FCC 47 CFR PART 15 SUBPART C
ISED RSS 210

CLASS II PERMISSIVE CHANGE TEST REPORT

FOR

WIRELESS SENSOR

MODEL NUMBERS: WST-600, CS-600

FCC ID: XQC-WST600
ISED ID: 9863B-WST600

REPORT NUMBER: 11988961-E1V2

ISSUE DATE: 11/13/2017

Prepared for
ECOLINK INTELLIGENT TECHNOLOGY, INC.
2055 CORTE DEL NOGAL
CARLSBAD, CA, 92011, U.S.A

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	10/31/2017	Initial Issue	-
V2	11/13/2017	Updated section 5.2, 5.3 and 7	C. Susa

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ECOLINK INTELLIGENT TECHNOLOGY, INC.
2055 CORTE DEL NOGAL
CARLSBAD, CA, 92011, U.S.A

EUT DESCRIPTION: WIRELESS SENSOR

MODELS: WST-600, CS-600

SERIAL NUMBER: #4 (Normal Operating); #6 (Continuous Operating)

DATE TESTED: October 25th , 2017 – October 26th, 2017

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Pass
ISED RSS-210 Issue 9, Annex A	Pass
ISED RSS-GEN Issue 4	Pass

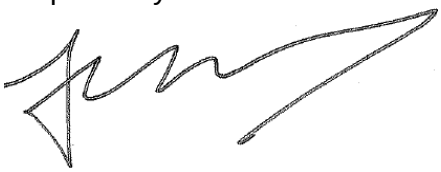
UL Verification Services Inc tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties 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 the U.S. government.

Reviewed By:

Clifford Susa
Project Engineer
UL Verification Service Inc.

Prepared By:



Jason Qian
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UL Verification Services Inc.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-210 Issue 9.

Test Item	Result	Remarks
20dB and 99% BW	Pass	Please refer to original submission report number "15U20415A"
Duty Cycle	Pass	--
Supervision Transmissions	Pass	Please refer to original submission report number "15U20415A"
Transmission Time	Pass	Please refer to original submission report number "15U20415A"
Fundamental Strength	Pass	--
Spurious Emissions	Pass	--

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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(ISED: 2324B-1)	☐ Chamber D(ISED: 22541-1)
☐ Chamber B(ISED: 2324B-2)	☒ Chamber E(ISED: 22541-2)
☐ Chamber C(ISED: 2324B-3)	☐ Chamber F(ISED: 22541-3)
	☐ Chamber G(ISED: 22541-4)
	☐ Chamber H(ISED: 22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through C are covered under ISED 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 22541-5, 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.

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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 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 wireless audio detector

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The purpose of this C2PC is to cover a new enclosure and extension of wire to microphone.

5.3. MAXIMUM OUTPUT POWER

The measured output power values were verified to be less or equal than the original values transmitter. Refer to original report number “15U20415A“ for original output power values and for all antenna port results.

Frequency Range (MHz)	Mode	Field Strength Peak (dBuV/m)	Field Strength Average (dBuV/m)
433.92	Normal	93.73	71.79

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal, wire, loop antenna, with a maximum gain of -15 dBi.

5.5. SOFTWARE AND FIRMWARE

The typical factory firmware installed in the EUT during testing was ESW1048-03-003.HEX.

The firmware installed in the EUT to allow continuous transmit during testing was 1048-03_CONST_TX.HEX.

5.6. WORST-CASE CONFIGURATION AND MODE

The EUT was investigated in each of its three orthogonal axes. All radiated testing was performed in the worse-case axis, which was found to be the “Y-axis”. See photos for details.

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5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

NONE

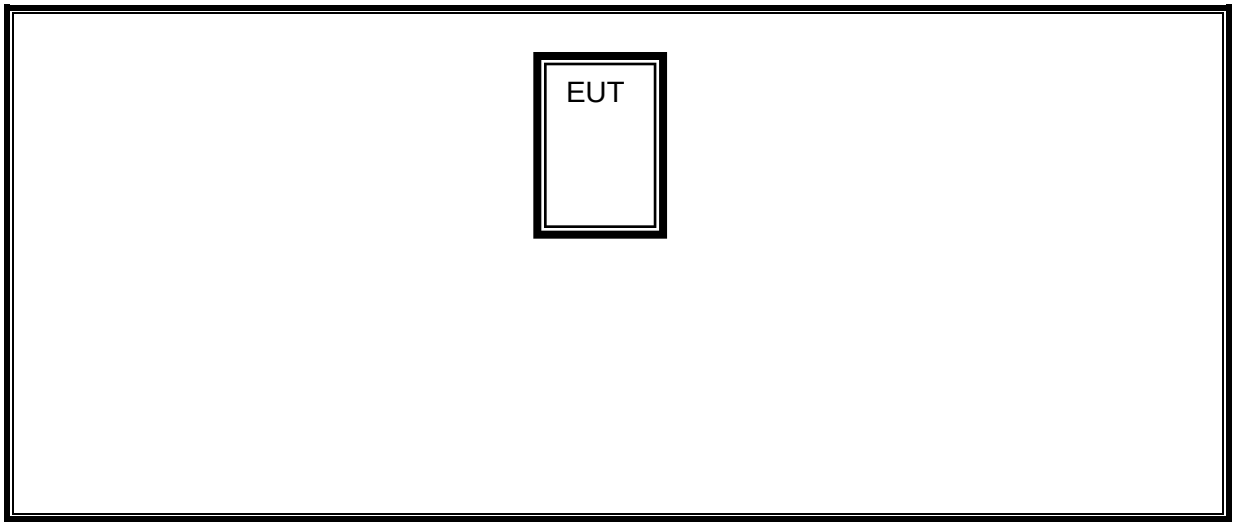
I/O CABLES

NONE

TEST SETUP

The EUT was tested as a standalone device.

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 Number**	**Cal Date**	**Cal Due**
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	906	02/04/17	02/04/18
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	1131	06/29/17	06/29/18
Amplifier, 10KHz to 1GHz, 32dB	HP	8447D	285	06/24/17	06/24/18
Antenna, Horn 1-18GHz	ETS Lindgren	3117	346	03/28/17	03/28/18
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	900	05/31/17	05/31/18
Loop Antenna	ETS Lindgren	6502	1683	02/17/17	02/17/18

Test Software List			
Description	**Manufacturer**	**Model**	**Version**
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016

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7. RADIATED EMISSION TEST RESULTS

LIMITS

FCC §15.231 (b)
RSS-210 A.1.2

In addition to the provisions of § 15.205, the field strength of emissions from Intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolation

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 – 13.41	322 - 335.4		

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1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
2 Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for 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.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. Please refer to test report section 7.2 for duty cycle factor information. Note: The pre-scan measurements above 1GHz the VBW is set to 30 kHz.

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.

RESULTS

No non-compliance noted:

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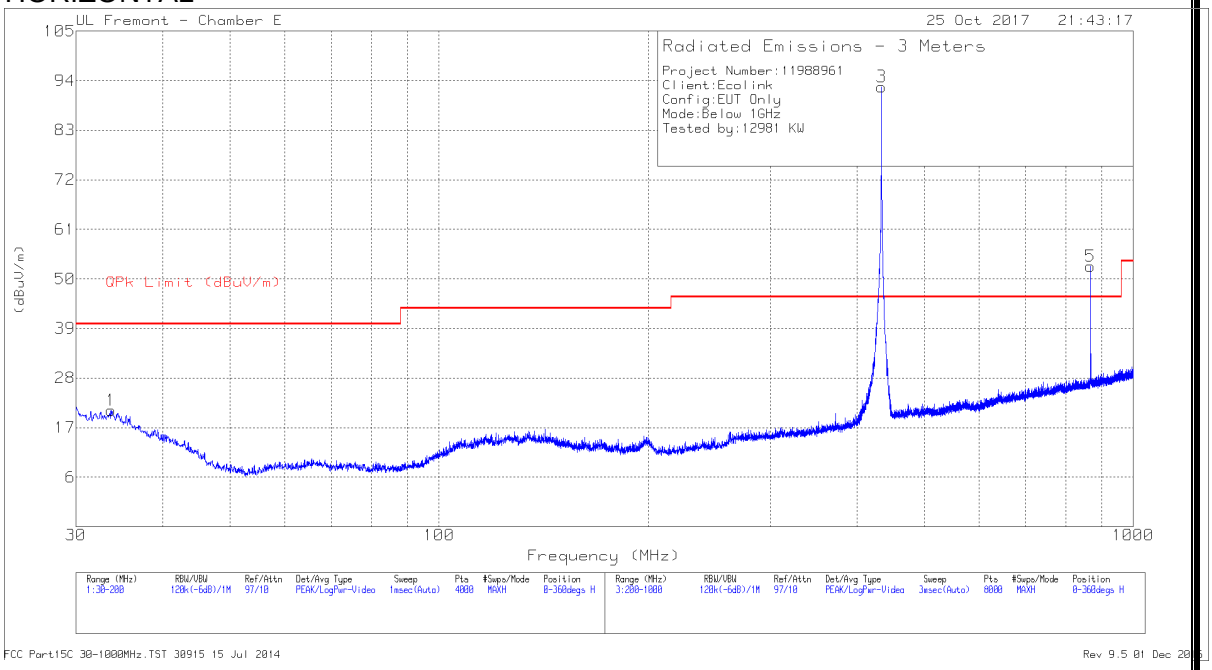
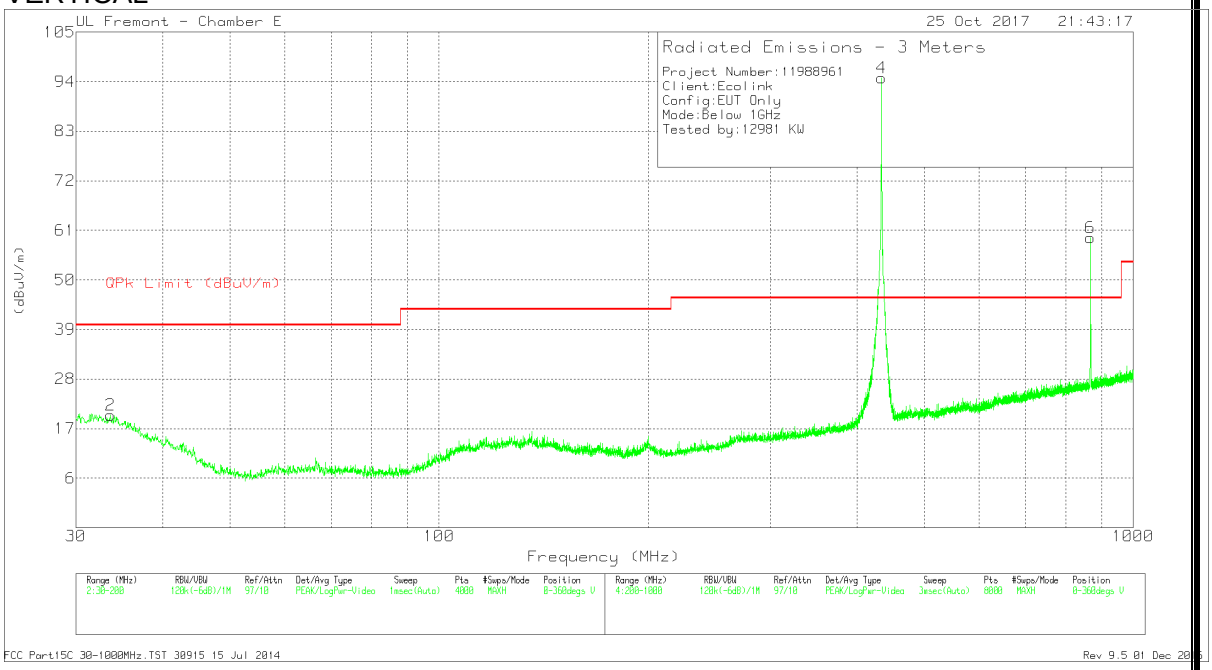
FUNDAMENTAL, HARMONICS AND TX SPURIOUS EMISSION (30 – 1000 MHz)

HORIZONTAL



VERTICAL



BELOW 1GHZ RADIATED EMISSIONS

FUNDAMENTAL FIELD STRENGTH AND HARMONICS SPURIOUS EMISSIONS

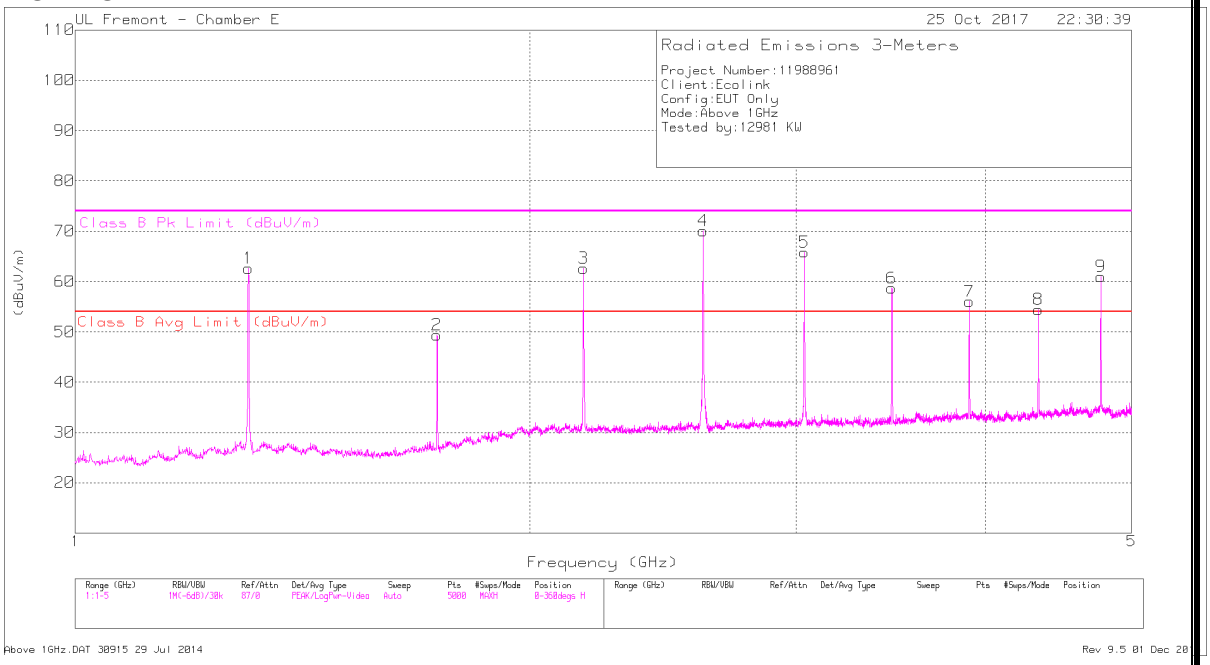
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	33.7475	29.52	Pk	22.6	-31.6	20.52	40	-19.48	251	143	H
2	33.8523	29.18	Pk	22.5	-31.6	20.08	40	-19.92	144	239	V
4	433.912	102.23	Pk	20	-28.5	93.73	100.83	-7.1	285	135	V
			Av			71.79	80.83	-9.04	285	135	V
3	433.913	101.08	Pk	20	-28.5	92.58	100.83	-8.25	31	171	H
			Av			70.64	80.83	-10.19	31	171	H
5	867.815	56.33	Pk	25.7	-26.3	55.73	80.83	-25.1	28	168	H
			Av			33.79	60.83	-27.04	28	168	H
6	867.821	62.98	Pk	25.7	-26.3	62.38	80.83	-18.45	286	127	V
			Av			40.44	60.83	-20.39	286	127	V

Pk - Peak detector
Av – Average detector

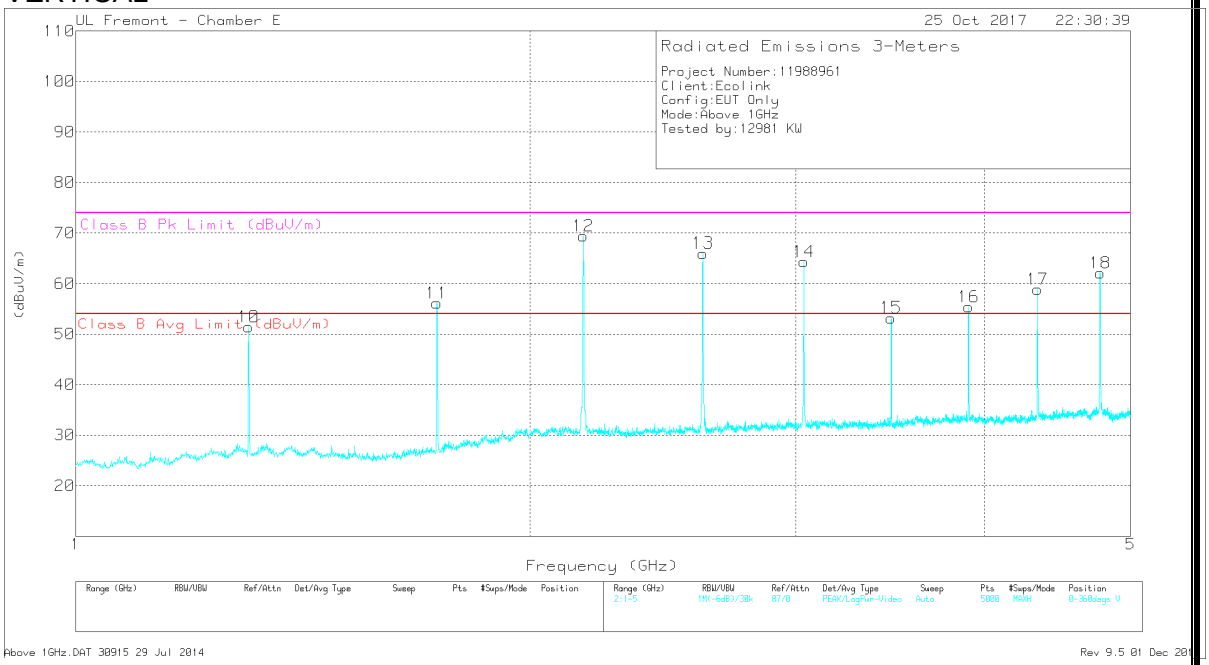
* Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle), Where Duty Cycle is -21.94dB
(# of long pulses * long pulse width) + (# of ,medium pulses * medium pulse width) + (# of short pulses * short pulse width) / 100 or T
Refer to original report 15U201415A section 7.2 for duty cycle factor calculation (-21.94dB)
Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF
** Harmonics of fundamental 433.915 MHz

HARMONICS AND TX SPURIOUS EMISSIONS ABOVE 1GHz

HORIZONTAL



VERTICAL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Av Limit (dBuV/m)	Peak Margin (dB)	Av Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.302	69.89	Pk	28.9	-35.1	63.69	74	-	-10.31	-	160	249	H
			Av			41.75	-	54	-	-12.25	160	249	H
10	1.302	58.03	Pk	28.9	-35.1	51.83	74	-	-22.17	-	233	249	V
			Av			29.89	-	54	-	-24.11	233	249	V
2	1.736	57.56	Pk	28.7	-34.1	52.16	74	-	-21.84	-	159	115	H
			Av			30.22	-	54	-	-23.78	159	115	H
11	1.736	61.78	Pk	28.7	-34.1	56.38	74	-	-17.62	-	30	155	V
			Av			34.44	-	54	-	-19.56	30	155	V
3	2.17	64.99	Pk	32.1	-33.2	63.89	74	-	-10.11	-	154	131	H
			Av			41.95	-	54	-	-12.05	154	131	H
12	2.17	70.92	Pk	32.1	-33.2	69.82	74	-	-4.18	-	153	170	V
			Av			47.88	-	54	-	-6.12	153	170	V
4	2.603	71.74	Pk	32.2	-32.3	71.64	74	-	-2.36	-	117	117	H
			Av			49.7	-	54	-	-4.3	117	117	H
13	2.604	68.01	Pk	32.2	-32.3	67.91	74	-	-6.09	-	125	254	V
			Av			45.97	-	54	-	-8.03	125	254	V
5	3.037	62.92	Pk	33	-31.4	64.52	74	-	-9.48	-	209	135	V
			Av			42.58	-	54	-	-11.42	209	135	V
14	3.038	64.82	Pk	33	-31.4	66.42	74	-	-7.58	-	126	124	H
			Av			44.48	-	54	-	-9.52	126	124	H
6	3.471	58.92	Pk	33.1	-30.8	61.22	74	-	-12.78	-	259	178	H
			Av			39.28	-	54	-	-14.72	259	178	H
15	3.471	53.84	Pk	33.1	-30.8	56.14	74	-	-17.86	-	234	313	V
			Av			34.2	-	54	-	-19.8	234	313	V
7	3.905	55.18	Pk	33.7	-30.7	58.18	74	-	-15.82	-	185	265	H
			Av			36.24	-	54	-	-17.76	185	265	H
16	3.905	56.15	Pk	33.7	-30.7	59.15	74	-	-14.85	-	185	271	V
			Av			37.21	-	54	-	-16.79	185	271	V
8	4.339	56.65	Pk	34	-30	60.65	74	-	-13.35	-	108	278	H
			Av			38.71	-	54	-	-15.29	108	278	H
17	4.34	58.05	Pk	34	-30	62.05	74	-	-11.95	-	113	301	V
			Av			40.11	-	54	-	-13.89	113	301	V
9	4.773	60.74	Pk	34.4	-29.9	65.24	74	-	-8.76	-	111	362	H
			Av			43.3	-	54	-	-10.7	111	362	H
18	4.773	62.59	Pk	34.4	-29.8	67.19	74	-	-6.81	-	132	283	V
			Av			45.25	-	54	-	-8.75	132	283	V

Pk - Peak detector
Av – Average detector

* Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle), Where Duty Cycle is -21.94dB
(# of long pulses * long pulse width) +(# of ,medium pulses * medium pulse width) + (# of short pulses * short pulse width) / 100 or T
Refer to original report 15U201415A section 7.2 for duty cycle factor calculation (-21.94dB)
Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF
** Harmonics of fundamental 433.915 MHz

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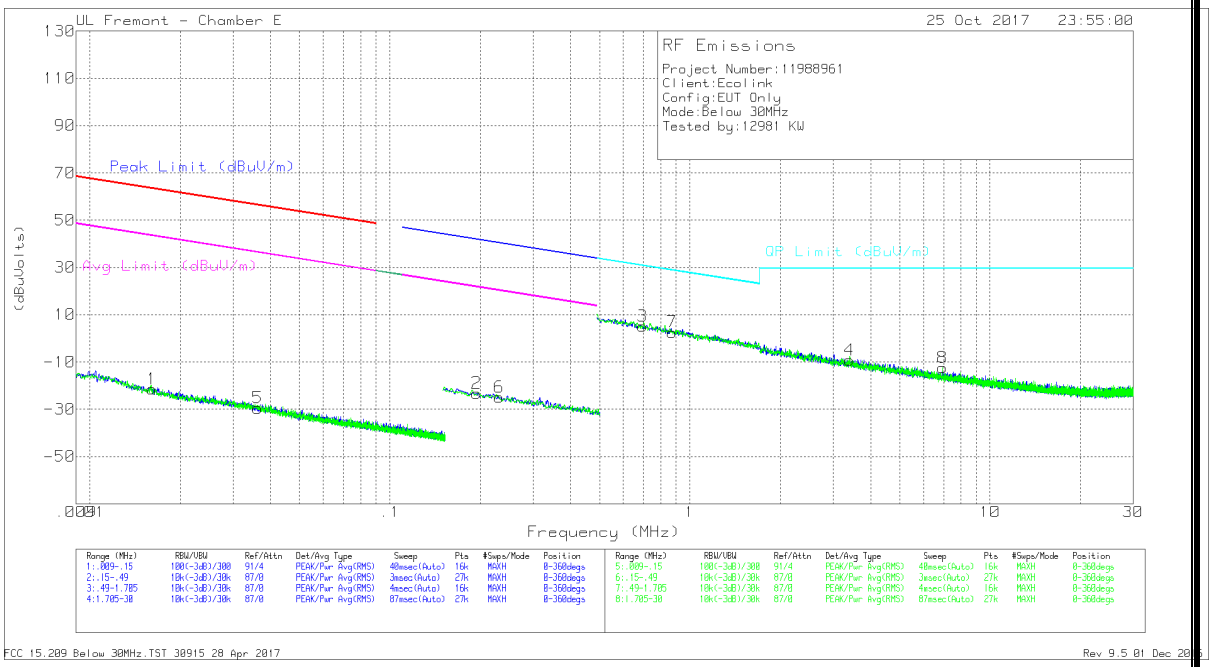
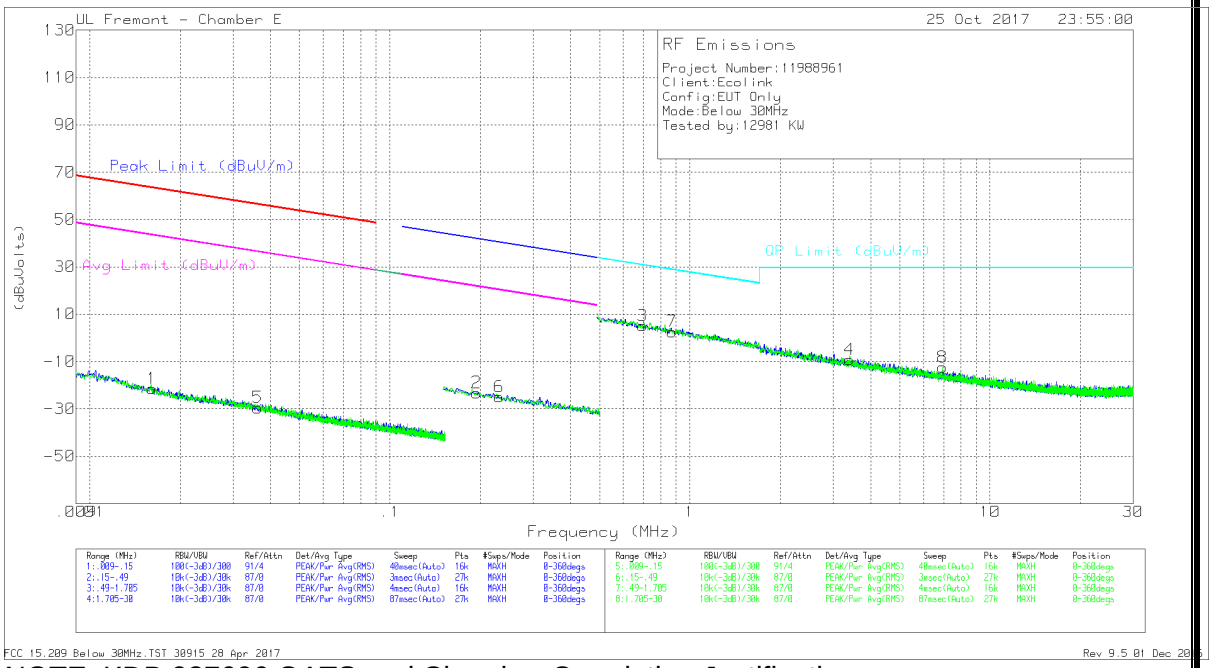
BELOW 30MHz





NOTE: KDB 937606 OATS and Chamber Correlation Justification

- Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
- OATs and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

BELOW 30MHz RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.01616	41.5	Pk	16.9	.1	-80	-21.5	63.41	-84.91	43.41	-64.91	-	-	-	-	0-360
5	.0363	36.69	Pk	13.7	.1	-80	-29.51	56.39	-85.9	36.39	-65.9	-	-	-	-	0-360
2	.19452	45.15	Pk	11.6	.1	-80	-23.15	-	-	-	-	41.84	-64.99	21.84	-44.99	0-360
6	.23137	43.43	Pk	11.5	.1	-80	-24.97	-	-	-	-	40.33	-65.3	20.33	-45.3	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.69573	33.49	Pk	11.5	.1	-40	5.09	30.76	-25.67	0-360
7	.8727	30.94	Pk	11.5	.2	-40	2.64	28.8	-26.16	0-360
4	3.39962	18.91	Pk	11.7	.3	-40	-9.09	29.5	-38.59	0-360
8	6.94814	15.96	Pk	11.2	.4	-40	-12.44	29.5	-41.94	0-360

Pk - Peak detector

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