FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT

FOR

SHINE

MODEL NUMBER: SH0AZ

FCC ID: PT3-SH0AZ
IC: 10638A-SH0AZ

REPORT NUMBER: 13U14889-3A

ISSUE DATE: July 12, 2013

Prepared for
MISFIT WEARABLES CORPORATION
5 Brookdale Rd., Salem,
New Hampshire 03079

Prepared by
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/13/2013	Initial Issue	D.Cieplik
A	07/12/2013	RF Exposure revised	B. Mucha

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MISFIT WEARABLES CORPORATION
5 Brookdale Rd., Salem, New Hampshire 03079

EUT DESCRIPTION: SHINE

MODEL: SH0AZ

DATE TESTED: April 22, 2013 – July 10, 2013

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL By:

Bart Mucha
WiSE Staff Engineer
UL LLC

Tested By:

Daniel Cieplik
WiSE Project Lead
UL LLC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL 60062, USA.
UL NBK is accredited by NVLAP, Laboratory Code 100414-0

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Sample Calculations
Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)
Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)
Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test	Range	Equipment	Uncertainty k=2
Radiated Emissions	30-200MHz	Bicon 10m Horz	4.27dB
Radiated Emissions	30-200MHz	Bicon 10m Vert	4.28dB
Radiated Emissions	200-1000MHz	LogP 10m Horz	3.33dB
Radiated Emissions	200-1000MHz	LogP 10m Vert	3.39dB
Radiated Emissions	1-6GHz	Horn	5.02dB
Radiated Emissions	6-18GHz	Horn	5.34dB
Radiated Emissions	18-26GHz	Horn	6.60dB
Conducted Ant Port	30MHz-26GHz	Spectrum Analyzer	2.94dB
RF Power	dB	Power Meter	0.45dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a quarter sized pedometer that links to a cellular device to send real-time data. The EUT is an Bluetooth Low Energy 4.0 transceiver.

The radio module is manufactured by Misfit Wearables Corporation.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Chip antenna, with a maximum gain of 2.9dBi.

5.3. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Shine, rev. F50D3B01-8E9D-4B24-4FAB-C302AA53FC5C.

The EUT driver software installed in the host support equipment during testing was CC2541_BLe, rev. 1.2.

The test utility software used during testing was SmartRF Studio 7, rev. 1.10.3.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

5.1. DESCRIPTION OF TEST SETUP

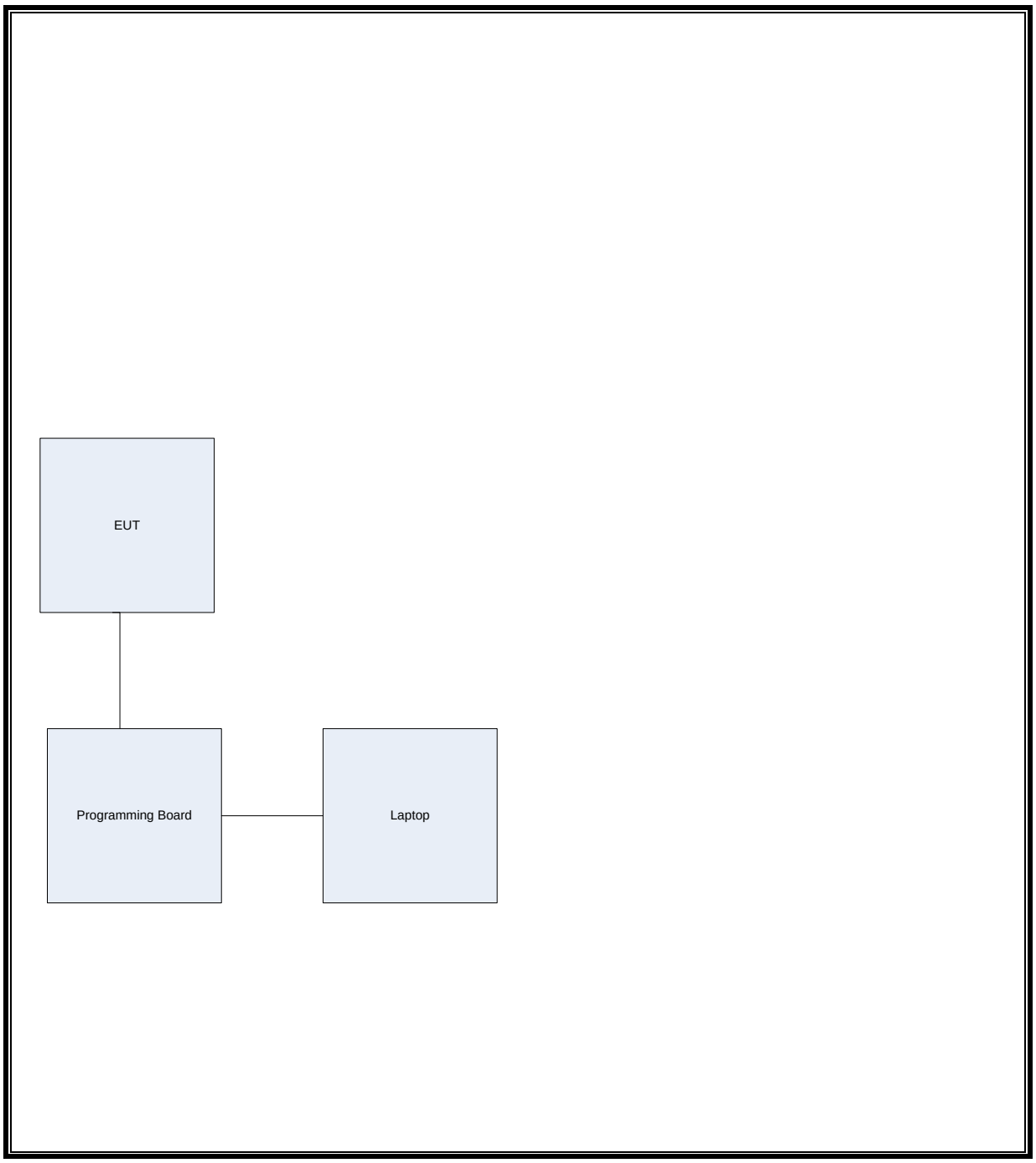
SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Computer	HP	Pavilion dv7	4CB1461026	VQF-RT5390
Daughter Board for programing	Texas Instruments	CC Debugger	N/A	N/A

TEST SETUP

The EUT is installed in a host laptop computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



SETUP FOR DIGITAL DEVICE TESTS

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Computer	HP	Pavilion dv7	4CB1461026	VQF-RT5390
Daughter Board for programing	Texas Instruments	CC Debugger	N/A	N/A

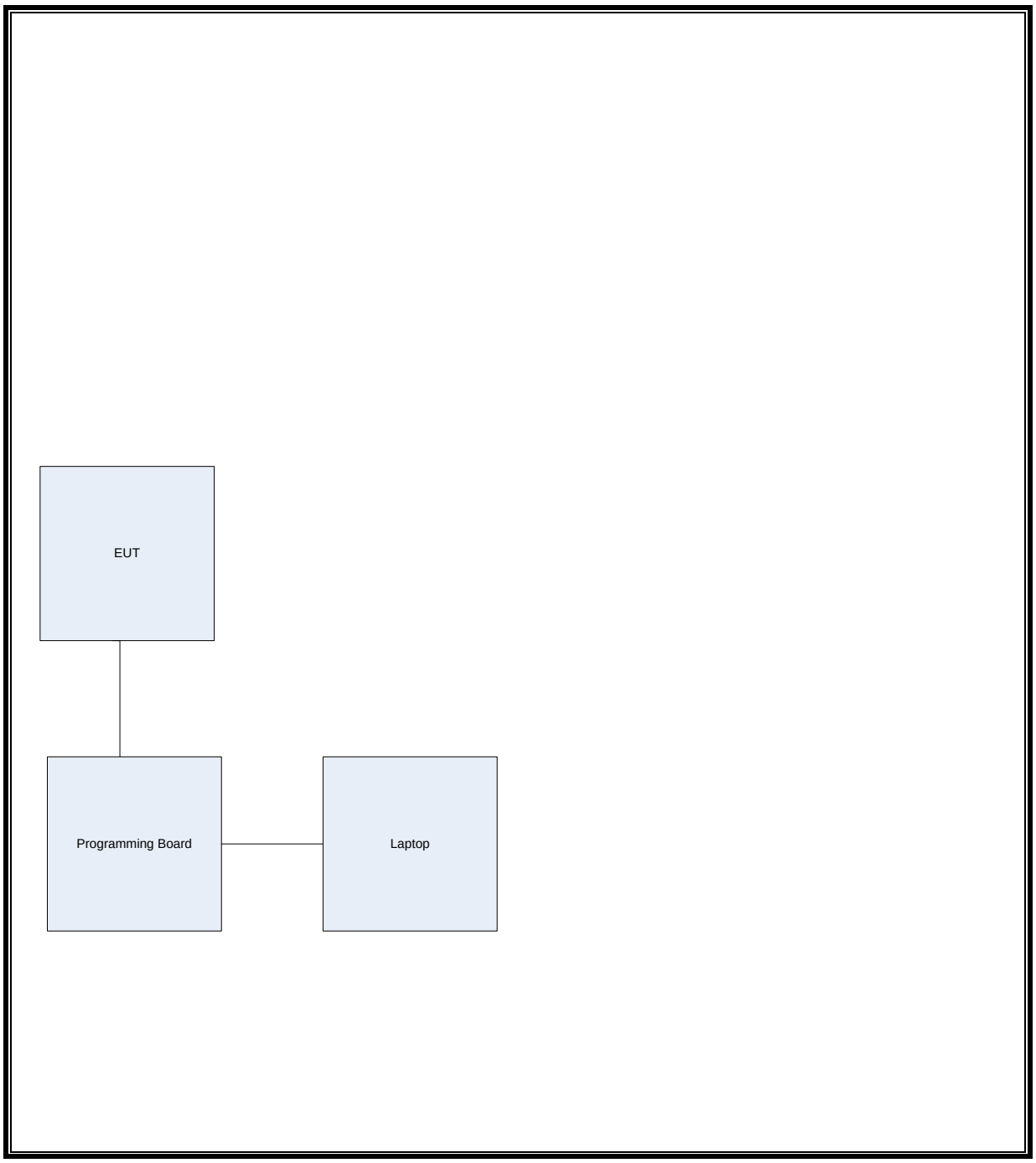
I/O CABLES

EUT does not contain IO ports

TEST SETUP

EUT is connected to a programming device that is controlled by a laptop.

SETUP DIAGRAM FOR DIGITAL DEVICE TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Description	Manufacturer	Model	Asset	Cal Date	Cal Due
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20121227	20131231
Bicon Antenna	Electro-Metrics	EM 6912A	EMC4070	20120830	20130830
Log-P Antenna	Schaffner	UPA6109	EMC4313	20120807	20130831
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20121226	20131231
Antenna Array	UL	BOMS	EMC4276	20111227	20131231
EMI Test Receiver	Agilent	N9030A	EMC4360	20121226	20131226

7. TEST RESULTS

7.1. 99% and 20dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

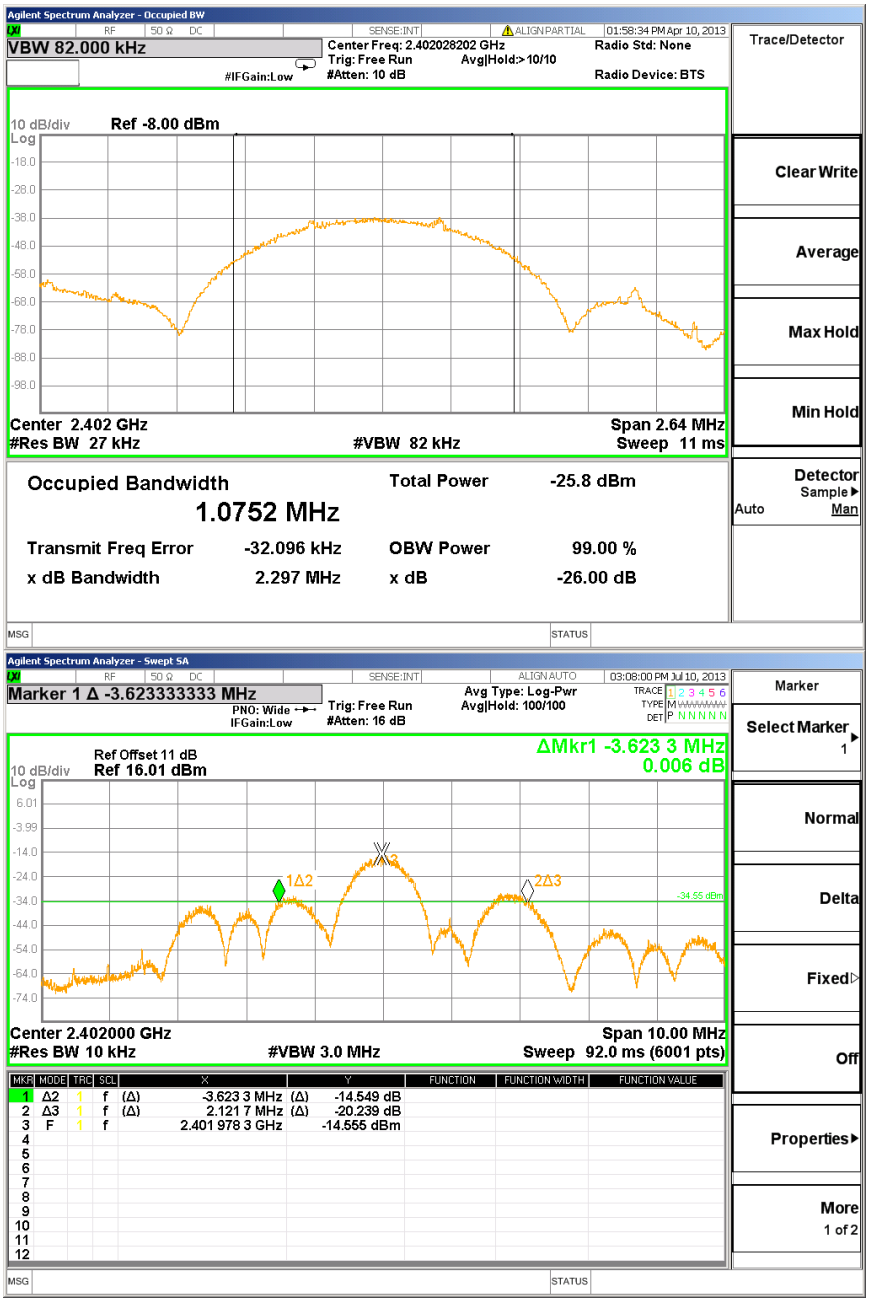
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

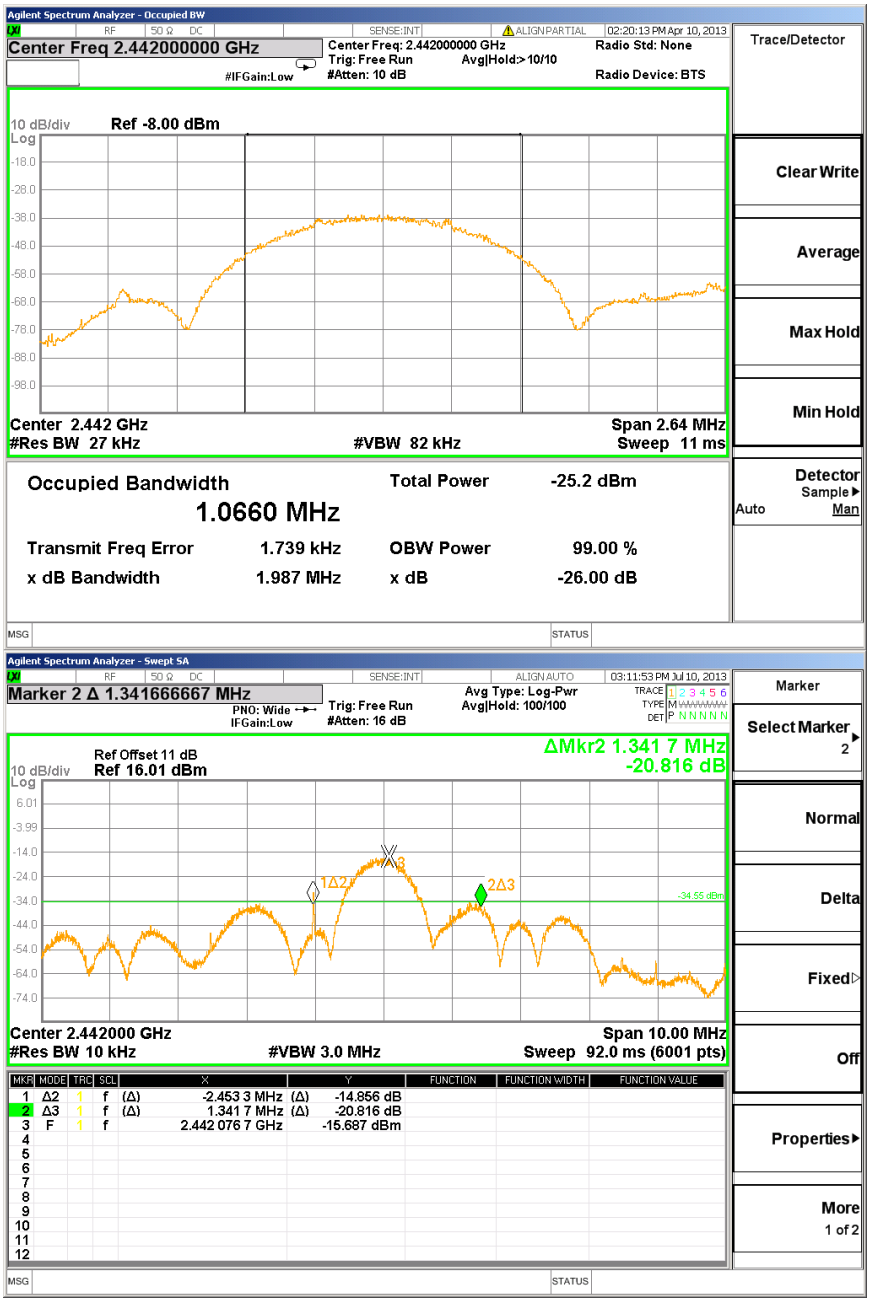
Channel	Frequency (MHz)	99% Bandwidth (MHz)	20dB Bandwidth (MHz)
Low	2402	1.0752	3.6233
Middle	2442	1.066	2.4533
High	2480	1.0609	1.5933

99% BANDWIDTH

99% BANDWIDTH LOW CH



99% BANDWIDTH MID CH



99% BANDWIDTH HIGH CH

7.2. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

IC RSS-210, A2.9
FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.
(a) Except as provided in paragraph (b) of this section, 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

(d) 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, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	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., §§15.231 and 15.241.

RESULTS

7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION

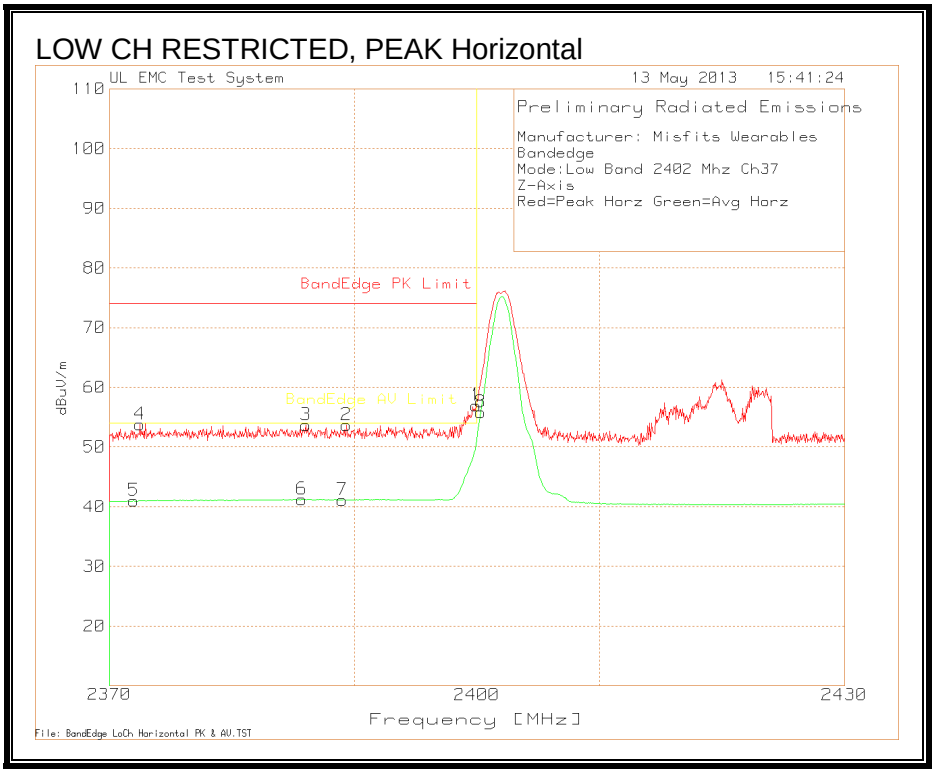
Manufacturer: Misfits Wearables
Mode:High Band 2480 Mhz Ch39
Z-Axis
Red=Horizontal Green=Vertical

Test Frequency	Meter Reading dBuV	Detector	Antenna Factor dB/m	Path Factor dB	dBuV/m	47 CFR Part 15.249 Limit @ 3m dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity
2479.8026	47.66	PK	22	3.77	73.43	94	-20.57	195	100	Horz Z-axis
2479.7936	44.19	PK	22	3.77	69.96	94	-24.04	0	100	Vert Z-axis
2441.6814	43.91	PK	21.9	4.3	70.11	94	-23.89	7	100	Vert Z-axis
2441.7144	48.69	PK	21.9	4.3	74.89	94	-19.11	189	100	Horz Z-axis
2402.252	45.95	PK	21.8	4.26	72.01	94	-21.99	13	150	Vert Z-axis
2402.402	48.14	PK	21.8	4.25	74.19	94	-19.81	204	100	Horz Z-axis

PK - Peak detector
AV measurements were no conducted do to Peak measurements at least 19dB under the limit.

7.2.2. TRANSMITTER RESTRICTED BAND EDGES

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

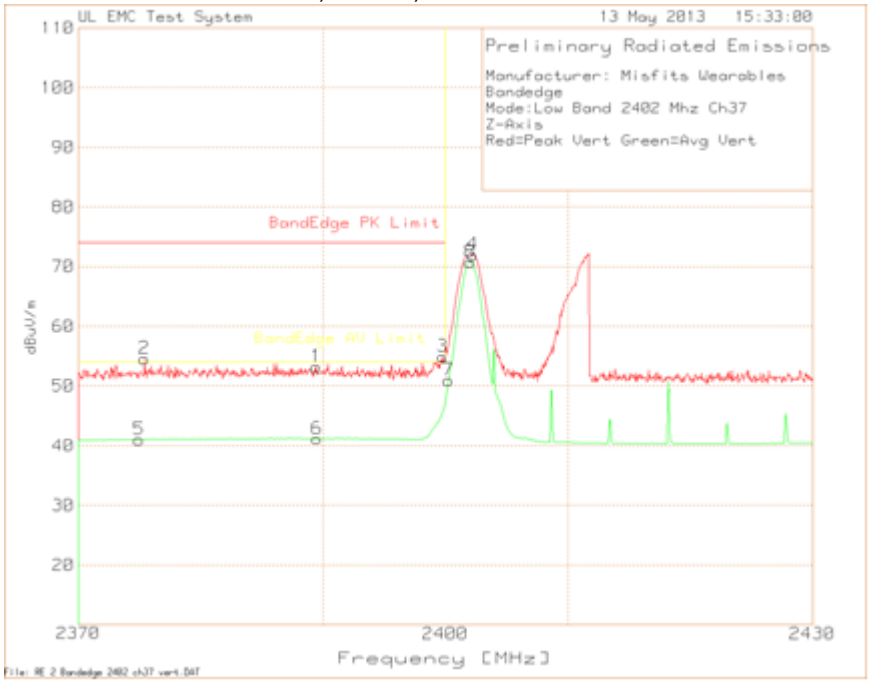


LOW CH RESTRICTED, AVG, Horizontal

Manufacturer: Misfits Wearables										
Bandedge										
Mode:Low Band 2402 Mhz Ch37										
Z-Axis										
Red=Peak Horz Green=Avg Horz										
Marker No.	Test Frequency MHz	Meter Reading dBuV	Detector	AF dB/m	Path Factor dB	Level dBuV/m	Peak Limit dBuV/m	Margin dB	Height [cm]	Polarity
1	2399.91	30.85	PK	21.8	4.31	56.96	74	-17.04	101	Horz
2	2389.339	27.45	PK	21.8	4.47	53.72	74	-20.28	101	Horz
3	2386.036	27.47	PK	21.8	4.41	53.68	74	-20.32	150	Horz
4	2372.462	27.92	PK	21.8	4.05	53.77	74	-20.23	101	Horz
Marker No.	Test Frequency MHz	Meter Reading dBuV	Detector	AF dB/m	Path Factor dB	Level dBuV/m	Average Limit dBuV/m	Margin dB	Height [cm]	Polarity
5	2371.982	15.16	AV	21.8	4.03	40.99	54	-13.01	100	Horz
6	2385.736	15.02	AV	21.8	4.41	41.23	54	-12.77	100	Horz
7	2389.009	14.9	AV	21.8	4.46	41.16	54	-12.84	151	Horz
8	2400.33	29.74	AV	21.8	4.3	55.84	n/a	n/a	100	Horz
PK - Peak detector										
Av - Average detector										

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

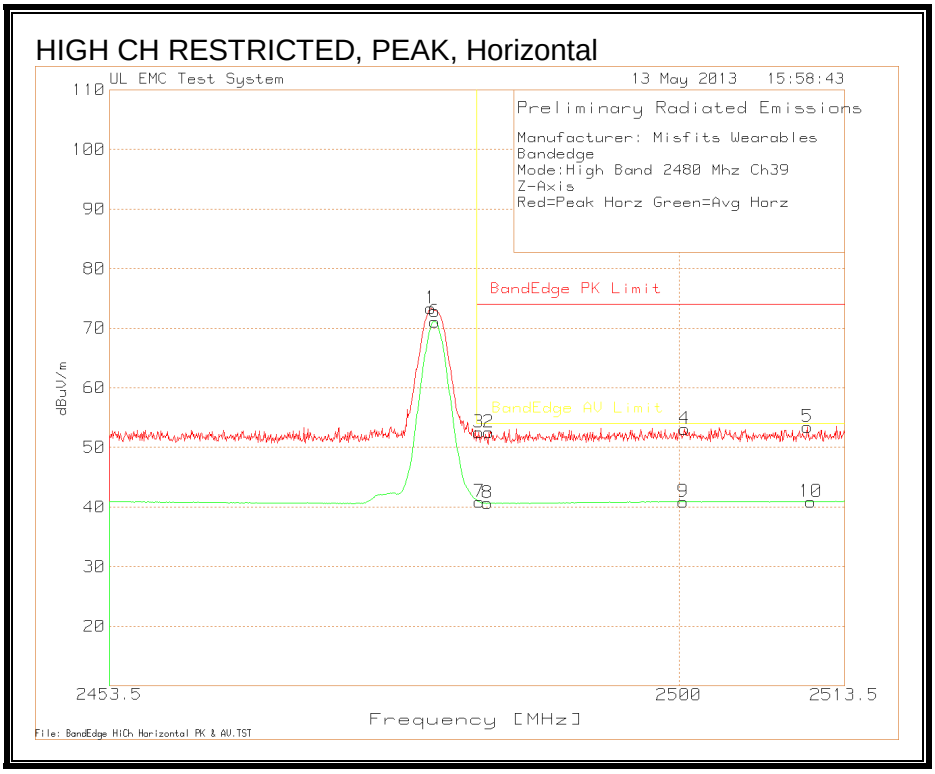
LOW CH RESTRICTED, PEAK, Vertical



LOW CH RESTRICTED, AVG, Vertical

Manufacturer: Misfits Wearables										
Bandedge										
Mode:Low Band 2402 Mhz Ch37										
Z-Axis										
Red=Peak Vert Green=Avg Vert										
Marker No.	Test Frequency MHz	Meter Reading dBuV	Detector	AF dB/m	Path Factor dB	Level dBuV/m	Peak Limit dBuV/m	Margin dB	Height [cm]	Polarity
1	2389.459	27	PK	21.8	4.47	53.27	74	-20.73	150	Vert
2	2375.405	28.63	PK	21.8	4.14	54.57	74	-19.43	100	Vert
3	2399.79	28.75	PK	21.8	4.32	54.87	74	-19.13	150	Vert
4	2402.252	45.95	PK	21.8	4.26	72.01	n/a	n/a	150	Vert
Marker No.	Test Frequency MHz	Meter Reading dBuV	Detector	AF dB/m	Path Factor dB	Level dBuV/m	Average Limit dBuV/m	Margin dB	Height [cm]	Polarity
5	2374.955	15.12	AV	21.8	4.13	41.05	54	-12.95	100	Vert
6	2389.489	14.9	AV	21.8	4.47	41.17	54	-12.83	150	Vert
7	2400.27	24.83	AV	21.8	4.3	50.93	n/a	n/a	150	Vert
8	2402.042	44.74	AV	21.8	4.26	70.8	n/a	n/a	150	Vert
PK - Peak detector										
Av - Average detector										

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



HIGH CH RESTRICTED, AVG, Horizontal

Manufacturer: Misfits Wearables
Bandedge
Mode:High Band 2480 Mhz Ch39
Z-Axis
Red=Peak Horz Green=Avg Horz

Peak 2453.5 - 2513.5MHz

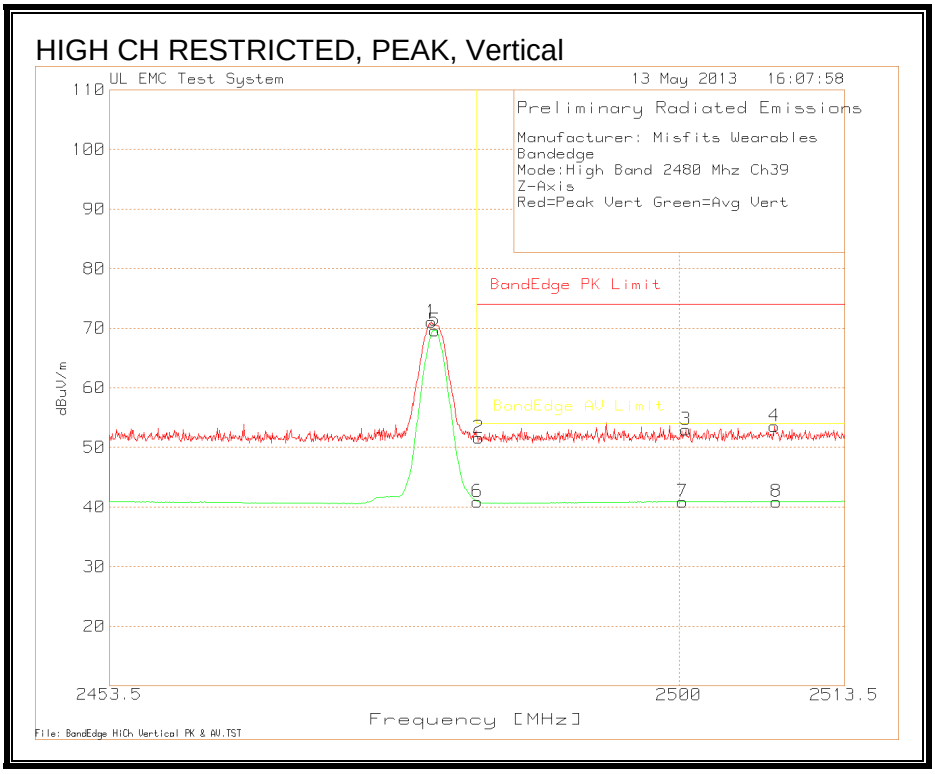
Marker No.	Test Frequency	Meter Reading	Detector	EMCO3161-02 S/N 9906105 2 3m UL (dB)	BOMS Factor (dB)	dBuV/m	BandEdge PK Limit	Margin	BandEdge AV Limit	Margin	Height [cm]	Polarity
1	2479.746	47.58	PK	22	3.77	73.35	n/a	n/a	n/a	n/a	94	Horz
2	2484.491	26.64	PK	22.1	3.77	52.51	74	-21.49	n/a	n/a	150	Horz
3	2483.65	26.71	PK	22.1	3.77	52.58	74	-21.42	n/a	n/a	150	Horz
4	2500.467	27.07	PK	22.1	3.93	53.1	74	-20.9	n/a	n/a	94	Horz
5	2510.497	27.47	PK	22.1	3.91	53.48	74	-20.52	n/a	n/a	94	Horz

Avearge 2453.5 - 2513.5MHz

Marker No.	Test Frequency	Meter Reading	Detector	EMCO3161-02 S/N 9906105 2 3m UL (dB)	BOMS Factor (dB)	dBuV/m	BandEdge PK Limit	Margin	BandEdge AV Limit	Margin	Height [cm]	Polarity
6	2480.047	45.36	AV	22	3.77	71.13	n/a	n/a	n/a	n/a	100	Horz
7	2483.71	14.99	AV	22.1	3.77	40.86	n/a	n/a	54	-13.14	100	Horz
8	2484.371	14.75	AV	22.1	3.77	40.62	n/a	n/a	54	-13.38	100	Horz
9	2500.347	14.89	AV	22.1	3.93	40.92	n/a	n/a	54	-13.08	150	Horz
10	2510.737	14.93	AV	22.1	3.91	40.94	n/a	n/a	54	-13.06	150	Horz

PK - Peak detector
Av - Average detector

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CH RESTRICTED, AVG, Vertical

Manufacturer: Misfits Wearables
Bandedge
Mode:High Band 2480 Mhz Ch39
Z-Axis
Red=Peak Vert Green=Avg Vert

Peak 2453.5 - 2513.5MHz

Marker No.	Test Frequency	Meter Reading	Detector	EMCO3161-02 S/N 99061052 3m UL (dB)	BOMS Factor (dB)	dBuV/m	BandEdge PK Limit	Margin	BandEdge AV Limit	Margin	Height [cm]	Polarity
1	2479.806	45.3	PK	22	3.77	71.07	n/a	n/a	n/a	n/a	151	Vert
2	2483.65	25.74	PK	22.1	3.77	51.61	74	-22.39	n/a	n/a	100	Vert
3	2500.587	26.96	PK	22.1	3.93	52.99	74	-21.01	n/a	n/a	100	Vert
4	2507.794	27.54	PK	22.1	3.9	53.54	74	-20.46	n/a	n/a	151	Vert

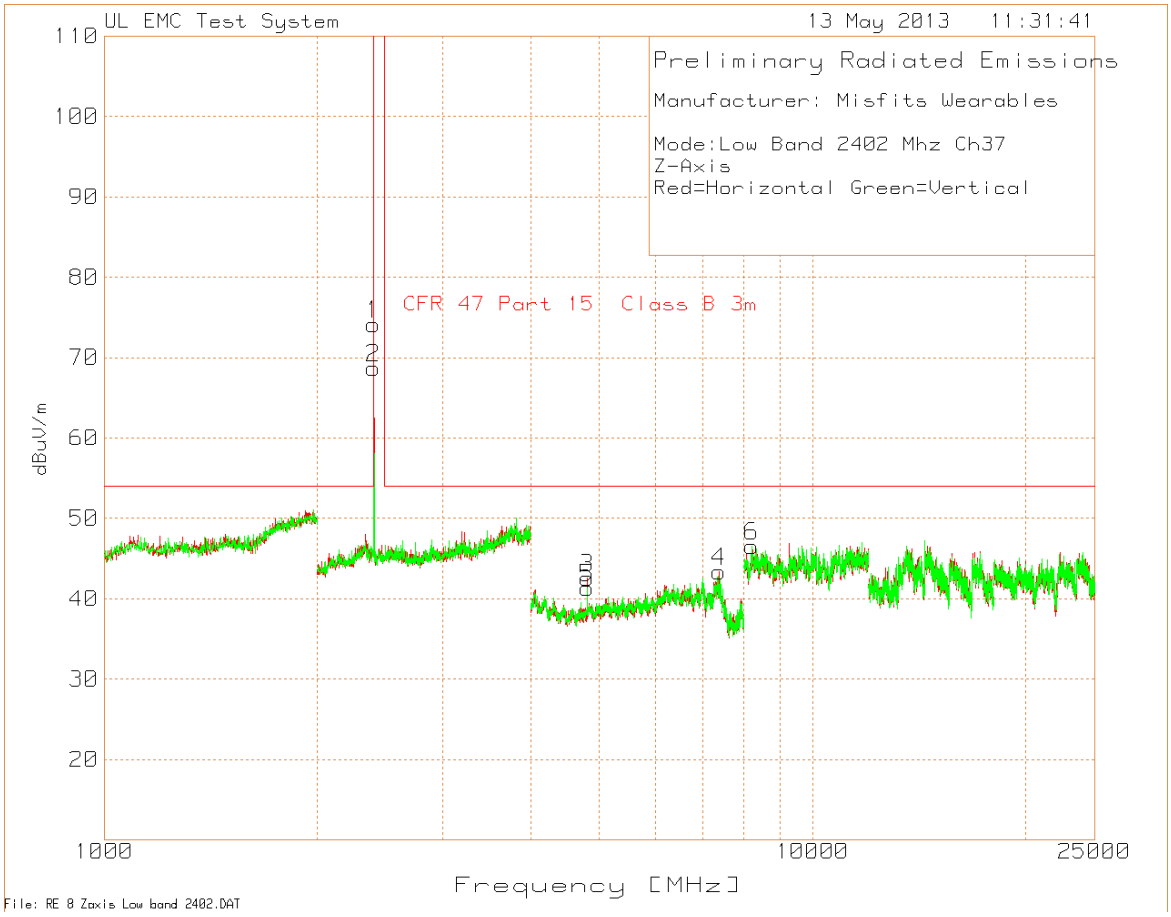
Avearge 2453.5 - 2513.5MHz

Marker No.	Test Frequency	Meter Reading	Detector	EMCO3161-02 S/N 99061052 3m UL (dB)	BOMS Factor (dB)	dBuV/m	BandEdge PK Limit	Margin	BandEdge AV Limit	Margin	Height [cm]	Polarity
5	2480.047	43.9	AV	22	3.77	69.67	n/a	n/a	n/a	n/a	150	Vert
6	2483.53	15.05	AV	22.1	3.77	40.92	n/a	n/a	54	-13.08	150	Vert
7	2500.287	14.89	AV	22.1	3.93	40.92	n/a	n/a	54	-13.08	150	Vert
8	2507.974	14.89	AV	22.1	3.9	40.89	n/a	n/a	54	-13.11	99	Vert

PK - Peak detector
Av - Average detector

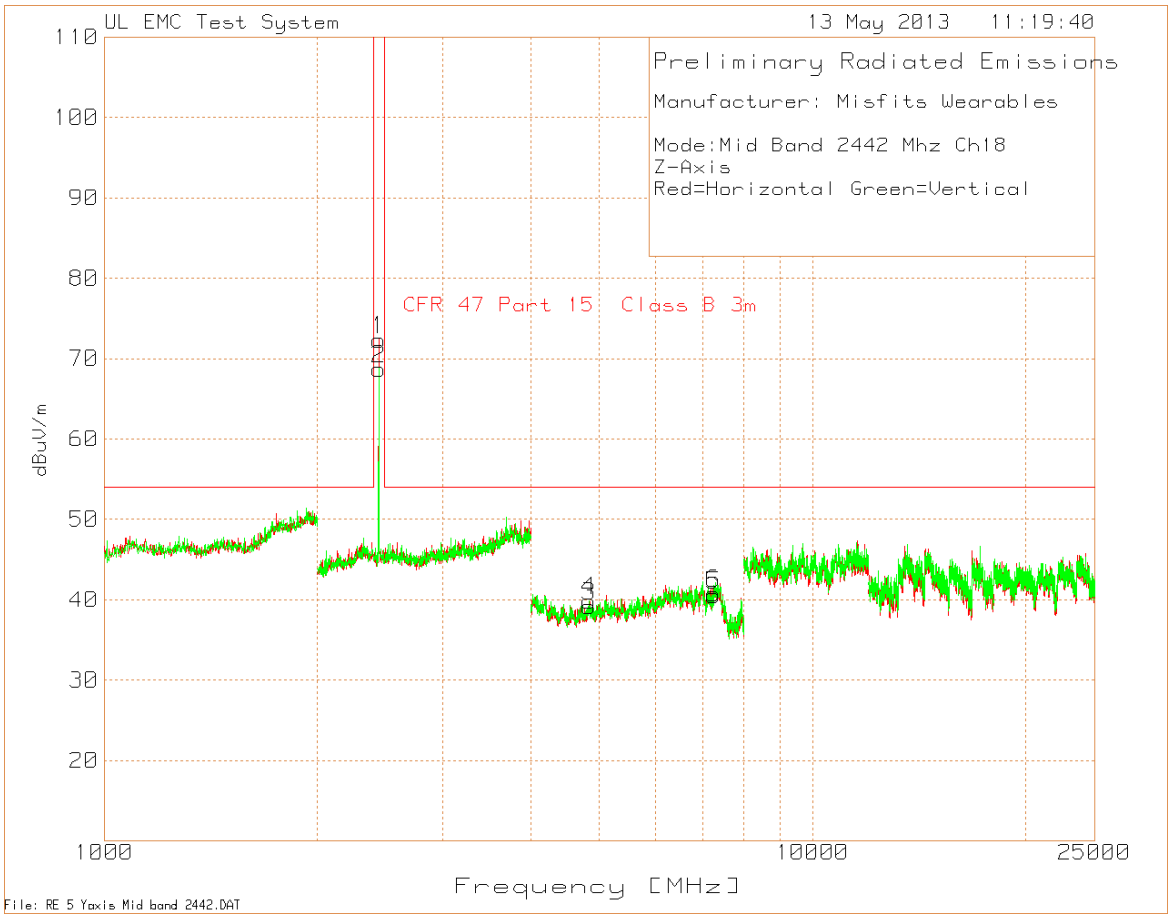
7.2.3. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

Lo CH Z-axis



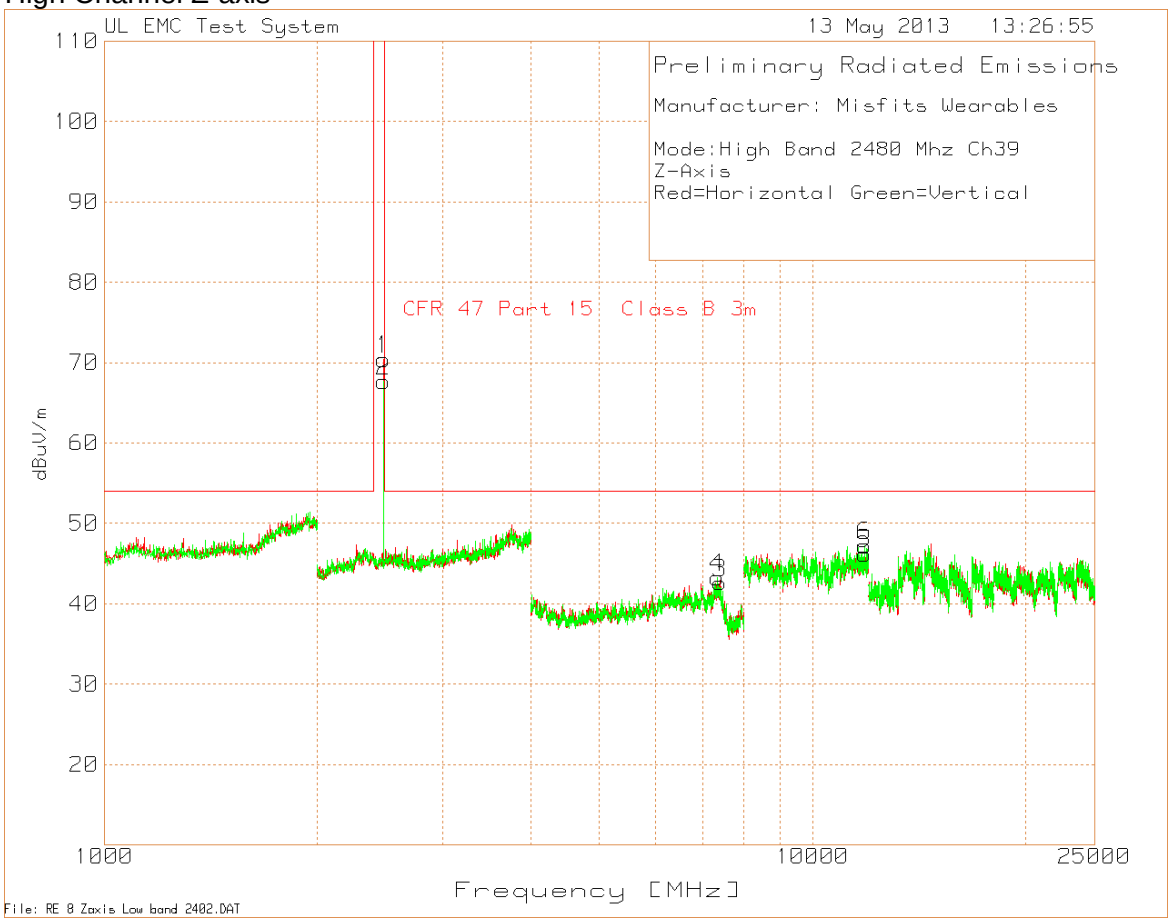
All Emissions at least 6dB from the limit, therefore no further measurements needed.

Mid CH Z-axis



All Emissions at least 6dB from the limit, therefore no further measurements needed.

High Channel Z-axis

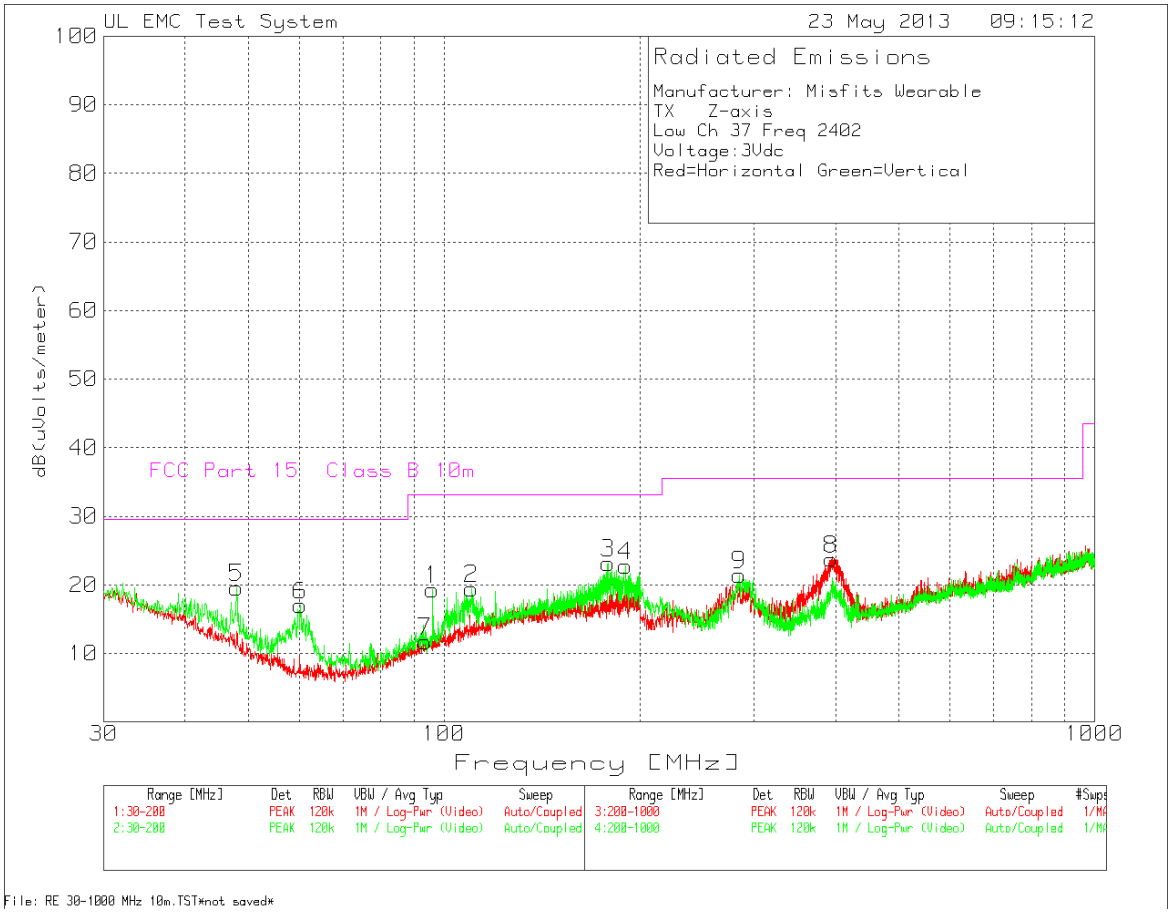


All Emissions at least 6dB from the limit, therefore no further measurements needed.

7.2.4. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz

PLOT



All Emissions at least 6dB from the limit, therefore no further measurements needed.

8. RF EXPOSURE EVALUATION

RF Exposure testing is not required as the device meets the SAR test exclusion criteria of KDB 447498 D01 v05

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
0.0	1	5	2.480	0.3

Conclusion:

The computed value is < 3; therefore, Bluetooth qualifies for Standalone SAR test exclusion.