FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

Pedometer

MODEL NUMBER: SC

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

REPORT NUMBER: 10629147A-1

ISSUE DATE: March 24, 2015
Revision Date: March 27, 2015

Prepared for
Misfit
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Prepared by
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	03/24/15	Initial Issue	M.Ferrer
1	03/27/15	Updated OCBW, Duty cycle factor, RE data	M.Ferrer

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Misfit
839 Mitten Rd. Suite 100
Burlingame, CA 94010

EUT DESCRIPTION: Pedometer

MODEL: SC

SERIAL NUMBER: Prototype

DATE TESTED: March 20, 2015 – March 27, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex A2.9	Pass
INDUSTRY CANADA RSS-GEN Issue 4	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 LLC By:

Bart Mucha
Staff Engineer
UL LLC

Tested By:

MICHAEL FERRER
Program Manager
UL LLC

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, 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. The full scope of accreditation can be viewed at http://ts.nist.gov/Standards/scopes/1004140.htm

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)

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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	2.94

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a pedometer. The EUT contains a wireless BTLE transceiver. The EUT is battery powered

The radio module is manufactured by Misfit.

5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output peak E-field as follows:

Frequency Range (MHz)	Mode	Output PK E-field Strength (dBuV/m)
2400-2483.5	TX	80.90

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a trace antenna, with a maximum gain of 0 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

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

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5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
EUT	Misfits Wearables	SC	-	PT3-SC

I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	DC	Wire	0.1	Only for testing purposes
2	Serial	1	IO	Wire	0.1	Only for testing purposes

TEST SETUP

The EUT was programmed using a PC connected via serial port. The EUT was powered via DC power supply to maintain constant 3VDC. Normally EUT is battery powered internally and no external connection accessible.

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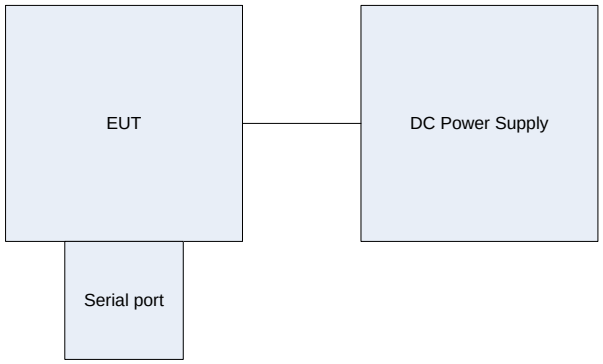
SETUP DIAGRAM FOR TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List					
Description	**Manufacturer**	**Model**	**T No.**	**Cal Date**	**Cal Due**
Radiated Software	UL	UL EMC	Ver 9.5, Jan 30, 2015		
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20141230	20151231
Bicon Antenna	Chase	VBA6106A	EMC4078	20140401	20150401
Log-P Antenna	Chase	UPA6109	EMC4313	24141119	20151130
Spectrum Analyzer	Rohde & Schwarz	ESU	EMC4323	20141216	20151231
Antenna Array	UL	BOMS	EMC4276	20141201	20151231
EMI Test Receiver	Agilent	N9030A	EMC4360	20141219	20151219

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7. TEST RESULTS

7.1. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

7.2. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
BLE	0.895	78.780	0.011	1.14%	38.89	1.117

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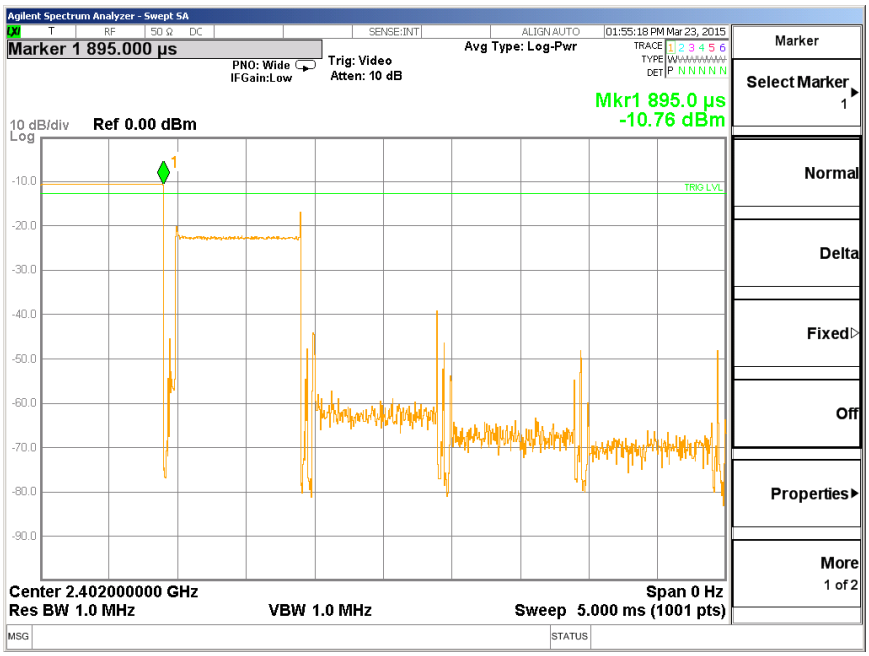
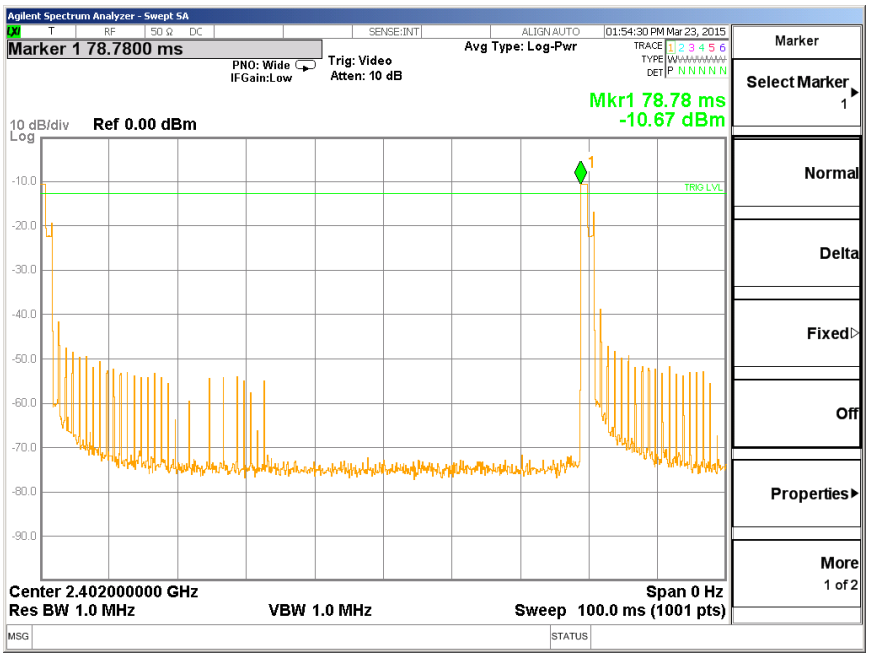
7.3. DUTY CYCLE PLOTS

DUTY CYCLE BLE MODE





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7.3.1. 99% 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	1.712	1.443
Middle	2442	1.732	1.492
High	2480	1.729	1.722

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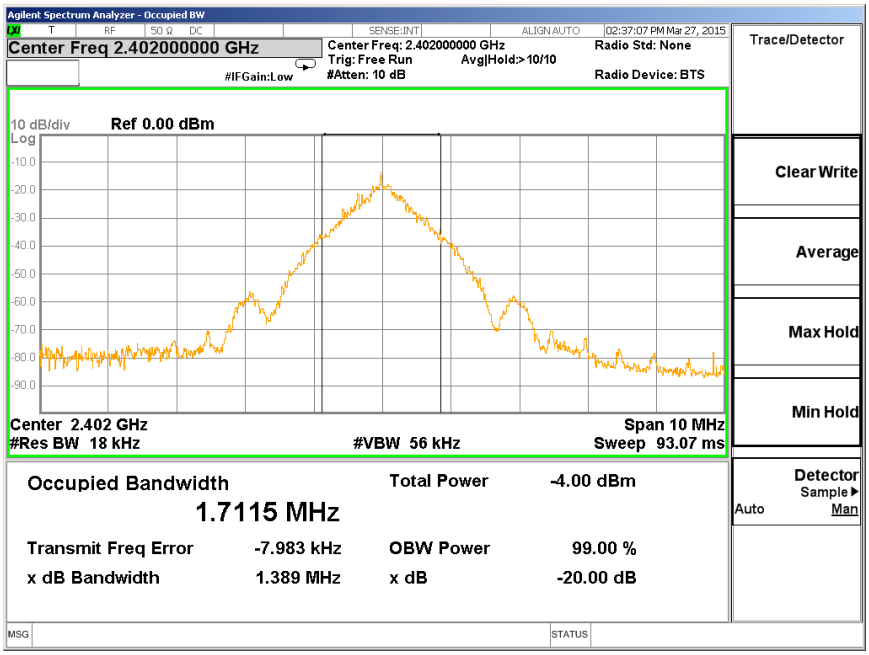
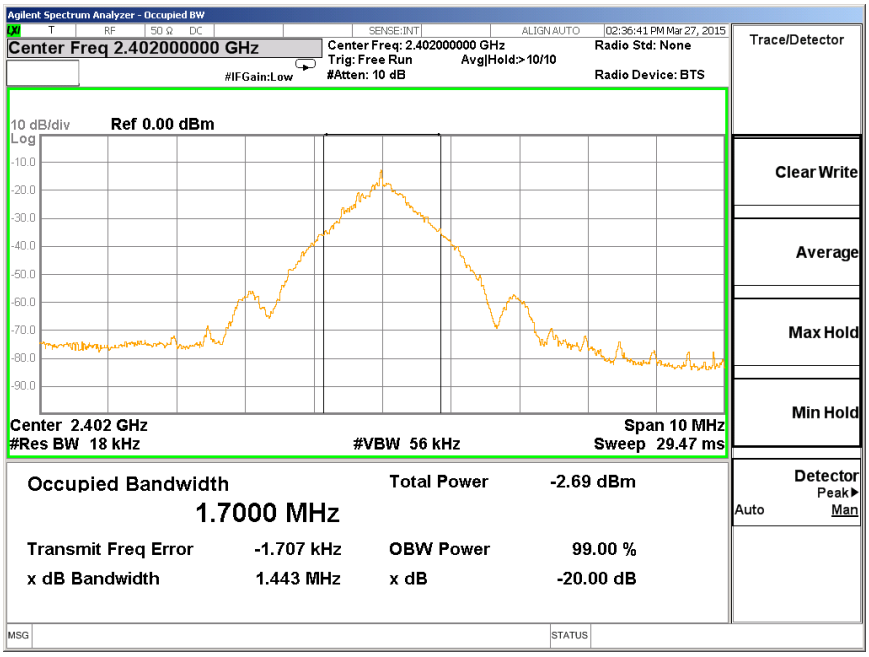
99% and 20dB BANDWIDTH

BANDWIDTH LOW CH
99%



20dB



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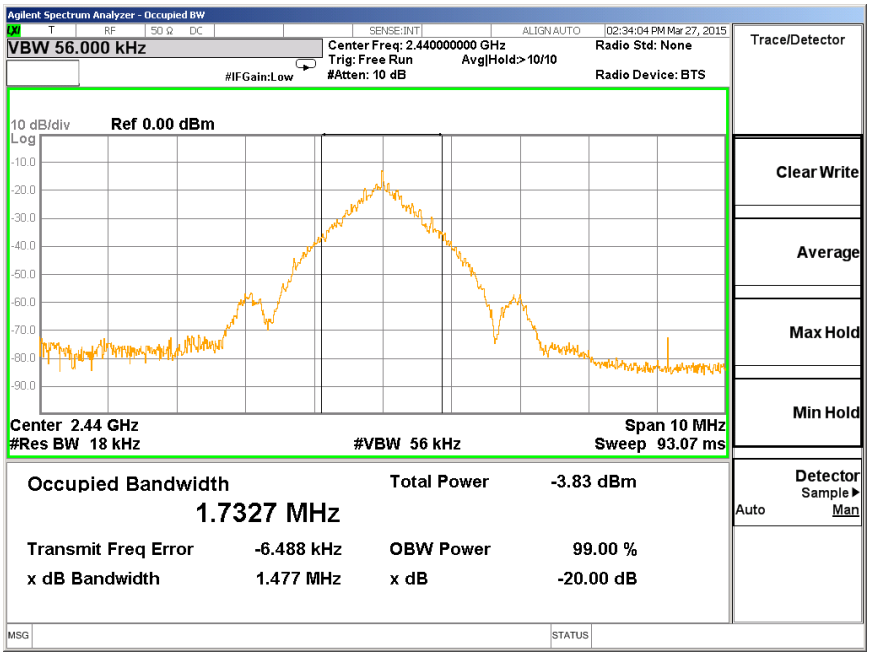
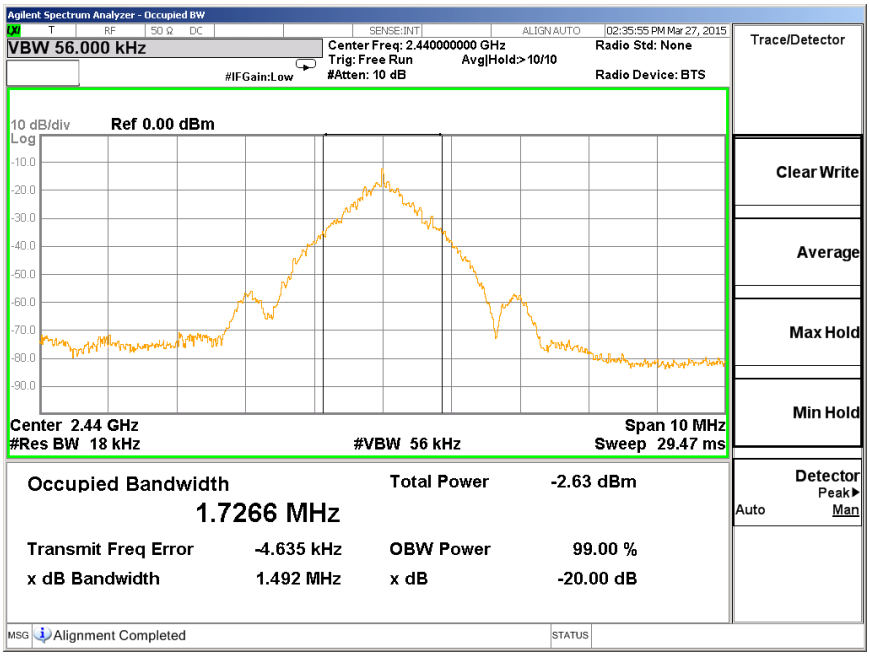
BANDWIDTH MID CH

99%



20dB



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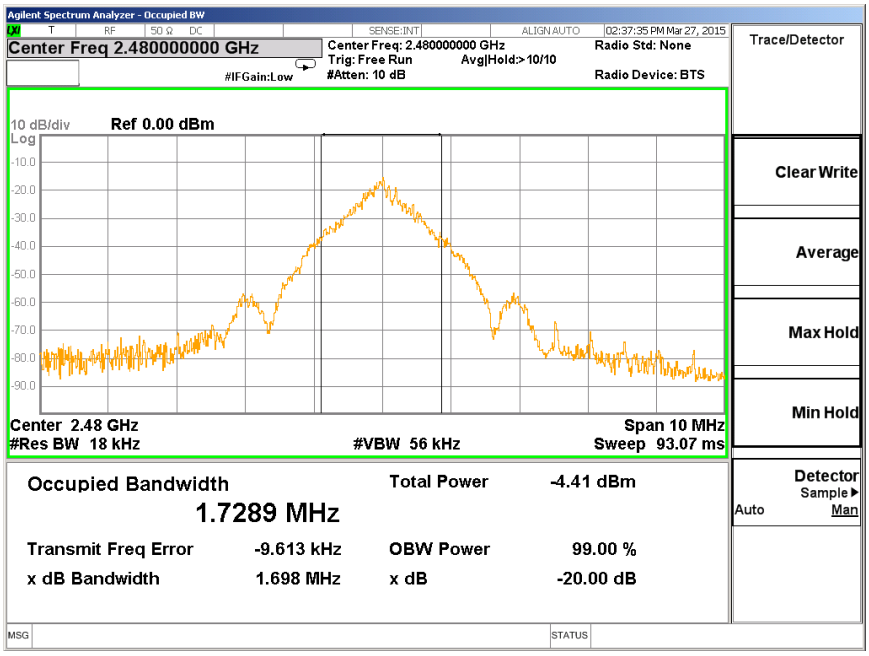
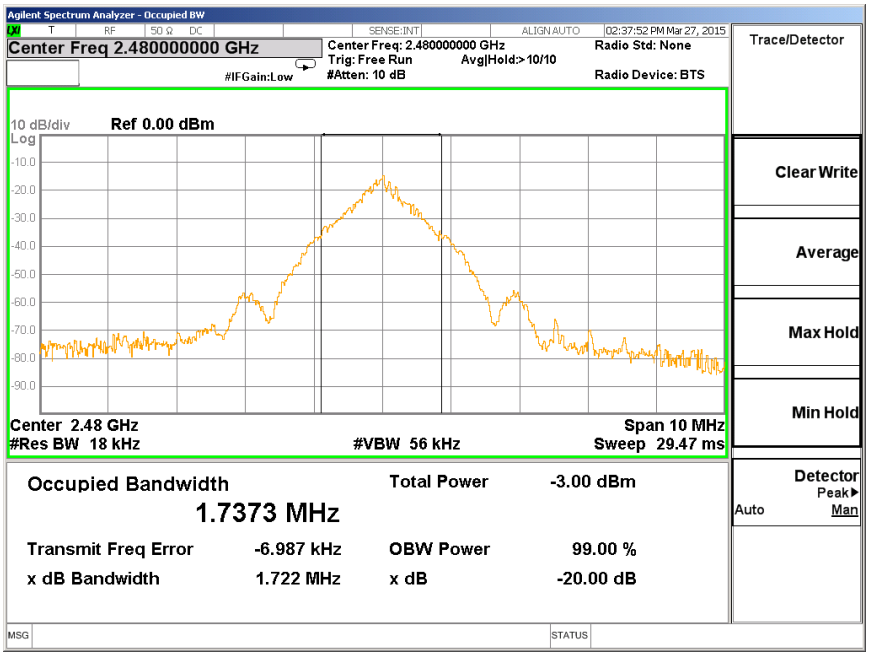
BANDWIDTH HIGH CH

99%



20dB



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7.4. RADIATED EMISSIONS

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.

Peak 1MHz RBW, 1MHz VBW

Duty cycle -38.89dB used with Peak measurement to determine AV measurement.

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RESULTS

7.4.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION

TX Transmitter
Worst Case and Fundamental
3VDC

Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Gain/Loss (dB)	Corrected Reading dBuV/m	Peak Limit	Margin (dB)	Duty Cycle Correction dB	AV Correction dBuV/m	AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4399	54.42	Pk	21.9	4.58	80.9	114	-92.1	-38.89	42.01	94	-51.99	305	109	H
2.44	52.11	Pk	21.9	4.58	78.59	114	-92.1	-38.89	39.7	94	-54.3	325	116	V
2.4023	52.47	Pk	21.8	4.58	78.85	114	-92.2	-38.89	39.96	94	-54.04	285	100	H
2.4023	47.87	Pk	21.8	4.58	74.25	114	-92.2	-38.89	35.36	94	-58.64	324	119	V
2.4776	54.34	Pk	22	4.36	80.7	114	-92	-38.89	41.81	94	-52.19	288	100	H
2.4783	47.7	Pk	22	4.36	74.06	114	-92	-38.89	35.17	94	-58.83	309	119	V

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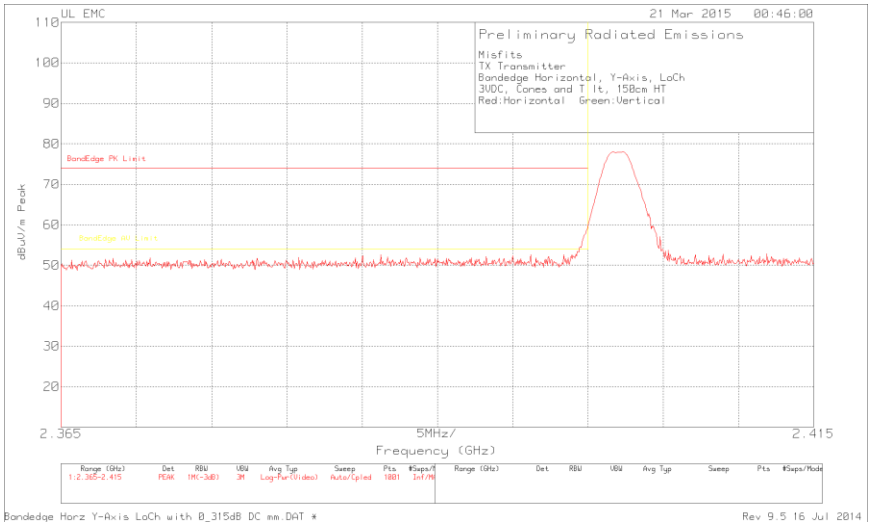
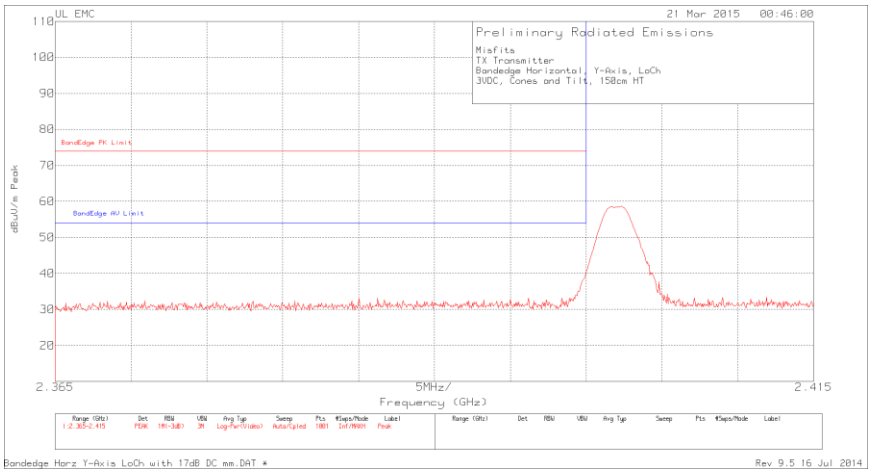
7.4.2. TRANSMITTER RESTRICTED BAND EDGES

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, Horizontal
Peak



AV



AV plot shows only a -19dB Duty Cycle correction. Text data shows correct -38dB Duty Cycle correction

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Misfits
TX Transmitter
Bandedge Horizontal, Y-Axis, LoCh
3VDC, Cones and Tilt, 150cm HT

Test Frequency (GHz)	Meter Reading(dBuV)	Detector	Antenna Factor dB/m	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4	38.15	PK	21.8	59.95	74	-14.05	-	-	302	100	H
2.4017	56.19	PK	21.8	77.99	-	-	-	-	302	100	H
2.3923	30	PK	21.8	51.8	74	-22.2	54	-2.2	302	100	H

Test Frequency (GHz)	Meter Reading(dBuV)	Detector	Antenna Factor dB/m	Duty Cycle	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4	38.15	PK	21.8	-38.89	21.06	74	-52.94	54	-32.94	302	100	H
2.4017	56.19	PK	21.8	-38.89	39.1	-	-	-	-	302	100	H
2.3923	30	PK	21.8	-38.89	12.91	74	-61.09	54	-41.09	302	100	H

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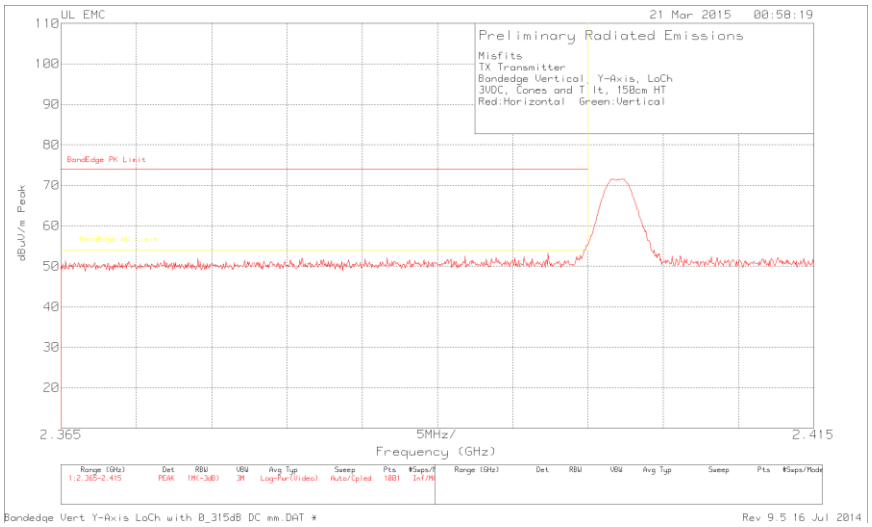
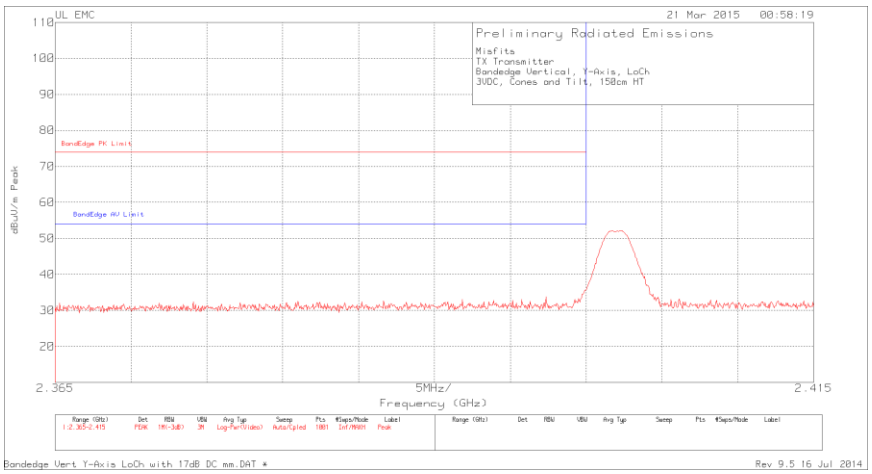
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, Vertical
Peak



AV



AV plot shows only a -19dB Duty Cycle correction. Text data shows correct -38dB Duty Cycle correction

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Misfits
TX Transmitter
Bandedge Vertical, Y-Axis, LoCh
3VDC, Cones and Tilt, 150cm HT

Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4016	49.73	PK	21.8	71.53	-	-	-	-	154	100	V
2.4	33.43	PK	21.8	55.23	74	-18.77	-	-	154	100	V
2.3882	29.86	PK	21.8	51.66	74	-22.34	54	-2.34	154	100	V

Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Duty Cycle correction	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4016	49.73	PK	21.8	-38.89	32.64	-	-	-	-	154	100	V
2.4	33.43	PK	21.8	-38.89	16.34	74	-57.66	54	-37.66	154	100	V
2.3882	29.86	PK	21.8	-38.89	12.77	74	-61.23	54	-41.23	154	100	V

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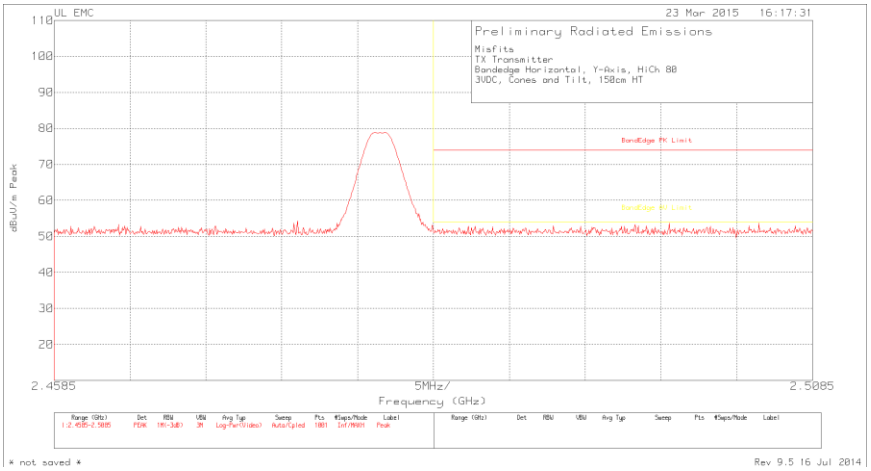
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, Horizontal
Peak



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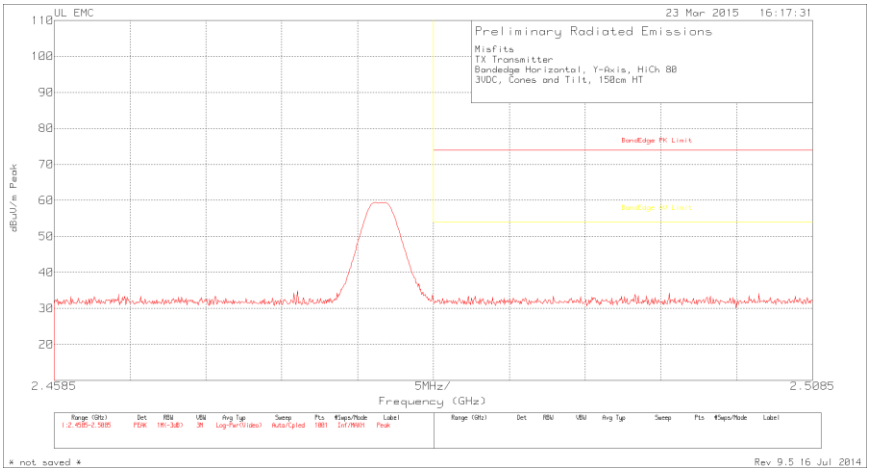

AV plot shows only a -19dB Duty Cycle correction. Text data shows correct -38dB Duty Cycle correction

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Misfits
TX Transmitter
Bandedge Horizontal, Y-Axis, HiCh 80
3VDC, Cones and Tilt, 150cm HT

Test Frequency (GHz)	Meter Reading(dBuV)	Detector	Antenna Factor dB/m	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4804	56.85	PK	22	78.85	-	-	-	-	292	99	H
2.4835	31.11	PK	22.1	53.21	-	-	-	-	292	99	H
2.4868	30.19	PK	22.1	52.29	74	-21.71	54	-1.71	292	99	H

Test Frequency (GHz)	Meter Reading(dBuV)	Detector	Antenna Factor dB/m	Duty Cycle	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4804	56.85	PK	22	-38.89	39.96	-	-	-	-	292	99	H
2.4835	31.11	PK	22.1	-38.89	14.32	-	-	-	-	292	99	H
2.4868	30.19	PK	22.1	-38.89	13.4	74	-60.6	54	-40.6	292	99	H

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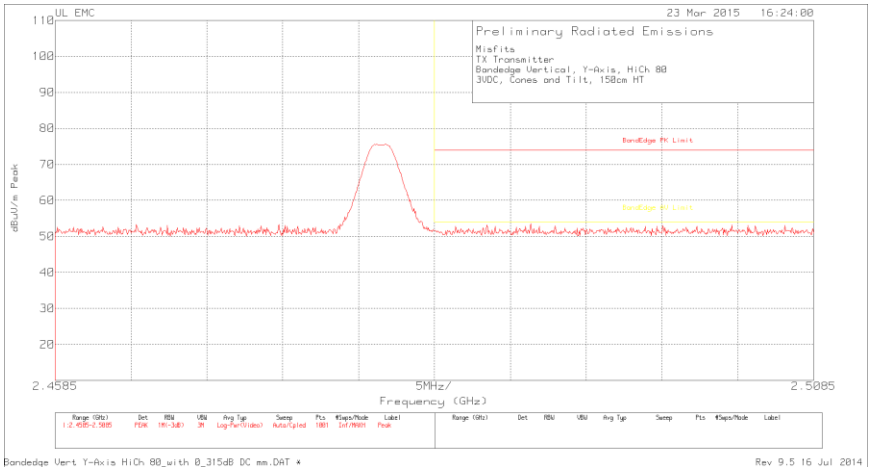
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, Vertical
Peak



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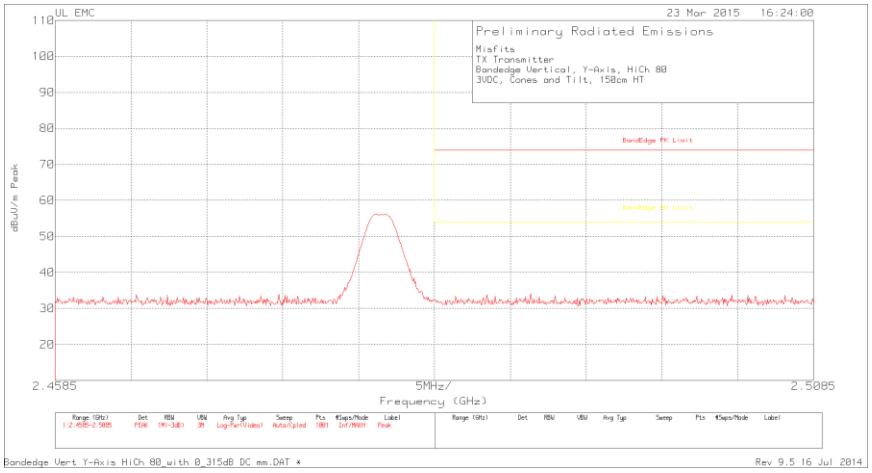

AV plot shows only a -19dB Duty Cycle correction. Text data shows correct -38dB Duty Cycle correction

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333 Pfingsten Rd., Northbrook, IL 60062, USA

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TEL: (847) 272-8800

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Misfits
TX Transmitter
Bandedge Vertical, Y-Axis, HiCh 80
3VDC, Cones and Tilt, 150cm HT

Test Frequency (GHz)	Meter Reading(dBuV)	Detector	Antenna Factor dB/m	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4804	53.43	PK	22	75.43	-	-	-	-	173	122	V
2.4835	29.66	PK	22.1	51.76	74	-22.24	54	-2.24	173	122	V
2.487	31.11	PK	22.1	53.21	74	-20.79	54	-0.79	173	122	V

Test Frequency (GHz)	Meter Reading(dBuV)	Detector	Antenna Factor dB/m	Duty Cycle	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
2.4804	53.43	PK	22	-38.89	36.54	-	-	-	-	173	122	V
2.4835	29.66	PK	22.1	-38.89	12.87	74	-61.13	54	-41.13	173	122	V
2.487	31.11	PK	22.1	-38.89	14.32	74	-59.68	54	-39.68	173	122	V

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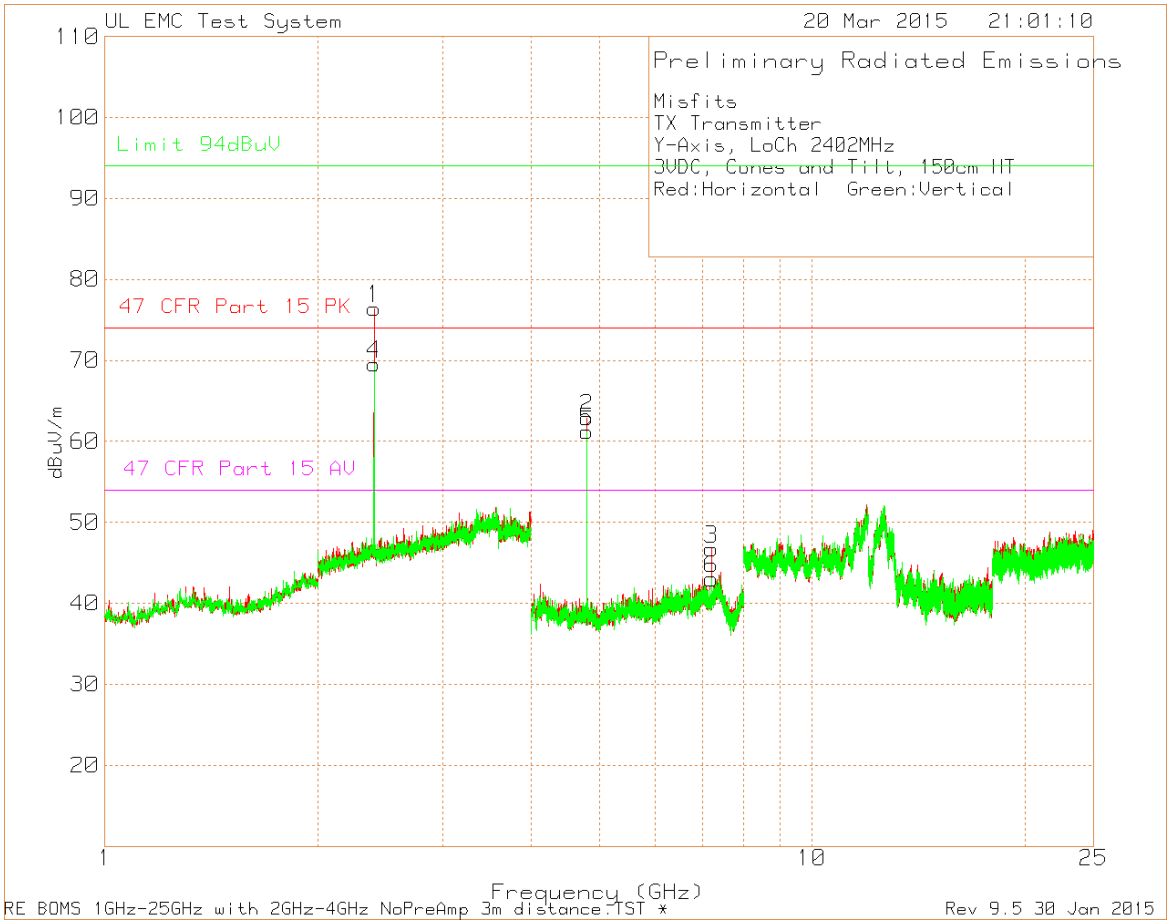
7.4.3. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

SPURIOUS EMISSIONS 1 TO 25 GHz (TX mode)



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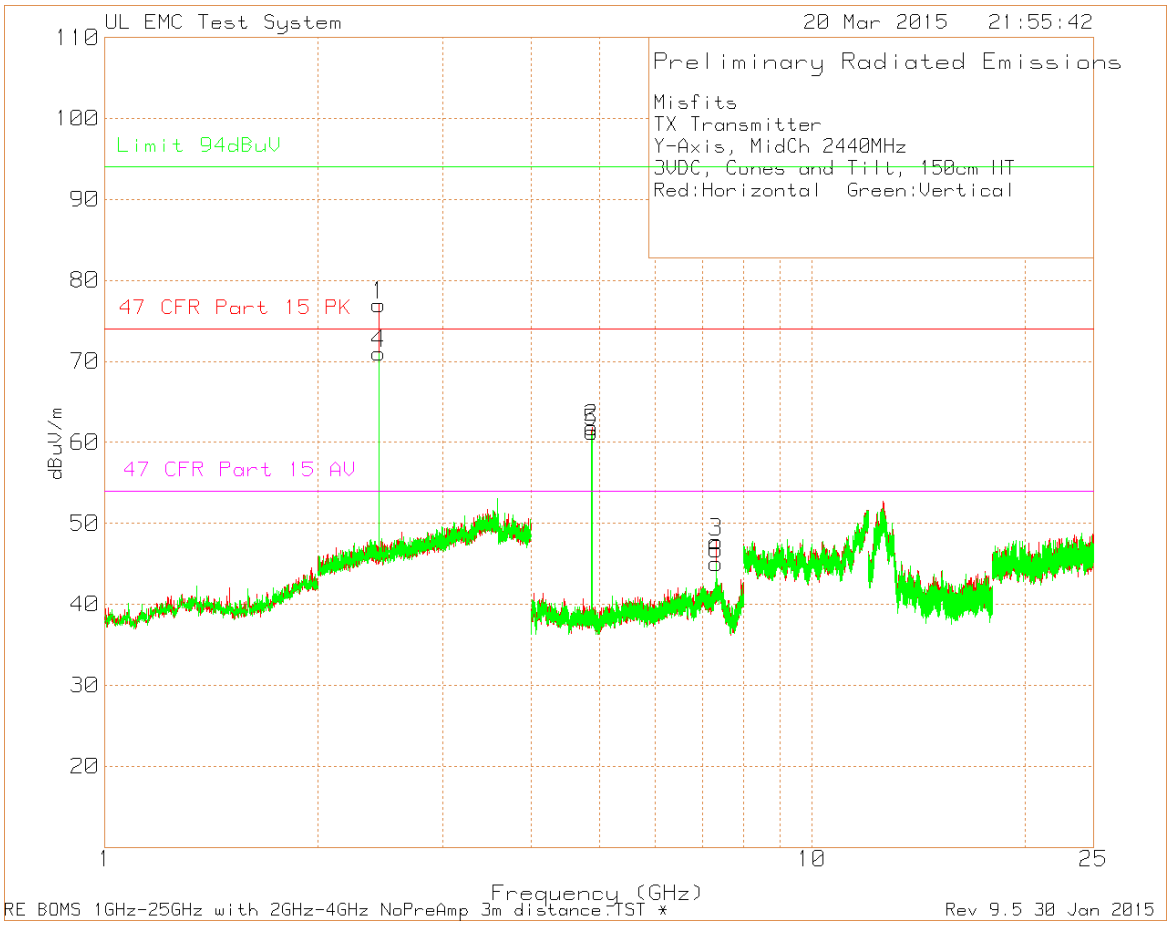

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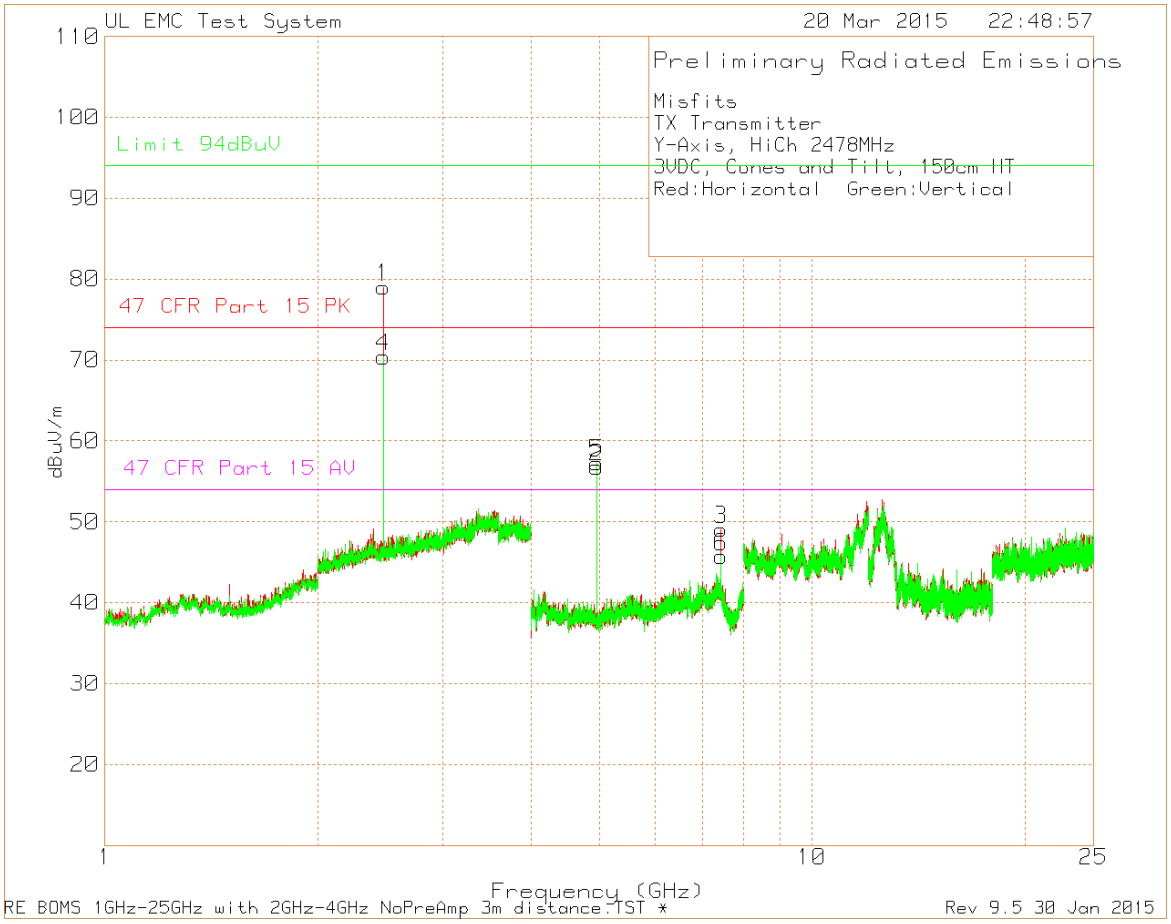

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Misfits
TX Transmitter
Y-Axis,
3VDC, Cones and Tilt, 150cm HT
Red:Horizontal Green:Vertical

Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Gain/Loss (dB)	Corrected Reading dBuV/m	47 CFR Part 15 PK	Margin (dB)	Duty Cycle correction dB	AV Reading dBuV/m	47 CFR Part 15 AV	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
4.8032	86.47	Pk	27.7	-50.66	63.51	74	-10.49	-38.89	24.62	54	-29.38	13	100	H
4.8032	84.85	Pk	27.7	-50.66	61.89	74	-12.11	-38.89	23	54	-31	165	100	V
7.2048	65.4	Pk	29.7	-46.66	48.44	74	-25.56	-38.89	9.55	54	-44.45	235	100	H
7.2049	62.53	Pk	29.7	-46.66	45.57	74	-28.43	-38.89	6.68	54	-47.32	153	100	V
4.8792	84.98	Pk	27.7	-50.34	62.34	74	-11.66	-38.89	23.45	54	-30.55	260	100	H
4.8792	84.53	Pk	27.7	-50.34	61.89	74	-12.11	-38.89	23	54	-31	183	100	V
7.3191	65.21	Pk	30.6	-45.88	49.93	74	-24.07	-38.89	11.04	54	-42.96	232	100	H
7.3189	63.81	Pk	30.6	-45.87	48.54	74	-25.46	-38.89	9.65	54	-44.35	146	100	V
4.9593	81.95	Pk	27.8	-50.74	59.01	74	-14.99	-38.89	20.12	54	-33.88	0	100	H
4.9592	81.56	Pk	27.8	-50.74	58.62	74	-15.38	-38.89	19.73	54	-34.27	174	100	V
7.4395	66.2	Pk	30.6	-46.8	50	74	-24	-38.89	11.11	54	-42.89	253	100	H
7.4394	65.5	Pk	30.6	-46.8	49.3	74	-24.7	-38.89	10.41	54	-43.59	152	100	V

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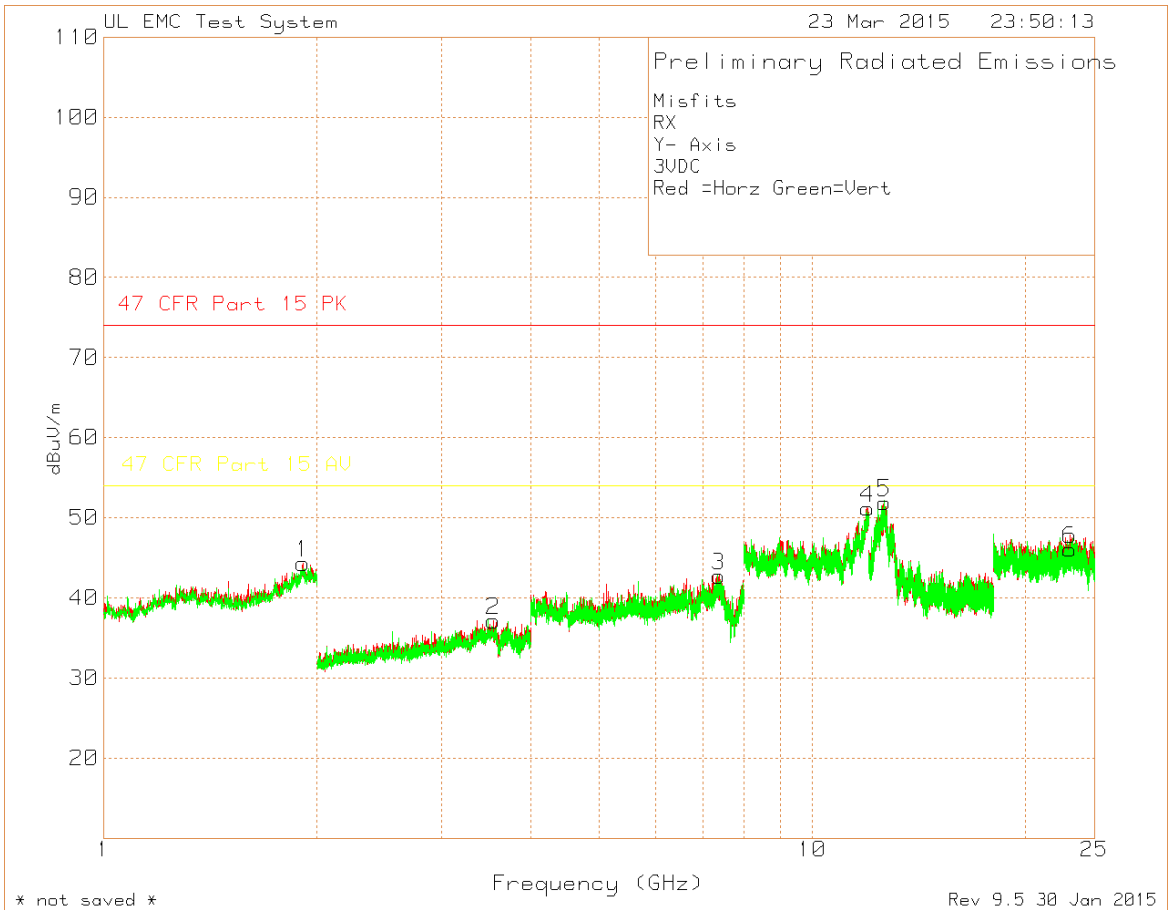
SPURIOUS EMISSIONS 1 TO 25 GHz (RX mode)



All emissions visible emission at least 6dB below the limit or under noise floor, therefore no further measurements needed.

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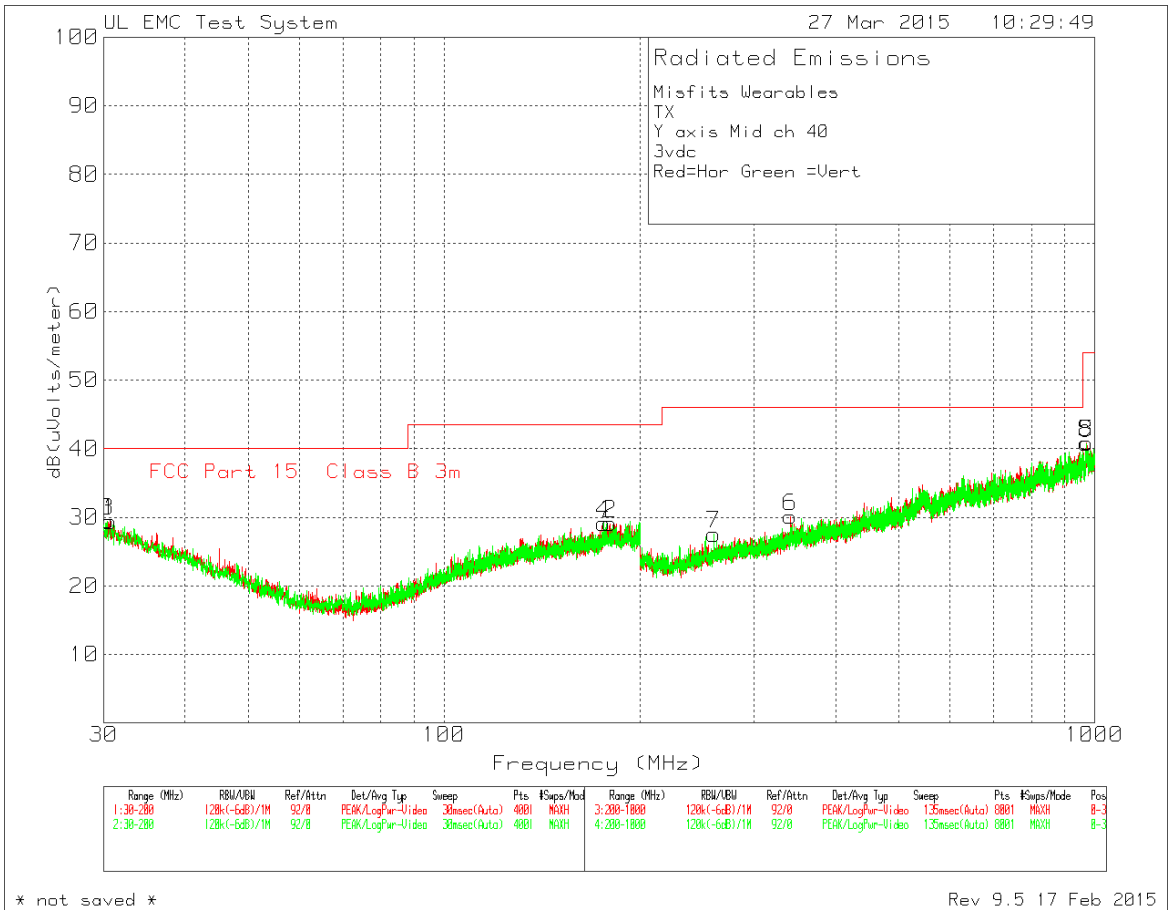
7.4.4. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz



No visible emissions above noise floor, therefore no further emissions

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