



**FCC 47 CFR PART 15 SUBPART B
ICES-003 ISSUE 6**

TEST REPORT

Report Number. : 11988952-E4V3

Applicant : RACHIO INC,
1321 15 ST.
DENVER, CO 80202, U.S.A

FCC ID : 2AOTB-ZULWC
IC: 23555-ZULWC

EUT Description : RACHIO 3 SPRINKLER CONTROLLER

Test Standard(s) : FCC 47 CFR PART 15 SUBPART B
ICES-003 ISSUE 6

Date Of Issue:

April 13, 2018

Prepared by:

UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888



Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	03/14/18	Initial Issue	Frank Ibrahim
V2	04/12/18	Re-tested FCC-B radiated and LC with adding load to EUT terminals.	Frank Ibrahim
V3	04/13/18	Updated Section 5.7: I/O cables & Setup Diagrams.	Vien Tran

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. DESCRIPTION OF DIFFERENCES BETWEEN 8 ZONE AND 16 ZONE DEVICES	7
5.3. TEST CONFIGURATIONS	7
5.4. MODE(S) OF OPERATION.....	7
5.5. SOFTWARE AND FIRMWARE	7
5.6. MODIFICATIONS	8
5.7. DETAILS OF TESTED SYSTEM.....	9
6. TEST AND MEASUREMENT EQUIPMENT	12
7. APPLICABLE EMISSIONS LIMITS AND TEST RESULTS	13
7.1. RADIATED EMISSIONS LIMITS AND RESULTS.....	13
7.1.1. RADIATED EMISSIONS 30 TO 1000 MHz.....	14
7.1.2. RADIATED EMISSIONS 1GHz to 18GHz.....	17
7.1.3. RADIATED EMISSIONS 18 to 26 GHz.....	21
7.1.4. RADIATED EMISSIONS 26 to 40 GHz.....	25
7.2. AC MAINS LINE CONDUCTED EMISSIONS.....	28
8. SETUP PHOTOS	33

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: RACHIO, INC.
1321 15 ST
DENVER, CO 80202, U.S.A.

EUT DESCRIPTION: RACHIO 3 SPRINKLER CONTROLLER

MODEL: 16ZULW-C

SERIAL NUMBER: 1109141171

DATE TESTED: April 11 to 12, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC 47 CFR PART 15 SUBPART B	Complies
ICES-003 ISSUE 6	Complies

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:



Frank Ibrahim
Operations Leader
UL Verification Services Inc.

Prepared By:



Jason Qian
Test Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2014.

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(IC: 2324B-1)	<input type="checkbox"/> Chamber D(IC: 22541-1)
<input type="checkbox"/> Chamber B(IC: 2324B-2)	<input type="checkbox"/> Chamber E(IC: 22541-2)
<input type="checkbox"/> Chamber C(IC: 2324B-3)	<input type="checkbox"/> Chamber F(IC: 22541-3)
	<input type="checkbox"/> Chamber G(IC: 22541-4)
	<input type="checkbox"/> Chamber H(IC: 22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. Chambers A through C are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under Industry Canada company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

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	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a RACHIO 3 SPRINKLER CONTROLLER.

GENERAL INFORMATION

Highest frequency generated or used by the EUT	5825 MHz
--	----------

5.2. DESCRIPTION OF DIFFERENCES BETWEEN 8 ZONE AND 16 ZONE DEVICES

The 8 zone device uses the same circuit board as the 16 zone with some small population differences. The 8 zone has 8 fewer triacs (analog switches) populated as well as supporting resistors/capacitors around the triacs. There are also jumpers populated differently to route connections to different poles on the connector. None of these parts are related to the RF circuitry, power supply or any high frequency operation.

A spot test was performed on harmonics and spurious for the 8 zone unit, the results showed that the levels of harmonics and spurious were not higher than the original ones by more than 3 dB, therefore, this qualifies for C1PC for the 8 zone unit.

5.3. TEST CONFIGURATIONS

The following configuration was tested:

EUT Configuration	Description
Typical	Standalone Powered by AC/DC adapter

5.4. MODE(S) OF OPERATION

Mode	Description
Sync and Charging Mode	Powered On and charging

5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was SONY, s_atp_1_00139_B_10_5.
The test utility software used during testing was Tera Term Ver 4.79.

5.6. MODIFICATIONS

No modifications were made during testing.

5.7. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
AC Adapter	Rachio	ILA48-24 1000	N/A
24VAC Solenoid	Hunter	PAT No. 5979482	N/A

I/O CABLES: 8 ZONE

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	2-Prong	Unshielded	1.5	
2	DC	8	Wire	Unshielded	0.8	EUT to Solenoids

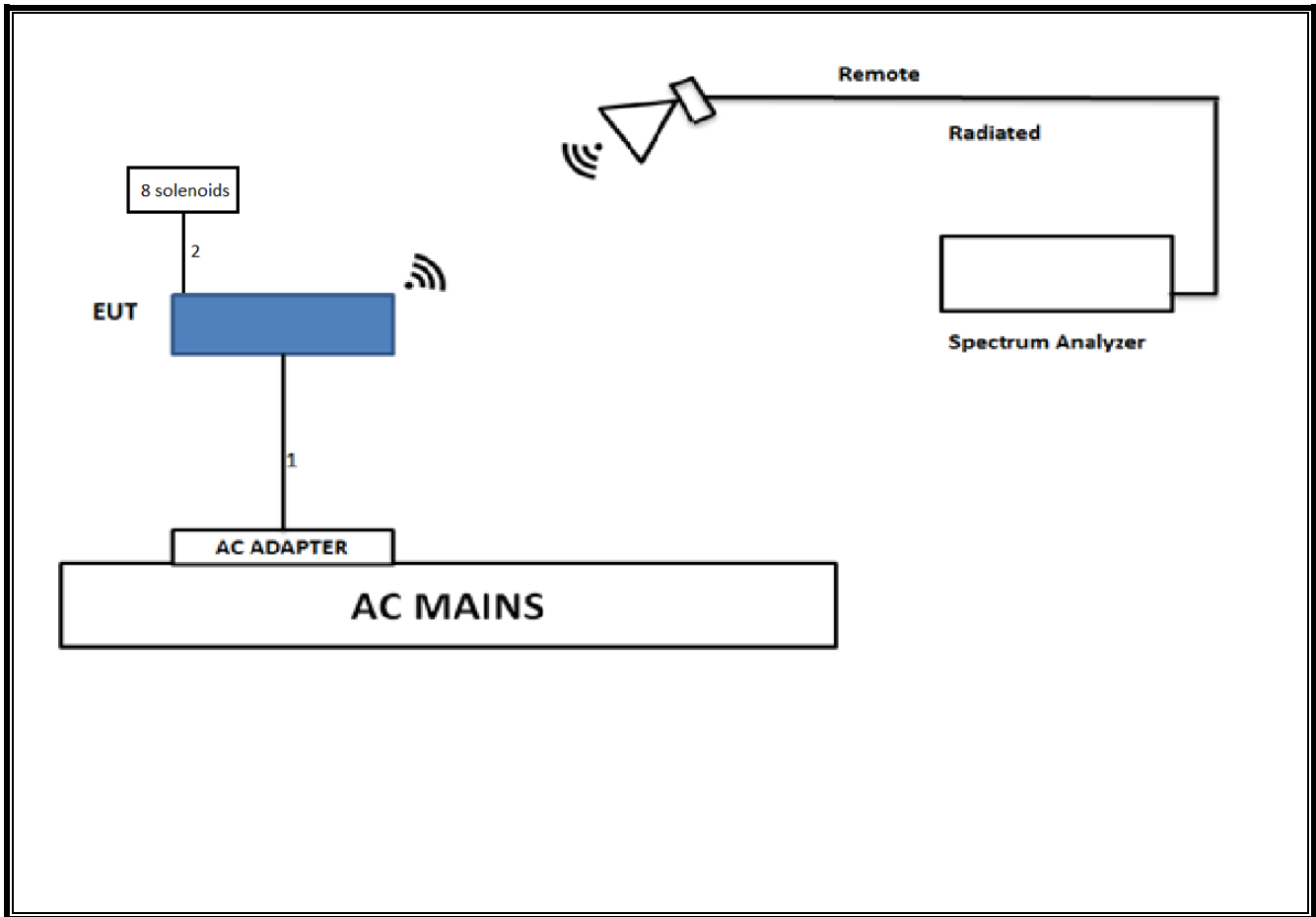
I/O CABLES: 16 ZONE

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	2-Prong	Unshielded	1.5	
2	DC	16	Wire	Unshielded	0.8	EUT to Solenoids

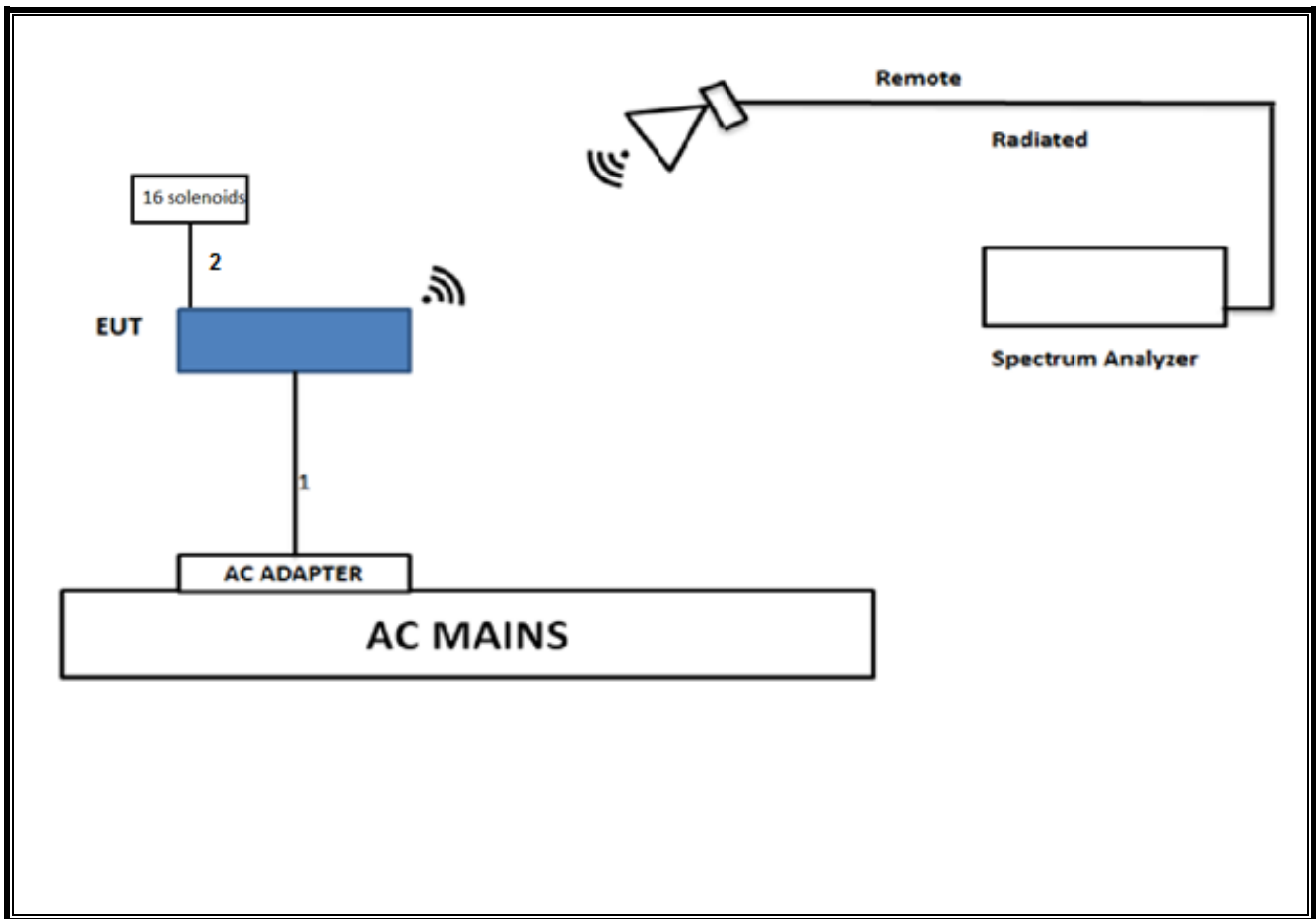
TEST SETUP

The EUT is a standalone device. Test software exercised the radio card.

SETUP DIAGRAM: 8 ZONE



SETUP DIAGRAM: 16 ZONE



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 Date	Cal Due
Amplifier, 1 to 18 GHz	Miteq	AFS43-00101800-25-S-42	1165	06/24/17	06/27/2018
Amplifier, 10KHz to 1GHz, 32dB	Keysight	8447D	15	08/14/17	08/14/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	862	06/09/17	06/09/2018
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	130	10/16/17	10/16/2018
PXA Spectrum Analyzer, 3Hz to 44GHz	Agilent	N9030A	906	02/16/18	02/16/2019
EMI Reciever	Rohde & Schwarz	ESR-EMI	1436	01/06/18	01/06/2019
LISN	FISCHER	FCC-LISN-50/250-25-2-01	1310	06/08/17	06/08/2018
18 - 26.5 GHz Horn Antenna	Seavey Division	MWH-1826/B	89	06/12/17	06/12/2018
26.5 - 40 GHz Horn Antenna	ARA	MWH-2640/B	90	06/12/17	06/12/2018
Pre-Amp 1-26.5 GHz	Agilent	8449B	404	07/23/17	07/23/2018
Pre-Amp, 26-40GHz	MITEQ	NSTTA2640-35-HG	1864	09/21/17	09/21/2018
PXA Spectrum Analyzer, 3Hz to 44GHz	Keysight	N9030A	1454	12/15/17	12/15/2018

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016

7. APPLICABLE EMISSIONS LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS LIMITS AND RESULTS

LIMIT

FCC Part 15 Subpart B

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dBµV/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54

Note: The lower limit shall apply at the transition frequency.

TEST PROCEDURE

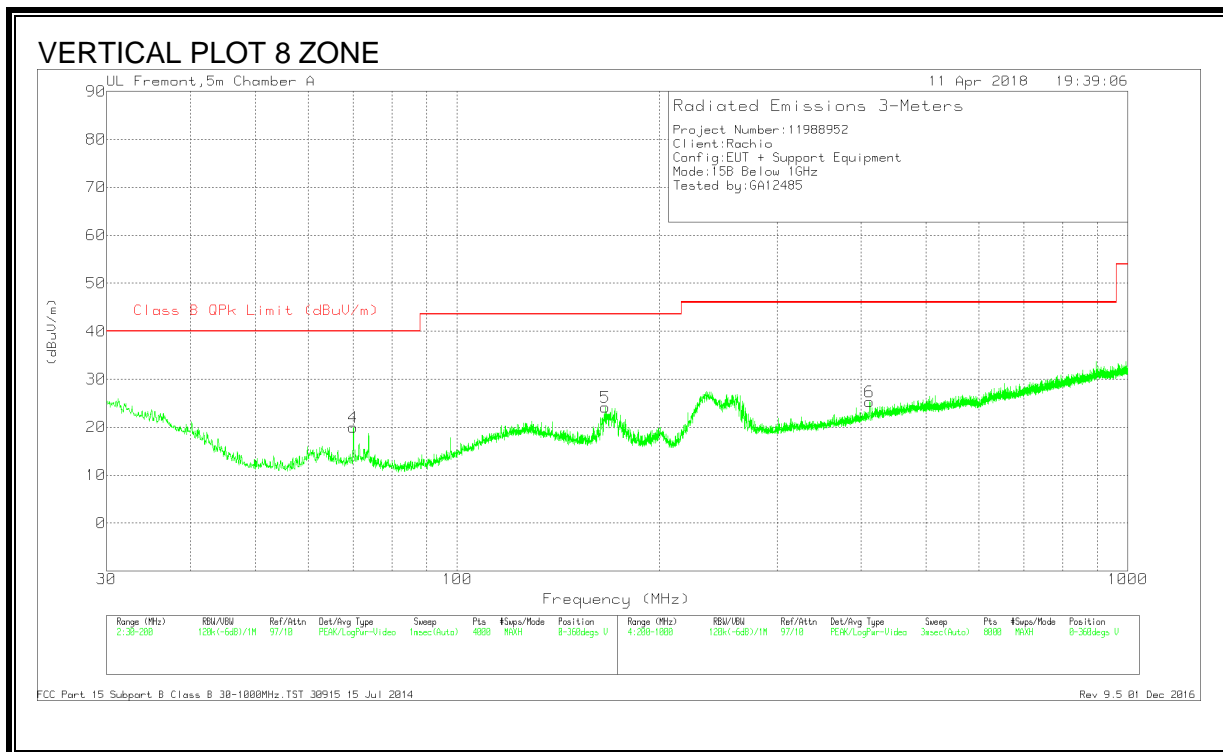
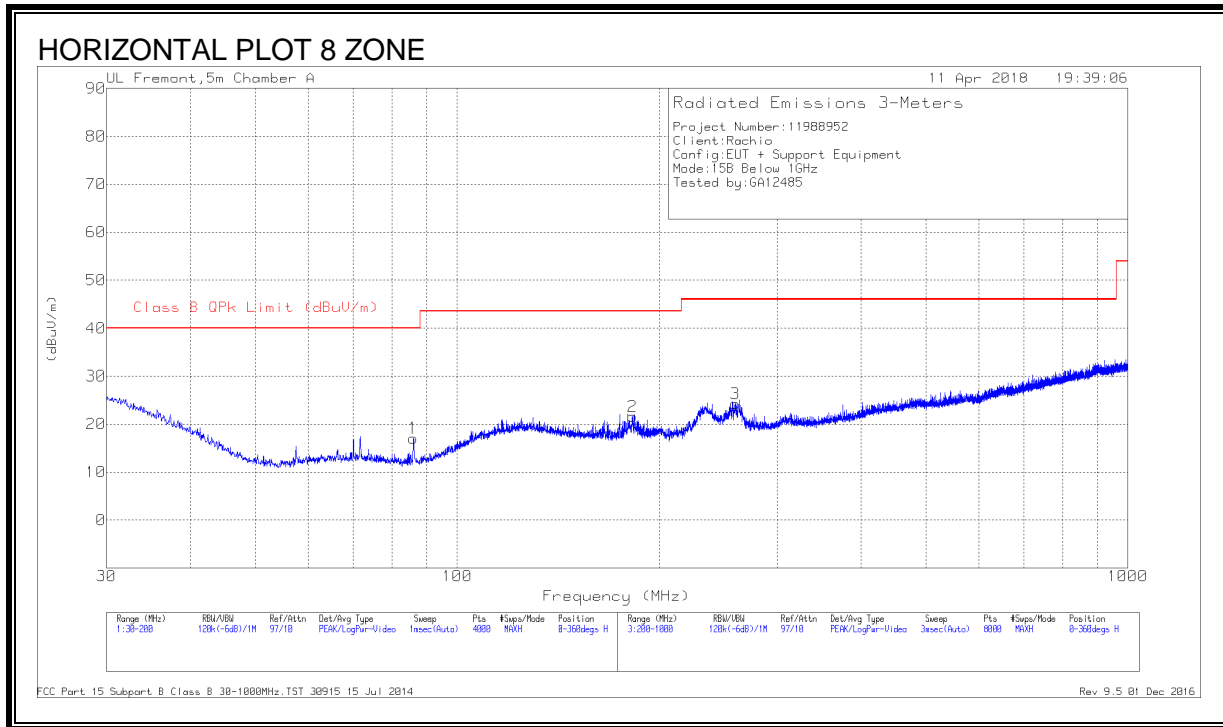
ANSI C63.4: 2014

The highest frequency generated or used in the EUT is 5.8 GHz therefore the frequency range was investigated from 30 MHz to 40 GHz.

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

RESULTS

7.1.1. RADIATED EMISSIONS 30 TO 1000 MHz

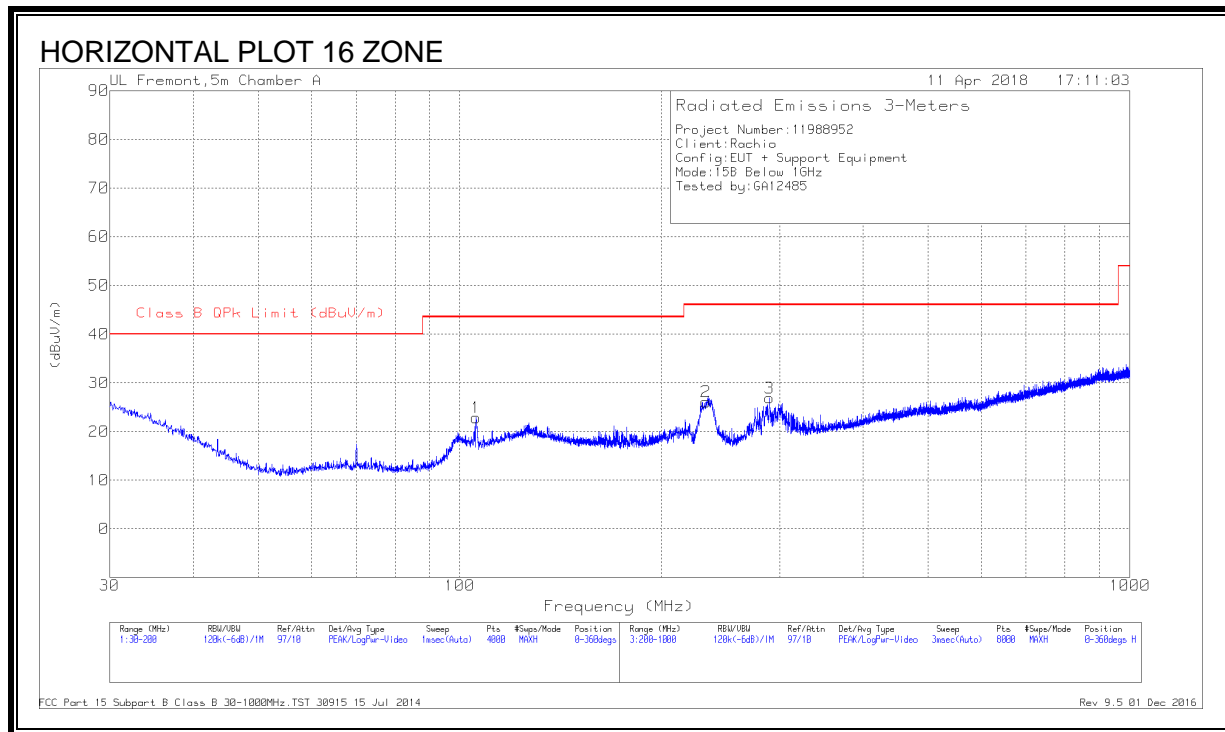


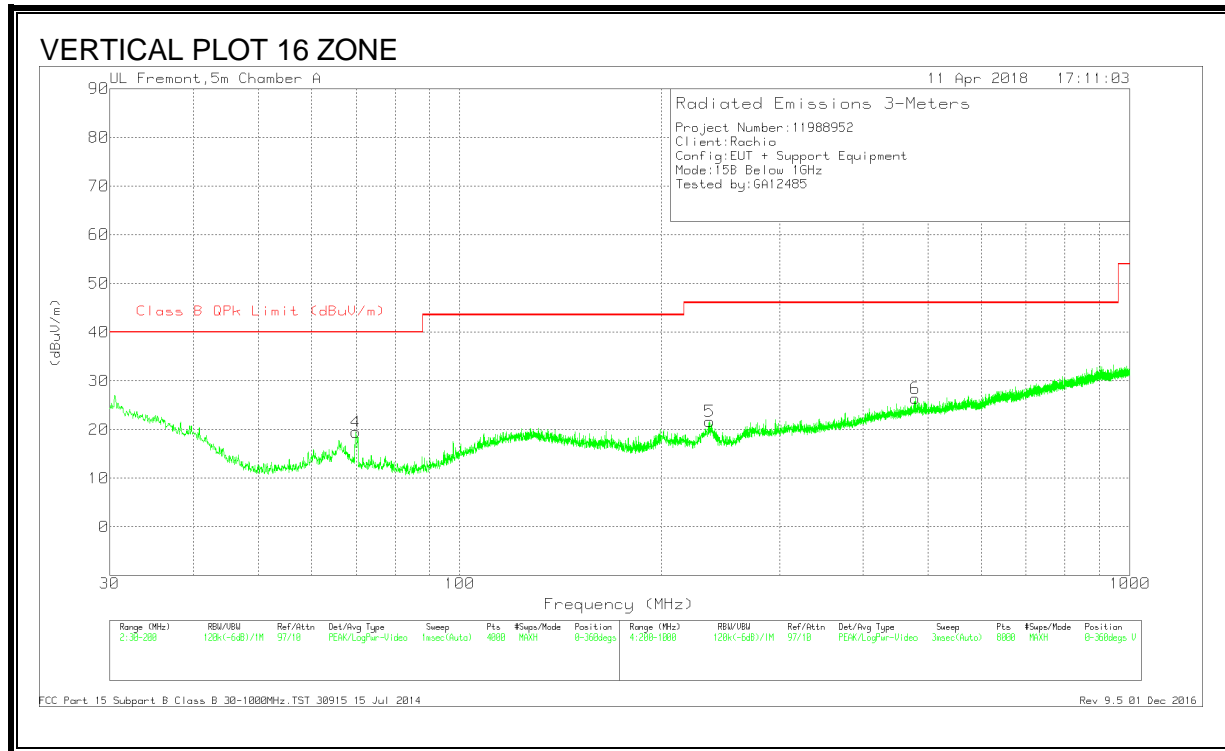
HORIZONTAL AND VERTICAL DATA 8 ZONE

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	70.0029	34.6	Pk	12.1	-26.7	20	40	-20	0-360	100	V
1	86.072	32.41	Pk	11.3	-26.6	17.11	40	-22.89	0-360	200	H
5	166.2903	33.99	Pk	15.9	-25.7	24.19	43.52	-19.33	0-360	100	V
2	182.487	31.91	Pk	15.2	-25.5	21.61	43.52	-21.91	0-360	200	H
3	260.0078	32.99	Pk	16	-24.7	24.29	46.02	-21.73	0-360	200	H
6	411.8275	30.34	Pk	20.1	-25.1	25.34	46.02	-20.68	0-360	101	V

Pk - Peak detector





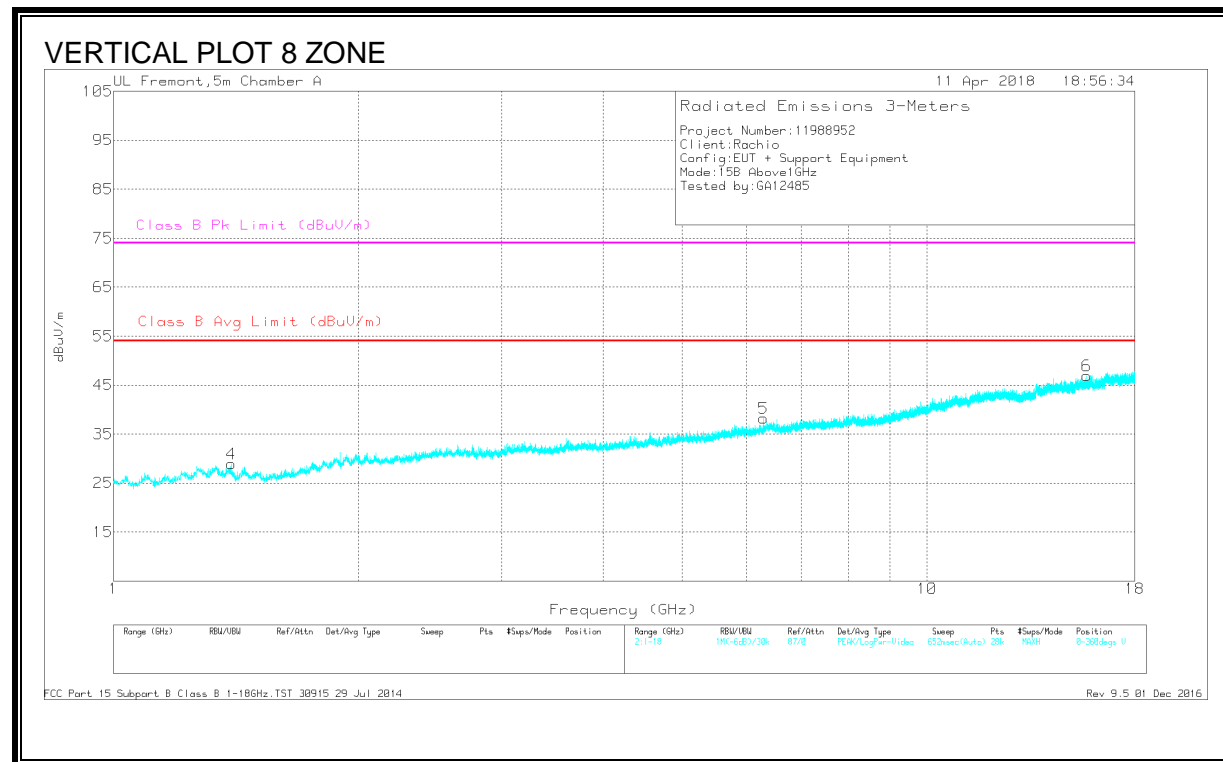
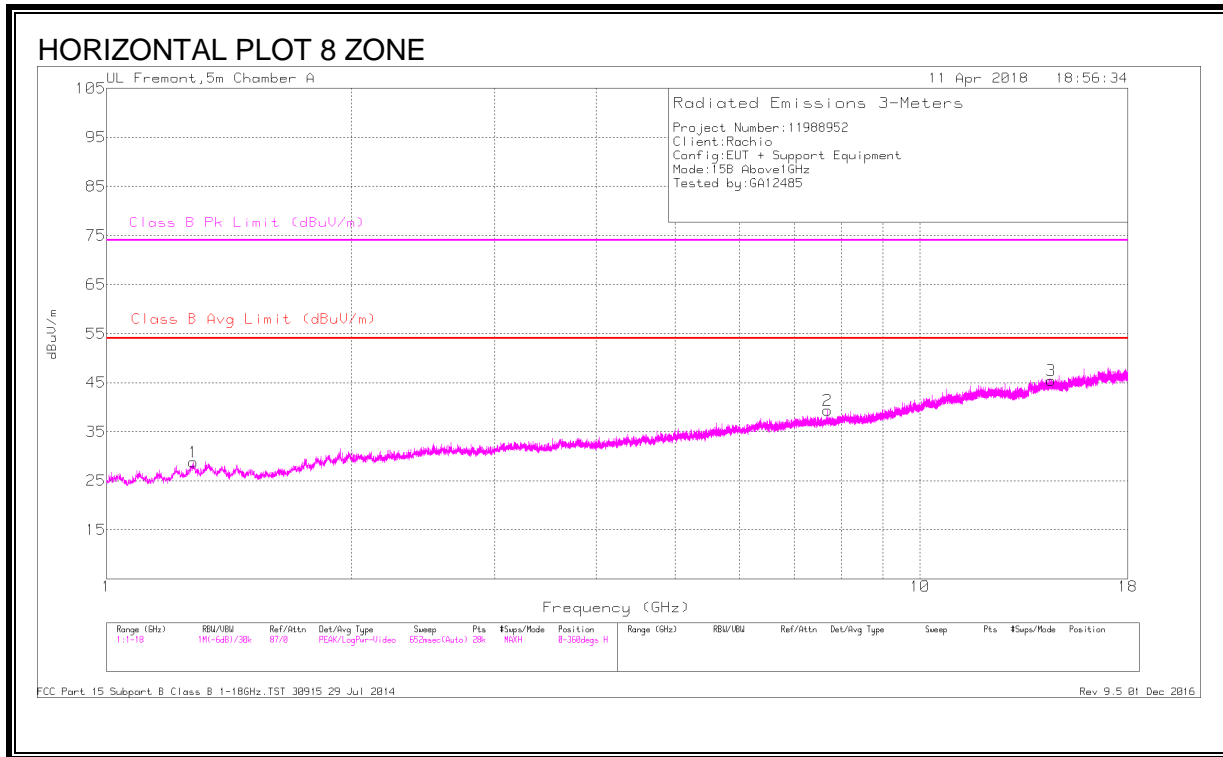
HORIZONTAL AND VERTICAL DATA 16 ZONE

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	69.9178	34.09	Pk	12.1	-26.7	19.49	40	-20.51	0-360	100	V
1	105.7546	33.35	Pk	15.8	-26.3	22.85	43.52	-20.67	0-360	300	H
2	233.0043	36.01	Pk	15.1	-25	26.11	46.02	-19.91	0-360	200	H
5	235.9047	31.38	Pk	15.3	-25	21.68	46.02	-24.34	0-360	101	V
3	289.9117	34.28	Pk	17.2	-24.6	26.88	46.02	-19.14	0-360	101	H
6	478.6362	30.12	Pk	21.6	-25.3	26.42	46.02	-19.6	0-360	300	V

Pk - Peak detector

7.1.2. RADIATED EMISSIONS 1GHz to 18GHz



HORIZONTAL AND VERTICAL DATA 8 ZONE

Trace Markers

Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl (dB)	Correcte d Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.279	31.63	Avg	29.3	-32.1	28.83	54	-25.17	-	-	0-360	101	H
4	1.395	32.01	Avg	28.7	-31.8	28.91	54	-25.09	-	-	0-360	200	V
5	6.293	27.84	Avg	35.7	-25.3	38.24	54	-15.76	-	-	0-360	200	V
2	7.695	26.74	Avg	35.7	-23.1	39.34	54	-14.66	-	-	0-360	199	H
3	14.488	24.92	Avg	39.8	-19.3	45.42	54	-8.58	-	-	0-360	101	H
6	15.705	25.32	Avg	40.2	-18.6	46.92	54	-7.08	-	-	0-360	200	V

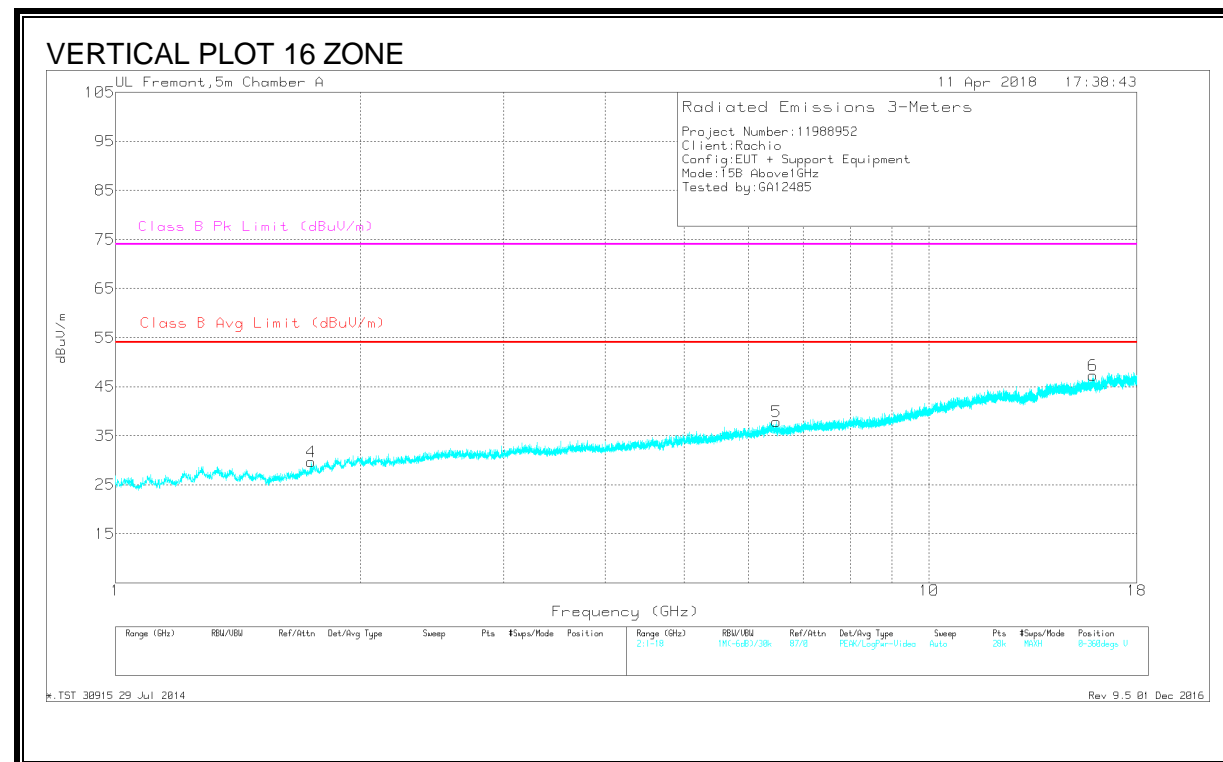
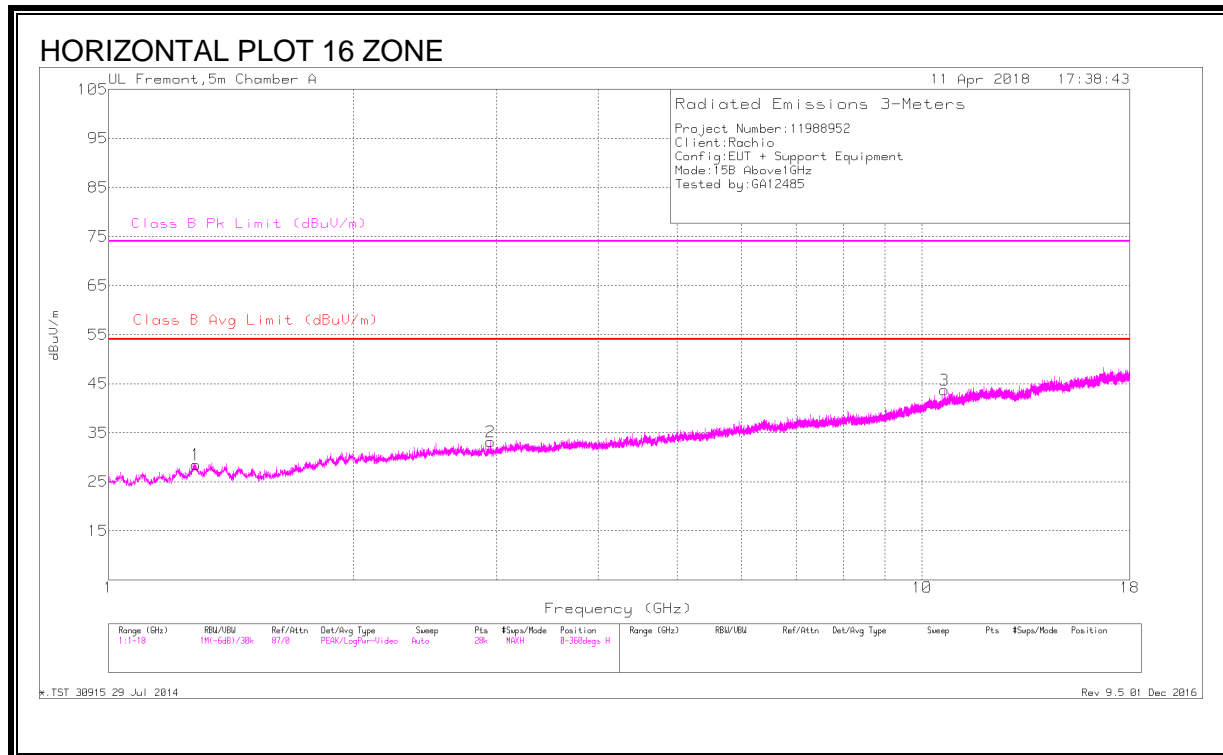
Avg - Video bandwidth < Resolution bandwidth

Radiated Emissions

Frequenc y (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl (dB)	Correcte d Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.279	39.82	Pk	29.3	-32.1	37.02	-	-	74	-36.98	87	112	H
1.279	26.43	Av	29.3	-32.1	23.63	54	-30.37	-	-	87	112	H
1.393	39.61	Pk	28.7	-31.8	36.51	-	-	74	-37.49	359	156	V
1.393	26.28	Av	28.7	-31.8	23.18	54	-30.82	-	-	359	156	V
6.293	34.85	Pk	35.7	-25.3	45.25	-	-	74	-28.75	102	143	V
6.293	21.78	Av	35.7	-25.3	32.18	54	-21.82	-	-	102	143	V
7.693	33.71	Pk	35.7	-23.1	46.31	-	-	74	-27.69	347	126	H
7.693	20.46	Av	35.7	-23.1	33.06	54	-20.94	-	-	347	126	H
14.487	33.13	Pk	39.8	-19.3	53.63	-	-	74	-20.37	184	117	H
14.487	19.85	Av	39.8	-19.3	40.35	54	-13.65	-	-	184	117	H
15.705	32.68	Pk	40.2	-18.5	54.38	-	-	74	-19.62	131	145	V
15.705	19.63	Av	40.2	-18.5	41.33	54	-12.67	-	-	131	145	V

Pk - Peak detector

Av - Average detection



HORIZONTAL AND VERTICAL DATA 8 ZONE

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.281	31.29	Avg	29.3	-32.1	28.49	54	-25.51	-	-	0-360	101	H
4	1.74	31.53	Avg	29.6	-31.5	29.63	54	-24.37	-	-	0-360	101	V
2	2.947	30.72	Avg	32.2	-29.8	33.12	54	-20.88	-	-	0-360	101	H
5	6.488	26.82	Avg	35.7	-24.7	37.82	54	-16.18	-	-	0-360	101	V
3	10.643	25.71	Avg	37.7	-19.7	43.71	54	-10.29	-	-	0-360	101	H
6	15.888	24.71	Avg	40.3	-17.7	47.31	54	-6.69	-	-	0-360	101	V

Avg - Video bandwidth < Resolution bandwidth

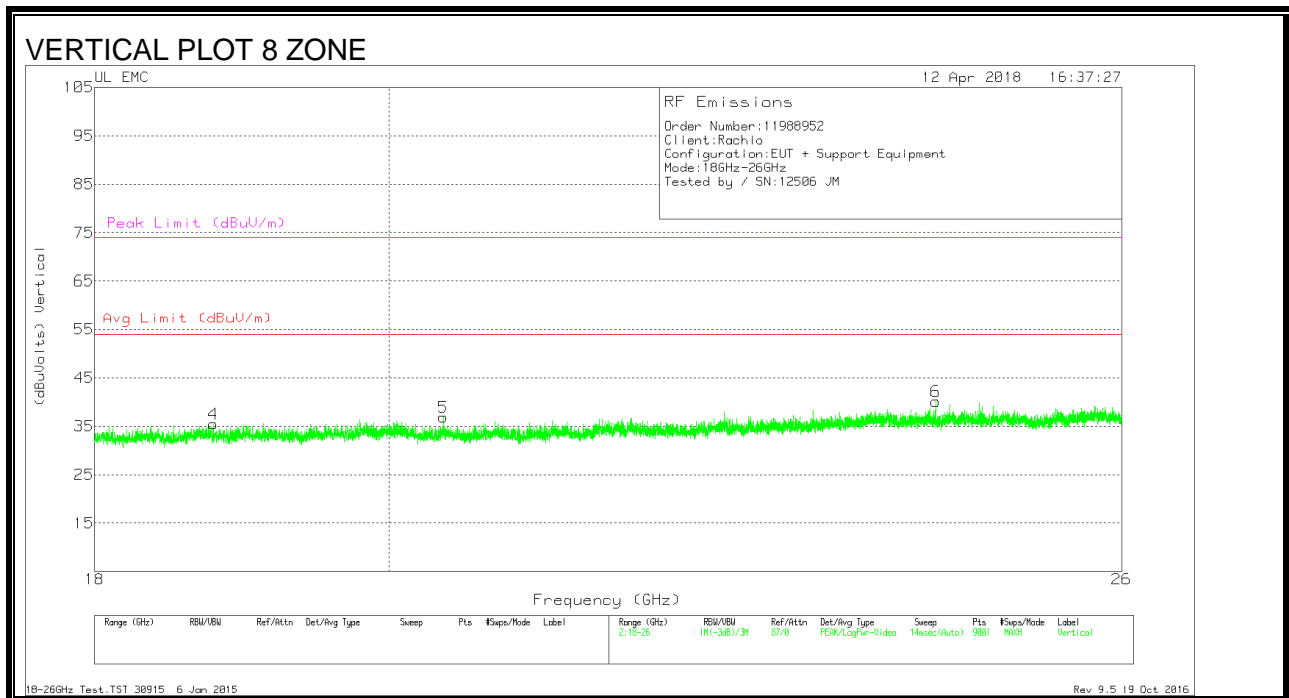
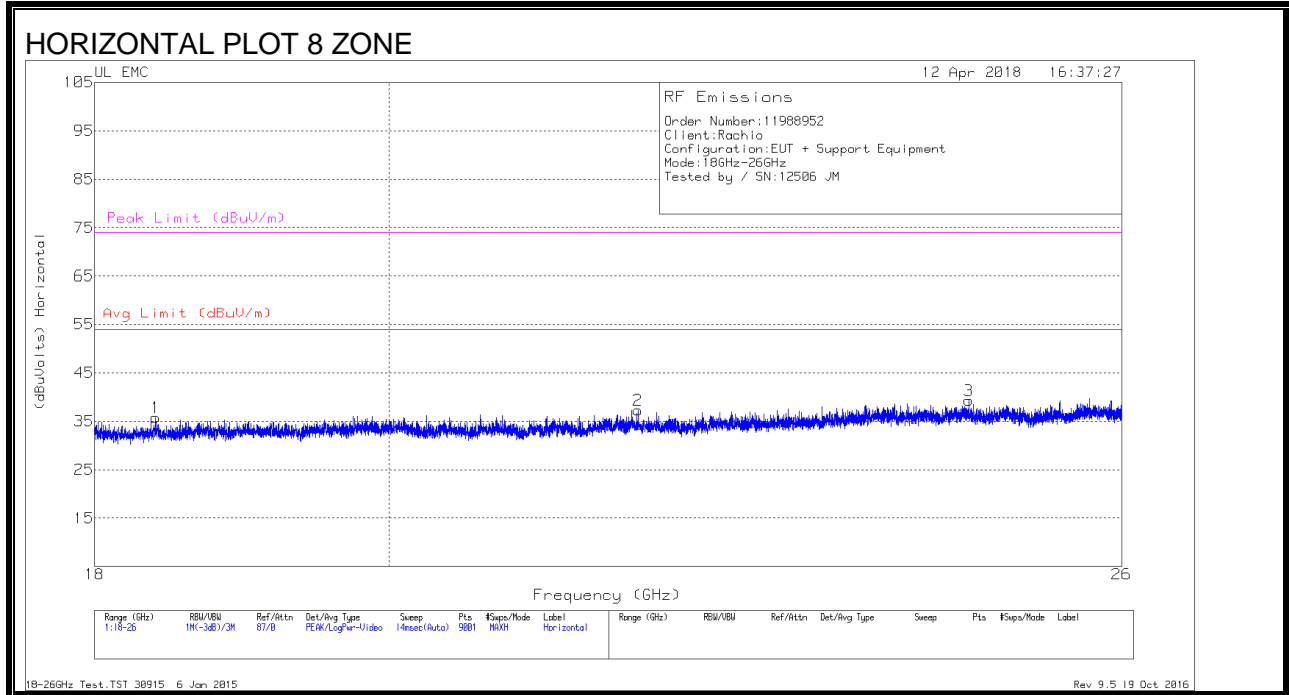
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.281	40.69	Pk	29.3	-32.1	37.89	-	-	74	-36.11	356	113	H
1.281	26.41	Av	29.3	-32.1	23.61	54	-30.39	-	-	356	113	H
1.739	38.7	Pk	29.6	-31.5	36.8	-	-	74	-37.2	237	114	V
1.739	25.51	Av	29.6	-31.5	23.61	54	-30.39	-	-	237	114	V
2.946	37.62	Pk	32.2	-29.8	40.02	-	-	74	-33.98	3	104	H
2.946	24.71	Av	32.2	-29.8	27.11	54	-26.89	-	-	3	104	H
6.487	35.15	Pk	35.7	-24.7	46.15	-	-	74	-27.85	224	104	V
6.487	21.37	Av	35.7	-24.7	32.37	54	-21.63	-	-	224	104	V
10.642	32.96	Pk	37.7	-19.7	50.96	-	-	74	-23.04	342	111	H
10.642	19.43	Av	37.7	-19.7	37.43	54	-16.57	-	-	342	111	H
15.886	31.94	Pk	40.3	-17.7	54.54	-	-	74	-19.46	234	123	V
15.886	19.27	Av	40.3	-17.7	41.87	54	-12.13	-	-	234	123	V

Pk - Peak detector

Av - Average detection

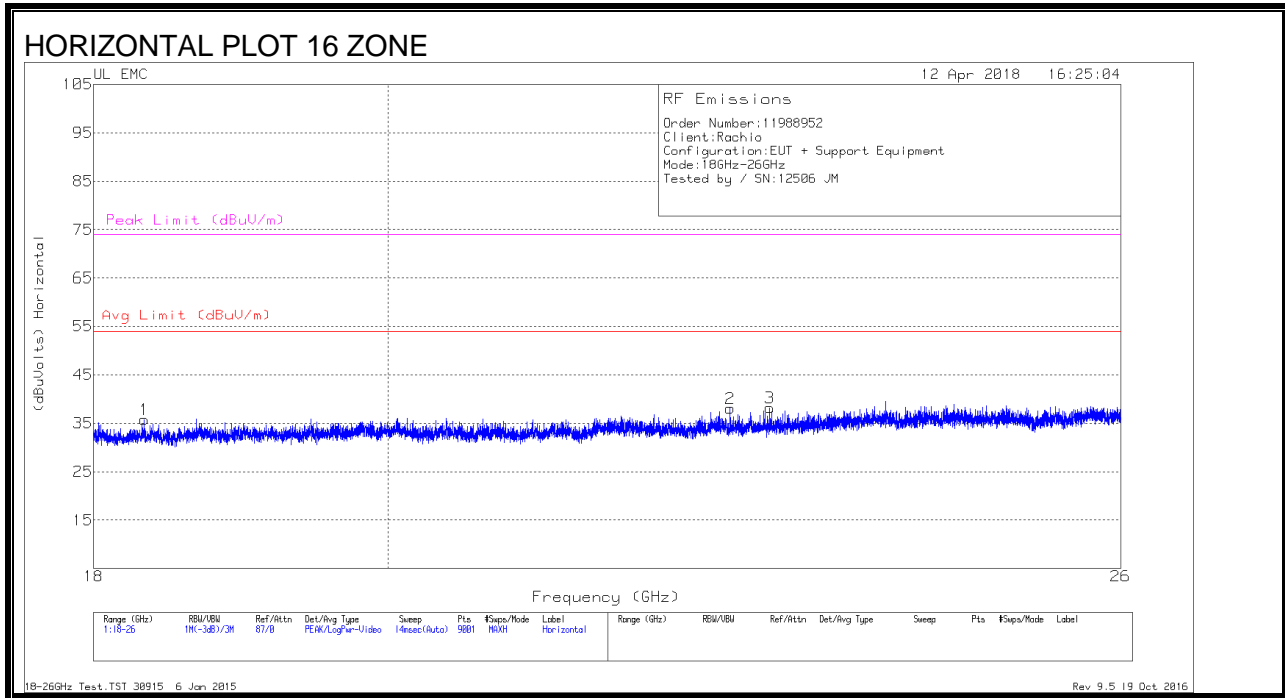
7.1.3. RADIATED EMISSIONS 18 to 26 GHz

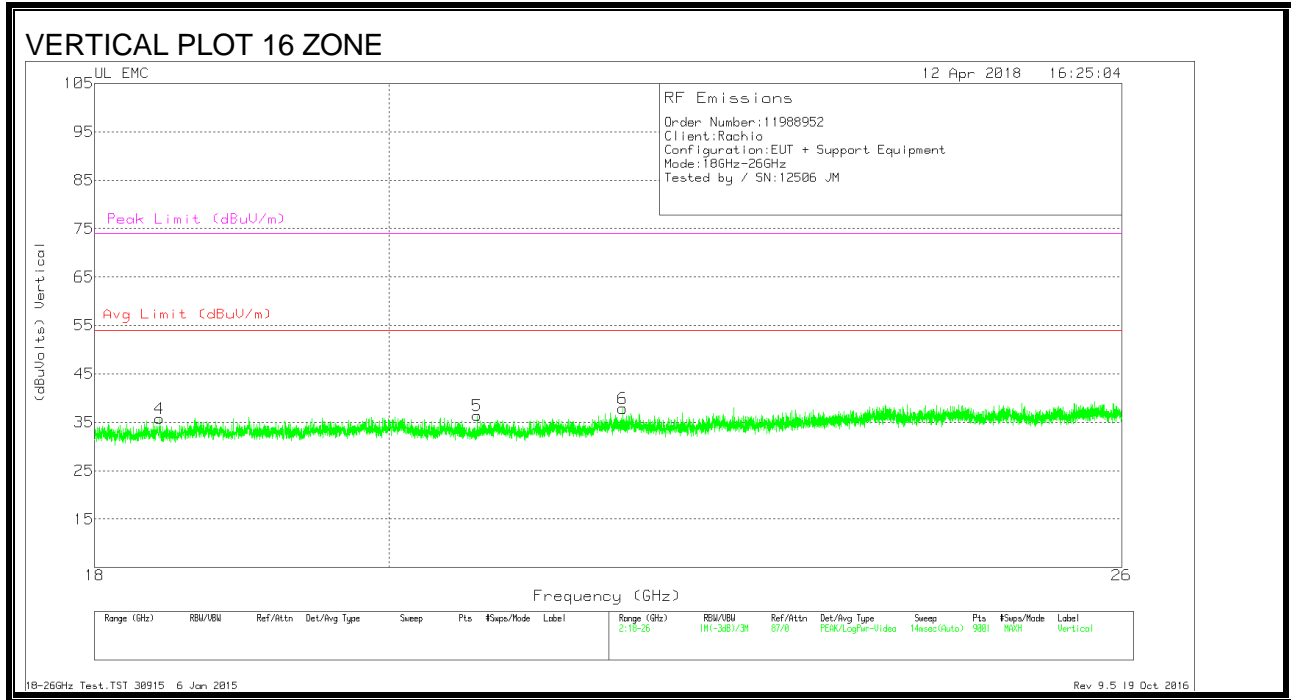


HORIZONTAL AND VERTICAL DATA 8 ZONE

Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	T89 AF (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	18.398	38.18	Pk	32.4	-25.3	-9.5	35.78	54	-18.22	74	-38.22
2	21.867	38.1	Pk	33.3	-24.6	-9.5	37.3	54	-16.7	74	-36.7
3	24.615	39.2	Pk	33.9	-24.3	-9.5	39.3	54	-14.7	74	-34.7
4	18.782	37.58	Pk	32.5	-25.1	-9.5	35.48	54	-18.52	74	-38.52
5	20.394	38.89	Pk	32.6	-25.1	-9.5	36.89	54	-17.11	74	-37.11
6	24.328	40.42	Pk	33.7	-24.5	-9.5	40.12	54	-13.88	74	-33.88

Pk - Peak detector



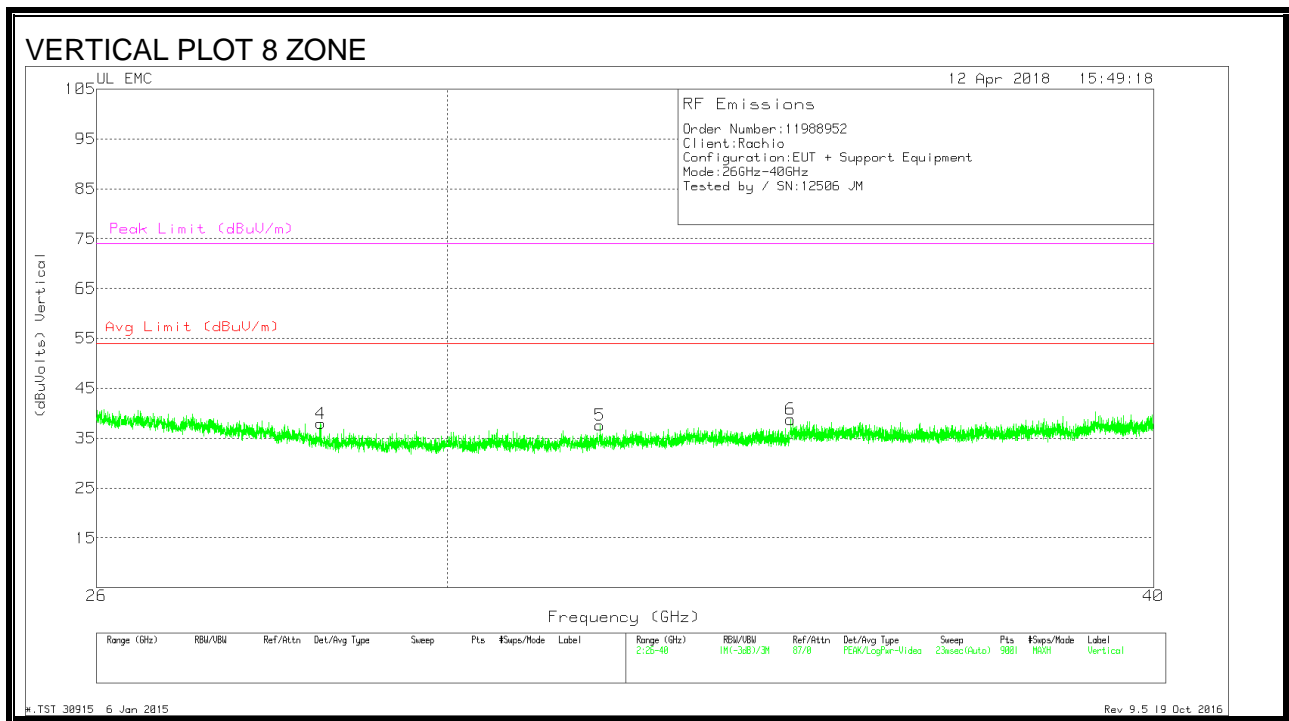
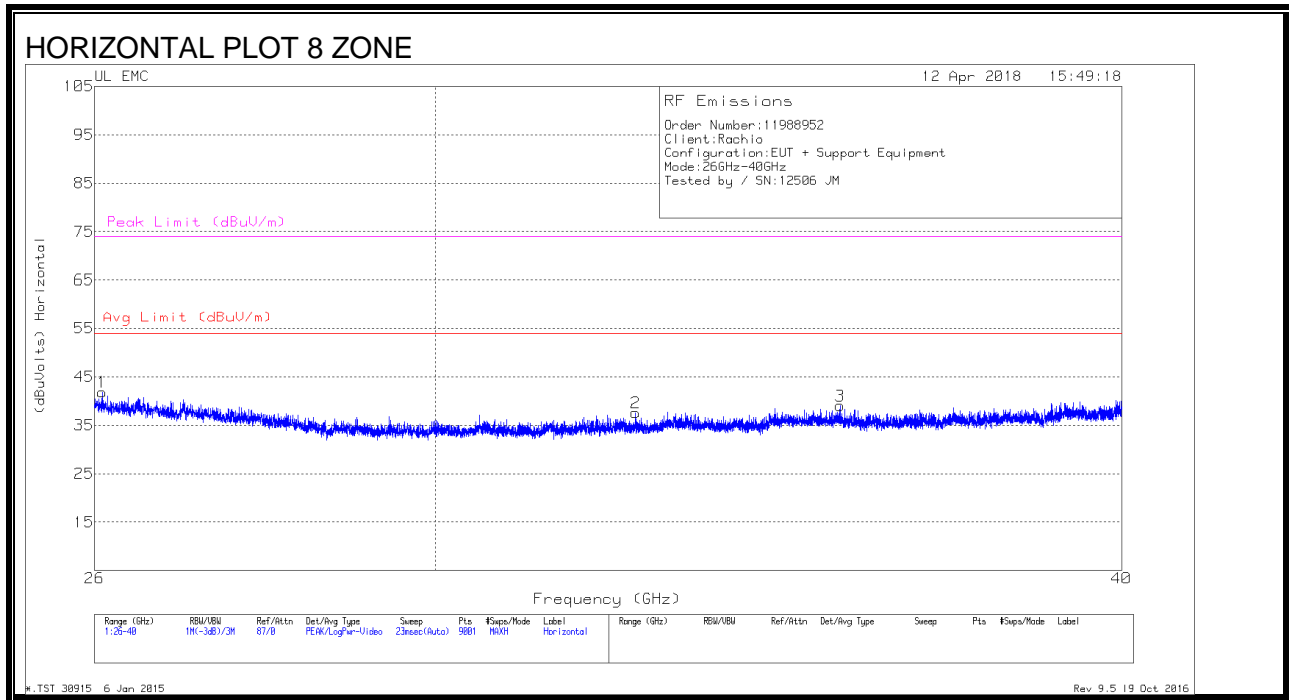


HORIZONTAL AND VERTICAL DATA 16 ZONE

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (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	18.33	38.06	Pk	32.4	-25.2	-9.5	35.76	54	-18.24	74	-38.24
2	22.608	39.39	Pk	33.3	-25.1	-9.5	38.09	54	-15.91	74	-35.91
3	22.931	39.21	Pk	33.5	-25	-9.5	38.21	54	-15.79	74	-35.79
4	18.423	38.19	Pk	32.4	-25.3	-9.5	35.79	54	-18.21	74	-38.21
5	20.644	38.7	Pk	32.7	-25.5	-9.5	36.4	54	-17.6	74	-37.6
6	21.748	38.95	Pk	33.3	-24.9	-9.5	37.85	54	-16.15	74	-36.15

Pk - Peak detector

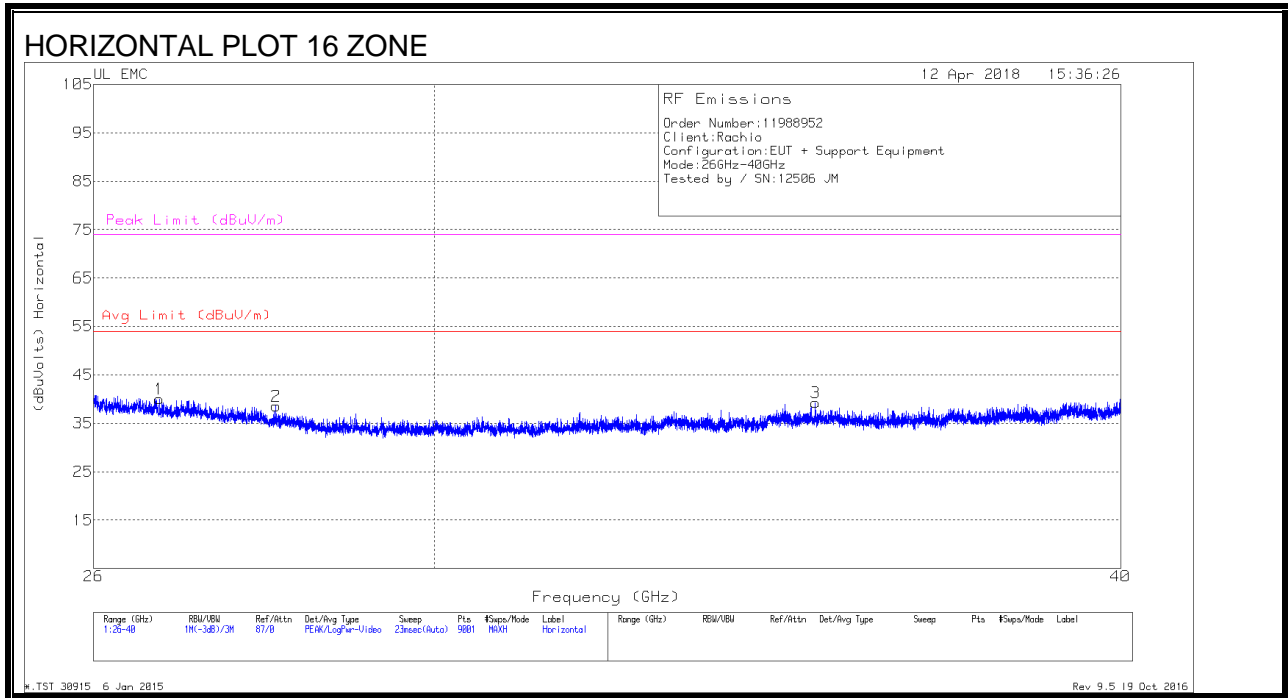
7.1.4. RADIATED EMISSIONS 26 to 40 GHz

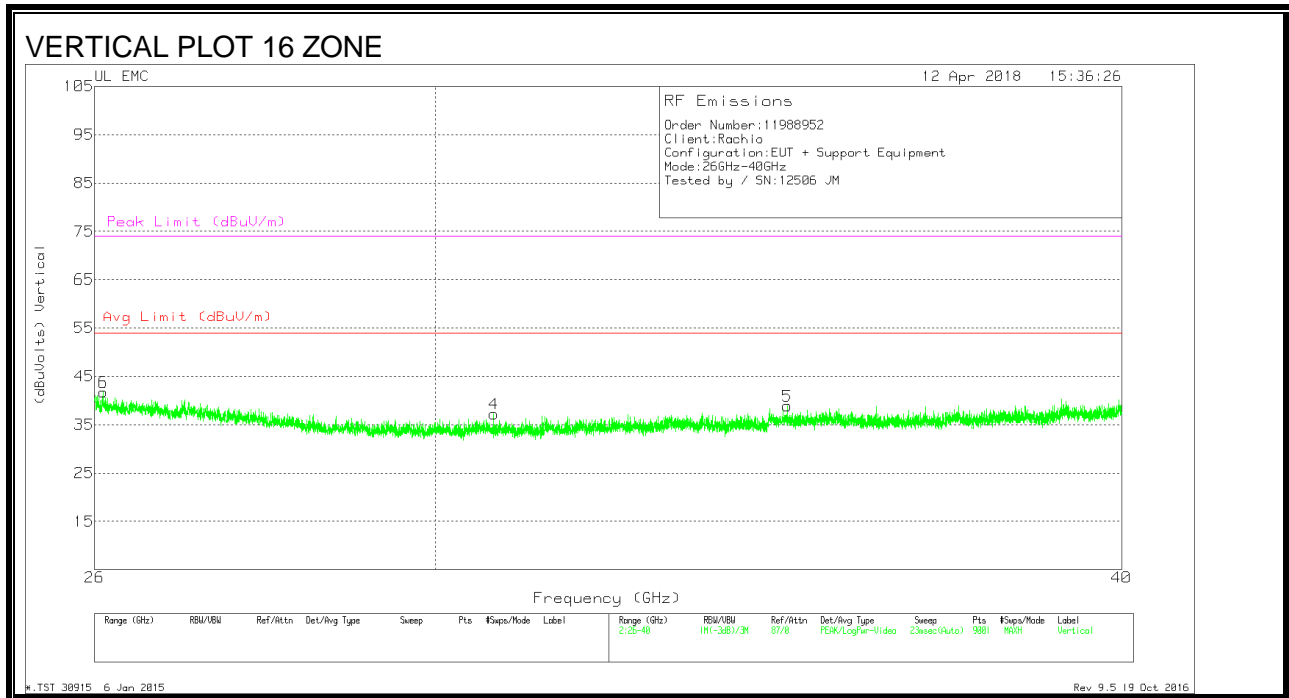


HORIZONTAL AND VERTICAL DATA 8 ZONE

Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	T90 AF (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	26.084	46.04	Pk	35.6	-30.3	-9.5	41.84	54	-12.16	74	-32.16
2	32.624	43.51	Pk	36.4	-32.8	-9.5	37.61	54	-16.39	74	-36.39
3	35.546	44.34	Pk	37.8	-33.6	-9.5	39.04	54	-14.96	74	-34.96
4	28.486	43.54	Pk	35.7	-31.8	-9.5	37.94	54	-16.06	74	-36.06
5	31.92	43.69	Pk	36.2	-32.8	-9.5	37.59	54	-16.41	74	-36.41
6	34.503	43.87	Pk	37.5	-33.1	-9.5	38.77	54	-15.23	74	-35.23

Pk - Peak detector





HORIZONTAL AND VERTICAL DATA 16 ZONE

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T90 AF (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	26.726	45.3	Pk	35.3	-31.1	-9.5	40	54	-14	74	-34
2	28.067	44.16	Pk	35.8	-31.9	-9.5	38.56	54	-15.44	74	-35.44
3	35.195	44.37	Pk	37.6	-33.2	-9.5	39.27	54	-14.73	74	-34.73
4	30.74	43.03	Pk	36.1	-32.4	-9.5	37.23	54	-16.77	74	-36.77
5	34.769	44.49	Pk	37.2	-33.3	-9.5	38.89	54	-15.11	74	-35.11
6	26.095	45.77	Pk	35.6	-30.1	-9.5	41.77	54	-12.23	74	-32.23

Pk - Peak detector

7.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4: 2014

LIMIT

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

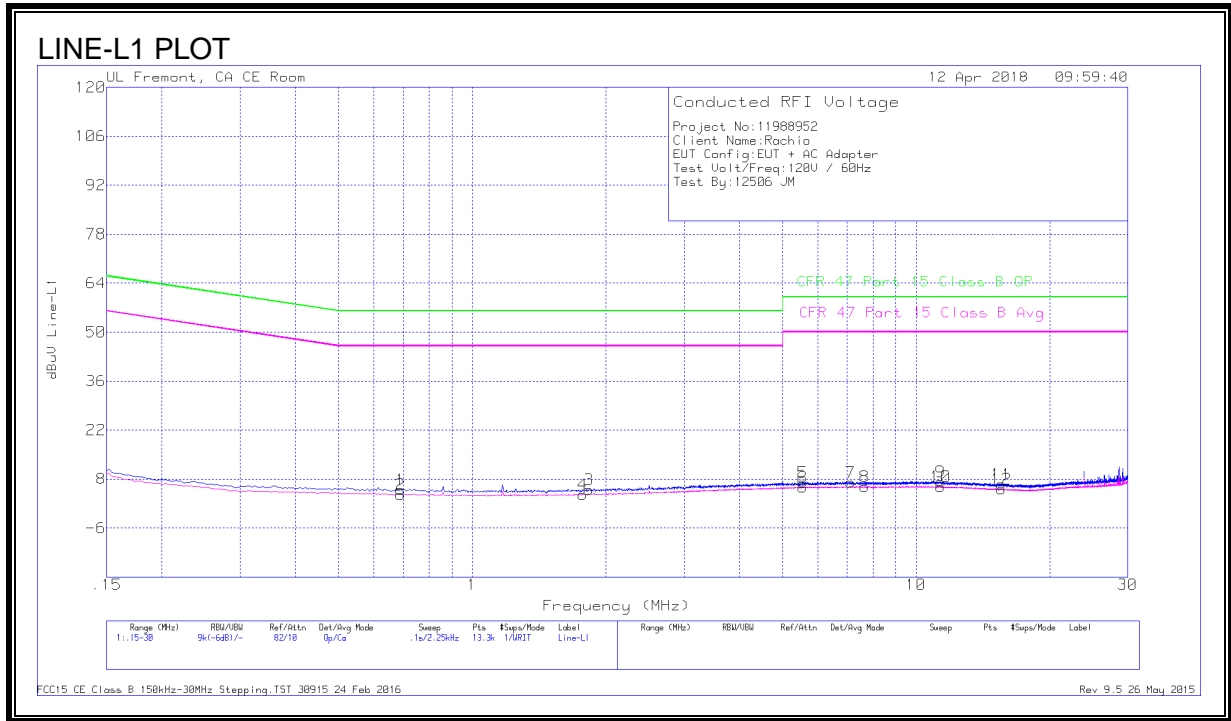
Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

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

RESULTS

6 WORST EMISSIONS 8 ZONE

Line-L1 .15 - 30MHz

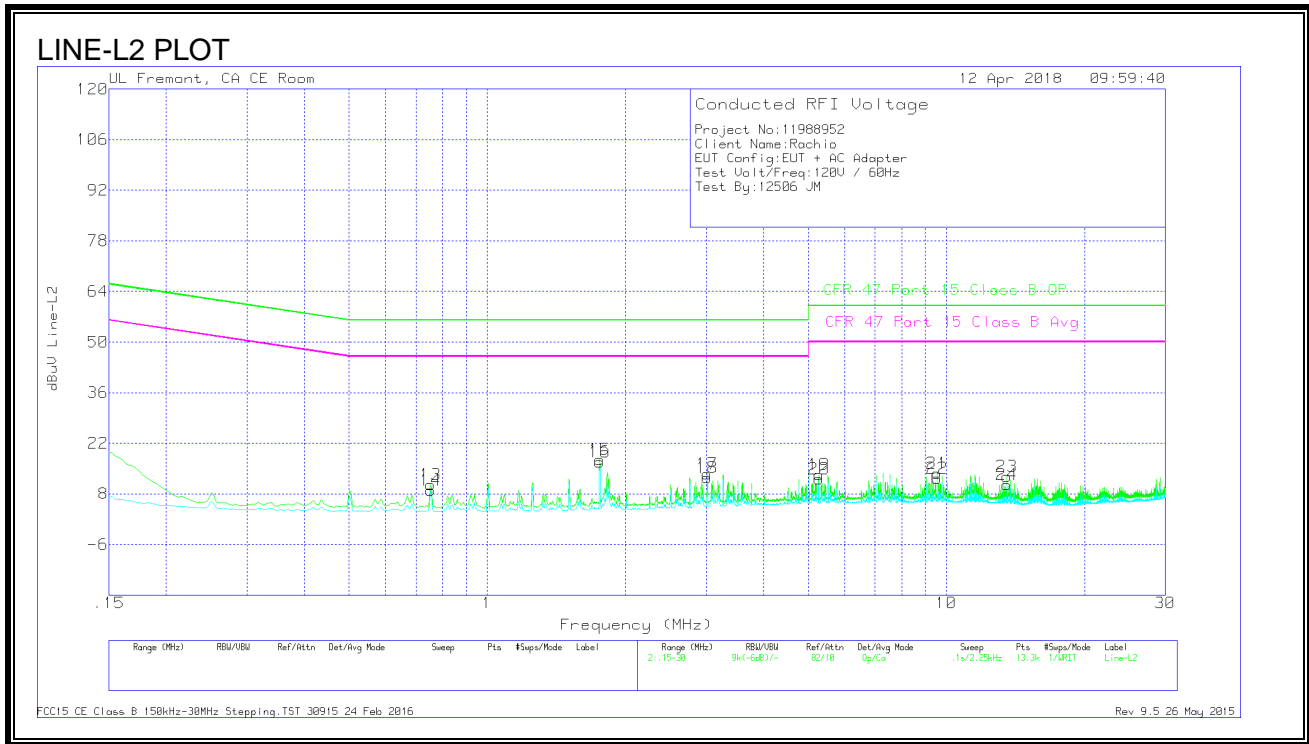


Trace Markers

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.69	-5.18	Qp	0	0	10.1	4.92	56	-51.08	-	-
2	.69	-6.49	Ca	0	0	10.1	3.61	-	-	46	-42.39
3	1.833	-5.24	Qp	0	.1	10.1	4.96	56	-51.04	-	-
4	1.7745	-6.55	Ca	0	.1	10.1	3.65	-	-	46	-42.35
5	5.5455	-3.27	Qp	0	.2	10.1	7.03	60	-52.97	-	-
6	5.5455	-4.68	Ca	0	.2	10.1	5.62	-	-	50	-44.38
7	7.13175	-3.26	Qp	0	.2	10.2	7.14	60	-52.86	-	-
8	7.6605	-4.57	Ca	0	.2	10.2	5.83	-	-	50	-44.17
9	11.3685	-3.21	Qp	.1	.2	10.2	7.29	60	-52.71	-	-
10	11.34825	-4.71	Ca	.1	.2	10.2	5.79	-	-	50	-44.21
11	15.57825	-3.95	Qp	0	.3	10.2	6.55	60	-53.45	-	-
12	15.57375	-5.4	Ca	0	.3	10.2	5.1	-	-	50	-44.9

Qp - Quasi-Peak detector
 Ca - CISPR average detection

Line-L2 .15 - 30MHz



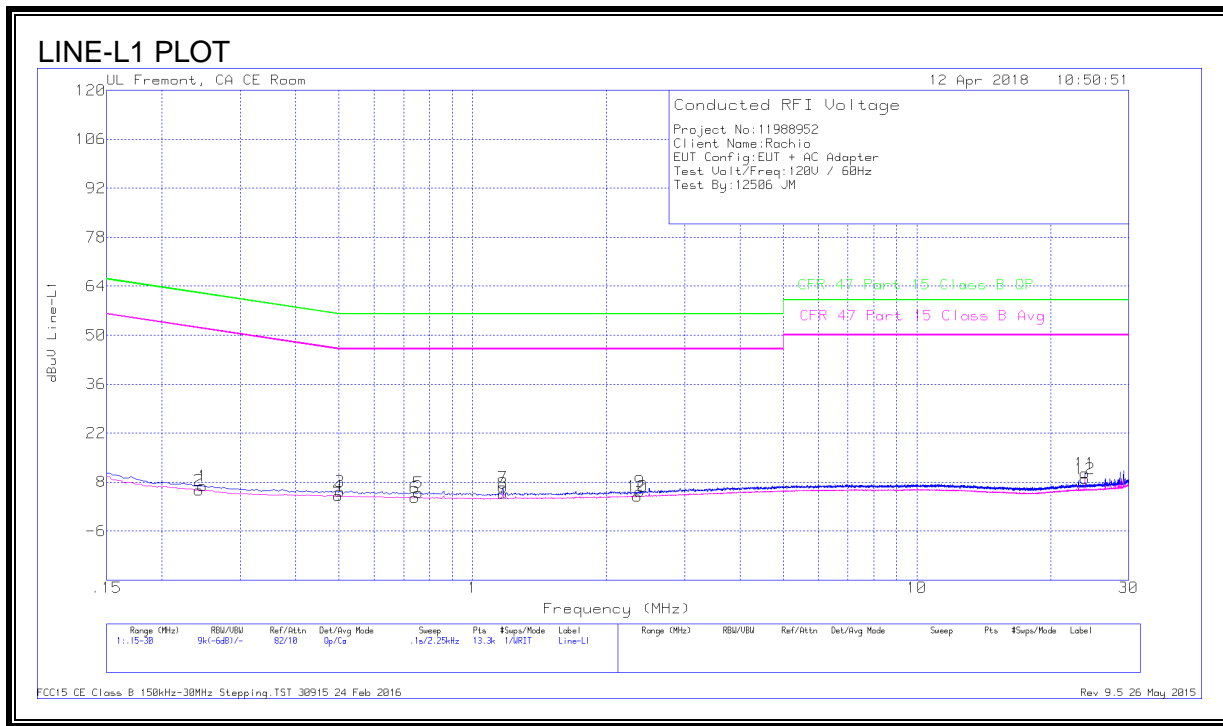
Trace Markers

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.753	.42	Qp	0	0	10.1	10.52	56	-45.48	-	-
14	.753	-1.11	Ca	0	0	10.1	8.99	-	-	46	-37.01
15	1.75875	7.24	Qp	0	.1	10.1	17.44	56	-38.56	-	-
16	1.75875	6.55	Ca	0	.1	10.1	16.75	-	-	46	-29.25
17	3.01425	3.27	Qp	0	.1	10.1	13.47	56	-42.53	-	-
18	3.01425	2.19	Ca	0	.1	10.1	12.39	-	-	46	-33.61
19	5.2755	3.19	Qp	0	.1	10.1	13.39	60	-46.61	-	-
20	5.2755	1.84	Ca	0	.1	10.1	12.04	-	-	50	-37.96
21	9.54375	3.3	Qp	0	.2	10.2	13.7	60	-46.3	-	-
22	9.54375	1.83	Ca	0	.2	10.2	12.23	-	-	50	-37.77
23	13.56225	2.23	Qp	.1	.2	10.2	12.73	60	-47.27	-	-
24	13.56225	.02	Ca	.1	.2	10.2	10.52	-	-	50	-39.48

Qp - Quasi-Peak detector
 Ca - CISPR average detection

6 WORST EMISSIONS 16 ZONE

Line-L1 .15 - 30MHz

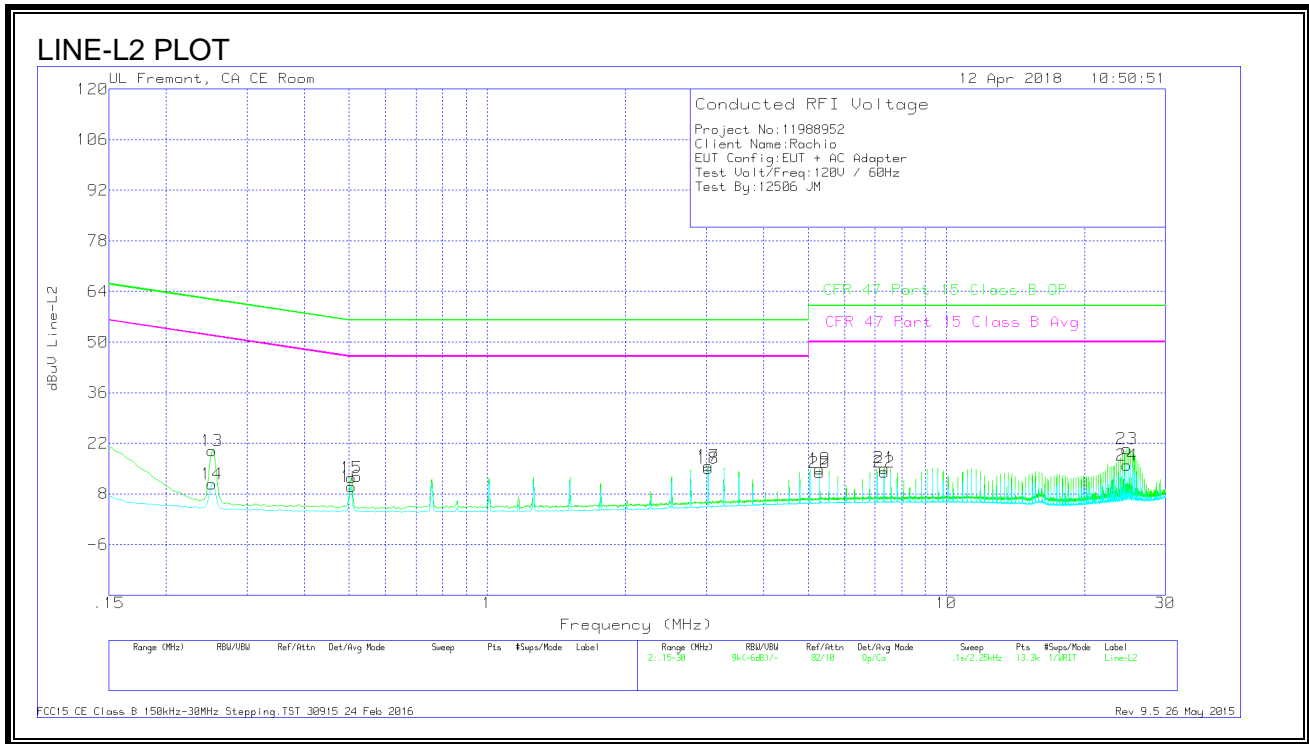


Trace Markers

Range 1: Line-L1 .15 - 30MHz												
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)	
1	.24675	-3.22	Qp	0	0	10.1	6.88	61.87	-54.99	-	-	
2	.24225	-4.37	Ca	0	0	10.1	5.73	-	-	52.02	-46.29	
3	.50325	-4.8	Qp	0	0	10.1	5.3	56	-50.7	-	-	
4	.49875	-6.03	Ca	0	0	10.1	4.07	-	-	46.02	-41.95	
5	.75525	-5.1	Qp	0	0	10.1	5	56	-51	-	-	
6	.74175	-6.47	Ca	0	0	10.1	3.63	-	-	46	-42.37	
7	1.16925	-3.58	Qp	0	.1	10.1	6.62	56	-49.38	-	-	
8	1.16925	-5.43	Ca	0	.1	10.1	4.77	-	-	46	-41.23	
9	2.382	-4.82	Qp	0	.1	10.1	5.38	56	-50.62	-	-	
10	2.346	-6.23	Ca	0	.1	10.1	3.97	-	-	46	-42.03	
11	23.91675	-28	Qp	.1	.3	10.5	10.62	60	-49.38	-	-	
12	23.91675	-1.88	Ca	.1	.3	10.5	9.02	-	-	50	-40.98	

Qp - Quasi-Peak detector
 Ca - CISPR average detection

Line-L2 .15 - 30MHz



Trace Markers

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.25125	9.9	Qp	0	0	10.1	20	61.72	-41.72	-	-
14	.25125	.66	Ca	0	0	10.1	10.76	-	-	51.72	-40.96
15	.5055	2.39	Qp	0	0	10.1	12.49	56	-43.51	-	-
16	.5055	-.1	Ca	0	0	10.1	10	-	-	46	-36
17	3.02775	5.56	Qp	0	.1	10.1	15.76	56	-40.24	-	-
18	3.02775	4.82	Ca	0	.1	10.1	15.02	-	-	46	-30.98
19	5.298	4.76	Qp	0	.1	10.1	14.96	60	-45.04	-	-
20	5.298	3.64	Ca	0	.1	10.1	13.84	-	-	50	-36.16
21	7.3185	4.75	Qp	0	.2	10.2	15.15	60	-44.85	-	-
22	7.3185	3.59	Ca	0	.2	10.2	13.99	-	-	50	-36.01
23	24.729	9.5	Qp	.1	.3	10.5	20.4	60	-39.6	-	-
24	24.729	5.02	Ca	.1	.3	10.5	15.92	-	-	50	-34.08

Qp - Quasi-Peak detector
 Ca - CISPR average detection