FCC/IC - TEST REPORT

Report Number	:	**68.760.12.309.01**	Date of Issue:	June 20, 2014
Model	:	**M5K001**		
Product Type	:	MedSense Badge		
Applicant	:	General Sensing Limited		
Address	:	Unit 716, Cyberport 1, 100 Cyberport Road, Pok Fu Lam, Hong Kong		
Manufacture	:	General Sensing Limited		
Address	:	Unit 716, Cyberport 1, 100 Cyberport Road, Pok Fu Lam, Hong Kong		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	27		

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1 Table of Contents

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P.R. China

2 Details about the Test Laboratory

Details about the Test Laboratory

Test site1:

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052, P.R. China

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

Test site2:

Company name: Audix Technology (shenzhen) Co.,Ltd
Block Shenzhen, Science & Industry Park,
Nantou, Shenzhen,
Guangdong,
China

Telephone: 86 755 2663 9496
Fax: 86 755 2663 2877

3 Description of the Equipment Under Test

Description of the Equipment Under Test

Product: MedSense Badge

Model no.: M5K001

Brand Name: MedSense

Options and accessories: NIL

Rating: DC3.7V

RF Transmission Frequency: 2402MHz - 2480.980MHz

Antenna Gain: 6dBi

Description of the EUT: NIL

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2013 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 3 December 2010	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 Issue 8 December 2010	RSS-210 — Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

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5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C, RSS-Gen, RSS-210					
Test Condition	Pages	Test Site	Test Result		
			Pass	Fail	N/A
15.207 & RSS-Gen A7.2.4 Conducted emission AC power port*	--	--	☐	☐	☒
§15.205(a), §15.209(a), §15.249(a), §15.249(c) & RSS-210 A2.9(a), RSS-Gen 7.2.2 Field strength of emissions and Restricted bands	9	Site 2	☒	☐	☐
RSS-GEN 4.10 Receiver Spurious Emissions*	--	Site 2	☐	☐	☒
§15.249(d) & RSS-210 A2.9(b) Out of band emissions	18	Site 2	☒	☐	☐
FCC §15.215(c) 20dB bandwidth & RSS-Gen 4.6.1 99% Occupied Bandwidth	23	Site 2	☒	☐	☐

Notice"*": Only radio communication receivers operating in stand-alone mode within the band 30-960 MHz and scanner receivers are subject to Industry Canada requirements, as described above. All other receivers are excluded from any Industry Canada certification, testing, labeling and reporting requirements.

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6 General Remarks

Remarks
This submittal(s) (test report) is intended for FCC ID: GPI-M5K001 & IC ID: 7310A-M5K001 complies with Section 15.205, 15.209, 15.249 of the FCC Part 15, Subpart C Rules; and RSS-210.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: 28 November, 2012

Testing Start Date: 29 November, 2012

Testing End Date: 18 June, 2014

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:	Prepared by:	Tested by:
		
Ken Li	Felix Li	Leo Li
EMC Project Manager	EMC Project Engineer	EMC Test Engineer

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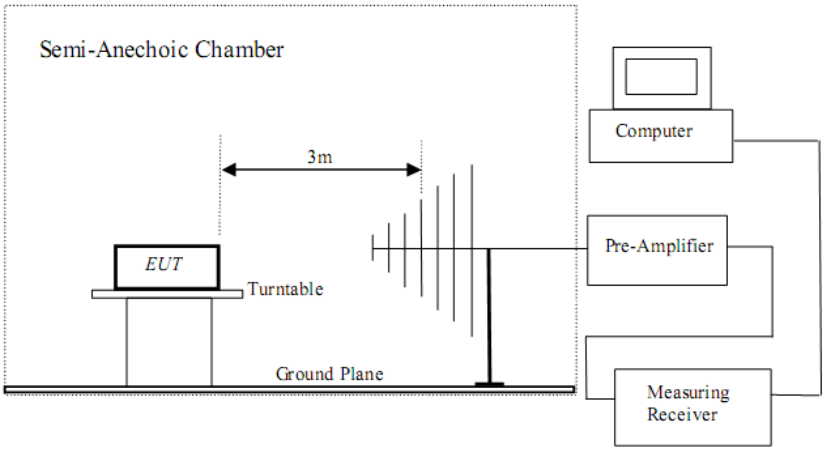
7 Test setups

Radiated test setups



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8 Technical Requirement

8.1 Field strength of emissions and Restricted bands

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured ,RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limits

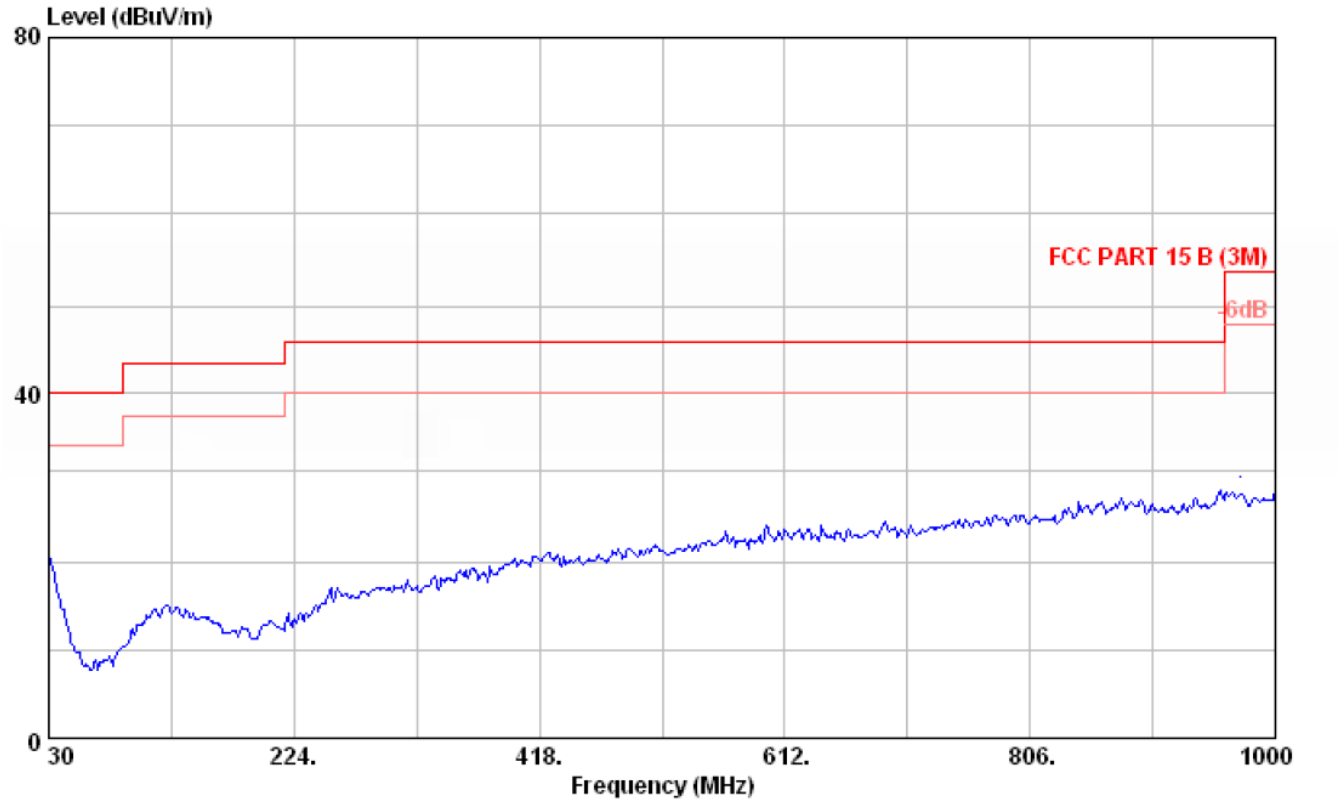
According to §15.249 (a) & RSS-210 A2.9(a) , the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

According to §15.249 (c)& RSS-210 A2.9(a), Field strength limits are specified at a distance of 3 meters.
According to §15.249 (d)& RSS-210 A2.9(b), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209& RSS-Gen, whichever is the lesser attenuation.
According to §15.205 and RSS-GEN 7.2.2 Unwanted emissions falling into restricted bands in §15.205 (a) and RSS-GEN 7.2.2 Table 3 shall comply with the limits specified in §15.209 and RSS-Gen.

Field strength of emissions and Restricted bands

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx
Ant. Polarity: Vertical
Comment: 30-1000MHz



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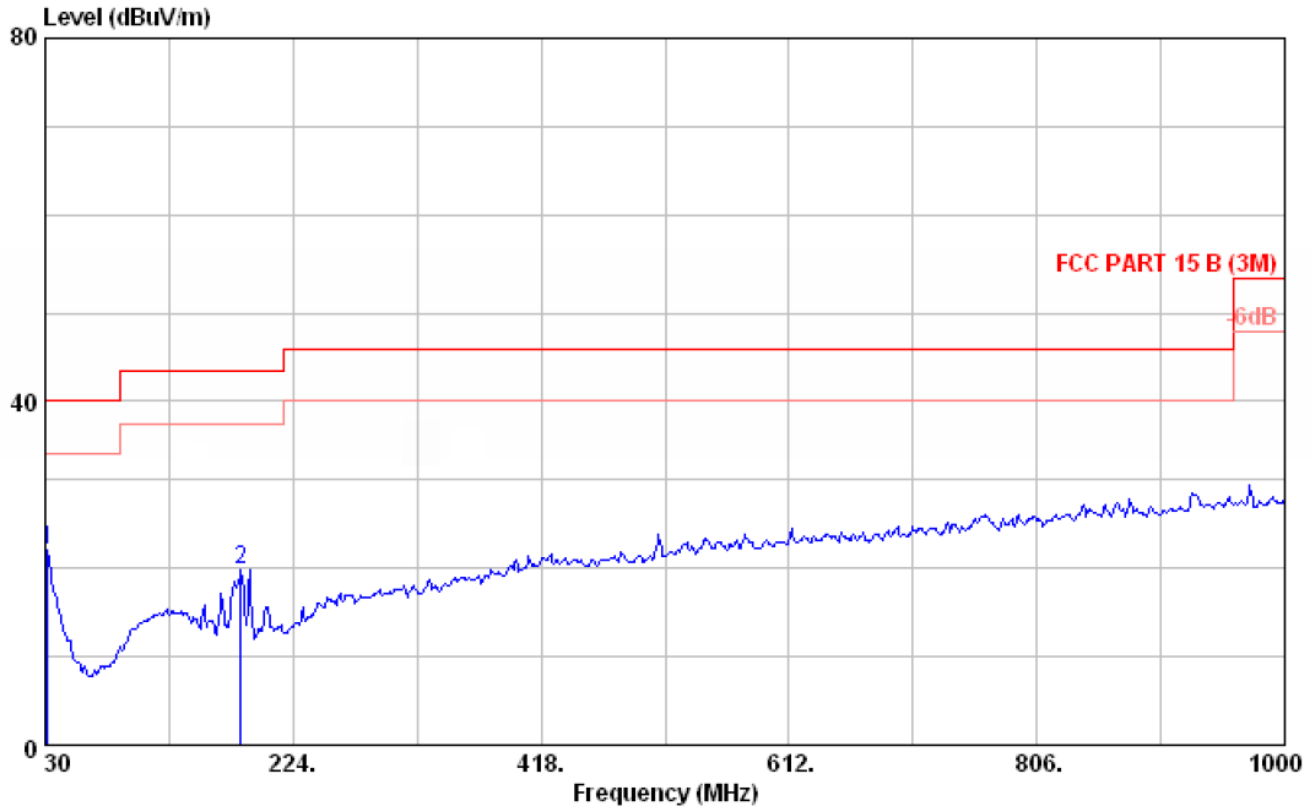
Field strength of emissions and Restricted bands

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx
Ant. Polarity: Horizontal
Comment: 30-1000MHz



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	31.940	18.84	0.86	28.31	30.64	22.03	40.00	17.97	Peak
2	183.260	9.64	1.73	27.69	36.14	19.82	40.00	20.18	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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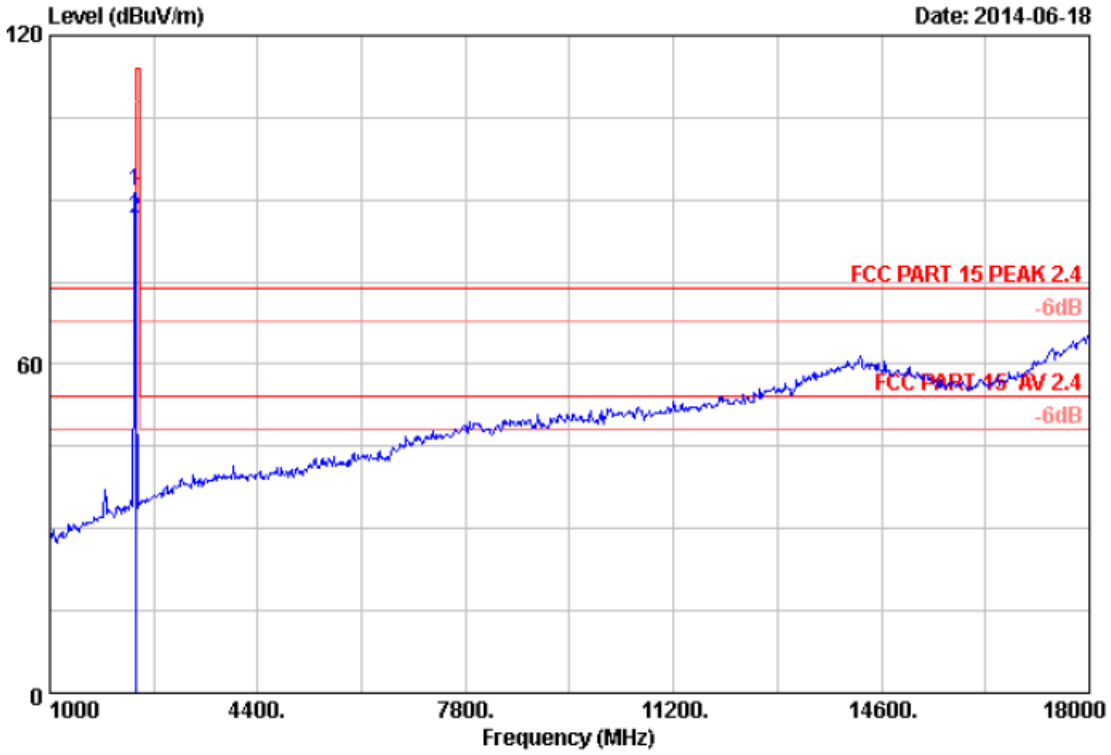
Field strength of emissions and Restricted bands

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx, 2402 MHz
Ant. Polarity: Vertical
Comment: Above 1GHz



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2401.999	28.18	5.80	35.70	93.43	91.71	114.00	22.29	Peak
2	2401.999	28.18	5.80	35.70	88.21	86.49	94.00	7.51	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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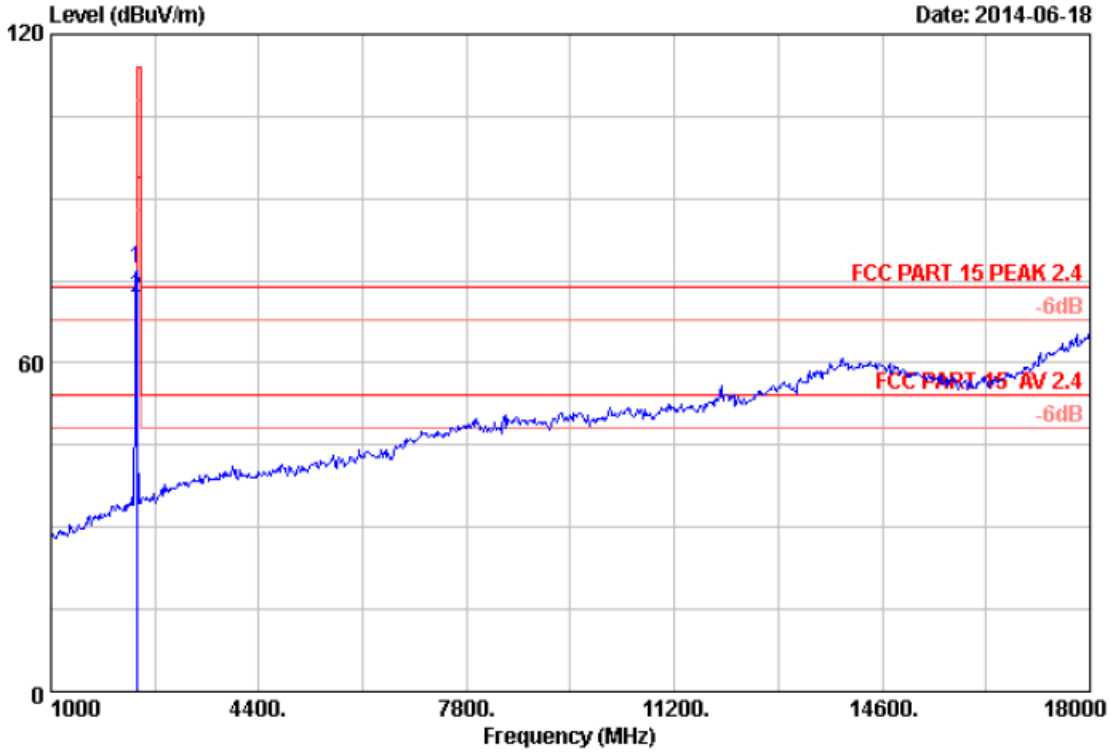
Field strength of emissions and Restricted bands

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx, 2402MHz
Ant. Polarity: Horizontal
Comment: Above 1GHz



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2401.999	28.18	5.80	35.70	78.90	77.18	114.00	36.82	Peak
2	2401.999	28.18	5.80	35.70	73.67	71.95	94.00	22.05	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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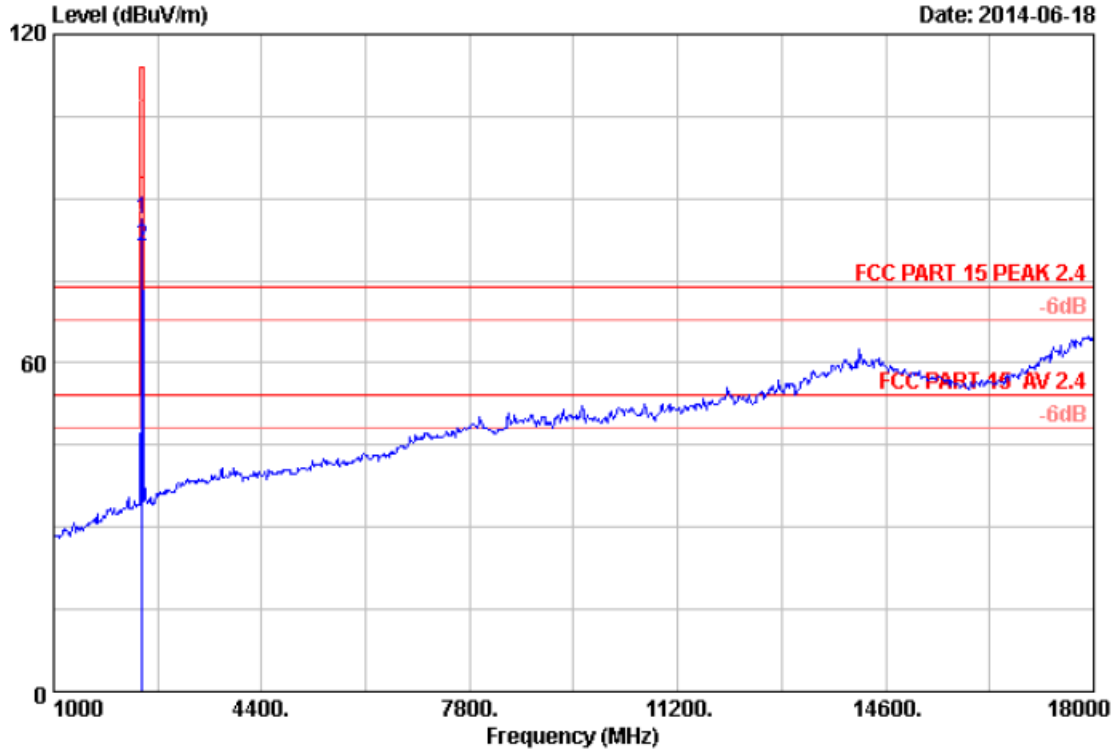
Field strength of emissions and Restricted bands

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx, 2440.324MHz
Ant. Polarity: Vertical
Comment: Above 1GHz



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.294	28.27	5.86	35.70	87.94	86.37	114.00	27.63	Peak
2	2440.294	28.27	5.86	35.70	82.72	81.15	94.00	12.85	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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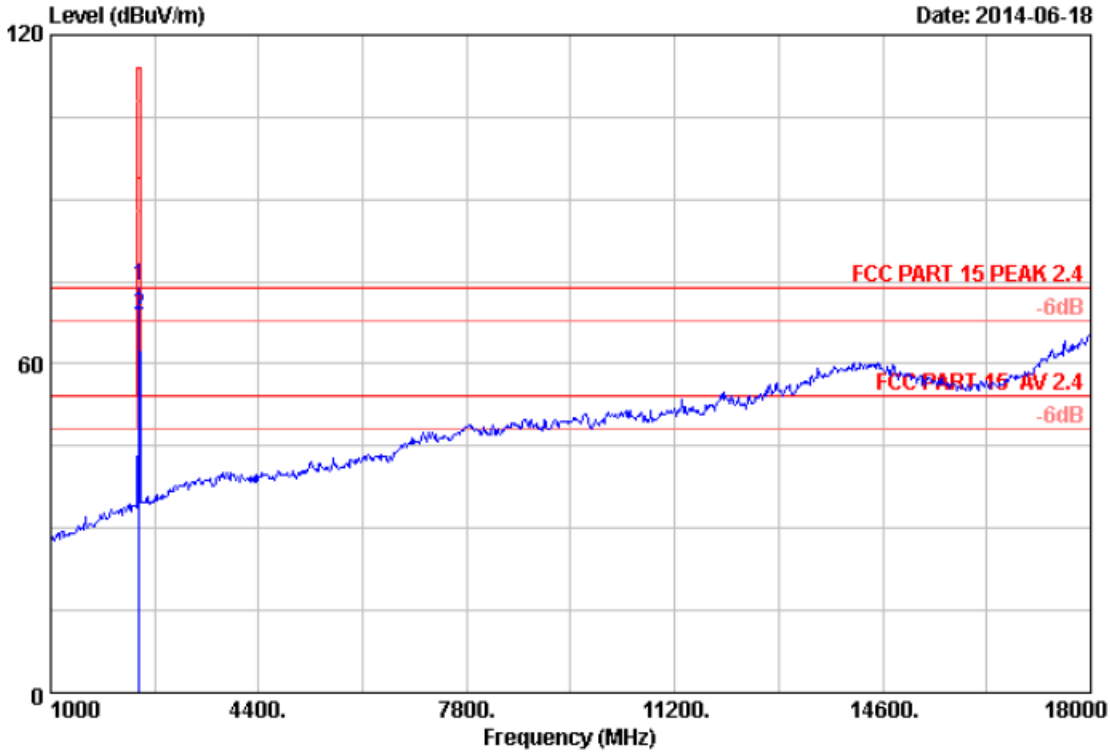
Field strength of emissions and Restricted bands

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx, 2440.324MHz
Ant. Polarity: Horizontal
Comment: Above 1GHz



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.294	28.27	5.86	35.70	75.70	74.13	114.00	39.87	Peak
2	2440.294	28.27	5.86	35.70	70.47	68.90	94.00	25.10	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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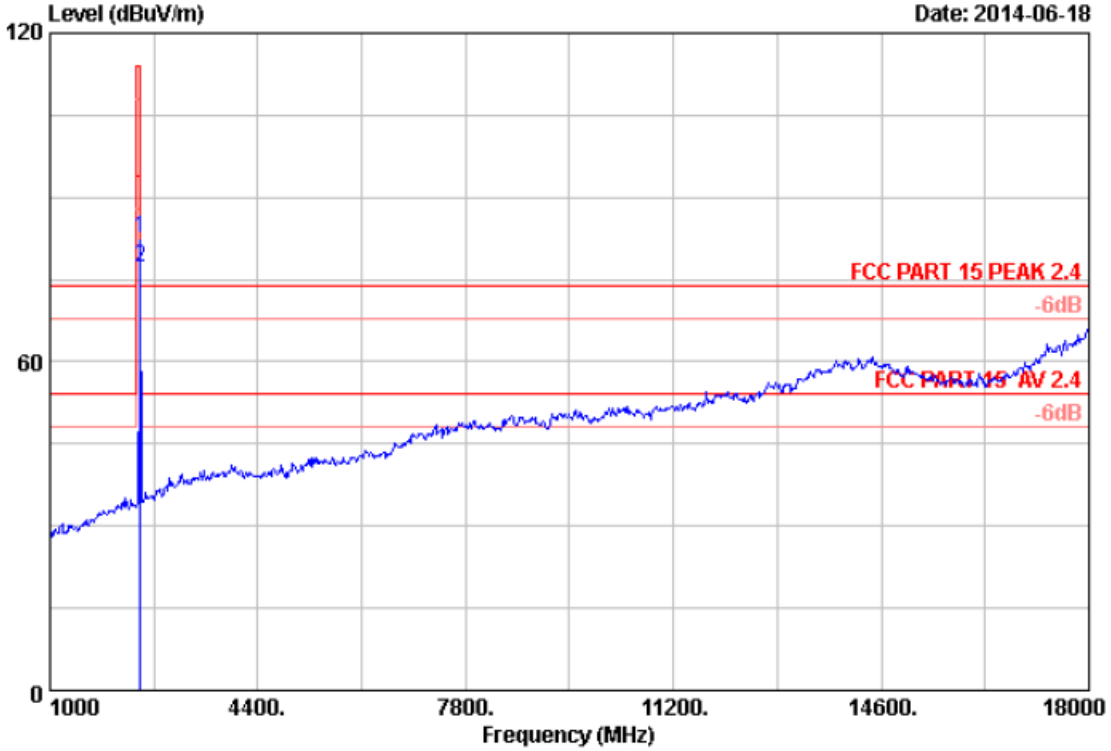
Field strength of emissions and Restricted bands

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx, 2480.980MHz
Ant. Polarity: Vertical
Comment: Above 1GHz



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.920	28.36	5.91	35.70	83.85	82.42	114.00	31.58	Peak
2	2480.920	28.36	5.91	35.70	78.62	77.19	94.00	16.81	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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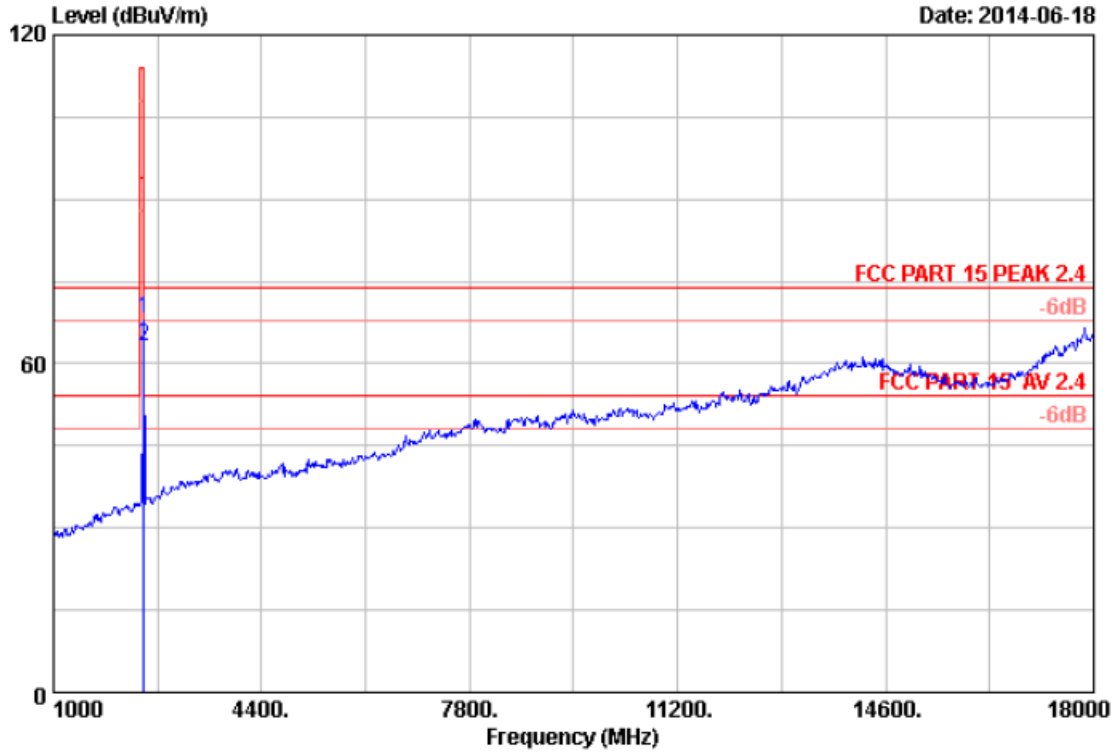
Field strength of emissions and Restricted bands

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx, 2480.980MHz
Ant. Polarity: Horizontal
Comment: Above 1GHz



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.920	28.36	5.91	35.70	69.76	68.33	114.00	45.67	Peak
2	2480.920	28.36	5.91	35.70	64.53	63.10	94.00	30.90	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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8.2 Out of Band Emissions

Test Method

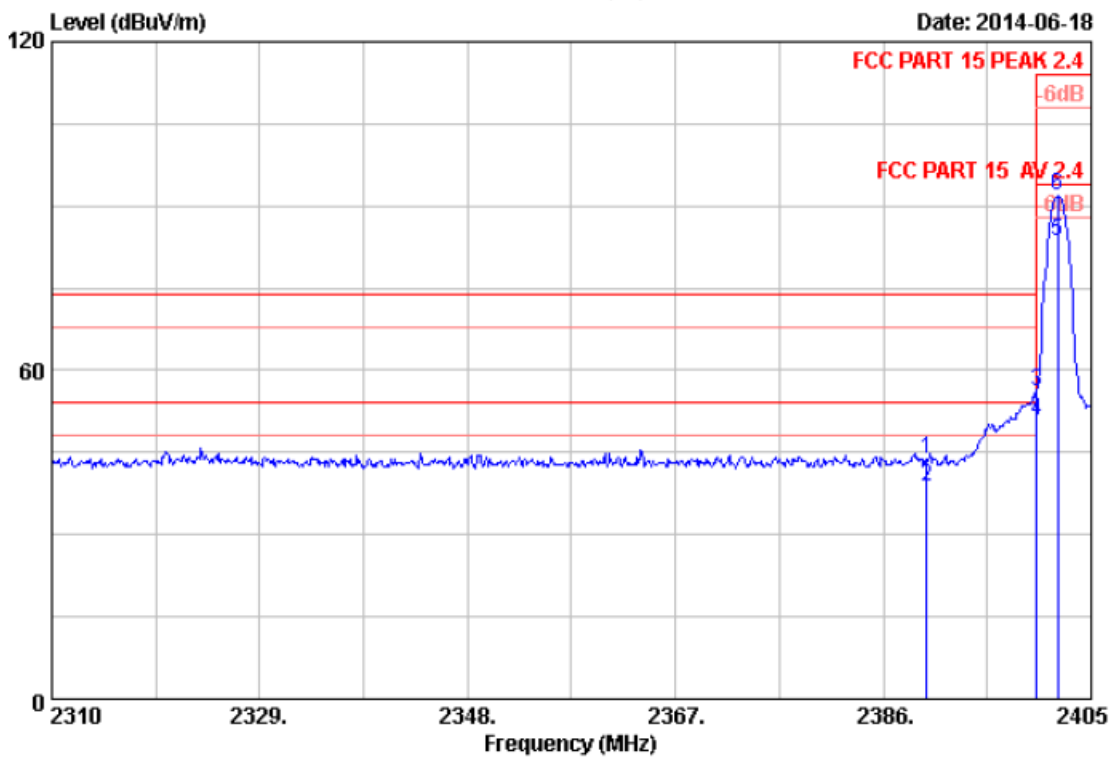
1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find outthe highest emissions.
4. The spectrum analyzer or receiver is set as:
   (1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
   (2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

Limits

According to §15.249(d) & RSS-210 A2.9(b) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209 and RSS-Gen, whichever is the lesser attenuation.

Out of Band Emissions

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx, lower edge
Ant. Polarity: Vertical



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	28.16	5.78	35.70	45.63	43.87	74.00	30.13	Peak
2	2390.000	28.16	5.78	35.70	40.40	38.64	54.00	15.36	Average
3	2400.000	28.18	5.80	35.70	57.71	55.99	74.00	18.01	Peak
4	2400.000	28.18	5.80	35.70	52.49	50.77	54.00	3.23	Average
5	2401.960	28.18	5.80	35.70	85.26	83.54	94.00	10.46	Average
6	2401.960	28.18	5.80	35.70	93.49	91.77	114.00	22.23	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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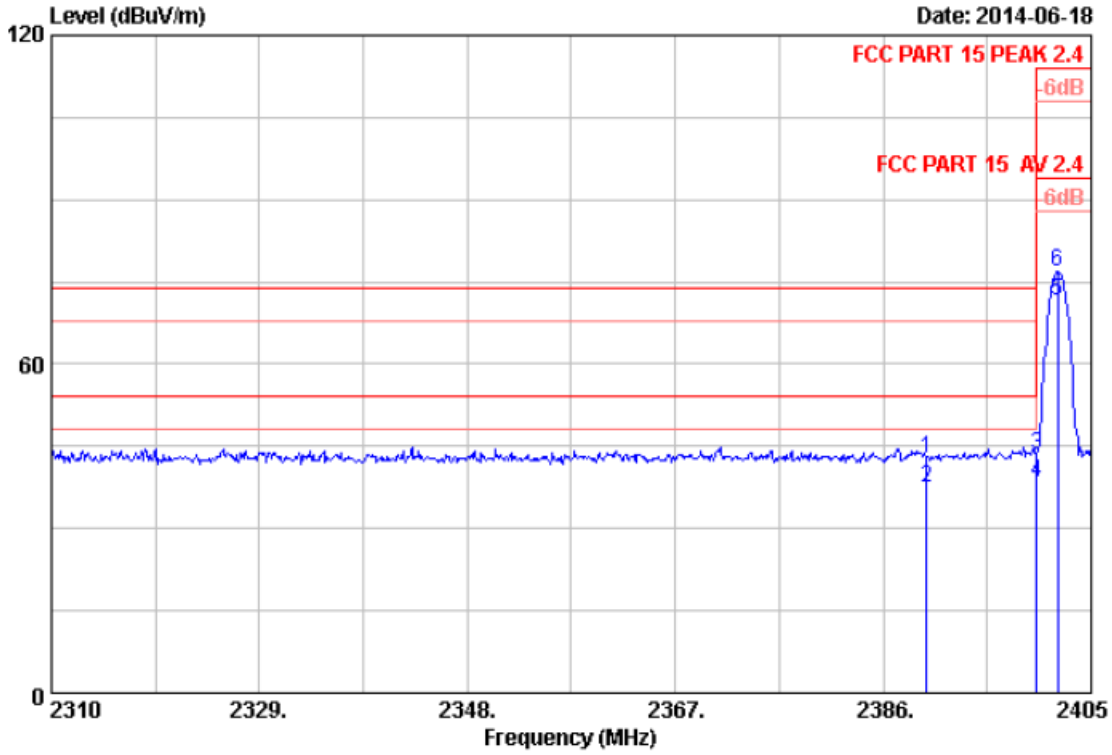
Out of Band Emissions

EUT: MedSense Badge M/N: M5K001
Operating Condition: Tx, lower edge
Ant. Polarity: Horizontal



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	28.16	5.78	35.70	44.47	42.71	74.00	31.29	Peak
2	2390.000	28.16	5.78	35.70	39.24	37.48	54.00	16.52	Average
3	2400.000	28.18	5.80	35.70	45.32	43.60	74.00	30.40	Peak
4	2400.000	28.18	5.80	35.70	40.10	38.38	54.00	15.62	Average
5	2401.960	28.18	5.80	35.70	73.34	71.62	94.00	22.38	Average
6	2401.960	28.18	5.80	35.70	78.57	76.85	114.00	37.15	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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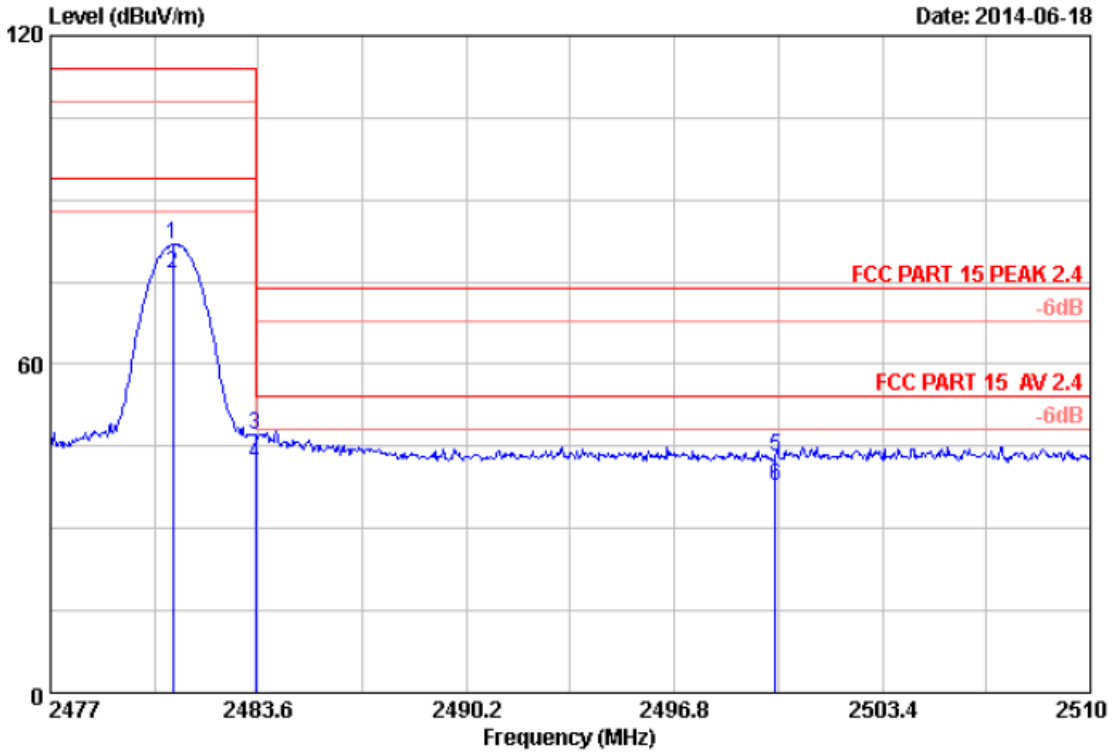
Out of Band Emissions

EUT: MedSense Bade M/N: M5K001
Operating Condition: Tx, upper edge
Ant. Polarity: Vertical



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.894	28.36	5.91	35.70	83.28	81.85	114.00	32.15	Peak
2	2480.894	28.36	5.91	35.70	78.06	76.63	94.00	17.37	Average
3	2483.500	28.36	5.92	35.70	48.55	47.13	74.00	26.87	Peak
4	2483.500	28.36	5.92	35.70	43.32	41.90	54.00	12.10	Average
5	2500.000	28.40	5.94	35.70	44.34	42.98	74.00	31.02	Peak
6	2500.000	28.40	5.94	35.70	39.12	37.76	54.00	16.24	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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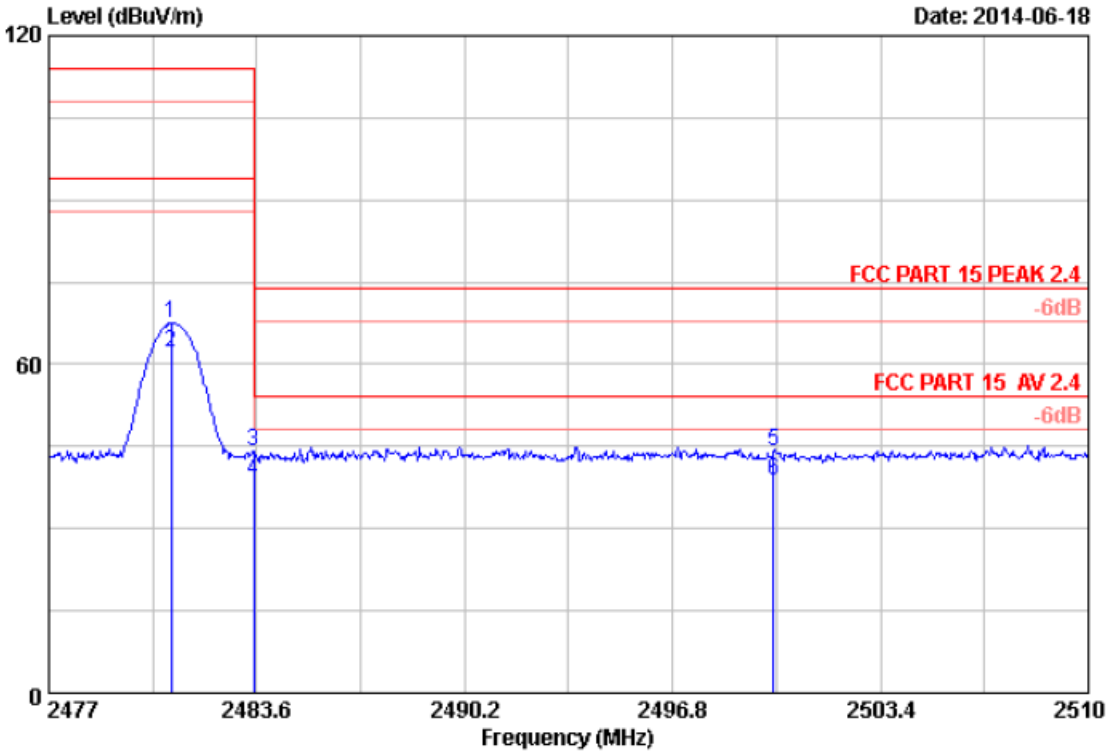
Out of Band Emissions

EUT: MedSense Bade M/N: M5K001
Operating Condition: Tx, upper edge
Ant. Polarity: Horizontal



No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.894	28.36	5.91	35.70	68.95	67.52	114.00	46.48	Peak
2	2480.894	28.36	5.91	35.70	63.73	62.30	94.00	31.70	Average
3	2483.500	28.36	5.92	35.70	45.48	44.06	74.00	29.94	Peak
4	2483.500	28.36	5.92	35.70	40.26	38.84	54.00	15.16	Average
5	2500.000	28.40	5.94	35.70	45.42	44.06	74.00	29.94	Peak
6	2500.000	28.40	5.94	35.70	40.20	38.84	54.00	15.16	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

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8.3 20dB Bandwidth & 99% Occupied Bandwidth

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

Limits:

According to 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

According to RSS-Gen 4.6.1 when an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

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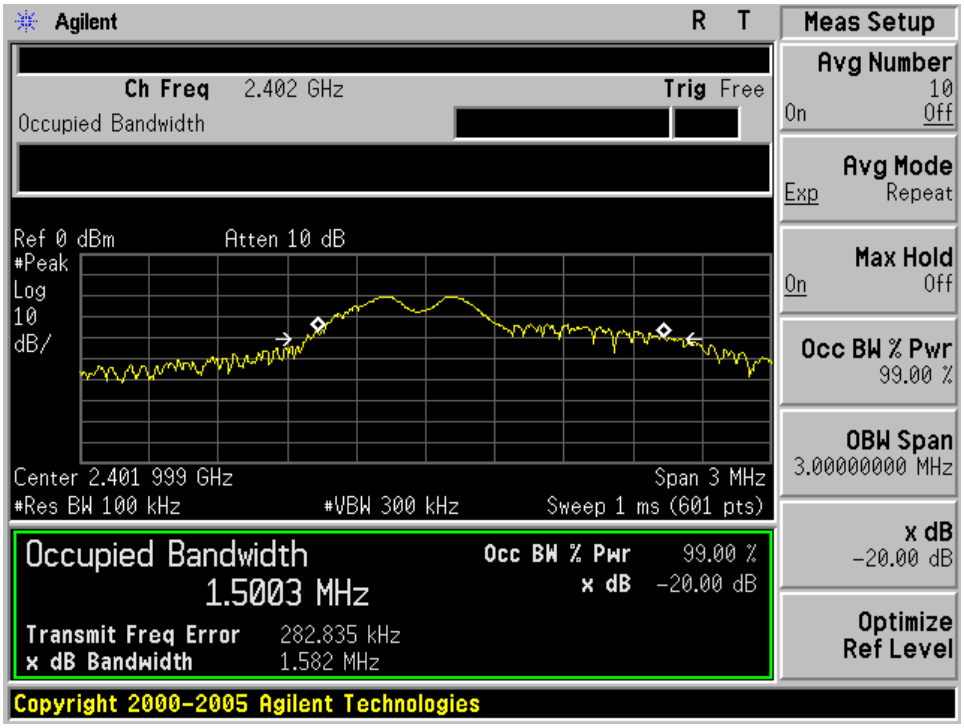
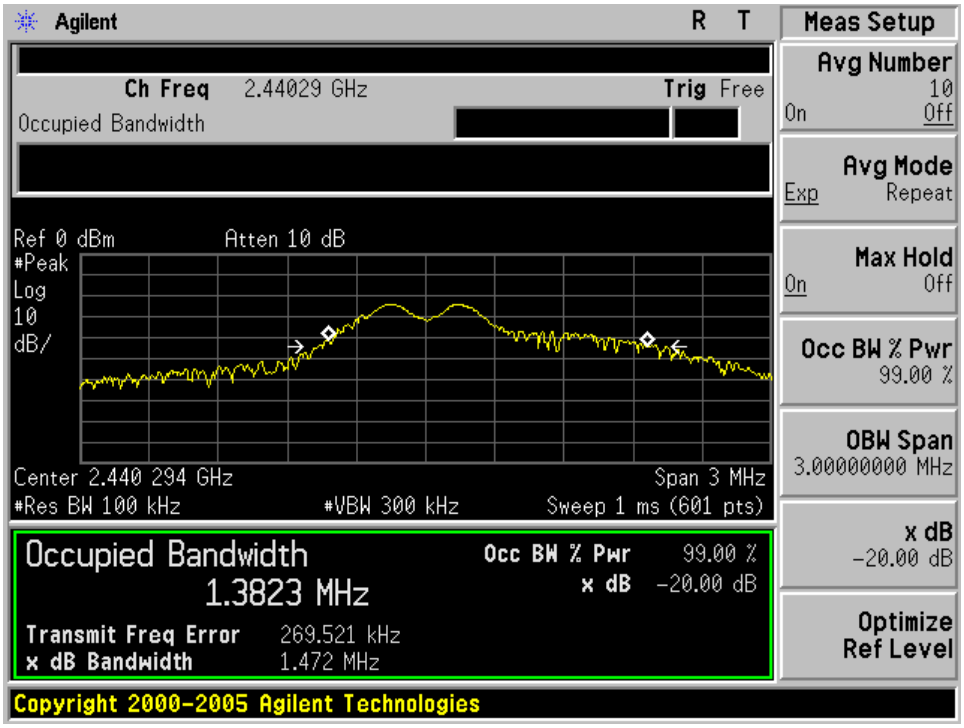
20dB Bandwidth & 99% Occupied Bandwidth

Frequency MHz	20dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
2401.999	1582	1500	--	Pass
2440.324	1472	1382	--	Pass
2480.980	1306	1211	--	Pass





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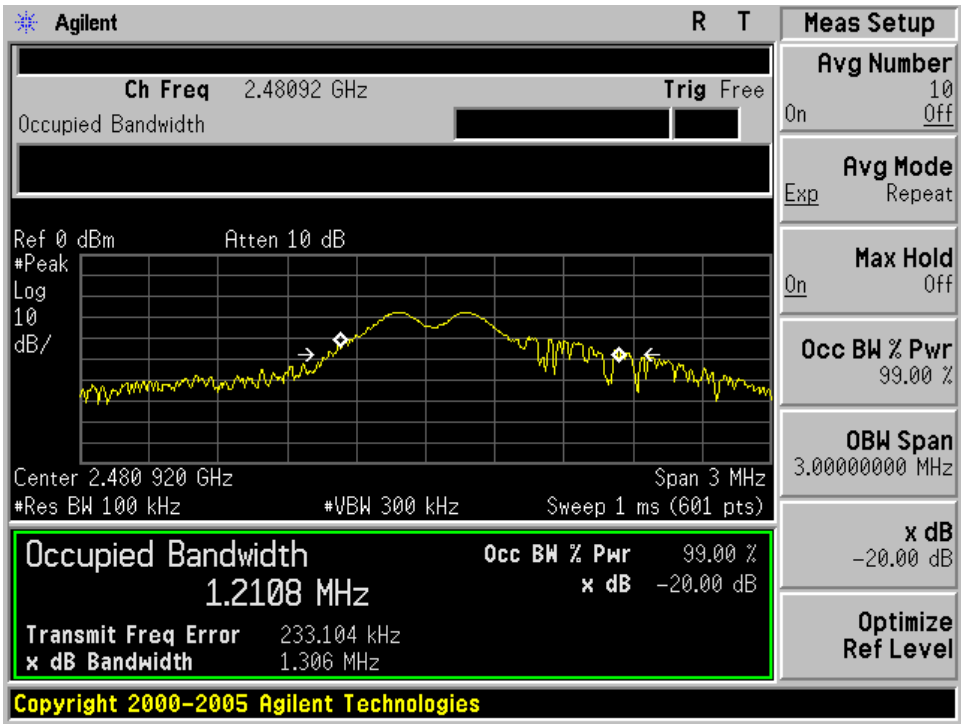
20dB Bandwidth & 99% Occupied Bandwidth



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9 Test equipment list

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE	
CE	Test Receiver	Rohde & Schwarz	ESHS10	838693/001	Nov.04, 14	☒
	L.I.S.N.#1	Rohde & Schwarz	ESH2-Z5	834066/011	Nov.04, 14	☒
	L.I.S.N.#3	Kyoritsu	KNW-242C	8-1920-1	May.07, 15	☐
	RF Cable	3D-2W	Fujikura	LISN Cable 1#	May.07, 15	☒
	Coaxial Switch	MP59B	Anritsu	M55367	May.07, 15	☒
	Passive Probe	ESH2-Z3	Rohde & Schwarz	299.7810.52	May.07, 15	☐
	Pulse Limiter	ESH3-Z2	Rohde & Schwarz	100341	May.07, 15	☐
C	Spectrum	Agilent	E4446A	US44300459	May.08, 15	☐
RE < 1 GHz	Test Receiver <1GHz	Rohde & Schwarz	ESVS10	834468/011	May.07, 15	☒
	Amplifier < 1 GHz	HP	8447D	2648A04738	May.07, 15	☒
	HF Cable	Hubersuhne	Sucoflex104	Room 2	May.08, 15	☒
	Bilog Antenna	Schaffner	CBL6111C	2598	Oct.25, 14	☒
RE > 1 GHz	Spectrum > 1GHz	Agilent	E4446A	US44300459	May.08, 15	☒
	Horn Antenna	EMCO	3115	9607-4877	Jun. 24, 14	☒
	Amp > 1 Ghz	HP	8449B	3008A08495	May.08, 15	☒
	HF Cable	Hubersuhne	Sucoflex104	Room1	May.08, 15	☒

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- 20dB bandwidth and 99% Occupied Bandwidth
- Carrier frequency separation
- Number of hopping frequencies
- Dwell Time
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

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10 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

Items		Extended Uncertainty
RE	Field strength (dBμV/m)	U=4.2dB (30MHz-1GHz) U=3.57dB (1GHz-25GHz)
CE	Disturbance Voltage (dBμV)	U=2.4dB
Bandwidth test	--	$1*10^{-9}$
Conducted emission	--	2.4dB

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