FCC & IC Test Report

Product Name	：	Wireless sensor
Trade Name	：	KONE
Model No.	：	WIBE
FCC ID.	：	2ALQBWIBE

Applicant	：	KONE Corporation
Address	：	Kartanontie 1 FIN-00330 Helsinki FINLAND

Date of Receipt	：	Oct. 25, 2017
Issued Date	：	Nov. 02, 2017
Report No.	：	17A0350R-RFUSP01V00
Report Version	：	V1.0

Testing Laboratory
3024

Test Report Certification

Issued Date : Nov. 02, 2017
Report No. : 17A0350R-RFUSP01V00

Product Name	：	Wireless sensor
Applicant	：	KONE Corporation
Address	：	Kartanontie 1 FIN-00330 Helsinki FINLAND
Manufacturer	：	KONE Corporation
Model No.	：	WIBE
FCC ID.	：	2ALQBWIBE
EUT Voltage	：	DC 3V
Testing Voltage	：	DC 3V
Trade Name	：	KONE
Applicable Standard	：	FCC CFR Title 47 Part 15 Subpart C Section 15.247: 2016 RSS-247 Issue 2 (Feb. 2017) ANSI C63.10: 2013
Laboratory Name	:	Hsin Chu Laboratory
Address	:	No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan, R.O.C. TEL: +886-3-582-8001 / FAX: +886-3-582-8958
Test Result	：	Complied

Documented By : Carol Tsai

(Carol Tsai / Engineering Adm. Assistant)

Tested By : Elwin Lin

(Elwin Lin / Engineer)

Approved By : Roy Wang

(Roy Wang / Director)

Revision History

Report No.	Version	Description	Issued Date
17A0350R-RFUSP01V00	V1.0	Initial issue of report	Nov. 02, 2017

Laboratory Information

We, **DEKRA Testing and Certification Co., Ltd.**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C.	**:**	**TAF, Accreditation Number: 3024**
USA	**:**	**FCC, Registration Number: 0007939127**
Canada	**:**	**IC, Submission No: 181665** **IC Registration Number: 22397-1 / 22397-2 / 22397-3**

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

If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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TABLE OF CONTENTS

1. General Information

1.1. EUT Description

Product Name	Wireless sensor
Trade Name	KONE
Model No.	WIBE
Frequency Range/ Channel Number	2402~2480MHz / 40 Channels
Type of Modulation	Bluetooth 4.0(GFSK)

Antenna Information	
Antenna Type	Monopole Antenna (internal on circuit board)
Antenna Gain	3.1dBi

Working Frequency of Each Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00	2402 MHz	Channel 10	2422 MHz	Channel 20	2442 MHz	Channel 30	2462 MHz
Channel 01	2404 MHz	Channel 11	2424 MHz	Channel 21	2444 MHz	Channel 31	2464 MHz
Channel 02	2406 MHz	Channel 12	2426 MHz	Channel 22	2446 MHz	Channel 32	2466 MHz
Channel 03	2408 MHz	Channel 13	2428 MHz	Channel 23	2448 MHz	Channel 33	2468 MHz
Channel 04	2410 MHz	Channel 14	2430 MHz	Channel 24	2450 MHz	Channel 34	2470 MHz
Channel 05	2412 MHz	Channel 15	2432 MHz	Channel 25	2452 MHz	Channel 35	2472 MHz
Channel 06	2414 MHz	Channel 16	2434 MHz	Channel 26	2454 MHz	Channel 36	2474 MHz
Channel 07	2416MHz	Channel 17	2436 MHz	Channel 27	2456 MHz	Channel 37	2476 MHz
Channel 08	2418 MHz	Channel 18	2438 MHz	Channel 28	2458 MHz	Channel 38	2478 MHz
Channel 09	2420 MHz	Channel 19	2440 MHz	Channel 29	2460 MHz	Channel 39	2480 MHz

Note:

1. This device is a Wireless sensor including BT4.0 transmitting and receiving function.
2. Regards to the frequency band operation; the lowest、middle and highest frequency of channel were selected to perform the test, and then shown on this report.

1.2. Test Mode

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Test Mode	Mode 1: Transmit

Test Items	Modulation	Channel	Antenna	Result
Conducted Emission	GFSK	19	0	NA
Peak Power Output	GFSK	00/19/39	0	Complies
Radiated Emission	GFSK	00/19/39	0	Complies
RF antenna conducted test	GFSK	00/19/39	0	Complies
Radiated Emission Band Edge	GFSK	00/39	0	Complies
DTS Bandwidth	GFSK	00/19/39	0	Complies
Power Density	GFSK	00/19/39	0	Complies

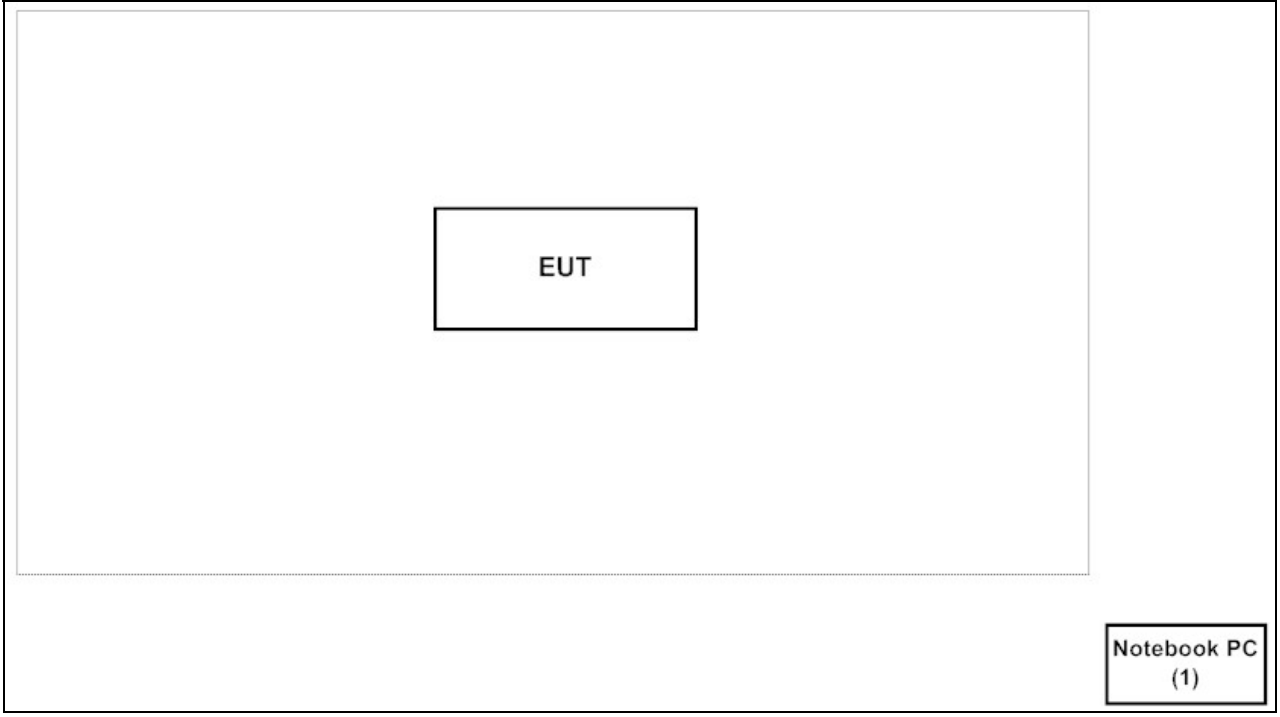
1.3. Tested System Details

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.	FCC ID	Power Cord
1	Notebook PC	Lenovo	B590	WB1529782	DoC	Non-Shielded, 1.8m, one ferrite core bonded

1.4. Configuration of tested System

Connection Diagram



1.5. EUT Exercise Software

1	Setup the EUT as shown in Section 1.4.
2	Execute the “Oracle VM Virtual Box” on the laptop.
3	Configure the test mode, the test channel, and the data rate.
4	Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual	Test Site
Temperature (°C)	FCC PART 15 C 15.207 Conducted Emission	15 - 35	20	--
Humidity (%RH)		25 - 75	50	
Barometric pressure (mbar)		860 - 1060	950-1000	
Temperature (°C)	FCC PART 15 C 15.247 Peak Power Output	15 - 35	25	3
Humidity (%RH)		25 - 75	45	
Barometric pressure (mbar)		860 - 1060	950-1000	
Temperature (°C)	FCC PART 15 C 15.247 Radiated Emission	15 - 35	25	2
Humidity (%RH)		25 - 75	65	
Barometric pressure (mbar)		860 - 1060	950-1000	
Temperature (°C)	FCC PART 15 C 15.247 Band Edge	15 - 35	25	2
Humidity (%RH)		25 - 75	45	
Barometric pressure (mbar)		860 - 1060	950-1000	
Temperature (°C)	FCC PART 15 C 15.247 DTS Bandwidth	15 - 35	25	3
Humidity (%RH)		25 - 75	48	
Barometric pressure (mbar)		860 - 1060	950-1000	
Temperature (°C)	FCC PART 15 C 15.247 RF antenna conducted test	15 - 35	25	3
Humidity (%RH)		25 - 75	45	
Barometric pressure (mbar)		860 - 1060	950-1000	
Temperature (°C)	FCC PART 15 C 15.247 Power Density	15 - 35	25	3
Humidity (%RH)		25 - 75	45	
Barometric pressure (mbar)		860 - 1060	950-1000	

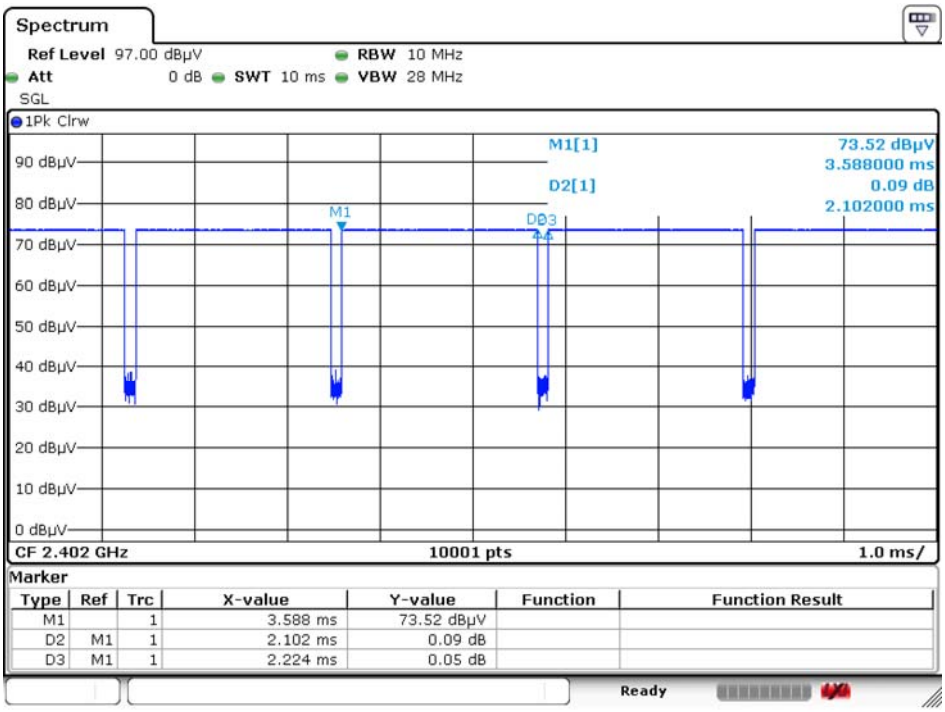
Note: Test site information refers to Laboratory Information.

1.7. Duty cycle

Duty Cycle=2.102msec /2.224msec= 0.945

Duty Cycle correction factor= 20 LOG 0.945= -0.49 dB

2402MHz



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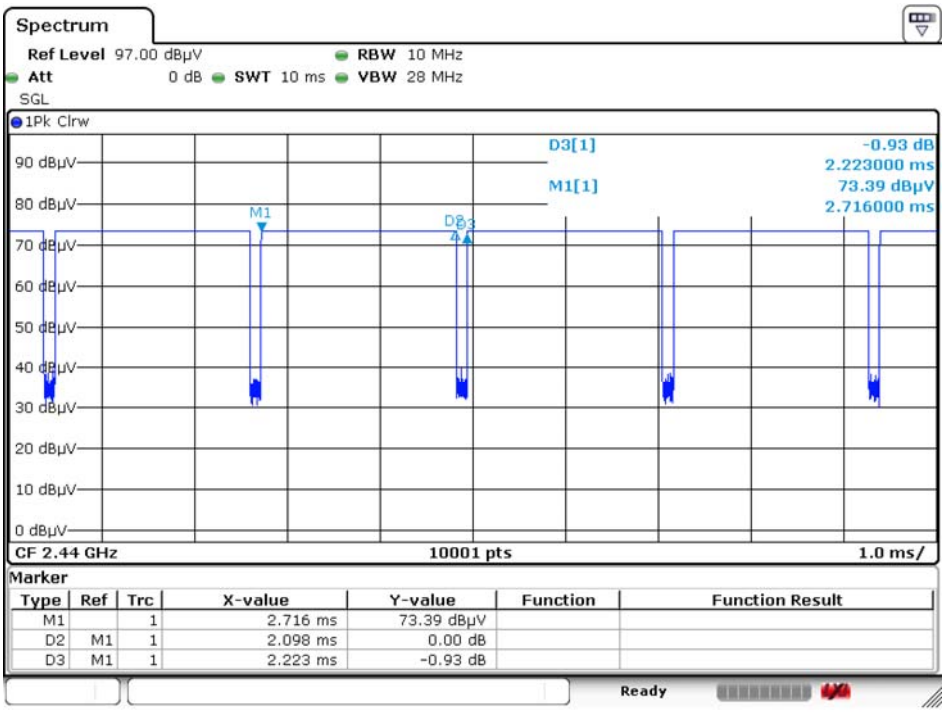
2440MHz



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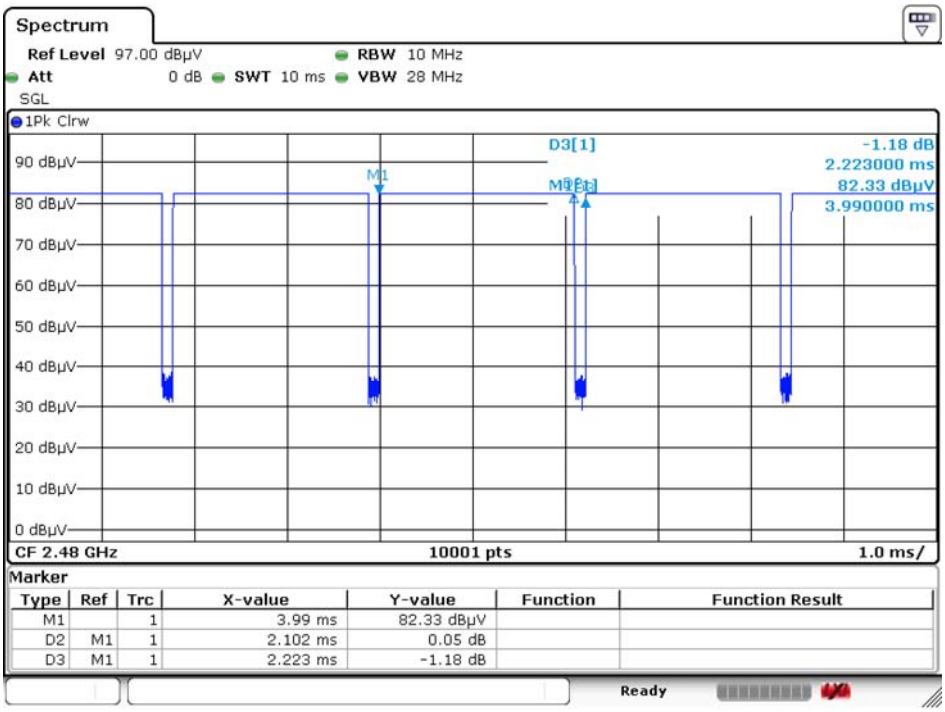
2480MHz



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2. Conducted Emission

2.1. Test Equipment

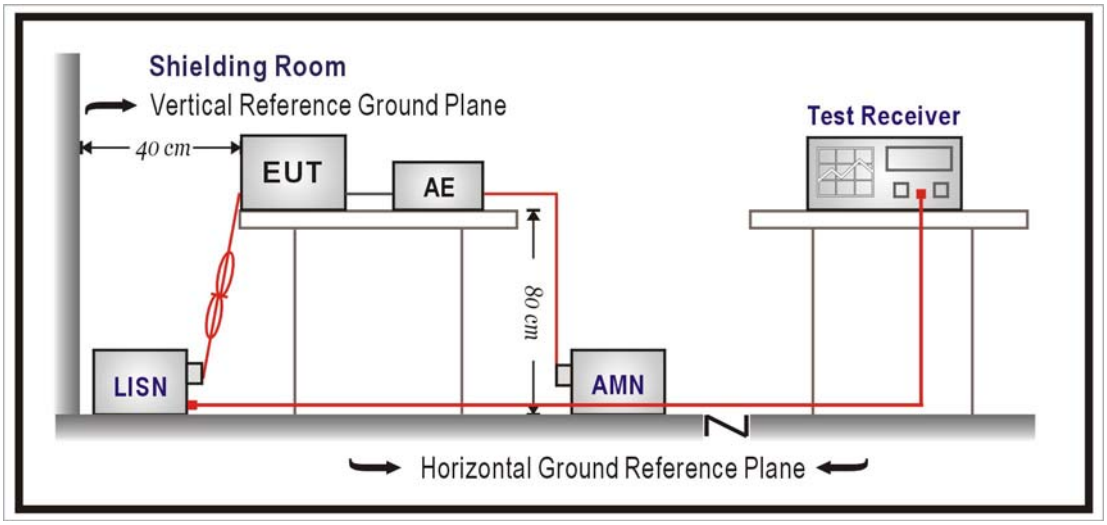
The following test equipment are used during the test:

Conducted Emission / SR2-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Artificial Mains Network	R&S	ENV4200	848411/010	2017/02/06	2018/02/05
Test Receiver	R&S	ESCS 30	836858/022	2017/04/12	2018/04/11
LISN	R&S	ENV216	100092	2017/07/31	2018/07/30

Note: All equipment that need to calibrate are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 Limits (dBuV)		
Frequency MHz	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.

2.4. Test Procedure

The EUT was setup according to ANSI C63.10:2013 and tested according to DTS test procedure of KDB558074 D01 V04 for compliance to FCC 47CFR 15.247 requirements.
The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs.)
Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

2.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.207: 2016 and RSS-247 Issue 2.

2.6. Uncertainty

The measurement uncertainty is defined as ± 2.26 dB.

2.7. Test Result

Owing to the DC operation of EUT, this test item is not performed.

3. Peak Power Output

3.1. Test Equipment

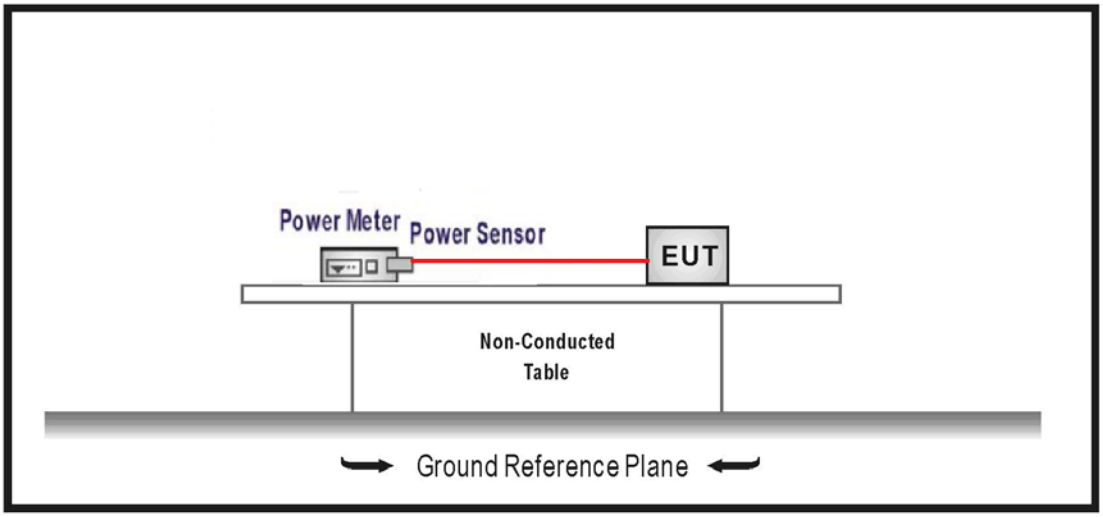
The following test equipment are used during the test:

Peak Power Output / SR10-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
High Speed Peak Power Meter Dual Input	Anritsu	ML2496A	1602004	2017/01/20	2018/01/19
Pulse Power Sensor	Anritsu	MA2411B	1531043	2017/01/20	2018/01/19
Pulse Power Sensor	Anritsu	MA2411B	1531044	2017/01/20	2018/01/19

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

3.2. Test Setup



3.3. Test procedures

The EUT was setup according to ANSI C63.10:2013; tested according to DTS test procedure of KDB558074 D01 V04 for compliance to FCC 47CFR 15.247 requirements.

3.4. Limits

FCC 15.247:
The maximum peak power shall be less 1 Watt.
RSS- 247:
For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W,

3.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247 and RSS-247 Issue 2.

3.6. Test Result

Product	Wireless sensor		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2017/10/12	Test Site	SR10-H

GFSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	EIRP Measure Level (dBm)	Limit (dBm)	Limit EIRP (dBm)	Result
0	2402	3.940	7.04	≦30	≦36	Pass
19	2440	3.910	7.01	≦30	≦36	Pass
39	2480	3.730	6.83	≦30	≦36	Pass

4. Radiated Emission

4.1. Test Equipment

The following test equipment are used during the test:

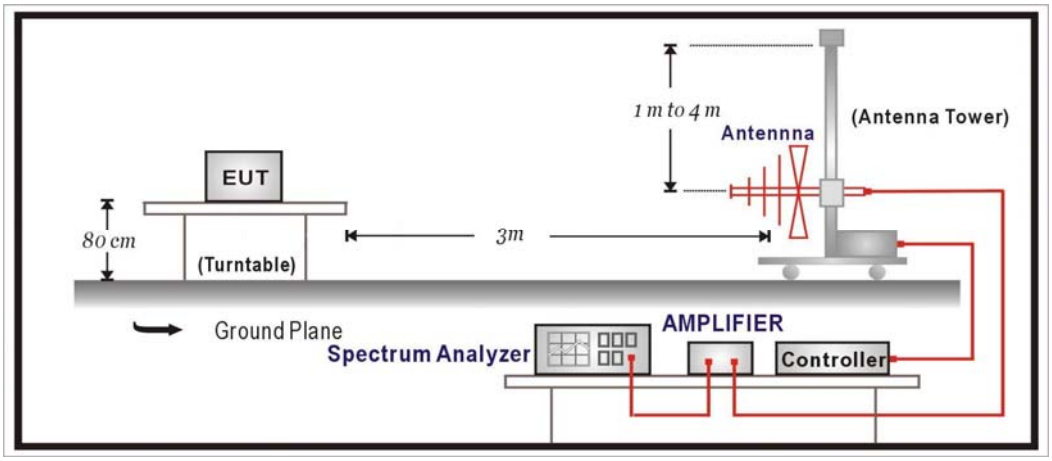
Radiated Emission / CB2-H,CB4-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal Analyzer	R&S	FSVA40	101455	2016/11/28	2017/11/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/23	2018/01/22
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2017/03/13	2018/03/12
Bilog Antenna	Teseq	CBL6112D	23191	2017/06/28	2018/06/27
Horn Antenna	Schwarzbeck	BBHA 9120D	639	2017/06/14	2018/06/13
Horn Antenna	Schwarzbeck	BBHA 9170	202	2017/02/15	2018/02/14
Pre-Amplifier	RF Bay Inc.	LNA-1330	12162511	2017/03/09	2018/03/08
Pre-Amplifier	EMCI	EMCI 1830I	980366	2017/01/23	2018/01/22
Pre-Amplifier	MITEQ	JS44-45-8P	2014754	2016/12/26	2017/12/25

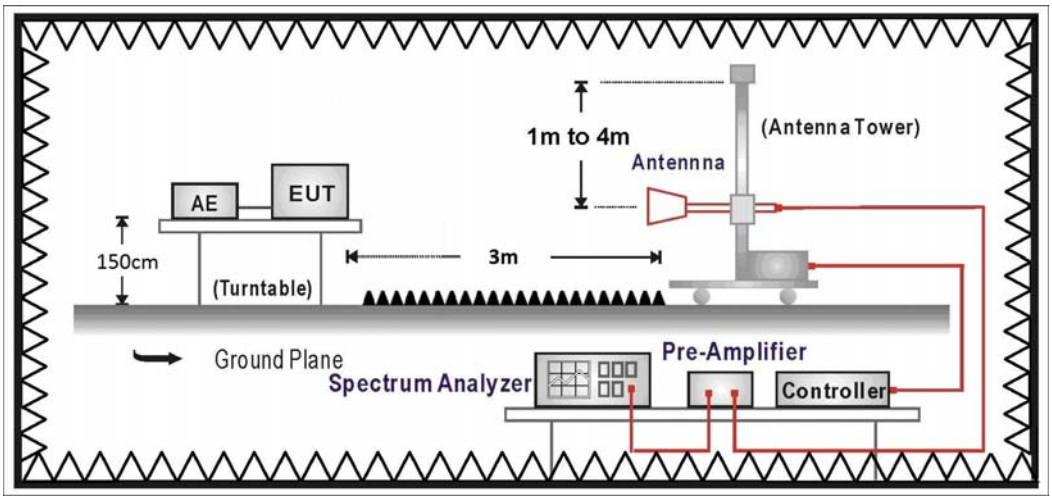
Note: All equipment that need to calibrate are with calibration period of 1 year.

4.2. Test Setup

Under 1GHz Test Setup:



Above 1GHz Test Setup:



4.3. 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	uV/m	dBuV/m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks : 1. RF Voltage (dBuV) = 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.

4.4. Test Procedure

The EUT was setup according to ANSI C63.10:2013 and tested according to DTS test procedure of KDB558074 D01 V04 for compliance to FCC 47CFR 15.247 requirements.
The EUT and its simulators are placed on a turn table which is 0.8 or 1.5 meter above ground.
The turn table can rotate 360 degrees to determine the position of the maximum emission level.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10:2013 on radiated measurement.
On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
The bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

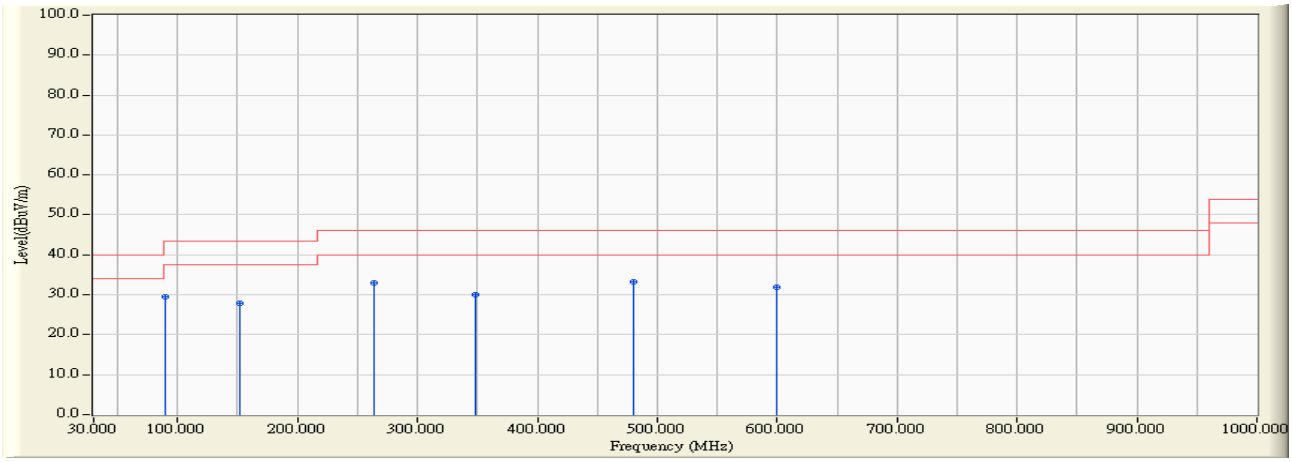
4.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247 and RSS-247 Issue 2.

4.6. Test Result

30MHz-1GHz Spurious

Site : CB4-H	**Time : 2017/10/24**
Limit : FCC_CLASS_B_03M_QP	**Margin : 6**
Probe : CB4-H_FCC_EFS_S2_30M-1GHz_1116 - HORIZONTAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2440MHz**

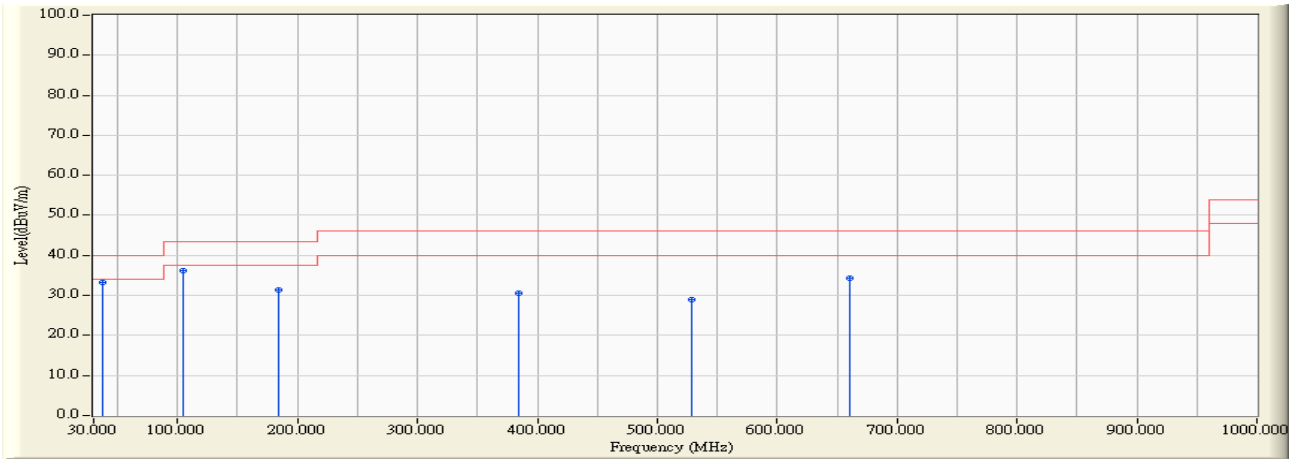


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		90.140	-25.489	54.973	29.484	-14.016	43.500	QUASIPEAK
2		152.220	-22.358	50.252	27.894	-15.606	43.500	QUASIPEAK
3		264.255	-20.115	53.218	33.103	-12.897	46.000	QUASIPEAK
4		348.645	-17.359	47.387	30.028	-15.972	46.000	QUASIPEAK
5	*	480.080	-14.513	47.675	33.162	-12.838	46.000	QUASIPEAK
6		599.875	-12.694	44.602	31.908	-14.092	46.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB4-H	**Time : 2017/10/24**
Limit : FCC_CLASS_B_03M_QP	**Margin : 6**
Probe : CB4-H_FCC_EFS_S2_30M-1GHz_1116 - VERTICAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2440MHz**



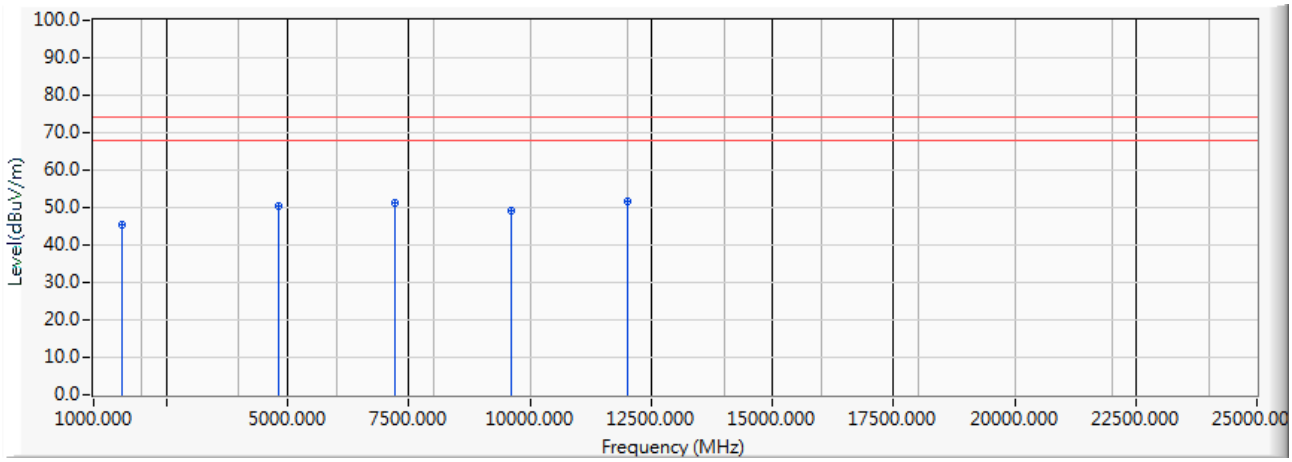
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	37.760	-16.544	49.823	33.279	-6.721	40.000	QUASIPEAK
2		105.175	-22.787	59.074	36.286	-7.214	43.500	QUASIPEAK
3		184.230	-23.892	55.229	31.337	-12.163	43.500	QUASIPEAK
4		384.050	-16.465	47.085	30.621	-15.379	46.000	QUASIPEAK
5		528.095	-13.848	42.877	29.028	-16.972	46.000	QUASIPEAK
6		660.015	-12.227	46.608	34.381	-11.619	46.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Above 1GHz Spurious

Site : CB2-H	**Time : 2017/10/2**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - HORIZONTAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2402MHz**

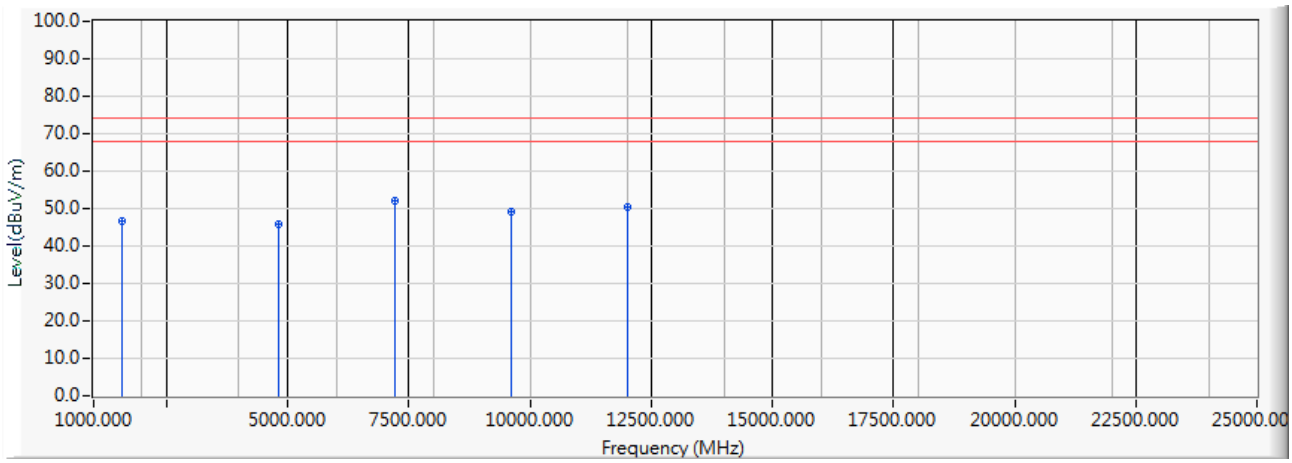


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1594.050	-12.499	57.788	45.289	-28.711	74.000	PEAK
2		4803.982	-0.209	50.718	50.510	-23.490	74.000	PEAK
3		7206.616	6.976	44.274	51.250	-22.750	74.000	PEAK
4		9607.063	12.538	36.495	49.033	-24.967	74.000	PEAK
5	*	12010.024	15.516	36.315	51.831	-22.169	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - VERTICAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2402MHz**

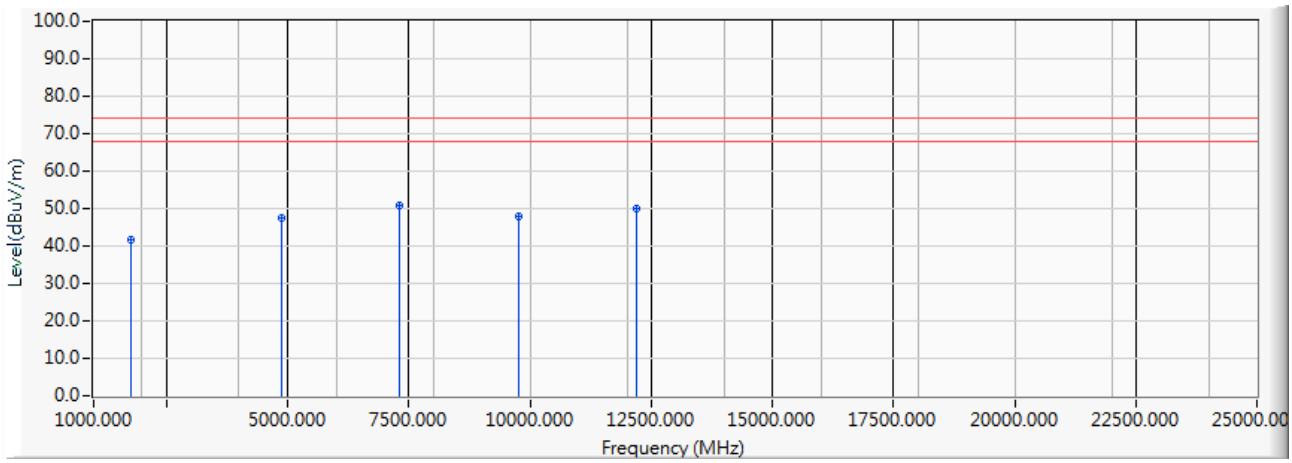


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1593.870	-12.500	59.306	46.806	-27.194	74.000	PEAK
2		4803.846	-0.208	45.889	45.681	-28.319	74.000	PEAK
3	*	7206.790	6.978	45.173	52.151	-21.849	74.000	PEAK
4		9608.804	12.543	36.513	49.056	-24.944	74.000	PEAK
5		12006.258	15.532	34.968	50.500	-23.500	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - HORIZONTAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2440MHz**

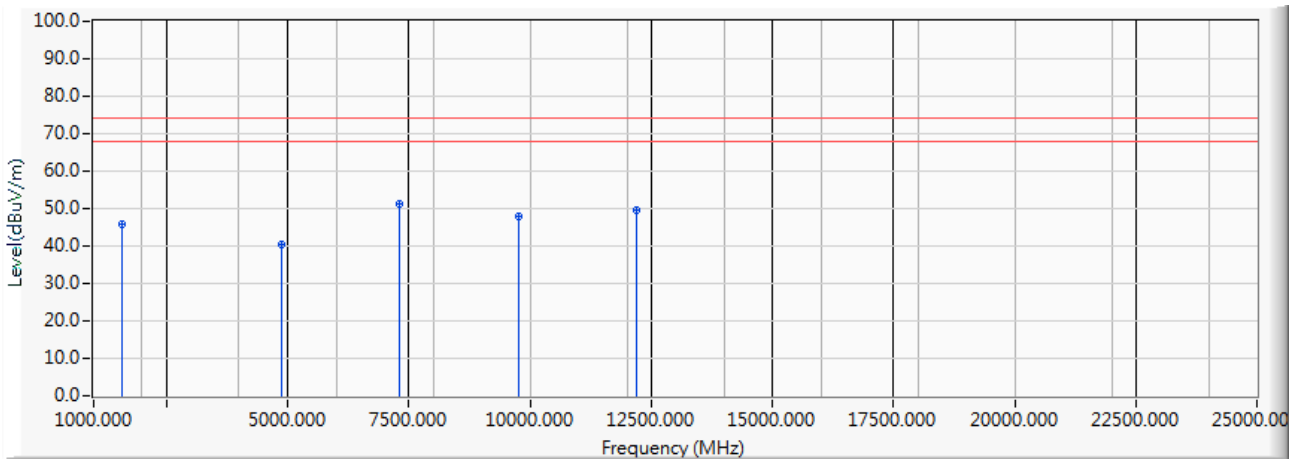


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1779.150	-11.862	53.355	41.493	-32.507	74.000	PEAK
2		4879.947	-0.126	47.424	47.298	-26.702	74.000	PEAK
3	*	7320.096	7.437	43.408	50.845	-23.155	74.000	PEAK
4		9762.730	12.869	35.183	48.052	-25.948	74.000	PEAK
5		12200.393	14.850	35.226	50.076	-23.924	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - VERTICAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2440MHz**

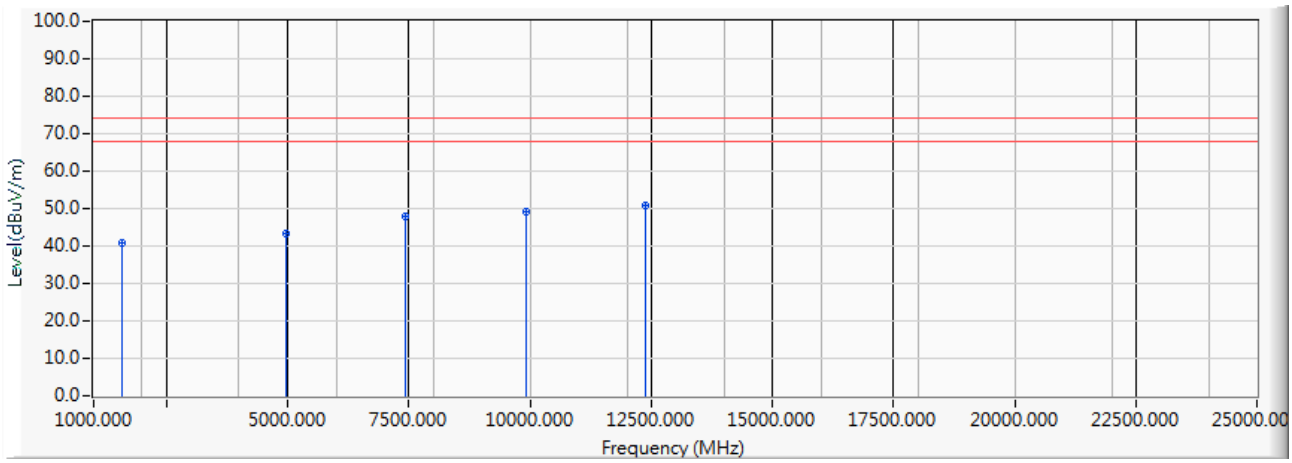


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1594.560	-12.497	58.453	45.956	-28.044	74.000	PEAK
2		4879.904	-0.126	40.530	40.404	-33.596	74.000	PEAK
3	*	7320.207	7.438	43.931	51.368	-22.632	74.000	PEAK
4		9758.708	12.863	35.051	47.915	-26.085	74.000	PEAK
5		12200.127	14.851	34.747	49.598	-24.402	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - HORIZONTAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2480MHz**

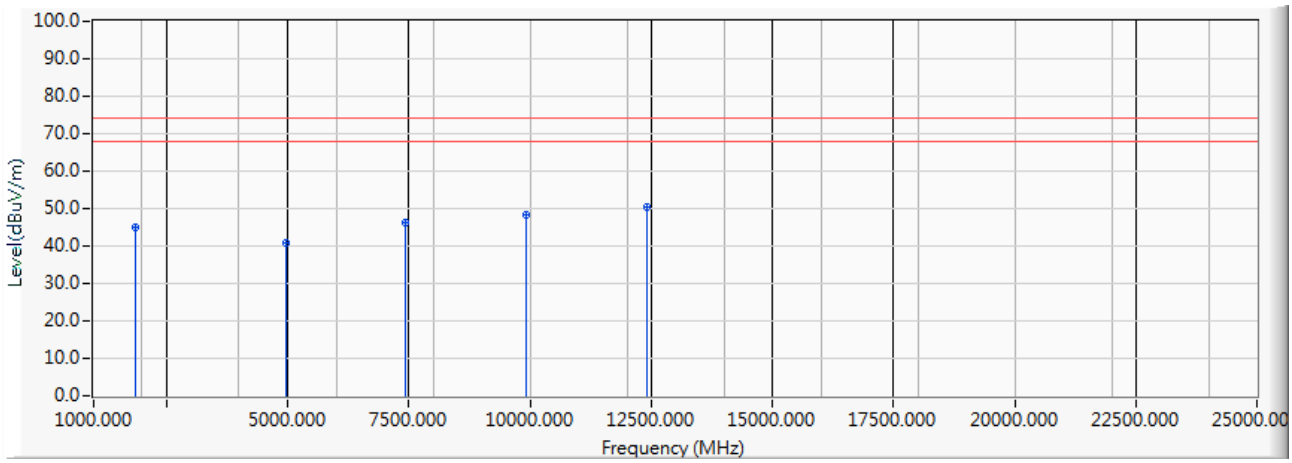


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1593.520	-12.501	53.183	40.682	-33.318	74.000	PEAK
2		4959.248	-0.035	43.168	43.133	-30.867	74.000	PEAK
3		7438.979	7.864	40.177	48.042	-25.958	74.000	PEAK
4		9924.878	13.098	35.963	49.061	-24.939	74.000	PEAK
5	*	12398.788	15.725	35.150	50.875	-23.125	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - VERTICAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2480MHz**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1866.400	-11.575	56.775	45.200	-28.800	74.000	PEAK
2		4960.210	-0.035	40.894	40.860	-33.140	74.000	PEAK
3		7440.746	7.872	38.398	46.269	-27.731	74.000	PEAK
4		9920.984	13.092	35.194	48.287	-25.713	74.000	PEAK
5	*	12400.122	15.734	34.568	50.302	-23.698	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

5. RF antenna conducted test

5.1. Test Equipment

The following test equipment is used during the test:

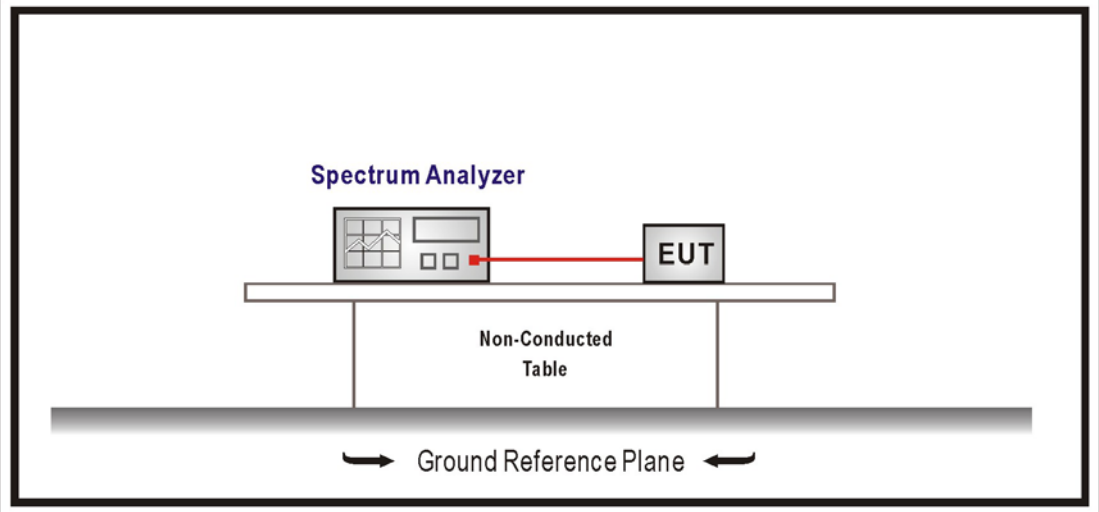
RF antenna conducted test / SR10-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/07/26	2018/07/25
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2017/03/13	2018/03/12

Note: All equipment that need to calibrate are with calibration period of 1 year.

5.2. Test Setup

RF Conducted Measurement:



5.3. 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 an RF conducted or 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)).

5.4. Test Procedure

The EUT was setup according to ANSI C63.10:2013 and tested according to DTS test procedure of KDB558074 D01 V04 for compliance to FCC 47CFR 15.247 requirements. Set RBW = 100 kHz, Set VBW> RBW, scan up through 10th harmonic.

5.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247 and RSS-247 Issue 2.

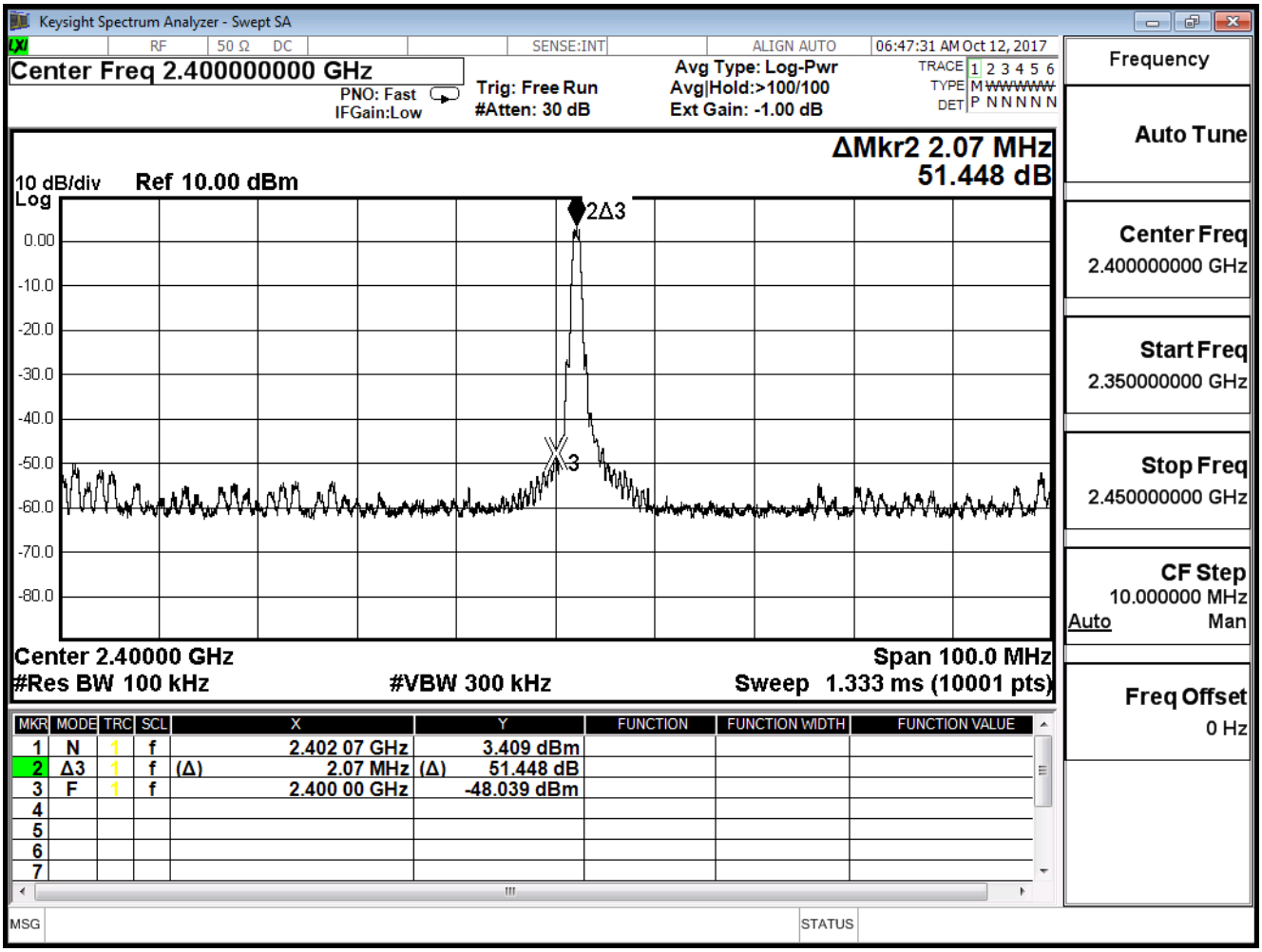
5.6. Test Result

Product	Wireless sensor		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2017/10/12	Test Site	SR10-H

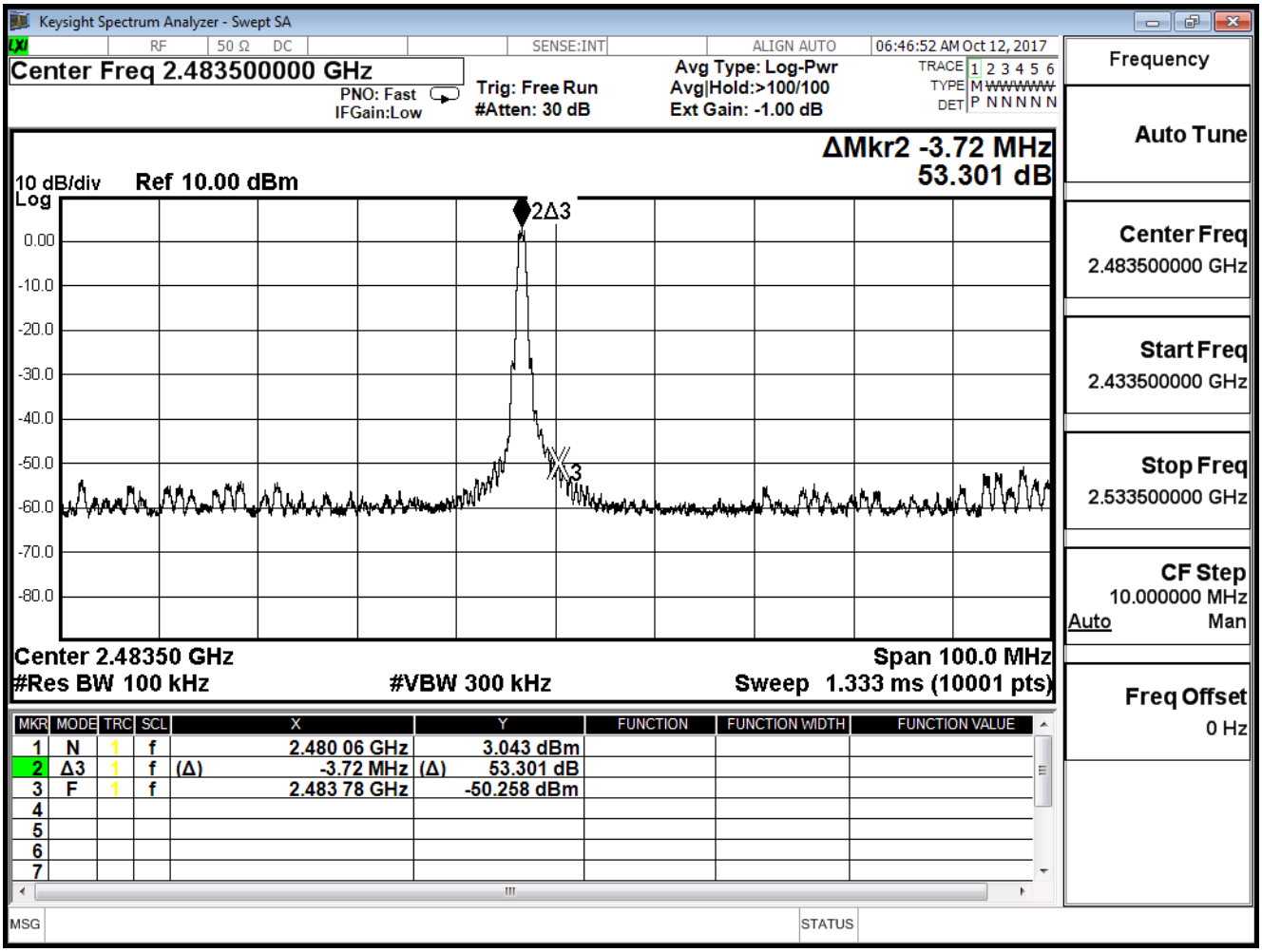
GFSK

Channel	Frequency (MHz)	Measure Level (dBc)	Limit (dBc)	Result
0	2402	51.448	≧20	Pass
39	2480	53.301	≧20	Pass

Channel 00

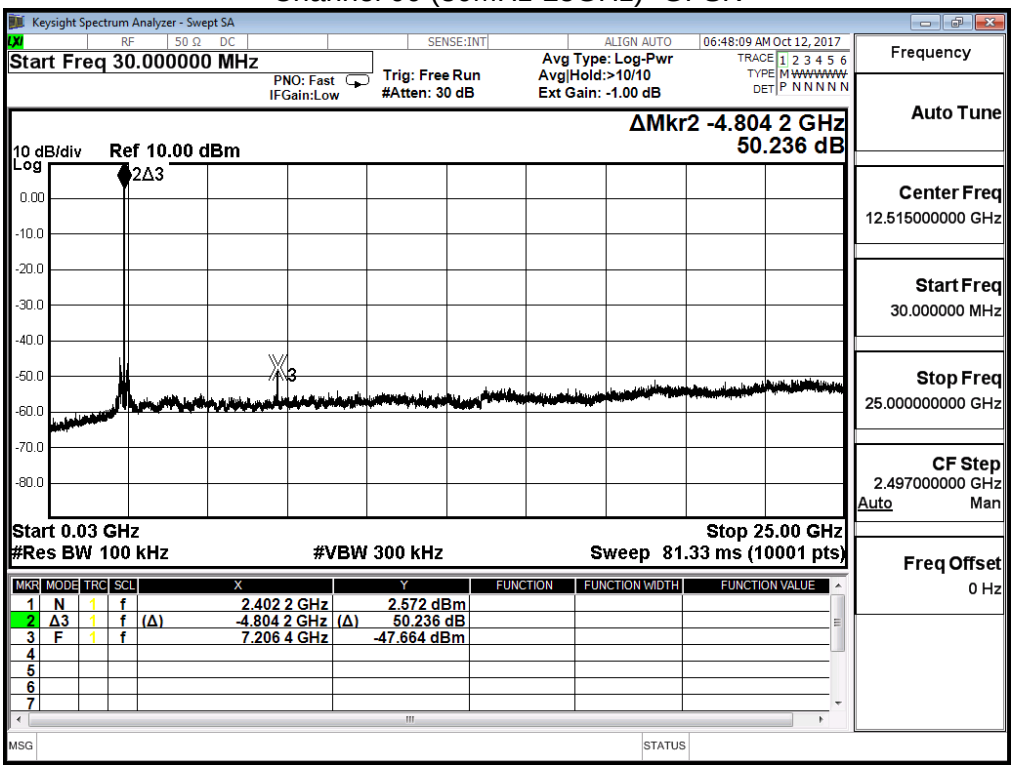


Channel 39

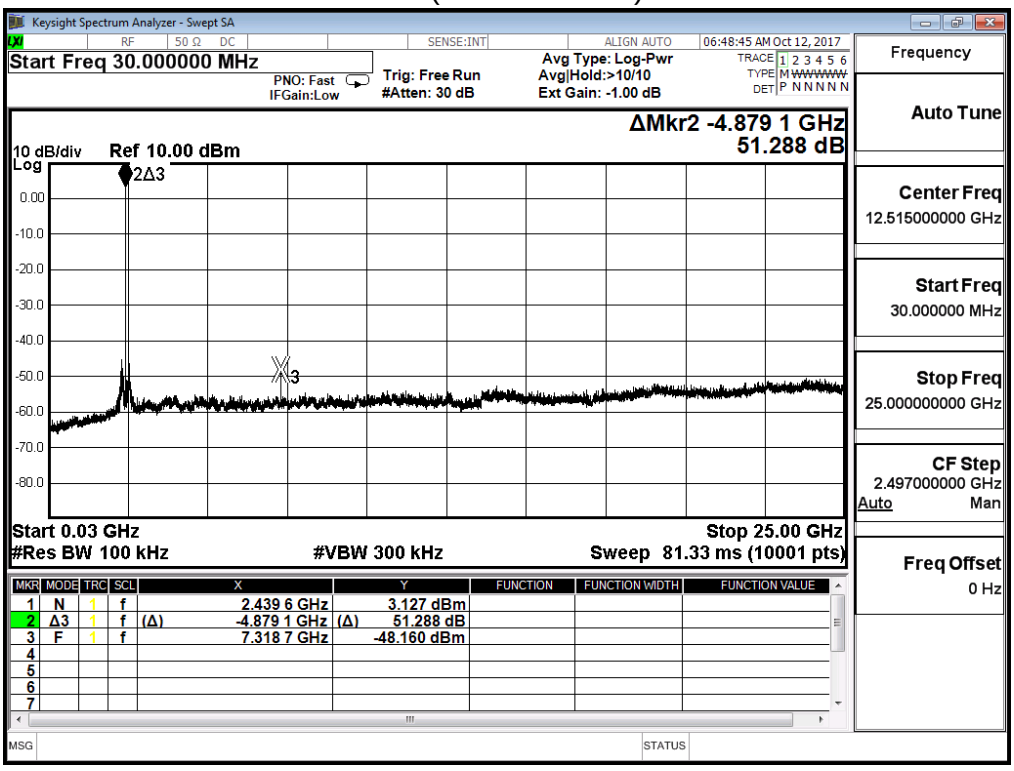

Keysight Spectrum Analyzer - Swept SA
RF 50 Ω DC
SENSE:INT
ALIGN AUTO
06:46:52 AM Oct 12, 2017
Center Freq 2.483500000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -1.00 dB
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
ΔMkr2 -3.72 MHz
53.301 dB
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
2Δ3
Center 2.48350 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 100.0 MHz
Sweep 1.333 ms (10001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.480 06 GHz 3.043 dBm
2 Δ3 1 f (Δ) -3.72 MHz (Δ) 53.301 dB
3 F 1 f 2.483 78 GHz -50.258 dBm
4
5
6
7
MSG
STATUS
Frequency
Auto Tune
Center Freq
2.483500000 GHz
Start Freq
2.433500000 GHz
Stop Freq
2.533500000 GHz
CF Step
10.000000 MHz
Auto
Man
Freq Offset
0 Hz

Product	Wireless sensor		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2017/10/12	Test Site	SR10-H

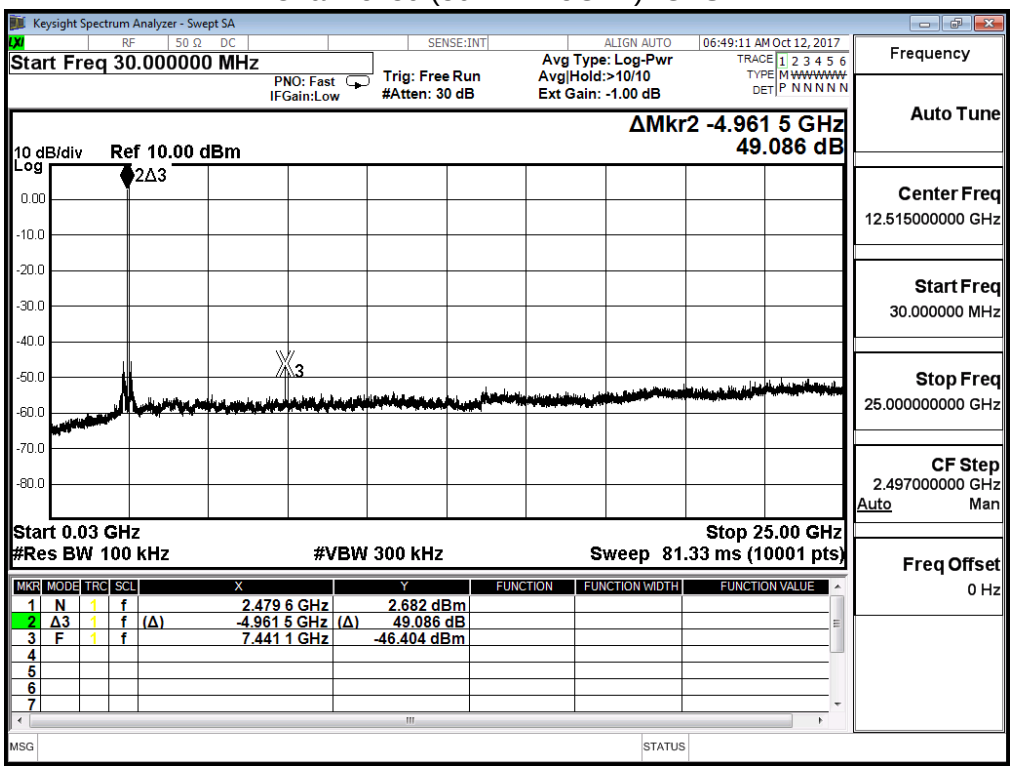
Channel 00 (30MHz-25GHz)- GFSK



Channel 19 (30MHz-25GHz)- GFSK



Channel 39 (30MHz-25GHz)- GFSK



6. Band Edge

6.1. Test Equipment

The following test equipment are used during the test:

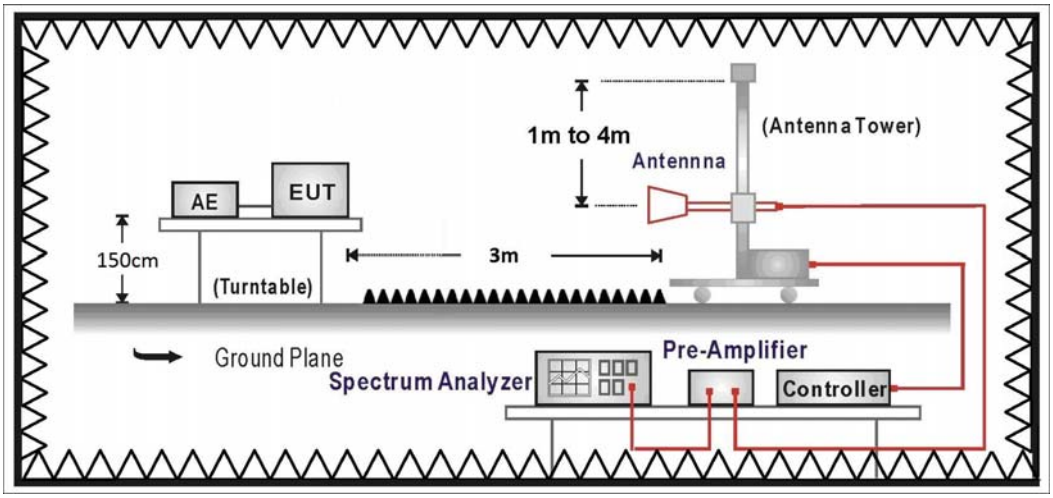
Band Edge / CB2-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal Analyzer	R&S	FSVA40	101455	2016/11/28	2017/11/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/23	2018/01/22
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2017/03/13	2018/03/12
Bilog Antenna	Teseq	CBL6112D	23191	2017/06/28	2018/06/27
Horn Antenna	Schwarzbeck	BBHA 9120D	639	2017/06/14	2018/06/13
Horn Antenna	Schwarzbeck	BBHA 9170	202	2017/02/15	2018/02/14
Pre-Amplifier	RF Bay Inc.	LNA-1330	12162511	2017/03/09	2018/03/08
Pre-Amplifier	EMCI	EMCI 1830I	980366	2017/01/23	2018/01/22
Pre-Amplifier	MITEQ	JS44-45-8P	2014754	2016/12/26	2017/12/25

Note: All equipment that need to calibrate are with calibration period of 1 year.

6.2. Test Setup

RF Radiated Measurement:



6.3. 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.

6.4. Test Procedure

The EUT was setup according to ANSI C63.10:2013 and tested according to DTS test procedure of KDB558074 D01 V04 for compliance to FCC 47CFR 15.247 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground.

The turn table can rotate 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 can move up and down between 1 meter and 4 meters to find out the maximum emission level.

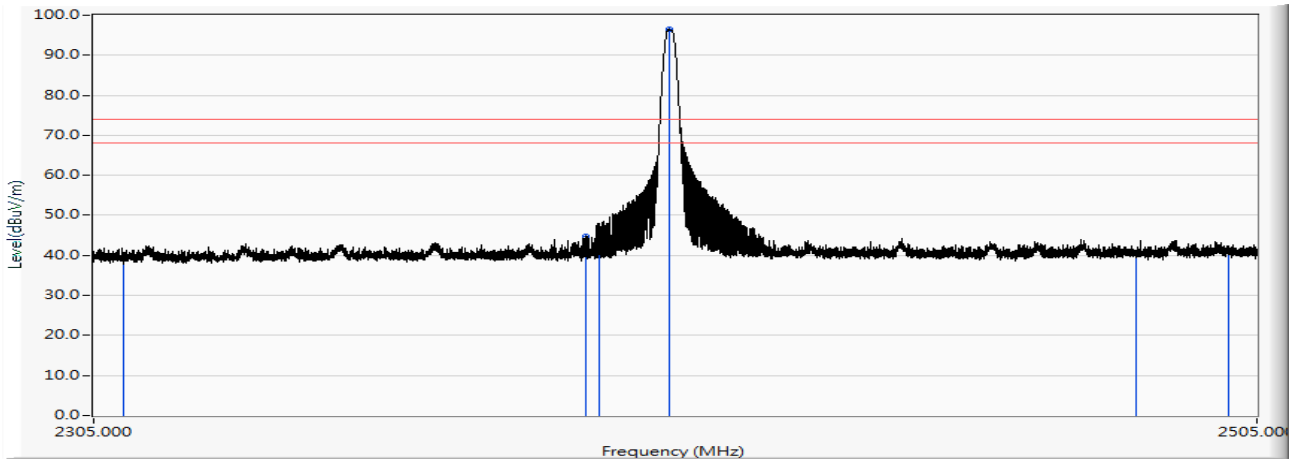
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10:2013 on radiated measurement.

6.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247 and RSS-247 Issue 2.

6.6. Test Result

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - HORIZONTAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2402MHz**

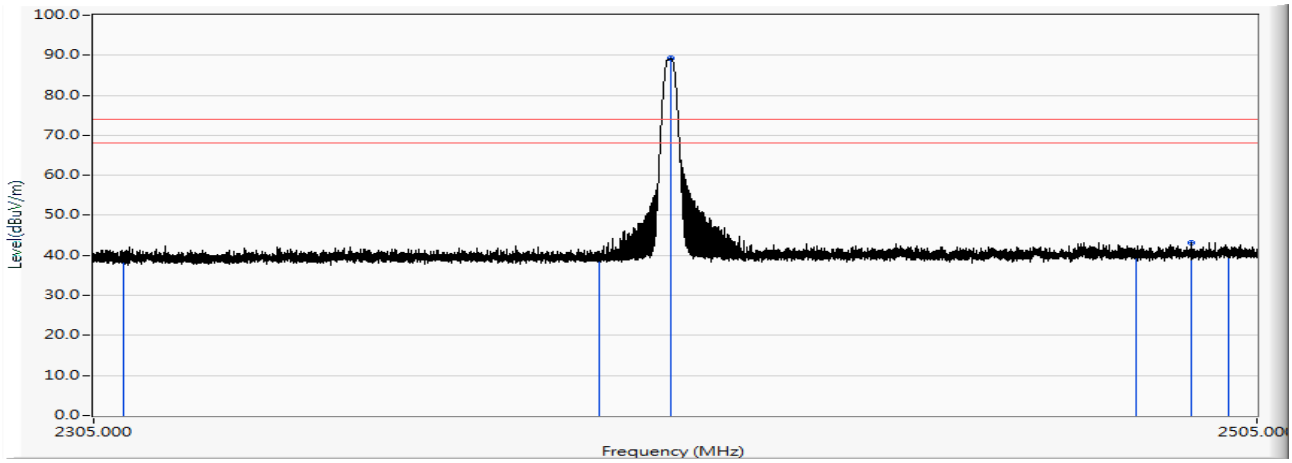


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	11.014	28.145	39.160	-34.840	74.000	PEAK
2		2387.520	11.527	33.289	44.816	-29.184	74.000	PEAK
3		2390.000	11.544	34.463	46.007	-27.993	74.000	PEAK
4	*	2401.780	11.622	84.772	96.395	22.395	74.000	PEAK
5		2483.500	12.172	28.433	40.605	-33.395	74.000	PEAK
6		2500.000	12.274	28.702	40.977	-33.023	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - VERTICAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2402MHz**

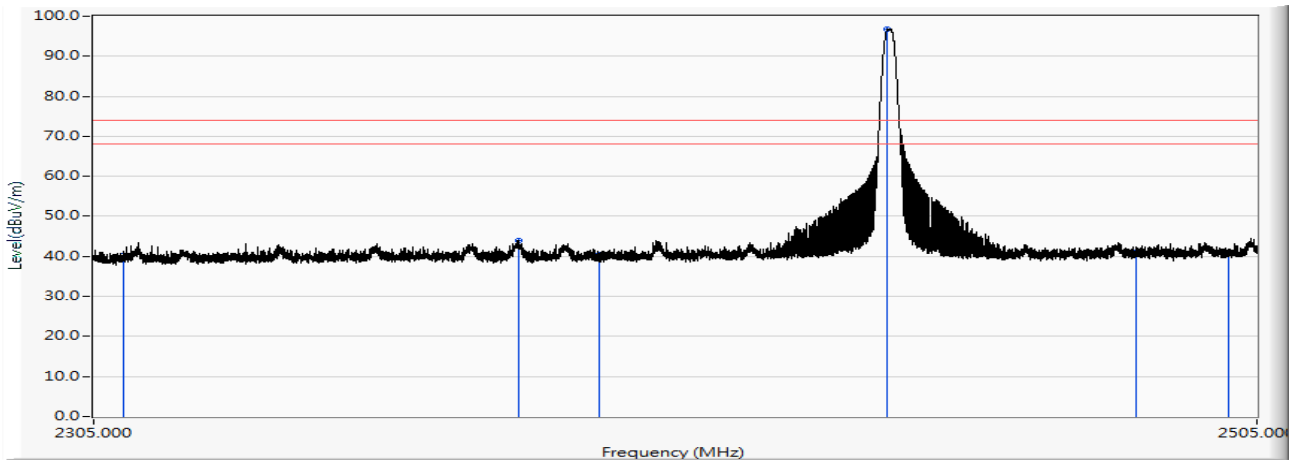


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	11.014	28.840	39.855	-34.145	74.000	PEAK
2		2390.000	11.544	28.026	39.570	-34.430	74.000	PEAK
3	*	2402.240	11.626	77.521	89.147	15.147	74.000	PEAK
4		2483.500	12.172	28.047	40.219	-33.781	74.000	PEAK
5		2493.360	12.237	31.006	43.243	-30.757	74.000	PEAK
6		2500.000	12.274	28.334	40.609	-33.391	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - HORIZONTAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2440MHz**

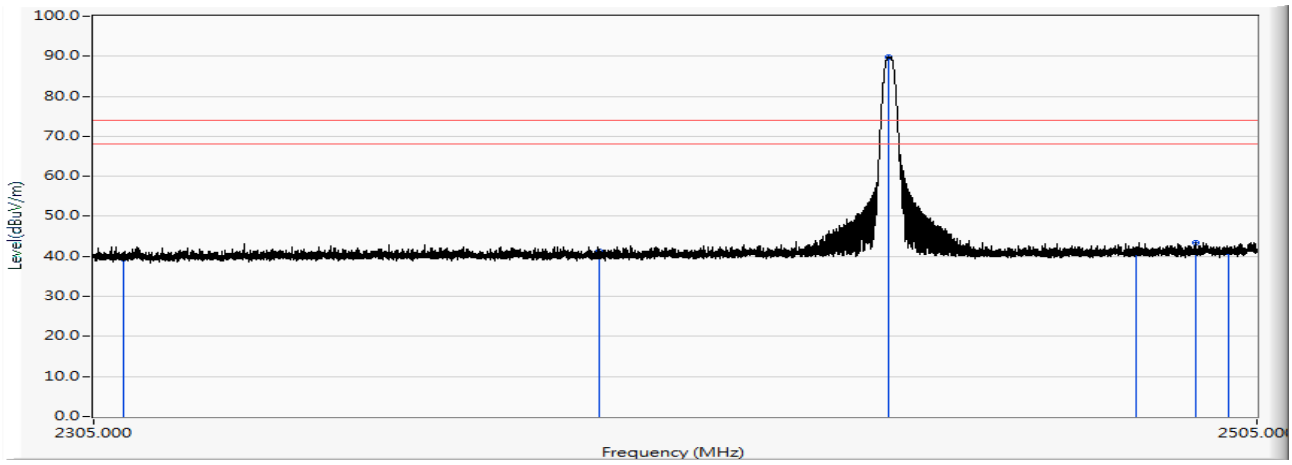


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	11.014	29.118	40.133	-33.867	74.000	PEAK
2		2376.200	11.452	32.604	44.056	-29.944	74.000	PEAK
3		2390.000	11.544	29.042	40.586	-33.414	74.000	PEAK
4	*	2439.720	11.878	84.875	96.753	22.753	74.000	PEAK
5		2483.500	12.172	28.922	41.094	-32.906	74.000	PEAK
6		2500.000	12.274	28.557	40.832	-33.168	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - VERTICAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2440MHz**

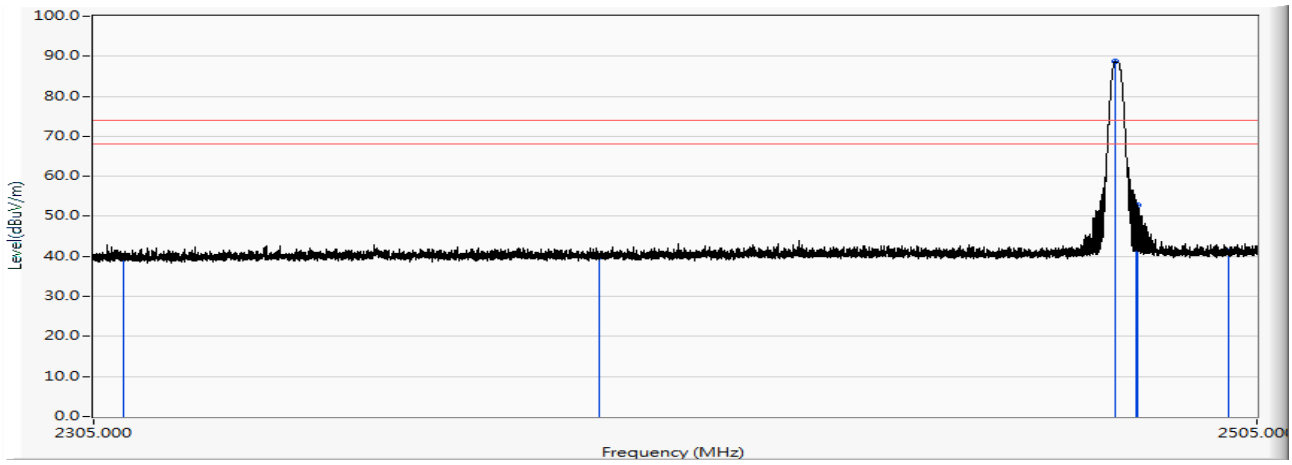


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	11.014	28.396	39.411	-34.589	74.000	PEAK
2		2390.000	11.544	29.842	41.386	-32.614	74.000	PEAK
3	*	2439.980	11.880	77.819	89.699	15.699	74.000	PEAK
4		2483.500	12.172	29.129	41.301	-32.699	74.000	PEAK
5		2494.180	12.243	31.100	43.343	-30.657	74.000	PEAK
6		2500.000	12.274	28.695	40.970	-33.030	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - HORIZONTAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2480MHz**

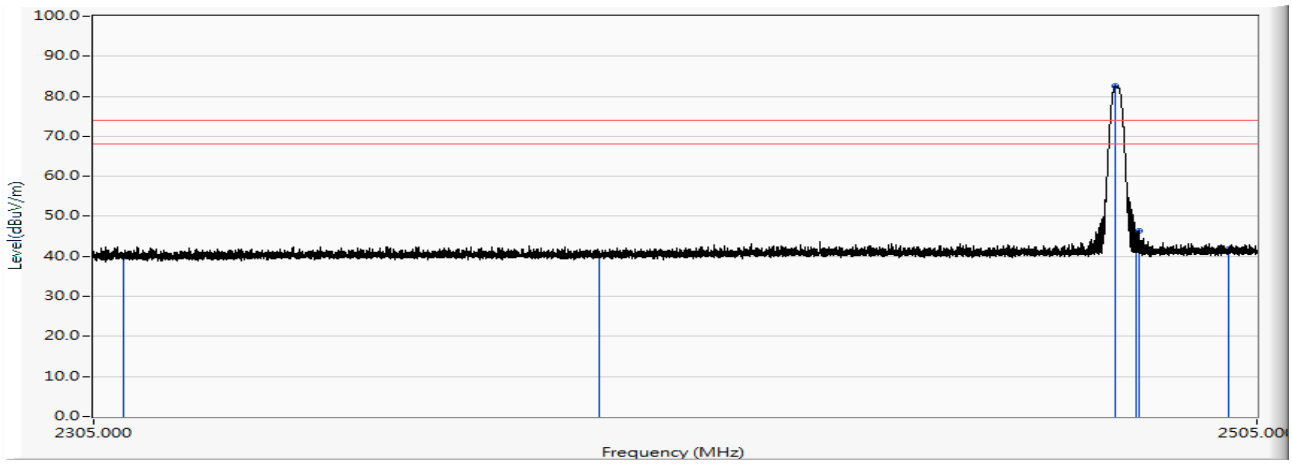


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	11.014	29.033	40.048	-33.952	74.000	PEAK
2		2390.000	11.544	28.516	40.060	-33.940	74.000	PEAK
3	*	2479.740	12.147	76.461	88.608	14.608	74.000	PEAK
4		2483.500	12.172	34.193	46.365	-27.635	74.000	PEAK
5		2483.620	12.172	40.565	52.738	-21.262	74.000	PEAK
6		2500.000	12.274	29.093	41.368	-32.632	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

Site : CB2-H	**Time : 2017/10/25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB2-H_FCC_EFS_B091_1-18GHz_3M_0117 - VERTICAL	**Power : DC 3V**
EUT : Wireless sensor	**Note : 802.15.1_BLE_2480MHz**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	11.014	29.055	40.070	-33.930	74.000	PEAK
2		2390.000	11.544	28.801	40.345	-33.655	74.000	PEAK
3	*	2479.720	12.147	70.390	82.537	8.537	74.000	PEAK
4		2483.500	12.172	29.530	41.702	-32.298	74.000	PEAK
5		2483.900	12.175	34.089	46.264	-27.736	74.000	PEAK
6		2500.000	12.274	29.668	41.943	-32.057	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The Emission above 18GHz were not included is because their levels are too low.

7. DTS Bandwidth

7.1. Test Equipment

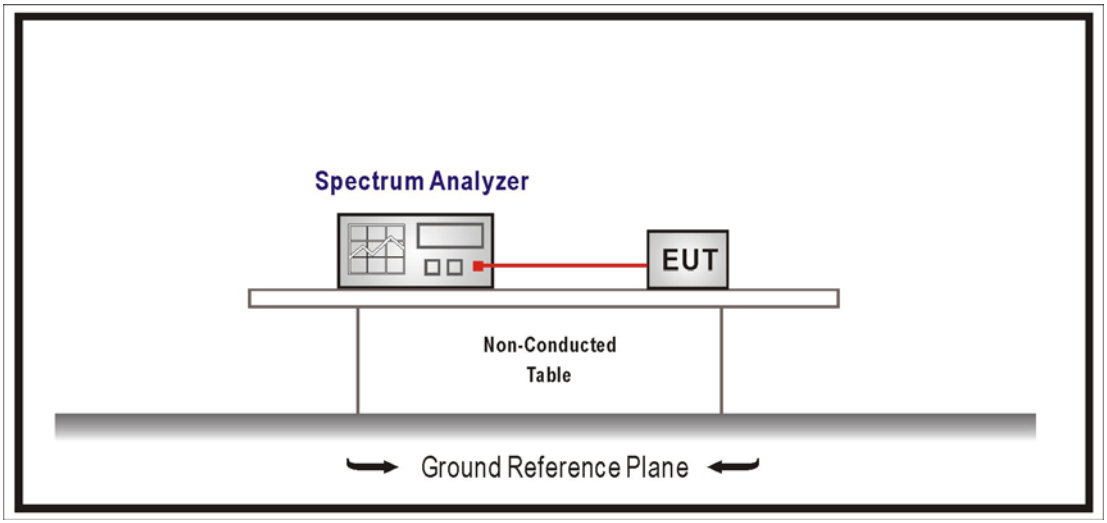
The following test equipment is used during the test:

DTS Bandwidth / SR10-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/07/26	2018/07/25
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2017/03/13	2018/03/12

Note: All equipment that need to calibrate are with calibration period of 1 year.

7.2. Test Setup



7.3. Limits

The 6 dB bandwidth must be greater than 500 kHz.

7.4. Test Procedures

The EUT was setup according to ANSI C63.10:2013; tested according to DTS test procedure of KDB558074 D01 V04 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 1% of EBW, Span greater than RBW.

7.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247 and RSS-247 Issue 2.

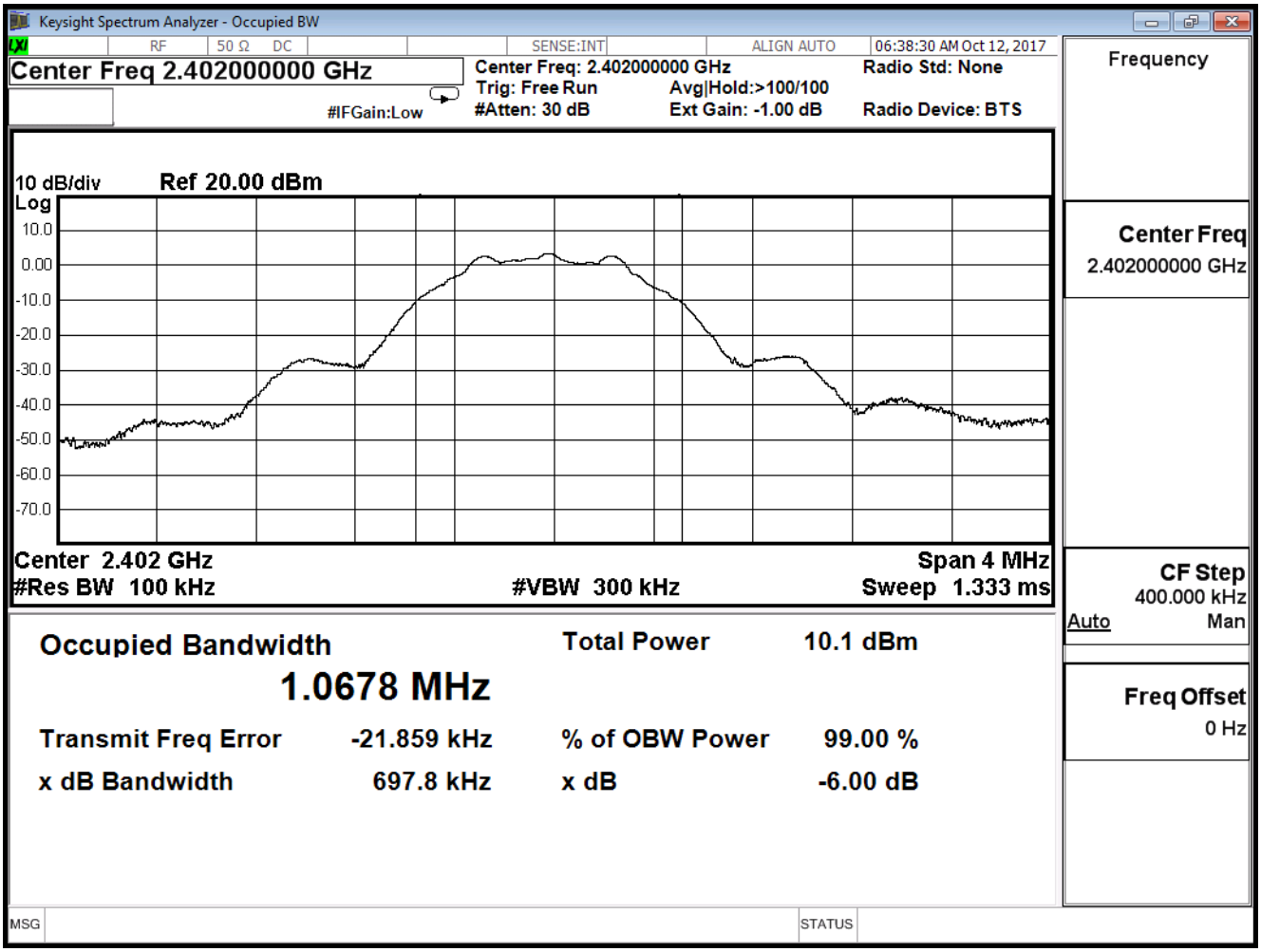
7.6. Test Result

Product	Wireless sensor		
Test Item	DTS Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2017/10/12	Test Site	SR10-H

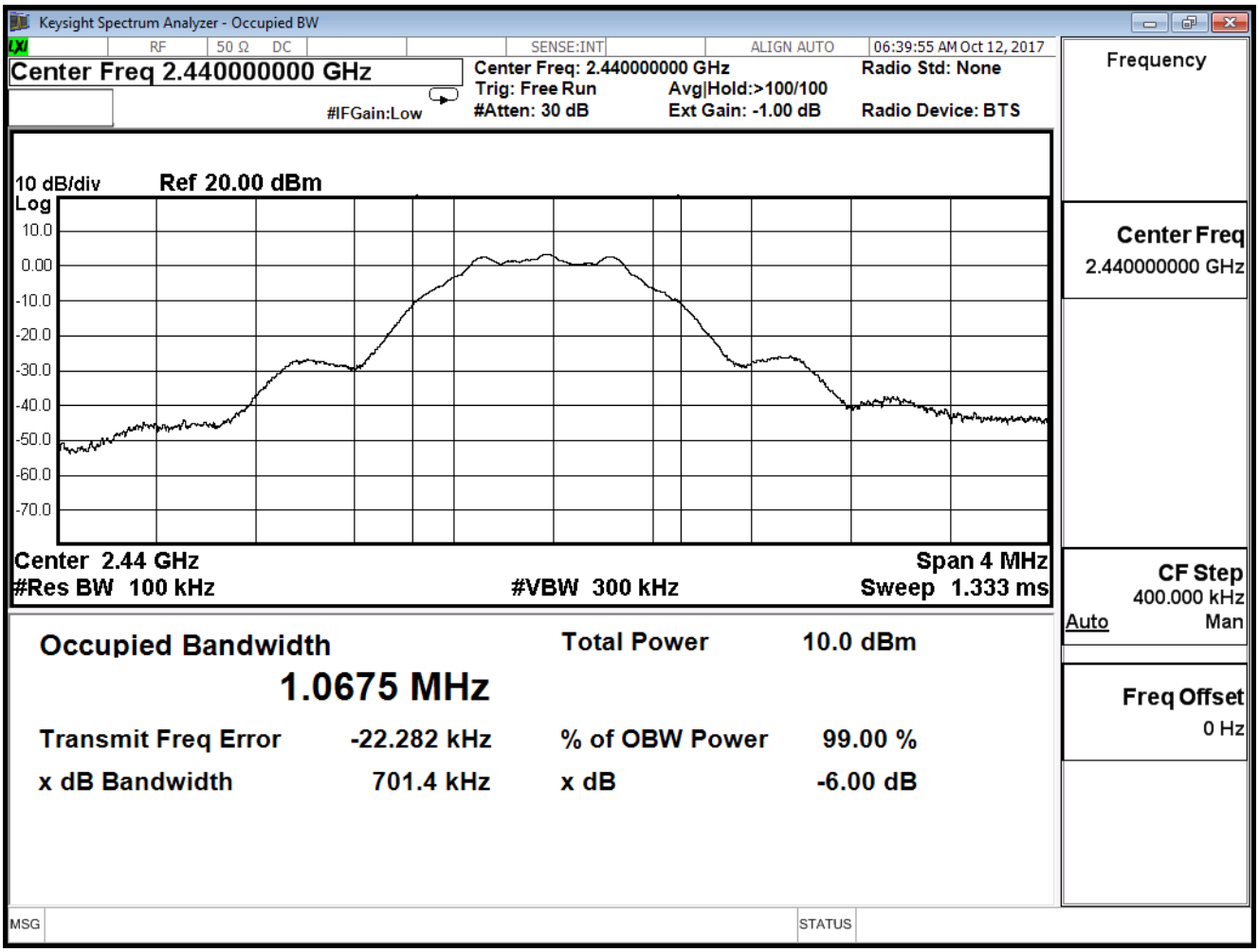
GFSK

Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Result
0	2402	0.698	1.0678	≧ 0.5	Pass
19	2440	0.701	1.0675	≧ 0.5	Pass
39	2480	0.694	1.0682	≧ 0.5	Pass

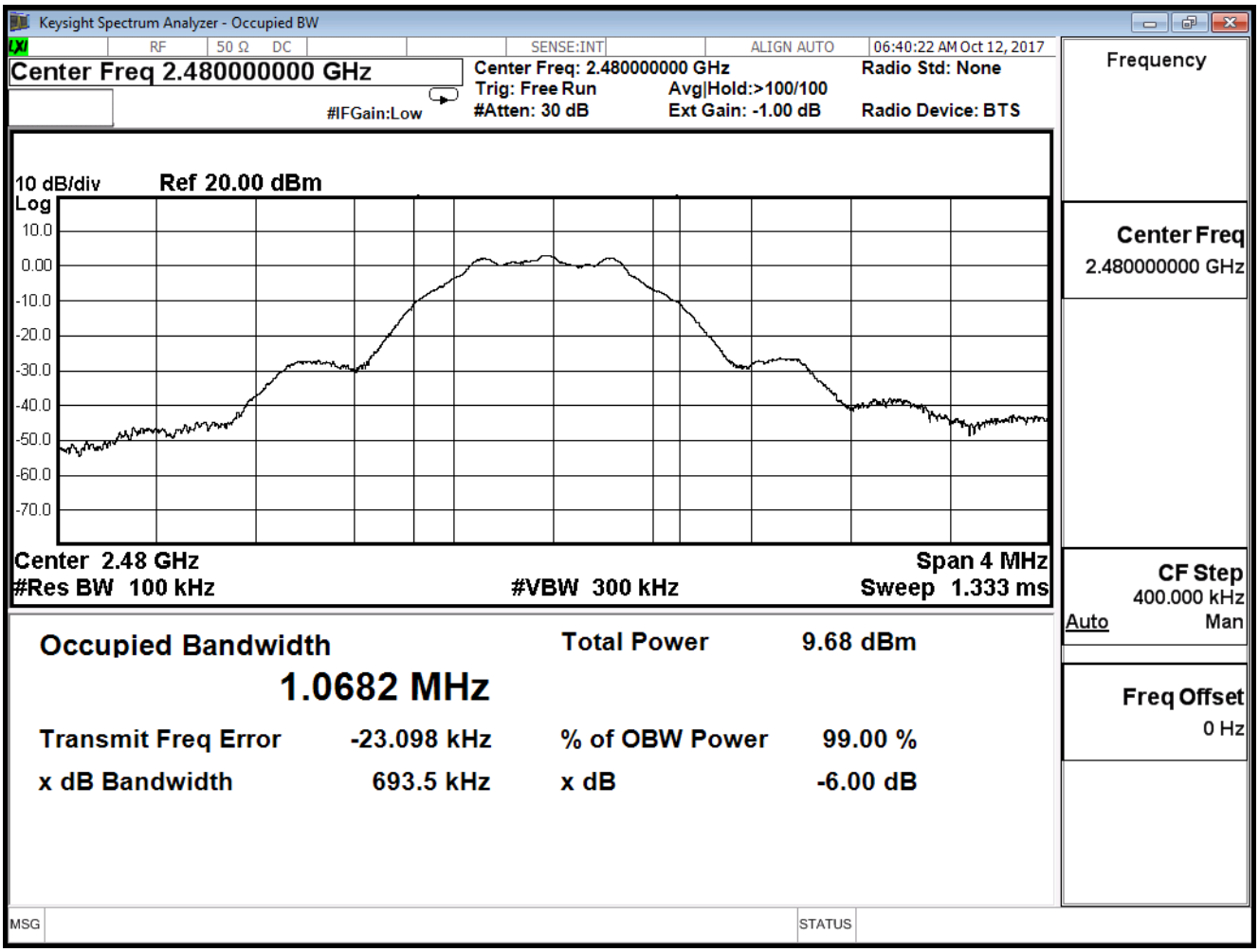
Channel 00



Channel 19


Keysight Spectrum Analyzer - Occupied BW
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
06:39:55 AM Oct 12, 2017
Center Freq 2.440000000 GHz
Center Freq: 2.440000000 GHz
Trig: Free Run
Avg|Hold:>100/100
#IFGain:Low
#Atten: 30 dB
Ext Gain: -1.00 dB
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Log
Ref 20.00 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center Freq
2.440000000 GHz
Center 2.44 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4 MHz
Sweep 1.333 ms
CF Step
400.000 kHz
Auto
Man
Occupied Bandwidth
1.0675 MHz
Total Power 10.0 dBm
Transmit Freq Error -22.282 kHz
% of OBW Power 99.00 %
x dB Bandwidth 701.4 kHz
x dB -6.00 dB
Freq Offset
0 Hz
MSG
STATUS

Channel 39


Keysight Spectrum Analyzer - Occupied BW
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
06:40:22 AM Oct 12, 2017
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>100/100
#IFGain:Low
#Atten: 30 dB
Ext Gain: -1.00 dB
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Log
Ref 20.00 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4 MHz
Sweep 1.333 ms
CF Step
400.000 kHz
Auto
Man
Occupied Bandwidth
1.0682 MHz
Total Power 9.68 dBm
Transmit Freq Error -23.098 kHz
% of OBW Power 99.00 %
x dB Bandwidth 693.5 kHz
x dB -6.00 dB
Freq Offset
0 Hz
MSG
STATUS

8. Power Density

8.1. Test Equipment

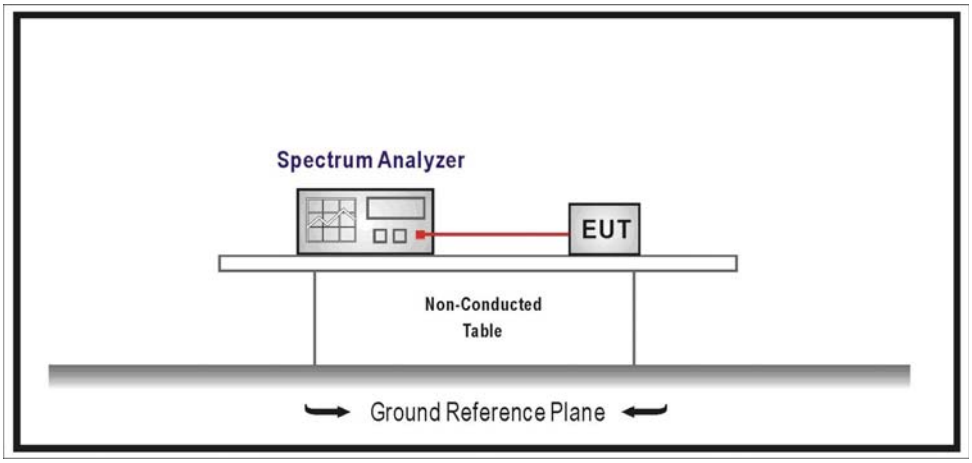
The following test equipment is used during the test:

Power Density / SR10-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/07/26	2018/07/25
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2017/03/13	2018/03/12

Note: All equipment that need to calibrate are with calibration period of 1 year.

8.2. Test Setup



8.3. Limits

The peak power spectral density conducted from the intentional radiated to the antenna shall not be greater than +8dBm in any 3kHz band during any time interval of continuous transmission.

8.4. Test Procedures

The EUT was setup according to ANSI C63.10:2013; tested according to DTS test procedure of KDB558074 D01 V04 for compliance to FCC 47CFR 15.247 requirements.

8.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247 and RSS-247 Issue 2.

8.6. Uncertainty

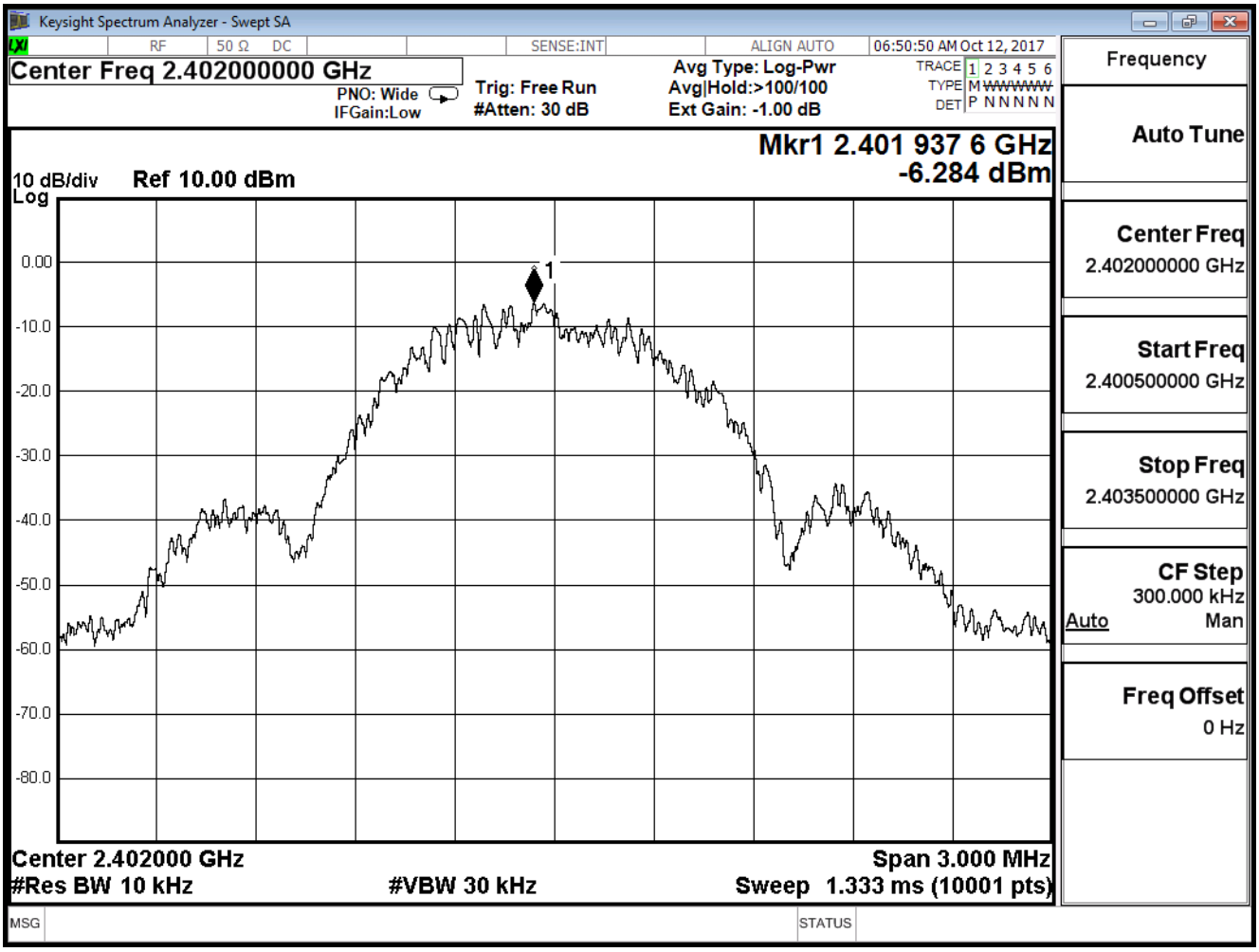
The measurement uncertainty is defined as ±1.27dB.

8.7. Test Result

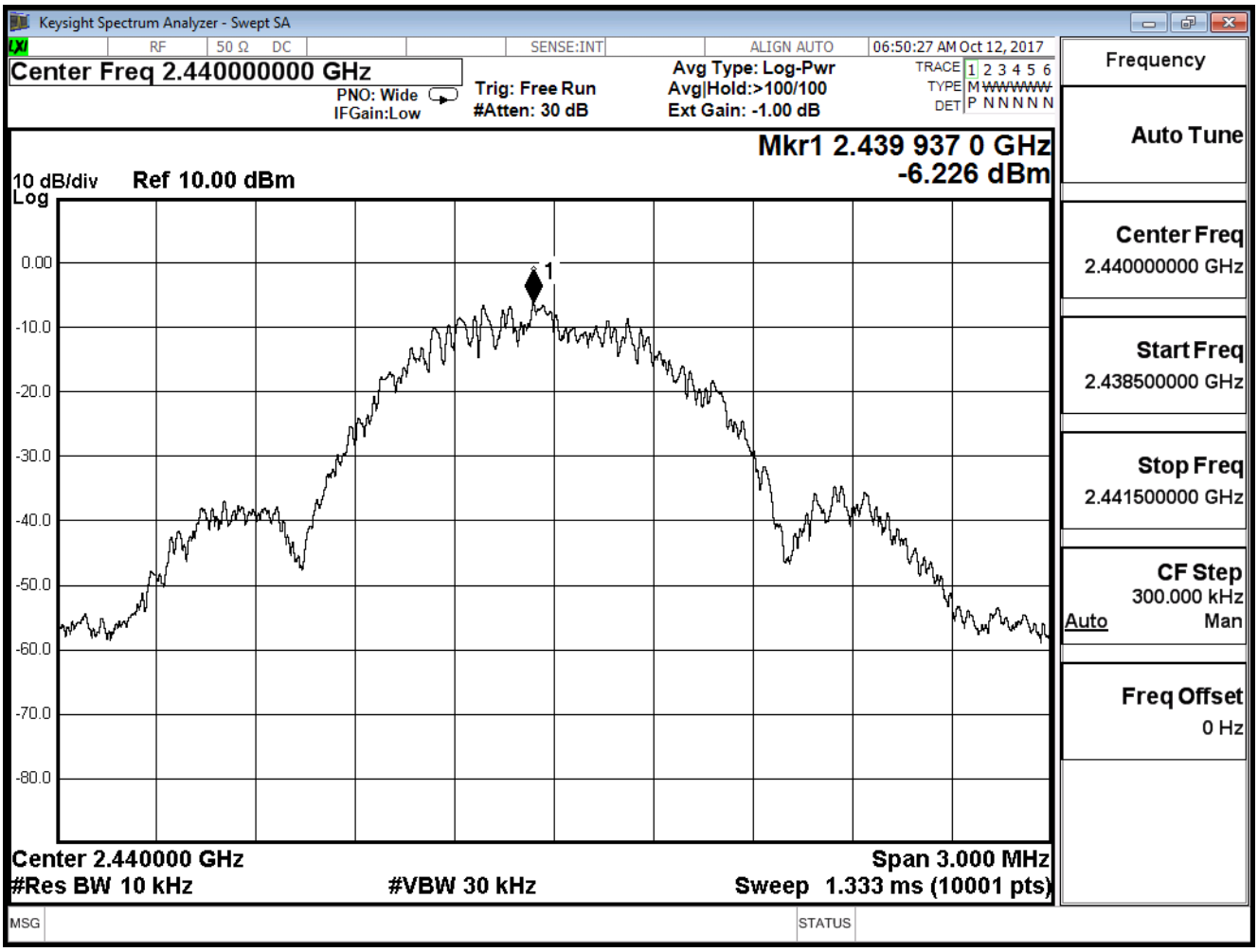
Product	Wireless sensor		
Test Item	Power Density		
Test Mode	Mode 1: Transmit		
Date of Test	2017/10/12	Test Site	SR10-H

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
0	2402	-6.284	≦8	Pass
19	2440	-6.226	≦8	Pass
39	2480	-6.621	≦8	Pass

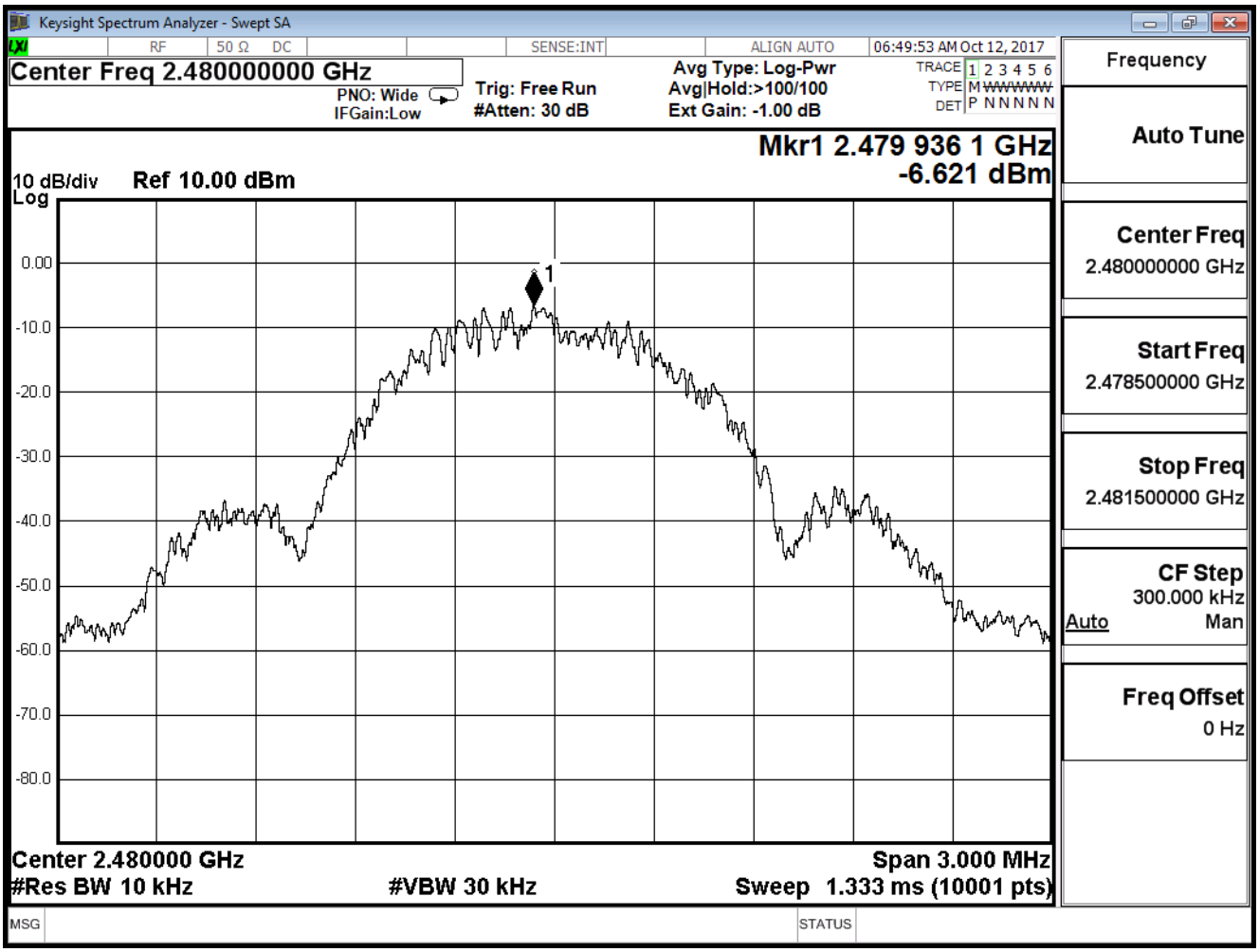
Channel 00



Channel 19


Keysight Spectrum Analyzer - Swept SA
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
06:50:27 AM Oct 12, 2017
Center Freq 2.440000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -1.00 dB
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Mkr1 2.439 937 0 GHz
-6.226 dBm
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.440000 GHz
#Res BW 10 kHz
#VBW 30 kHz
Span 3.000 MHz
Sweep 1.333 ms (10001 pts)
Frequency
Auto Tune
Center Freq
2.440000000 GHz
Start Freq
2.438500000 GHz
Stop Freq
2.441500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

Channel 39


Keysight Spectrum Analyzer - Swept SA
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
06:49:53 AM Oct 12, 2017
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -1.00 dB
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Mkr1 2.479 936 1 GHz
-6.621 dBm
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.480000 GHz
#Res BW 10 kHz
#VBW 30 kHz
Span 3.000 MHz
Sweep 1.333 ms (10001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.481500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS