



**FCC 47 CFR PART 15 SUBPART E
INDUSTRY CANADA RSS-247 ISSUE 1
CLASS II PERMISSIVE CHANGE
TEST REPORT
FOR**

802.11a/b/g/n 2x2 (HT20) CLIENT DEVICE

MODEL NUMBER: PLAY: 1 (Type1)

**FCC ID: SBVRM007
IC: 5373A-RM007**

REPORT NUMBER: 15U21732- E1

ISSUE DATE: JANUARY 8, 2016

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	1/8/16	Initial Issue	H. Mustapha

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Sonos, Inc.
614 Chapala Street
Santa Barbara, CA, 93101, U.S.A.

EUT DESCRIPTION: 802.11a/b/g/n 2x2 Client Device

MODEL: PLAY: 1 (Type 1)

SERIAL NUMBER: B8-E9-37-E7-86-2C (Type1).

DATE TESTED: OCTOBER 20, 2015 to DECEMBER 11, 2015
APRIL 11, 2013 to FEBUARY 27, 2014

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	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:

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Huda Mustapha



HUDA MUSTAPHA
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EMC ENGINEER
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FRANK IBRAHIM
PROGRAM MANAGER
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, FCC 06-96, FCC KDB 789033 D02 v01, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 1.

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	☐ 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 <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.

4.1. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.2. 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%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT is an 802.11a/b/g/n, 2x2, 20 MHz channel bandwidth only.

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The purpose of this C2PC is to upgrade the device described under section 5.1 of this report to the new rules per KDB 789033 D02 v01 and RSS-247.

For UNII-1, UNII-2 and UNII-2C bands, we have reviewed the original test report (report no. 13U14836-2B) and are hereby attesting that all the current technical requirements are still met and all applicable test procedures remain the same. Therefore, the original test report is still applicable and no additional testing is done.

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5745 - 5825	802.11n HT20	20.37	108.89

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes right and left dipole PCB antennas with a maximum gain of 3.59 dBi and 3.29 dBi, respectively.

5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Atheros Radio Test 2 (ART2-GUI).

5.6. WORST-CASE CONFIGURATION AND MODE

For Radiated Emissions below 1 GHz and Power line Conducted Emissions, the channel with the highest conducted output power was selected as worst-case scenario.

Worst-case data rate as provided by the manufacturer was as follows:
11n HT20 (5.8 GHz band): MCS9

The EUT is for desktop applications; all radiated testing was performed with EUT laid out in desktop configuration.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	X201	R9-6KTFV	N/A
Laptop AC Adapter	Lenovo	ADLX65NCT2A	11S45N0323Z1ZH3B4HPD	N/A

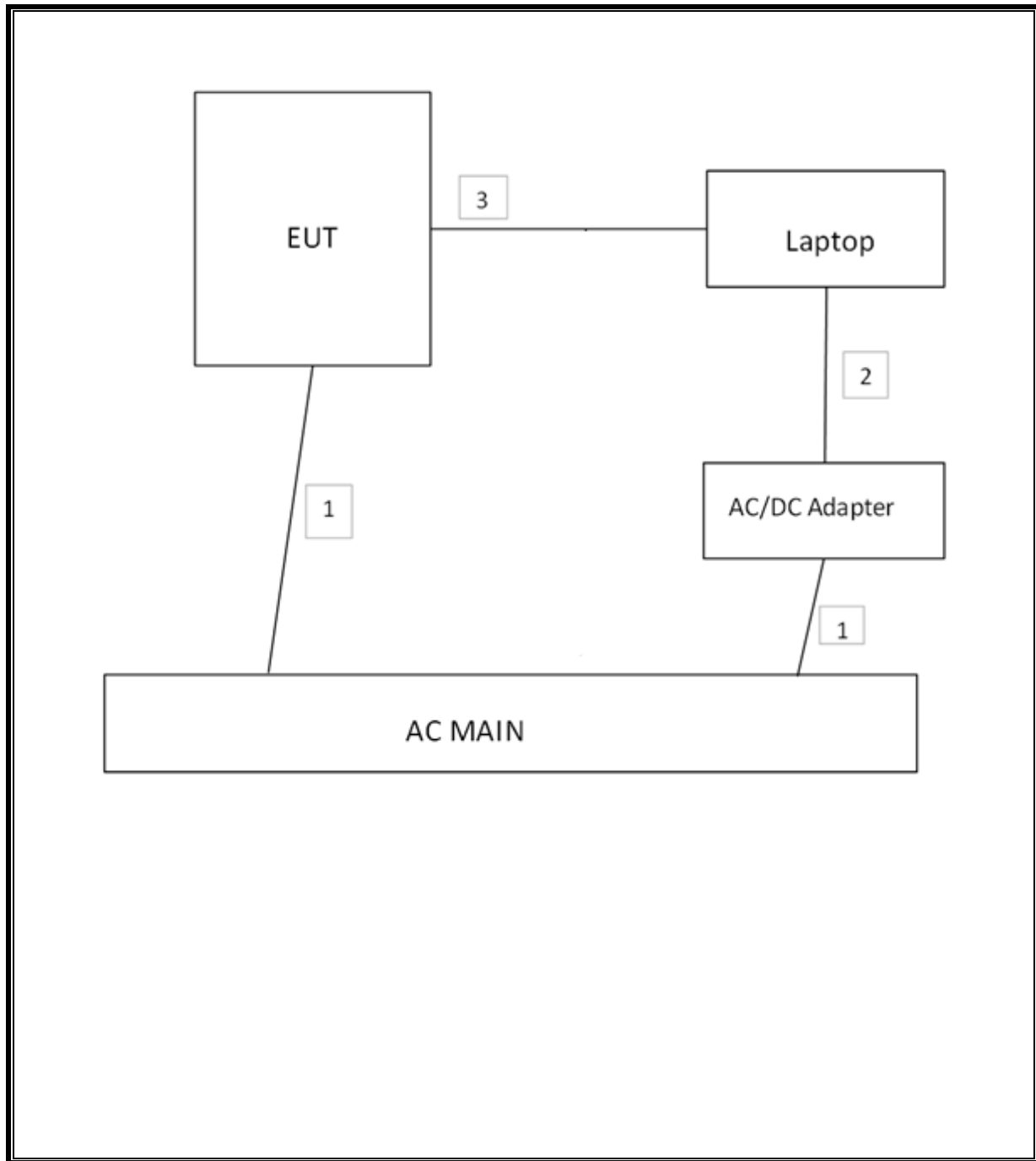
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	2	US 115V	Un-shielded	1.8m	N/A
2	DC	1	DC	Un-shielded	1.8m	N/A
3	Ethernet	1	RJ45	Un-shielded	1.5m	N/A

TEST SETUP

The EUT is connected to a laptop via an Ethernet cable during the tests and software exercised the radio card

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, June 6, 2015		
Conducted Software	UL	UL EMC	Ver 9.5, May 17 2012		
Bilog Antenna 30-1000MHz	Sunol	JB1	130	09/01/15	09/01/16
Horn Antenna 1-18GHz	ETS	3117	136	03/03/15	03/03/16
Horn Antenna 18-26GHz	ARA	SWH-28	98	12/17/14	12/17/15
Horn Antenna 26.5- 40GHz	ARA	MWH-2640/B	90	07/28/15	07/28/16
Preamp 10kHz-1000MHz	HP	8447D	10	01/16/15	01/16/16
Preamp 1-8GHz	Miteq	AMF-4D-01000800-30-29P	782	10/22/15	10/22/16
Preamp 1-26.5GHz	Agilent	8449B	404	04/13/15	04/13/16
Amplifier, 26-40GHz	Miteq	NSP4000-SP2	88	04/07/15	04/07/16
Spectrum Analyzer 3kHz - 44GHz	Agilent	N9030A	907	05/15/15	05/15/16
Spectrum Analyzer 9kHz - 40GHz	HP	8564E	106	08/14/15	08/14/16
Coaxial Switchbox	Agilent	SP6T	927	03/03/15	03/03/16
3GHz HPF	Micro-Tronics	HPM17543	487	01/31/15	01/31/16
5GHz LPF	Micro-Tronics	LPS17541	482	01/16/15	01/16/16
6GHz HPF	Micro-Tronics	HPS17542	483	01/16/15	01/16/16
EMI Test Receiver	Rohde & Schwarz	ECSI 7	212	08/07/15	08/07/16
Power Meter	Agilent	N1911A	T1268	06/07/15	06/07/16
Power Sensor	Agilent	N1921A	1223	06/07/15	02/06/16

7. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 789033 D02 v01, Section B.

6 dB Emission BW: KDB 789033 D02 v01, Section C.2.

99% Occupied BW: KDB 789033 D02 v01, Section D.

Conducted Output Power: KDB 789033 D02 v01, Section E.3.a (Method PM), and KDB 662911 D01 v02r01.

Power Spectral Density: KDB 789033 D02 v01, Section F.

Unwanted emissions in restricted bands: KDB 789033 D02 v01, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v01, Sections G.3, G.4, and G.5.

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

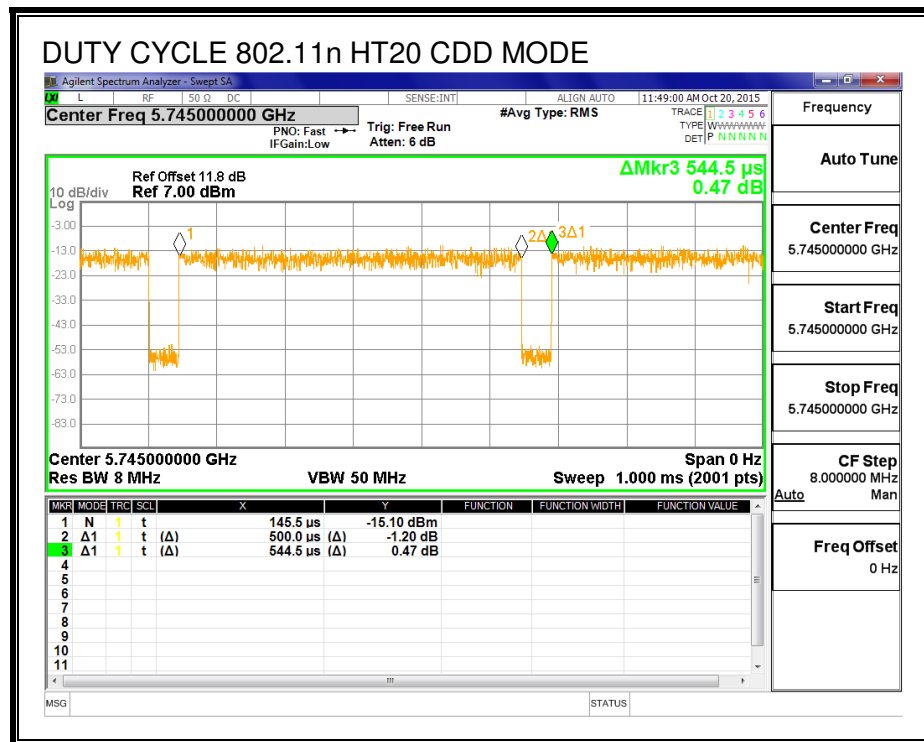
LIMITS

None; for reporting purposes only.

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)
802.11n HT20 CDD	0.500	0.545	0.918	91.83%	0.37	2.000

DUTY CYCLE PLOTS



8.2. 802.11n HT20 CDD 2Tx MODE IN THE 5.8 GHz BAND

8.2.1. 6 dB BANDWIDTH

LIMITS

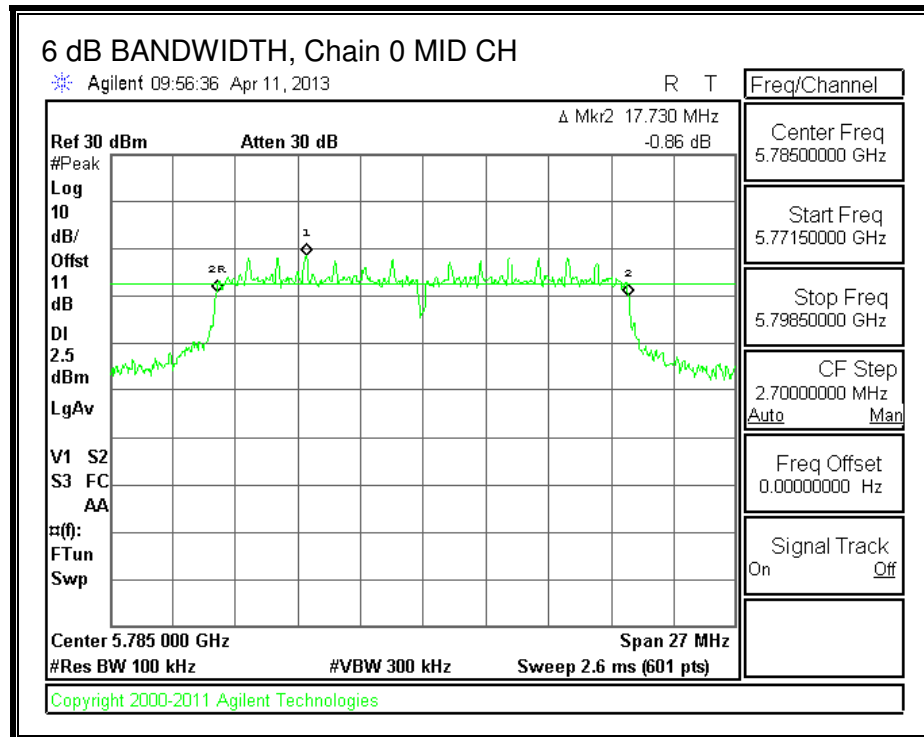
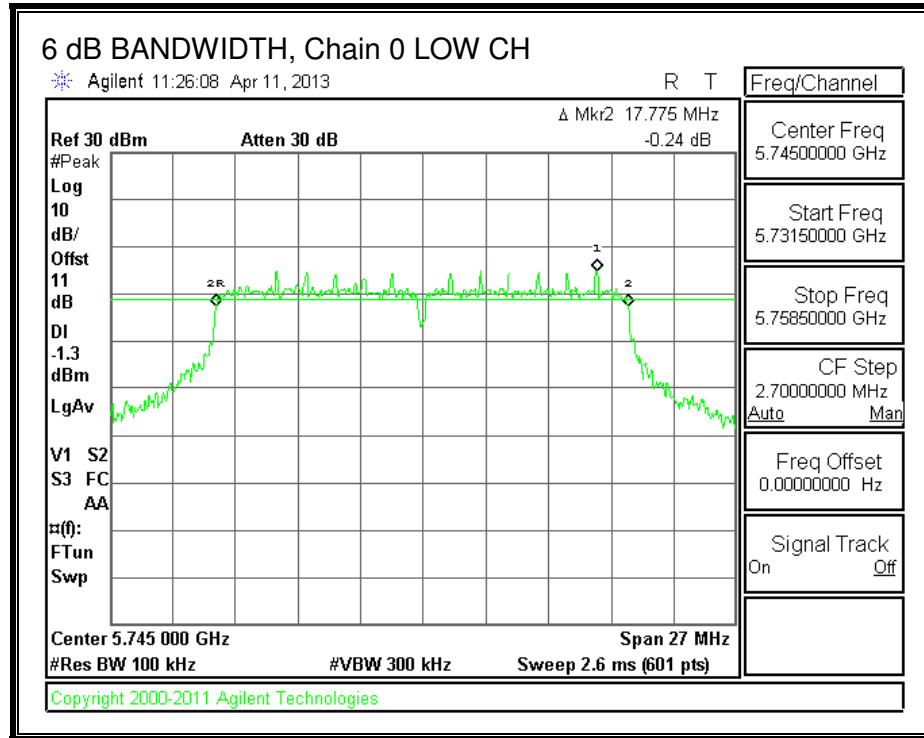
FCC §15.247 (a) (2)

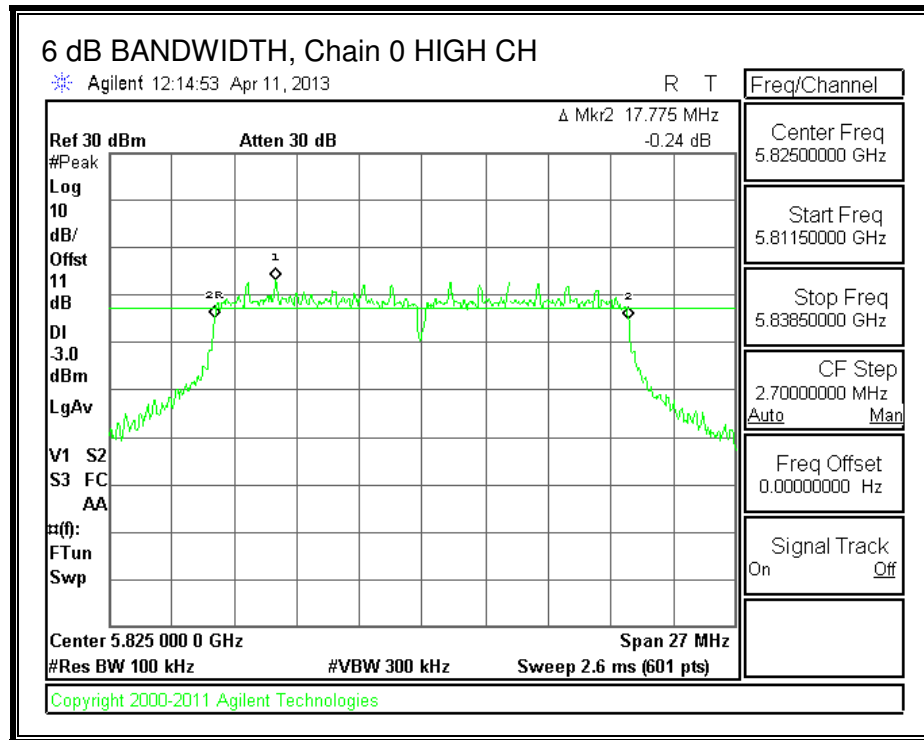
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

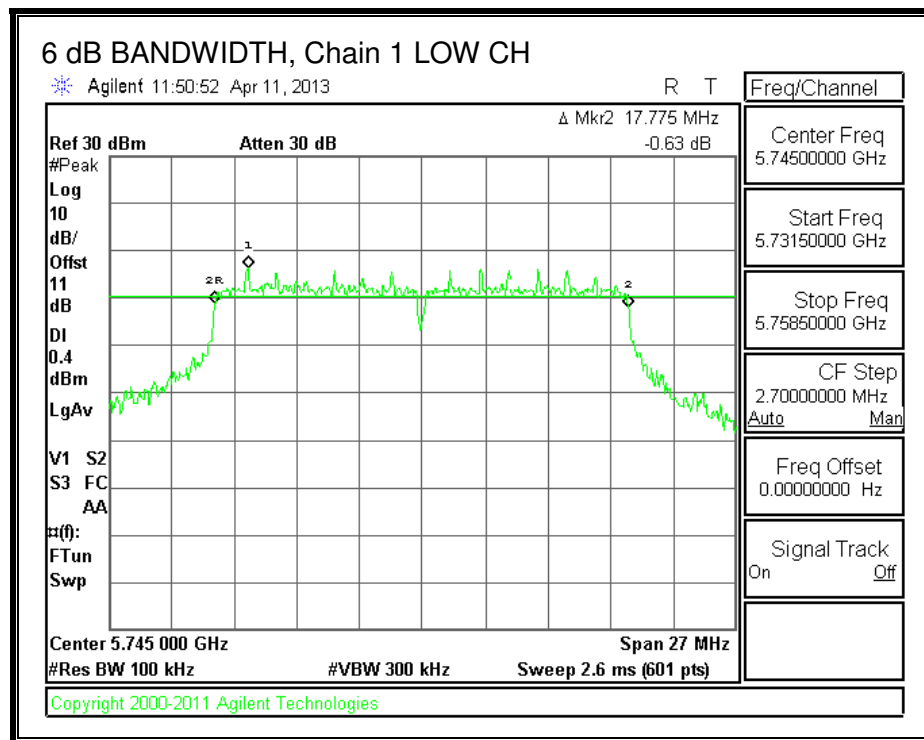
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	5745	17.775	17.775	0.5
Mid	5785	17.730	17.685	0.5
High	5825	17.775	17.730	0.5

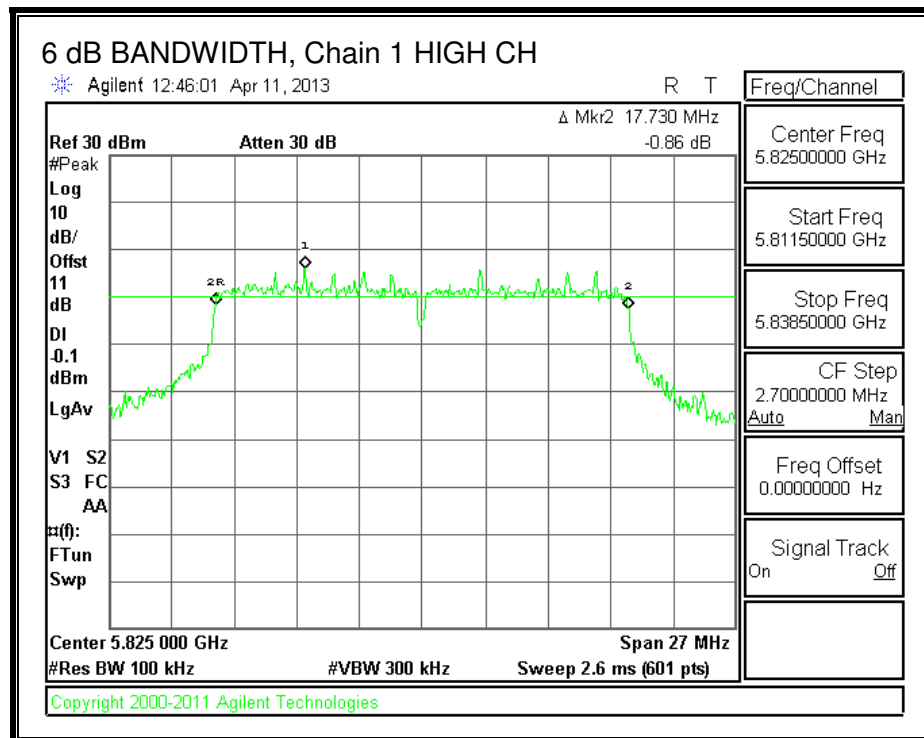
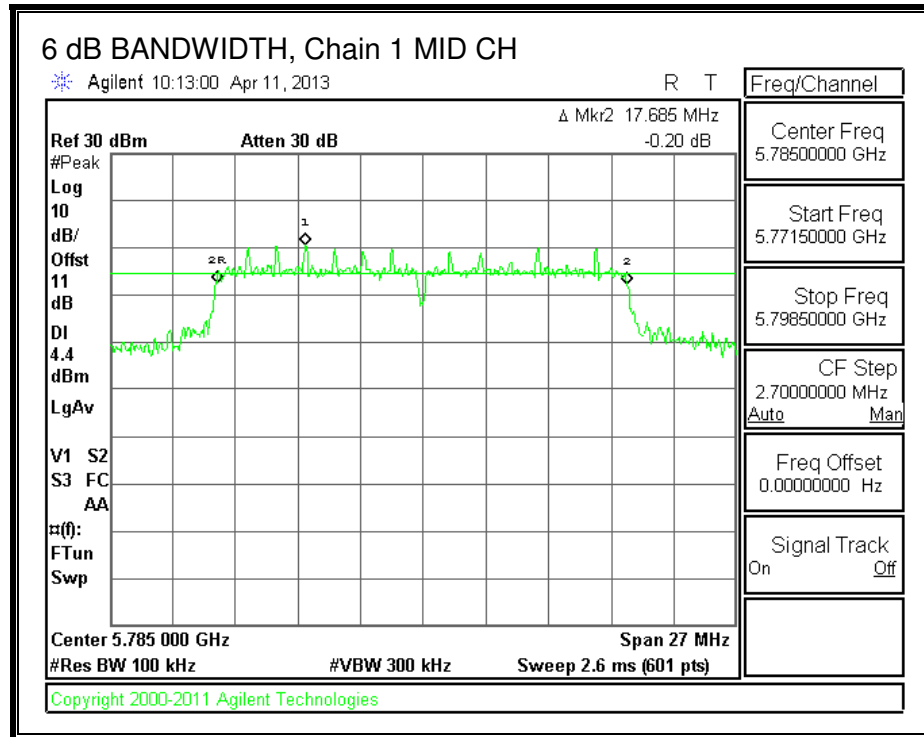
6 dB BANDWIDTH, Chain 0





6 dB BANDWIDTH, Chain 1





8.2.1. 99% BANDWIDTH

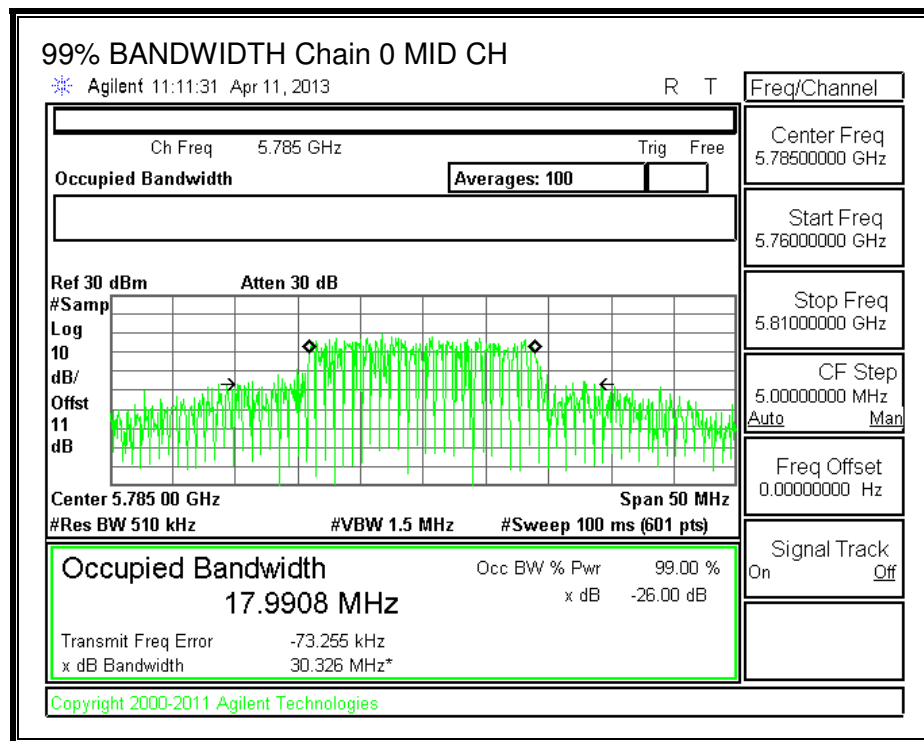
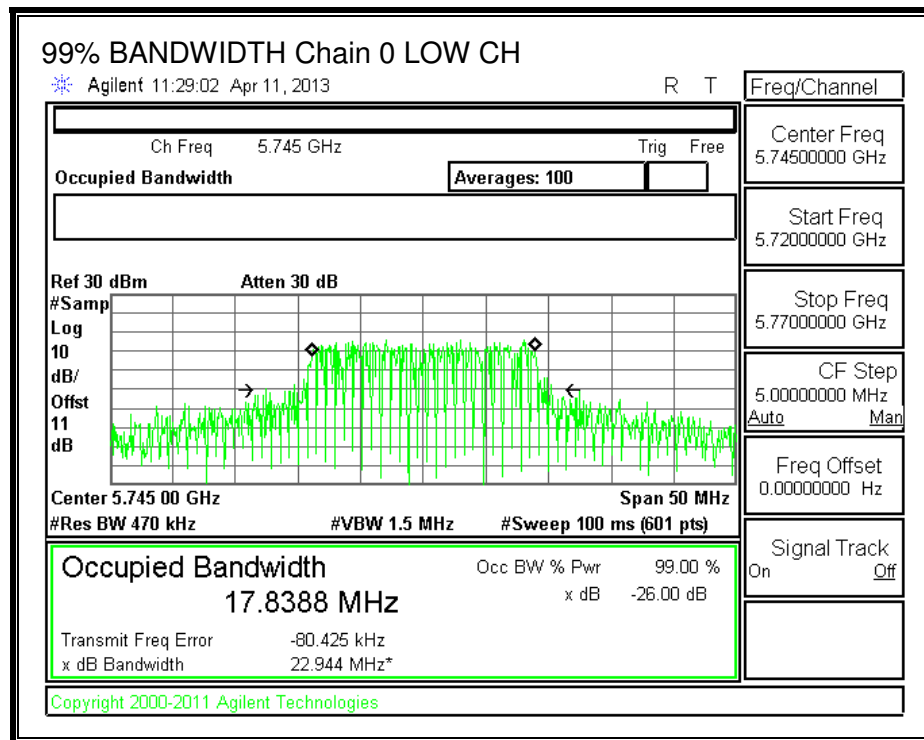
LIMITS

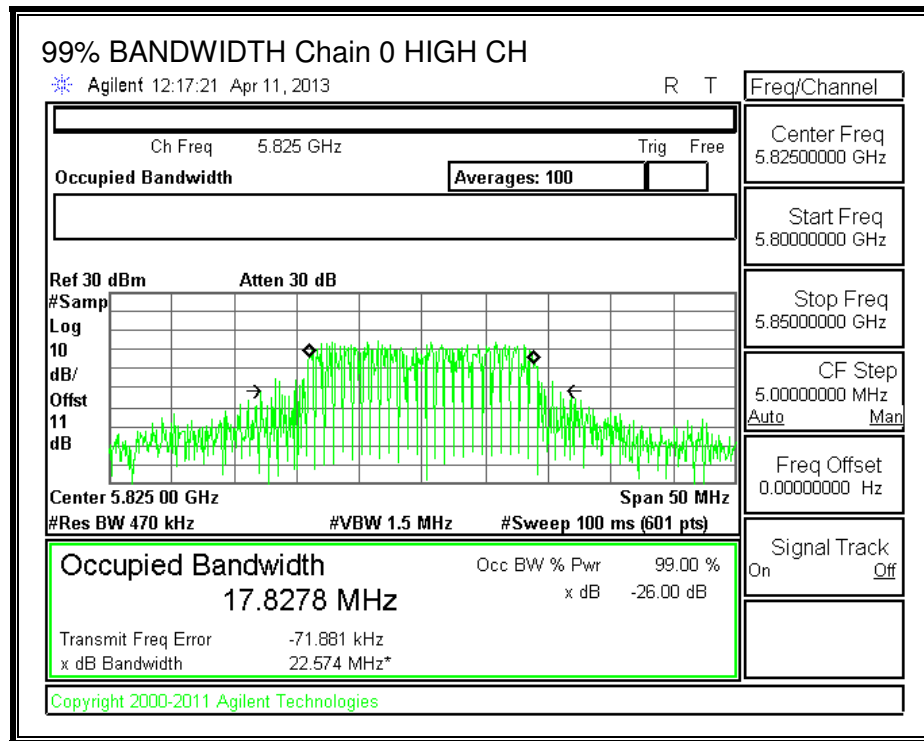
None; for reporting purposes only.

RESULTS

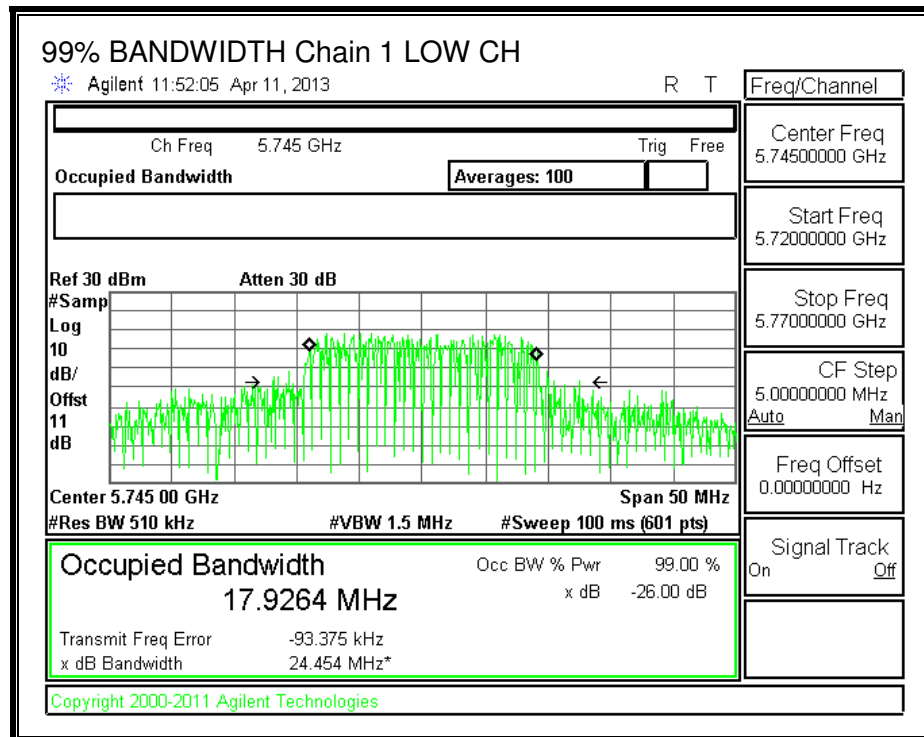
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5745	17.8388	17.9264
Mid	5785	17.9908	18.0926
High	5825	17.8278	17.8673

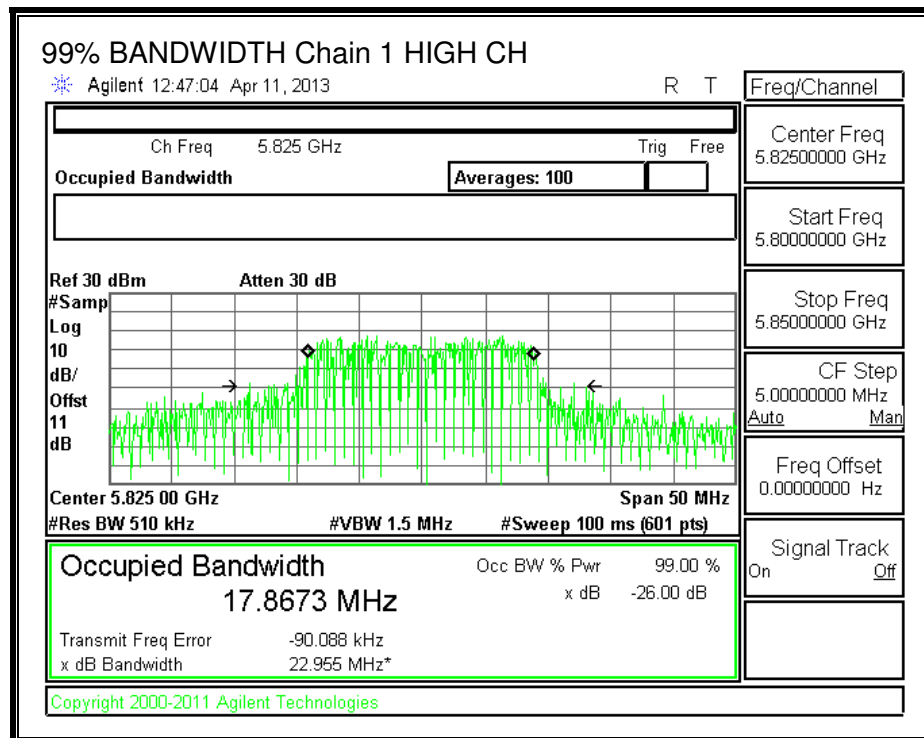
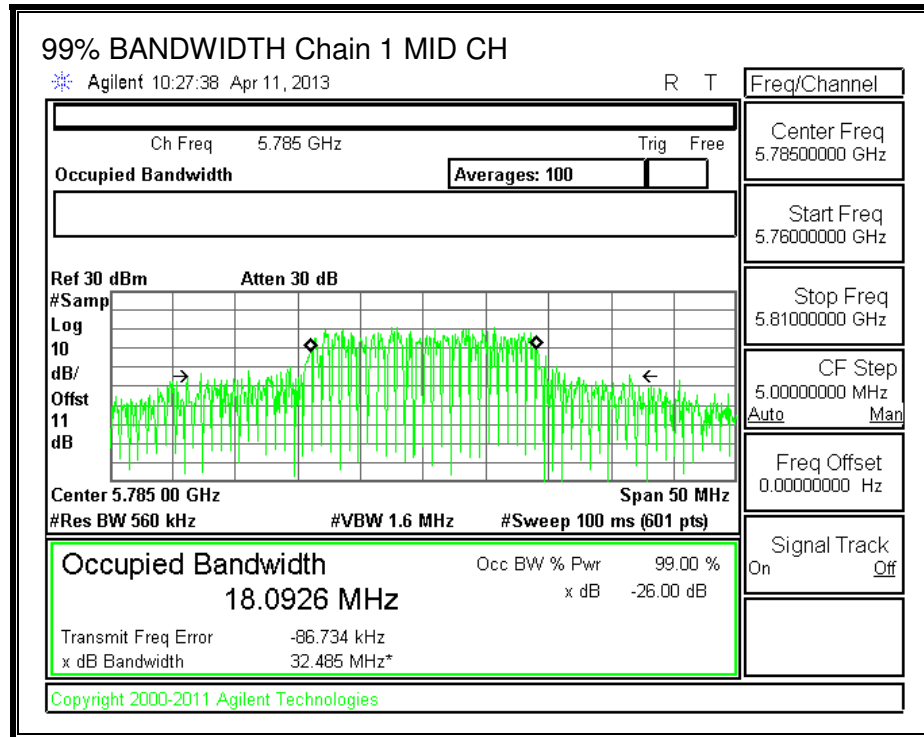
99% BANDWIDTH, Chain 0





99% BANDWIDTH, Chain 1





8.2.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (3)

IC RSS-247 6.2.4 (1)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.59	3.29	3.44

RESULTS

Antenna Gain and Limit

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Power Limit (dBm)
Low	5745	3.44	30.00
Mid	5785	3.44	30.00
High	5825	3.44	30.00

Duty Cycle CF (dB)	0.37	Included in Calculations of Corr'd Power
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Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	14.29	14.18	17.62	30.00	-12.38
Mid	5785	16.85	17.12	20.37	30.00	-9.63
High	5825	15.12	15.38	18.63	30.00	-11.37

8.2.3. MAXIMUM POWER SPECTRAL DENSITY (PSD)

LIMITS

FCC §15.407 (a) (3)

IC RSS-247 6.2.4 (1)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.59	3.29	6.45

RESULTS

Antenna Gain and Limits

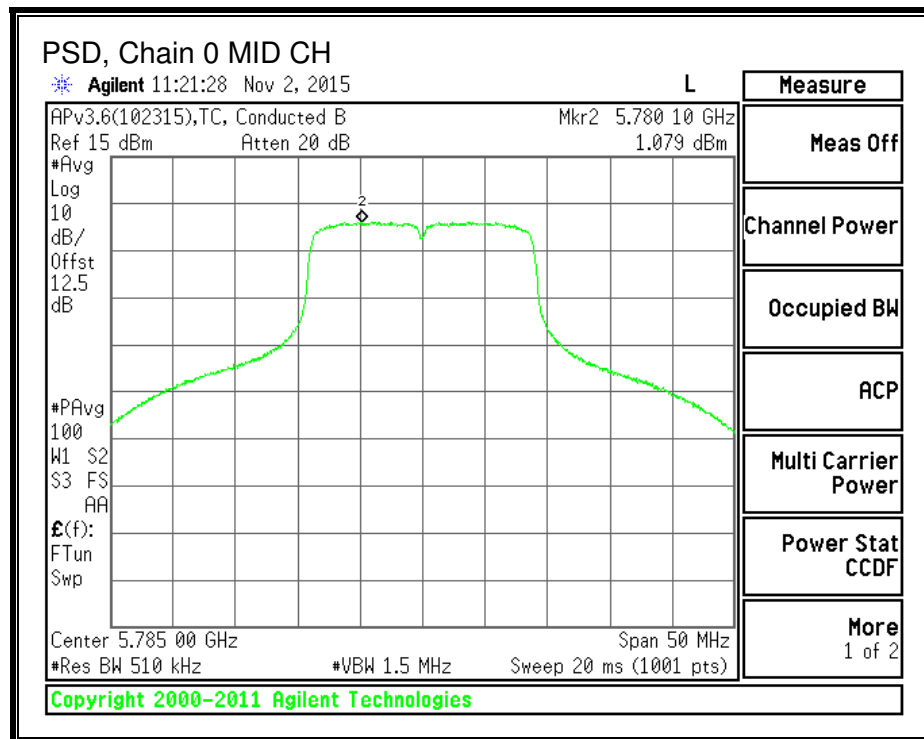
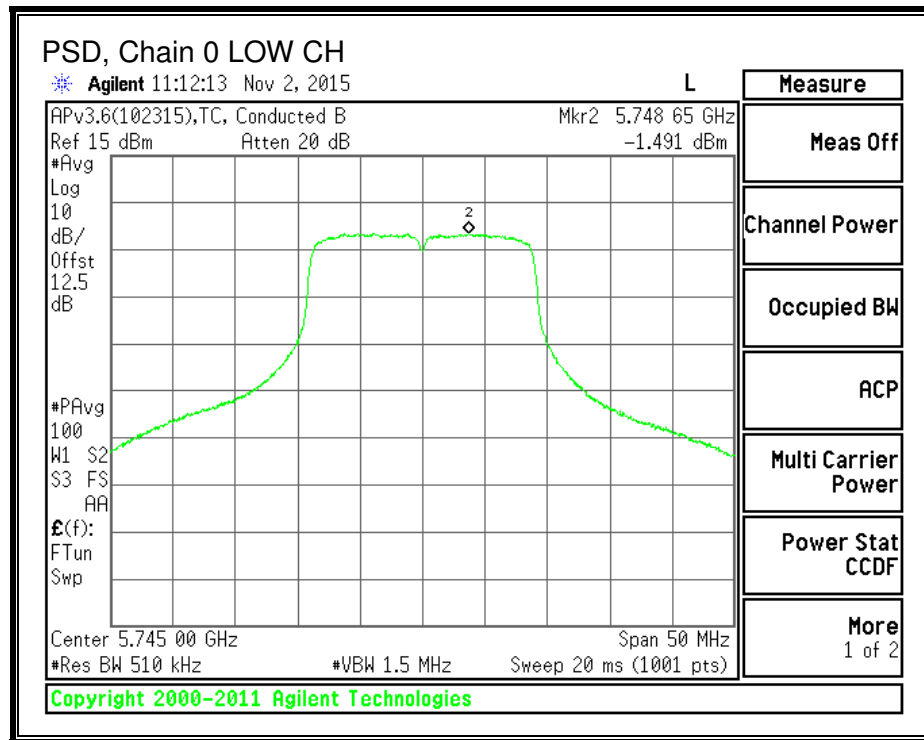
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5745	6.45	29.55
Mid	5785	6.45	29.55
High	5825	6.45	29.55

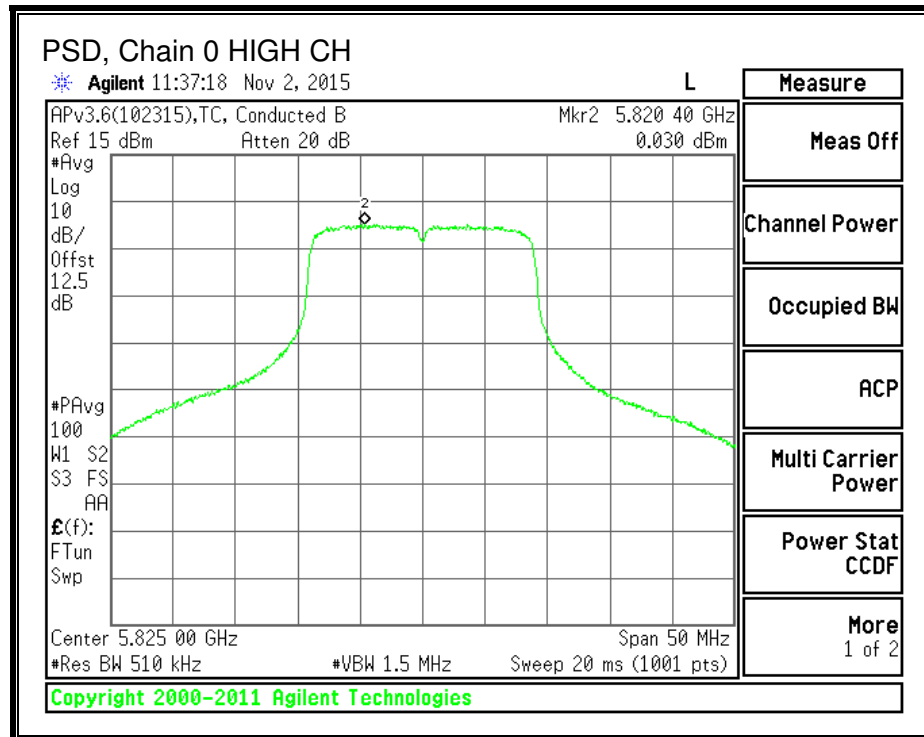
Duty Cycle CF (dB)	0.37	Included in Calculations of Corr'd PSD
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PSD Results

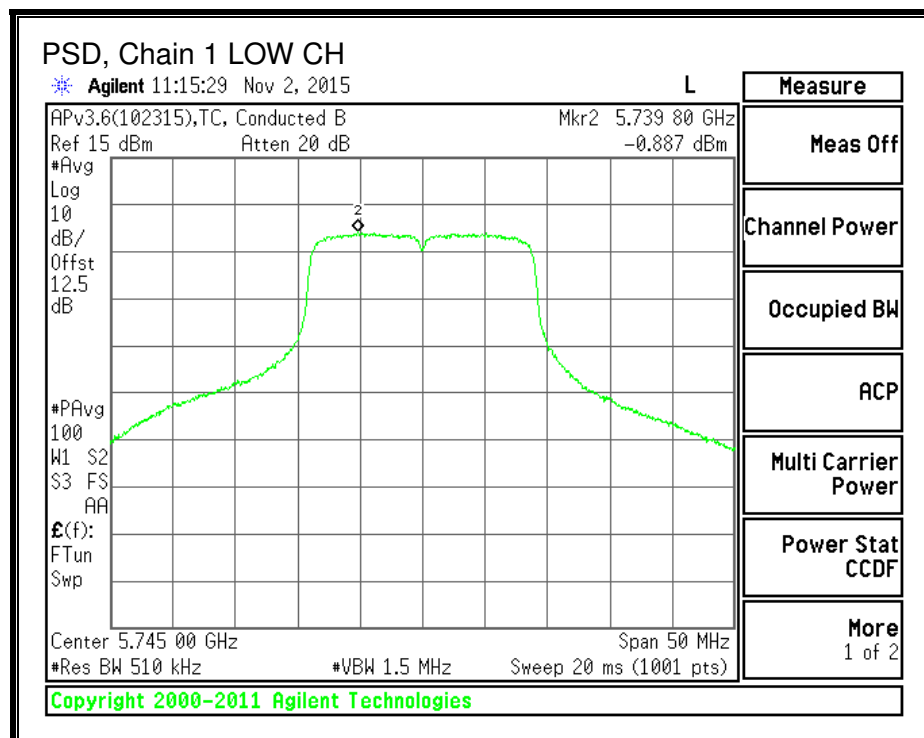
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5745	-1.491	-0.887	2.202	29.550	-27.348
Mid	5785	1.079	1.247	4.544	29.550	-25.006
High	5825	0.030	0.947	3.893	29.550	-25.657

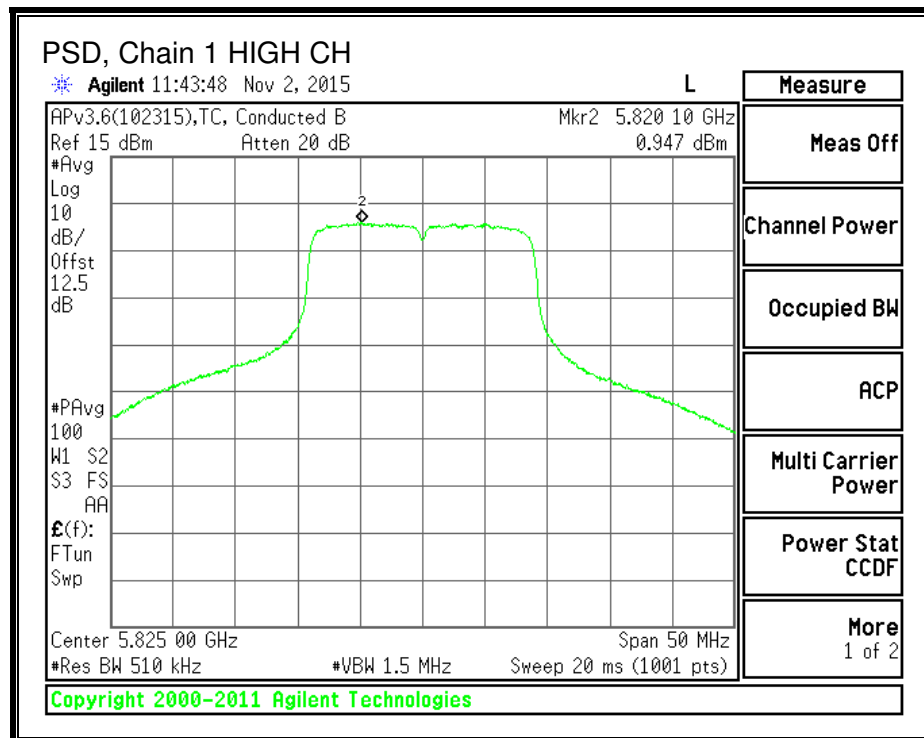
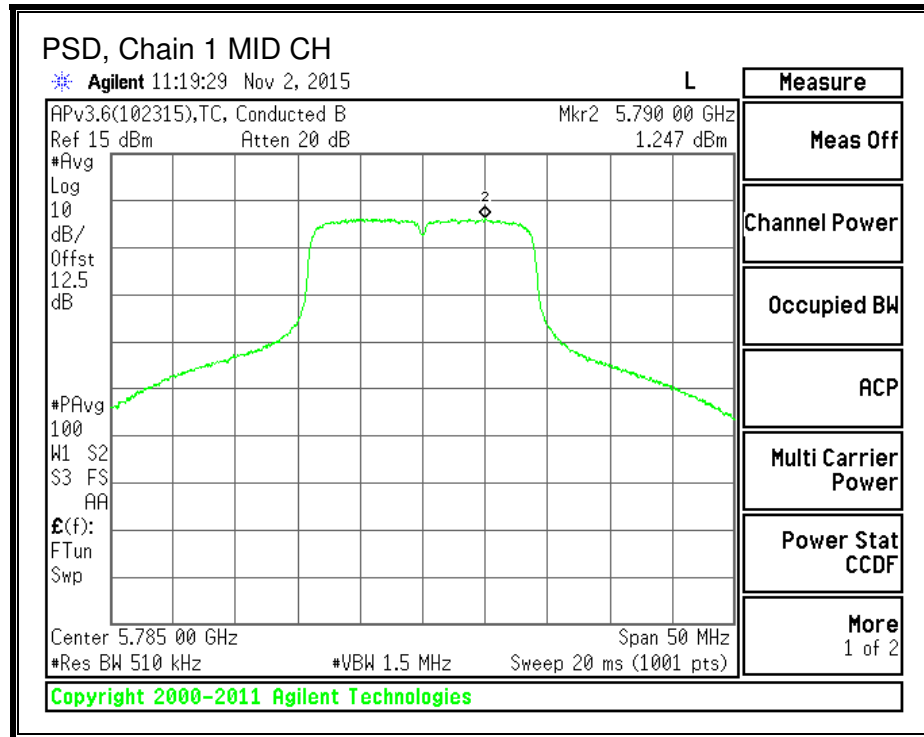
PSD, Chain 0





PSD, Chain 1





9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

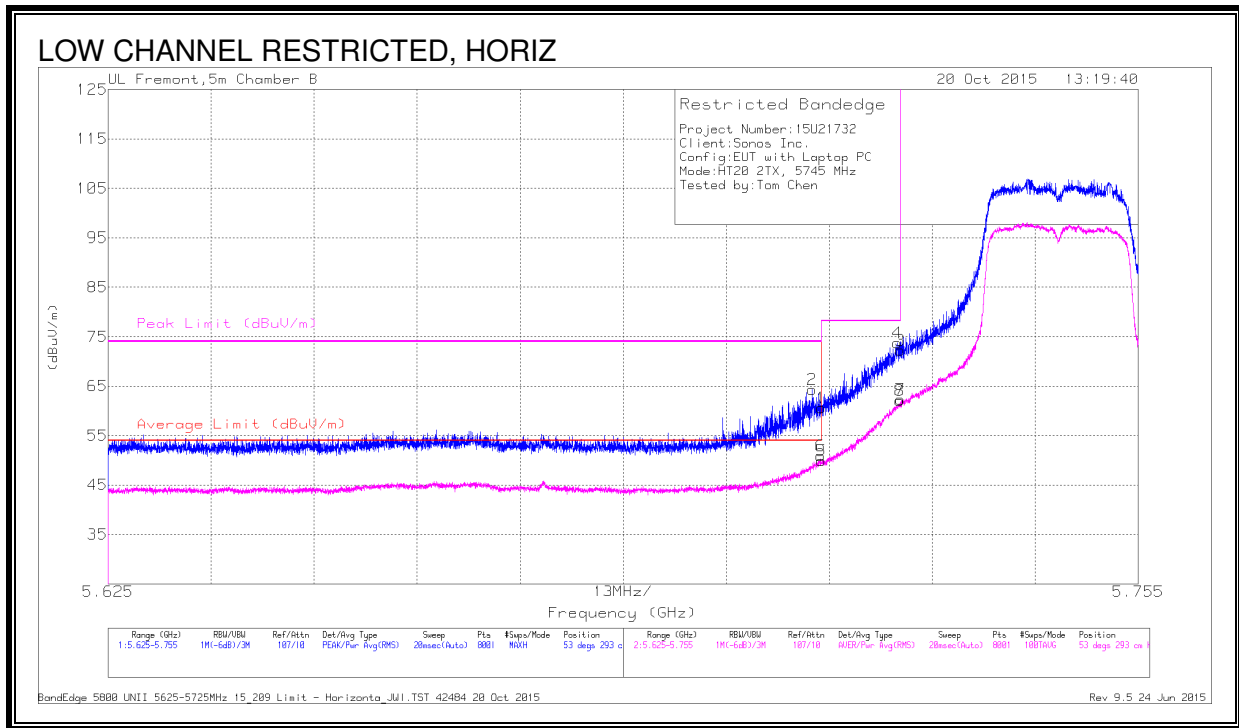
FCC §15.205 and §15.209

IC RSS-GEN Clause 8.9 (Transmitter)

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

9.2. TX ABOVE 1 GHz 802.11n HT20 CDD 2TX MODE IN THE 5.8 GHz BAND

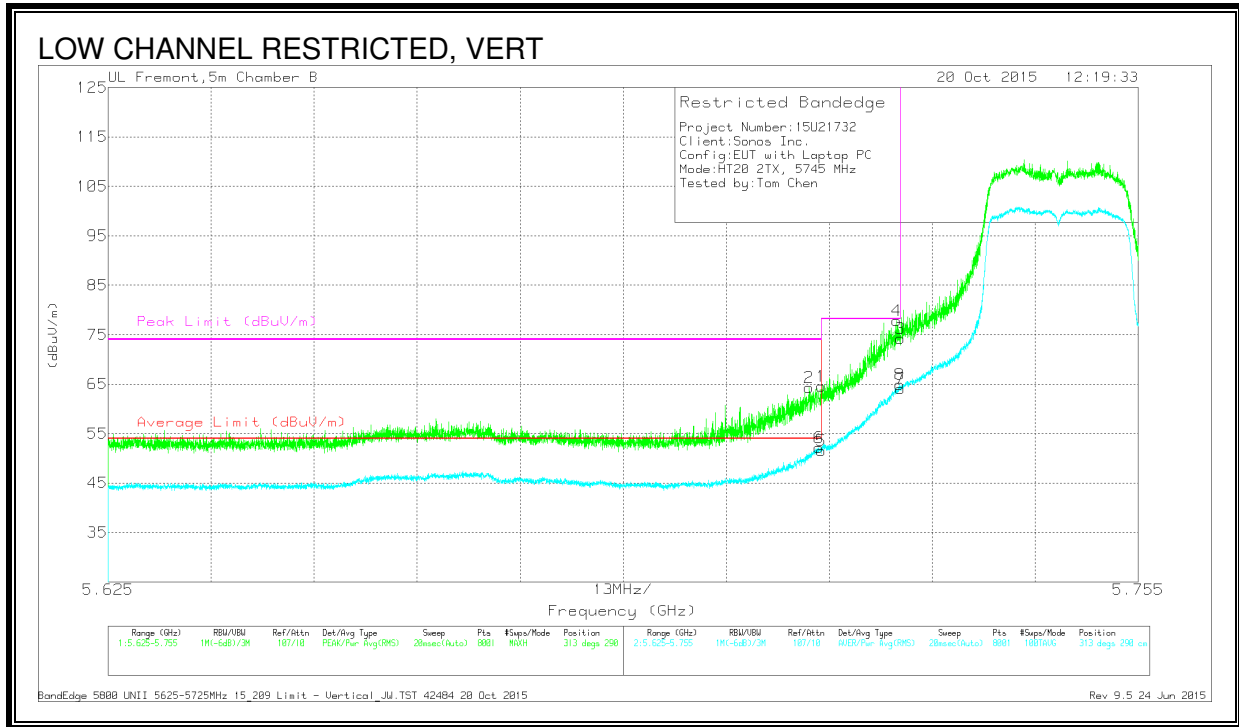
RESTRICTED BANDEDGE (LOW CHANNEL)



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dBm)	Amp/Cbl/Fitr/P ad (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
2	5.714	50.12	Pk	35	-20.8	0	64.32	-	-	74	-9.68	53	293	H
1	5.715	46.58	PK	35	-21	0	60.58	-	-	74	-13.42	53	293	H
5	5.715	34.94	RMS	35	-21	.37	49.31	54	-4.69	-	-	53	293	H
6	5.715	35.96	RMS	35	-21	.37	50.33	54	-3.67	-	-	53	293	H
3	5.725	58.1	Pk	35	-20.8	0	72.3	-	-	78.2	-5.9	53	293	H
4	5.725	59.68	Pk	35	-20.9	0	73.78	-	-	78.2	-4.42	53	293	H

Pk - Peak detector
RMS - RMS detection

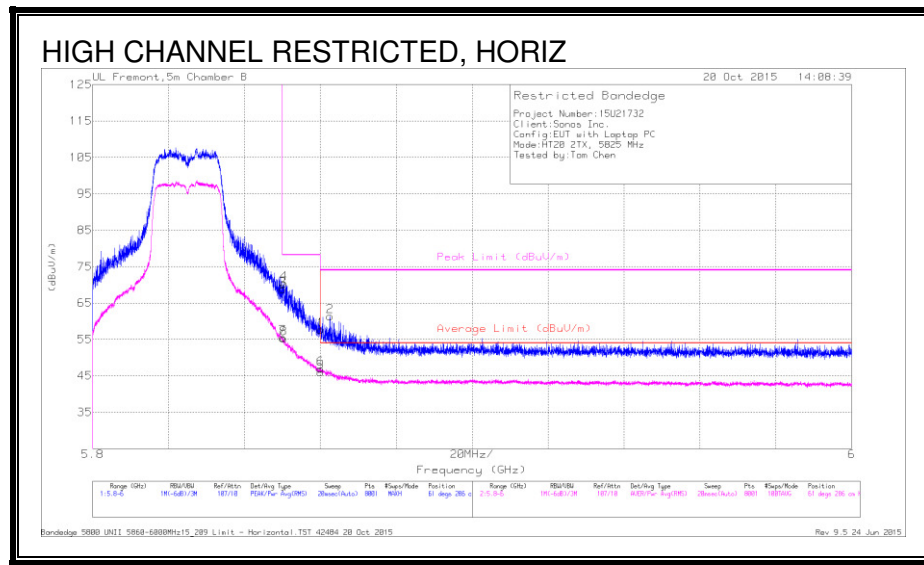


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dBm)	Amp/Cbl/Filt/P ad (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
2	5.713	50.25	Pk	35	-20.9	0	64.35	-	-	74	-9.65	313	290	V
1	5.715	50.62	Pk	35	-21	0	64.62	-	-	74	-9.38	313	290	V
5	5.715	37.19	RMS	35	-21	.37	51.56	54	-2.44	-	-	313	290	V
6	5.715	37.68	RMS	35	-20.9	.37	52.15	54	-1.85	-	-	313	290	V
4	5.724	63.76	Pk	35	-20.9	0	77.86	-	-	78.2	-3.4	313	290	V
3	5.725	60.03	Pk	35	-20.8	0	74.23	-	-	78.2	-3.97	313	290	V

Pk - Peak detector
RMS - RMS detection

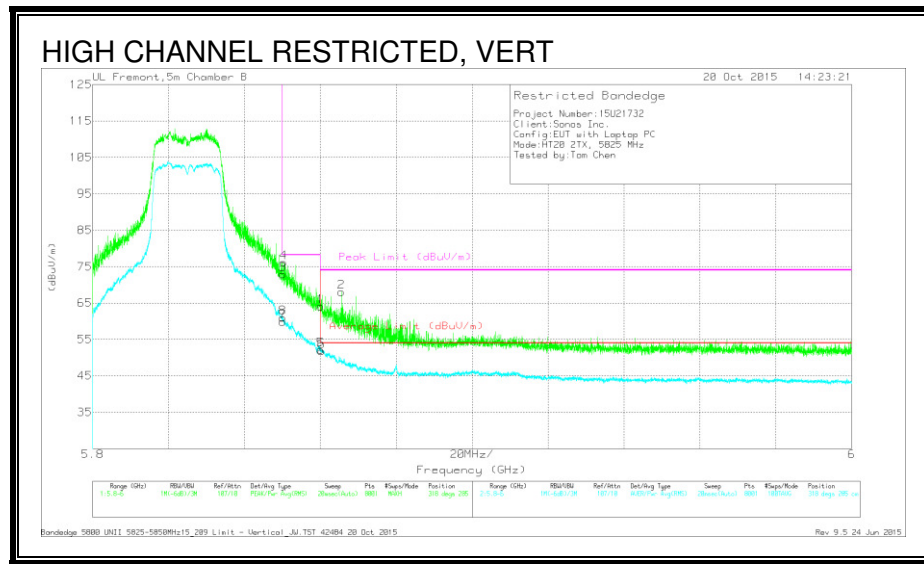
RESTRICTED BANDEDGE (HIGH CHANNEL)



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dBm)	Amp/Cb/Filt/P ad (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
3	5.85	54.32	Pk	35.4	-20.9	0	68.82	-	-	78.2	-9.38	61	286	H
4	5.85	55.96	Pk	35.4	-20.9	0	70.46	-	-	78.2	-7.74	61	286	H
1	5.86	43.15	Pk	35.4	-20.9	0	57.65	-	-	74	-16.35	61	286	H
5	5.86	31.13	RMS	35.4	-20.9	.37	46.00	54	-8.00	-	-	61	286	H
6	5.86	32.14	RMS	35.4	-20.9	.37	47.01	54	-6.99	-	-	61	286	H
2	5.863	46.66	Pk	35.4	-20.7	0	61.36	-	-	74	-12.64	61	286	H

Pk - Peak detector
RMS - RMS detection



Trace Markers

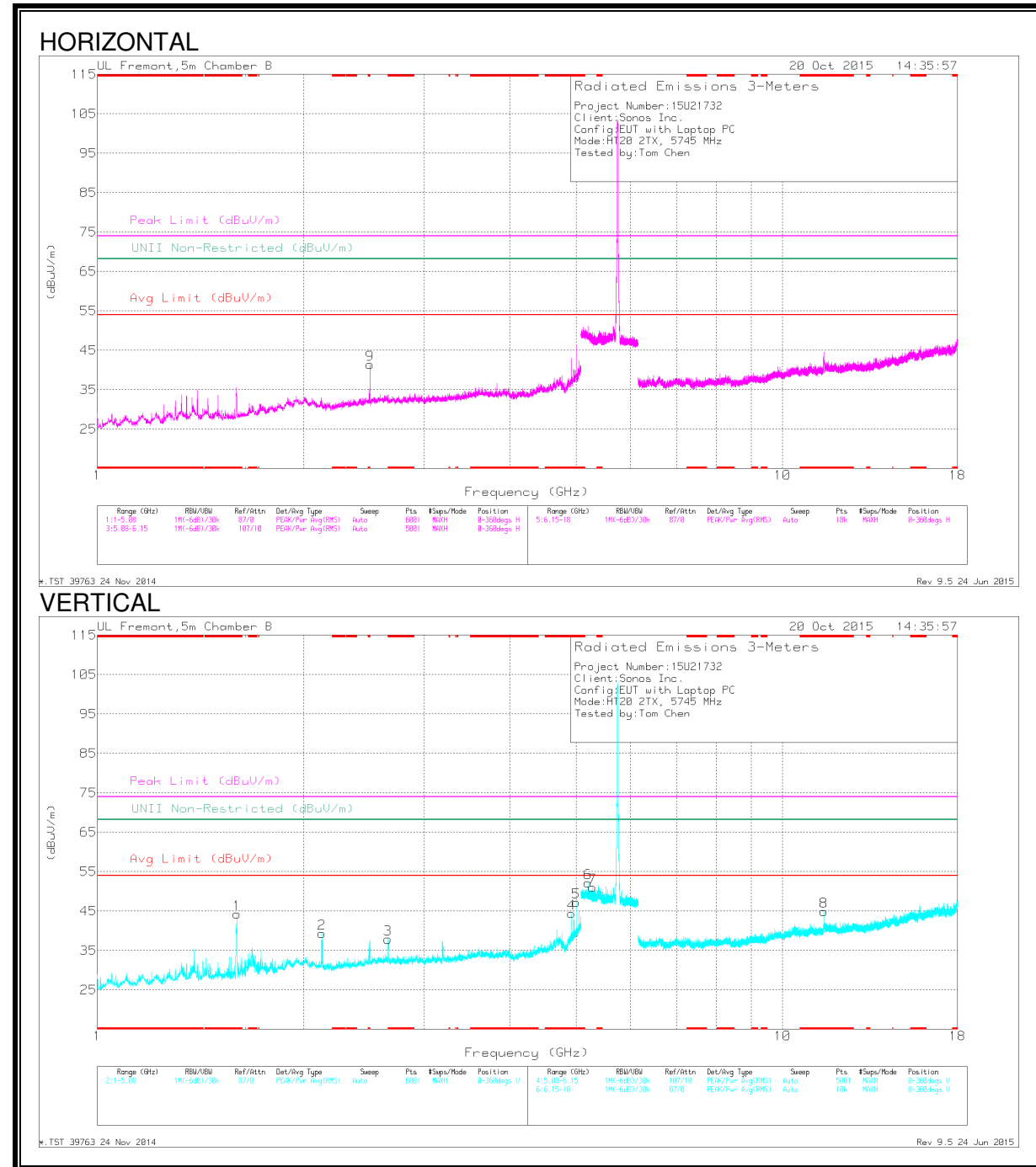
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dBm)	Amp/Cbl/Fitr/P ad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	5.85	58.34	PK	35.4	-20.9	0	72.84	-	-	78.2	-5.36	318	285	V
4	5.85	61.59	PK	35.4	-20.9	0	76.09	-	-	78.2	-2.11	318	285	V
1	5.86	49.55	PK	35.4	-20.9	0	64.05	-	-	74	-9.95	318	285	V
5	5.86	37.65	RMS	35.4	-20.9	.37	52.52	54	-1.48	-	-	318	285	V
6	5.86	37.43	RMS	35.4	-21	.37	52.20	54	-1.80	-	-	318	285	V
2	5.866	53.56	PK	35.4	-20.9	0	68.06	-	-	74	-5.94	318	285	V

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.597	57.29	PK-U	28.8	-35.2	0	50.89	-	-	74	-23.11	-	-	0	212	V
	* 1.597	37.11	ADR	28.8	-35.2	.37	31.08	54	-22.92	-	-	-	-	0	212	V
3	2.654	46.31	PK-U	32.7	-33.5	0	45.51	-	-	-	-	68.2	-22.69	318	233	V
4	* 4.92	47.82	PK-U	34.1	-31.1	0	50.82	-	-	74	-23.18	-	-	134	182	V
	* 4.92	39.64	ADR	34.1	-31.2	.37	42.91	54	-11.11	-	-	-	-	134	182	V
5	* 5	50.05	PK-U	34	-29.9	0	54.15	-	-	74	-19.85	-	-	50	216	V
	* 5	41.57	ADR	34	-29.9	.37	46.04	54	-7.98	-	-	-	-	50	216	V
8	* 11.49	40.29	PK-U	38.3	-25.4	0	53.19	-	-	74	-20.81	-	-	213	392	V
	* 11.49	27.01	ADR	38.3	-25.4	.37	40.28	54	-13.74	-	-	-	-	213	392	V
2	2.126	52.28	PK-U	31.6	-35	0	48.88	-	-	-	-	68.2	-19.32	286	256	V
9	2.5	48.77	PK-U	32.5	-34.1	0	47.17	-	-	-	-	68.2	-21.03	244	154	H
6	5.2	46.21	PK-U	34.3	-19.5	0	61.01	-	-	-	-	68.2	-7.19	234	105	V
7	5.28	45.44	PK-U	34.3	-19.6	0	60.14	-	-	-	-	68.2	-8.06	149	220	V

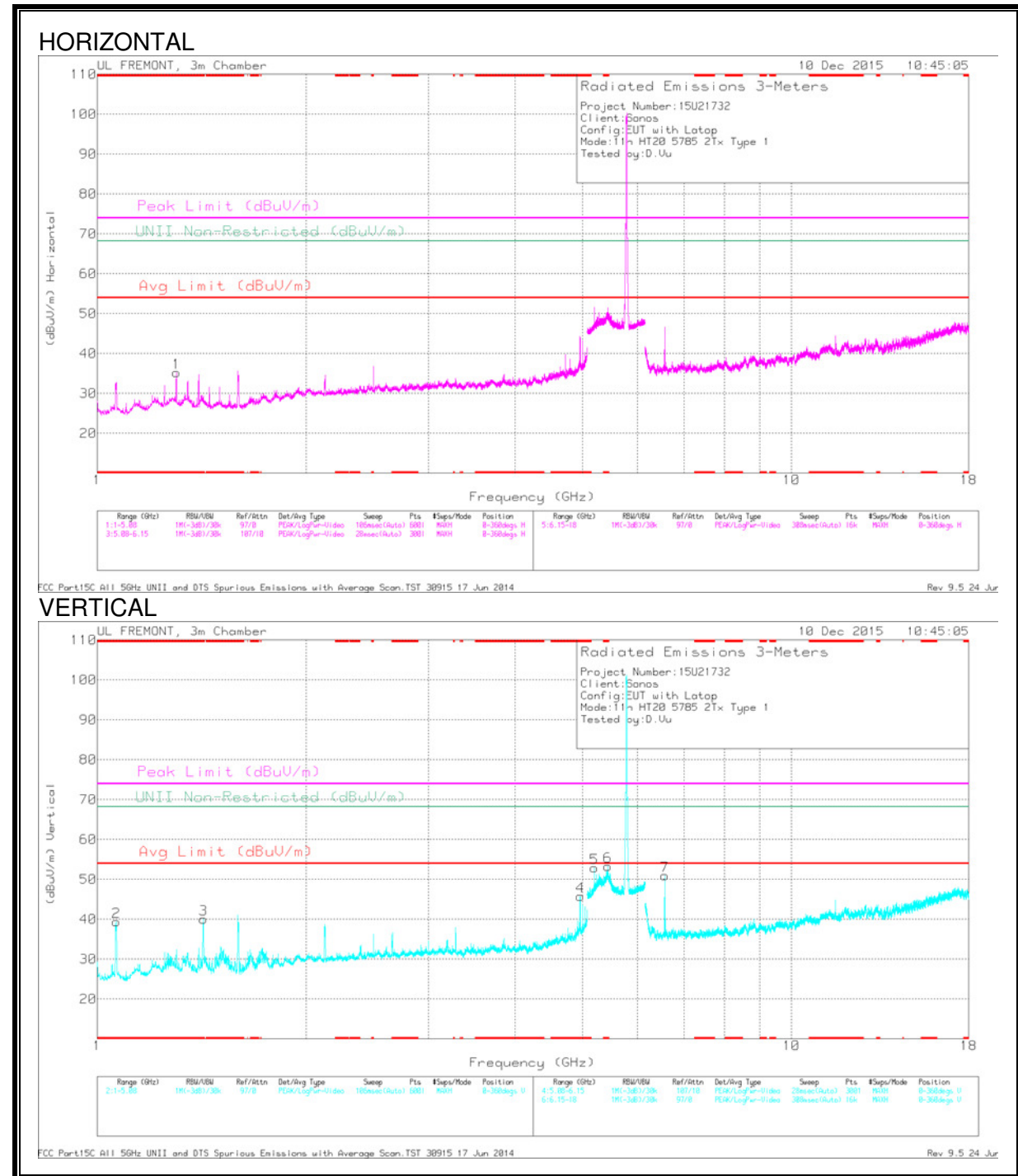
* - indicates frequency in CFR15.205 Restricted Band.

PK - Peak detector

PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

MID CHANNEL



Radiated Emissions

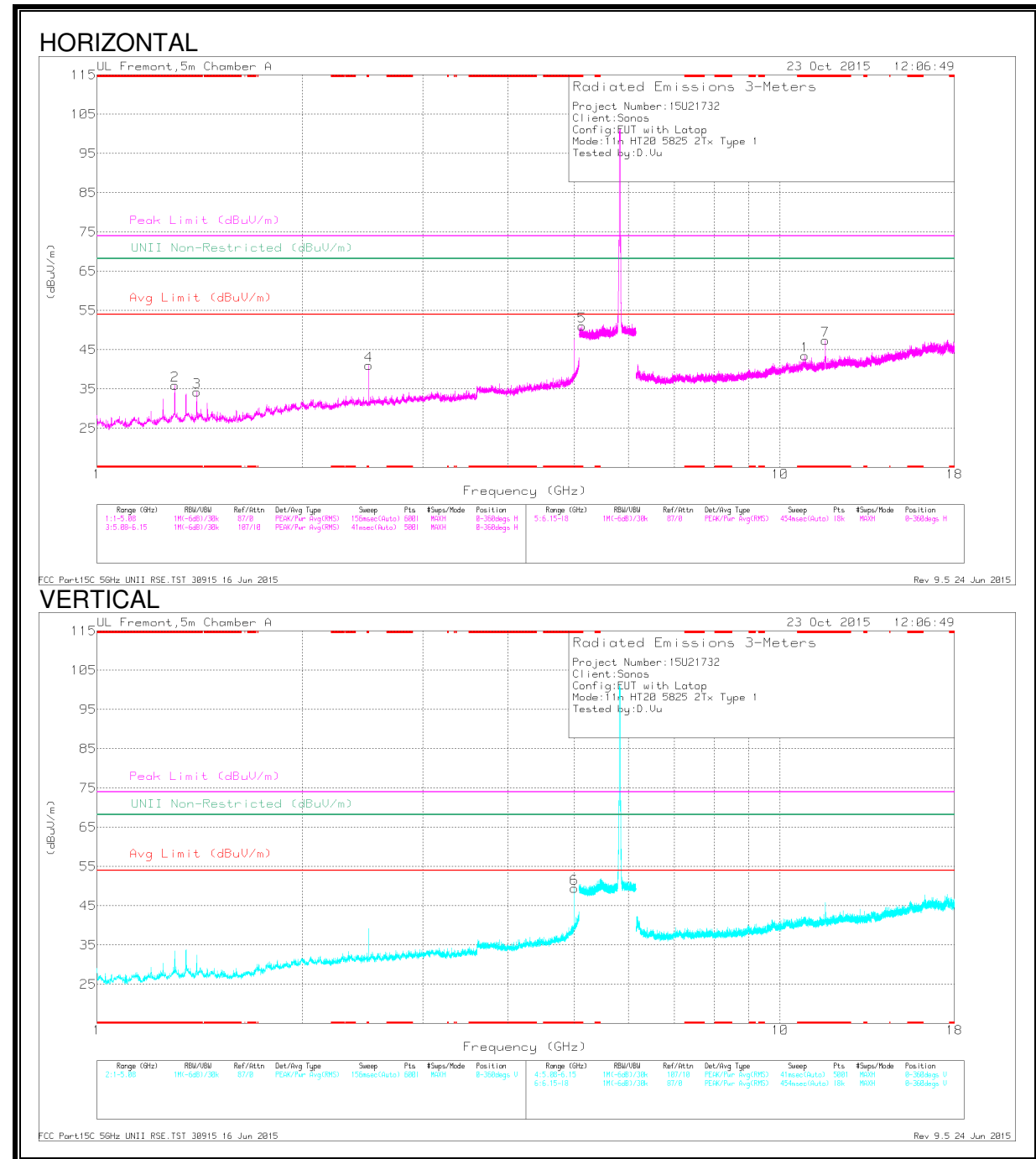
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.3	46.04	PK-U	29.9	-33.1	0	42.84	-	-	74	-31.16	-	-	149	137	H
* 1.3	39.81	ADR	29.9	-33.1	.37	36.98	54	-17.02	-	-	-	-	149	137	H
* 1.063	55.64	PK-U	27.3	-33	0	49.94	-	-	74	-24.06	-	-	158	195	V
* 1.065	40.71	ADR	27.3	-33	.37	35.38	54	-18.62	-	-	-	-	158	195	V
* 1.42	54.17	PK-U	28.5	-32.2	0	50.47	-	-	74	-23.53	-	-	224	249	V
* 1.421	31.94	ADR	28.5	-32.2	.37	28.61	54	-25.39	-	-	-	-	224	249	V
* 4.96	47.26	PK-U	34	-28	0	53.26	-	-	74	-20.74	-	-	177	198	V
* 4.96	36.24	ADR	34	-28	.37	42.61	54	-11.39	-	-	-	-	177	198	V
* 5.44	49.21	PK-U	34.6	-19.9	0	63.91	-	-	74	-10.09	-	-	94	185	V
* 5.44	37	ADR	34.6	-19.9	.37	52.07	54	-1.93	-	-	-	-	94	185	V
5.2	44.59	PK-U	34.3	-20.4	0	58.49	-	-	-	-	68.2	-9.71	313	180	V
6.565	47.59	PK-U	35.6	-28	0	55.19	-	-	-	-	68.2	-13.01	177	101	V

* - indicates frequency in CFR15.205 Restricted Band

PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

HIGH CHANNEL



Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/FI tr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 1.3	48	PK-U	28.8	-35.6	0	41.2	-	-	74	-32.8	-	-	235	202	H
	* 1.3	41.57	ADR	28.8	-35.6	.37	35.14	54	-18.86	-	-	-	-	235	202	H
3	* 1.4	47.32	PK-U	28.5	-35.2	0	40.62	-	-	74	-33.38	-	-	183	198	H
	* 1.4	40.57	ADR	28.5	-35.2	.37	34.24	54	-19.76	-	-	-	-	183	198	H
6	* 5	49.19	PK-U	34	-28.9	0	54.29	-	-	74	-19.71	-	-	326	205	V
	* 5	42.41	ADR	34	-28.9	.37	47.88	54	-6.12	-	-	-	-	326	205	V
5	* 5.131	45.43	PK-U	34.2	-20.8	0	58.83	-	-	74	-15.17	-	-	209	100	H
	* 5.132	33.3	ADR	34.2	-20.8	.37	47.07	54	-6.93	-	-	-	-	209	100	H
1	* 10.875	33.78	PK-U	37.8	-22.1	0	49.48	-	-	74	-24.52	-	-	304	202	H
	* 10.877	22.35	ADR	37.8	-22.1	.37	38.42	54	-15.58	-	-	-	-	304	202	H
7	* 11.65	40.46	PK-U	38.2	-22.4	0	56.26	-	-	74	-17.74	-	-	151	158	H
	* 11.649	27.85	ADR	38.2	-22.4	.37	44.02	54	-9.98	-	-	-	-	151	158	H
4	2.5	48.66	PK-U	32.1	-34.4	0	46.36	-	-	-	-	68.2	-21.84	252	204	H

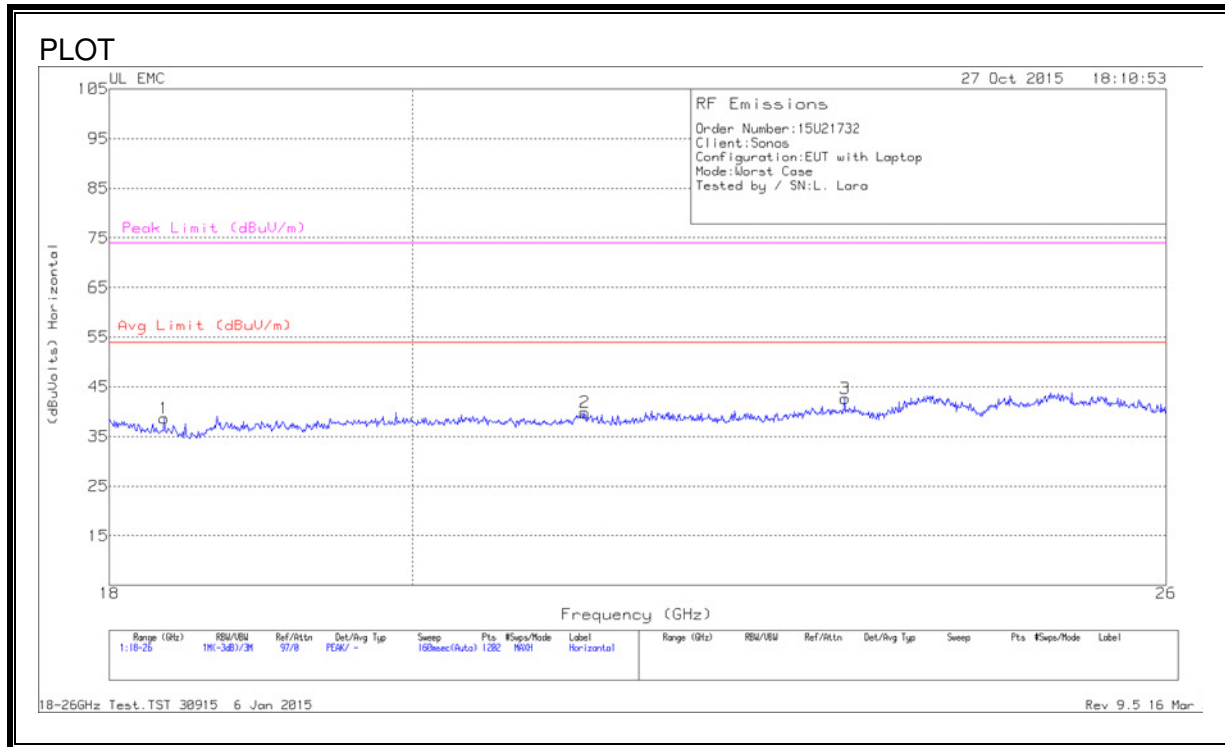
* - indicates frequency in CFR15.205 Restricted Band

PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

9.3. WORST-CASE ABOVE 18GHz

SPURIOUS EMISSIONS 18 – 26 GHz



Trace Markers

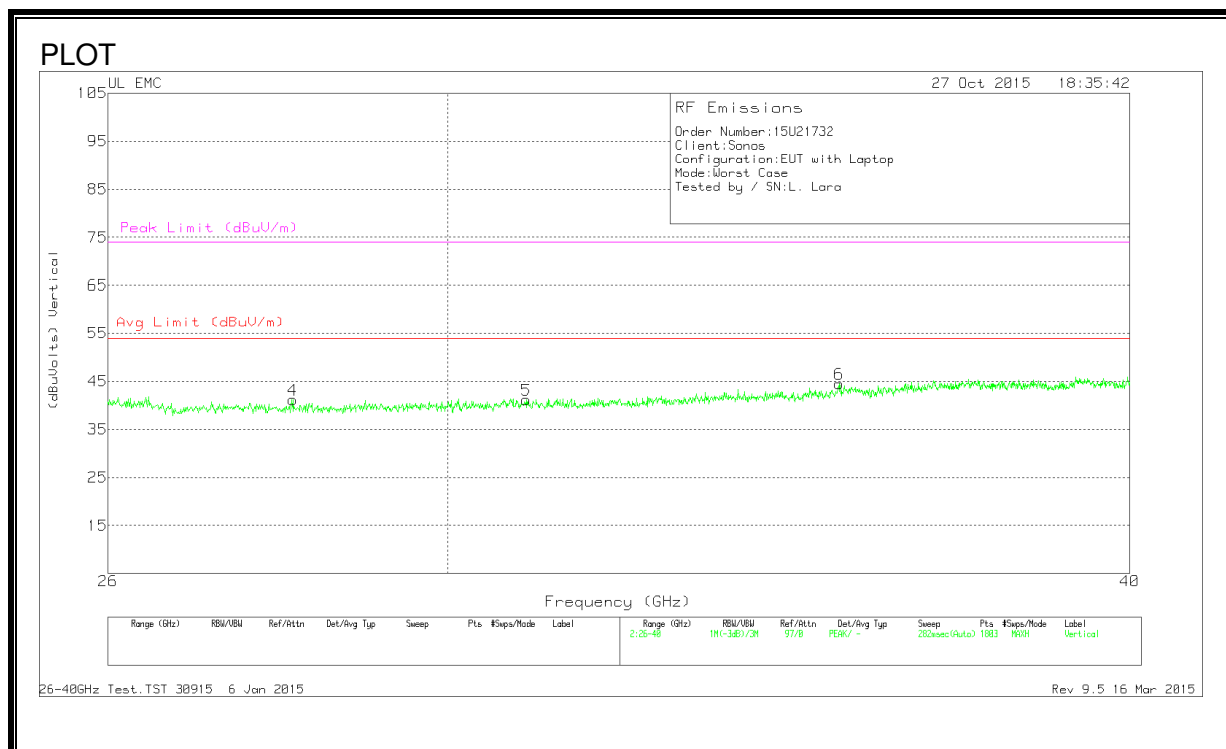
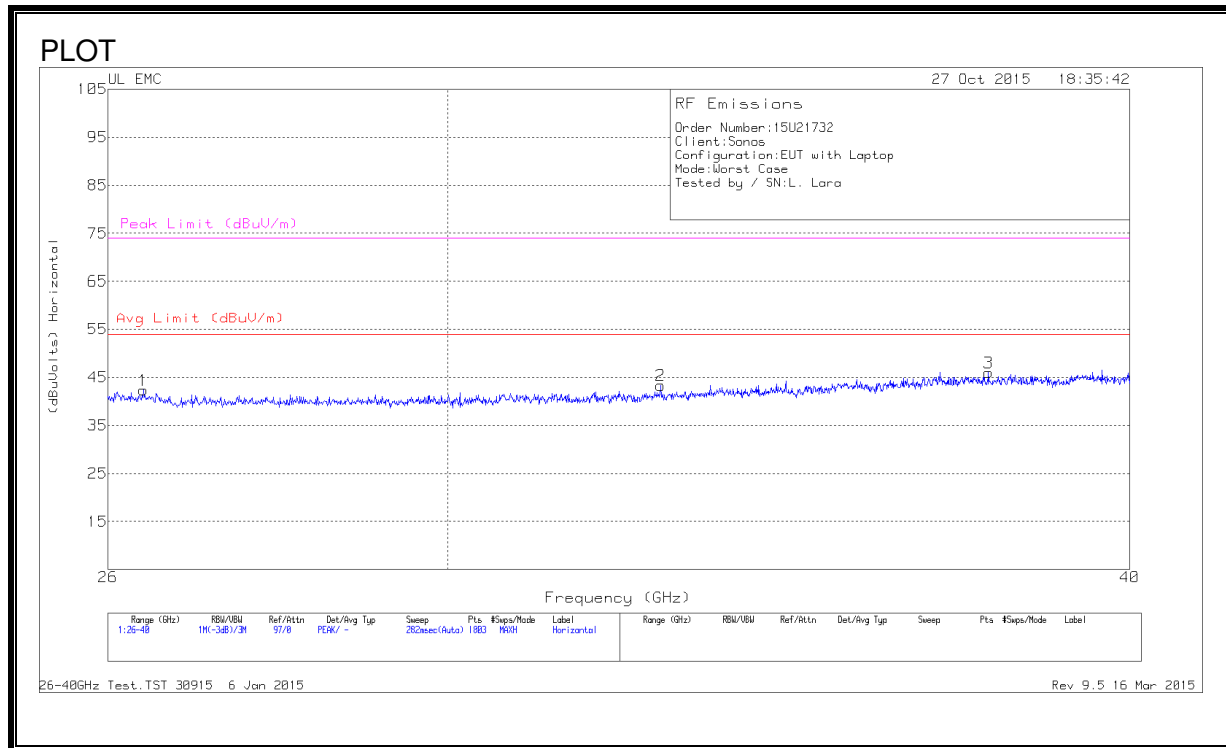
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	DC Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.346	40.97	Pk	32.4	-25.2	-9.5	0	38.67	54	-15.33	74	-35.33
2	21.237	41.43	Pk	33.2	-25.3	-9.5	0	39.83	54	-14.17	74	-34.17
3	23.249	43.67	Pk	33.5	-25	-9.5	0	42.67	54	-11.33	74	-31.33
4	19.792	41.7	Pk	32.6	-24.8	-9.5	0	40	54	-14	74	-34
5	21.017	42.77	Pk	32.4	-25.5	-9.5	0	40.17	54	-13.83	74	-33.83
6	25.001	44.07	Pk	34.2	-24.6	-9.5	0	44.17	54	-9.83	74	-29.83

Pk - Peak detector

18-26GHz Test.TST 30915 6 Jan 2015

Rev 9.5 16 Mar 2015

SPURIOUS EMISSIONS 26 – 40GHz



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T90 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	DC Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	26.388	47.23	Pk	35.5	-30.9	-9.5	0	42.33	54	-11.67	74	-31.67
2	32.821	49.03	Pk	36.6	-32.8	-9.5	0	43.33	54	-10.67	74	-30.67
3	37.685	51.4	Pk	37	-32.9	-9.5	0	46	54	-8	74	-28
4	28.105	46.87	Pk	35.8	-32	-9.5	0	41.17	54	-12.83	74	-32.83
5	31.011	47.57	Pk	35.9	-32.8	-9.5	0	41.17	54	-12.83	74	-32.83
6	35.385	49.5	Pk	37.8	-33.3	-9.5	0	44.5	54	-9.5	74	-29.5

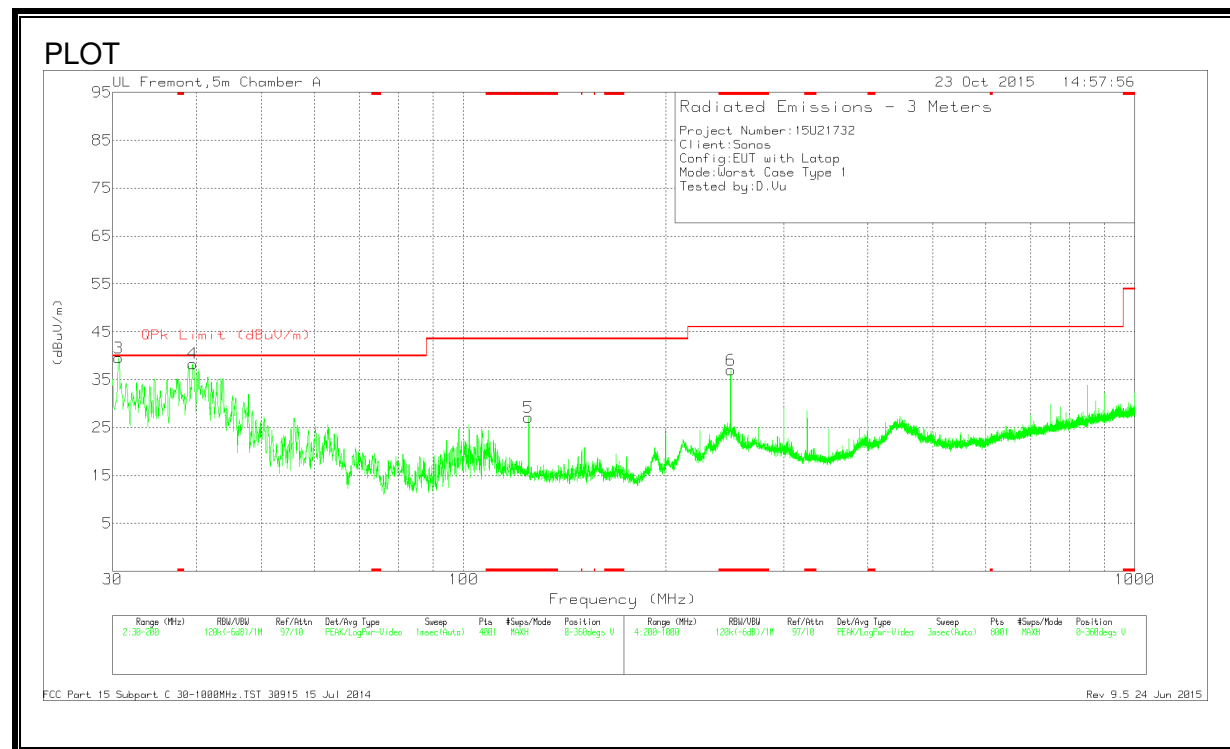
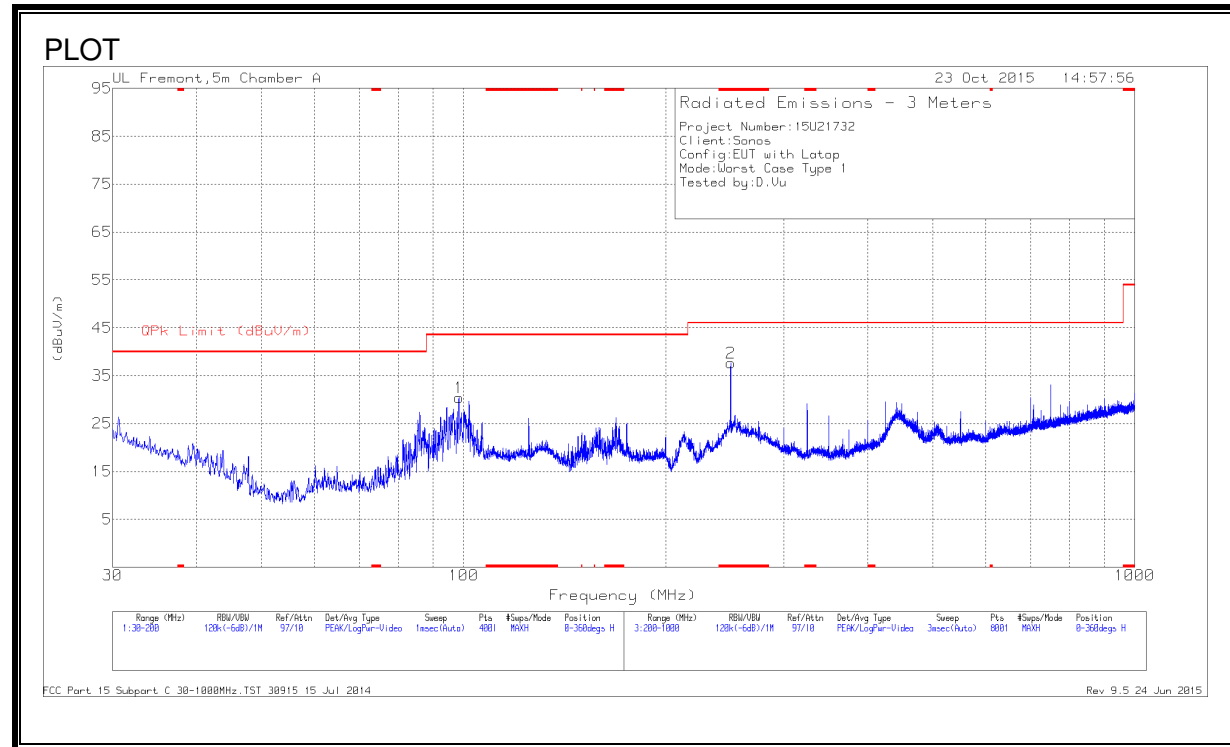
Pk - Peak detector

26-40GHz Test.TST 30915 6 Jan 2015

Rev 9.5 16 Mar 2015

9.4. WORST-CASE BELOW 1 GHz

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



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 124.9875	39.75	Pk	17.8	-30.4	27.15	43.52	-16.37	0-360	101	V
2	* 250	51.91	Pk	15.4	-29.6	37.71	46.02	-8.31	0-360	101	H
6	* 250	51.17	Pk	15.4	-29.6	36.97	46.02	-9.05	0-360	101	V
3	30.6375	46.03	Pk	24.7	-31.2	39.53	40	-.47	0-360	101	V
4	39.4775	51.16	Pk	18.3	-31.1	38.36	40	-1.64	0-360	101	V
1	98.425	47.28	Pk	13.7	-30.6	30.38	43.52	-13.14	0-360	199	H

Radiated Emissions

Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
30.6165	43.49	Qp	24.7	-31.2	36.99	40	-3.01	234	103	V
39.4674	48.62	Qp	18.3	-31.1	35.82	40	-4.18	85	115	V

* - indicates frequency in CFR15.205 Restricted Band

Qp - Quasi-Peak detector

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-GEN Clause 8.8

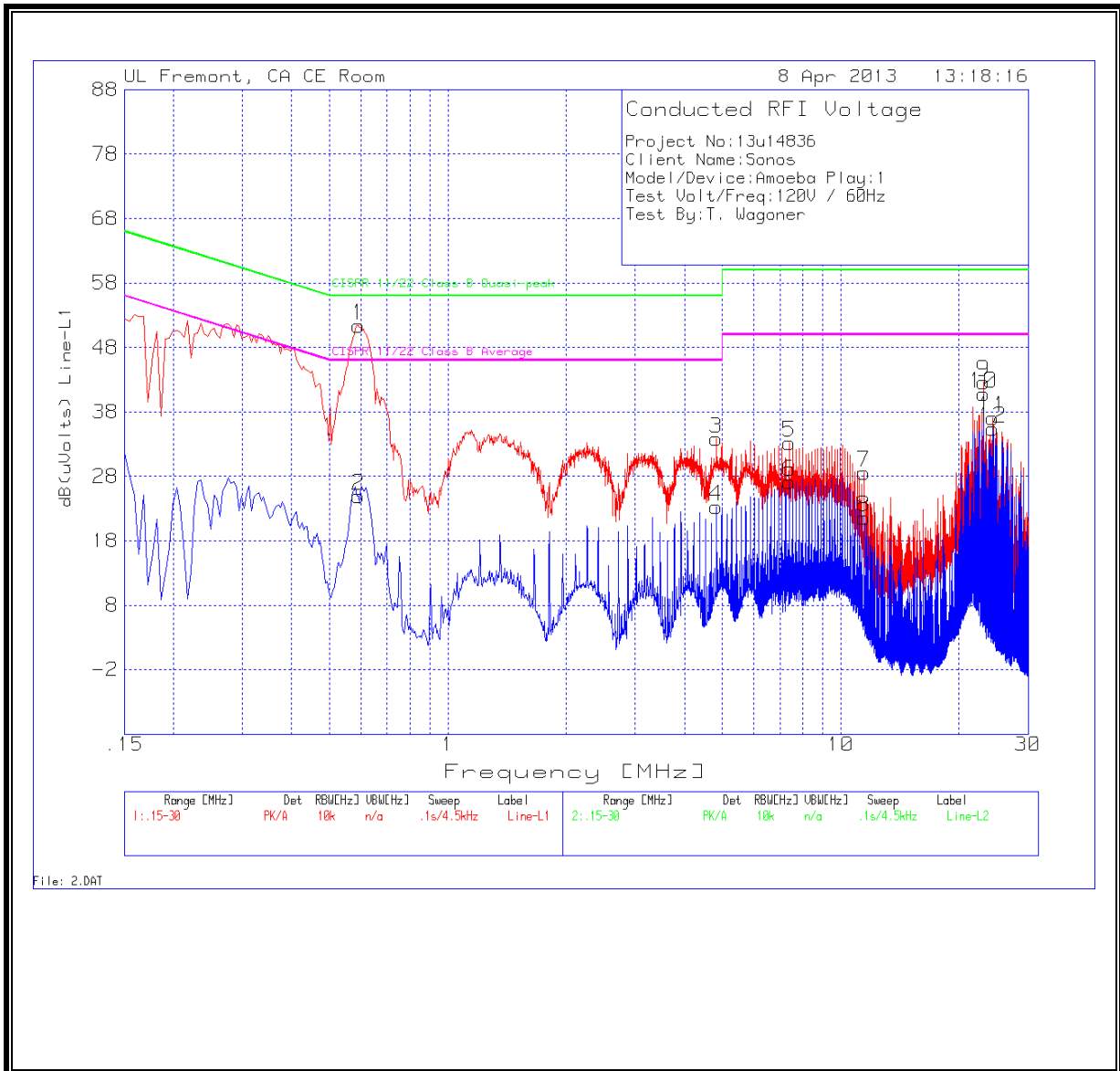
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

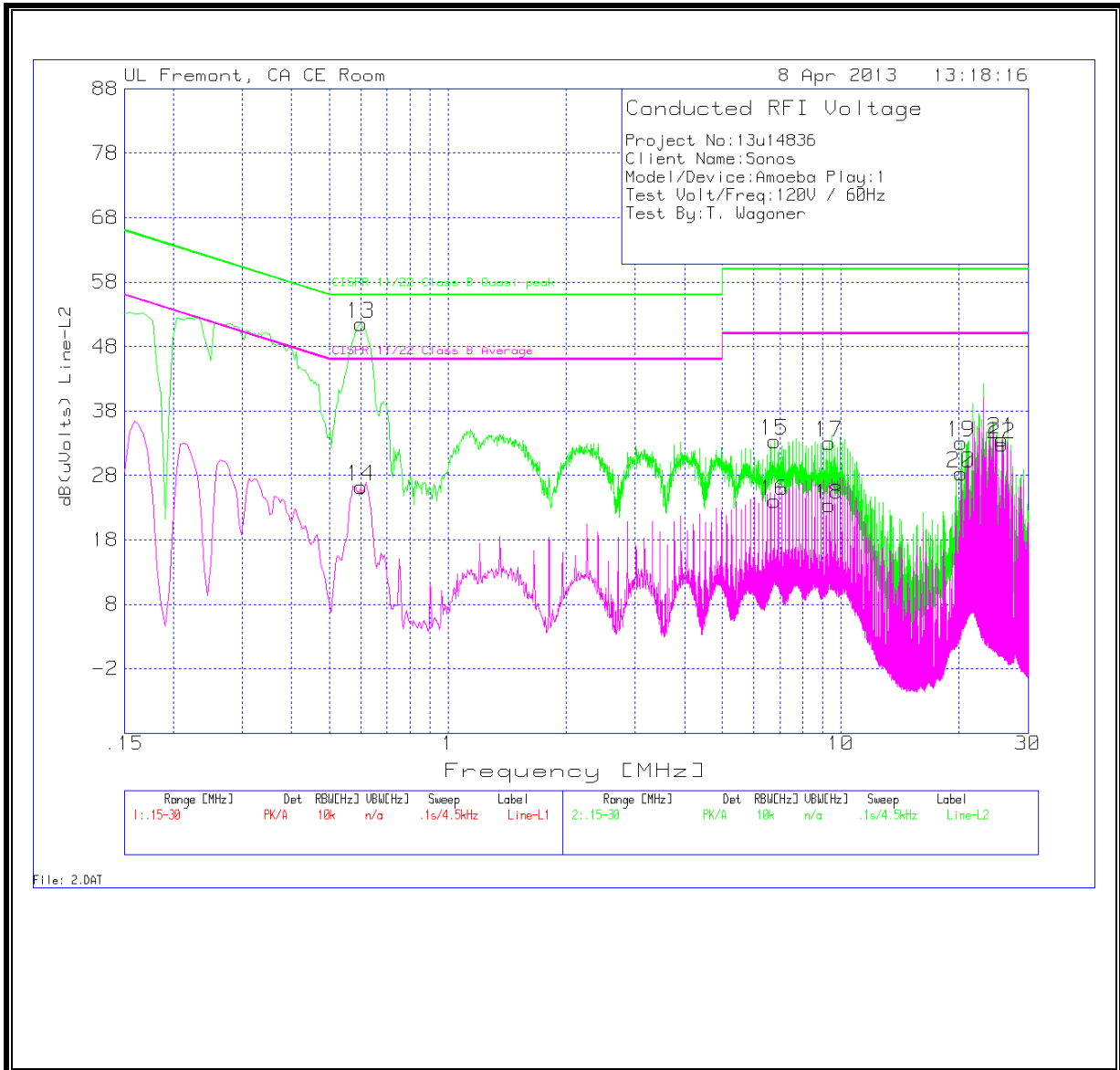
RESULTS

6 WORST EMISSIONS

LINE 1 RESULTS



LINE 2 RESULTS



Data

Project No:		13u14836							
Client Name:		Sonos							
Model/Device:		Amoeba Play:1							
Test Volt/Freq:		120V / 60Hz							
Test By:		T. Wagoner							
Line-L1 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin	CISPR 11/22 Class B Average	Margin
0.591	51.23	PK	0.1	0	51.33	56	-4.67	-	-
0.591	24.85	Av	0.1	0	24.95	-	-	46	-21.05
4.8255	33.59	PK	0.1	0.1	33.79	56	-22.21	-	-
4.8255	23.06	Av	0.1	0.1	23.26	-	-	46	-22.74
7.3905	32.95	PK	0.1	0.1	33.15	60	-26.85	-	-
7.3905	26.89	Av	0.1	0.1	27.09	-	-	50	-22.91
11.463	28.17	PK	0.2	0.2	28.57	60	-31.43	-	-
11.463	21.26	Av	0.2	0.2	21.66	-	-	50	-28.34
23.1315	42.02	PK	0.4	0.2	42.62	60	-17.38	-	-
23.1315	40.24	Av	0.4	0.2	40.84	-	-	50	-9.16
24.3555	36.53	PK	0.4	0.2	37.13	60	-22.87	-	-
24.3555	34.84	Av	0.4	0.2	35.44	-	-	50	-14.56
Line-L2 .15 - 30MHz									
0.6	51.37	PK	0.1	0	51.47	56	-4.53	-	-
0.6	26.11	Av	0.1	0	26.21	-	-	46	-19.79
6.7785	33.17	PK	0.1	0.1	33.37	60	-26.63	-	-
6.7785	23.79	Av	0.1	0.1	23.99	-	-	50	-26.01
9.339	32.93	PK	0.1	0.1	33.13	60	-26.87	-	-
9.339	23.15	Av	0.1	0.1	23.35	-	-	50	-26.65
20.2605	32.62	PK	0.3	0.2	33.12	60	-26.88	-	-
20.2605	27.78	Av	0.3	0.2	28.28	-	-	50	-21.72
25.6965	32.84	PK	0.5	0.3	33.64	60	-26.36	-	-
25.6965	31.97	Av	0.5	0.3	32.77	-	-	50	-17.23
PK - Peak detector									
Av - Average detector									

12. ART POWER SETTINGS TABLE

Channel	Frequency	FCC (Region 1)		
		11b	11g	11n
149	5745			14.5
157	5785			17
165	5825			15

END OF REPORT