



**FCC 47 CFR PART 15 SUBPART B
ICES-003 ISSUE 5**

TEST REPORT

FOR

802.11ad MODULE

MODEL NUMBER: QCA9008-SBD1

**FCC ID: PPD-QCA9008-SBD1
IC: 4104A-QCA9008SBD1**

ISSUE DATE: AUGUST 13, 2015

Prepared for

**QUALCOMM Atheros, INC
1700 TECHNOLOGY DRIVE
SAN JOSE, CA 95110-1383 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

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: QUALCOMM Atheros, INC.
1700 TECHNOLOGY DRIVE
SAN JOSE, CA 95110, U.S.A.

EUT DESCRIPTION: 802.11ad MODULE

MODEL: QCA9008-SBD1

SERIAL NUMBER: 1351300100

DATE TESTED: AUGUST 11-12, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART B	Pass
ICES-003 ISSUE 5	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:



Steve Leitner
Program Manager
UL Verification Services Inc.

Tested By:



Steve Aguilar
WiSE ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009.

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

The above test sites and facilities are covered under FCC Test Firm Registration # 208313 and under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

QCA9008-SBD1 is a wireless module that operates in the 60 GHz frequency band, supporting 802.11ad.

GENERAL INFORMATION

Power Requirements	3.3 VDC from host equipment
List of frequencies generated or used by the EUT	40 MHz, 100 MHz, 320 MHz

5.2. PRELIMINARY TEST CONFIGURATIONS

The following configurations were investigated during preliminary testing:

EUT Configuration	Description
Worst Case	EUT connected to host PC via PCIe adapter. Host in "minimum configuration".

5.3. MODE OF OPERATION

Mode	Description
Standby	Module in receive mode

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was rev 2.0.

The test utility software used during testing was DMTools v1.2 Build 5500, Devmon Utility ver 1.0.0.11 Marlon, Falcon Gui 2014.

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	Manufacturer	Model	S/N
Laptop	HP	8440p	CZC0457V8C
Laptop Power supply	HP	608425-003	WBGSV0AAR0L5U
Mouse	Lenovo	M-U0025-0	HS409HA0XN5
PCI Express Card	Azurewave	--	--
HMC to M2 Card	Qualcomm	--	--
Switch	TP-Link	TL-SG1005D	214C037000114
Switch Power supply	TP-Link	T090060-2B1	--

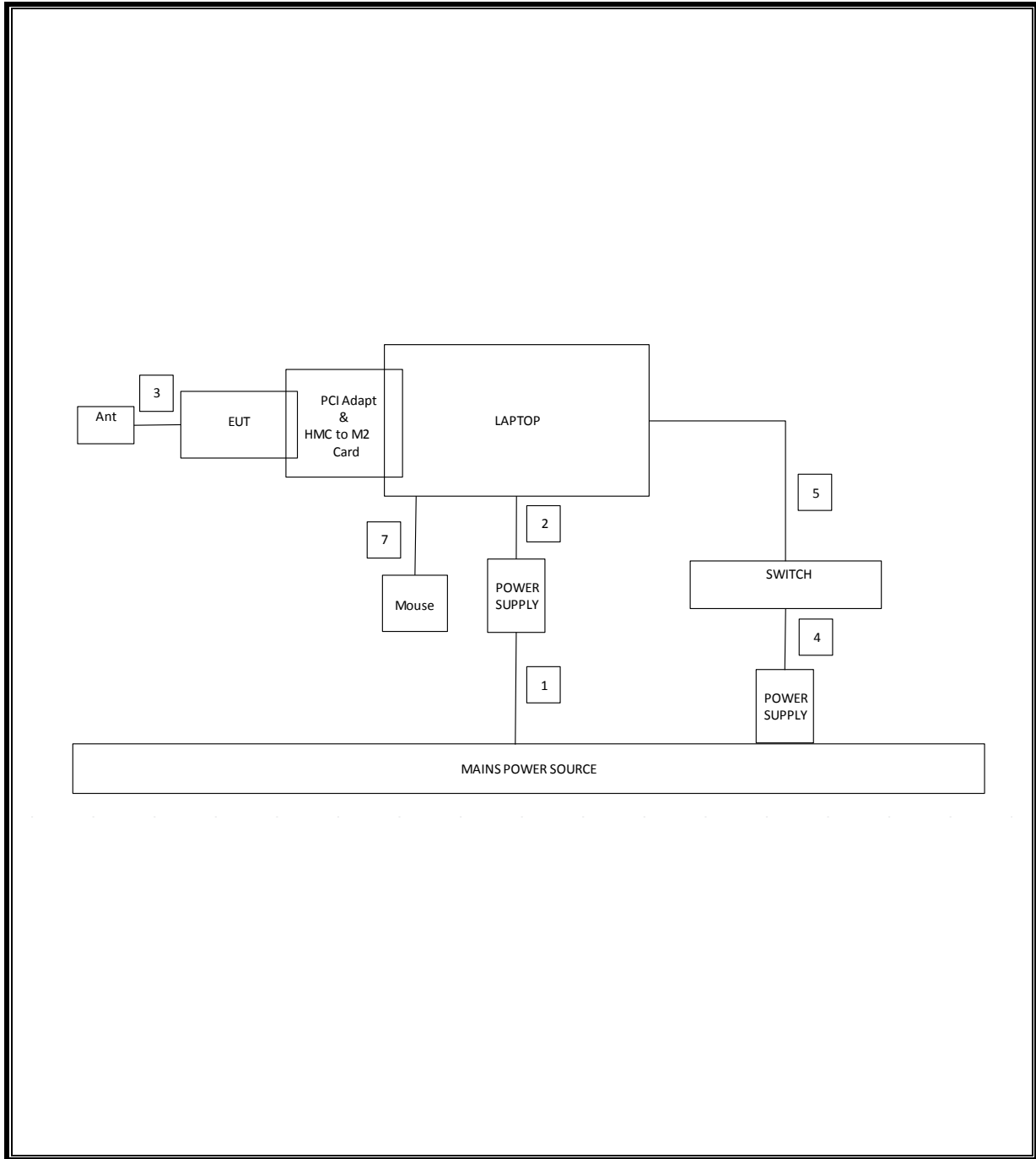
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	No. of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	3-Prong	Unshielded	1	None
2	DC	1	Barrel	Shielded	2	None
3	RF	1	U.FL-R	Shielded	0.4	None
4	DC	1	Barrel	Unshielded	1.4	None
5	Ethernet	1	RJ45	Unshielded	3	None

TEST SETUP

A laptop computer was utilized as a host and to adjust the EUT for testing purposes. Connection to the EUT was by the use of a PCIe card adapter and mPCIe extender. Refer to the following setup diagram.

SETUP DIAGRAM



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 24, 2015		
Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015		
PXA, 3Hz o 44 GHz	Keysight	N9030A	906	06/11/2015	06/11/2016
Amplifier, 1-18 Ghz	Miteq	AFS42-001018-25-S	495	06/16/2015	06/16/2016
Amplifier, 10kHz to 1 GHz	Sonoma	310N	835	06/09/2015	06/08/2016
Antenna, Horn, 1-18	ETS Lindgren	3117	863	03/03/2015	03/03/2016
Antenna,30Mhz to 2Ghz	Sunol Sciences	JB3	900	04/10/2015	04/10/2016
EMI Test Rec. 9kHz to 7GHz	Rohde & Schwarz	ESCI7	284	09/16/2015	09/16/2016
LISN	FCC	50/250-25-2	24	01/16/2015	01/15/2016
LISN	Solar	8012-50-R-24-BNC	29	06/11/2015	06/11/2016

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

LIMIT

FCC Part 15 Subpart B, Class B

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dBµV/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54

Note: The lower limit shall apply at the transition frequency.

TEST PROCEDURE

ANSI C63.4

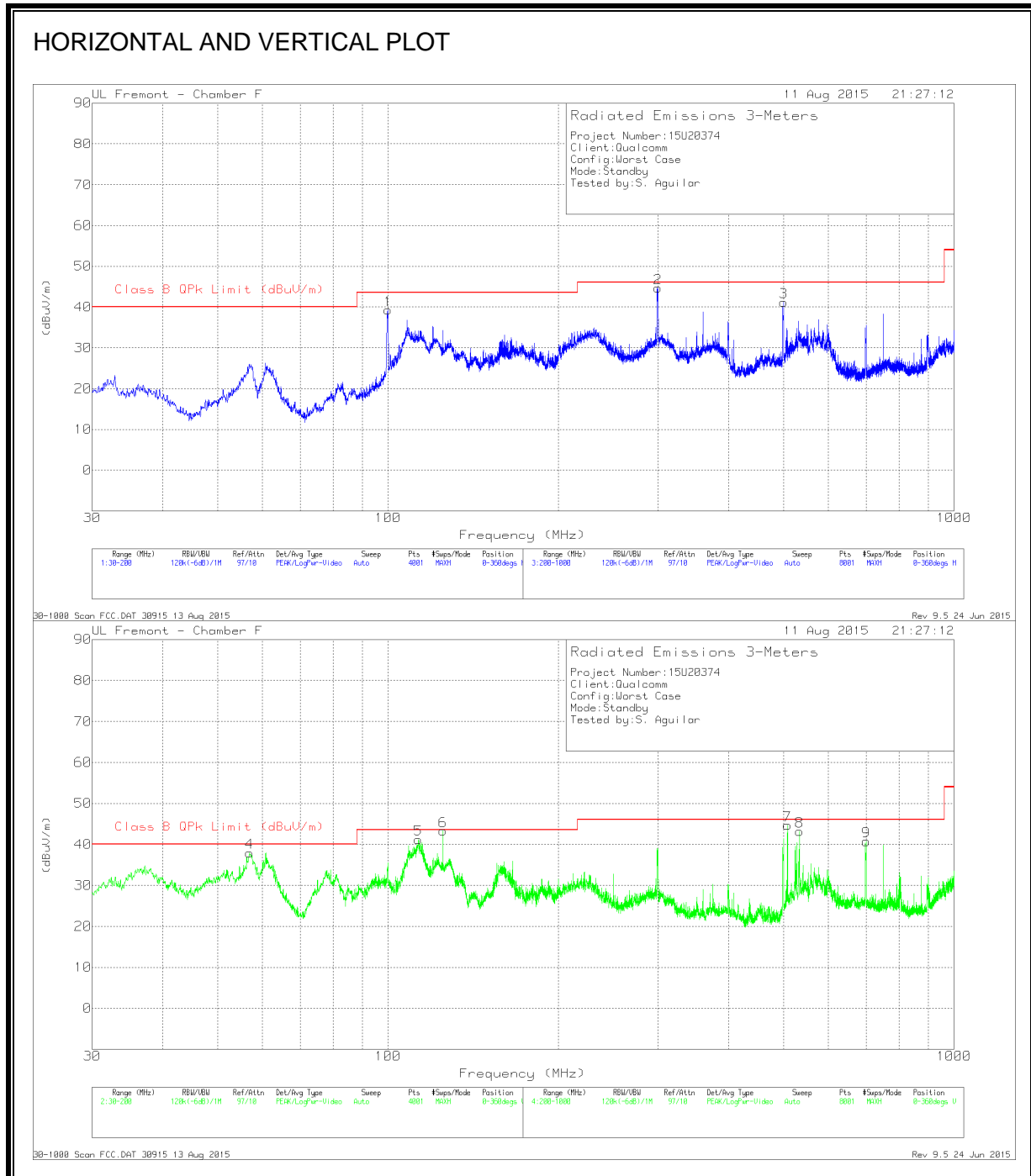
The highest clock frequency generated or used in the EUT is 320 MHz, therefore the frequency range was investigated from 30 MHz to 2 GHz according to the following table, although measured to 18,000 MHz.

All measurements were made at a 3 m test distance. Where 10 m limits are specified, a 10.5 dB distance correction factor was applied as seen in the results tables.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5 th harmonic of the highest frequency or 40,000 MHz, whichever is lower

RESULTS

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

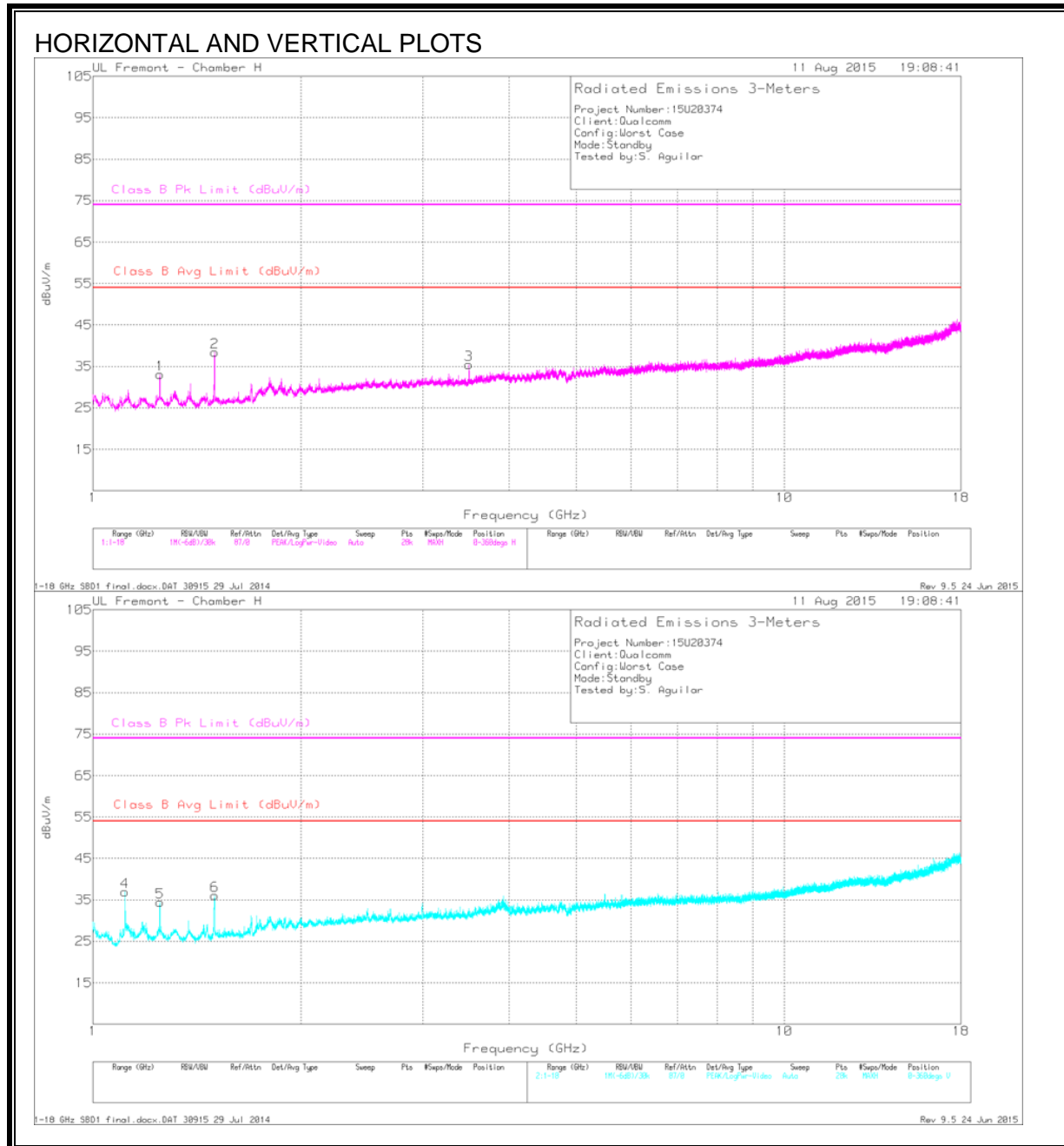


TABULATED DATA

Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/ Cbl (dB)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
99.9154	56.58	Qp	10.1	-30.5	36.18	43.52	-7.34	96	324	H
125.0107	56.52	Qp	13.8	-30.3	40.02	43.52	-3.5	106	109	V
113.5957	45.77	Qp	13.1	-30.4	28.47	43.52	-15.05	348	122	V
56.896	55.61	Qp	7.4	-30.9	32.11	40	-7.89	204	101	V
299.7972	60.85	Qp	13.2	-29.1	44.95	46.02	-1.07	133	101	H
499.6949	50.5	Qp	17.5	-28.3	39.7	46.02	-6.32	356	100	H
504.0016	37.41	Qp	17.7	-28.3	26.81	46.02	-19.21	86	116	V
533.1278	36.69	Qp	18	-28.2	26.49	46.02	-19.53	29	182	V
699.6044	44.65	Qp	20.2	-27.8	37.05	46.02	-8.97	344	110	V

Qp - Quasi-Peak detector

RADIATED EMISSIONS ABOVE 1000 TO 18,000 MHz (WORST-CASE CONFIGURATION)



TABULATED DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR) Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.114	45.1	Pk	27.2	-34.7	37.6	-	-	74	-36.4	312	400	V
1.114	31.93	Av	27.2	-34.7	24.43	54	-29.57	-	-	312	400	V
1.25	44.87	Pk	28.5	-34.8	38.57	-	-	74	-35.43	30	400	H
1.25	37.34	Av	28.5	-34.8	31.04	54	-22.96	-	-	30	400	H
1.25	44.15	Pk	28.5	-34.9	37.75	-	-	74	-36.25	333	399	V
1.25	34.4	Av	28.5	-34.8	28.1	54	-25.90	-	-	333	399	V
1.5	53.25	Pk	28.1	-34.3	47.05	-	-	74	-26.95	29	339	H
1.5	43.07	Av	28.1	-34.3	36.87	54	-17.13	-	-	29	339	H
1.5	48.8	Pk	28.1	-34.3	42.6	-	-	74	-31.4	283	400	V
1.5	32.7	Av	28.1	-34.3	26.5	54	-27.5	-	-	283	400	V
3.5	42.05	Pk	32.8	-32.4	42.45	-	-	74	-31.55	179	238	H
3.5	33.73	Av	32.8	-32.4	34.13	54	-19.87	-	-	179	238	H

Pk - Peak detector, Av - Average detection

7.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

FCC 15B Class B

Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Notes:
1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

RESULTS

6 WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz

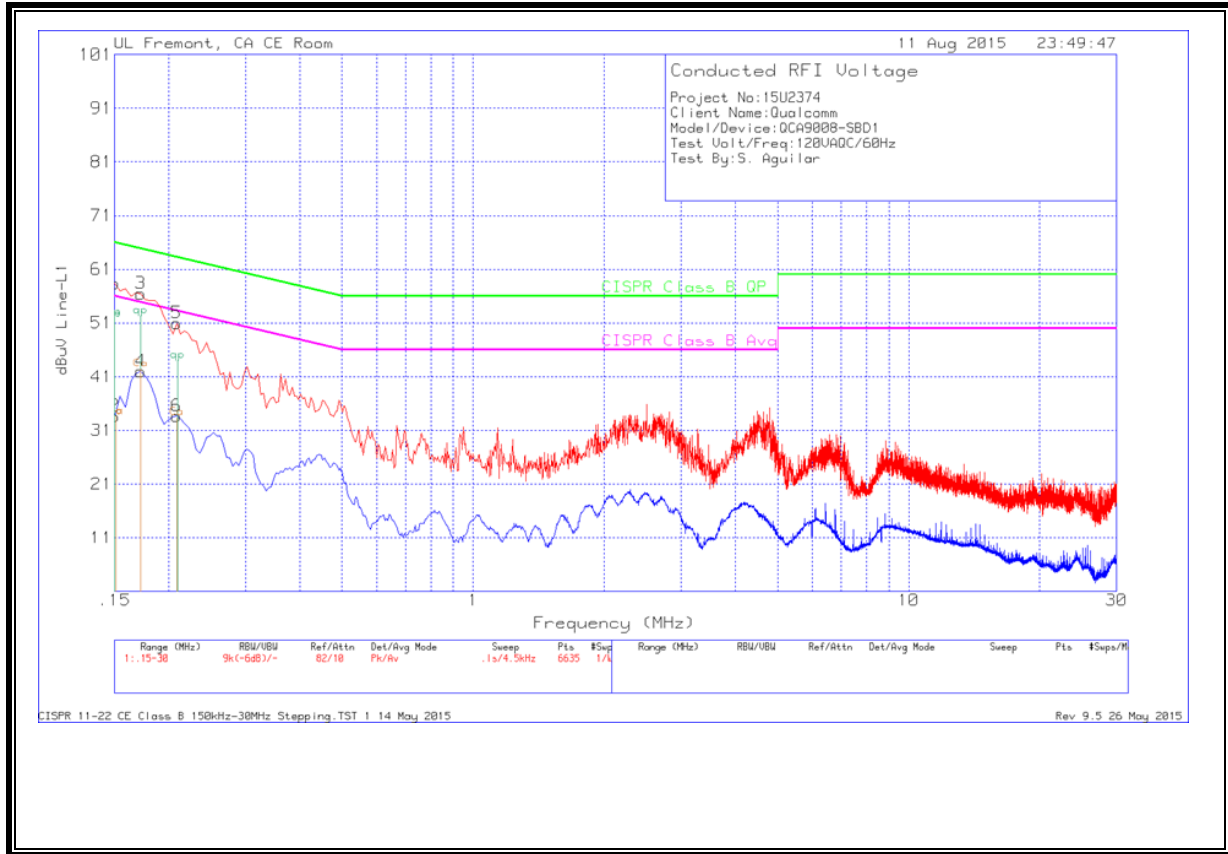
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR Class B QP	Margin (dB)	CISPR Class B Avg	Margin (dB)
1	.15	50.59	Qp	1.4	0	51.99	66	-14.01	-	-
2	.15	32.23	Ca	1.4	0	33.63	-	-	56	-22.37
3	.17228	51.24	Qp	1.1	0	52.34	64.85	-12.51	-	-
4	.17228	41.27	Ca	1.1	0	42.37	-	-	54.85	-12.48
5	.20963	43.09	Qp	.9	0	43.99	63.22	-19.23	-	-
6	.20963	32.45	Ca	.9	0	33.35	-	-	53.22	-19.87

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR Class B QP	Margin (dB)	CISPR Class B Avg	Margin (dB)
7	.17228	51.23	Qp	1.2	0	52.43	64.85	-12.42	-	-
8	.17228	40.66	Ca	1.2	0	41.86	-	-	54.85	-12.99
9	.18713	49.04	Qp	1.1	0	50.14	64.16	-14.02	-	-
10	.18713	35.47	Ca	1.1	0	36.57	-	-	54.16	-17.59
11	.21368	43.99	Qp	.9	0	44.89	63.06	-18.17	-	-
12	.21368	32.78	Ca	.9	0	33.68	-	-	53.06	-19.38

Qp - Quasi-Peak detector, Ca - CISPR average detection

LINE 1 RESULTS



LINE 2 RESULTS

