



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

**HOME AUTOMATION GATEWAY PRODUCT: 802.11a/b/g/n 2x2 MIMO,
BLUETOOTH, BLUETOOTH LOW ENERGY, ZigBee and Z-WAVE**

MODEL NUMBER: ID: 087

FCC ID: DKNCS08

REPORT NUMBER: R10526502-RF6A

ISSUE DATE: 2015-05-27

Prepared for
**ECHOSTAR TECHNOLOGIES LLC
90 INVERNESS CIRCLE EAST
ENGLEWOOD
CO, 80112, USA**

Prepared by
**UL LLC
12 LABORATORY DR.
RESEARCH TRIANGLE PARK, NC 27709 USA
TEL: (919) 549-1400**



NVLAP LAB CODE 200246-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	2015-05-27	Initial Issue	Jeff Moser

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. CALIBRATION AND UNCERTAINTY	5
4.1. MEASURING INSTRUMENT CALIBRATION	5
4.2. SAMPLE CALCULATION	5
4.3. MEASUREMENT UNCERTAINTY	6
5. EQUIPMENT UNDER TEST	7
5.1. DESCRIPTION OF EUT	7
5.2. MAXIMUM OUTPUT E-FIELD STRENGTH	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	8
5.4. SOFTWARE AND FIRMWARE	8
5.5. WORST-CASE CONFIGURATION AND MODE	8
5.6. DESCRIPTION OF TEST SETUP	9
6. TEST AND MEASUREMENT EQUIPMENT	11
7. TEST RESULTS	12
7.1. 99% and 20dB BANDWIDTH	12
7.2. RADIATED EMISSIONS	16
7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION	17
7.2.2. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz	23
7.2.3. WORST-CASE BELOW 1 GHz	26
8. AC POWER LINE CONDUCTED EMISSIONS	27
9. SETUP PHOTOS	30

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ECHOSTAR TECHNOLOGIES LLC
90 INVERNESS CIRCLE EAST
ENGLEWOOD CO, 80112, USA

EUT DESCRIPTION: HOME AUTOMATION GATEWAY PRODUCT

MODEL: ID: 087

SERIAL NUMBER: FCC4

DATE TESTED: March 30, 2015 – April 10, 2015

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

UL LLC 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 LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 LLC By:

Prepared By:



Bart Mucha
EMC Staff Engineer
UL – Consumer Technology Division



Jeff Moser
EMC Program Manager
UL – Consumer Technology Division

2. TEST METHODOLOGY

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

Note – Radiated testing above 1GHz was performed on a 1.5m table height, per ANSI C63.10: 2013. All other testing was performed per ANSI C63.10: 2009.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA.

12 Laboratory Dr., RTP, NC 27709	
☐	Chamber A
☒	Chamber C

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2002460.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:

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

4.3. MEASUREMENT UNCERTAINTY

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

Test	Uncertainty
Conducted Emissions (0.150-30MHz)	+/- 2.37 dB
Radiated Emissions (30-1000 MHz)	+/- 6.04 dB (3m)
Radiated Emissions (1-6 GHz)	+/- 5.96 dB
Radiated Emissions (6-18 GHz)	+/- 6.10 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT, EchoStar's ID:087 Home Automation Gateway Product, is a controller with a portfolio of connected devices offered as part of connected home services which allows the user to manage their home automation connected devices on the TV and their connected mobile hand held devices.

The EUT contains an 802.11a/b/g/n (n - 20MHz/40MHz) 2x2 MIMO transceiver, along with Bluetooth, Bluetooth Low Energy, ZigBee and Z-Wave (908 MHz and 916 MHz) transceivers.

The Z Wave radio utilizes FSK modulation at 9kpbs, 40kbps, and 100kbps. For operation in the 9kbps and 40kbps modes the radio operates at 908.4 or 908.42MHz. For operation in the 100kbps mode the radio operates at 916MHz.

The Z-wave Plus 900MHz radio in the ID:087 is derived from the Sigma Designs Inc. SD3503A-CNE3 chipset.

This report covers the Z-Wave radio. Other reports were issued to cover the other radio technologies:

- R10526502-RF1: 802.11 b/g/n 2.4 GHz
- R10526502-RF2: 802.11 a/n 5 GHz
- R10526502-RF3: Bluetooth
- R10526502-RF4: Bluetooth Low Energy
- R10526502-RF5: ZigBee

5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output quasi-peak (QP) E-field as follows:

Frequency Range (MHz)	Mode	Output QP E-field Strength (dBuV/m)
908.4	40 kbps	90.3
908.42	9.6kbps	90.4
916	100 kbps	89.9

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The Z-wave antenna is a trace antenna on the PCB. The trace antenna has a gain of 1.6dBi.

The 802.11a/b/g/n 2.4/5GHz radio uses two Airgain, model N2420DS series antennas.

WLAN Antenna 0 has a gain of 3.1dBi in the 2.4GHz band and 2.5dBi in the 5GHz band.
WLAN Antenna 1 has a gain of 3.1dBi in the 2.4GHz band and 2.5dBi in the 5GHz band.

The Zigbee antenna is a trace antenna on the PCB. The trace antenna has a gain of 3dBi.

The Bluetooth antenna is a trace antenna on the PCB. The trace antenna has a gain of 3dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware in all units was: Linux kernel version 3.1.10

The driver for Z-wave: ZWave test ZM5304

The driver SW for Zigbee: Nodetest version 1.0

The driver for Bluetooth: HCI Control 1.0

The driver for Wi-Fi: Linux MT7662 0.0.00

The test utility SW: Python Test Scripts rev. 1.0

5.5. WORST-CASE CONFIGURATION AND MODE

The device is a table-top device and was tested in this orientation. The worst-case channel is determined as the channel with the highest output quasi-peak electric-field strength.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
EUT AC adapter	LITEON	PB-1180-2ES1	ETC1444046079	-
Laptop PC	HP	EliteBook 8470p	CNU342CL9Z	-
Laptop PC AC adapter	HP	677774-001	WCNXA0C3U5IA7F	

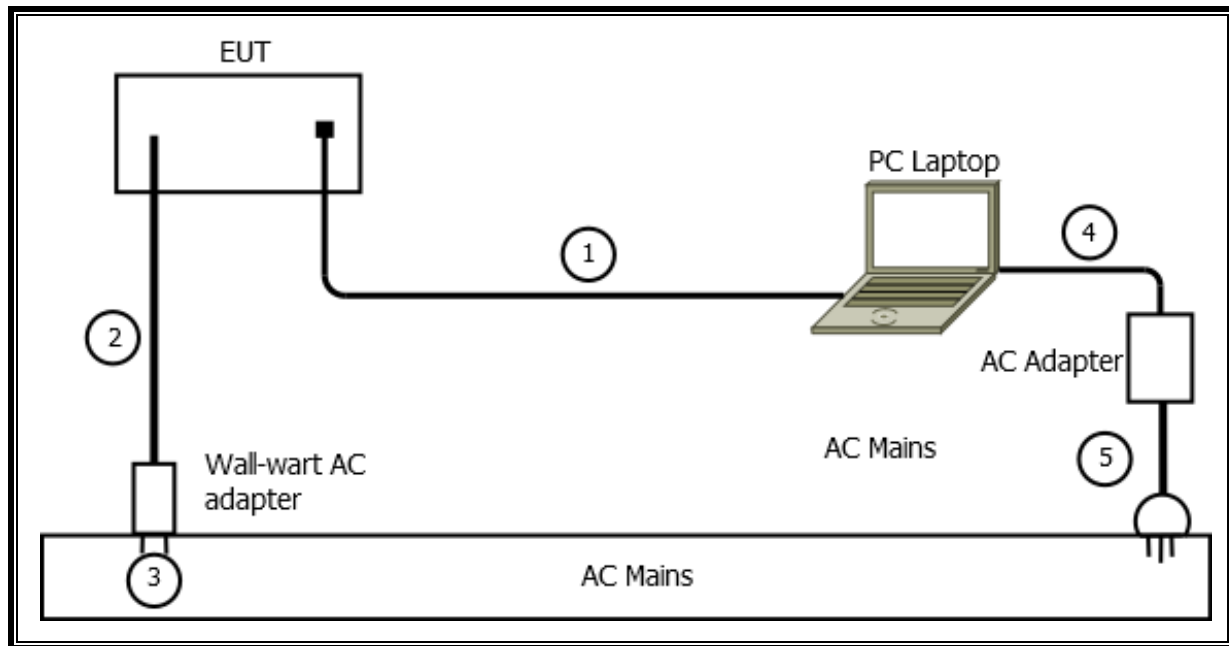
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Ethernet	1	RJ45	CAT5UTP	15	Connection between laptop PC and EUT used to control the transmitter function of the EUT.
2	DC (12V)	1	2C DC	Unshielded	1.8	Wall-wart AC adapter DC output to EUT. Non-detachable.
3	AC	1	2C AC	N/A	0	Wall-wart AC adapter's AC input.
4	DC	1	2C DC	Unshielded	1.8	Laptop AC adapter output to laptop PC. Non-detachable
5	AC	1	3C AC	Unshielded	1.8	Laptop PC power adapter AC input. Detachable.

TEST SETUP

The EUT was configured as a table-top device connected to a located laptop PC over an Ethernet cable. This Ethernet connection was used to control the transmitter function of the EUT.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Radiated Disturbance Emissions (E-field) – Chamber C

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0066	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB1	2014-07-10	2015-07-31
AT0062	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2014-07-22	2015-07-31
SAC_G (Hybrid)	Gain-Loss string for Hybrid antenna at 3m	Various	Various	2015-02-01	2016-02-29
SAC_G (3117)	Gain-Loss string for 3117 antenna at 3m	Various	Various	2015-02-01	2016-02-29
SA0018	Spectrum Analyzer	Agilent	N9030A	2014-06-26	2015-06-30
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
HPF009	1GHz High-pass Filter	Micro-Tronics	HPM17672	2015-01-28	2016-01-31
HI0069	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2014-06-27	2015-06-27

Power-line Conducted Disturbance Emissions - Voltage

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0021	EMI Test Receiver 9kHz-3.6GHz	Rohde & Schwarz	ESR3	2014-05-26	2015-05-31
ATA509	Coaxial cable, 20 ft., BNC -male to BNC-male	UL	RG-223	2014-09-15	2015-07-31
HI0041	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2015-03-23	2016-03-31
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
ATA508	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM 7600	2014-09-03	2015-09-30
LISN002 (EUT)	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2014-09-04	2015-09-30
LISN003 (AUX)	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2014-09-04	2015-09-30

7. TEST RESULTS

7.1. 99% and 20dB BANDWIDTH

LIMITS

None; for reporting purposes only.

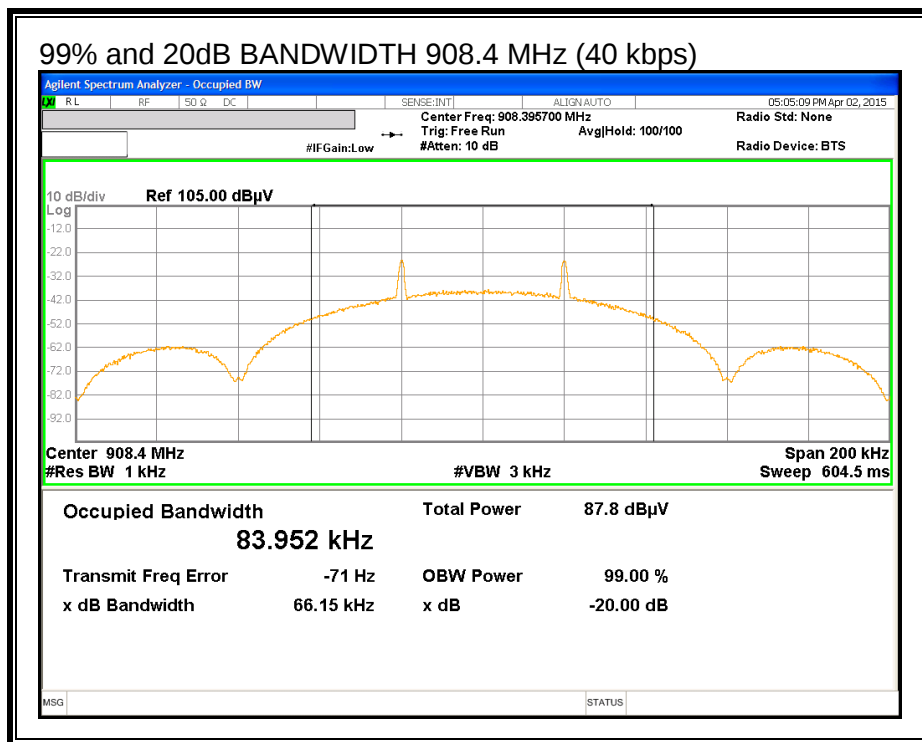
TEST PROCEDURE

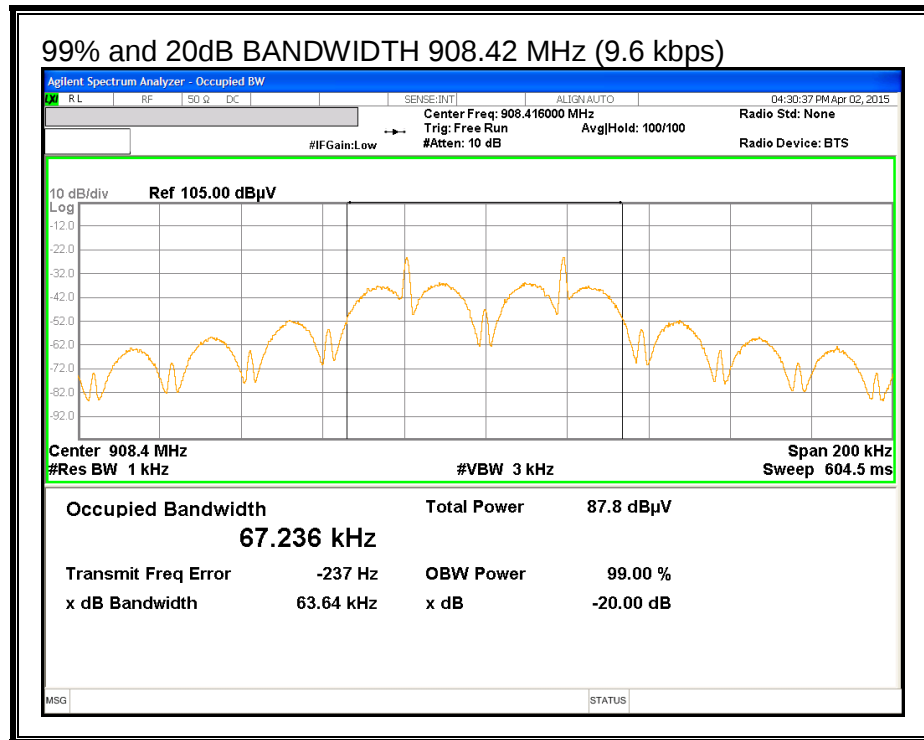
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 5% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

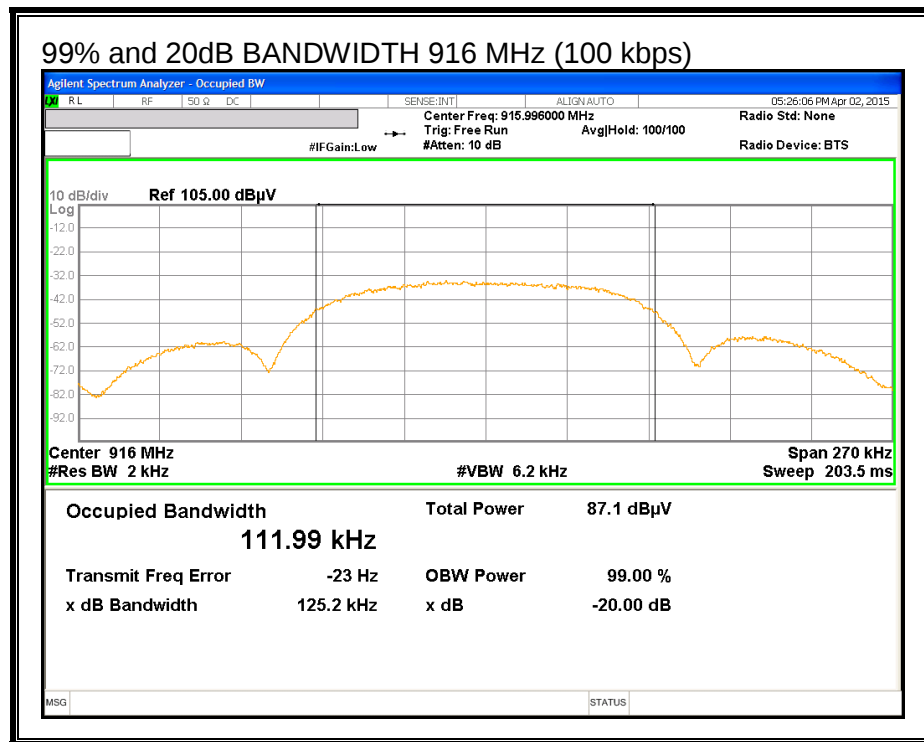
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (kHz)	20dB (kHz)
908.4 (40 kbps)	908.4	83.95	66.15
908.42 (9.6 kbps)	908.42	67.24	63.64
916 (100 kbps)	916	111.99	125.2

99% and 20dB BANDWIDTH







7.2. RADIATED EMISSIONS

LIMIT

FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

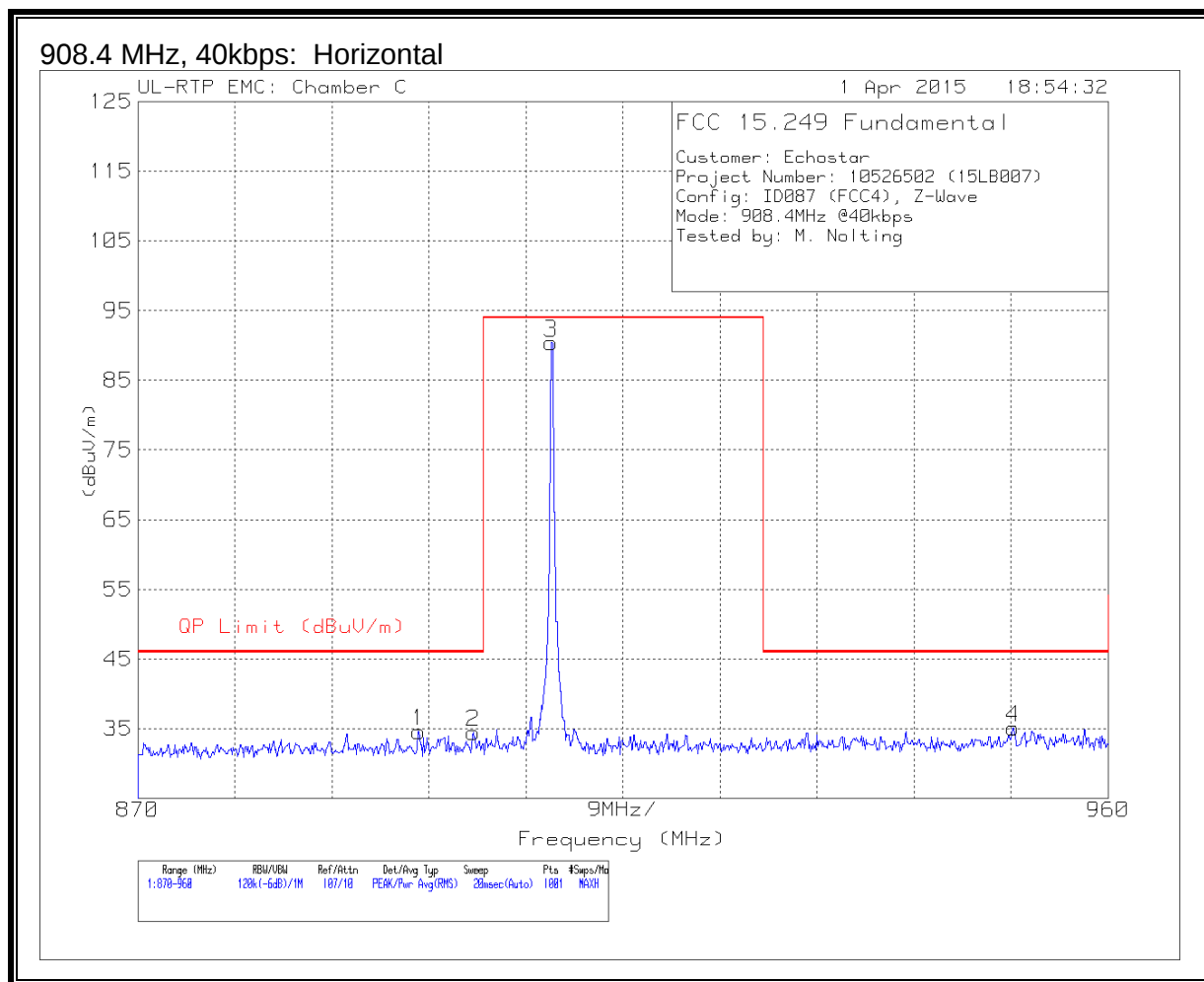
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

RESULTS

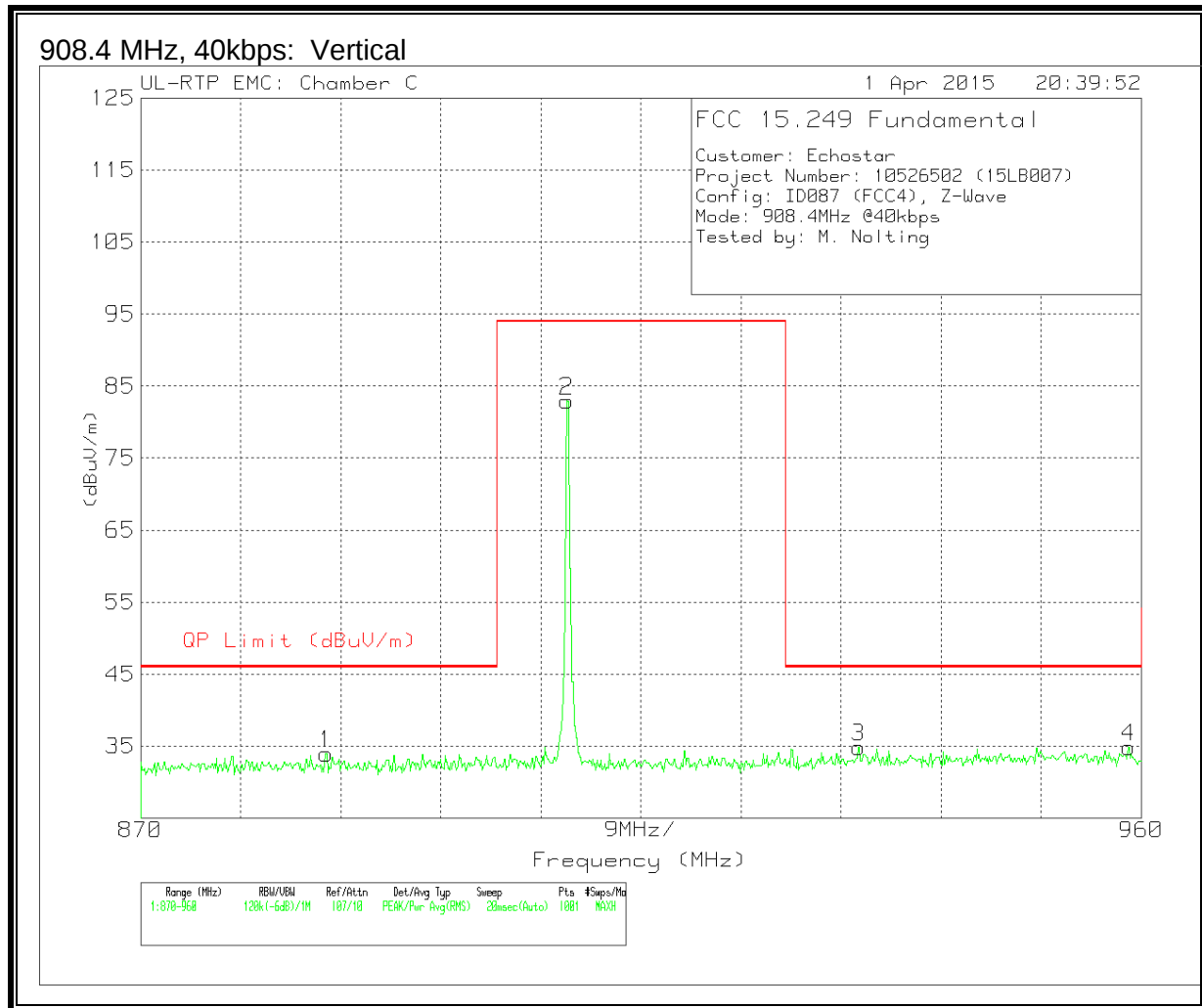
7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Amp/Cbl/Filtr /Pad	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	896.055	29.82	Pk	22.3	-17.5	34.62	46	-11.38	74	101	H
2	901.14	29.58	Pk	22.3	-17.4	34.48	46	-11.52	74	101	H
3	908.3764	85.54	Qp	22.3	-17.5	90.34	93.98	-3.64	74	101	H
4	951.18	29.11	Pk	23	-17	35.11	46	-10.89	74	101	H

Pk - Peak detector

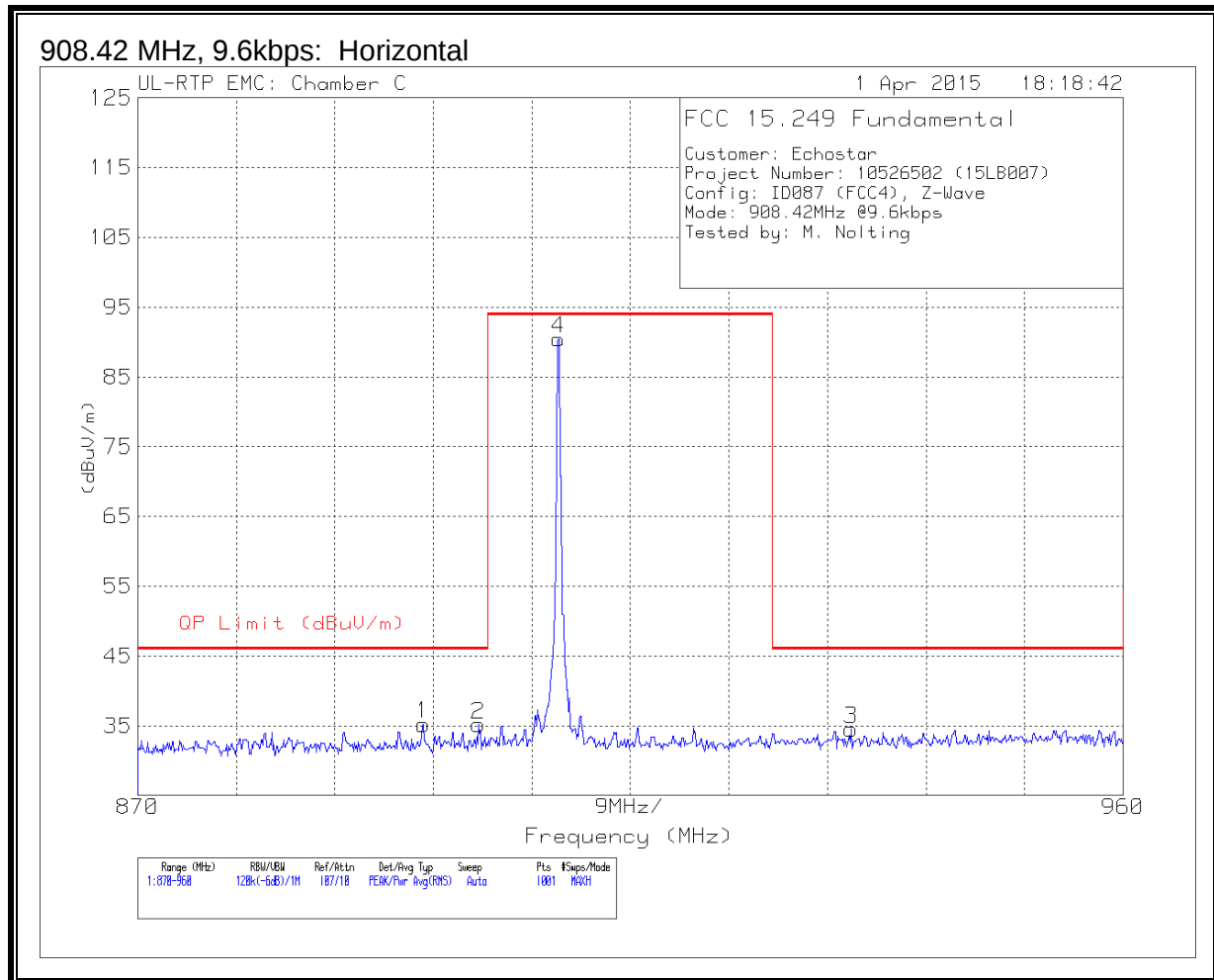
Qp - Quasi-Peak detector



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Amp/Cbl/Filtr /Pad	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	886.695	29.39	Pk	22.2	-17.6	33.99	46	-12.01	136	156	V
2	908.3762	78.12	Qp	22.3	-17.5	82.92	93.98	-11.06	136	156	V
3	934.575	29.15	Pk	22.8	-17.1	34.85	46	-11.15	136	156	V
4	958.875	28.78	Pk	23	-16.9	34.88	46	-11.12	136	156	V

Pk - Peak detector

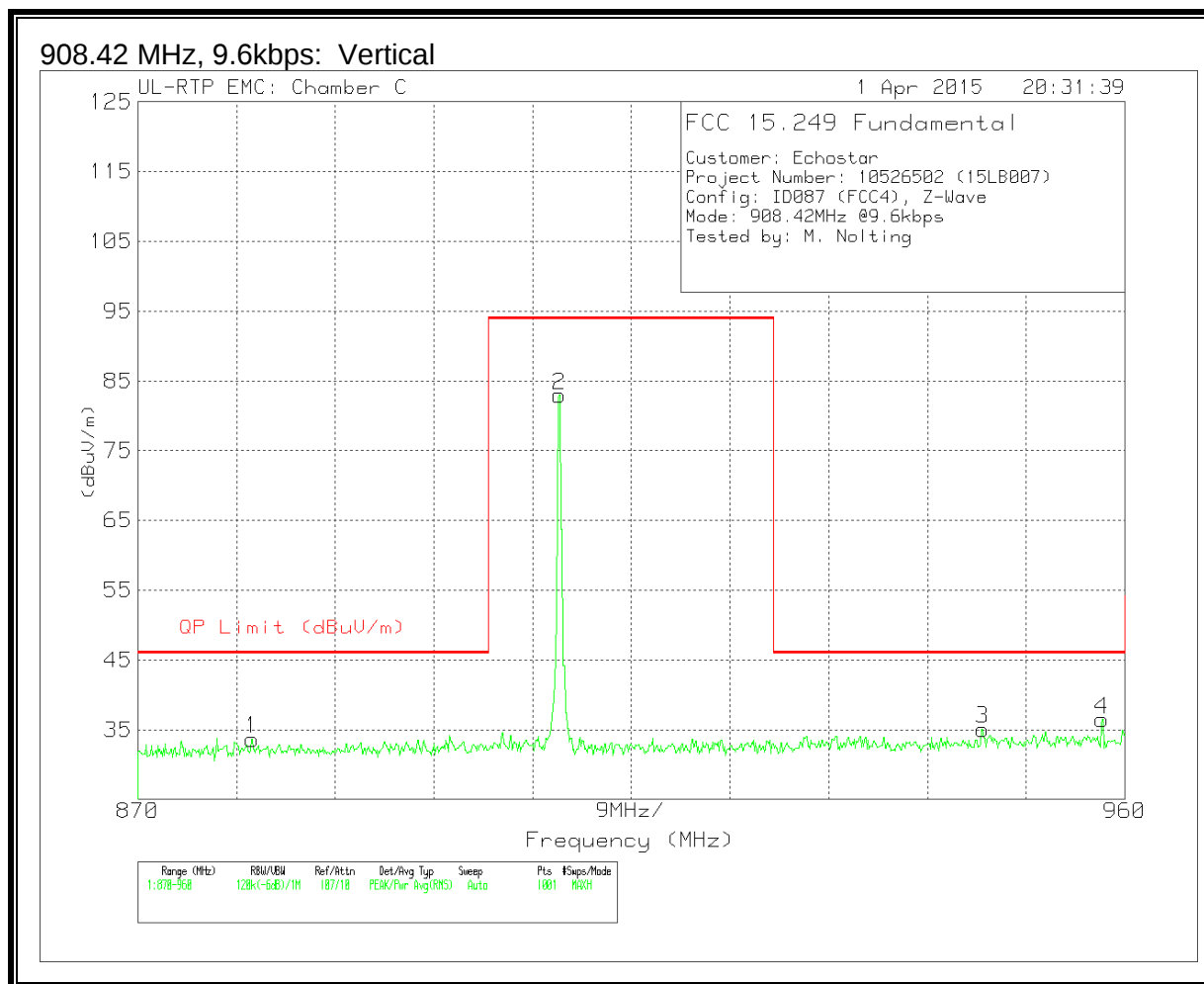
Qp - Quasi-Peak detector



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Amp/Cbl/Filtr /Pad	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	896.1	30.4	Pk	22.3	-17.5	35.2	46	-10.8	74	101	H
2	901.14	30.25	Pk	22.3	-17.4	35.15	46	-10.85	74	101	H
4	908.3958	85.62	Qp	22.3	-17.5	90.42	93.98	-3.56	74	101	H
3	935.16	28.82	Pk	22.8	-17.1	34.52	46	-11.48	74	101	H

Pk - Peak detector

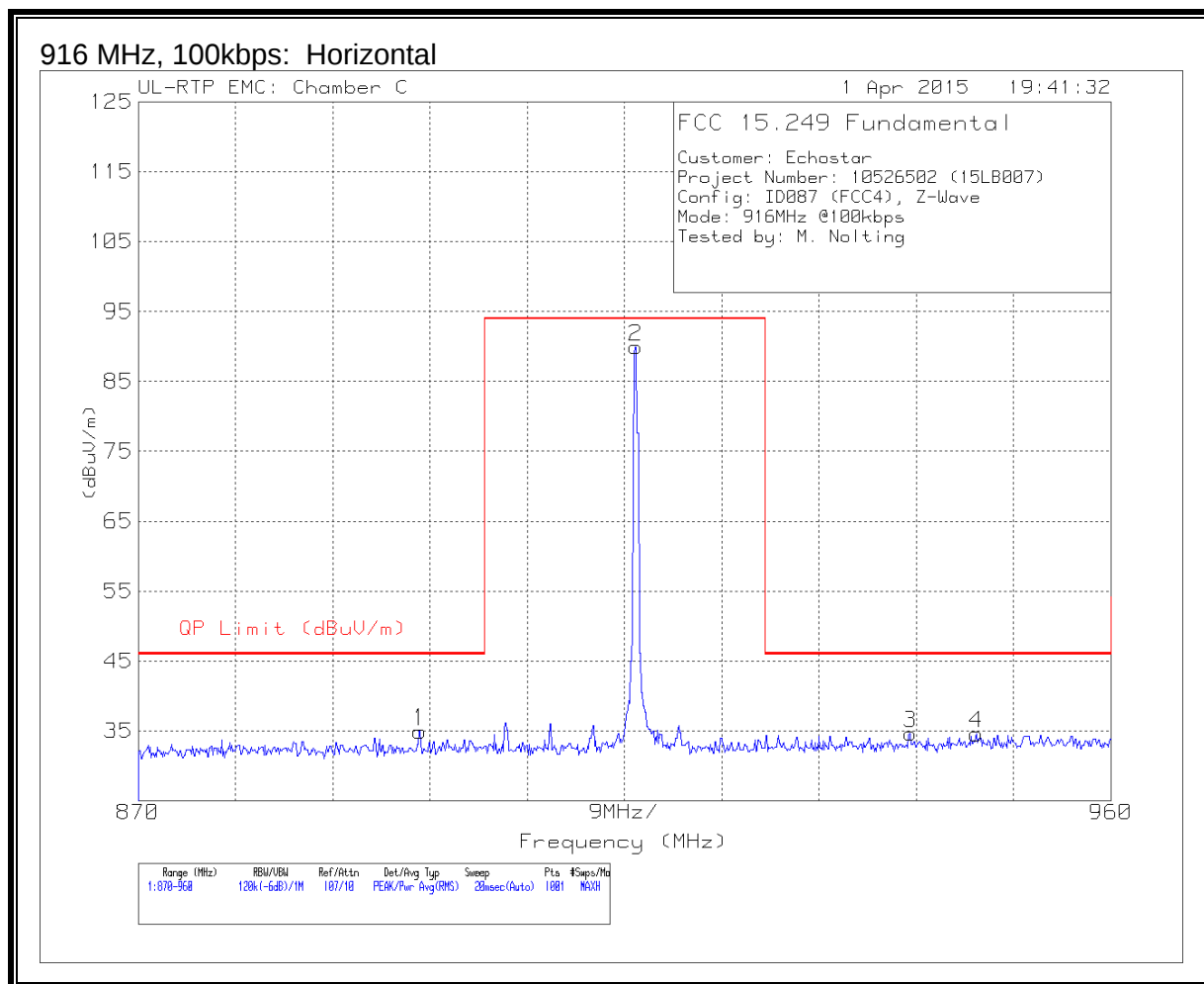
Qp - Quasi-Peak detector



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Amp/Cbl/Filtr /Pad	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	880.44	29.13	Pk	22.1	-17.6	33.63	46	-12.37	136	156	V
2	908.3964	78.12	Qp	22.3	-17.5	82.92	93.98	-11.06	136	156	V
3	947.04	29.26	Pk	22.9	-17.1	35.06	46	-10.94	136	156	V
4	957.93	30.36	Pk	23	-16.9	36.46	46	-9.54	136	156	V

Pk - Peak detector

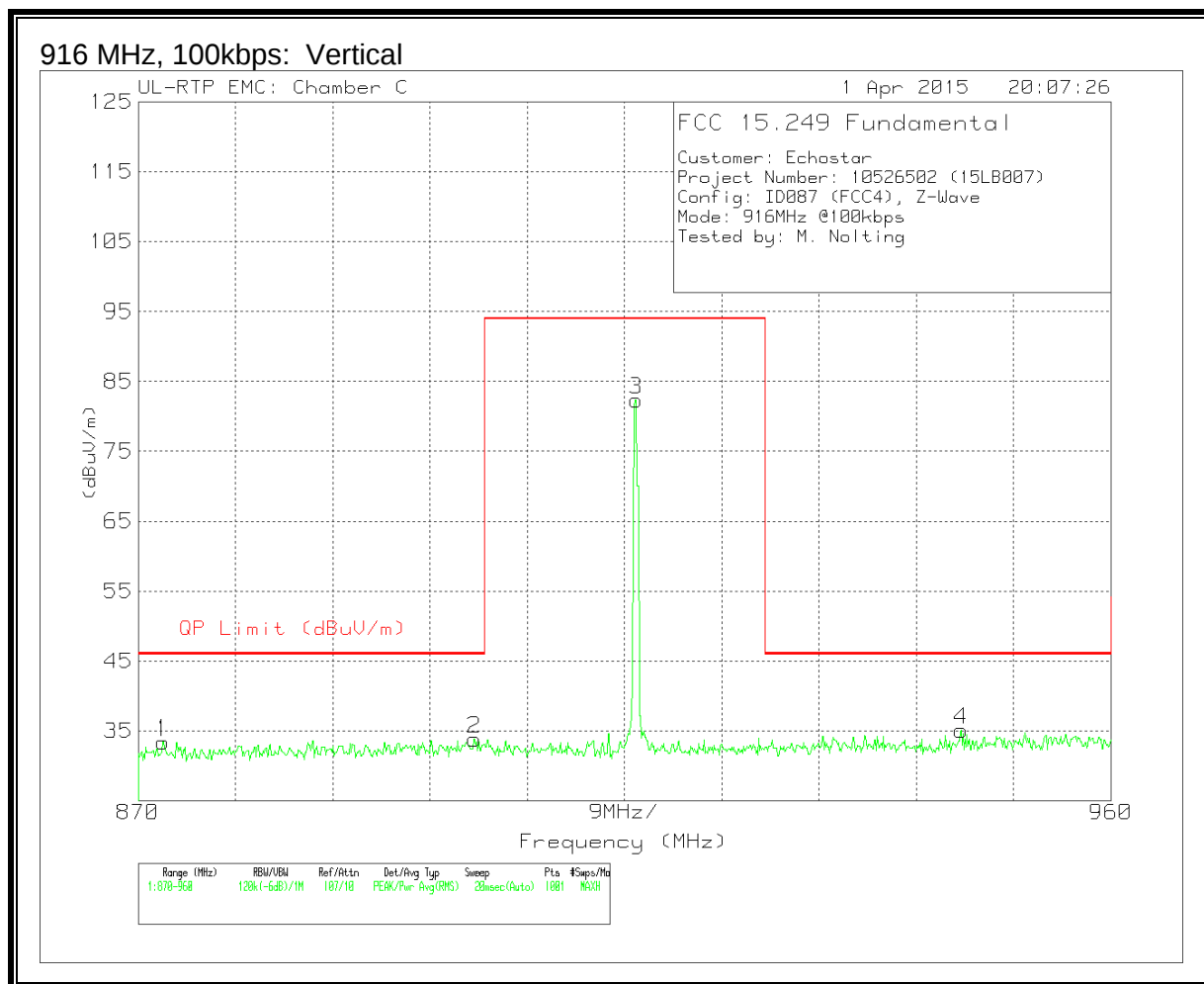
Qp - Quasi-Peak detector



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Amp/Cbl/Filtr /Pad	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	896.055	30.14	Pk	22.3	-17.5	34.94	46	-11.06	71	101	H
2	916.0254	85.01	Qp	22.4	-17.5	89.91	93.98	-4.07	71	101	H
3	941.46	29.05	Pk	22.8	-17.2	34.65	46	-11.35	71	101	H
4	947.58	28.62	Pk	23	-17	34.62	46	-11.38	71	101	H

Pk - Peak detector

Qp - Quasi-Peak detector

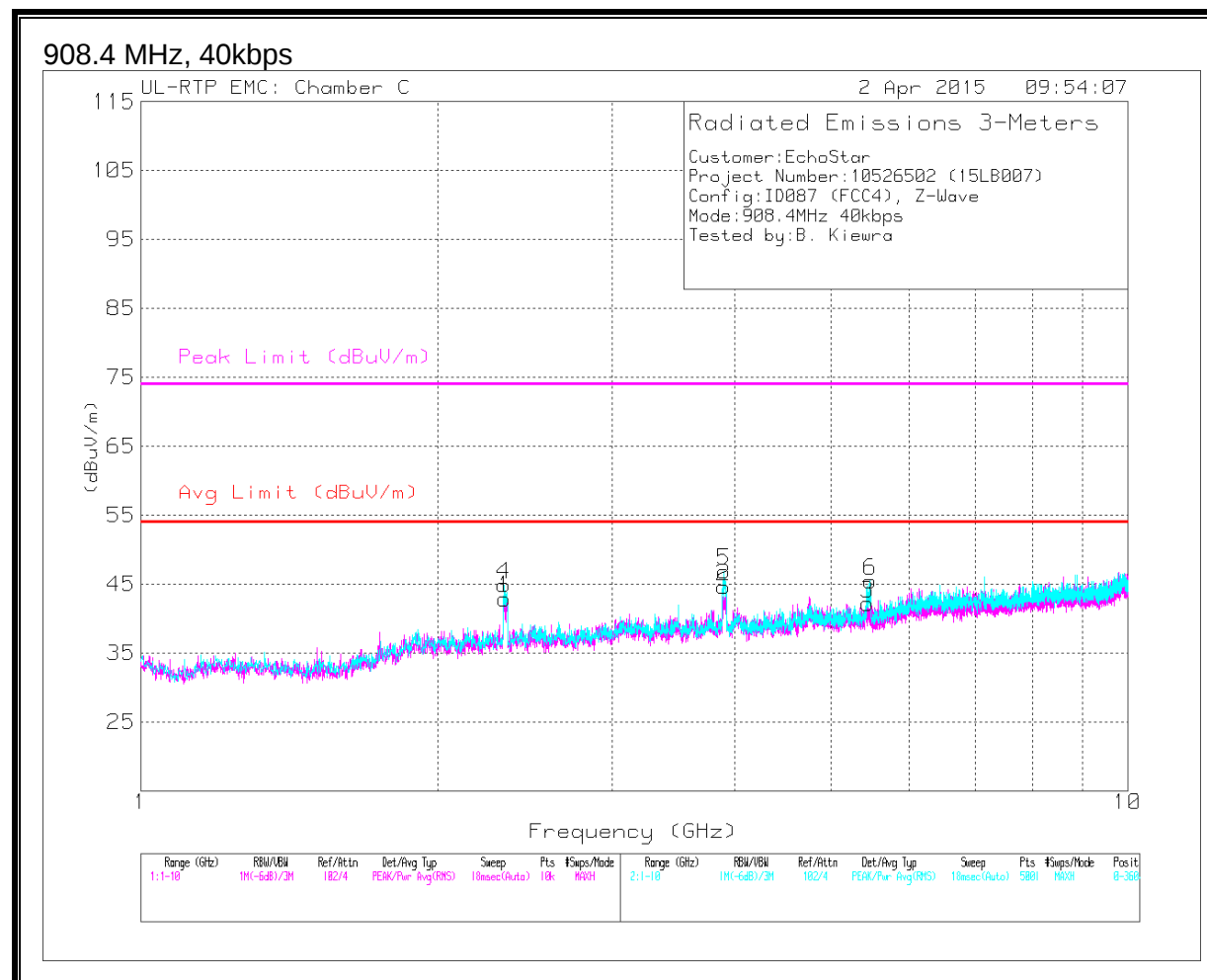


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Amp/Cbl/Filtr /Pad	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	872.295	29.2	Pk	22	-17.8	33.4	46	-12.6	140	158	V
2	901.095	28.94	Pk	22.3	-17.4	33.84	46	-12.16	140	158	V
3	916.0256	77.38	Qp	22.4	-17.5	82.28	93.98	-11.7	140	158	V
4	946.14	29.32	Pk	22.9	-17.1	35.12	46	-10.88	140	158	V

Pk - Peak detector

Qp - Quasi-Peak detector

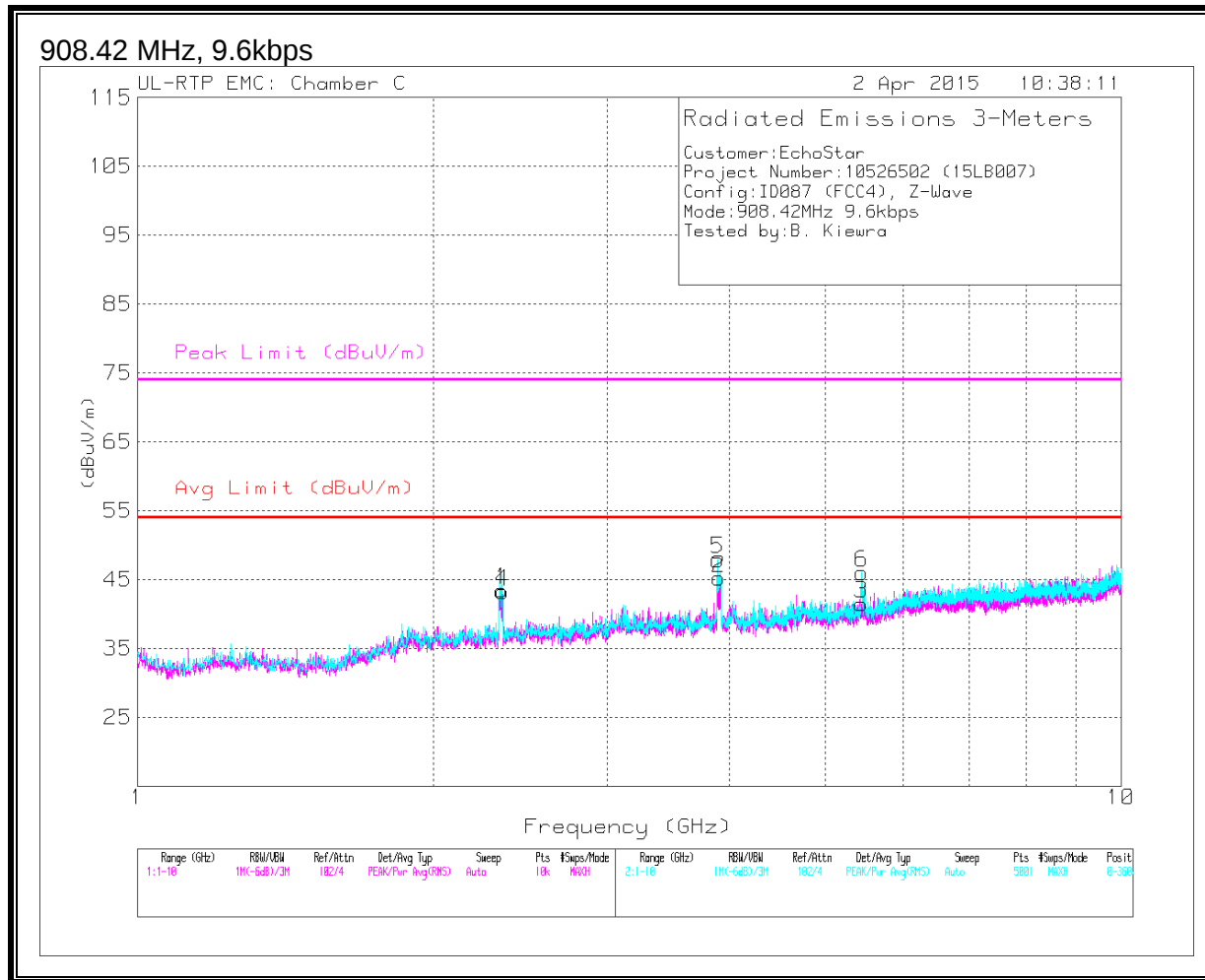
7.2.2. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/ Ftr/Pad	1GHz HPF009	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.33	50.03	Pk	32	-36.7	.4	45.73	-	-	74	-28.27	37	351	H
	2.331	32.88	Av	32	-36.7	.4	28.58	54	-25.42	-	-	37	351	H
2	3.895	49.15	Pk	33.6	-34.9	.5	48.35	-	-	74	-25.65	139	377	H
	3.896	33.68	Av	33.6	-34.9	.5	32.88	54	-21.12	-	-	139	377	H
3	5.45	42.86	Pk	34.5	-32.2	.4	45.56	-	-	74	-28.44	130	356	H
	5.45	27.59	Av	34.5	-32.2	.4	30.29	54	-23.71	-	-	130	356	H
4	2.333	51.45	Pk	32	-36.7	.4	47.15	-	-	74	-26.85	359	387	V
	2.331	33.48	Av	32	-36.7	.4	29.18	54	-24.82	-	-	359	387	V
5	3.889	48.21	Pk	33.6	-34.9	.6	47.51	-	-	74	-26.49	90	251	V
	3.9	31.47	Av	33.6	-34.9	.5	30.67	54	-23.33	-	-	90	251	V
6	5.45	44.45	Pk	34.5	-32.2	.4	47.15	-	-	74	-26.85	87	301	V
	5.45	27.94	Av	34.5	-32.2	.4	30.64	54	-23.36	-	-	87	301	V

Pk - Peak detector

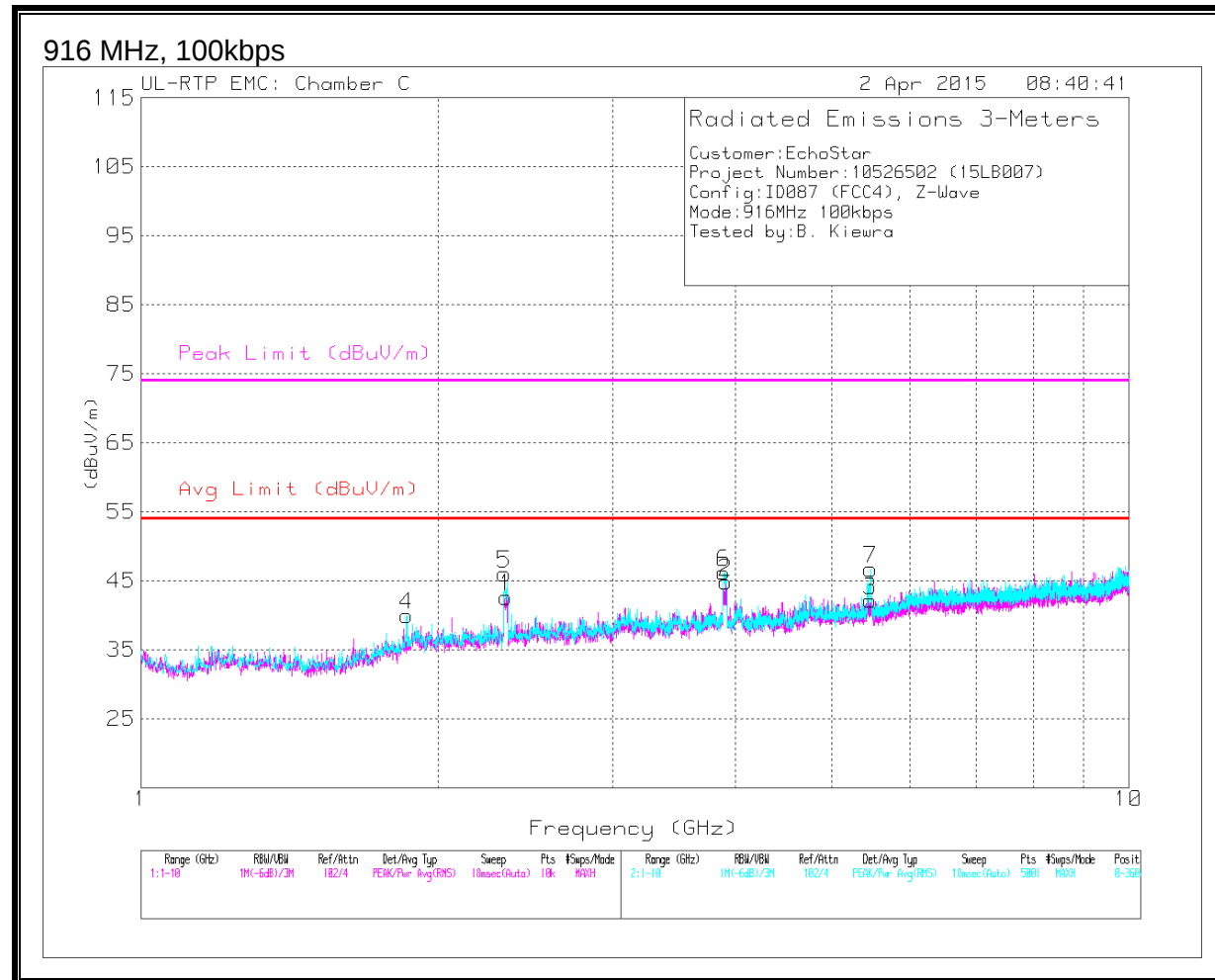
Av - Average detection



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/FI tr/Pad	1GHz HPF009	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.35	50.19	Pk	32	-36.6	.5	46.09	-	-	74	-27.91	53	352	H
	2.349	32.75	Av	32	-36.6	.5	28.65	54	-25.35	-	-	53	352	H
2	3.912	46.77	Pk	33.6	-34.9	.6	46.07	-	-	74	-27.93	103	355	H
	3.912	32.93	Av	33.6	-34.9	.6	32.23	54	-21.77	-	-	103	355	H
3	5.45	42.5	Pk	34.5	-32.2	.4	45.2	-	-	74	-28.8	162	364	H
	5.45	27.42	Av	34.5	-32.2	.4	30.12	54	-23.88	-	-	162	364	H
4	2.347	51.6	Pk	32	-36.6	.5	47.5	-	-	74	-26.5	97	334	V
	2.347	33.55	Av	32	-36.6	.5	29.45	54	-24.55	-	-	97	334	V
5	3.889	50.68	Pk	33.6	-34.9	.6	49.98	-	-	74	-24.02	251	253	V
	3.888	33.72	Av	33.6	-34.9	.6	33.02	54	-20.98	-	-	251	253	V
6	5.45	43.78	Pk	34.5	-32.2	.4	46.48	-	-	74	-27.52	297	246	V
	5.45	27.68	Av	34.5	-32.2	.4	30.38	54	-23.62	-	-	297	246	V

Pk - Peak detector

Av - Average detection



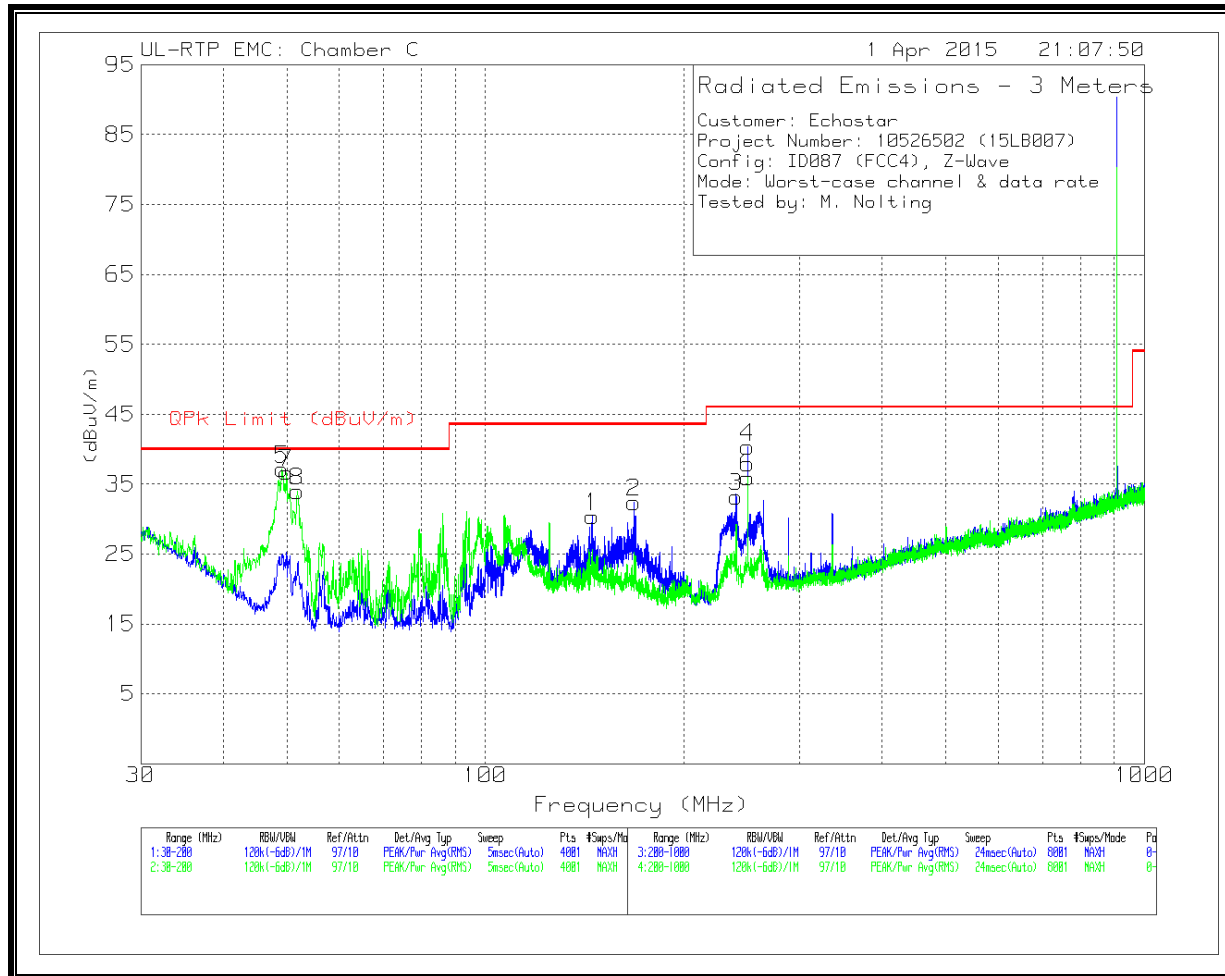
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/FI tr/Pad	1GHz HPF009	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.34	49.17	Pk	32	-36.6	.4	44.97	-	-	74	-29.03	46	303	H
	2.34	32.68	Av	32	-36.6	.4	28.48	54	-25.52	-	-	46	303	H
2	3.888	49.7	Pk	33.6	-34.9	.6	49	-	-	74	-25	139	375	H
	3.885	31.89	Av	33.6	-34.9	.6	31.19	54	-22.81	-	-	139	375	H
3	5.496	39.81	Pk	34.5	-32.1	.4	42.61	-	-	74	-31.39	53	250	H
	5.496	27.18	Av	34.5	-32.1	.4	29.98	54	-24.02	-	-	53	250	H
4	1.832	44.22	Pk	30.7	-37.9	.6	37.62	-	-	74	-36.38	314	318	V
	1.832	31.28	Av	30.7	-37.9	.6	24.68	54	-29.32	-	-	314	318	V
5	2.333	52.34	Pk	32	-36.7	.4	48.04	-	-	74	-25.96	347	262	V
	2.333	35.73	Av	32	-36.7	.4	31.43	54	-22.57	-	-	347	262	V
6	3.889	50.66	Pk	33.6	-34.9	.6	49.96	-	-	74	-24.04	249	335	V
	3.888	33.94	Av	33.6	-34.9	.6	33.24	54	-20.76	-	-	249	335	V
7	5.496	40.97	Pk	34.5	-32.1	.4	43.77	-	-	74	-30.23	100	215	V
	5.496	27.19	Av	34.5	-32.1	.4	29.99	54	-24.01	-	-	100	215	V

Pk - Peak detector

Av - Average detection

7.2.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Amp/Cbl/Filtr/ Pad	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	49.0482	47.37	Qp	8.2	-21.4	34.17	40	-5.83	70	100	V
7	49.8461	47.62	Qp	7.9	-21.4	34.12	40	-5.88	23	101	V
8	51.8127	44.74	Qp	7.3	-21.3	30.74	40	-9.26	64	122	V
1	145.26	37.95	Pk	13	-20.6	30.35	43.52	-13.17	0-360	200	H
2	167.9975	40.88	Pk	11.9	-20.4	32.38	43.52	-11.14	0-360	200	H
3	240.15	41.82	Pk	11.5	-20.1	33.22	46.02	-12.8	0-360	101	H
4	250.0047	48.97	Qp	11.5	-20	40.47	46.02	-5.55	264	115	H
6	250	44.41	Pk	11.5	-20	35.91	46.02	-10.11	0-360	200	V

Pk - Peak detector

Qp - Quasi-Peak detector

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

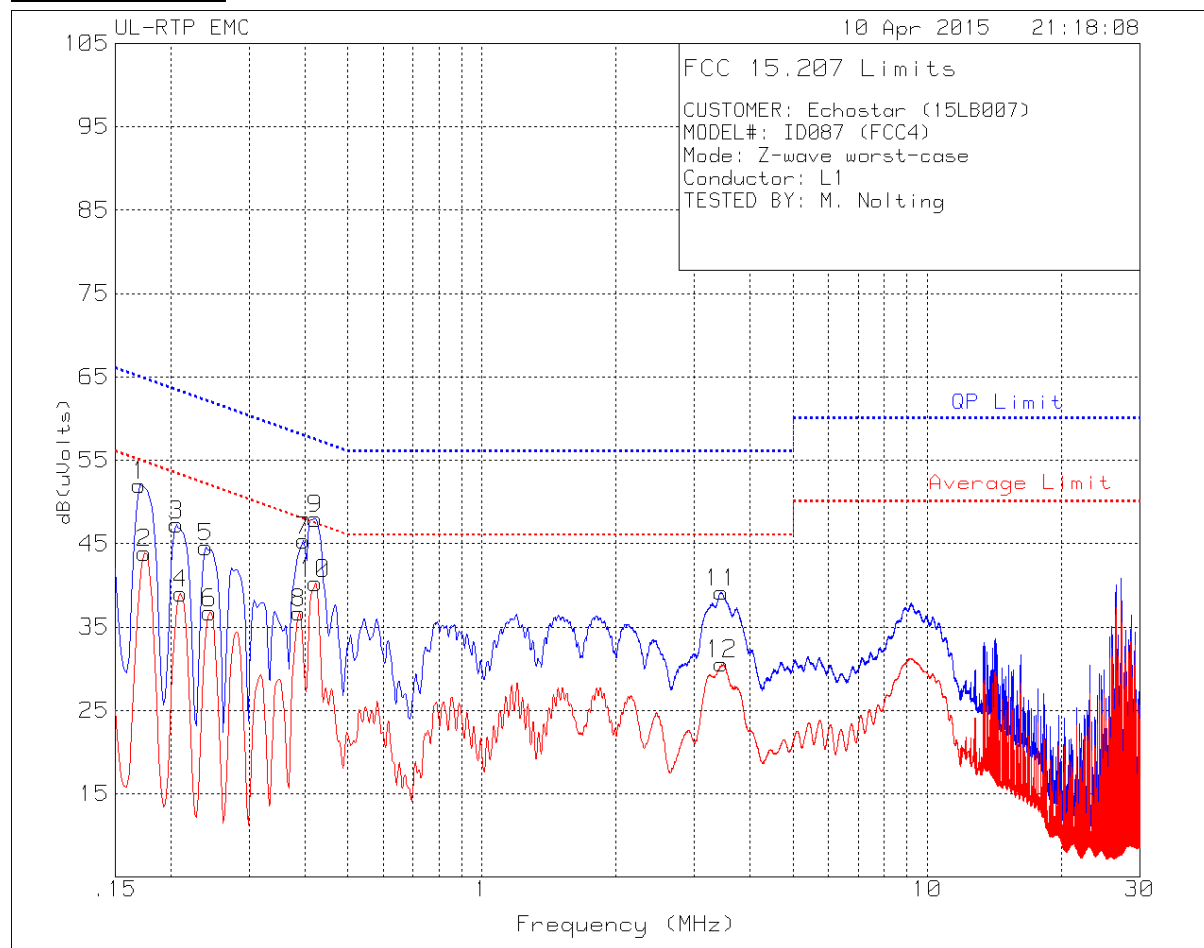
* Decreases with the logarithm of the frequency.

TEST PROCEDURE

Consistent with ANSI C63.4 and ANSI C63.10.

RESULTS

LINE 1 RESULTS

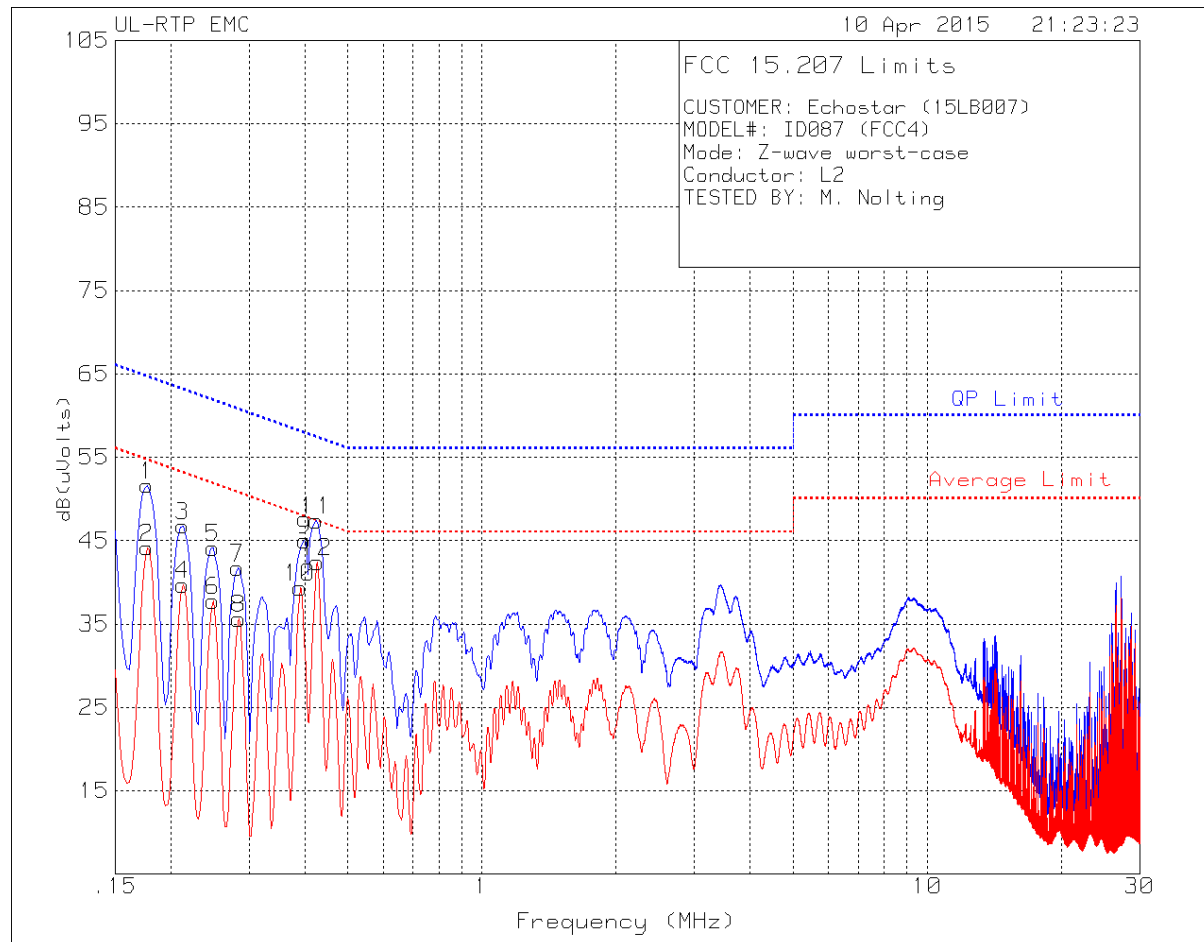


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN (dB)	Limiter & Cable (dB)	Corrected Reading (dBuV)	QP Limit	QP Margin (dB)	Average Limit	Average Margin (dB)
1	.17025	42.31	Qp	.3	9.4	52.01	64.95	-12.94	-	-
2	.17475	34.19	Ca	.3	9.4	43.89	-	-	54.73	-10.84
3	.20625	37.66	Qp	.2	9.4	47.26	63.35	-16.09	-	-
4	.21075	29.44	Ca	.2	9.4	39.04	-	-	53.18	-14.14
5	.24	34.99	Qp	.2	9.4	44.59	62.1	-17.51	-	-
6	.2445	27.13	Ca	.2	9.4	36.73	-	-	51.94	-15.21
8	.3885	27.21	Ca	.1	9.4	36.71	-	-	48.1	-11.39
7	.3975	35.87	Qp	.1	9.4	45.37	57.91	-12.54	-	-
9	.42225	38.5	Qp	.1	9.4	48	57.4	-9.4	-	-
10	.42225	30.74	Ca	.1	9.4	40.24	-	-	47.4	-7.16
11	3.45075	29.67	Qp	0	9.5	39.17	56	-16.83	-	-
12	3.45413	21.08	Ca	0	9.5	30.58	-	-	46	-15.42

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN (dB)	Limiter & Cable (dB)	Corrected Reading (dBuV)	QP Limit	QP Margin (dB)	Average Limit	Average Margin (dB)
1	.177	41.94	Qp	.3	9.4	51.64	64.63	-12.99	-	-
2	.177	34.46	Ca	.3	9.4	44.16	-	-	54.63	-10.47
3	.213	37.17	Qp	.2	9.4	46.77	63.09	-16.32	-	-
4	.213	30.13	Ca	.2	9.4	39.73	-	-	53.09	-13.36
5	.249	34.54	Qp	.2	9.4	44.14	61.79	-17.65	-	-
6	.249	28.18	Ca	.2	9.4	37.78	-	-	51.79	-14.01
7	.28275	32.2	Qp	.1	9.4	41.7	60.73	-19.03	-	-
8	.285	26.14	Ca	.1	9.4	35.64	-	-	50.67	-15.03
10	.39075	29.89	Ca	.1	9.4	39.39	-	-	48.05	-8.66
9	.39975	35.54	Qp	.1	9.4	45.04	57.86	-12.82	-	-
11	.4245	37.9	Qp	.1	9.4	47.4	57.36	-9.96	-	-
12	.42675	32.92	Ca	.1	9.4	42.42	-	-	47.32	-4.9

Qp - Quasi-Peak detector

Ca - CISPR average detection