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

TEST REPORT

FOR

2400 – 2483.5 MHZ TRANSCEIVER

MODEL NUMBER: A20737A, A20737C*

FCC ID: X7J-A14070701
IC: 8975A-A14070701

REPORT NUMBER: 14M18350-E4

ISSUE DATE: SEPTEMBER 08, 2014

Prepared for
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*Model differences are explained in the body of this report

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	09/08/14	Initial Issue	F. Ibrahim

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ANAREN, INC.
6635 KIRKVILLE ROAD
EAST SYRACUSE, NEW YORK 13057-9600, U.S.A.

EUT DESCRIPTION: 2400 – 2483.5 MHZ TRANSCEIVER

MODEL: A20737A with PCB antenna and A20737C with Monopole antenna (for radiated testing)
A20737A with PCB antenna (for power line conducted emissions testing)

SERIAL NUMBER: S/N 14 and S/N 15 (for radiated testing)
S/N 14 (for power line conducted emissions testing)

DATE TESTED: SEPTEMBER 02-03, 2014

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART B	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.

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UL Verification Services Inc.

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GLENN ESCANO
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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
☒ 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.

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:

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
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

The EUT is a 2.4 GHz BLE module.

The transceiver is manufactured by Anaren, Inc.

GENERAL INFORMATION

Power Requirements	RF: +1.2 VDC Digital: +2.7 VDC
List of frequencies generated or used by the EUT	24 MHz

5.2. MANUFACTURER'S DESCRIPTION OF MODEL DIFFERENCES

The two models are identical except that model A20737A has an integral printed antenna while model A20737C has a U.FL connector.

For radiated emissions testing, both models (A20737A and A20737C) were tested.

For power line conducted emissions, A20737A was selected as representative model of the two models.

5.3. TEST CONFIGURATIONS

EUT Configuration	Description
Minimum Configuration (A20737A with PCB antenna)	EUT was connected to a host laptop by USB cable. Laptop was connected to two devices using two different types of I/O interface.
Minimum Configuration (A20737C with Monopole antenna)	EUT was connected to a host laptop by USB cable. Laptop was connected to two devices using two different types of I/O interface.

5.4. WORST CASE MODE OF OPERATION

Mode	Description
Radio powered ON	Radio powered ON and transmitting.

5.5. SOFTWARE AND FIRMWARE

The software installed in the EUT during testing was A20737x_cert_test.exe, Ver. 1.0.0.0.

The EUT driver software installed during testing was FTDI 2232H D2XX Ver 2.10.0.0

5.6. MODIFICATIONS

No modifications were made to the EUT during testing.

5.7. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

Description	Manufacturer	Model	S/N	FCC ID
Laptop	Lenovo	T430	PB05HPL	DOC
AC Adapter	Lenovo	42T4418	42T4419	DOC
Switch	Netgear	Switch FS105 v2	1D52163304A74	DOC
AC/DC Adapter	Netgear	FA-0751000SUA	332-10154-01	DOC
Mouse	Lenovo	M-U0025-O	Not Available	DOC
Test Board	Anaren	WES-12288	N/A	N/A

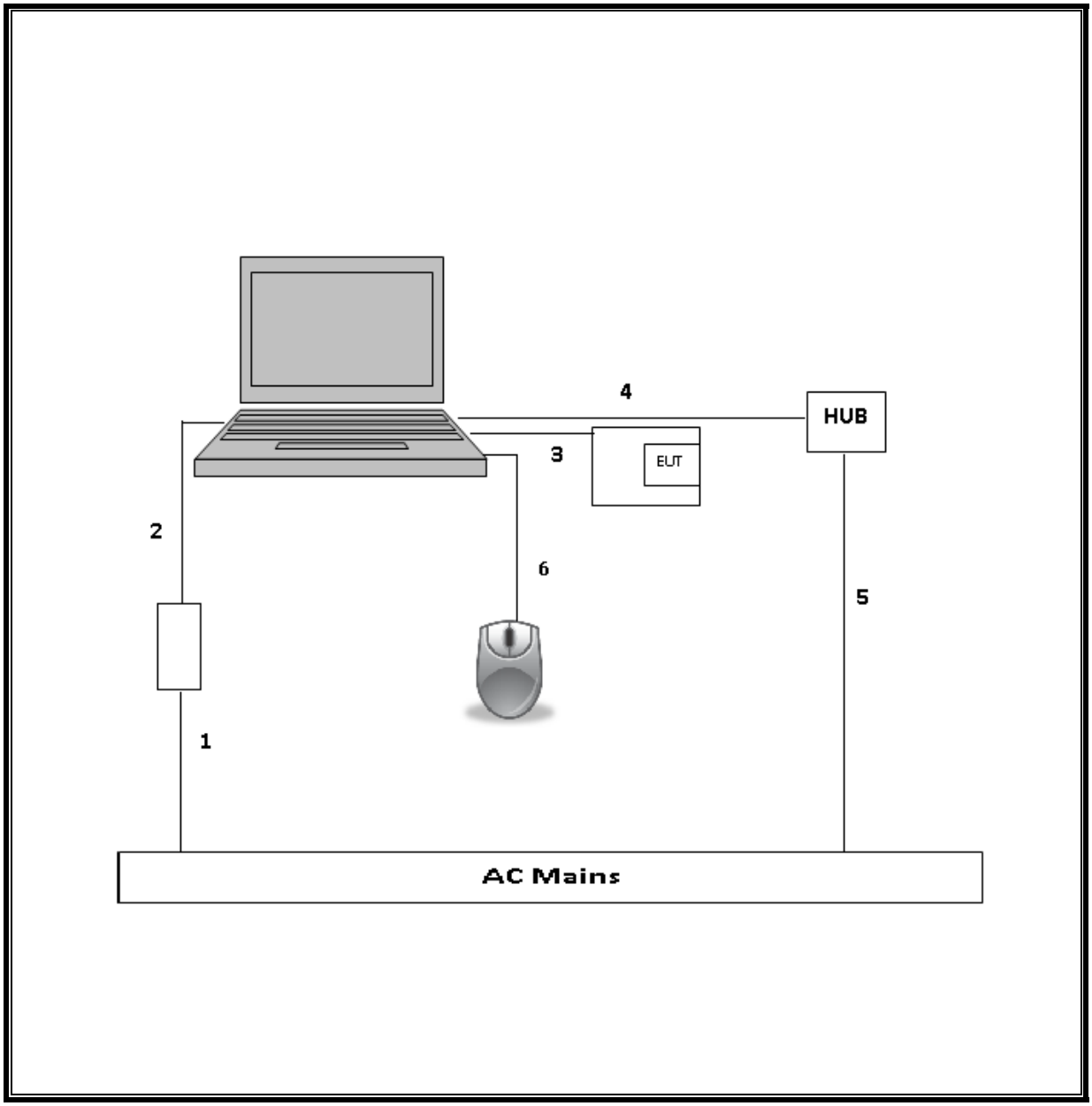
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	No. of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	US 115V	Un-Shielded	1.0m	NA
2	DC	1	DC	Un-Shielded	0.8m	NA
3	USB	1	USB	Un-Shielded	1.0m	Laptop to EUT
4	Internet	1	RJ-45	Un-Shielded	<1.0m	Laptop to HUB
5	AC/DC	1	US 115V	Un-Shielded	1.0m	HUB AC/DC Adapter
6	USB	1	USB	Un-Shielded	1.0m	Mouse

TEST SETUP

The EUT is connected with a host laptop computer by USB cable during the tests. Test software exercised the radio module.

TEST 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**	**S/N**	**Cal Due**
Spectrum Analyzer, PXA	Agilent	N9030A	F00491	05/19/15
Spectrum Analyzer, PXA	Agilent	N9030A	MY5230675	03/11/15
Amplifier, 10kHz to 1GHz, 32dB	Sonoma	310N	171202	10/25/14
Amplifier, 10kHz to 1GHz, 32dB	Sonoma	310N	323562	04/23/15
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A042613	05/29/15
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A022813-2	05/05/15
EMI Test Receiver	Rohde & Schwarz	ESCI7	100773	08/14/15
LISN	FCC	50/250-25-2	114	01/17/15

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4

The highest clock frequency generated or used in the EUT is 24 MHz; therefore the frequency range was investigated from 30 MHz to 1000 MHz.

LIMIT

FCC Part 15 Subpart 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:

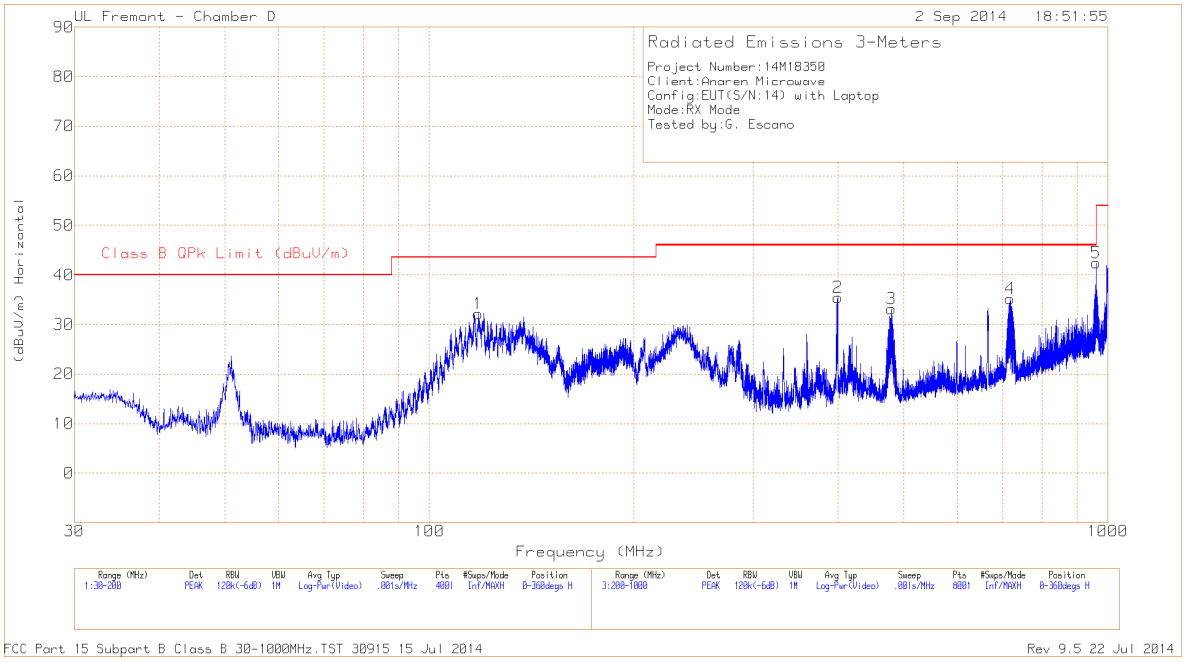
Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dBµV/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

The following table is used to determine the upper test frequency:

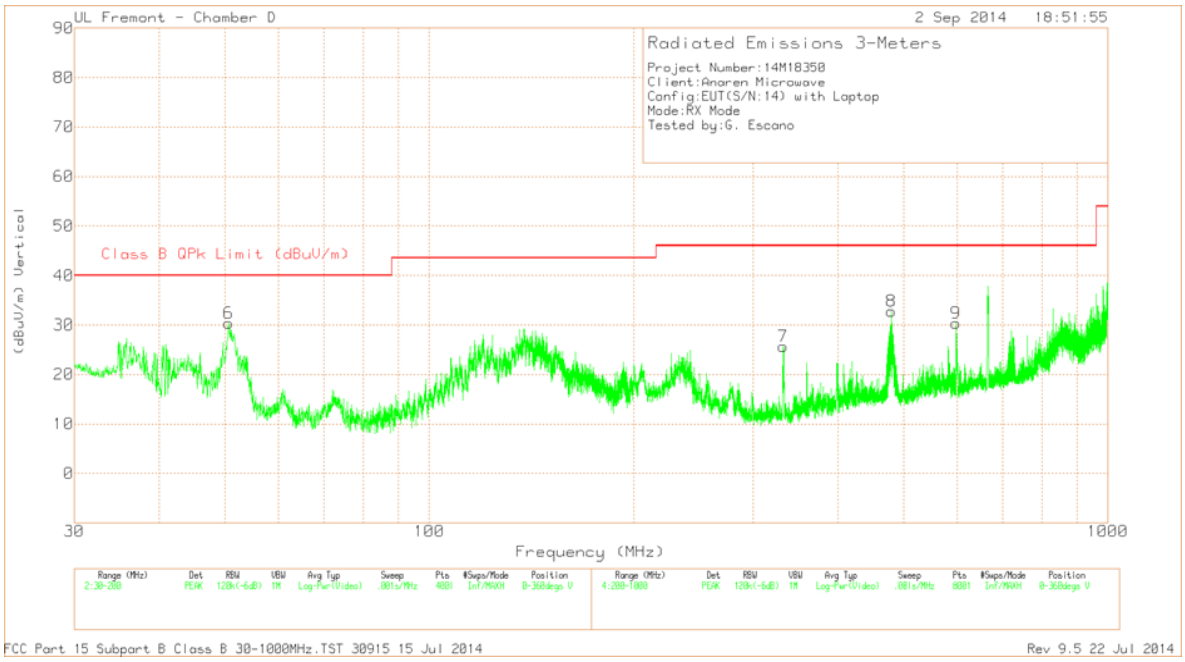
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5^{th} harmonic of the highest frequency or 40,000 MHz, whichever is lower

7.1.1. RESULTS FOR A20737A (MODULE WITH PCB ANTENNA)

HORIZONTAL PLOT



VERTICAL PLOT



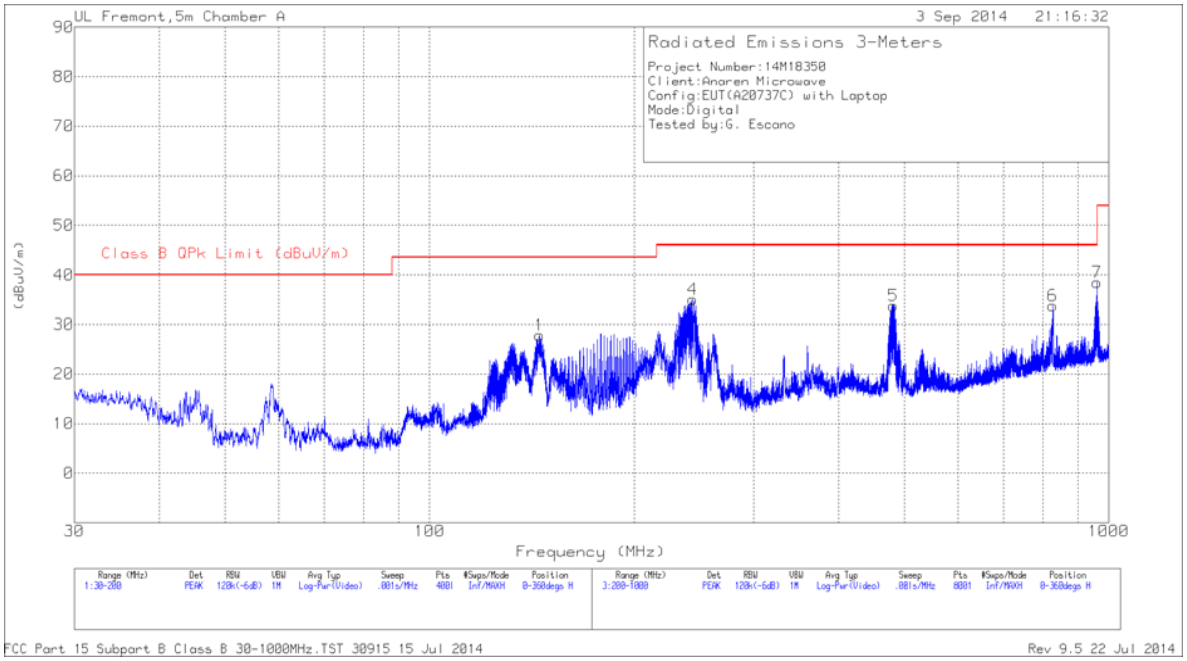
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	50.6332	48.02	QP	7.7	-31.6	24.12	40	-15.88	39	103	V
1	118.1698	41.66	QP	13.7	-30.9	24.46	43.52	-19.06	165	320	H
7	332.4368	31.27	QP	13.9	-30.2	14.97	46.02	-31.05	360	348	V
2	399.9227	28.6	QP	15.6	-29.8	14.4	46.02	-31.62	335	287	H
3	479.6128	40.73	QP	17.7	-29.8	28.63	46.02	-17.39	18	100	H
8	480.0082	47.33	QP	17.7	-29.8	35.23	46.02	-10.79	90	127	V
9	597.7578	24.62	QP	18.3	-29.5	13.42	46.02	-32.6	286	260	V
4	716.8439	35.48	QP	20.4	-29.3	26.58	46.02	-19.44	151	102	H
5	960.016	45.13	QP	23	-27.8	40.33	53.97	-13.64	106	111	H

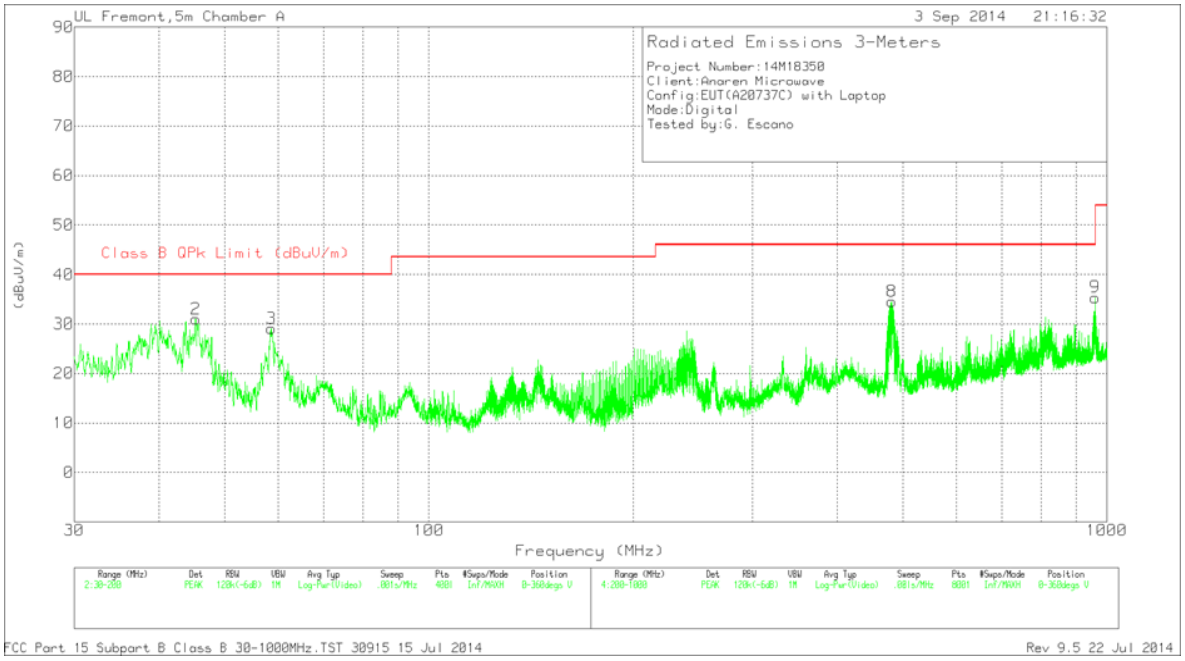
QP - Quasi-Peak detector

7.1.2. RESULTS FOR A20737C (CONNECTORIZED MODULE WITH MONOPOLE ANTENNA)

HORIZONTAL PLOT



VERTICAL PLOT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	45.264	49.85	QP	10.1	-30.8	29.15	40	-10.85	131	102	V
3	58.4964	47.31	QP	7.4	-30.4	24.31	40	-15.69	7	111	V
1	145.2845	42.35	QP	12.7	-30.2	24.85	43.52	-18.67	269	182	H
4	243.5868	42.12	QP	11.6	-29.6	24.12	46.02	-21.9	267	119	H
8	481.3348	29.67	QP	17.7	-28.5	18.87	46.02	-27.15	269	107	V
5	481.8892	38.33	QP	17.7	-28.6	27.43	46.02	-18.59	131	234	H
6	826.6143	24.14	QP	21.7	-27.7	18.14	46.02	-27.88	61	123	H
7	960.0159	39.06	QP	22.9	-26.7	35.26	53.97	-18.71	119	104	H
9	960.021	38.64	QP	22.9	-26.7	34.84	53.97	-19.13	267	141	V

QP - Quasi-Peak detector

7.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dBμV)	
	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

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin to Limit (dB)	CFR 47 Part 15 Class B Avg	Margin to Limit (dB)
1	.15	51.55	PK	1.4	0	52.95	66	-13.05	--	--
2	.15	30.26	Av	1.4	0	31.66	--	--	56	-24.34
3	.483	33.96	PK	.4	0	34.36	56.3	-21.94	--	--
4	.483	23.85	Av	.4	0	24.25	--	--	46.3	-22.05
13	1.2165	21.81	PK	.2	.1	22.11	56	-33.89	--	--
14	1.2165	14.36	Av	.2	.1	14.66	--	--	46	-31.34
5	4.578	27.86	PK	.2	.1	28.16	56	-27.84	--	--
6	4.578	9.39	Av	.2	.1	9.69	--	--	46	-36.31

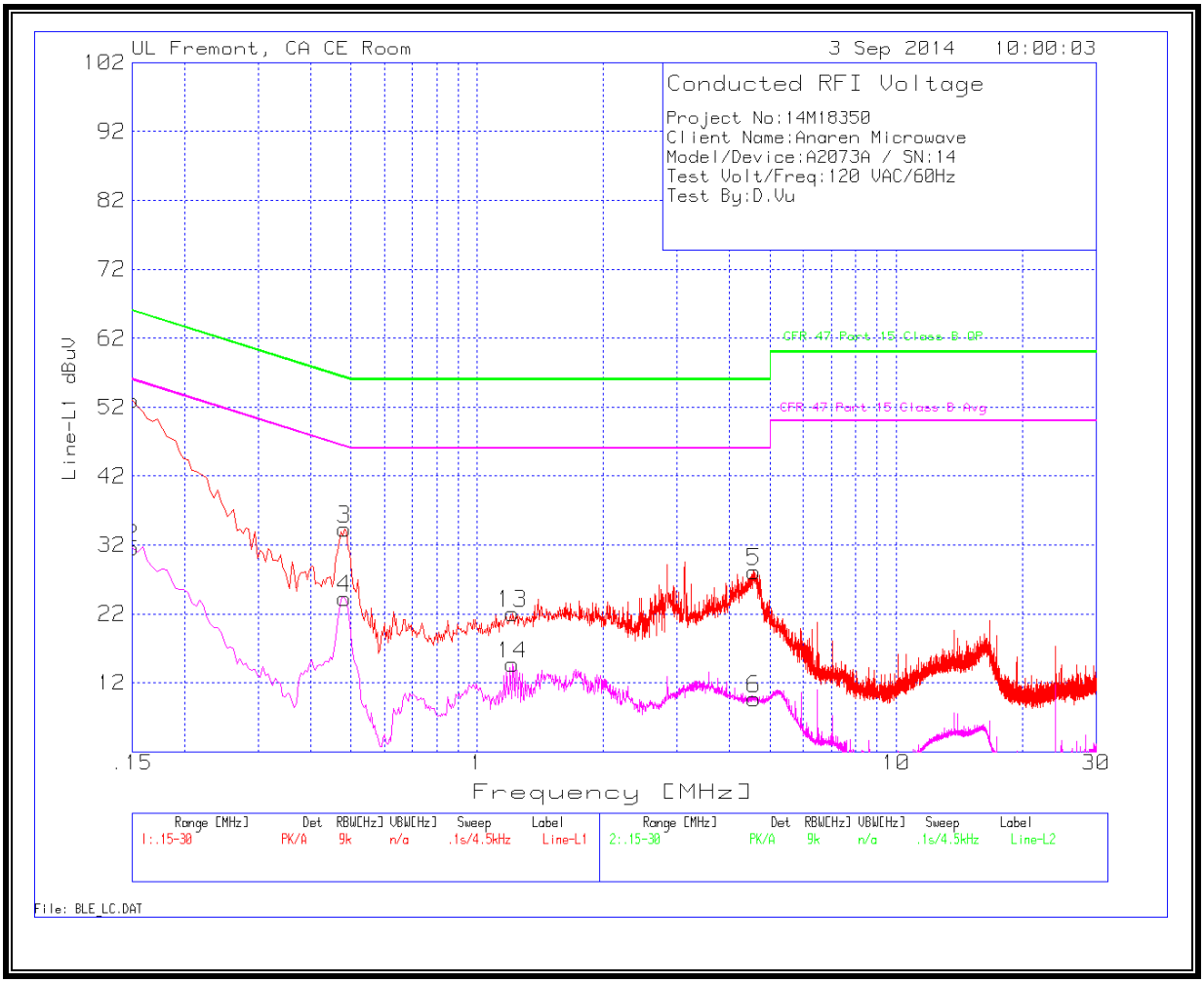
Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin to Limit (dB)	CFR 47 Part 15 Class B Avg	Margin to Limit (dB)
7	.15	52.97	PK	1.5	0	54.47	66	-11.53	--	--
8	.15	33.4	Av	1.5	0	34.9	--	--	56	-21.1
9	.483	33.61	PK	.4	0	34.01	56.3	-22.29	--	--
10	.483	22.81	Av	.4	0	23.21	--	--	46.3	-23.09
11	4.587	26.79	PK	.2	.1	27.09	56	-28.91	--	--
12	4.587	9.31	Av	.2	.1	9.61	--	--	46	-36.39

PK - Peak detector
Av - Average detector

LINE 1 RESULTS



LINE 2 RESULTS