TRaC Wireless Test Report : TTR003356WUS1

Applicant : Widex A/S

Apparatus : Proglink

Specification(s) : CFR47 Part 15 October 2008

Purpose of Test : Certification

FCCID : TTY- PROGL

IC ID : 5676B-PROGL

Authorised by : 

:Radio Product Manager

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Section 1: Introduction

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 :

Widex A/S
Nymoellevej 6
DK-3540 Lynge
Denmark

1.3 Manufacturer

Widex A/S
Nymoellevej 6
DK-3540 Lynge
Denmark

1.4 Apparatus Assessed

The following apparatus was assessed between: 26/01/11 and 28/01/11

Proglink

The above equipment was an accessory to be used in conjunction with the Widex range of hearing aids. The Proglink contains radio circuitry operating at 10.6 MHz.

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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
Spurious Emissions Radiated >1000MHz	Title 47 of the CFR: Part 15 Subpart (c)	ANSI C63.10	N/A
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	ANSI C63.10	Pass
Intentional Emission Field Strength:	Title 47 of the CFR: Part 15 Subpart (c) 15. 209	ANSI C63.10	Pass
Intentional Emission Band Occupancy	Title 47 of the CFR: Part 15 Subpart (c) 15.215	ANSI C63.10	Pass
Intentional Emission ERP (mW)	Title 47 of the CFR: Part 15 Subpart (c)	ANSI C63.10	N/A
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	-	-
Restricted Bands	Title 47 of the CFR: Part 15 Subpart (c) 15.205	-	-
Maximum Frequency Of Search	Title 47 of the CFR: Part 15 Subpart (c) 15.33	-	-
Extrapolation Factor	Title 47 of the CFR: Part 15 Subpart (c) 15.31(f)	-	-

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 %
Barometric Pressure	: 86 to 106 kPa

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.

Section 2: Measurement Uncertainty

2.1 Measurement Uncertainty Values

For test data recorded in accordance with this standard the following measurement uncertainty was calculated:

Radiated Electric Field Emissions

Quantity Range	Quantity	Expanded Uncertainty
9kHz to 150 kHz	Amplitude dB(µV/m)	±1.6dB
150 kHz to 30 MHz	Amplitude dB(µV/m)	±2.1dB
30MHz to 300MHz Horizontal	Amplitude dB(µV/m)	±5.1dB
30MHz to 300MHz Vertical	Amplitude dB(µV/m)	±5.2dB
300MHz to 1GHz Horizontal	Amplitude dB(µV/m)	±5.4dB
300MHz to 1GHz Vertical	Amplitude dB(µV/m)	±5.2dB
1GHz to 18GHz Horizontal	Amplitude dB(µV/m)	±4.4dB
1GHz to 18GHz Vertical	Amplitude dB(µV/m)	±4.4dB
18GHz to 26.5GHz Horizontal	Amplitude dB(µV/m)	±4.2dB
18GHz to 26.5GHz Vertical	Amplitude dB(µV/m)	±4.2dB
26.5GHz to 40GHz Horizontal	Amplitude dB(µV/m)	±4.3dB
26.5GHz to 40GHz Vertical	Amplitude dB(µV/m)	±4.3dB

ac Power Line Conducted Emissions

Quantity Range	Quantity	Expanded Uncertainty
9kHz to 150kHz	Amplitude dB(µV)	±3.9dB
150kHz to 30MHz	Amplitude dB(µV)	±3.6dB

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

A1 Transmitter Intentional Emission Radiated

Carrier power was verified with the EUT transmitting Test Details:	
Regulation	Title 47 of the CFR 47 Part15 Subpart (c) 15.209(b)(1)
Measurement standard	ANSI C63.10:2009
EUT sample number	S06
Modification state	0
SE in test environment	S05 and S09
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 1

FREQ. (MHz)	MEASUREMENT DISTANCE Meters	MEASUREMENT Rx. READING (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)
10.816	3	48.0	40	2.5
Limit value @ fc		**30 µV/m**		
Band occupancy @ -20 dBc		f lower	f higher	
		10.269 MHz	10.951 MHz	
		682 kHz		

Notes:
1 Results quoted are extrapolated as indicated
2 Receiver detector @ fc = Quasi Peak 10 kHz
3 When battery powered the EUT was powered with new batteries
4 Extrapolation 3 - 30 Meters 40 dB as per 15.31(f)

Test Method:
1 As per Radio – Noise Emissions, ANSI C63.10
2 Measuring distances 3m
3 EUT 0.8 metre above ground plane
4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes.
Maximum results recorded

A2 Radiated Electric Field Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. 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 : [X]

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

Test Details:	
Regulation	Title 47 of the CFR47 Part 15 Subpart (c) Clause 15.209
Measurement standard	ANSI C63.10:2009
Frequency range	9kHz – 1000MHz
EUT sample number	S06
Modification state	0
SE in test environment	S05 and S09
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photographs 1 to 4

The worst case radiated emission measurements for spurious emissions and harmonics that fall within the restricted bands are listed below:

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.	2.001	26.4	0.1	18.9	0.0	45.4	40	1.9	30

All other emissions were at least 20 dB below the test limit

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 Part 15:2008 Clause 15.33(a) and 15.33(a)(1).

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

Frequency of emission (MHz)	Field strength µV/m	Measurement Distance m	Field strength dBµV/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:

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

(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

A3 Unintentional Radiated Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric filed emission test applies to all spurious emissions on directly related to the transmitter. The maximum permitted field strength is listed in Section 15.109. The EUT was set to operate in a transmit standby / receive mode.

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.

Test Details:	
Regulation	Title 47 of the CFR47Part 15 Subpart (c) Clause 15.109
Measurement standard	ANSI C63.10:2009
Frequency range	9kHz – 1000MHz
EUT sample number	S06
Modification state	0
SE in test environment	S05 and S08
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photographs 1 and 2

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

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	No Significant Emissions Within 20 dB of the limit								

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 Part 15:2008 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 47 CFR Part 15: Clause 15.109 for all emissions:

Frequency of emission (MHz)	Field strength µV/m	Measurement Distance m	Field strength dBµV/m
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:

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

(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

A4 ac Power Line Conducted Emissions

Preview ac power line port 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) below.
Where applicable formal measurements of the emissions were performed with a peak, average and/or quasi peak detector. The formal measurements are detailed below:

Test Details Transmit Mode	
Regulation	Title 47 of the CFR47 Part 15 Subpart (b) 15.207
Measurement standard	ANSI C63.10:2009
Frequency range	150kHz to 30MHz
EUT sample number	S06
Modification state	0
SE in test environment	S05 and S09
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs	Photograph 5

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

Results measured using the average detector compared to the average limit

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.672	Live	34.5	46.0	-11.5	Pass
2	0.862	Live	32.1	46.0	-13.9	Pass
3	1.187	Live	25.0	46.0	-21.0	Pass
4	10.393	Live	36.9	50.0	-13.1	Pass
5	10.817	Live	37.3	50.0	-12.7	Pass
6	15.190	Live	31.2	50.0	-18.8	Pass
7	0.672	Neutral	31.5	46.0	-14.5	Pass
8	0.862	Neutral	31.3	46.0	-14.7	Pass
9	1.187	Neutral	23.4	46.0	-22.6	Pass
10	10.393	Neutral	36.2	50.0	-13.8	Pass
11	10.817	Neutral	36.7	50.0	-13.3	Pass
12	15.190	Neutral	31.1	50.0	-18.9	Pass

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)	Result Summary
1	0.672	Live	44.0	56.0	-12.0	Pass
2	0.862	Live	41.6	56.0	-14.4	Pass
3	1.187	Live	38.4	56.0	-17.6	Pass
4	10.393	Live	42.3	60.0	-17.7	Pass
5	10.817	Live	43.0	60.0	-17.0	Pass
6	15.190	Live	37.4	60.0	-22.6	Pass
7	0.672	Neutral	38.5	56.0	-17.5	Pass
8	0.862	Neutral	39.8	56.0	-16.2	Pass
9	1.187	Neutral	36.2	56.0	-19.8	Pass
10	10.393	Neutral	42.7	60.0	-17.3	Pass
11	10.817	Neutral	43.4	60.0	-16.6	Pass
12	15.190	Neutral	38.8	60.0	-21.2	Pass

Test Details Receive Mode	
Regulation	Title 47 of the CFR47 Part 15 Subpart (b) 15.107
Measurement standard	ANSI C63.10:2009
Frequency range	150kHz to 30MHz
EUT sample number	S06
Modification state	0
SE in test environment	S05 and S09
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs	Photograph 5

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

Results measured using the average detector compared to the average limit

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.672	Live	12.3	46.0	-33.7	Pass
2	0.862	Live	5.5	46.0	-40.5	Pass
3	1.187	Live	4.8	46.0	-41.2	Pass
4	10.393	Live	6.9	50.0	-43.1	Pass
5	10.817	Live	10.7	50.0	-39.3	Pass
6	15.190	Live	16.0	50.0	-34.0	Pass
7	0.672	Neutral	10.0	46.0	-36.0	Pass
8	0.862	Neutral	4.4	46.0	-41.6	Pass
9	1.187	Neutral	5.2	46.0	-40.8	Pass
10	10.393	Neutral	7.3	50.0	-42.7	Pass
11	10.817	Neutral	10.4	50.0	-39.6	Pass
12	15.190	Neutral	16.0	50.0	-34.0	Pass

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)	Result Summary
1	0.672	Live	19.5	56.0	-36.5	Pass
2	0.862	Live	15.1	56.0	-40.9	Pass
3	1.187	Live	14.7	56.0	-41.3	Pass
4	10.393	Live	13.4	60.0	-46.6	Pass
5	10.817	Live	17.6	60.0	-42.4	Pass
6	15.190	Live	21.3	60.0	-38.7	Pass
7	0.672	Neutral	15.3	56.0	-40.7	Pass
8	0.862	Neutral	14.1	56.0	-41.9	Pass
9	1.187	Neutral	14.3	56.0	-41.7	Pass
10	10.393	Neutral	15.9	60.0	-44.1	Pass
11	10.817	Neutral	17.4	60.0	-42.6	Pass
12	15.190	Neutral	22.1	60.0	-37.9	Pass

Specification limits :

ac power port conducted emission limits (CFR 47Part15 :2008 Clauses 15.107 and 207):

Frequency range MHz	Limits dBμV	
	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46
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 1)	See 2)	See 3)	See 4)
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		✓		
1) Parameter defined by standard and / or single possible. 2) Parameter defined by client and / or single possible. 3) Parameter had a negligible effect on emission levels. 4) Worst case determined by initial measurement.				

Appendix B: Supporting Graphical Data

This appendix contains graphical data obtained during testing.

Notes:

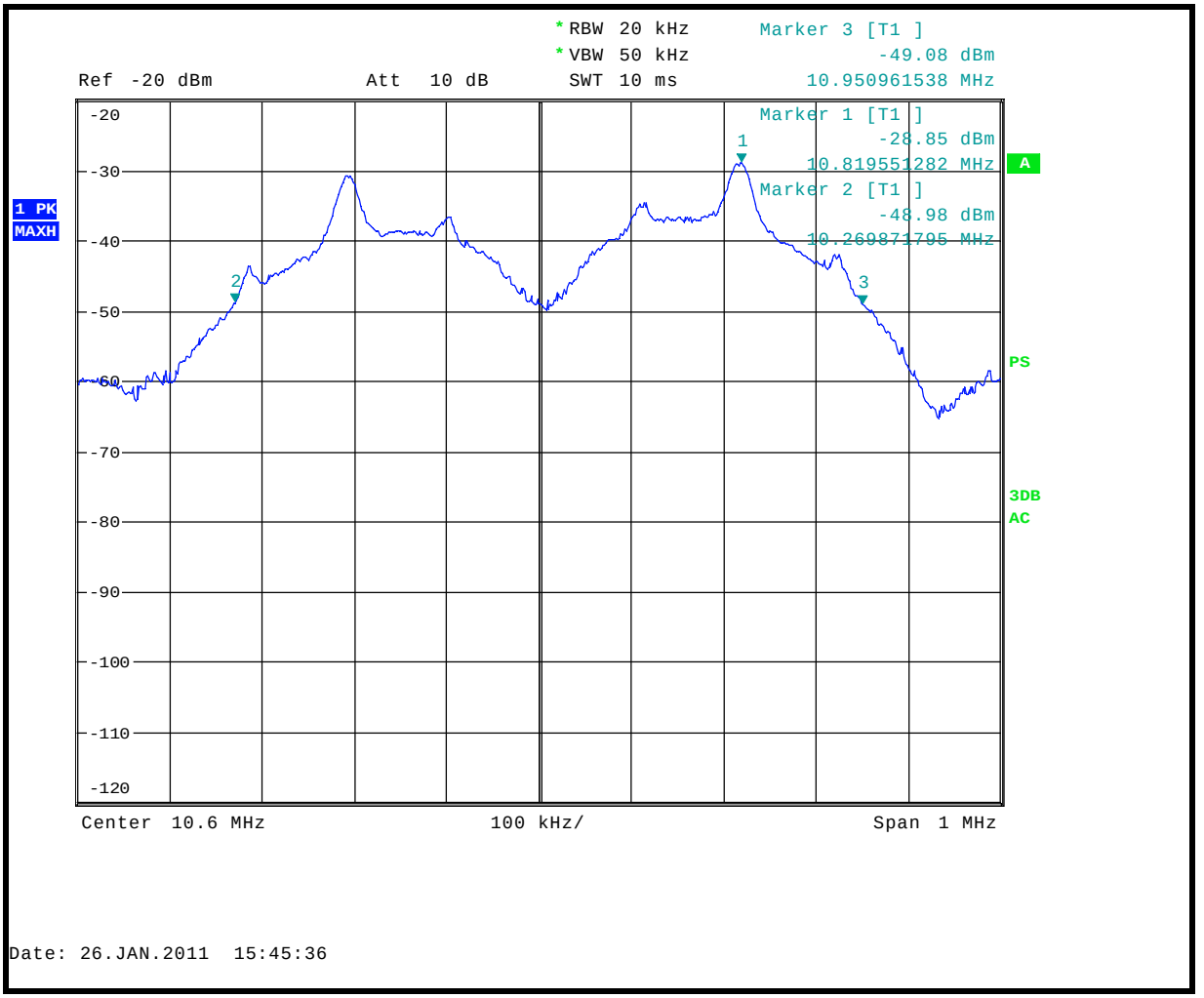
(a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.

(b) The time and date on the plots do not necessarily equate to the time of the test.

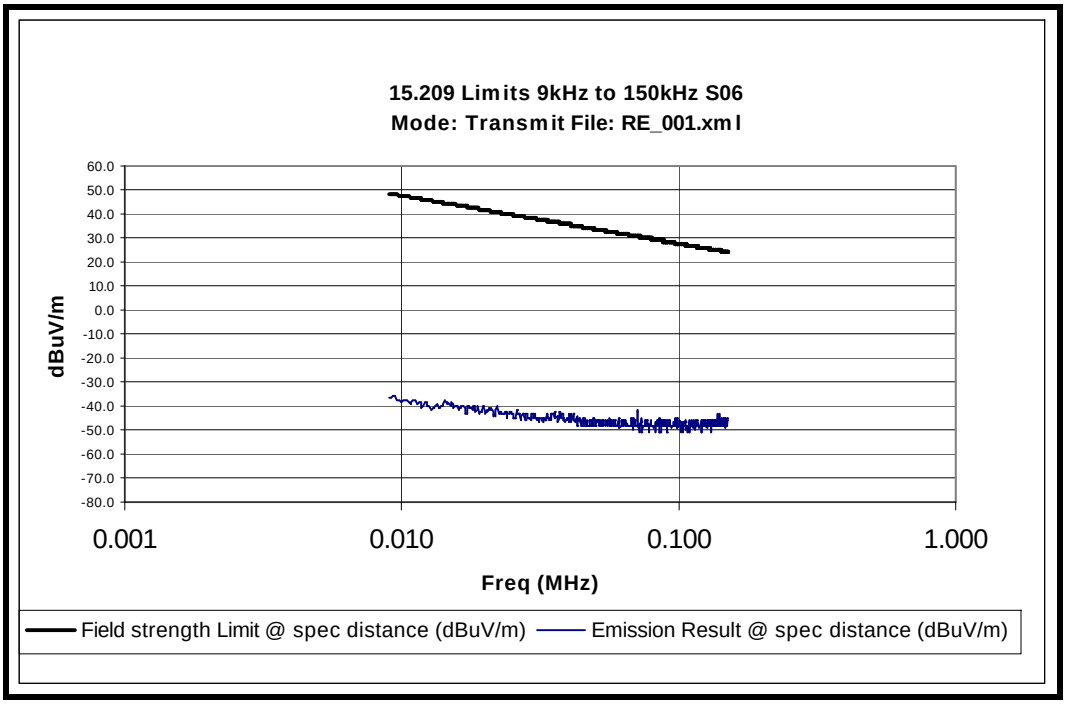
(c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.

(d) Appendix C details the numbering system used to identify the sample and its modification state.

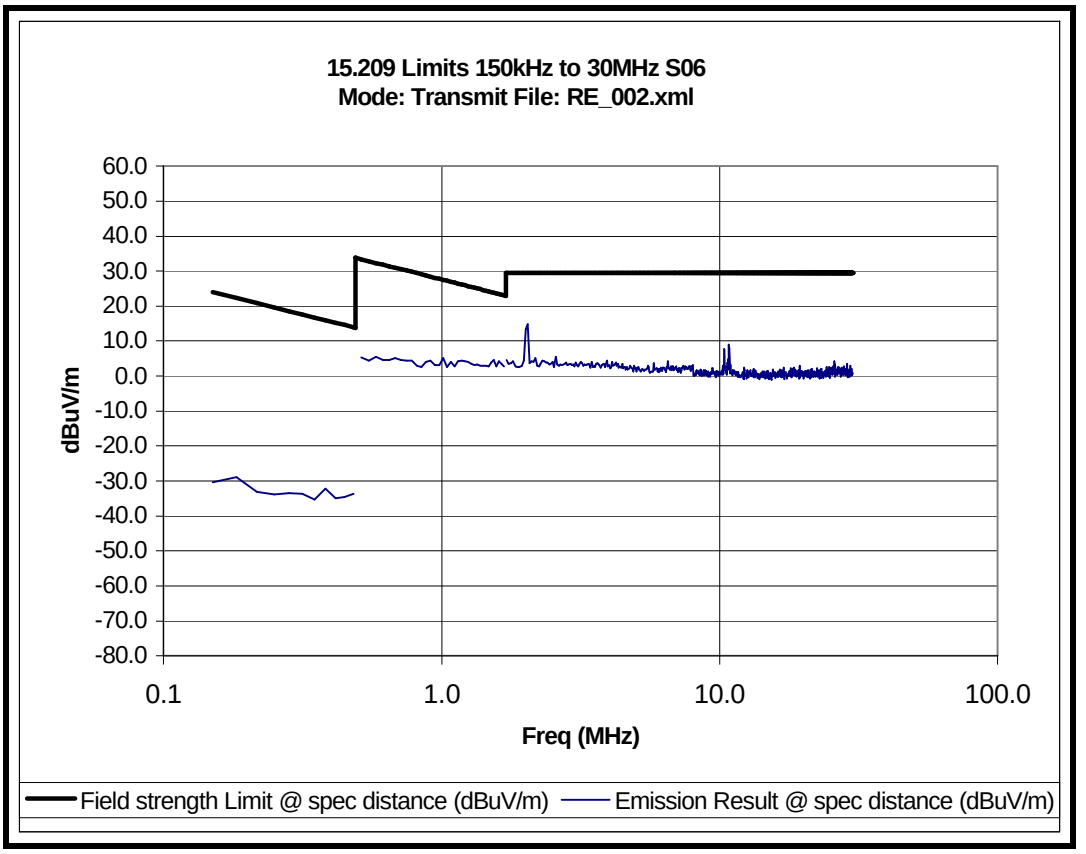
(e) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.



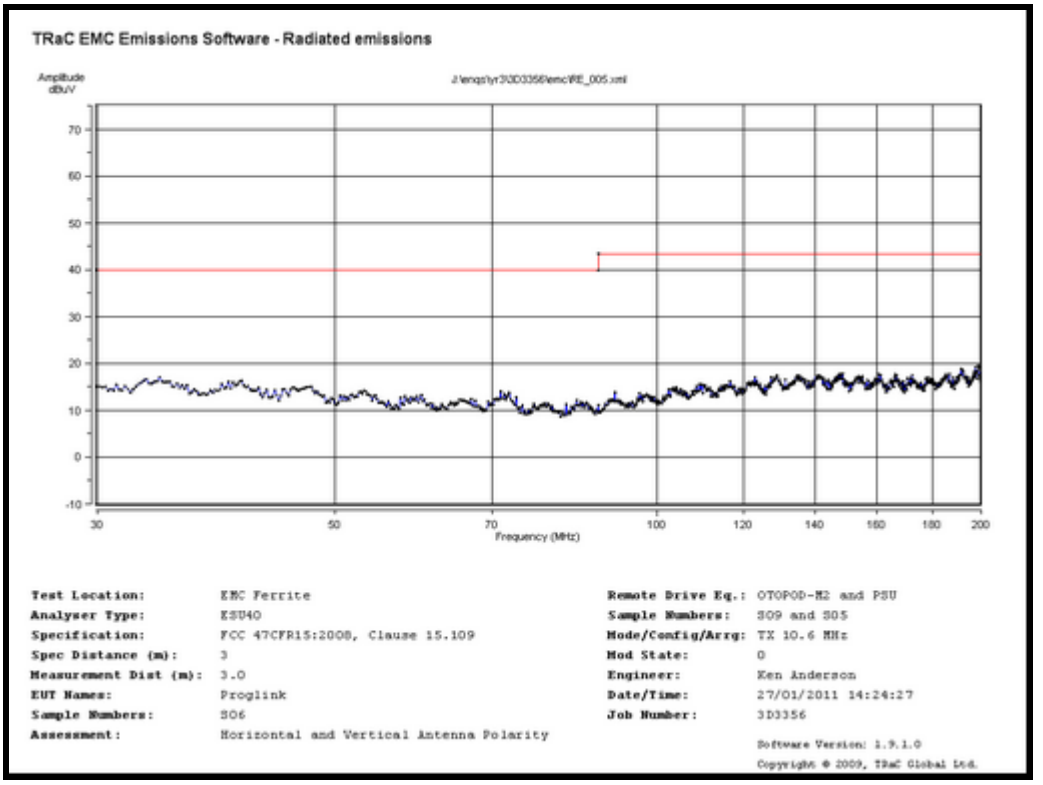
20dB Bandwidth



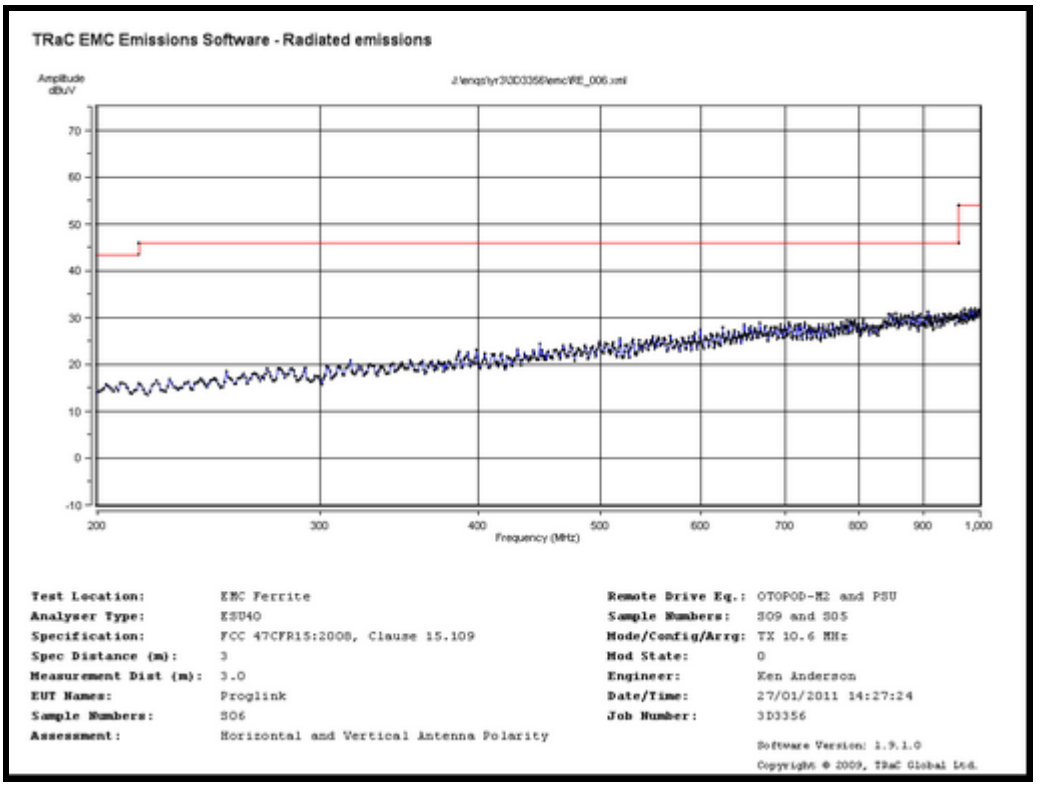
Radiated spurious emissions 9kHz to 150kHz



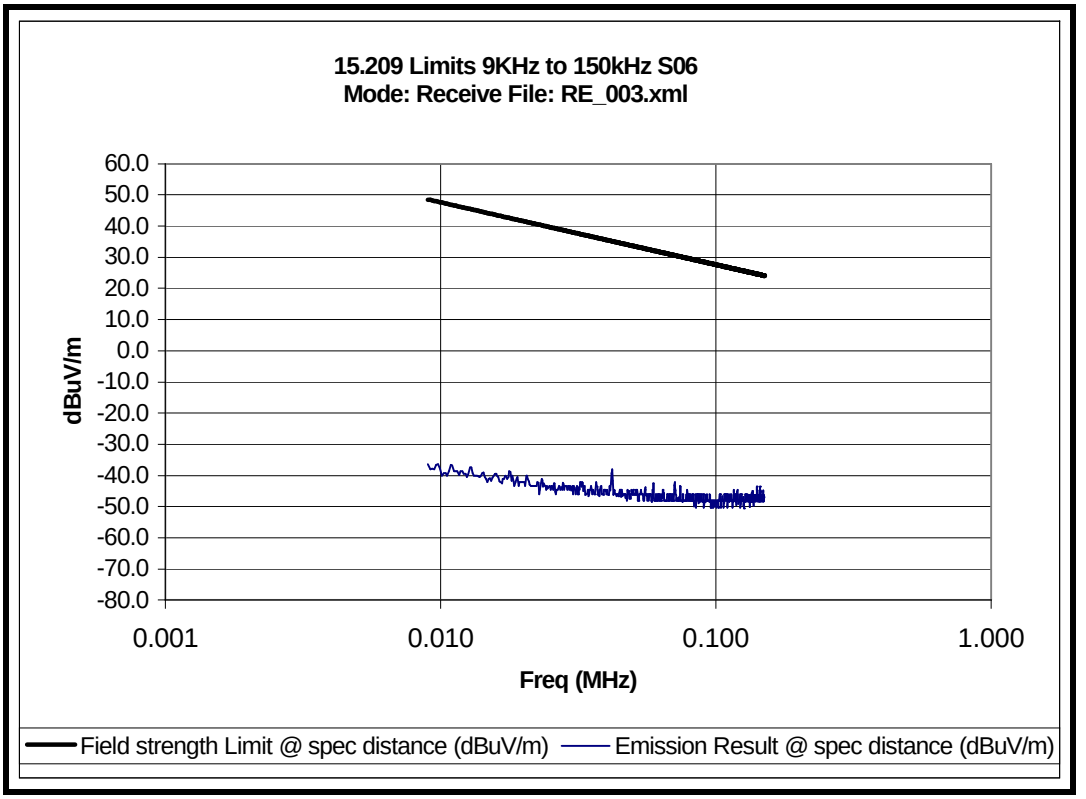
Radiated spurious emissions 150kHz to 30MHz



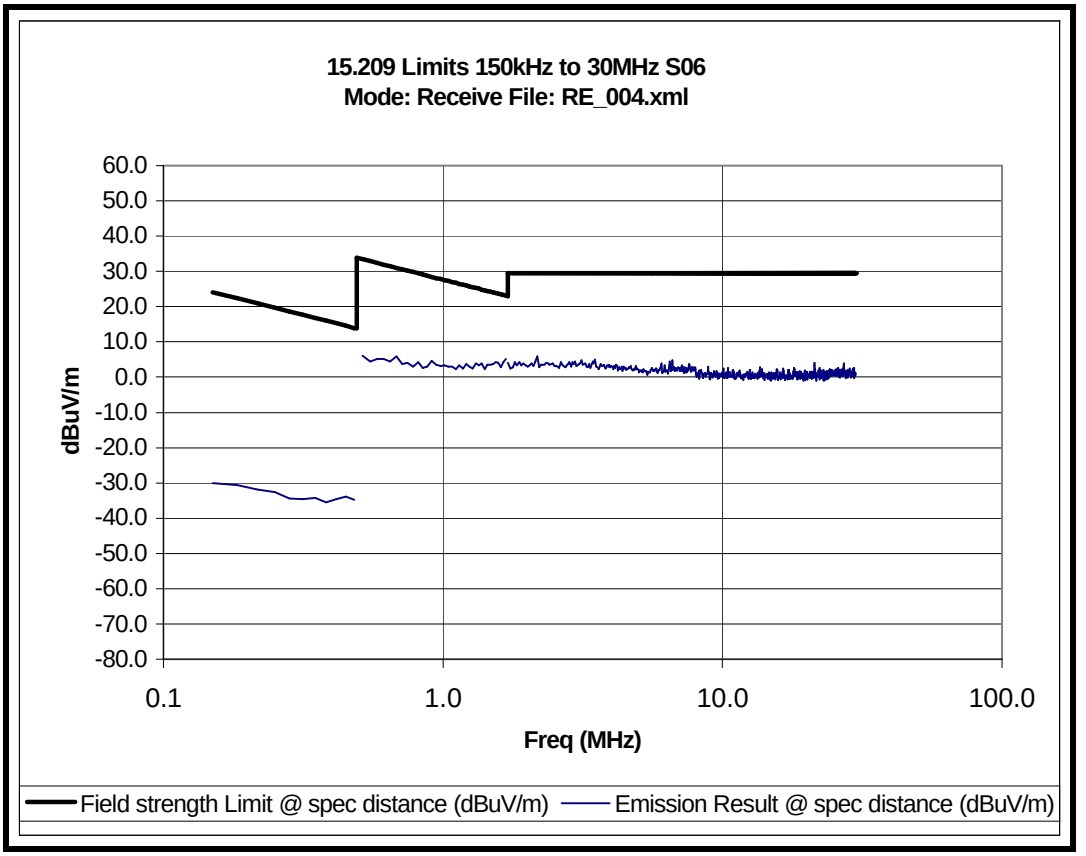
Radiated spurious emissions 30MHz to 200MHz



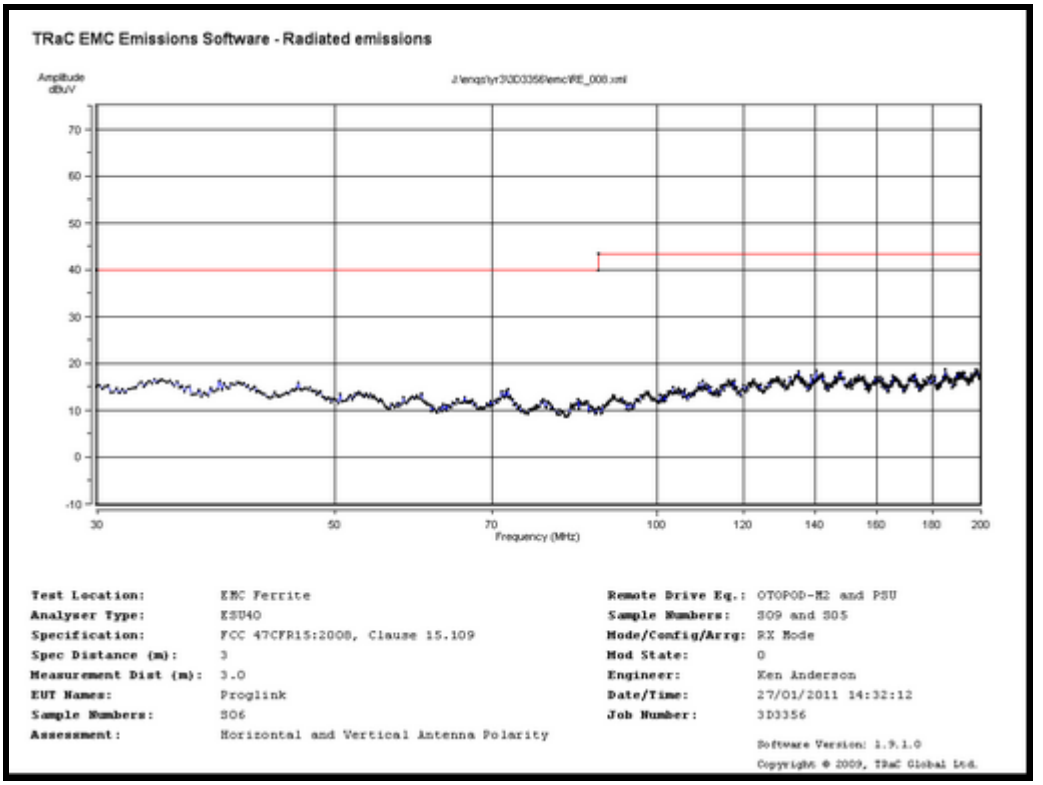
Radiated spurious emissions 200MHz to 1GHz



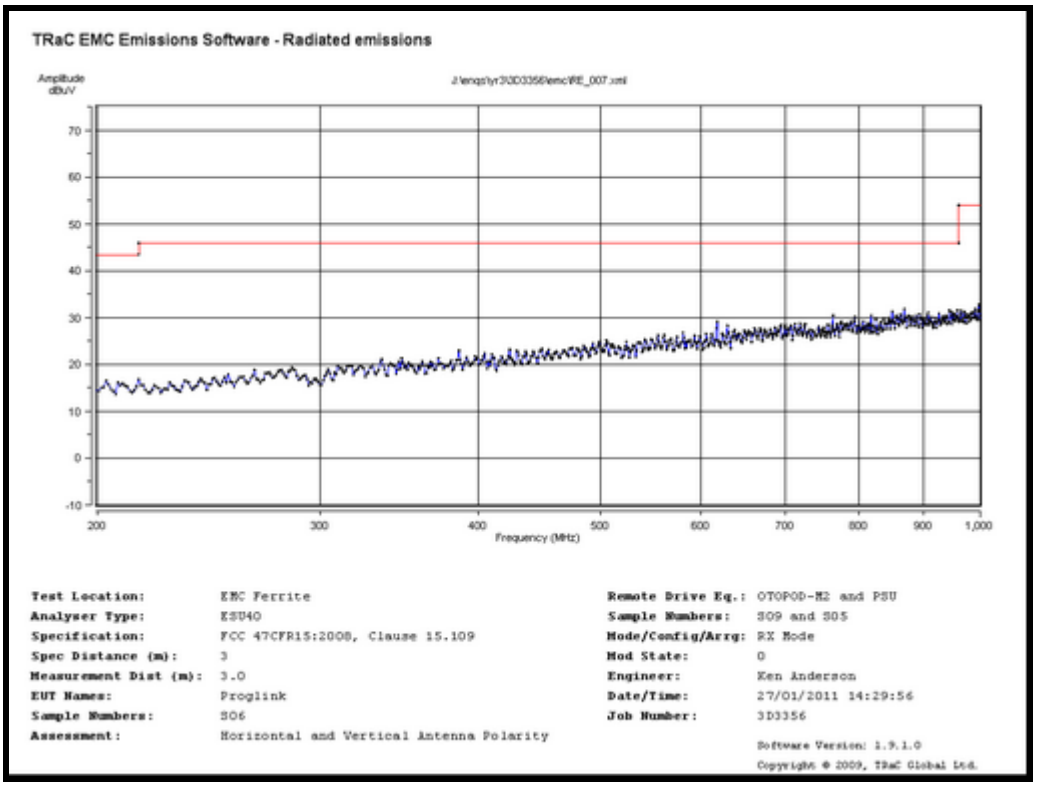
Unintentional Radiated spurious emissions 9kHz to 150kHz



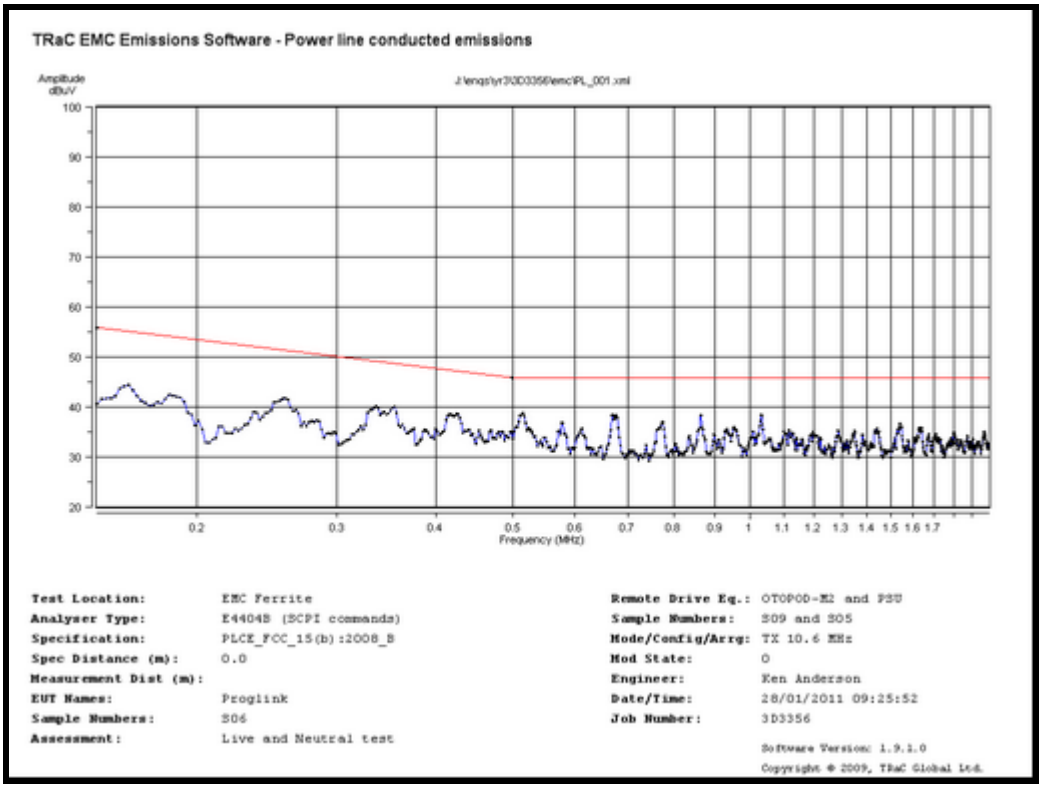
Unintentional Radiated spurious emissions 150kHz to 30MHz



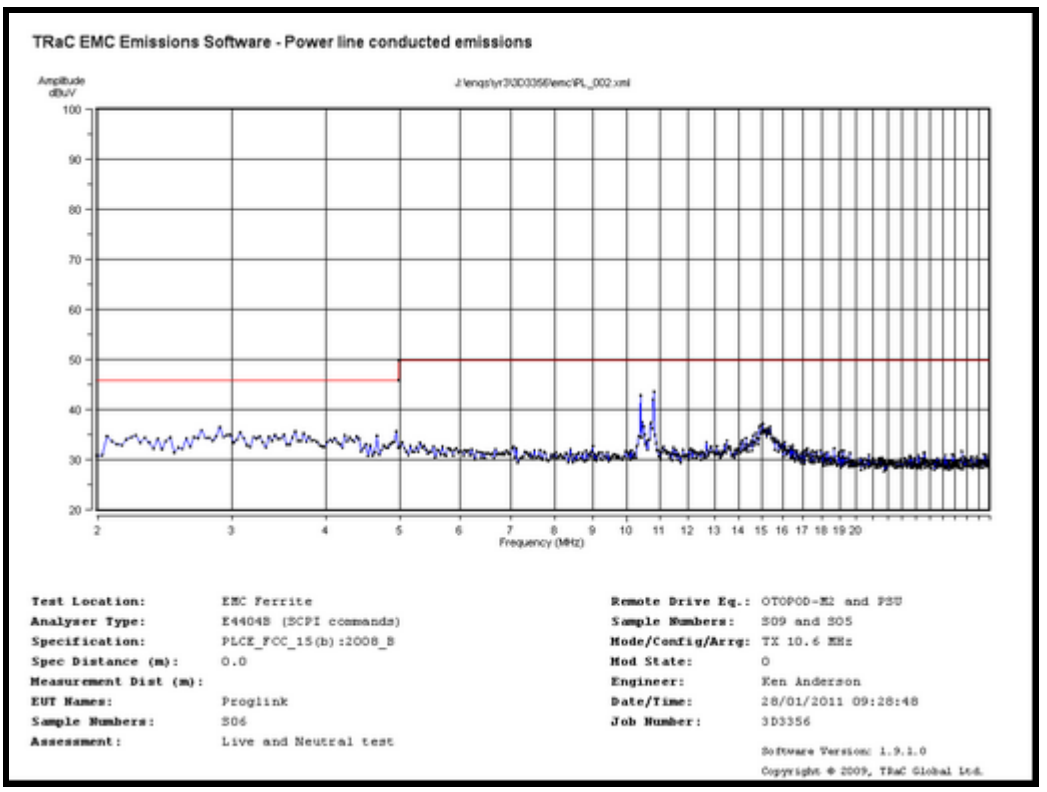
Unintentional Radiated spurious emissions 30MHz to 200MHz



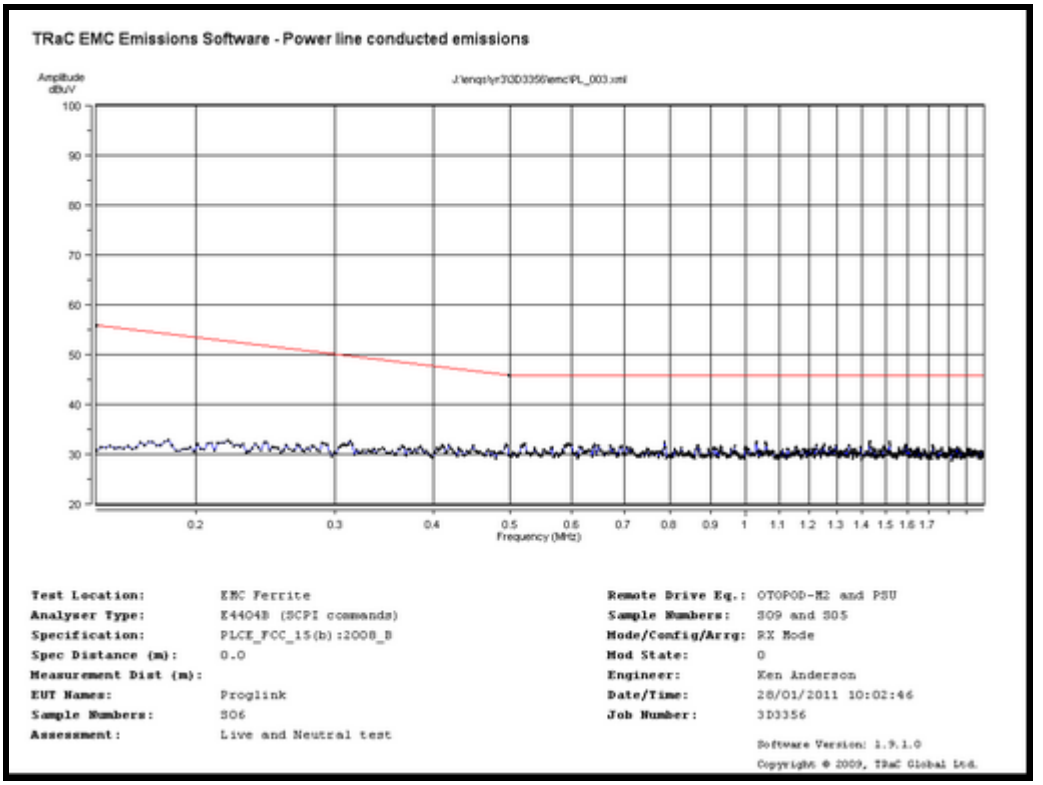
Unintentional Radiated spurious emissions 200MHz to 1GHz



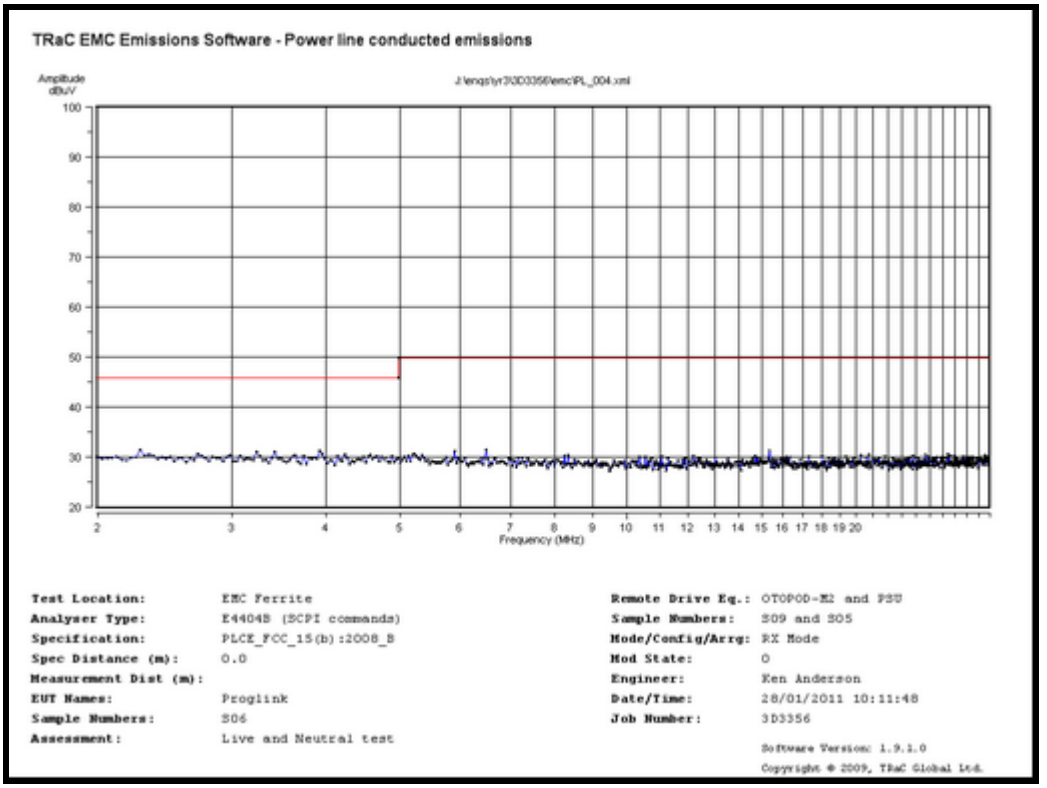
ac Power Line Emissions – Transmit Mode



ac Power Line Emissions – Transmit Mode



ac Power Line Emissions – Receive Mode



ac Power Line Emissions – Receive Mode

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
S06	Proglink (Constant transmit sample)	None

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

Sample No.	Description	Identification
S05	Charger/PSU (for S09)	None
S08	OTONet	Serial No. OTON-0906-0457
S09	OTOPOD-M2	Serial No.OPOD-1003-0053

The following samples of apparatus were supplied by TRaC Telecoms & Radio as support or drive equipment (auxiliary equipment):

Identification	Description
NONE	Laptop PC

C2) EUT Operating Mode During Testing.

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

Test	Description of Operating Mode: Transmit
REFE: Radiated E-Field (Transmitter carrier output levels dBuV/m)	The EUT was transmitting continuously on maximum power using FSK (center frequency 10.6MHz / Deviation ±200kHz) modulation and powered by S05/S09. Device was programmed prior to testing using S08 and Laptop PC
REFE: Radiated Spurious emissions E-Field at frequencies below 30MHz (dBuV/m) (15.209)	
Radiated Spurious emissions (E-Field) at frequencies ≥ 30MHz (15.209)	
20dB Bandwidth of Emissions	

Test	Description of Operating Mode: Receive mode
REFE: 15.109 Radiated Spurious emissions E-field below 30MHz (Receive)	The EUT was placed in receive mode (non-transmitting) Mode during the test. Powered by S05/S09 Device was programmed prior to testing using S08 and Laptop PC
REFE: 15.109 Radiated Spurious emissions (E-Field) frequencies ≥ 30MHz (Receive)	

C3) EUT Configuration Information.

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

C4) List of EUT Ports

The tables below describe the termination of EUT ports:

Sample : S06
Tests : Radiated E-Field, (Carrier power), 20dB Bandwidth of Emissions, REFE

Port	Description of Cable Attached	Cable length	Equipment Connected
dc power port	None	N/A	S09
Antenna port	None	N/A	Integral

.

C5 Details of Equipment Used

For Radiated Electric Field Emissions 9 kHz to 30 MHz

REF No	Type	Description	Manufacturer	Date Calibrated.
886	ATS	Semi-Anechoic Chamber	TRaC	10/06/10
023	HFH-Z2	Mag Loop Antenna 9kHz-30MHz	R & S	26/05/09
847	ESU40	Spec Analyser/Test Rxer (LF/HF)	R & S	14/06/10
881	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10
882	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10
883	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10
884	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10
885	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10

For Radiated Electric Field Emissions 30MHz to 1GHz

REF No	Type	Description	Manufacturer	Date Calibrated.
886	ATS	Semi-Anechoic Chamber	TRaC	10/06/10
RFG 095	3109	Biconical Antenna	EMCO	12/05/10
RFG 191	3146	Log Periodic Antenna	EMCO	12/05/10
847	ESU40	Spec Analyser/Test Rxer (LF/HF)	R & S	14/06/10
881	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10
882	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10
883	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10
884	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10
885	N-type	RF coaxial cable (Lab 16)	Teledyne Reynolds	10/06/10

For 20dB and 99% Bandwidth measurement

REF No	Type	Description	Manufacturer	Date Calibrated
847	ESU40	Spec Analyser/Test Rxer (LF/HF)	R & S	14/06/10

For ac Power Line Conducted Emissions

RFG No	Type	Description	Manufacturer	Date Calibrated
n/a	Lab 5	Small Screened Chamber	TRaC	-
189	ESH3-Z5	Single-phase LISN	R & S	17/06/10
232	ESH3-Z2	Pulse Limiter	R & S	16/02/10
125	ESHS 10	Test Receiver (LF)	R & S	23/11/10
657	E4404B	Spectrum Analyser	Agilent	30/06/10
296	BNC	RF coaxial cable (Lab 5)	TRaC	17/09/10
298	BNC	RF coaxial cable (Lab 5)	TRaC	19/09/10

Appendix D: Additional Information

This Appendix contains no additional information

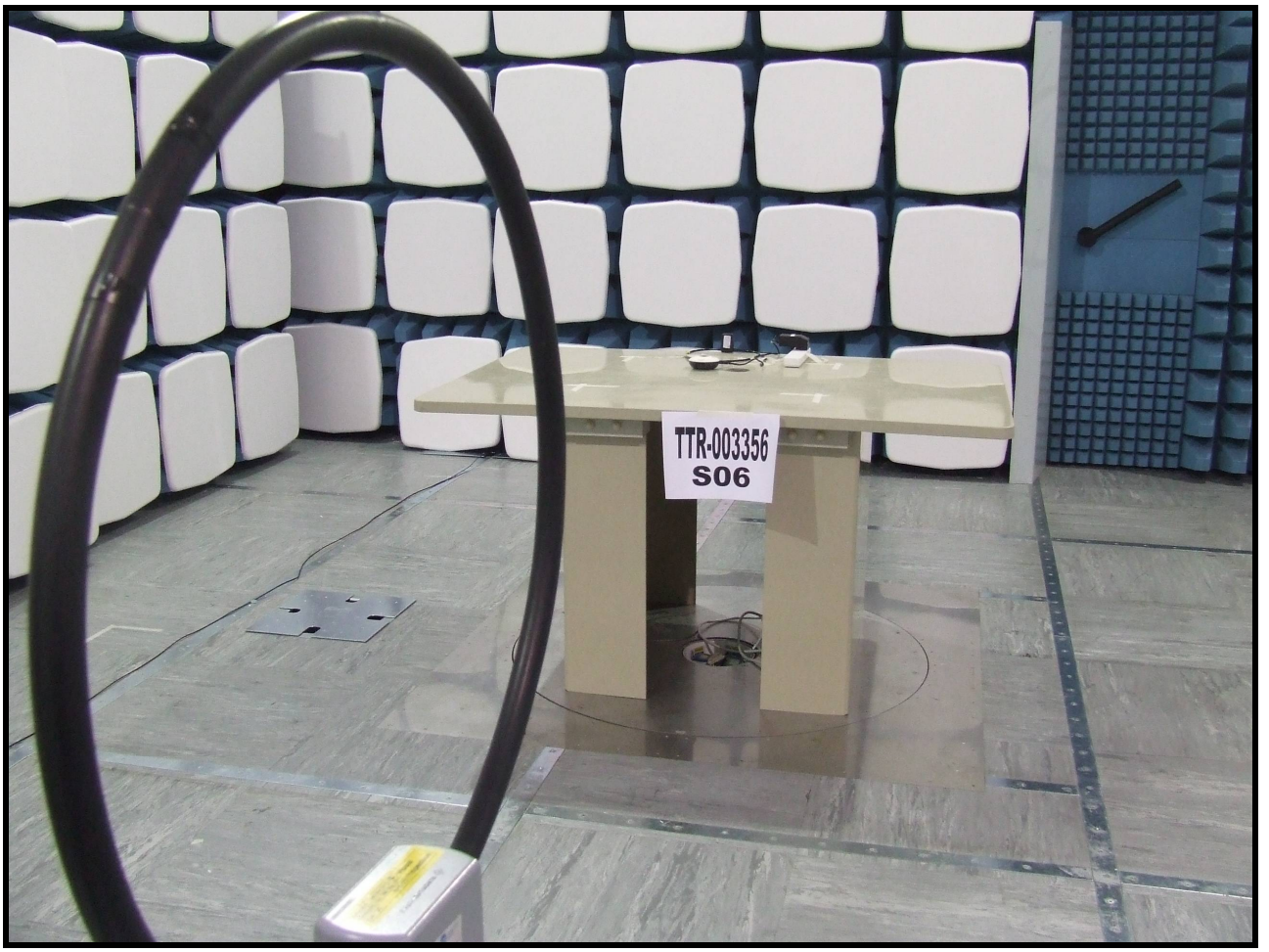
Appendix E: Calculation of the duty cycle correction factor

No average detector measurements were made during testing, therefore this calculation is not required

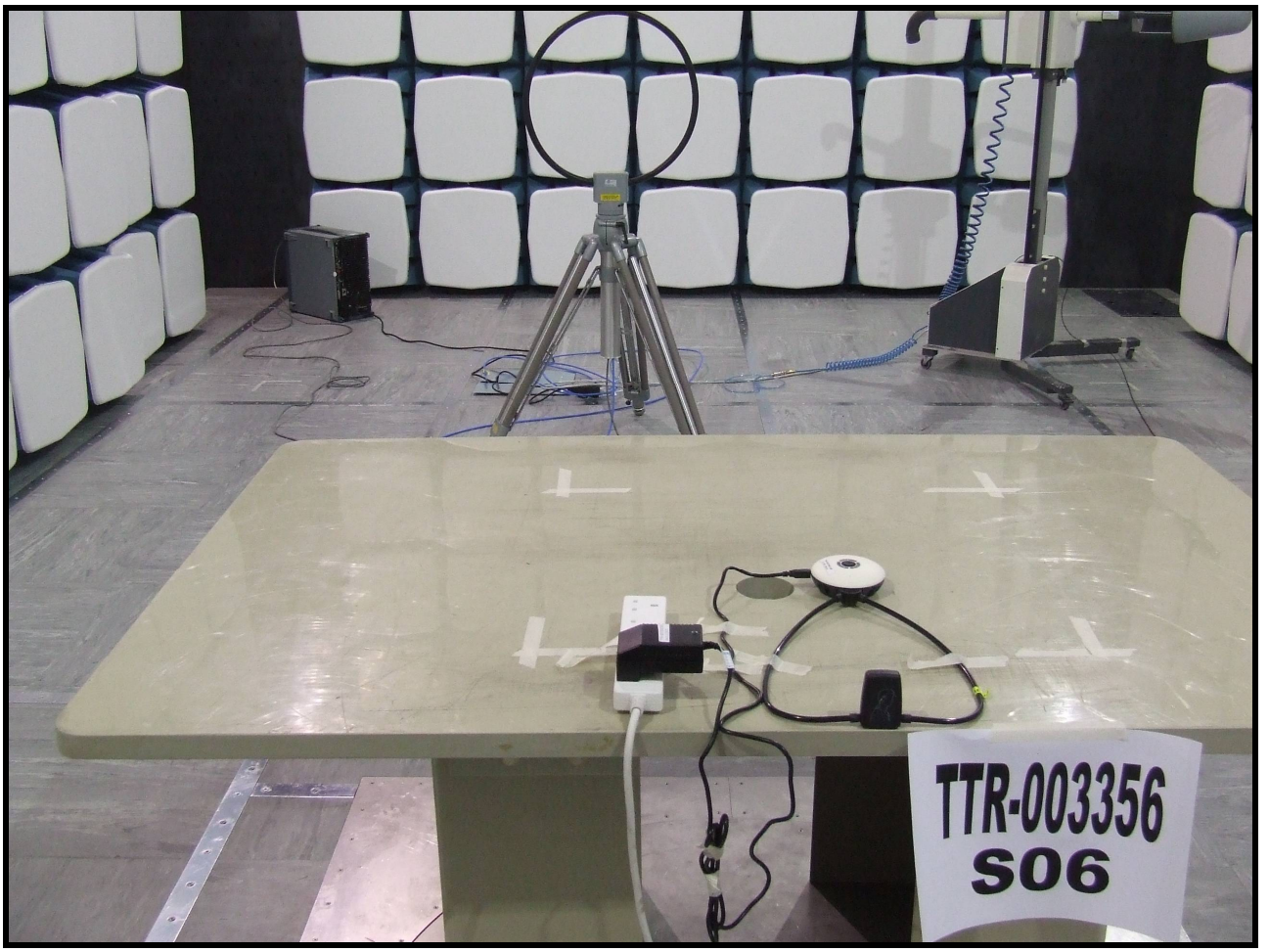
Appendix F: Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: < 30 MHz front view.
2. Radiated electric field emissions arrangement: < 30 MHz rear view.
3. Radiated electric field emissions arrangement: > 30 MHz front view.
4. Radiated electric field emissions arrangement: > 30 MHz rear view.
5. ac Power Line conducted emissions arrangement



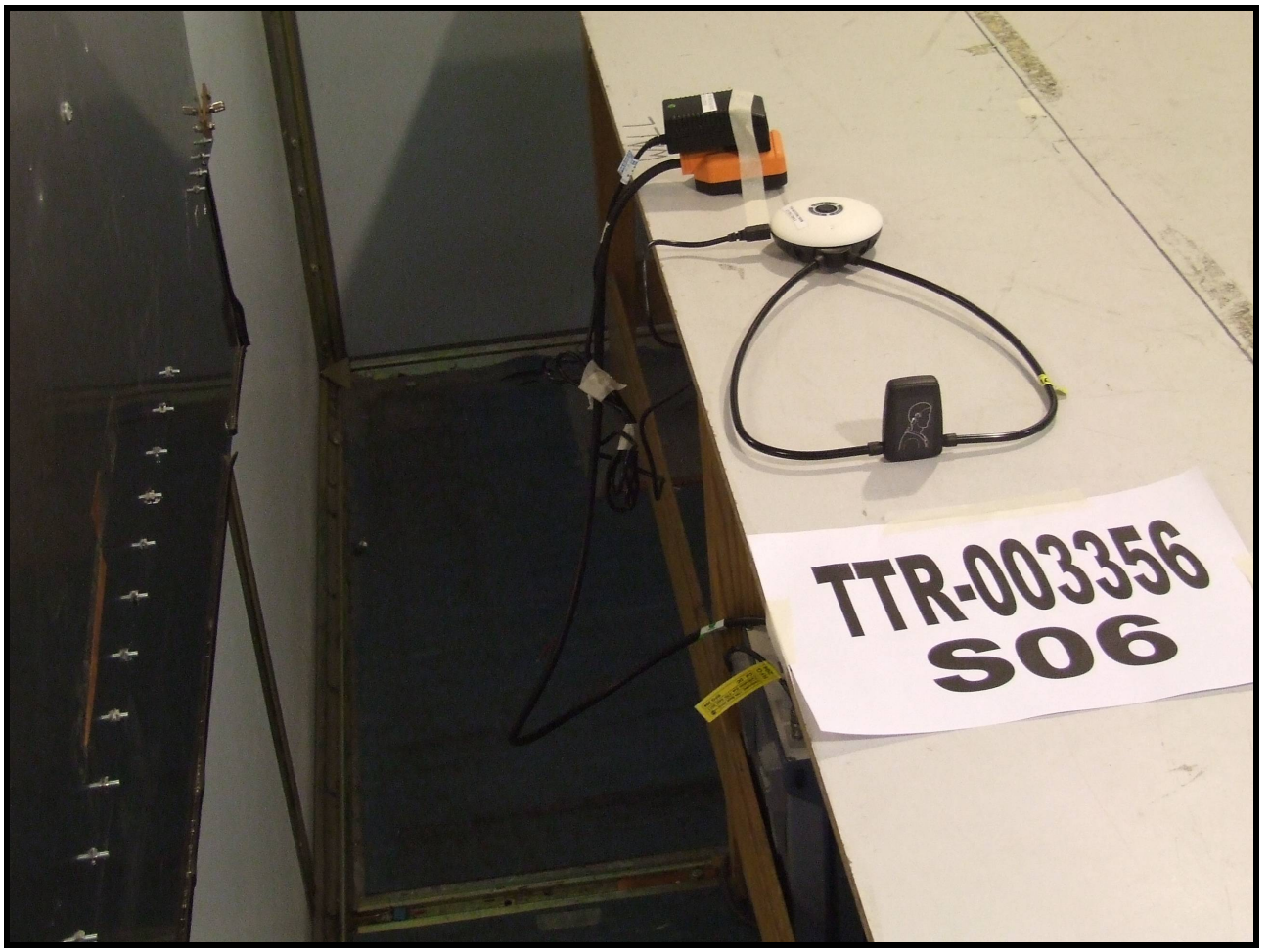
Photograph 1



Photograph 2

Photograph 3

Photograph 4



Photograph 5

Appendix G: **MPE Calculation**

OET Bulletin No. 65, Supplement C 01-01

47 CFR §§1.1307 and 2.1091

2.1091 Radio frequency radiation exposure evaluation: mobile devices.

For purposes of these requirements mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimetres is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limits. As the 20cm separation specified under FCC rules may not be achievable under normal operation of the EUT, an RF exposure calculation is needed to show the minimum distance required to be less than 1mW/cm^2 power density limit, as required under FCC rules.

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{EIRP}{4\pi R^2} \quad \text{re - arranged} \quad R = \sqrt{\frac{EIRP}{S\ 4\pi}}$$

where:

S = power density
R = distance to the centre of radiation of the antenna
EIRP = EUT Maximum power

Note:

The EIRP value was determined using the peak E Field measurement.

Result

Prediction Frequency (MHz)	Maximum EIRP (mW)	Power density limit (S) (mW/cm^2)	Distance (R) cm required to be less than 1mW/cm^2
10.816	1.1x10^{-4}	1	0.05

Appendix H: **Cross Reference FCC Part 15c to IC RSS 210**

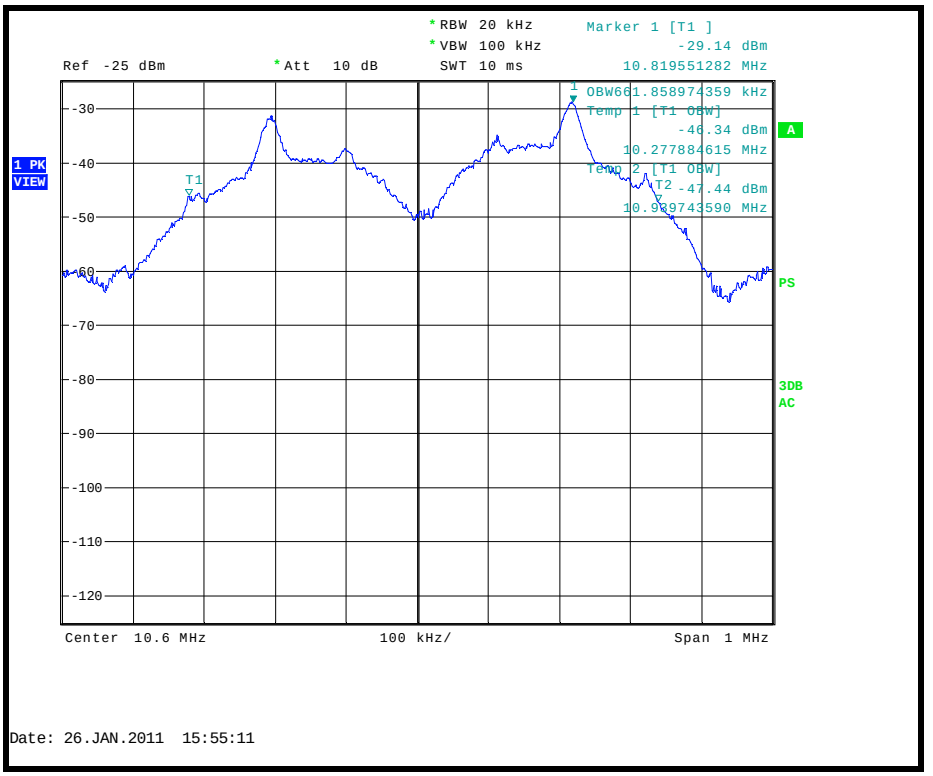
The testing of the C4-9 was carried out to FCC 47CFR Part 15c and the results for this testing can be found in Appendix A of this report.

All measurements were carried out in accordance with ANSI C63.4, 'Methods of Measurements of RF Emissions from low voltage Electrical and Electronic Equipment in the Range 9kHz to 40GHz.

The table below shows the applicable RSS-210 parts and the corresponding FCC 47CFR Part 15 rules:

RSS-210	FCC 47CFR Part 15
2.6	Part 15.109
2.6	Part 15.209

In addition below is a plot of the 99% emissions bandwidth, as stipulated in Section 4.4.1 of RSS-Gen.



99% Bandwidth = 661.859kHz

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