

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

BLUETOOTH LOW ENERGY CERTIFICATION TEST REPORT

FOR

LED INTERACTIVE WRISTBAND WITH BLE

MODEL NUMBER: LED INTERACTIVE WRISTBAND

FCC ID: 2AB8ZND13

IC: 1000X-ND13

REPORT NUMBER: 15U22361-E2V3

ISSUE DATE: DECEMBER 10, 2015

Prepared for INTEL CORPORATION 2200 MISSION COLLEGE BOULEVARD, SANTA CLARA, CA 95052, U.S.A

Prepared by UL VERIFICATION SERVICES INC. 47173 BENICIA STREET FREMONT, CA 94538, U.S.A. TEL: (510) 771-1000 FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	12/04/2015	Initial Issue	C. Pang
V2	12/09/2015	Add Setup Photo	C. Pang
V3	12/10/2015	Address TCB's Question	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:	LED interactive wristband with BLE		
MODEL:	LED Interactive Wristband		
SERIAL NUMBER:	002		
DATE TESTED:	NOVEMBER 30 TH – DECEMBER 1 st 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 UL Verification Services Inc. By:

CHIN PANG SENIOR ENGINEER UL Verification Services Inc.

Tested By:

lifted the

CLIFFORD SUSA EMC ENGINEER UL Verification Services Inc.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, RSS-GEN Issue 4, RSS-247 Issue 1.

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. 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
Chamber A	Chamber D
Chamber B	Chamber E
Chamber C	Chamber F
	Chamber G
	🛛 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 <u>http://ts.nist.gov/standards/scopes/2000650.htm</u>.

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: Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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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	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

BLE interactive wristband

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range	Mode	Output Power	Output Power
(MHz)		(dBm)	(mW)
2402 - 2480	BLE	4.67	2.93

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a trace antenna, with a maximum gain of 1.7 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was debug-custom build 20151122

5.5. 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 and Z, it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

Based on the baseline scan, the worst-case data rates were:

BLE: 1 Mbps.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List							
Description	Manufacturer	Model	Serial Number	FCC ID			
Laptop	Lenovo	Yoga 2 11	YB04282152	DoC			
AC adapter	Lenovo	ADLX45NCC3A	11S45N0297Z1ZSH443G0XE	DoC			
AC adapter	Phihong	PSC12R-050	P22501361A1	DoC			

I/O CABLES

	I/O Cable List							
Cable	Port	# of identical	Connector	Cable Type	Cable Length	Remarks		
No		ports	Туре		(m)			
1	AC	1	3-Prong	Un-Shielded	1	N/A		
2	DC	1	DC	Un-Shielded	1.75	N/A		
3	USB	1	USB	Un-Shielded	1.75	Laptop to EUT		
4	DC	1	DC	Un-Shielded	1.6	AC Adapter to EUT		
5	Antenna	1	SMA	Shielded	0.1	EUT to spectrum Analyzer		

TEST SETUP

Test software exercised the radio card.

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SETUP DIAGRAM FOR CONDUCTED TESTS



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SETUP DIAGRAM FOR RADIATED TESTS



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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			
Conducted Software	UL	UL EMC		Ver 3.8			
Spectrum Analyzer,	Keysight	N9030A	906	6/11/2015	6/11/2016		
PXA, 3Hz to 44GHz				0/11/2013	0/11/2010		
Antenna, Horn 1-18GHz	ETS Lindgren	3117	863	4/10/2015	4/10/2016		
Antenna,	Sunol Sciences	JB3					
Broadband Hybrid, 30 to 2000MHz			900	4/10/2015	4/10/2016		
Amplifier, 1-18GHz	Miteq	AFS42-00101800-25-	495	10/21/2015	10/21/2016		
		S-42		,,	,		
Spectrum Analyzer, PXA, 3Hz to	Keysight	N9030A	1210	5/22/2015	5/22/2016		
44GHz				3,22,2013	3,22,2010		
Amplifier, 10kHz to 1GHz	Sonoma	310N	835	6/9/2015	6/9/2016		
Power Meter	Keysight	N1911A	1244	7/2/2015	7/2/2016		
Power Sensor	Keysight	N1921A	1226	7/6/2015	7/6/2016		
Amplifier, 1-26.5GHz	Keysight	8449B	404	6/29/2015	6/29/2016		
Antenna, Horn 18 - 26GHz	ARA	MWH-1826	89	12/17/2014	12/17/2015		
Spectrum Analyzer, 40GHz	Keysight	8564E	106	8/14/2015	8/14/2016		
Filter, HPF 3.0GHz	Micro-Tronics	HPM17543	427	1/31/2015	1/31/2016		

6. ANTENNA PORT TEST RESULTS

6.1. MEASUREMENT METHODS

<u>6 dB BW</u>: KDB 558074 D01 v03r03, Section 8.1.

Output Power: KDB 558074 D01 v03r03, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r03, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r03, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r03, Section 12.1.

Band-edge: KDB 558074 D01 v03r03, Section 12.1

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6.2. ON TIME, DUTY CYCLE

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	lode ON Time Perio		Duty Cycle	Duty	Duty Cycle	1/B
	В		х	Cycle Correction Factor		Minimum VBW
	(msec)	(msec)	(linear)	(%)	(dB)	(kHz)
BLE	0.161	0.625	0.257	25.74%	5.89	6.219

DUTY CYCLE PLOTS



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6.3. 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.

<u>RESULTS</u>

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.672	0.5
Middle	2440	0.704	0.5
High	2480	0.684	0.5

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6 dB BANDWIDTH





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6.4. 99% **BANDWIDTH**

<u>LIMITS</u>

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	99% Bandwidth
	(MHz)	(MHz)
Low	2402	0.9854
Middle	2440	0.9760
High	2480	0.9754

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99% BANDWIDTH





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6.5. 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	Peak Power Reading	Limit	Margin		
	(MHz)	(dBm)	(dBm)	(dB)		
Low	2402	4.67	30	-25.330		
Middle	2440	4.18	30	-25.820		
High	2480	4.30	30	-25.700		

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OUTPUT POWER

enter l	RF 50 Ω DC Freq 2.40200000) GHz PNO: Fast	SENS Trig: Free	e:int Run	ALIC #Avg Type: F	IN AUTO	01:30:09 PM TRAC TYP	4Dec 01, 2015 2 3 4 5 6 ≈ Mwwwwww	Frequency
0 dB/div	Ref Offset 10.7 dB Ref 20.00 dBm	IFGain:Low	Atten: 20 d	IB		M	₀ lkr1 2.4 4.0	02 GHz 67 dBm	Auto Tune
10.0				1					Center Freq 2.402000000 GHz
0.00									Start Freq 2.400500000 GHz
20.0									Stop Fred 2.403500000 GHz
10.0									CF Step 300.000 kHz <u>Auto</u> Mar
0.0									Freq Offset
'0.0									



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enter l	RF 50 Ω DC Freq 2.480000000) GHz PNO: Fast G	SENSE:I	vT #Avg T n	ALIGN AUTO 'ype: RMS	01:48:23 PMD TRACE TYPE DET	BC 01, 2015	Frequency
0 dB/div	Ref Offset 10.7 dB Ref 20.00 dBm	IFGain:Low	Atten: 20 dB		P	/kr1 2.48 4.30	0 GHz 0 dBm	Auto Tune
og			1					Center Freq 2.480000000 GHz
0.00								Start Freq 2.478500000 GHz
0.0								Stop Fred 2.481500000 GHz
0.0								CF Step 300.000 kHz <u>Auto</u> Man
0.0								Freq Offset 0 Hz
enter 2	.480000 GHz				_	Span 3.0	00 MHz	

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6.6. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	AV power
	(MHz)	(dBm)
Low	2402	4.52
Middle	2440	4.07
High	2480	4.15

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6.7. 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	PSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	-10.50	8	-18.50
Middle	2440	-11.01	8	-19.01
High	2480	-11.05	8	-19.05

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POWER SPECTRAL DENSITY





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6.8. 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.

RESULTS

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SPURIOUS EMISSIONS, LOW CHANNEL





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SPURIOUS EMISSIONS, MID CHANNEL





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SPURIOUS EMISSIONS, HIGH CHANNEL





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7. RADIATED TEST RESULTS

<u>LIMITS</u>

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 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured 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

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7.1. **TRANSMITTER ABOVE 1 GHz**



7.1.1. RESTRICTED BANDEDGE (LOW CHANNEL)

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fl 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	44.11	Pk	32	-23.5	0	52.61	-	-	74	-21.39	191	215	Н
2	* 2.319	53.08	Pk	31.8	-23.5	0	61.38	-	-	74	-12.62	191	215	Н
3	* 2.39	29.81	RMS	32	-23.5	5.89	44.2	54	-9.8	-	-	191	215	Н
4	* 2.319	35.26	RMS	31.8	-23.5	5.89	49.45	54	-4.55	-	-	191	215	Н

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band Pk - Peak detector **RMS - RMS detection**



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fl 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	40.64	Pk	32	-23.5	0	49.14	-	-	74	-24.86	96	209	V
2	* 2.319	47.26	Pk	31.8	-23.5	0	55.56	-	-	74	-18.44	96	209	V
3	* 2.39	29.12	RMS	32	-23.5	5.89	43.51	54	-10.49	-	-	96	209	V
4	* 2.32	30.45	RMS	31.8	-23.5	5.89	44.64	54	-9.36	-	-	96	209	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band Pk - Peak detector

RMS - RMS detection

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7.1.2. AUTHORIZED BANDEDGE (HIGH CHANNEL)



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fl 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	* 2.484	45.1	Pk	32.4	-23.4	0	54.1	-	-	74	-19.9	190	167	Н
2	* 2.497	52.75	Pk	32.4	-23.4	0	61.75	-	-	74	-12.25	190	167	Н
3	* 2.484	29.27	RMS	32.4	-23.4	5.89	44.16	54	-9.84	-	-	190	167	Н
4	* 2.497	37.19	RMS	32.4	-23.4	5.89	52.08	54	-1.92	-	-	190	167	Н

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band Pk - Peak detector RMS - RMS detection

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Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fl 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	* 2.484	39.61	Pk	32.4	-23.4	0	48.61	-	-	74	-25.39	139	223	V
2	* 2.497	48.66	Pk	32.4	-23.4	0	57.66	-	-	74	-16.34	139	223	V
3	* 2.484	29.32	RMS	32.4	-23.4	5.89	44.21	54	-9.79	-	-	139	223	V
4	* 2.497	33.74	RMS	32.4	-23.4	5.89	48.63	54	-5.37	-	-	139	223	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band Pk - Peak detector RMS - RMS detection

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7.1.3. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL



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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimut h (Degs)	Heig ht (cm)	Polari ty
1	* 2.319	53.1	PK2	31.8	-23.5	0	61.4	-	-	74	-12.6	173	122	Н
	* 2.319	35.48	MAv1	31.8	-23.5	5.89	49.67	54	-4.33	-	-	173	122	Н
2	* 2.376	50.85	PK2	32	-23.5	0	59.35	-	-	74	-14.65	199	167	Н
	* 2.376	33.14	MAv1	32	-23.5	5.89	47.53	54	-6.47	-	-	199	167	Н
3	2.436	48.11	Pk	32.2	-23.4	0	56.91	-	-	-	-	0-360	201	Н
5	2.436	40.61	Pk	32.2	-23.4	0	49.41	-	-	-	-	0-360	100	V
4	2.451	41.78	Pk	32.3	-23.4	0	50.68	-	-	-	-	0-360	201	Н
6	7.069	34.79	Pk	35.8	-28.6	0	41.99	-	-	-	-	0-360	200	V

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

* - Compliance for emissions in restricted bands near the fundamental is shown in radiated bandedge testing

- Compliance for emissions in non-restricted bands is shown in conducted out of band testing

Pk - Peak detector PK2 - KDB558074 Method: Maximum Peak MAv1 - KDB558074 Option 1 Maximum RMS Average

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MID CHANNEL



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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl /Fltr/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
2	* 2.497	54.32	PK2	32.4	-23.4	0	63.32	-	-	74	-10.68	198	203	Н
	* 2.497	35.2	MAv1	32.4	-23.4	5.89	50.09	54	-3.91	-	-	198	203	Н
1	2.464	48.18	Pk	32.3	-23.4	0	57.08	-	-	-	-	0-360	100	Н
4	2.464	41.41	Pk	32.3	-23.4	0	50.31	-	-	-	-	0-360	200	V
3	2.566	46.1	Pk	32.5	-23.2	0	55.4	-	-	-	-	0-360	201	Н
5	2.567	42.47	Pk	32.5	-23.2	Ö	51.77	-	-	-	-	0-360	200	V
6	7.069	34.63	Pk	35.8	-28.6	0	41.83	-	-	-	-	0-360	200	V

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

- Compliance for emissions in non-restricted bands is shown in conducted out of band testing

Pk - Peak detector PK2 - KDB558074 Method: Maximum Peak MAv1 - KDB558074 Option 1 Maximum RMS Average

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HIGH CHANNEL

115 _C	JL Fremont – Chamber H			1							30 Nov	2015	20:47	:42
105						Project Client:	ted Em Number: INTEL	15U223	ons 、 61	d-Me	ters			
95						Mode:ËLE, 248BMHz Tested by:C. XIONG								
85						L								
75	Peak Limit (dBuV/m)													
65														
55			34 50											
45							L . mainte	فتعملهم	المانحين الأقد استقرر	ر مەجرىلىيە	فلعملما		and the second sec	
35				Manufal and the second dates of the second dat	بهمانيل ويزور	printer in a state in								
25														
1		1		Eneru	i encu (GH	1z)				11	3			18
rt15 Su RT	ubpart C 2488MHz Spurious Emissions wit	ih Average Sca	n.TST 30915	5 23 Jun 2015									Rev	9.5 24
L RT 115	ubpart C 2488MHz Spurious Emissions wit TICAL JL Fremant - Chamber H	ih Average Sca	n.TST 30915	5 23 Jun 2815							30 Nov	2015	Rev 20:47	9.5 24
RT 115 105 95	ubpart C 2480MHz Spurious Emissions wit TICAL JL Fremant - Chamber H	ih Average Sca	n.TST 30915	5 23 Jun 2015		Radia Project Client: Config:E Mode:BLE Tested	ted Em Number: INTEL EUT WITH E, 2480M by:C. XI	issi 15U2231 AC ADI Hz DNG	ONS (61 APTER -	3−Me + LAPT	30 Nov ters OP	2015	Rev 20:47	9.5 24
115 95	ubpart C 2400MHz Spurious Emissions wit TICAL JL Fremont - Chamber H	h Average Sca	n.TST 30915	5 23 Jun 2015		Radia Project Client: Config Mode: BLE Tested I	ted Em Number: INTEL EUT WITH 2, 2488M Sy:C. XI	1 i ss i 15U223I AC ADI Hz DNG	ons (61 APTER -	3-Me + LAPT	30 Nov ters OP	2015	Rev 20:47	9.5 24
RT 115 105 85 75	ubpart C 2400MHz Spurious Emissions wit TICAL JL Fremant - Chamber H Peak Limit (dBuU/m)	h Average Sca	n.TST 30915	5 23 Jun 2015		Radia Project Client: Config: Mode:BL Tested I	ted Em Number: INTEL EUT WITH C, 2480M Dy:C. XI	1551 15U223 AC ADI Hz ONG	ons (61 APTER -	3-Me + LAPT	30 No∨ ters OP	2015	Rev 20:47	9.5 24
115 Sur RT 115 95 85 75 65	ubpart C 2400MHz Spurious Emissions wit TICAL JL Fremont - Chamber H Peak Limit (dBuV/m)	h Average Sca	n.TST 38915	5 23 Jun 2015		Radia Project Client: Config: Mode: BLE Tested H	ted Em Number: INTEL UT WITH Z, 2480M Sy:C. XI	1 i s s i 15U2230 AC ADI Hz ONG	ons (61 APTER -	3-Me + LAPT	<u>30 Nov</u> ters OP	2015	Rev.	9.5 24
1115 ⁴ 1115 ⁴ 1115 ⁴ 1105 1105 1105 1105 1105 1105 1105 110	ubpart C 2400MHz Spurious Emissions wit TICAL JL Fremont - Chamber H Peak Limit (dBuV/m) Avg Limit (dBuV/m)	h Average Sca	n.TST 38915	5 23 Jun 2015		Radia Project Client: Config: Mode:BL Tested I	ted Em Number: INTEL 2480M 99:C. XI	15U223I AC ADI Hz ONG	ons (61 APTER -	3-Me + LAPT	30 Nov ters OP	2015	Rev 20:47	9.5 24 ; 42
RT 115 1105 95 65 65 45	ubport C 2480MHz Spurious Emissions wit TCAL JL Fremont - Chamber H Peak Limit (dBuU/m) Avg Limit (dBuU/m)	h Average Sca	n.TST 38915	5 23 Jun 2015		Radia Project Client: Config: Mode:BL Tested I	ted Er Number: INTEL UT WITH 2 2480M 29:C. XI	nissi 15U223 Hz DNG	ons (3-Me + LAPT	30 Nov ters OP	2015	Rev 20:47	9.5 24
E C C C C C C C C C C C C C C C C C C C	ubpart C 2400MHz Spurious Emissions wit TCAL JL Fremont - Chamber H Peak Limit (dBuU/m) Avg Limit (dBuU/m)	h Average Sca	n. TST 38915	5 23 Jun 2015		Radia Project Client: Config: Tested H Hode:BL	ted Err Number: INTEL UT WITH yg:C. XI	issi 15U223 AC ADJ DNG	ONS S	3-Me + LAPT	30 Nov ters OP	2015	Rev 28:47	9.5 24
E C C C C C C C C C C C C C C C C C C C	ukpart C 2400MHz Spurious Emissions wit TCAL JL Fremant - Chamber H Peak Limit (dBuU/m) Avg Limit (dBuU/m)	h Average Sca	n. TST 30915	5 23 Jun 2015		Radia Project Client: Gonfig: Mode:BLI Tested I	ted Em Number: INTEL UT WITH 5, 2488M Sg:C. XI	IISSI 15U223 AC ADI DNG	ons (3-Me + LAPT	30 Nov ters OP	2015	Rev 28:47	9.5 24
1115 95 65 45 25 1	ubpart C 2400MHz Spurious Emissions with TCAL JL Fremant - Chamber H Peak Limit (dBuU/m) Avg Limit (dBuU/m)	h Average Sca	n.TST 30915	5 23 Jun 2015		Radia Project Client: Config: Mode:BLI Tested I	ted Em Number: INTEL UT WITH 2,2488M 9g:C. XI	nissi 15u223 Hz DNG	ONS	3-Me + LAPT	38 Nov ters OP	2015	Rev 20:47	9.5 24
1115 RT 1115 95 65 65 45 25 1	Udpart C 2400MHz Spurious Emissions with TCAL JL Fremont - Chamber H Peak Limit (dBuU/m) Avg Limit (dBuU/m) Avg Limit (dBuU/m) Emission Emission Emissions with Avg Limit (dBuU/m) Emission Emission Emiss	h Average Sca	n. TST 38915	5 23 Jun 2015	ency (Gf	Radia Project Client: Config: Mode: BLI Tested I	ted Em Number: INTEL UT WITH S, 2488M Sg:C. XI	1/1 ssii 1 suz23 Hz NNG	et/hg lys	3-Me + LAPT	30 Nov ters 0P	2015	Rev 28:47	9.5 24 :42

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<u>DATA</u>

Marker	Frequency (GHz)	Meter Reading	Det	AF T863 (dB/m)	Amp/Cbl /Fltr/Pad	DC Corr (dB)	Corrected Reading	Avg Limit	Margin (dB)	Peak Limit	PK Margin	Azimut h	Heigh t	Polarity
		(aBuv)			(ab)		(aBuv/m)	(aBuv/m)		(aBuv/m)	(ab)	(Degs)	(cm)	
5	* 5.001	42.01	PK2	34.3	-30.7	0	45.61	-	-	74	-28.39	242	115	V
	* 5	32.74	MAv1	34.3	-30.7	5.89	42.23	54	-11.77	-	-	242	115	V
3	* 2.497	53.08	PK2	32.4	-23.4	0	62.08	-	-	74	-11.92	168	130	Н
	* 2.497	36.39	MAv1	32.4	-23.4	5.89	51.28	54	-2.72	-	-	168	130	Н
1	2.436	45.18	Pk	32.2	-23.4	0	53.98	-	-	-	-	0-360	100	Н
2	2.463	44.46	Pk	32.3	-23.4	0	53.36	-	-	-	-	0-360	201	Н
4	2.566	44.21	Pk	32.5	-23.2	0	53.51	-	-	-	-	0-360	201	Н
6	7.07	34.05	Pk	35.8	-28.6	0	41.25	-	-	-	-	0-360	200	V

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

- Compliance for emissions in non-restricted bands is shown in conducted out of band testing

Pk - Peak detector PK2 - KDB558074 Method: Maximum Peak MAv1 - KDB558074 Option 1 Maximum RMS Average

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7.2. WORST-CASE BELOW 1 GHz



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DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	55.225	54.14	Qp	7.2	-30.9	30.44	40	-9.56	296	158	V
3	72.8275	48.51	Qp	8.5	-30.8	26.21	40	-13.79	359	240	V
4	106.415	54.66	Pk	11.7	-30.5	35.86	43.52	-7.66	0-360	100	V
1	107.265	52.34	Pk	11.9	-30.4	33.84	43.52	-9.68	0-360	301	Н
5	395.8	51.42	Pk	15.2	-28.7	37.92	46.02	-8.1	0-360	100	Н
7	430.38	51.03	Qp	16.4	-28.6	38.83	46.02	-7.19	318	104	V
8	480.015	49.89	Qp	17.7	-28.3	39.29	46.02	-6.73	155	107	V
6	666.7	44.71	Pk	19.5	-27.8	36.41	46.02	-9.61	0-360	201	Н
9	666.675	49.71	Qp	19.5	-27.8	41.41	46.02	-4.61	127	109	V
10	800.02	43.31	Qp	21.4	-27.4	37.31	46.02	-8.71	267	116	V
11	866 71	38.87	On	21 7	-26.8	33 77	46.02	-12 25	228	126	V

Pk - Peak detector

Qp - Quasi-Peak detector

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7.3. WORST-CASE 18 - 26GHz

_UL EMC		
		RF Emissions
5		Order Number:15U22361
		Configuration:EUT WITH AC ADAPTER + LAPTOP
5		Tested by / SN:C. XIONG
Real Carls	(-)	
	/ m /	
_		
Avg Limit (dBuU/r	۲n	
5		
And more allowed	and annullier melering man	and and an an an and a second and a second and a second and a second and the second and a second and a second a
5		
10		Erequency (GHz)
Range (GHz) RBU/VBU	Ref/Attn Det/Avg Typ Sweep Pts #Swpa/No	ade Label Range (GHz) R84/VB4 Ref/Attn Det/Avg Type Sweep Pts #Swps/Mode Label
Test. TST 38915 6 Jan TICAL	9//8 PLR/ - IBBRRE(Ruto) [282 With 2815	Rev 9.5 16
Test.TST 38915 6 Jan TICAL	9//8 PL/K/ - IBBAsec(Ruto) 1282 MiXH 2815	Rev 9.5 16
Test.TST 38915 6 Jan TICAL	9//8 PL/R/ - IBBAsec(Ruto) 1282 MiXH 2815	Rev 9.5 16 30 Nov 2015 21:29:51 RF Emissions
1:18-26 114-3487.34 Test.TST 38915 6 Jan TICAL	9//8 PL/R/ - IBBAsec(Ruto) 1282 Million 2815	Rev 9.5 16 30 Nov 2015 21:29:51 0rder Number:15U22361 Client:INTEL Client:INTEL
Test.TST 38915 6 Jan TICAL UL EMC	9//8 PL/R/ - IBBAsec(Ruto) 1282 Million 2815	Rev 9.5 16 30 Nov 2015 21:29:51 0rder Number:15U22361 Client:INTEL Configuration:EUT WITH AC ADAPTER + LAPTOP Mode:ELE WORST CASE
1:18-26 114-3487.34 Test.TST 38915 6 Jan TICAL UL EMC	2815	Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEL Configuration:EUT WITH AC ADAPTER + LAPTOP Mode:BLE WORST CASE Tested by / SN:C. XIONG
1:8-26 1:8-26 3:80:38 Test.TST 38915 6 Jan TICAL 5 JU_EMC Supervision Peak Limit (dBuU)	2815	Morizantal Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEL Configuration:EUT WITH AC ADAPTER + LAPTOP Mode: BLE WORST CASE Tested by / SN:C. XIONG
1:18-26 1911-3480/38 Test.TST 38915 6 Jan TICAL 5 JUL EMC 5 Peak Limit (dBuU)	2815	Morizantal Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEL Configuretion:EUT WITH AC ADAPTER + LAPTOP Mode: BLE WORST CASE Tested by / SN:C. XIONG
1:18-26 141-3487.34 Test.TST 38915 6 Jan TICAL UL EMC 	2815	Morizantal Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEL Configuretion:EUT WITH AC ADAPTER + LAPTOP Mode: BLE WORST CASE Tested by / SN:C. XIONG
1:8-26 1:8-26 3:80:38 Test.TST 38915 6 Jan JUL EMC Jul EMC </td <td>2815</td> <td>Morizantal Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEL Configuretion:EUT WITH AC ADAPTER + LAPTOP Mori SLE WIST CASE Tested by / SN:C. XIONG</td>	2815	Morizantal Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEL Configuretion:EUT WITH AC ADAPTER + LAPTOP Mori SLE WIST CASE Tested by / SN:C. XIONG
Test.TST 38915 6 Jan TICAL JUL EMC Peak Limit (dBuU/r	2815	Morizantal Rev 9.5 16 30 Nov 2015 21:29:51 RF Emissions Order Number:15U22361 Client:INTEL Configuration:EUT WITH AC ADAPTER + LAPTOP ModelsEE WORST CASE Tested by / SN:C. XIONG
1:8-26 1:8-26 1:8-26 3:80:38 Test.TST 38915 6 Jan 5 5 5 JUL EMC 5 5 5 5 Peak Limit (dBuU/r 5 5 5 Avg Limit (dBuU/r 5 6 5	9//8 PLR/ - Iddeec(Auto) 1282 Mont 2815 /m)	Morizantal Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEL Configuration:EUT WITH AC ADAPTER + LAPTOP Tested by / SN:C. XIONG
1:8-26 1:8-26 3 Test.TST 38915 6 Jan TICAL 3 JUE EMC 3 Peak Limit (dBuU/r Avg Limit (dBuU/r	2815	Rev 9.5 16 38 Nov 2815 21:29:51 RF Emissions Order Number:15U22361 Client:INTEL Configuration:EUT WITH AC ADAPTER + LAPTOP ModelsEE WORK: CASE Tested by / SN:C. XIONG
1:18-26 1:18-26 3:18-26 June 2007 Test.TST 38915 6 Jan JUL EMC	2815	Merizatal Rev 9.5 16 38 Nov 2815 21:29:51 Order Number:15U22361 Client:INTEL Configuretion:EUT WITH AC ADAPTER + LAPTOP Mode: BLE UNCET CASE Tested by / SN:C. XIONG
Test.TST 38915 6 Jan TICAL UL EMC Peak Limit (dBuU/r Avg Limit (dBuU/r	2815	Rev 9.5 16 38 Nov 2815 21:29:51 RF Emissions Order Number:15U22361 Client:INTEL Configuration:EUT WITH AC ADAPTER + LAPTOP Mode:BLE UNCE: CASE Tested by / SN:C. XIONG
Tinza Misabian Test.TST 38915 6 Jan TICAL UL EMC Peak Limit (dBuU/r Avg Limit (dBuU/r	2815	Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INUE Configuration:EUT WITH AC ADAPTER + LAPTOP Mode:BLE UNC: CASE Tested by / SN:C. XIONG
1:18-26 IM-3487.31 Test.TST 38915 6 Jan TICAL UL EMC UL EMC Peak Limit (dBuU/r Avg Limit (dBuU/r Avg Limit (dBuU/r	2815	Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEL Configuration:EUT WITH AC ADAPTER + LAPTOP Mode:BLE UNCE CASE Tested by / SN:C. XIONG
1:18-26 IM-3487.31 Test.TST 38915 6 Jan TICAL UL EMC Peak Limit (dBuU/r Avg Limit (dBuU/r Avg Limit (dBuU/r	2815	Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEL Configuration:EUT WITH AC ADAPTER + LAPTOP Mode: BLE UNCE CASE Tested by / SN:C. XIONG
1:18-26 INI-3487.31 Test.TST 38915 6 Jan TICAL UL EMC Peak Limit (dBuU/r Avg Limit (dBuU/r Avg Limit (dBuU/r	2815	Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INUEL Client:INUEL Configuration:EUT WITH AC ADAPTER + LAPTOP Tested by / SN:C. XIONG
1:18-26 1:18-26 Jule 2007 Test.TST 38915 6 Jon JL EMC Jule 2007 Jule 2007 Jule	2815	Rev 9.5 16 30 Nov 2015 21:29:51 Order Number:15U22361 Client:INTEUT WITH AC ADAPTER + LAPTOP Configuration:EUT WITH AC ADAPTER + LAPTOP Tested by / SN:C. XIONG
1:18-26 MR-3487.31 Test.TST 38915 6 Jon TICAL JUL EMC Peok Limit (dBuU/r Avg Limit (dBuU/r Avg Limit (dBuU/r	2815	Rev 9.5 16 38 Nov 2815 21:29:51 Order Number:15U22361 Client:INTEUT WITH AC ADAPTER + LAPTOP Mode:BLE UNGET CASE Tested by / SN:C. XIONG
1:18-26 1MI-3487.31 Test.TST 38915 6 Jan JUL EMC	2815	Rev 9.5 16 30 Nov 2815 21:29:51 Order Number: 15U22361 Client: INTEL Order Number: 15U22361 Client: INTEL Order Number: 15U22361 Client: INTEL Tested by / SN:C. XIONG Status Status Frequency (GHz) 2 Frequency (GHz) 2 Status Status<

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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.699	40.2	Pk	32.5	-24.2	-9.5	39	54	-15	74	-35
2	23.975	43.4	Pk	33.3	-24.2	-9.5	43	54	-11	74	-31
3	25.127	43.63	Pk	33.8	-24.6	-9.5	43.333	54	-10.667	74	-30.667
4	19.818	41.4	Pk	32.7	-25.1	-9.5	39.5	54	-14.5	74	-34.5
5	24.128	43.07	Pk	33.4	-24.3	-9.5	42.667	54	-11.333	74	-31.333
6	25.394	44.77	Pk	33.7	-24.3	-9.5	44.667	54	-9.333	74	-29.333

Pk - Peak detector

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