



**FCC 47 CFR PART 15 SUBPART B
ICES-003 ISSUE 5
EN 55022:2010 + AC: 2011**

TEST REPORT

BLUETOOTH HEADSET

MODEL NUMBER: WEARABLE CONCEPT 2

REPORT NUMBER: 15U20565-E5V3

ISSUE DATE: FEBRUARY 17, 2016

Prepared for
**PLANTRONICS, INC.
345 ENCINAL STREET
SANTA CRUZ, CA 95060
U.S.A.**

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	10/01/2015	Initial Issue	C. Pang
V2	11/19/2015	Address TCB's Questions	C. Pang
V3	2/17/2016	Update Section 6.2 Table	C. Pang

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PLANTRONICS INC.
345 ENCINAL STREET
SANTA CRUZ, CA 95060, U.S.A.

EUT DESCRIPTION: BLUETOOTH HEADSET

MODEL: WEARABLE CONCEPT 2

SERIAL NUMBER: BLD2_COMP02

DATE TESTED: APRIL 17, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC 47 CFR PART 15 SUBPART B	Pass
ICES-003 ISSUE 5	Pass
EN 55022:2010 + AC:2011	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:



CHIN PANG
SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

Tested By:



JOEY GOMEZ
EMC ENGINEER
UL VERIFICATION SERVICES INC.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009, EN 5022:2010 and CAN/CSA-CEI/IEC CISPR 22-10 as referenced by ICES-003 Issue 5.

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
☐ Chamber A	☐ Chamber D
☐ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F
	☐ Chamber G
	☒ Chamber H

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. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, 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	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth headset.

GENERAL INFORMATION

Power Requirements	5Vdc
Highest frequency generated or used by the EUT	2.4GHz

5.2. TEST CONFIGURATIONS

The following configuration was tested:

EUT Configuration	Description
Typical	EUT connected to host laptop via USB cable with minimum configuration

5.3. MODE(S) OF OPERATION

Mode	Description
Normal	Running 1kHz tone from Windows Media Player in a continuous loop, and microphone recording continuously.

5.4. SOFTWARE AND FIRMWARE

Only Windows Media Player was utilized

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	D400	45426167881	N/A
AC/DC Adapter	Dell	LA90PS0-00	ODF266-71615-67J-34B1	N/A

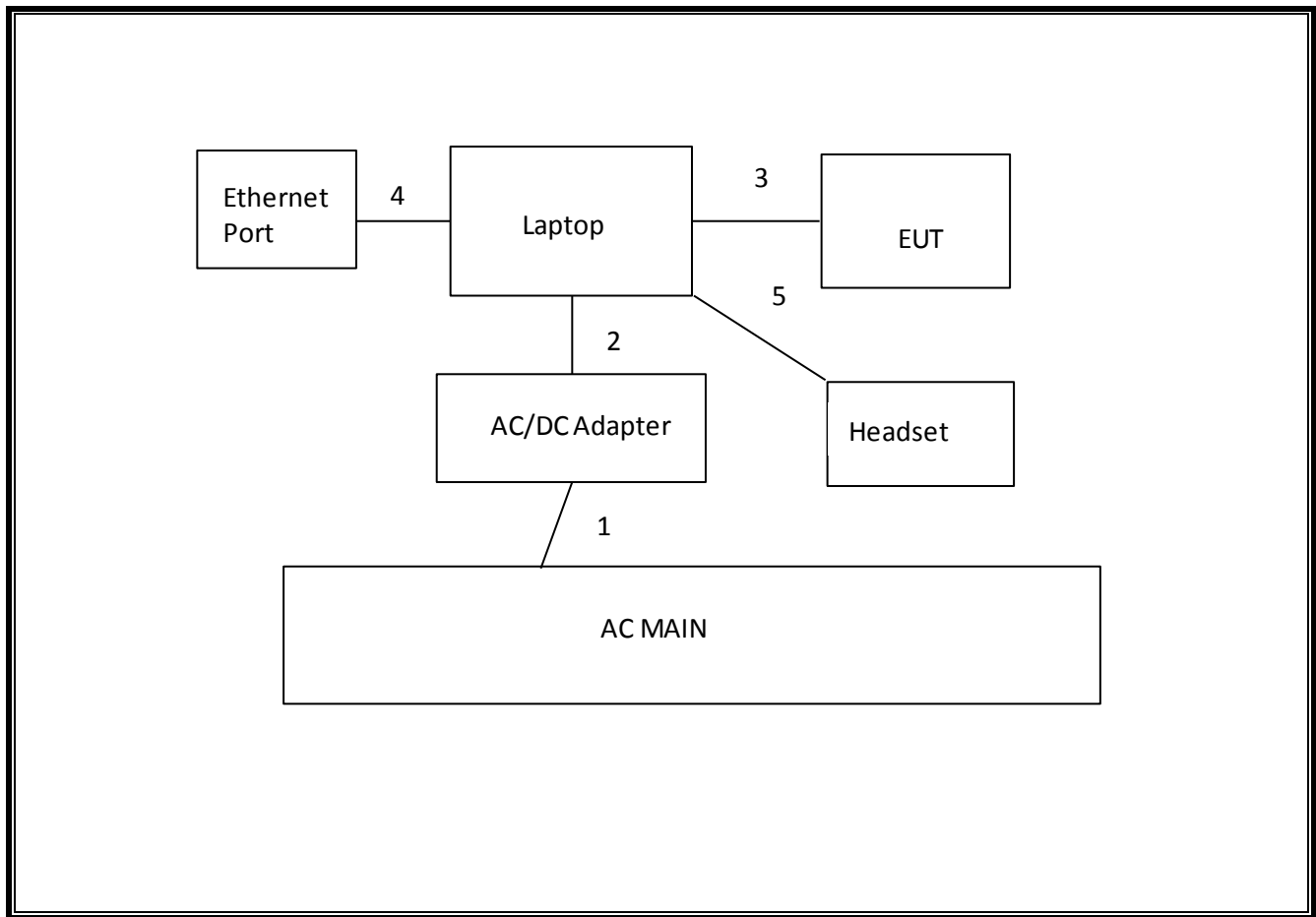
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	3-Prong	Unshielded	1	N/A
2	DC	1	Barrel	Unshielded	1	N/A
3	USB	1	USB	Unshielded	0.3	N/A
4	Ethernet	1	RJ45	Unshielded	5	N/A
5	Jack	1	headset	Unshielded	1	N/A

TEST SETUP

The EUT is connected to a host laptop via USB cable. The customer provided test software to exercise the EUTs during test. Refer to the following diagram.

SETUP DIAGRAM



6. APPLICABLE EMISSIONS LIMITS AND TEST RESULTS

6.1. EMISSIONS TEST AND MEASUREMENT EQUIPMENT

Radiated Emissions

Test Equipment List					
Description	Manufacturer	Model	Local ID (T No.)	Cal Date	Cal Due
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T863	1/7/2015	1/7/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T900	4/10/2015	4/10/2016
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T495	6/5/2014	6/5/2015
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T835	6/5/2014	6/5/2015
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T906	6/11/2015	6/11/2016
Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014		

Line Conducted Emissions

Test Equipment List					
Description	Manufacturer	Model	Local ID (T No.)	Cal Date	Cal Due
EMI Test Receiver 9KHz-7GHz	Rohde & Schwarz	ECSI7	T284	09/16/14	09/16/15
LISN for Conducted Emissions CISPR-16	FCC	50/250-25-2	T24	1/16/2015	1/16/2016
Power Cable, Line Conducted Emissions ANSI 63.4	U L	PG1	T861	7/28/2014	7/28/2015
Conducted Software	UL	UL EMC	Ver 9.5, May 17 2012		

6.2. RADIATED EMISSIONS LIMITS AND RESULTS

LIMIT

FCC Part 15 Subpart B Class B
ICES-003 Class B
EN 55022 Class B

Class B Limits

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

TEST PROCEDURE

ANSI C63.4
EN 55022

The highest clock frequency generated or used in the EUT was 2.4 GHz. Therefore, the frequency range was investigated from 30 MHz to 18 GHz, and for EN55022, measured to 6 GHz, based on the following table.

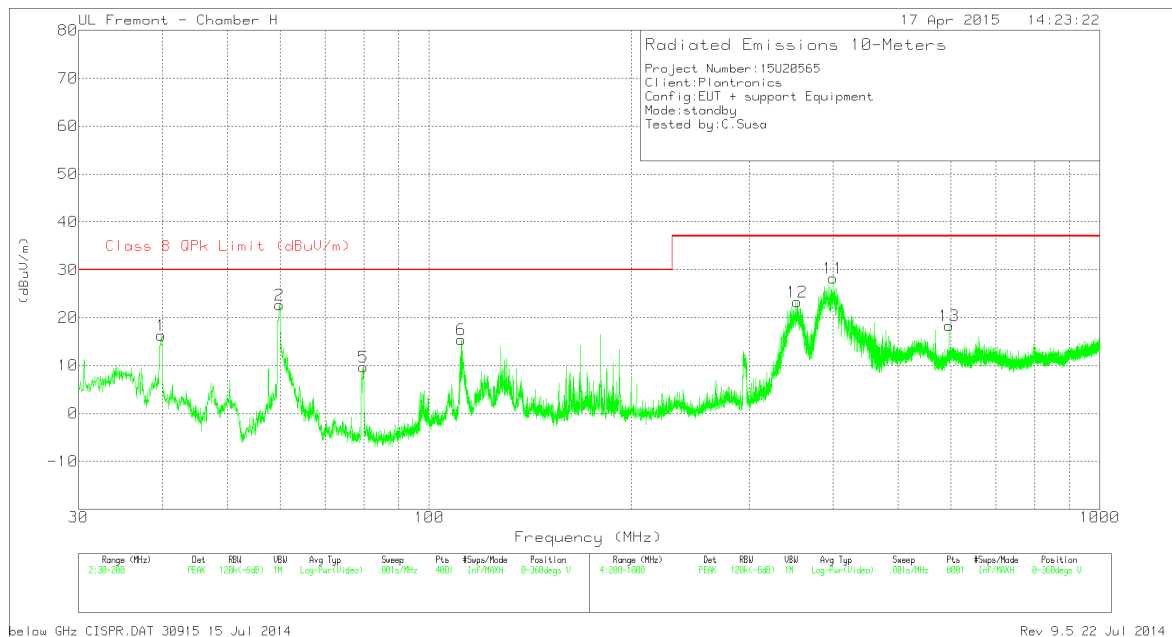
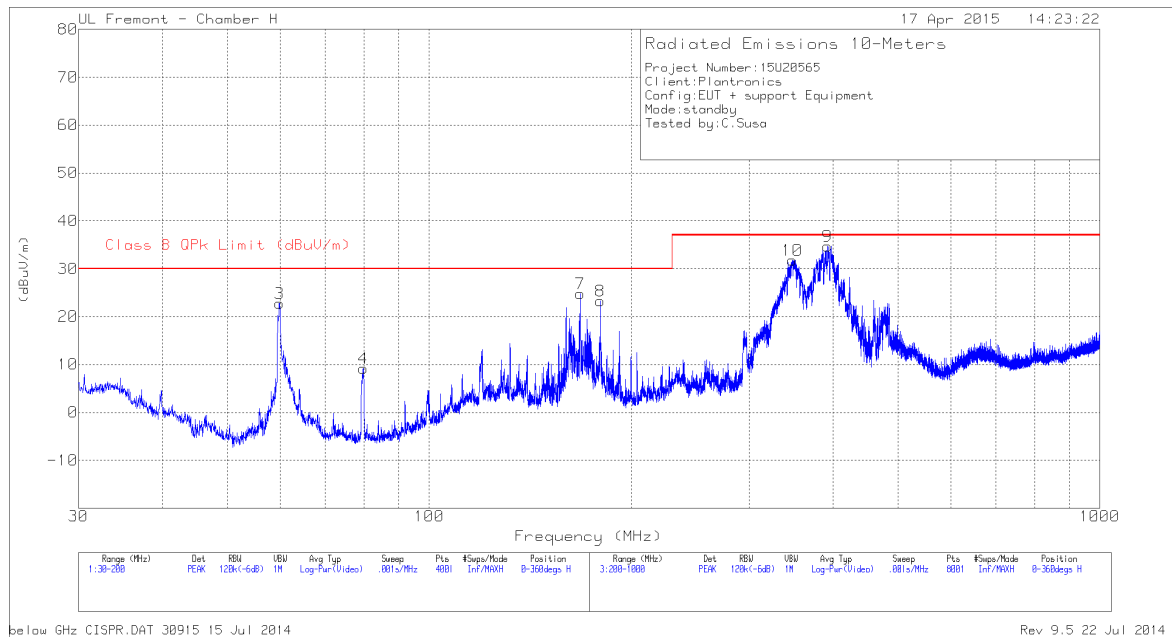
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1000
108-500	2000
500-1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower for FCC/IC, or 6 GHz for EU and others

RESULTS

3m RADIATED EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

Ambient Temperature: 23.6°C

HORIZONTAL AND VERTICAL PLOTS



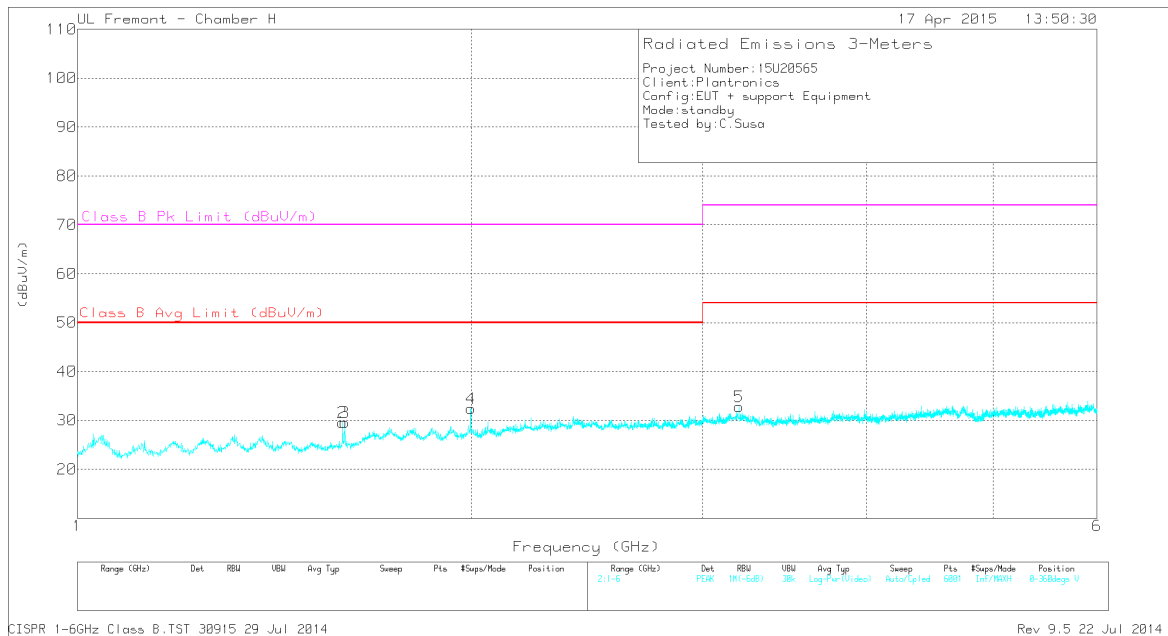
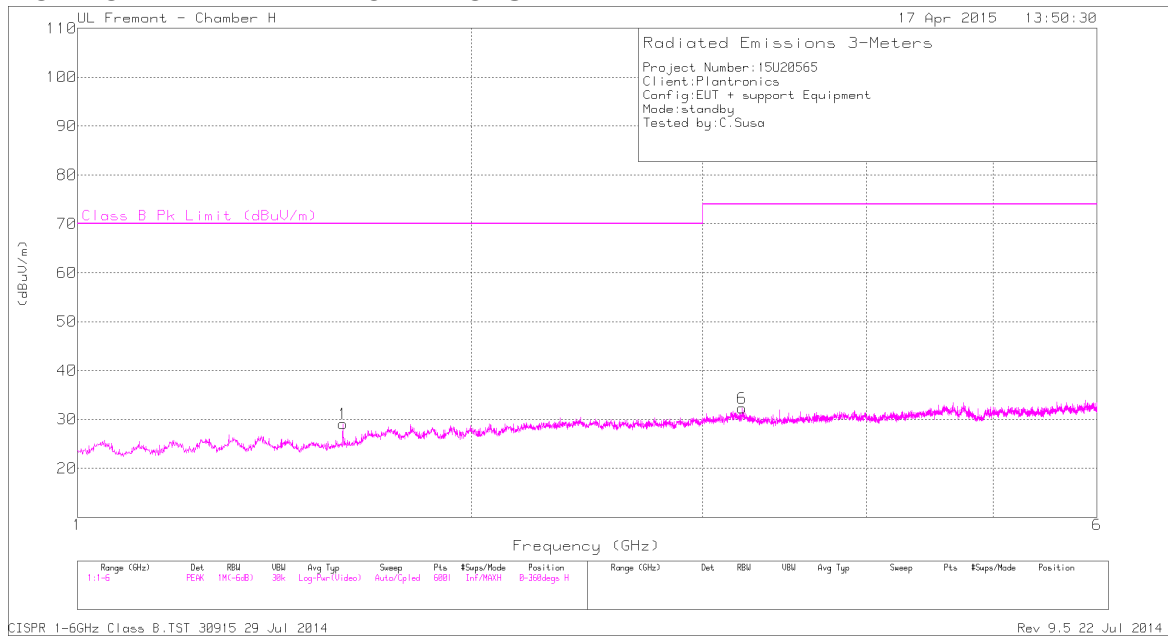
3m WORST CASE EMISSIONS – DATA FOR 30 TO 1000 MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Dist Corr (dB) 20Log	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	39.8388	43.33	PK	14.7	-31.2	-10.5	16.33	30	-13.67	0-360	100	V
3	59.7713	56.43	PK	7.8	-30.9	-10.5	22.83	30	-7.17	0-360	400	H
2	59.7925	56.29	PK	7.8	-30.9	-10.5	22.69	30	-7.31	0-360	100	V
5	79.7463	43.07	PK	7.8	-30.7	-10.5	9.67	30	-20.33	0-360	100	V
4	79.7675	42.57	PK	7.8	-30.7	-10.5	9.17	30	-20.83	0-360	301	H
6	111.6	43.51	PK	12.8	-30.4	-10.5	15.41	30	-14.59	0-360	100	V
7	167.9975	53.43	PK	11.8	-29.9	-10.5	24.83	30	-5.17	0-360	201	H
	168.0495	50.28	QP	11.8	-29.9	-10.5	21.68	30	-8.32	97	211	H
8	180.025	52.27	PK	11.4	-29.9	-10.5	23.27	30	-6.73	0-360	201	H
10	347.7	56.87	PK	14.3	-28.9	-10.5	31.77	37	-5.23	0-360	100	H
	347.6957	35.66	QP	14.3	-28.9	-10.5	10.56	37	-26.44	53	112	H
12	354	48.21	PK	14.4	-28.8	-10.5	23.31	37	-13.69	0-360	201	V
9	392.9	58.68	PK	15.2	-28.7	-10.5	34.68	37	-2.32	0-360	100	H
	393.0243	32.66	QP	15.2	-28.7	-10.5	8.66	37	-28.34	47	127	H
11	400.4	51.98	PK	15.4	-28.6	-10.5	28.28	37	-8.72	0-360	100	V
13	595.9	38.3	PK	18.6	-28.1	-10.5	18.3	37	-18.7	0-360	100	V

PK - Peak detector
QP - Quasi-Peak detector
below GHz CISPR.DAT 30915 15 Jul 2014
Rev 9.5 22 Jul 2014

3m RADIATED EMISSIONS 1000 TO 6000 MHz except FCC/ICES

HORIZONTAL AND VERTICAL PLOTS



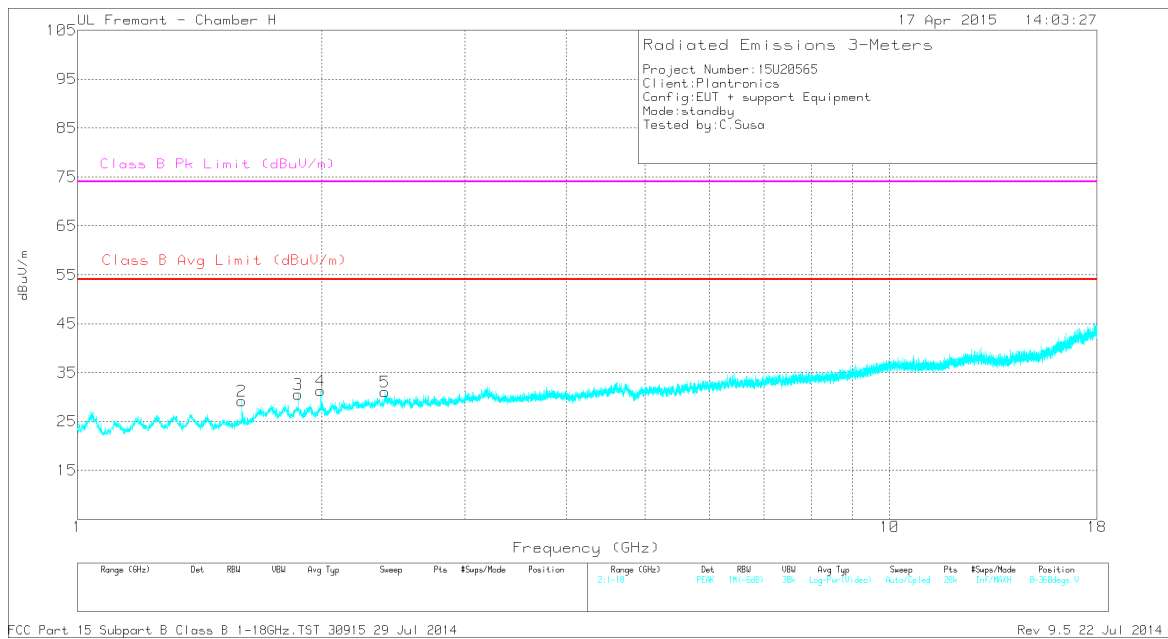
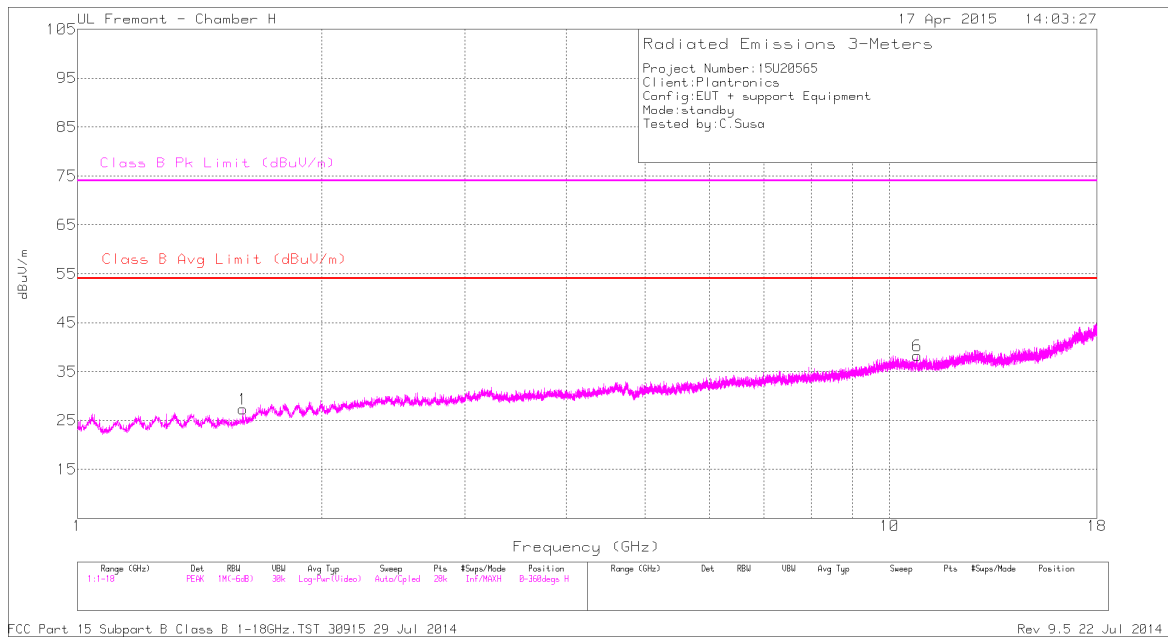
3m WORST CASE EMISSIONS – DATA FOR 1000 TO 6000 MHz except FCC/ICES

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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
2	1.593	36.93	PK	27.7	-35	29.63	50	-20.37	70	-40.37	0-360	100	V
1	1.594	36.44	PK	27.7	-35	29.14	-	-	70	-40.86	0-360	201	H
3	1.599	36.91	PK	27.7	-35	29.61	50	-20.39	70	-40.39	0-360	100	V
4	1.997	36.83	PK	30.5	-34.9	32.43	50	-17.57	70	-37.57	0-360	100	V
5	3.199	32.85	PK	33.7	-33.7	32.85	54	-21.15	74	-41.15	0-360	100	V
6	3.217	32.54	PK	33.5	-33.7	32.34	-	-	74	-41.66	0-360	100	H

PK - Peak detector
CISPR 1-6GHz Class B.TST 30915 29 Jul 2014
Rev 9.5 22 Jul 2014

3m RADIATED EMISSIONS 1000 TO 18,000 MHz – FCC/ICES Class B

HORIZONTAL AND VERTICAL PLOTS



3m WORST CASE EMISSIONS – DATA FOR 1000 TO 18,000 MHz – FCC /ICES Class B

Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl (dB)	Correcte d Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR) Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	1.594	36.53	PK	27.7	-35	29.23	-	-	74	-44.77	0-360	201	V
1	1.598	34.65	PK	27.7	-35	27.35	-	-	74	-46.65	0-360	201	H
3	1.869	35.21	PK	30.3	-35	30.51	-	-	74	-43.49	0-360	201	V
4	1.992	35.66	PK	30.5	-34.9	31.26	-	-	74	-42.74	0-360	201	V
5	2.389	33.39	PK	32.1	-34.4	31.09	-	-	74	-42.91	0-360	100	V
6	10.809	26.8	PK	37.2	-25.8	38.2	-	-	74	-35.8	0-360	98	H

PK - Peak detector

FCC Part 15 Subpart B Class B 1-18GHz.TST 30915 29 Jul 2014

Rev 9.5 22 Jul 2014

6.3. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

FCC Part 15 Subpart B Class B
ICES-003 Class B
EN 55022 Class B

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 0.30MHz.		

TEST PROCEDURE

ANSI C63.4-2009
CISPR 22
EN 55022

6.3.2. RESULTS – 120 V, 60 Hz

WORST CONDUCTED EMISSIONS – 120 V, 60 Hz

Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.18578	43.83	Qp	1	0	44.83	64.22	-19.39	54.22	-9.39
2	.18578	27.06	Ca	1	0	28.06	64.22	-36.16	54.22	-26.16
3	.2445	49.22	Pk	.7	0	49.92	61.94	-12.02	-	-
4	.2580	29.23	Av	.7	0	29.93	-	-	51.5	-21.57
5	4.389	38.47	Pk	.2	.1	38.77	56	-17.23	-	-
6	4.389	17.3	Av	.2	.1	17.6	-	-	46	-28.4

Pk - Peak detector

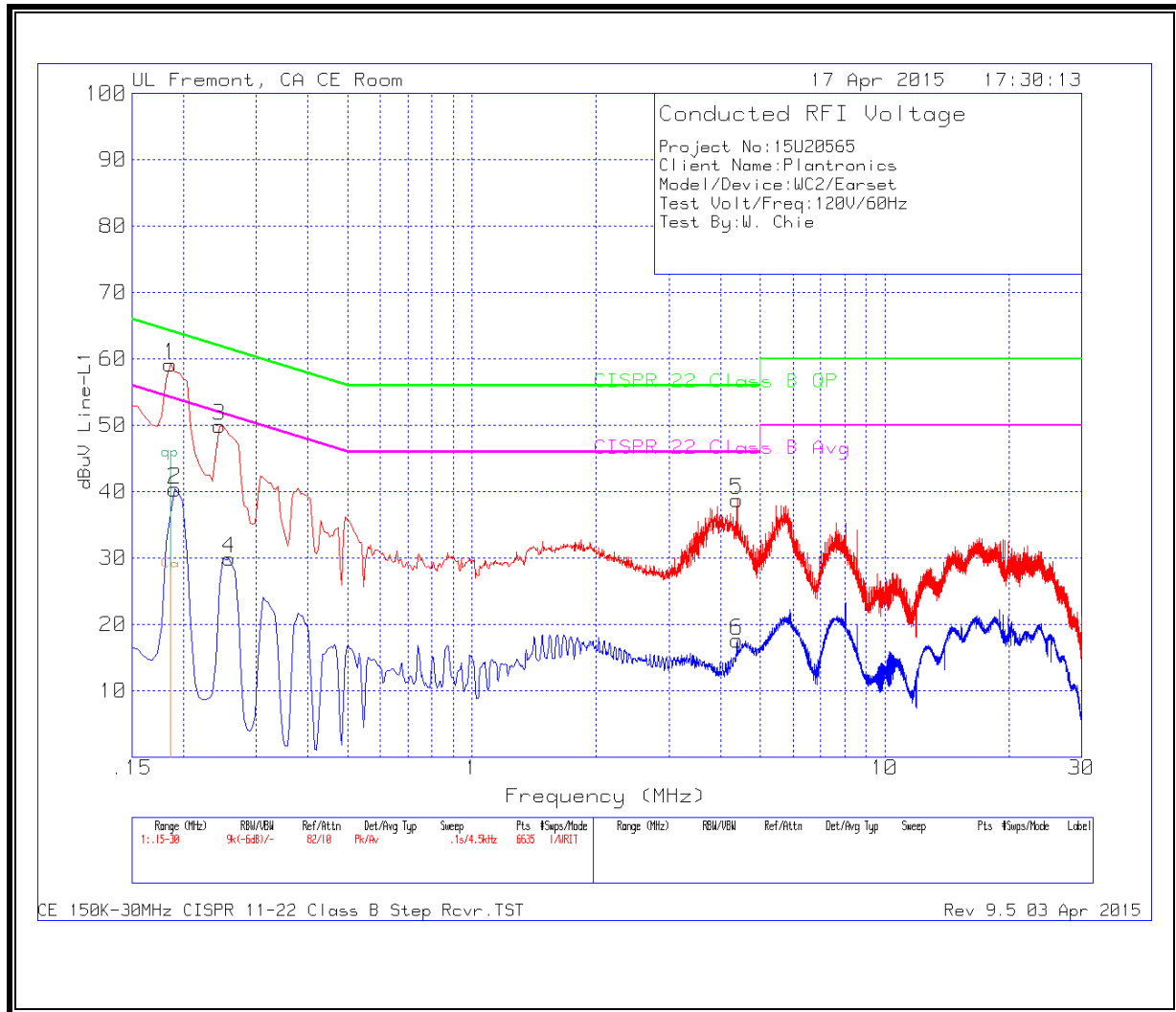
Av - Average detection

Ca - CISPR average detection

Qp - Quasi-Peak detector

CE 150K-30MHz CISPR 11-22 Class B Step Rcvr.TST
Rev 9.5 03 Apr 2015

LINE 1 RESULTS – 120 V, 60 Hz



WORST CONDUCTED EMISSIONS – 120 V, 60 Hz

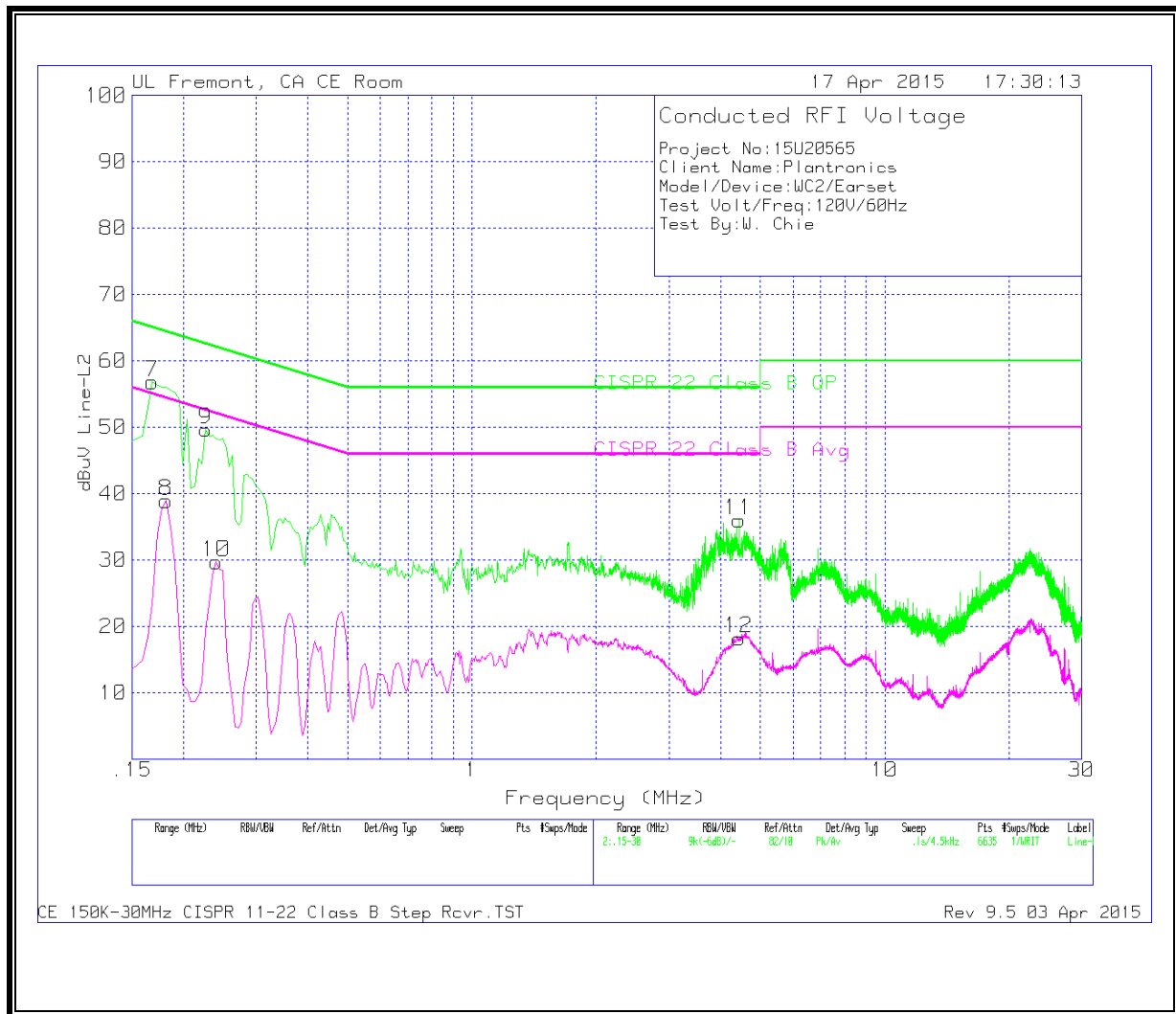
Range 2: Line-L2 .15 - 30MHz										
Marker	Frequenc y (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
7	.168	55.54	Pk	1.3	0	56.84	65.06	-8.22	-	-
8	.1815	37.72	Av	1.2	0	38.92	-	-	54.42	-15.5
9	.2265	48.75	Pk	.9	0	49.65	62.58	-12.93	-	-
10	.24	28.92	Av	.8	0	29.72	-	-	52.1	-22.38
11	4.434	35.7	Pk	.2	.1	36	56	-20	-	-
12	4.434	17.92	Av	.2	.1	18.22	-	-	46	-27.78

Pk - Peak detector

Av - Average detection

Peak/Average/RMS Emissions

LINE 2 RESULTS – 120 V, 60 Hz



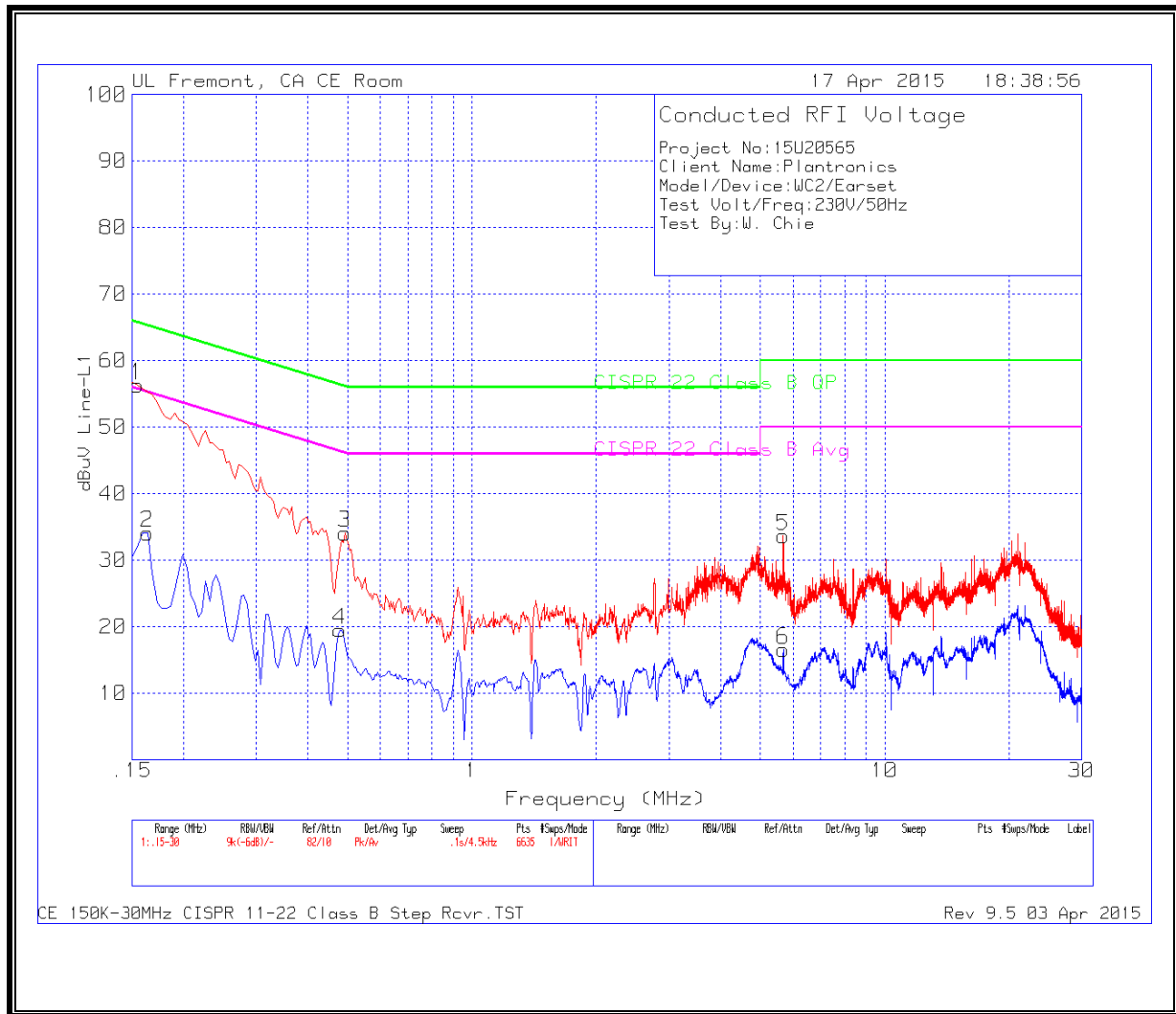
6.3.3. RESULTS – 230 V, 50 Hz

WORST CONDUCTED EMISSIONS – 230 V, 50 Hz

Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.1545	55.02	Pk	1.3	0	56.32	65.75	-9.43	-	-
2	.1635	32.9	Av	1.2	0	34.1	-	-	55.28	-21.18
3	.492	33.79	Pk	.3	0	34.09	56.13	-22.04	-	-
4	.4785	19.09	Av	.4	0	19.49	-	-	46.37	-26.88
5	5.676	33.36	Pk	.2	.1	33.66	60	-26.34	-	-
6	5.6805	16.27	Av	.2	.1	16.57	-	-	50	-33.43

Pk - Peak detector

Av - Average detection



WORST CONDUCTED EMISSIONS – 230 V, 50 Hz

Range 2: Line-L2 .15 - 30MHz										
Marker	Frequenc y (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
7	.1545	51.55	Pk	1.4	0	52.95	65.75	-12.8	-	-
8	.1545	27.58	Av	1.4	0	28.98	-	-	55.75	-26.77
9	1.896	28.8	Pk	.2	.1	29.1	56	-26.9	-	-
10	1.8375	17.89	Av	.2	.1	18.19	-	-	46	-27.81
11	4.47	34.08	Pk	.2	.1	34.38	56	-21.62	-	-
12	4.4655	17.77	Av	.2	.1	18.07	-	-	46	-27.93

Pk - Peak detector

Av - Average detection

CE 150K-30MHz CISPR 11-22 Class B Step Rcvr.TST

Rev 9.5 03 Apr 2015

