

**Test Report (pdf copy)  
EMC FCC Testing of  
The Ax60 CO2 Monitor  
For  
Analox Sensor Technology  
Ltd**

Document number 11588/TR/1

Project number C1712/1

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Issue	Description	Issue by	Date
1	<b>First Issue</b>	<b>SM</b>	<b>14<sup>th</sup> November 2014</b>

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**This test reports relates only to the unit(s) tested**



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1 ..... **Introduction**

**Name and address of laboratory:** York EMC Services Ltd  
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**Name and address of client:** Analox Sensor Technology Ltd  
 15 Ellerbeck Court  
 Stokesley Business Park  
 STOKESLEY  
 North Yorkshire

The test results contained in this test report relate only to the unit(s) tested.

**Equipment under test** CO2 Monitor

**Manufacturer** Analox Sensor Technology Ltd

**Product name** Ax60 CO2 Monitor

**Model number** Ax60

**PCB numbers** Strobe Sounder: P0159-230-01,  
 Sensor: P0159-220-01, Central Unit: P0159-210-01

**Serial number** Strobe Sounder: AX60RQM, Sensor: AX60S5938,  
 Central Unit: AX60C Test

**No. tested of each item** One

**Customer supplied test plan ref.** None

**Date of receipt of EUT** 4/11/14

**Method of receipt** Brought by the customer

**Date(s) of test(s)** 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, and 10<sup>th</sup> November 2014

**Date(s) when EUT was out of laboratory's control** None

**Method of disposal** Taken by customer

**Personnel witnessing tests** Mr Chris Garbutt

**Any other relevant information:** None

## 2 Test Specification

### 2.1 Environment

The equipment is intended for use in the domestic/commercial environment.

### 2.2 Relevant standards

#### 2.2.1 Emissions

Regulation Test Standard	Basic Standard	Class/limit	Test
CFR47 Part 15B 15.109  &  ANSI C63.4:2009	Radiated emissions ANSI C63.4:2009	B	2&16
CFR47 Part 15B 15.107  &  ANSI C63.4:2009	Conducted emissions ANSI C63.4:2009	B	13

Note 1: The EUT was tested in one mode of operation.

### 3 Test Results

#### 3.1 Conducted emissions (150kHz to 30MHz)

Mode of operation	Description	Mode No.
	120V 60Hz ac powered, normal operating mode, measuring ambient CO2.	1

Test standard	Test description	Class/limit
Conducted emissions ANSI C63.4:2009	Conducted emissions	B

Results	Mode	Figure	Result	Comments
	1	C01	Pass	None

Frequency	Peak	Average	Average Limit	Average Difference	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	LISN
150 kHz	52.7 dBµV	31.5 dBµV	56 dBµV	-24.48 dB	49.9 dBµV	66 dBµV	-16.08 dB	Neutral
250 kHz	42.4 dBµV	36.1 dBµV	51.8 dBµV	-15.61 dB	40.6 dBµV	61.8 dBµV	-21.11 dB	Neutral
375 kHz	39.1 dBµV	34.7 dBµV	48.4 dBµV	-13.65 dB	38.6 dBµV	58.4 dBµV	-19.75 dB	Neutral
440 kHz	42.9 dBµV	20.3 dBµV	47.1 dBµV	-26.72 dB	40.3 dBµV	57.1 dBµV	-16.75 dB	Neutral
685 kHz	32.7 dBµV	11.1 dBµV	46 dBµV	-34.92 dB	29.8 dBµV	56 dBµV	-26.17 dB	Neutral
1.125 MHz	30.1 dBµV	10 dBµV	46 dBµV	-35.98 dB	25.7 dBµV	56 dBµV	-30.34 dB	Neutral
1.74 MHz	30.1 dBµV	15.6 dBµV	46 dBµV	-30.37 dB	26.7 dBµV	56 dBµV	-29.28 dB	Neutral
2.13 MHz	31.6 dBµV	16.9 dBµV	46 dBµV	-29.13 dB	27.1 dBµV	56 dBµV	-28.91 dB	Neutral
2.75 MHz	32.4 dBµV	18.5 dBµV	46 dBµV	-27.52 dB	28.3 dBµV	56 dBµV	-27.7 dB	Neutral
3.205 MHz	34.7 dBµV	20.5 dBµV	46 dBµV	-25.54 dB	30 dBµV	56 dBµV	-25.98 dB	Neutral
3.75 MHz	34 dBµV	20.8 dBµV	46 dBµV	-25.23 dB	30 dBµV	56 dBµV	-26 dB	Neutral
4.19 MHz	36.4 dBµV	22.8 dBµV	46 dBµV	-23.21 dB	31.7 dBµV	56 dBµV	-24.29 dB	Neutral
4.67 MHz	36.3 dBµV	23.2 dBµV	46 dBµV	-22.78 dB	32 dBµV	56 dBµV	-24.05 dB	Neutral
5.19 MHz	38.2 dBµV	25.4 dBµV	50 dBµV	-24.61 dB	34 dBµV	60 dBµV	-26 dB	Neutral
5.515 MHz	38.5 dBµV	23.4 dBµV	50 dBµV	-26.62 dB	33.3 dBµV	60 dBµV	-26.71 dB	Neutral
6.575 MHz	39.1 dBµV	26.7 dBµV	50 dBµV	-23.34 dB	34.8 dBµV	60 dBµV	-25.16 dB	Neutral
7.55 MHz	39.7 dBµV	27.3 dBµV	50 dBµV	-22.66 dB	35 dBµV	60 dBµV	-25.03 dB	Neutral
15.205 MHz	38.4 dBµV	26.5 dBµV	50 dBµV	-23.5 dB	33 dBµV	60 dBµV	-26.96 dB	Neutral
27.58 MHz	41 dBµV	32 dBµV	50 dBµV	-17.99 dB	37 dBµV	60 dBµV	-23.01 dB	Neutral

Note 1: Testing was carried out to the FCC part 15 requirements using the set-ups described in ANSI C63.4

Modifications	Required for this test	Modification state
	None	0

**3.2 Radiated emissions (30MHz to 1000MHz)**

Mode of operation	Description	Mode No.
	120V 60Hz ac powered, normal operating mode, measuring ambient CO2.	1

Test standard	Test description	Class/limit
Radiated emissions ANSI C63.4:2009	Radiated emissions	B

Results	Mode	Figure	Result	Comments
	1	R01	N/A	Chamber measurement.
	1	R02	Pass	OATS

Frequency (MHz)	Polarity (H/V)	Height (m)	Angle (degrees)	Detector Type	Meas distance (m)	Spec distance (m)	E field @ spec distance (dBuV/m)	E field Limit (dBuV/m)	Margin (dB)	Result
30.000	V	1	0	QP	3	3	22.8	40.0	-17.2	Compliant
49.200	V	1	0	QP	3	3	24.8	40.0	-15.2	Compliant
80.340	V	1	0	QP	3	3	22.5	40.0	-17.5	Compliant
149.040	V	1	0	QP	3	3	26.7	42.0	-15.3	Compliant
178.020	V	1	83	QP	3	3	24.5	42.0	-17.5	Compliant
193.020	V	1	116	QP	3	3	27.2	42.0	-14.8	Compliant
211.200	V	1	0	QP	3	3	32.5	42.0	-9.5	Compliant
214.860	V	1	275	QP	3	3	33.9	42.0	-8.1	Compliant
276.720	V	1	256	QP	3	3	30.1	46.0	-15.9	Compliant
382.080	V	1	0	QP	3	3	38.2	46.0	-7.8	Compliant
391.200	V	1	0	QP	3	3	37.8	46.0	-8.2	Compliant
467.400	V	1	0	QP	3	3	34.5	46.0	-11.5	Compliant
600.780	V	1	0	QP	3	3	28.3	46.0	-17.7	Compliant

Note 1: Testing was carried out to the FCC part 15 requirements using the set-ups described in ANSI C63.4

Modifications	Required for this test	Modification state
	None	0

Note 1: The highest frequency generated by the EUT is <30MHz therefore measurements >1GHz are not required.

**4 Summary**

**4.1 Emissions**

<b>Regulation Test Standard</b>	ANSI C63.4:2009
---------------------------------	-----------------

<b>Product Specific Standard</b>	<b>Class/limit</b>	<b>Result</b>
47 CFR Part 15B 15.109  &  ANSI C63.4:2009	Radiated emissions ANSI C63.4:2003 (See Note 1)	Pass (Case A)
47 CFR Part 15B 15.107  &  ANSI C63.4:2009	Conducted emissions ANSI C63.4:2003 (See Note 1)	Pass (Case A)

Note 1: Testing is to be carried out using the set-ups described in ANSI C63.4:2003

## **4.2 Compliance statement**

The Ax60 CO2 Monitor, as tested, was shown to meet the requirements of the standards listed in 4.1 of this report.



## 5 Appendices

### 5.1 Appendix 1 Radiated emission test method (30MHz to 1000MHz)

#### 5.1.1 Test information

<b>Standards</b>	ANSI C63.4:2009
<b>YES Test Method</b>	CEP23
<b>Measurement uncertainty</b>	±5.0dB
<b>Equipment Used</b>	Rohde & Schwarz receiver Bilog antenna Rohde & Schwarz positioning mast and controller EMCO 2m diameter turntable and controller

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

**5.2 Appendix 2 Conducted emission test method (150kHz to 30MHz)**

5.2.1 Test information

<b>Standards</b>	ANSI C63.4:2009
<b>YES Test Method</b>	CEP19
<b>Measurement uncertainty</b>	±3.4dB
<b>Equipment Used</b>	Rohde & Schwarz ESHS10 receiver Rohde & Schwarz ESH3-Z5 LISN Chase 9206 transient limiter

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

### 5.3 Appendix 3 Conducted emission test results

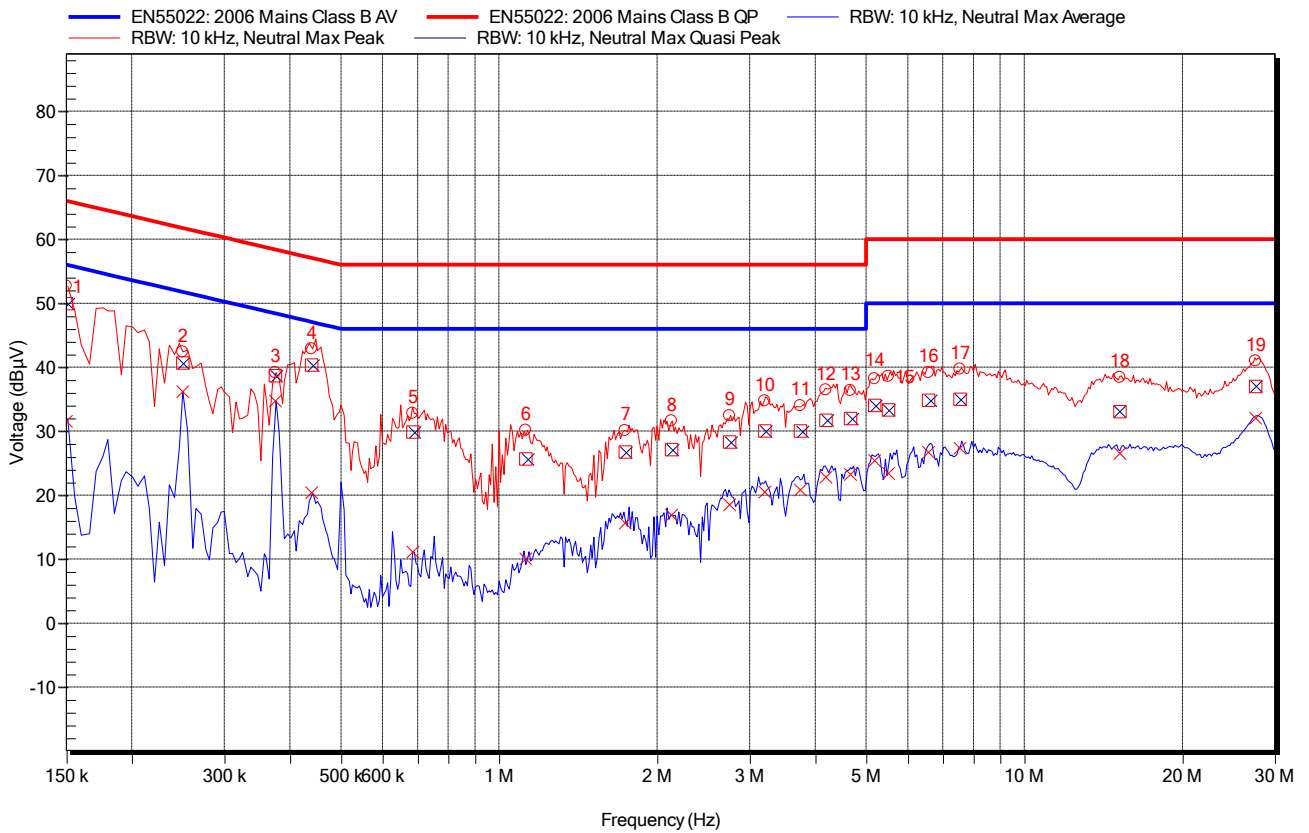


Figure 5.2.1 Conducted emissions results

5.4 Appendix 4 Radiated emission test results

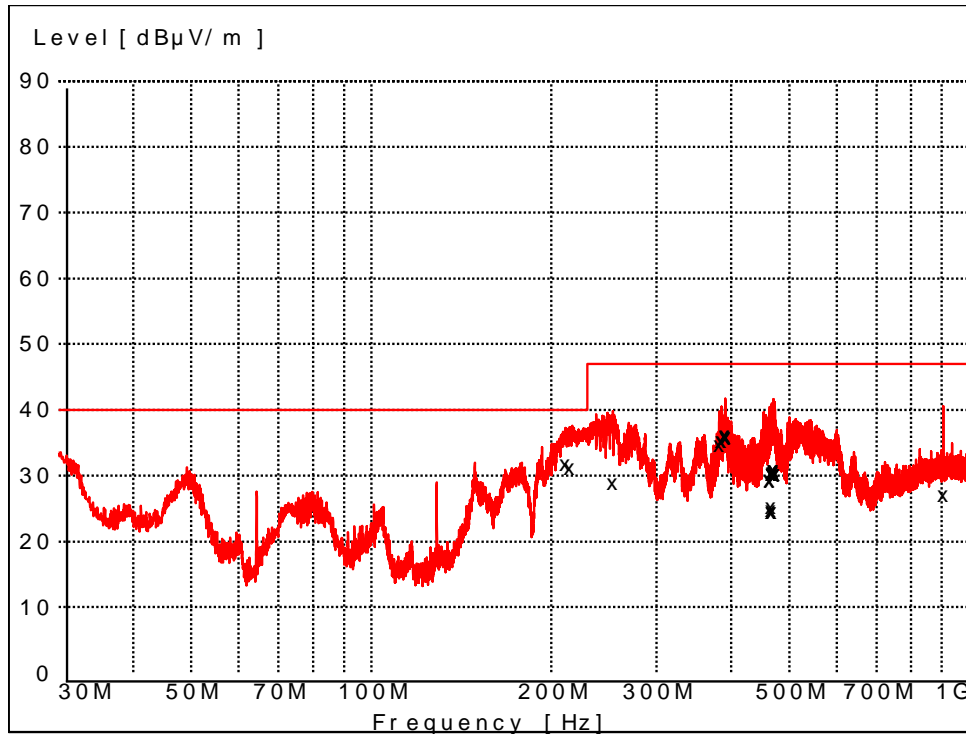


Figure 5.3.1 Radiated emissions results (R01, Chamber)

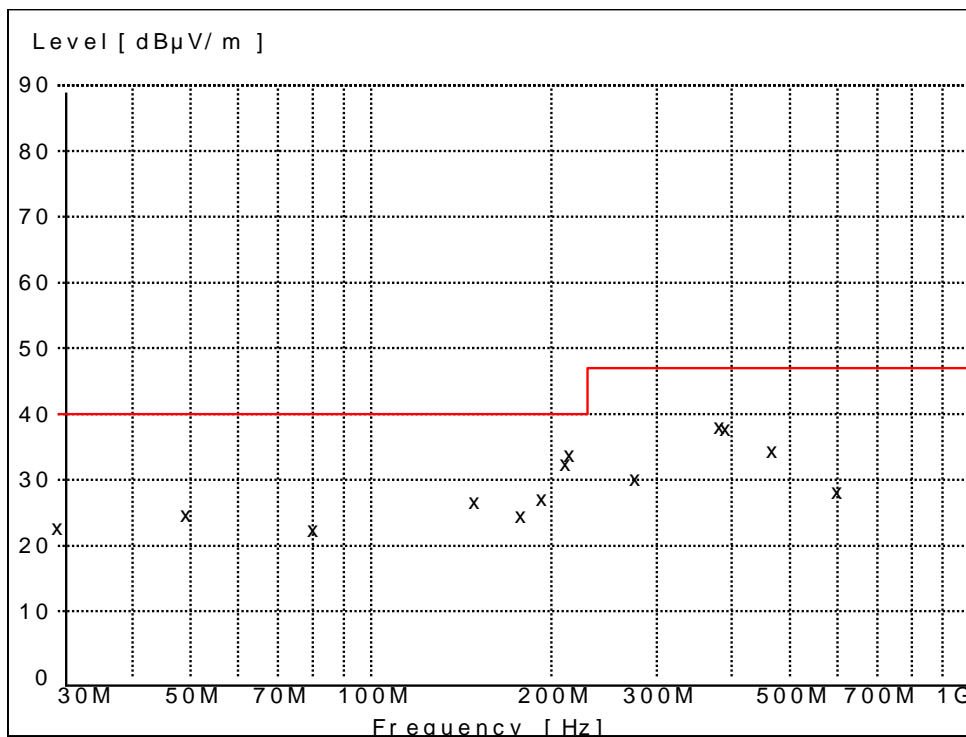
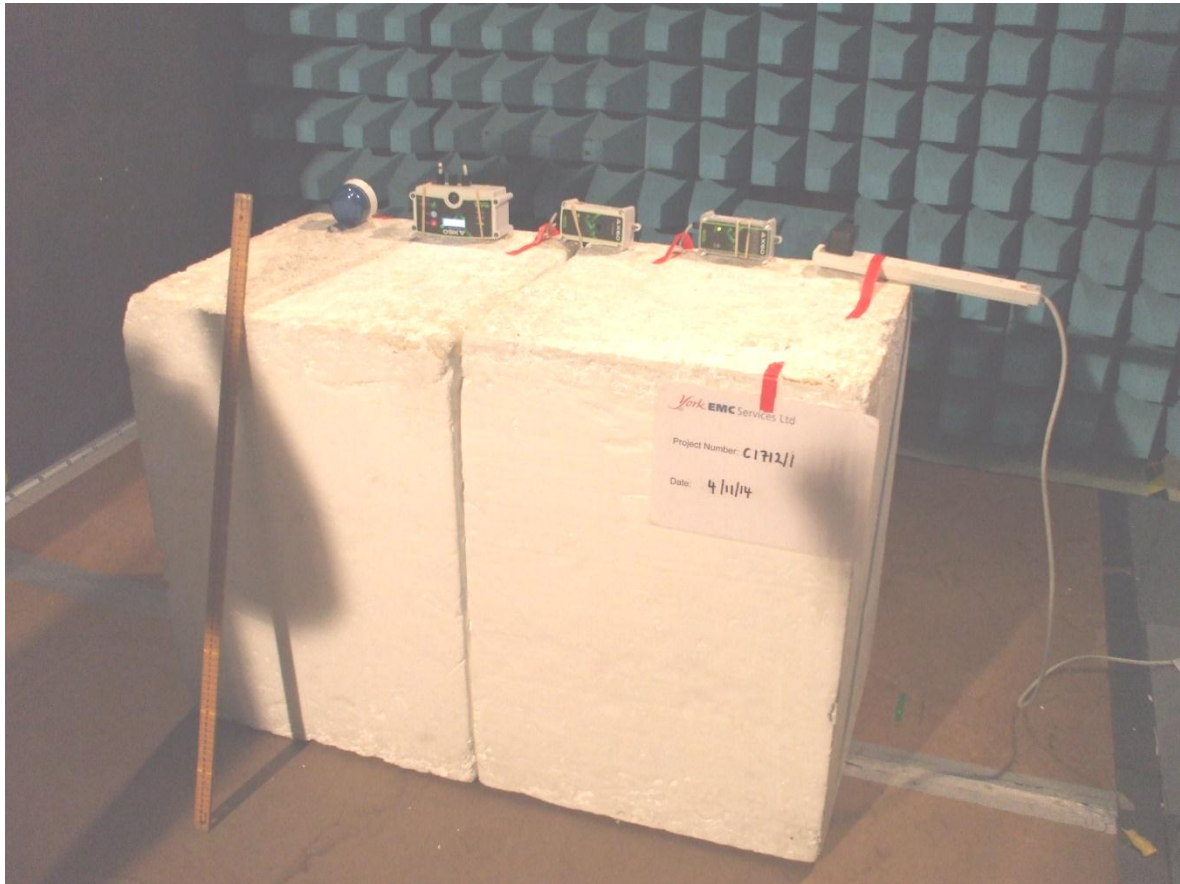


Figure 5.3.2 Radiated emissions results (R02, OATS)

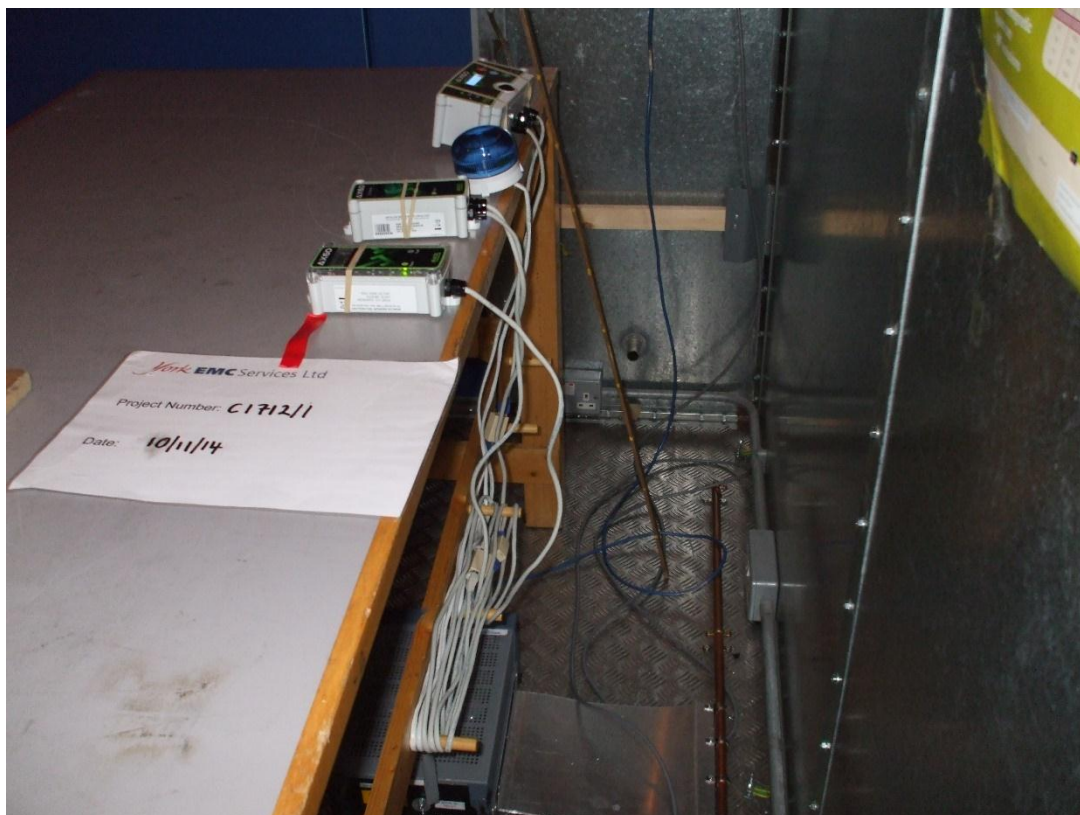
**5.5 Appendix 5 EUT test configurations**



***Photograph 5.4.1 Radiated emissions testing, chamber***

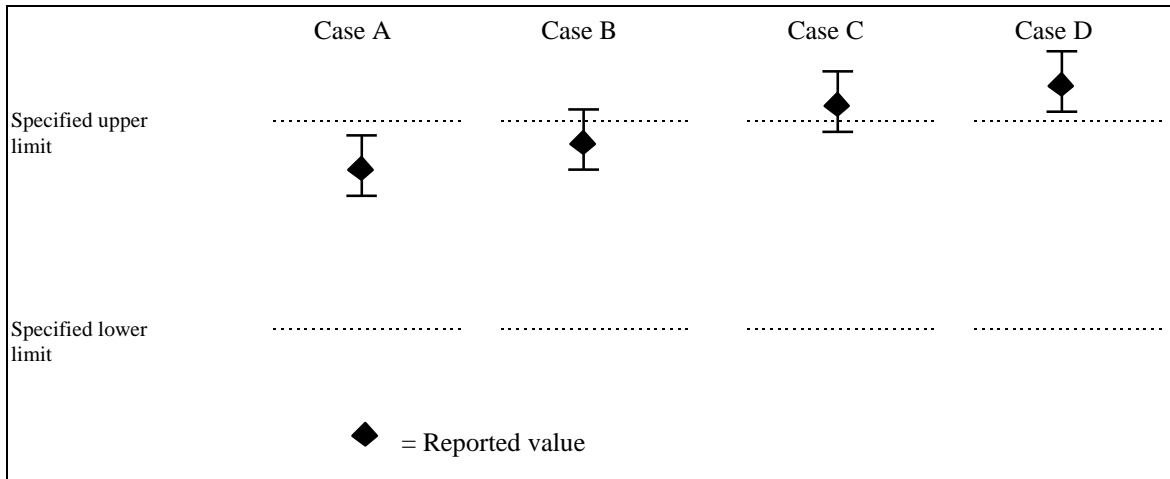


**Photograph 5.4.2 Radiated emissions testing, OATS**



**Photograph 5.4.3 Conducted emissions testing**

**5.6 Appendix 6 Reporting the results**



**Case A**

The equipment complies with the stated specification of the measured points, due allowance having been made for the uncertainty of the measurements. *It may be deemed as a pass.*

**Case B**

The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the stated level of confidence. However the result indicates that compliance is more probable than non-compliance with the specification limit. *It is a likely pass but within the measurement uncertainty.*

**Case C**

The measured result is above the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the stated level of confidence. However the result indicates that non-compliance is more probable than compliance with the specification limit. *It is a likely fail but within the measurement uncertainty.*

**Case D**

The equipment does not comply with the stated specification of the measured points, due allowance having been made for the uncertainty of the measurements. *It may be deemed as a fail.*

5.7 Appendix 7 Equipment used

Equipment	No.	Cal Type	Used	Equipment	No.	Cal Type	Used
AR FM2000 Field Probe Set	78108	UKAS		R&S SMY02 Signal Generator	78653	UKAS	
AR FM2000 Field Probe Set	78211	UKAS		Rolfe Heine 200A 3 Phase LISN	78206	UKAS	
AR50W1000 50W Amplifier	78313	NCS		Rolfe Heine 32A 3 Phase LISN	78205	UKAS	
Blackstar Function Generator	78200	In-house		Schaffner NSG1025 EFT/B Gen	78136	UKAS	
Chase Van Veen Loop	78217	In-house		Schaffner NSG2025 EFT/B Gen	78006	UKAS	
Chase CBL 6111A Bilog Antenna	78167	UKAS	✓	Schaffner NSG2050 + PNW2055	78178	UKAS	
Chase CFL 9206 Transient Limiter	78087	In-house	✓	Schaffner NSG435 ESD Simulator	78008	UKAS	
Chase HLA6120 Loop Antenna	78128	NPL		Schaffner NSG650 + CDN113	78478	UKAS	
Chase MDS21 Absorbing Clamp	78195	UKAS		Schaffner NSG2050 + PNW2056	78458	UKAS	
EMCO 3115 Double Ridged Horn	78347	Manufac		Schaffner Profline	78374	UKAS	
Fischer FCC-801-M1-16 CDN	78240	UKAS		Schaffner voltage probe CVP2200	78596	UKAS	
Fischer FCC-801-M2-25 CDN	78241	UKAS		Schaffner current probe SMZ11	78569	UKAS	
Fischer FCC-801-M2-16 CDN	78400	UKAS		Schaffner T200 ISN	78591	UKAS	
Fischer FCC-801-M3-16 CDN	78044	UKAS		Schaffner T400 ISN	78570	UKAS	
Fischer FCC-801-M3-25 CDN	78242	UKAS		Schaffner Chase CBL6111C	78707	UKAS	✓
Fischer FCC-801-M4-25 CDN	78045	UKAS		Schaffner Chase CBL6112B	78708	Manufac	
Fischer EM clamp	78130	NCS		Schaffner INA 175 surge CDN	78461	In-house	
Fischer FCC-801-T2	78372	UKAS		Schaffner INA 172 surge CDN	78462	In-house	
Fluke 45 Digital Mutimeter	78655	UKAS		Solar 9108-IN Current Probe	78545	UKAS	
Fluke 85 Digital Mutimeter	78375	UKAS		Voltech PM3000A Harmonic Analyser	78342	UKAS	
Gould 475 Digital Oscilloscope	78057	UKAS		Fischer FCC-801-M3-25 CDN	79002	UKAS	
HP Infinium oscilloscope	78654	UKAS		Fischer FCC-801 M1-16 CDN	79001	UKAS	
HP programmable power supply	78657	UKAS		EM Test UCS 500	79059	UKAS	
Instek GFG-8020H	78673	In-house		Fischer FCC-801-M1-16 CDN			
ISO-TECH ICA32N current transducer	78677	NCS		Fisher FCC-801-M3-25 CDN	79001	UKAS	
ISO-TECH 9053 LCR meter	78487	NCS		Keytek AC line qualifier	79002	UKAS	
Keytek EMC Pro	78348	UKAS		Spitzenberger & Spies power source	78131	NCS	
Keytek MZ-15/EC ESD Simulator	78133	UKAS		6dB attenuator	79073	In-house	
LEM HEME LH2015 true RMS meter	78483	NCS		6dB attenuator	79074	In-house	
Marconi 2390	78349	UKAS		Magnetic immunity loop (single)	78475	In-house	
R&S ESH3-Z5 LISN	78037	UKAS	✓	Magnetic immunity loop (multi)	78722	In-house	
R&S ESH3-Z5 LISN	78119	UKAS		Wandel & Golterman EFA-2	78551	Manufac	
R&S ESHS 10 Receiver	78035	UKAS	✓	Schaffner EFT/B clamp	78690	In-house	
R&S ESHS10 Receiver	79182	UKAS		CDN 118	78460	In-house	
R&S ESVS 30 Receiver	78107	UKAS	✓	Minizap ESD generator	78133	UKAS	
R&S ESVS10 Receiver	78036	UKAS		Fisher clamp	78043	NCS	
UCS 500	79054	UKAS		AR25A250A Amplifier	79000	NCS	

Unit 5 immunity rack	Used	Equipment	No.	Cal Type
		R&S SMX Signal Generator	78117	UKAS
		AR150W220A 150W Amplifier	78308	NCS
		Schaffner CBA9443 amplifier	78682	In-house
		R&S NRVD Power Meter	78314	UKAS
		AR DC2600 Directional Coupler	78311	In-house
		AR DC6080 Directional Coupler	78312	In-house
		R&S URV5-Z2 10V Insertion Unit (9)	78040	UKAS
		R&S URV5-Z4 100V Insertion Unit	78041	UKAS
		Chase CBL 6140 X-Wing Antenna	78309	In-house

NCS - Not on calibration schedule



**5.8 Appendix 8 Customers test equipment used**

<b>Equipment</b>	<b>Serial number</b>	<b>Cal status</b>
NA	N/A	N/A

**5.9 Appendix 9 Modification States**

<b>Modification state</b>	<b>Modification</b>
0	As supplied by the customer.

**5.10 Appendix 10 Test Report History**

<b>Issue</b>	<b>Modification details</b>
1	Original issue of the test report