

TRaC Wireless Test Report : TTR-000174WUS1

Applicant : Promethean Ltd

Apparatus : Activboard 300 Pro Series

Specification(s) : CFR47 Part 15 July 2008

Purpose of Test : Class II Permissive Change

FCCID : QAM015

Authorised by :



: Radio Product Manager

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1.1 General

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on samples submitted to the Laboratory.

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1.2 Tests Requested By

This testing in this report was requested by :

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1.3 Manufacturer

As Above

1.4 Apparatus Assessed

The following apparatus was assessed between 20th August 2010 – 20th September 2010:

Activboard 300 Pro Series

Models:-

PRM-AB378-03
PRM-AB387-03
PRM-AB395-03

Equipment description

The Promethean 300 Pro Series are available in three sizes 78", 87", 95 and have the following features:

Stereo Amplifier
Stereo Loudspeakers
USB Hub
USB Port
2.4GHz Radio Link
2 Pen Frequencies
18.0Vdc Power supply unit, model number DPS-605B A

The cables for the Loudspeakers are pre installed into the outer case of the boards.

The 300 Pro Series, testing was carried out with the audio amplifier and USB Hub and USB port exercised, and connected to the PC via a USB lead.

When required the testing was carried out with all of the boards connected to the PC via the 2.4GHz radio link.

1.5 Test Result Summary

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

The statements relating to compliance with the standards below apply ONLY as qualified in the notes and deviations stated in sections 1.6 to 1.7 of this test report.

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

Test Type	Regulation	Measurement standard	Result
Spurious Emissions Radiated <1000MHz	Title 47 of the CFR: Part 15 Subpart (c) 15.209	ANSI C63.10	Pass
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart (c) 15.207	ANSI C63.10	Pass
Intentional Emission Frequency	Title 47 of the CFR: Part 15 Subpart (c) 15.209(a)	ANSI C63.10	Pass
Intentional Emission Field Strength	Title 47 of the CFR: Part 15 Subpart (c) 15.209(a)	ANSI C63.10	Pass
Intentional Emission Band Occupancy	Title 47 of the CFR: Part 15 Subpart (c) 15.215(c)	ANSI C63.10	Pass
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart (b) 15.109	ANSI C63.10	Pass
Antenna Arrangements Integral:	Title 47 of the CFR: Part 15 Subpart (c) 15.203	-	Pass
Antenna Arrangements External Connector	Title 47 of the CFR: Part 15 Subpart (c) 15.204	-	Pass
Restricted Bands	Title 47 of the CFR: Part 15 Subpart (c) 15.205	-	Pass
Maximum Frequency of Search	Title 47 of the CFR: Part 15 Subpart (c) 15.33	-	Pass
Extrapolation Factor	Title 47 of the CFR: Part 15 Subpart (c) 15.31(f)	-	Pass

Abbreviations used in the above table:

CFR : Code of Federal Regulations
REFE : Radiated Electric Field Emissions

ANSI : American National Standards Institution
PLCE : Power Line Conducted Emissions

1.6 Notes Relating To The Assessment

With regard to this assessment, the following points should be noted:

The results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 1.7 of this test report (Deviations from Test Standards).

For emissions testing, throughout this test report, "Pass" indicates that the results for the sample as tested were below the specified limit (refer also to Section 2, Measurement Uncertainty).

Where relevant, the apparatus was only assessed using the monitoring methods and susceptibility criteria defined in this report.

All testing with the exception of testing at the Open Area Test Site was performed under the following environmental conditions:

Temperature	: 17 to 23 °C
Humidity	: 45 to 75 %

All dates used in this report are in the format dd/mm/yy.

This assessment has been performed in accordance with the requirements of ISO/IEC 17025.

1.7 Deviations from Test Standards

There were no deviations from the standards tested to.

2.1 Measurement Uncertainty Values

The following page contains the measurement uncertainties for measurements

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**

Uncertainty in test result (Equipment – TRL05) = **1.08dB**

Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**

Uncertainty in test result (Equipment – TRL05) = **0.113ppm**

Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**,

Uncertainty in test result (30MHz – 1GHz) = **4.6dB**,

Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**

Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%**, Uncertainty in Amplitude measurement = **0.82%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

[18] Transmission Time Measurement

Uncertainty in test result = **7.98%**

Section 3:

Modifications

3.1 Modifications Performed During Assessment

No modifications were performed during the assessment

Appendix A:

Formal Emission Test Results

Abbreviations used in the tables in this appendix:

Spec	: Specification	ALSR	: Absorber Lined Screened Room
Mod	: Modification	OATS	: Open Area Test Site
EUT	: Equipment Under Test	ATS	: Alternative Test Site
SE	: Support Equipment	Ref	: Reference
L	: Live Power Line	Freq	: Frequency
N	: Neutral Power Line	MD	: Measurement Distance
E	: Earth Power Line	SD	: Spec Distance
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

A1 Transmitter Intentional Emission Radiated

Test Details: PRM-AB378-03	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.209(a)
Measurement standard	ANSI C63.10:2009
EUT sample number	S01
Modification state	0
SE in test environment	S04, S05, S06
SE isolated from EUT	S07, S08
EUT set up	Refer to Appendix C

Highest power output Recorded for 78"BOARDS	Frequency (kHz)	Meas. Rx. (dBuV/m)	Distance (m)	Extrapolation Factor	Field Strength (dB μ V/m)	Result (μ V/m)
	123.63	86.1	1	103.70	-17.60	0.132
	123.63	62.4	3	80.00	-17.60	0.132
	130.14	86.40	1	104.00	-17.60	0.132
	130.14	62.40	3	80.00	-17.60	0.132

- Notes:**
- 1 Results quoted are extrapolated as indicated
 - 2 1m – 3m extrapolation factor is difference between measured results at the distances.
 - 3 3m – 300m extrapolation factor is 80dB using the extrapolation factor of 40dB/decade as per 15.31(f)
 - 4 1m – 300m extrapolation factor is sum of the extrapolations between 1m - 3m and 3m – 300m.
 - 5 Receiver detector @ fc = Average 10 kHz
 - 6 When battery powered the EUT was powered with new batteries

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10 2009 section 6.4
 - 2 Measuring distances 3m & 10m
 - 3 EUT 0.8 metre above ground plane
 - 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Rotation of the receiver antenna about its vertical plane (and horizontal plane if require).
EUT manipulated through typical positions or orientated in three orthogonal planes as required.
Maximum results recorded

Test Details: PRM-AB387-03	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.209(a)
Measurement standard	ANSI C63.10:2009
EUT sample number	S02
Modification state	0
SE in test environment	S04, S05, S06
SE isolated from EUT	S07, S08
EUT set up	Refer to Appendix C

Highest power output Recorded for 87"BOARDS	Frequency (kHz)	Meas. Rx. (dBuV/m)	Distance (m)	Extrapolation Factor	Field Strength (dBµV/m)	Result (µV/m)
	123.63	82.0	1	104.7	-22.70	0.073
	123.63	57.3	3	80.00	-22.70	0.073
	130.14	81.2	1	106.8	-25.60	0.052
	130.14	54.4	3	80.00	-25.60	0.052
Limit value @ 123.50kHz			19.51 (µV/m)@300m			
Limit value @ 130.5 kHz			18.46 (µV/m)@300m			

- Notes:**
- 1 Results quoted are extrapolated as indicated
 - 2 1m – 3m extrapolation factor is difference between measured results at the distances.
 - 3 3m – 300m extrapolation factor is 80dB using the extrapolation factor of 40dB/decade as per 15.31(f)
 - 4 1m – 300m extrapolation factor is sum of the extrapolations between 1m - 3m and 3m – 300m.
 - 5 Receiver detector @ fc = Average 10 kHz
 - 6 When battery powered the EUT was powered with new batteries

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10 2009 section 6.4
 - 2 Measuring distances 3m & 10m
 - 3 EUT 0.8 metre above ground plane
 - 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Rotation of the receiver antenna about its vertical plane (and horizontal plane if require).
EUT manipulated through typical positions or orientated in three orthogonal planes as required.
Maximum results recorded

Test Details: PRM-AB395-03	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.209(a)
Measurement standard	ANSI C63.10:2009
EUT sample number	S03
Modification state	0
SE in test environment	S04, S05, S06
SE isolated from EUT	S07, S08
EUT set up	Refer to Appendix C

Highest power output Recorded for 95" BOARDS	Frequency (kHz)	Meas. Rx. (dBuV/m)	Distance (m)	Extrapolation Factor	Field Strength (dBuV/m)	Result (uV/m)
	123.63	82.6	1	102.1	-19.50	0.106
	123.63	60.5	3	80.00	-19.50	0.106
	130.14	82.5	1	103.8	-21.30	0.086
	130.14	58.7	3	80.00	-21.30	0.086
Limit value @ 123.50kHz			19.51 (uV/m)@300m			
Limit value @ 130.5 kHz			18.46 (uV/m)@300m			

- Notes:**
- 1 Results quoted are extrapolated as indicated
 - 2 1m – 3m extrapolation factor is difference between measured results at the distances.
 - 3 3m – 300m extrapolation factor is 80dB using the extrapolation factor of 40dB/decade as per 15.31(f)
 - 4 1m – 300m extrapolation factor is sum of the extrapolations between 1m - 3m and 3m – 300m.
 - 5 Receiver detector @ fc = Average 10 kHz
 - 6 When battery powered the EUT was powered with new batteries

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10 2009 section 6.4
 - 2 Measuring distances 3m & 10m
 - 3 EUT 0.8 metre above ground plane
 - 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Rotation of the receiver antenna about its vertical plane (and horizontal plane if require).
EUT manipulated through typical positions or orientated in three orthogonal planes as required.
Maximum results recorded

A2 Intentional Emission Band Occupancy

Test Details: PRM-AB378-03	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.215(c)
Measurement standard	ANSI C63.10:2009
EUT sample number	S01
Modification state	0
SE in test environment	S04, S05, S06
SE isolated from EUT	S07, S08
EUT set up	Refer to Appendix C

Band occupancy @ 20dBc	f lower	f higher
Board Free Running	120.910256 kHz	132.993589 kHz
123 kHz Pen	122.000000 kHz	125.461438 kHz
130 kHz Pen	128.570128 kHz	132.224358 kHz

See spectrum analyser plot – Annex B

Notes: 1 When battery powered the EUT was powered with new batteries

Test 1 As per Radio – Noise Emissions, ANSI C63.10 2009 section 6.4

Method: 2 Measuring distances 3m & 10m

3 EUT 0.8 metre above ground plane

4 Emissions maximised by rotation of EUT, on an automatic turntable.

Rotation of the receiver antenna about its vertical plane (and horizontal plane if require).

EUT manipulated through typical positions or orientated in three orthogonal planes as required.

Maximum results recorded

A3 Radiated Electric Filed Emissions

Preliminary scans were performed using a peak detector with the RBW = 100 kHz. The radiated electric filed emission test applies to all spurious emissions and harmonics emissions. The maximum permitted field strength is listed in Section 15.209. The EUT was set to transmit as required.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site : 3m alternative test site :

The effect of the EUT set-up on the measurements is summarised in note (c) below.

PRM-AB378-03

Test Details Connected to Laptop	
Regulation	CFR 47 2008, Part 15 Subpart (c) Clause 15.209(d)
Measurement standard	ANSI C63.4:2003
Frequency range	9kHz to 1GHz
EUT sample number	S01,S05
Modification state	0
SE in test environment	S04
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 1 and 2

The worst case radiated emission measurements for spurious emissions and harmonics are listed below:

PRM-AB378-03 Radiated emissions 9kHz – 1GHz

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1.	31.35	33.83	0.6	18.10	27.53	25.00	N/A	17.78	100
2.	32.70	42.93	0.6	17.00	27.53	33.00	N/A	44.66	100
3.	33.10	42.03	0.6	16.90	27.53	32.00	N/A	39.81	100
4.	33.25	42.03	0.6	16.90	27.53	32.00	N/A	39.81	100
5.	33.65	45.63	0.6	16.90	27.53	35.60	N/A	60.25	100
6.	33.95	45.43	0.6	16.90	27.53	35.40	N/A	58.88	100
7.	34.50	46.73	0.6	16.00	27.53	35.80	N/A	61.66	100
8.	36.00	51.53	0.6	15.10	27.53	39.70	N/A	96.60	100
9.	36.85	42.31	0.6	14.60	27.51	30.00	N/A	31.62	100
10.	37.25	42.31	0.6	14.60	27.51	30.00	N/A	31.62	100
11.	40.20	45.41	0.7	13.00	27.51	31.60	N/A	38.01	100
12.	48.00	47.07	0.7	8.70	27.57	28.90	N/A	27.86	100
13.	53.25	47.39	0.7	6.50	27.59	27.00	N/A	22.38	100
14.	57.10	47.31	0.8	5.50	27.61	26.00	N/A	19.95	100
15.	58.35	49.41	0.8	5.40	27.61	28.00	N/A	25.11	100
16.	60.00	53.81	0.8	5.00	27.61	32.00	N/A	39.81	100
17.	67.35	49.63	0.8	5.20	27.63	28.00	N/A	25.11	100
18.	68.70	48.03	0.8	5.30	27.63	26.50	N/A	21.13	100
19.	72.00	47.45	0.8	5.60	27.65	26.20	N/A	20.41	100
20.	78.00	49.26	0.8	6.60	27.66	29.00	N/A	28.14	100
21.	79.15	43.66	0.8	6.80	27.66	23.60	N/A	15.13	100
22.	80.95	45.75	0.8	7.00	27.65	25.90	N/A	19.72	100
23.	81.40	48.65	0.9	7.10	27.65	29.00	N/A	28.14	100
24.	82.75	47.75	0.9	7.30	27.65	28.30	N/A	26.00	100
25.	84.00	58.57	0.9	7.70	27.67	39.50	N/A	94.40	100
26.	86.45	46.69	0.9	8.00	27.69	27.90	N/A	24.83	100
27.	88.85	45.60	0.9	8.40	27.70	27.20	N/A	22.90	150
28.	91.10	46.81	1.0	8.80	27.71	28.90	N/A	27.86	150

PRM-AB378-03 Radiated emissions 9kHz – 1GHz

Ref No.	FREQ. (MHz)	MEAS Rx (dB μ V)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dB μ V/m)	EXTRAP FACT (dB)	FIELD ST'GH (μ V/m)	LIMIT (μ V/m)
29.	93.45	46.58	1.1	9.00	27.68	29.00	N/A	28.18	150
30.	96.00	56.87	1.1	9.30	27.67	39.60	N/A	95.49	150
31.	104.60	47.28	1.1	10.30	27.68	31.00	N/A	35.48	150
32.	108.00	48.78	1.2	10.70	27.68	33.00	N/A	44.66	150
33.	111.05	44.49	1.2	11.00	27.69	29.00	N/A	28.18	150
34.	120.00	47.14	1.2	11.60	27.74	32.20	N/A	40.73	150
35.	123.50	41.80	1.2	11.70	27.70	27.00	N/A	22.38	150
36.	144.25	46.72	1.3	11.10	27.72	31.40	N/A	37.15	150
37.	145.75	46.62	1.3	10.90	27.72	31.10	N/A	35.89	150
38.	150.80	47.22	1.4	10.50	27.72	31.40	N/A	37.15	150
39.	159.80	46.06	1.4	10.20	27.76	29.90	N/A	31.26	150
40.	162.30	43.26	1.4	9.80	27.76	26.70	N/A	21.62	150
41.	204.55	52.15	1.5	8.10	27.75	34.00	N/A	50.11	150
42.	206.60	48.85	1.6	8.30	27.75	31.00	N/A	35.48	150
43.	211.15	49.31	1.7	8.60	27.71	31.90	N/A	39.35	150
44.	212.00	46.31	1.8	8.60	27.71	29.00	N/A	28.18	150
45.	234.25	47.00	1.9	9.70	27.70	30.90	N/A	35.07	200
46.	236.65	48.40	1.9	9.90	27.70	32.50	N/A	42.17	200
47.	240.00	47.90	1.9	10.40	27.70	32.50	N/A	42.17	200
48.	360.00	40.74	2.2	14.50	27.54	29.90	N/A	31.26	200
49.	480.00	45.60	2.4	17.50	27.50	38.00	N/A	79.43	200
50.	540.00	31.68	2.7	20.10	27.58	26.90	N/A	22.13	200
51.	576.00	44.92	2.7	19.90	27.52	40.00	N/A	100.00	200
52.	648.00	37.72	2.8	20.60	27.72	33.40	N/A	46.77	200
53.	720.00	43.06	3.0	22.40	27.96	40.50	N/A	105.92	200
54.	864.00	32.31	3.3	23.50	28.11	31.00	N/A	35.48	200
55.	960.05	38.56	3.5	24.70	27.76	39.00	N/A	89.12	500

Note: For radiated emissions that fall within 30MHz -1GHz the required limits are as part 15.209.

A4 Radiated Electric Filed Emissions

Preliminary scans were performed using a peak detector with the RBW = 100 kHz. The radiated electric filed emission test applies to all spurious emissions and harmonics emissions. The maximum permitted field strength is listed in Section 15.209. The EUT was set to transmit as required.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site :

3m alternative test site :

The effect of the EUT set-up on the measurements is summarised in note (c) below.

PRM-AB387-03

Test Details Connected to Laptop	
Regulation	CFR 47 2008, Part 15 Subpart (c) Clause 15.209(d)
Measurement standard	ANSI C63.4:2003
Frequency range	9kHz to 1GHz
EUT sample number	S02,S05
Modification state	0
SE in test environment	S04
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 1 and 2

The worst case radiated emission measurements for spurious emissions and harmonics are listed below:

PRM-AB387-03 Radiated emissions 9kHz – 1GHz

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1.	31.25	32.82	0.6	18.10	27.53	24.00	N/A	15.84	100
2.	33.10	30.93	0.6	16.90	27.53	20.90	N/A	11.09	100
3.	34.35	32.73	0.6	16.00	27.53	21.80	N/A	12.30	100
4.	34.85	33.93	0.6	16.00	27.53	23.00	N/A	14.12	100
5.	36.00	50.03	0.6	15.10	27.53	38.20	N/A	81.28	100
6.	37.05	41.11	0.6	14.60	27.51	28.80	N/A	27.54	100
7.	37.50	41.01	0.6	14.60	27.51	28.70	N/A	27.22	100
8.	39.30	45.31	0.7	13.00	27.51	31.50	N/A	37.58	100
9.	41.45	43.31	0.7	12.50	27.51	29.00	N/A	28.18	100
10.	43.55	43.42	0.7	11.40	27.52	28.00	N/A	25.11	100
11.	45.25	46.63	0.7	10.20	27.53	30.00	N/A	31.62	100
12.	45.95	49.63	0.7	10.20	27.53	33.00	N/A	44.66	100
13.	47.75	45.15	0.7	9.20	27.55	27.50	N/A	23.71	100
14.	48.00	48.27	0.7	8.70	27.57	30.10	N/A	31.98	100
15.	49.20	40.57	0.7	8.20	27.57	21.90	N/A	12.44	100
16.	50.35	49.17	0.7	7.70	27.57	30.00	N/A	31.98	100
17.	50.60	46.67	0.7	7.70	27.57	27.50	N/A	23.71	100
18.	50.90	49.17	0.7	7.70	27.57	30.00	N/A	31.98	100
19.	52.20	50.39	0.7	6.80	27.59	30.30	N/A	32.73	100
20.	53.45	51.89	0.7	6.50	27.59	31.50	N/A	37.58	100
21.	54.70	51.59	0.7	6.30	27.59	31.00	N/A	35.48	100
22.	56.00	49.91	0.8	5.70	27.61	28.80	N/A	27.54	100
23.	57.25	47.71	0.8	5.50	27.61	26.40	N/A	20.89	100
24.	58.55	45.80	0.8	5.40	28.00	24.00	N/A	15.84	100
25.	60.00	47.81	0.8	5.00	27.61	26.00	N/A	19.95	100
26.	61.05	45.71	0.8	5.10	27.61	24.00	N/A	15.84	100
27.	62.30	47.61	0.8	5.00	27.61	25.80	N/A	19.49	150
28.	64.80	48.82	0.8	5.00	27.62	27.00	N/A	22.38	150

PRM-AB387-03 Radiated emissions 9kHz – 1GHz

Ref No.	FREQ. (MHz)	MEAS Rx (dBμV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBμV/m)	EXTRAP FACT (dB)	FIELD ST'GH (μV/m)	LIMIT (μV/m)
29.	66.05	50.23	0.9	5.00	27.63	28.50	N/A	26.60	100
30.	67.30	49.83	0.9	5.20	27.63	28.30	N/A	26.00	100
31.	68.55	50.43	0.9	5.30	27.63	29.00	N/A	28.18	100
32.	70.80	48.63	0.9	5.40	27.63	27.30	N/A	23.17	100
33.	71.10	50.64	0.9	5.50	27.64	29.40	N/A	29.51	100
34.	72.00	60.84	0.9	5.60	27.64	39.70	N/A	96.60	100
35.	75.80	47.35	0.9	6.10	27.65	26.70	N/A	21.62	100
36.	78.00	49.46	0.9	6.60	27.66	29.30	N/A	29.17	100
37.	80.90	42.65	0.9	7.00	27.65	22.90	N/A	13.96	100
38.	83.10	43.16	0.9	7.60	27.66	24.00	N/A	15.84	100
39.	84.10	49.16	1.0	7.70	27.66	30.20	N/A	32.35	100
40.	91.20	44.31	1.0	8.80	27.71	26.40	N/A	20.89	150
41.	93.25	43.71	1.0	9.00	27.71	26.00	N/A	19.95	150
42.	96.00	56.57	1.0	9.30	27.67	39.20	N/A	91.20	150
43.	98.45	46.97	1.1	9.60	27.67	30.00	N/A	31.62	150
44.	105.10	43.48	1.1	10.40	27.68	27.30	N/A	23.17	150
45.	108.00	47.69	1.1	10.70	27.69	31.80	N/A	38.90	150
46.	120.00	47.54	1.2	11.60	27.74	32.60	N/A	42.65	150
47.	128.85	43.00	1.2	11.50	27.70	28.00	N/A	25.11	150
48.	130.20	42.96	1.2	11.50	27.66	28.00	N/A	25.11	150
49.	132.00	46.39	1.2	11.50	27.69	31.40	N/A	37.15	150
50.	134.00	44.86	1.3	11.50	27.66	30.00	N/A	31.62	150
51.	136.55	44.29	1.3	11.40	27.69	29.30	N/A	29.17	150
52.	140.15	40.62	1.3	11.30	27.72	25.50	N/A	18.83	150
53.	141.70	39.82	1.3	11.30	27.72	24.70	N/A	17.17	150
54.	154.00	39.54	1.3	10.50	27.74	23.60	N/A	15.13	150
55.	156.00	44.14	1.3	10.30	27.74	28.00	N/A	25.11	150

PRM-AB387-03 Radiated emissions 9kHz – 1GHz

Ref No.	FREQ. (MHz)	MEAS Rx (dB μ V)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dB μ V/m)	EXTRAP FACT (dB)	FIELD ST'GH (μ V/m)	LIMIT (μ V/m)
29.	156.70	40.74	1.3	10.3	27.74	24.60	N/A	16.98	150
30.	165.45	42.86	1.4	9.60	27.76	26.10	N/A	20.18	150
31.	179.30	44.15	1.5	9.00	27.75	26.90	N/A	22.13	150
32.	202.00	45.18	1.6	8.00	27.78	27.00	N/A	22.38	150
33.	204.60	46.38	1.6	8.10	27.78	28.30	N/A	26.00	150
34.	208.20	48.12	1.6	8.50	27.72	30.50	N/A	31.80	150
35.	216.00	46.41	1.6	8.90	27.71	29.20	N/A	28.84	150
36.	228.30	47.59	1.6	9.50	27.69	31.00	N/A	35.48	200
37.	229.70	46.77	1.7	9.50	27.67	30.30	N/A	32.73	200
38.	233.35	30.00	1.7	9.70	27.70	29.70	N/A	30.54	200
39.	235.95	45.82	1.7	9.80	27.72	29.60	N/A	30.20	200
40.	242.20	42.27	1.7	10.80	27.77	27.00	N/A	22.38	200
41.	253.45	44.49	1.8	12.40	27.69	31.00	N/A	35.48	200
42.	276.20	44.45	1.8	12.70	27.65	31.30	N/A	36.72	200
43.	330.10	38.50	2.0	14.10	27.60	27.00	N/A	22.38	200
44.	360.00	40.24	2.2	14.50	27.54	29.40	N/A	29.51	200
45.	480.00	46.50	2.4	17.50	27.50	38.90	N/A	88.10	200
46.	540.00	33.98	2.7	20.10	27.58	29.20	N/A	28.84	200
47.	552.00	30.40	2.7	20.60	27.60	26.10	N/A	20.18	200
48.	576.00	40.92	2.7	19.90	27.52	36.00	N/A	63.09	200
49.	648.00	33.42	2.8	20.60	27.72	29.10	N/A	28.51	200
50.	720.00	38.86	3.0	22.40	27.96	36.30	N/A	65.31	200
51.	780.05	35.17	3.1	22.80	28.07	33.00	N/A	44.66	200
52.	792.00	28.89	3.2	23.00	28.09	27.00	N/A	22.38	200
53.	810.05	28.13	3.2	23.20	28.13	26.40	N/A	20.89	200
54.	864.00	32.31	3.3	23.50	28.11	31.00	N/A	35.48	200
55.	870.05	29.47	3.3	23.30	28.07	28.00	N/A	25.11	200
56.	900.05	28.99	3.3	23.80	28.09	28.00	N/A	25.11	200
57.	930.05	30.85	3.4	24.70	27.95	31.00	N/A	35.48	200
58.	959.95	37.66	3.5	24.70	27.76	38.10	N/A	80.35	200

Note: For radiated emissions that fall within 30MHz -1GHz the required limits are as part 15.209.

A5 Radiated Electric Filed Emissions

Preliminary scans were performed using a peak detector with the RBW = 100 kHz. The radiated electric filed emission test applies to all spurious emissions and harmonics emissions. The maximum permitted field strength is listed in Section 15.209. The EUT was set to transmit as required.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site : 3m alternative test site :

The effect of the EUT set-up on the measurements is summarised in note (c) below.

PRM-AB395-03

Test Details Connected to Laptop	
Regulation	CFR 47 2008, Part 15 Subpart (c) Clause 15.209(d)
Measurement standard	ANSI C63.4:2003
Frequency range	9kHz to 1GHz
EUT sample number	S03,S05
Modification state	0
SE in test environment	S04
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 1 and 2

The worst case radiated emission measurements for spurious emissions and harmonics are listed below:

Radiated Electric Field Emissions Within The Restricted Band 15.205 continued:

PRM-AB395-03 Radiated emissions 9kHz – 1GHz

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1.	31.50	36.03	0.6	18.10	27.53	27.20	N/A	22.90	100
2.	32.70	39.13	0.6	17.40	27.53	29.60	N/A	30.20	100
3.	33.35	42.03	0.6	16.90	27.53	32.00	N/A	39.81	100
4.	34.25	39.63	0.6	16.30	27.53	29.00	N/A	28.18	100
5.	34.50	40.23	0.6	16.30	27.53	29.60	N/A	30.20	100
6.	34.85	39.43	0.6	16.30	27.53	28.80	N/A	27.54	100
7.	36.00	47.82	0.6	15.10	27.52	36.00	N/A	63.09	100
8.	36.75	40.12	0.6	15.10	27.52	28.30	N/A	26.00	100
9.	37.05	41.32	0.6	14.60	27.52	29.00	N/A	28.18	100
10.	38.20	41.72	0.7	14.10	27.52	29.00	N/A	28.18	100
11.	39.15	43.31	0.7	13.50	27.51	30.00	N/A	31.62	100
12.	40.30	42.11	0.7	13.00	27.51	28.30	N/A	26.00	100
13.	44.90	46.92	0.7	10.20	27.52	30.30	N/A	32.73	100
14.	48.00	45.16	0.7	8.70	27.56	27.00	N/A	22.37	100
15.	51.60	41.17	0.7	7.30	27.57	21.60	N/A	12.02	100
16.	54.70	42.21	0.7	6.30	27.61	21.60	N/A	12.02	100
17.	60.00	50.91	0.8	5.00	27.61	29.10	N/A	28.51	100
18.	61.40	43.71	0.8	5.10	27.61	22.00	N/A	12.58	100
19.	72.00	58.04	0.9	5.60	27.64	36.90	N/A	69.98	100
20.	84.00	58.07	0.9	7.70	27.67	39.00	N/A	89.12	100
21.	89.25	48.01	1.0	8.50	27.71	29.80	N/A	30.90	150
22.	96.00	52.37	1.0	9.30	27.67	35.00	N/A	56.23	150
23.	105.60	44.68	1.1	10.40	27.68	28.50	N/A	26.60	150
24.	106.30	44.58	1.1	10.50	27.68	28.50	N/A	26.60	150
25.	107.85	43.08	1.1	10.70	27.68	27.20	N/A	22.90	150
26.	136.75	46.99	1.3	11.40	27.69	32.00	N/A	39.81	150
27.	144.00	43.42	1.3	11.10	27.72	28.10	N/A	25.41	150
28.	151.20	45.52	1.3	10.50	27.72	29.60	N/A	30.20	150

PRM-AB395-03 Radiated emissions 9kHz – 1GHz

Ref No.	FREQ. (MHz)	MEAS Rx (dB μ V)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dB μ V/m)	EXTRAP FACT (dB)	FIELD ST'GH (μ V/m)	LIMIT (μ V/m)
29.	167.70	42.26	1.4	9.40	27.76	25.30	N/A	18.40	150
30.	180.00	47.55	1.5	9.00	27.75	30.30	N/A	32.73	150
31.	193.00	45.97	1.5	7.90	27.77	27.60	N/A	23.98	150
32.	200.70	46.69	1.6	7.90	27.79	28.40	N/A	26.30	150
33.	240.00	48.67	1.7	10.40	27.77	33.00	N/A	44.66	200
34.	295.50	42.73	1.9	13.00	27.63	30.00	N/A	31.62	200
35.	311.05	47.16	1.9	13.30	27.66	34.70	N/A	54.32	200
36.	480.00	40.60	2.4	17.50	27.50	33.00	N/A	44.66	200
37.	492.00	38.07	2.5	17.90	27.47	31.00	N/A	35.48	200
38.	503.95	39.23	2.6	18.10	27.43	32.50	N/A	42.17	200
39.	516.00	37.37	2.6	18.40	27.47	30.90	N/A	35.07	200
40.	564.00	39.75	2.7	20.10	27.55	35.00	N/A	56.23	200
41.	576.00	43.82	2.7	19.90	27.52	38.90	N/A	88.10	200
42.	600.05	38.42	2.8	20.20	27.62	33.80	N/A	48.97	200
43.	648.00	32.42	2.8	20.60	27.72	28.10	N/A	25.41	200
44.	720.00	36.76	3.0	22.40	27.96	34.20	N/A	51.28	200
45.	959.95	37.16	3.5	24.70	27.76	37.60	N/A	75.85	200

Note: For radiated emissions that fall within 30MHz -1GHz the required limits are as part 15.209.

Notes:

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10: section 4.5, Table 1 For emissions below 30MHz the cable losses are assumed to be negligible.
- 2 In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.
- 3 Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.
- 4 For Frequencies below 1 GHz, RBW = 120 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak RBW=VBW= 1MHz
Average RBW=VBW= 1MHz

The upper and lower frequency of the measurement range was decided according to 47 CFR 15:2008 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 47 CFR 15: Clause 15.209 for all emissions:

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Measurement Distance m	Field strength $\text{dB}\mu\text{V/m}$
0.009-0.490	2400/F(kHz)	300	67.6/F (kHz)
0.490-1.705	24000/F(kHz)	30	87.6/F (kHz)
1.705-30	30	30	29.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

- (a) Where results have been measured at one distance, and a signal level displayed at another, the results have been extrapolated using the following formula:

$$\text{Extrapolation (dB)} = 20 \log_{10} \left(\frac{\text{measurement distance}}{\text{specification distance}} \right)$$

- (b) The levels may have been rounded for display purposes.
- (c) The following table summarises the effect of the EUT operating mode, internal configuration and arrangement of cables / samples on the measured emission levels :

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels	✓	✓	✓	✓
Effect of EUT internal configuration on emission levels	✓	✓	✓	✓
Effect of Position of EUT cables & samples on emission levels	✓	✓	✓	✓
(i) Parameter defined by standard and / or single possible, refer to Appendix D				
(ii) Parameter defined by client and / or single possible, refer to Appendix D				
(iii) Parameter had a negligible effect on emission levels, refer to Appendix D				
(iv) Worst case determined by initial measurement, refer to Appendix D				

A6 Power Line Conducted Emissions

Preview power line conducted emission measurements were performed with a peak detector in a screened room. The effect of the EUT set-up on the measurements is summarised in note (b). Where applicable formal measurements of the emissions were performed with a peak, average and/or quasi peak detector.

Test Details: PRM-AB378-03	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10:2009
Frequency range	150kHz to 30MHz
EUT sample number	S01
Modification state	0
SE in test environment	S04, S05, S06
SE isolated from EUT	S07, S08
EUT set up	Refer to Appendix C
Photographs (Appendix F)	

The worst-case power line conducted emission measurements are listed below:

Results measured using the Quasi Peak detector compared to the Quasi Peak limit

PRM-AB378-03	Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)
	1	0.155	Live	53.12	65.73	12.61
	2	0.17	Neutral	48.67	64.96	16.29
	3	0.205	Live	45.58	63.41	17.83
	4	0.24	Live	42.60	62.10	19.50
	5	0.53	Live	42.58	56.00	13.42
	6	0.55	Live	45.49	56.00	10.51
	7	2.11	Live	36.04	56.00	19.96

Results measured using the average detector compared to the average limit

PRM-AB378-03	Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)
	1	0.175	Neutral	34.90	54.72	19.82
	2	0.525	Live	32.91	46.00	13.09
	3	0.555	Live	40.60	46.00	5.40
	4	0.96	Live	27.87	46.00	18.13
	5	1.605	Live	31.04	46.00	14.96
	6	2.24	Neutral	28.28	46.00	17.72
	7	2.885	Neutral	30.60	46.00	15.40
	8	3.52	Neutral	29.54	46.00	16.46
	9	3.635	Neutral	28.48	46.00	17.52
	10	5.13	Live	30.94	50.00	19.06
	12	6.415	Live	33.54	50.00	16.46
	13	15.575	Neutral	31.29	50.00	18.71

Test Details: PRM-AB387-03	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10:2009
Frequency range	150kHz to 30MHz
EUT sample number	S02
Modification state	0
SE in test environment	S04, S05, S06
SE isolated from EUT	S07, S08
EUT set up	Refer to Appendix C
Photographs (Appendix F)	

The worst-case power line conducted emission measurements are listed below:

Results measured using the Quasi Peak detector compared to the Quasi Peak limit

	Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)
PRM-AB387-03	1	0.175	Live	48.22	64.72	16.50
	2	0.21	Live	43.68	63.21	19.53
	3	0.525	Live	41.37	56.00	14.63
	4	0.555	Live	45.67	56.00	10.33
	5	2.2	Neutral	36.27	56.00	19.73

Results measured using the average detector compared to the average limit

	Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)
PRM-AB387-03	1	0.175	Live	36.11	54.72	18.61
	2	0.345	Live	30.79	49.08	18.29
	3	0.38	Live	30.05	48.28	18.23
	4	0.52	Live	36.27	46.00	9.73
	5	0.555	Live	42.90	46.00	3.10
	6	0.73	Live	30.35	46.00	15.65
	7	1.005	Live	29.18	46.00	16.82
	8	1.11	Live	29.57	46.00	16.43
	9	1.14	Live	27.66	46.00	18.34
	10	1.49	Live	29.72	46.00	16.28
	11	1.625	Live	27.62	46.00	18.38
	12	1.905	Live	28.44	46.00	17.56
	13	2.215	Neutral	32.48	46.00	13.52
	14	2.6	Neutral	31.80	46.00	14.20
	15	2.98	Neutral	31.80	46.00	14.20
	16	5.03	Neutral	33.09	50.00	16.91
	17	6.29	Neutral	37.46	50.00	12.54
	18	15.955	Neutral	34.33	50.00	15.67

Test Details: PRM-AB395-03	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10:2009
Frequency range	150kHz to 30MHz
EUT sample number	S03
Modification state	0
SE in test environment	S04, S05, S06
SE isolated from EUT	S07, S08
EUT set up	Refer to Appendix C
Photographs (Appendix F)	

The worst-case power line conducted emission measurements are listed below:

Results measured using the Quasi Peak detector compared to the Quasi Peak limit

PRM-AB395-03	Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)
	1	0.17	Live	48.31	64.96	16.65
	2	0.205	Live	44.14	63.41	19.27
	3	0.525	Live	40.31	56.00	15.69
	4	0.55	Live	45.53	56.00	10.47
	5	2.11	Neutral	37.32	56.00	18.68
	6	2.95	Neutral	36.12	56.00	19.88

Results measured using the average detector compared to the average limit

PRM-AB395-03	Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)
	1	0.17	Live	36.12	54.96	18.84
	2	0.345	Live	31.51	49.08	17.57
	3	0.38	Live	30.27	48.28	18.01
	4	0.52	Live	34.11	46.00	11.89
	5	0.55	Neutral	42.90	46.00	3.10
	6	0.72	Live	30.70	46.00	15.30
	7	0.755	Live	30.62	46.00	15.38
	8	1.13	Live	28.85	46.00	17.15
	9	2.215	Live	30.03	46.00	15.97
	10	2.22	Neutral	27.19	46.00	18.81
	11	2.53	Neutral	29.20	46.00	16.80
	12	2.85	Live	29.60	46.00	16.40
13	3.48	Live	29.45	46.00	16.55	

Specification limits :

Conducted emission limits (47 CFR 15: Clause 15.207):

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dB μ V	
	Quasi-peak	Average
0.15 to 0.5	66 to 56 ²	56 to 46 ²
0.5 to 5	56	46
5 to 30	60	50

Notes:
 1. The lower limit shall apply at the transition frequency.
 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

Notes:

- (a) The levels may have been rounded for display purposes.
- (b) The following table summarises the effect of the EUT operating mode and internal configuration on the measured emission levels :

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels		✓		
Effect of EUT internal configuration on emission levels		✓		

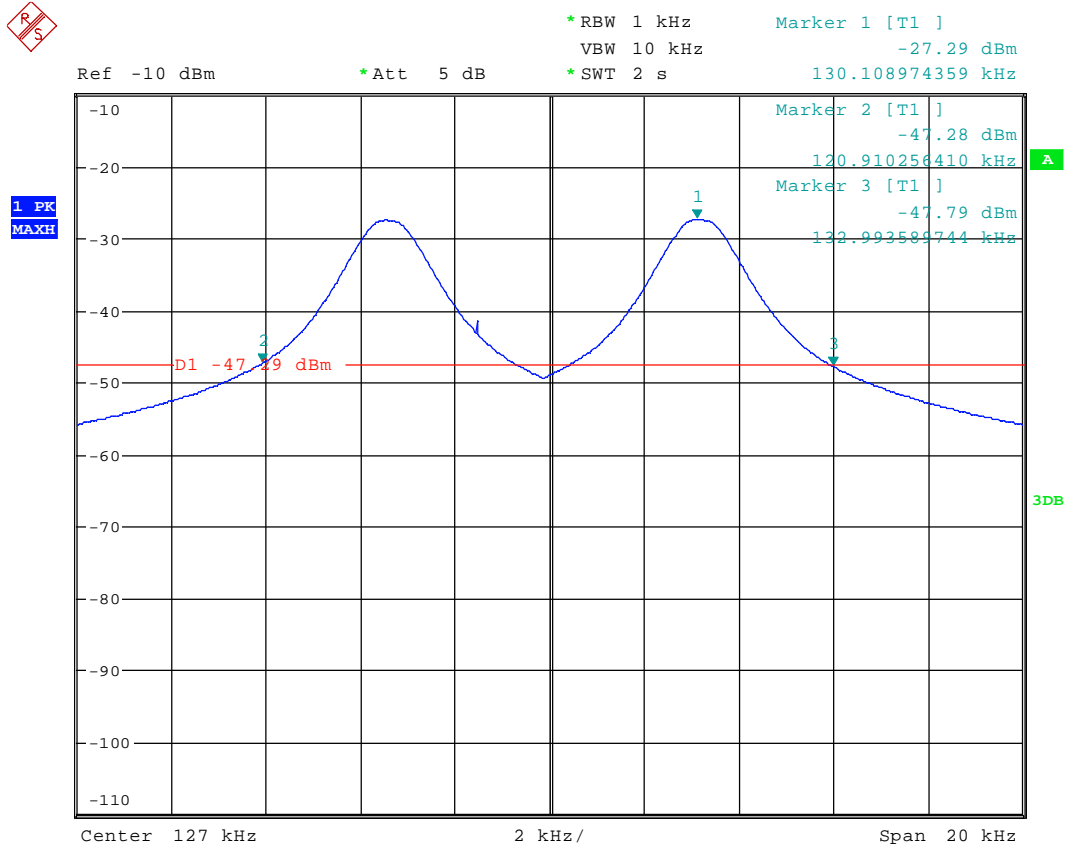
(i) Parameter defined by standard and / or single possible, refer to Appendix C
 (ii) Parameter defined by client and / or single possible, refer to Appendix C
 (iii) Parameter had a negligible effect on emission levels, refer to Appendix C
 (iv) Worst case determined by initial measurement, refer to Appendix C

This appendix contains graphical data obtained during testing.

Notes:

- (a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.
- (b) The time and date on the plots do not necessarily equate to the time of the test.
- (c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.
- (d) Appendix C details the numbering system used to identify the sample and its modification state.
- (e) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.

20dB Bandwidth



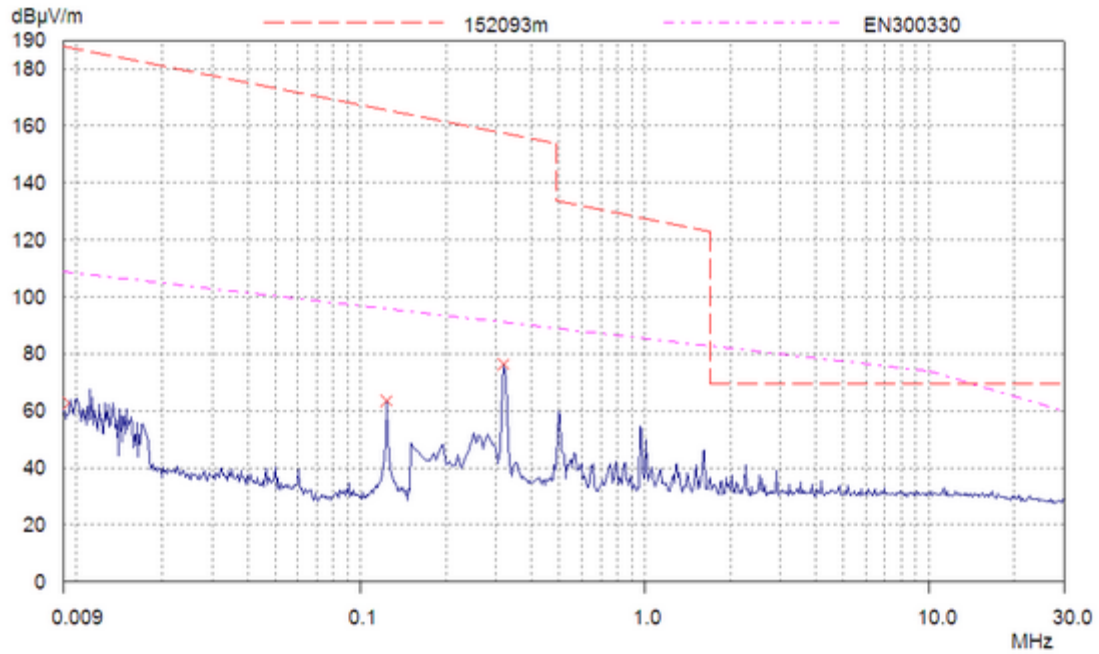
Date: 9.SEP.2010 15:51:57

Fl = 120.910256410kHz
 Fh = 132.993589744kHz

20dB Bandwidth = 12.0833kHz

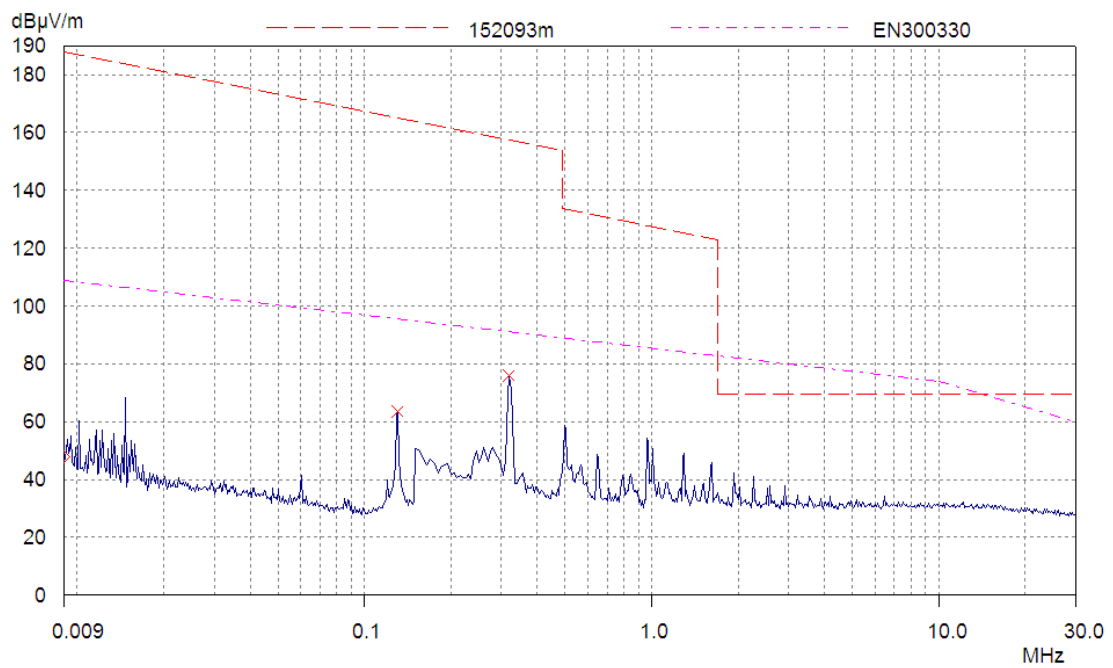
PRM-AB378-03 123kHz Pen

Radiated spurious emissions 9kHz – 30MHz



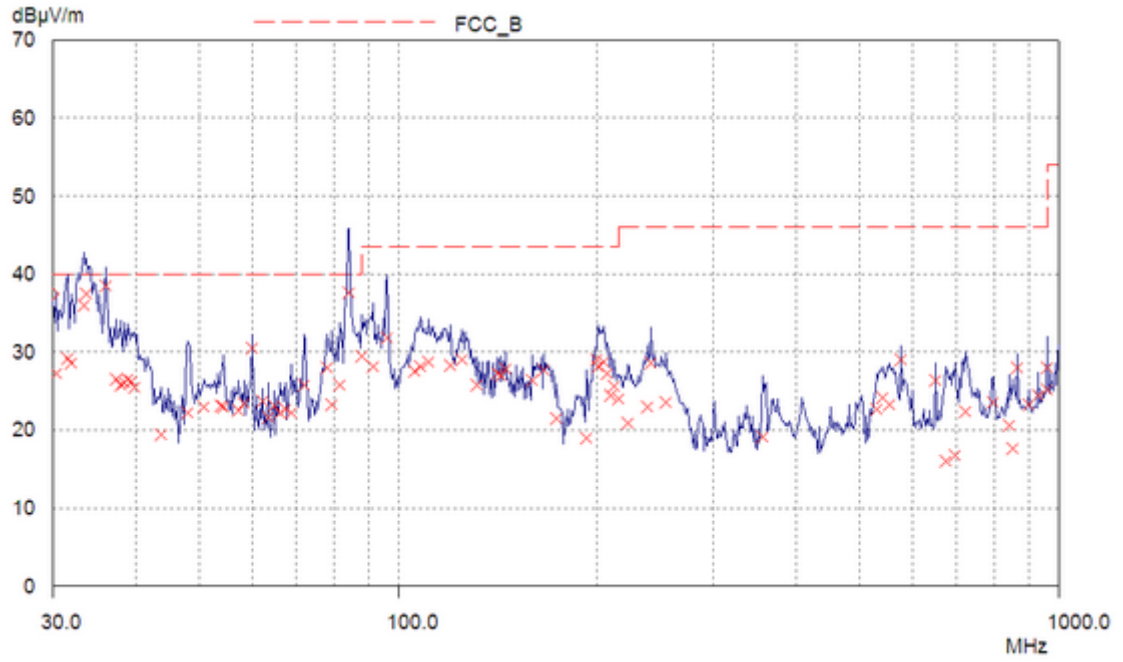
PRM-AB378-03 130kHz Pen

Radiated spurious emissions 9kHz – 30MHz



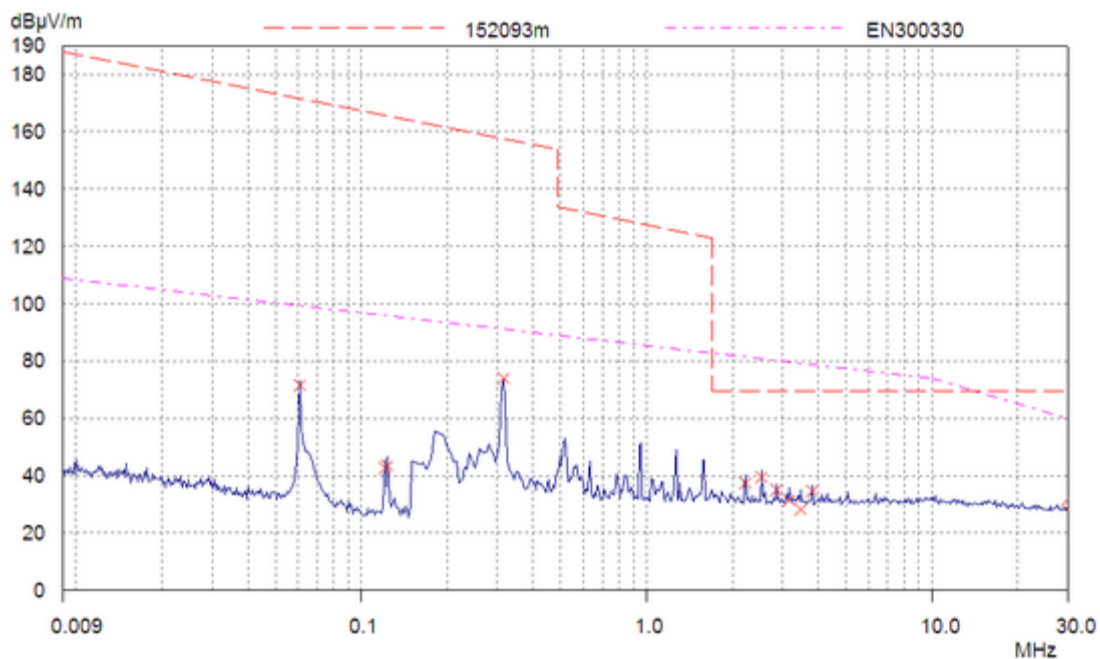
PRM-AB378-03

Radiated spurious emissions 30 MHz to 1 GHz



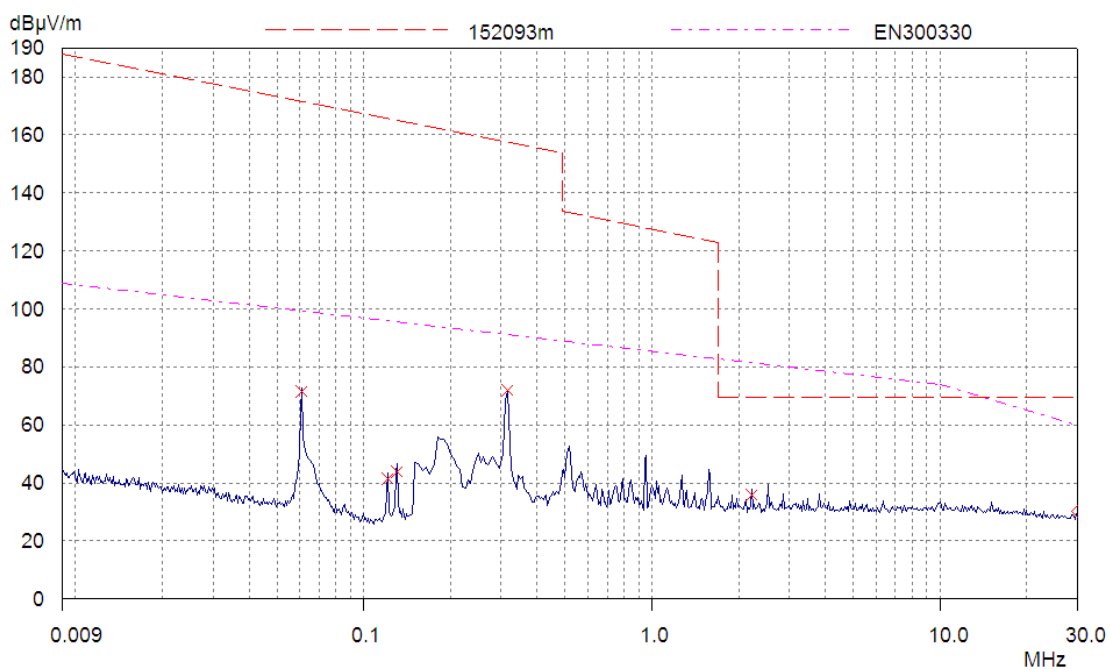
PRM-AB387-03 123kHz Pen

Radiated spurious emissions 9kHz – 30MHz



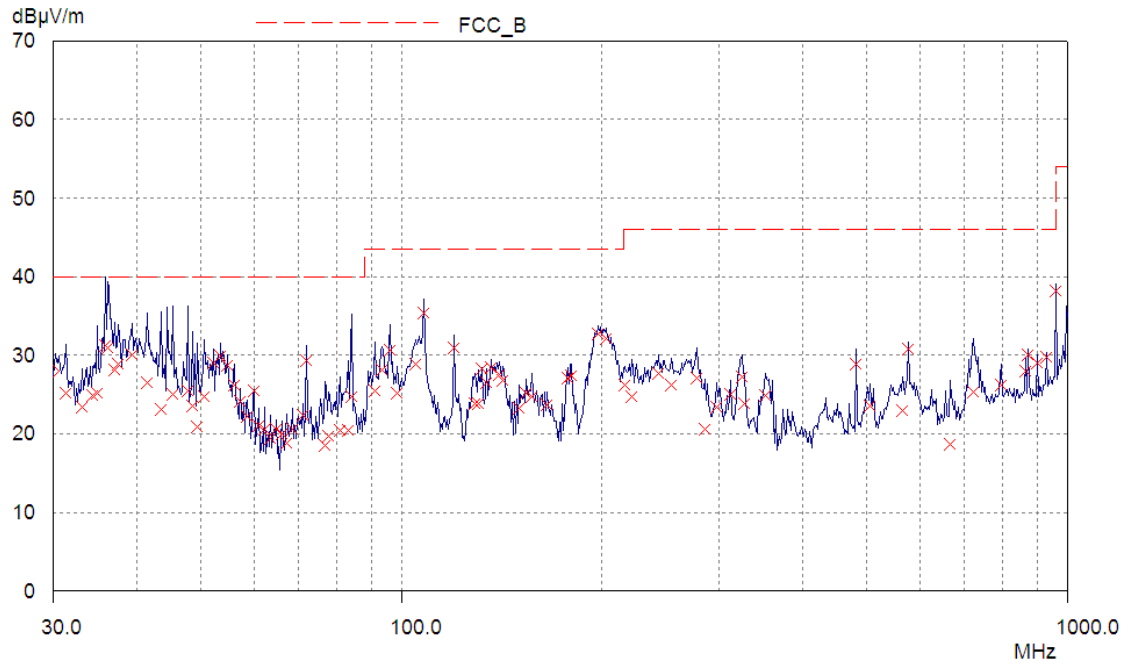
PRM-AB387-03 130kHz Pen

Radiated spurious emissions 9kHz – 30MHz



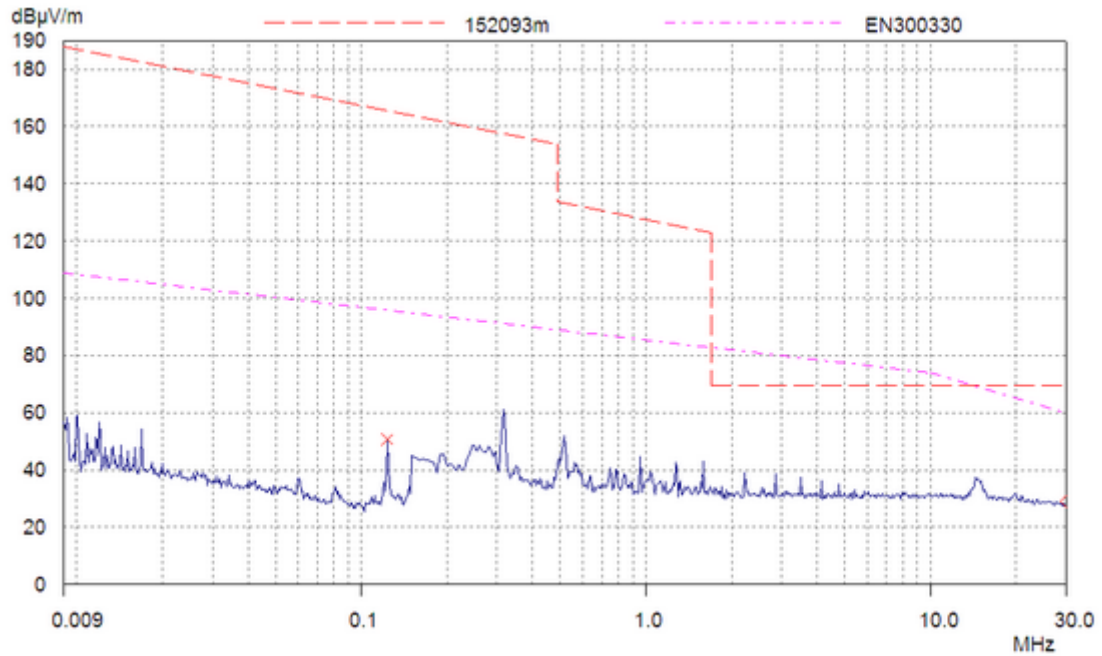
PRM-AB387-03

Radiated spurious emissions 30 MHz to 1 GHz



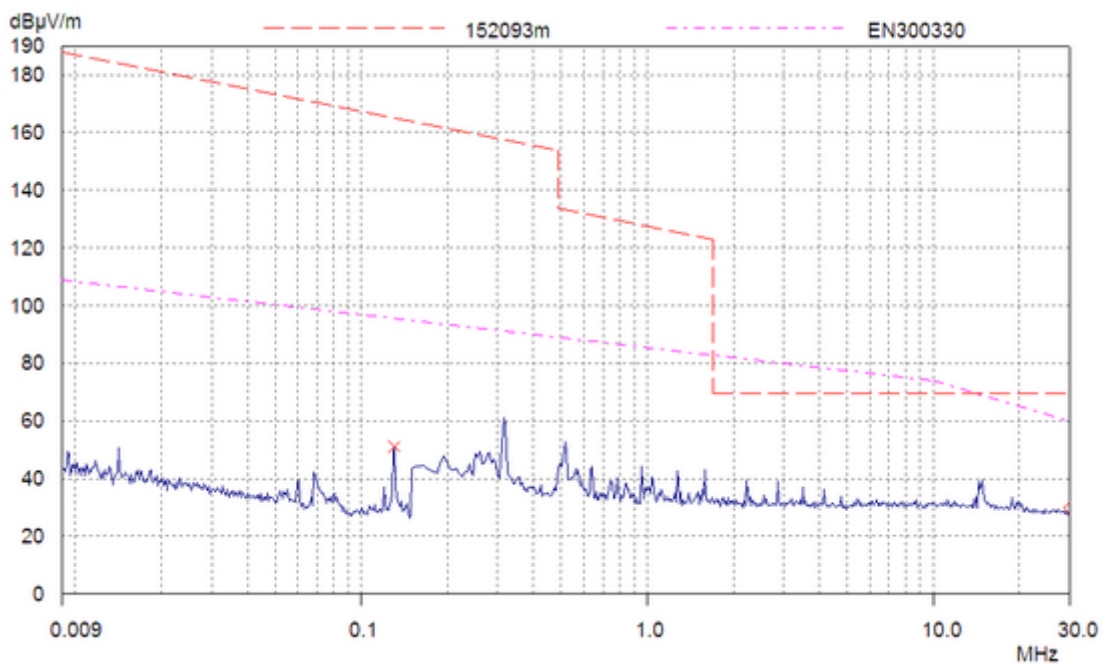
PRM-AB395-03 123kHz Pen

Radiated spurious emissions 9kHz – 30MHz



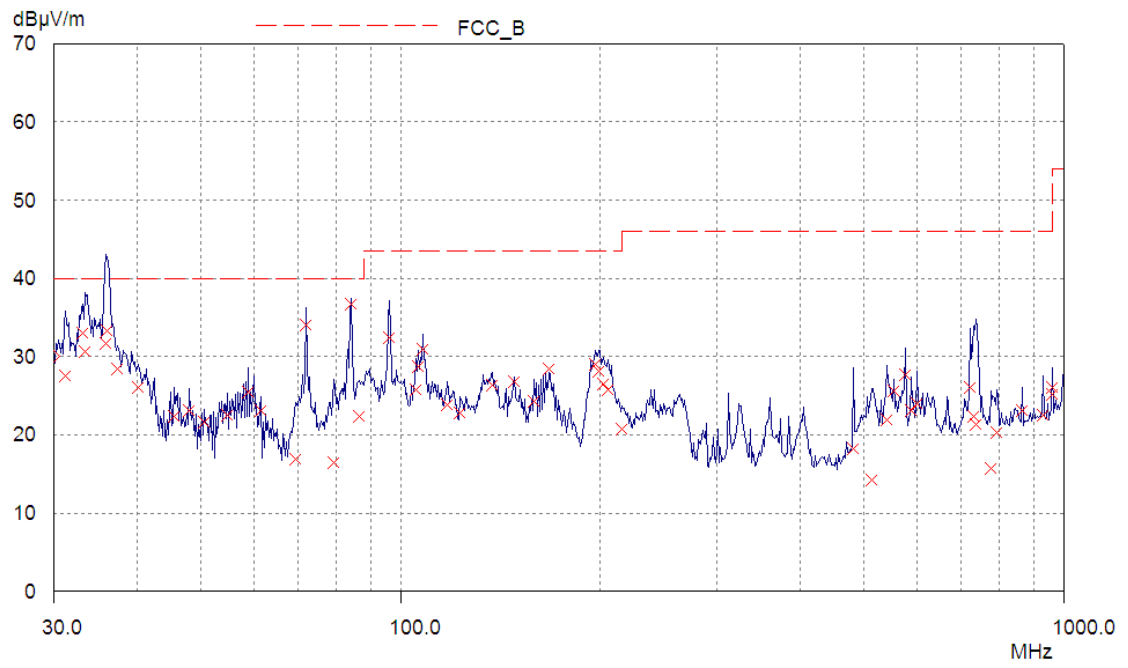
PRM-AB395-03 130kHz Pen

Radiated spurious emissions 9kHz – 30MHz



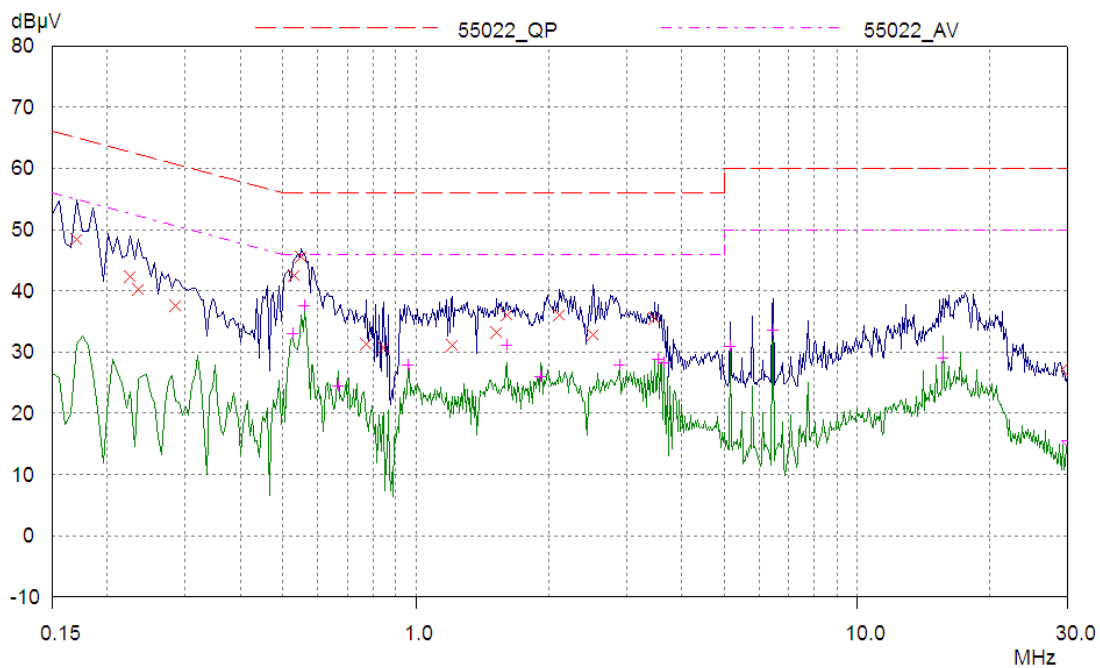
PRM-AB395-03

Radiated spurious emissions 30 MHz to 1 GHz

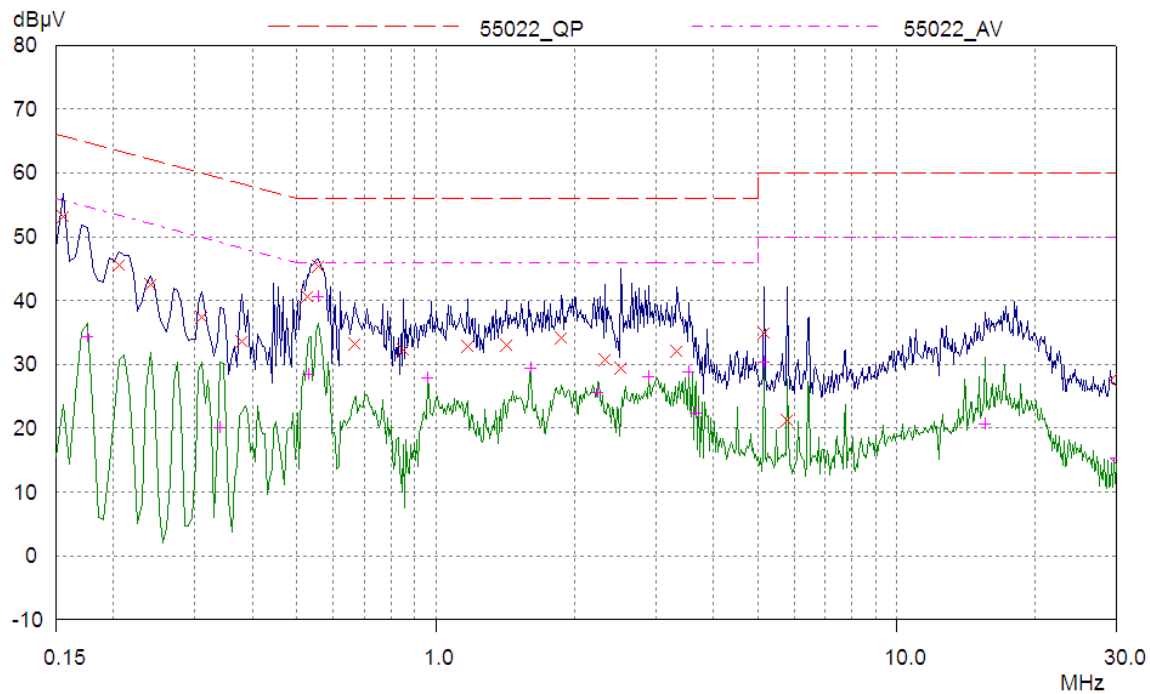


PRM-AB378-03 123kHz Pen

AC Powerline Conducted Emissions

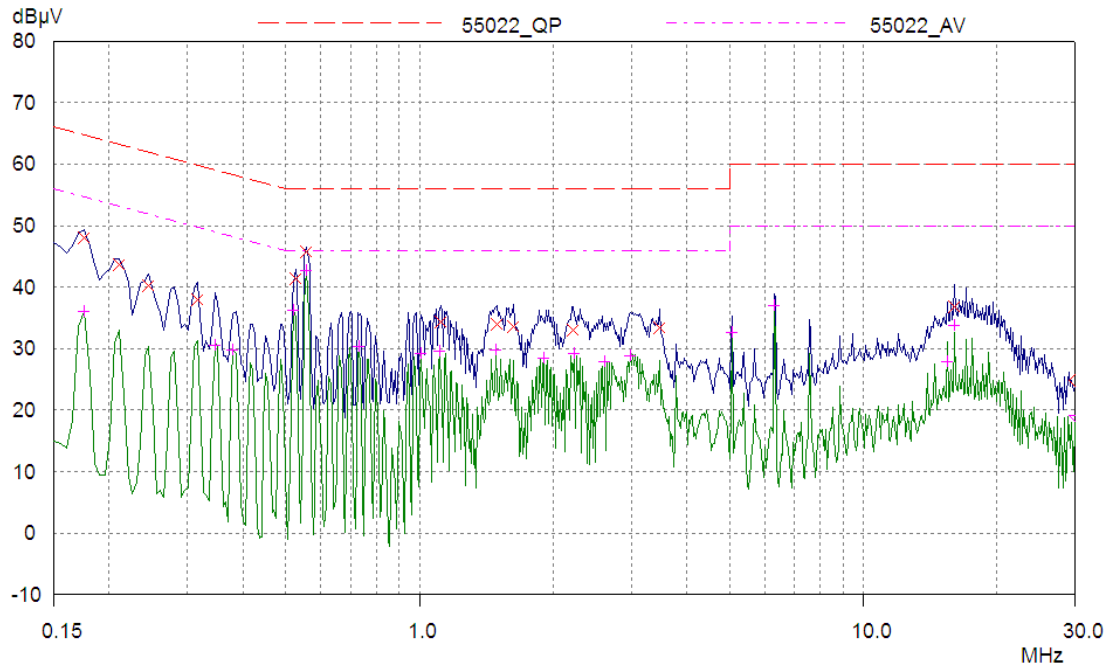


PRM-AB378-03 130kHz Pen

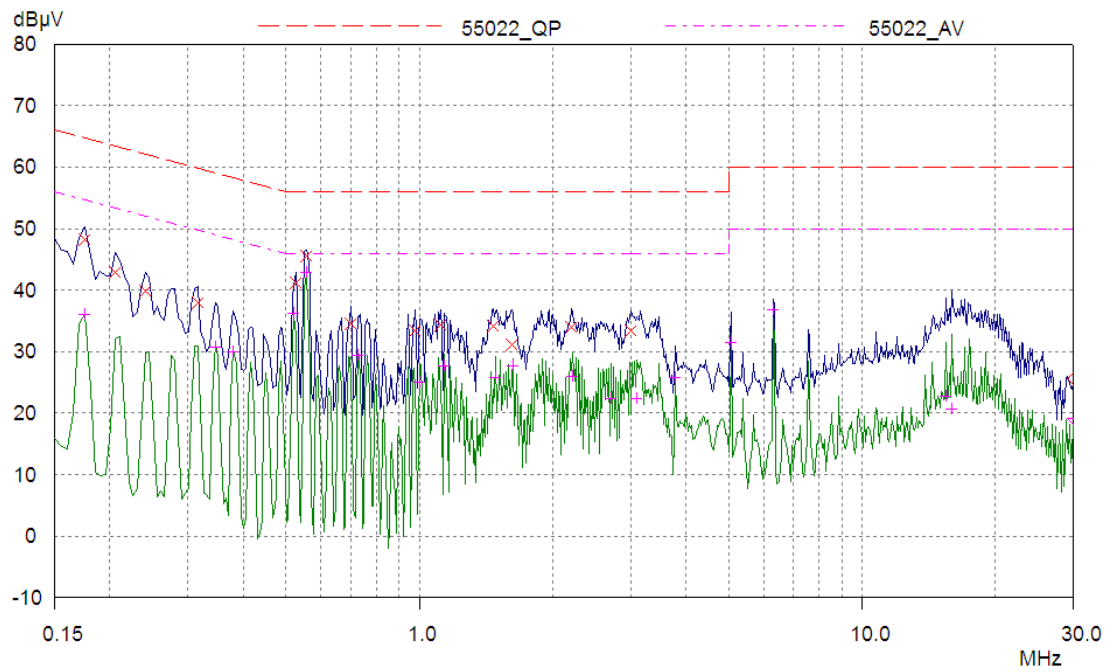


PRM-AB385-03 123kHz Pen

AC Powerline Conducted Emissions

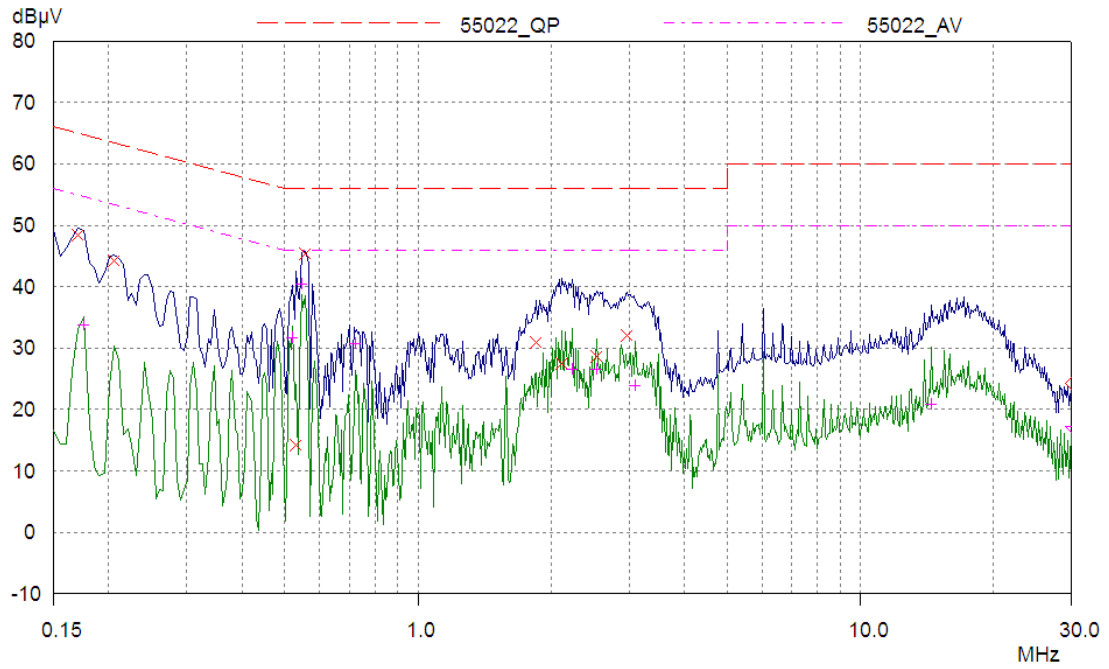


PRM-AB385-03 130kHz Pen

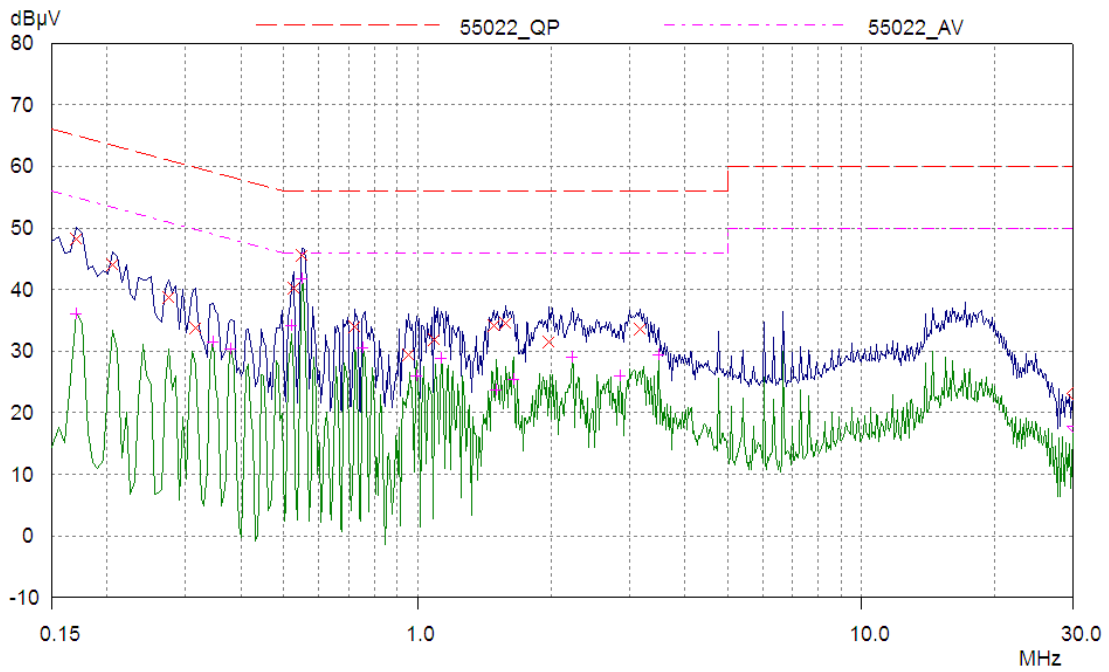


PRM-AB395-03 123kHz Pen

AC Powerline Conducted Emissions



PRM-AB395-03 30kHz Pen



Appendix C: Additional Test and Sample Details

This appendix contains details of:

1. The samples submitted for testing.
2. Details of EUT operating mode(s)
3. Details of EUT configuration(s) (see below).
4. EUT arrangement (see below).

Throughout testing, the following numbering system is used to identify the sample and it's modification state:

Sample No: Sxx Mod w

where:

xx	= sample number	eg. S01
w	= modification number	eg. Mod 2

The following terminology is used throughout the test report:

Support Equipment (SE) is any additional equipment required to exercise the EUT in the applicable operating mode. Where relevant SE is divided into two categories:

SE in test environment: The SE is positioned in the test environment and is not isolated from the EUT (e.g. on the table top during REFE testing).

SE isolated from the EUT: The SE is isolated via filtering from the EUT. (e.g. equipment placed externally to the ALSR during REFE testing).

EUT configuration refers to the internal set-up of the EUT. It may include for example:

- Positioning of cards in a chassis.
- Setting of any internal switches.
- Circuit board jumper settings.
- Alternative internal power supplies.

Where no change in EUT configuration is **possible**, the configuration is described as "single possible configuration".

EUT arrangement refers to the termination of EUT ports / connection of support equipment, and where relevant, the relative positioning of samples (EUT and SE) in the test environment.

For further details of the test procedures and general test set ups used during testing please refer to the related document "EMC Test Methods - An Overview", which can be supplied by TRaC Telecoms & Radio upon request.

C1) Test samples

The following samples of the apparatus were submitted by the client for testing :

Sample No.	Description	Identification
S01	PRM-AB378-03	N/A
S02	PRM-AB387-03	N/A
S03	PRM-AB395-03	N/A
S05	Delta power supply	DPS-605B A

The following samples of apparatus were submitted by the client as host, support or drive equipment (auxiliary equipment):

Sample No.	Description	Identification
S04	Dell Laptop	Service Tag 8Q0314J
S06	Activhub	N/A

C2) EUT Operating Mode During Testing.

During testing, the EUT was exercised as described in the following tables :

Test	Description of Operating Mode:
All tests detailed in this report	<i>EUT transmitting on maximum power</i>

C3) EUT Configuration Information.

Sample	Internal Configuration Details
S01	Single possible internal configuration

The EUT was submitted for testing in one single possible configuration.

C4) List of EUT Ports

The table below describes the termination of EUT ports:

Sample : S01,S02,S03

Port	Description of Cable Attached	Cable length	Equipment Connected
<i>USB</i>	<i>USB</i>	<i>5.0mtr</i>	<i>PC - Activboard</i>
<i>USB</i>	<i>USB</i>	<i>1.5mtr</i>	<i>USB-Hub</i>
<i>USB</i>	<i>USB</i>	<i>0.90mtr</i>	<i>Audio Amp - Hub</i>
<i>Dc</i>	<i>Power supply</i>	<i>0.33mtr</i>	<i>Audio Amp – AC3</i>
<i>Dc</i>	<i>Power supply</i>	<i>1.8 5mtr</i>	<i>Switch mode supply - Audio Amp</i>

Notes on the above:

A photograph showing the termination of EUT ports is contained within Appendix F

C5 Details of Equipment Used

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
TRLUH281	FSU46	Spectrum Analyser	Rhode & Schwarz	29/01/2010
TRLUH04	ESVS10	Receiver	Rhode & Schwarz	10/12/2009
TRLUH372	6201-69	Pre amp	Watkins& Johnson	27/11/2009
TRLUH93	CBL6112B	Antenna	Chase	03/06/2009
TRLUH377	FSU	Spectrum Analyser	Rhode & Schwarz	101/01/2010
TRLUH191	CBL611/A	Antenna	York	01/10/2008
TRLUH195	ESH3	Lisn	Rhode & Schwarz	27/01/10
TRLUH04	ESVS10	Receiver	Rhode & Schwarz	10/12/2009
TRLUH372	6201-69	Pre amp	Watkins& Johnson	27/11/2009
TRL07	HFH2	Loop Antenna	Rhode & Schwarz	26/08/2010

Appendix D:

Additional Information

No additional information is included within this test report.

Appendix E:

Calculation of the duty cycle correction factor

Using a spectrum analyser in zero span mode, centred on the fundamental carrier frequency with a RBW of 1MHz and a video Bandwidth of 1MHz the sweep time was set accordingly to capture the pulse train. The transmit pulsewidths and period was measured. A plots of the pulse train is contained in Appendix B of this test report.

If the pulse train was less than 100 ms, including blanking intervals, the duty cycle was calculated by averaging the sum of the pulsewidths over one complete pulse train. However if the pulse train exceeds 100ms then the duty cycle was calculated by averaging the sum of the pulsewidths over the 100ms width with the highest average value. (The duty cycle is the value of the sum of the pulse widths in one period (or 100ms), divided by the length of the period (or 100ms). The duty cycle correction factor was then expressed in dB and the peak emissions adjusted accordingly to give an average value of the emission.

Correction factor dB = $20 \times (\text{Log}_{10} \text{ Calculated Duty Cycle})$

Therefore the calculated duty cycle was determined:

The pulse train period was greater than >100ms and in as shown from the plots in contained in appendix B of this test report.

Duty cycle = $\frac{\text{the sum of the highest average value pulsewidths over 100ms}}{100\text{ms}}$

e.g

$$= \frac{7.459\text{ms}}{100\text{ms}} = 0.07459$$

0.07459 or 7.459%

Correction factor (dB) = $20 \times (\text{Log}_{10} 0.07459) = -22.54\text{dB}$

Appendix F:

Photographs and Figures

The following photographs were taken of the test samples:

- 1: Radiated emissions test setup
- 2: Power line conducted emissions arrangement
- 3: Overview/ AC3 and Hub cover removed
- 4: Top View AC3 PCB/ Underside View AC3 PCB
- 5: Top View Hub PCB/ Underside View Hub PCB
- 6: Overview of Audio Amplifier
- 7: Top View Audio Amplifier PCB/ Underside View Audio PCB
- 8: Radio Section Screening cover removed

Photograph 11

Radiated emissions test setup



Photograph 2

Power line conducted emissions arrangement



Photograph 3

Overview



AC3 and Hub cover removed

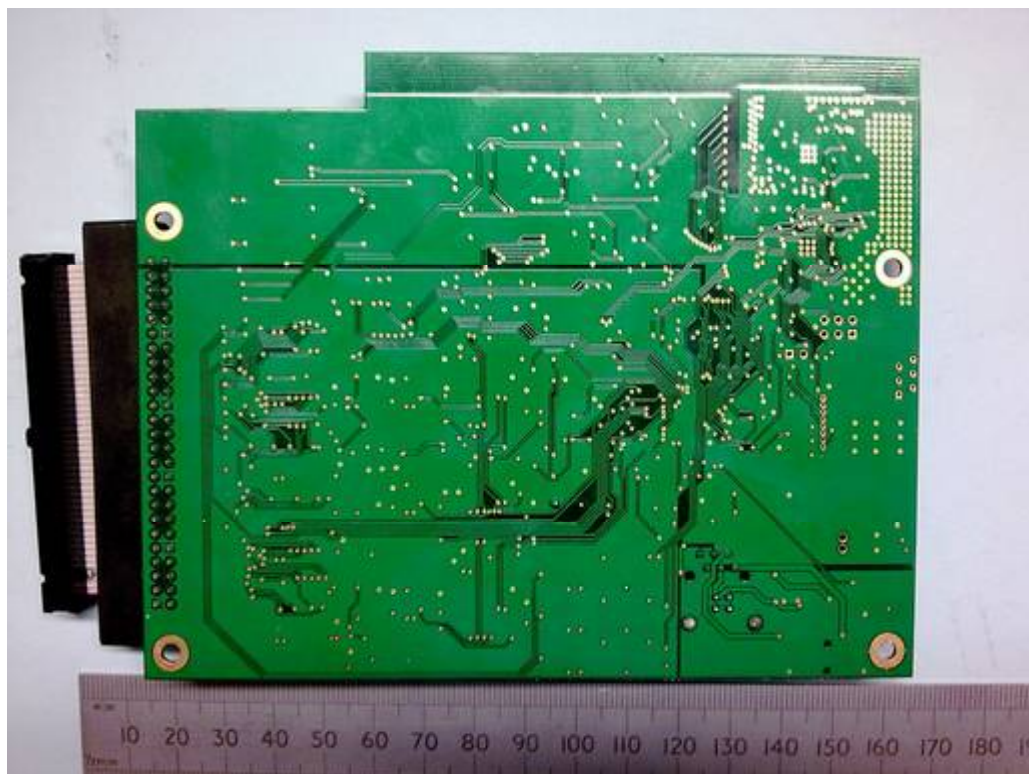


Photograph 4

Top View AC3 PCB



Underside View AC3 PCB



Photograph 5

Top View Hub PCB



Underside View Hub PCB



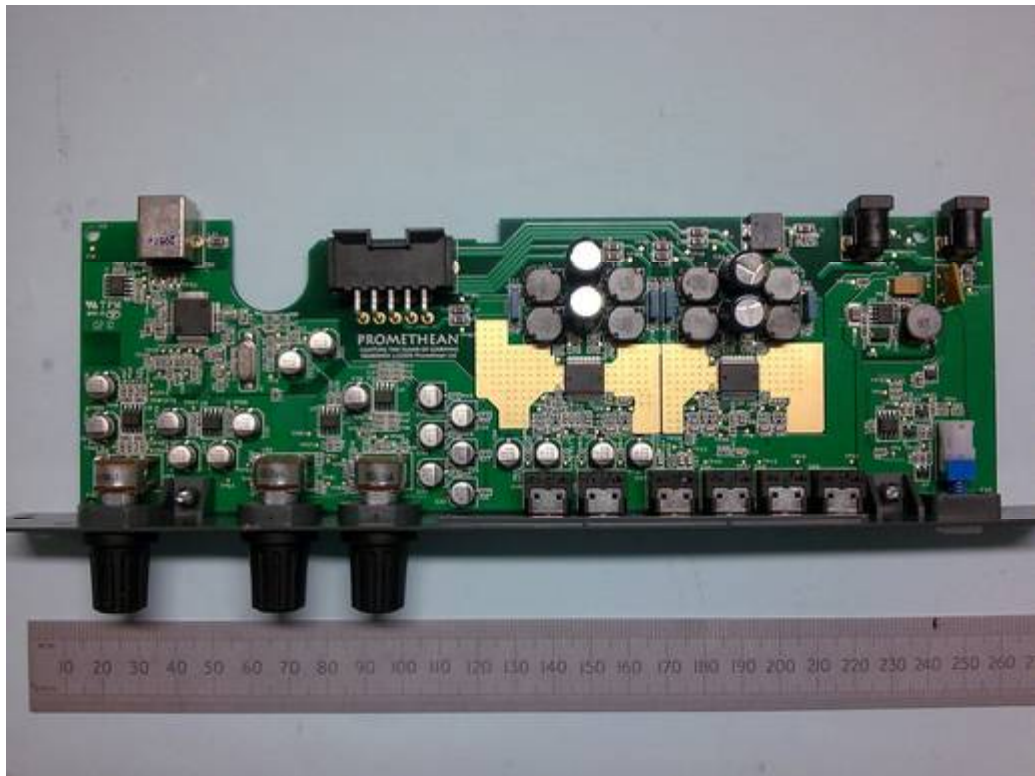
Photograph 6

Overview of Audio Amplifier

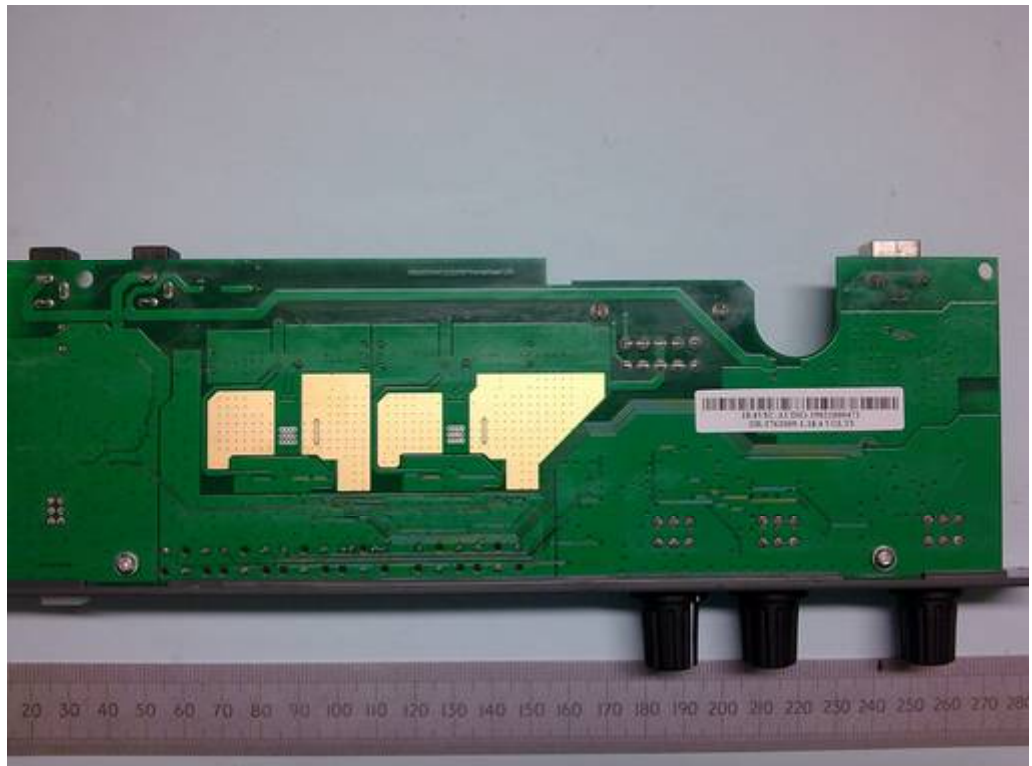


Photograph 7

Top View Audio Amplifier PCB



Underside View Audio PCB



Photograph 8

Radio Section Screening cover removed

