



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 1**

CERTIFICATION TEST REPORT

FOR

Zigbee Door Sensor

MODEL NUMBER: A94

FCC ID: DKN-501CS

IC ID: 1707A-501CS

REPORT NUMBER: 15U22255-E1V2

ISSUE DATE: MARCH 9, 2016

Prepared for

**Echostar Technologies, LLC
90 Inverness Circle East
Englewood, CO 80112**

Prepared by

**UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888**



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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	12/29/15	Initial Issue	C. Vergonio
V2	3/9/16	Added a note in the plot in Page 28	C. Vergonio

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Echostar Technologies LLC
90 Inverness Circle East
Englewood, CO 80112

EUT DESCRIPTION: Zigbee Door Sensor

MODEL: A94

SERIAL NUMBER: 2263411-1, 2263411-2

DATE TESTED: December 8-17, 2015

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



CHARLES VERGONIO
CONSUMER TECHNOLOGY DIVISION
WISE ENGINEER
UL Verification Services Inc.

Tested By:



JUSTIN KO
CONSUMER TECHNOLOGY DIVISION
TEST TECHNICIAN
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, 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 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(IC: 2324B-1)	<input type="checkbox"/> Chamber D(IC: 2324B-4)
<input type="checkbox"/> Chamber B(IC: 2324B-2)	<input type="checkbox"/> Chamber E(IC: 2324B-5)
<input checked="" type="checkbox"/> Chamber C(IC: 2324B-3)	<input type="checkbox"/> Chamber F(IC: 2324B-6)
	<input type="checkbox"/> Chamber G(IC: 2324B-7)
	<input type="checkbox"/> Chamber H(IC: 2324B-8)

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:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

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 18000 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 a Zigbee Door Sensor. Small sensor device designed to be installed on doors and windows and sense if the door/window has been opened via a magnetic sense.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2405-2480	ZIGBEE	5.95	3.94

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a meandering inverted F antenna, with a maximum gain of 1.25 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. Radiated test were performed for demonstrating compliance to the conducted emission requirements.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

SUPPORT EQUIPMENT			
Description	Manufacturer	Model	Serial Number
Power Supply	Sorenson-Ametek	XT15-4	1319A02779
Laptop	HP	EliteBook740 (CM03XL)	BCAJWZ5E8F
Adapter	Echostar	RS232	N/A

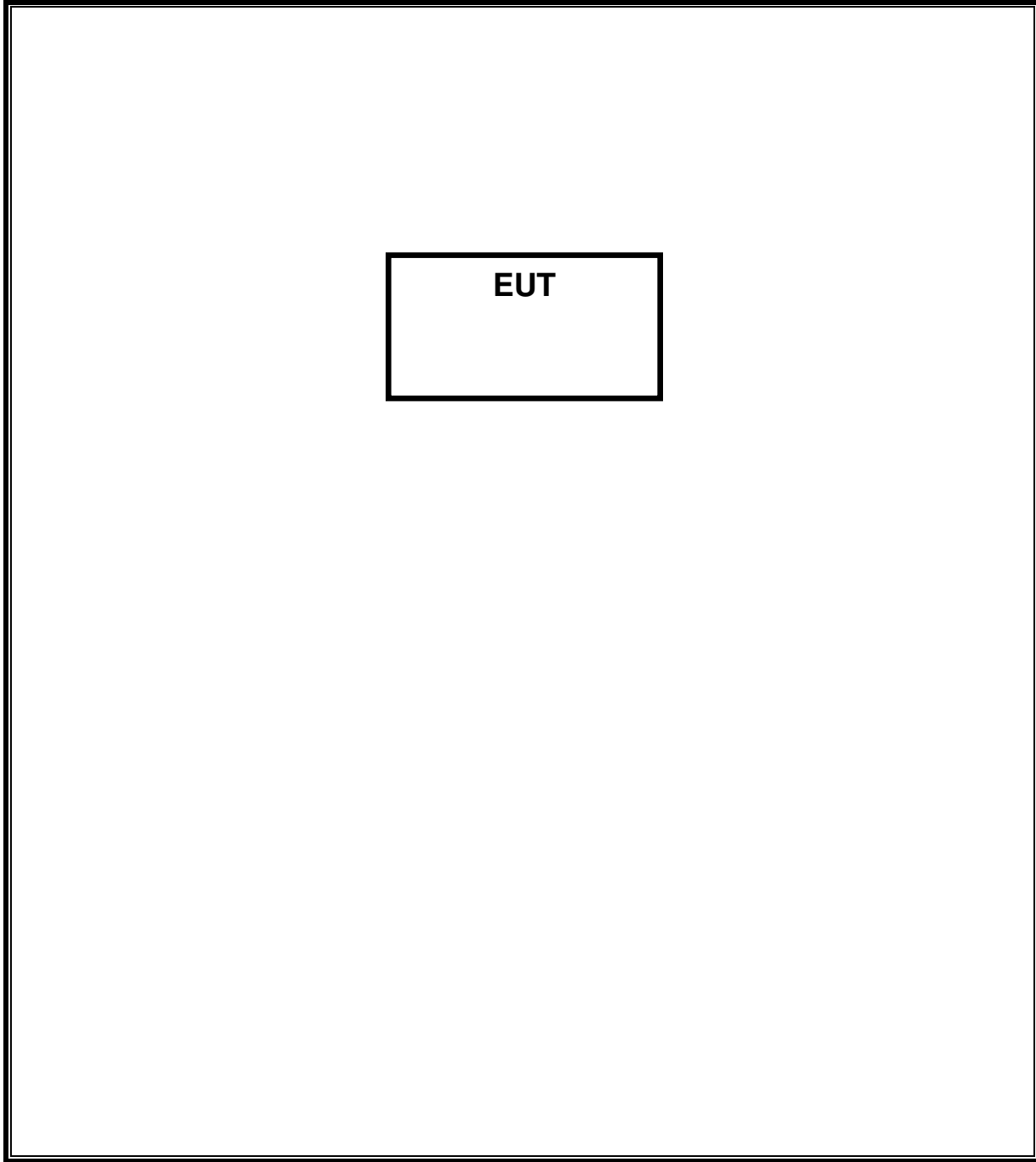
I/O CABLES

Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB to Serial	1		un-shielded	1.5	N/A
2	Banana to Alligator	1		un-shielded	1	N/A

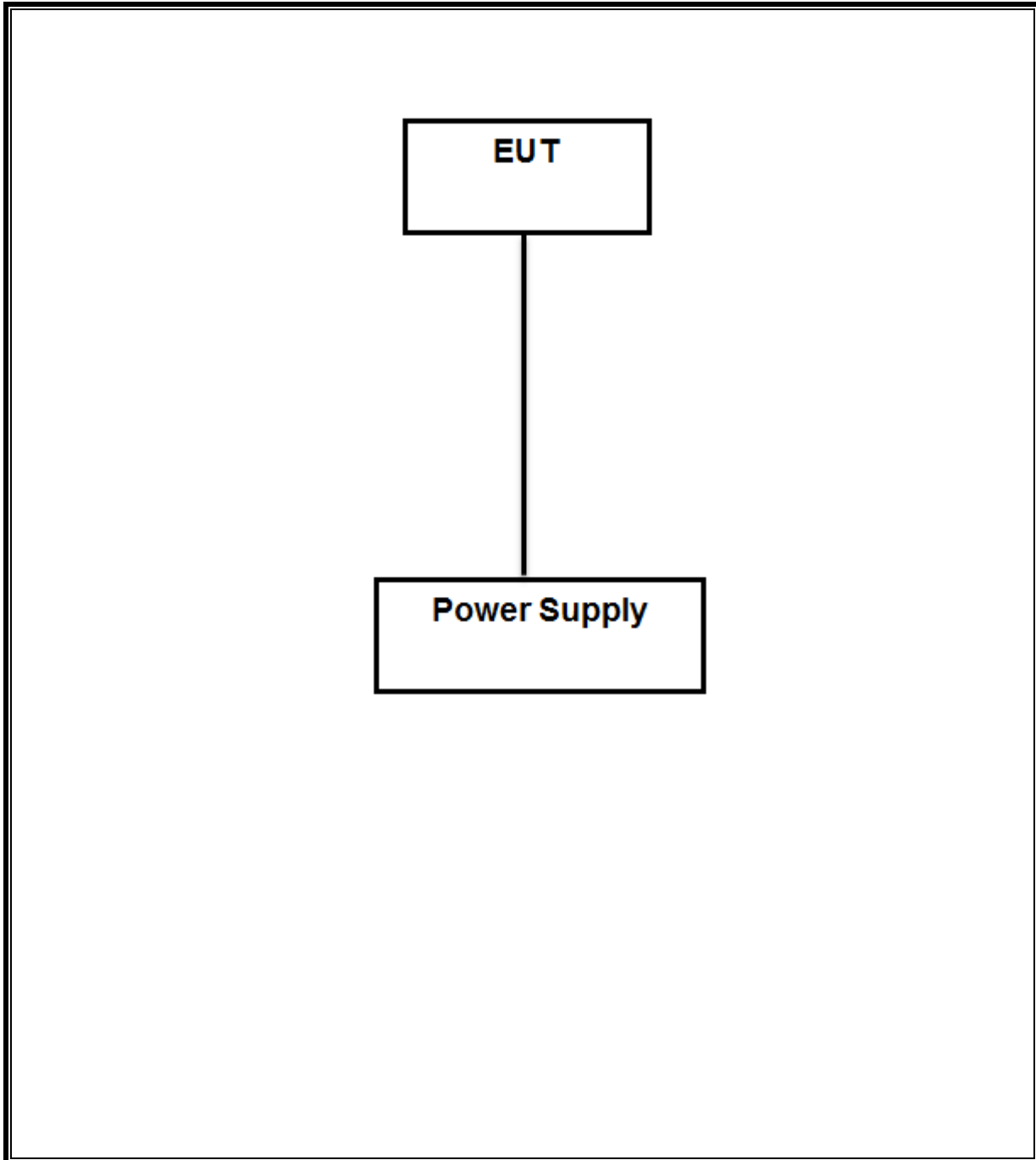
TEST SETUP

The EUT was installed in a typical configuration. The customer provided test software to exercise the EUT during test. Refer to the following diagram.

SETUP DIAGRAM FOR 30-1000MHz TESTS



SETUP DIAGRAM FOR 1000 - 18000MHz 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 Number	Cal Due
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	130	09/01/16
Antenna, Horn, 18GHz	ETS Lindgren	3117	863	04/10/16
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	447	05/12/16
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	88	04/07/16
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	404	06/29/16
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	123	10/22/16
Spectrum Analyzer, PXA, 3 Hz to 44 GHz	Keysight	N9030A	908	03/03/16
Spectrum Analyzer, PXA, 3 Hz to 44 GHz	Keysight	N9030A	907	01/07/16
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	160	CNR
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	417	05/04/16
High Pass Filter 6GHz	Micro-Tronics	HPS17542	893	04/25/16
High Pass Filter 3GHz	Micro-Tronics	HPS17543	898	04/25/16
Amplifier 10KHz to 1GHz 32db	HP	8447D	15	8/14/2016

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015

7. SUMMARY

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
15.247 (a)(2)	RSS-247 5.2.1	Occupied Band width (6dB)	>500KHz	Conducted	Pass	1.587MHz
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-46.227dBm (Convert from 49.84 dBuV EIRP)*
15.247	RSS-247 5.4.4	TX conducted output power	<30dBm		Pass	5.95 dBm
15.247	RSS-247 5.2.2	PSD	<8dBm		Pass	-10.33dBm
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	N/A	N/A
15.205, 15.209	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m		Pass	53.32dBuV/m

*Conducted Band Edge EIRP reading was take into account the Antenuation Factor and Gain/Loss.
 The Conducted Band Edge raw reading was 49.84 dBuV. Final reading is $49.84 + 32.335 - 31.952 - 95.2 - 1.25 = -46.227$ dBm, where the 32.225 is the antenuation factor, 31.952 is the gain/loss, and 1.25 is the antenna gain.

8. RADIATED TEST RESULTS

8.1. ON TIME, DUTY CYCLE

LIMITS

None; for reporting purposes only.

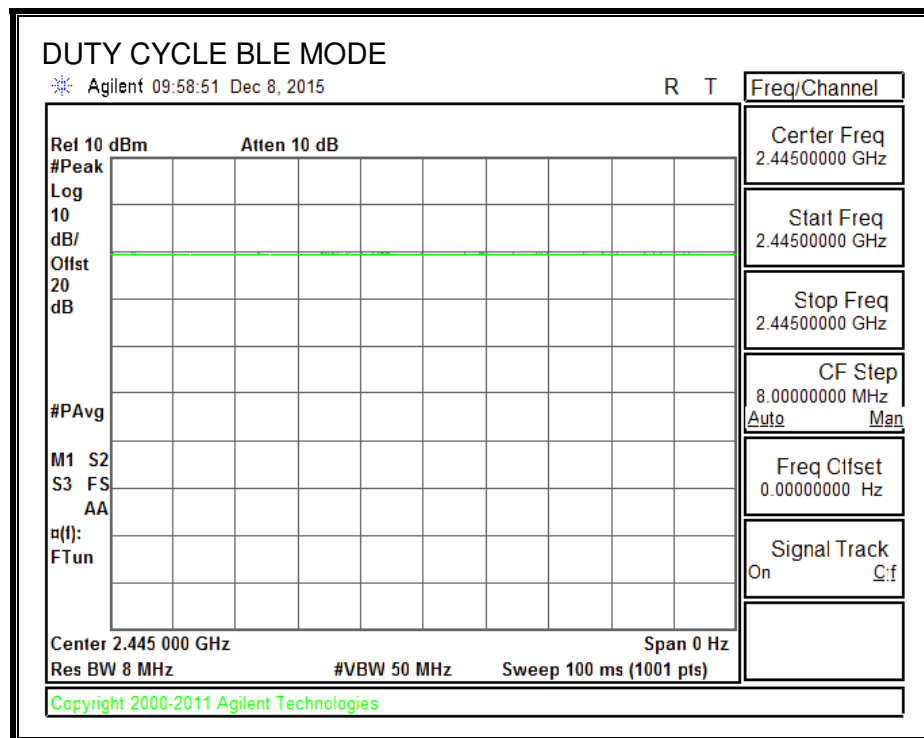
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

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)
Zigbee	1.000	1.000	1.000	100.00%	0.00	0.010

DUTY CYCLE PLOTS



**8.2. 6 dB BANDWIDTH
LIMITS**

FCC §15.247 (a) (2)

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

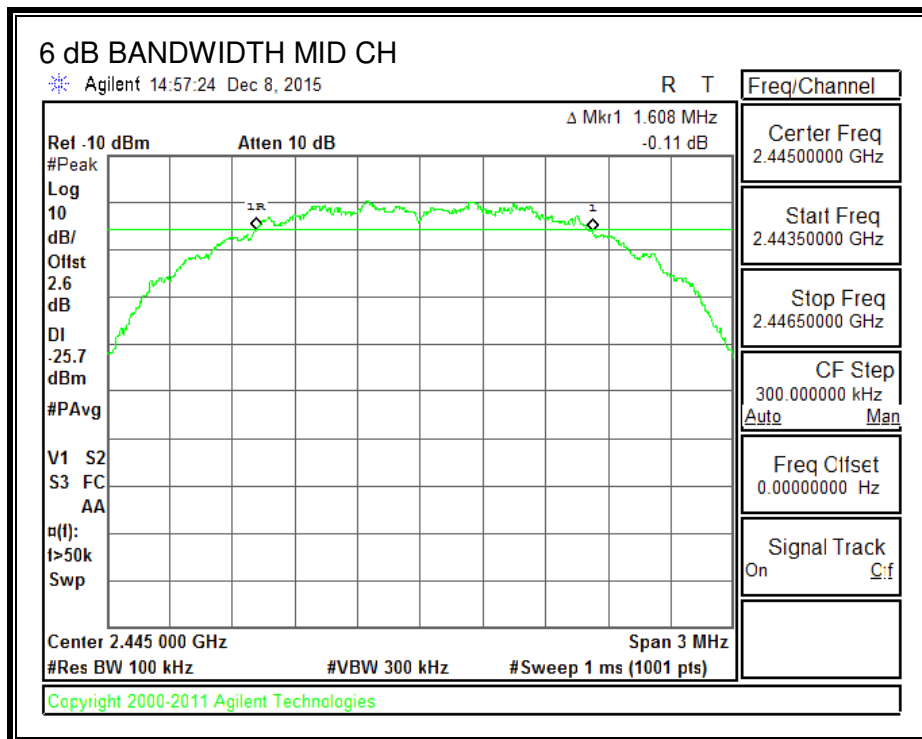
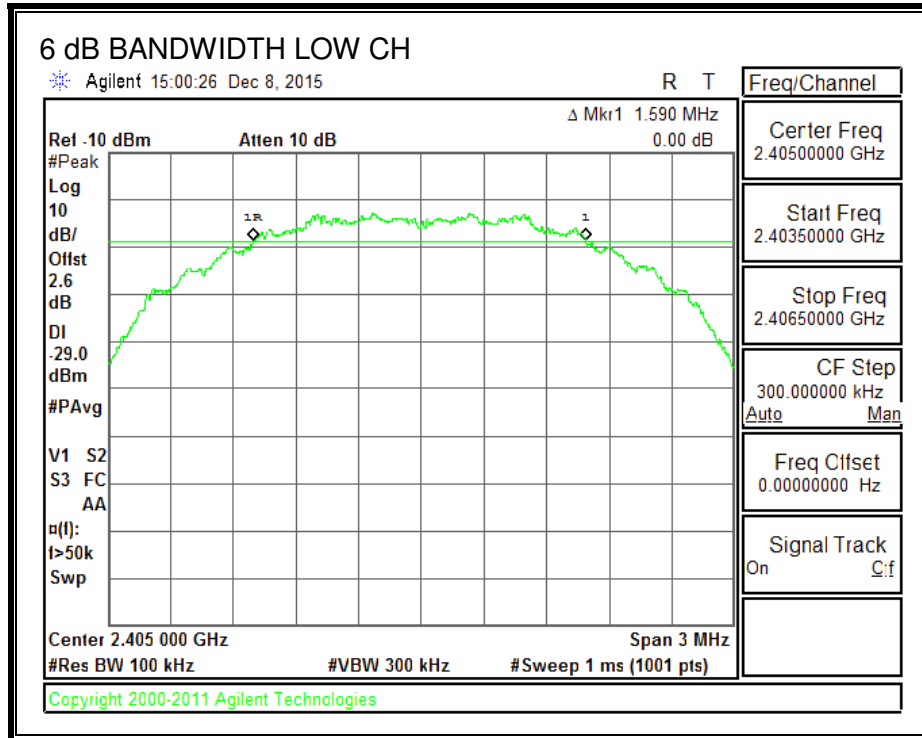
TEST PROCEDURE

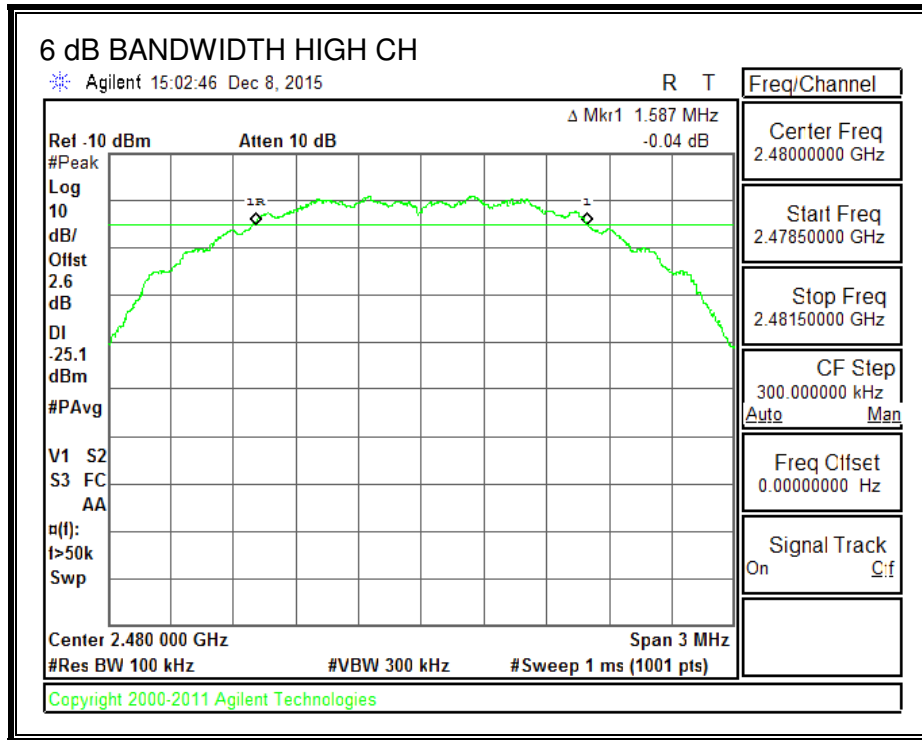
6 dB bandwidth was measured under radiated test configuration. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.5900	0.5
Middle	2445	1.6080	0.5
High	2480	1.5870	0.5

6 dB BANDWIDTH





**8.3. 99% BANDWIDTH
LIMITS**

None; for reporting purposes only.

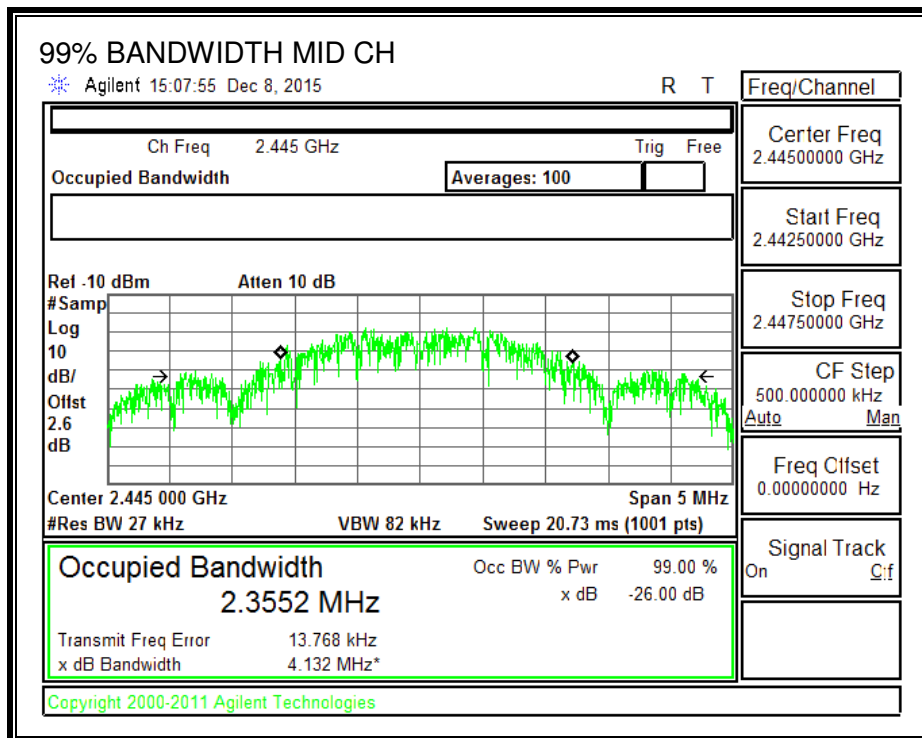
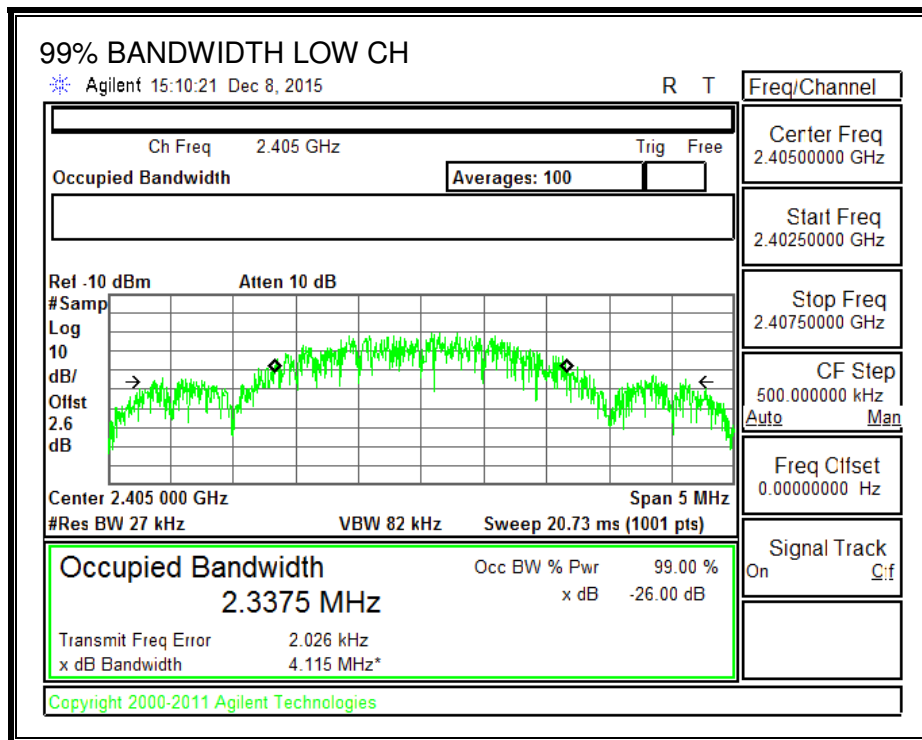
TEST PROCEDURE

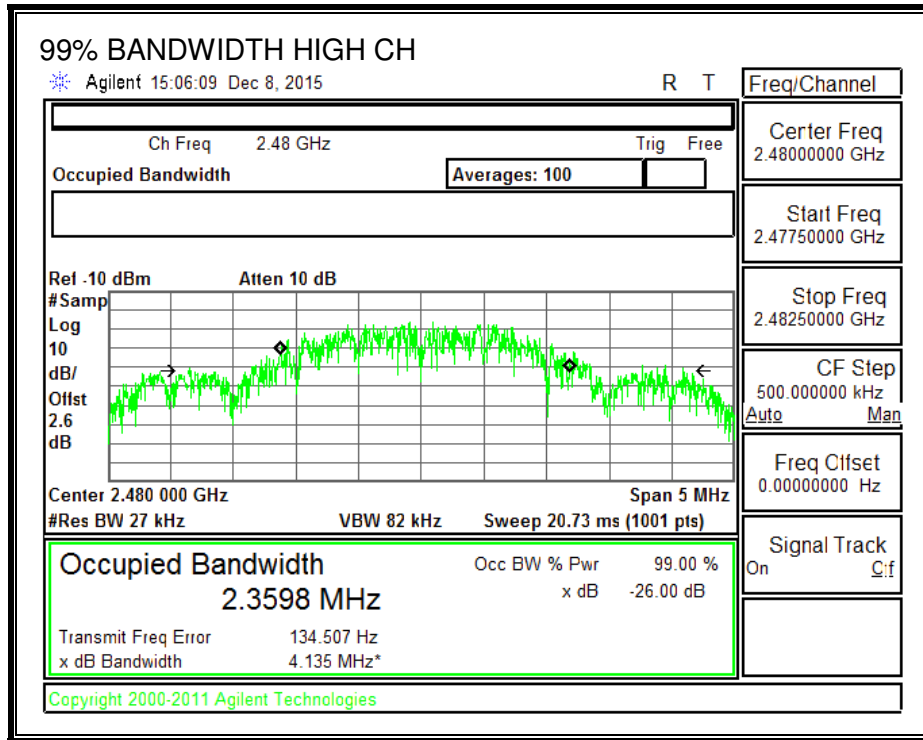
Reference to KDB558074 D01 DTS Meas Guidance v03r03: 99% bandwidth was measured under radiated test configuration. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.3375
Middle	2445	2.3552
High	2480	2.3598

99% BANDWIDTH





8.4. OUTPUT POWER LIMITS

FCC §15.247 (b)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Peak power is measured using KDB558074 D01 DTS Meas Guidance v03r03 utilizing spectrum analyzer. Radiated test were performed for demonstrating compliance to the conducted emission requirements.

DIRECTIONAL ANTENNA GAIN

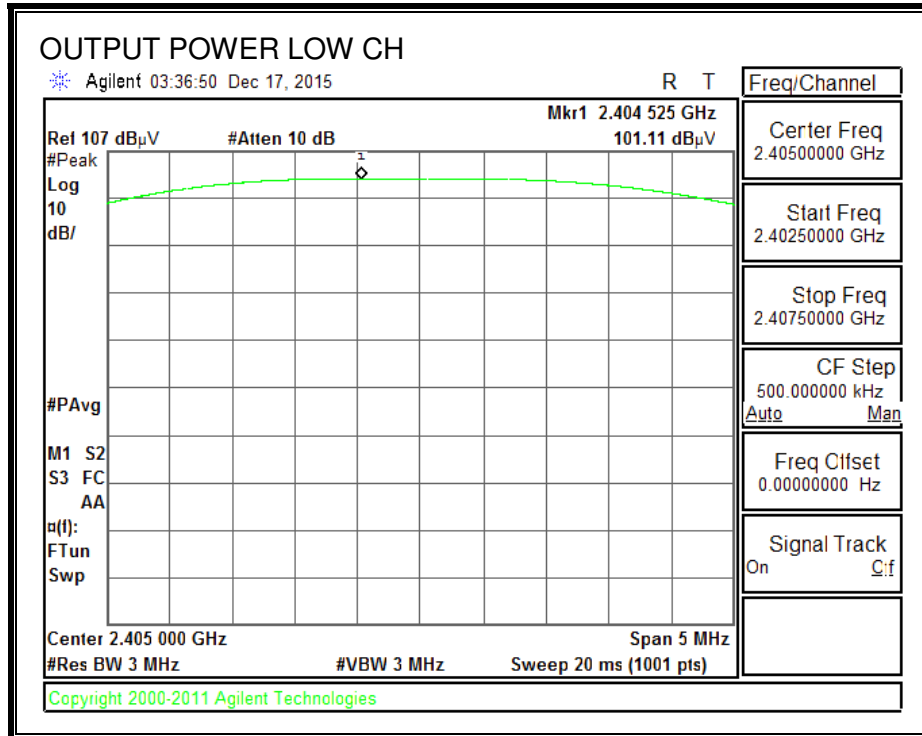
There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

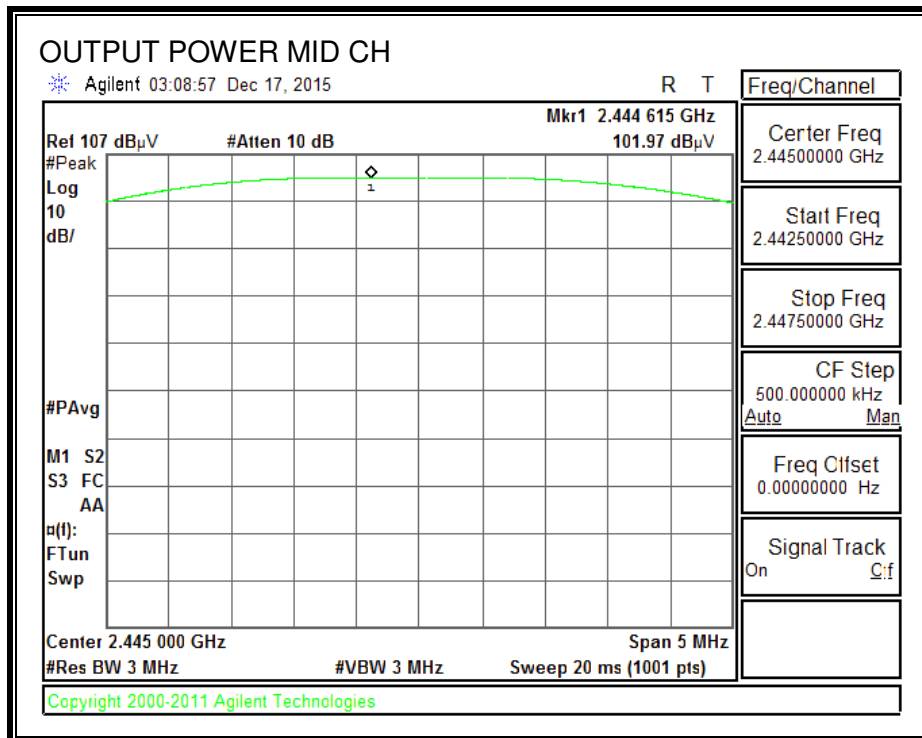
Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2405	4.907	30	-25.093
Middle	2445	5.951	30	-24.049
High	2480	-2.807	30	-32.807

Power was measured under radiated test configuration.
EIRP Power (in dBuV)=PSA reading + Attenuation Factor + Gain/Loss
Power=EIRP-95.2-Antenna Gain

OUTPUT POWER

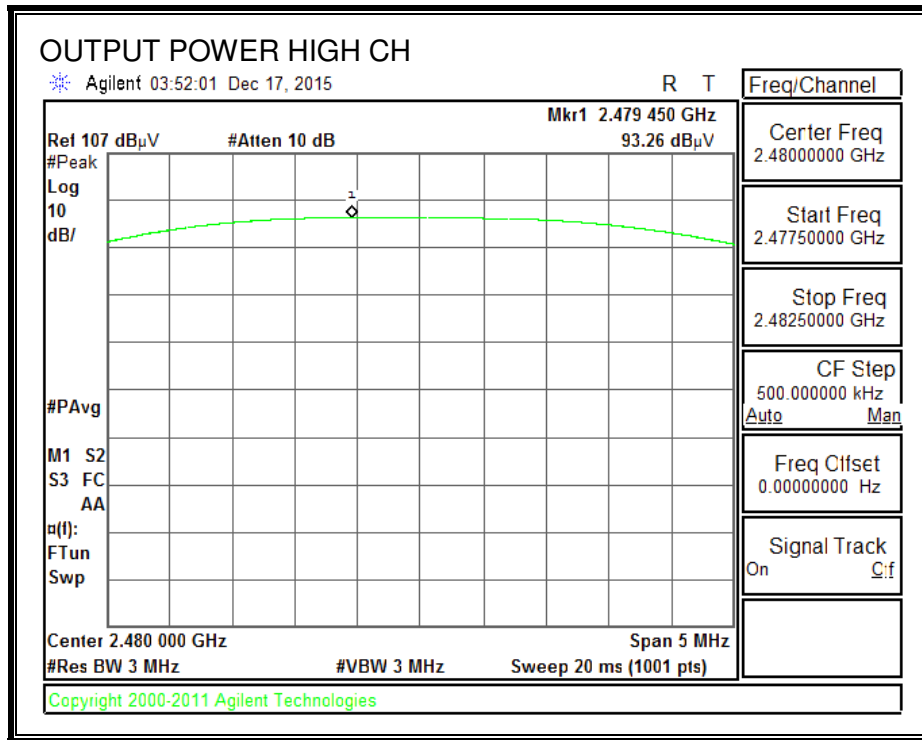


EIRP Power=101.11+32.335-32.088=101.357 dBuV
 Power=101.357-95.2-1.25=4.907 dBm



EIRP Power=101.97+32.345-31.914=102.401 dBuV

Power=102.401-95.2-1.25=5.951 dBm



EIRP Power=93.26+32.335-31.952= 93.643 dBuV
 Power=93.643-95.2-1.25=-2.807 dBm

8.5. POWER SPECTRAL DENSITY LIMITS

FCC §15.247 (e)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

Power Spectral Density was performed utilizing the “Method PKPSD (Peak PSD)” under KDB558074 D01 DTS Meas Guidance v03r03. Radiated test were performed for demonstrating compliance to the conducted emission requirements.

RESULTS

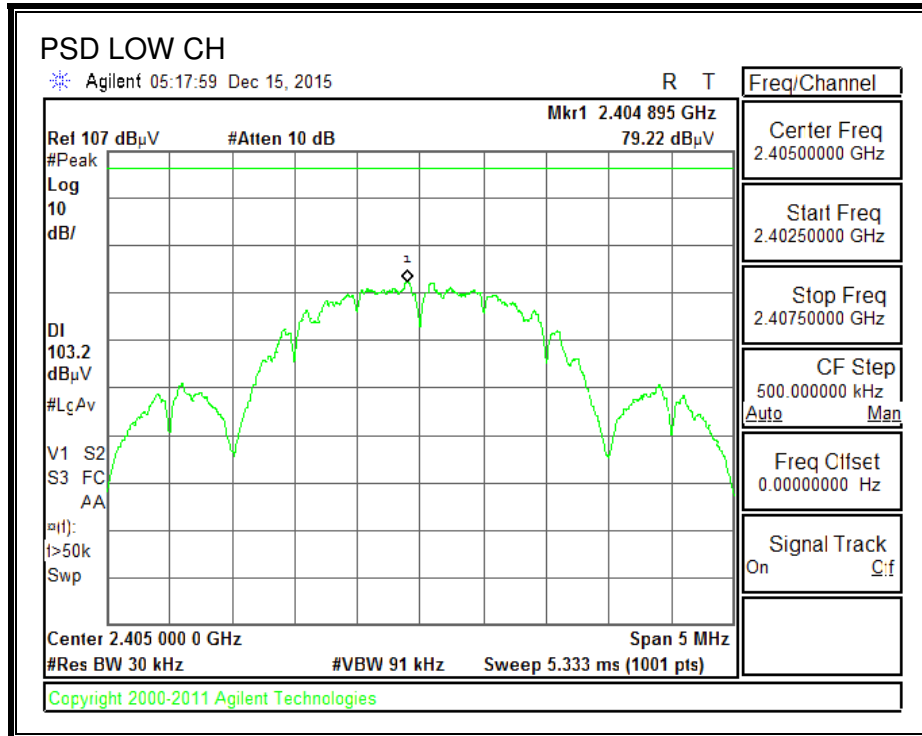
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2405	-16.98	8	-24.98
Middle	2445	-10.33	8	-18.33
High	2480	-23.64	8	-31.64

PSD was measured under radiated test configuration.

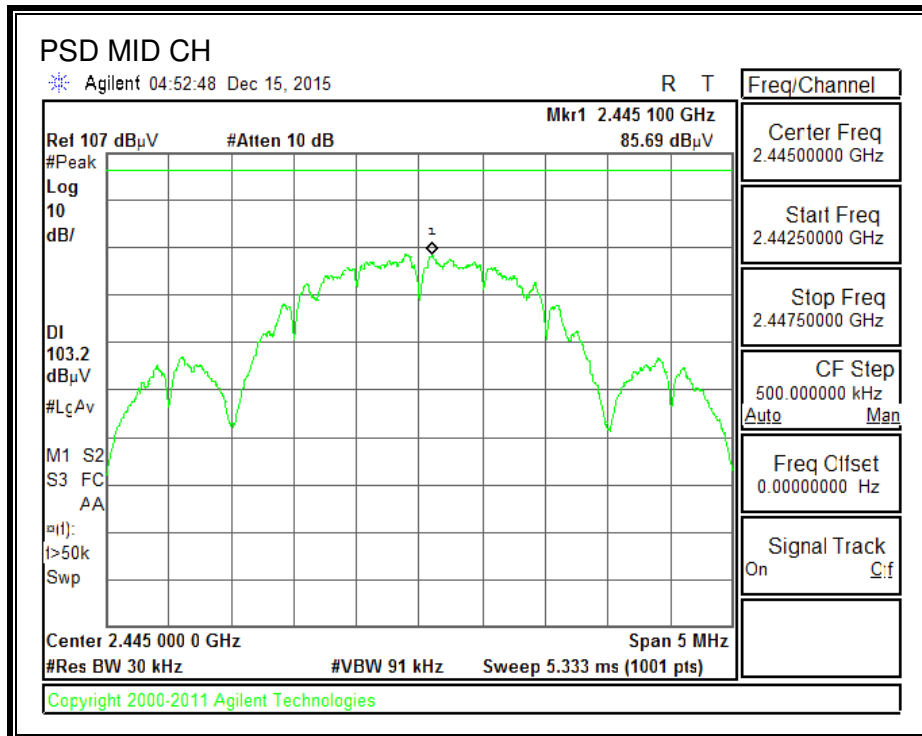
$EIRP\ PSD(\text{in dBuV}) = \text{PSA reading} + \text{Attenuation Factor} + \text{Gain/Loss}$

$PSD = EIRP\ PSD - 95.2 - \text{Antenna Gain}$

POWER SPECTRAL DENSITY

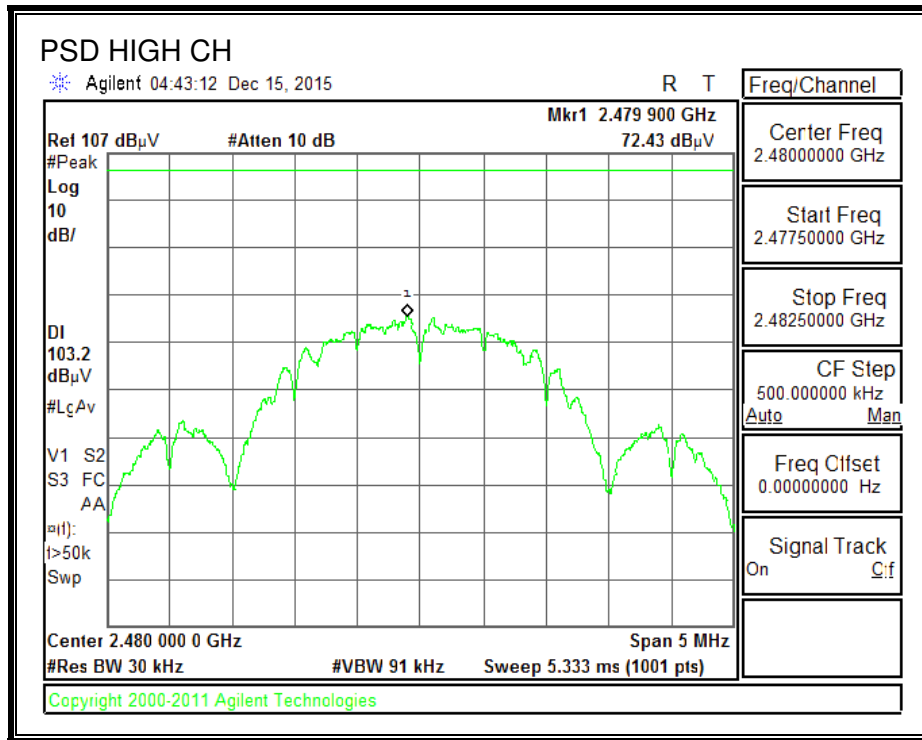


EIRP PSD=79.22+32.335-32.088=79.467 dBuV
 PSD=79.467-95.2-1.25=-16.983 dBm



EIRP PSD=85.69+32.345-31.914=86.121 dBuV

PSD=86.121-95.2-1.25=-10.329 dBm



EIRP PSD=72.43+32.335-31.952=72.813 dBuV
 PSD=72.813-95.2-1.25=-23.637 dBm

8.6. CONDUCTED SPURIOUS EMISSIONS LIMITS

FCC §15.247 (d)

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

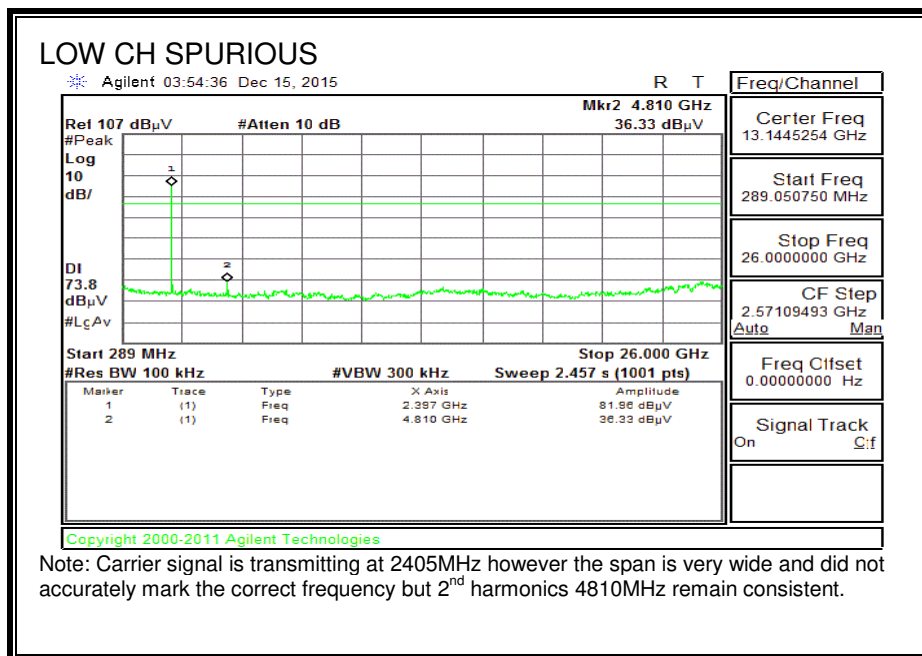
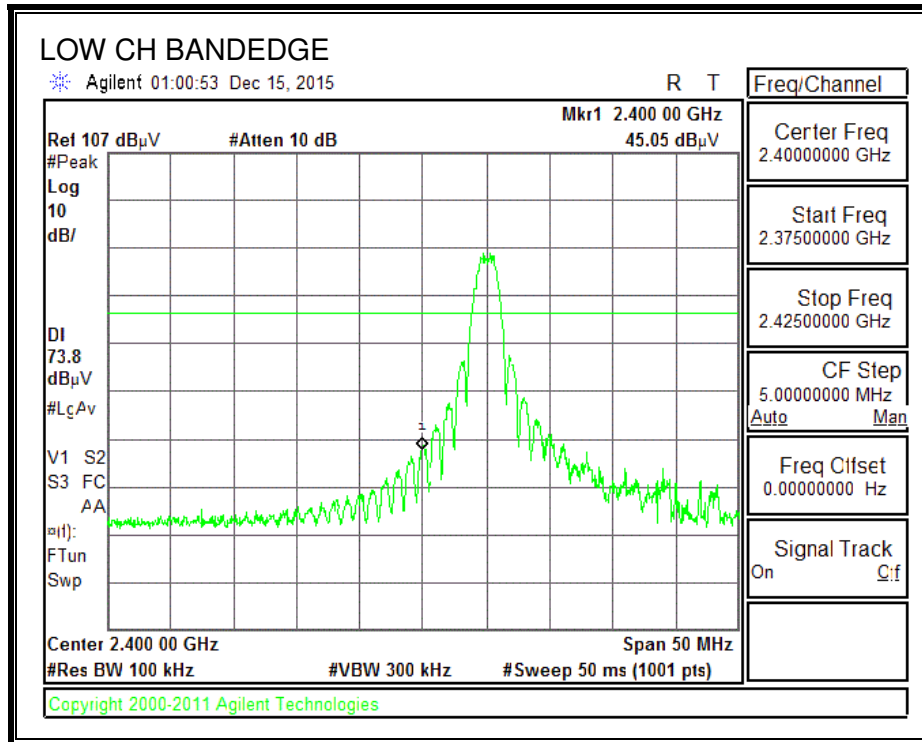
Limit was set by the mid channel as reference.

Final reading = PSA reading + Attenuation Factor + Gain/Loss – Antenna Gain
 $94.62 + 32.335 - 31.914 - 1.25 = 93.791$ dBuV

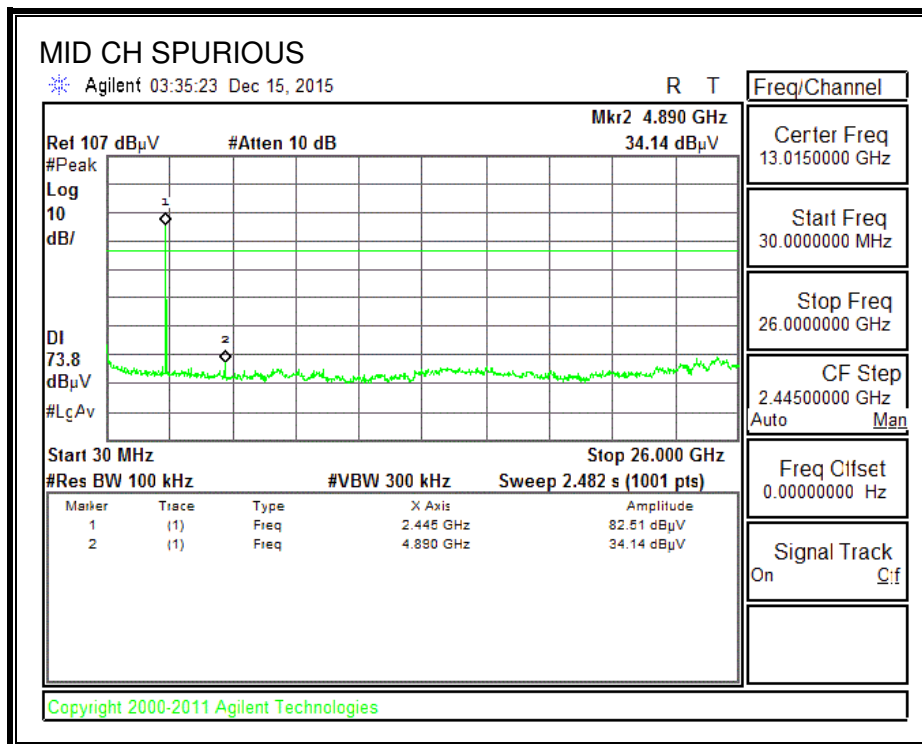
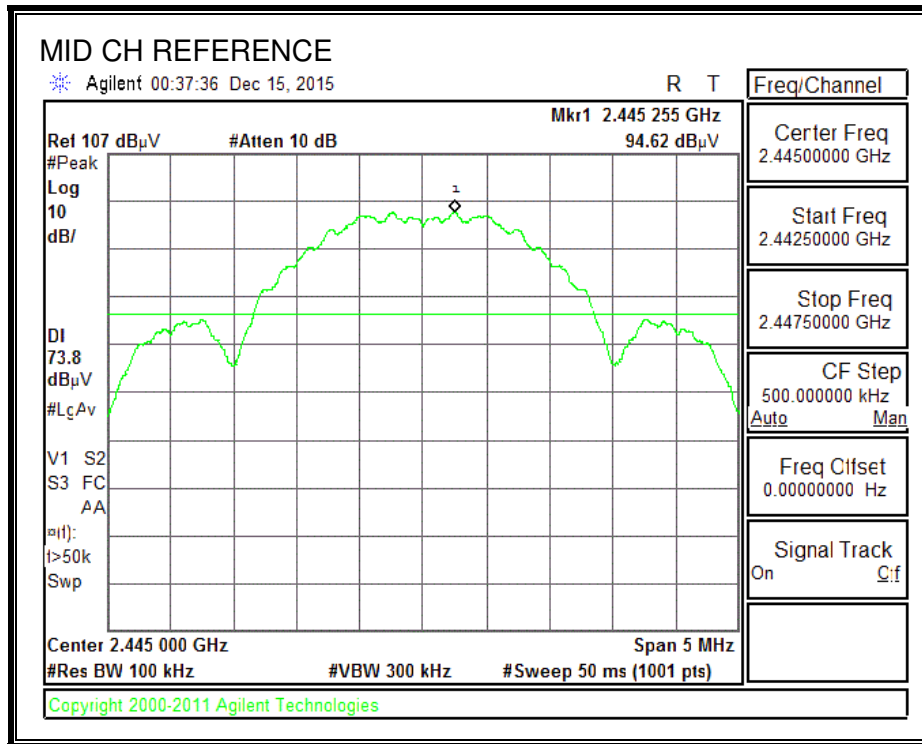
The limit line was set to 73.791 dBuV.

RESULTS

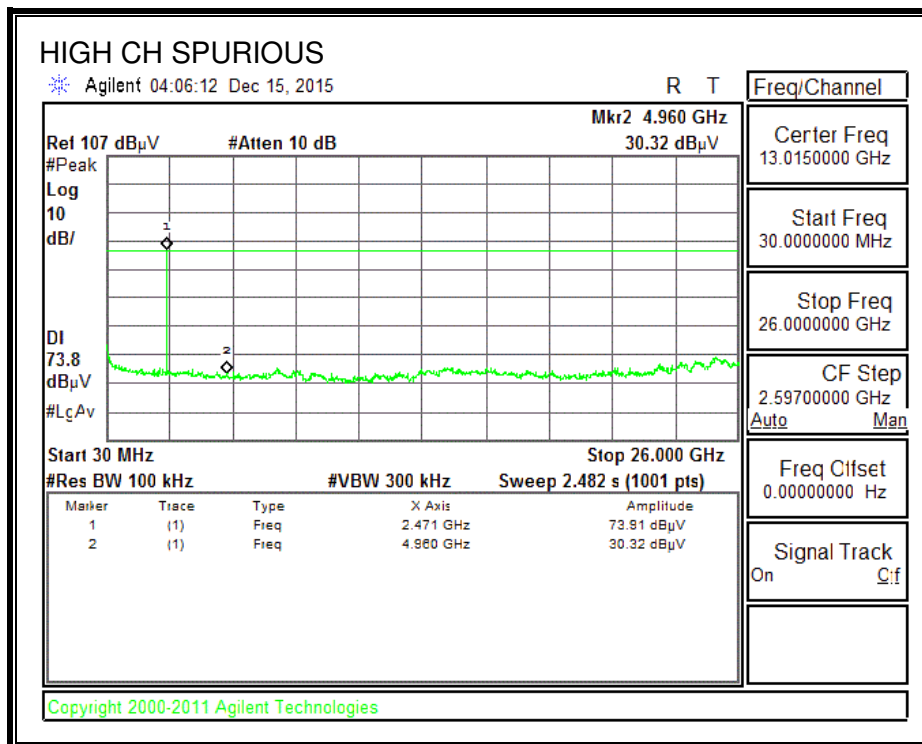
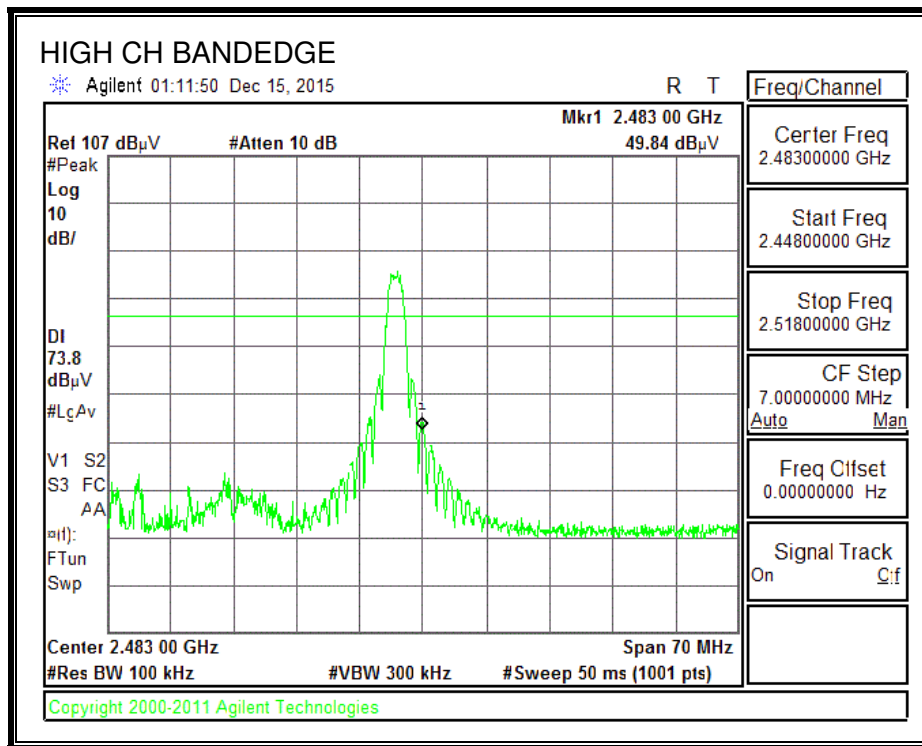
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



8.7. HARMONIC AND BANDEDGE

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 for below 1GHz and 150cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

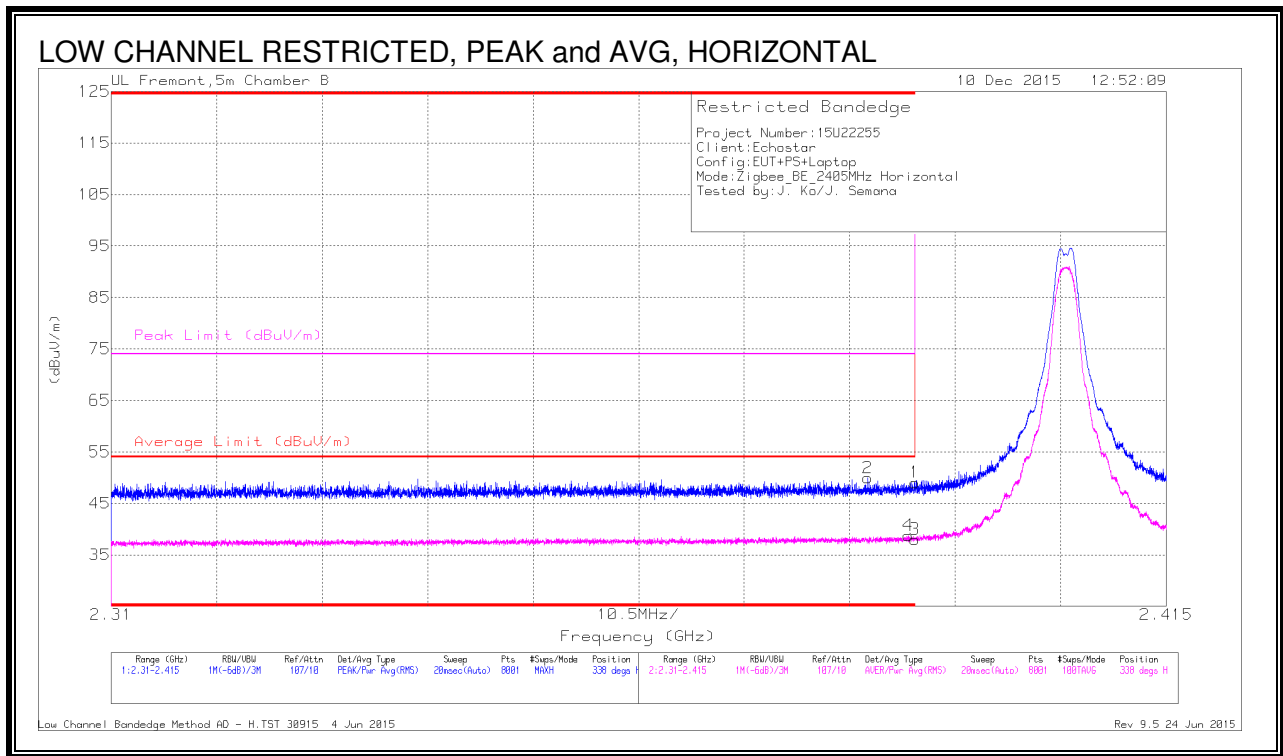
For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

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 add duty cycle factor for average measurements. Duty cycle factor = $10 \log (1/x)$, For this sample, the unit is control by test software which is transmit continues wave(duty cycle greater than 98%) .

The spectrum from 1GHz 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.

8.7.1. TRANSMITTER ABOVE 1 GHz
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

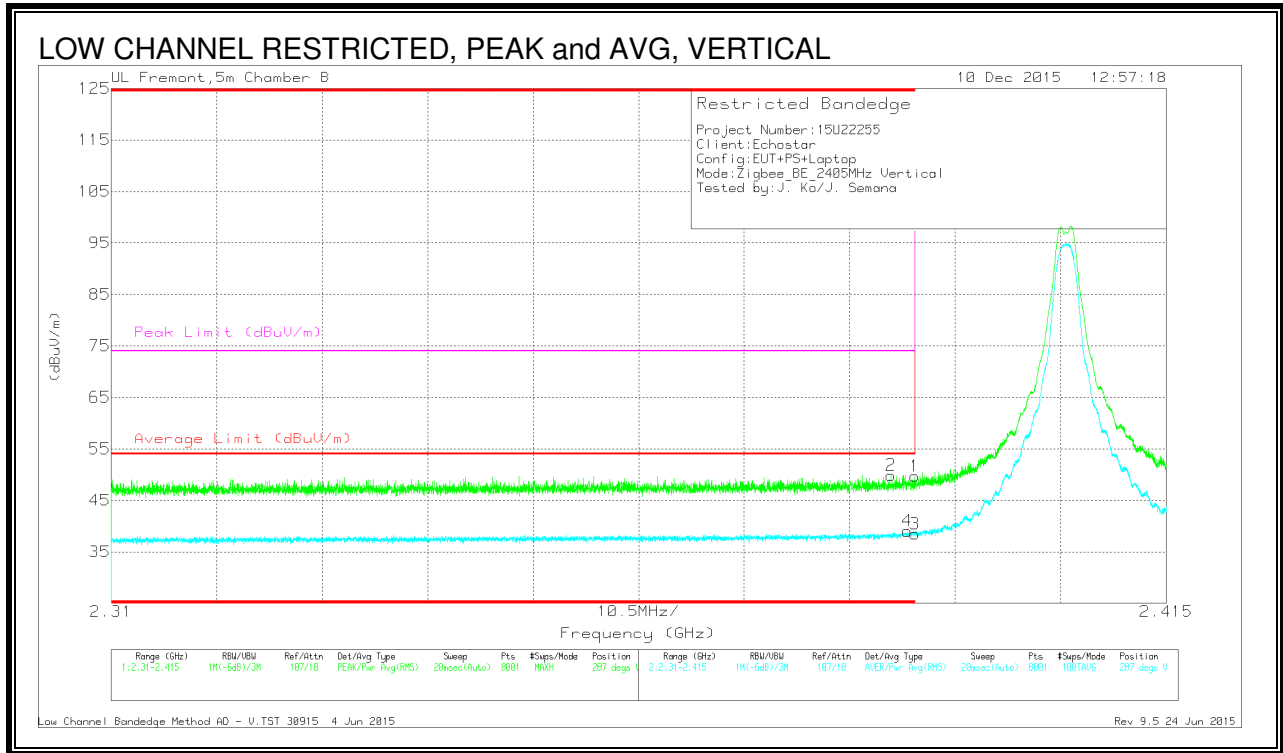


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fitr/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	* 2.39	41.14	Pk	32	-24.1	49.04	-	-	74	-24.96	338	125	H
2	* 2.385	42.03	Pk	32	-24.1	49.93	-	-	74	-24.07	338	125	H
3	* 2.39	30.11	RMS	32	-24.1	38.01	54	-15.99	-	-	338	125	H
4	* 2.389	30.86	RMS	32	-24.1	38.76	54	-15.24	-	-	338	125	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
 PK - Peak detector
 RMS - RMS detection

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

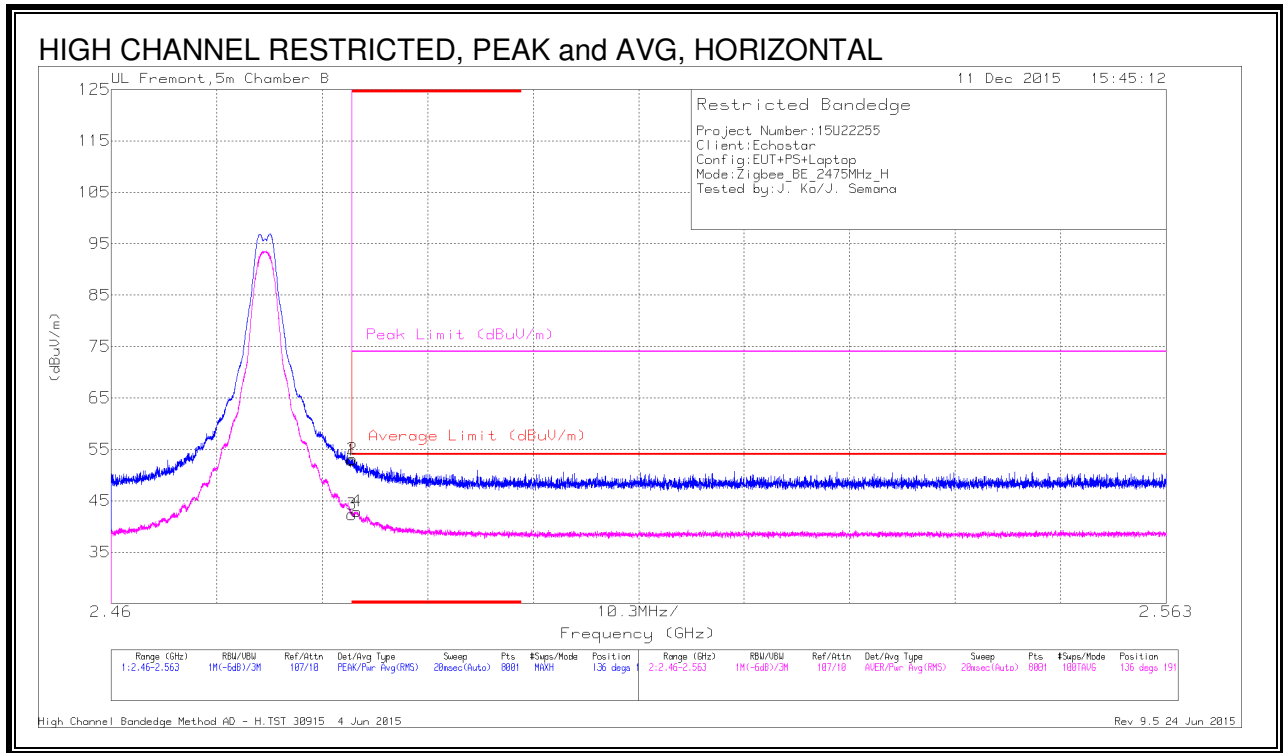


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fitr/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	* 2.39	41.82	Pk	32	-24.1	49.72	-	-	74	-24.28	287	162	V
2	* 2.388	41.96	Pk	32	-24.1	49.86	-	-	74	-24.14	287	162	V
3	* 2.39	30.56	RMS	32	-24.1	38.46	54	-15.54	-	-	287	162	V
4	* 2.389	31.15	RMS	32	-24.1	39.05	54	-14.95	-	-	287	162	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
 PK - Peak detector
 RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

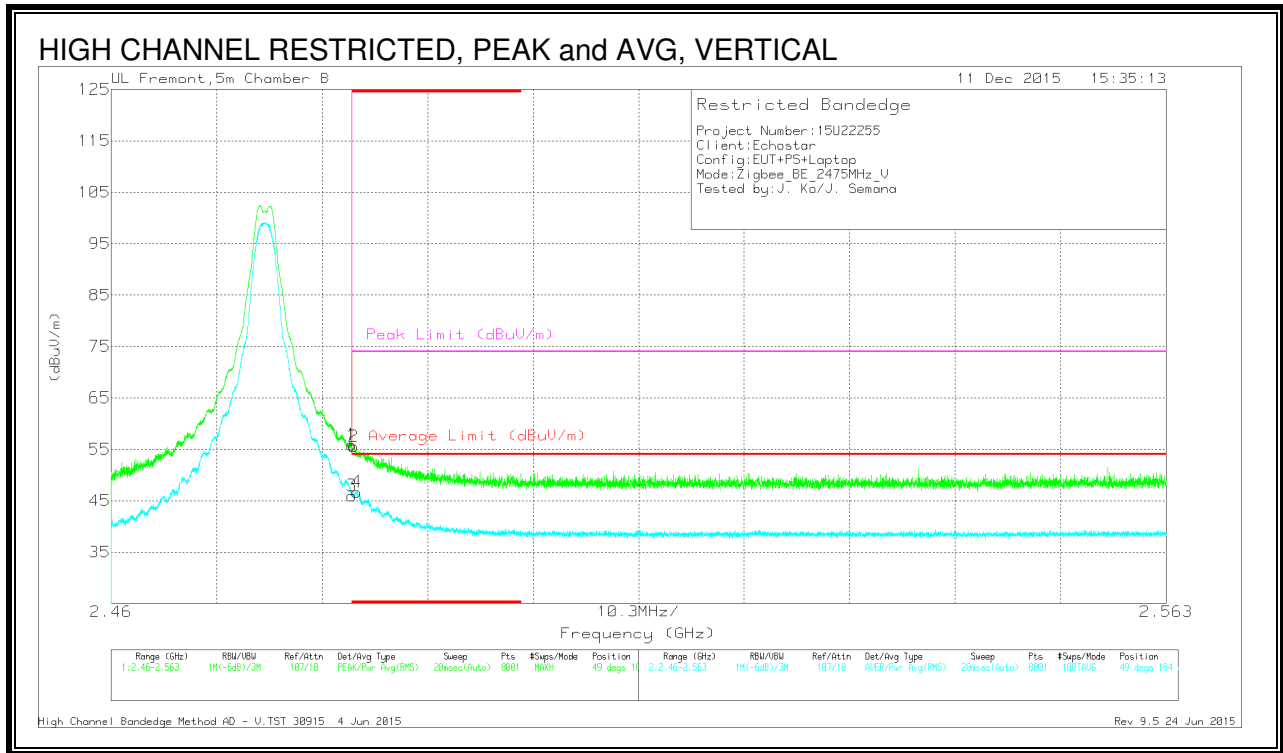


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	44.37	Pk	32.5	-24	52.87	-	-	74	-21.13	136	191	H
2	* 2.484	44.6	Pk	32.5	-24	53.1	-	-	74	-20.9	136	191	H
3	* 2.484	33.83	RMS	32.5	-24	42.33	54	-11.67	-	-	136	191	H
4	* 2.484	34.43	RMS	32.5	-24	42.93	54	-11.07	-	-	136	191	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
 PK - Peak detector
 RMS - RMS detection

RESTRICTED BANDEGE (HIGH CHANNEL, VERTICAL)

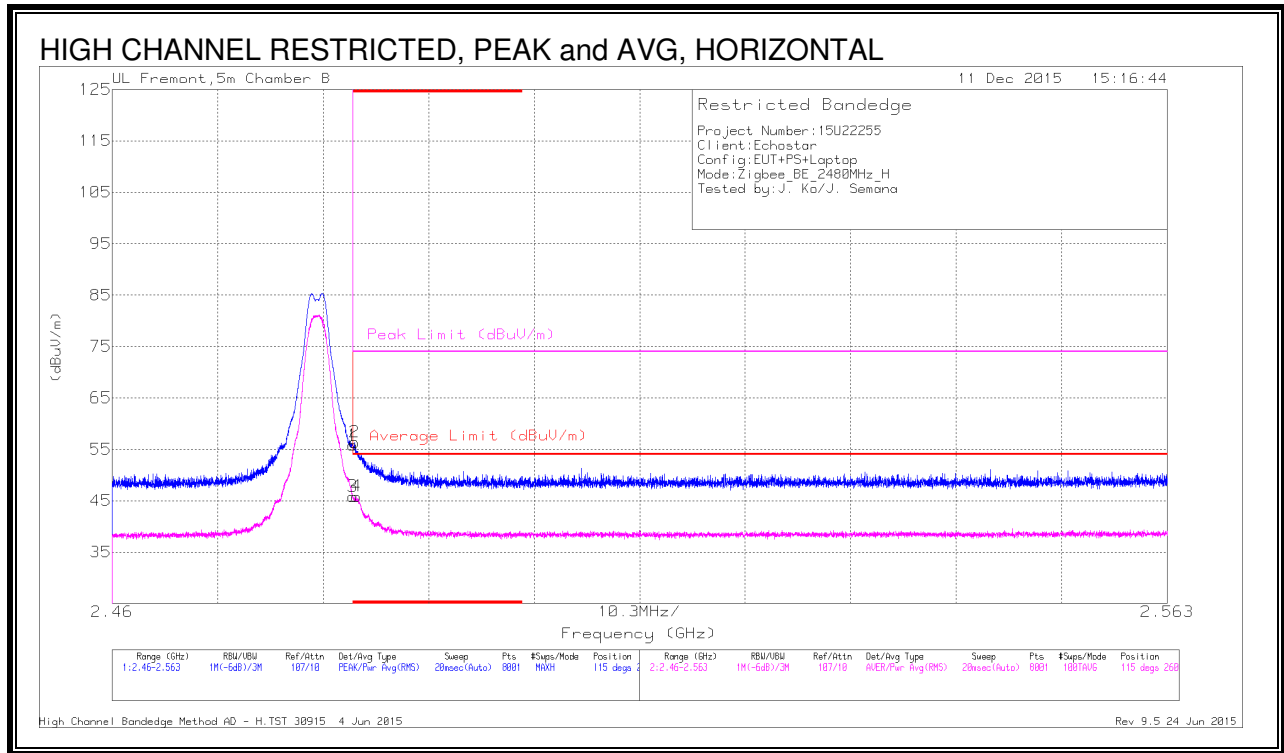


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Ftr/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	47.37	Pk	32.5	-24	55.87	-	-	74	-18.13	49	184	V
2	* 2.484	47.05	Pk	32.5	-24	55.55	-	-	74	-18.45	49	184	V
3	* 2.484	37.47	RMS	32.5	-24	45.97	54	-8.03	-	-	49	184	V
4	* 2.484	38.19	RMS	32.5	-24	46.69	54	-7.31	-	-	49	184	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
 PK - Peak detector
 RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

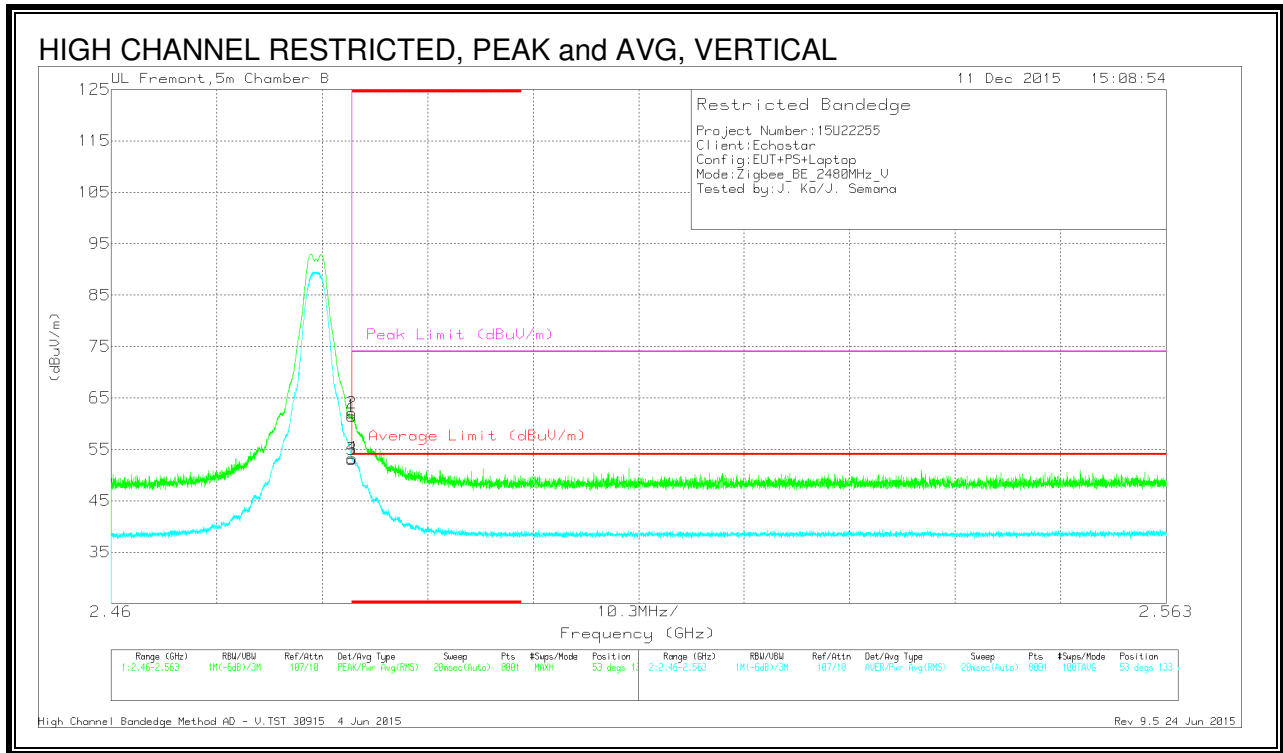


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Ftr/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	47.29	Pk	32.5	-24	55.79	-	-	74	-18.21	115	260	H
2	* 2.484	47.88	Pk	32.5	-24	56.38	-	-	74	-17.62	115	260	H
3	* 2.484	37.33	RMS	32.5	-24	45.83	54	-8.17	-	-	115	260	H
4	* 2.484	37.37	RMS	32.5	-24	45.87	54	-8.13	-	-	115	260	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
 PK - Peak detector
 RMS - RMS detection

RESTRICTED BANDEGE (HIGH CHANNEL, VERTICAL)



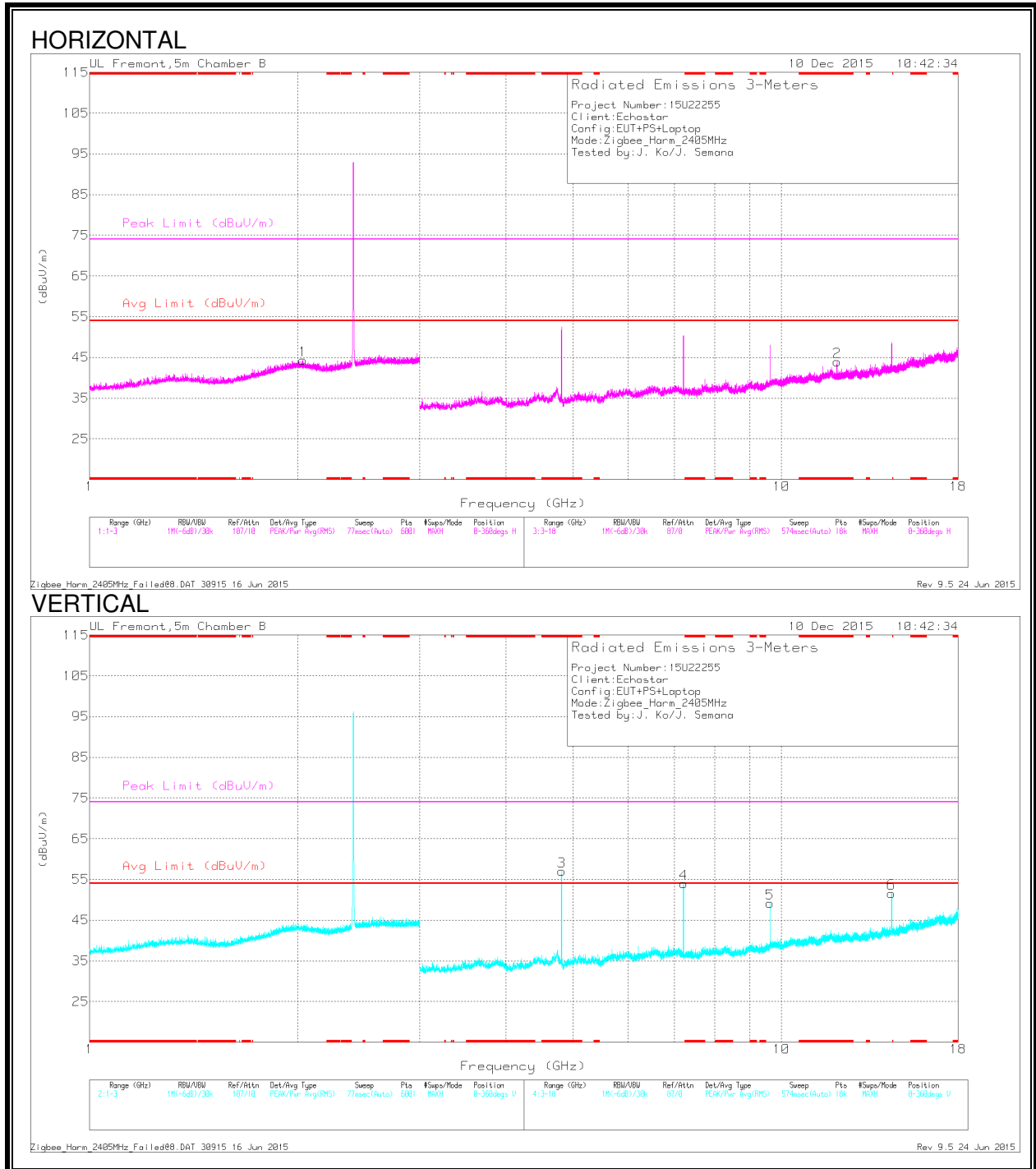
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Ftr/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	52.98	Pk	32.5	-24	61.48	-	-	74	-12.52	53	133	V
2	* 2.484	53.55	Pk	32.5	-24	62.05	-	-	74	-11.95	53	133	V
3	* 2.484	44.56	RMS	32.5	-24	53.06	54	-94	-	-	53	133	V
4	* 2.484	44.82	RMS	32.5	-24	53.32	54	-68	-	-	53	133	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
 PK - Peak detector
 RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 12.028	30.55	Pk	38.6	-25.2	43.95	-	-	74	-30.05	0-360	101	H
3	* 4.809	53.98	Pk	34.3	-31.2	57.08	-	-	74	-16.92	0-360	199	V
1	2.035	36.67	Pk	32.2	-24.5	44.37	-	-	-	-	0-360	199	H
4	7.216	48.24	Pk	35.3	-29.6	53.94	-	-	-	-	0-360	199	V
5	9.617	38.98	Pk	36.7	-26.5	49.18	-	-	-	-	0-360	199	V
6	14.427	35.33	Pk	39.6	-23.3	51.63	-	-	-	-	0-360	101	V

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

Pk - Peak detector

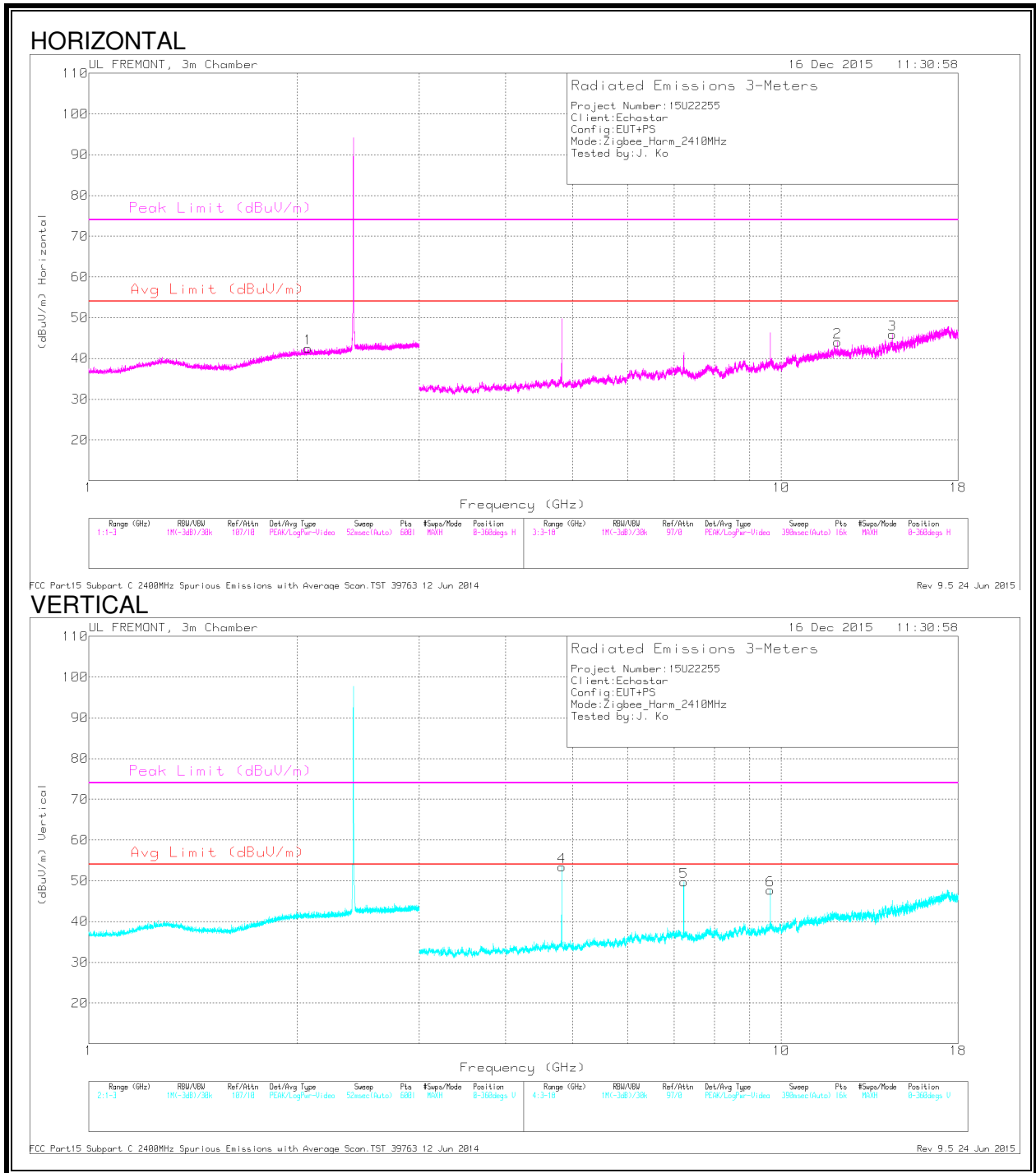
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 12.028	37.56	PK2	38.6	-25.2	50.96	-	-	74	-23.04	318	108	H
* 12.028	27.7	MAV1	38.6	-25.2	41.1	54	-12.9	-	-	318	108	H
* 4.811	54.49	PK2	34.3	-31.2	57.59	-	-	74	-16.41	142	237	V
* 4.811	49.26	MAV1	34.3	-31.2	52.36	54	-1.64	-	-	142	237	V
2.033	32.22	MAV1	32.2	-24.5	39.92	54	-14.08	-	-	1	199	H
2.036	44.04	PK2	32.1	-24.5	51.64	-	-	74	-22.36	1	199	H
7.216	54.45	PK2	35.3	-29.6	60.15	-	-	74	-13.85	144	233	H
7.216	38.41	MAV1	35.3	-29.6	44.11	54	-9.89	-	-	144	233	H
9.618	44.62	PK2	36.7	-26.5	54.82	-	-	74	-19.18	133	243	V
9.618	37.8	MAV1	36.7	-26.5	48	54	-6	-	-	133	243	V
14.427	40.85	PK2	39.6	-23.3	57.15	-	-	74	-16.85	2	101	H
14.427	26.64	MAV1	39.6	-23.3	42.94	54	-11.06	-	-	2	101	H

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

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/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	2.073	33.18	Avg	31.5	-22.2	42.48	54	-11.52	-	-	0-360	101	H
4	4.821	48.48	Avg	34	-29.1	53.38	54	-.62	-	-	0-360	100	V
5	7.229	42.22	Avg	35.6	-28.1	49.72	54	-4.28	-	-	0-360	100	V
6	9.642	34.32	Avg	36.8	-23.4	47.72	54	-6.28	-	-	0-360	100	V
2	12.048	28.31	Avg	39.1	-23.4	44.01	54	-9.99	-	-	0-360	100	H
3	14.457	29.7	Avg	39.6	-23.4	45.9	54	-8.1	-	-	0-360	100	H

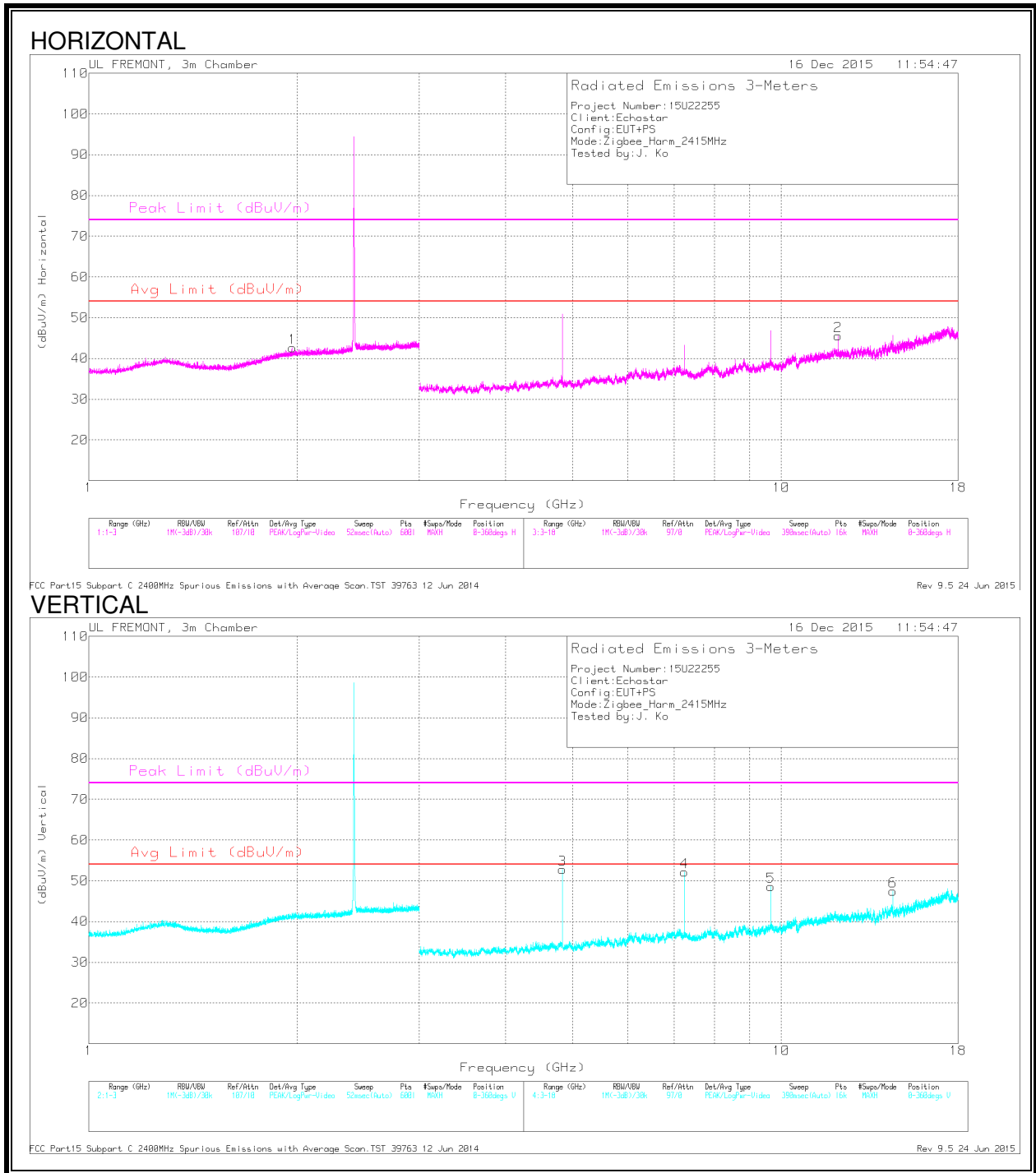
Avg - Video bandwidth < Resolution bandwidth

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.073	30.69	MAv1	31.5	-22.2	39.99	54	-14.01	-	-	1	100	H
2.074	42.62	PK2	31.5	-22.2	51.92	-	-	74	-22.08	1	100	H
4.819	52.2	PK2	34	-29.1	57.1	-	-	74	-16.9	93	116	H
4.819	46.52	MAv1	34	-29.1	51.42	54	-2.58	-	-	93	116	H
7.228	40.36	MAv1	35.6	-28.1	47.86	54	-6.14	-	-	93	100	V
7.229	46.89	PK2	35.6	-28.1	54.39	-	-	74	-19.61	93	100	V
9.642	37.95	PK2	36.8	-23.4	51.35	-	-	74	-22.65	93	100	V
9.642	28.58	MAv1	36.8	-23.4	41.98	54	-12.02	-	-	93	100	V
12.05	36.2	PK2	39.1	-23.4	51.9	-	-	74	-22.1	1	100	H
12.05	24.35	MAv1	39.1	-23.4	40.05	54	-13.95	-	-	1	100	H
14.457	37.37	PK2	39.6	-23.4	53.57	-	-	74	-20.43	1	100	H
14.457	26.23	MAv1	39.6	-23.4	42.43	54	-11.57	-	-	1	100	H

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/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	1.969	33.68	Avg	31.4	-22.5	42.58	54	-11.42	-	-	0-360	200	H
3	4.831	47.81	Avg	34	-29	52.81	54	-1.19	-	-	0-360	100	V
4	7.247	44.52	Avg	35.6	-28	52.12	54	-1.88	-	-	0-360	100	V
5	9.661	35.25	Avg	36.8	-23.5	48.55	54	-5.45	-	-	0-360	100	V
2	12.078	30.4	Avg	39	-23.9	45.5	54	-8.5	-	-	0-360	100	H
6	14.487	31.74	Avg	39.7	-24	47.44	54	-6.56	-	-	0-360	100	V

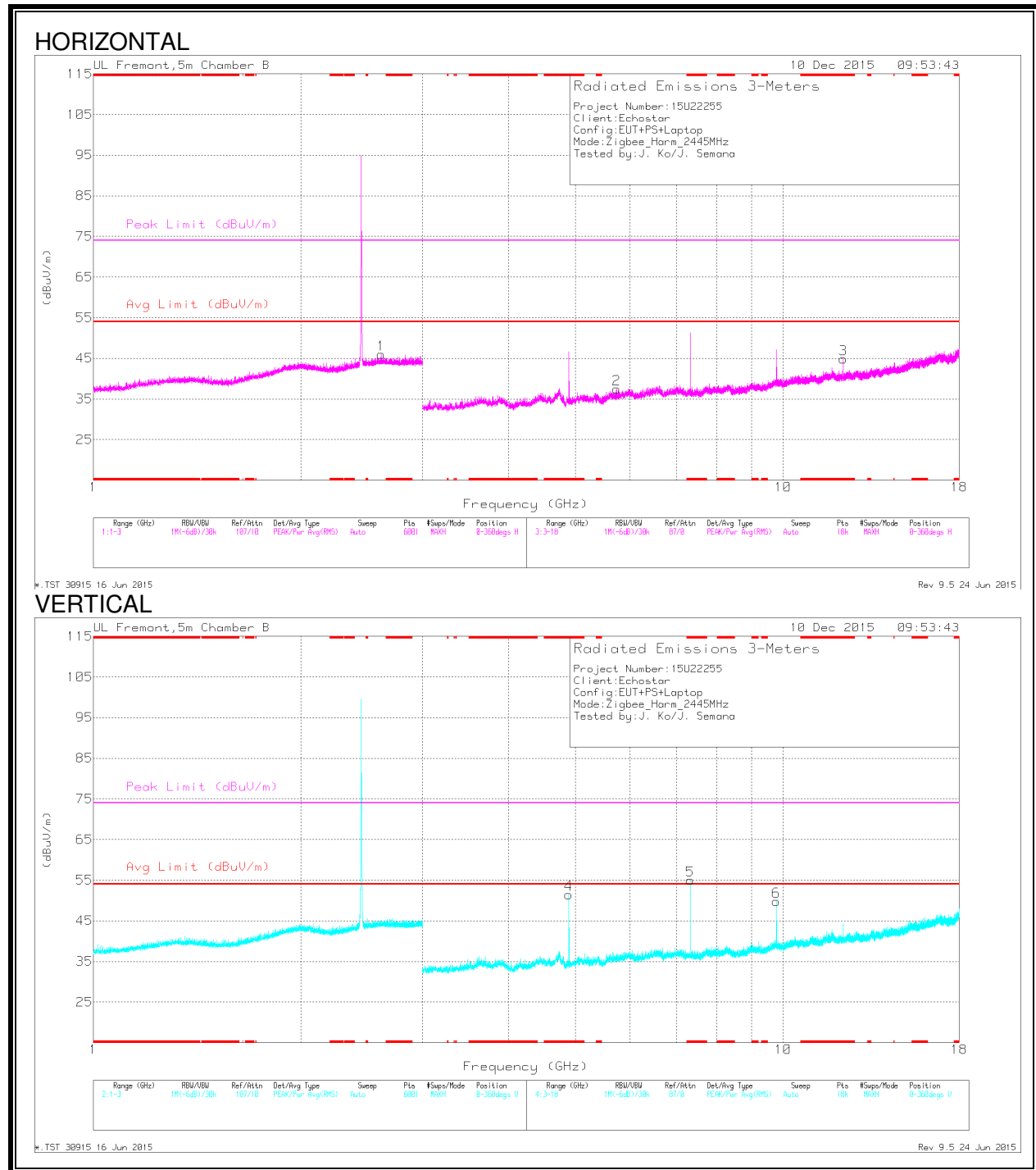
Avg - Video bandwidth < Resolution bandwidth

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.97	42.47	PK2	31.4	-22.4	51.47	-	-	74	-22.53	0	200	H
1.97	30.72	MAv1	31.4	-22.4	39.72	54	-14.28	-	-	0	200	H
4.829	53.39	PK2	34	-29.1	58.29	-	-	74	-15.71	82	129	V
4.829	47.99	MAv1	34	-29.1	52.89	54	-1.11	-	-	82	129	V
7.246	50.81	PK2	35.6	-28	58.41	-	-	74	-15.59	131	106	V
7.247	44.76	MAv1	35.6	-28	52.36	54	-1.64	-	-	131	106	V
9.662	42.43	PK2	36.8	-23.5	55.73	-	-	74	-18.27	131	100	V
9.662	35.2	MAv1	36.8	-23.5	48.5	54	-5.5	-	-	131	100	V
12.078	36.63	PK2	39	-23.9	51.73	-	-	74	-22.27	0	100	H
12.08	24.81	MAv1	39	-23.9	39.91	54	-14.09	-	-	0	100	H
14.487	38.38	PK2	39.7	-24	54.08	-	-	74	-19.92	131	100	V
14.487	27.98	MAv1	39.7	-24	43.68	54	-10.32	-	-	131	100	V

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 12.223	31.08	Pk	38.6	-24.8	44.88	-	-	74	-29.12	0-360	101	H
4	* 4.889	49.8	Pk	34.2	-32.5	51.5	-	-	74	-22.5	0-360	199	V
5	* 7.333	49.46	Pk	35.3	-29.8	54.96	-	-	74	-19.04	0-360	199	V
1	2.612	37.09	Pk	32.8	-23.9	45.99	-	-	-	-	0-360	199	H
2	5.738	34	Pk	35.1	-31.6	37.5	-	-	-	-	0-360	101	H
6	9.781	38.76	Pk	37	-26	49.76	-	-	-	-	0-360	199	V

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

Pk - Peak detector

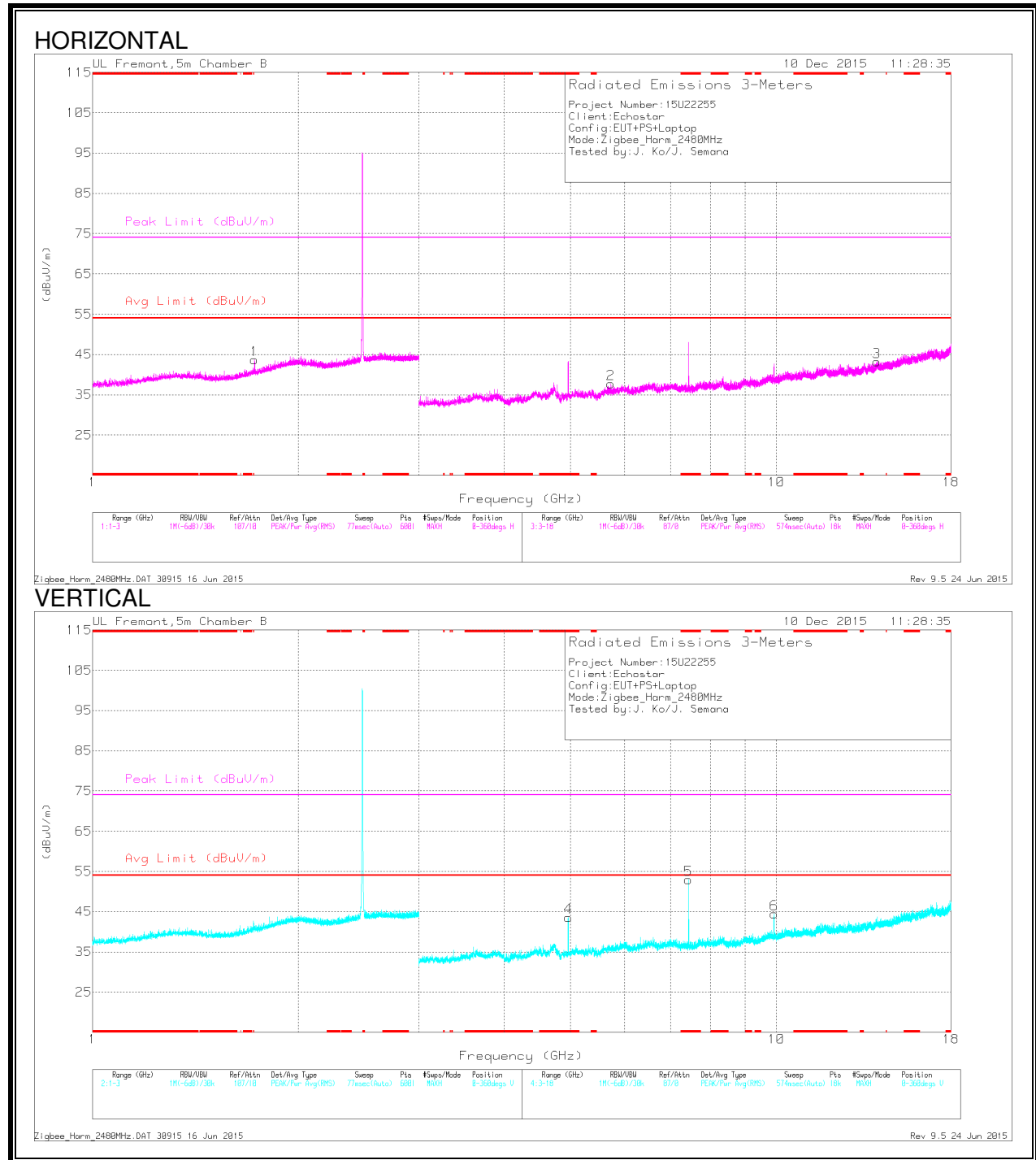
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 12.223	40.43	PK2	38.6	-24.8	54.23	-	-	74	-19.77	323	102	H
* 12.223	31.07	MAV1	38.6	-24.8	44.87	54	-9.13	-	-	323	102	H
* 7.333	52.53	PK2	35.3	-29.8	58.03	-	-	74	-15.97	135	320	V
* 7.334	46.97	MAV1	35.3	-29.8	52.47	54	-1.53	-	-	135	320	V
* 4.889	54.14	PK2	34.2	-32.5	55.84	-	-	74	-18.16	149	158	V
* 4.889	48.77	MAV1	34.2	-32.5	50.47	54	-3.53	-	-	149	158	V
2.612	31.95	MAV1	32.8	-23.9	40.85	54	-13.15	-	-	135	200	H
2.613	43.81	PK2	32.8	-23.9	52.71	-	-	74	-21.29	135	200	H
5.738	30.18	MAV1	35	-31.6	33.58	54	-20.42	-	-	135	102	H
5.739	41.26	PK2	35.1	-31.6	44.76	-	-	74	-29.24	135	102	H
9.782	44.49	PK2	37	-26	55.49	-	-	74	-18.51	156	213	V
9.782	37.59	MAV1	37	-26	48.59	54	-5.41	-	-	156	213	V

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

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 4.961	41.43	Pk	34.1	-31.9	43.63	-	-	74	-30.37	0-360	102	V
5	* 7.441	46.82	Pk	35.3	-29.2	52.92	-	-	74	-21.08	0-360	199	V
1	1.725	38.45	Pk	30	-24.8	43.65	-	-	-	-	0-360	199	H
2	5.722	34.16	Pk	35	-31.4	37.76	-	-	-	-	0-360	199	H
6	9.921	33.58	Pk	37.1	-26.2	44.48	-	-	-	-	0-360	199	V
3	14.024	27.54	Pk	39.1	-23.4	43.24	-	-	-	-	0-360	199	H

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

Pk - Peak detector

Radiated Emissions

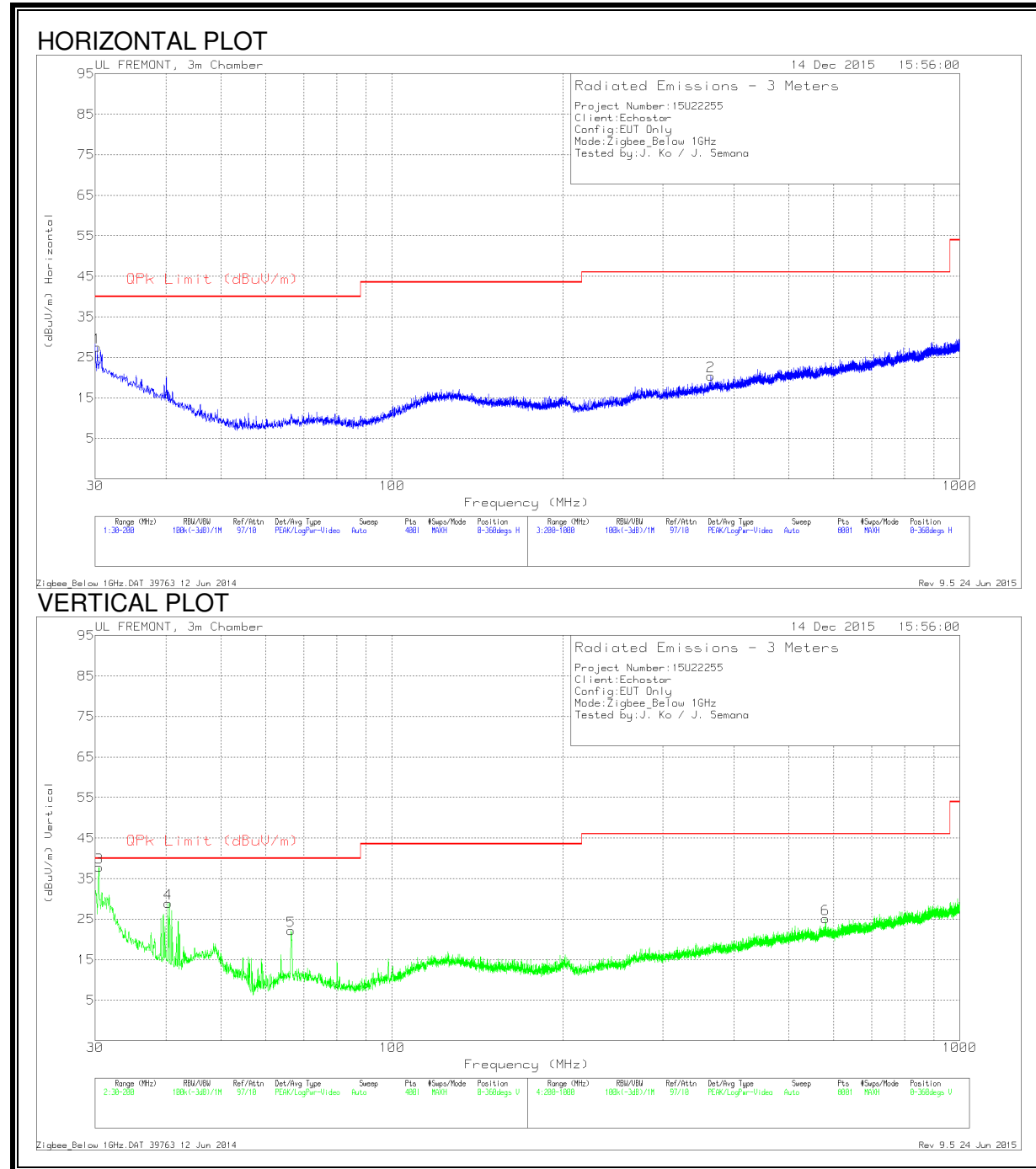
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.441	49.61	PK2	35.3	-29.2	55.71	-	-	74	-18.29	133	282	V
* 7.441	43.34	MAV1	35.3	-29.2	49.44	54	-4.56	-	-	133	282	V
* 4.961	48.16	PK2	34.1	-31.9	50.36	-	-	74	-23.64	308	137	V
* 4.959	40.24	MAV1	34.1	-32	42.34	54	-11.66	-	-	308	137	V
1.724	43.86	PK2	30	-24.8	49.06	-	-	74	-24.94	1	198	H
1.726	32.58	MAV1	30	-24.8	37.78	54	-16.22	-	-	1	198	H
5.722	30.33	MAV1	35	-31.4	33.93	54	-20.07	-	-	1	198	H
5.723	41.47	PK2	35	-31.4	45.07	-	-	74	-28.93	1	198	H
9.922	41.1	PK2	37.1	-26.2	52	-	-	74	-22	135	186	V
9.922	32.58	MAV1	37.1	-26.2	43.48	54	-10.52	-	-	135	186	V
14.023	35.37	PK2	39.1	-23.4	51.07	-	-	74	-22.93	1	198	H
14.025	24.17	MAV1	39.1	-23.4	39.87	54	-14.13	-	-	1	198	H

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

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

8.8. WORST-CASE BELOW 1 GHz SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.255	33.05	Pk	21.6	-27.2	27.45	40	-12.55	0-360	200	H
3	30.4675	43.59	Pk	21.4	-27.2	37.79	40	-2.21	0-360	100	V
4	40.3275	41.96	Pk	14	-27	28.96	40	-11.04	0-360	100	V
5	66.4225	40.75	Pk	8.1	-26.7	22.15	40	-17.85	0-360	100	V
2	364.3	30.16	Pk	14.9	-24.6	20.46	46.02	-25.56	0-360	400	H
6	580.15	31.14	Pk	18.7	-24.8	25.04	46.02	-20.98	0-360	300	V

Pk - Peak detector

Radiated Emissions

Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
30.0564	33.31	Qp	21.7	-27.3	27.71	40	-12.29	274	159	V

Qp - Quasi-Peak detector

9. POWER SETTING TABLE

Output Peak Power in dBm		Channel ID	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
SKU	Countries	Center Freq.	2405	2410	2415	2420	2425	2430	2435	2440	2445	2450	2455	2460	2465	2470	2475	2480
SISO	US & IC	Zigbee	4.9	5.27	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	-2.8