



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION TEST REPORT**

FOR

**TABLET WITH CELLULAR GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/LTE
IEEE 802.11A/B/G/N (MIMO 2X2) AND BLUETOOTH RADIO**

MODEL: A1476

FCC ID: BCGA1476

REPORT NUMBER: 13U16584-6, Revision A

ISSUE DATE: FEBRUARY 21, 2013

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
---	02/15/14	Initial Issue	T. Chan
A	02/21/14	Addressed TCB's Questions	T. Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: TABLET WITH CELLULAR
GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/LTE IEEE
802.11A/B/G/N (MIMO 2X2) AND BLUETOOTH RADIO

MODEL: A1476

SERIAL NUMBER: DLXLP024FVJ0

DATE TESTED: AUGUST 21 – AUGUST 28, 2013 AND FEBRUARY 14, 2014

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	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 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.

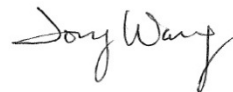
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services and all revisions are duly noted in the revisions section. Any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

Tested By:



Thu Chan
WiSE Operations Manager
UL Verification Services Inc.



TONY WANG
WiSE Technician
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, and ANSI C63.10-2009.

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 checked="" type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input checked="" 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

Tablet with cellular GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA, LTE/IEEE 802.11a/b/g/n (MIMO 2x2) and Bluetooth radio.

5.2. MAXIMUM OUTPUT POWER

Please refer to project number 13U15555-11, Section 5.2

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PiFA antenna, with a maximum gain of 0.5dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Broadcom Bluetooth 1.5.6.2.

5.5. WORST-CASE CONFIGURATION AND MODE

There are two vendors of the WiFi/Bluetooth radio modules: BOM #1, vender1 and BOM #2, vender 2, and they have the same mechanical outline, same on board antenna, matching circuit, antenna structure and same specification and baseline was performed on both vendors to determine the worst case on conducted power and radiated emissions.

The worst-position was the EUT with highest emissions. To determine the worst-case, the EUT is a portable device that has three orientations; therefore X, Y and Z orientations have been investigated with AC adapter and Headset, and the worst case was found to be at X position without AC adapter and headset.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC/DC Adapter	Apple	A1401	60812	DoC

I/O CABLES (Conducted Setup)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	SMA	Shielded	0.1m	To Spectrum Analyzer

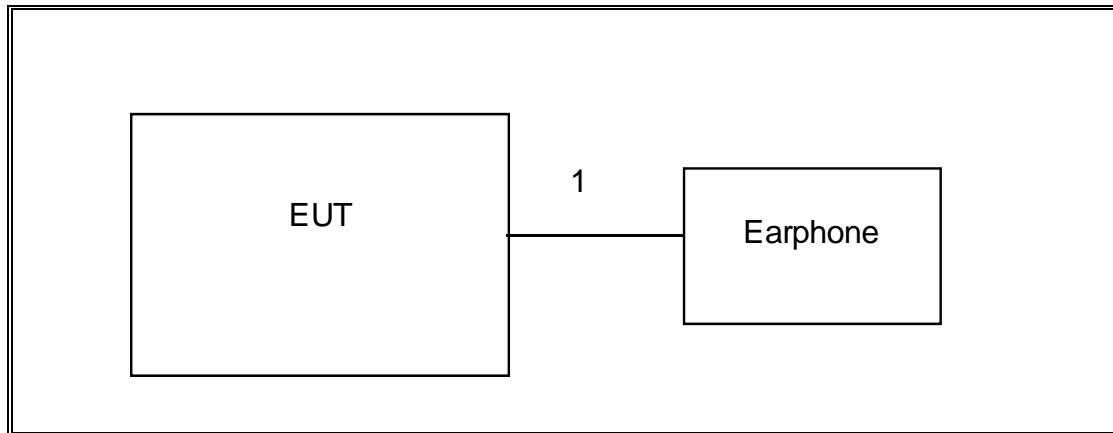
I/O CABLES (Radiated Setup)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AudioJack	1	Earphone	Unshielded	0.5m	N/A

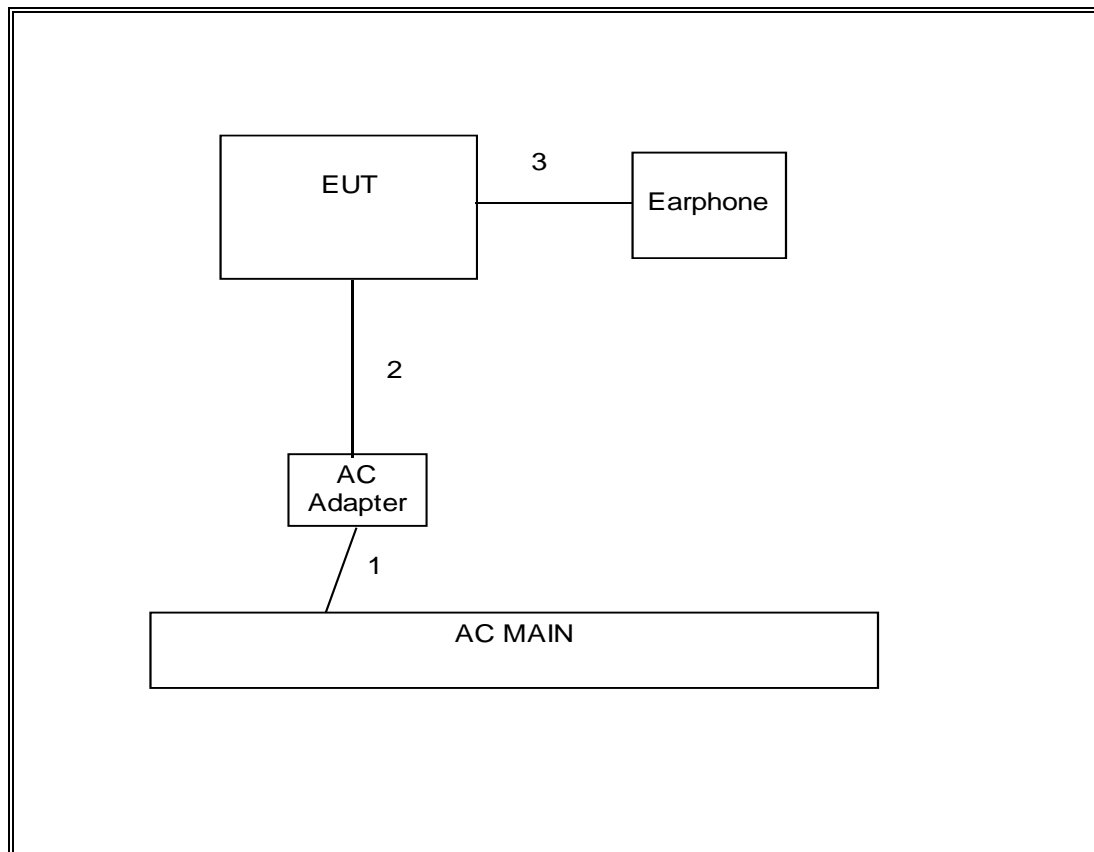
I/O CABLES (RADIATED BELOW 1GHz TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	US115	Un-Shielded	2m	NA
2	DC	1	USB	Un-Shielded	2m	NA
3	Audio	1	Jack	Un-Shielded	0.5m	NA

SETUP DIAGRAM FOR RADIATED TESTS



SETUP DIAGRAM FOR BELOW 1GHZ 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
Horn Antenna 1-18GHz	ETS Lindgren	3117	F00131	02/18/15
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/14
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	05/06/14
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB3	F00027	03/07/14
Peak / Average Power Sensor	Agilent / HP	E9323A	F00026	04/03/14
P-Series single channel Power Meter	Agilent / HP	N1911A	F00153	04/05/14
Spectrum Analyzer, 44GHz	Agilent	E4446A	C01159	04/10/14
PreApmplifier, 1-26.5GHz	Agilent	8449B	C01052	10/22/14

7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

Refer the on time and duty cycle data in FCC DTS report with the FCC ID BCGA1475 and project number 13U15555-11 at Section 7.1

7.1. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01.

Output Power: KDB 558074 D01.

Power Spectral Density: KDB 558074 D01.

Out-of-band emissions in non-restricted bands: KDB 558074 D01.

Out-of-band emissions in restricted bands: KDB 558074 D01.

8. ANTENNA PORT TEST RESULTS

Note that for all antenna port data refer to the FCC BLE DTS report with the FCC ID BCGA1475 and project number 13U15555-11 from Section 8.1. to 8.6.

9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. 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 as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

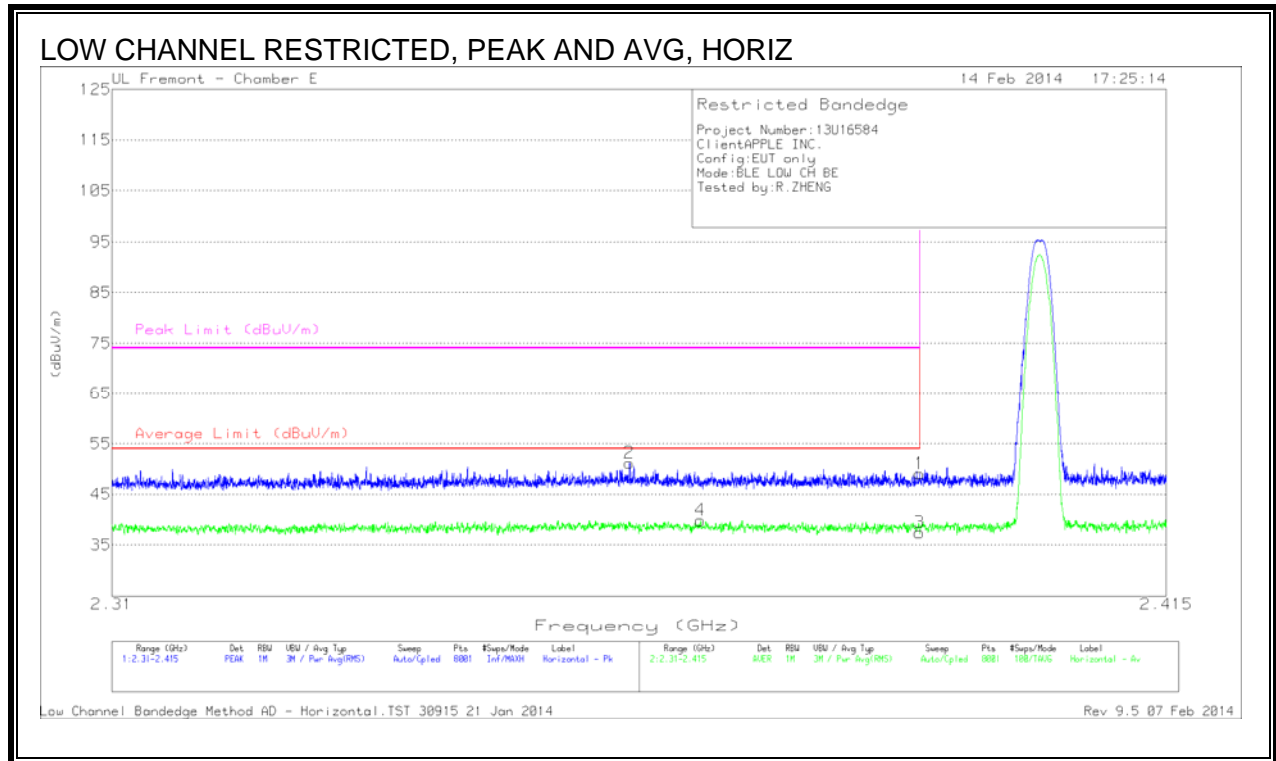
For 2.4 GHz band, the spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

RESULT

9.2. TRANSMITTER ABOVE 1 GHz

RESTRICTED BANDEGE (LOW CHANNEL, HORIZONTAL)



DATA

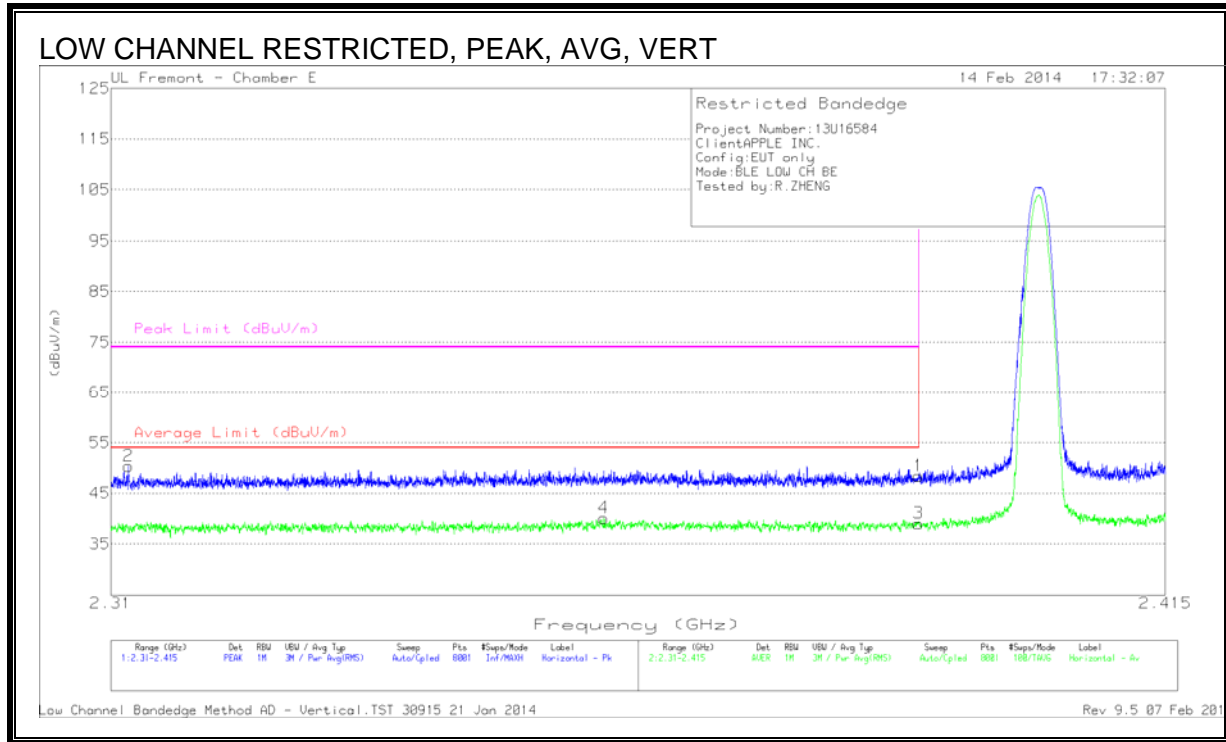
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.361	43.26	PK	32.6	-24.7	51.16	-	-	74	-22.84	100	178	H
4	2.368	32.02	RMS	32.6	-24.8	39.82	54	-14.18	-	-	100	178	H
1	2.39	41.46	PK	32.6	-25	49.06	-	-	74	-24.94	100	178	H
3	2.39	29.84	RMS	32.6	-25	37.44	54	-16.56	-	-	100	178	H

PK - Peak detector

RMS - RMS detection

Low Channel Bandedge Method AD - Horizontal

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



DATA

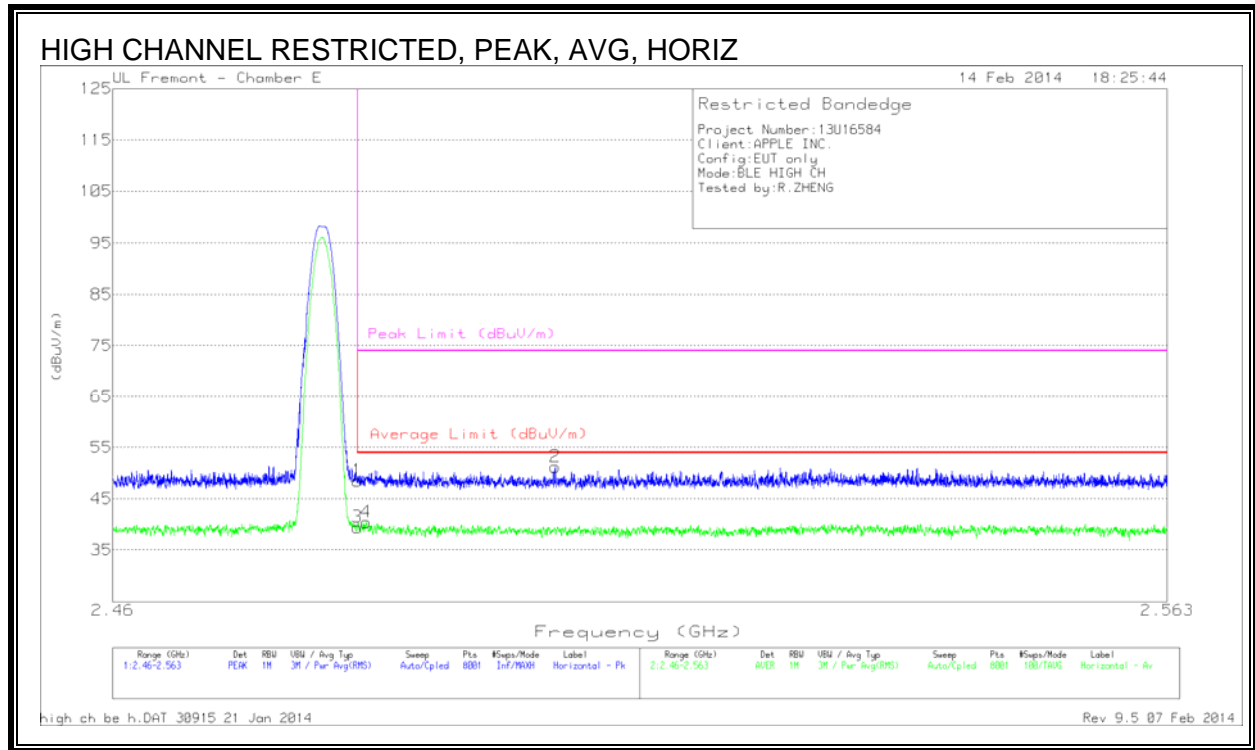
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2	2.312	43.16	PK	32.5	-25.3	50.36	-	-	74	-23.64	251	171	V
4	2.359	32.17	RMS	32.6	-24.7	40.07	54	-13.93	-	-	251	171	V
1	2.39	40.78	PK	32.6	-25	48.38	-	-	74	-25.62	251	171	V
3	2.39	31.44	RMS	32.6	-25	39.04	54	-14.96	-	-	251	171	V

PK - Peak detector

RMS - RMS detection

Low Channel Bandedge Method AD - Vertical

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



DATA

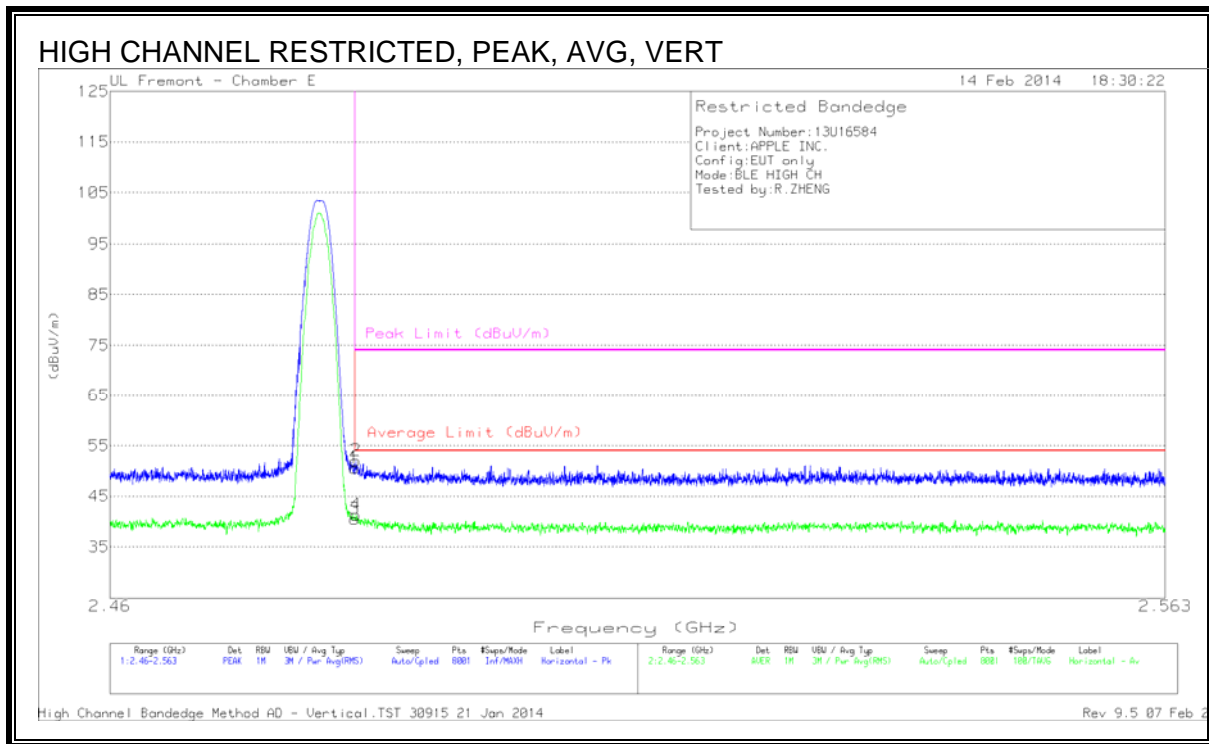
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	40.19	PK	32.7	-24.4	48.49	-	-	74	-25.51	302	247	H
2	2.503	43.02	PK	32.7	-24.5	51.22	-	-	74	-22.78	302	247	H
3	2.484	31.12	RMS	32.7	-24.4	39.42	54	-14.58	-	-	302	247	H
4	2.484	32.11	RMS	32.7	-24.4	40.41	54	-13.59	-	-	302	247	H

PK - Peak detector

RMS - RMS detection

High Channel Bandedge Method AD - Horizontal

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



DATA

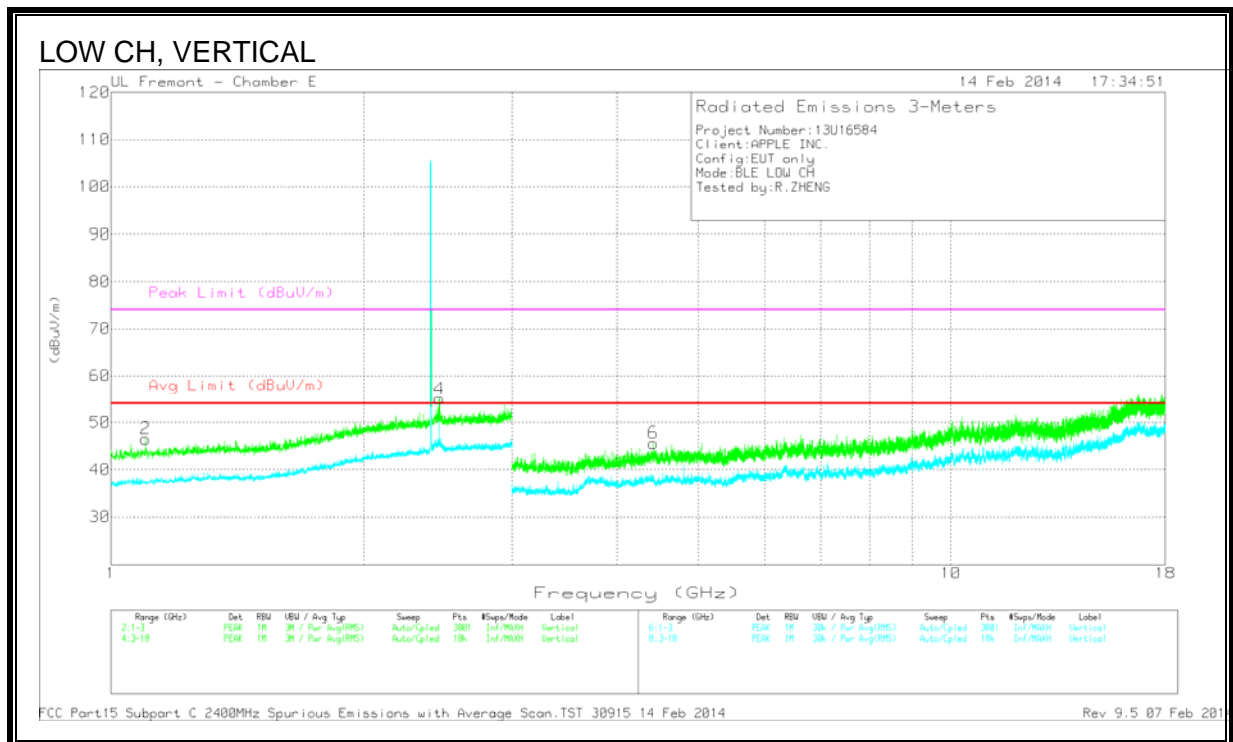
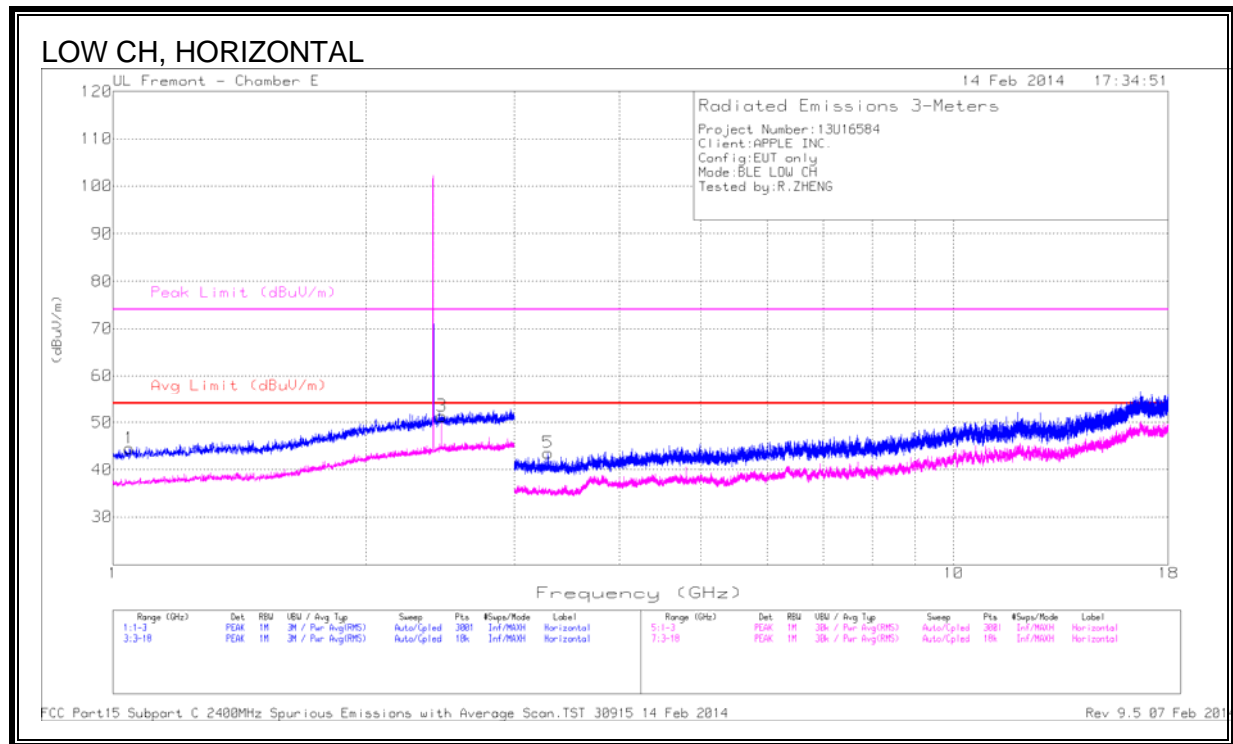
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	42.24	PK	32.7	-24.4	50.54	-	-	74	-23.46	259	257	V
2	2.484	43.71	PK	32.7	-24.4	52.01	-	-	74	-21.99	259	257	V
3	2.484	32.22	RMS	32.7	-24.4	40.52	54	-13.48	-	-	259	257	V
4	2.484	33.01	RMS	32.7	-24.4	41.31	54	-12.69	-	-	259	257	V

PK - Peak detector

RMS - RMS detection

High Channel Bandedge Method AD - Vertical

HARMONICS AND SPURIOUS EMISSIONS

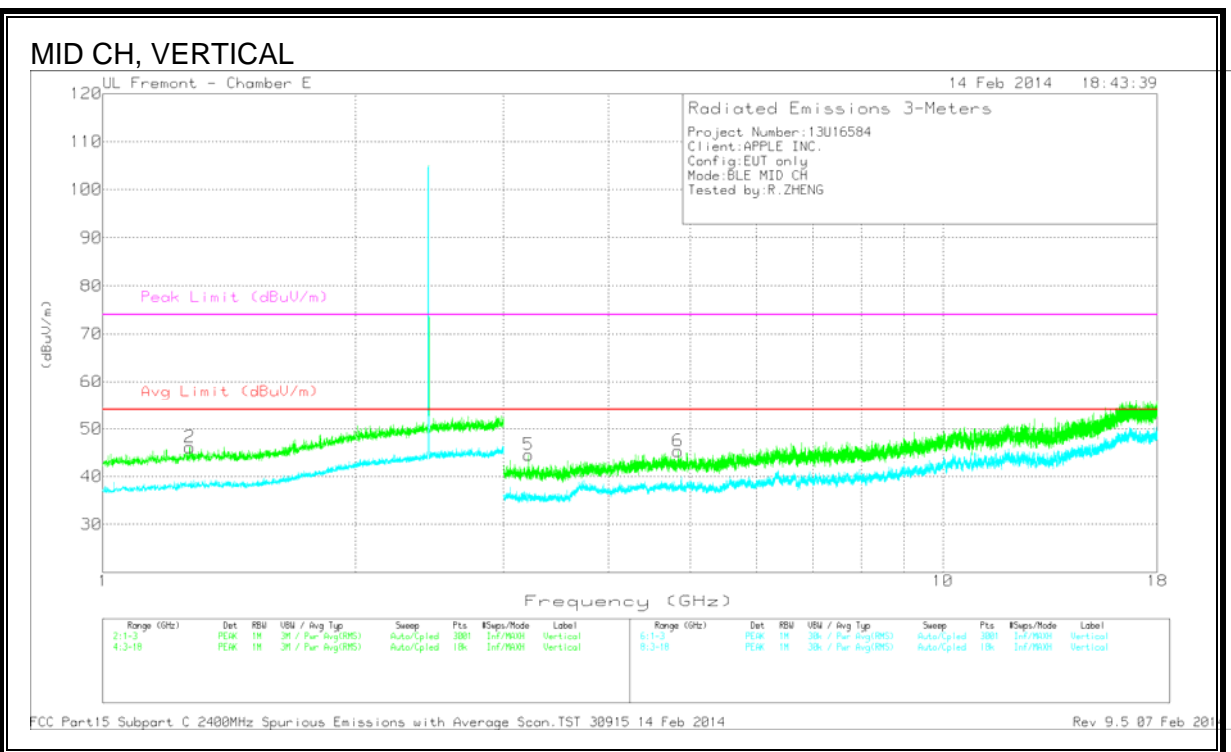
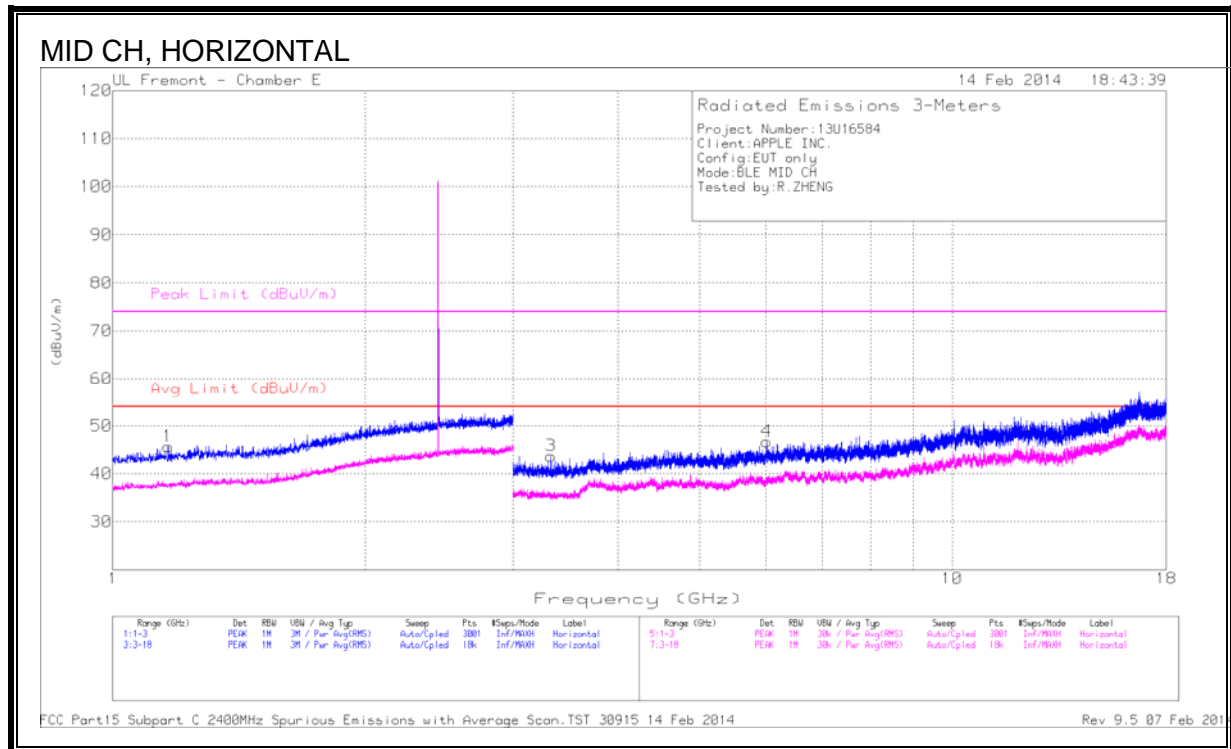


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/F lter/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.046	44.19	PK	28.3	-28	44.49	54	-9.51	74	-29.51	0-360	199	H
2	* 1.099	46.1	PK	28.4	-28	46.5	54	-7.5	74	-27.5	0-360	101	V
4	2.46	46.94	PK	32.7	-24.6	55.04	-	-	-	-	0-360	200	V
3	2.461	43.2	PK	32.7	-24.6	51.3	-	-	-	-	0-360	101	H
5	3.292	42.23	PK	33.3	-32	43.53	-	-	-	-	0-360	101	H
6	4.425	42.57	PK	34.2	-31.2	45.57	-	-	-	-	0-360	200	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

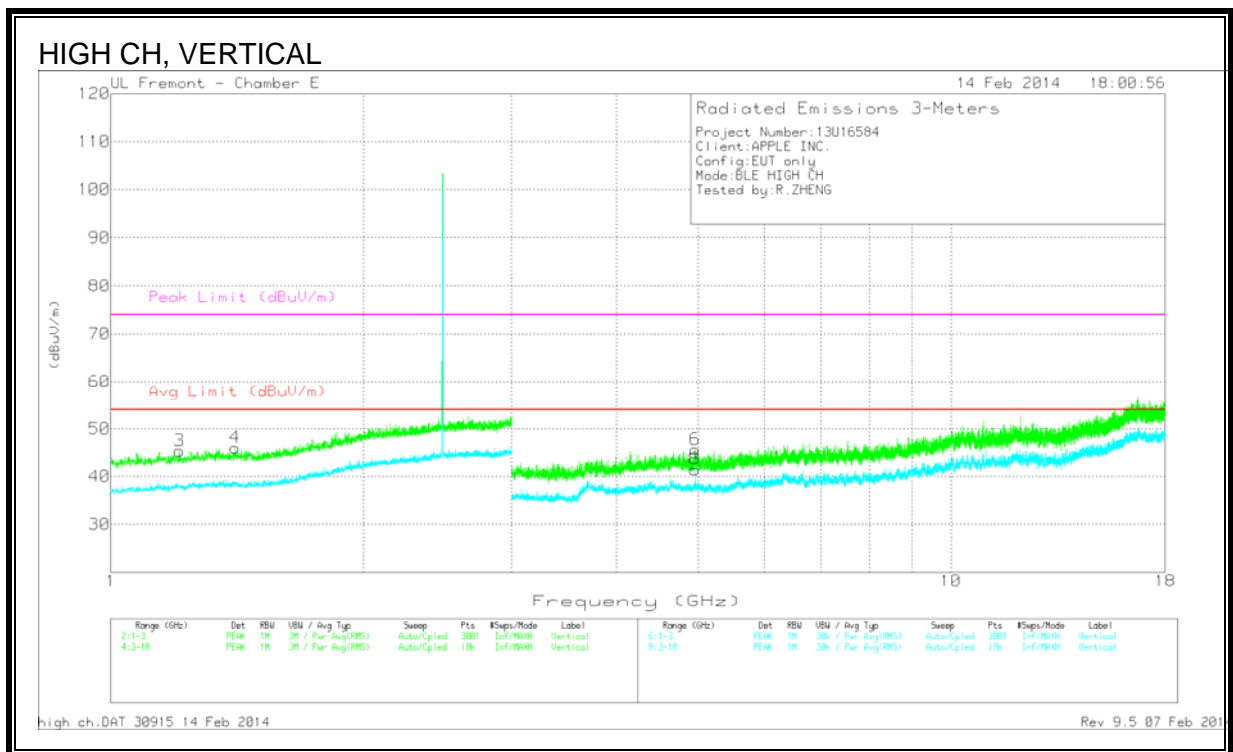
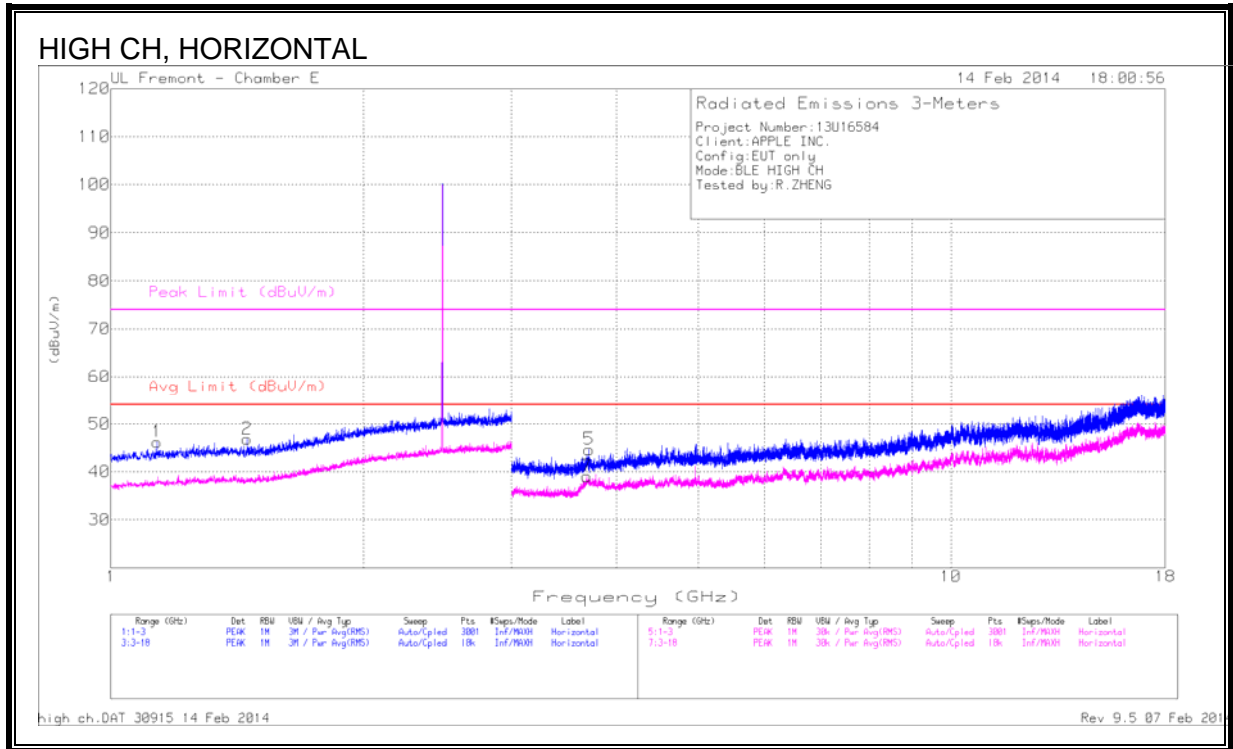


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/F lter/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.164	44.85	PK	28.6	-27.8	45.65	54	-8.35	74	-28.35	0-360	199	H
2	* 1.269	44.53	PK	28.8	-27.2	46.13	54	-7.87	74	-27.87	0-360	101	V
6	* 4.84	42.02	PK	34.5	-31.2	45.32	54	-8.68	74	-28.68	0-360	101	V
5	3.212	43.34	PK	33.3	-32.1	44.54	-	-	-	-	0-360	101	V
3	3.327	42.21	PK	33.2	-31.7	43.71	-	-	-	-	0-360	200	H
4	6.013	40.9	PK	35.5	-29.7	46.7	-	-	-	-	0-360	200	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/F lter/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.135	45.43	PK	28.5	-27.7	46.23	54	-7.77	74	-27.77	0-360	200	H
2	* 1.453	44.94	PK	28.4	-26.5	46.84	54	-7.16	74	-27.16	0-360	101	H
3	* 1.207	44.24	PK	28.7	-27.6	45.34	54	-8.66	74	-28.66	0-360	200	V
4	* 1.406	44.03	PK	28.5	-26.5	46.03	54	-7.97	74	-27.97	0-360	200	V
5	* 3.709	42.36	PK	33.6	-31.3	44.66	-	-	74	-29.34	0-360	199	H
7	* 3.688	36.68	Avg	33.5	-31.1	39.08	54	-14.92	-	-	0-360	101	H
6	* 4.961	41.87	PK	34.4	-30.6	45.67	-	-	74	-28.33	0-360	200	V
8	* 4.959	37.58	Avg	34.4	-30.5	41.48	54	-12.52	-	-	0-360	200	V

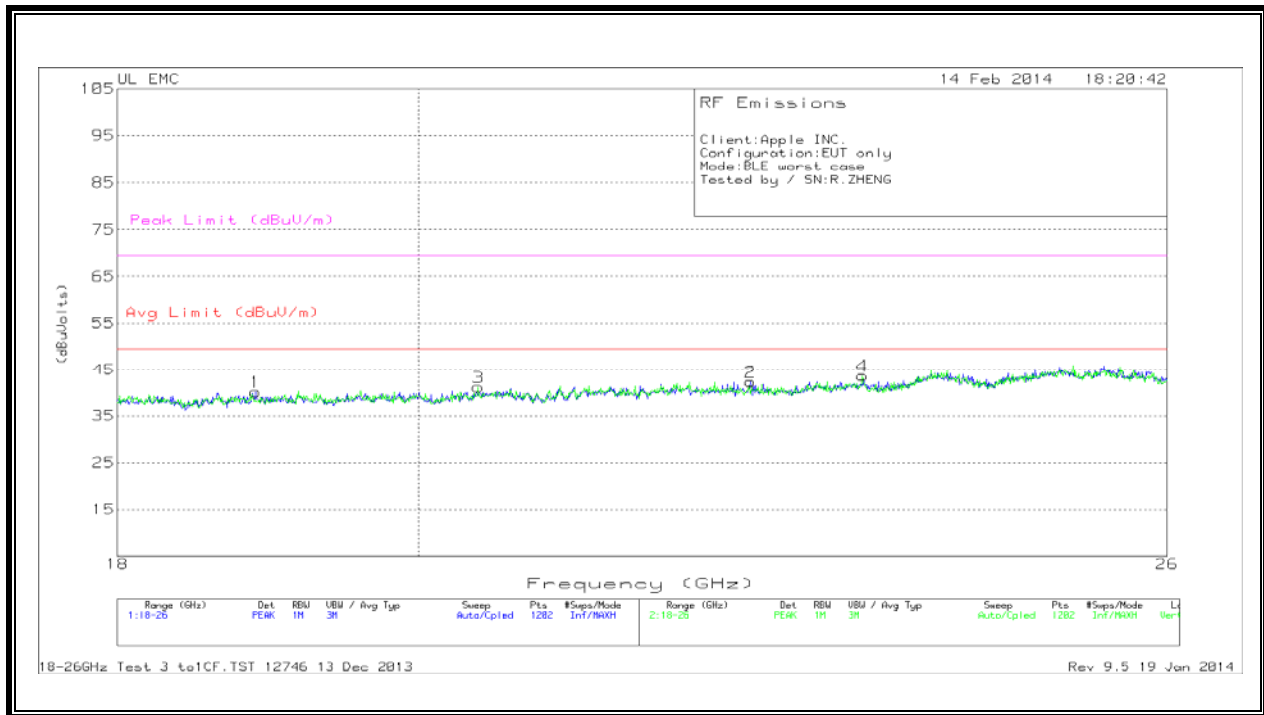
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

9.3. WORST-CASE ABOVE 18 GHz

SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)



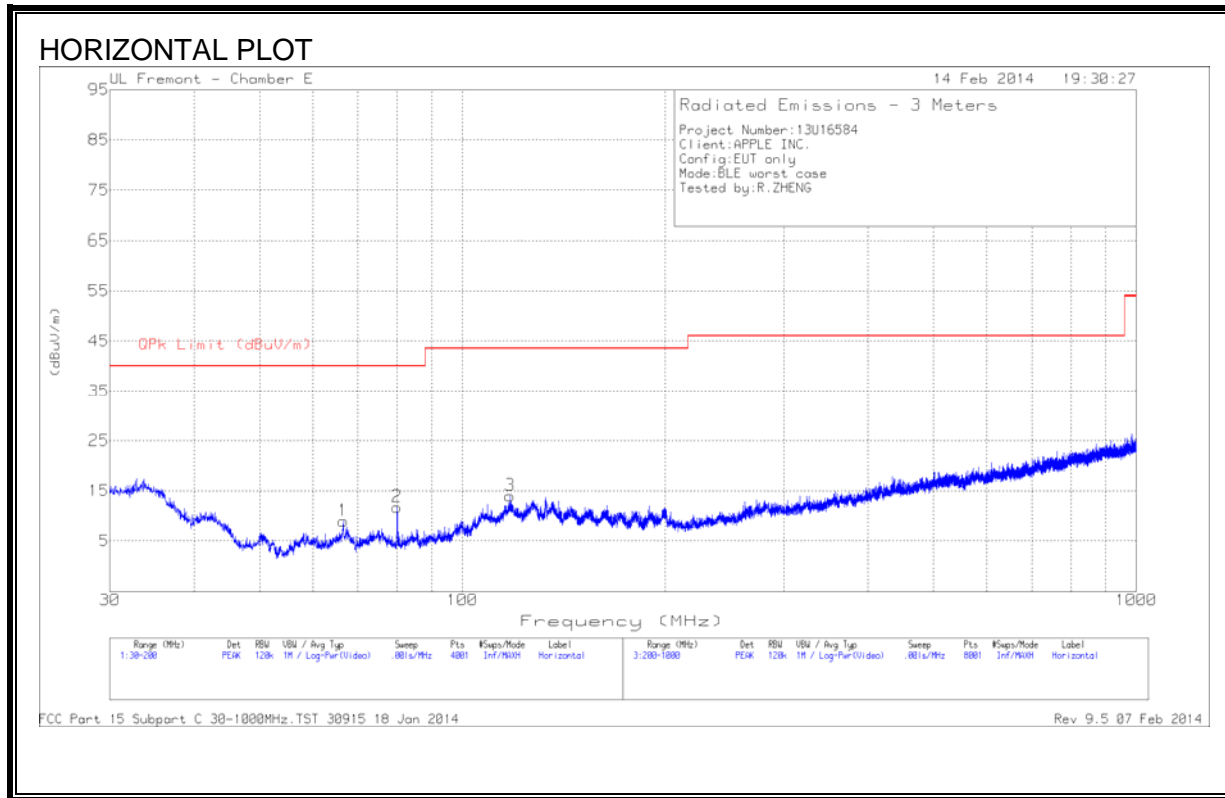
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T89 (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.893	41.67	PK	32.5	-24.5	-9.5	40.166	49.5	-9.333	69.5	-29.333
2	22.470	41.73	PK	33.4	-23.3	-9.5	42.333	49.5	-7.166	69.5	-27.166
3	20.425	41.77	PK	32.8	-23.9	-9.5	41.166	49.5	-8.333	69.5	-28.333
4	23.369	42.77	PK	33.4	-23	-9.5	43.666	49.5	-5.833	69.5	-25.833

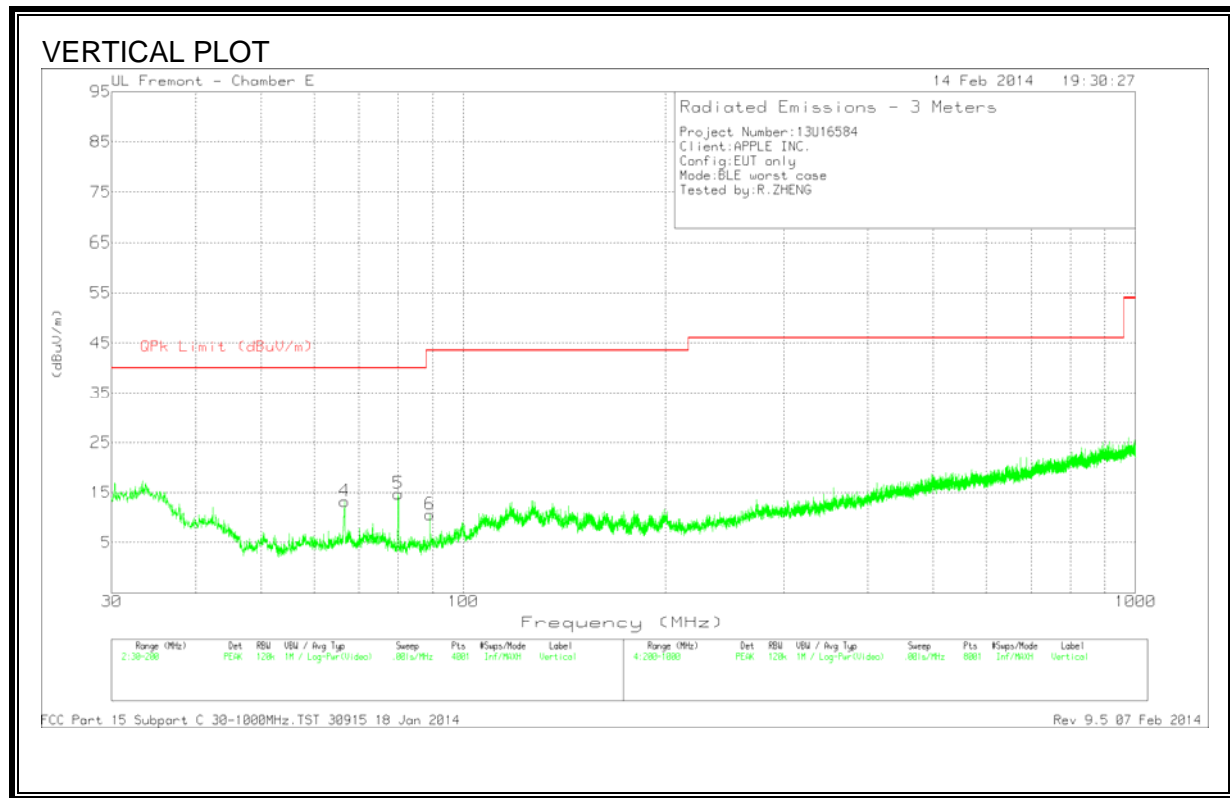
PK - Peak detector

9.4. WORST-CASE BELOW 1 GHz

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



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



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 117.72	31.59	PK	13.5	-31.1	13.99	43.52	-29.53	0-360	401	H
1	66.5925	32.08	PK	8.1	-31.2	8.98	40	-31.02	0-360	301	H
4	66.635	36.44	PK	8.1	-31.3	13.24	40	-26.76	0-360	100	V
2	79.98	35.54	PK	7.7	-31.5	11.74	40	-28.26	0-360	401	H
5	80.0225	38.54	PK	7.7	-31.5	14.74	40	-25.26	0-360	100	V
6	89.2025	34.21	PK	7.7	-31.3	10.61	43.52	-32.91	0-360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector