

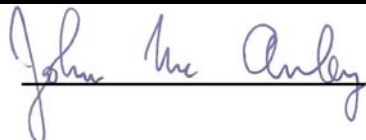


Confidential Report

Client: Schrader Electronics Ltd 11 Technology Park Belfast Road Antrim Northern Ireland BT41 1QS <u>Att: James Kyle</u>	Test of: CRMJ1939 Receiver To: FCC CFR 47 Part 15 RSS Gen
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FCC Site Registration: 92592
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REPORT REF:	15E5408-2	TESTED BY:	M Kirby
DATE RECEIVED:	7th Jan 2015	REPORT BY:	M Kirby
ISSUE DATE:	6th Feb 2015	APPROVED SIGNATORY:	J McAuley
		JOB TITLE:	Technical Manager
		SIGNATURE:	

Executive Summary

Emissions Testing performed according to FCC Part 15

Result:	Test standard referenced:	Test Title
Complied	FCC Part 15.109	Radiated Emissions
Complied	RSS Gen,	Radiated Emissions

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Appendix A: Test Equipment Used

1 Equipment Under Test (EUT)

1.1 Identification of EUT

1.2

FCCID:	MRXCRMJ1939
Manufacturer:	Schrader Electronics Ltd
Model Name or Number:	CRMJ1939
Power Supply Requirement:	24 V Battery

1.2 Description of E.U.T.

The EUT purpose is to receive data from Schrader tyre sensors over a radio link and to relay this data onto a controller over CAN link.

1.3 Modifications

There were no modifications on the EUT

1.4 Date of Test

The tests were carried out on dates of the 8th and 9th January 2015.

2 Test Specification, Methods and Procedures

2.1 Emissions

Emissions were assessed to the following standards:

FCC CFR 47 Part 15.109
Federal Communications Commission: Part 15 Radio Frequency Devices
Radiated Emissions Limits

RSS Gen Issue 4 — General Requirements and Information for the Certification of Radio Apparatus

ANSI C63.4-2014
"Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

3 Deviations and Exclusions from the Test Specifications

3.1 Deviations

There were no deviations from the test specification.

3.2 Exclusions

There were no exclusions from the test specification.

4 Operation of E.U.T. During Testing

4.1 Operating Environment

The EUT was powered using a 24 Volt battery.

4.2 Operating Mode:

The EUT was connected to a laptop via a CAN connection and a Schrader tyre sensor (TMS truck sensor) provided pulses to the EUT over radio link. .

Note the laptop was used solely to exercise the EUT and in normal operation, the EUT would not connect to or exchange data with a laptop.

5 Results

5.1 Radiated Emissions

Compliant measurements of radiated emissions were carried out in a 10 metre anechoic chamber from 30 MHz to 6 GHz. The equipment and cable orientation were investigated to ensure that maximum emissions were obtained at critical frequencies.

The receiver bandwidth was set to 120 kHz for frequencies between 30 MHz and 1 GHz.

For frequencies between 1GHz and 6 GHz, the resolution bandwidth was 1MHz and video bandwidth was 1MHz. for peak measurements. The Video bandwidth was changed to 10Hz for Average measurements (as per ANSI 63.4-2014 Section 4.2.3 e) .

5.2.1 Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for the radiated emissions test was ± 5.3 dB (from 30 to 100 MHz), ± 4.7 dB (from 100 to 300 MHz), ± 3.9 dB (from 300 to 1000 MHz) and ± 3.8 dB (from 1 to 12.75 GHz).

5.3 Radiated Emissions

Exploratory radiated emissions were carried out to determine the orientation that maximised the emissions.

Final radiated emissions measurements were carried out on the EUT in the orientation determined from the exploratory measurements.

For the spurious and harmonics measurements, below 1000 MHz, the EUT was set up at a 3 metre distance from the receiving antenna, in a semi Anechoic Chamber, with the EUT running in a receive mode. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the emissions.

For measurements above 1000MHz, the EUT was set up at a 3 metre distance from the antenna, in a fully anechoic chamber, with the EUT running in receive mode. The EUT was rotated 360 degrees azimuth in order to maximize the emissions.

Significant peaks from the EUT were then recorded to determine margin to the limits.

Results

Frequency MHz	Quasi Peak Level dBuV/m	Antenna Polarity	Antenna Factor dB	Cable loss dB	Final Field Strength Quasi Peak dBuV/m	Quasi Peak Limit dBuV/m	Margin dB
433.989	5.7	Vertical	16.1	1.2	23	46.0	23.0
658.344	-3.89	Vertical	19.8	1.2	17.11	46.0	28.9
685.293	-3.96	Vertical	20.1	1.2	17.34	46.0	28.7
884.968	-6.06	Vertical	22	1.4	17.34	46.0	28.7
728.781	-3.61	Horizontal	21.4	1.4	19.19	46.0	26.8
823.106	-5.17	Horizontal	22.2	1.4	18.43	46.0	27.6
886.193	-0.17	Horizontal	22	1.4	23.23	46.0	22.8

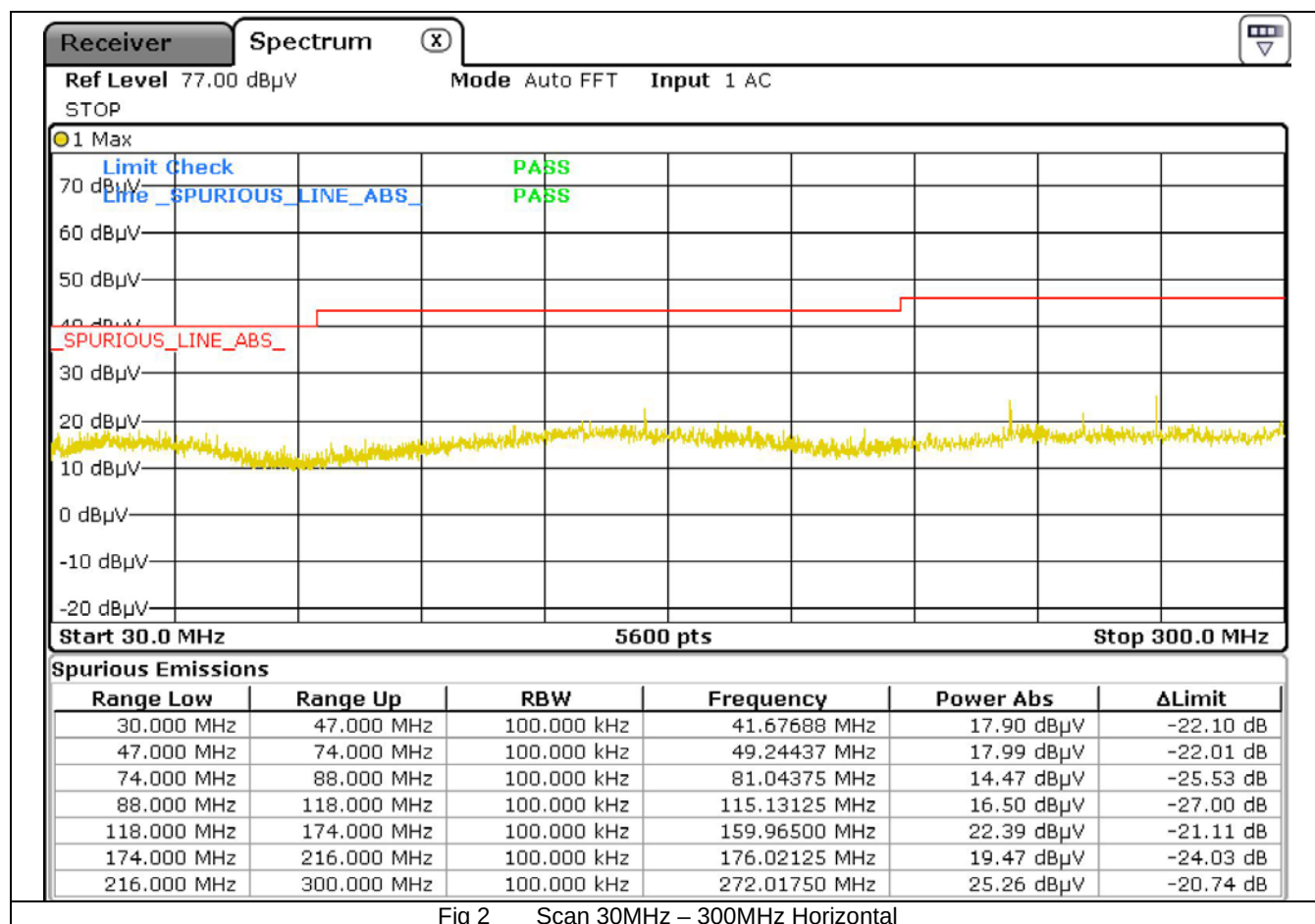
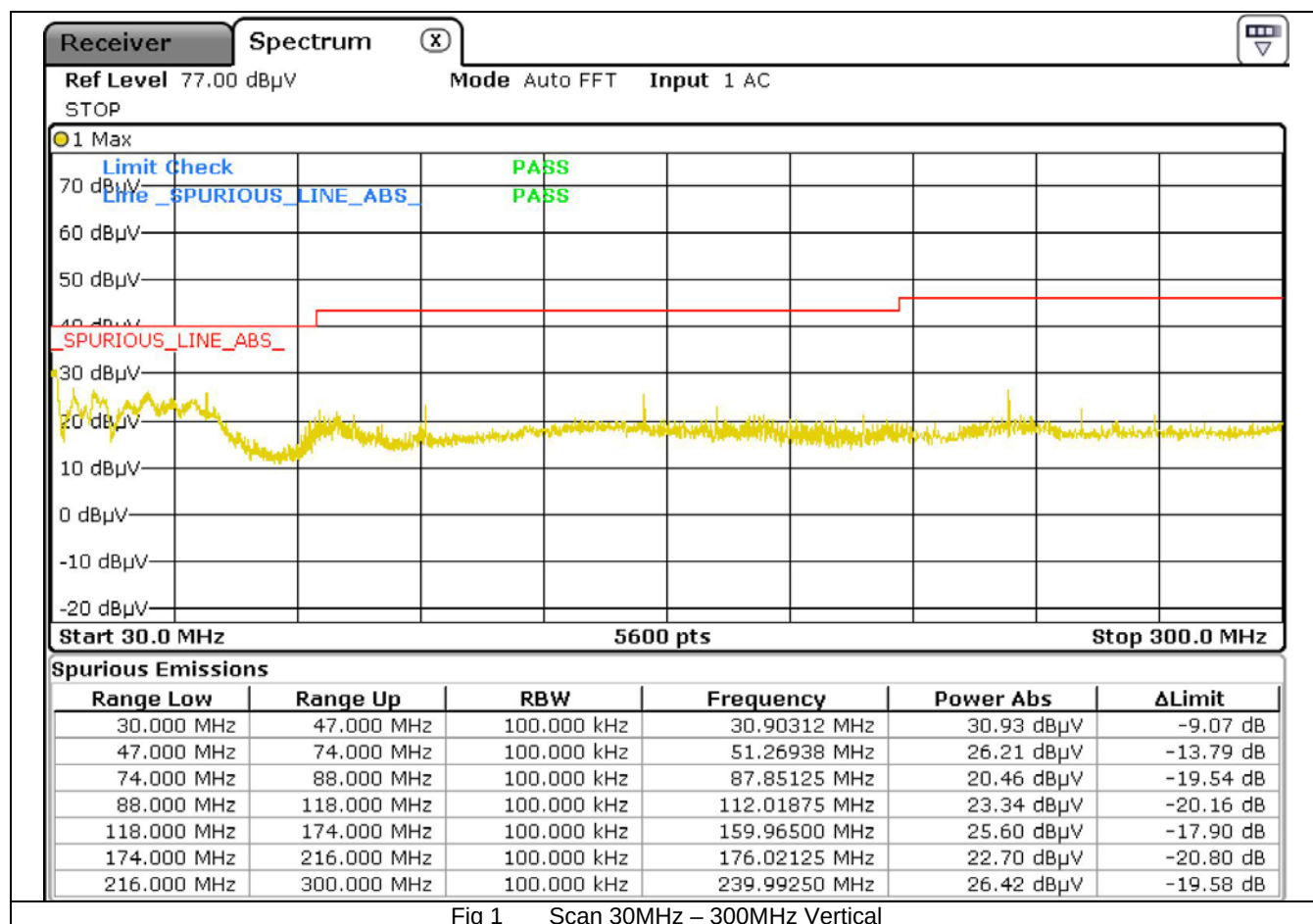
Table 1 Results for spurious emissions below 1 GHz (3 metre)

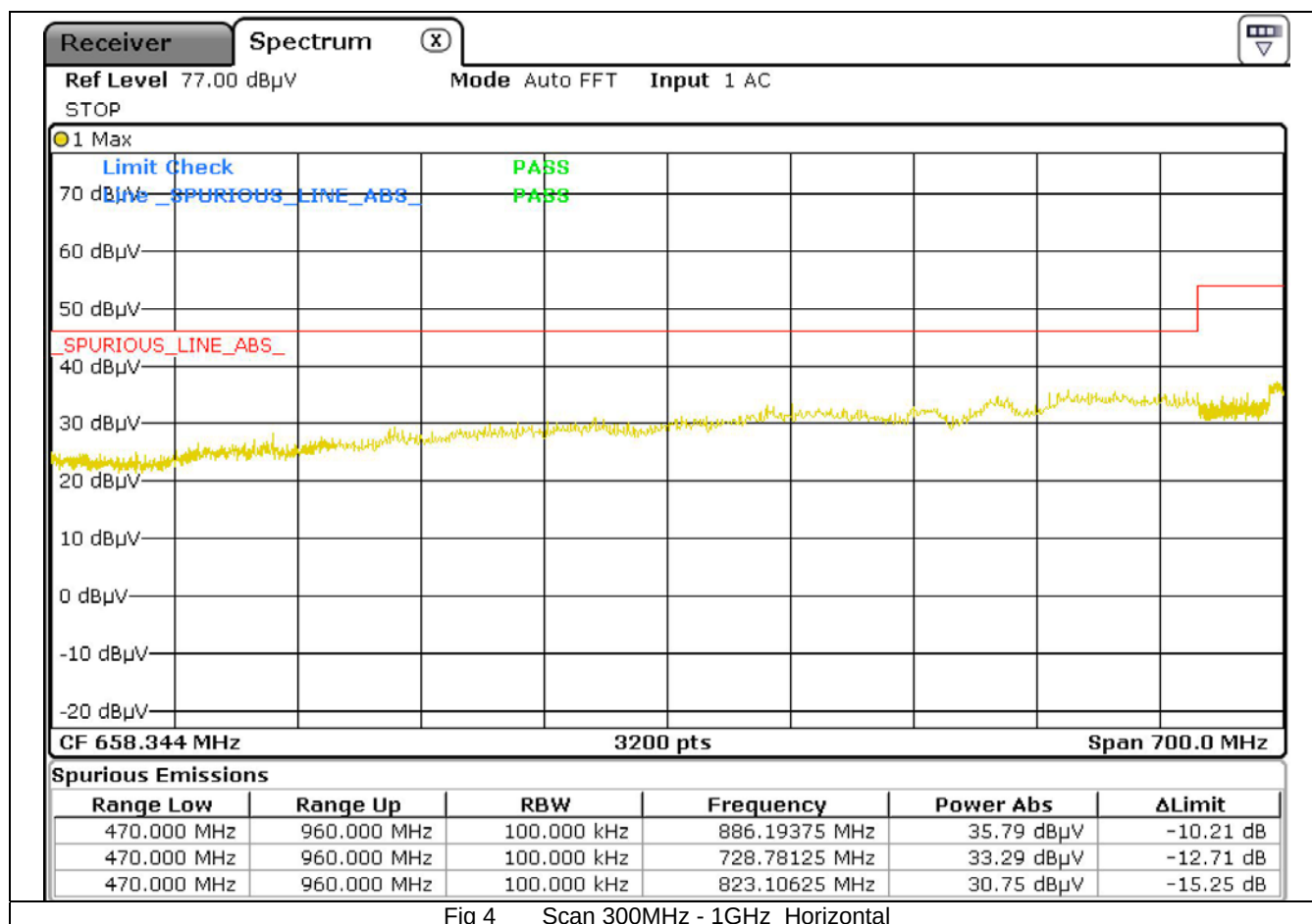
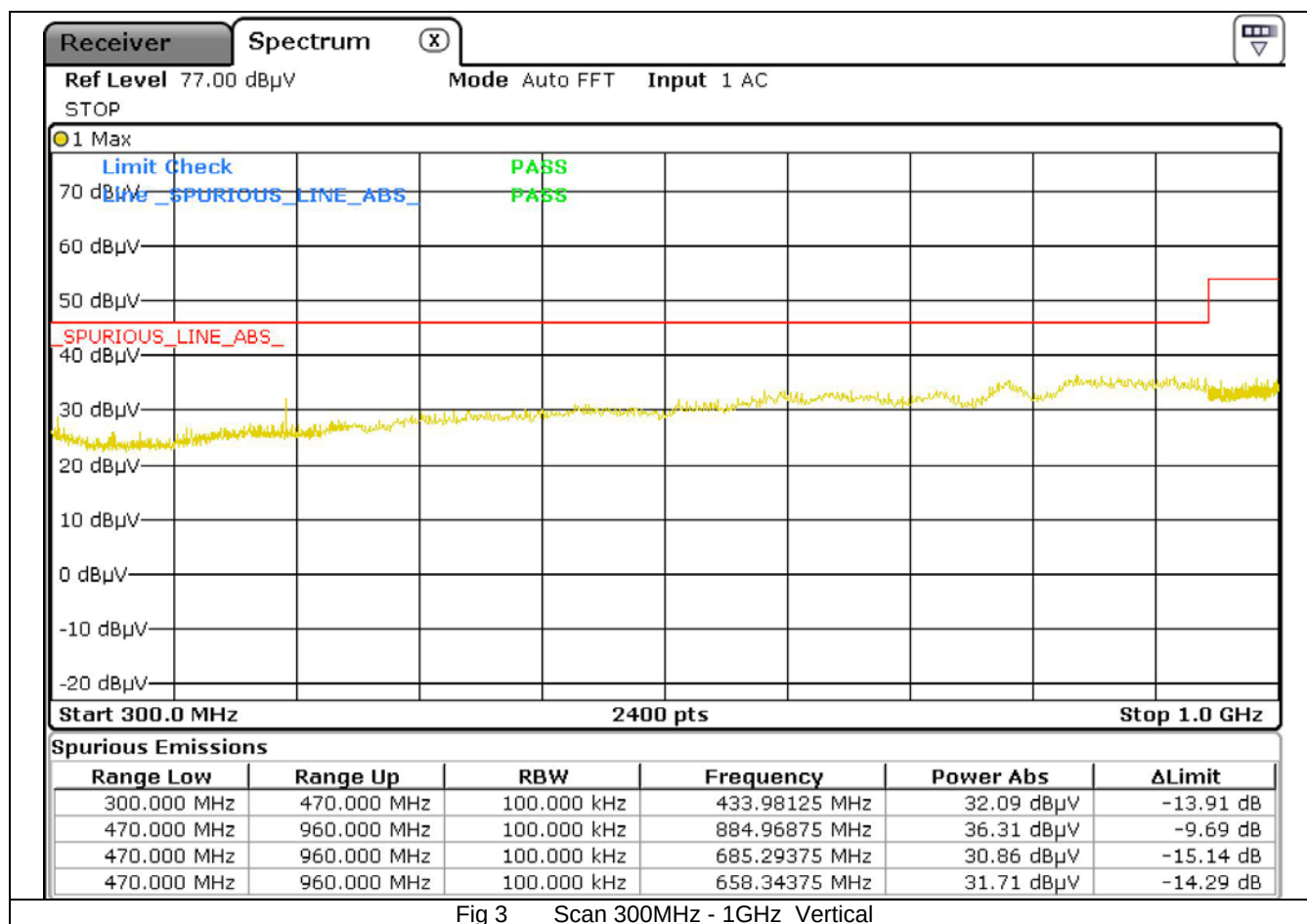
Frequency	Measured Peak Level	Antenna Factor	Preamplifier Gain	Cable Loss	Antenna Polarity	Final Peak Level	Average Limit+20dB	Margin
GHz	dBuV/m	dB	dB	dB		dBuV/m	dBuV/m	dB
2.114	42.2	28	39	3.2	Vertical	50.0	74.0	23.9
3.058	47.4	30.6	39.3	4.1	Vertical	52.0	74.0	22.0
3.843	53.7	30.6	37.7	4.6	Vertical	56.2	74.0	17.8
2.113	43.4	28	39	3.2	Horizontal	51.2	74.0	22.8
2.931	46.6	29.4	38.3	3.6	Horizontal	51.9	74.0	22.1
3.838	52.3	30.6	37.7	4.6	Horizontal	54.8	74.0	19.2

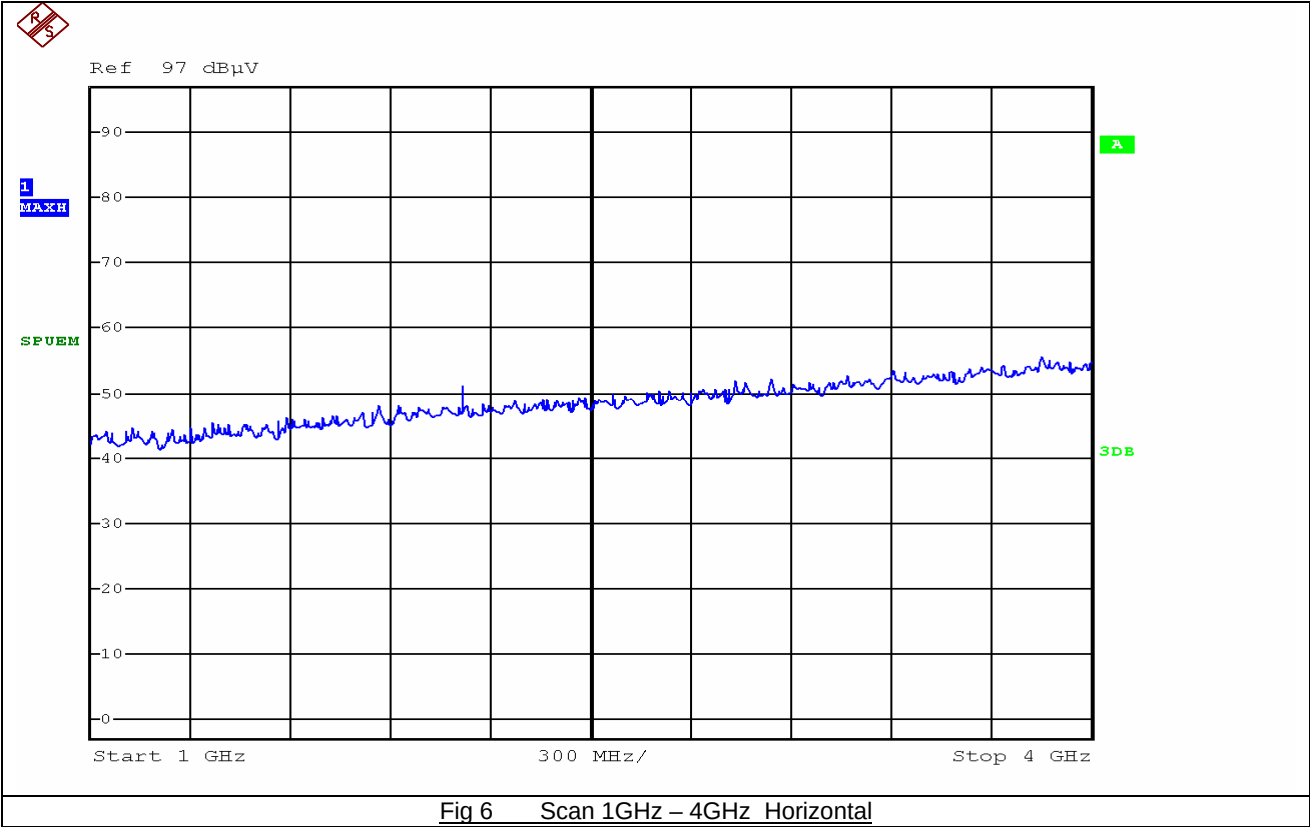
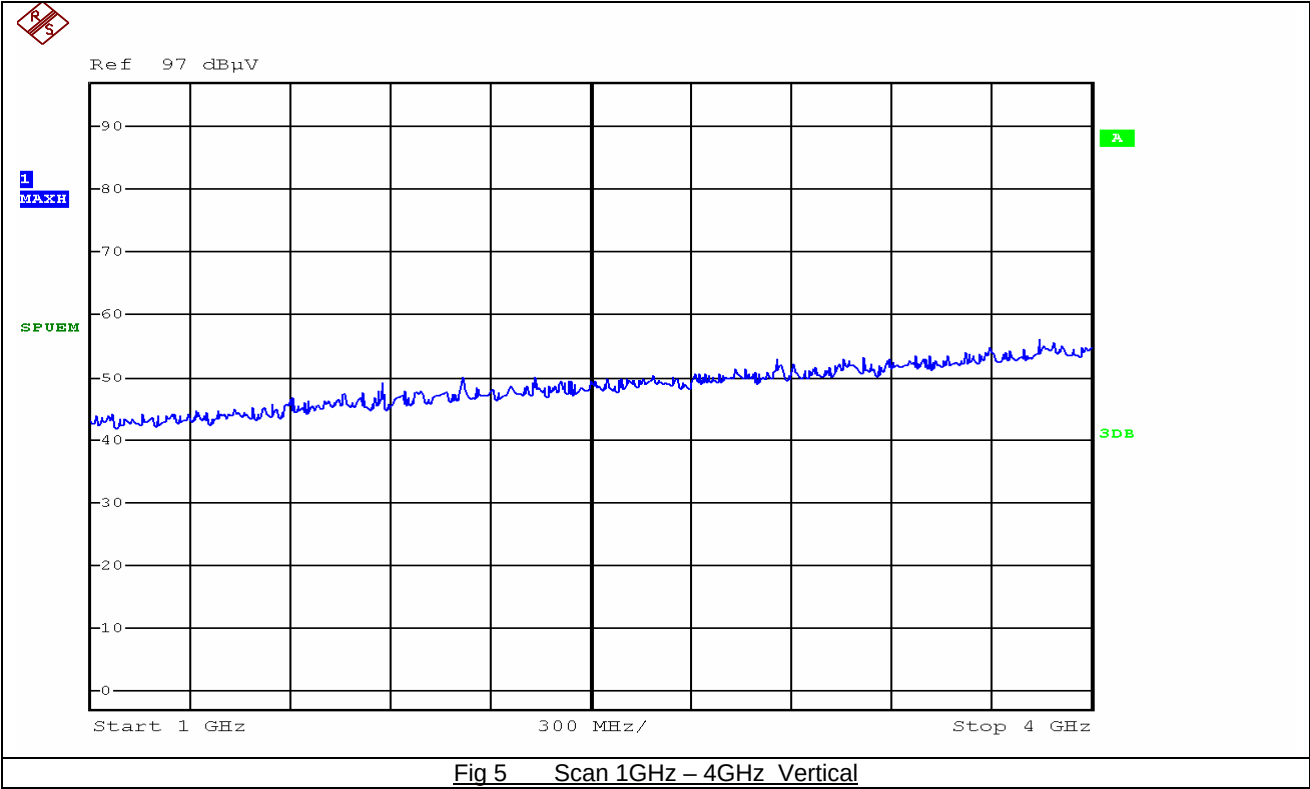
Frequency	Measured Average Level	Antenna Factor	Preamplifier Gain	Cable Loss	Antenna Polarity	Final Average Level	Average Limit	Margin
GHz	dBuV/m	dB	dB	dB		dBuV/m	dBuV/m	dB
2.114	32.5	28	39	3.2	Vertical	40.3	54.0	13.7
3.058	34.8	30.6	39.3	4.1	Vertical	39.4	54.0	14.6
3.843	40.3	30.6	37.7	4.6	Vertical	42.8	54.0	11.2
2.113	32.6	28	39	3.2	Horizontal	40.4	54.0	13.6
2.931	33.3	29.4	38.3	3.6	Horizontal	38.6	54.0	15.4
3.838	40.2	30.6	37.7	4.6	Horizontal	42.7	54.0	11.3

Table 2 Results for spurious emissions above 1 GHz (3 metre)

The plots are shown on the following pages.







6 Analysis of Test Results, Conclusions

6.1 Measurement Uncertainties

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4 with a confidence level of 95%.

6.2 Radiated Emissions to FCC Part 15, Class B

The E.U.T. complied with the radiated emission specification.

Appendix A
Test Equipment Used:

Instrument	Mftr.	Model	CEI Ref No.	Cal Due Date
Preamplifier	Hewlett Packard	83017A	805	19/09/2015
Spectrum Analyser	Rohde & Schwarz	FSP 40	850	14/08/2015
Spectrum Analyser/Receiver	Rohde & Schwarz	ESR	869	06/06/2017
Antenna Trilog	Schwarzbeck	VULB 9160	889	29/07/2017
Anechoic Chamber	CEI	10M	845	23/09/2015
Antenna Log Periodic	Chase	UPA6108	609	11/09/2015
Horn Antenna	EMCO	3115	655	14/11/2015

Table A1

End of Report