

**A RADIO TEST REPORT**

**FOR**

**AGD SYSTEMS Ltd**

**ON**

**AGD342-100-XXX**

**DOCUMENT NO. TRA-011405-W-US-1**

**HULL**

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**TRaC Wireless Test Report** : TRA-011405-W-US-1

**Applicant** : AGD Systems Ltd

**Apparatus** : AGD342-100-XXX

**Specification(s)** : CFR47 Part 15

**Purpose of Test** : Certification

**FCCID** : WH3342100

**Authorised by** :



: Radio Product Manager

**Issue Date** : 24<sup>th</sup> January 2013

**Authorised Copy Number** : PDF

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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 :

AGD Systems Ltd  
White Lion House  
Gloucester Road  
Staverton  
Cheltenham  
Gloucestershire

## **1.3 Manufacturer**

As Above

## **1.4 Apparatus Assessed**

The following apparatus was assessed between 11<sup>th</sup> – 18<sup>th</sup> December 2012:

AGD342-100-XXX

The AGD342-100-XXX is a speed enforcement ranging radar for use in the roadside & motorway environment.

## 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 & 15.245	ANSI C63.10:2009	Pass
Spurious Emissions Radiated >1000MHz	Title 47 of the CFR: Part 15 Subpart (c) 15.209 & 15.245	ANSI C63.10:2009	Pass
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart (c) 15.207	ANSI C63.10:2009	Pass
Intentional Emission Frequency	Title 47 of the CFR: Part 15 Subpart (c) 15.245(b)	ANSI C63.10:2009	Pass
Intentional Emission Field Strength	Title 47 of the CFR: Part 15 Subpart (c) 15.245(b)	ANSI C63.10:2009	Pass
Intentional Emission Band Occupancy	Title 47 of the CFR: Part 15 Subpart (c) 15.215(c)	ANSI C63.10:2009	Pass
Intentional Emission ERP (mW)	Title 47 of the CFR: Part 15 Subpart (c)	ANSI C63.10:2009	N/A
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart (b) 15.109	ANSI C63.10:2009	N/A*
Antenna Arrangements Integral:	Title 47 of the CFR: Part 15 Subpart (c) 15.203	-	-
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)	-	-

\*The AGD342 is a permanently transmitting device, emissions are covered under the transmitter spurious measurements.

Abbreviations used in the above table:

ANSI C 63.10:2009 is outside the scope of the laboratories UKAS accreditation.

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 the test data recorded in accordance with note (iii) of Section 2.1 the following measurement uncertainty was calculated:

**Radio Testing – General Uncertainty Schedule**

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

**[1] Adjacent Channel Power**

Uncertainty in test result = **1.86dB**

**[2] Carrier Power**

Uncertainty in test result (Power Meter) = **1.08dB**  
 Uncertainty in test result (Spectrum Analyser) = **2.48dB**

**[3] Effective Radiated Power**

Uncertainty in test result = **4.71dB**

**[4] Spurious Emissions**

Uncertainty in test result = **4.75dB**

**[5] Maximum frequency error**

Uncertainty in test result (Power Meter) = **0.113ppm**  
 Uncertainty in test result (Spectrum Analyser) = **0.265ppm**

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

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**,  
 Uncertainty in test result (30MHz – 1GHz) = **4.6dB**,  
 Uncertainty in test result (1GHz – 18GHz) = **4.7dB**

**[7] Frequency deviation**

Uncertainty in test result = **3.2%**

**[8] Magnetic Field Emissions**

Uncertainty in test result = **2.3dB**

**[9] Conducted Spurious**

Uncertainty in test result – Up to 8.1GHz = **3.31dB**  
 Uncertainty in test result – 8.1GHz – 15.3GHz = **4.43dB**  
 Uncertainty in test result – 15.3GHz – 21GHz = **5.34dB**  
 Uncertainty in test result – Up to 26GHz = **3.14dB**

**[10] Channel Bandwidth**

Uncertainty in test result = **15.5%**



**[11] Amplitude and Time Measurement – Oscilloscope**

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

**[12] Power Line Conduction**

Uncertainty in test result = **3.4dB**

**[13] Spectrum Mask Measurements**

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

**[14] Adjacent Sub Band Selectivity**

Uncertainty in test result = **1.24dB**

**[15] Receiver Blocking – Listen Mode, Radiated**

Uncertainty in test result = **3.42dB**

**[16] Receiver Blocking – Talk Mode, Radiated**

Uncertainty in test result = **3.36dB**

**[17] Receiver Blocking – Talk Mode, Conducted**

Uncertainty in test result = **1.24dB**

**[18] Receiver Threshold**

Uncertainty in test result = **3.23dB**

**[19] Transmission Time Measurement**

Uncertainty in test result = **7.98%**

**Section 3:**

**Modifications**

**3.1 Modifications Performed During Assessment**

No modifications were performed during the assessment

**Appendix A:****Formal Emission Test Results**

Abbreviations used in the tables in this appendix:

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

**A1 Transmitter Intentional Emission Radiated**

<b>Carrier power was verified with the EUT transmitting Test Details:</b>	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.245
Measurement standard	ANSI C63.10:2009
EUT sample number	S03
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	20
Photographs (Appendix F)	1

<b>FREQ. (MHz)</b>	<b>MEASUREMENT Rx. READING (dBµV)</b>	<b>CABLE LOSS (dB)</b>	<b>ANT FACTOR (dB/m)</b>	<b>PRE AMP (dB)</b>	<b>FIELD STRENGTH (dBµV/m)</b>	<b>FIELD STRENGTH (mV/m)</b>
24100.0	100.71	9.9	37.6	35.3	112.91	442.08
Limit value @ fc			<b>2500 (mV/m)</b>			
Band occupancy @ -20 dBc			f lower		f higher	
			24095.064103 MHz		24104.807692 MHz	
			9.7435 MHz			

- Notes:**
- 1 Results quoted are extrapolated as indicated
  - 2 Receiver detector @ fc = Peak 1MHz bandwidth
  - 3 When battery powered the EUT was powered with new batteries

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10:2009
  - 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 orthogonal planes.  
Maximum results recorded

**A2 Radiated Electric Field Emissions**

Preliminary scans were performed using a peak detector with the RBW = 100 kHz. The radiated electric field emission test applies to all spurious emissions and harmonics emissions. The maximum permitted field strength is listed in Section 15.209 and 15.245. The EUT was set to transmit as required.

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

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

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

<b>Test Details:</b>	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.209 & 15.245
Measurement standard	ANSI C63.10:2009
Frequency range	30MHz – 100 GHz
EUT sample number	S03
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	20
Photographs (Appendix F)	1

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

Ref No.	FREQ. (MHz)	MEAS Rx (dB $\mu$ V)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dB $\mu$ V/m)	EXTRAP FACT (dB)	FIELD ST'GH ( $\mu$ V/m)	LIMIT ( $\mu$ V/m)
1	30.35	6.1	0.7	17.7	-	24.5	-	16.79	100
2	34.40	9.1	0.7	15.6	-	25.4	-	18.62	100
3	36.90	14.1	0.7	14.2	-	29	-	28.18	100
4	37.50	15.6	0.7	13.8	-	30.1	-	31.99	100
5	37.70	15.5	0.7	13.7	-	29.9	-	31.26	100
6	38.10	16.3	0.7	13.5	-	30.5	-	33.50	100
7	38.20	15.7	0.7	13.4	-	29.8	-	30.90	100
8	38.50	16.7	0.7	13.3	-	30.7	-	34.28	100
9	39.50	13.5	0.7	12.8	-	27	-	22.39	100
10	40.65	16.8	0.7	12.2	-	29.7	-	30.55	100
11	41.15	17.4	0.7	11.9	-	30	-	31.62	100
12	42.45	15.7	0.7	11.3	-	27.7	-	24.27	100
13	43.30	18.8	0.8	10.8	-	30.4	-	33.11	100
14	43.70	16.3	0.8	10.6	-	27.7	-	24.27	100
15	43.80	15.9	0.8	10.5	-	27.2	-	22.91	100
16	44.10	14.1	0.8	10.4	-	25.3	-	18.41	100
17	44.50	15.2	0.8	10.2	-	26.2	-	20.42	100
18	44.90	15.5	0.8	10	-	26.3	-	20.65	100
19	45.70	13.3	0.8	9.6	-	23.7	-	15.31	100
20	59.00	23.8	0.9	5.3	-	30	-	31.62	100
21	140.20	15.7	1.3	11	-	28	-	25.12	150
22	144.45	19.9	1.3	10.6	-	31.8	-	38.90	150
23	147.35	16.0	1.4	10.3	-	27.7	-	24.27	150
24	196.35	16.2	1.6	8.7	-	26.5	-	21.13	150
25	199.80	14.9	1.7	8.7	-	25.3	-	18.41	150
26	203.65	17.2	1.7	8.8	-	27.7	-	24.27	150
27	255.00	22.2	1.8	12.4	-	36.4	-	66.07	200
28	305.60	15.7	1.9	13.3	-	30.9	-	35.08	200
29	1897.79	54.0	2.8	27.6	35.3	49.1	-	286.09	5000
30	1897.79	36.3	2.8	27.6	35.3	31.4	-	36.94	500
31	1967.90	54.1	2.8	27.6	35.2	49.3	-	292.75	5000
32	1967.90	35.9	2.8	27.6	35.2	31.1	-	35.89	500

Ref Numbers 1-28 measured using QP detector

Ref Numbers 29 & 31 measured using Pk detector

Ref Numbers 20 & 32 measured using Av detector

**Notes:**

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10:2009: 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= 1MHz, VBW $\geq$ RBW
Average	RBW= 1MHz, VBW $\geq$ RBW

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

Radiated emission limits 47 CFR Part 15: Clause 15.209 & 15.245 for all emissions:

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Measurement Distance m
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Un-restricted Bands & Harmonics		
Frequency of emission (MHz)	Field strength mV/m	Measurement Distance m
Harmonics <17.7 GHz Un-restricted Bands	25.0	3
Harmonics in restricted bands >17.7 GHz	25.0*	3
Harmonics in restricted bands >17.7 GHz	7.5#	3
All other Emissions	-50dBc	3

\* For the second and third harmonics of field disturbance sensors operating in the 24075–24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors

# For all other field disturbance sensors

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

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

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

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



### A3 Power Line Conducted Emissions

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

Test Details:	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10:2009
Frequency range	150kHz to 30MHz
EUT sample number	S03
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	1

The worst-case power line 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	14.745	Neutral	34.35	50.0	15.65	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	No Significant Emissions within 20 dB of the limit					Pass

**Specification limits :**

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

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dB $\mu$ V	
	Quasi-peak	Average
0.15 to 0.5	66 to 56 <sup>2</sup>	56 to 46 <sup>2</sup>
0.5 to 5	56	46
5 to 30	60	50

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

Notes:

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

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

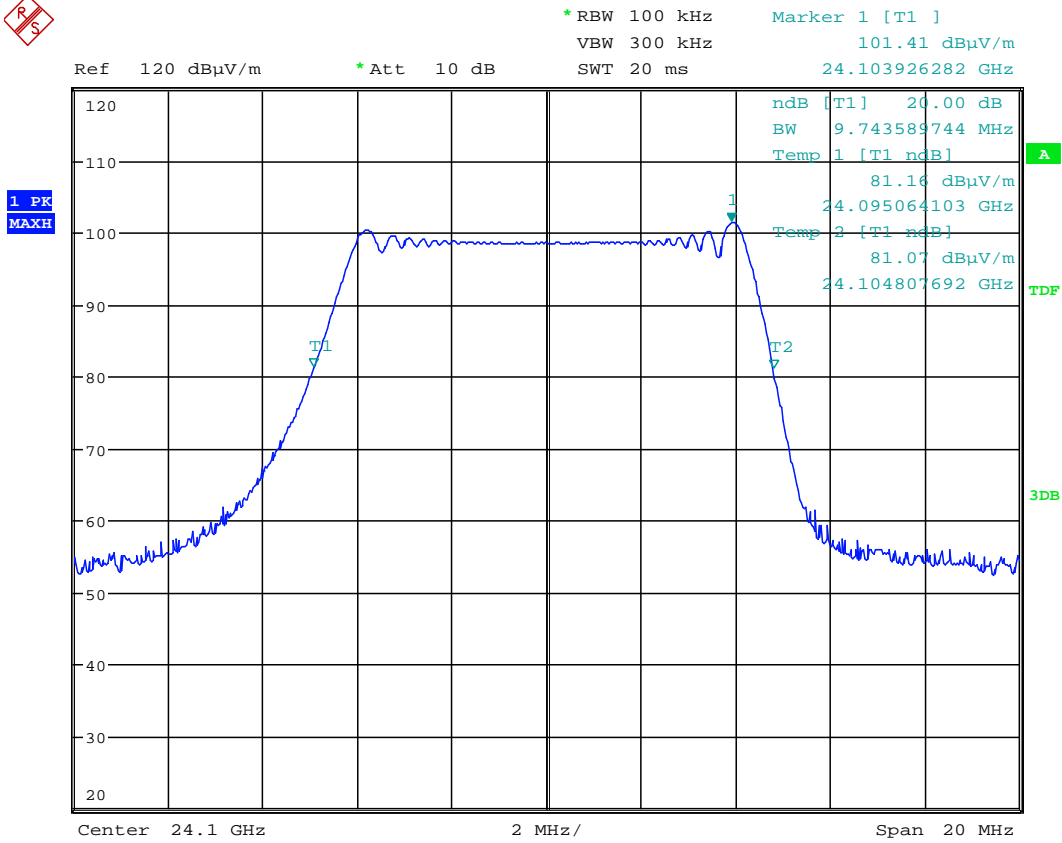
(i) Parameter defined by standard and / or single possible, refer to Appendix C  
 (ii) Parameter defined by client and / or single possible, refer to Appendix C  
 (iii) Parameter had a negligible effect on emission levels, refer to Appendix C  
 (iv) Worst case determined by initial measurement, refer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

**Appendix B:****Supporting Graphical Data**

This appendix contains graphical data obtained during testing.

**Notes:**

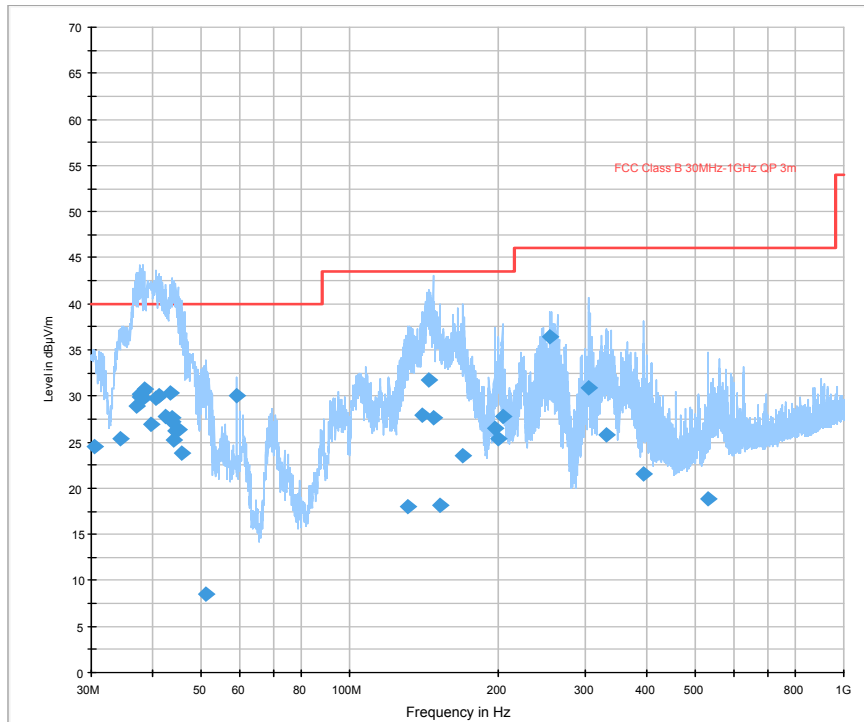
- (a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.
- (b) The time and date on the plots do not necessarily equate to the time of the test.
- (c) Where relevant, on power 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.



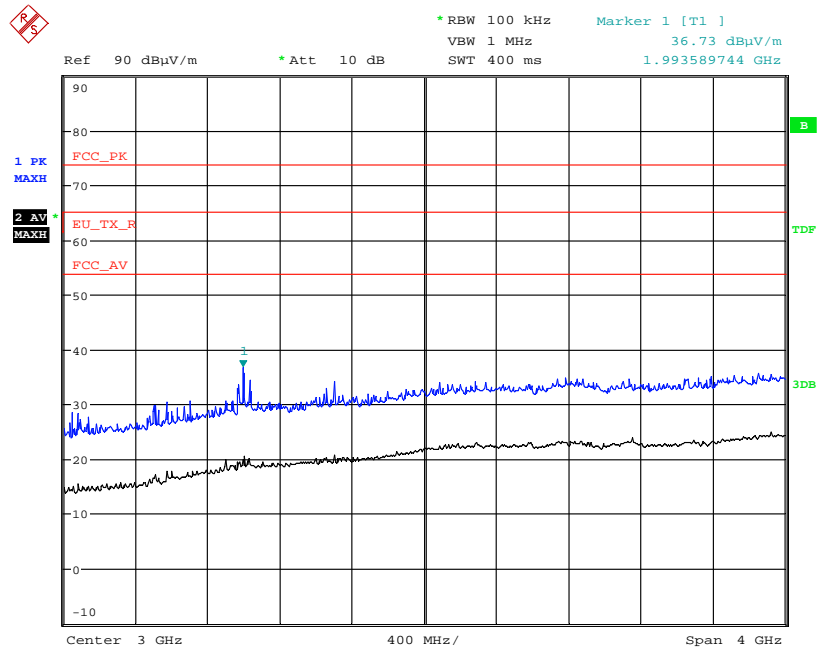
Date: 13.DEC.2012 11:51:52

20dB Bandwidth

FCC pt15.109 RE Class B 30MHz-1GHz ESCI7 + UH93 - 19May2011

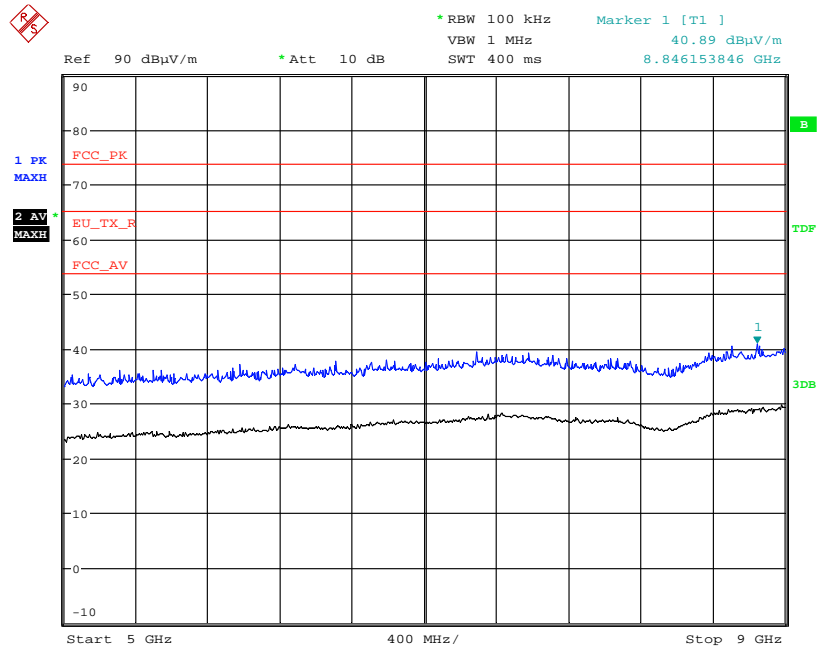


Radiated spurious emissions 30 MHz to 1 GHz



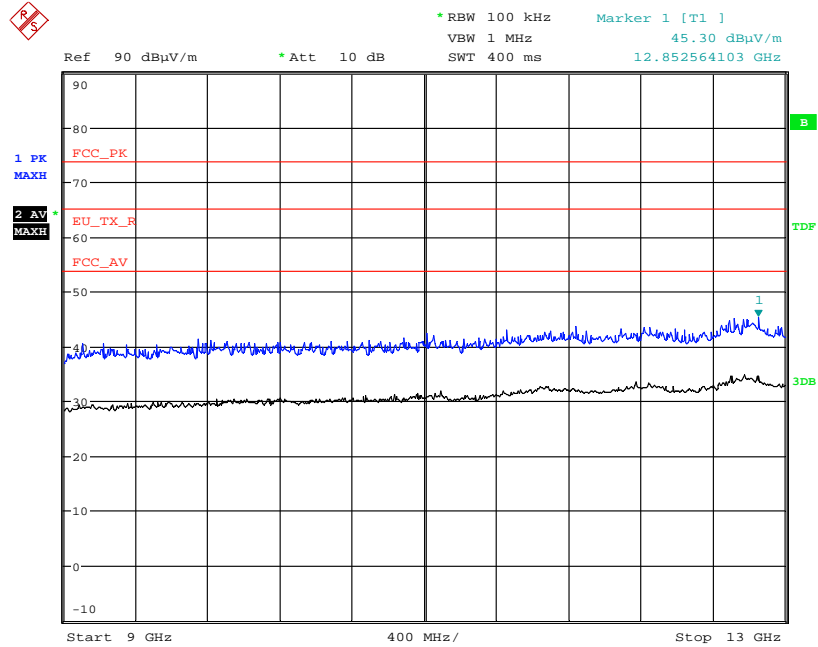
Date: 13.DEC.2012 11:13:35

Radiated spurious emissions 1 GHz to 5 GHz



Date: 13.DEC.2012 11:18:20

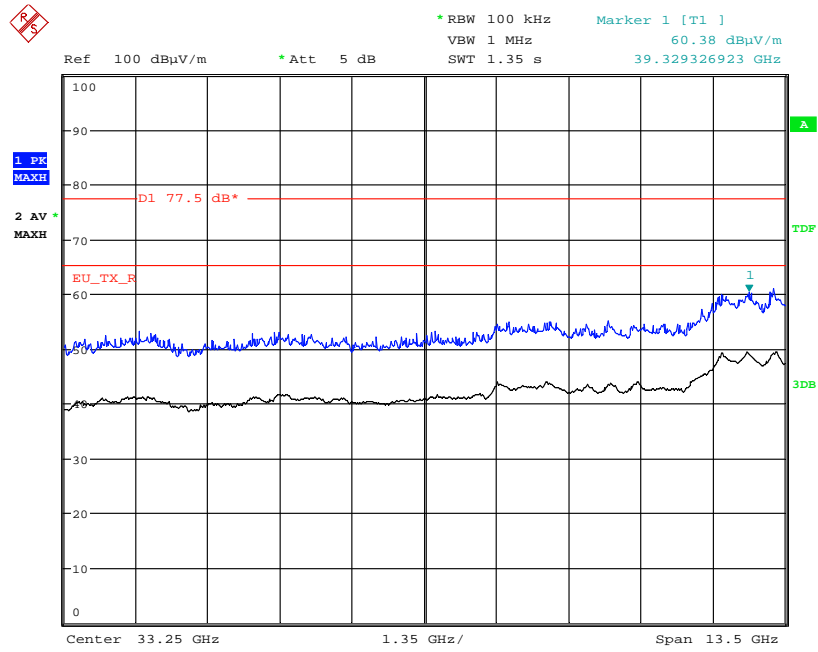
### Radiated spurious emissions 5 GHz to 9 GHz



Date: 13.DEC.2012 11:17:14

### Radiated spurious emissions 9 GHz to 13 GHz

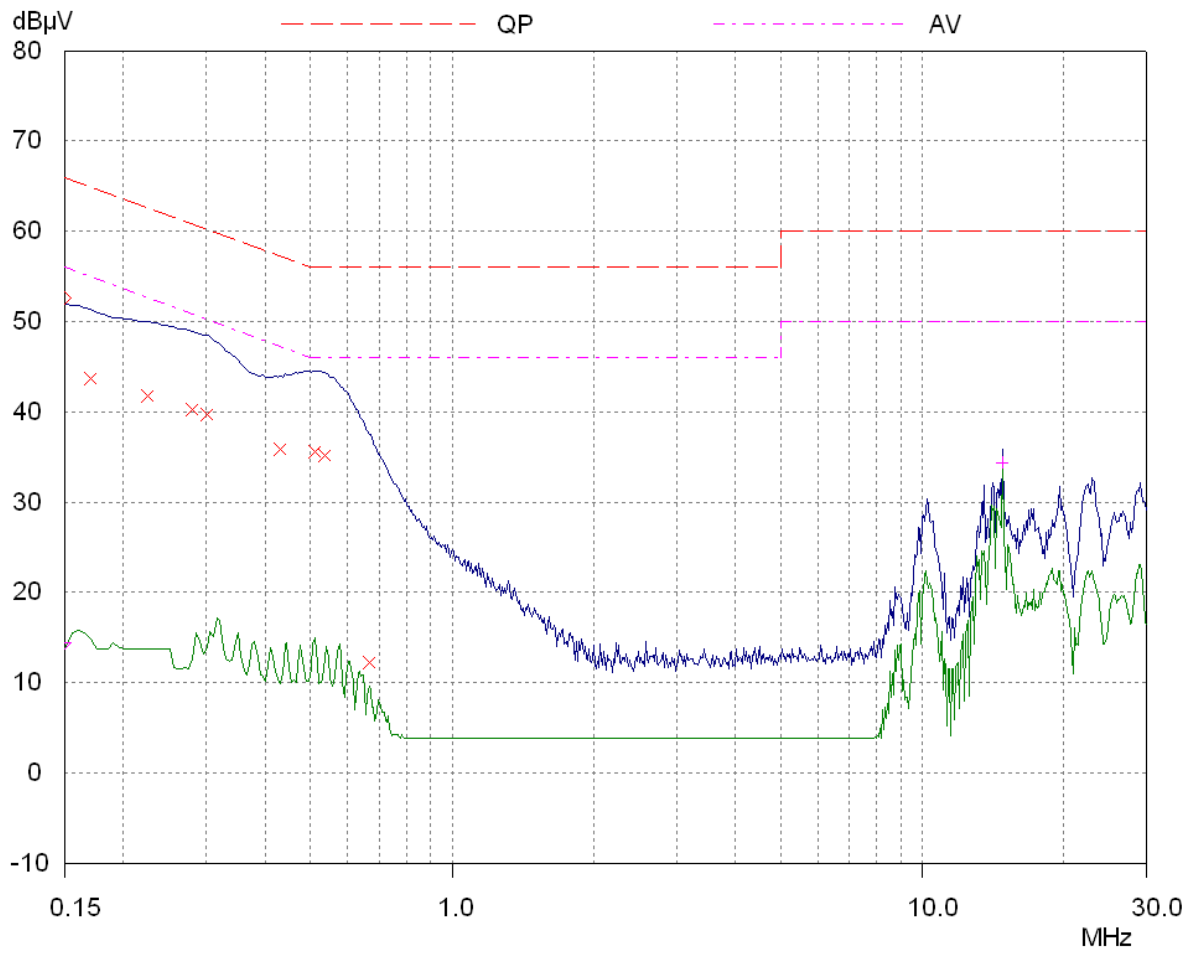




Date: 13.DEC.2012 13:00:13

### Radiated spurious emissions 26.5 GHz to 40 GHz





AC Powerline Conducted Emissions

**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 Global upon request.

**C1) Test samples**

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

Sample No.	Description	Identification
S03	AGD342-100-XXX	34374-00002

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

Sample No.	Description	Identification
None		

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

Identification	Description
It1025	Toshiba Laptop

**C2) EUT Operating Mode During Testing.**

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

Test	Description of Operating Mode:
All tests detailed in this report	EUT active and transmitting at full power

**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 : N/A  
Tests : Conducted

Port	Description of Cable Attached	Cable length	Equipment Connected

Sample : S03  
Tests : Radiated Emissions & powerline Conduction

Port	Description of Cable Attached	Cable length	Equipment Connected
Power	6 core unshielded	<10m	+12Vdc
Data	8 core unshielded	<10m	Laptop

\* Only connected during setup.

**C5 Details of Equipment Used**

TRaC No	Equipment Type	Equipment Description	Manufacturer	Last Cal	Cal Period	Cal Due
UH004	ESVS10	Receiver	R&S	12/01/2012	12	12/01/2013
UH093	CBL6112B	Bilog	Chase	20/06/2011	24	20/06/2013
UH096	6960B	Power meter	Marconi	04/11/2012	12	04/11/2013
UH191	CBL611/A	Bilog	Chase	13/12/2012	24	13/12/2014
UH195	ESH3-Z5.831.5	Lisn	R&S	01/06/2012	12	01/06/2013
UH281	FSU46	Spectrum Analyser	R&S	09/02/2012	12	09/02/2013
UH372	6201-69	PreAmp	Wat-John	20/10/2010	24	20/10/2012
UH396	ENV216	Lisn	R&S	12/04/2012	12	12/04/2013
UH403	ESCI 7	Recevier	R&S	27/06/2012	12	27/06/2013
UH405	FSU26	Spectrum Analyser	R&S	06/04/2011	12	06/04/2012
L138	3115	1-18GHz Horn	EMCO	08/11/2011	24	08/11/2013
L139	3115	1-18GHz Horn	EMCO	14/09/2011	24	14/09/2013
L263/A	20240-20	Horn 18-26GHz	Flann	17/11/2011	24	17/11/2013
L290	CBL611/A	Bilog	Chase	13/12/2012	24	13/12/2014
L300	20240-20	Horn 18-26GHz	Flann	17/11/2011	24	17/11/2013
L317	ESVS10	Receiver	R&S	21/12/2011	12	21/12/2012
L572	8449B	Pre Amp	Agilent	12/12/2012	24	12/12/2014
L654	8563A	Spectrum Analyser	HP	18/10/2012	12	18/10/2013
REF940	ATS	Radio Chamber - PP	Rainford EMC	26/06/2012	12	26/06/2013
UH330	N/A	K type transition	Maury M'wave	Connected & Calibrated with TRL300		
UH365	11970Q	Harmonic Mixer (33-50)	Agilent	16/07/2008	24	16/07/2010
UH366	11970V	Harmonic Mixer (50-75)	Agilent	21/07/2008	24	21/07/2010
UH367	11970W	Harmonic Mixer (75-110)	Agilent	02/07/2008	24	02/07/2010
UH368	25240-20	Standard Gain Horn (50-75)	Flann	See Note Below		
UH369	27240-20	Standard Gain Horn (75-110)	Flann			
L264/A	2324-20	Standard Gain Horn 33-50	Flann			
L301	22240-20	Standard Gain Horn 26-40	Flann			

**Note: ANSI C63.10 - 4.6.2 Antenna calibration**

Standard gain horn antennas have gain characteristics that are established by the physical dimensions and dimensional tolerances. Consequently, standard-gain horn antennas need not be calibrated beyond the dimensional characteristics that are provided by the manufacturer, unless damage or deterioration is suspected, or if used at distances closer than  $2D^2/\lambda$ .

**Appendix D:**

**Additional Information**

No additional information is included within this test report.



## Appendix E: Calculation of the duty cycle correction factor

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

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

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

Therefore the calculated duty cycle was determined:

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

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

e.g

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

0.07459 or 7.459%

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

Duty cycle correction may not be applicable / required by the device covered in this report.

The correction factor above is for example of how the correction is calculated.

Any applicable duty cycle used will be recorded in the relevant results sections of this report.

**Appendix F:**

**Photographs and Figures**

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: Overview.
2. Radiated electric field emissions arrangement: Close up.
3. AC powerline conducted emissions arrangement: Overview.



Photograph 1



Photograph 2



Photograph 3

**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  $1\text{mW}/\text{cm}^2$  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

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

where:

S = power density

R = distance to the centre of radiation of the antenna

EIRP = EUT Maximum power

Note:

The EIRP measurement was performed using a signal substitution method.

Result

Prediction Frequency (MHz)	Maximum EIRP (mW)	Power density limit (S) ( $\text{mW}/\text{cm}^2$ )	Distance (R) cm required to be less than $1\text{mW}/\text{cm}^2$
24100	58.67	1	2.17

