



**FCC 47 CFR PART 15 SUBPART C  
INDUSTRY CANADA RSS-247 ISSUE 1**

**BLUETOOTH LOW ENERGY  
CERTIFICATION TEST REPORT**

**FOR**

**WEARABLE DEVICE**

**MODEL NUMBERS:  
FTW1000, FTW1001, FTW1002, FTW1003**

**FCC ID: 2AB8ZND4  
IC: 1000X-ND4**

**REPORT NUMBER: 15U20523-E1**

**ISSUE DATE: JUNE 16, 2015**

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**NVLAP LAB CODE 200065-0**

Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/16/2015	Initial Issue	C. Pang

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** INTEL CORPORATION  
2200 MISSION COLLEGE BOULEVARD  
SANTA CLARA, CA 95052, U.S.A

**EUT DESCRIPTION:** WEARABLE DEVICE

**MODEL:** FTW1001 and FTW1002

**SERIAL NUMBER:** CL8354FZ521009S and CL8354FZ52100AX

**DATE TESTED:** JUNE 09-12, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 1	Pass
INDUSTRY CANADA RSS-GEN Issue 4	Pass

UL Verification Services Inc. 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 Verification Services Inc. 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.

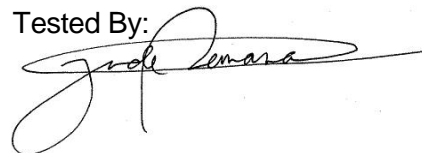
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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  
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Tested By:



JUDE SEMANA  
EMC LABORATORY TECHNICIAN  
UL VERIFICATION SERVICES INC.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-247 Issue 1, and ANSI C63.10-2009 for FCC test and ANSI C63.10-2013 with deviation of measurement height of 0.8m rather than 1.5m for IC test.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
<input checked="" type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D
<input checked="" type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E
<input checked="" type="checkbox"/> Chamber C	<input type="checkbox"/> Chamber F
	<input type="checkbox"/> Chamber G
	<input type="checkbox"/> Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.

Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.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

Where relevant, the following sample calculation is provided:

$$\begin{aligned}\text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m}\end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	$\pm 3.52$ dB
Radiated Disturbance, 30 to 1000 MHz	$\pm 4.94$ dB
Radiated Disturbance, 1 to 6 GHz	$\pm 3.86$ dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a wearable device intended for Health tracking. The device incorporates a BLE radio with an integral antenna.

The EUT is battery powered and incorporates wireless charging.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	3.85	2.42

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was DVT, rev. build 1883.

### 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission was 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 and Z orientation, it was determined that X orientation was worst-case orientation for the EUT without metal band and the Y orientation was worst-case orientation for the EUT with metal band, therefore, all final radiated testing was performed with the EUT in X orientation without metal band and Y orientation with metal band.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	20332	YB04282152	None
Pass Thru Board	Intel	N/A	N/A	None

### I/O CABLES

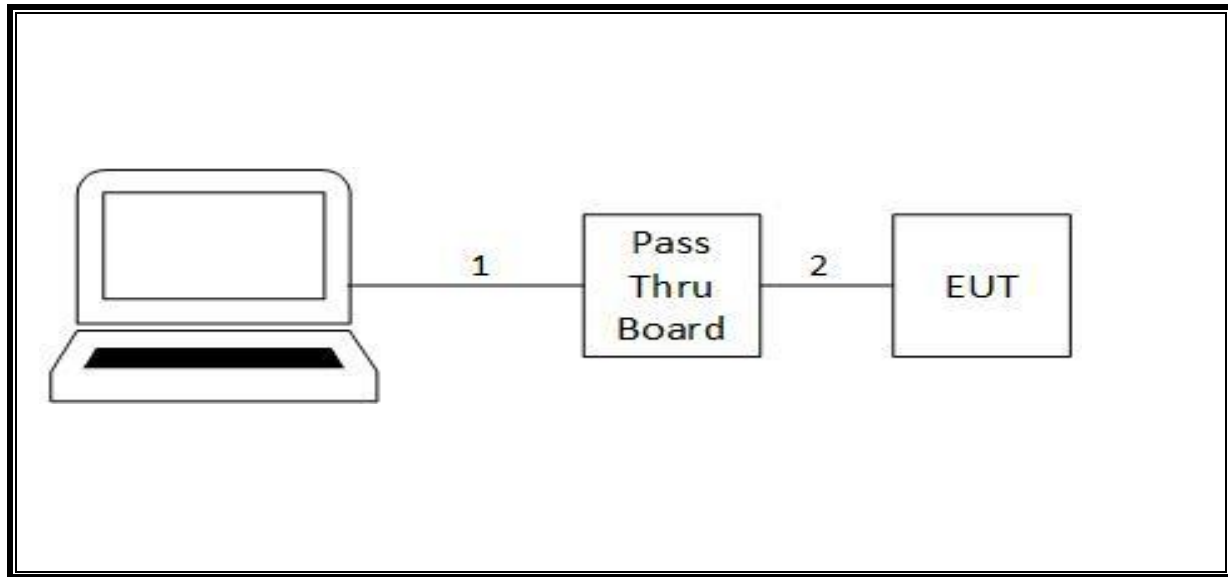
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB B	shielded	1	Laptop to Pass Thru Board
2	DATA	1	Soldered Pins	Unshielded	0.03	Pass Thru Board to EUT

### TEST SETUP

The EUT is continuously transmitting during the tests.



**SETUP DIAGRAM FOR TESTS**



## 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, July 22, 2014		
Antenna, Horn 1-18GHz	ETS	3117	345	03/03/2015	03/03/2016
Antenna, Horn 1-18GHz	ETS	3117	119	01/25/2015	01/15/2016
Spectrum Analyzer, PXA, 3Hz-44GHz	Agilent	N8030A	342	06/25/2014	06/25/2015
Spectrum Analyzer, PXA, 3Hz-44GHz	Agilent	E4446A	99	06/03/2014	06/03/2015
Antenna, Broadband Hybrid, 30Mhz - 1000Mhz	Sunol Sciences	JB1	243	12/08/2014	12/08/2015
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	1049	12/17/2014	12/17/2015
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Agilent	8449B	N/A	10/4/2014	10/4/2015
Power Meter, P-series single channel	Agilent	N1911A	229	08/07/2014	08/07/2015
Power Sensor, Peak and average, 50MHz-6 GHz, 5MHz BW	Agilent	E9323A	117	03/09/2015	03/09/2016

## 7. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v03r02, Section 8.1.

Output Power: KDB 558074 D01 v03r02, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r02, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r02, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r02, Section 12.1.

Band-edge: KDB 558074 D01 v03r02, Section 12.1

## 8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

### LIMITS

None; for reporting purposes only.

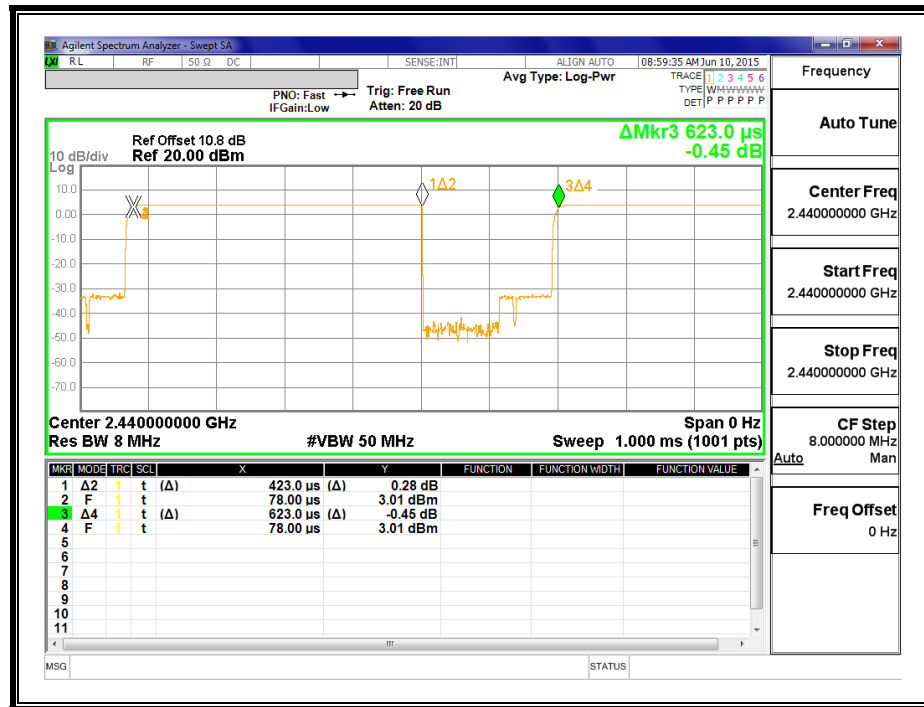
### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

### 8.1. 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	0.423	0.623	0.679	67.90%	1.68	2.364

## DUTY CYCLE PLOTS



## 9. ANTENNA PORT TEST RESULTS

### 9.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.247 (a) (2)

IC RSS-247 (5.2) (1)

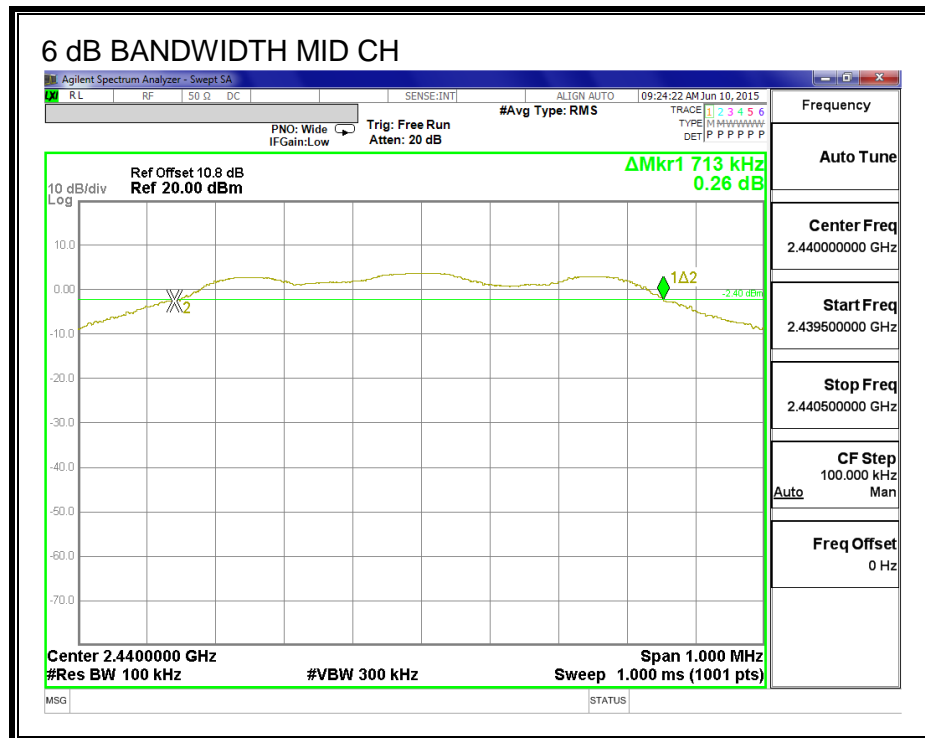
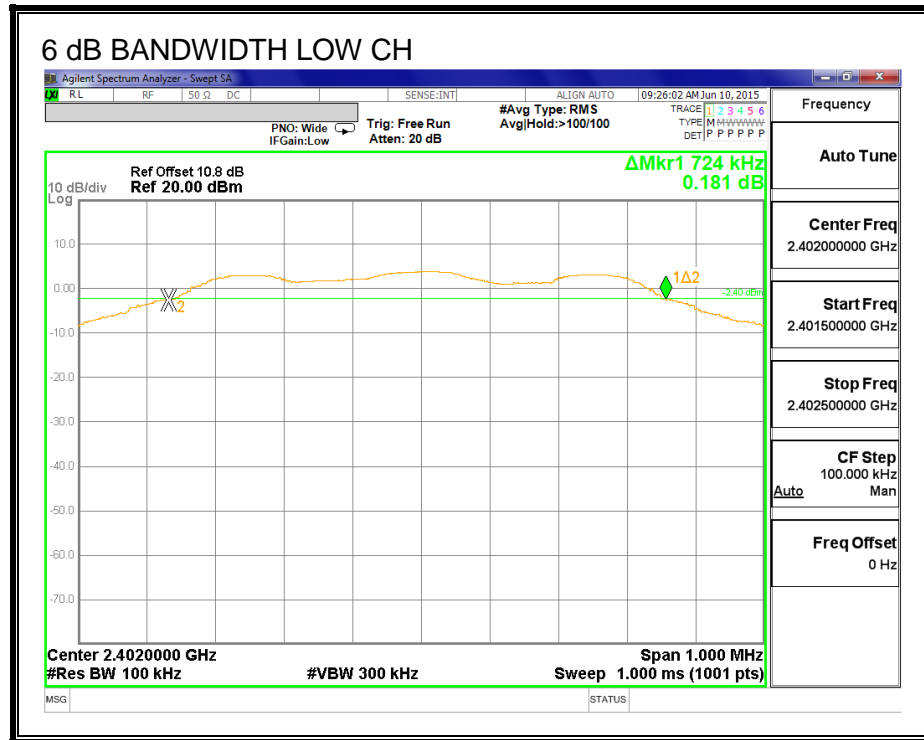
The minimum 6 dB bandwidth shall be at least 500 kHz.

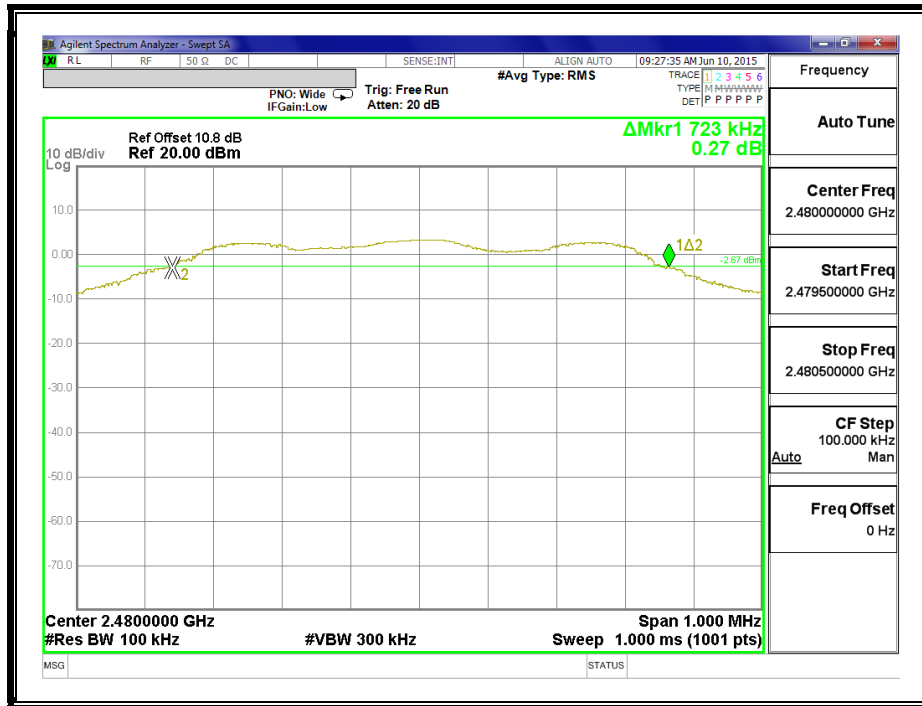
#### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7240	0.5
Middle	2440	0.7130	0.5
High	2480	0.7230	0.5

#### 6 dB BANDWIDTH PLOTS

## 6 dB BANDWIDTH PLOTS







## 9.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

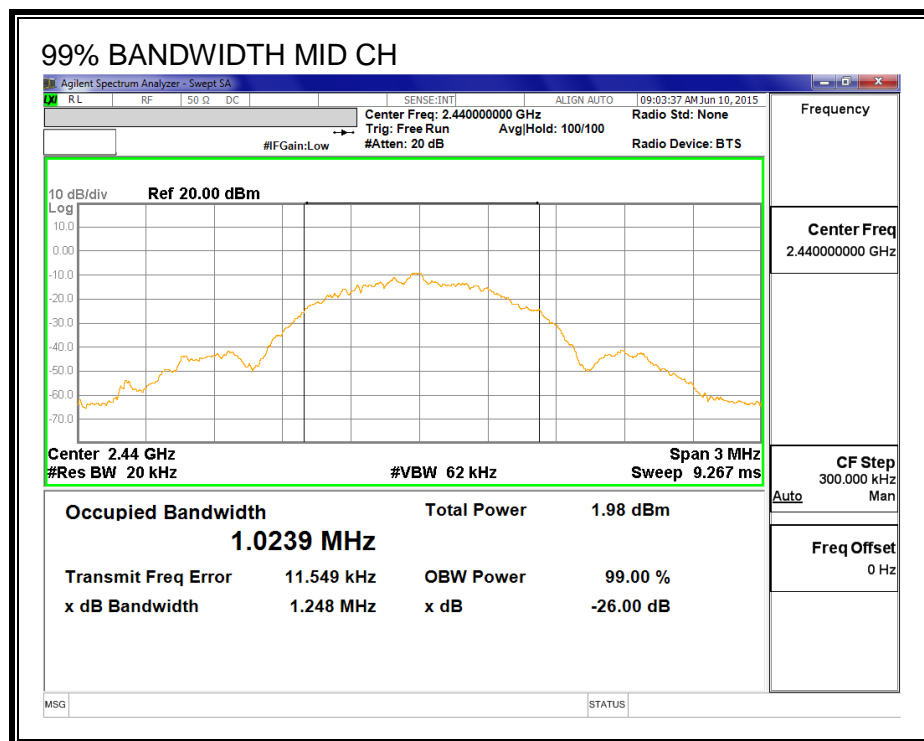
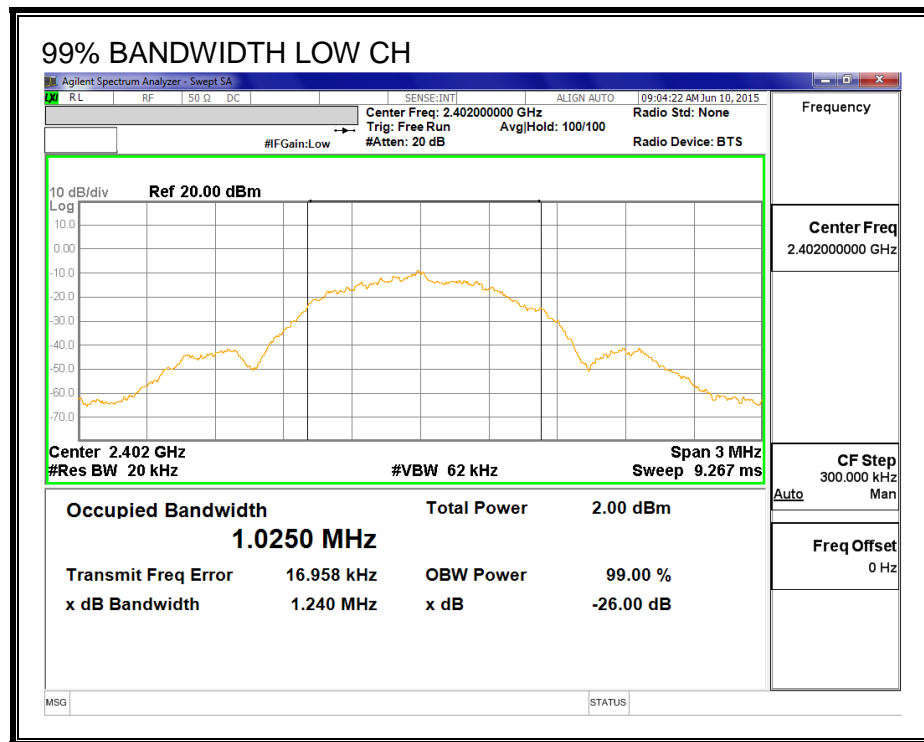
### TEST PROCEDURE

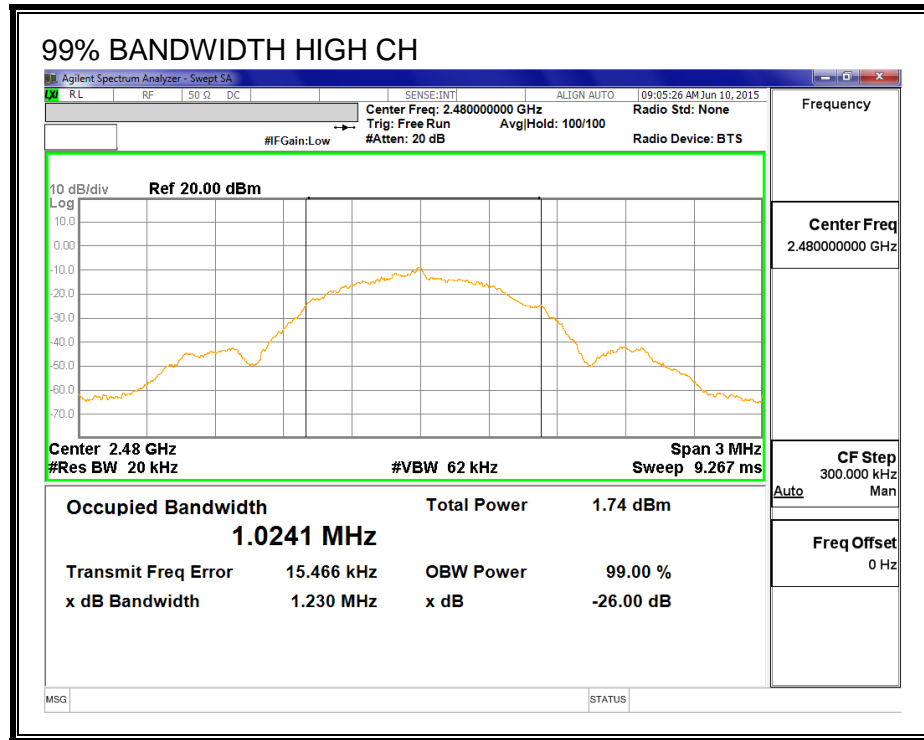
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0250
Middle	2440	1.0239
High	2480	1.0241

## 99% BANDWIDTH





### 9.3. OUTPUT POWER

#### LIMITS

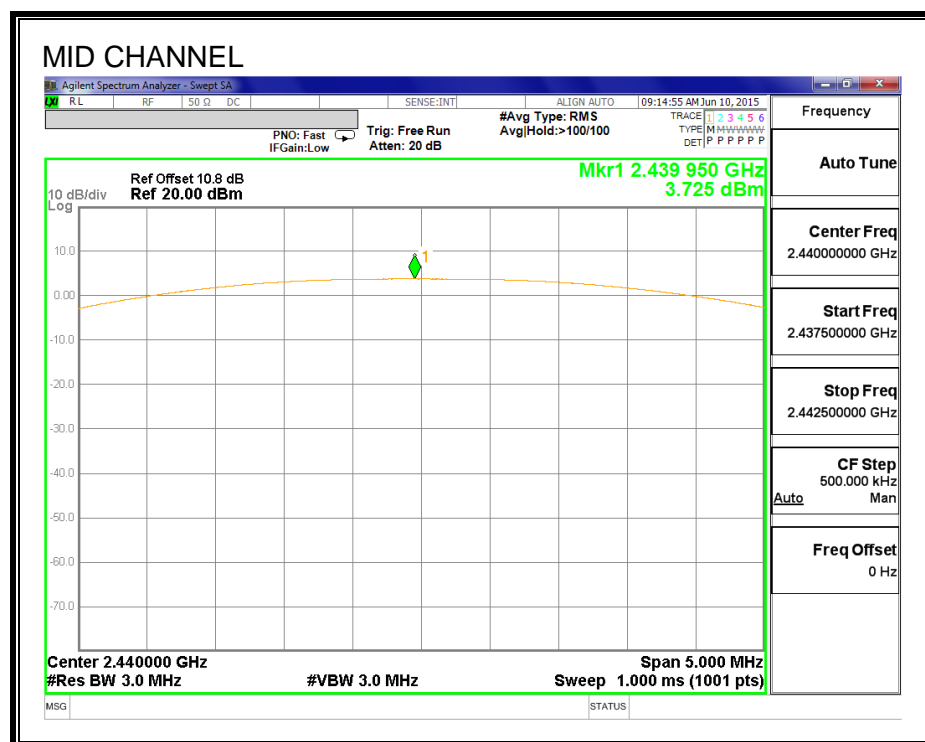
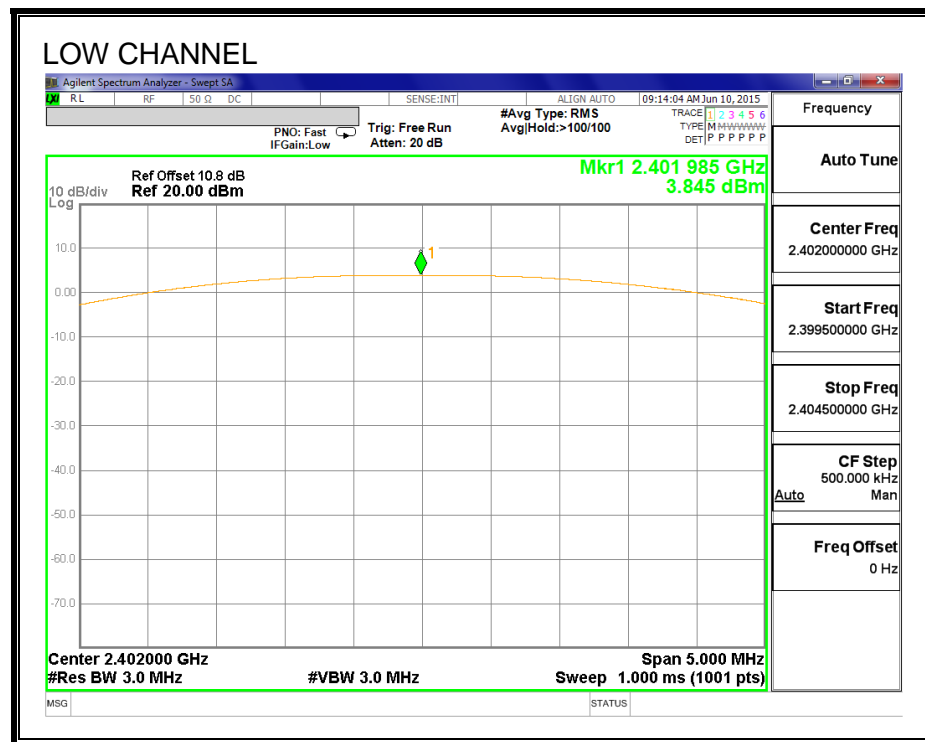
FCC §15.247 (b)

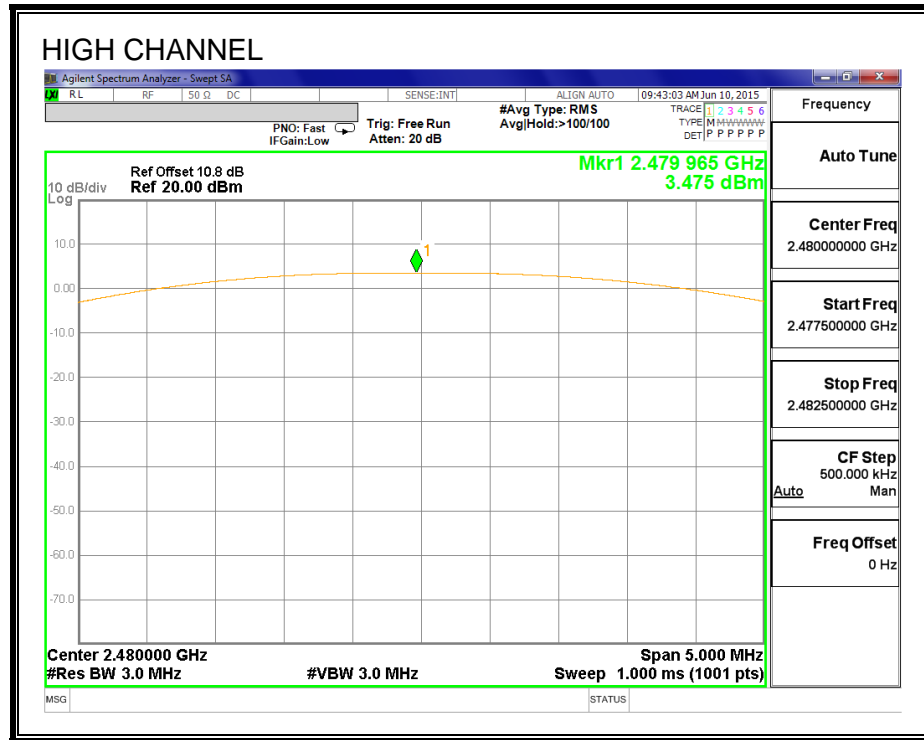
IC RSS-247 (5.4) (4)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

#### RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.845	30	-26.155
Middle	2440	3.725	30	-26.275
High	2480	3.475	30	-26.525





## 9.4. AVERAGE POWER

### LIMITS

None; for reporting purposes only.

### RESULTS

The cable assembly insertion loss of 0.80 dB was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average power (dBm)
Low	2402	3.65
Middle	2440	3.53
High	2480	3.39

## 9.5. POWER SPECTRAL DENSITY

### LIMITS

FCC §15.247 (e)

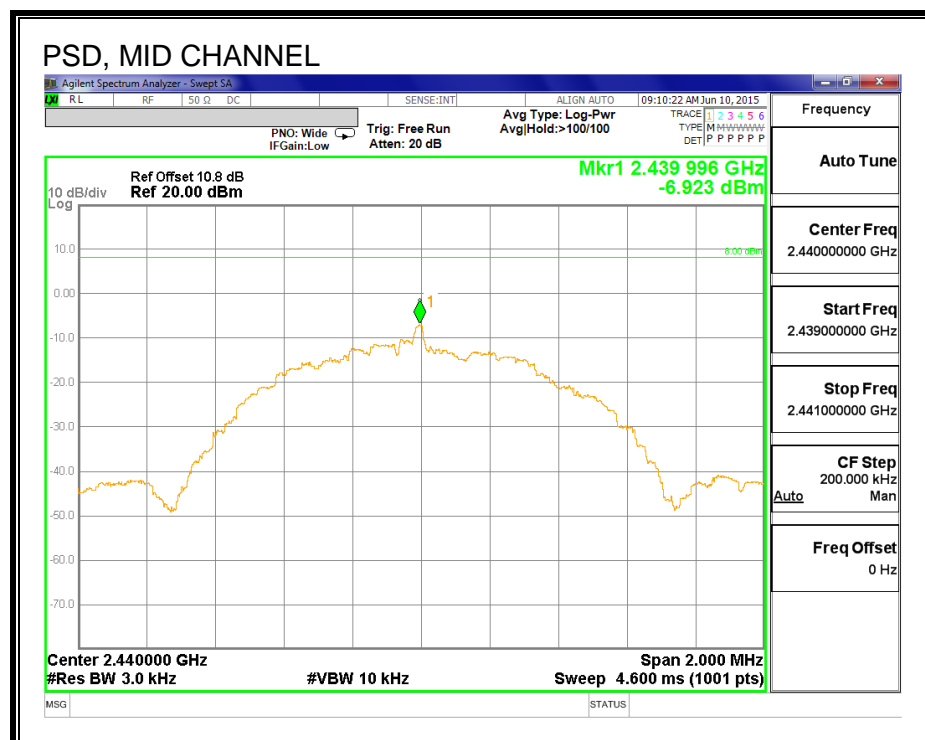
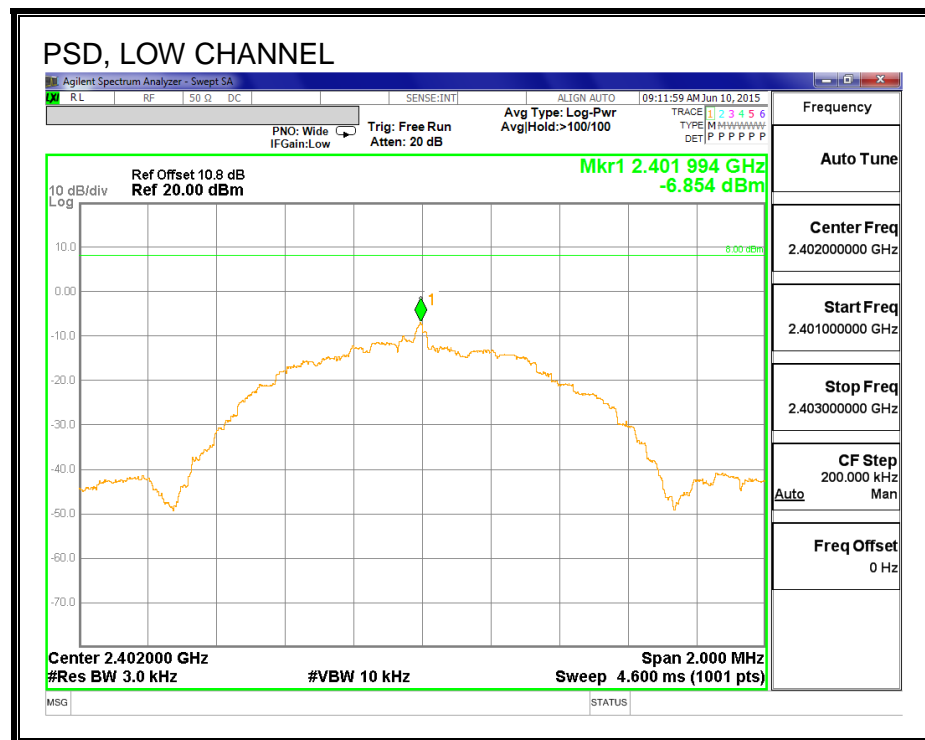
IC RSS-247 (5.2) (2)

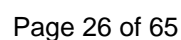
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-6.85	8	-14.85
Middle	2440	-6.92	8	-14.92
High	2480	-6.91	8	-14.91







## **9.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

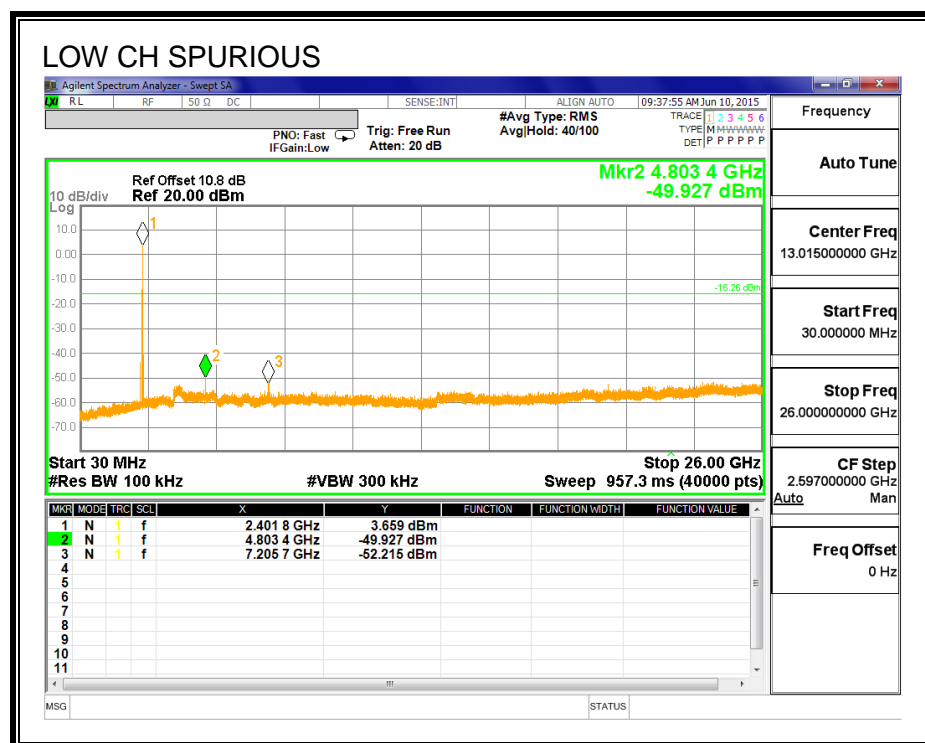
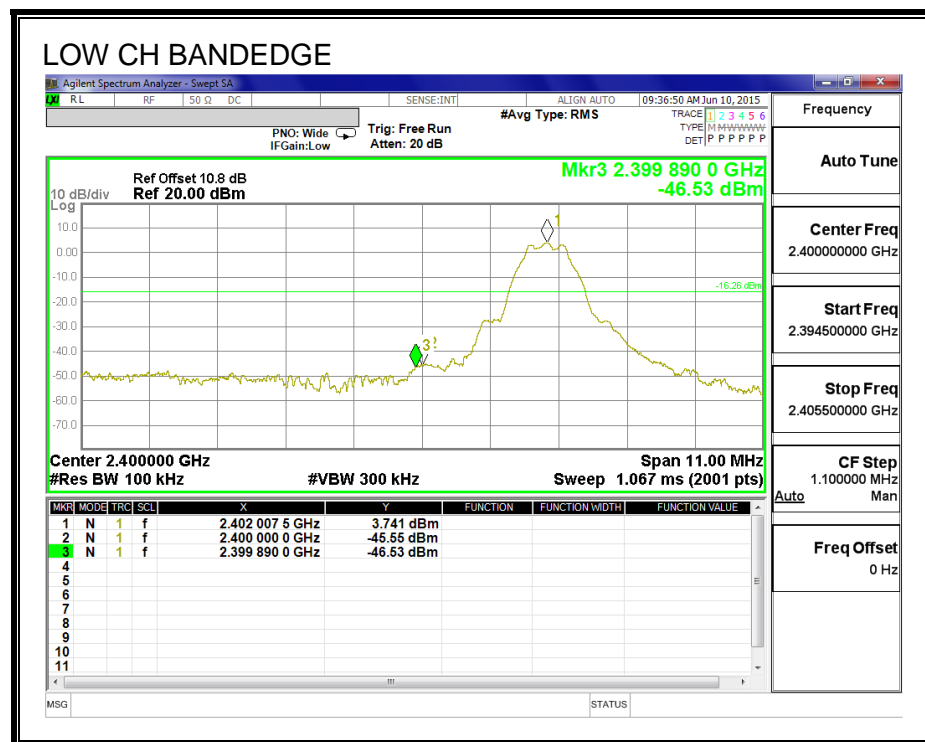
IC RSS-247 (5.5)

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

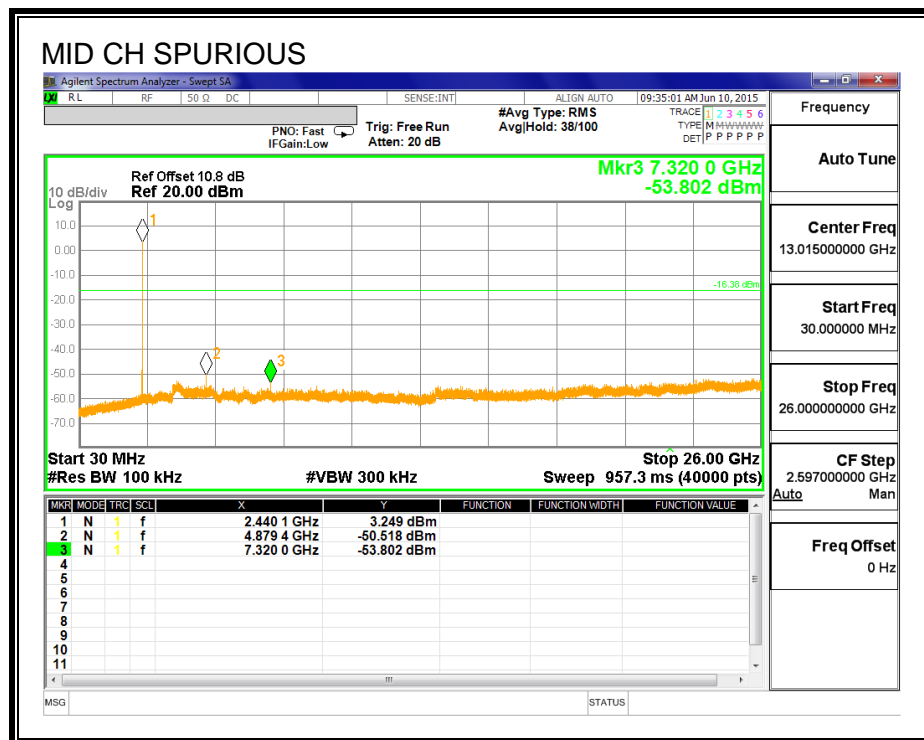
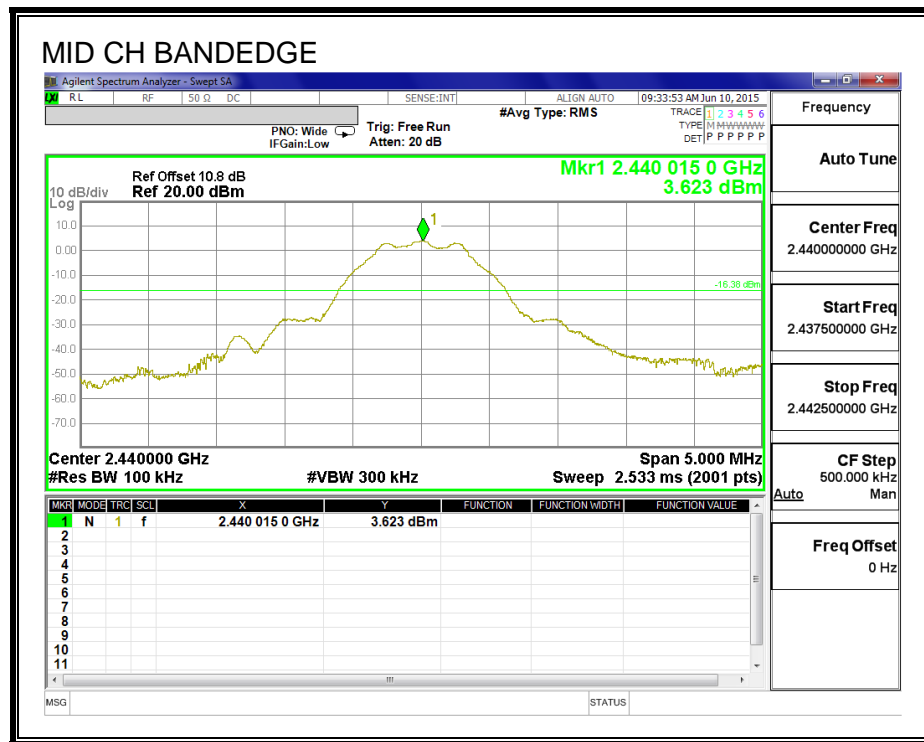
### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

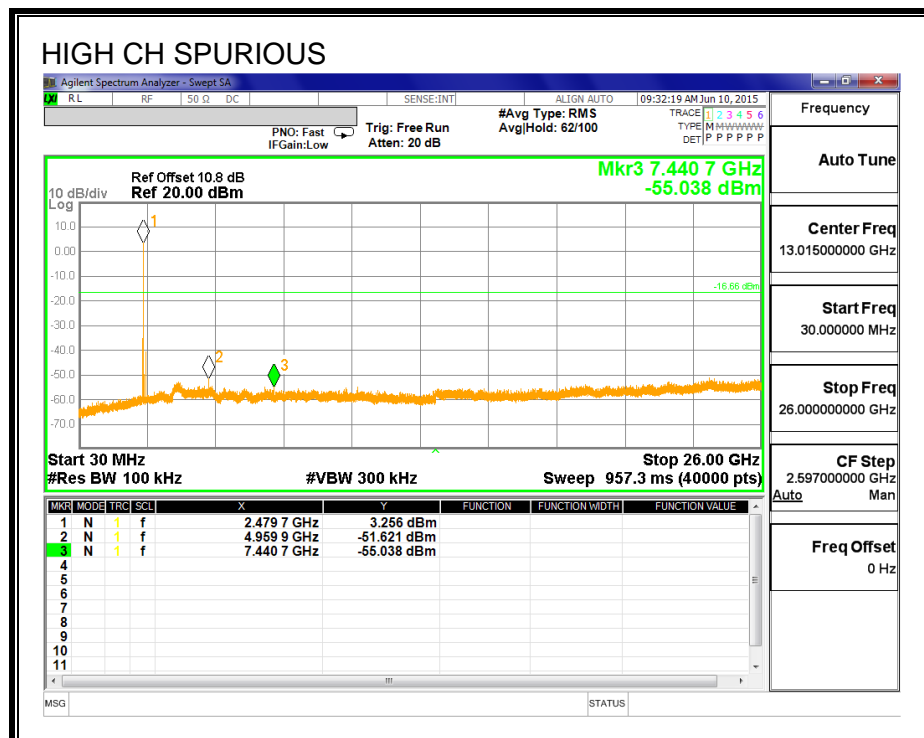
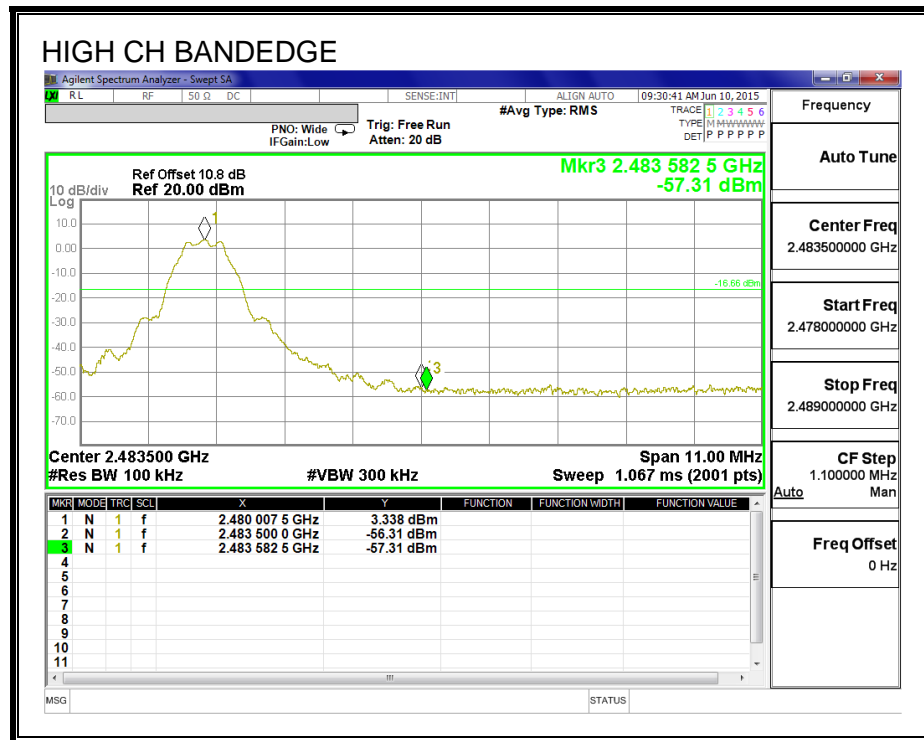
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.



## SPURIOUS EMISSIONS, MID CHANNEL



## SPURIOUS EMISSIONS, HIGH CHANNEL



## 10. RADIATED TEST RESULTS

### 10.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

#### TEST PROCEDURE

The EUT is placed on a non-conducting table EUT 3 meter distance in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 3MHz video bandwidth with average detector for average measurements.

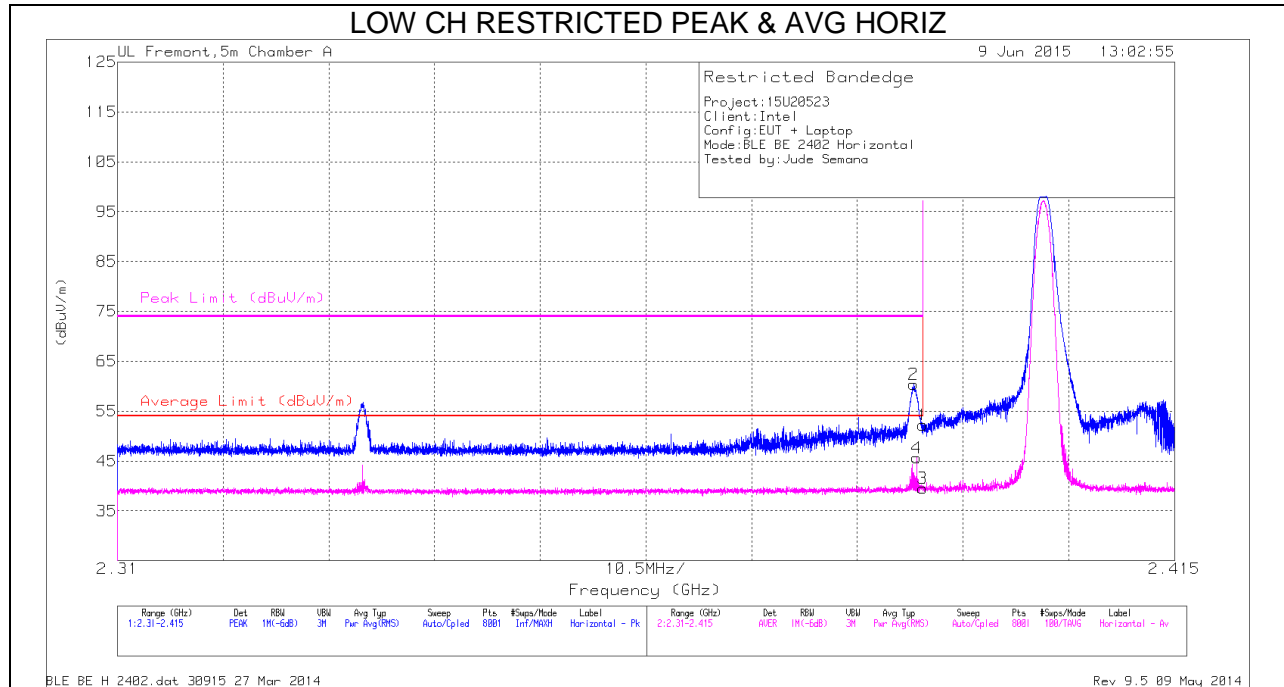
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 10.2. TRANSMITTER ABOVE 1 GHz –

### 10.2.1. EUT WITHOUT WRISTBAND

#### RESTRICTED BANDEDGE



#### HORIZONTAL DATA

##### Trace Markers

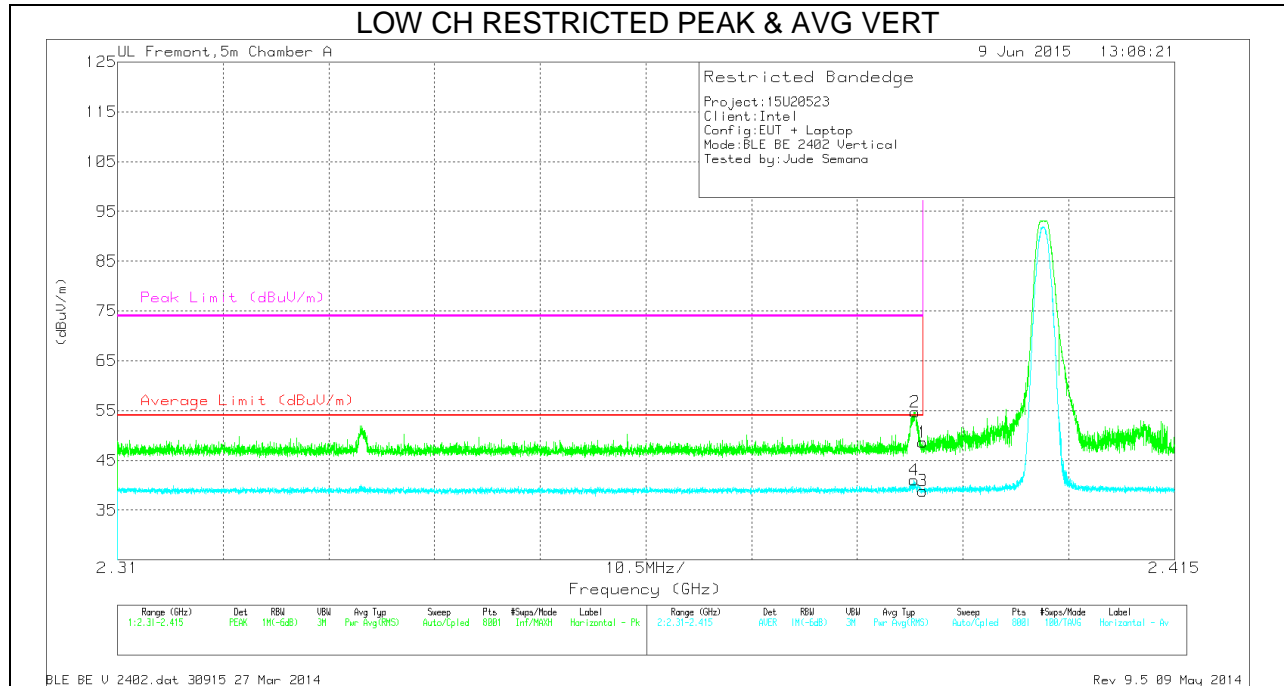
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cb/FI tr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	45.11	PK	32	-24.9	0	52.21	-	-	74	-21.79	242	316	H
2	* 2.389	53.29	PK	32	-24.9	0	60.39	-	-	74	-13.61	242	316	H
3	* 2.39	30.74	RMS	32	-24.9	1.7	39.54	54	-14.46	-	-	242	316	H
4	* 2.389	36.9	RMS	32	-24.9	1.7	45.7	54	-8.3	-	-	242	316	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection





## VERTICAL DATA

### Trace Markers

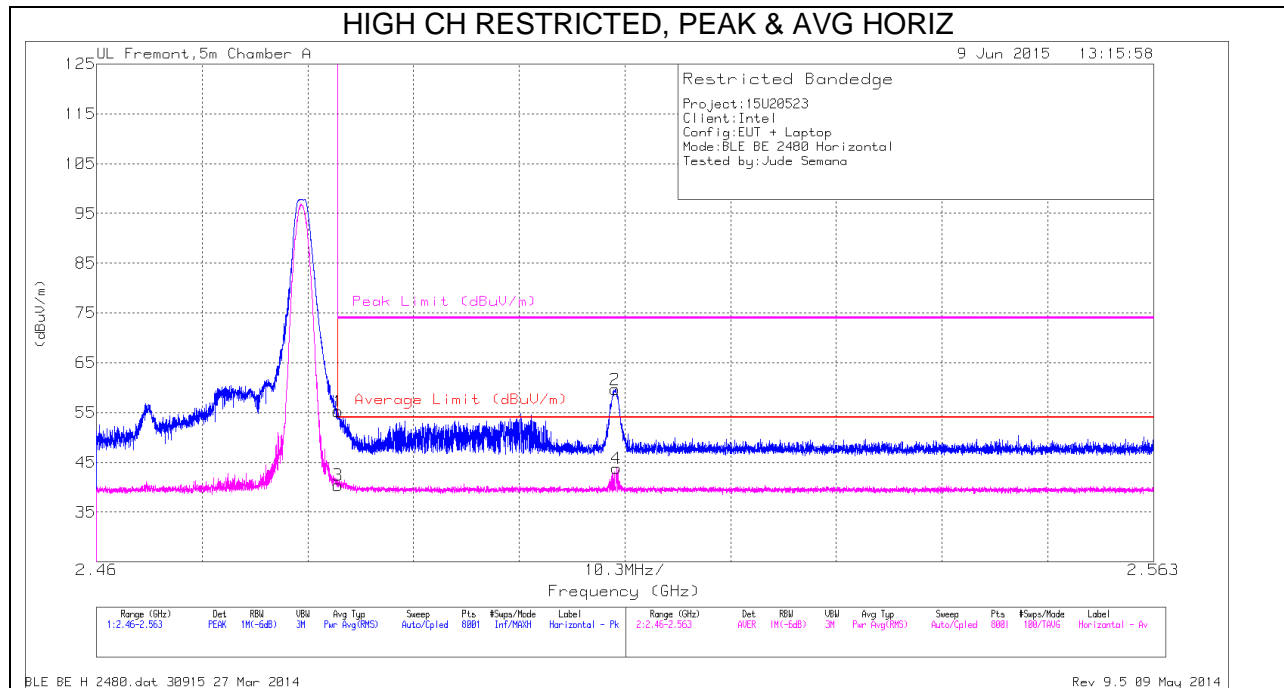
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.51	PK	32	-24.9	0	48.61	-	-	74	-25.39	354	315	V
2	* 2.389	47.6	PK	32	-24.9	0	54.7	-	-	74	-19.3	354	315	V
3	* 2.39	30.1	RMS	32	-24.9	1.7	38.9	54	-15.1	-	-	354	315	V
4	* 2.389	32.26	RMS	32	-24.9	1.7	41.06	54	-12.94	-	-	354	315	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

## EUT WITHOUT WRISTBAND



## HORIZONTAL DATA

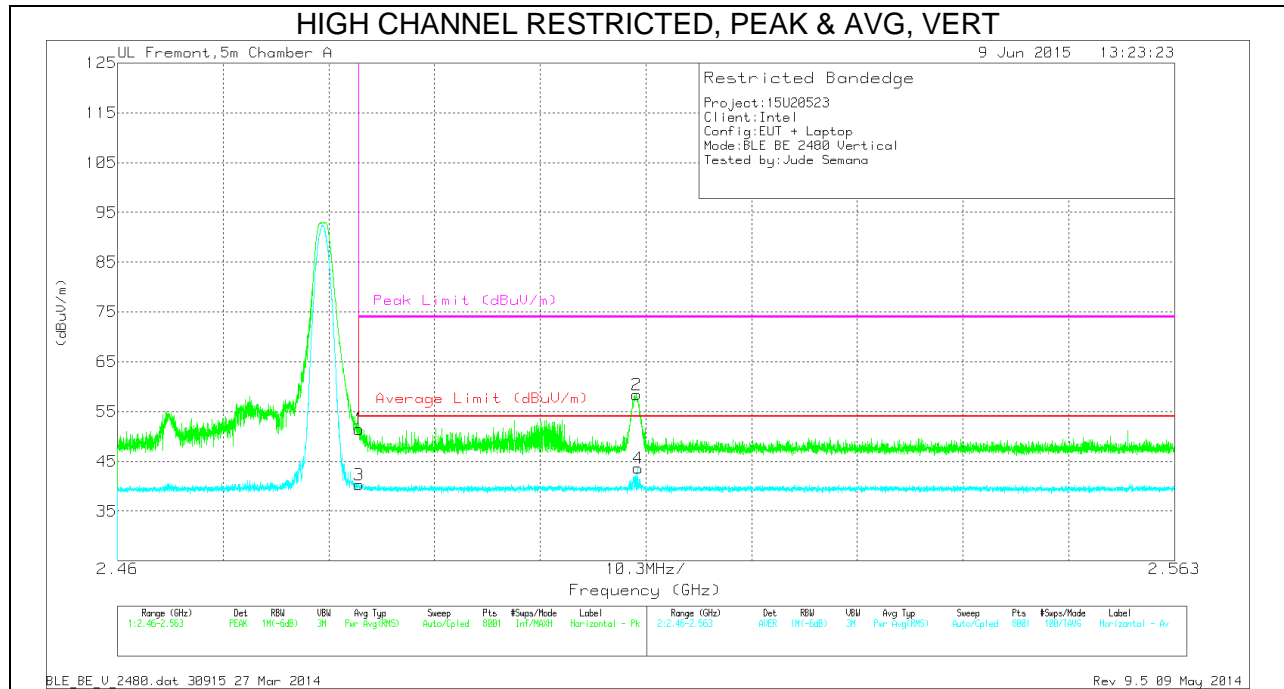
### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	47.95	PK	32.1	-24.8	0	55.25	-	-	74	-18.75	63	250	H
2	2.511	52.25	PK	32.1	-24.7	0	59.65	-	-	74	-14.35	63	250	H
3	* 2.484	31.43	RMS	32.1	-24.8	1.7	40.43	54	-13.57	-	-	63	250	H
4	2.511	34.76	RMS	32.1	-24.7	1.7	43.86	54	-10.14	-	-	63	250	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection



## VERTICAL DATA

### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	44.17	PK	32.1	-24.8	0	51.47	-	-	74	-22.53	0	361	V
2	2.511	51.03	PK	32.1	-24.7	0	58.43	-	-	74	-15.57	0	361	V
3	* 2.484	31.35	RMS	32.1	-24.8	1.7	40.35	54	-13.65	-	-	0	361	V
4	2.511	34.54	RMS	32.1	-24.7	1.7	43.64	54	-10.36	-	-	0	361	V

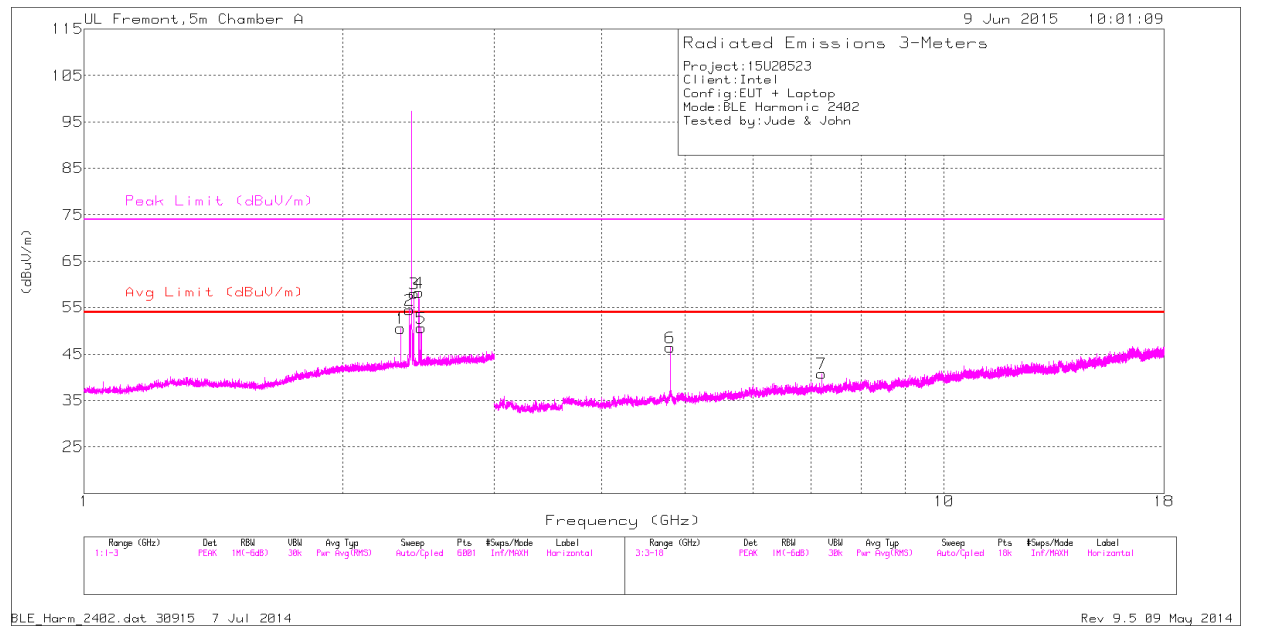
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

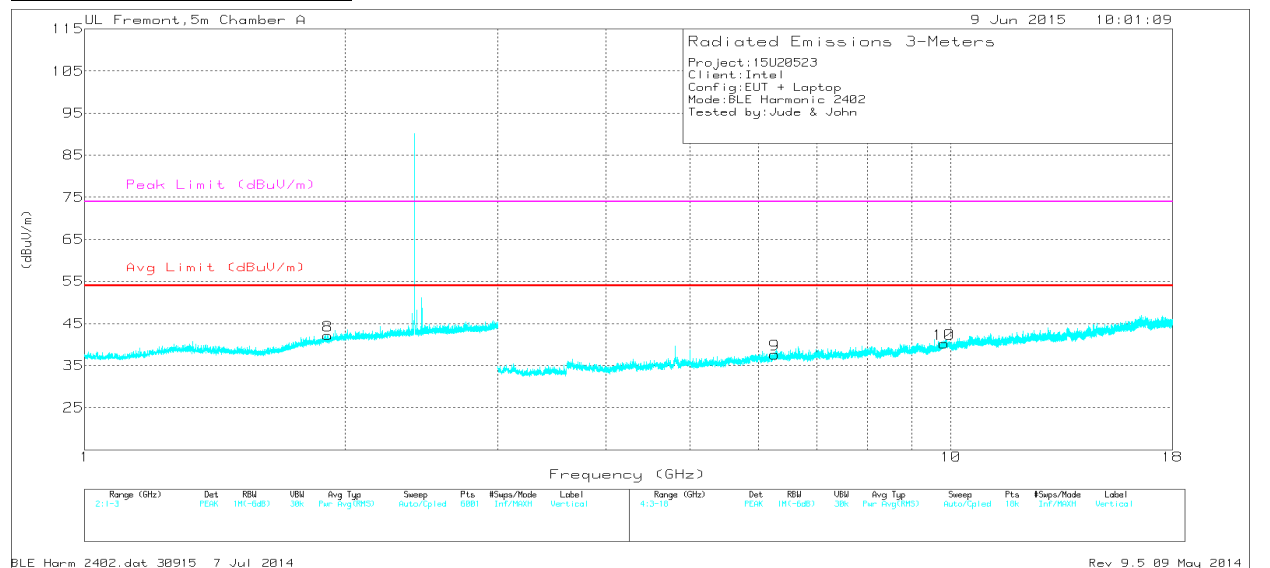
## HARMONICS AND SPURIOUS EMISSIONS – EUT WITHOUT WRIST BAND

### LOW CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

### LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## LOW CHANNEL DATA

### Radiated Emissions

Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m )	Amp/Cbl/ Filtr/Pad (dB)	DC Corr (dB)	Correcte d Reading (dBuV/m )	Avg Limit (dBuV/m )	Margin (dB)	Peak Limit (dBuV/m )	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.334	52.25	PK2	31.9	-25	0	59.15	-	-	74	-14.85	249	262	H
* 2.334	29.75	MAv1	31.9	-25	1.68	38.33	54-	-15.67	-	-	245	215	H
* 2.389	54.1	PK2	32	-24.9	0	61.2	-	-	74	-12.8	267	383	H
* 4.803	42.08	PK2	34	-31.2	0	44.88	-	-	74	-29.12	316	325	H
* 4.804	44.06	MAv1	34	-31.2	1.68	48.54	54	-5.46	-	-	335	292	H
1.91	44.24	PK2	30.8	-25.5	0	49.54	-	-	74	-24.46	316	100	V
2.418	55.21	PK2	32	-24.9	0	62.31	-	-	74	-11.69	257	376	H
2.449	56.51	PK2	32	-24.8	0	63.71	-	-	74	-10.29	266	303	H
2.465	55.18	PK2	32	-24.8	0	62.38	-	-	74	-11.62	252	299	H
6.262	38.83	PK2	35.5	-28.2	0	46.13	-	-	74	-27.87	316	100	V
7.205	38.14	PK2	35.5	-27.3	0	46.34	-	-	74	-27.66	316	100	H
9.811	35.9	PK2	37	-23.9	0	49	-	-	74	-25	316	100	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Av - Average detection

PK2 - KDB558074 Method: Maximum Peak

BLE\_Harm\_2402.dat 30915 7 Jul 2014

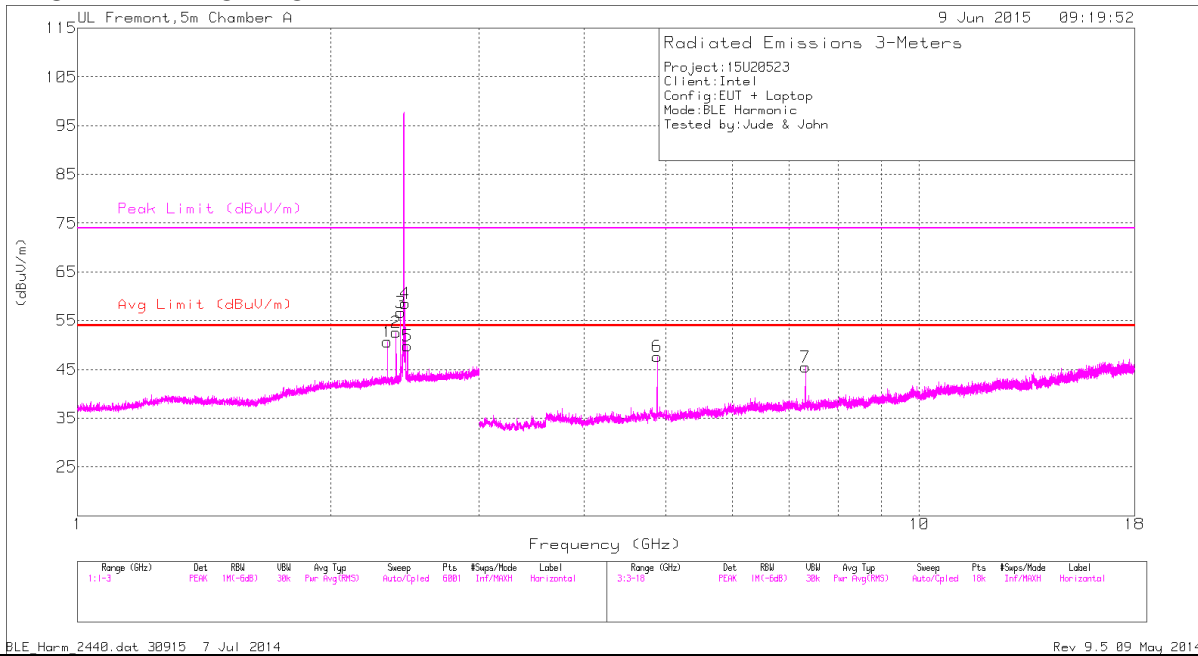
Rev 9.5 06 Jun 2015

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

## EUT WITHOUT WRISTBAND

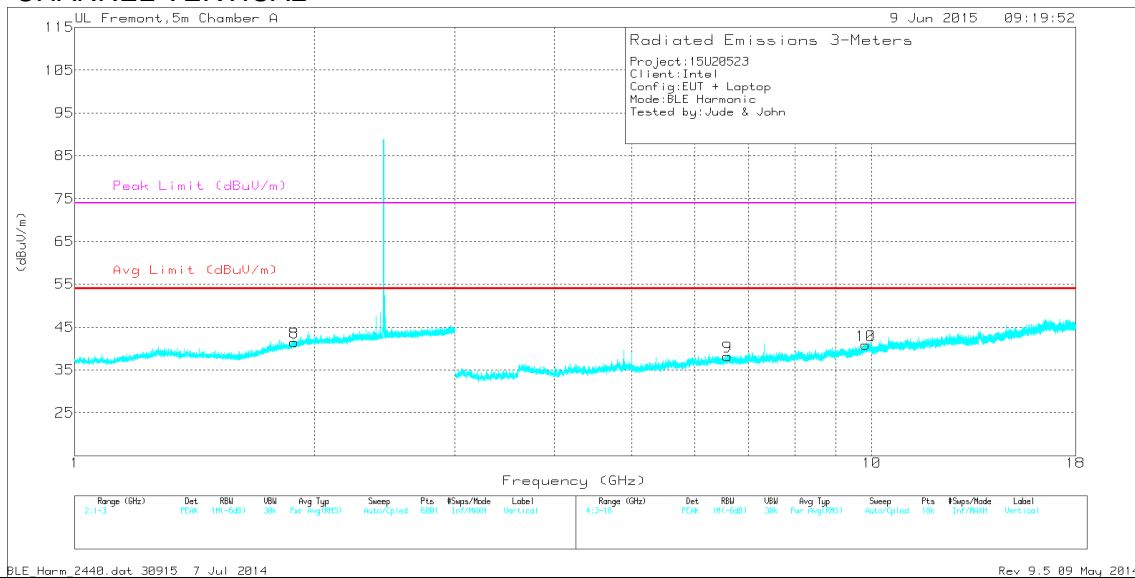
### MID CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## EUT WITHOUT WRISTBAND

### MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## MID CHANNEL DATA

### Radiated Emissions

Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	DC Corr (dB)	Correcte d Reading (dBuV/m )	Avg Limit (dBuV/m )	Margin (dB)	Peak Limit (dBuV/ m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.335	51.73	PK2	31.9	-25	0	58.63	-	-	74	-15.37	244	261	H
* 2.335	31.2	MAv1	31.9	-25	1.68	39.78	54	-14.22-	-	-	318	167	H
* 2.389	53.7	PK2	32	-24.9	0	60.8	-	-	74	-13.2	245	262	H
* 4.881	47.31	PK2	33.9	-30	0	51.21	-	-	74	-22.79	351	315	H
* 4.879	47.53	PK2	33.9	-30	0	51.43	-	-	74	-22.57	351	315	H
* 4.879	23.55	MAv1	33.9	-30	1.68	29.13	54	-24.87-	-	-	267	199	H
* 7.32	41.42	PK2	35.5	-26.4	0	50.52	-	-	74	-23.48	206	322	H
* 7.32	23.74	MAv1	35.5	-26.4	1.68	34.7	54	-19.3	-	-	316	131	H
2.418	54.95	PK2	32	-24.9	0	62.05	-	-	74	-11.95	254	379	H
2.449	56.04	PK2	32	-24.8	0	63.24	-	-	74	-10.76	233	299	H
2.465	54.69	PK2	32	-24.8	0	61.89	-	-	74	-12.11	243	304	H
6.259	38.29	PK2	35.5	-28.2	0	45.59	-	-	74	-28.41	316	100	V
6.593	37.71	PK2	35.6	-27.7	0	45.61	-	-	74	-28.39	206	100	V
9.811	35.9	PK2	37	-23.9	0	49	-	-	74	-25	316	100	V
9.821	35.05	PK2	37	-23.9	0	48.15	-	-	74	-25.85	206	201	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Av - Average detection

PK2 - KDB558074 Method: Maximum Peak

BLE\_Harm\_2440.dat 30915 7 Jul 2014

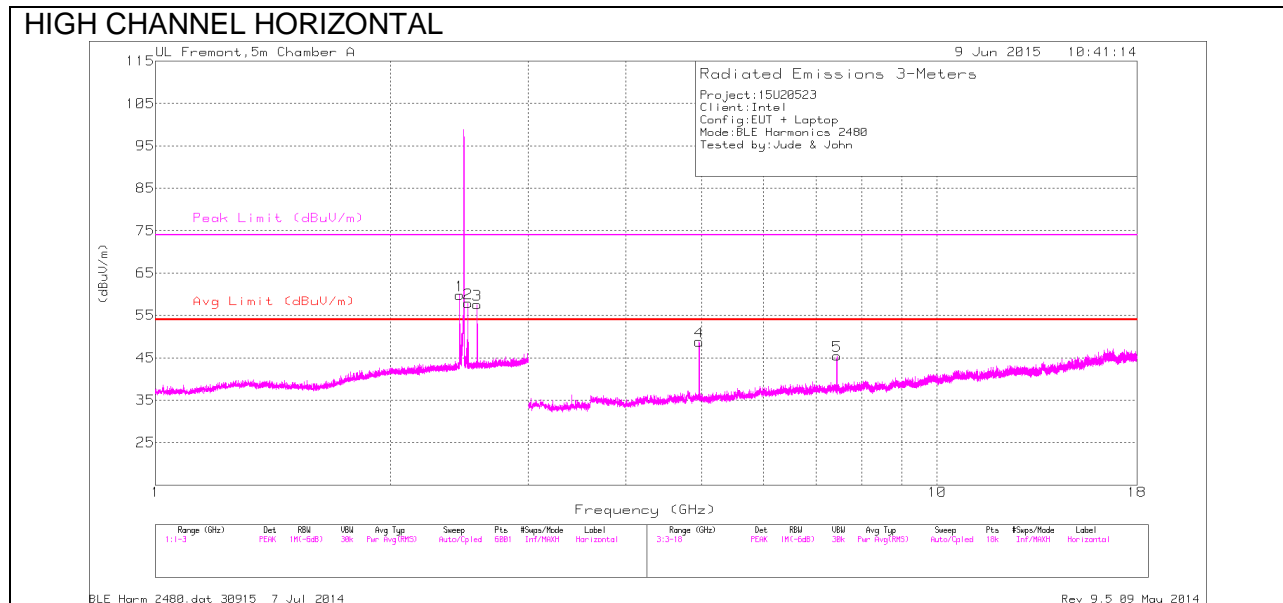
Rev 9.5 06 Jun 2015

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

## EUT WITHOUT WRISTBAND

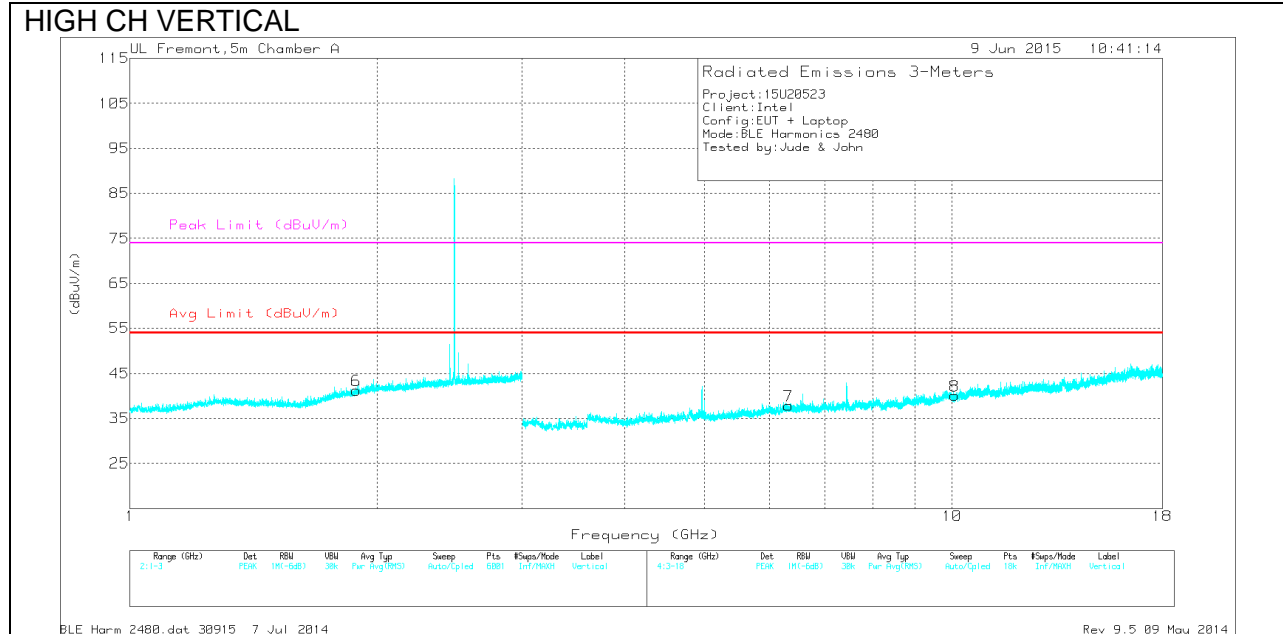
### HIGH CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## EUT WITHOUT WRISTBAND

### HIGH CH VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.



## HIGH CHANNEL DATA

### Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl /Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96	44.8	Pk	33.9	-29.9	0	48.8	-	-	74	-25.2	0-360	100	H
* 4.96	43.78	MAv1	33.9	-29.9	1.68	49.46	54	-4.54	-	-	351	343	H
* 7.442	36.68	PK2	35.5	-26.2	0	45.98	-	-	74	-28.02	202	294	H
* 7.442	31.55	MAv1	35.5	-26.2	1.68	42.53	54	-11.47	-	-	203	316	H
1.886	45.41	PK2	30.7	-25.5	0	50.61	-	-	74	-23.39	202	200	V
1.836	32.81	MAv1	30.3	-25.5	1.68	39.29	54	-14.71	-	-	203	100	H
2.449	55.97	PK2	32	-24.8	0	63.17	-	-	74	-10.83	259	248	H
6.326	38.57	PK2	35.5	-28.2	0	45.87	-	-	74	-28.13	202	100	V
9.811	35.61	PK2	37	-23.9	0	48.71	-	-	74	-25.29	316	100	V
9.811	35.9	PK2	37	-23.9	0	49	-	-	74	-25	316	100	V
10.066	34.95	PK2	37.1	-24.1	0	47.95	-	-	74	-26.05	202	201	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Av - Average detection

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

BLE\_Harm\_2480.dat 30915 7 Jul 2014

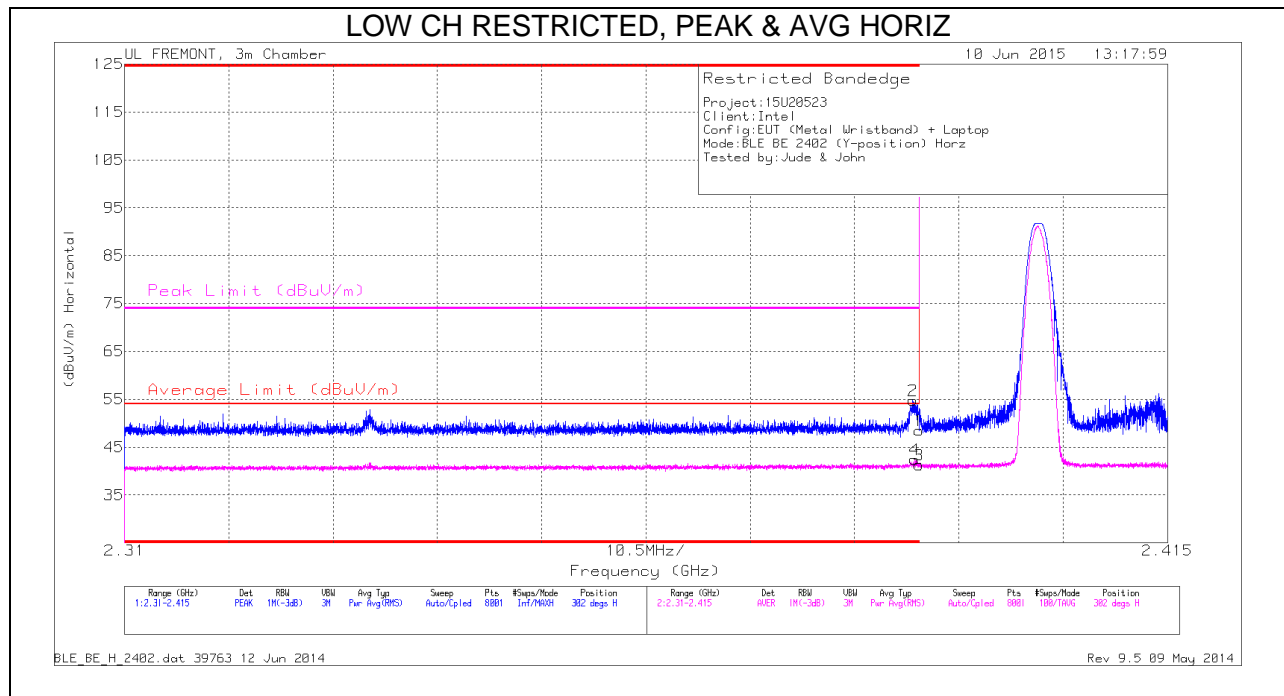
Rev 9.5 06 Jun 2015

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

## 10.2.2. EUT WITH METAL WRISTBAND

### RESTRICTED BANDEDGE (LOW CHANNEL)



### HORIZONTAL DATA

#### Trace Markers

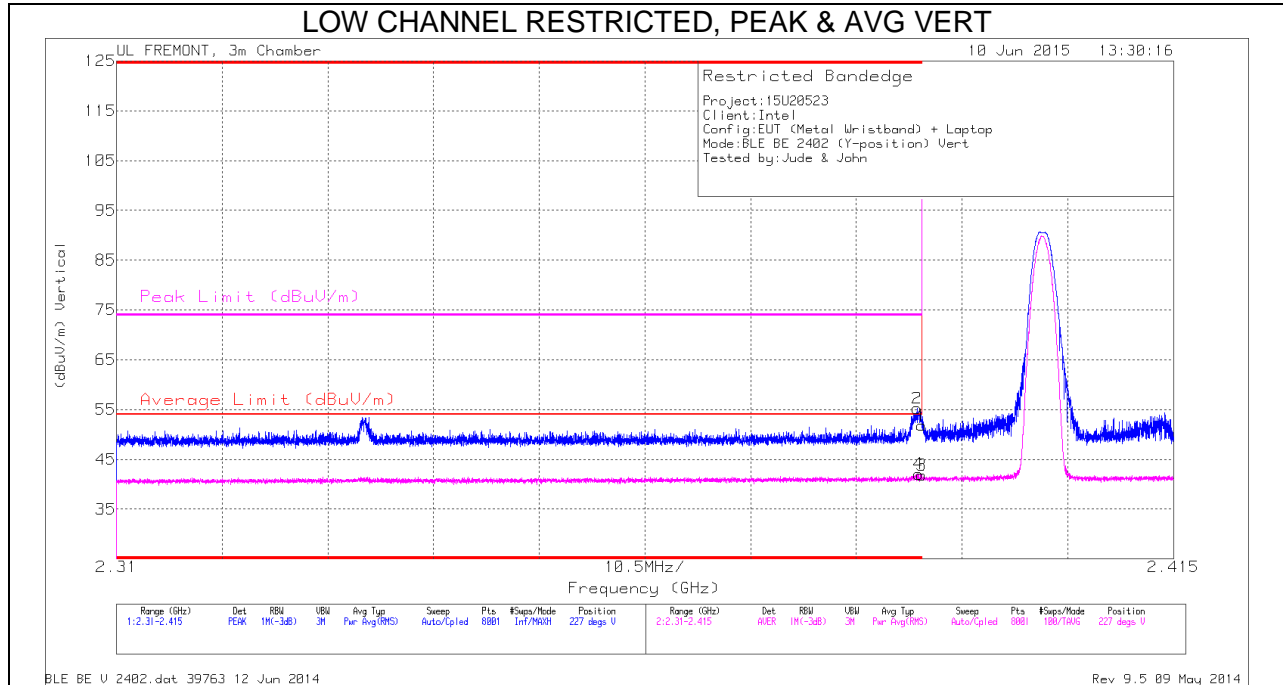
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cb/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.88	Avg	32	-22.4	0	48.48	-	-	-	-	302	100	H
2	* 2.389	45.17	Avg	32	-22.4	0	54.77	-	-	-	-	302	100	H
3	* 2.39	30.01	RMS	32	-22.4	1.7	41.31	54	-12.69	-	-	302	100	H
4	* 2.39	31.21	RMS	32	-22.4	1.7	42.51	54	-11.49	-	-	302	100	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Avg - Video bandwidth < Resolution bandwidth

RMS - RMS detection

# **RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



## **VERTICAL DATA**

### **Trace Markers**

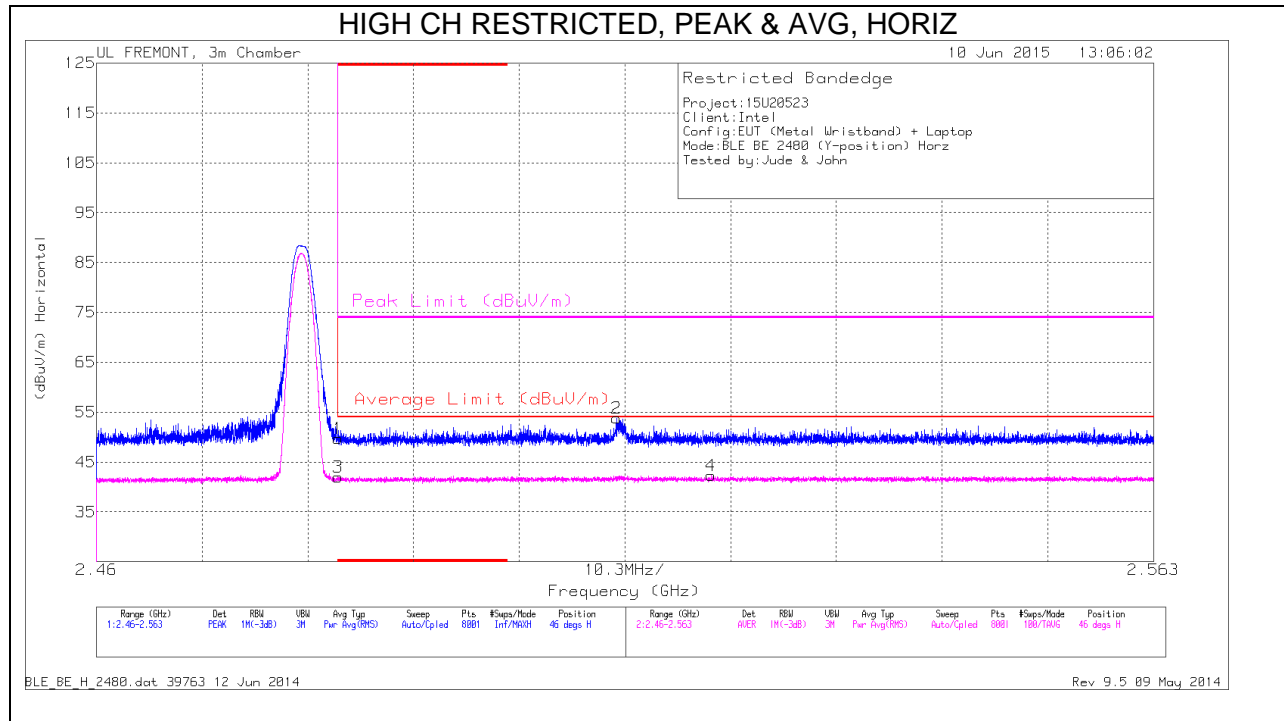
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	42.21	Avg	32	-22.4	0	51.81	-	-	-	-	227	100	V
2	* 2.39	45.65	Avg	32	-22.4	0	55.25	-	-	-	-	227	100	V
3	* 2.39	30.58	RMS	32	-22.4	1.7	41.88	54	-12.12	-	-	227	100	V
4	* 2.39	30.8	RMS	32	-22.4	1.7	42.1	54	-11.9	-	-	227	100	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Avg - Video bandwidth < Resolution bandwidth

RMS - RMS detection

## EUT WITH METAL WRISTBAND



## HORIZONTAL DATA

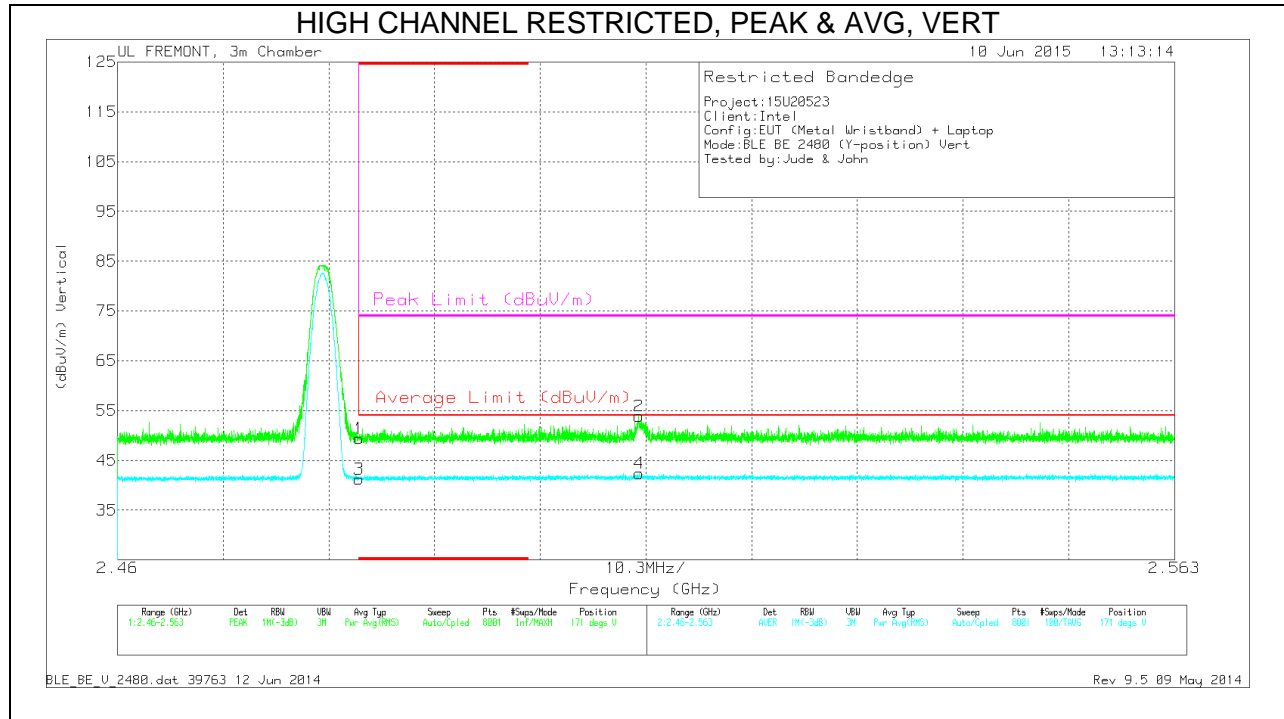
### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Ch/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.52	Avg	32.3	-22.1	0	49.72	-	-	-	-	46	100	H
3	* 2.484	30.13	RMS	32.3	-22.1	1.7	42.03	54	-11.97	-	-	46	100	H
2	2.511	43.59	Avg	32.3	-22.1	0	53.79	-	-	-	-	46	100	H
4	2.52	30.44	RMS	32.3	-22.1	1.7	42.34	54	-11.66	-	-	46	100	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Avg - Video bandwidth < Resolution bandwidth

RMS - RMS detection



## VERTICAL DATA

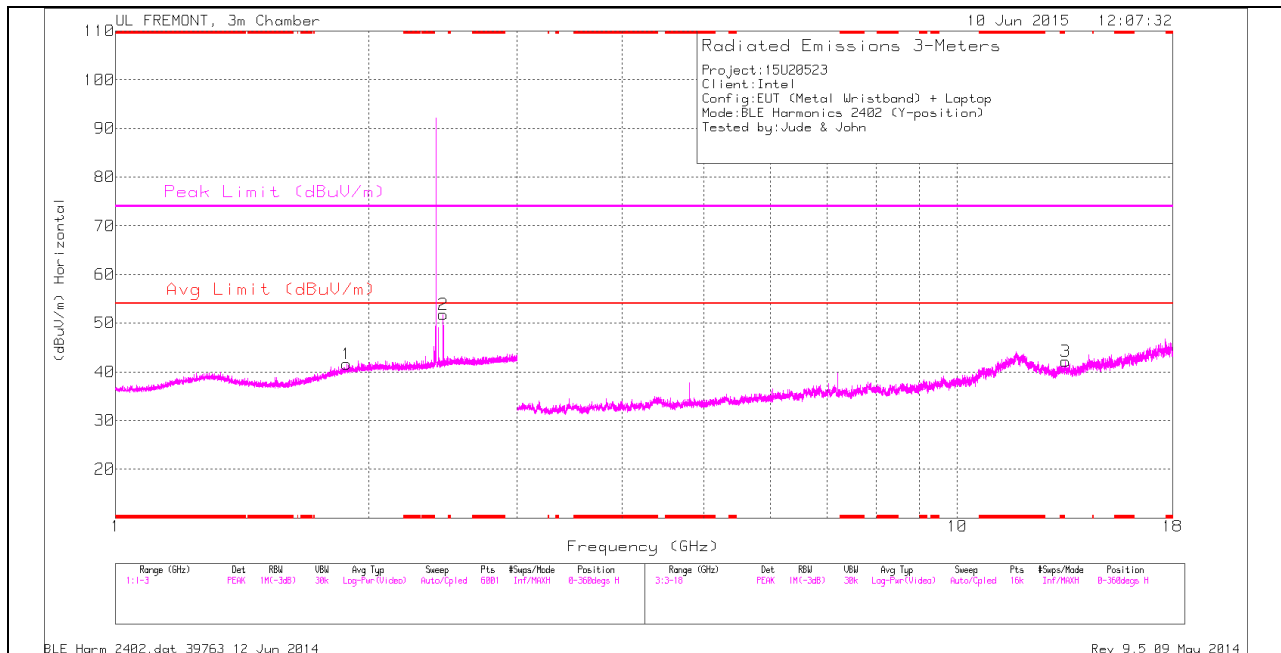
### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBUV)	Det	AF T119 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBUV/m)	Average Limit (dBUV/m)	Margin (dB)	Peak Limit (dBUV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.16	Avg	32.3	-22.1	0	49.36	-	-	-	-	171	100	V
3	* 2.484	29.4	RMS	32.3	-22.1	1.7	41.3	54	-12.7	-	-	171	100	V
2	2.511	43.69	Avg	32.3	-22.1	0	53.89	-	-	-	-	171	100	V
4	2.511	30.49	RMS	32.3	-22.1	1.7	42.39	54	-11.61	-	-	171	100	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band  
Avg - Video bandwidth < Resolution bandwidth  
RMS - RMS detection

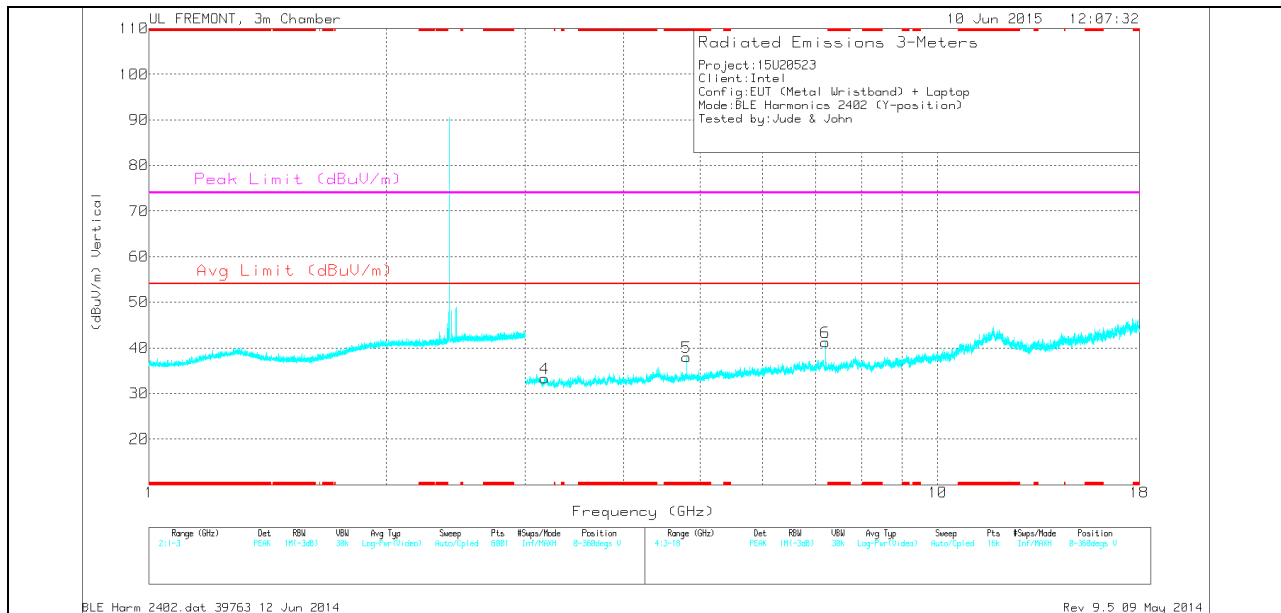
## LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS

### HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

### VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## LOW CHANNEL DATA

### Radiated Emissions

Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	DC Corr (dB)	Correcte d Reading (dBuV/m )	Avg Limit (dBuV/m )	Margin (dB)	Peak Limit (dBuV/m )	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.961	49.26	PK2	34	-30.4	0	52.86	-	-	74	-21.14	343	308	H
* 7.442	36.68	PK2	35.7	-27.6	0	44.78	-	-	74	-29.22	202	294	H
* 4.805	39.95	PK2	34	-29.4	0	44.55	-	-	74	-29.45	127	113	V
* 4.805	33.34	MAv1	34	-29.4	1.68	39.62	54	-14.38	-	-	0-360	200	V
1.882	42.55	PK2	30.9	-22.5	0	50.95	-	-	74	-23.05	360	200	H
1.881	33.23	MAv1	30.9	-22.5	1.68	41.63	54	-10.69	-	-	0-360	200	H
1.886	45.41	PK2	31	-22.6	0	53.81	-	-	74	-20.19	202	200	V
2.449	55.97	PK2	32.2	-22.2	0	65.97	-	-	74	-8.03	259	248	H
2.449	40.11	MAv1	32.2	-22.2	1.68	51.79	54	-2.21	-	-	0-360	100	H
2.45	48.26	PK2	32.2	-22.2	0	58.26	-	-	74	-15.74	156	100	H
3.173	41.23	PK2	32.7	-30.3	0	43.63	-	-	74	-30.37	156	200	V
3.172	30.92	MAv1	32.7	-30.3	1.68	33.32	54	-19.00	-	-	0-360	200	V
6.259	38.29	PK2	35.4	-29.6	0	44.09	-	-	74	-29.91	316	100	V
6.326	38.57	PK2	35.4	-28.5	0	45.47	-	-	74	-28.53	202	100	V
7.206	38.92	PK2	35.6	-28.4	0	46.12	-	-	74	-27.88	127	200	V
7.206	34.02	MAv1	35.6	-28.4	1.68	41.22	54	-11.10	-	-	0-360	200	V
9.811	35.61	PK2	36.9	-24.7	0	47.81	-	-	74	-26.19	316	100	V
9.811	35.9	PK2	36.9	-24.8	0	48	-	-	74	-26	316	100	V
9.821	35.05	PK2	36.9	-24.7	0	47.25	-	-	74	-26.75	206	201	V
10.066	34.95	PK2	36.9	-24.6	0	47.25	-	-	74	-26.75	202	201	V
13.442	39.15	PK2	38.9	-26	0	52.05	-	-	74	-21.95	156	100	H
13.441	29.27	MAv1	38.9	-26	1.68	42.17	54	-10.15	-	-	0-360	100	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

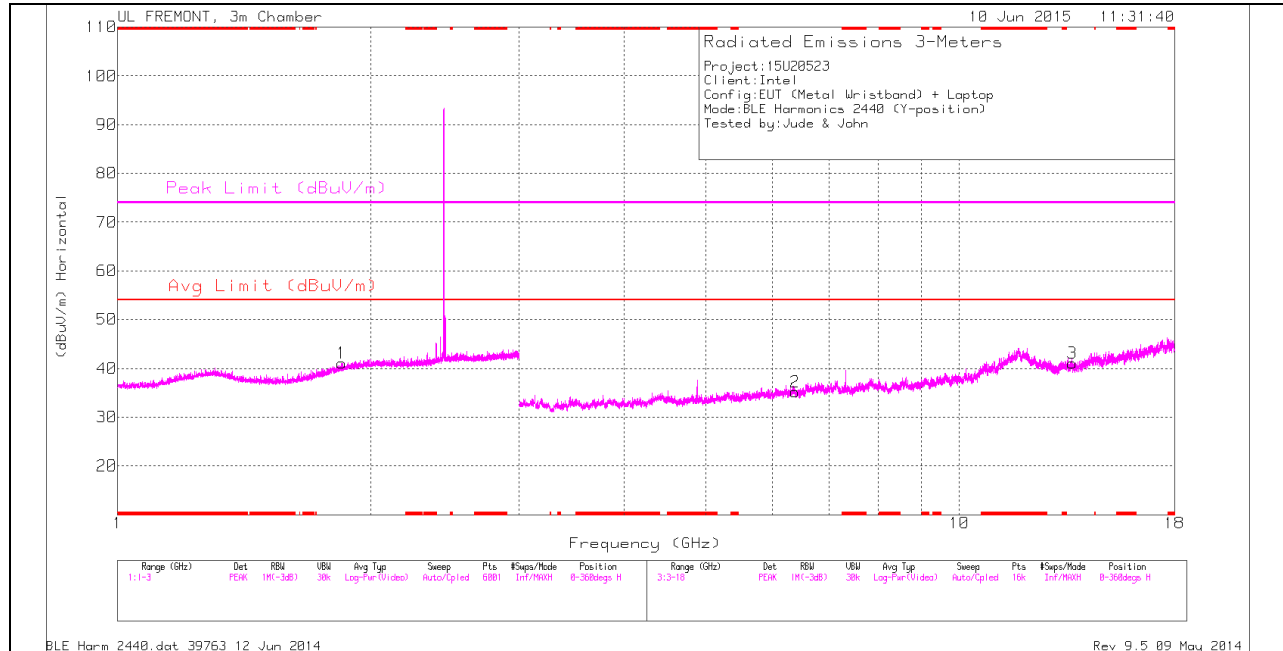
BLE\_Harm\_2402.dat 39763 12 Jun 2014

Rev 9.5 06 Jun 2015

PK2 - KDB558074 Method: Maximum Peak

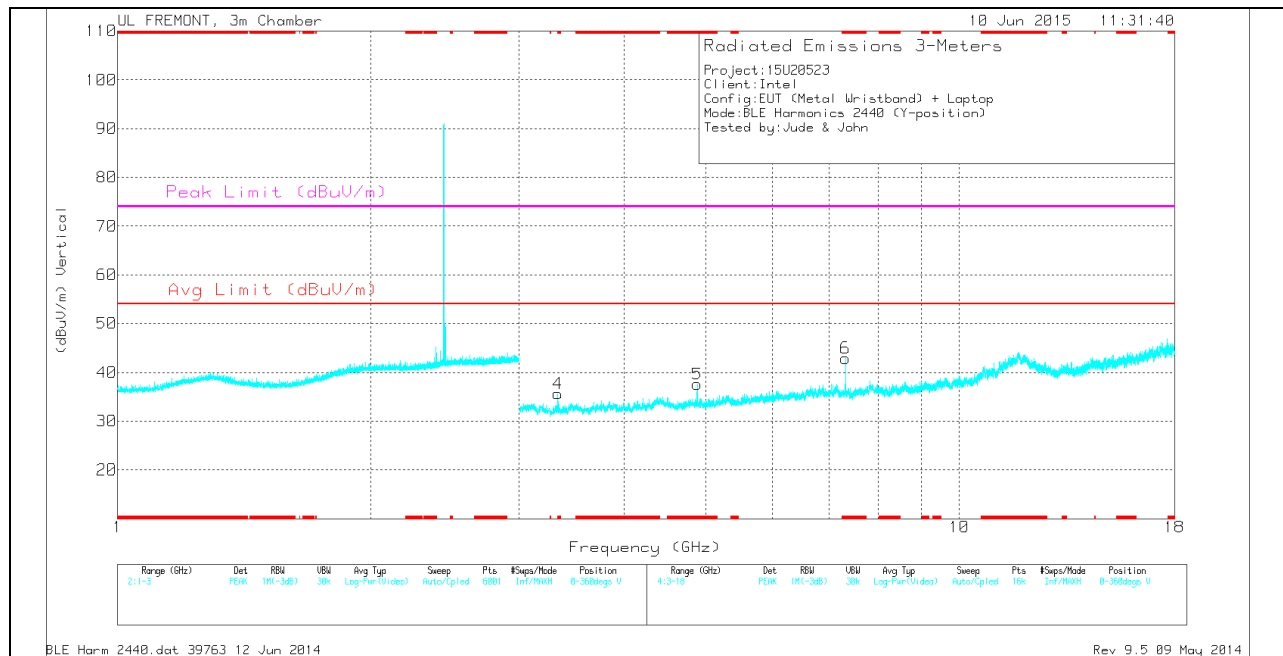
MAv1 - KDB558074 Option 1 Maximum RMS Average

# MID CHANNEL HORIZONTAL - METAL WRISTBAND



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

# MID CHANNEL VERTICAL- WITH METAL WRISTBAND



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.



## MID CHANNEL DATA

### Radiated Emissions

Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	DC Corr (dB)	Correcte d Reading (dBuV/m )	Avg Limit (dBuV/m )	Margin (dB)	Peak Limit (dBuV/m )	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.333	42.21	PK2	32.6	-30.5	0	44.31	-	-	74	-29.69	100	198	V
* 3.334	33.51	MAv1	32.6	-30.5	1.68	35.61	54	-16.71	-	-	0-360	100	V
* 4.88	41.94	PK2	34	-29.1	0	46.84	-	-	74	-27.16	293	158	V
* 4.88	32.69	MAv1	34	-29.1	1.68	37.59	54	-14.73	-	-	0-360	200	V
* 7.442	36.68	PK2	35.7	-27.6	0	44.78	-	-	74	-29.22	202	294	H
* 7.442	34.48	MAv1	35.6	-27.2	1.68	42.88	54	-9.44	-	-	0-360	200	V
1.846	43.04	PK2	30.6	-22.6	0	51.04	-	-	74	-22.96	0	200	H
1.846	33.07	MAv1	30.6	-22.6	1.68	41.07	54	-11.25	-	-	0-360	200	H
1.886	45.41	PK2	31	-22.6	0	53.81	-	-	74	-20.19	202	200	V
6.379	39.04	PK2	35.5	-28.4	0	46.14	-	-	74	-27.86	0	200	H
6.379	28.06	MAv1	35.5	-28.4	1.68	35.16	54	-17.16	-	-	0-360	200	H
9.811	35.9	PK2	36.9	-24.8	0	48	-	-	74	-26	316	100	V
10.066	34.95	PK2	36.9	-24.6	0	47.25	-	-	74	-26.75	202	201	V
13.617	38.81	PK2	38.7	-26.6	0	50.91	-	-	74	-23.09	0	200	H
13.617	28.98	MAv1	38.7	-26.6	1.68	41.08	54	-11.24	-	-	0-360	200	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

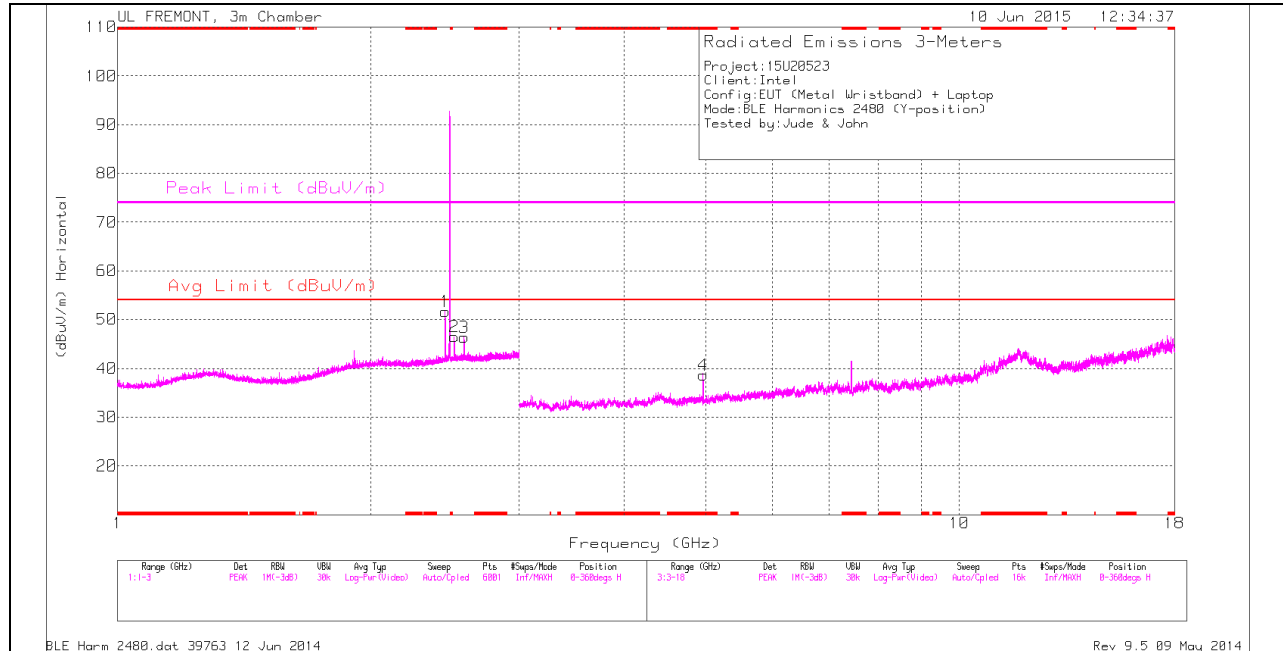
BLE\_Harm\_2440.dat 39763 12 Jun 2014

Rev 9.5 06 Jun 2015

PK2 - KDB558074 Method: Maximum Peak

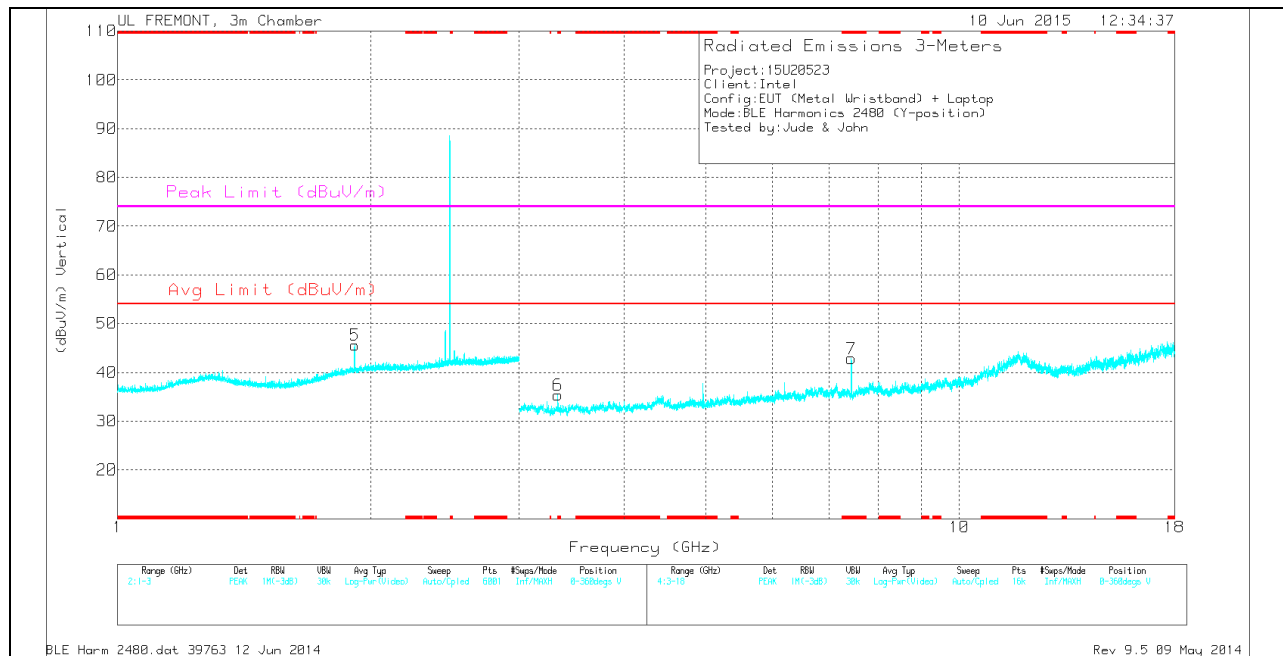
MAv1 - KDB558074 Option 1 Maximum RMS Average

# HIGH CHANNEL HORIZONTAL – WITH METAL WRISTBAND



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

# HIGH CHANNEL VERTICAL– WITH METAL WRISTBAND



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## HIGH CHANNEL DATA

### Radiated Emissions

Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	DC Corr (dB)	Correcte d Reading (dBuV/m )	Avg Limit (dBuV/m )	Margin (dB)	Peak Limit (dBuV/m )	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96	44.2	PK2	34	-30.3	0	47.9	-	-	74	-26.1	231	251	H
* 4.96	34.94	MAV1	34	-30.3	1.68	38.64	54	-13.68	-	-	0-360	200	H
* 7.442	36.68	PK2	35.7	-27.6	0	44.78	-	-	74	-29.22	202	294	H
* 7.442	30.68	MAV1	35.7	-27.6	1.68	38.78	54	-13.54	74	-29.22	202	294	H
* 3.334	41.23	PK2	32.6	-30.5	0	43.33	-	-	74	-30.67	231	100	V
* 3.334	33.27	MAV1	32.6	-30.5	1.68	35.37	54	-16.95	-	-	0-360	100	V
* 7.441	40.59	PK2	35.7	-27.6	0	48.69	-	-	74	-25.31	231	200	V
* 7.441	34.66	MAV1	35.7	-27.5	1.68	42.86	54	-9.46	-	-	0-360	200	V
1.886	45.41	PK2	31	-22.6	0	53.81	-	-	74	-20.19	202	200	V
1.915	42.42	PK2	31.2	-22.6	0	51.02	-	-	74	-22.98	0	200	V
1.914	36.98	MAV1	31.2	-22.6	1.68	45.58	54	-6.74	-	-	0-360	200	V
2.445	46.76	PK2	32.2	-22.2	0	56.76	-	-	74	-17.24	0	100	H
2.45	43.34	MAV1	32.2	-22.2	1.68	51.66	54	-2.34	-	-	0-360	100	H
2.511	44.91	PK2	32.3	-22.1	0	55.11	-	-	74	-18.89	0	100	H
2.511	36.3	MAV1	32.3	-22.1	1.68	46.5	54	-5.82	-	-	0-360	100	H
2.58	47.01	PK2	32.4	-22	0	57.41	-	-	74	-16.59	0	100	H
2.579	35.98	MAV1	32.4	-22	1.68	46.38	54	-5.94	-	-	0-360	100	H
6.326	38.57	PK2	35.4	-28.5	0	45.47	-	-	74	-28.53	202	100	V
9.811	35.61	PK2	36.9	-24.7	0	47.81	-	-	74	-26.19	316	100	V
10.066	34.95	PK2	36.9	-24.6	0	47.25	-	-	74	-26.75	202	201	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

BLE\_Harm\_2480.dat 39763 12 Jun 2014

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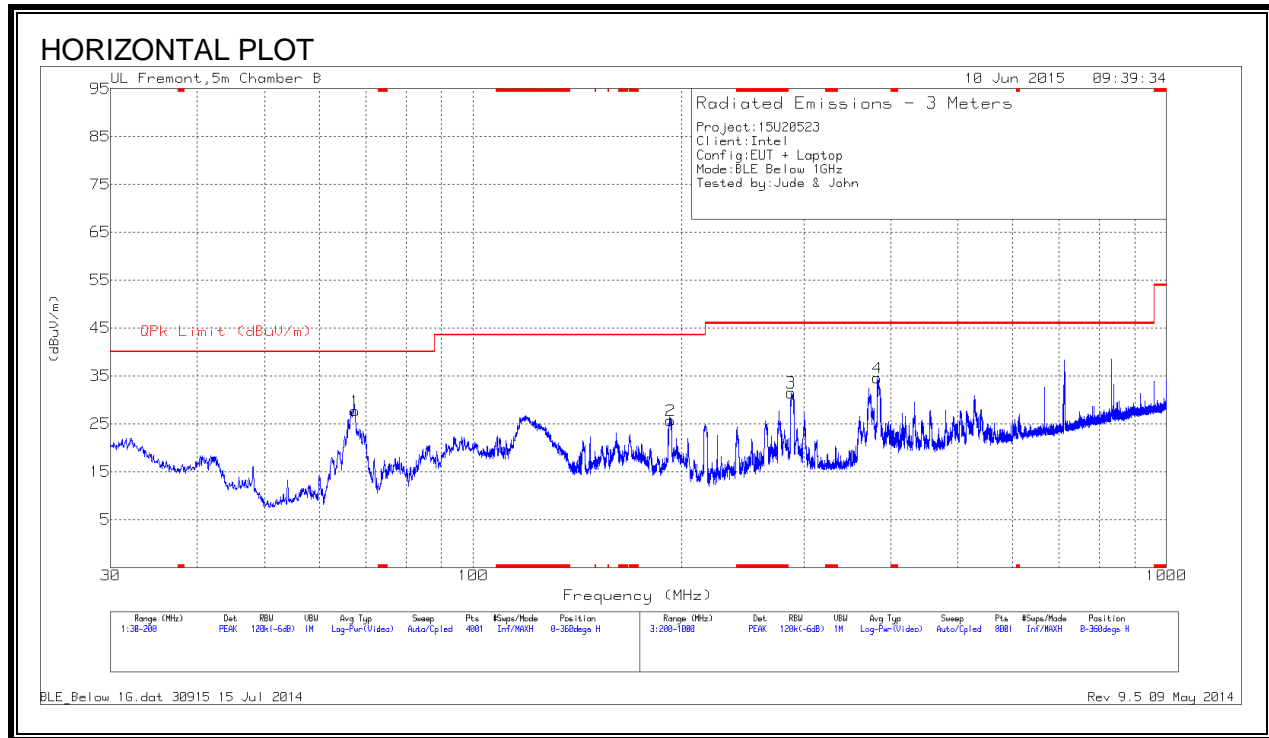
PK2 - KDB558074 Method: Maximum Peak

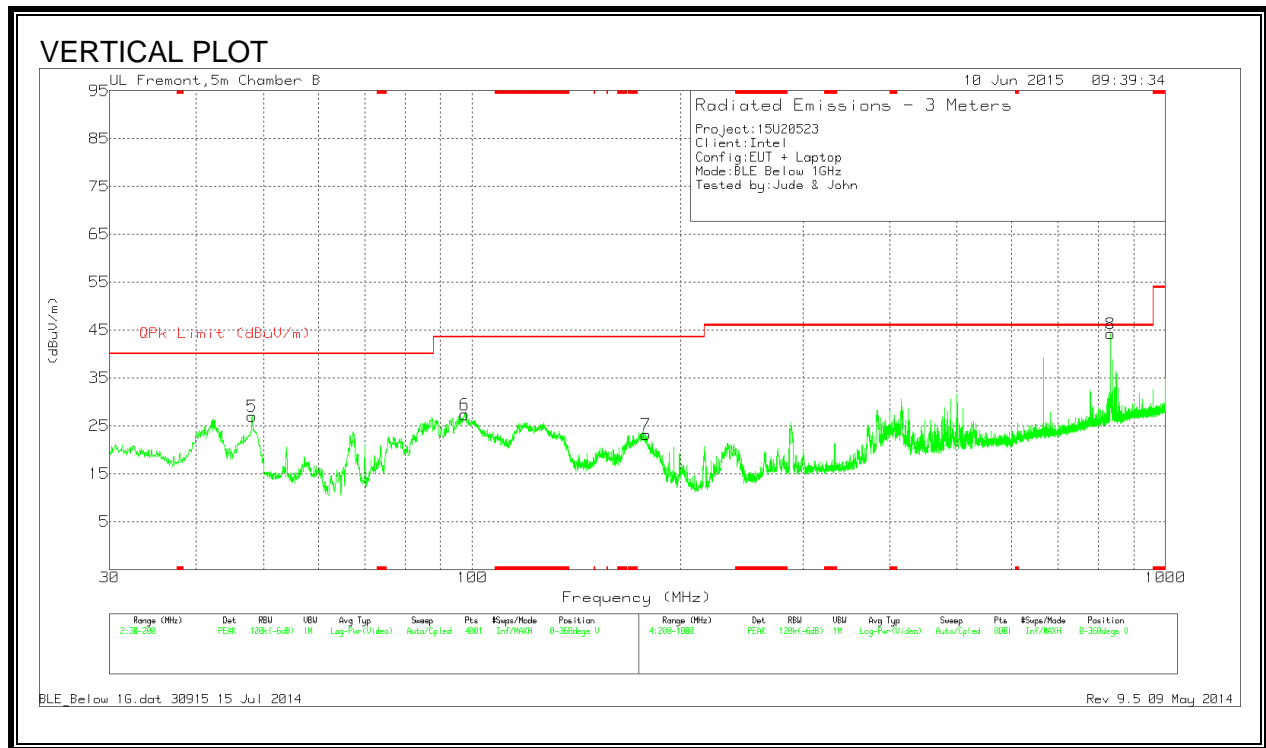
MAV1 - KDB558074 Option 1 Maximum RMS Average

### 10.3. WORST-CASE BELOW 1 GHz

#### 10.3.1. EUT WITHOUT WRISTBAND

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)





## DATA

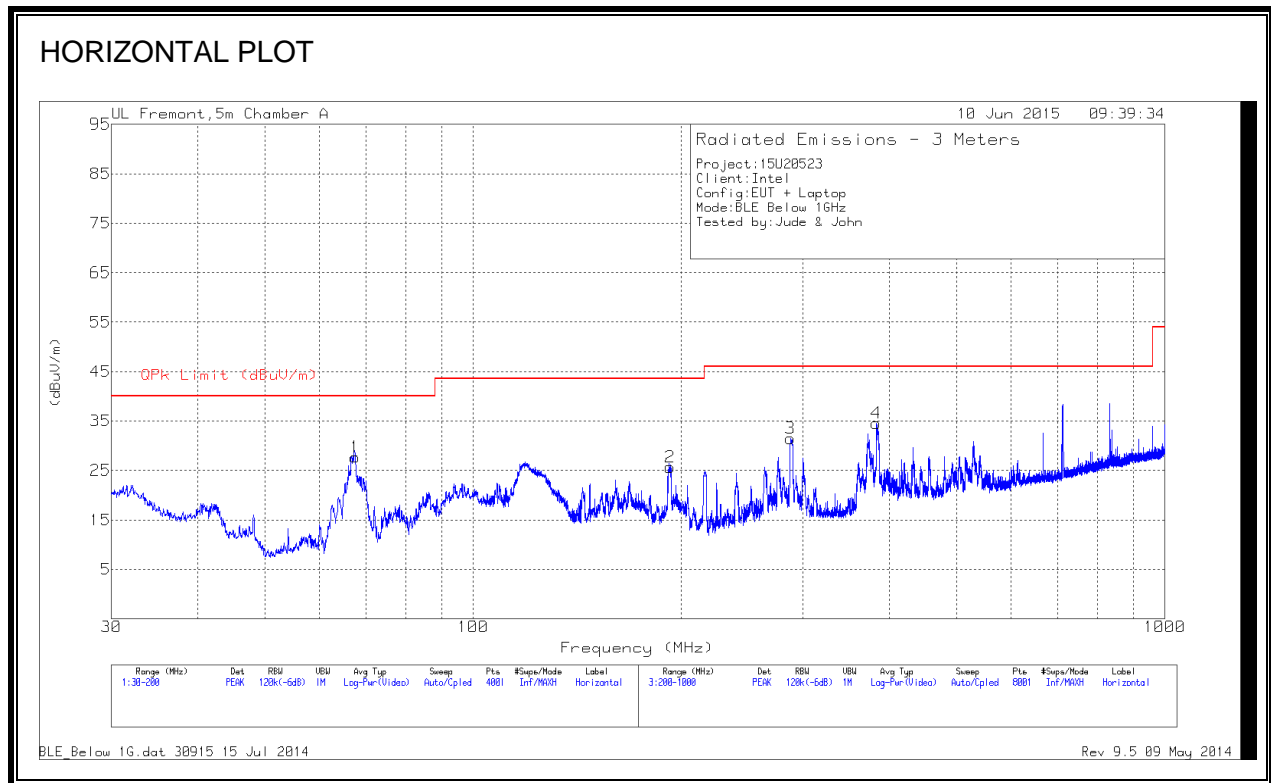
### Trace Markers

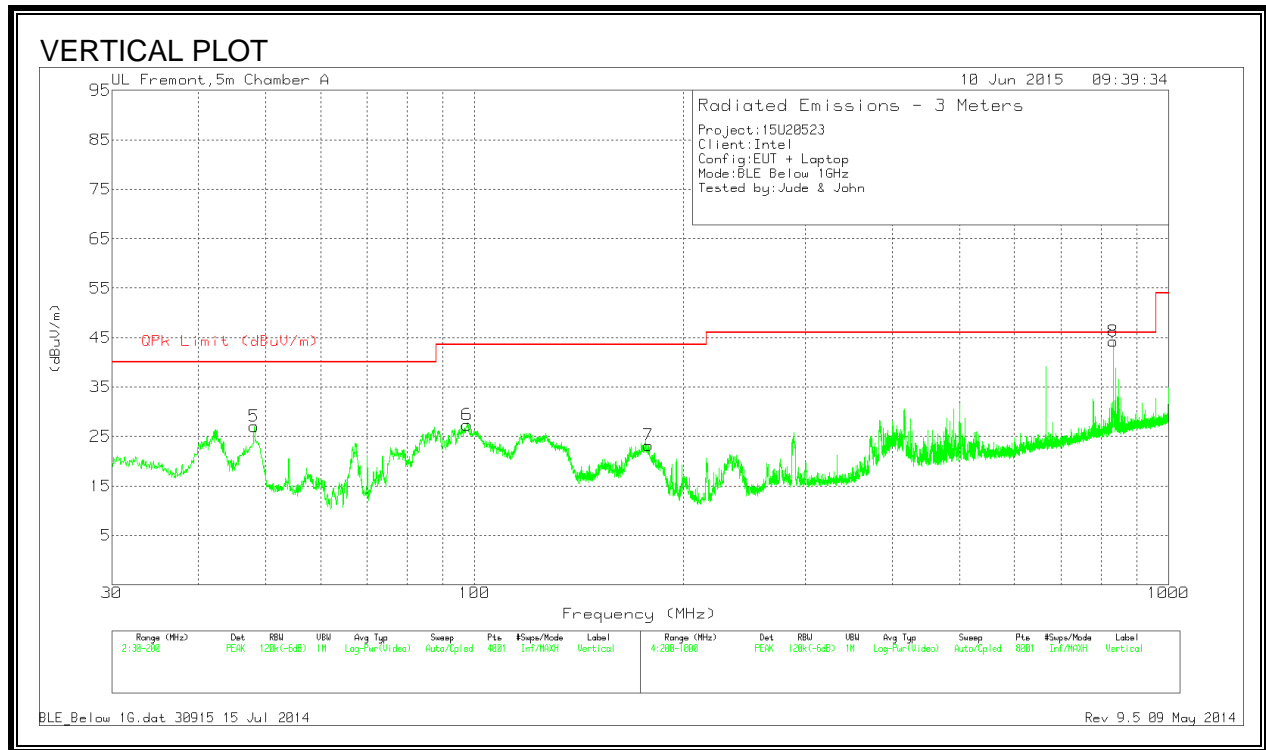
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	48.1475	46.81	PK	8.9	-28.7	27.01	40	-12.99	0-360	101	V
1	67.57	48.09	PK	8	-28.4	27.69	40	-12.31	0-360	299	H
6	97.575	45.95	PK	9.5	-28.1	27.35	43.52	-16.17	0-360	101	V
7	178.0488	39.07	PK	11.3	-27.2	23.17	43.52	-20.35	0-360	101	V
2	192.5625	40.95	PK	11.8	-27.1	25.65	43.52	-17.87	0-360	101	H
3	287.6	44.28	PK	13.3	-26.1	31.48	46.02	-14.54	0-360	101	H
4	382.7	45.23	PK	15.2	-25.9	34.53	46.02	-11.49	0-360	101	H
8	833.3	45.85	PK	21.9	-23.5	44.25	46.02	-1.77	0-360	101	V

PK - Peak detector

### 10.3.2. EUT WITH METAL WRISTBAND

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)







## DATA

### Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	67.57	48.09	PK	8	-28.4	27.69	40	-12.31	0-360	299	H
2	192.5625	40.95	PK	11.8	-27.1	25.65	43.52	-17.87	0-360	101	H
5	48.1475	46.81	PK	8.9	-28.7	27.01	40	-12.99	0-360	101	V
6	97.575	45.95	PK	9.5	-28.1	27.35	43.52	-16.17	0-360	101	V
7	178.0488	39.07	PK	11.3	-27.2	23.17	43.52	-20.35	0-360	101	V
3	287.6	44.28	PK	13.3	-26.1	31.48	46.02	-14.54	0-360	101	H
4	382.7	45.23	PK	15.2	-25.9	34.53	46.02	-11.49	0-360	101	H
8	833.3	45.85	PK	21.9	-23.5	44.25	46.02	-1.77	0-360	101	V

PK - Peak detector