2017/12/07	2018/12/06
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2018/04/10	2019/04/09
	Horn Antenna	Com-Power	AH-840	101043	2018/01/09	2019/01/08
	Amplifier + Cable	EMCI	EMC184045SE	980370	2018/03/21	2019/03/20
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 (dBµV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and Peripherals 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 refer 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 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.

The EUT was setup to ANSI C63.4, 2014; tested to DTS test procedure of FCC KDB-558074 for compliance to FCC 47CFR Subpart C requirements.

2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : Wireless Remote Control
Test Item : Conducted Emission Test
Power Line : Line 1
Test date : 2018/07/03
Test Mode : Mode 1: Transmit - GFSK (2441MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 1					
Quasi-Peak					
0.162	9.745	41.900	51.645	-14.012	65.657
0.263	9.740	43.580	53.320	-9.451	62.771
0.392	9.746	40.420	50.166	-8.920	59.086
0.521	9.751	38.500	48.251	-7.749	56.000
1.935	9.819	40.420	50.239	-5.761	56.000
2.521	9.845	23.800	33.645	-22.355	56.000
Average					
0.162	9.745	21.800	31.545	-24.112	55.657
0.263	9.740	40.470	50.210	-2.561	52.771
0.392	9.746	34.280	44.026	-5.060	49.086
0.521	9.751	33.170	42.921	-3.079	46.000
1.935	9.819	33.840	43.659	-2.341	46.000
2.521	9.845	14.390	24.235	-21.765	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 Remote Control
Test Item : Conducted Emission Test
Power Line : Line 2
Test date : 2018/07/03
Test Mode : Mode 1: Transmit - GFSK (2441MHz)

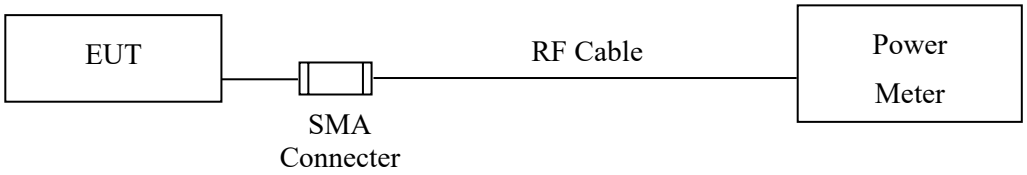
Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 2					
Quasi-Peak					
0.259	9.740	41.060	50.800	-12.086	62.886
0.404	9.736	36.020	45.756	-12.987	58.743
0.670	9.747	32.040	41.787	-14.213	56.000
1.998	9.821	36.240	46.061	-9.939	56.000
3.646	9.873	20.020	29.893	-26.107	56.000
25.228	10.464	17.140	27.604	-32.396	60.000
Average					
0.259	9.740	28.170	37.910	-14.976	52.886
0.404	9.736	25.350	35.086	-13.657	48.743
0.670	9.747	23.820	33.567	-12.433	46.000
1.998	9.821	27.630	37.451	-8.549	46.000
3.646	9.873	12.610	22.483	-23.517	46.000
25.228	10.464	16.310	26.774	-23.226	50.000

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



3.2. Limit

The maximum peak power shall be less 1Watt.

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

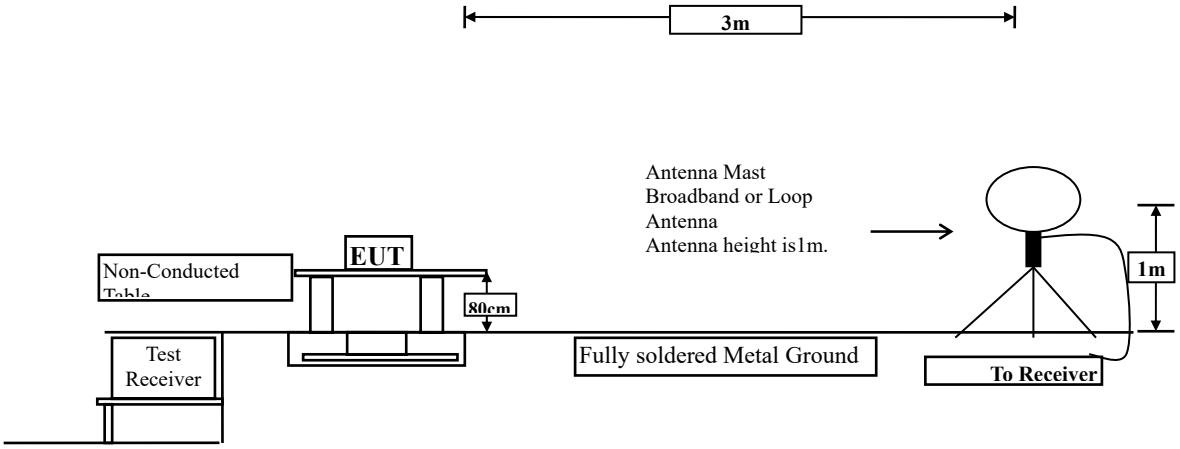
Product : Wireless Remote Control
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2018/07/03
Test Mode : Mode 1: Transmit - GFSK

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 02	2402.00	-1.69	1 Watt= 30 dBm	Pass
Channel 41	2441.00	-0.68	1 Watt= 30 dBm	Pass
Channel 80	2480.00	-1.22	1 Watt= 30 dBm	Pass

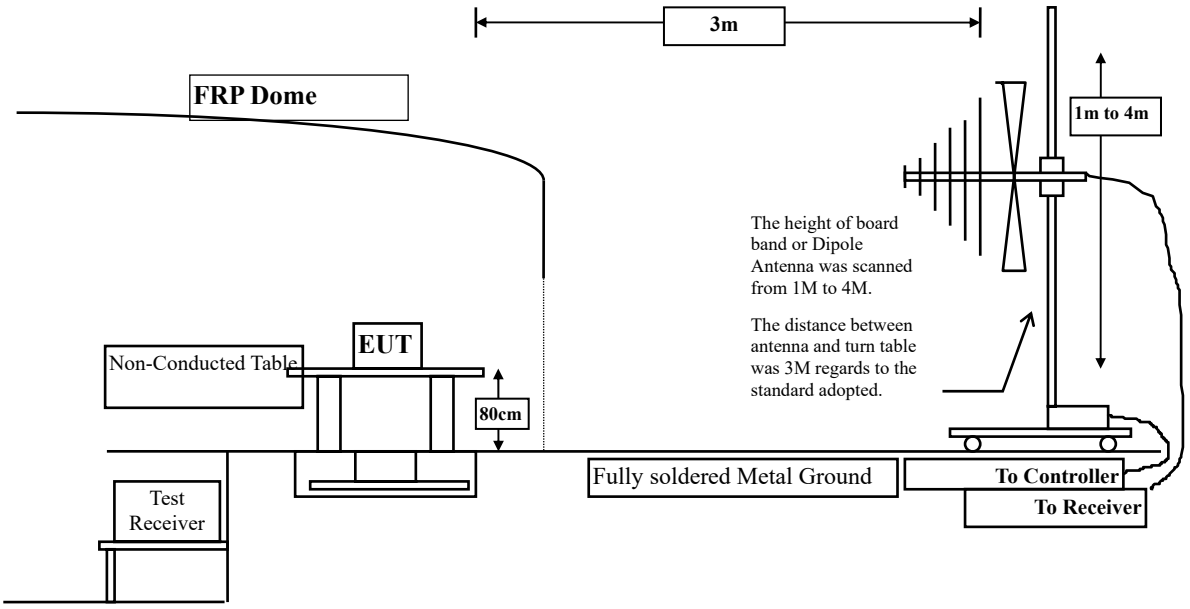
4. Radiated Emission

4.1. Test Setup

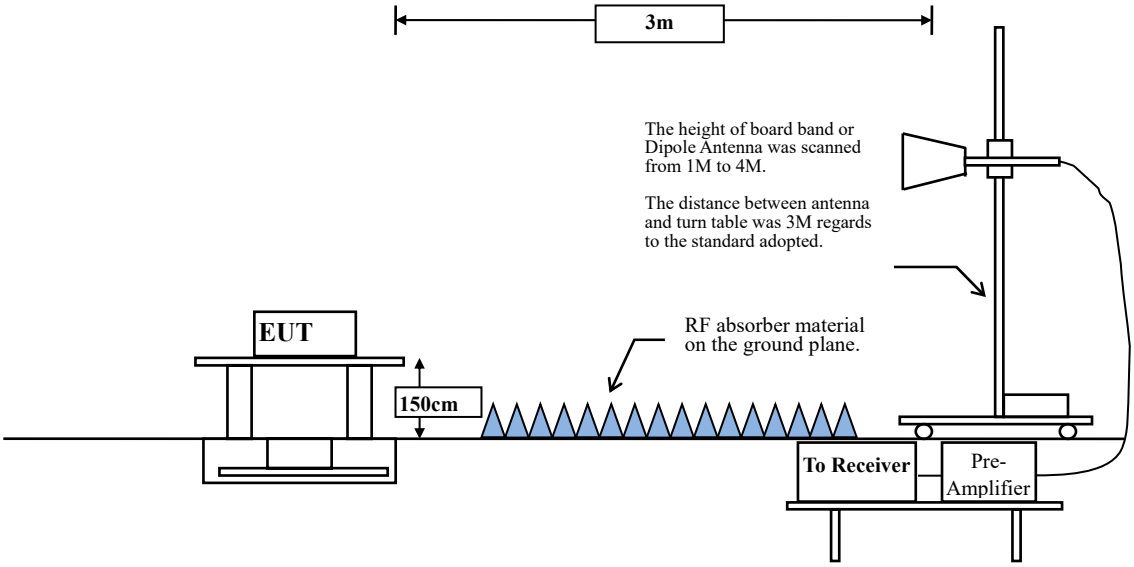
Under 30MHz



Below 1GHz



Above 1GHz



4.2. Limits

➢ **General Radiated Emission 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 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: 1. RF Voltage (dBμV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

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)
GFSK	0.037	0.45	2222	3k

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 Remote Control
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2018/07/03
Test Mode : Mode 1: Transmit - GFSK(2402MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4804.000	-9.896	55.410	45.514	-28.486	74.000
7206.000	-5.013	54.370	49.357	-24.643	74.000
9608.000	-1.472	43.660	42.189	-31.811	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	-6.585	54.369	47.784	-26.216	74.000
7206.000	-4.144	55.370	51.226	-22.774	74.000
9608.000	-1.075	44.890	43.816	-30.184	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. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report..

Product	:	Wireless Remote Control
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2018/07/03
Test Mode	:	Mode 1: Transmit - GFSK (2441MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4882.000	-10.318	52.040	41.722	-32.278	74.000
7323.000	-3.858	55.480	51.622	-22.378	74.000
9764.000	-2.596	43.950	41.354	-32.646	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4882.000	-7.606	55.830	48.224	-25.776	74.000
7323.000	-2.977	53.310	50.334	-23.666	74.000
9764.000	-2.131	43.610	41.479	-32.521	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. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	:	Wireless Remote Control
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2018/07/03
Test Mode	:	Mode 1: Transmit - GFSK (2480MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4960.000	-10.666	56.080	45.415	-28.585	74.000
7440.000	-3.631	51.300	47.669	-26.331	74.000
9920.000	-2.397	45.670	43.273	-30.727	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4960.000	-7.869	57.120	49.252	-24.748	74.000
7440.000	-2.772	53.630	50.858	-23.142	74.000
9920.000	-1.895	45.730	43.835	-30.165	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. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless Remote Control
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test date : 2018/06/25
Test Mode : Mode 1: Transmit - GFSK (2441MHz)

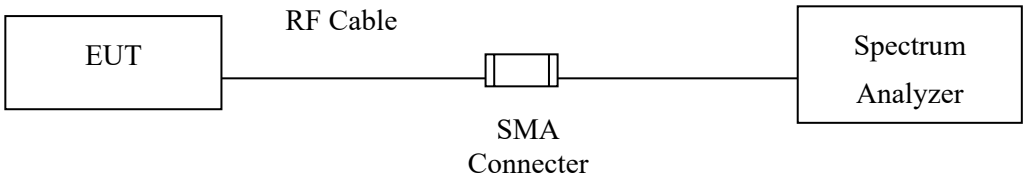
Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
120.210	-9.169	44.621	35.452	-8.048	43.500
344.280	-2.110	32.344	30.234	-15.766	46.000
443.220	2.010	31.995	34.005	-11.995	46.000
545.070	4.623	27.882	32.505	-13.495	46.000
822.490	7.862	24.106	31.968	-14.032	46.000
998.060	8.859	23.748	32.607	-21.393	54.000
Vertical					
98.870	-2.913	38.681	35.768	-7.732	43.500
176.470	-3.222	38.225	35.003	-8.497	43.500
370.470	-1.253	35.121	33.868	-12.132	46.000
539.250	2.267	30.676	32.943	-13.057	46.000
682.810	4.283	23.334	27.617	-18.383	46.000
939.860	9.119	19.706	28.825	-17.175	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 15.247(d). 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

The EUT was tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

5.4. Uncertainty

± 1.20dB

5.5. Test Result of RF Antenna Conducted Test

Product	:	Wireless Remote Control
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test date	:	2018/06/29
Test Mode	:	Mode 1: Transmit - GFSK

Figure Channel 02:

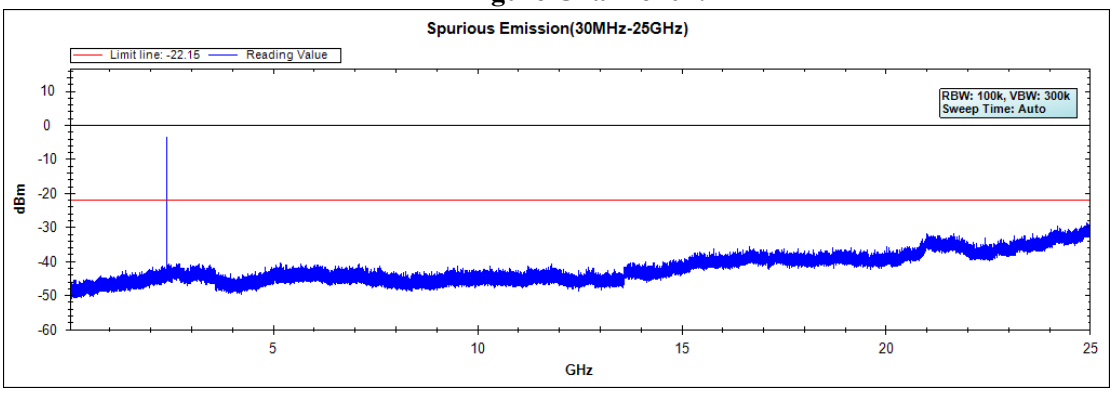


Figure Channel 41:

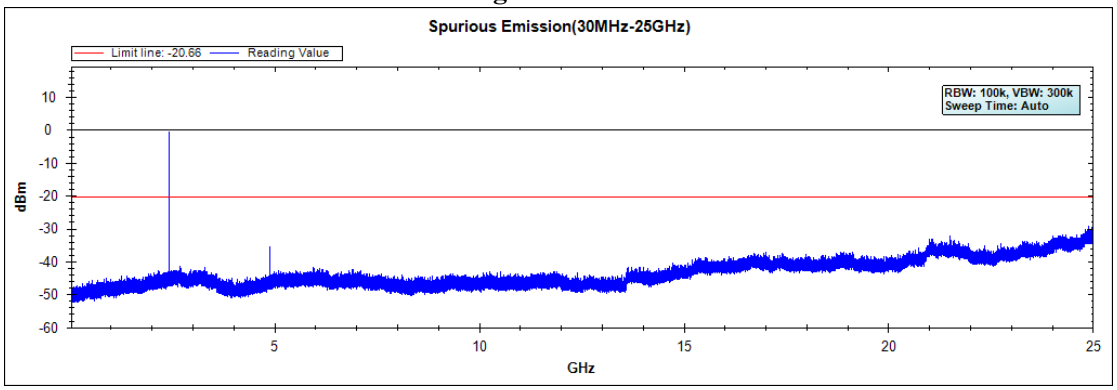
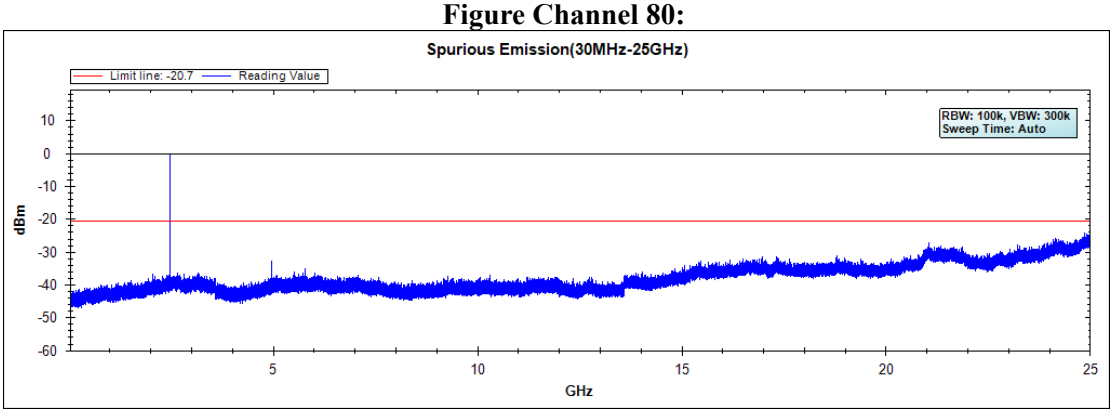


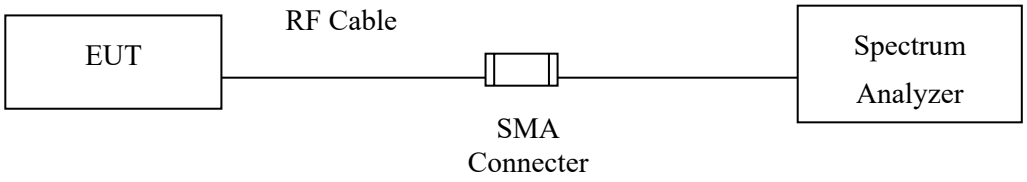
Figure Channel 80:



6. Band Edge

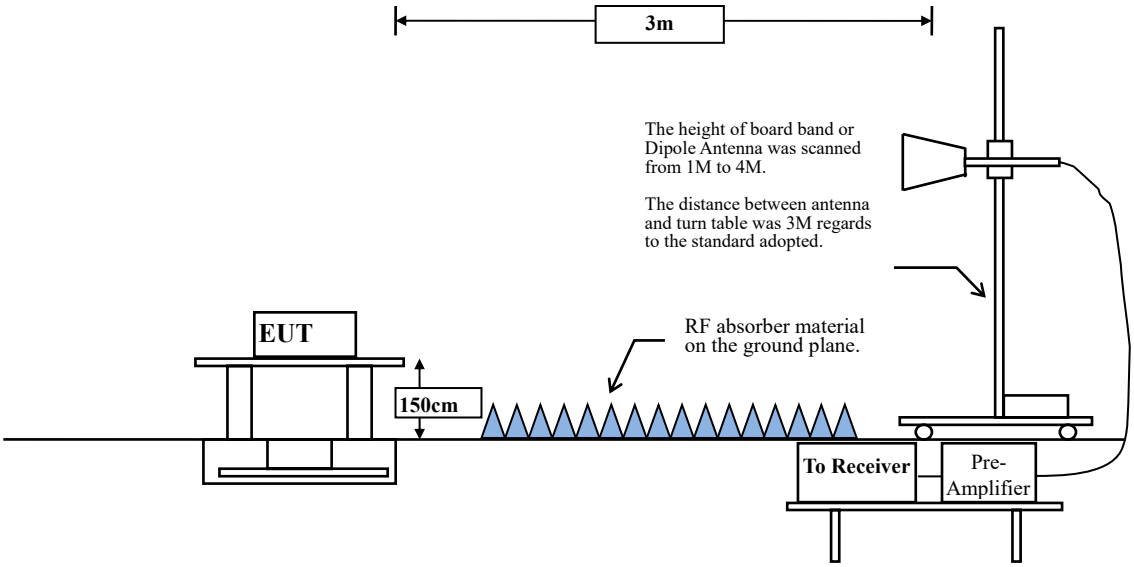
6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:

Above 1GHz



6.2. Limit

According to FCC Section 15.247(d). 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. 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)).

6.3. 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.
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 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)
GFSK	0.037	0.45	2222	3k

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 Remote Control
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2018/06/29
Test Mode : Mode 1: Transmit - GFSK (2402MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
02 (Peak)	2390.000	-2.687	65.472	62.785	74.00	54.00	Pass
02 (Peak)	2401.739	-2.658	99.392	96.734	--	--	--
02 (Average)	2390.000	-2.687	33.834	31.147	74.00	54.00	Pass
02 (Average)	2401.884	-2.658	98.378	95.720	--	--	--

Figure Channel 02: Horizontal (Peak)

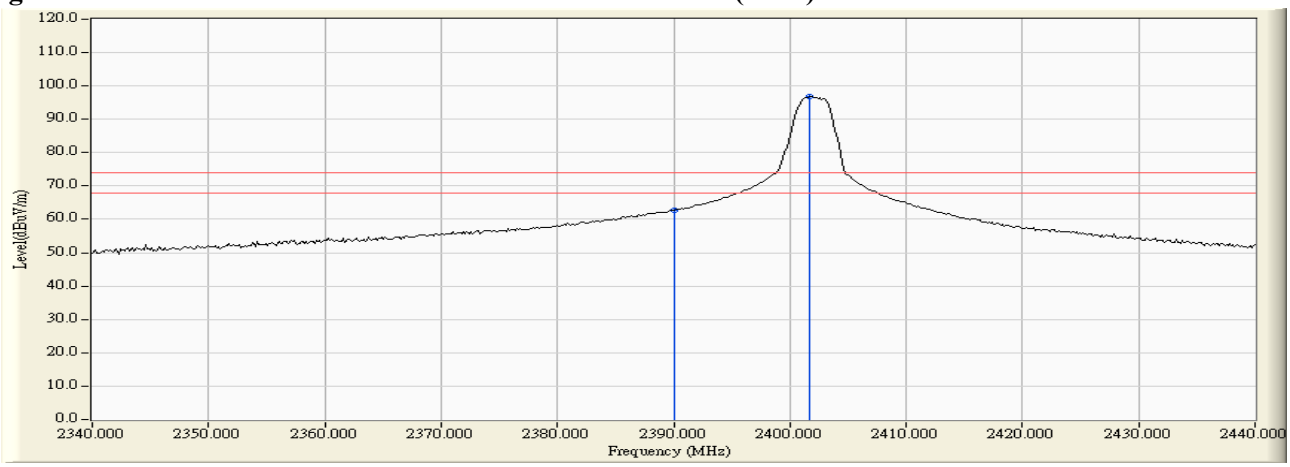
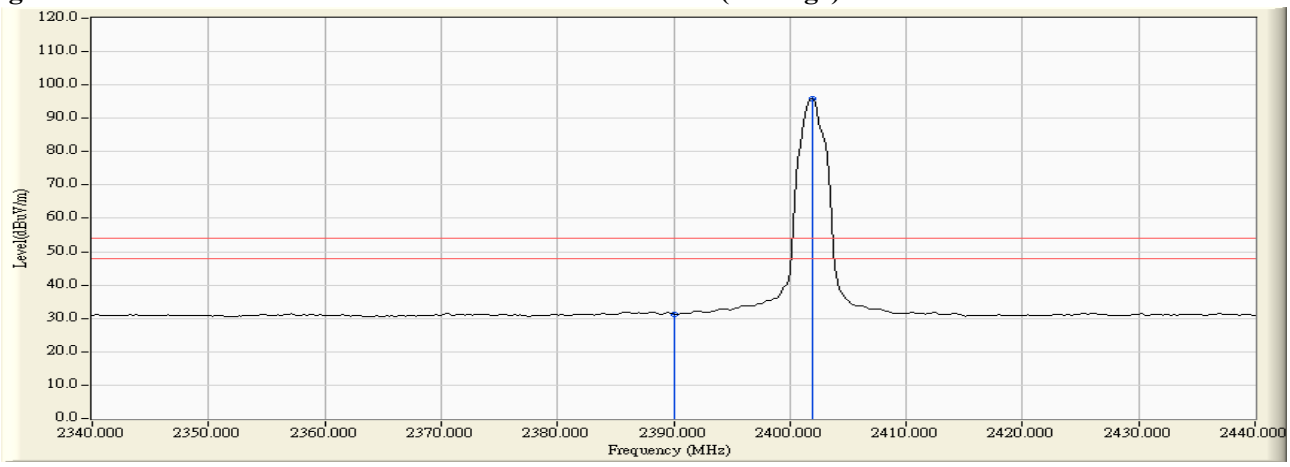


Figure Channel 02: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Wireless Remote Control
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2018/06/29
Test Mode	:	Mode 1: Transmit - GFSK (2402MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
02 (Peak)	2390.000	-4.159	56.938	52.779	74.00	54.00	Pass
02 (Peak)	2402.029	-4.171	92.495	88.324	--	--	--
02 (Average)	2390.000	-4.159	33.472	29.313	74.00	54.00	Pass
02 (Average)	2401.884	-4.171	91.999	87.828	--	--	--

Figure Channel 02: Vertical (Peak)

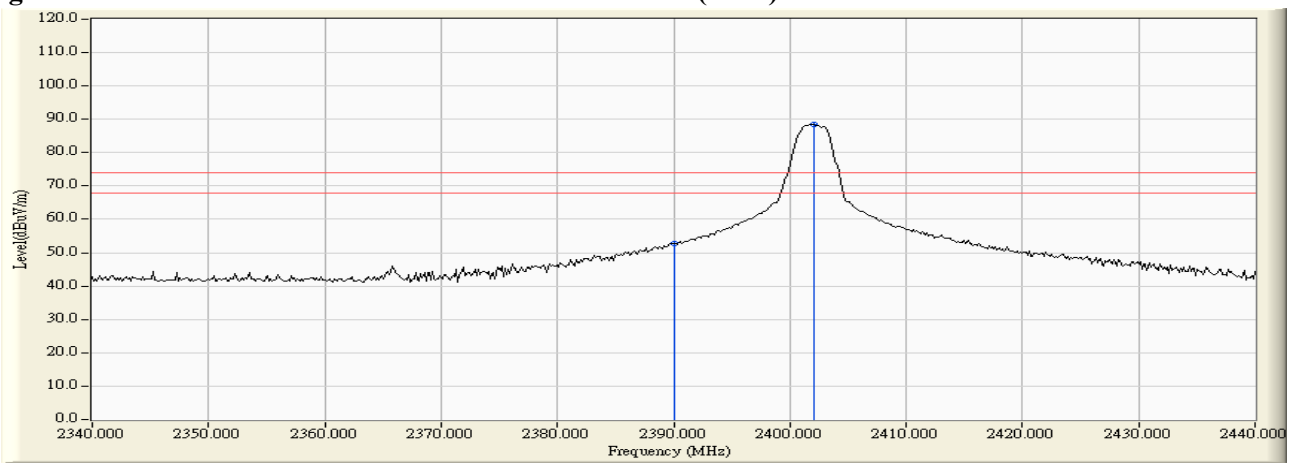
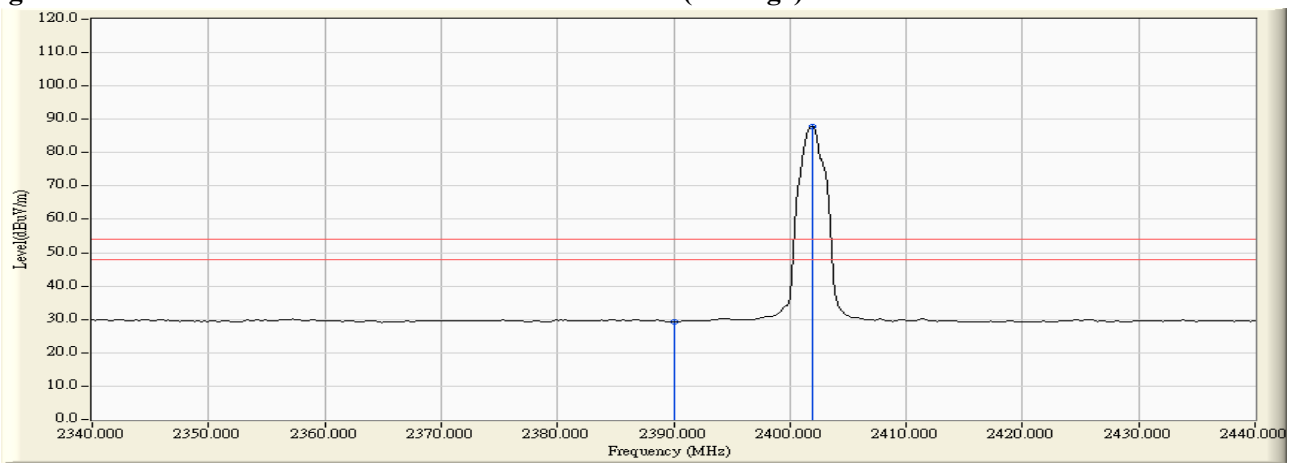


Figure Channel 02: Vertical (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Wireless Remote Control
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2018/06/29
Test Mode	:	Mode 1: Transmit - GFSK (2480MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
80 (Peak)	2480.167	-2.605	92.832	90.227	--	--	--
80 (Peak)	2483.500	-2.601	68.853	66.251	74.00	54.00	Pass
80 (Average)	2480.312	-2.605	91.508	88.903	--	--	--
80 (Average)	2483.500	-2.601	35.223	32.621	74.00	54.00	Pass

Figure Channel 80: Horizontal (Peak)

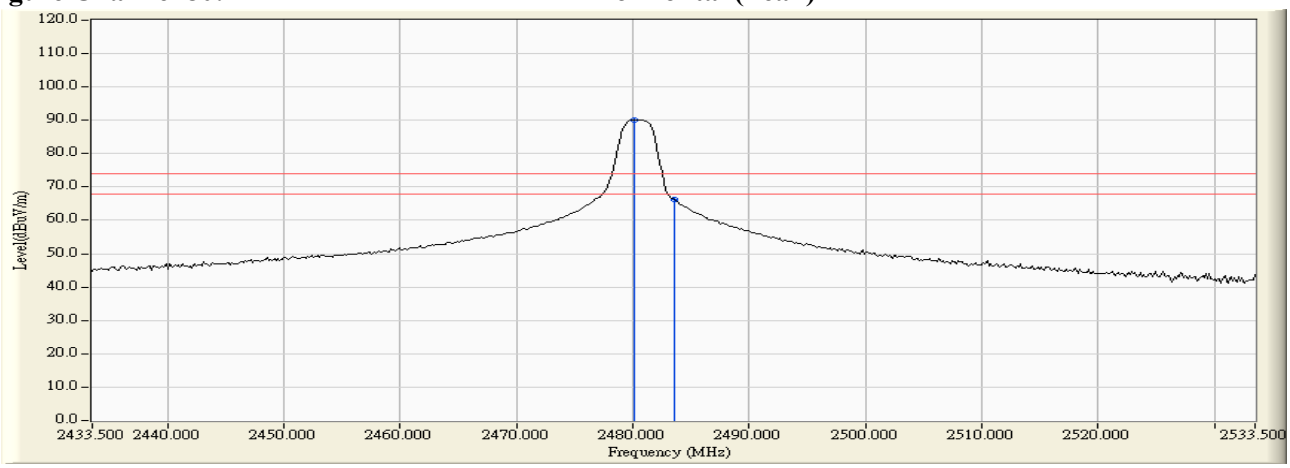
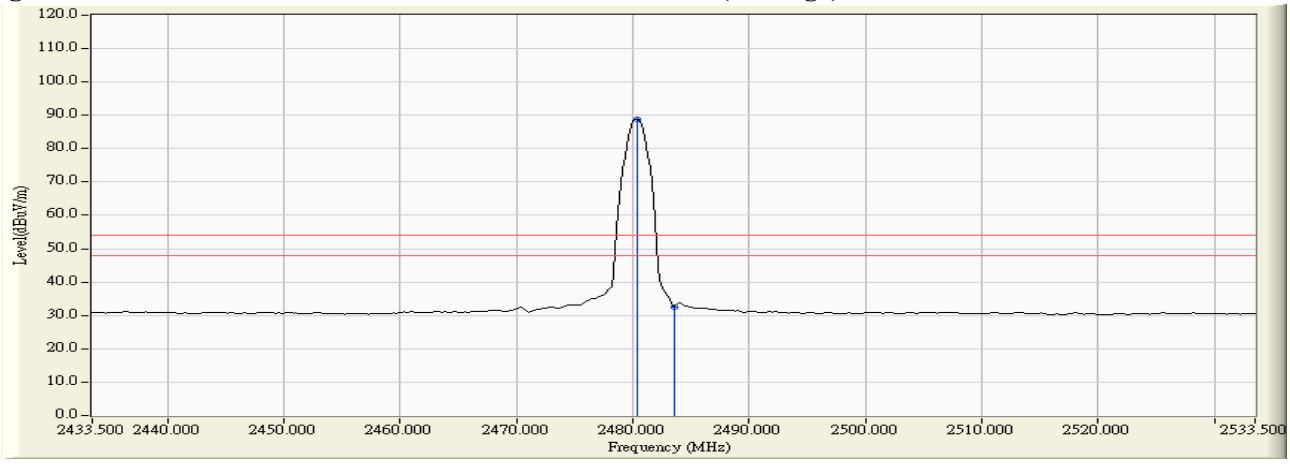


Figure Channel 80: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Wireless Remote Control
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2018/06/29
Test Mode	:	Mode 1: Transmit - GFSK (2480MHz)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
80 (Peak)	2480.167	-3.977	92.212	88.235	--	--	--
80 (Peak)	2483.500	-3.966	68.500	64.533	74.00	54.00	Pass
80 (Average)	2480.312	-3.977	91.214	87.237	--	--	--
80 (Average)	2483.500	-3.966	34.022	30.055	74.00	54.00	Pass

Figure Channel 80: Vertical (Peak)

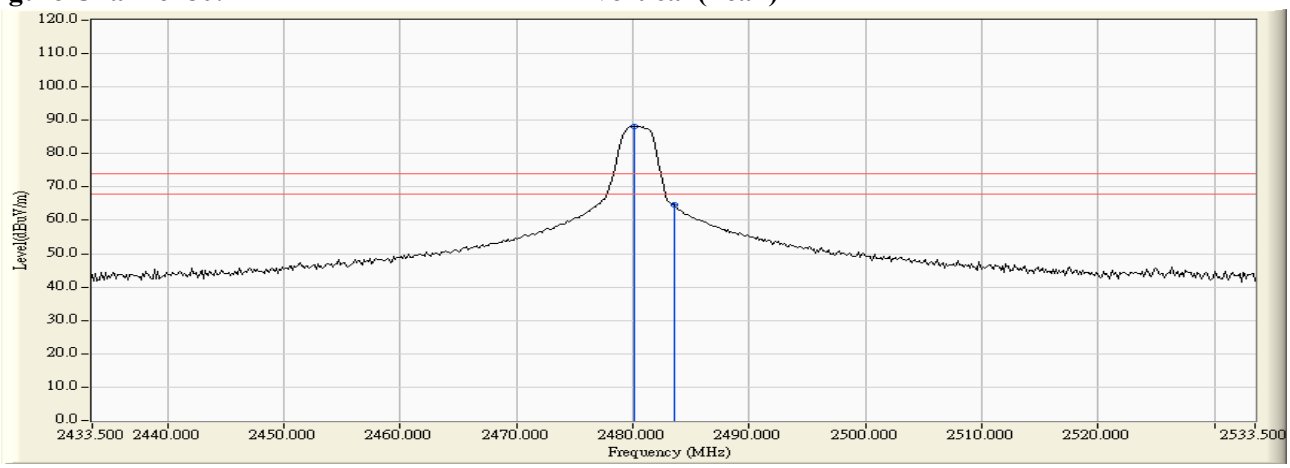
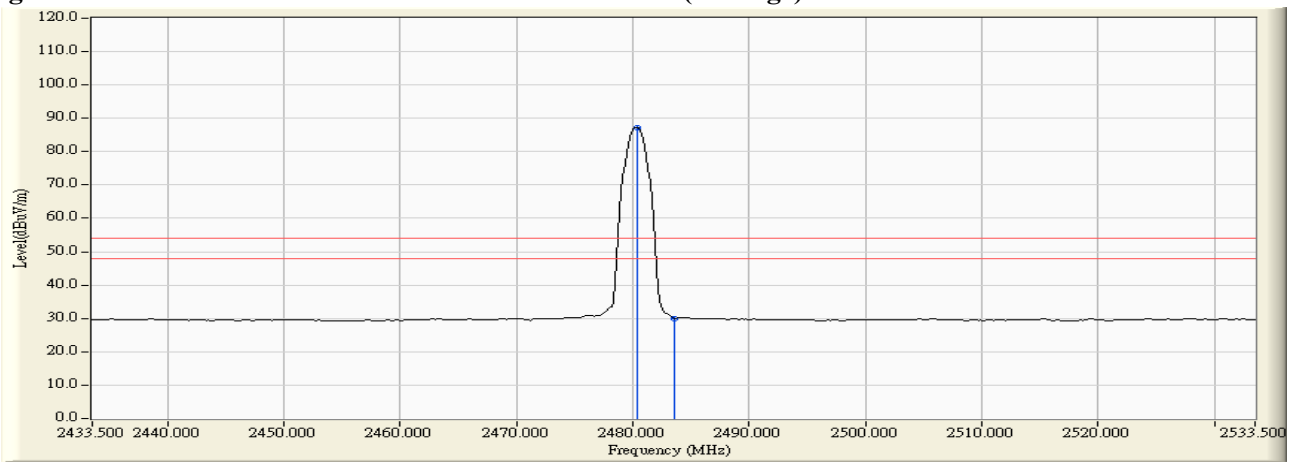


Figure Channel 80: Vertical (Average)

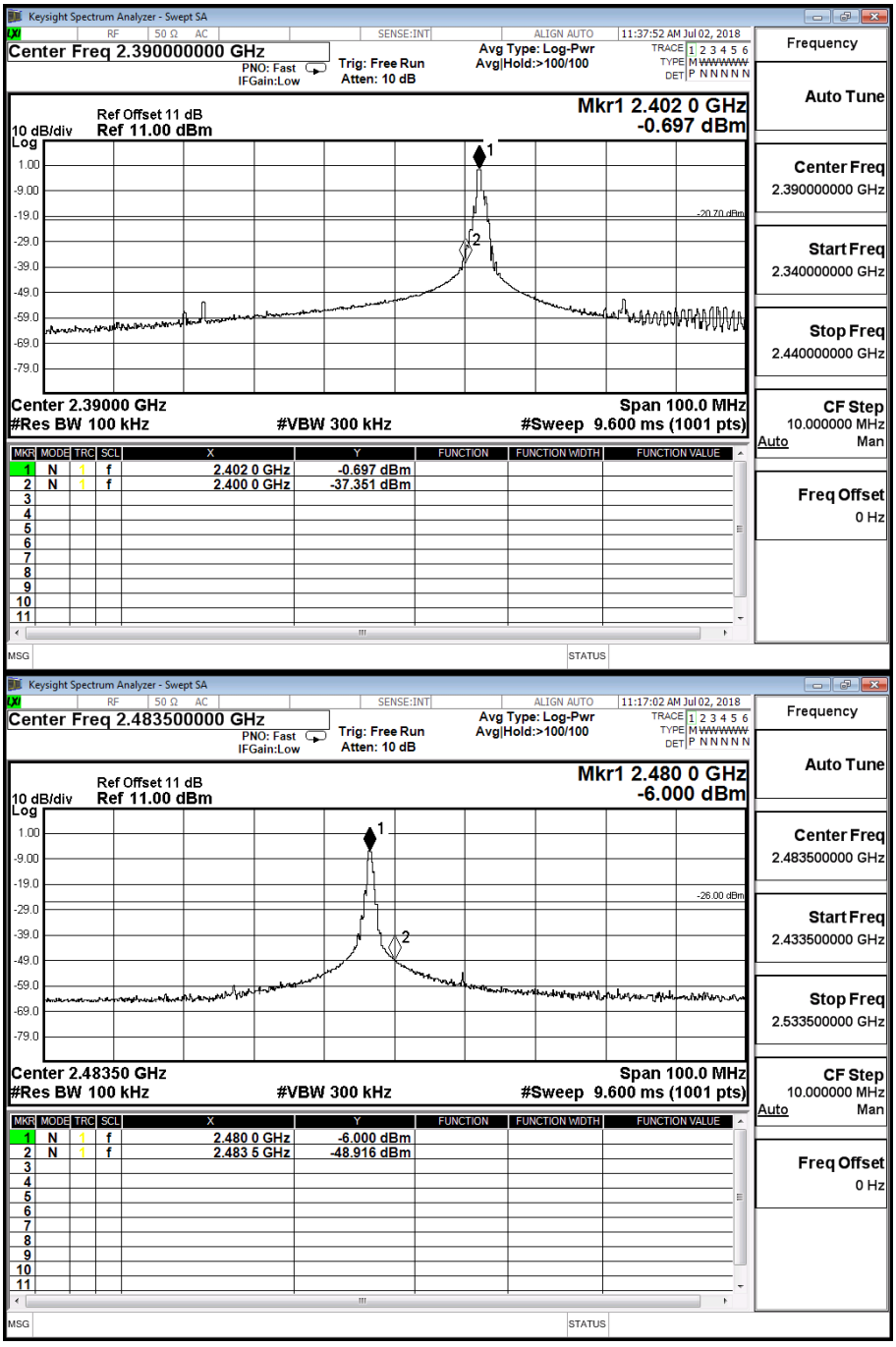


Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

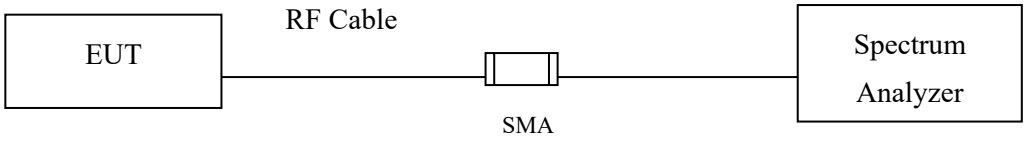
Product : Wireless Remote Control
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - GFSK

Test Frequency (MHz)	Measurement Level Δ (dB)	Limit Δ (dB)	Result
2402	36.654	>20	PASS
2480	42.916	>20	PASS



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

Set RBW = 1-5% of the emission bandwidth, VBW≥3*RBW

7.4. Uncertainty

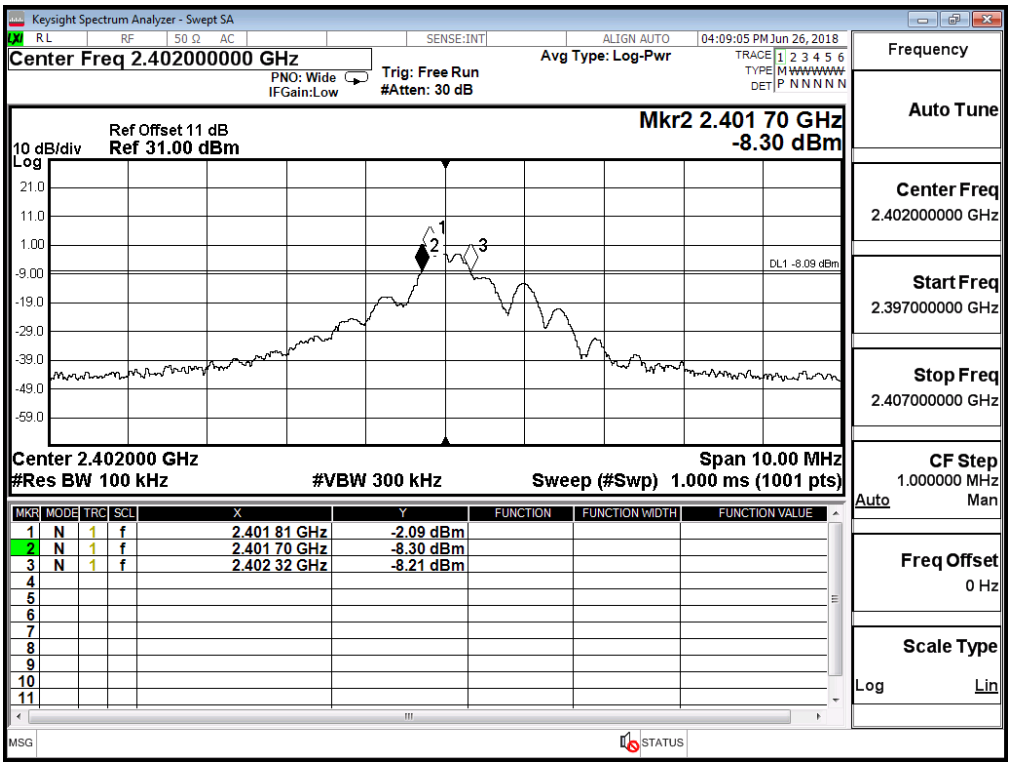
± 283Hz

7.5. Test Result of 6dB Bandwidth

Product : Wireless Remote Control
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - GFSK (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
02	2402	620	>500	Pass

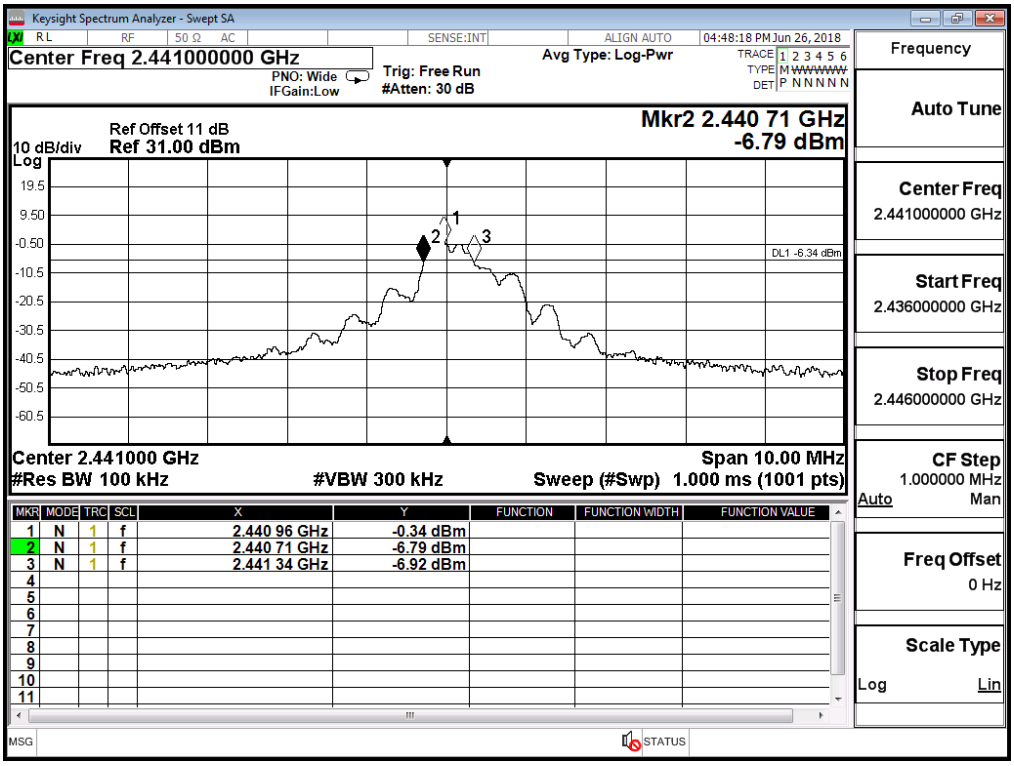
Figure Channel 02:



Product : Wireless Remote Control
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - GFSK (2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
41	2441	630	>500	Pass

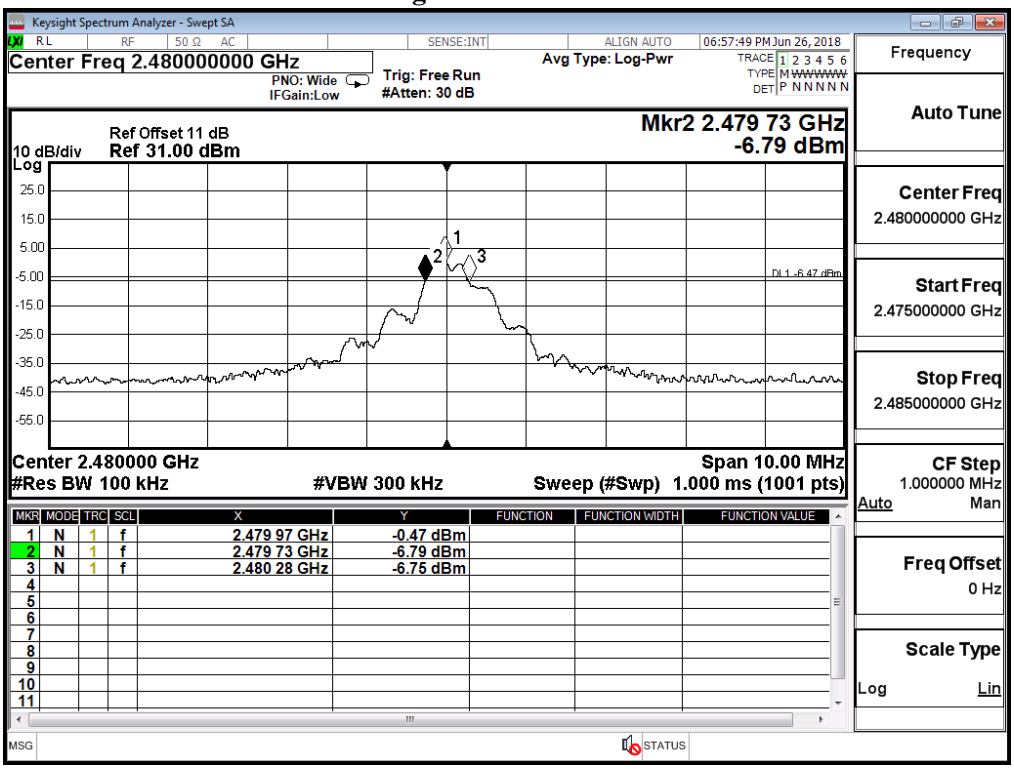
Figure Channel 41:



Product : Wireless Remote Control
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - GFSK (2480MHz)

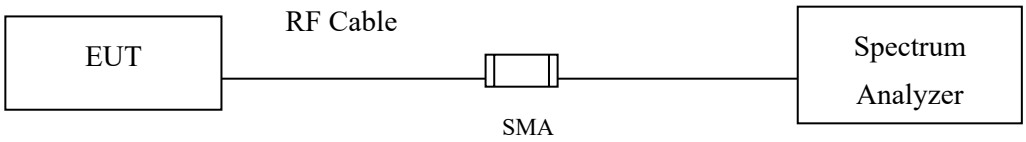
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
80	2480	550	>500	Pass

Figure Channel 80:



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

8.4. Uncertainty

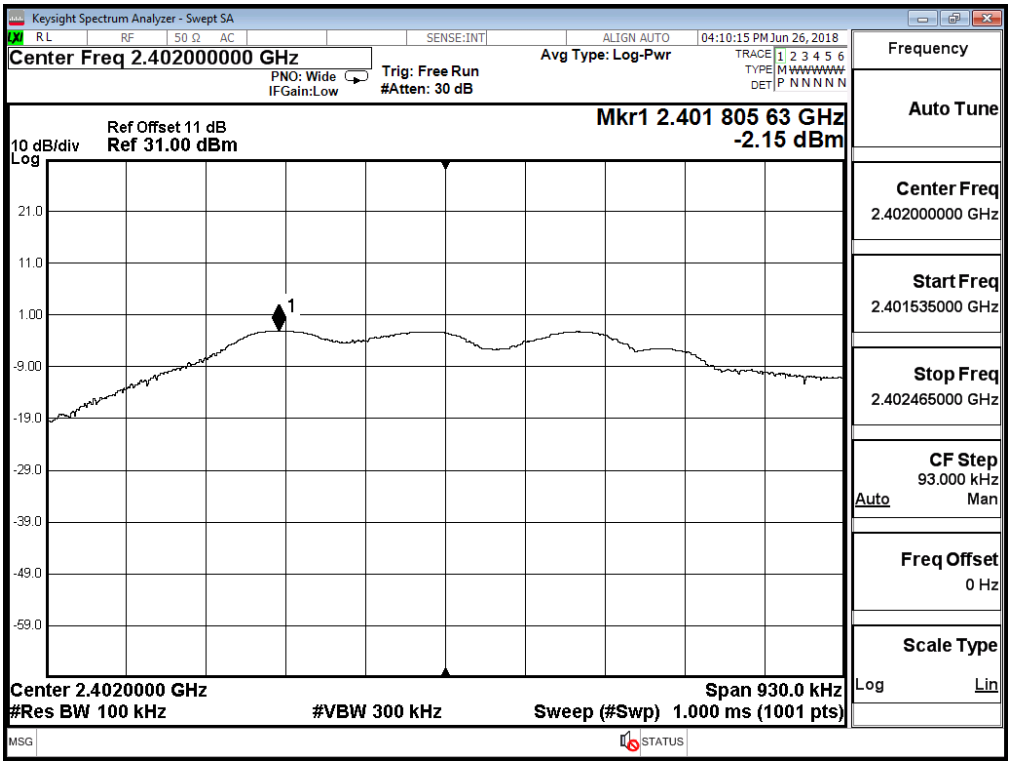
± 1.20 dB

8.5. Test Result of Power Density

Product : Wireless Remote Control
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - GFSK (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
02	2402	-2.150	≦8dBm	Pass

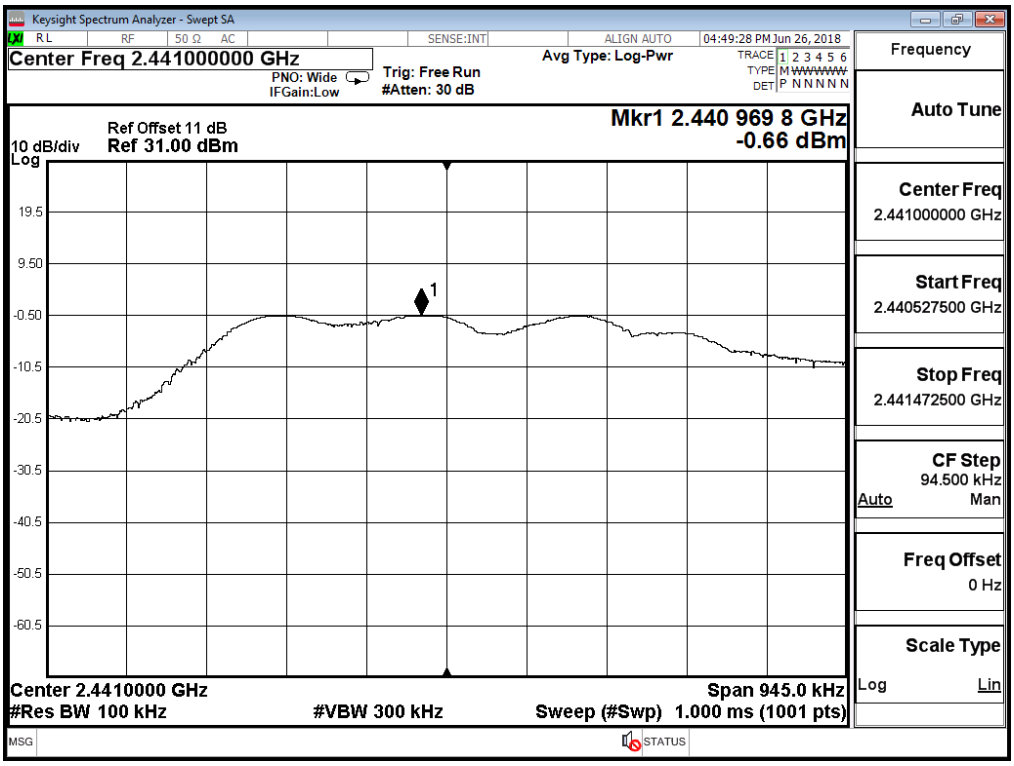
Figure Channel 02:



Product : Wireless Remote Control
Test Item : Power Density Data
Test Site : No.3OATS
Test Mode : Mode 1: Transmit - GFSK (2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
41	2441	-0.660	≦8dBm	Pass

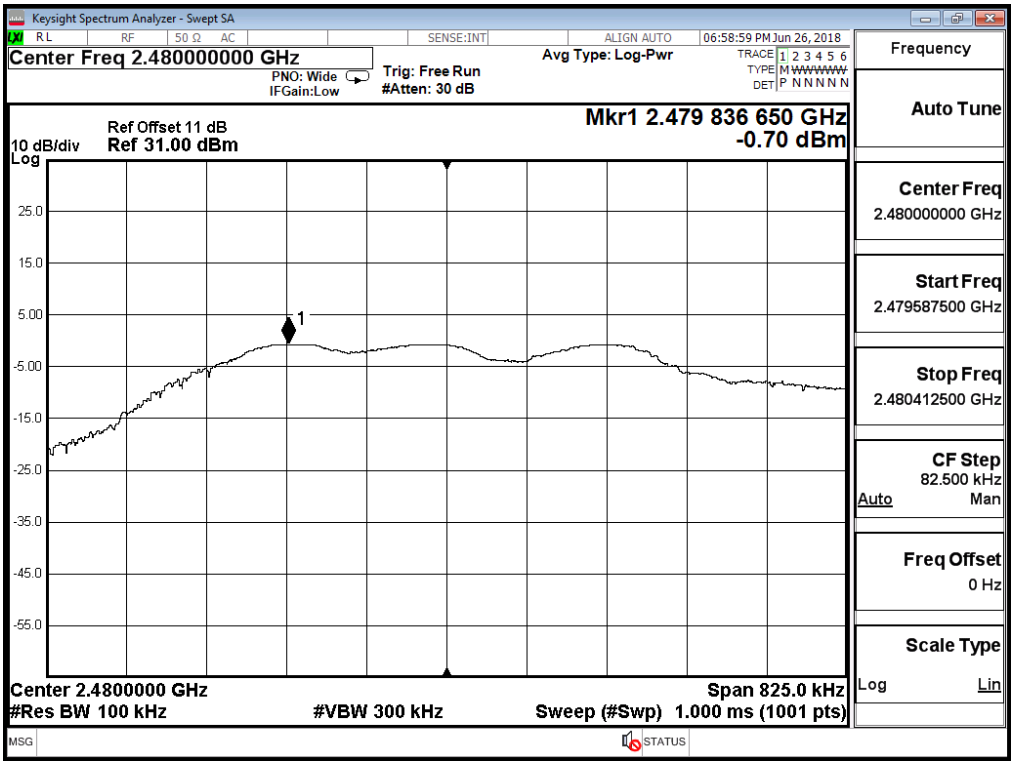
Figure Channel 41:



Product : Wireless Remote Control
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - GFSK (2480MHz)

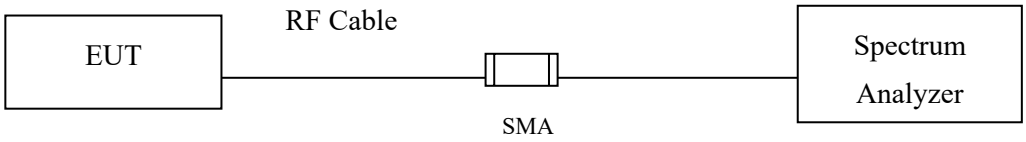
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
80	2480	-0.700	≦8dBm	Pass

Figure Channel 80:



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 Remote Control
Test Item : Duty Cycle
Test Mode : Mode 1: Transmit - GFSK

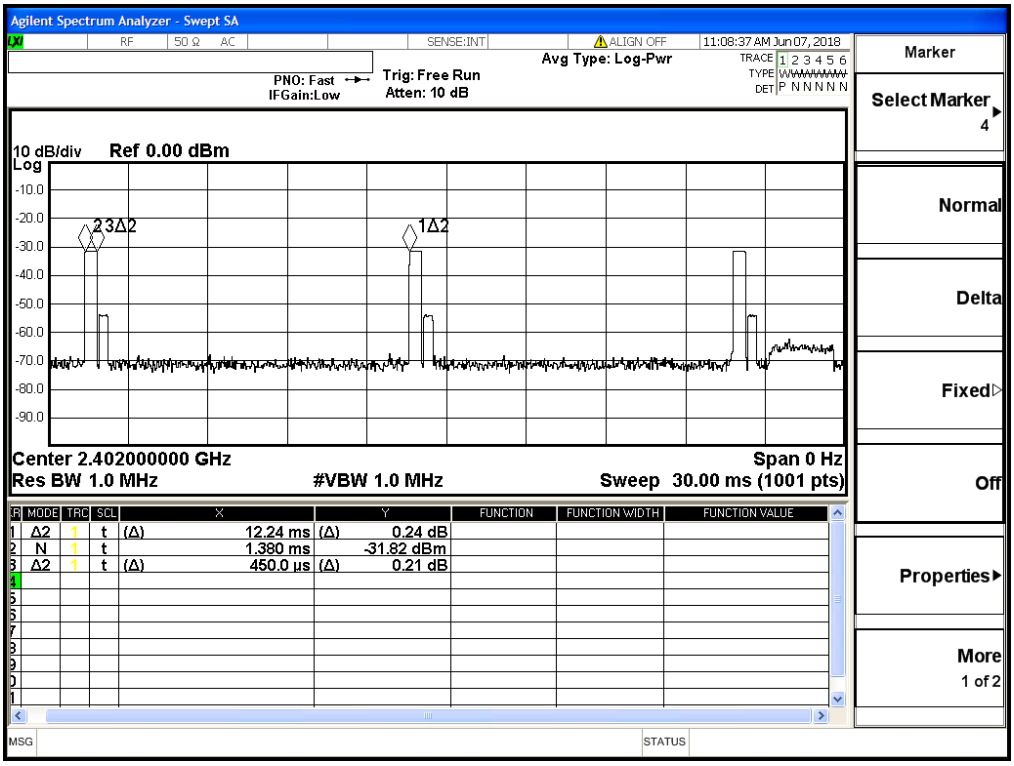
Duty Cycle Formula:

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)
BLE	0.45	12.24	3.68	14.34



10. EMI Reduction Method During Compliance Testing

No modification was made during testing.