

CERTIFICATION TEST REPORT

Report Number : 11735596-E2V2

Applicant : MICROSOFT CORP ONE MICROSOFT WAY REDMOND, WA 98052, U.S.A.

Model : 1807

- FCC ID : C3K1807
 - IC : 3048A-1807
- EUT Description : PORTABLE COMPUTING DEVICE
- Test Standard(s) : FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS - 247 ISSUE 2

Date Of Issue: October 02, 2017

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	08/23/17	Initial Release	
V2	10/02/17	 Updated section 2 Updated section 7.1 Updated test procedure in section 7.5 and 7.6 	C. Susa

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REPORT NO: 11735 FCC ID: C3K1807	5596-E2V2	DATE: October 2 nd , 2017 IC: 3048A-1807
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	MICROSOFT CORP ONE MICROSOFT WAY REDMOND, WA 98052, U.S.A.	
EUT DESCRIPTION:	PORTABLE COMPUTING DEVICE	
MODEL:	1807	
SERIAL NUMBER:	RADIATED: 032012672953 CONDUCTED: 031936672953	
DATE TESTED:	AUGUST 04 – AUGUST 14, 2017	
	APPLICABLE STANDARDS	
S	TANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C		Pass
INDUSTRY CA	NADA RSS-247 Issue 2	Pass
INDUSTRY CA	NADA 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, or any agency of the U.S. Government.

Approved & Released For UL Verification Services Inc. By:

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FRANCISCO DE ANDA WiSE Program Manager UL VERIFICATION SERVICES INC.

Prepared By:

ERIC YU WISE LAB 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, KDB 558704 D01 v04, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 2.

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
Chamber A(IC: 2324B-1)	Chamber D(IC: 22541-1)
Chamber B(IC: 2324B-2)	Chamber E(IC: 22541-2)
Chamber C(IC: 2324B-3)	Chamber F(IC: 22541-3)
	Chamber G(IC: 22541-4)
	Chamber H(IC: 22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration *#* 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. Chambers A through C are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under Industry Canada company address code 22541 with site numbers 22541 -1 through 2324B-3, respectively.

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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

4.3. MEASUREMENT UNCERTAINTY

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

Parameter	Uncertainty
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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 handheld computing device with 802.11 2x2, a/b/g/n/ac WLAN, Bluetooth, Bluetooth LE.

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	2.73	1.87

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

Frequency Mode Range		Output Power (dBm)	Output Power (mW)
(MHz)			
2402 - 2480	BLE	1.76	1.50

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes integrated antenna, with the maximum gains:

Frequency Band (GHz)	Antenna Gain (dBi)	
2402-2480	0.20	

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 14.2.201.159

The test utility software used during testing was Wifi tool v2.0.0.77

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated band edge, harmonics, and spurious emissions from 1 GHz to 18GHz were performed with the EUT was set to transmit at the Low/Middle/High channels.

Radiated emission below 30MHz, below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT was set to transmit at the channel with highest output power as worst-case scenario.

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

Worst-case data rates as provided by the client 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 AC/DC adapter	Lenovo	ADLX45NCC2A	11S36200281ZZ20059W0H5	NA			
Laptop	Lenovo	11e	LR-04N7BL	NA			
USB Ethernet Adapter	Linksys	USB3GIGV1	15710S08406242	NA			

I/O CABLES

I/O Cable List								
Cable	Cable Port # of identical Connector Cable Type Cable Remarks							
No		ports	Туре		Length (m)			
1	USB	1	USB	Un-Shielded	0.17			
2	DC	1	Proprietary	Un-Shielded	1.75			
3	AC	1	2-prong	Un-Shielded	0.5			
4	Ethernet	1	RJ45	Un-Shielded	2			

TEST SETUP

The EUT was tested connected to a host Laptop via RJ45/USB cable and AC adapter for antenna port. For radiated and AC line, tests were performed with EUT connected to AC adapter. Laptop was used to program settings then removed from 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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SETUP DIAGRAM FOR AC LINE CONDUCTED TESTS



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5.7. 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	Asset	Cal Due			
Antenna, Broadband Hybrid, 30MHz to 2000MHz w/4dB Pad	Sunol Sciences Corp.	JB3	T477	06/22/2018			
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T345	03/07/2018			
Antenna, Horn 18-26.5GHz	ARA	MWH-1826/B	T449	05/26/2018			
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1264	07/08/2018			
Power Sensor, P – series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T413	06/20/2018			
Amplifier, 1-26.5GHz	Agilent (Keysight) Technologies	8449B	T404	07/05/2018			
Amplifier, 10kHz-1GHz	Agilent (Keysight) Technologies	8447D	T15	08/26/2017			
RF Amplifier	MITEQ	AFS42-00101800-25- S-42	T493	02/15/2018			
Spectrum Analyzer, PSA, 3Hz to 26.5GHz	Agilent (Keysight) Technologies	E4440A	T199	07/22/2018			
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T907	01/23/2018			
Spectrum Analyzer, PSA, 3Hz to 26.5GHz	Agilent (Keysight) Technologies	E9030A	T905	01/11/2018			
LISN	FISCHER	FCC-LISN-50/250- 25-2-01	T1310	01/17/2018			

Test Software List						
Description Manufacturer Model Version						
Radiated Software	UL	UL EMC	Ver 9.5, Apr 26, 2016			
Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015			
Antenna Port Software	UL	UL RF	Ver 5.1.1, July 15, 2016			

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6. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	Occupied Band width (6dB)	>500KHz		Pass
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass
15.247	TX conducted output power	<30dBm	Conducted	Pass
15.247	PSD	<8dBm/3kHz		Pass
15.207 (a)	AC Power Line conducted emissions	Section 10		Pass
15.205, 15.209,	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass
15.247(d)		< 74dBuV/m		

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7. ANTENNA PORT TEST RESULTS

7.1. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 558074 D01 v04, Section 6.

<u>6 dB BW</u>: KDB 558074 D01 v04, Section 8.1.

Output Power: KDB 558074 D01 v04, Section 9.1.3.

Power Spectral Density: KDB 558074 D01 v04, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v04, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v04, Section 12.1.

Band-edge: KDB 558074 D01 v04, Section 12.1.

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

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7.2. ON TIME, DUTY CYCLE

<u>LIMITS</u>

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time	Period	Duty Cycle	Duty	Duty Cycle	1/T
	В		x	Cycle	Correction Factor	Minimum VBW
	(msec)	(msec)	(linear)	(%)	(dB)	(kHz)
BLE	0.390	0.624	0.625	62.46%	2.04	2.564

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DUTY CYCLE PLOT



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7.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 (5.2) (a)

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

RESULTS

6 dB BANDWIDTH

Channel	Frequency	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.67	0.5
Middle	2440	0.66	0.5
High	2480	0.67	0.5



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K Agilent 11:50:49	Aug 7,2017				_L	Measure
Pv7.0.1(072717),37 ef 30 dBm Peak 🔽 🔋	7699 CS, Condu #Atten 40 dB	icted A		▲ Mkr1 0.2	660 kHz 242 dB	Meas Of
og Ø B/						Channel Powe
3	18					Occupied B
3.9 Bm PAvg						AC
L S2				ha		Multi Carrie Powe
(f): -50k /p						Power Sta CCD
enter 2.440 000 G es BW 100 kHz	l Hz #VB	W 300 kHz	 Sweep 1		2 MHz 1 pts)	Mor 1 of



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7.4. 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

99% BANDWIDTH

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0178
Middle	2440	1.0177
High	2480	1.0185

OBW LOW CH		
🔆 Agilent 11:47:54 Aug 7, 2017	L	Measure
Ch Freq 2.402 GHz	Trig Free Averages: 20	Meas Off
APv7.0.1(072717),37699 CS, Conducted A		Channel Power
Ref 20 dBm #Atten 30 dB #Peak		Occupied BW
dB/ 0ffst 10.7		ACP
Center 2.402 000 GHz	Span 2 MHz	Multi Carrier Power
1000000000000000000000000000000000000	*5weep 100 ms (1001 pts) Occ BW % Pwr 99.00 % × dB -26.00 dB	Power Stat CCDF
Transmit Freq Error 4.867 kHz × dB Bandwidth 1.231 MHz		More 1 of 2
Copyright 2000–2010 Agilent Technologi	ies	

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OBW MID CH			Masaura
Aglient 11:51:16 Hug 7, 2017		L	measure
Ch Freq 2.44 GHz Occupied Bandwidth	Averages: 20	Trig Free	Meas Off
	10		Channel Power
HPV/.0.1(0/2/17),3/699 LS, Londuct	ed H		
Htten 30 dB #Htten 30 dB			Occupied BW
dB/ offst 10.7	× × × × × × × × × × × × × × × × × × ×	the and	ACP
dB Center 2.440 000 GHz		Span 2 MHz	Multi Carrier Power
#Res BW 18 kHz #VBW	51 kHz = #Sweep 100 m	s (1001 pts)	
Occupied Bandwidth 1 Ø177 MHz	Occ BW % Pwr x dB	99.00 % -26.00 dB	CCDF
Transmit Freq Error 3.494 kHz x dB Bandwidth 1.228 MHz			More 1 of 2
Copyright 2000–2010 Agilent Tec	nologies		
	•••••		



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7.5. AVERAGE POWER

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

TEST 37699	Date:	08/04/17
------------	-------	----------

1Mbps

Channel	Frequency (MHz)	AV Power (dBm)
Low	2402	1.04
Middle	2440	1.76
High	2480	0.05

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7.6. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-247 (5.4) (d)

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

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

OUTPUT POWER

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	1.87	30	-28.13
Middle	2440	2.73	30	-27.27
High	2480	1.34	30	-28.66

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7.7. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-247 (5.2) (b)

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

POWER SPECTRAL DENSITY

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-12.508	8	-20.508
Middle	2440	-11.768	8	-19.768
High	2480	-13.720	8	-21.720



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🕴 Agi	lent 11	:51:41	Aug 7,	, 2017						L	Measure
Pv7.0. ≷ef20 ⊧Peak∥	.1(0727 dBm	′17),37	699 CS #Atten	, Condu 30 dB	icted A			Mkr1 2	2.439 9 -11.76	72 GHz ;8 dBm	Meas Of
.og .0 HB/ Nffst											Channel Powe
.0.7 JB		<u>.</u>	miliyin	mahr	MANN	hamen.	-	Alv ^a ude			Occupied B
}.0 ¦Bm ⊧PAvg L00	MA	NW'' Y	11. 11 M	¥		`Ψ' Р	· • •	¶° °¶¥ 	WV MA	MAN	AC
41 S2 53 FS AA											Multi Carrie Powe
:(f): >50k ≽wp											Power Sta CCD
] Center •R <u>es B</u> 1	2.440 W <u>3 kH</u> ;	000 GH z	lz		 3W_9.1_	kHz	Sweep	106.1 n	Span ns (100	1 MHz 1 pts)	Mor 1 of



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7.8. CONDUCTED BANDEDGE AND 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

CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

CBE LOW CH				
🔆 Agilent 14:15:35	Aug 7, 2017		L	Measure
APv7.0.1(072717),376 Ref 20 dBm # Peak	399 CS, Conducted A Atten 30 dB	Mkr1	2.401 98 GHz 1.29 dBm	Meas Off
Log 10 dB/ 0ffst		÷		Channel Power
10.7 dB DI -18.7	3			Occupied BW
dBm #PAvg				ACP
Center 2.400 00 GHz #Res BW 100 kHz Marker Trace	#VBW 300 kHz Type X Axis	Sweep 1 :	Span 10 MHz ms (1001 pts) Amplitude	Multi Carrier Power
$ \begin{array}{cccc} 1 & (1) \\ 2 & (1) \\ 3 & (1) \end{array} $	Freq 2.401 98 6 Freq 2.400 00 6 Freq 2.400 00 6	Hz Hz Hz	1.29 dBm -43.74 dBm -43.74 dBm	Power Stat CCDF
				More 1 of 2
Copyright 2000-201	10 Agilent Technologie	S		

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🔆 Agilent 14:1	7:43 Aug	7,2017						L	Measure
1Pv7.0.1(07271 ≷ef 20 dBm ≥eak Г	7),37699 C #Atter	.S, Condu 1 30 dB	cted A			Mkr1	2.440	00 GHz 19 dBm	Meas Of
.0g .0 JB/									Channel Power
			\neq	\vdash					Occupied Bl
+17.9 IBm PAvg		+		\vdash					ACI
11 S2 3 FS	nor the summer					mme	han the state	America	Multi Carrie Powe
2(f): >50k Эмр									Power Sta CCDI
L Center 2.440 0 #Res BW 100 kH	0 GHz Iz	 #VB		kHz	Sw.	eep 1 m	Span 1 ns (100	.0 MHz 1 pts)	More 1 of



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			IIGH CH	CSPUR HI
Measure	L	,2017	1:21:46 Aug 7,	🔆 Agilent 14:
Meas Off	Mkr4 25.594 GHz -32.621 dBm	6, Conducted A 40 dB	717),37699 CS, #Atten 4	APv7.0.1(0727) Ref 30 dBm #Peak
Channel Power			<u> </u>	Log 101- dB/ Offst
Occupied BW	4		2 3	10.7 dB DI -19.8
ACP				dBm #PAvg
Multi Carrier Power	Stop 26.000 GHz veep 2.482 s (8192 pts) Amplitude	#VBW 300 kHz	kHz race Type	Start 30 MHz #Res BW 100 k Marker Tr
Power Stat CCDF	0.17 dBm -44.23 dBm -40.93 dBm -32.62 dBm	q 2.480 GHz q 4.960 GHz q 7.440 GHz q 25.594 GHz	(1) Freq (1) Freq (1) Freq (1) Freq	1 () 2 () 3 () 4 ()
More 1 of 2				
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8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

<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
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
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 pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

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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Results

8.2. TRANSMITTER ABOVE 1 GHz

LOW CHANNEL HORIZONTAL 125UL FREMONT, 3m Chamber 7 Aug 2017 16:05:54 Restricted Bandedge Project Number:11735596 Client:Microsoft Config:EUT w/ AC Adapter Mode:BLE 2402 H Tested by:39317 115 105 95 (dBuU/m) Harizontal 85 Peak Limit (dBuU/m) 75 65 Average Limit (dBuV/m) 55 2 45 dungn 35 2.415 2.31 10.5MHz/ Frequency (GHz) Ref/Attn Det/Avg Tupe Sweep Pts #Swps/Made Position Range (RHz) 189/12 PEAK/Pwr Avg(RMS) Imsec(Auto) 8868 MAXH 188 degs ; 2;2;31-2;415 RBU/UBU Ref/Attn Det/Avg Type Sweep 109/12 AVER/Pwr Avg (RMS) Insec (Auto) Range (GHz) 1:2:31-2:415 RBU/UBU 1M(-6dB)/3M Pts #Sups/Mode Position BLE_BE_2402_H.DAT 30915 28 Dec 2015 Rev 9.5 01 Dec

8.2.1. RESTRICTED BANDEDGE (LOW CHANNEL)

Trace Markers

Marker	Frequency	Meter	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected	Average Limit (dBuV/m)	Margin	Peak Limit (dBuV/m)	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading					Reading		(dB)		(dB)	(Degs)	(cm)	
		(dBuV)					(dBuV/m)							
2	2.329	38.58	Pk	31.8	-22.6	0	47.78			74	-26.22	100	353	н
4	2.388	27.79	RMS	31.9	-22.4	2.04	39.31	54	-14.69	-	-	100	353	н
1	2.39	37.27	Pk	31.9	-22.6	0	46.57	-	-	74	-27.43	100	353	н
3	2.39	26.05	RMS	31.9	-22.6	2.04	37.37	54	-16.63		-	100	353	н

Pk - Peak detector RMS - RMS detection

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Trace Markers

Marker	Frequency	Meter	Det	AF T712 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected	Average Limit (dBuV/m)	Margin	Peak Limit (dBuV/m)	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading					Reading		(dB)		(dB)	(Degs)	(cm)	
		(dBuV)					(dBuV/m)							
2	2.375	39.05	Pk	31.9	-22.5	0	48.45	-	-	74	-25.55	351	113	v
4	2.382	28.1	RMS	31.9	-22.4	2.04	39.62	54	-14.38	-	-	351	113	V
1	2.39	36.42	Pk	31.9	-22.6	0	45.72		-	74	-28.28	351	113	V
3	2.39	27.13	RMS	31.9	-22.6	2.04	38.45	54	-15.55	-	-	351	113	V

Pk - Peak detector RMS - RMS detection

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8.2.2. AUTHORIZED BANDEDGE (HIGH CHANNEL)



Trace Markers

Marker	Frequency	Meter	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected	Average Limit (dBuV/m)	Margin	Peak Limit (dBuV/m)	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading					Reading		(dB)		(dB)	(Degs)	(cm)	
		(dBuV)					(dBuV/m)							
1	2.484	48.58	Pk	32.4	-22.7	0	58.28		-	74	-15.72	25	231	н
2	2.484	48.38	Pk	32.4	-22.7	0	58.08			74	-15.92	25	231	н
3	2.484	27.37	RMS	32.4	-22.7	2.04	39.09	54	-14.91	-		25	231	н
4	2.484	29.64	RMS	32.4	-22.7	2.04	41.36	54	-12.64	-	-	25	231	н

Pk - Peak detector RMS - RMS detection

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Trace Markers

Marker	Frequency	Meter	Det	AF T712 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected	Average Limit (dBuV/m)	Margin	Peak Limit (dBuV/m)	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading					Reading		(dB)		(dB)	(Degs)	(cm)	
		(dBuV)					(dBuV/m)							
1	2.484	48.64	Pk	32.4	-22.7	0	58.34	-	-	74	-15.66	285	114	v
2	2.484	48.91	Pk	32.4	-22.7	0	58.61	-	-	74	-15.39	285	114	V
3	2.484	26.75	RMS	32.4	-22.7	2.04	38.47	54	-15.53	-	-	285	114	V
4	2.525	27.86	RMS	32.4	-22.2	2.04	40.08	54	-13.92	-	-	285	114	V

Pk - Peak detector RMS - RMS detection

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Radiated Emissions

Marker	Frequency	Meter	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected	Avg Limit (dBuV/m)	Margin	Peak Limit (dBuV/m)	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading					Reading		(dB)		(dB)	(Degs)	(cm)	
		(dBuV)					(dBuV/m)							
2	* 11.594	34.06	PK2	38.2	-22.5	0	49.76		-	74	-24.24	112	101	н
	* 11.594	22.09	MAv1	38.2	-22.5	2.04	39.83	54	-14.17		-	112	101	Н
4	* 5.033	38.7	PK2	34.4	-28.3	0	44.8		-	74	-29.2	103	200	V
	* 5.034	26.56	MAv1	34.4	-28.3	2.04	34.7	54	-19.3		-	103	200	V
5	* 8.318	36.21	PK2	36.1	-25	0	47.31		-	74	-26.69	21	200	V
	* 8.319	24.29	MAv1	36.1	-25	2.04	37.43	54	-16.57	-	-	21	200	v
1	1.877	41.23	PK2	30.9	-20.8	0	51.33		-		-	65	100	н
3	13.132	32.33	PK2	39.3	-21.9	0	49.73	-	-	-		271	101	Н
6	13.82	32.09	PK2	39.1	-20.9	0	50.29	-	-	-	-	301	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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Radiated Emissions

Marker	Frequency (GHz)	Meter	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin	Azimuth (Degs)	Height (cm)	Polarity
	(unit)	(dBuV)					(dBuV/m)		(00)		(00)	(5-63)	(cm)	
1	* 1.324	36.31	PK2	28.9	-21.7	0	43.51	-	-	74	-30.49	268	199	н
	* 1.323	17.71	MAv1	28.9	-21.6	2.04	27.05	54	-26.95	-	-	268	199	н
2	* 7.675	35.72	PK2	36	-26	0	45.72	-	-	74	-28.28	288	104	н
	* 7.674	23.23	MAv1	36	-26	2.04	35.27	54	-18.73	-	-	288	104	н
3	* 11.749	33.05	PK2	38.5	-21.9	0	49.65	-	-	74	-24.35	319	104	н
	* 11.749	19.53	MAv1	38.5	-21.9	2.04	38.17	54	-15.83	-	-	319	104	н
4	* 4.738	39.25	PK2	34.2	-28.3	0	45.15	-	-	74	-28.85	351	104	V
	* 4.739	26.85	MAv1	34.2	-28.3	2.04	34.79	54	-19.21	-	-	351	104	v
5	* 7.307	37.37	PK2	35.8	-27.2	0	45.97	-	-	74	-28.03	182	104	V
	* 7.308	24.93	MAv1	35.8	-27.1	2.04	35.67	54	-18.33	-	-	182	104	V
6	* 12.422	32.49	PK2	39	-21.6	0	49.89	-	-	74	-24.11	360	199	V
	* 12.423	19.56	MAv1	39	-21.6	2.04	39	54	-15	-	-	360	199	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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Radiated Emissions

Marker	Frequency	Meter	Det	AF T863 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected	Avg Limit (dBuV/m)	Margin	Peak Limit (dBuV/m)	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading					Reading		(dB)		(dB)	(Degs)	(cm)	
		(dBuV)					(dBuV/m)							
4	* 10.672	33.33	PK2	37.6	-22.6	0	48.33		-	74	-25.67	80	104	н
	* 10.672	19.62	MAv1	37.6	-22.6	2.04	36.66	54	-17.34	-	-	80	104	н
6	* 12.14	32.8	PK2	39	-22	0	49.8		-	74	-24.2	342	104	V
	* 12.139	19.36	MAv1	39	-22	2.04	38.4	54	-15.6	-	-	342	104	V
5	2.099	35.87	PK2	31.4	-21.1	0	46.17		-	-	-	268	199	V
1	2.635	35.29	PK2	32.5	-21	0	46.79		-	-	-	57	199	н
2	4.446	38.33	PK2	33.8	-28.3	0	43.83		-	-	-	146	104	н
3	5.151	39.93	PK2	34.4	-29.6	0	44.73		-		-	262	104	н

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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8.3. SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



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



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Radiated Emissions

Marker	Frequency	Meter	Det	AF T408 (dB/m)	Amp/Cbl (dB)	Corrected	QPk Limit (dBuV/m)	Margin	Azimuth	Height	Polarity
	(MHz)	Reading				Reading		(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)					
4	30.8502	32.16	Pk	24.6	-27.2	29.56	40	-10.44	0-360	100	V
1	31.3604	29.62	Pk	24.3	-27.2	26.72	40	-13.28	0-360	200	Н
5	37.0568	33.72	Pk	20.2	-27.2	26.72	40	-13.28	0-360	100	V
2	56.7394	35.72	Pk	11.2	-26.9	20.02	40	-19.98	0-360	400	Н
3	208.1362	49.8	Pk	14.8	-25	39.6	43.52	-3.92	205	165	Н
		45.69	Qp	14.8	-25	35.49	43.52	-8.03	205	165	Н
6	209.1012	43.26	Pk	14.6	-25	32.86	43.52	-10.66	0-360	200	V
7	705.9658	35.3	Pk	24.2	-23.6	35.9	46.02	-10.12	0-360	200	V

Pk - Peak detector

Qp - Quasi-Peak detector

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8.4. WORST-CASE 18 to 26 GHz

SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)

RF Emissions Project Number: 11735596 Client WICROSOFT Configuration: EUT + AC Adapter Models Limit (dBuU/m) Avg Limit (dBuU/m) Avg Limit (dBuU/m) 8 8 Frequency (GHz)	UL EMC	14 Aug 2017 20:49:29
Project Number: 1173596 Chineren Horosoft Configuration:EUT + 40 Adopter Modelstreament Modelstreament Avg Limit (dBuU/m) Avg Limit (dBuU/m) 8 8 Frequency (GHz)		RF Emissions
5 Peak Limit (dBuU/m) 5 Avg Limit (dBuU/m) 5 5 5 5 5 5 5 5 5 5 5 5 5	5	Project Number:11735596 ClientMICROSOFT Configuration:EUT + AC Adapter
5 Feak Limit (dBuV/m)	5	Tested by / SN:6E43578
5 Avg Limit (dBuV/m) 5 5 5 5 18 7 18 7 18 7 18 7 18 7 18 7 18 7 18 7 10 10 10 10 10 10 10 10 10 10	5 Peak Limit (dBuV/m)	
Avg Limit (dBuU/m) 3 15 2 15 2 15 1 15 2 16 1 17 2 18 26 18 Frequency (GHz)	i5	
15 15 15 18 18 18 18 Frequency (GHz) 10 10 10 10 10 10 10 10 10 10	5 Avg Limit (dBuU/m)	
5 5 18 Frequency (GHz)	5	and a second and a
5 5 18 Frequency (GHz)	Munummental and a second secon	
5 18 26 Frequency (GHz)	5	
18 26 Frequency (GHz)	5	
Frequency (GHz)	18	26
		Frequency (GHz)
Rompe (BHz) RBM/BW Ref/Rttn Det/ Sweep Pts HSwps/Hode Lobel Rompe (BHz) RBM/BW Ref/Rttn Det/ Sweep Pts HSwps/Hode Lobel 11/8-26 11/(-3d6)/311 97/8 PERK/- I6Bisec(Auto) 1282 HW81 Horizontal	Range (GHz) RBM/UBW Ref/Attn Det/ 1:18-26 1M(-3dB)/3M 97/8 PEAK/ -	Sweep Pts #Swps/Hode Label 1600seec(Auto)1202 HWM Horizontal

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<u>DATA</u>

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T449 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	20.684	41.03	Pk	33	-21.7	-9.5	42.83	54	-11.17	74	-31.17
2	22.316	40.7	Pk	33.5	-20.7	-9.5	44	54	-10	74	-30
3	24.694	42.93	Pk	34.1	-20.2	-9.5	47.33	54	-6.67	74	-26.67
4	18.733	41.1	Pk	32.3	-21.9	-9.5	42	54	-12	74	-32
5	22.729	41.5	Pk	33.4	-20.9	-9.5	44.5	54	-9.5	74	-29.5
6	23.449	41.6	Pk	33.9	-20.5	-9.5	45.5	54	-8.5	74	-28.5

Pk - Peak detector

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9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Fraguancy of Emission (MHz)	Conducted Limit (dBµV)					
Frequency of Emission (MHZ)	Quasi-peak	Average				
0.15-0.5	66 to 56 *	56 to 46 *				
0.5-5	56	46				
5-30	60	50				

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

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LINE 1 RESULTS



WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency	Meter	Det	LISN L1	LC Cables	Limiter	Corrected	CFR 47	QP Margin	CFR 47	Av(CISPR)
	(MHz)	Reading			C1&C3	(dB)	Reading	Part 15	(dB)	Part 15	Margin
		(dBuV)					dBuV	Class B QP		Class B Avg	(dB)
1	.15225	41.42	Qp	.1	.1	10.1	51.72	65.88	-14.16	-	-
2	.15225	24.49	Ca	.1	.1	10.1	34.79	-	-	55.88	-21.09
3	.65737	19.5	Qp	0	.1	10.1	29.7	56	-26.3	-	-
4	.66075	15.45	Ca	0	.1	10.1	25.65	-	-	46	-20.35
5	2.47425	13.02	Qp	0	.1	10.1	23.22	56	-32.78	-	-
6	2.47425	10.67	Ca	0	.1	10.1	20.87	-	-	46	-25.13
7	7.22625	12.73	Qp	0	.2	10.2	23.13	60	-36.87	-	-
8	7.2285	5.69	Ca	0	.2	10.2	16.09	-	-	50	-33.91
9	13.299	14.34	Qp	.1	.2	10.2	24.84	60	-35.16	-	-
10	13.299	4	Ca	.1	.2	10.2	14.5	-	-	50	-35.5
11	19.28625	7.62	Qp	.1	.3	10.3	18.32	60	-41.68	-	-
12	19.4685	3.36	Ca	.1	.3	10.3	14.06	-	-	50	-35.94

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



WORST EMISSIONS

Marker	Frequency	Meter	Det	LISN L2	LC Cables	Limiter	Corrected	CFR 47	QP Margin	CFR 47	Av(CISPR)
	(MHz)	Reading			C2&C3	(dB)	Reading	Part 15	(dB)	Part 15	Margin
		(dBuV)					dBuV	Class B QP		Class B Avg	(dB)
13	.15225	40.79	Qp	0	0	10.1	50.89	65.88	-14.99	-	-
14	.15225	23.49	Ca	0	0	10.1	33.59	-	-	55.88	-22.29
15	.65625	19.66	Qp	0	.1	10.1	29.86	56	-26.14	-	-
16	.66075	15.5	Ca	0	.1	10.1	25.7	-	-	46	-20.3
17	2.8905	21.94	Qp	0	.1	10.1	32.14	56	-23.86	-	-
18	2.8905	5.47	Ca	0	.1	10.1	15.67	-	-	46	-30.33
19	4.047	18.45	Qp	0	.1	10.1	28.65	56	-27.35	-	-
20	4.04925	5.68	Ca	0	.1	10.1	15.88	-	-	46	-30.12
21	13.299	13.89	Qp	.1	.2	10.2	24.39	60	-35.61	-	-
22	13.299	4.61	Ca	.1	.2	10.2	15.11	-	-	50	-34.89
23	27.28613	6.18	Qp	.1	.3	10.5	17.08	60	-42.92	-	-
24	27.285	2.05	Ca	.1	.3	10.5	12.95	-	-	50	-37.05

Qp - Quasi-Peak detector

Ca - CISPR average detection