



FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

COMPACT SURVEILLANCE RADAR

MODEL NUMBER: C40

**FCC ID: CO6-C40-UNL
IC: 11390AC-40UNL**

REPORT NUMBER: 13U15473-1, REVISION C

ISSUE DATE: OCTOBER 25, 2013

Prepared for
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709 E. TECHNOLOGY AVE. BLDG E 3100
OREM, UTAH 84097, U.S.A.

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	09/23/13	Initial Issue	T. Chan
A	10/09/13	Addressed TCB's Questions	M. Mekuria
B	10/21/13	Addressed TCB's Questions	M. Mekuria
C	10/25/13	Updated To The Restricted Bands Limits on Page 26	T. Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SPOTERRF LLC
709 E. TECHNOLOGY AVE. BLDG E 3100
OREM, UTAH 84097, U.S.A.

EUT DESCRIPTION: COMPACT SURVEILLANCE RADAR

MODEL: C40

SERIAL NUMBER: C40-00013 (CONDUCTED) & SP10015 (RADIATED)

DATE TESTED: AUGUST 30 - SEPTEMBER 20, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	PASS
INDUSTRY CANADA RSS-210 ISSUE 8, ANNEX 7	PASS
INDUSTRY CANADA RSS-GEN ISSUE 3	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.

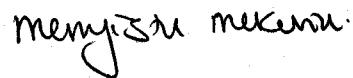
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. 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:



Thu Chan
WiSE Operations Manager
UL Verification Services Inc.

Tested By:



Mengistu Mekuria
WiSE Senior Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

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

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ul.com>.

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is 10 GHz medium range Compact Surveillance Radar (CSR). The unit operates only at one channel with the frequency range of (10.502 GHz to 10.548 GHz).

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes patch antenna with a maximum gain of 14 dBi.

5.3. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Spotter RF C40 SP0003 v3.0.0-alpha.00502 (2012-10-16_12-19).

5.4. WORST-CASE CONFIGURATION AND MODE

The worst-case is determined as the channel with the highest output power.

The EUT operates at single channel in 50MHz bandwidth with frequency modulation on continuous wave format. However, the test utility software that is provided for the test purpose only, not part of end product, helps to determine the worst case. Therefore, two scenarios were investigated as follows:

Non-Sweeping or single frequency mode at which using a utility software to stop sweeping at low, mid, and high frequencies of the sweeping range to evaluate the fundamental field strength (worst case for fundamental was the center of the channel as shown under 9.2.1.a.).

Sweeping mode at which the continuous wave frequency sweeps inside the 50 MHz band while the fundamental field strength measured as shown under 9.2.1.b.

In both cases the peak power measurement values are the same and all the other tests have done on the worst-case that satisfies individual cases.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Power Over Ethernet Adapter	Phihng	POE31U-240	P104205531 A1	DoC

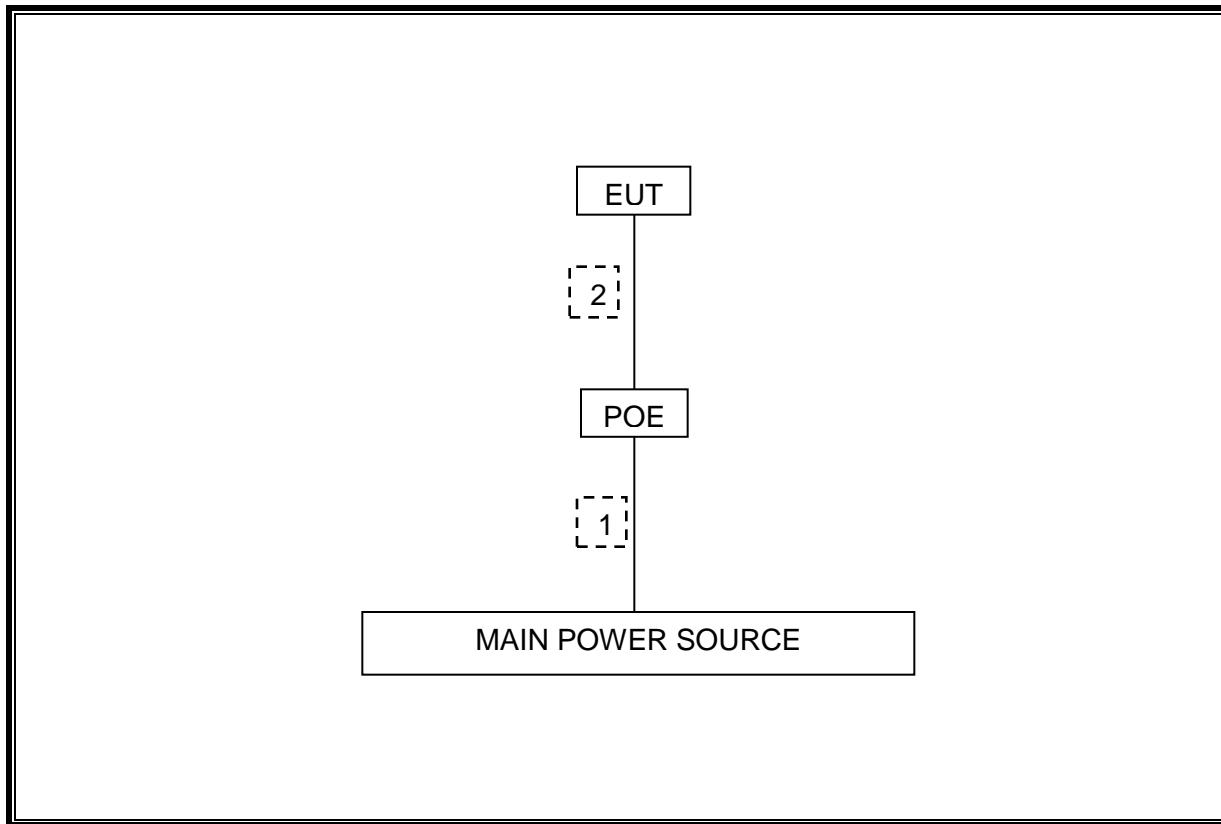
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC 2P	Unshielded	1.8m	None
2	LAN	1	CAT5	Unshielded	2m	None

TEST SETUP

The EUT is powered via the POE adapter. Test software exercised using the Laptop controlled through the Ethernet cables.

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	Asset	Cal Due
Universal Power Meter	Giga-tronics	8651A	C0091	06/05/14
Power Sensor, 18 GHz	Giga-tronics	80701A	C00992	06/05/14
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	11/01/13
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	09/18/14
Spectrum Analyzer, 44 GHz	Agilent	E4446A	C00986	04/01/14
Spectrum Analyzer, 40 GHz	Agilent	8564E	C00951	07/29/14
Spectrum Analyzer, 44 GHz	Agilent	E4446A	C00996	05/22/14
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01016	08/22/14
Antenna, Horn, 18 GHz	ETS Lindgren	3117	C01022	02/21/14
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/13
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	06/28/14
Harmonic Mixer, 50 GHz	Agilent	11970Q	C00769	10/21/13
Harmonic Mixer, 75 GHz	Agilent	11970V	C00768	01/31/14
Preamplifier, 1300 MHz	Agilent	8447D	C00885	01/16/14
PreAmplifier, 1-26.5GHz	Agilent	8449B	F00167	03/23/14
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/20/14

7. DUTY CYCLE

LIMITS

None; for reporting purposes only.

RESULTS

Tx on (usec)	Tx on + Tx off (usec)	Duty Cycle (%)	Correction Factor (dB)
100	100	100.00	0.00

8. OCCUPIED BANDWIDTH

8.1. 26dB BANDWIDTH

LIMITS

None; for reporting purposes only.

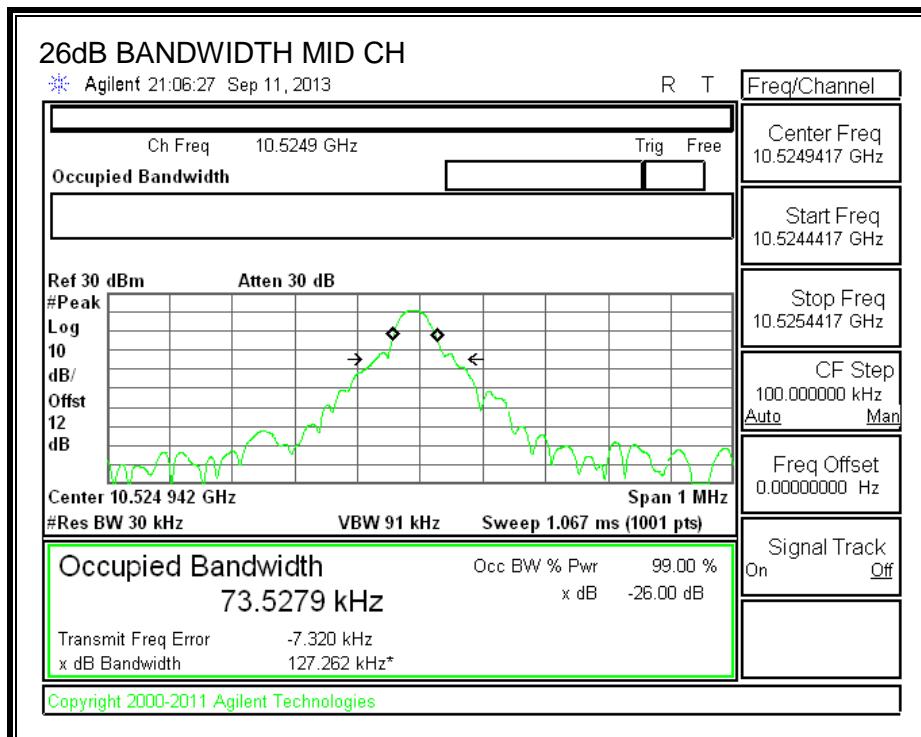
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 26 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

26dB BANDWIDTH NONE-SWEEPING MODE

Channel	Frequency (GHz)	26dB Bandwidth (KHz)
Middle	10.525	127.262



8.2. 99% BANDWIDTH

LIMITS

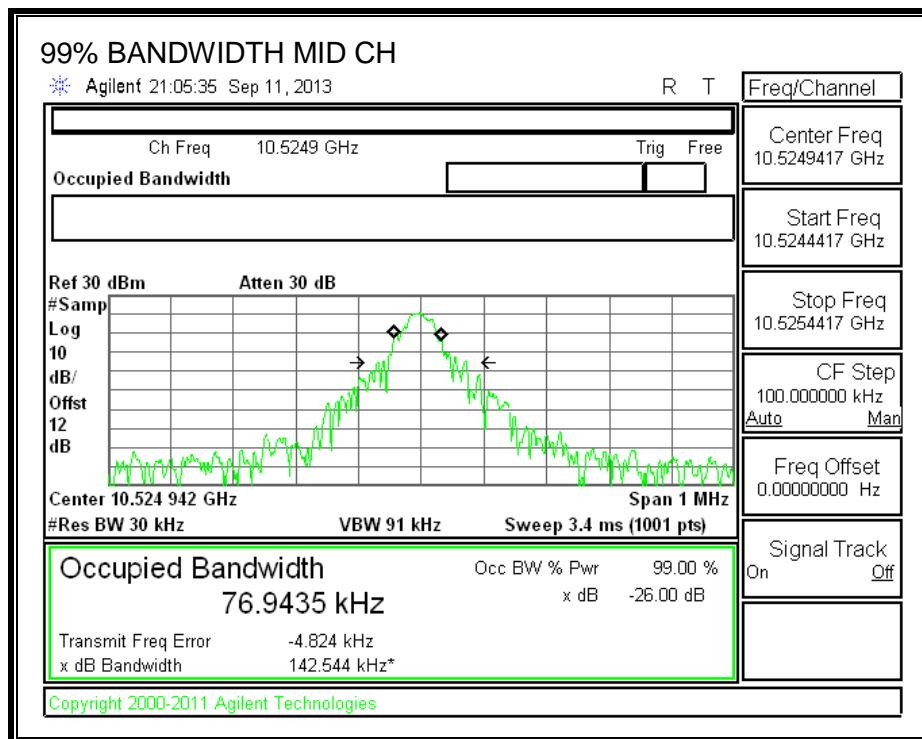
None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 99% bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

Channel	Frequency (GHz)	99% Bandwidth (KHz)
Middle	10.525	76.9435



9. RADIATED EMISSION TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMIT

§15.245 and §15.209
IC RSS-210, Section 2.6 (Transmitter), Annex 7
IC RSS-GEN, Section 6 (Receiver)

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Limits for radiated disturbance of an intentional radiator		
Fundamental Frequency (MHz)	Field Strength of fundamental (millivolts / meter)	Field Strength of harmonic (millivolts / meter)
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25
24075-24175	2500	25

TEST PROCEDURE

ANSI C63.4

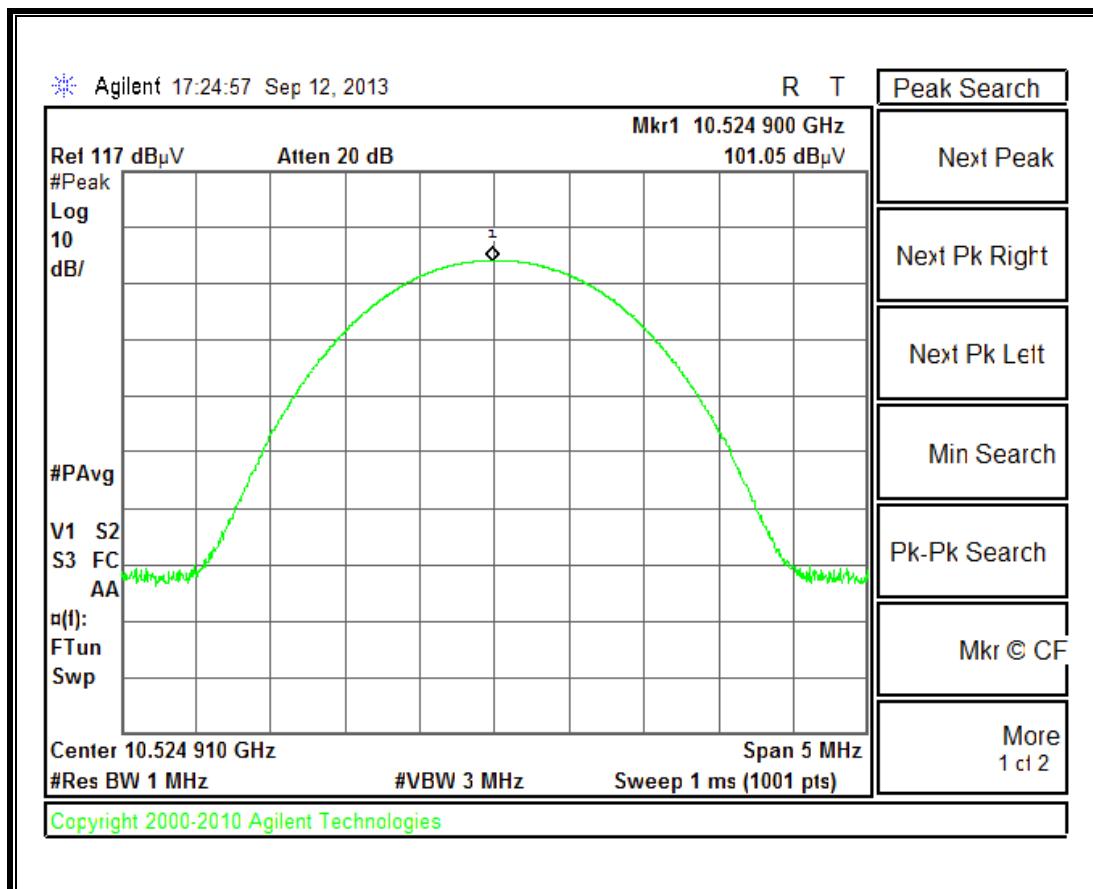
The EUT is an intentional radiator that does not incorporate a digital device, the highest fundamental frequency generated or used in the device is 10.525 GHz; therefore, the frequency range was investigated from 30 MHz to the 5th harmonic of the highest fundamental frequency (10.525 GHz).

RESULTS

9.2. TX SPURIOUS RADIATED EMISSIONS ABOVE 1 GHz

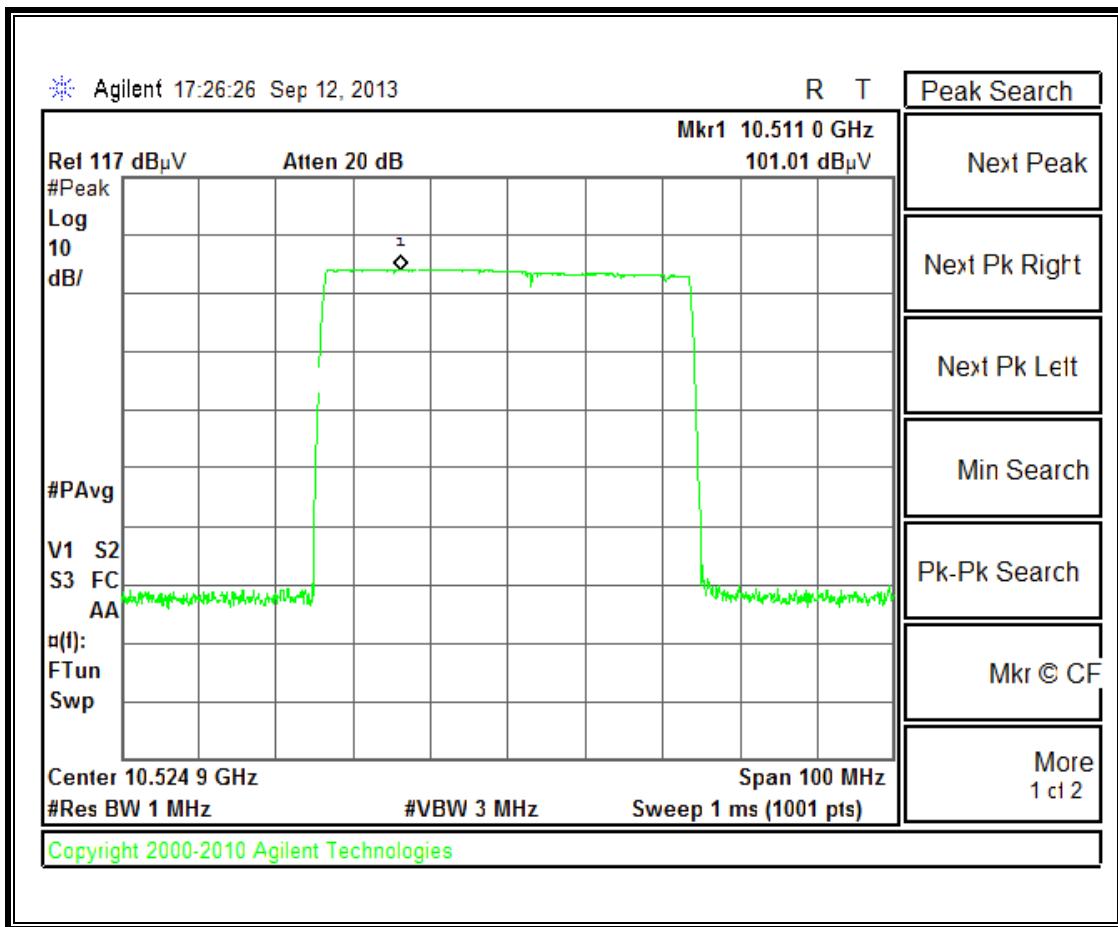
9.2.1. RADIATED FUNDAMENTAL EMISSIONS

a. NON-SWEEPING MODE WORSE CASE POLARIZATION:



f GHz	Dist (m)	Read Pk dB μ V	AF dB/m	Amp + Cbl dB	Peak dB μ V/m	Pk Lim dB μ V/m	Avg Lim dB μ V/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
10.525	3.00	101.05	37.5	-22.0	116.55	147.96	127.96	-31.41	-11.41	V

b. **SWEEEPING MODE WORSE CASE POLARIZATION:**

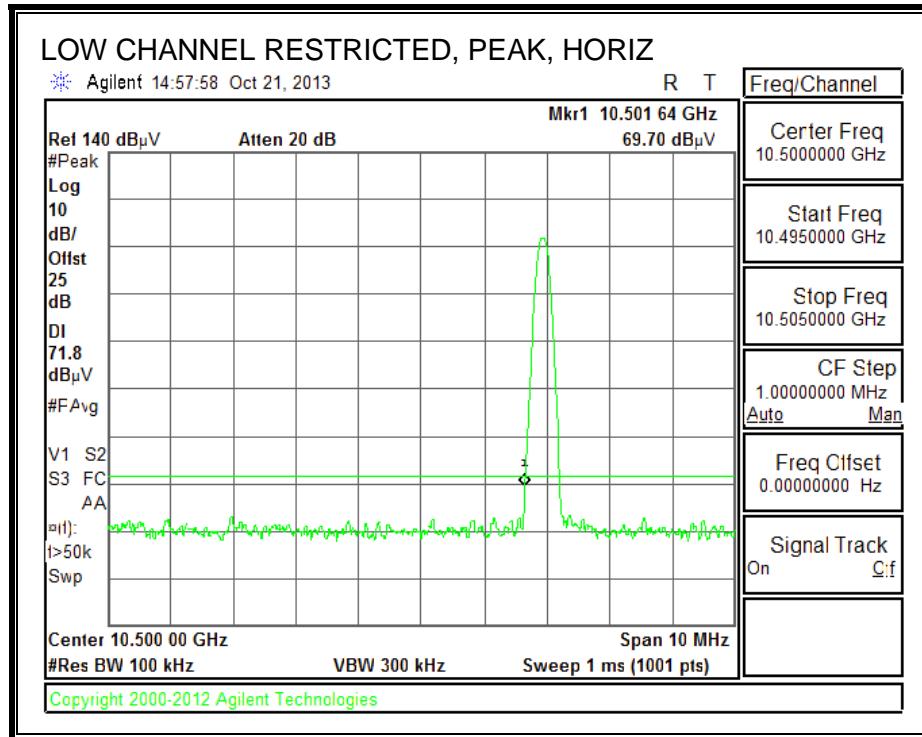


f GHz	Dist (m)	Read Pk dBµV	AF dB/m	Amp + Cbl dB	Peak dBµV/m	Pk Lim dBµV/m	Avg Lim dBµV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
10.511	3.00	101.01	37.5	-22.0	116.51	147.96	127.96	-31.45	-11.45	V

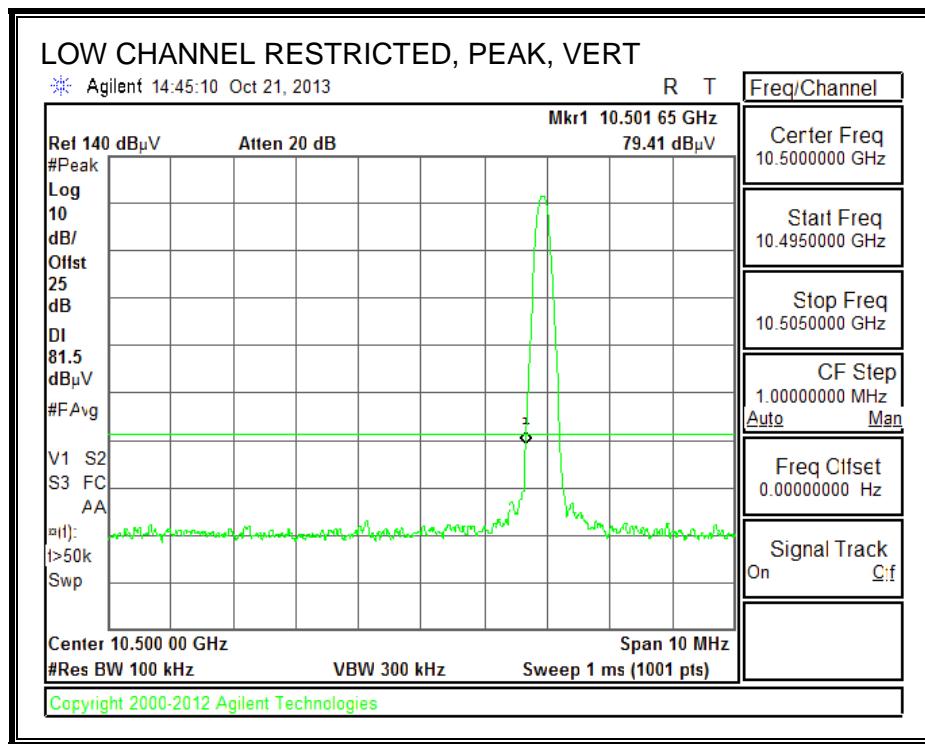
9.2.2. RADIATED RESTRICTED BANDEDGE

NON-SWEEPING MODE:

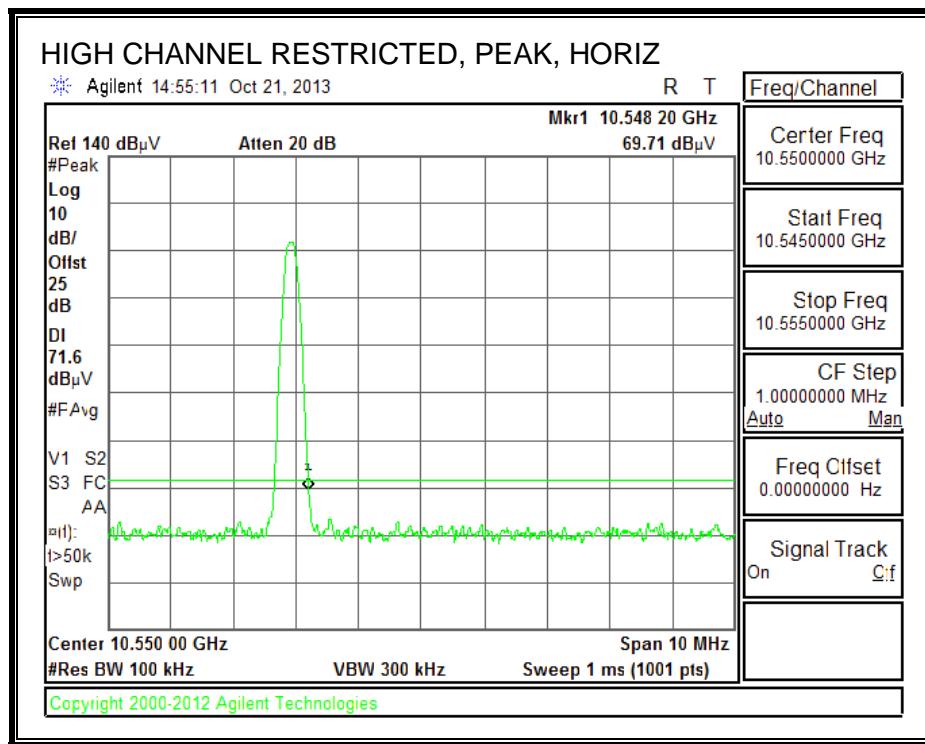
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



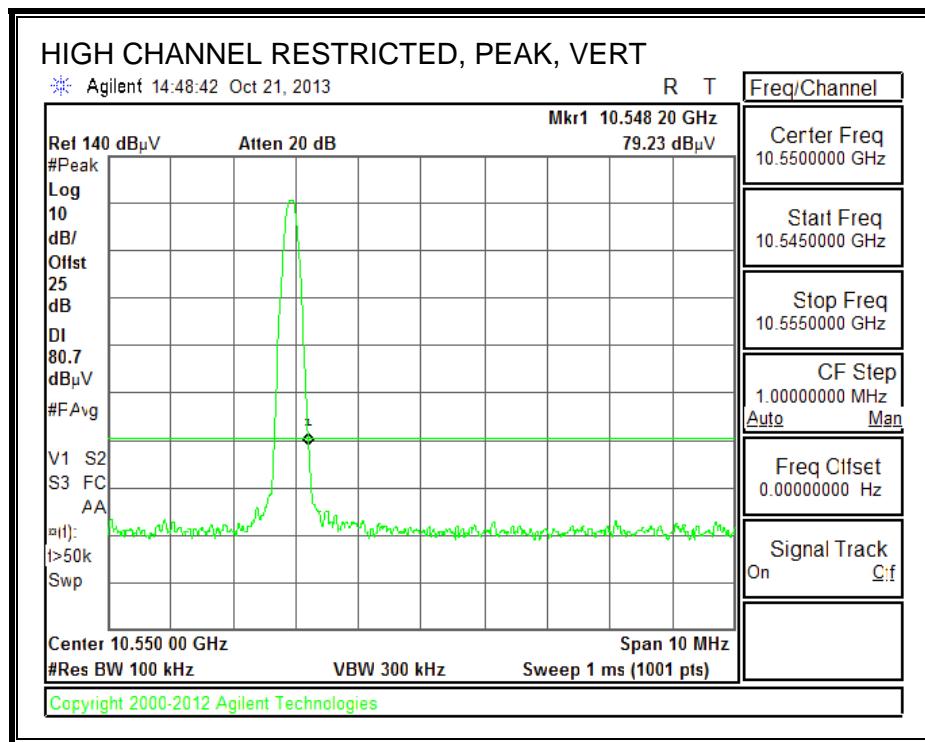
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

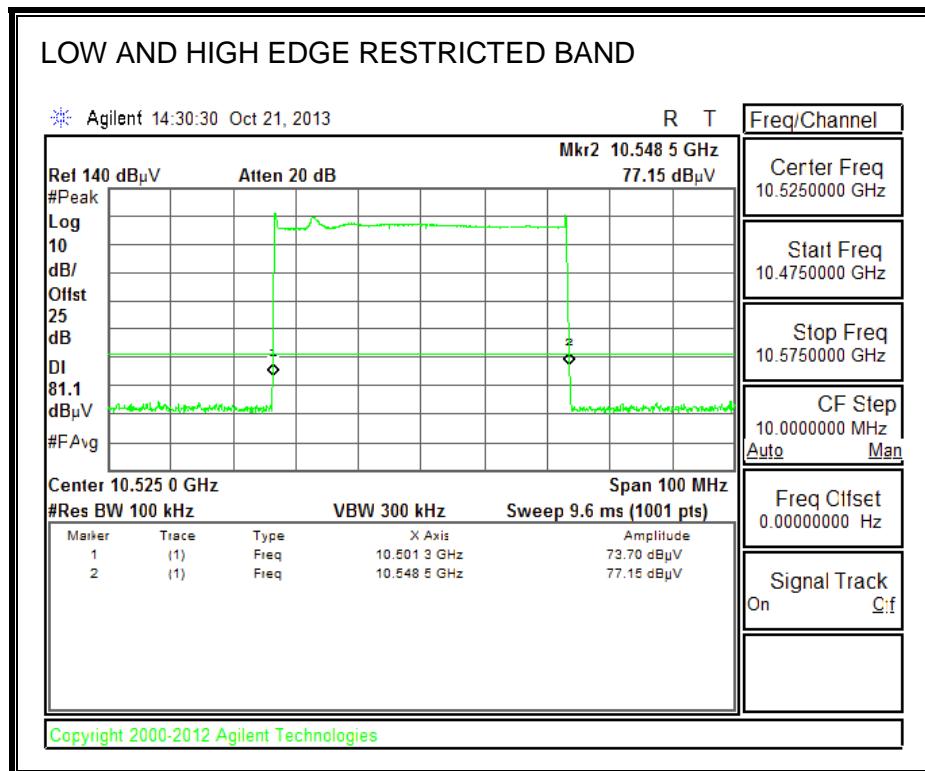


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

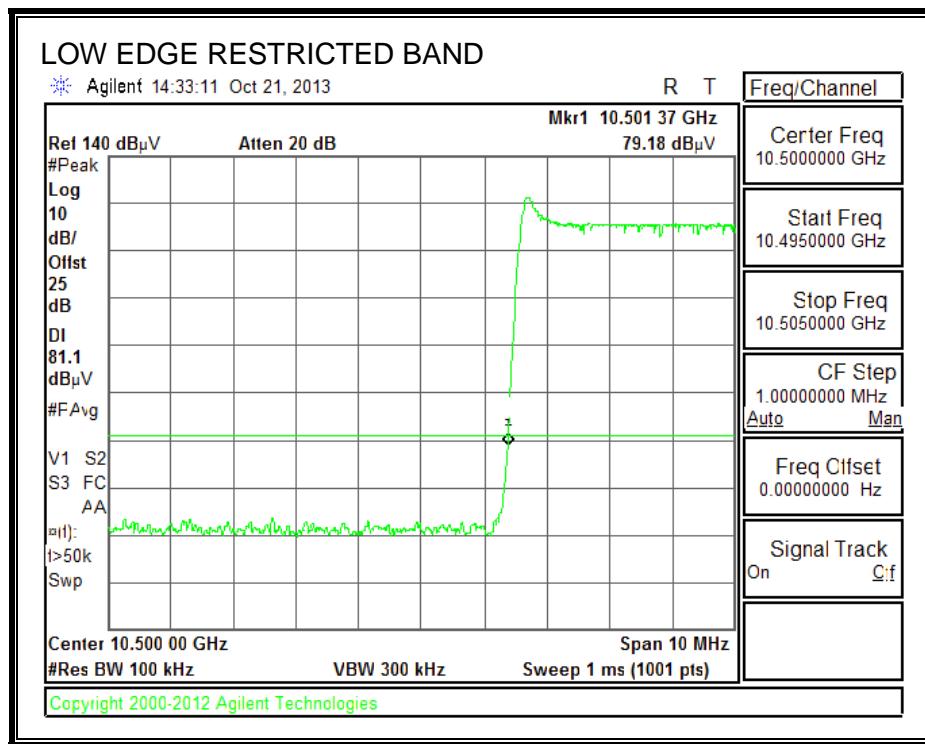


SWEEPING MODE:

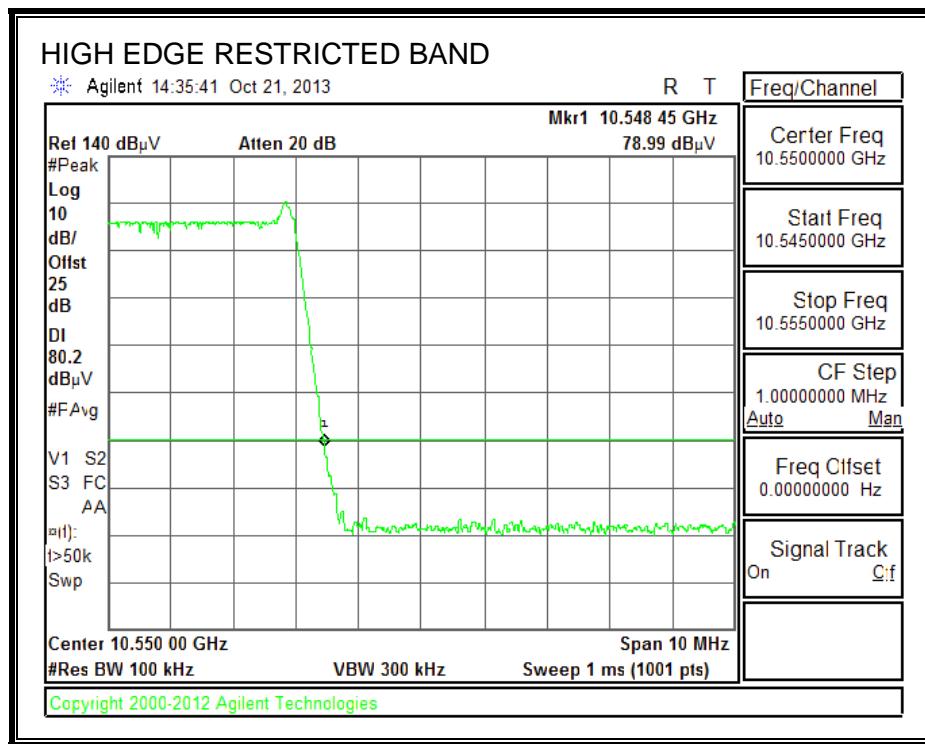
RESTRICTED BANDEDGE (LOW AND HIGH EDGE, WORST-CASE)



LOW RESTRICTED BANDEDGE

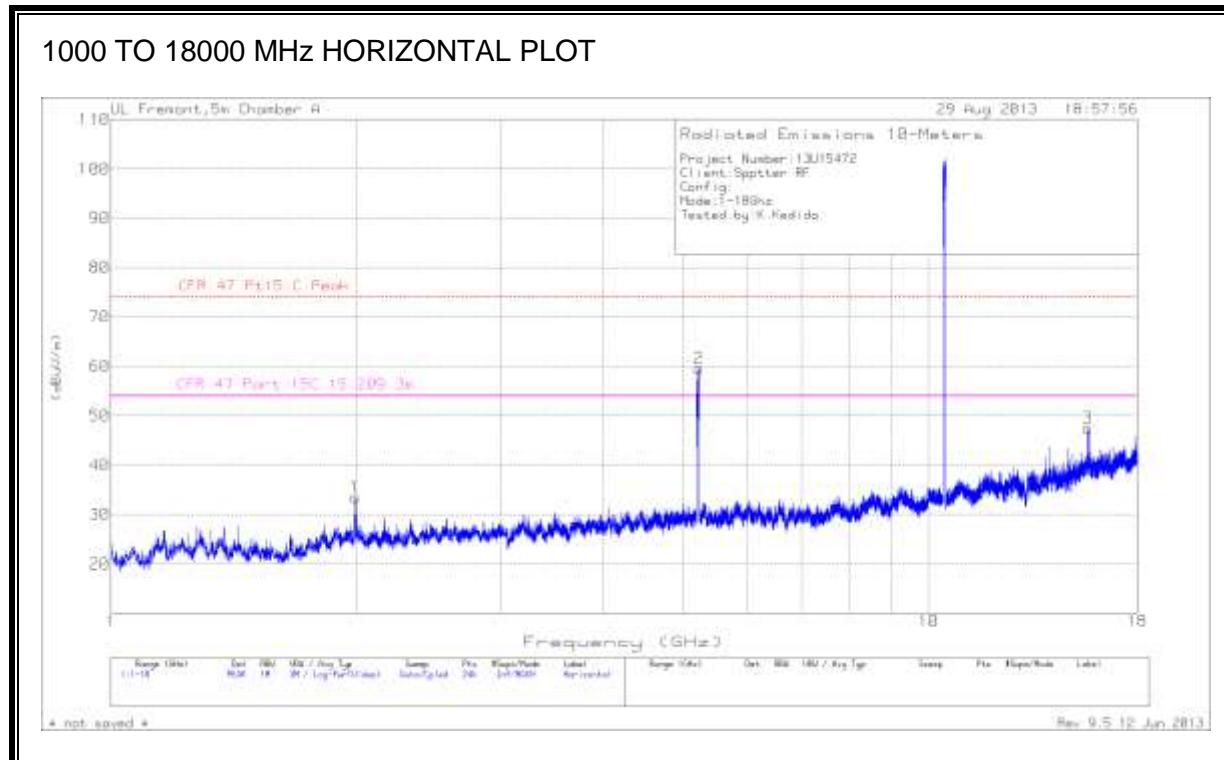


HIGH RESTRICTED BANDEDGE

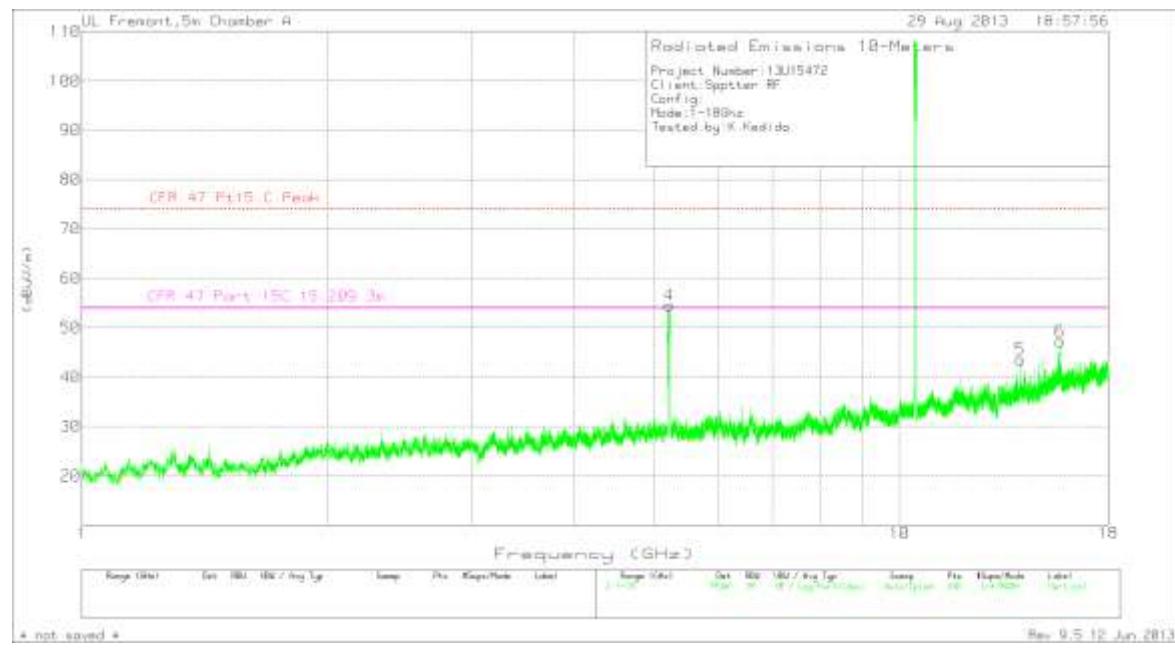


9.2.3. RADIATED SPURIOUS HARMONIC

NON-SWEEPING MODE WORSE CASE:



1000 TO 18000 MHz VERTICAL PLOT



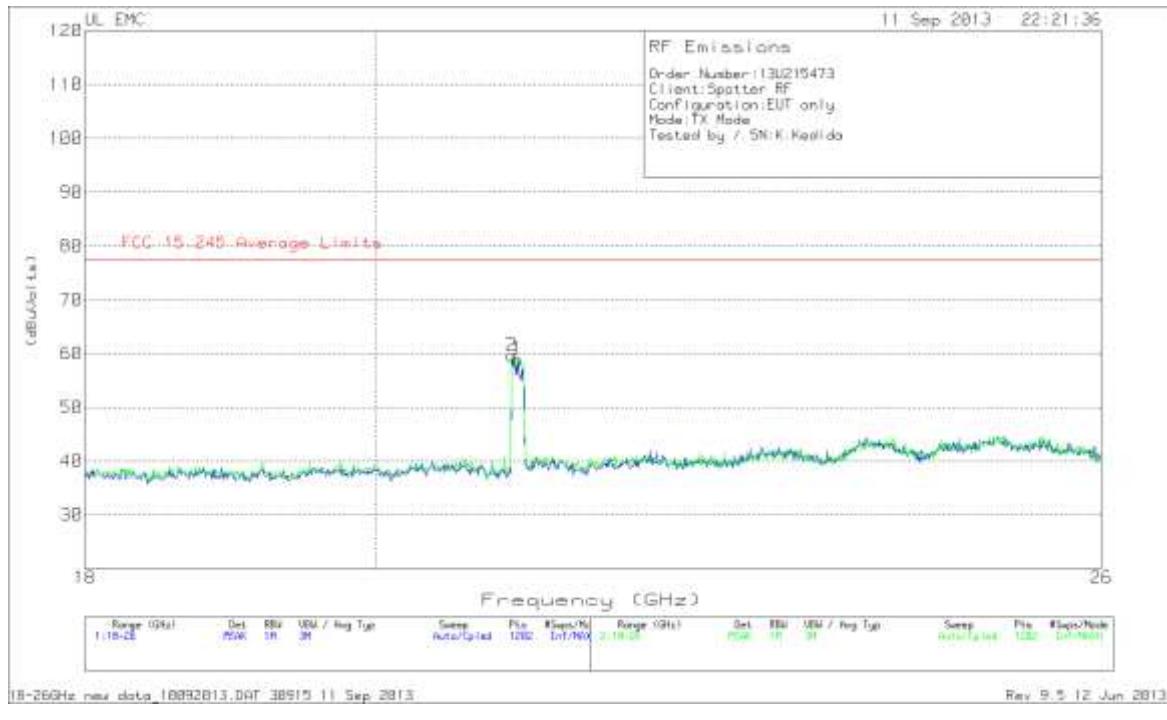
Note that the signal over the limit is the Fundamental frequency of the EUT.

1000 TO 18000 MHz HORIZONTAL &VERTICAL DATA

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Dist Cor (dB)	Corrected Reading (dBuV/m)	FCC 15.209 Peak Limit (dBuV/m)	Margin (dB)	FCC 15.209 Average Limit (dBuV/m)	Margin (dB)	FCC 15.245 Peak Limit (dBuV/m)	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.9895	45.59	PK	31.9	-33.5	-10.5	33.49	74	-40.51	54	-20.51			0-360	100	H
2*	5.2383	64.71	PK	34.2	-28.8	-10.5	59.61				66.6	-6.99	0-360	100	H	
3	15.657	38.68	PK	40.4	-21.1	-10.5	47.48	74	-26.52	54	-6.52			0-360	100	H
4*	5.2263	59.92	PK	34.2	-29.1	-10.5	54.52				66.6	-12.08	0-360	100	V	
5	14.0443	37.87	PK	39.1	-22.9	-10.5	43.57	74	-30.43	54	-10.43			0-360	100	V
6	15.7165	38.76	PK	40.4	-21.4	-10.5	47.26	74	-26.74	54	-6.74			0-360	100	V

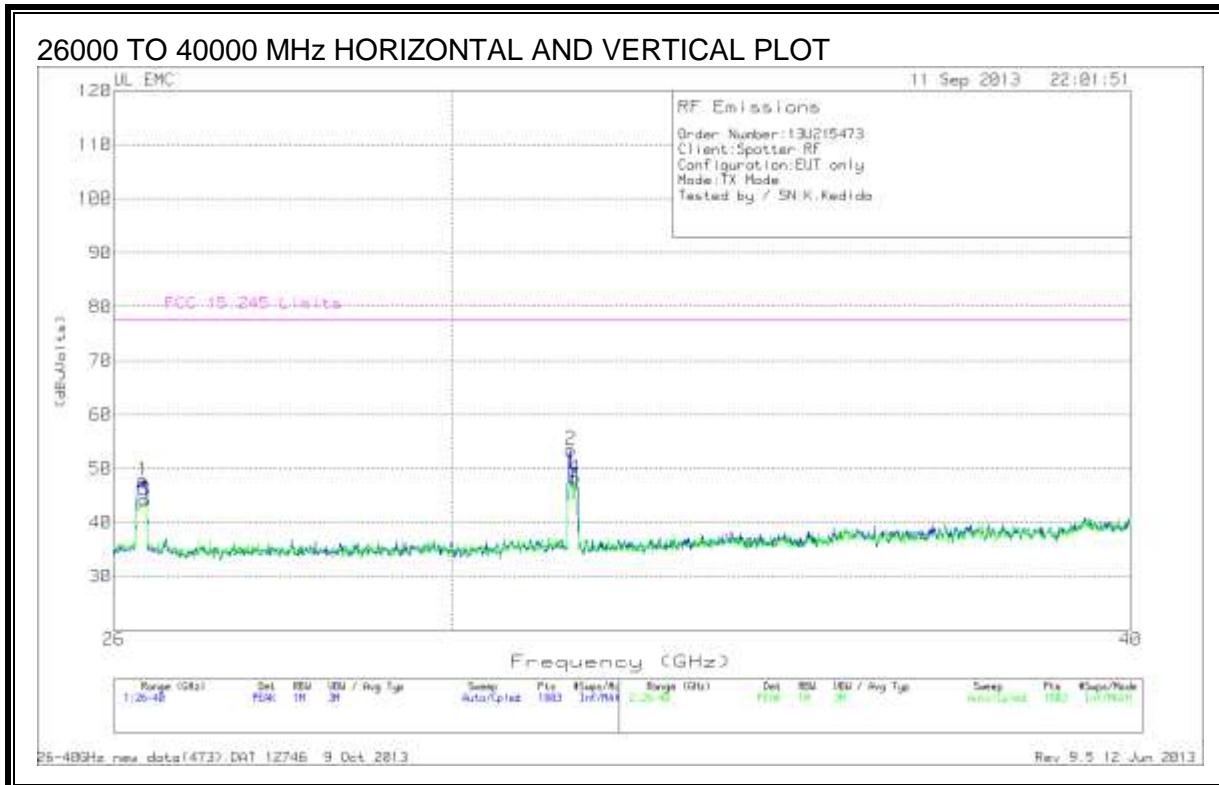
*Not in Restricted bands

18000 TO 26000 MHz HORIZONTAL AND VERTICAL PLOT



18000 TO 26000 MHz HORIZONTAL & VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	FCC 15.245 Average Limits	Margin (dB)
1	21.051	61.13	PK	32.6	-24.9	-10	58.83	77.5	-18.67
2	21.007	60.97	PK	32.4	-23.7	-10	59.67	77.5	-17.83



26000 TO 40000 MHz HORIZONTAL & VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBµV)	Det	T90 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBµVolts)	FCC 15.245 Limits	Margin (dB)
1	26.326	56.43	PK	35.6	-34.2	-10	47.83	77.50	-29.67
2	31.555	63.40	PK	36.3	-36.2	-10	53.50	77.50	-24.00
3	26.342	52.77	PK	35.6	-34.2	-10	44.17	77.50	-33.33
4	31.609	58.23	PK	36.3	-36.2	-10	48.33	77.50	-29.17

Note: Frequencies above 40GHz up to the 5th harmonics of the fundamental was tested using a Harmonic Mixer and no emissions were found.

9.3. TX SPURIOUS RADIATED EMISSIONS BELOW 1 GHZ

HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dB _{UV})	Det	AF T408 (dB/m)	Amp/Cbl (dB)	Corrected Reading dB _{UV} /m	Class B QPk Limit (dB _{UV} /m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	52.4825	56.59	PK	7.4	-27.7	36.29	40.00	-3.71	0-360	400	H
2	125.03	54.44	PK	13.8	-27.4	40.84	43.50	-2.66	0-360	200	H
3	471.8	47.65	PK	17.1	-26.4	38.35	46.00	-7.65	0-360	200	H
4	750	43.58	PK	20.8	-26.2	38.18	46.00	-7.82	0-360	300	H
5	200	55.18	PK	12.2	-27.2	40.18	43.50	-3.32	0-360	100	V
6	275	53.2	PK	13.3	-26.4	40.1	46.00	-5.90	0-360	199	V
7	280.2	52.65	PK	13.5	-26.3	39.85	46.00	-6.15	0-360	199	V
8	625	47.33	PK	19.3	-26.8	39.83	46.00	-6.17	0-360	199	V
9	689.1	48.88	PK	19.6	-27.3	41.18	46.00	-4.82	0-360	199	V

10. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207
IC RSS-GEN, Section 7.2.2

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.

TEST PROCEDURE

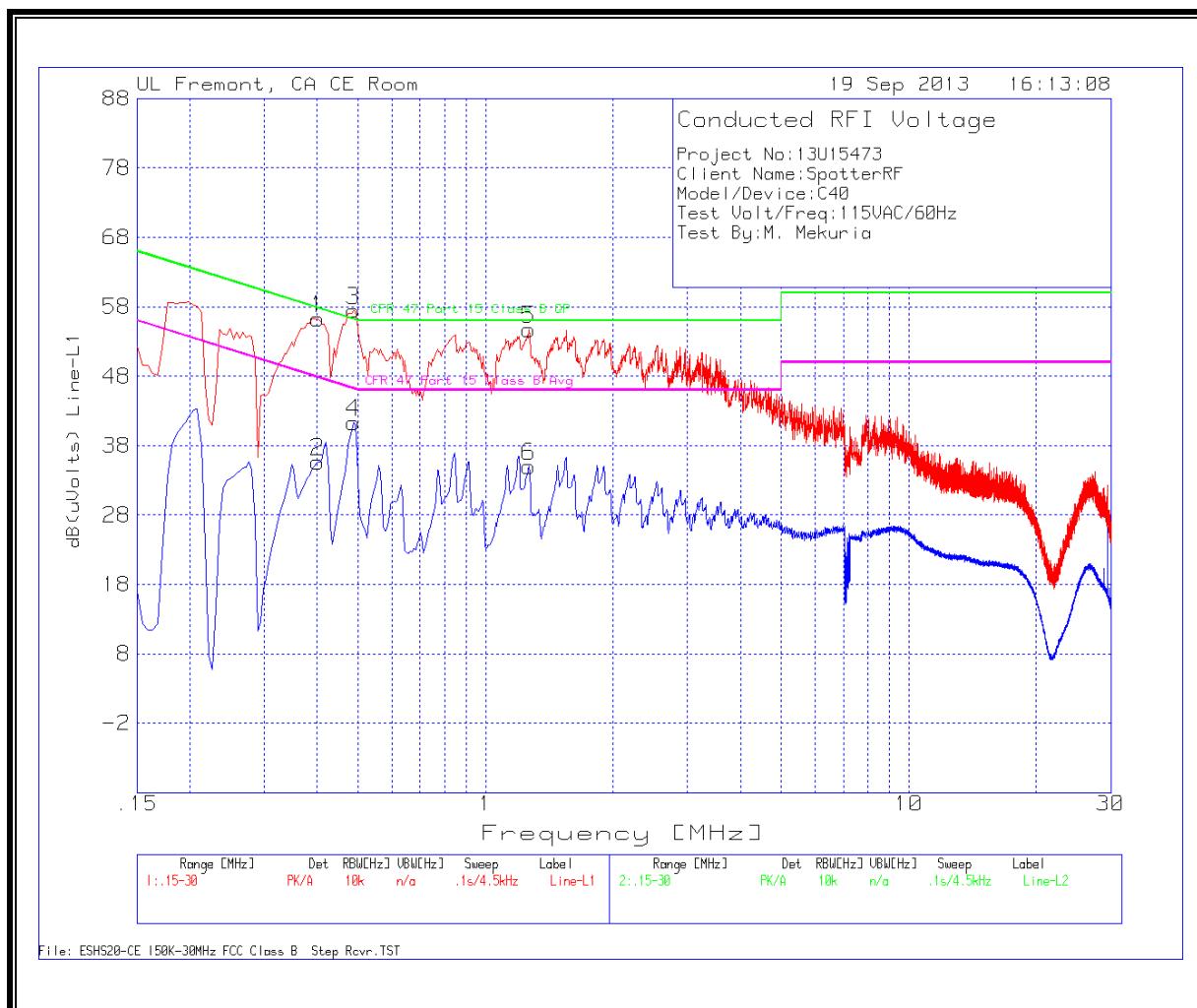
ANSI C63.4

RESULTS

6 WORST EMISSIONS

Project No:13U15473									
Client Name:SpotterRF									
Model/Device:C40									
Test Volt/Freq:115VAC/60Hz									
Test By:M. Mekuria									
Line-L1 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dB(uVolts)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
0.402	56.2	PK	0.1	0	56.3	57.8	-1.5	-	-
0.402	35.57	Av	0.1	0	35.67	-	-	47.8	-12.13
0.4875	55.7	QP	0.1	0	55.8	56.2	-0.4	-	-
0.4875	41.21	Av	0.1	0	41.31	-	-	46.2	-4.89
1.266	54.51	PK	0.1	0.1	54.71	56	-1.29	-	-
1.266	34.78	Av	0.1	0.1	34.98	-	-	46	-11.02
Line-L2 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	T24 IL L2.TXT (dB)	LC Cables 2&3.TXT (dB)	dB(uVolts)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
0.402	56.58	PK	0.1	0	56.68	57.8	-1.12	-	-
0.402	36.14	Av	0.1	0	36.24	-	-	47.8	-11.56
0.4875	55.5	QP	0.1	0	55.6	56.2	-0.4	-	-
0.4875	41.81	Av	0.1	0	41.91	-	-	46.2	-4.29
1.2615	54.64	PK	0.1	0.1	54.84	56	-1.16	-	-
1.2615	35.51	Av	0.1	0.1	35.71	-	-	46	-10.29
PK - Peak detector									
QP - Quasi-Peak detector									
Av - Average detector									

LINE 1 RESULTS



LINE 2 RESULTS

