

Radio Test Report

for

G4S Technology Ltd

on

S680

Document No: TRA-012532-47-03-A

HULL

Unit E, South Orbital Trading Park, Hedon Road, Hull, HU9 1NJ, UK.

T +44 (0)1482 801801 **F** +44 (0)1482 801806 **E** test@tracglobal.com

www.tracglobal.com

TRaC Wireless Test Report : TRA-012532-47-03-A

Applicant : G4S Technology Ltd

Apparatus : S680

Specification(s) : CFR47 Part 15.209, July 2011

Purpose of Test : Certification

FCC ID : OE5S680A

Authorised by :



Radio Products Manager

Issue Date : 18th November 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.

Test performed by: TRaC Global []
Unit E
South Orbital Trading Park
Hedon Road
Hull, HU9 1NJ.
United Kingdom.

Telephone: +44 (0) 1482 801801
Fax: +44 (0) 1482 801806

TRaC Global [X]
Unit 1
Pendle Place
Skelmersdale
West Lancashire, WN8 9PN
United Kingdom

Telephone: +44 (0) 1695 556666
Fax: +44 (0) 1695 577077

Email: test@tracglobal.com
Web site: <http://www.tracglobal.com>

Tests performed by: S Hodgkinson

Report author: S Hodgkinson

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1.2 Tests Requested By

This testing in this report was requested by:

G4S Technology Ltd
Challenge House
International Drive
Tewkesbury GL20 8UQ
Gloucestershire, UK

1.3 Manufacturer

Same as above

1.4 Apparatus Assessed

The following apparatus was assessed between 30th October and 4th November 2013

S680

The above equipment is an RFID card reader with a radio transmitter operating at 125.3 kHz.

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) 15.209	ANSI C63.10	Pass
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart (c) 15.207	ANSI C63.10	Pass
Intentional Emission Frequency	Title 47 of the CFR: Part 15 Subpart (c) 15.209	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) 15.209	ANSI C63.10	Pass
Intentional Emission ERP (mW)	Title 47 of the CFR: Part 15 Subpart (c) 15.209	ANSI C63.10	Pass
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart (b) 15.109	ANSI C63.10	Pass
Antenna Arrangements Integral:	Title 47 of the CFR: Part 15 Subpart (c) 15.203	-	N/A
Antenna Arrangements External Connector	Title 47 of the CFR: Part 15 Subpart (c) 15.204	-	N/A
Restricted Bands	Title 47 of the CFR: Part 15 Subpart (c) 15.205	-	N/A
Maximum Frequency of Search	Title 47 of the CFR: Part 15 Subpart (c) 15.33	-	N/A
Extrapolation Factor	Title 47 of the CFR: Part 15 Subpart (c) 15.31(f)	-	N/A

Abbreviations used in the above table:

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

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

1.6 Notes relating to the assessment

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

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

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

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

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

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

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

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

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

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

1.7 Deviations from Test Standards

There were no deviations from the standards tested to.

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

Test Details	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.209
Measurement standard	ANSI C63.10:2003
EUT sample number	S05
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Temperature	20
Photographs (Appendix E)	2

Frequency (kHz)	Measurement Distance (m)	Measurement Rx. Reading (dBµV/m)	Extrapolation Factor (dB)	Field Strength at 300m (µV/m)
125.3	1	107.30	105.7	1.202
125.3	3	81.60	80	1.202
Limit at 300m		19.15 µV/m		
Band occupancy at -20 dBc		f_L	f_H	
		123.317307kHz	128.605769kHz	
		BW = 5.28kHz		

- Notes:**
- 1 Results quoted are extrapolated as indicated
 - 2 Receiver detector @ f_c = Average / Quasi Peak with 10kHz / 120kHz bandwidth appropriately
 - 3 When battery powered the EUT was powered with new batteries

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10
 - 2 Measuring distances: 1m, 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 Spurious 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. 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.

Test Details	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.209
Measurement standard	ANSI C63.10:2003
Frequency range	9kHz – 1GHz
EUT sample number	S05
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Temperature	20
Photographs (Appendix E)	1

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

Frequency (MHz)	Meas Rx (dBuV)	Cable Loss (dB)	Antenna Fact (dB/m)	Pre-amp (dB)	Field Strength (dBuV/m)	Extrap Fact	Field Strength (uV/m)	Limit (uV/m)
30.350000	12.97	0.72	13.01	N/A	26.70	N/A	21.63	100
31.200000	15.27	0.72	13.01	N/A	29.00	N/A	28.18	100
31.800000	12.07	0.72	13.01	N/A	25.80	N/A	19.50	100
32.450000	12.47	0.72	13.01	N/A	26.20	N/A	20.42	100
33.050000	12.67	0.72	13.01	N/A	26.40	N/A	20.89	100
33.250000	11.17	0.72	13.01	N/A	24.90	N/A	17.58	100
33.550000	12.07	0.72	13.01	N/A	25.80	N/A	19.50	100
33.950000	12.17	0.72	13.01	N/A	25.90	N/A	19.72	100
34.250000	11.97	0.72	13.01	N/A	25.70	N/A	19.28	100
35.300000	14.07	0.72	13.01	N/A	27.80	N/A	24.55	100
35.700000	14.17	0.72	13.01	N/A	27.90	N/A	24.83	100
36.100000	15.17	0.72	13.01	N/A	28.90	N/A	27.86	100
36.550000	15.07	0.72	13.01	N/A	28.80	N/A	27.54	100
37.300000	14.97	0.72	13.01	N/A	28.70	N/A	27.23	100
38.050000	15.07	0.72	13.01	N/A	28.80	N/A	27.54	100
38.600000	14.77	0.72	13.01	N/A	28.50	N/A	26.61	100
39.600000	14.17	0.72	13.01	N/A	27.90	N/A	24.83	100
40.350000	14.77	0.72	13.01	N/A	28.50	N/A	26.61	100
41.100000	17.47	0.72	13.01	N/A	31.20	N/A	36.31	100
41.650000	15.77	0.72	13.01	N/A	29.50	N/A	29.85	100
42.350000	16.93	0.74	12.63	N/A	30.30	N/A	32.73	100
43.100000	18.72	0.73	12.25	N/A	31.70	N/A	38.46	100
44.100000	19.14	0.72	11.74	N/A	31.60	N/A	38.02	100
44.850000	19.09	0.72	11.29	N/A	31.10	N/A	35.89	100
45.600000	19.37	0.73	10.9	N/A	31.00	N/A	35.48	100
46.350000	19.84	0.73	10.53	N/A	31.10	N/A	35.89	100
46.850000	16.58	0.74	10.28	N/A	27.60	N/A	23.99	100
47.350000	19.17	0.74	9.99	N/A	29.90	N/A	31.26	100
47.600000	18.21	0.75	9.84	N/A	28.80	N/A	27.54	100
47.850000	17.66	0.75	9.69	N/A	28.10	N/A	25.41	100
48.600000	16.23	0.77	9.30	N/A	26.30	N/A	20.65	100
49.350000	16.28	0.79	8.93	N/A	26.00	N/A	19.95	100
51.350000	17.43	0.84	8.03	N/A	26.30	N/A	20.65	100
51.850000	19.46	0.86	7.78	N/A	28.10	N/A	25.41	100
52.100000	21.07	0.86	7.67	N/A	29.60	N/A	30.20	100
52.350000	21.83	0.87	7.60	N/A	30.30	N/A	32.73	100
52.850000	23.96	0.89	7.45	N/A	32.30	N/A	41.21	100
53.100000	24.14	0.89	7.37	N/A	32.40	N/A	41.69	100
53.850000	26.94	0.91	7.15	N/A	35.00	N/A	56.23	100
54.600000	27.96	0.86	6.98	N/A	35.80	N/A	61.66	100
55.150000	27.21	0.83	6.86	N/A	34.90	N/A	55.59	100
55.600000	27.37	0.81	6.72	N/A	34.90	N/A	55.59	100
56.400000	27.12	0.76	6.52	N/A	34.40	N/A	52.48	100
56.600000	27.47	0.75	6.48	N/A	34.70	N/A	54.33	100
57.400000	27.39	0.75	6.36	N/A	34.50	N/A	53.09	100
57.900000	25.94	0.75	6.31	N/A	33.00	N/A	44.67	100
58.150000	27.77	0.76	6.27	N/A	34.80	N/A	54.95	100
58.850000	27.70	0.77	6.13	N/A	34.60	N/A	53.70	100
59.400000	27.96	0.78	6.06	N/A	34.80	N/A	54.95	100
60.400000	28.14	0.80	5.96	N/A	34.90	N/A	55.59	100

Frequency (MHz)	Meas Rx (dBuV)	Cable Loss (dB)	Antenna Fact (dB/m)	Pre-amp (dB)	Field Strength (dBuV/m)	Extrap Fact	Field Strength (uV/m)	Limit (uV/m)
66.900000	26.34	0.88	6.28	N/A	33.50	N/A	47.32	100
67.150000	25.59	0.89	6.32	N/A	32.80	N/A	43.65	100
67.400000	25.66	0.9	6.34	N/A	32.90	N/A	44.16	100
67.900000	25.78	0.93	6.39	N/A	33.10	N/A	45.19	100
68.150000	25.24	0.94	6.42	N/A	32.60	N/A	42.66	100
68.400000	24.71	0.95	6.44	N/A	32.10	N/A	40.27	100
68.650000	24.37	0.96	6.47	N/A	31.80	N/A	38.90	100
68.900000	25.05	0.96	6.49	N/A	32.50	N/A	42.17	100
69.150000	25.24	0.96	6.5	N/A	32.70	N/A	43.15	100
69.400000	24.74	0.96	6.50	N/A	32.20	N/A	40.74	100
69.900000	25.45	0.95	6.50	N/A	32.90	N/A	44.16	100
70.150000	25.02	0.95	6.53	N/A	32.50	N/A	42.17	100
70.650000	25.42	0.95	6.63	N/A	33.00	N/A	44.67	100
71.900000	25.07	0.94	6.79	N/A	32.8	N/A	43.65	100
72.200000	22.53	0.93	6.84	N/A	30.30	N/A	32.73	100
72.950000	23.09	0.92	6.99	N/A	31.00	N/A	35.48	100
73.150000	23.56	0.92	7.02	N/A	31.50	N/A	37.58	100
73.700000	24.32	0.91	7.07	N/A	32.30	N/A	41.21	100
74.400000	26.26	0.90	7.14	N/A	34.30	N/A	51.88	100
75.150000	25.29	0.89	7.22	N/A	33.40	N/A	46.77	100
75.900000	25.63	0.88	7.29	N/A	33.80	N/A	48.98	100
76.900000	25.15	0.87	7.48	N/A	33.50	N/A	47.32	100
77.650000	26.46	0.87	7.57	N/A	34.90	N/A	55.59	100
78.150000	25.09	0.89	7.62	N/A	33.60	N/A	47.86	100
78.650000	26.41	0.92	7.67	N/A	35.00	N/A	56.23	100
78.900000	24.78	0.93	7.69	N/A	33.40	N/A	46.77	100
79.650000	24.64	0.96	7.90	N/A	33.50	N/A	47.32	100
80.650000	24.69	1.01	8.00	N/A	33.70	N/A	48.42	100
81.150000	26.16	1.01	8.03	N/A	35.20	N/A	57.54	100
81.650000	26.36	1.01	8.13	N/A	35.50	N/A	59.57	100
82.400000	26.00	1.02	8.28	N/A	35.30	N/A	58.21	100
83.150000	25.65	1.02	8.43	N/A	35.10	N/A	56.89	100
83.400000	24.00	1.02	8.48	N/A	33.50	N/A	47.32	100
83.900000	25.19	1.03	8.58	N/A	34.80	N/A	54.95	100
84.150000	22.94	1.04	8.62	N/A	32.60	N/A	42.66	100
84.450000	24.81	1.04	8.65	N/A	34.50	N/A	53.09	100
84.700000	21.58	1.05	8.67	N/A	31.30	N/A	36.73	100
85.150000	23.21	1.06	8.73	N/A	33.00	N/A	44.67	100
85.900000	22.84	1.08	8.88	N/A	32.80	N/A	43.65	100
86.650000	23.14	1.09	8.97	N/A	33.20	N/A	45.71	100
87.200000	23.47	1.09	9.04	N/A	33.60	N/A	47.86	100
87.700000	24.77	1.09	9.14	N/A	35.00	N/A	56.23	100
87.950000	22.91	1.10	9.19	N/A	33.20	N/A	45.71	100
88.450000	24.35	1.10	9.25	N/A	34.70	N/A	54.33	150
88.700000	23.83	1.10	9.27	N/A	34.20	N/A	51.29	150
89.450000	24.05	1.10	9.35	N/A	34.50	N/A	53.09	150
89.700000	22.92	1.11	9.37	N/A	33.40	N/A	46.77	150
90.450000	22.56	1.15	9.49	N/A	33.20	N/A	45.71	150
90.700000	23.40	1.16	9.54	N/A	34.10	N/A	50.70	150
91.100000	15.02	1.18	9.60	N/A	25.80	N/A	19.50	150

Frequency (MHz)	Meas Rx (dBuV)	Cable Loss (dB)	Antenna Fact (dB/m)	Pre-amp (dB)	Field Strength (dBuV/m)	Extrap Fact	Field Strength (uV/m)	Limit (uV/m)
91.450000	22.70	1.20	9.60	N/A	33.50	N/A	47.32	150
92.450000	20.86	1.25	9.69	N/A	31.80	N/A	38.90	150
93.100000	15.36	1.22	9.82	N/A	26.40	N/A	20.89	150
93.850000	16.34	1.19	9.97	N/A	27.50	N/A	23.71	150
94.650000	18.38	1.15	10.07	N/A	29.60	N/A	30.20	150
95.400000	17.84	1.12	10.14	N/A	29.10	N/A	28.51	150
96.000000	17.87	1.13	10.20	N/A	29.20	N/A	28.84	150
96.700000	17.69	1.14	10.27	N/A	29.10	N/A	28.51	150
97.200000	19.16	1.14	10.30	N/A	30.60	N/A	33.88	150
98.200000	18.23	1.15	10.32	N/A	29.70	N/A	30.55	150
98.800000	15.87	1.15	10.38	N/A	27.40	N/A	23.44	150
99.400000	15.63	1.15	10.52	N/A	27.30	N/A	23.17	150
100.200000	17.03	1.15	10.72	N/A	28.90	N/A	27.86	150
100.800000	11.97	1.15	10.78	N/A	23.90	N/A	15.67	150
101.500000	15.10	1.15	10.85	N/A	27.10	N/A	22.65	150
102.000000	15.04	1.16	10.90	N/A	27.10	N/A	22.65	150
102.250000	14.24	1.16	10.90	N/A	26.30	N/A	20.65	150
102.600000	15.73	1.17	10.90	N/A	27.80	N/A	24.55	150
102.950000	15.12	1.18	10.90	N/A	27.20	N/A	22.91	150
103.350000	15.68	1.18	10.94	N/A	27.80	N/A	24.55	150
103.700000	14.44	1.19	10.97	N/A	26.60	N/A	21.38	150
104.100000	15.59	1.20	11.01	N/A	27.80	N/A	24.55	150
104.350000	15.06	1.20	11.04	N/A	27.30	N/A	23.17	150
104.600000	15.24	1.20	11.06	N/A	27.50	N/A	23.71	150
105.100000	16.08	1.21	11.11	N/A	28.40	N/A	26.30	150
105.450000	14.64	1.21	11.15	N/A	27.00	N/A	22.39	150
105.850000	16.30	1.21	11.19	N/A	28.70	N/A	27.23	150
106.350000	16.24	1.22	11.24	N/A	28.70	N/A	27.23	150
107.100000	16.27	1.22	11.31	N/A	28.80	N/A	27.54	150
107.850000	14.60	1.21	11.39	N/A	27.20	N/A	22.91	150
108.350000	15.06	1.20	11.44	N/A	27.70	N/A	24.27	150
108.600000	14.55	1.19	11.46	N/A	27.20	N/A	22.91	150
109.100000	14.31	1.18	11.51	N/A	27.00	N/A	22.39	150
109.600000	14.57	1.17	11.56	N/A	27.30	N/A	23.17	150
110.250000	11.29	1.16	11.65	N/A	24.10	N/A	16.03	150
110.600000	14.00	1.18	11.72	N/A	26.90	N/A	22.13	150
111.000000	10.90	1.20	11.80	N/A	23.90	N/A	15.67	150
111.600000	13.66	1.24	11.80	N/A	26.70	N/A	21.63	150
112.100000	12.12	1.27	11.81	N/A	25.20	N/A	18.20	150
112.850000	12.49	1.32	11.89	N/A	25.70	N/A	19.28	150
113.150000	11.64	1.34	11.92	N/A	24.90	N/A	17.58	150
113.600000	12.10	1.34	11.96	N/A	25.40	N/A	18.62	150
114.150000	11.04	1.34	12.02	N/A	24.40	N/A	16.60	150
114.650000	10.28	1.35	12.07	N/A	23.70	N/A	15.31	150
127.400000	10.14	1.36	12.40	N/A	23.90	N/A	15.67	150
128.900000	10.54	1.36	12.40	N/A	24.30	N/A	16.41	150
129.400000	10.95	1.35	12.40	N/A	24.70	N/A	17.18	150
130.150000	11.77	1.33	12.40	N/A	25.50	N/A	18.84	150
130.400000	11.07	1.33	12.40	N/A	24.80	N/A	17.38	150
131.150000	12.18	1.32	12.40	N/A	25.90	N/A	19.72	150

Frequency (MHz)	Meas Rx (dBuV)	Cable Loss (dB)	Antenna Fact (dB/m)	Pre-amp (dB)	Field Strength (dBuV/m)	Extrap Fact	Field Strength (uV/m)	Limit (uV/m)
133.200000	11.47	1.33	12.40	N/A	25.20	N/A	18.20	150
134.650000	11.86	1.34	12.40	N/A	25.60	N/A	19.05	150
137.900000	11.13	1.37	12.30	N/A	24.80	N/A	17.38	150
138.400000	11.62	1.38	12.30	N/A	25.30	N/A	18.41	150
138.900000	11.60	1.4	12.30	N/A	25.30	N/A	18.41	150
139.400000	11.49	1.41	12.30	N/A	25.20	N/A	18.20	150
140.950000	11.36	1.43	12.21	N/A	25.00	N/A	17.78	150
142.200000	11.17	1.45	12.28	N/A	24.90	N/A	17.58	150
142.950000	10.83	1.46	12.21	N/A	24.50	N/A	16.79	100
144.700000	10.87	1.44	11.89	N/A	24.20	N/A	16.22	100
145.450000	11.01	1.43	11.76	N/A	24.20	N/A	16.22	100
148.200000	10.73	1.47	11.50	N/A	23.70	N/A	15.31	100

There were no further emissions within 20dB 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 15.209 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:

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

- (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 C63.10:2003
Frequency range	150kHz to 30MHz
EUT sample number	S01
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Photographs (Appendix E)	2

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	No Significant emissions within 20dB of the Limit					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 20dB of the Limit					Pass

Specification limits:

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

Conducted disturbance at the mains ports shall be no more than the following values.

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

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

Notes:

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

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

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

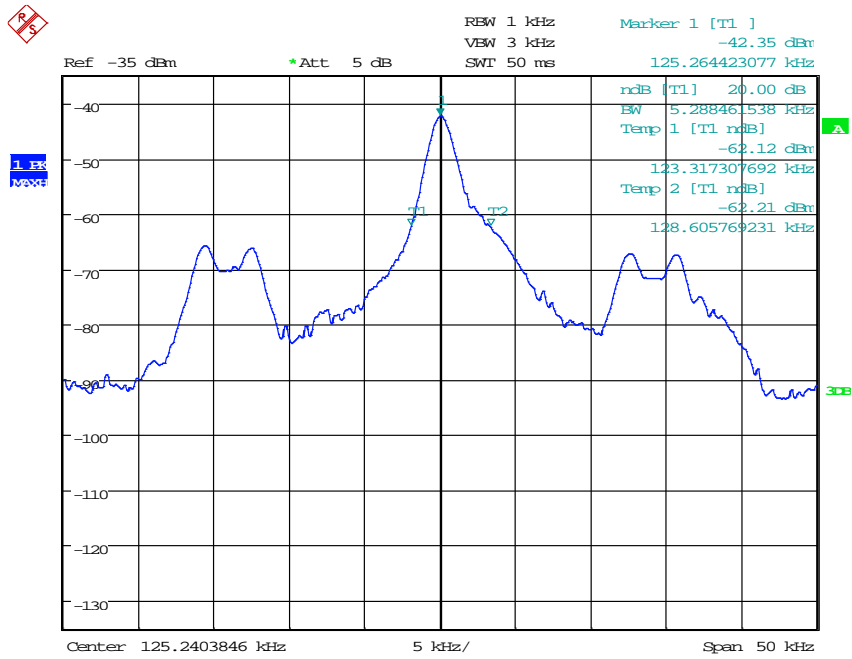
Appendix B:**Supporting Graphical Data**

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.

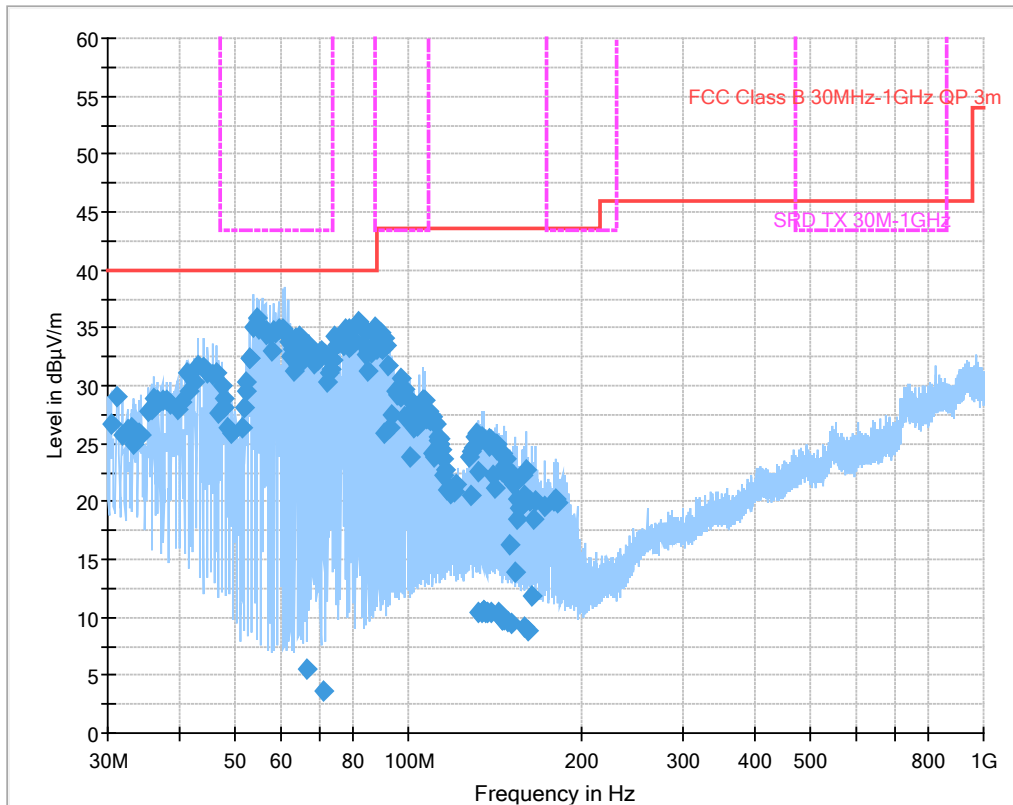
20dB Bandwidth



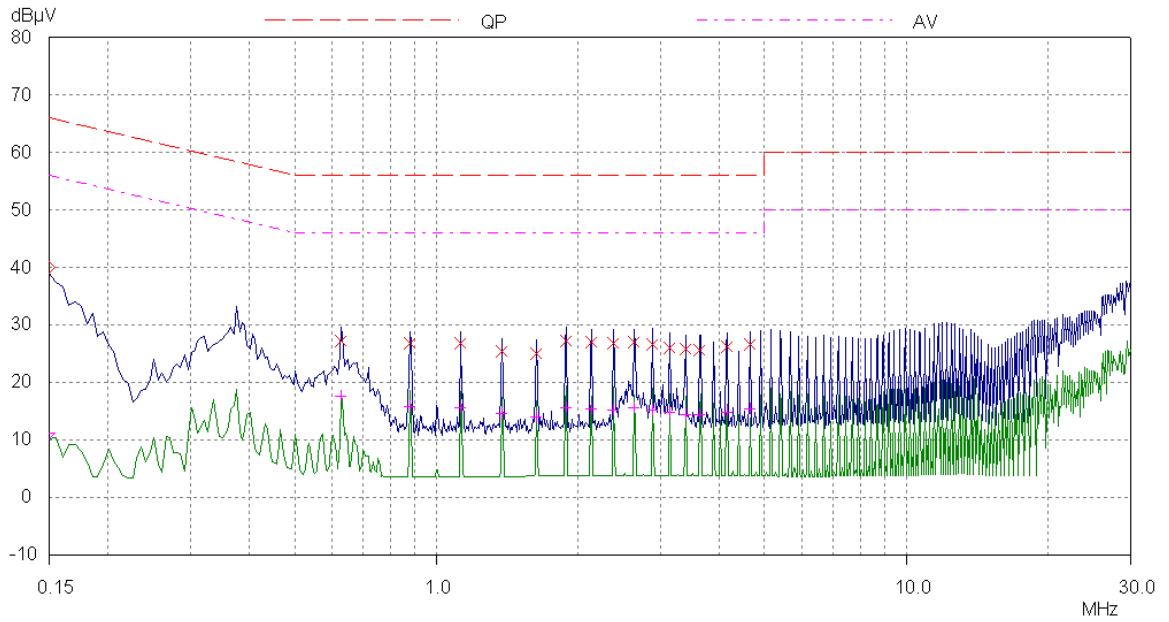
Date: 1.NOV.2013 14:43:42

Radiated spurious emissions 30 MHz to 1 GHz

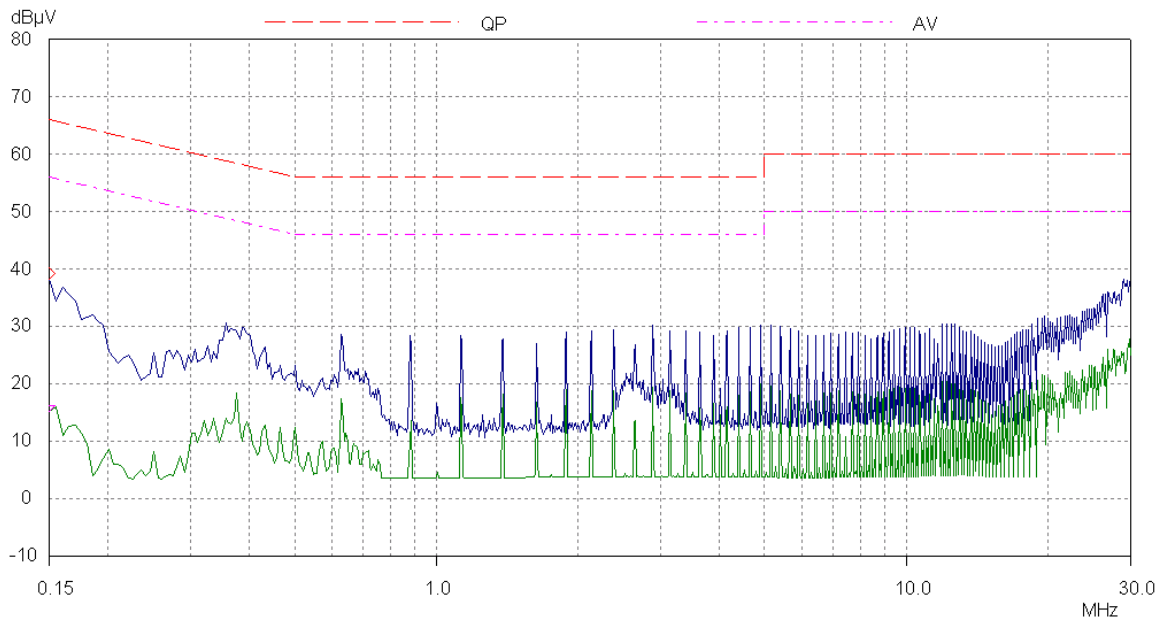
FCC RE Class B 30MHz-1GHz ESVS20 + UH191



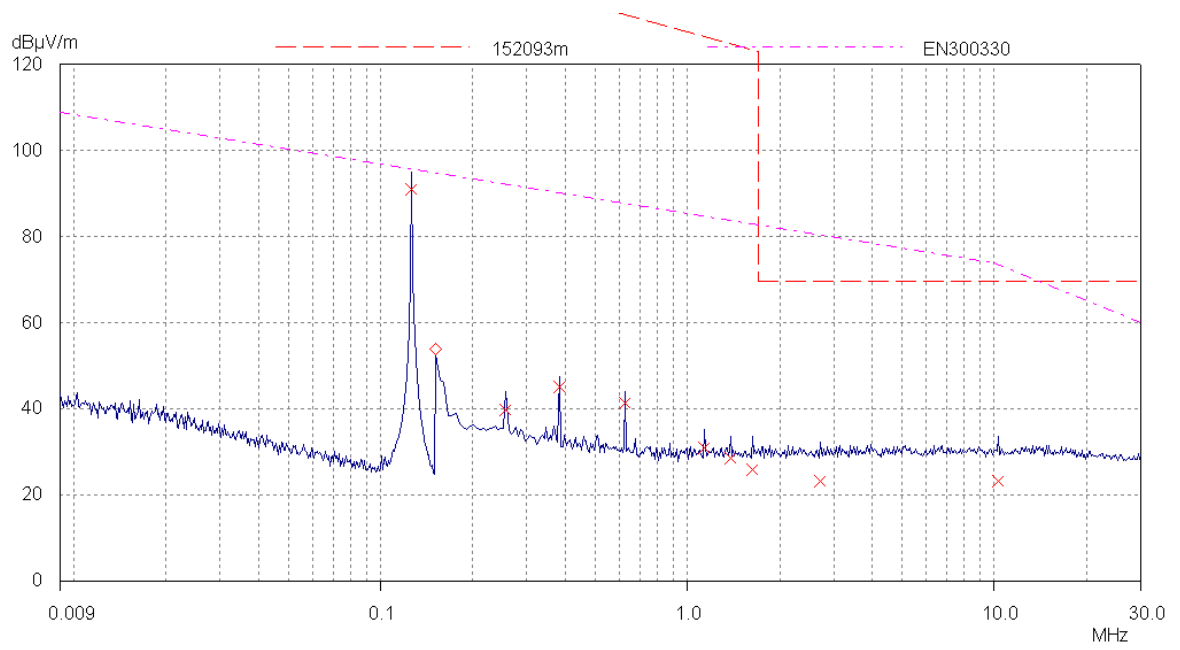
Powerline Conducted Emissions – Live



Powerline Conducted Emissions – Neutral



Radiated spurious emissions 9KHz to 30MHz



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 its 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
S01	S680	None

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 actively transmitting

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 : S05

Port	Description of Cable Attached	Cable length	Equipment Connected
Power	Shielded power cable	1m	Power supply

C5 Details of Equipment Used

Ref	Type	Description	Manufacturer	Date Calibrated
REF940	ATS	Ferrite Lined Chamber	Rainford EMC	09/07/2013
TRL007	HFH2	Loop Antenna	R&S	17/10/2013
UH191	CBL611/A	Bilog Antenna	Chase	13/12/2012
UH281	FSU46	Spectrum Analyser	R&S	06/03/2013
REF976	3440A	Multimeter	Agilent	26/04/2013
UH004	ESVS10	E-field Receiver	R&S	11/02/2013
UH003	ESHS10	H-field Receiver	R&S	08/05/2013

Appendix D:

Additional Information

No additional information is included within this test report.

Appendix E:

Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement
2. Radiated H-field emissions arrangement
3. AC Powerline conducted emissions setup

Photograph 1



Photograph 2



Photograph 3



