



FCC 47 CFR PART 15 SUBPART C

TEST REPORT

FOR

Evluent VerticalMouse C Replacement Receiver

Model : VMCRR

Trade Name: Evluent

Issued to

Evluent

925 Linden Ave., Unit C, South San Francisco, CA 94080 USA

Issued by

WEISHANG Certification Co., Ltd.

Xizhi Office	12F.-3, No.27-1, Ln. 169, Kangning St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)
Test Site	No. 74-1, Shibachong Xi, Shiding Shiang, New Taipei City 223, Taiwan (R.O.C.)

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1. GENERAL INFORMATION

Applicant : **Evoluent**

Address : **925 Linden Ave., Unit C, South San Francisco, CA 94080 USA**

Manufacturer : **Evoluent**

Address : **925 Linden Ave., Unit C, South San Francisco, CA 94080 USA**

EUT : **Evoluent VerticalMouse C Replacement Receiver**

Model Name : **VMCRR**

Model Differences : **N/A**

Is here with confirmed to comply with the requirements set out in the FCC Rules and Regulations Part 15 Subpart C and the measurement procedures were according to ANSI C63.10-2013. The said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

FCC part 15 subpart C

Receipt Date : 07/20/2015

Final Test Date : 10/16/2015

Tested By:

Reviewed by:

OCT. 21, 2015
Date



Ben Lu / Engineer

OCT. 21, 2015
Date



Brian Yu / Manager

Designation Number: TW1048



2. REPORT OF MEASUREMENTS AND EXAMINATIONS

2.1 LIST OF MEASUREMENTS AND EXAMINATIONS

FCC Rule	Description of Test	Result
15.249(a)	. Field Strength of Fundamental Emissions	Pass
15.249(d)	. Band Edge Emissions	Pass
15.249(a)(d)	. Radiated Emissions	Pass
15.207	. Conducted Emissions	Pass
15.215(c)	. 20dB Bandwidth	Pass
15.203	. Antenna Requirements	Pass

*Note : All test sites and the data are completed in the lab with TAF qualifications. (TW1048)

Test Location;

Max Light Technology Co., Ltd.

No. 74-4, Shibachong Xi, Shiding Dist., New Taipei City, Taiwan (R.O.C.)



2.2 DESCRIPTION OF THE TESTED SAMPLES

EUT Name : Evoluent VerticalMouse C Replacement Receiver
Model Number :: VMCRR
FCCID Number R6Y-VMCRR
Receipt Date : 07/20/2015
Input Voltage : 5Vdc From USB Port
Power From Inside Outside
Adaptor BATTERY AC Power Source
DC Power Source Support Unit PC or NB
Operate Frequency : Refer to the channel list as described below
Modulation Technique : GFSK
Number of Channels : 15
Channel spacing : N/A 5 MHz
Operating Mode : Simplex Duplex
Antenna Type : Chip Antenna
Antenna gain 3.45 dBi



2.3 CARRIER FREQUENCY OF CHANNELS

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



3. TEST METHODOLOGY

All testing as described bellowed were performed in accordance with ANSI C63.10:2013 and FCC CFR 47 Part 15 Subpart C.

3.1 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on a wood table, which is at 0.8 m above ground plane acceding to clause 15.207 and requirements of ANSI C63.10:2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz are using CISPR Quasi-Peak / Average detectors.

Radiated Emissions

The EUT is a placed on a turn table, which is 0.8 m above ground plane (1.5 m for above 1GHz). The turntable was rotated through 360 degrees to determine the position of maximum emission level. The EUT is placed at 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.



3.2 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 ⁽¹⁾ - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

2 Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.3 DESCRIPTION OF TEST MODES

All testing and the worst radiated emission case from X,Y and Z axis evaluation was selected for testing.

The worst case on dedicated Y axis and all testing with this mode was performed.

The EUT was tested under following modes:

Modes:

1. Continuous transmitting

Channels:

1. CH1, 2.405 GHz
2. CH8, 2.440 GHz
3. CH15, 2.475 GHz



3.4 MEASUREMENT UNCERTAINTY

Measurement Item	Uncertainty
Conducted emissions	±2.24 dB
Radiated emissions (30MHz ~ 1GHz)	±3.96 dB
Radiated emissions (above 1GHz)	±3.74 dB

3.5 DESCRIPTION OF THE SUPPORT EQUIPMENTS

Setup Diagram

See test photographs attached in appendix 1 for the actual connections between EUT and support equipment.

Support Equipment

Peripherals Devices:

OUTSIDE SUPPORT EQUIPMENT							
No.	Equipment	Model	Serial No.	FCC ID/ BSMI ID	Trade name	Data Cable	Power Cord
1.	PC	IV8	99AKDV1	FCC DOC	IBM	N/A	Unshielded /1.8m
2.	LCD Monitor	SDM-HS74	1356906	FCC DOC	SONY	Shielded/ 1.8m	Unshielded /1.8m
3.	Printer	C4562B	H946151BZ	FCC DOC	HP	Shielded/ 1m	N/A
4.	Keyboard	SK-8115	MY-0DJ325-7161 9-885-0166	FCC DOC	DELL	Shielded/ 1.8m	N/A
5.	Mouse	MOC5UO	HOYO2HZ4	FCC DOC	DELL	Shielded/ 1.8m	N/A
6.	Modem	DFM-560EL	ES0025A000007	FCC DOC	D-Link	N/A	N/A

Note: All the above equipment /cable were placed in worse case position to maximize emission signals during emission test

Grounding: Grounding was in accordance with the manufacturer's requirement and conditions for the intended use.



4. TEST AND MEASUREMENT EQUIPMENT

4.1 CALIBRATION

The measuring equipment utilized to perform the tests documented in the report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2 EQUIPMENT

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and. Other required standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective.

List of Test and Measurement Equipment

Item	Instrument	Manufacturer	Model No.	S/N	Next Cal. Date
1.	Spectrum Analyzer	HP	8691EM	72412A00110	2016/03/21
2.	Pre Amplifier	MLT	PREAMP6G-01	20110209	2016/03/01
3.	Pre Amplifier	MLT	PREAMP6G-02	20110301	2016/03/01
4.	Biconilog Antenna	EMCO	3142C	00044568	2016/10/30
5.	Spectrum Analyzer	Agilent	E7403A	US40240137	2016/02/27
6.	LISN	EMCO	3825/2	2658	2016/03/01
7.	Spectrum Analyzer	Agilent	E4446A	US44300422	2015/12/30
8.	Biconilog Antenna	EMCO	3142C	00059739	2016/10/30
9.	Home Antenna	SCHWARZBECK	BBHA 9120D	304	2016/10/22
10.	Home Antenna	SCHWARZBECK	BBHA 9170	181	2016/10/22
11.	TA	Pre Amplifier	0.10~19.1GHz 60dBm	RF01	2016/10/22
12.	Herotek	Pre Amplifier	A402-417	30690	2015/11/06
13.	Spectrum Analyzer	Agilent	N9010A	MY50060164	2016/04/08

#: Calibration interval of instruments listed above is one year



5. SECTION 15.249 REQUIREMENTS (FUNDAMENTAL/ HARMONICS)

5.1 TEST SETUP

Refer to paragraph 7.1.

5.2 LIMIT

Fundamental Frequency (MHz)	Field Strength of Fundamental (dB μ V/m at 3-meter)	Detector
902 - 928 2400 – 2483 5725 - 5875	114	Peak
902 - 928 2400 – 2483 5725 - 5875	94	Average

Fundamental Frequency (MHz)	Field Strength of Harmonics (dB μ V/m at 3-meter)	Detector
902 - 928 2400 – 2483 5725 - 5875	74	Peak
902 - 928 2400 – 2483 5725 - 5875	54	Average

5.3 RESULT: PASSED



5.4 TEST DATA:

Measurements above 1000 MHz, Average detector setting:

Average Value = Peak Value + Duty Factor

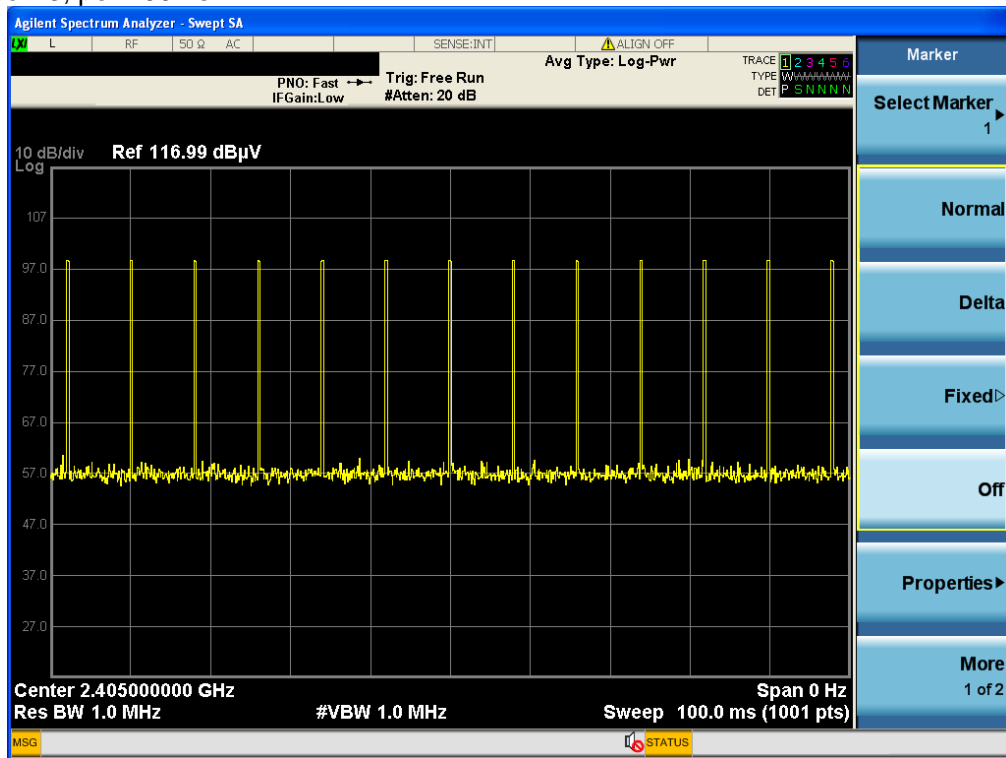
Duty Factor = 20 log (Total Duty / Period of Pulse Train)

$$= 20 \log (0.188\text{ms} \cdot 13 / 100\text{ms})$$

$$= -32.23$$

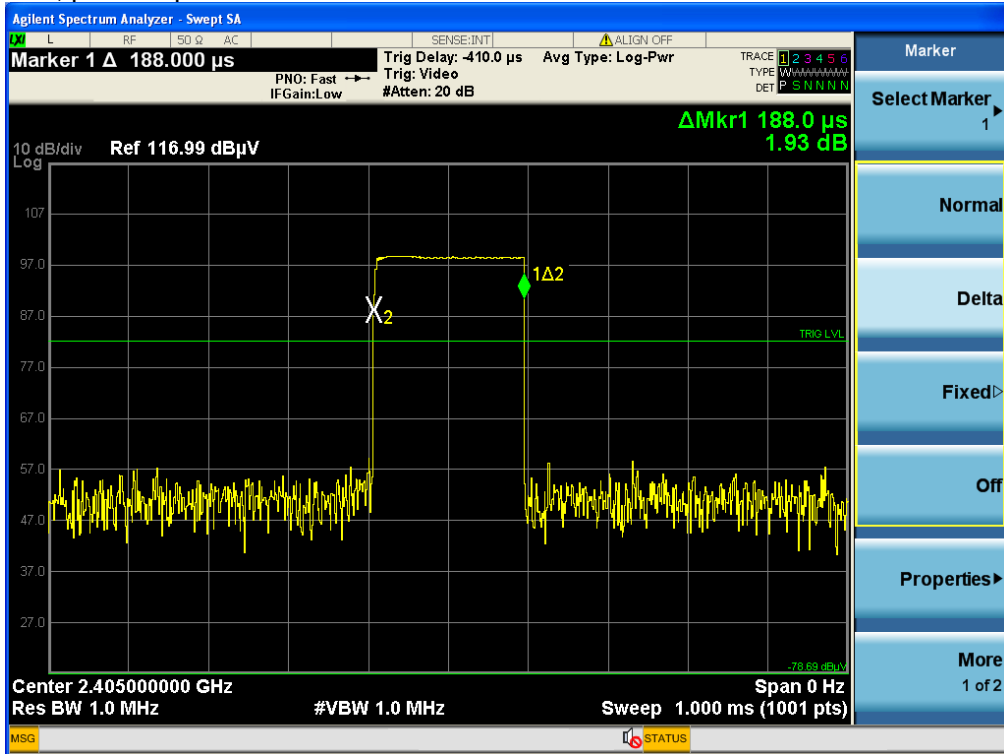
Modulation Standard: GFSK

Pulse*13, per 100ms





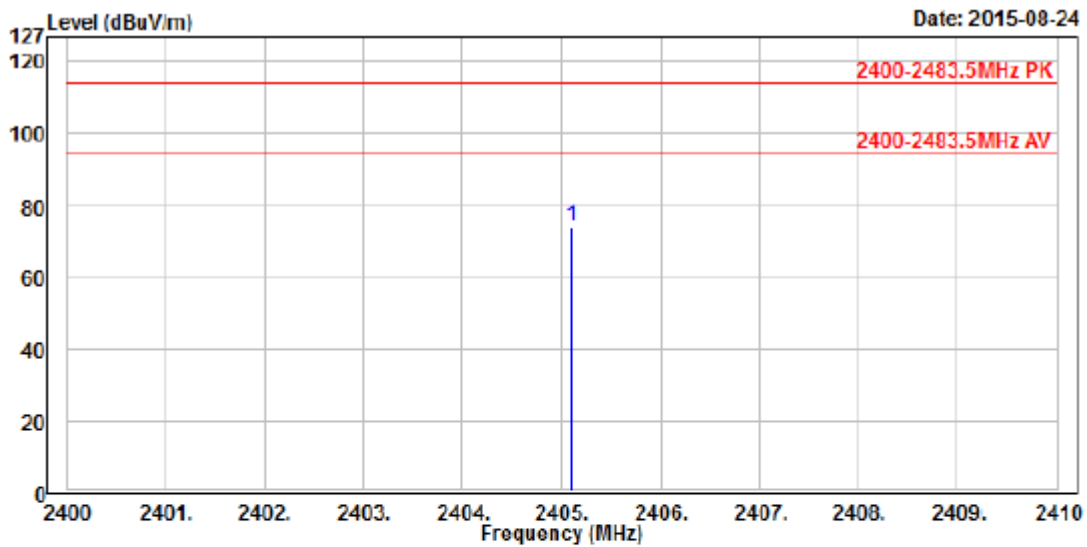
Modulation Standard: GFSK
0.188ms, per one pulse bandwidth





Fundamental

Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode	: GFSK CH1	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		



Condition: 2400-2483.5MHz PK 3m Vertical

EUT : 1507031

Mode : Transmit/Receive

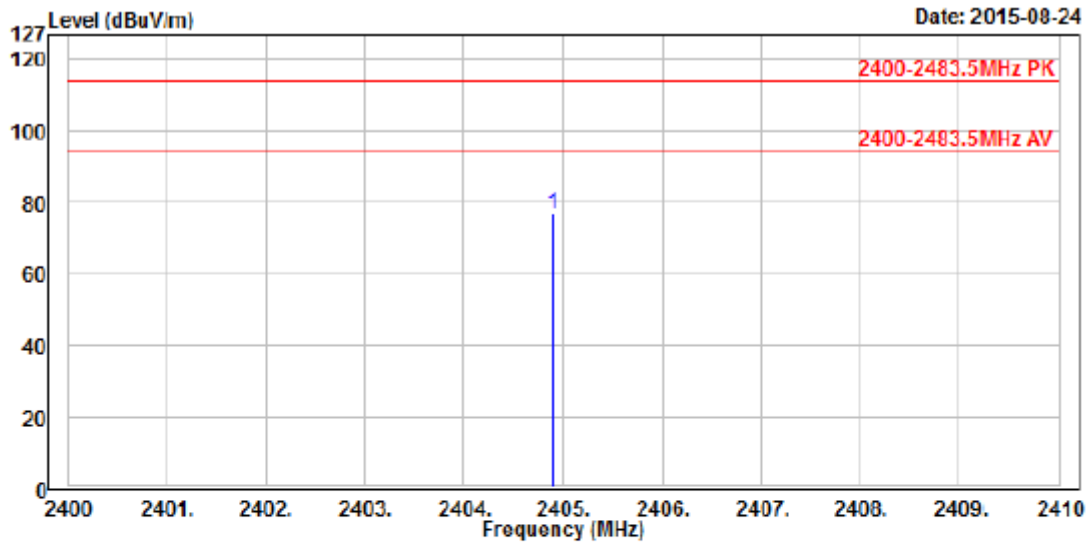
Note : Dongle FSK 2405MHz

	Read		Limit	Over	
Freq	Level	Factor	Level	Line	Limit Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB

1	2405.10	90.51	-16.38	74.13	114.00	-39.87	Peak
---	---------	-------	--------	-------	--------	--------	------



Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode	: GFSK CH1	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		



Condition: 2400-2483.5MHz PK 3m Horizontal

EUT : 1507031

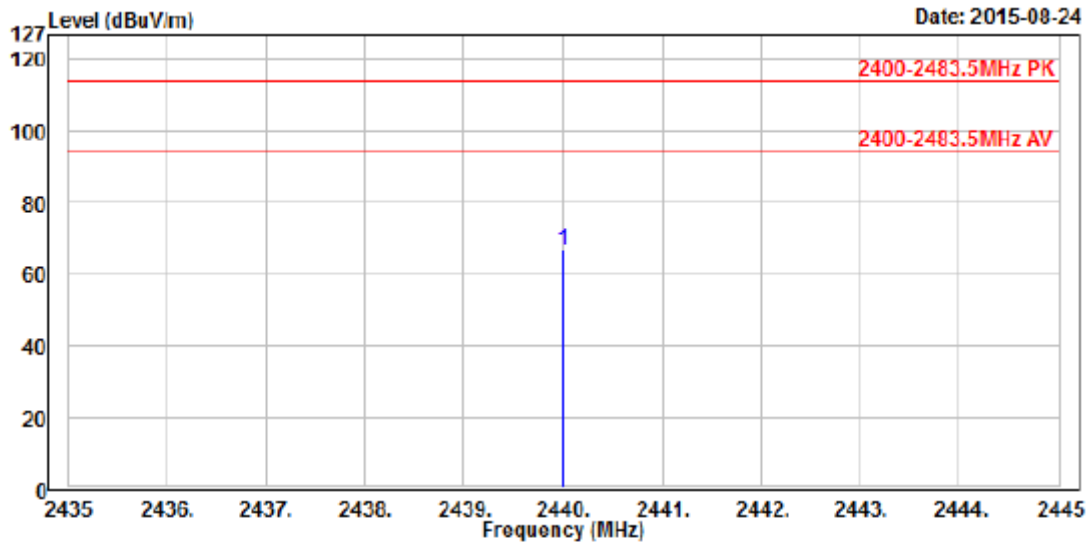
Mode : Transmit/Receive

Note : Dongle FSK 2405MHz

	Read		Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1 2404.90	93.09	-16.38	76.71	114.00	-37.29	Peak



Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode	: GFSK CH8	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		



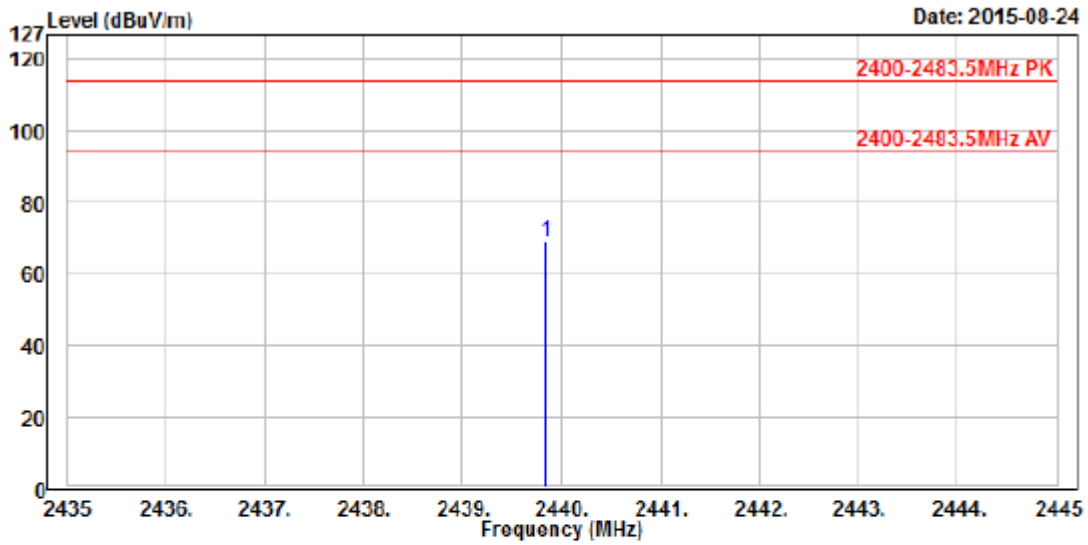
Condition: 2400-2483.5MHz PK 3m Vertical

EUT : 1507031
 Mode : Transmit/Receive
 Note : Dongle FSK 2440MHz

	Read		Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1 2440.00	82.90	-16.25	66.65	114.00	-47.35	Peak



Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode	: GFSK CH8	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		



Condition: 2400-2483.5MHz PK 3m Horizontal

EUT : 1507031

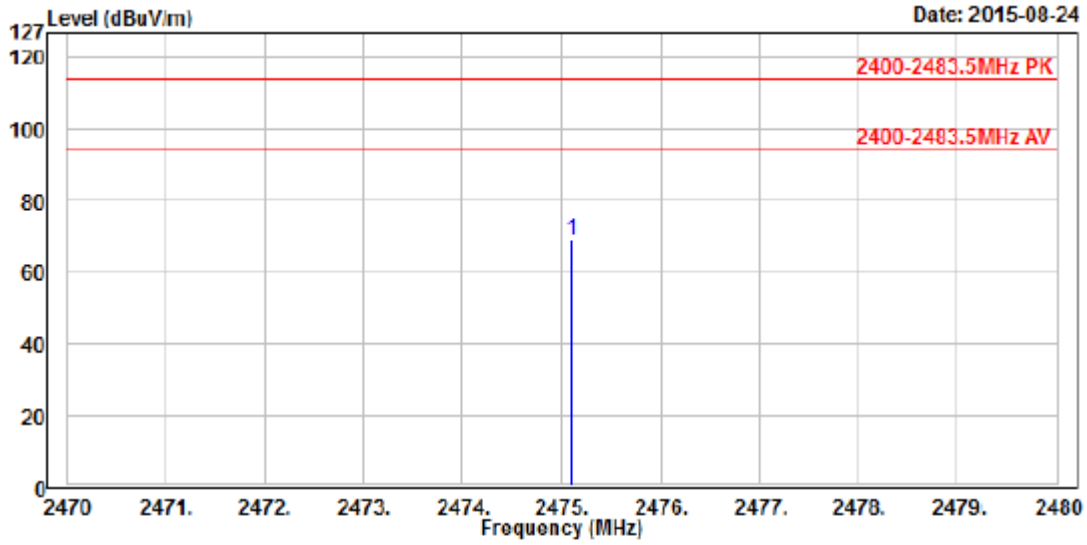
Mode : Transmit/Receive

Note : Dongle FSK 2440MHz

	Read		Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1 2439.85	85.10	-16.25	68.85	114.00	-45.15	Peak



Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode	: GFSK CH15	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		



Condition: 2400-2483.5MHz PK 3m Vertical

EUT : 1507031

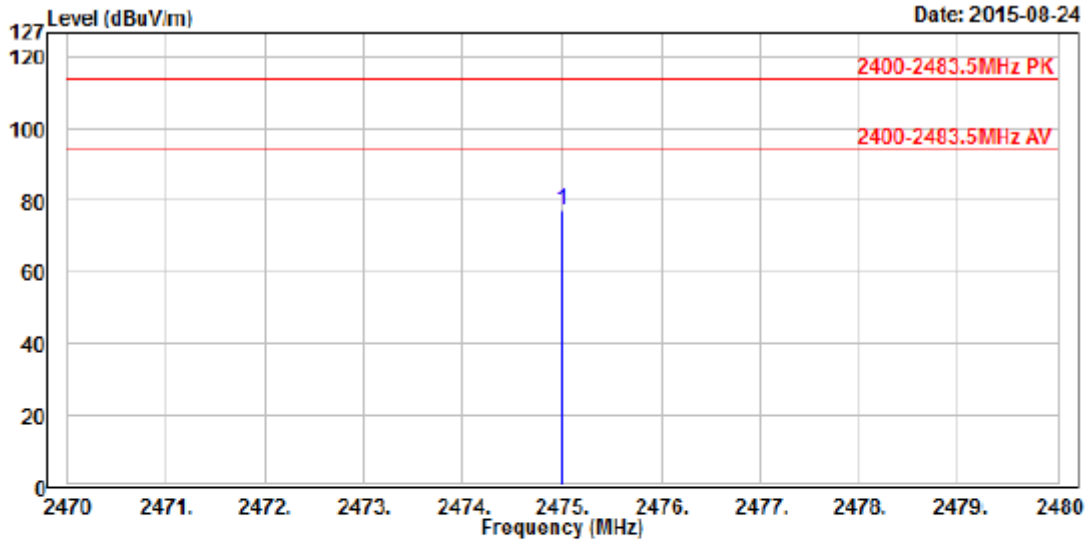
Mode : Transmit/Receive

Note : Dongle FSK 2475MHz

	Read		Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1 2475.10	84.98	-16.13	68.85	114.00	-45.15	Peak



Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode	: GFSK CH15	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		



Condition: 2400-2483.5MHz PK 3m Horizontal

EUT : 1507031

Mode : Transmit/Receive

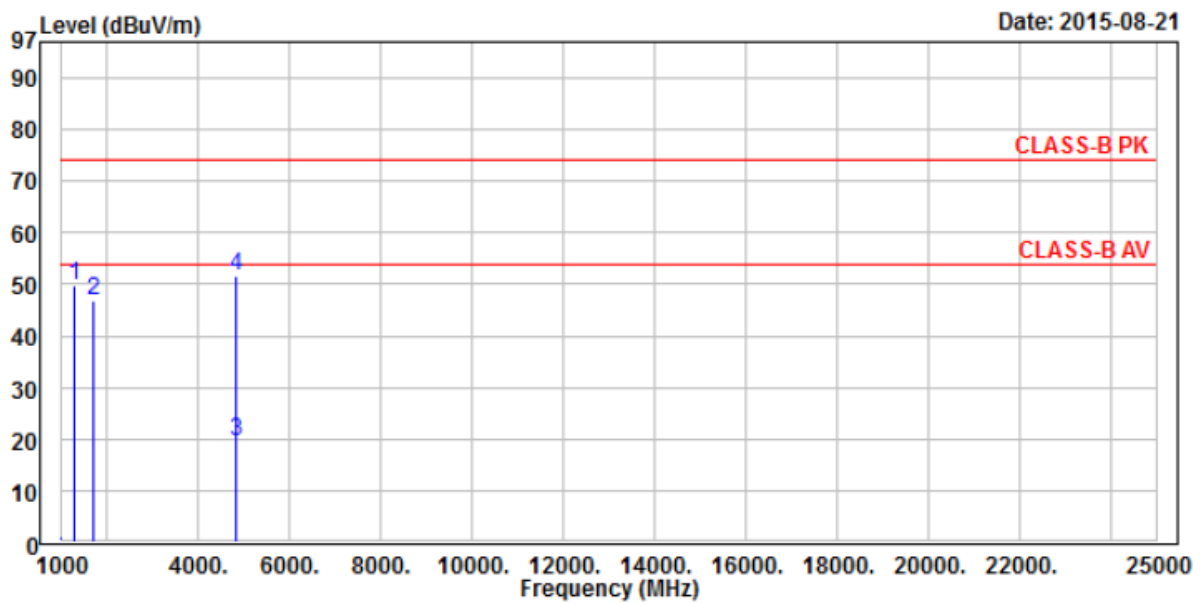
Note : Dongle FSK 2475MHz

	Read		Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1 2475.00	93.28	-16.13	77.15	114.00	-36.85	Peak



Harmonics

Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode	: GFSK CH1	Temperature	: 28 °C
Test Date	: Aug. 21, 2015	Humidity	: 66 %
Memo	: Y axis		



Condition: CLASS-B PK 3m Vertical

EUT : 1507031

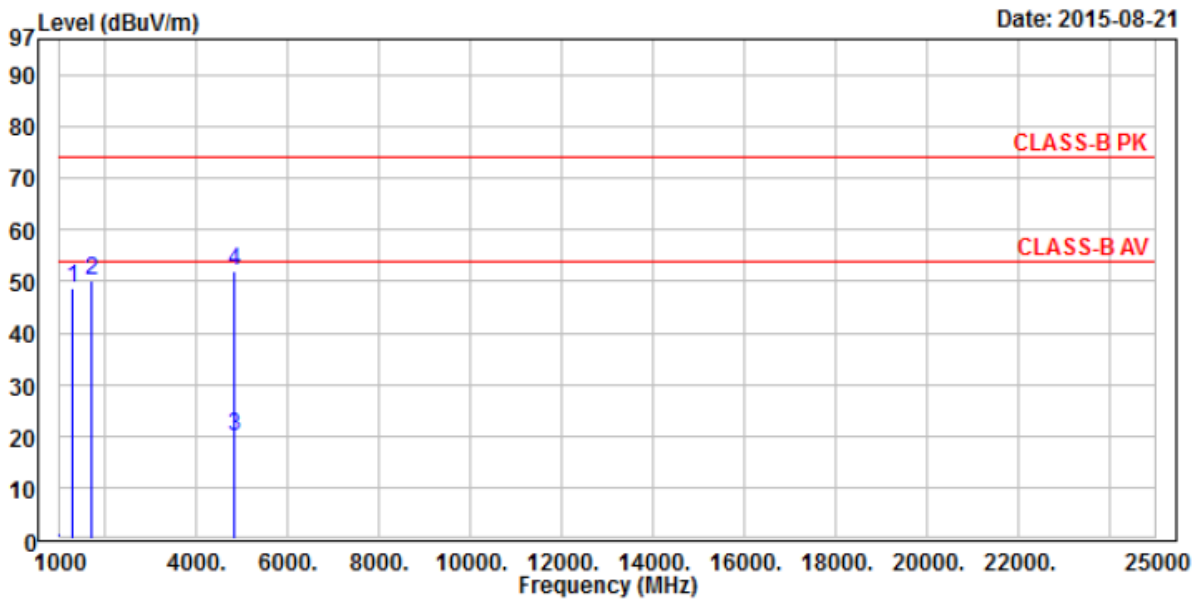
Mode : Transmit/Receive

Note : Dongle GFSK 2405MHz

	Read	Limit	Over				
Freq	Level	Factor	Level	Line			
MHz	dBuV	dB/m	dBuV/m	dBuV/m			
1	1270.00	70.03	-20.34	49.69	74.00	-24.31	Peak
2	1692.00	65.41	-18.64	46.77	74.00	-27.23	Peak
3	4810.00	-----		19.38	54.00	-34.62	Average
4	4810.00	58.24	-6.63	51.61	74.00	-22.39	Peak



Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode	: GFSK CH1	Temperature	: 28 °C
Test Date	: Aug. 21, 2015	Humidity	: 66 %
Memo	: Y axis		



Condition: CLASS-B PK 3m Horizontal

EUT : 1507031

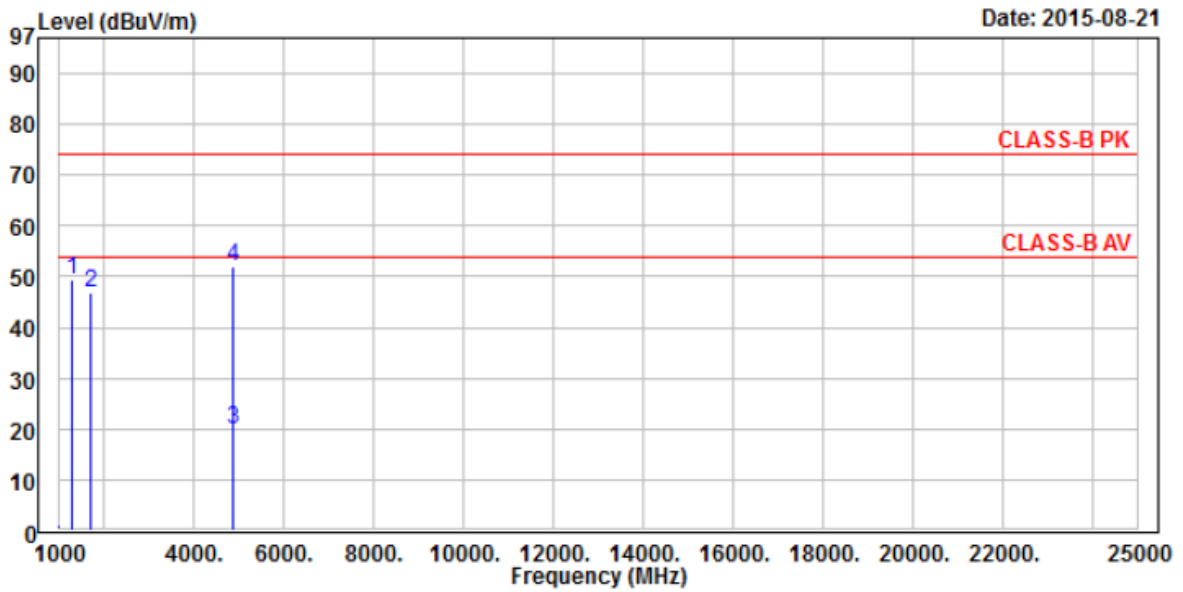
Mode : Transmit/Receive

Note : Dongle GFSK 2405MHz

	Read	Limit	Over			
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	1270.00	69.00 -20.34	48.66	74.00	-25.34	Peak
2	1692.00	68.84 -18.64	50.20	74.00	-23.80	Peak
3	4810.00	19.90	54.00	-34.10	Average
4	4810.00	58.76 -6.63	52.13	74.00	-21.87	Peak



Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode	: GFSK CH8	Temperature	: 28 °C
Test Date	: Aug. 21, 2015	Humidity	: 66 %
Memo	: Y axis		



Condition: CLASS-B PK 3m Vertical

EUT : 1507031

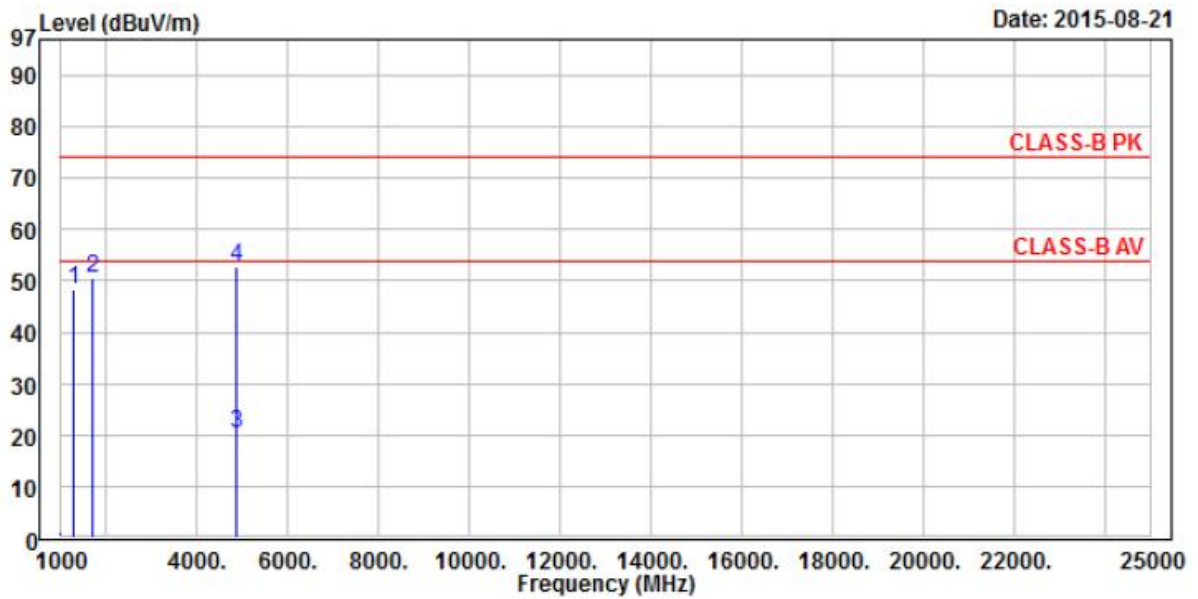
Mode : Transmit/Receive

Note : Dongle GFSK 2440MHz

	Read		Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	1270.00	69.61	-20.34	49.27	74.00	-24.73 Peak
2	1692.00	65.49	-18.64	46.85	74.00	-27.15 Peak
3	4880.00	-----		19.94	54.00	-34.06 Average
4	4880.00	58.49	-6.32	52.17	74.00	-21.83 Peak



Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode	: GFSK CH8	Temperature	: 28 °C
Test Date	: Aug. 21, 2015	Humidity	: 66 %
Memo	: Y axis		



Condition: CLASS-B PK 3m Horizontal

EUT : 1507031

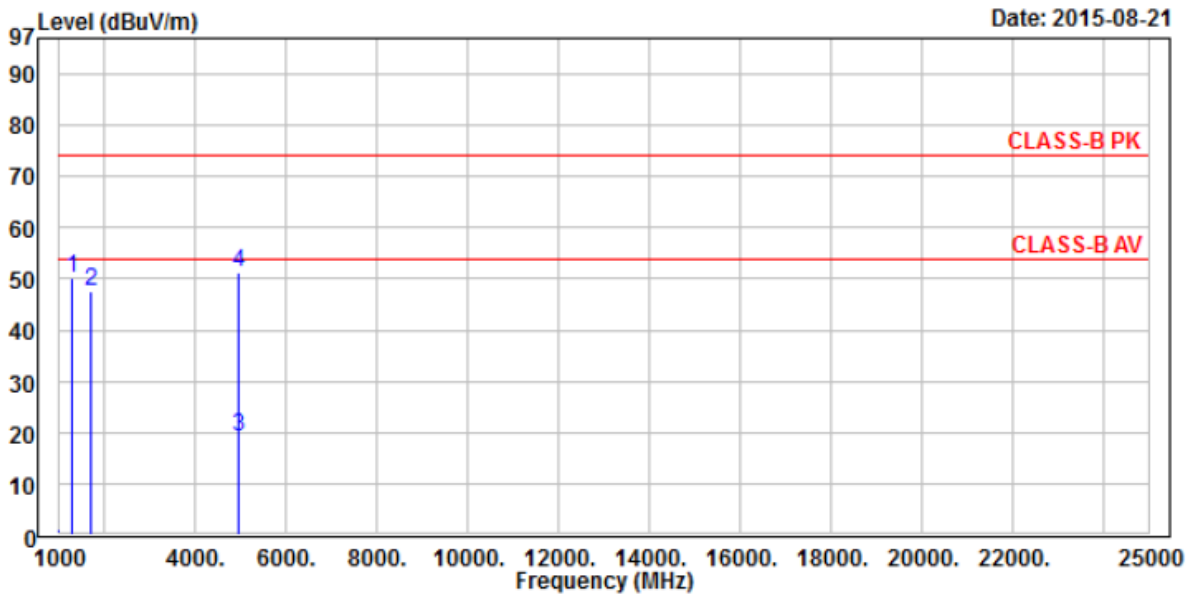
Mode : Transmit/Receive

Note : Dongle GFSK 2440MHz

	Read			Limit	Over	
	Freq	Level	Factor	Level	Line	Limit Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB
1	1270.00	68.67	-20.34	48.33	74.00	-25.67 Peak
2	1692.00	69.22	-18.64	50.58	74.00	-23.42 Peak
3	4880.00	-----	-----	20.35	54.00	-33.65 Average
4	4880.00	58.90	-6.32	52.58	74.00	-21.42 Peak



Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode	: GFSK CH15	Temperature	: 28 °C
Test Date	: Aug. 21, 2015	Humidity	: 66 %
Memo	: Y axis		



Condition: CLASS-B PK 3m Vertical

EUT : 1507031

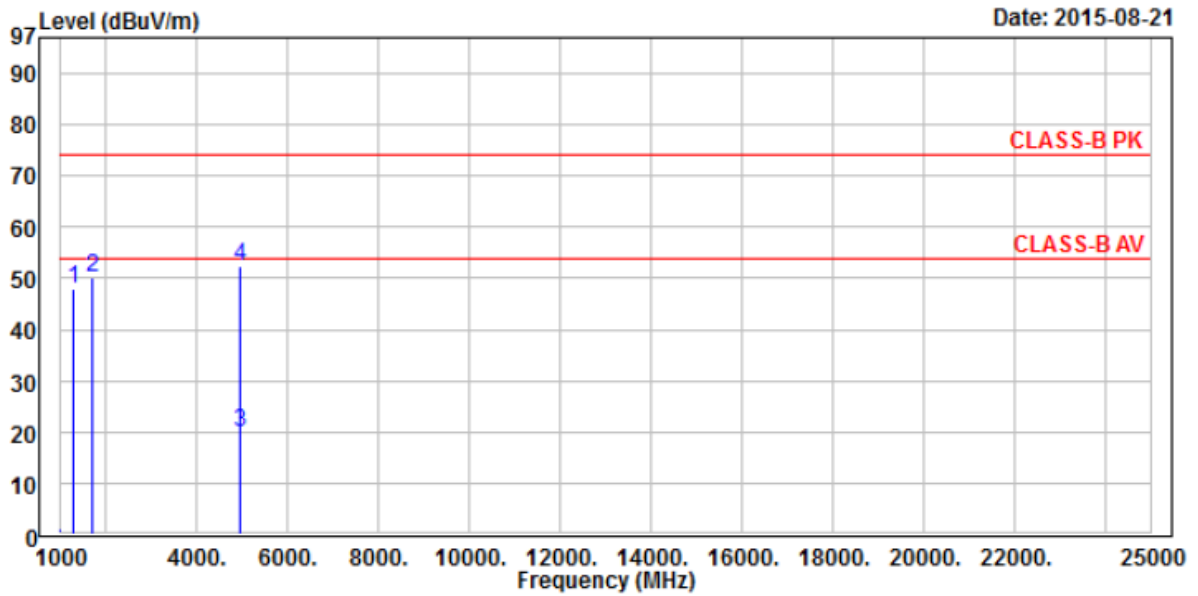
Mode : Transmit/Receive

Note : Dongle GFSK 2475MHz

	Read	Limit	Over				
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	1270.00	70.47	-20.34	50.13	74.00	-23.87	Peak
2	1692.00	66.21	-18.64	47.57	74.00	-26.43	Peak
3	4949.85	-----	-----	19.07	54.00	-34.93	Average
4	4949.85	57.31	-6.01	51.30	74.00	-22.70	Peak



Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode	: GFSK CH15	Temperature	: 28 °C
Test Date	: Aug. 21, 2015	Humidity	: 66 %
Memo	: Y axis		



Condition: CLASS-B PK 3m Horizontal

EUT : 1507031

Mode : Transmit/Receive

Note : Dongle GFSK 2475MHz

	Read		Limit	Over			
	Freq	Level	Factor	Level	Line	Limit	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	1270.00	68.17	-20.34	47.83	74.00	-26.17	Peak
2	1692.00	68.72	-18.64	50.08	74.00	-23.92	Peak
3	4950.75	-----	-----	20.05	54.00	-33.95	Average
4	4950.75	58.29	-6.01	52.28	74.00	-21.72	Peak



Note:

1. Emission level = Reading level + Correction factor
2. Correction factor : Antenna factor, Cable loss, Pre-Amp, etc.
3. All emissions as described above were determining by rotating the EUT through three orthogonal axes to maximizing the emissions if the EUT belongs to hand-held or body-worn devices.
4. Measurements above 1000 MHz, Peak detector setting:
1 MHz RBW with 3 MHz VBW (Peak Detector).
5. Measurements above 1000 MHz, Average detector setting:
Average Value = Peak Value + Duty Factor
Duty Factor = $20 \log (\text{Total Duty} / \text{Period of Pulse Train})$
6. Peak detector measurement data will represent the worst case results.
7. “---” denotes the data which is not available.
8. Where limits are specified for both average and peak detector functions, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.



6. SECTION 15.249 REQUIREMENTS (BAND EDGE)

6.1 TEST SETUP

Refer to paragraph 7.1.

6.2 LIMIT

Restricted Bands:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

Operation within the bands:

902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

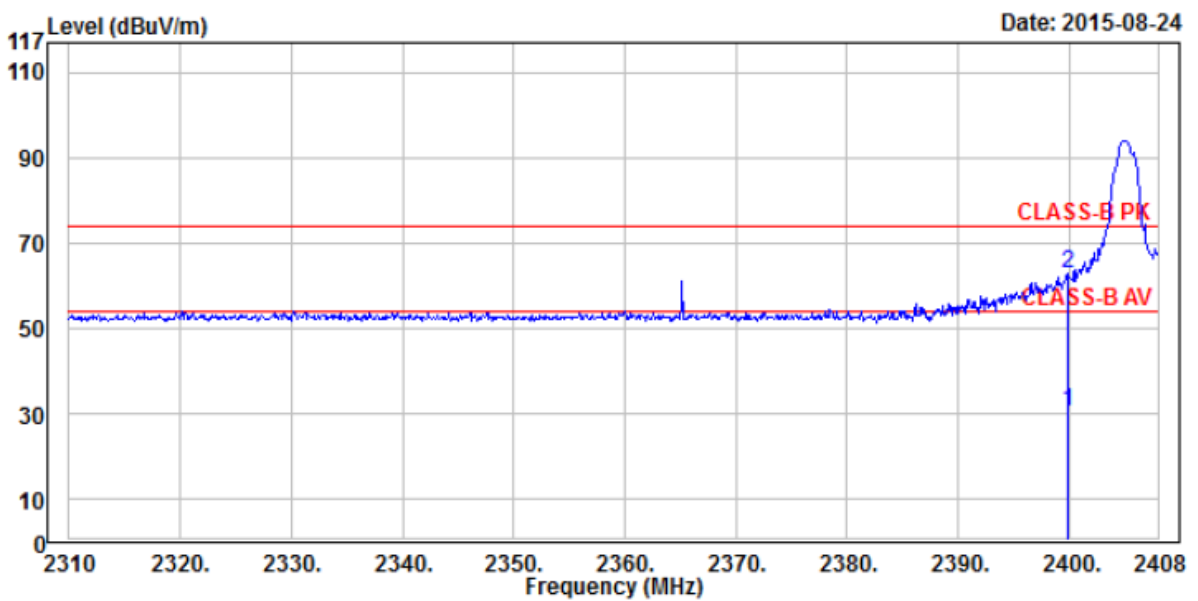
Frequency (Hz)	Field Strength ($\mu\text{V}/\text{m}$ at 3-meter)	Field Strength ($\text{dB}\mu\text{V}/\text{m}$ at 3-meter)
1.705-30	30 (at 30-meter)	49.5
30-88	100	40
88-216	150	43
216-960	200	46
Above 960	500	54



6.3 RESULT: PASSED

6.4 TEST DATA:

Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode	: GFSK CH1	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		

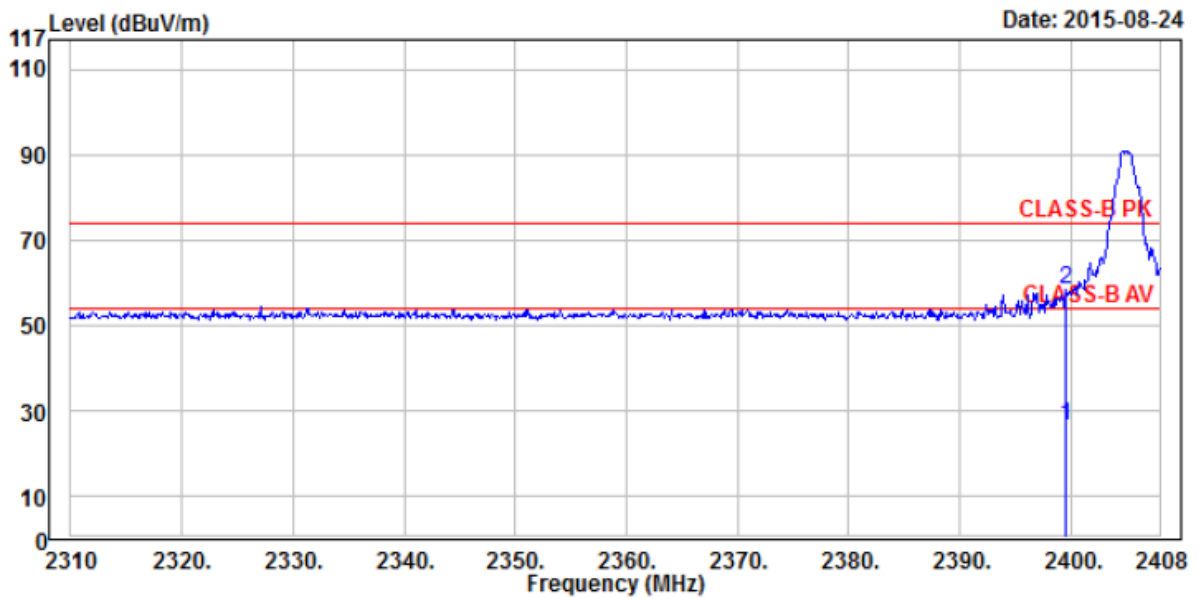


Condition : CLASS-B PK 3m Vertical
 EUT : 1507031
 Power : DC 5V from USB
 Mode : Transmit/Receive
 Temperature: 28
 Humidity : 65
 Note : Dongle GFSK CH1
 Remark :

	Read		Limit	Over	
Freq	Level	Factor	Level	Line	Limit
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB
1	2399.87	-----	30.28	54.00	-23.72 Average
2	2399.87	68.55	-6.04	62.51	74.00 -11.49 Peak



Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode	: GFSK CH1	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		

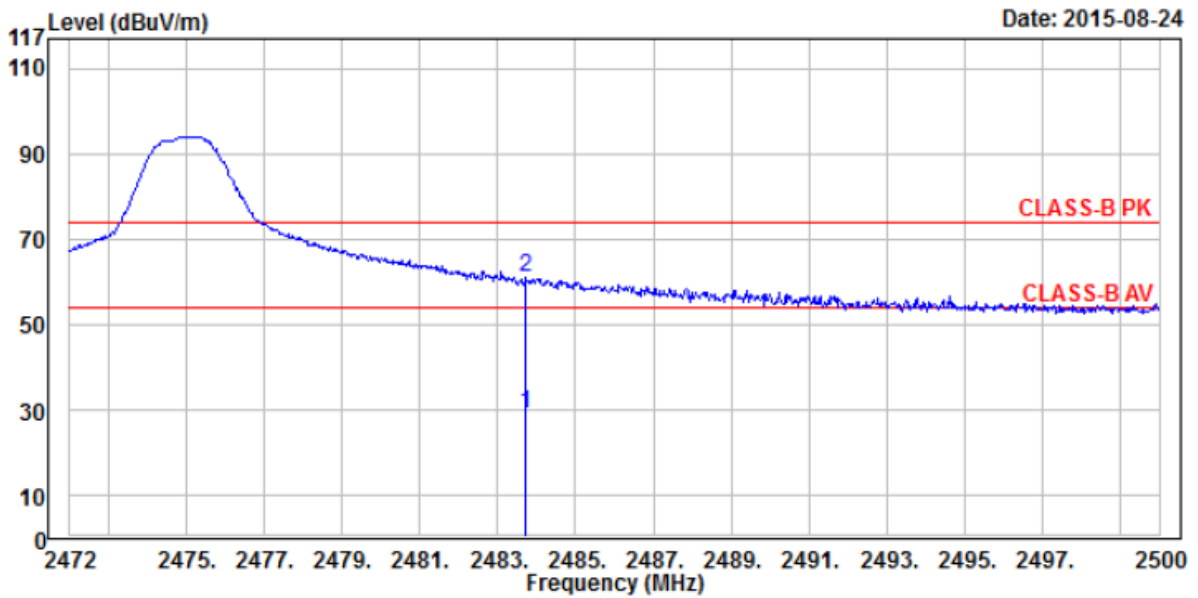


Condition : CLASS-B PK 3m Horizontal
 EUT : 1507031
 Power : DC 5V from USB
 Mode : Transmit/Receive
 Temperature: 28
 Humidity : 65
 Note : Dongle GFSK CH1
 Remark :

	Read		Limit	Over		
	Freq	Level	Factor	Level	Line	Limit Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB
1	2399.57	-----		26.12	54.00	-27.88 Average
2	2399.57	64.39	-6.04	58.35	74.00	-15.65 Peak



Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode	: GFSK CH15	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		

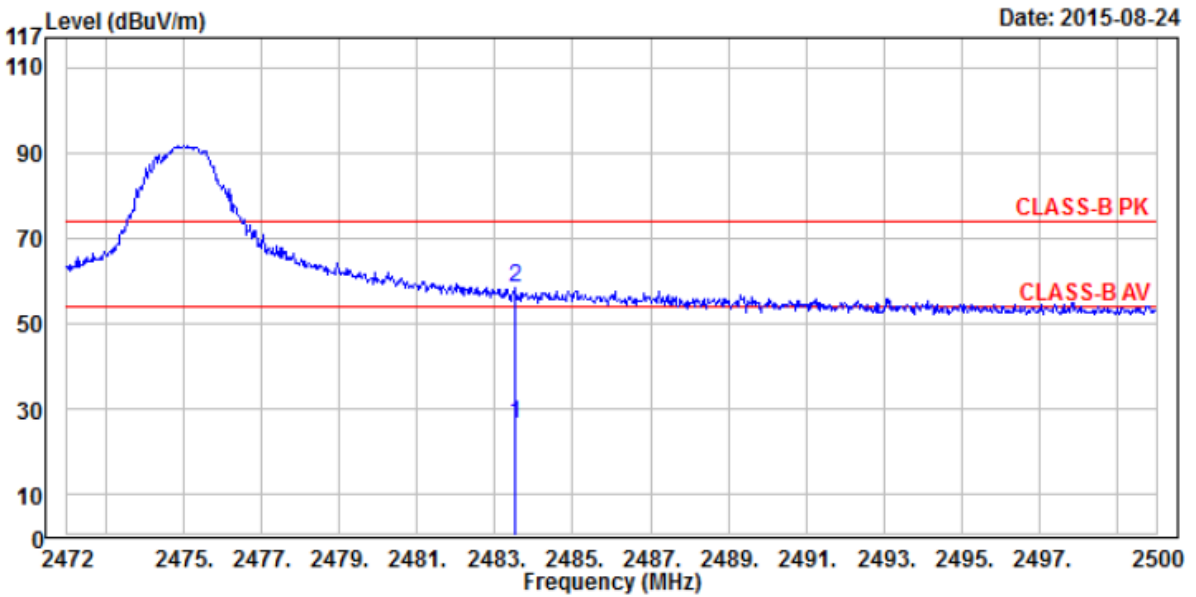


Condition : CLASS-B PK 3m Vertical
 EUT : 1507031
 Power : DC 5V from USB
 Mode : Transmit/Receive
 Temperature: 28
 Humidity : 65
 Note : Dongle GFSK CH15
 Remark :

	Read	Limit	Over				
Freq	Level	Factor	Level	Line			
MHz	dBuV	dB/m	dBuV/m	dBuV/m			
1	2483.73	-----	28.70	54.00	-25.30	Average	
2	2483.73	66.66	-5.73	60.93	74.00	-13.07	Peak



Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode	: GFSK CH15	Temperature	: 28 °C
Test Date	: Aug. 24, 2015	Humidity	: 65 %
Memo	: Y axis		



Condition : CLASS-B PK 3m Horizontal
 EUT : 1507031
 Power : DC 5V from USB
 Mode : Transmit/Receive
 Temperature: 28
 Humidity : 65
 Note : Dongle GFSK CH15
 Remark :

	Freq	Read Level	Factor	Level	Limit	Over	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	2483.54	-----		26.18	54.00	-27.82	Average
2	2483.54	64.14	-5.73	58.41	74.00	-15.59	Peak



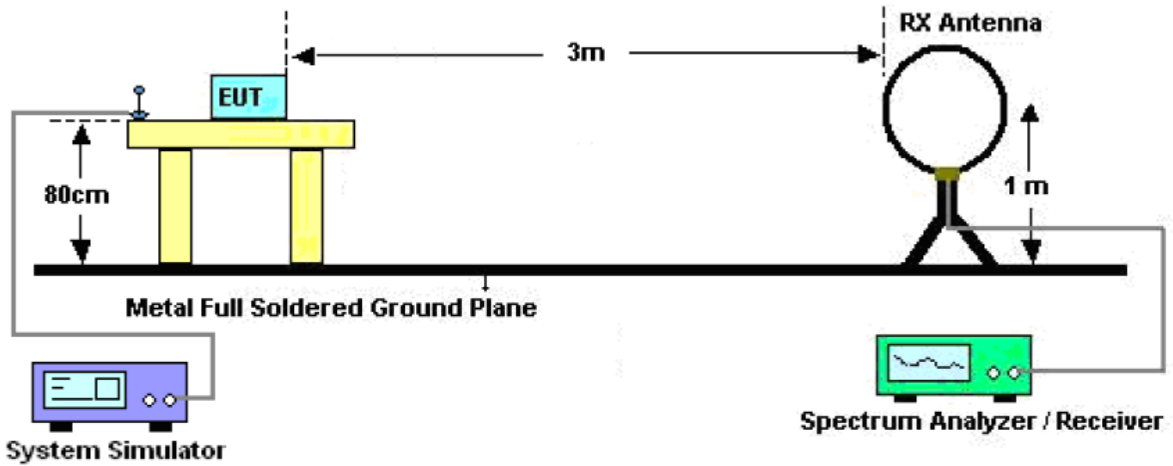
Note:

1. Emission level = Reading level + Correction factor
2. Correction factor : Antenna factor, Cable loss, Pre-Amp, etc.
3. All emissions as described above were determining by rotating the EUT through three orthogonal axes to maximizing the emissions if the EUT belongs to hand-held or body-worn devices.
4. Measurements above 1000 MHz, Peak detector setting:
1 MHz RBW with 3 MHz VBW (Peak Detector).
5. Measurements above 1000 MHz, Average detector setting:
Average Value = Peak Value + Duty Factor
Duty Factor = $20 \log (\text{Total Duty} / \text{Period of Pulse Train})$
6. Peak detector measurement data will represent the worst case results.
7. Where limits are specified for both average and peak detector functions, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

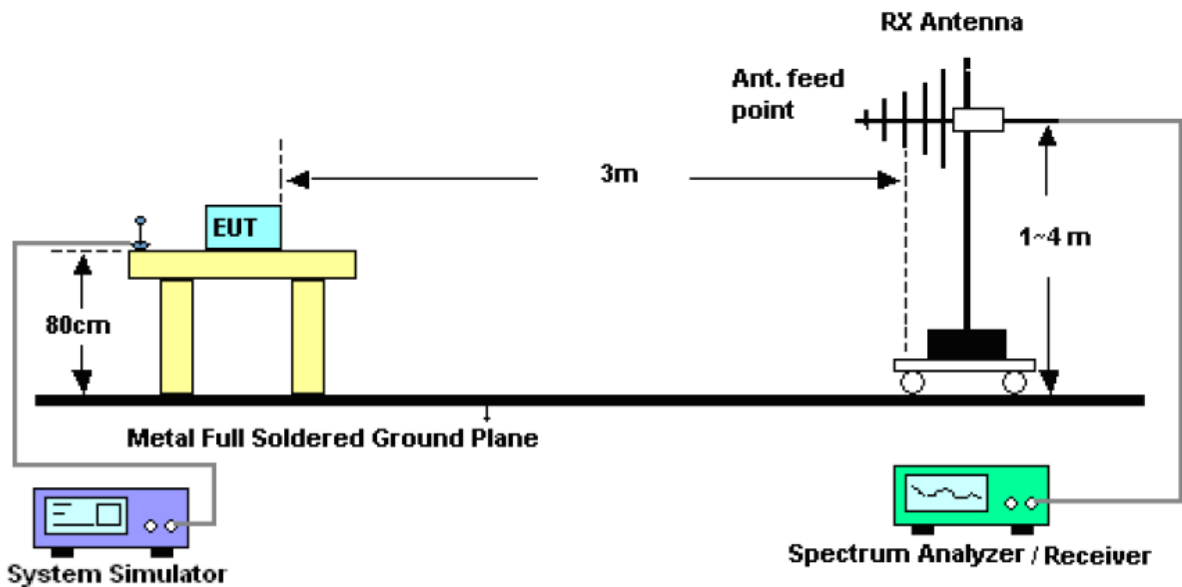
7. SECTION 15.209 REQUIREMENTS (GENERAL RADIATED EMISSION)

7.1 TEST SETUP

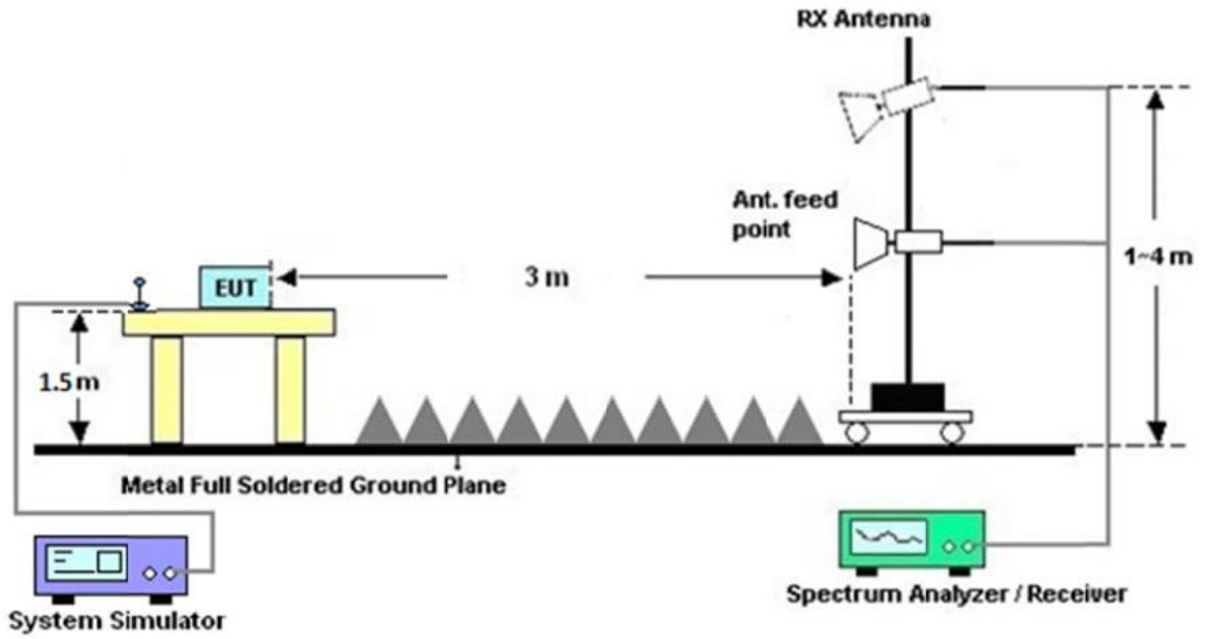
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





7.2 LIMIT

The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in section 15.209 as below.

Frequency (MHz)	Field Strength (mV/m)	Measurement Distance (m)
1.705-30	30	30
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500*	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz,*

174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

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

Frequency (Hz)	Field Strength ($\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
1.705-30	30 (at 30-meter)	49.5
30-88	100	40
88-216	150	43
216-960	200	46
Above 960	500	54



7.3 TEST PROCEDURE

1. The EUT was placed on a turntable, which was 0.8m above ground plane (1.5 m for above 1GHz).
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT was set at 3m away from the receiving antenna, which was varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was maximized by changing the polarization of receiving antenna, both horizontal and vertical.
6. Repeated above procedures until the measurements for all frequencies are completed.

7.4 RESULT: PASSED



7.5 TEST DATA:

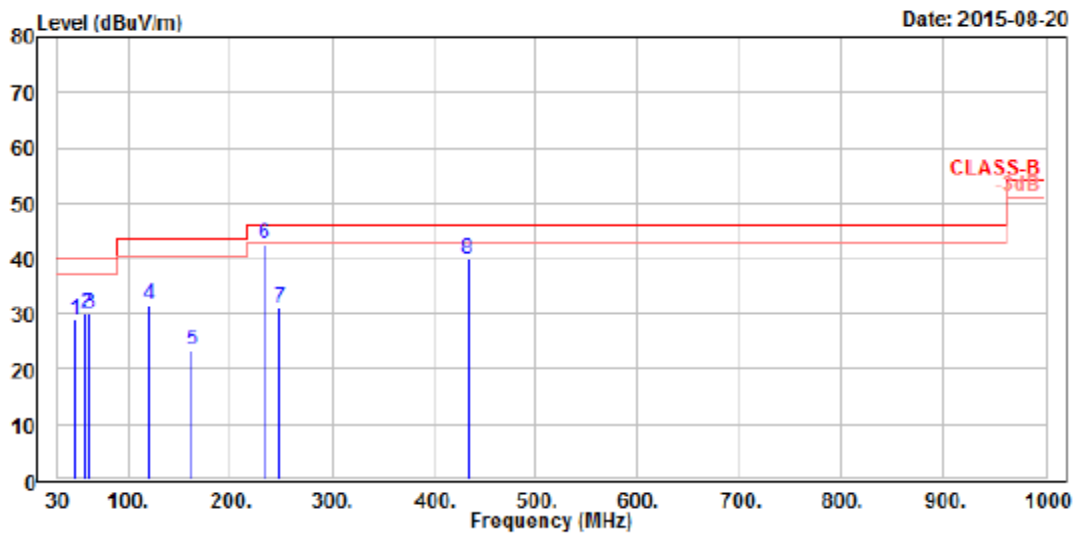
All frequencies not described in this test report and within the range of the general radiated emission limits are not detectable significantly. The table as below is representing worst emissions found.



※The 9kHz - 30MHz spurious emission is under limit 20dB more.

30MHz ~ 1GHz, worst emissions found

Power	: DC 5V	Pol/Phase	: VERTICAL
Test Mode	: GFSK CH1	Temperature	: 28 °C
Test Date	: Aug. 20, 2015	Humidity	: 66 %
Memo	: Y axis		



Condition: CLASS-B 3m Vertical

EUT : 1507031

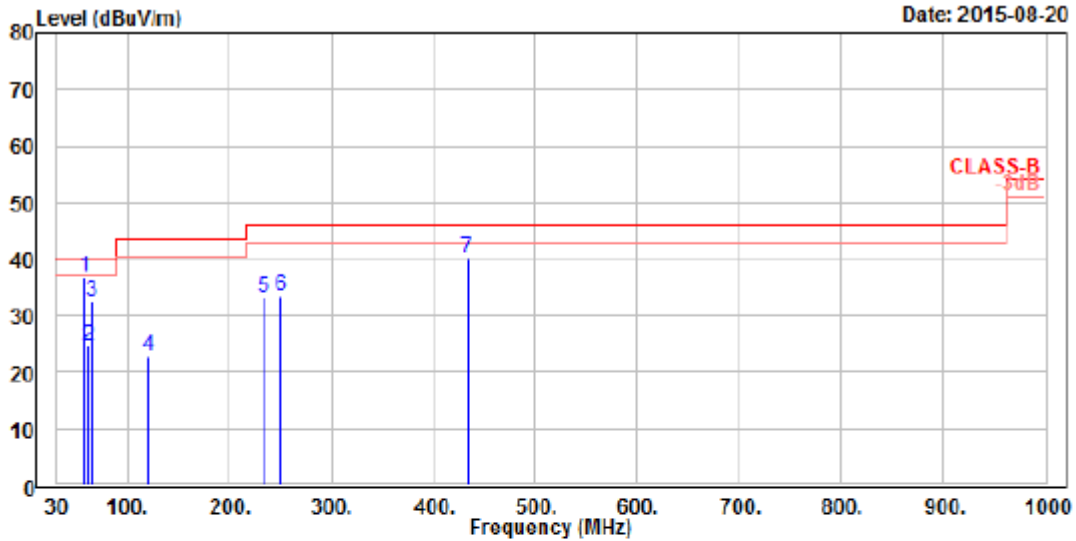
Mode : Transmit/Receive

Note : Dongle FSK 2405MHz

	Read		Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	48.26	37.42	-8.47	28.95	40.00	-11.05 QP
2	57.75	42.28	-12.18	30.10	40.00	-9.90 QP
3	61.50	43.10	-12.95	30.15	40.00	-9.85 QP
4	120.00	38.76	-7.02	31.74	43.50	-11.76 QP
5	162.05	30.29	-6.79	23.50	43.50	-20.00 QP
6	233.50	49.39	-6.83	42.56	46.00	-3.44 QP
7	249.22	35.89	-4.77	31.12	46.00	-14.88 QP
8	433.25	40.25	-0.38	39.87	46.00	-6.13 QP



Power	: DC 5V	Pol/Phase	: HORIZONTAL
Test Mode	: GFSK CH1	Temperature	: 28 °C
Test Date	: Aug. 20, 2015	Humidity	: 66 %
Memo	: Y axis		



Condition: CLASS-B 3m Horizontal

EUT : 1507031

Mode : Transmit/Receive

Note : Dongle FSK 2405MHz

	Read		Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	57.75	49.07	-12.18	36.89	40.00	-3.11 QP
2	61.33	37.61	-12.96	24.65	40.00	-15.35 QP
3	64.50	45.38	-12.81	32.57	40.00	-7.43 QP
4	120.00	29.81	-7.02	22.79	43.50	-20.71 QP
5	233.50	40.02	-6.83	33.19	46.00	-12.81 QP
6	250.00	38.22	-4.62	33.60	46.00	-12.40 QP
7	433.25	40.60	-0.38	40.22	46.00	-5.78 QP

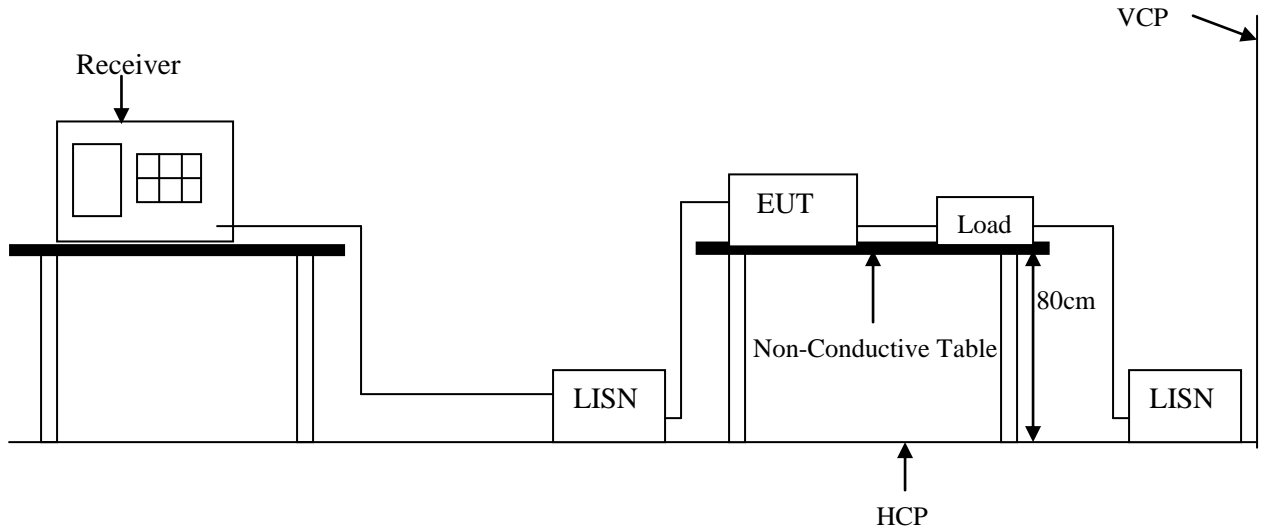


Note:

1. Emission level = Reading level + Correction factor
2. Correction factor : Antenna factor, Cable loss, Pre-Amp, etc.
3. All emissions as described above were determining by rotating the EUT through three orthogonal axes to maximizing the emissions if the EUT belongs to hand-held or body-worn devices.
4. Measurements from 9 kHz to 150 kHz, Peak detector setting: 100 Hz RBW
5. Measurements from 150 kHz to 30MHz, Peak detector setting: 10 kHz RBW
6. Measurements from 30 MHz to 1000 MHz, Peak detector setting: 100 kHz RBW
7. Measurements from 9 kHz to 150 kHz, CISPR Quasi-Peak detector: 200 Hz RBW
8. Measurements from 150 kHz to 30MHz, CISPR Quasi-Peak detector: 9 kHz RBW
9. Measurements from 30 MHz to 1000 MHz, CISPR Quasi-Peak detector: 120 kHz RBW
10. Peak detector measurement data will represent the worst case results.

8. SECTION 15.207 REQUIREMENTS (POWERLINE CONDUCTED EMISSIONS)

8.1 TEST SETUP



8.2 LIMIT

Frequency range (MHz)	CLASS B	
	QP dB(uV)	Average dB(uV)
0.15-0.5	66 - 56 dBuV	56 - 46 dBuV
0.5-5.0	56 dBuV	46 dBuV
5.0-30.0	60 dBuV	50 dBuV

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

8.3 TEST PROCEDURE

The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). It provides a 50 ohm / 50 μ H coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm / 50 μ H coupling impedance with 50 ohm termination. (Please refer to the block diagram of the test setup and photograph.)

Both sides of AC line are checked for the maximum conducted emission interference. In order to find the maximum emissions, the relating positions of equipment and all of the interference cables must be changed according to EN 55022 regulations: The measurement procedure on conducted emission interference.

The resolution bandwidth of the field strength meter is set at 9 KHz.



8.4 TEST SPECIFICATION

According to PART15.207

8.5 RESULT: PASSED

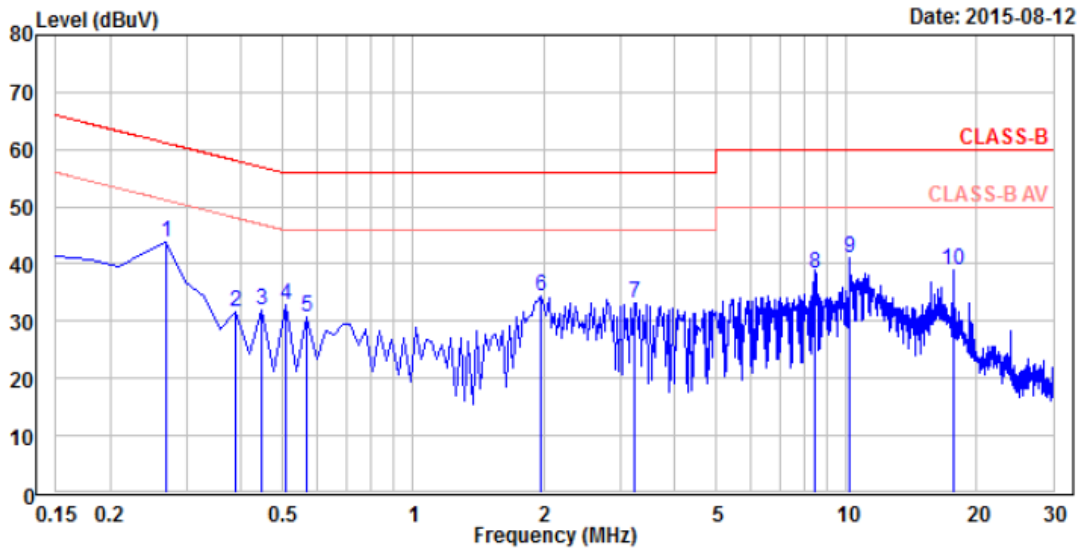
EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range:	150KHz--30MHz
Detector Function:	Quasi-Peak / Average Mode
Resolution Bandwidth:	9KHz



8.6 TEST DATA:

Power	: AC 120V	Pol/Phase	: LINE
Test Mode	: GFSK CH15	Temperature	: 25 °C
Test Date	: Aug. 12, 2015	Humidity	: 60 %
Memo	: Y axis		

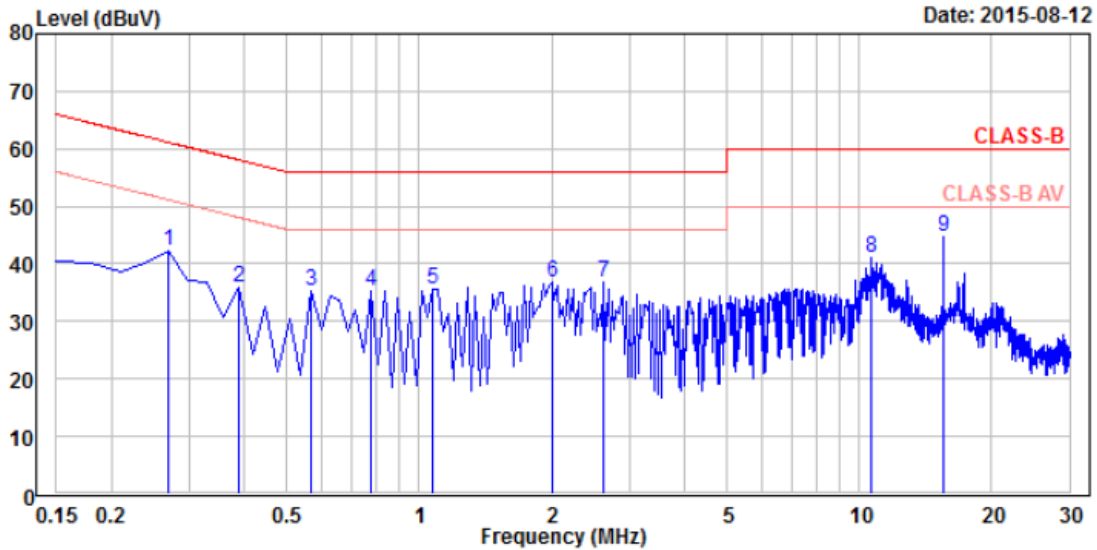


Condition : CLASS-B Line
 EUT : 1507031
 Power : DC 5V from System
 Mode : Transmit/Receive
 Temperature: 25
 Humidity : 60
 Note :

	Read Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.269	43.63	0.11	43.74	61.14	-17.40	Peak
2	0.389	31.50	0.13	31.63	58.09	-26.46	Peak
3	0.449	31.88	0.13	32.01	56.90	-24.89	Peak
4	0.508	32.83	0.13	32.96	56.00	-23.04	Peak
5	0.568	30.50	0.13	30.63	56.00	-25.37	Peak
6	1.971	34.23	0.16	34.39	56.00	-21.61	Peak
7	3.254	32.96	0.18	33.14	56.00	-22.86	Peak
8	8.478	38.18	0.27	38.45	60.00	-21.55	Peak
9	10.180	40.68	0.29	40.97	60.00	-19.03	Peak
10	17.582	38.53	0.41	38.94	60.00	-21.06	Peak



Power	: AC 120V	Pol/Phase	: NEUTRAL
Test Mode	: GFSK CH15	Temperature	: 25 °C
Test Date	: Aug. 12, 2015	Humidity	: 60 %
Memo	: Y axis		

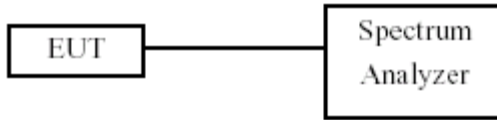


Condition : CLASS-B Neutral
 EUT : 1507031
 Power : DC 5V from System
 Mode : Transmit/Receive
 Temperature: 25
 Humidity : 60
 Note :

	Read Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.269	42.30	0.11	42.41	61.14	-18.73	Peak
2	0.389	35.91	0.12	36.03	58.09	-22.06	Peak
3	0.568	35.14	0.12	35.26	56.00	-20.74	Peak
4	0.777	35.05	0.14	35.19	56.00	-20.81	Peak
5	1.075	35.51	0.14	35.65	56.00	-20.35	Peak
6	2.001	36.69	0.16	36.85	56.00	-19.15	Peak
7	2.628	36.74	0.18	36.92	56.00	-19.08	Peak
8	10.627	40.71	0.29	41.00	60.00	-19.00	Peak
9	15.553	44.38	0.39	44.77	60.00	-15.23	Peak

9. 20DB BANDWIDTH MEASUREMENT

9.1 TEST SETUP



9.2 LIMIT

N/A

9.3 TEST PROCEDURE

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set RBW=1MHz and VBW=3MHz.
- c. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.
- d. The 20 dB Bandwidth was measured and recorded.

9.4 RESULT: PASSED



9.5 TEST DATA

Test Date: AUG. 24, 2015

Temperature: 28°C

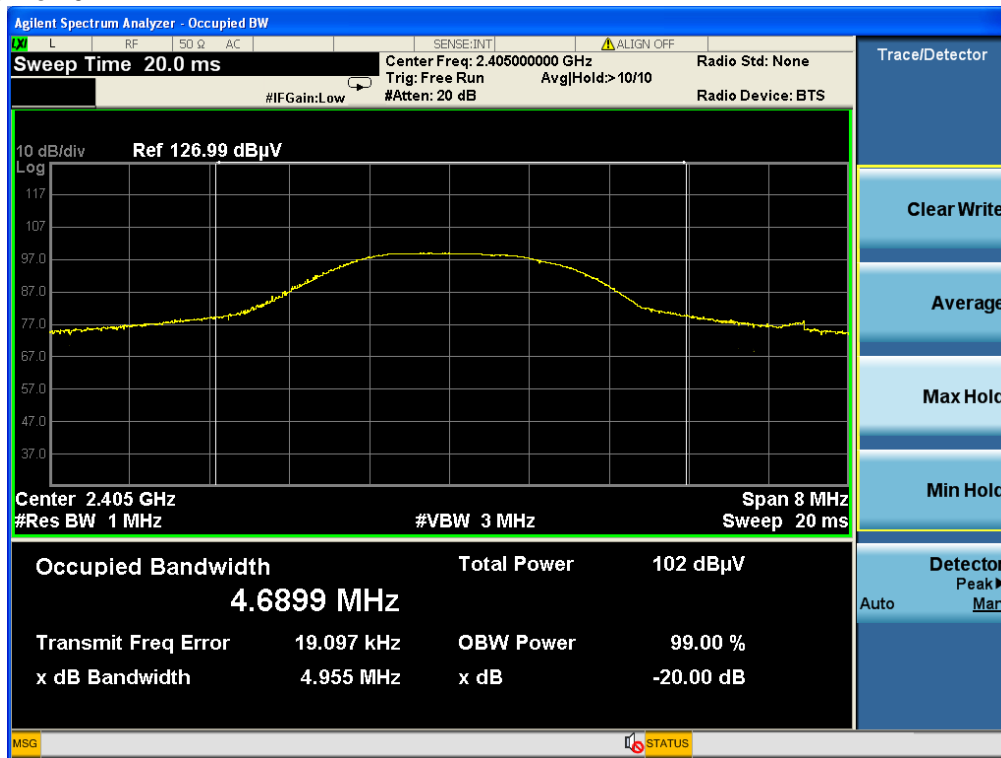
Atmospheric pressure: 1010 hPa

Humidity: 65%

Modulation Type	Channel	Frequency (MHz)	20dB Bandwidth (MHz)
GFSK	01	2405	4.955
	08	2440	5.052
	15	2475	5.013

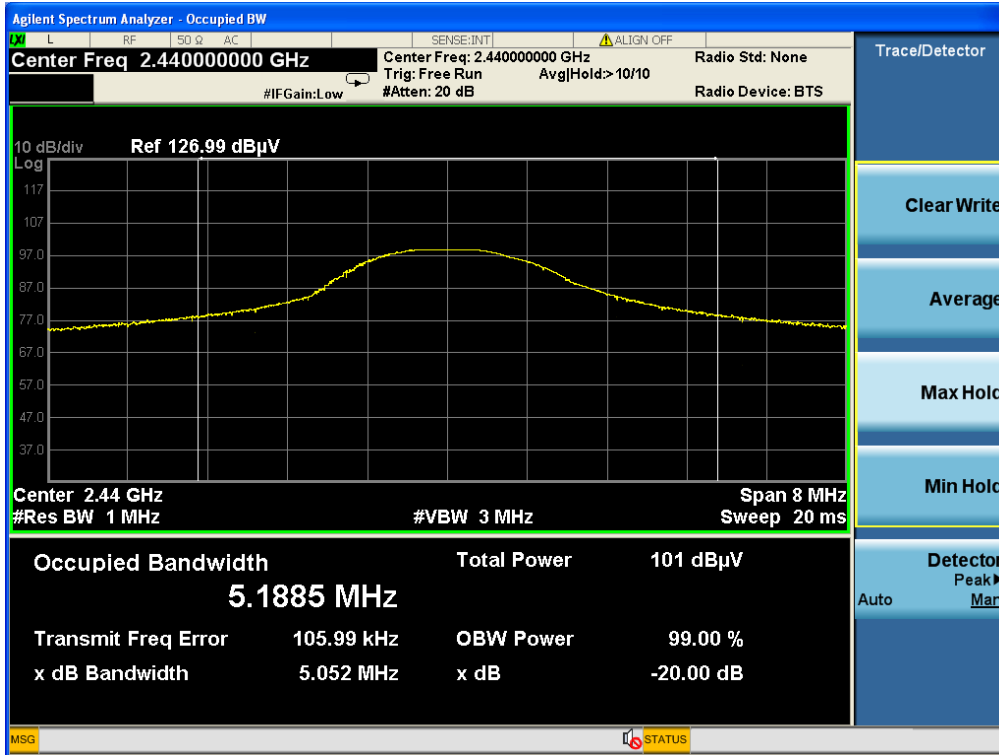
Modulation Standard: GFSK

Channel: 01

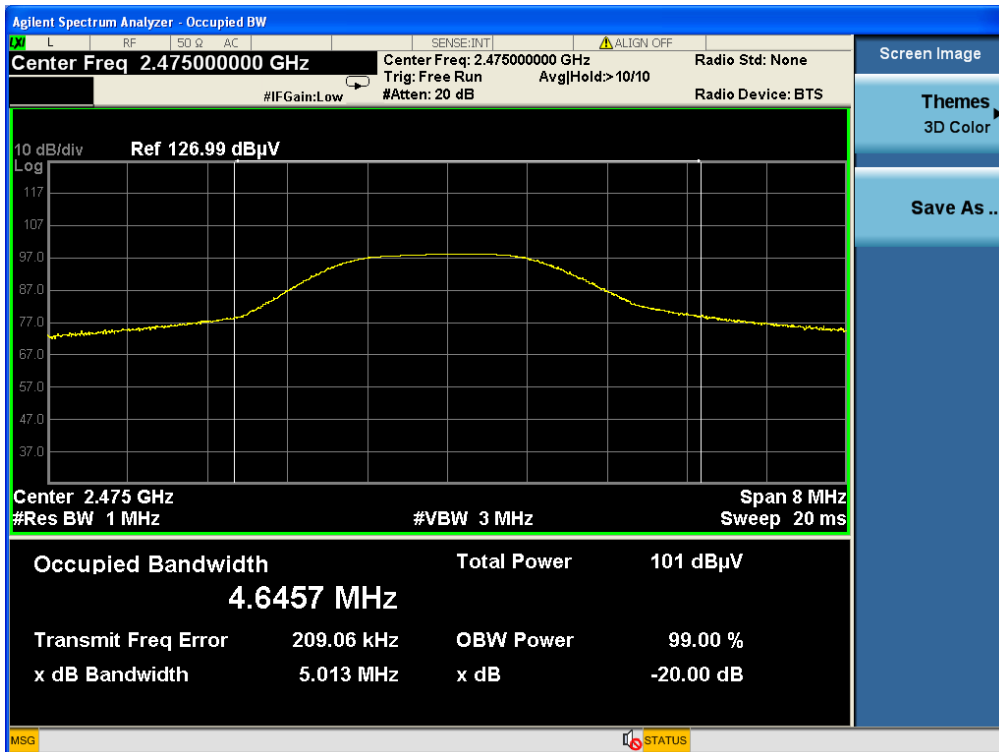




Modulation Standard: GFSK
Channel: 08



Modulation Standard: GFSK
Channel: 15





10. ANTENNA REQUIREMENTS

10.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

10.2 ANTENNA CONSTRUCTION AND DIRECTIONAL GAIN

Antenna Type: CHIP Antenna

Antenna Gain: 3.45 dBi