EMC Test Report

for the

MUSIC Group Macao Commercial Offshore Limited

Audio System Console
Model: Pro-X Surface

EMC Test Report

for the

MUSIC Group Macao Commercial Offshore Limited

Audio System Console
Model: Pro-X Surface

Project Engineer: J. A. Jones

Approval Signatory

Approved signatories: S. M. Connolly ☑ R. P. St John James ☐

The above named are authorised Hursley EMC Services engineers.

Hursley EMC Services Ltd.
Trafalgar House
Trafalgar Close
Chandlers Ford, Eastleigh
Hampshire. UK. SO53 4BW

Tel. +44 (0) 23 8027 1111
Fax. +44 (0) 23 8027 1144
e mail. sales@hursley-emc.co.uk
www.hursley-emc.co.uk

1871

Contents

1.0 OVERVIEW

1.1 Introduction

The Equipment Under Test (EUT), as described within this document, was submitted for EMC testing as agreed with the customer.

1.2 Objective

The purpose of the test was to measure and report the EUT against limits and methods of the emissions and immunity standards, as requested for and listed in section **2.0 Test Summary**.

1.3 Product Modifications

Paint was removed from the chassis to improve grounding and gasket added between mating surfaces.

1.4 Conclusion

The EUT met the emission limits and immunity requirements of the tests defined in section **2.0 Test Summary**.

This report relates to the sample tested and may not represent the entire population. It is valid only for the product identified, either in part or in full, to the relevant electromagnetic requirements necessary for compliance with the EMC Directive 2004/108/EC and other national requirements.

1.5 Test Deviations

Latest versions of standards were used.

1.6 EMC Test Lab Reference

Hursley EMC Services files: 14J335 & 14J363.

2.0 TEST SUMMARY

2.1 Summary

The EUT, as described and reported within this document, complies with the European Standard (CE), the USA Federal Communications Commission (FCC) part 15 (unintentional radiators) of the CFR 47:2013 FCC rules in accordance with ANSI C63.4:2003 and the Canadian Standard ICES-003:Issue 5 (CISPR 22:2008) measurement procedure.

The EUT was also tested to EN 55103-1 and EN 55103-2 EMC standard for Audio, Video, Audio-Visual and Entertainment Lighting Control Apparatus for Professional use.

The EN 55103-1 and -2 testing was performed to the limits and severity levels as defined within the General Standards for apparatus intended for Electromagnetic Environment category '**E4**' for emissions and '**E1, E2, E3 & E4**' for immunity. The EUT was also designated as non RACK MOUNTED apparatus and tested accordingly.

The EUT met the **emission** test requirements of the following standards:

Description	General Standard	Referenced Standard
Radiated disturbance, 30.0 MHz to 18.0 GHz	FCC/CFR 47; Part 15:2014	ANSI C63.4:2003, Class A
Conducted disturbance		
Radiated disturbance, 30.0 MHz to 6.0 GHz	Canadian Standard ICES-003:Issue 5	CISPR 22:2008
Conducted disturbance		
Radiated magnetic disturbance, 50 Hz to 50 kHz	EN 55103-1:2009 Environment E4 non rack-mounted	Annex A of EN 55103-1
Radiated disturbance, 30.0 MHz to 6.0 GHz		CISPR 22: Class A
Conducted disturbance, ac port		Annex C
Mains harmonics		EN 61000-3-2:2006 inc A1/A2:2009
Mains voltage flicker (dmax=4%)		EN 61000-3-3:2013

The uncertainty of measurement for each test has been included to support a level of confidence of approximately 95%.

Note: The highest internal operating frequency declared by the manufacturer is a clock rate of 3.5 GHz.

Test Summary *(continued)*

The EUT was tested to and met the following **immunity** standards:

Description	General Standard	Referenced Standard
Electrostatic discharge	EN 55103-2:2009 Environments E1, E2, E3 & E4 non rack-mounted	EN 61000-4-2:2009
Radiated RF disturbance, 80 to 2700 MHz		EN 61000-4-3:2006 inc A1:2008 & A2:2010
Magnetic LF disturbance, 50 Hz to 10 kHz		Annex A of EN 55103-2
Fast transient bursts, ac & signal ports		EN 61000-4-4:2012
Surge, ac port		EN 61000-4-5:2006
Conducted RF field, ac & signal ports		EN 61000-4-6:2009
Power frequency magnetic field		EN 61000-4-8:2010
Mains voltage dips and interruptions		EN 61000-4-11:2004

The uncertainty of measurement for each test has been included to support a level of confidence of approximately 95%.

3.0 EQUIPMENT & TEST DETAILS

3.1 General

EUT:	Audio System Console Model: Pro-X Surface Serial number: 60366
EUT build level:	Prototype
EUT manufacturer:	MUSIC Group Macao Commercial Offshore Limited
Customer:	MUSIC Group Macao Commercial Offshore Limited Rua de Pequim No 202-A Macau Finance Centre 9/J Macau
Test commissioned by:	Mr Mark Boden, ☎ +44 (0) 1562 732299 ext 4483
Date EUT received:	28th July 2014
Test date(s):	28th & 29th July and the 21st August 2014
EMC measurement site:	Hursley EMC Services Limited Hursley Park, Winchester, Hampshire

3.2 EUT Description

The PRO-X surface is a professional audio mixing console with an external DSP Engine (Neutron).

- 1 x DL561A Router Board
- Front of house I/O
  - XLR (Input)
  - XLR (Output)
  - AES3 I/O

3.3 EUT Properties

Product Name	Processor	Interfaces	Populated Interfaces
PRO-X Surface	2.29 GHz	3 x AES50 I/O 1 x Ethernet Tunnel 2x Ethernet Control 1 x Copper/Fiber Snake X 1 x Copper/Fiber Snake Y 1 x AES3 Input 1 x AES3 Output 1 x Word Clock Input 1 x Word Clock Output 1 x Control Expansion	1 x AES50 Snake X (Copper or Fiber) 3 x PSU Monitor A

NOTE(S):

- The HMAC connection will be either Copper or Fibre Optic, this will be determined by a radiated emissions scan for each variation & proceed with the **WORST** case.
- Product minimum requirement criteria is class A, however Class B will be attempted.
- ALL 3 x PSU should be populated and exercised throughout testing.

3.4 Test Exerciser

The testing equipment for the tests consisted of the following items:

- **1 x Neutron DSP Engine –** In support of PRO-X Surface.
- **PRO-X Internal Oscillator –** This will provide the audio source for exercising the EUT.
- **1 x PRO-X Console –** DUT.
- **1 x DL152 –** I/O Box, used for D/A conversion, and to relay the audio signal back to the
- PRO-X Surface, vital for exercising all ports.
- **1 x Speaker -** Used for monitoring the audio signal during radiated immunity.

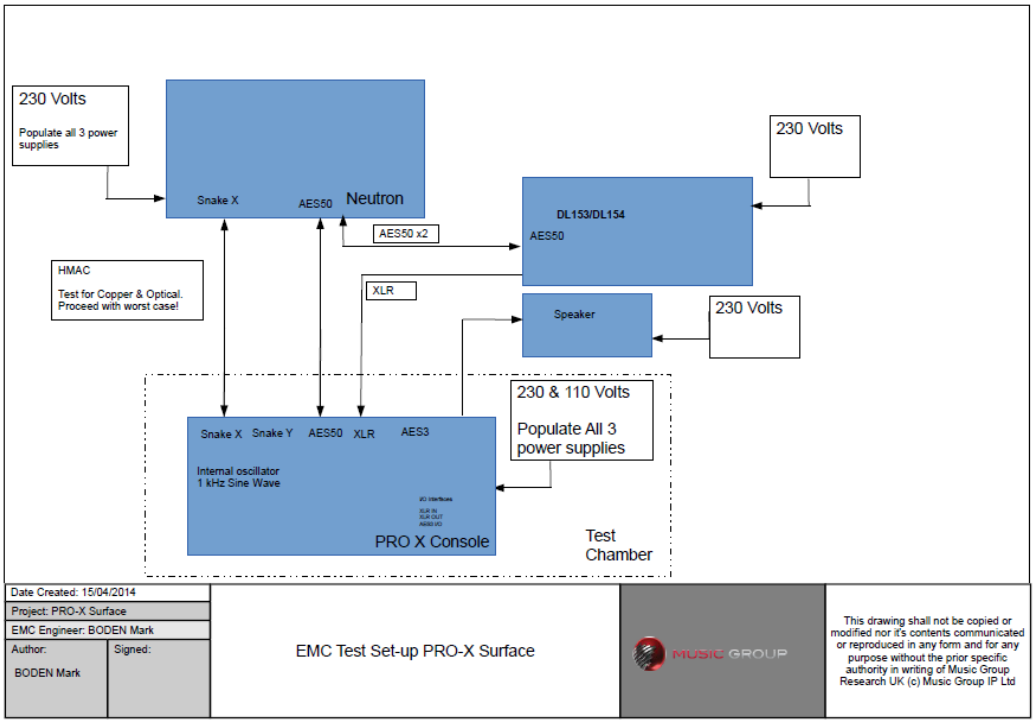
3.5 Test Configuration

The audio signal was generated internally by the PRO-X Surface and routed via HMAC along Snake X to the Neutron DSP Engine. Populating two of the AES50 ports on the Neutron Engine the signal was routed from one of these ports along unshielded AES50 cable to the DL152.

The signal was then undergone D/A conversion and fed along XLR back to the PRO-X Surface, and finally outputting to a speaker to monitor the audio signal for immunity purposes.

Before testing was commenced, the audio tone was clearly displayed upon meters and the tone was heard on the speaker for monitoring purposes.

3.6 EUT Test Set-up



3.7 Environmental Test Conditions

Temperature	22 to 25º Celsius
Relative Humidity	49 to 58%
Atmospheric Pressure	1005 to 1006 millibars

3.8 EMC Test Equipment

#ID	CP	Manufacturer	Type	Serial Nø	Description	Calibration due date
004	1	Rohde & Schwarz	ESH-3	893607/002	Test receiver (9kHz-30MHz)	10/01/2015
008	1	HP	8568B	2517A01791	Spectrum analyser	Internal
010	1	HP	8568B	2601A02322	Spectrum analyser	Internal
021	1	Rohde & Schwarz	ESIB	100192	Test receiver (40GHz)	25/08/2014
024	3	EMCO	7604	2109	Loop antenna, 13cm (20Hz-500kHz)	26/11/2014
026	1	Chase	CBL6140	1036	Antenna X-wing (chamber)	Internal
071a	3	Q-par Angus	WBH218HN	5367	Horn antenna (2-18GHz)	28/05/2016
073	3	Schwarzbeck	BBHA9120B	237	Horn antenna (1-10GHz)	03/07/2016
090	1	Rohde & Schwarz	ESS	839643/011	EMI test receiver (5Hz-1GHz)	28/11/2014
109	3	Schwarzbeck	VULB 9163	9163-321	Trilog antenna (OATS)	19/10/2015
110	1	HP	3314A	2505A08120	Function generator	06/02/2015
118	1	KeyTek	Pro CCL	9711291	Capacitive clamp	Internal
121	1	EM	CWS500A	0898-02	Conducted immunity simulator	20/03/2015
132	1	HP	8447D	2944A07094	Pre-amplifier (30-1000MHz)	Internal
135	1	KeyTek	EMC Pro	9806258	Immunity tester	20/03/2015
154	1	Fischer	F-33-2	091672	Current probe 1kHz-250MHz	28/11/2014
157	1	Haefely Trench	PESD 3000	H907013	ESD gun (30kV)	20/03/2015
166	1	Oregon Sci	BA-888	-	Electronic barometer	Internal
199	1	Fischer	801-M3-16	146	CDN 3W 16A	20/03/2015
200	1	Fischer	F-203I-32MM	09849	EM Injection clamp (10k-1GHz)	27/02/2015
201	1	Boonton	4231A	12402	Power meter	25/09/2014
215	1	Sucoflex	106		Cable SMA (18GHz)	30/09/2014
252	1	Rohde & Schwarz	ESH 3 Z2	08970	10dB pulse limiter	19/02/2015
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	06/06/2015
294	1	Techron	7560 AMP	14	Audio DCS Amplifier	Internal
315	2	EMC Partner	HAR1000	90	Harmonics & flicker analyser	19/08/2015
339	1	Rohde & Schwarz	SMT-06	1039.2000.06	5kHz - 6GHz	17/12/2014
400	1	Rohde & Schwarz	ESI26	833362/006	Test Receiver	02/07/2015
401	0	AR	30S1G3	28117	Amplifier	Internal
417	1	Schaffner	CDN M2/M3	14595	CDN M2/M3	24/07/2014
430	0	EMCO	3115	9704-5166	Horn Antenna	Internal
451	1	AH Systems	Loop for 461 DRS01	149	SAS-561 Loop for Radiated	Internal
459	1	TESEQ	CAT5 8 wire ISN	30879	cat 5 ISN good one and CAT 3 option	04/12/2014
538	1	HP	8593EM Analyser	3710A00204	0	03/10/2014
547	3	DARE	RadiSense	018	RF field probe (4GHz)	Internal
550	1	AR	200W1000N7A	0	80 to 1000MHz RF Amplifier	Internal

CP = Interval period [year] prescribed for external calibrations

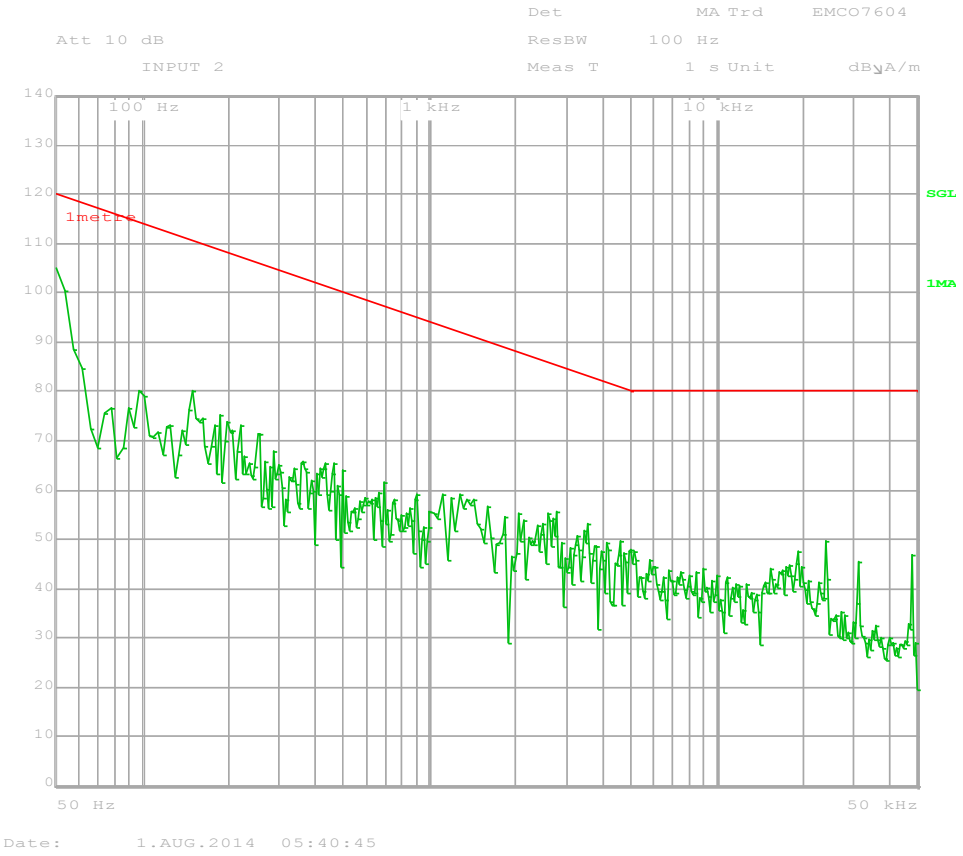
Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.
'Internal' means internally calibrated using HEMCS procedures

4.0 EMISSION RESULTS

4.1 Radiated Magnetic Disturbance, 50 Hz to 50 kHz

Profile scans between 50 Hz and 50 kHz were taken at a measuring distance of 1m, as prescribed for non-rack-mounted equipment. The emissions were systematically maximised by moving the measuring antenna laterally along each face to realise the highest values at significant profiled frequencies. The highest recorded values are presented within this report.

4.1.1 Data; A01



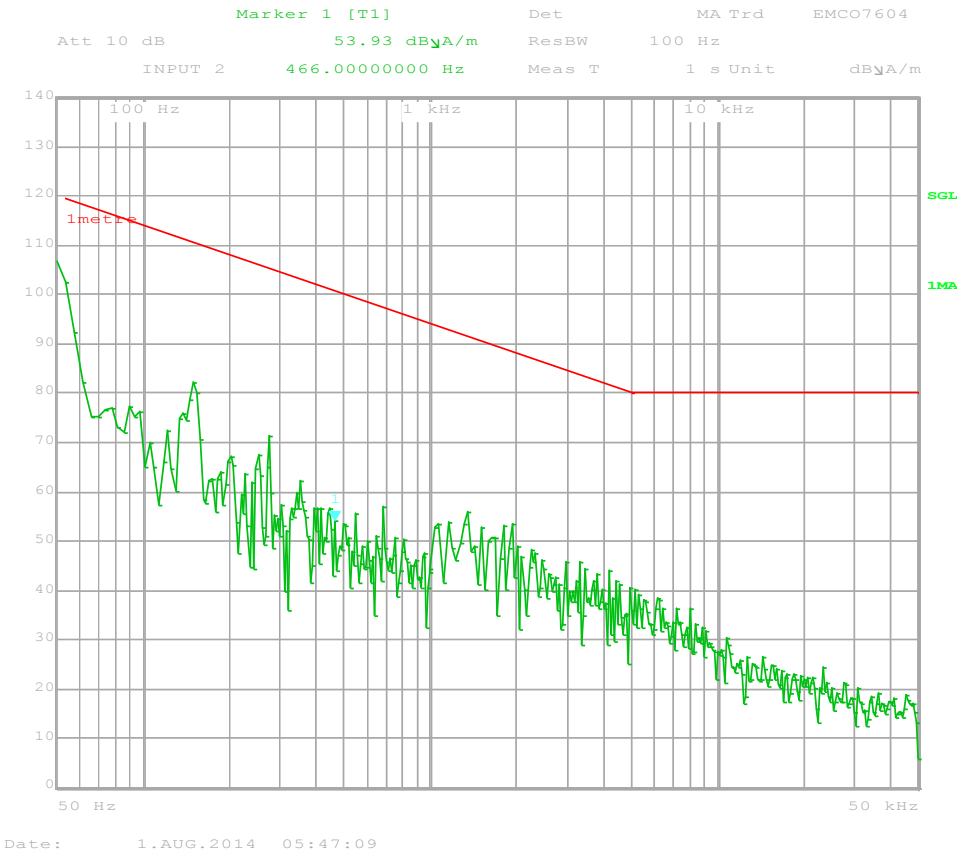
TRACE	FREQUENCY	LEVEL	DELTA LIMIT dB
1 Max Peak	50.0000 Hz	104.67	-15.33
1 Max Peak	150.0000 Hz	79.98	-30.47
1 Max Peak	466.0000 Hz	65.14	-35.46
1 Max Peak	466.0000 Hz	65.14	-35.46
1 Max Peak	2.7600 kHz	55.55	-29.60
1 Max Peak	3.5600 kHz	52.89	-30.05
1 Max Peak	19.3200 kHz	47.39	-32.61
1 Max Peak	24.1200 kHz	49.37	-30.62
1 Max Peak	31.3200 kHz	45.30	-34.69
1 Max Peak	48.2400 kHz	46.84	-33.15

Uncertainty of measurement: ± 4.2dBµV for a 95% confidence level.

Note: Graph scaled in dBµA not A/m (120 dBµA = 1A/m, 80 dBµA = 0.01A/m)

TEST ENGINEER: Julian Jones

4.1.2 Data; A02



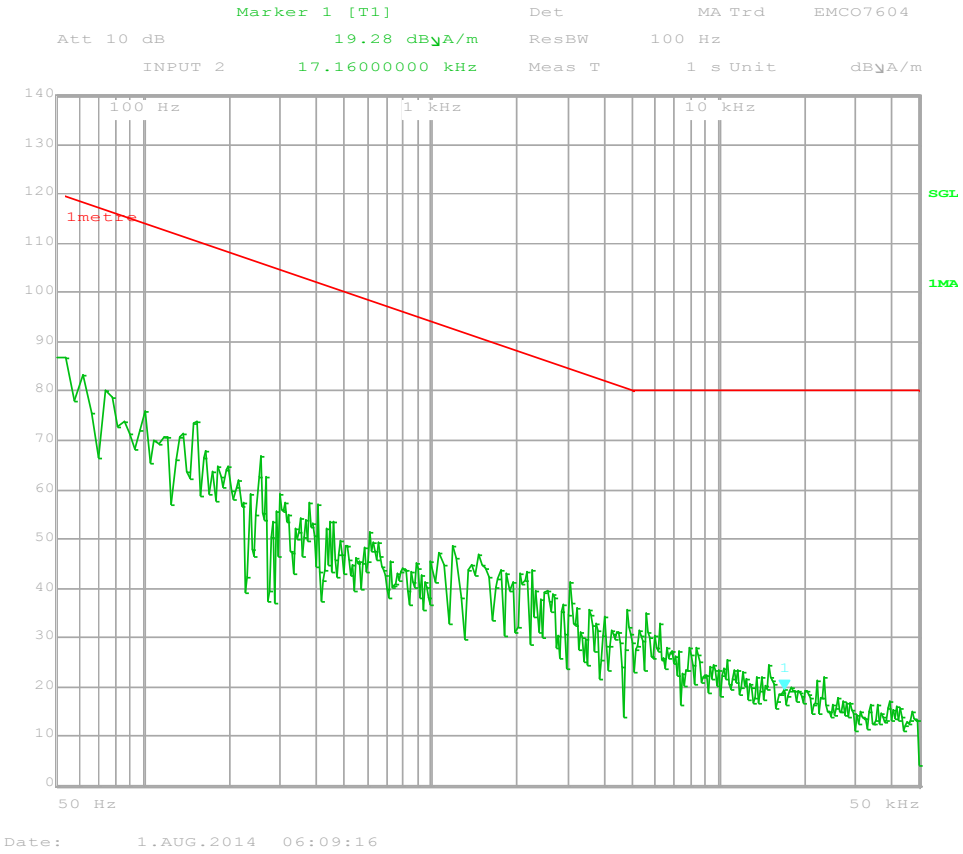
TRACE	FREQUENCY	LEVEL	DELTA LIMIT dB
1 Max Peak	50.0000 Hz	106.62	-13.38
1 Max Peak	150.0000 Hz	81.90	-28.54
1 Max Peak	274.0000 Hz	71.21	-34.01
1 Max Peak	1.3600 kHz	55.65	-35.65
1 Max Peak	1.9200 kHz	53.39	-34.91
1 Max Peak	3.3200 kHz	45.63	-37.92
1 Max Peak	4.4400 kHz	41.92	-39.11
1 Max Peak	7.1600 kHz	36.34	-43.65
1 Max Peak	7.1600 kHz	36.34	-43.65
1 Max Peak	23.4400 kHz	24.38	-55.61

Uncertainty of measurement: ± 4.2dBµV for a 95% confidence level.

Note: Graph scaled in dBµA not A/m (120 dBµA = 1A/m, 80 dBµA = 0.01A/m)

TEST ENGINEER: Julian Jones

4.1.3 Data; A03



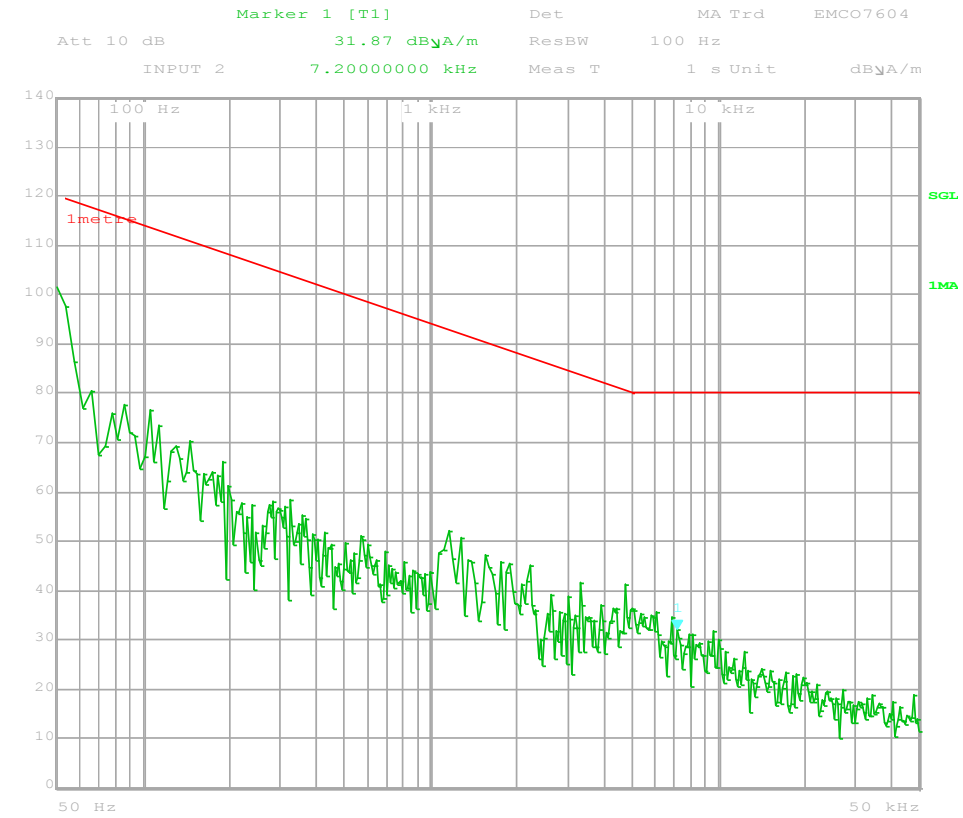
TRACE	FREQUENCY	LEVEL	DELTA LIMIT dB
1 Max Peak	50.0000 Hz	86.72	-33.27
1 Max Peak	154.0000 Hz	73.71	-36.51
1 Max Peak	254.0000 Hz	66.84	-39.03
1 Max Peak	374.0000 Hz	57.27	-45.24
1 Max Peak	630.0000 Hz	49.07	-48.91
1 Max Peak	1.2000 kHz	48.56	-43.83
1 Max Peak	2.2400 kHz	43.65	-43.32
1 Max Peak	4.8000 kHz	35.69	-44.66
1 Max Peak	6.2800 kHz	32.63	-47.36
1 Max Peak	8.4000 kHz	27.86	-52.13

Uncertainty of measurement: ± 4.2dBµV for a 95% confidence level.

Note: Graph scaled in dBµA not A/m (120 dBµA = 1A/m, 80 dBµA = 0.01A/m)

TEST ENGINEER: Julian Jones

4.1.4 Data; A04



TRACE	FREQUENCY	LEVEL	DELTA LIMIT dB
1 Max Peak	50.0000 Hz	101.34	-18.66
1 Max Peak	106.0000 Hz	76.53	-36.93
1 Max Peak	190.0000 Hz	65.80	-42.60
1 Max Peak	322.0000 Hz	58.30	-45.51
1 Max Peak	582.0000 Hz	50.19	-48.48
1 Max Peak	1.1600 kHz	51.81	-40.87
1 Max Peak	3.2800 kHz	41.51	-42.15
1 Max Peak	4.7200 kHz	41.13	-39.36
1 Max Peak	9.7200 kHz	31.52	-48.47
1 Max Peak	12.4800 kHz	27.58	-52.41

Uncertainty of measurement: ± 4.2dBµV for a 95% confidence level.

Note: Graph scaled in dBµA not A/m (120 dBµA = 1A/m, 80 dBµA = 0.01A/m)

TEST ENGINEER: Julian Jones

4.2 Radiated Disturbance; 30 to 1000 MHz

Profile scans between 30.0 MHz and 1.0 GHz were taken at a distance of three metres on eight azimuths of the EUT in both the vertical and horizontal polarities of the antenna in a semi-anechoic chamber. The EUT was powered at 110V/60Hz.

Using the data obtained from the chamber profile-scan as an engineering guide, the EUT was then transferred onto the turntable in the Open Area Test Site. The antenna was positioned at a distance of ten metres from the periphery of the EUT. Radiated emissions were then systematically maximised by revolving the EUT and adjusting the antenna in polarity and height. The highest emissions are presented here.

4.2.1 Data; EUT running on Copper powered at 100V/60Hz

Emission frequency (MHz)	Antenna polarity	Measured quasi-peak value (dBµV/m)	Class A specified quasi-peak limit (dBµV/m)	Status
31.5441	Vertical	21.32	40.00	Pass
125.0030	Vertical	33.38	40.00	Pass
129.9960	Vertical	24.94	40.00	Pass
184.3330	Vertical	27.19	40.00	Pass
189.2010	Vertical	19.08	40.00	Pass
195.0000	Vertical	29.98	40.00	Pass
250.0000	Vertical	31.17	47.00	Pass
260.0000	Vertical	33.75	47.00	Pass
270.3560	Vertical	30.35	47.00	Pass
300.0100	Vertical	33.45	47.00	Pass
325.0000	Horizontal	36.99	47.00	Pass
380.9000	Vertical	37.77	47.00	Pass
390.0000	Vertical	42.69	47.00	Pass
417.8200	Vertical	41.46	47.00	Pass
442.3900	Vertical	39.87	47.00	Pass
455.6300	Vertical	28.79	47.00	Pass
491.5800	Vertical	34.97	47.00	Pass
499.7600	Horizontal	36.95	47.00	Pass
503.8500	Vertical	40.45	47.00	Pass
519.9500	Horizontal	37.23	47.00	Pass
540.6800	Vertical	37.18	47.00	Pass
565.3000	Vertical	31.25	47.00	Pass
589.9000	Vertical	29.37	47.00	Pass
650.0000	Horizontal	40.15	47.00	Pass
761.8500	Vertical	30.30	47.00	Pass
844.9700	Horizontal	32.38	47.00	Pass
862.4800	Vertical	30.45	47.00	Pass
909.9800	Vertical	31.98	47.00	Pass
974.9700	Horizontal	36.93	47.00	Pass

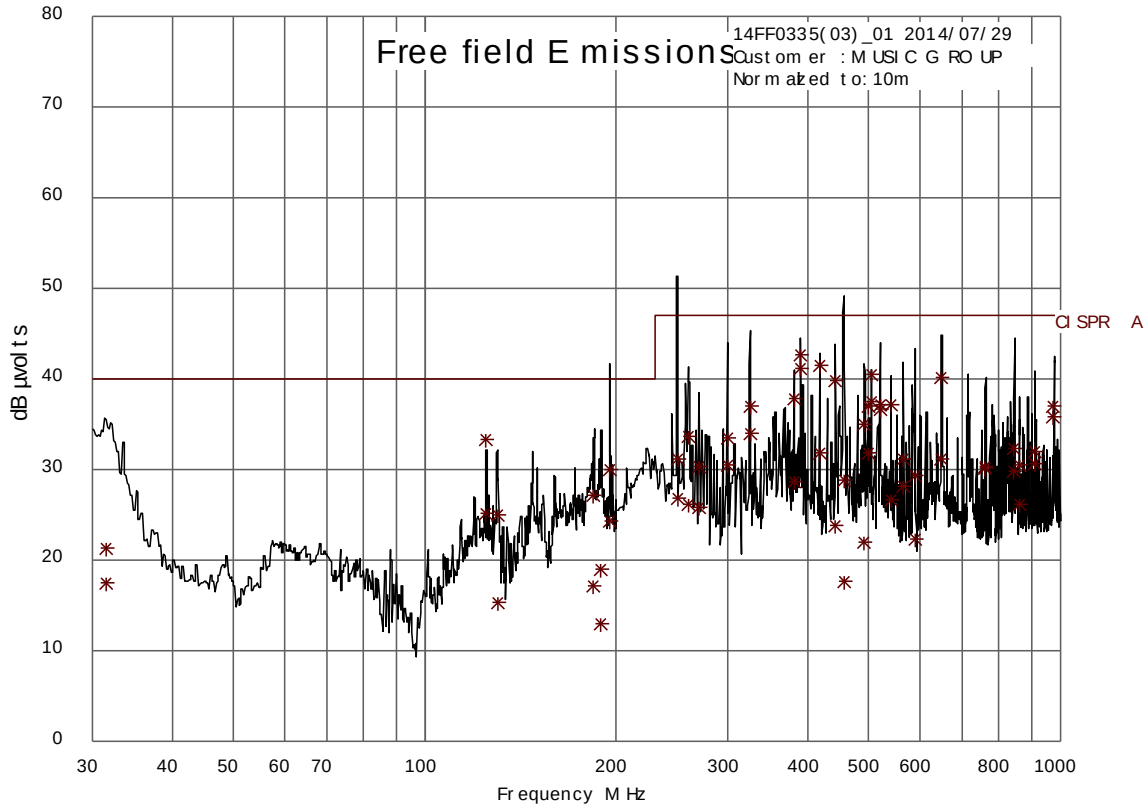
Uncertainty of measurement: ± 4.2 dBµV for a 95% confidence level.

The measurements reported are the highest emissions relative to the FCC / CISPR 22 Class A limits and take into account the antenna and cable loss factors. Results are normalised to ten metres for direct comparison with the specified limit. Measurements made according to the FCC / CISPR 22 test standard and Hursley EMC Services test procedure RAD-01.

TEST ENGINEER: Allan Wheelen

4.2.2 Profile; EUT running on Copper powered at 100V/60Hz

Maximum peak hold trace with quasi-peak values (∗)



Radiated Disturbance (continued)

4.2.3 Data; EUT running on Fibre powered at 100V/60Hz

Emission frequency (MHz)	Antenna polarity	Measured quasi-peak value (dBµV/m)	Class A specified quasi-peak limit (dBµV/m)	Status
31.5441	Vertical	22.45	40.00	Pass
129.9960	Vertical	24.11	40.00	Pass
147.4500	Vertical	23.10	40.00	Pass
150.0000	Vertical	19.89	40.00	Pass
184.3330	Vertical	25.41	40.00	Pass
189.2010	Vertical	17.80	40.00	Pass
195.0000	Vertical	29.56	40.00	Pass
208.8950	Vertical	24.33	40.00	Pass
250.0000	Vertical	31.66	47.00	Pass
260.0000	Vertical	37.89	47.00	Pass
300.0100	Vertical	36.09	47.00	Pass
325.0000	Horizontal	33.08	47.00	Pass
361.1100	Vertical	33.33	47.00	Pass
380.9000	Vertical	37.16	47.00	Pass
390.0000	Vertical	42.36	47.00	Pass
405.5200	Vertical	38.91	47.00	Pass
417.8500	Vertical	37.84	47.00	Pass
422.3900	Horizontal	15.69	47.00	Pass
430.1100	Vertical	39.34	47.00	Pass
442.3900	Vertical	38.90	47.00	Pass
455.6300	Vertical	28.81	47.00	Pass
479.2400	Vertical	40.83	47.00	Pass
491.5800	Vertical	33.86	47.00	Pass
540.6800	Vertical	36.68	47.00	Pass
565.3000	Vertical	30.43	47.00	Pass
585.0000	Vertical	32.52	47.00	Pass
650.0000	Horizontal	40.67	47.00	Pass
663.6400	Vertical	33.04	47.00	Pass
714.9500	Vertical	40.12	47.00	Pass
761.8500	Vertical	35.18	47.00	Pass
844.9700	Vertical	35.87	47.00	Pass
974.9500	Horizontal	36.15	47.00	Pass

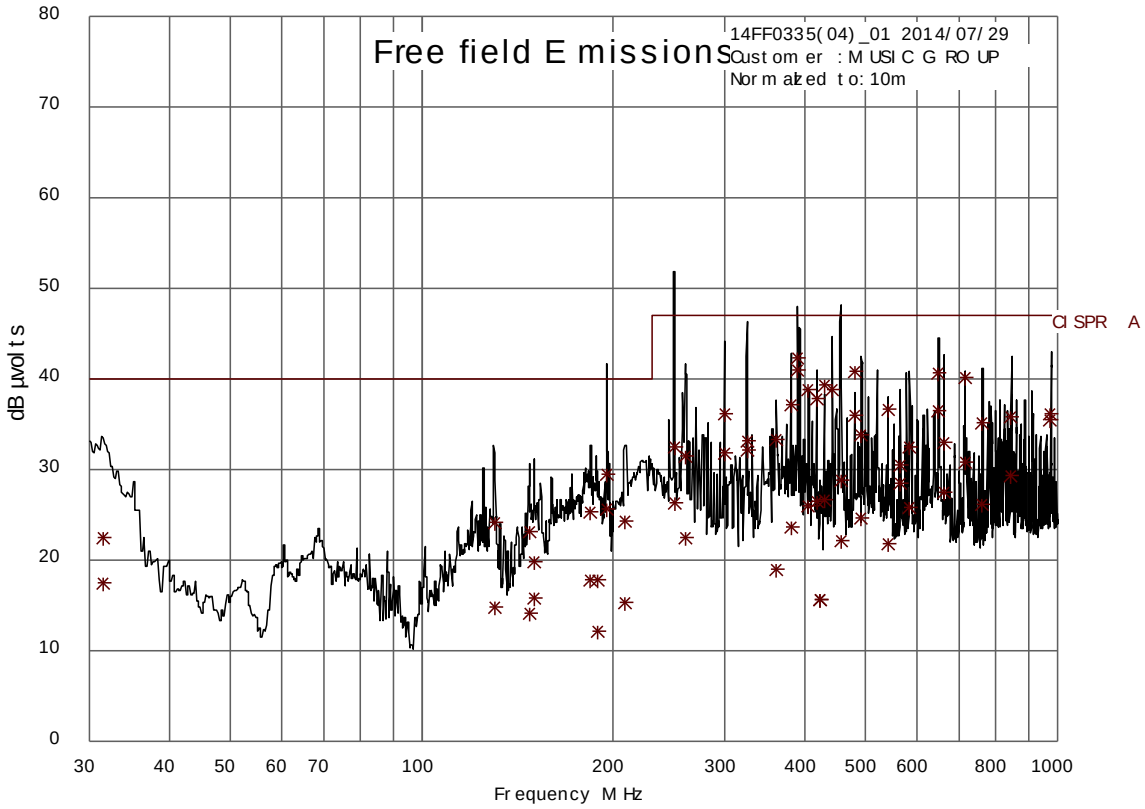
Uncertainty of measurement: ± 4.2 dBµV for a 95% confidence level.

The measurements reported are the highest emissions relative to the FCC / CISPR 22 Class A limits and take into account the antenna and cable loss factors. Results are normalised to ten metres for direct comparison with the specified limit. Measurements made according to the FCC / CISPR 22 test standard and Hursley EMC Services test procedure RAD-01.

TEST ENGINEER: Allan Wheelen

4.2.4 Profile; EUT running on Fibre powered at 100V/60Hz

Maximum peak hold trace with quasi-peak values (∗)



4.3 Radiated Disturbance; 1.0 to 6.0 GHz

Radiated emissions pre-scan profile measurements were taken at a distance of three metres with the EUT turned through 360°, with both horizontal and vertical antennae polarities in an anechoic chamber. This pre-scan profile was made from 1.0 to 6.0 GHz and evaluated against the CISPR Class A limit.

The sample was then re-measured in an anechoic chamber; the pre-scan results were used as a guide at three metre. Each emission from the EUT was maximised. Cable positions were then finally adjusted to produce the maximum emission levels. There were no frequencies found within the laboratory's ≤12dB criterion and so no further measurements were necessary.

4.3.1 Data

	AVERAGE @ 3m		PEAK @ 3m					
Frequency	**Measured**	**Specified CLASS A Limit**	**Measured**	**Specified CLASS A Limit**	**Antenna polarity**	**Antenna height**	**Turntable azimuth**	
GHz	**dBµV/m**	**dBµV/m**	**dBµV/m**	**dBµV/m**	**H/V**	**m**	**deg**	**STATUS**
No significant peaks found within the specified limit.								Pass

Uncertainty of measurements: ± 5.1 dBµV for a 95% confidence level for >1.0 GHz.

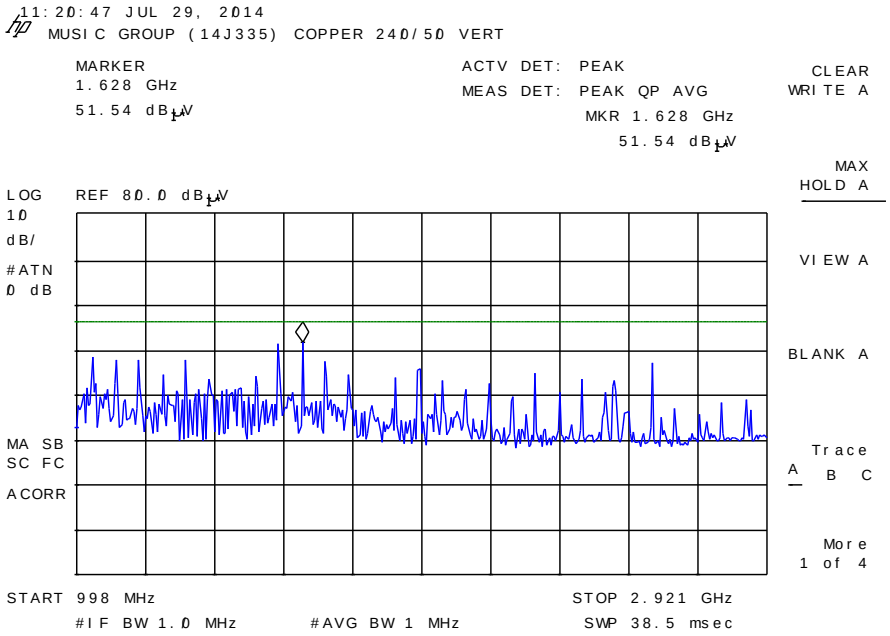
The measurements reported are the highest emissions relative to the CISPR Class A limits and take into account the antenna and cable loss factors. Measurements made according to the CISPR Class A test standard and Hursley EMC Services test procedure RHF-01.

Procedure: In accordance with CISPR 16-2-3.

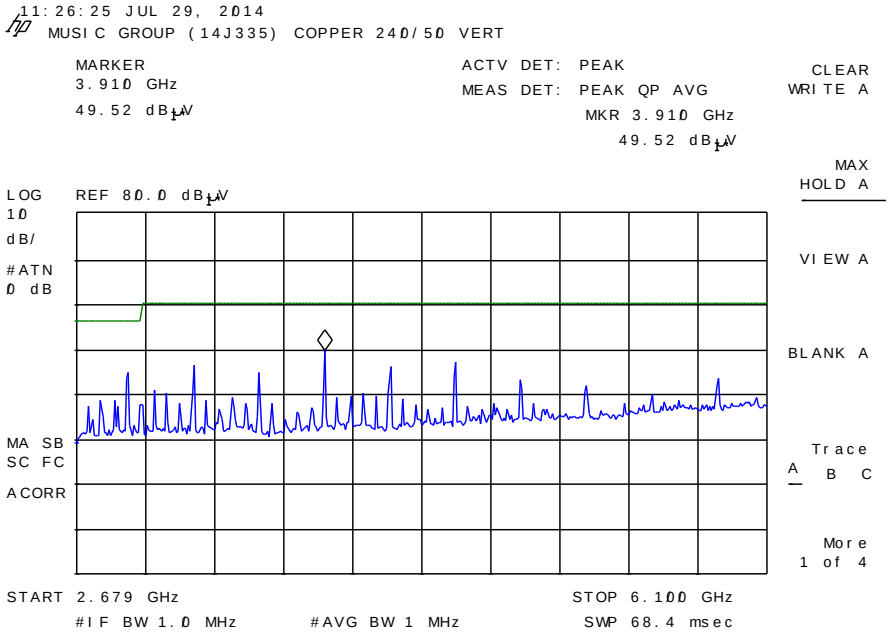
TEST ENGINEER: Allan Wheelen

4.3.2 Profiles; EUT running on Copper powered at 240V/50Hz

1.0 to 2.921 GHz, vertical

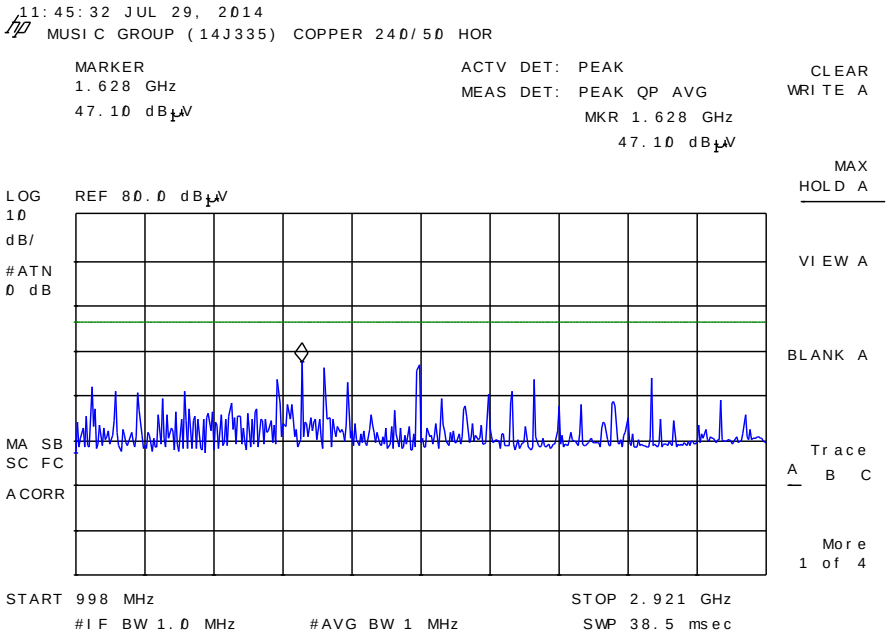


2.679 to 6.0 GHz, vertical

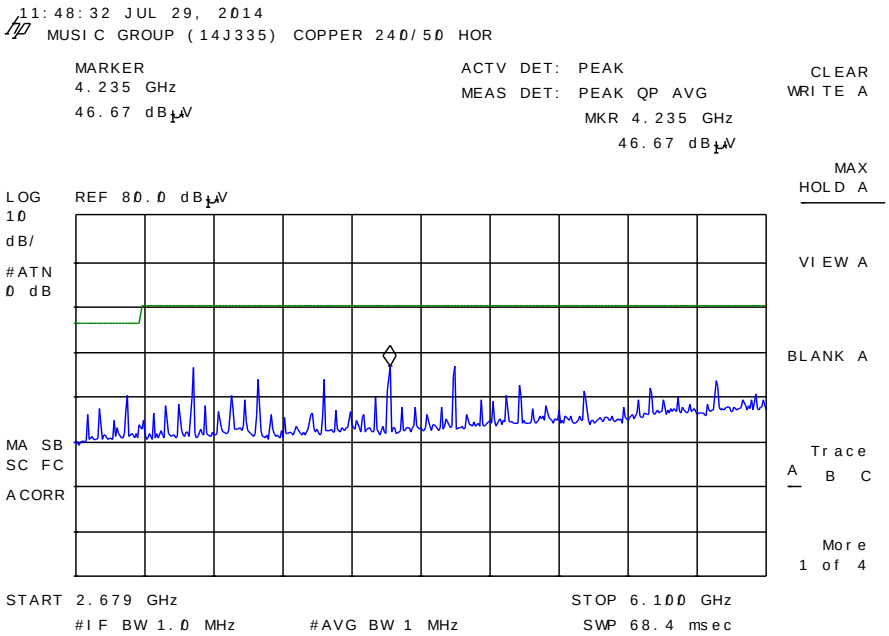


Profiles (continued); EUT running on Copper powered at 240V/50Hz

1.0 to 2.921 GHz, horizontal

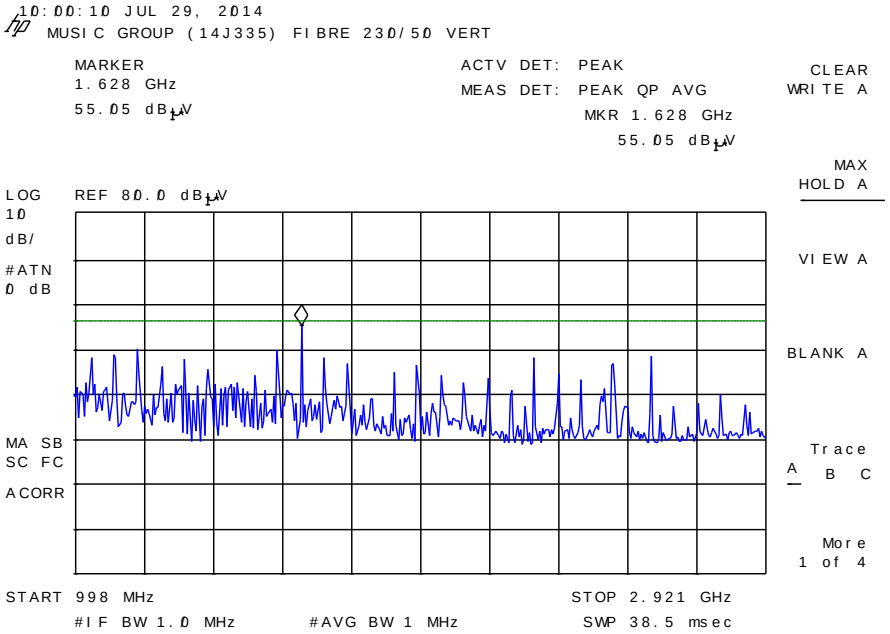


2.679 to 6.0 GHz, horizontal

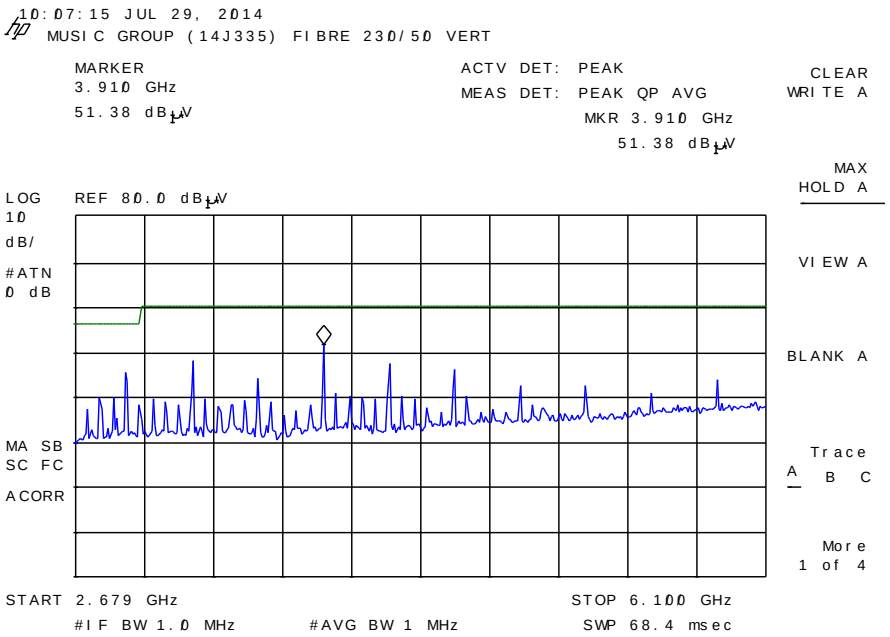


4.3.3 Profiles; EUT running on Fibre powered at 240V/50Hz

1.0 to 2.921 GHz, vertical

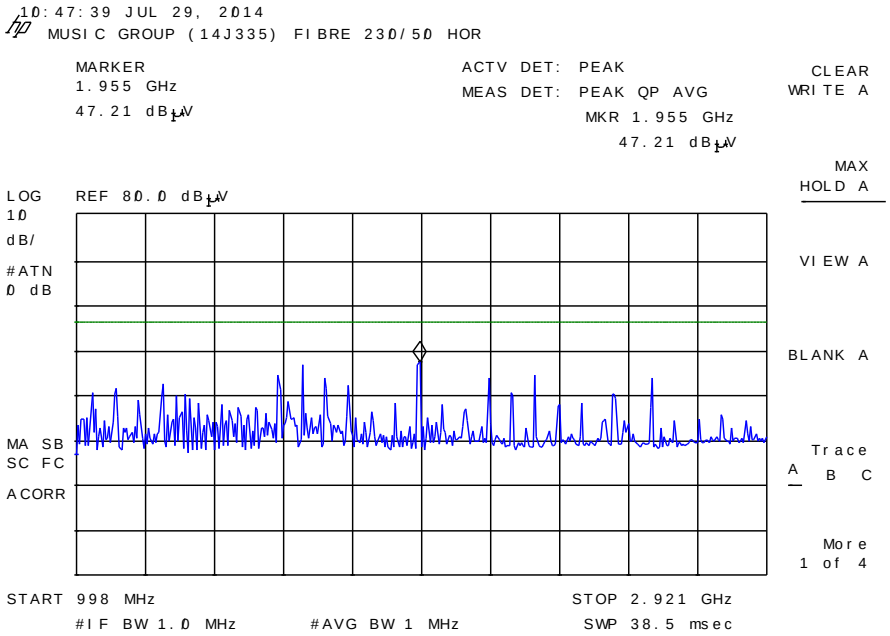


2.679 to 6.0 GHz, vertical

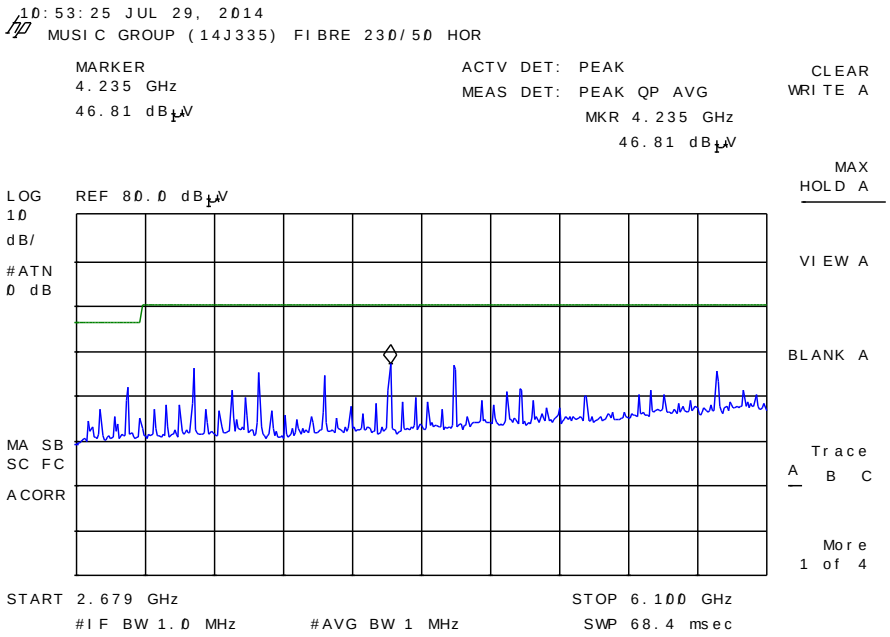


Profiles (continued): **EUT running on Fibre powered at 240V/50Hz**

1.0 to 2.921 GHz, horizontal



2.679 to 6.0 GHz, horizontal



4.4 Radiated Disturbance; FCC, 1.0 to 18.0 GHz

Radiated emissions pre-scan profile measurements were taken at a distance of three metres with the EUT turned through 360°, with both horizontal and vertical antennae polarities in an anechoic chamber. This pre-scan profile was made from 1.0 GHz to 18.0 GHz and evaluated against the FCC Class A limit.

The sample was then re-measured in an anechoic chamber; the pre-scan results were used as a guide at three metre. Each emission from the EUT was maximised. Cable positions were then finally adjusted to produce the maximum emission levels. There were no frequencies found within the laboratory's ≤12dB criterion and so no further measurements were necessary.

4.4.1 Data

	AVERAGE @ 3m		PEAK @ 3m					
Frequency	**Measured**	**Specified CLASS A Limit**	**Measured**	**Specified CLASS A Limit**	**Antenna polarity**	**Antenna height**	**Turntable azimuth**	
GHz	**dBµV/m**	**dBµV/m**	**dBµV/m**	**dBµV/m**	**H/V**	**m**	**deg**	**STATUS**
No significant peaks found within the specified limit.								Pass

Uncertainty of measurements: ± 5.1 dBµV for a 95% confidence level for >1.0 GHz.

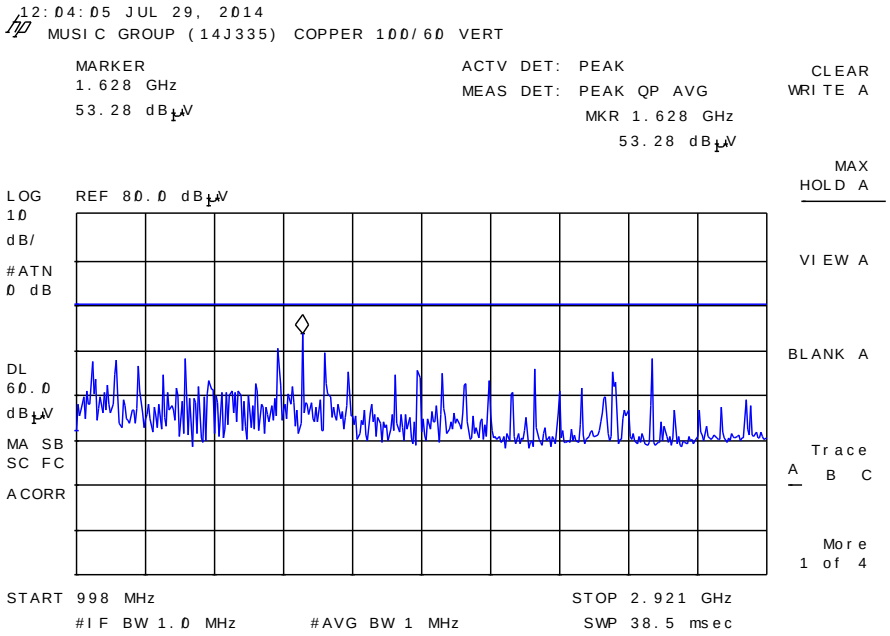
The measurements reported are the highest emissions relative to the FCC Class A limits and take into account the antenna and cable loss factors. Measurements made according to the FCC Class A test standard and Hursley EMC Services test procedure RHF-01.

Procedure: In accordance with ANSI C63.4:2003 & CISPR 16-2-3.

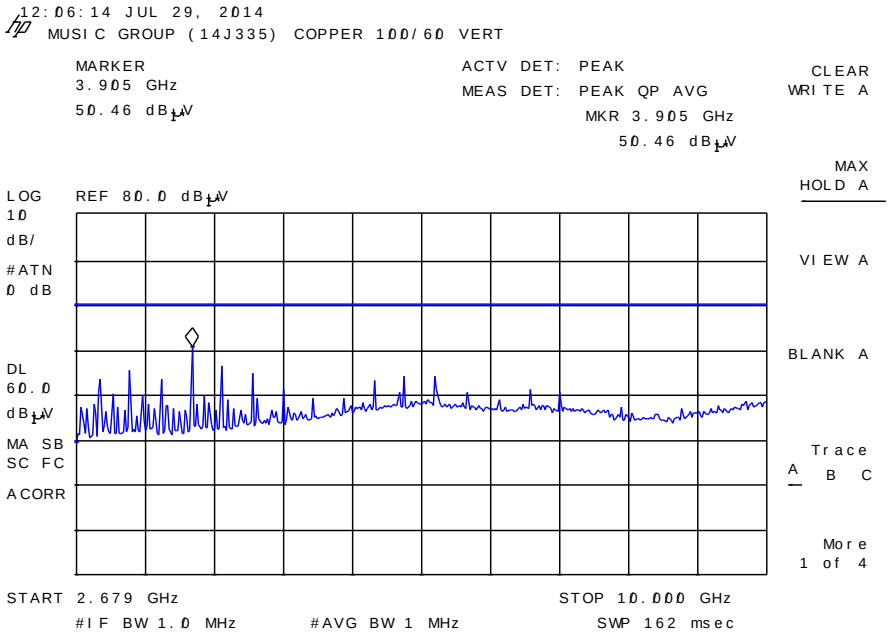
TEST ENGINEER: Allan Wheelen

4.4.2 Profiles; EUT running on Copper powered at 100V/60Hz

1.0 to 2.921 GHz, vertical

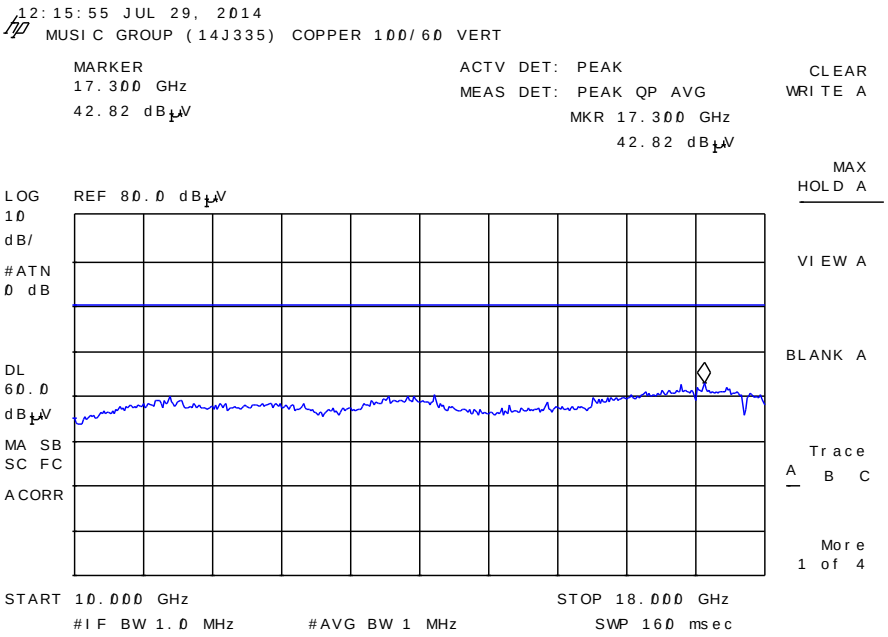


2.679 to 10.0 GHz, vertical



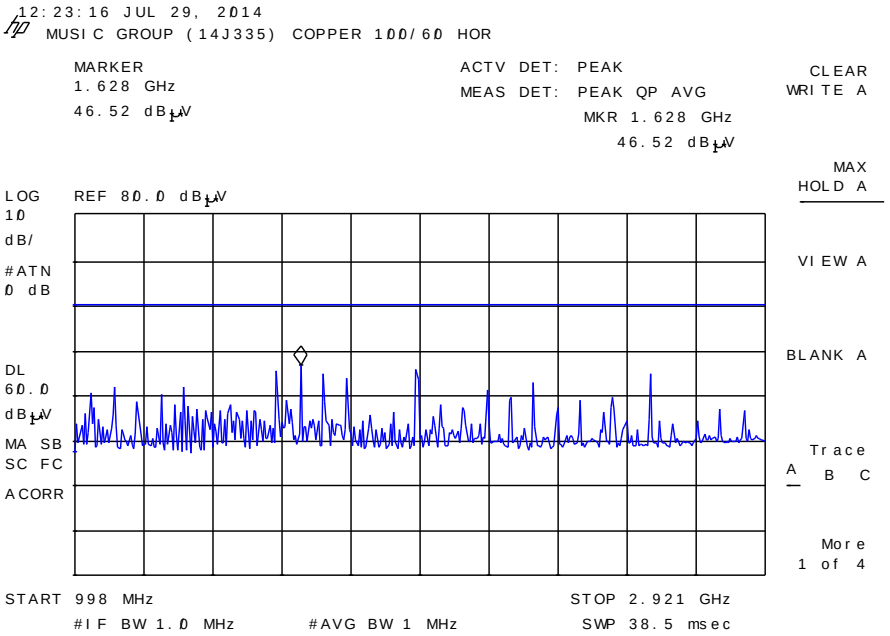
Profiles (continued): **EUT running on Copper powered at 100V/60Hz**

10.0 to 18.0 GHz, vertical

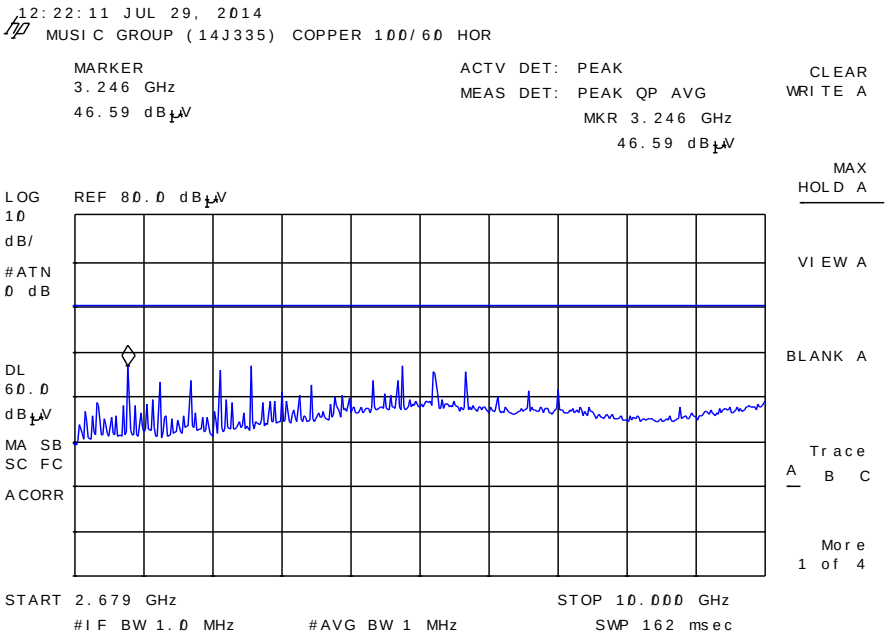


Profiles (continued): EUT running on Copper powered at 100V/60Hz

1.0 to 2.921 GHz, horizontal

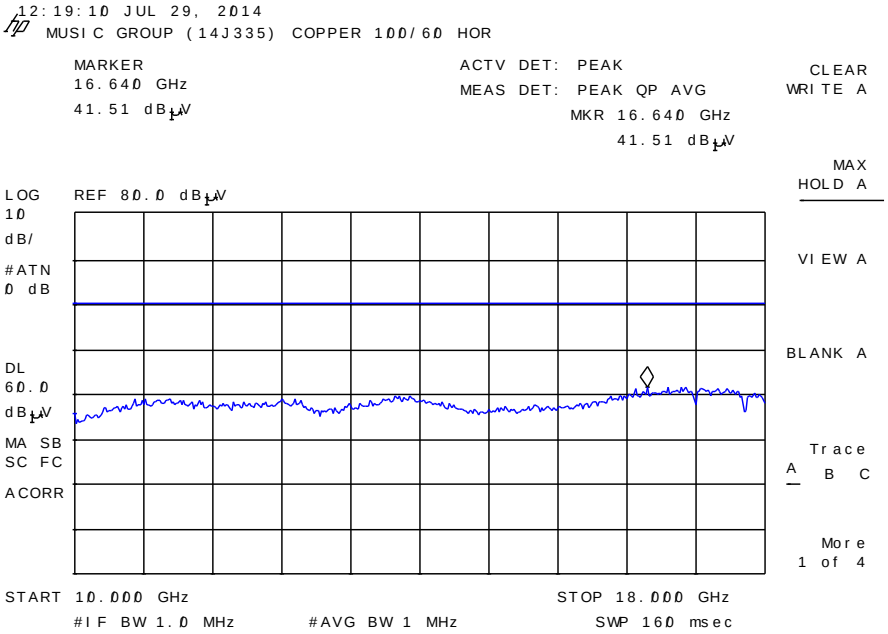


2.679 to 10.0 GHz, horizontal



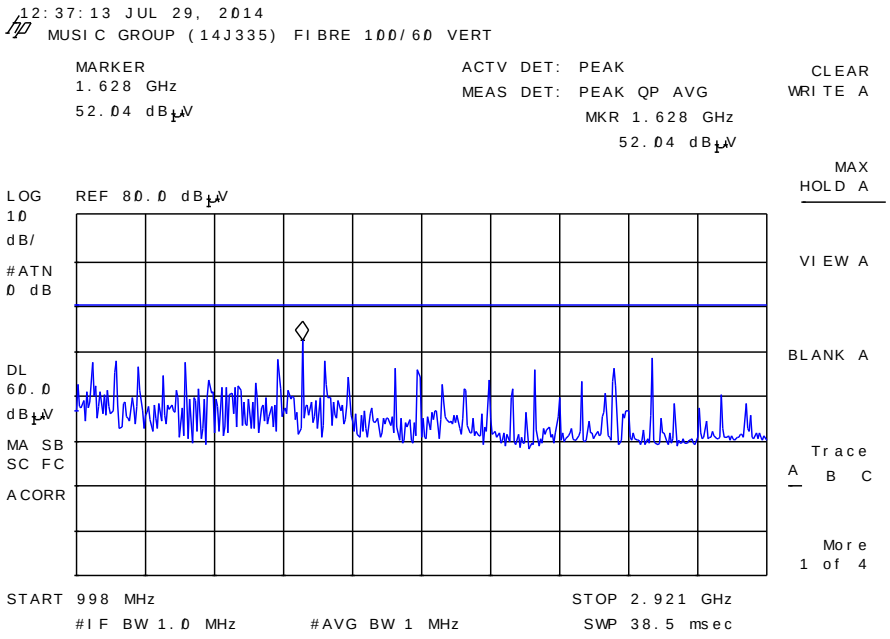
Profiles (continued): **EUT running on Copper powered at 100V/60Hz**

10.0 to 18.0 GHz, horizontal

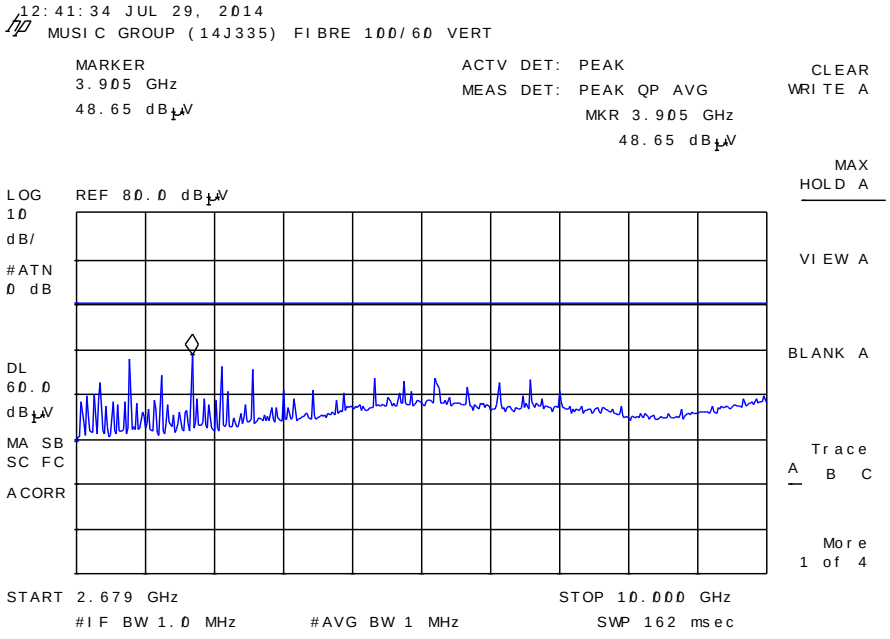


4.4.3 Profiles; EUT running on Fibre powered at 100V/60Hz

1.0to 2.921 GHz, vertical

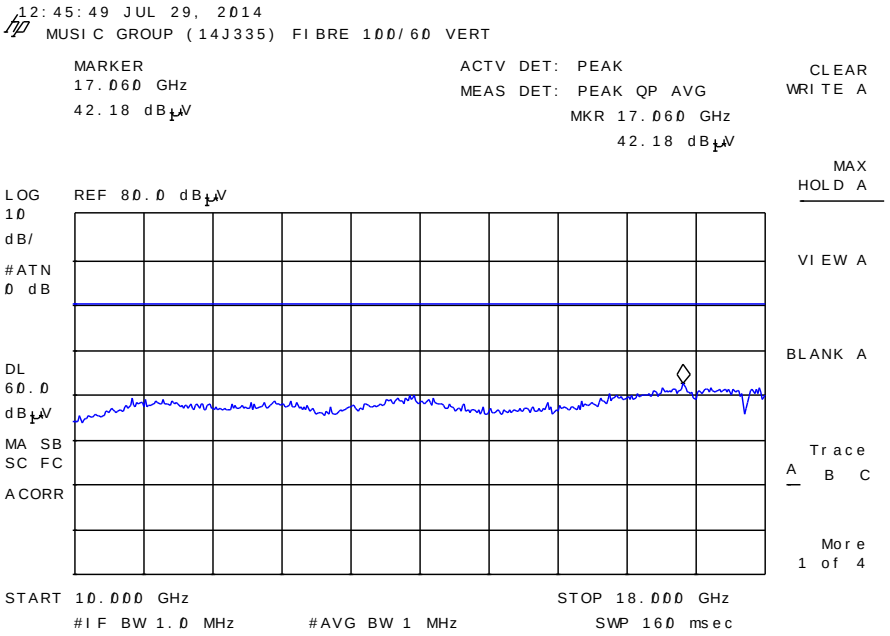


2.679 to 10.0 GHz, vertical



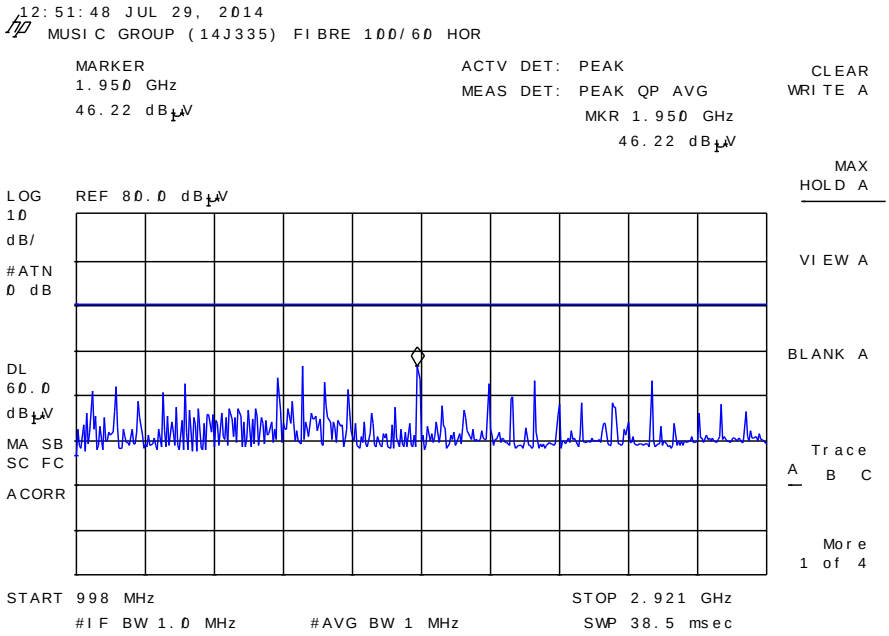
Profiles (continued): **EUT running on Fibre powered at 100V/60Hz**

10.0 to 18.0 GHz, vertical

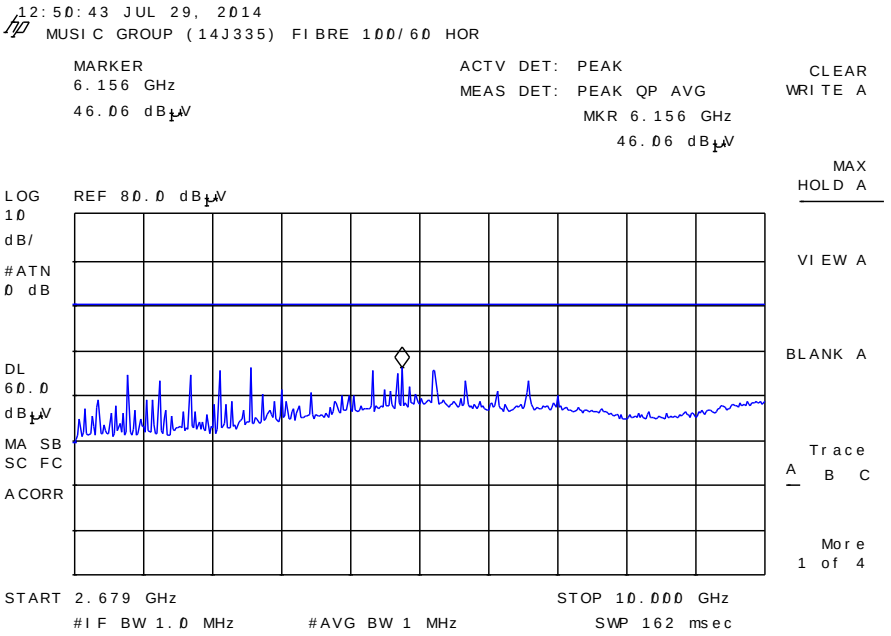


Profiles (continued): EUT running on Fibre powered at 100V/60Hz

1.0 to 2.921 GHz, horizontal

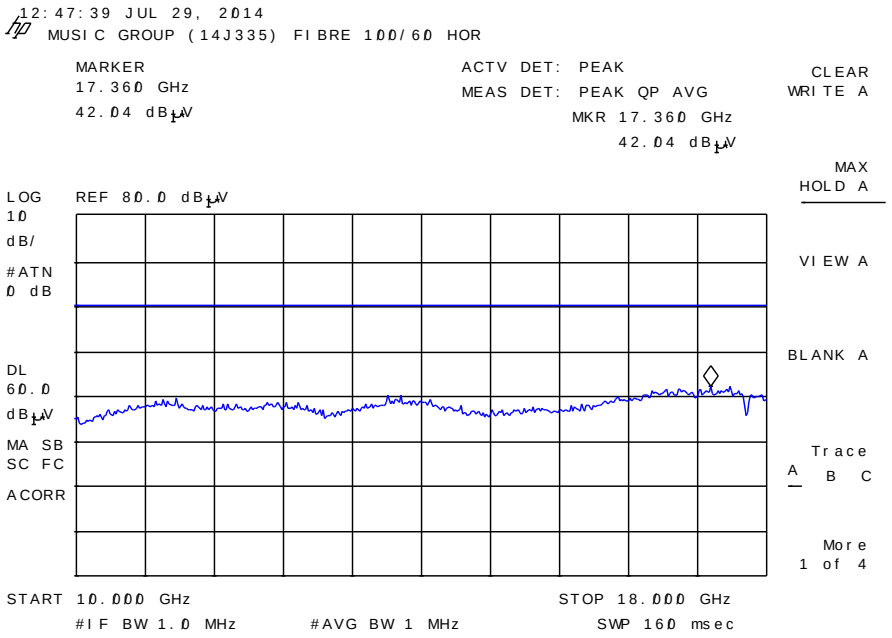


2.679 to 6.0 GHz, horizontal



Profiles (continued): **EUT running on Fibre powered at 100V/60Hz**

10.0 to 18.0 GHz, horizontal



4.5 Conducted Disturbance, ac port

A filtered 240V/50Hz or 100V/60Hz supply was fed to the EUT power supply unit via a 50Ω/50µH Artificial Mains Network (AMN). The AMN was bonded to a conductive ground plane. Line and neutral phases were measured separately.

A spectrum analyser was set to scan between 0.15 MHz and 30.0 MHz to record the peak emission profiles. The worst-case peaks were then measured using an average and/or quasi-peak receiver and compared to the EN 55103-1 Class A limits. Measurements made according to the FCC / EN 55022 test standard and Hursley EMC Services test procedure CON-02. The highest emissions are presented here.

4.5.1 Data; 100V/60Hz

MAINS - NEUTRAL

Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Class A Limit	Measured	Class A Limit	
14.197	43.00	73.00	35.60	60.00	Pass
21.850	51.74	73.00	40.14	60.00	Pass
23.798	50.09	73.00	35.79	60.00	Pass

MAINS – LINE

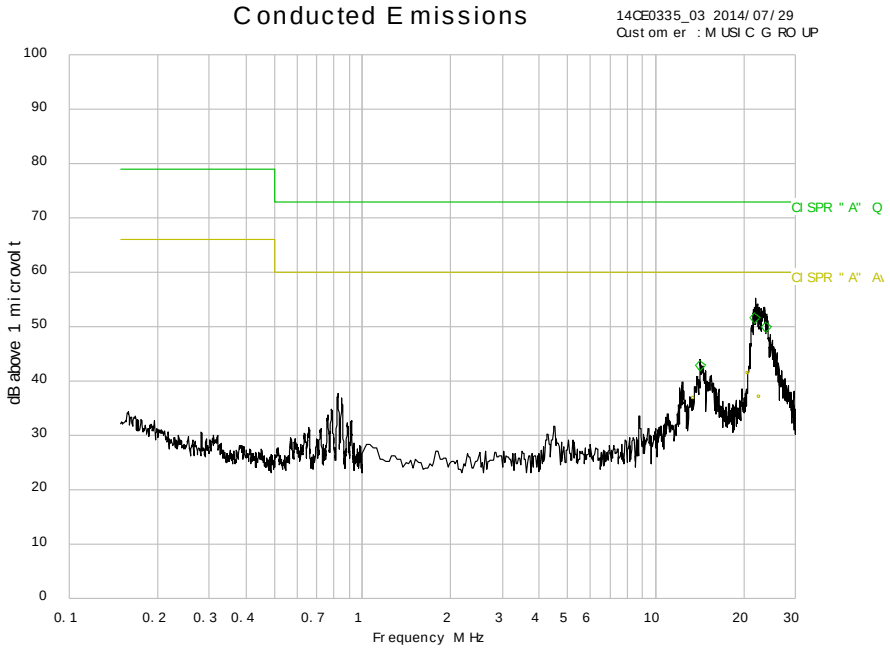
Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Class A Limit	Measured	Class A Limit	
12.301	36.92	73.00	27.52	60.00	Pass
14.196	41.10	73.00	33.50	60.00	Pass
21.926	49.75	73.00	35.95	60.00	Pass
23.666	48.08	73.00	34.28	60.00	Pass

Uncertainty of measurement: ± 3.22dBµV for a 95% confidence level.

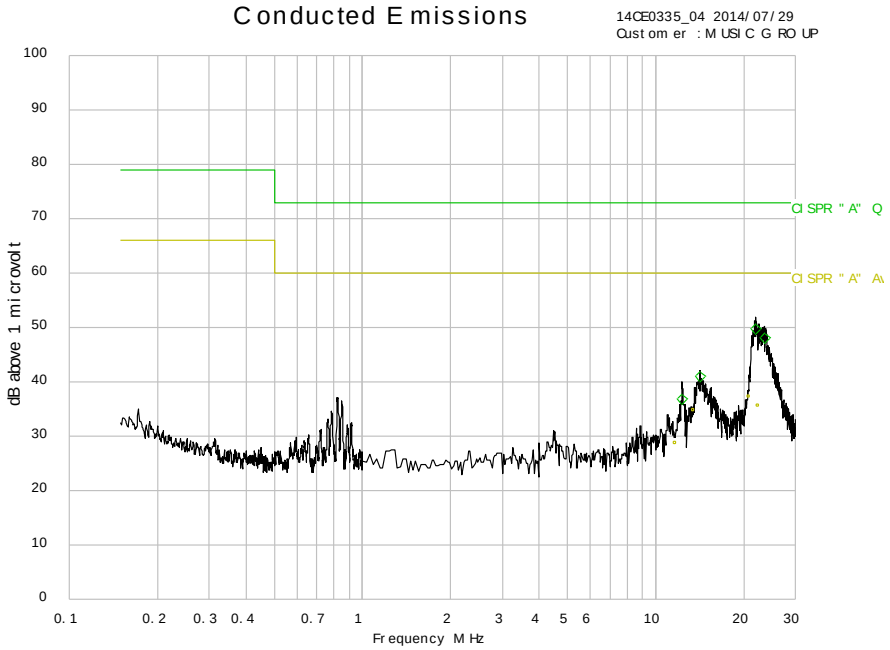
TEST ENGINEER: Allan Wheelen

4.5.2 Profiles; 100V/60Hz

Shown here is the mains-neutral plot.



Shown here is the mains-line plot.



Conducted disturbance (continued)

4.5.3 Data; 240V/50Hz

MAINS - NEUTRAL

Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Class A Limit	Measured	Class A Limit	
14.193	45.30	73.00	38.20	60.00	Pass
21.849	51.74	73.00	42.04	60.00	Pass
23.477	49.48	73.00	38.18	60.00	Pass

MAINS – LINE

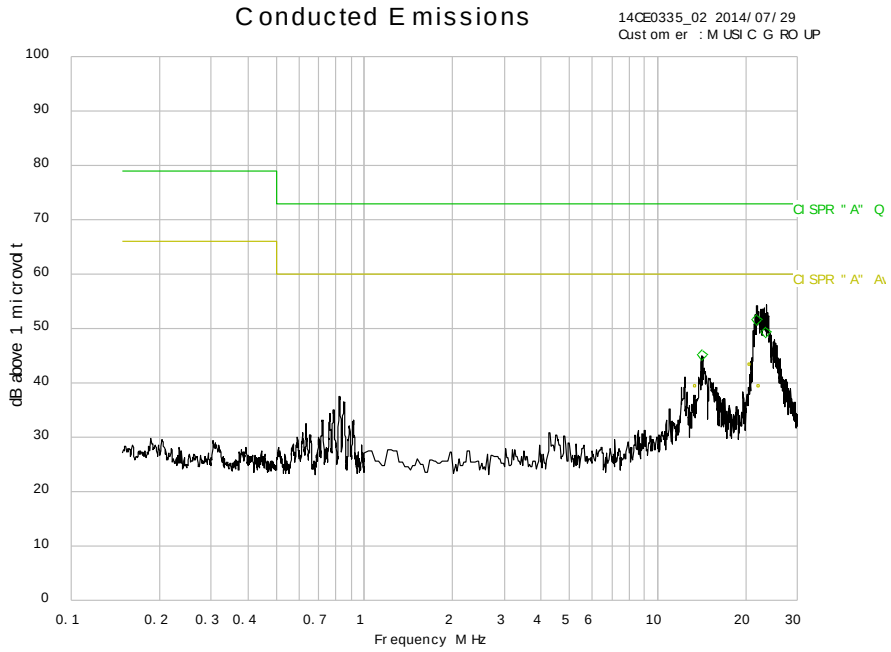
Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Class A Limit	Measured	Class A Limit	
0.820	35.50	73.00	34.60	60.00	Pass
14.190	42.40	73.00	35.60	60.00	Pass
21.788	49.04	73.00	35.54	60.00	Pass
23.597	48.28	73.00	35.18	60.00	Pass

Uncertainty of measurement: ± 3.22dBµV for a 95% confidence level.

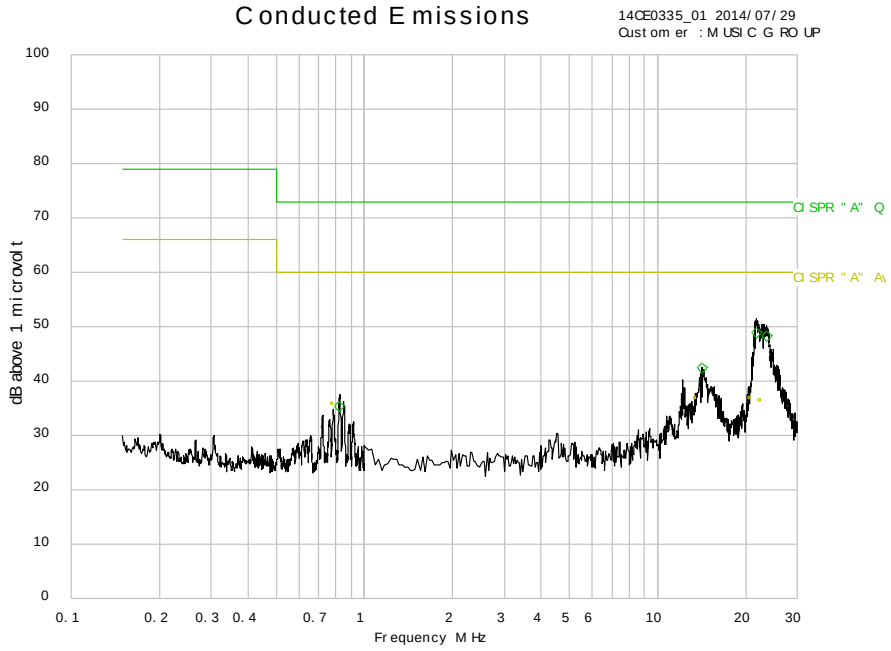
TEST ENGINEER: Allan Wheelen

4.5.4 Profiles; 240V/50Hz

Shown here is the mains-neutral plot.



Shown here is the mains-line plot.



4.6 Conducted Disturbance, Telecommunication Line (worst-case)

The conducted emissions were measured in a partially screened room in order to eliminate ambient noise. The signal port cable was unscreened and as a result the voltage measurement was made by using an Impedance Stabilisation Network (ISN). The ISN was bonded to the ground plane and the signal fed into the receiver.

A spectrum analyser was set to scan between 0.15MHz and 30.0MHz to record the peak emission profile. The worst-case peaks were then measured using an average and/or quasi-peak receiver and compared to the EN 55022 / CISPR 22 Class A telecoms limits. Measurements made according to the EN 55022 / CISPR 22 test standard and Hursley EMC Services test procedure CON-02. .

The worst-case quasi-peak results are recorded below

4.6.1 Data; EUT running on Copper powered at 240V/50Hz

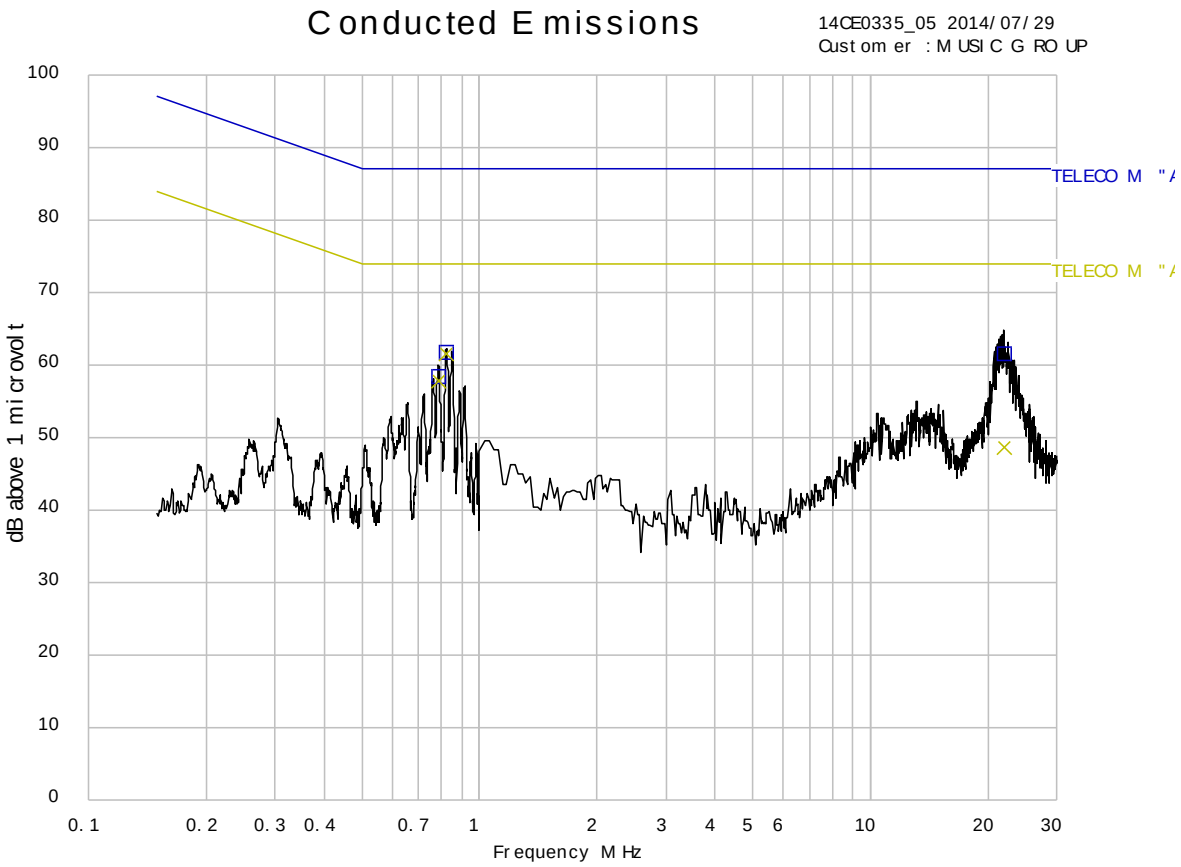
	Quasi-peak value (dBµV)		Average value (dBµV)		
(MHz)	Measured	Class A Limit	Measured	Class A Limit	Status
0.783	58.64	87.00	57.94	74.00	Pass
0.821	61.94	87.00	61.74	74.00	Pass
21.928	61.77	87.00	48.77	74.00	Pass

Uncertainty of measurement: ± 3.22 dBµV for a 95% confidence level.

The emissions reported are the highest relative to the Class A limit, the measured results meet the conducted limits with a significant pass margin. The emissions profile from the cable is shown on the next page.

TEST ENGINEER: Allan Wheelen

4.6.2 Profile; EUT running on Copper powered at 240V/50Hz



Conducted disturbance, telecommunication (continued)

4.6.3 Data; EUT running on Fibre powered at 240V/50Hz

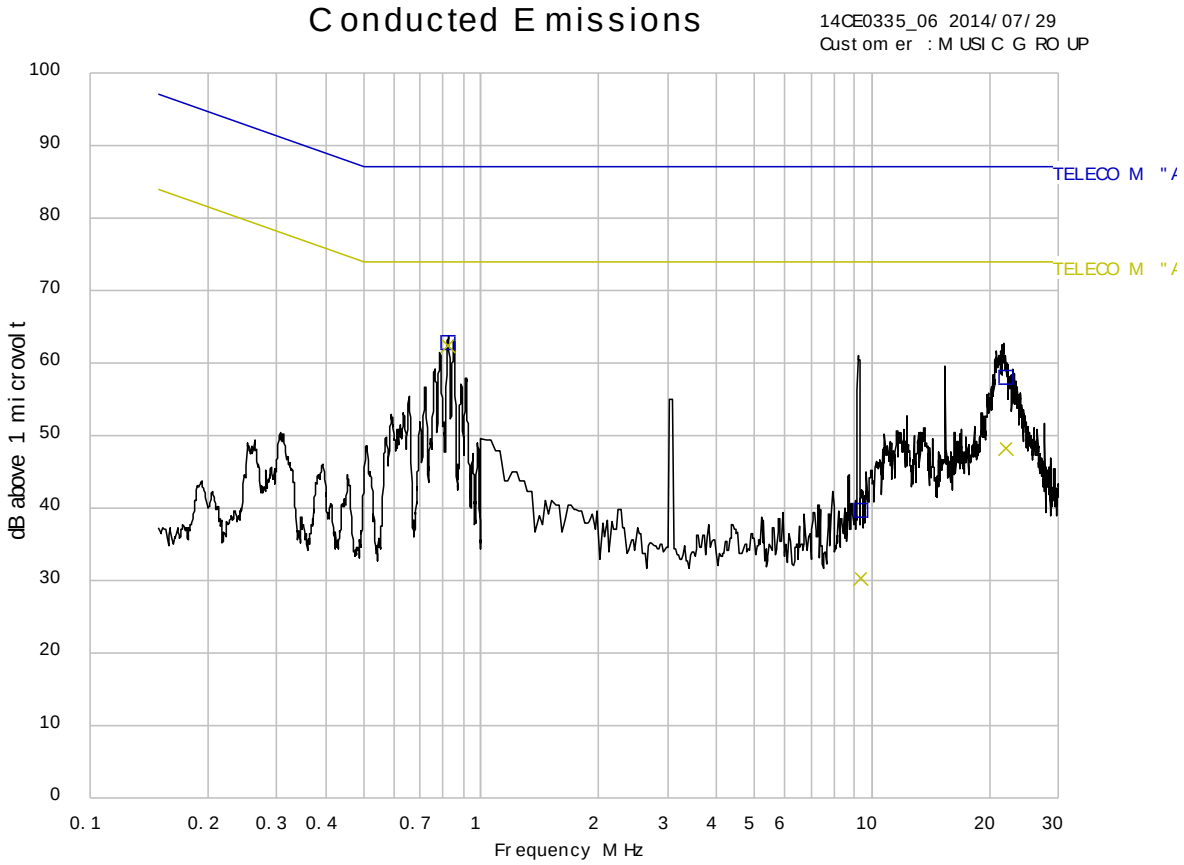
	Quasi-peak value (dBµV)		Average value (dBµV)		
(MHz)	Measured	Class A Limit	Measured	Class A Limit	Status
0.822	62.94	87.00	62.54	74.00	Pass
9.330	39.70	87.00	30.50	74.00	Pass
21.982	58.17	87.00	48.37	74.00	Pass

Uncertainty of measurement: ± 3.22 dBµV for a 95% confidence level.

The emissions reported are the highest relative to the Class A limit, the measured results meet the conducted limits with a significant pass margin. The emissions profile from the cable is shown on the next page.

TEST ENGINEER: Allan Wheelen

4.6.4 Profile; EUT running on Fibre powered at 240V/50Hz



4.7 Mains Harmonics (worst-case)

The EN 61000-3-2 test currently applies to equipment with a power consumption greater than 75 watts. It is intended to ensure that any spurious low harmonic emissions of the fundamental mains frequency generated by the EUT are below the allowable values set by the standard. Measurements show that the specification requirement was met.

Test completed, Result: PASSED

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Limit [A]
1	50	0.3807	0.3772	98.408		0.3888	
2	100	0.0055	0.0058	1.5127	0.5369	0.0061	1.0800
3	150	0.0443	0.0427	11.146	1.8576	0.0473	2.3000
4	200	0.0000	0.0003	0.0796	0.0710	0.0003	0.4300
5	250	0.0122	0.0122	3.1847	1.0708	0.0125	1.1400
6	300	0.0000	0.0009	0.2389	0.3052	0.0009	0.3000
7	350	0.0117	0.0116	3.0255	1.5061	0.0119	0.7700
8	400	0.0000	0.0012	0.3185	0.5307	0.0012	0.2300
9	450	0.0089	0.0092	2.3885	2.2888	0.0095	0.4000
10	500	0.0000	0.0021	0.5573	1.1610	0.0024	0.1840
11	550	0.0064	0.0055	1.4331	1.6646	0.0082	0.3300
12	600	0.0000	0.0009	0.2389	0.5971	0.0009	0.1533
13	650	0.0000	0.0021	0.5573	1.0173	0.0027	0.2100
14	700	0.0000	0.0009	0.2389	0.6966	0.0009	0.1314
15	750	0.0074	0.0076	1.9904	5.0863	0.0079	0.1500
16	800	0.0000	0.0006	0.1592	0.5307	0.0006	0.1150
17	850	0.0000	0.0037	0.9554	2.7669	0.0037	0.1324
18	900	0.0000	0.0003	0.0796	0.2985	0.0003	0.1022
19	950	0.0038	0.0055	1.4331	4.6387	0.0055	0.1184
20	1000	0.0000	0.0006	0.1592	0.6634	0.0012	0.0920
21	1050	0.0000	0.0034	0.8758	3.1331	0.0043	0.1071
22	1100	0.0000	0.0006	0.1592	0.7298	0.0006	0.0836
23	1150	0.0000	0.0040	1.0350	4.0554	0.0040	0.0978
24	1200	0.0000	0.0003	0.0796	0.3981	0.0003	0.0767
25	1250	0.0058	0.0058	1.5127	6.4426	0.0061	0.0900
26	1300	0.0000	0.0003	0.0796	0.4312	0.0006	0.0708
27	1350	0.0000	0.0046	1.1943	5.4932	0.0046	0.0833
28	1400	0.0000	0.0003	0.0796	0.4644	0.0003	0.0657
29	1450	0.0039	0.0049	1.2739	6.2934	0.0049	0.0776
30	1500	0.0000	0.0003	0.0796	0.4976	0.0006	0.0613
31	1550	0.0000	0.0027	0.7166	3.7842	0.0034	0.0726
32	1600	0.0000	0.0003	0.0796	0.5307	0.0003	0.0575
33	1650	0.0000	0.0037	0.9554	5.3711	0.0037	0.0682
34	1700	0.0000	0.0003	0.0796	0.5639	0.0003	0.0541
35	1750	0.0000	0.0037	0.9554	5.6966	0.0037	0.0643
36	1800	0.0000	0.0003	0.0796	0.5971	0.0003	0.0511
37	1850	0.0000	0.0037	0.9554	6.0221	0.0037	0.0608
38	1900	0.0000	0.0003	0.0796	0.6303	0.0003	0.0484
39	1950	0.0000	0.0034	0.8758	5.8187	0.0040	0.0577
40	2000	0.0000	0.0003	0.0796	0.6634	0.0003	0.0460

Uncertainty of measurement: ± 5.8% for a 95% confidence level.

Measurements made according to the EN 61000-3-2 standard and Hursley EMC Services procedure HAR-02.

TEST ENGINEER: Allan Wheelen

4.8 Mains Voltage Flicker (worst-case)

The EN 61000-3-3 test is designed to determine whether the EUT is capable of causing observable mains flicker beyond an acceptable amount on voltage dependent devices such as incandescent lighting. Measurements show that the specification requirement was satisfactorily met.

Test completed, Results: PASSED

	Pst	**dc%**	**dmax%**	**D(t)>3.3%ms**
Limit	1.0	3.3	6.0	500
EUT	0.07	0.00	0.00	0.00
Status	Pass	Pass	Pass	Pass

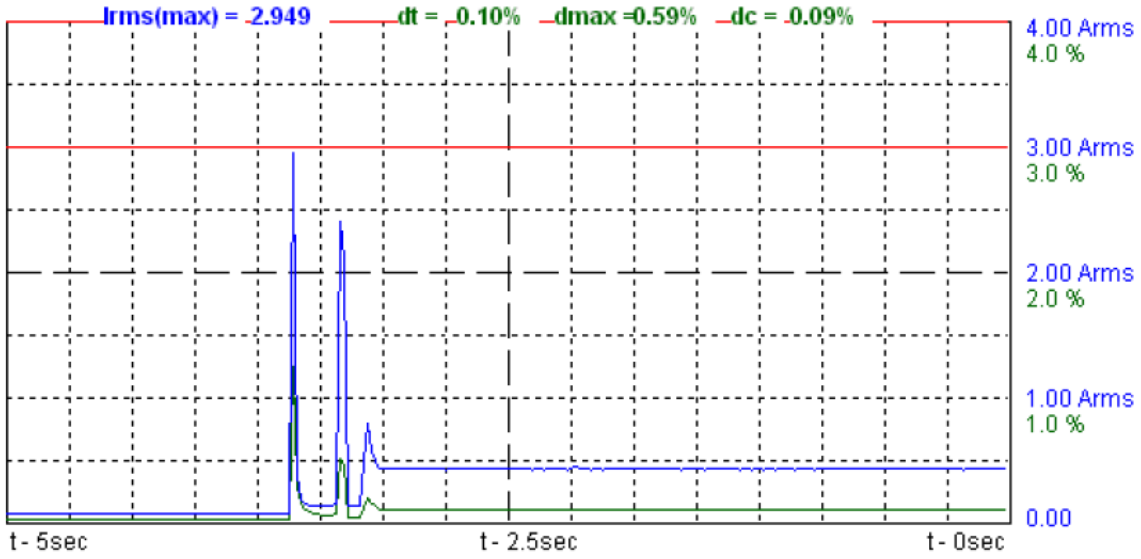
Uncertainty of measurement: +/-3.8% for a 95% confidence level.

Measurements made according to the EN 61000-3-3 standard and Hursley EMC Services procedure FLK-02.

TEST ENGINEER: Allan Wheelen

4.9 Mains Voltage Flicker; Manual Switching (worst-case)

A peak inrush current measurement was made of the EUT at 230V/50Hz at switch on in real time and a graph recorded, as shown here:-



Uncertainty of measurement: ± 3.8% for a 95% confidence level.

Measurements made according to the EN 61000-3-3 standard and Hursley EMC Services procedure FLK-02.

The maximum rms inrush current was measured at 2.949A

TEST ENGINEER: Allan Wheelen

5.0 IMMUNITY RESULTS

5.1 Performance Criteria

General performance criteria for immunity testing are defined below:-

Criterion A:	No degradation of performance during or after the test beyond a limit stated by the manufacturer. Note 1: This degradation limit is expected to be similar to the most unfavourable limit of the normal performance specification in most cases, but this is not necessary. A limit much difference from the normal specification limit would be expected to be justified by the manufacturer to prospective users in the instruction manual or similar document.
Criterion B:	Degradation (small or large, but not loss of data or operating state) during the test, but conformity with the specification after the test.
Criterion C:	Degradation during the test and, temporarily, after the test, but conformity with the specification after either automatic recovery or adjustment of the controls by the operator. Note 2: The acceptable duration implied by 'temporarily' depends on the application of the apparatus. 'Adjustment of controls' does not include such activities as replacement of fuses, which are classed a 'repairs'.

5.2 Electrostatic Discharge

TEST METHOD	EN 61000-4-2 REFERENCING PROCEDURE: ESD-03

TEST DETAILS

Test severity, <u>contact discharge</u>	**± 4.0 kV, 50 strikes per point. Total of 200 strikes (minimum).**
Test severity, <u>air discharge</u>	**± 8.0 kV, 10 strikes for each selected point**
Exerciser program during test	**Referencing section 3.2**
Specified test criterion	**Criterion 'B'**
EUT performance criterion	**Criterion 'B'**

RESULTS

Contact, Indirect

SPECIFIED VOLTS	REFERENCE PLANE @ 10 cm	STATUS
± 4.0 kV	**Horizontal & vertical; front, rear and sides**	**PASS**

Contact, Direct To EUT

SPECIFIED VOLTS	TEST POINTS	STATUS
± 2.0 & 4.0 kV	• **See following pages**	**PASS**

Air Discharge (Insulating, Slots & Apertures)

SPECIFIED VOLTS	TEST POINTS	STATUS
± 2.0, 4.0 & 8.0 kV	• **See following pages**	**PASS**

UNCERTAINTY: It has been demonstrated that the ESD simulator met the specified requirements in the standard with at least a 95% confidence.

COMMENT: The EUT met the specified test criterion.

TEST ENGINEER: Allan Wheelen

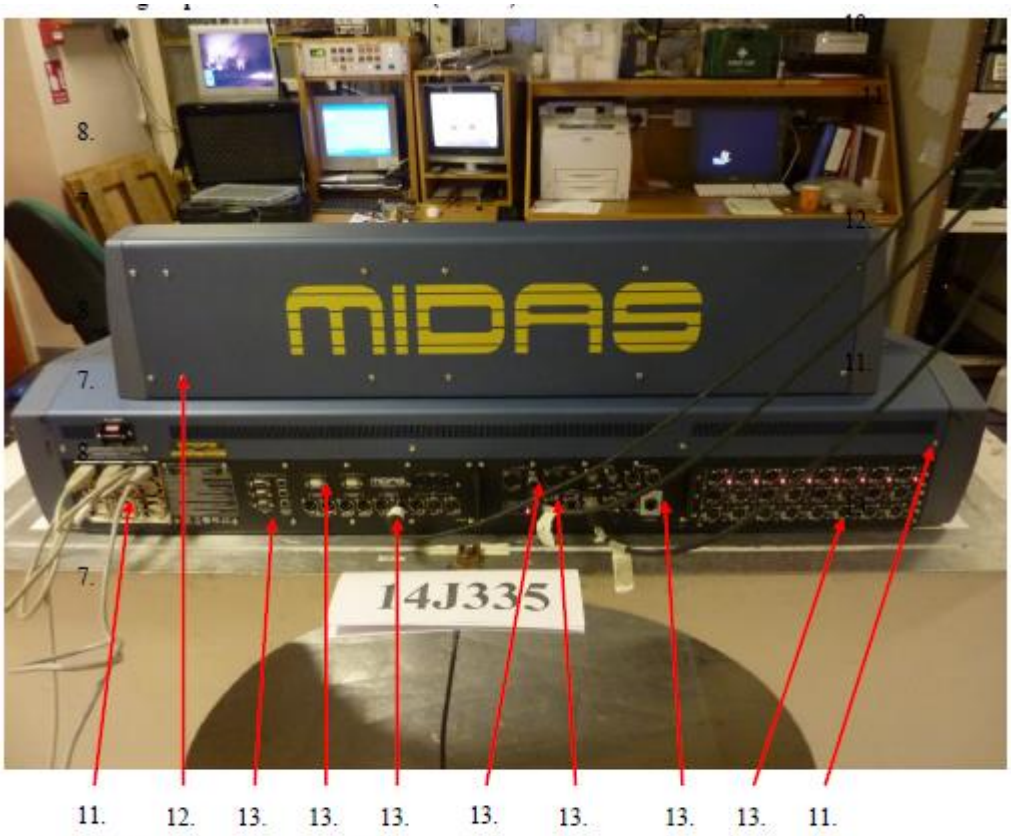
5.2.1 Electrostatic Discharge, Test Points

1. All push buttons (Air)
2. All fixing screws (Contact)
3. All slider slots (Air)
4. All rotary controls (Air)
5. All push buttons (Air)
6. Display x 2 (Air)
7. Controller (Air)

Electrostatic Discharge, Test Points (continued)

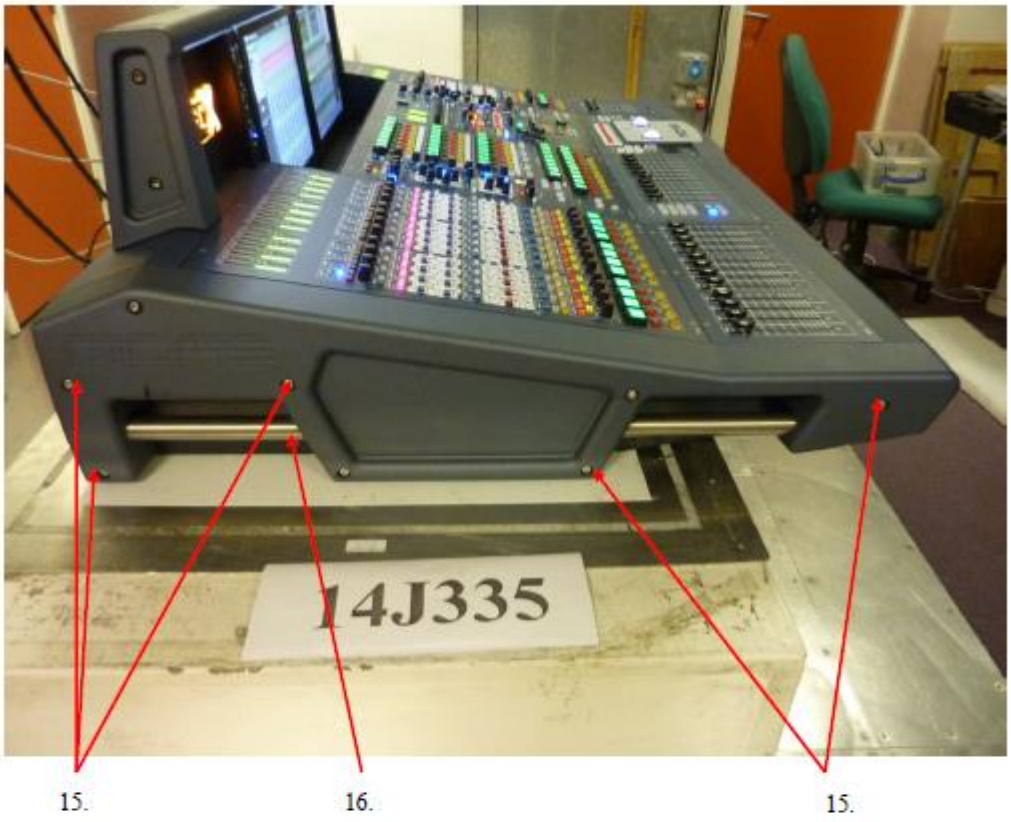
8. Jack socket under front x both sides (Contact)
9. Handles x 2 (Contact)
10. Right hand side fixing screws (Contact)

Electrostatic Discharge, Test Points (continued)



11. Around power inlet x 3 (Air)
12. All rear fixing screw (Contact)
13. All outer connector shells (Contact)
14. Retraction handles (Contact)

Electrostatic Discharge, Test Points (continued)



15. Left hand side fixing screws (Contact)
16. Handles x 2 (Contact)

HCP : (Indirect)
VCP: (Indirect)

5.3 Radiated RF Interference

TEST METHOD	**EN 61000-4-3** **REFERENCING PROCEDURE: RES-02**

TEST DETAILS

Test severity levels	• **80 to 1000 MHz; 3.0 V/m** • **1.4 to 2.0 GHz; 3.0 V/m** • **2.0 to 2.7 GHz; 1.0 V/m** **80% amplitude modulation at 1kHz** **1% Steps, 3s dwell time**
Exerciser program during test	**Referencing section 3.2**
Specified test criterion	**Criterion 'A'**
EUT performance criterion	**Criterion 'A'**

RESULTS

TEST POINTS	ANTENNA POLARITIES	FIELD LEVEL SWEPT FREQUENCY	STATUS
Front	**Horizontal & vertical**	**3.0 & 1.0 V/m**	**PASS**
Left side	**Horizontal & vertical**	**3.0 & 1.0 V/m**	**PASS**
Right side	**Horizontal & vertical**	**3.0 & 1.0 V/m**	**PASS**
Rear	**Horizontal & vertical**	**3.0 & 1.0 V/m**	**PASS**

UNCERTAINTY: The field level has been applied at level higher than that specified to give a greater confidence that the EUT meets the specified level.

COMMENT: No deviations observed or measured. The EUT met the specified test criterion.

TEST ENGINEER: Allan Wheelen

5.4 Magnetic LF Disturbance

TEST METHOD	Annex A A.5 REFERENCING PROCEDURE: MAG-01

TEST DETAILS

Test severity levels, 50 Hz to 10 kHz spot frequencies **Test method applied as A.5 of EN 55103-2 for use in close proximity to other equipment inc TV monitors**	• **4.0 to 0.4 A/m from 50 to 500Hz** • **0.4 A/m, 500 Hz to 10 kHz** **0.4 A/m, 15.625 kHz** • **Test Method A.5 in test standard at a 5cm probe to EUT distance**
Exerciser program during test	**Referencing section 3.2**
Specified test criterion	**Criterion 'A'**
EUT performed criterion	**Criterion 'A'**

RESULTS

SPOT FREQUENCIES	ILLUMINATED EUT FACES	FIELD LEVEL [dBμA]	STATUS
50 Hz	**TOP, FRONT, SIDES & BASE**	**132**	**PASS**
150 Hz		**123**	**PASS**
350 Hz		**115**	**PASS**
500 Hz		**112**	**PASS**
1.0 kHz		**112**	**PASS**
5.0 kHz		**112**	**PASS**
10.0 kHz		**112**	**PASS**

UNCERTAINTY: The test was performed at a level of 3dBμA above the specification levels to take into account the uncertainties and be able to declare a pass at the specification levels for a 95% confidence level for RACK MOUNTED apparatus

COMMENT: No deviations observed or measured. The EUT met the specified test criterion.

NOTE: 4.0 A/m = 132 dBμA
0.4 A/m = 112 dBμA

TEST ENGINEER: Neil Constance

5.5 Fast Transient Bursts, ac & signal ports

TEST METHOD	EN 61000-4-4 REFERENCING PROCEDURE: FTB-01

TEST DETAILS

Test severity	• **± 0.5 kV Signal Port** • **± 1.0 kV AC Mains Port** **5/50ns Tr/Td 5kHz Repetition Rate**
Exerciser program during test	**Referencing section 3.2**
Specified test criterion	**Criterion 'B'**
EUT performance criterion	**Criterion 'B'**

RESULTS

Injection via Coupling Network

PORT	TEST VOLTAGE	STATUS
AC Power Port	**± 1.0 kV**	**PASS**

Capacitive Coupling

PORT	TEST VOLTAGE	STATUS
HMAC Port	**± 0.5 kV**	**PASS**
SMAC Port	**± 0.5 kV**	**PASS**
Speaker	**± 0.5 kV**	**PASS**

UNCERTAINTY: It has been demonstrated that the transient simulator met the specified requirements in the standard with at least a 95% confidence.

COMMENT: The EUT met the specified test criterion.

TEST ENGINEER: Allan Wheelen

5.6 Surge, ac port

TEST METHOD	EN 61000-4-5 REFERENCING PROCEDURE: SUR-02

TEST DETAILS

Test severity level	• **± 0.5 kV Line to Line** • **± 1.0 kV Line to Earth** **Phase Angles: 0, 90, 180, 270 degrees** **1.2/50us Tr/Td** **60s event intervals**
Exerciser program during test	**Referencing section 3.2**
Specified test criterion	**Criterion 'B'**
EUT performance criterion	**Criterion 'A'**

RESULTS

TEST VOLTAGES	COUPLING MODES	STATUS
± 1.0 kV	**Line to Earth**	**PASS**
± 0.5 kV	**Line to Line**	**PASS**

UNCERTAINTY: It has been demonstrated that the surge simulator met the specified requirements in the standard with at least a 95% confidence.

COMMENT: No performance degradation was observed. The EUT met the specified test criterion.

TEST ENGINEER: Allan Wheelen

5.7 Conducted RF Field, ac & signal ports

TEST METHOD	**EN 61000-4-6** **REFERENCING PROCEDURE: CES-02**

TEST DETAILS

Test severity level	• **3.0 V rms, 150 kHz to 80 MHz** • **400 Hz 80% amplitude modulation** • **1% increment, 3 seconds dwell time**
Exerciser program during test	**Referencing section 3.2**
Specified test criterion	**Criterion 'A'**
EUT performance criterion	**Criterion 'A'**

RESULTS

TEST VOLTAGE	TEST POINTS	COUPLING METHOD	STATUS
3.0V	**AC power port**	**CDN**	**PASS**
3.0V	**HMAC Port**	**EM-Clamp**	**PASS**
3.0V	**SMAC Port**	**EM-Clamp**	**PASS**
3.0V	**Speaker Port**	**EM-Clamp**	**PASS**

UNCERTAINTY: It has been demonstrated that the conducted immunity simulator met the specified requirements in the standard with at least a 95% confidence.

COMMENT: No performance degradation was observed. The EUT met the specified test criterion.

TEST ENGINEER: Allan Wheelen

5.8 Mains Voltage Dips & Interruptions

TEST METHOD	EN 61000-4-11 REFERENCING PROCEDURE: PLD-01

TEST DETAILS	Specified test types & levels (voltage shift @ zero phase crossing)	Specified criteria
	Dips: 30% reduction for ½ cycle	B
	Dips: 60% reduction for 5 cycles	B
	Interruptions: > 95% for 250 cycles	C
Exerciser program during test	Referencing section 3.2	

RESULTS

Applied test types & levels	Test point	Nominal operation frequency / voltage	Performed criteria	Status
30% for ½ cycle	AC power port	50Hz / 230 volts & 60Hz / 100 volts	A	PASS
60% for 5 cycles			A	PASS
100% for 250 cycles			C	PASS

UNCERTAINTY: It has been demonstrated that the power line disturbance simulator met the specified requirements in the standard with at least a 95% confidence.

COMMENT: The EUT met the specified test criteria.

TEST ENGINEER: Allan Wheelen

6.0 PHOTO LOG

Emissions:

Radiated magnetic disturbance

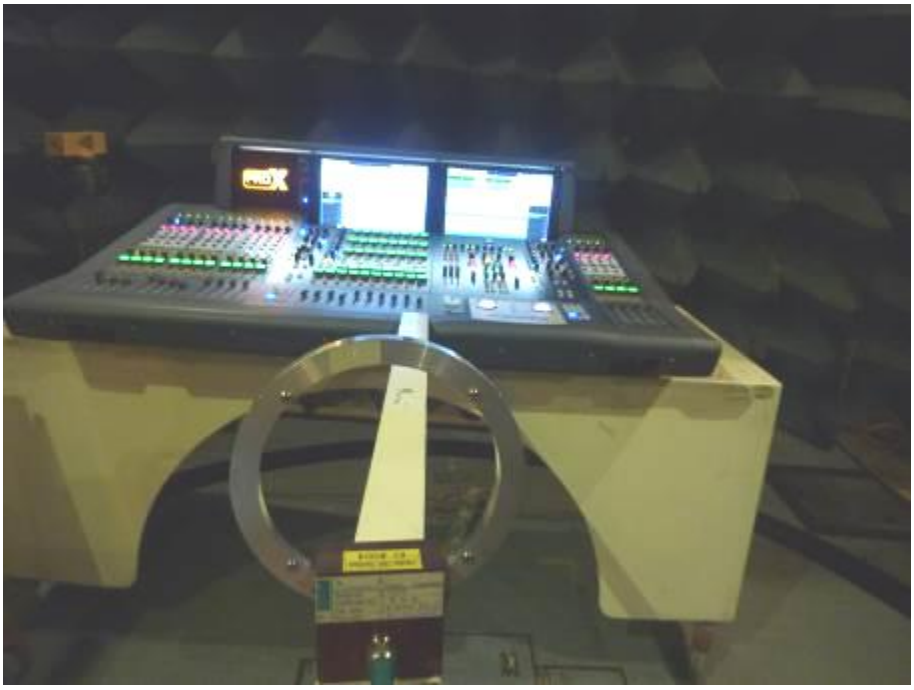


Photo Log (continued)

Emissions:

Radiated disturbance; OATS

Photo Log (continued)

Emissions:

Conducted disturbance

Photo Log (continued)

Emissions:

Conducted disturbance; Ethernet

Photo Log (continued)

Immunity:

Electrostatic discharge (set-up)

Photo Log (continued)

Immunity:

Radiated RF interference

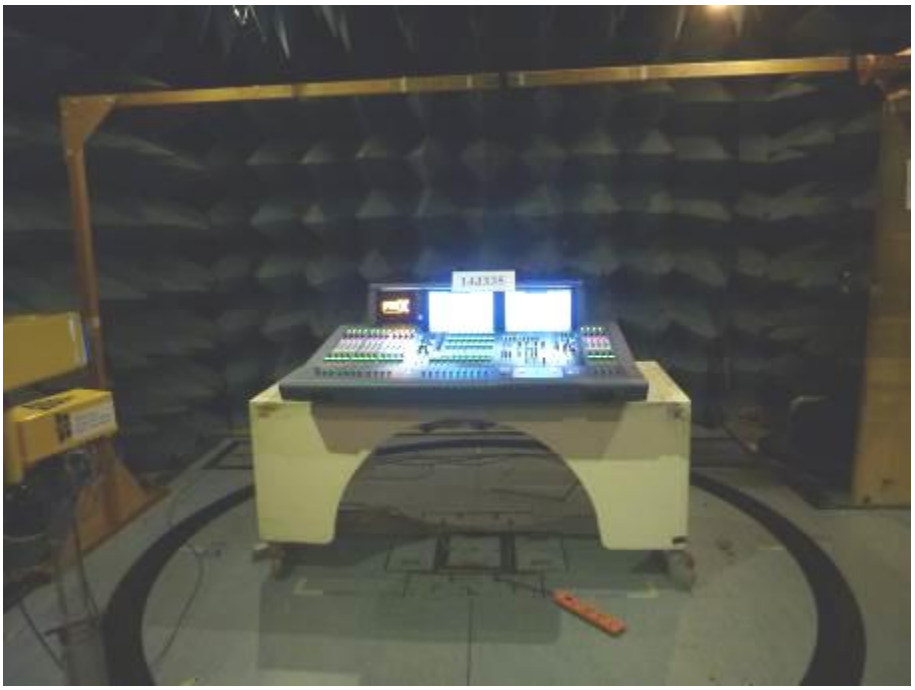


Photo Log (continued)

Immunity:

Fast transient bursts; mains

Photo Log (continued)

Immunity:

Fast transient bursts; Speaker

Fast transient bursts; HMAC

Photo Log (continued)

Immunity:

Fast transient bursts; SMAC

Photo Log (continued)

Immunity:

Surge

Photo Log (continued)

Immunity:

Conducted RF field; mains

Photo Log (continued)

Immunity:

Conducted RF field; Speaker

Conducted RF field; HMAC

Photo Log (continued)

Immunity:

Conducted RF field; SMAC

Photo Log (continued)

Immunity:

Power frequency magnetic field

Photo Log (continued)

Immunity:

PLD

7.0 FCC DETAILS

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

February 13, 2006

Hursley EMC Services Ltd.
Unit 16
Brickfield Lane
Chandlers Ford - Hampshire, SO53 4DB
United Kingdom
Attention: R P St John James

Re: Accreditation of Hursley EMC Services Ltd.
Designation Number: UK0006

Dear Sir or Madam:

We have been notified by Department of Trade and Industry (DTI) that Hursley EMC Services Ltd. has been accredited as a Conformity Assessment Body (CAB).

At this time your organization is hereby designated to perform compliance testing on equipment subject to Declaration Of Conformity (DOC) and Certification under Parts 15 and 18 of the Commission's Rules.

This designation will expire upon expiration of the accreditation or notification of withdrawal of designation.

Sincerely,

Thomas Phillips
Electronics Engineer

End of document