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Project Number: 14E4885-1b

Prepared for:

Controlled Electronic Management Systems Ltd

By

Compliance Engineering Ireland Ltd

Clonross Lane

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Co. Meath

FCC Site Registration: 92592

Industry Canada Assigned Site Code: 8517A-2

FCC ID: QABS610MSCRM

IC: 12009A-S610MSCRM

Date

4 Sept 2014

FCC EQUIPMENT AUTHORISATION

Test Report

EUT Description

RFID Reader module

Authorised :

John McAuley

A handwritten signature in blue ink, appearing to read 'John McAuley', written over a horizontal line.

TEST SUMMARY

Emissions were assessed to the following standards:

FCC CFR 47 Part 15

Federal Communications Commission: Part 15 Radio Frequency Devices

The equipment complies with the requirements according to the following standards.

FCC Part Section(s)	RSS-210 Section	TEST PARAMETERS	Test Result
15.203		Antenna Requirement	Pass
15.225	RSS210 A2.6	Spectrum Mask	Pass
15.225(d), 15.209	RSS Gen 7.2.5	Limit outside band 13.11-14.01MHz	Pass
15.225e	RSS210 A2.6	Frequency Stability	Pass
15.207	RSS Gen 7.2.4	Conducted Emissions	Pass
	RSS210 A4.6	Occupied Bandwidth	Pass

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF COMPLIANCE ENGINEERING IRELAND LTD

Exhibit A – Technical Report

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1.0 EUT Description

Model:	S610MSCRM
Type:	RFID reader module
FCC ID:	QABS610MSCRM
Company:	Controlled Electronic Management Systems Ltd
Contact	Ewan Peyton
Address:	195 Airport Road West, Belfast, Co Antrim, UK, BT3 9ED
Phone:	+44 28 90788026
e-mail:	ewpeyton@tycoint.com
Test Standards:	47 CFR, Part 15.225
Type of radio:	Stand-alone
Transmitter Type:	AM
Operating Frequency Range(s):	13.56MHz
Number of Channels:	1
Antenna:	Integral
Power configuration:	12 v dc
Oper. Temp Range:	5° C to +35° C
Classification:	DXX
Test Methodology:	Measurements performed according to the procedures in ANSI C63.4-2009

1.1 EUT Operation

Operating Conditions during Test:

The equipment under test was operated during the measurement under the following conditions:

The EUT was powered from a 12v dc mains adapter.

The module was operated in normal modulated mode for all tests. In this mode the EUT transmitted with duty cycle with Ton of 15.7mS and Period of 98.9 mS.

Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: +15 to +35 ° C

Humidity: 20-75 %

1.2 Modifications

No modifications were required in order to pass the test specifications.

1.3 Date of Test

The tests were carried out on one sample of the EUT on the 5th June 2014.

1.4 Electromagnetic Emissions Testing

The guidelines of CISPR 16-4 were used for all uncertainty calculations, estimates and expressions thereof for EMC testing. A copy of Compliance Engineering Ireland Ltd.'s policy for EMC Measurement Uncertainty is available on request.

RF Requirements: Spurious emissions in accordance with FCC CFR 15.107, 15.109 and 15.209. Tests were carried out to the requirements of CISPR 16-4 and ANSI C63.4-2003.

1.4.1 Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for the conducted emissions test was ± 3.5 dB.

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 GHz to 40 GHz).

2.0 Emissions Measurements

2.1 Conducted Emissions Measurements

The EUT was connected to the mains through a LISN and measurements were carried out using a Receiver over the frequency range 150KHz to 30MHz.

2.2 Radiated Emissions Measurements

Radiated Power measurements were made at the Compliance Engineering Ireland Ltd anechoic chamber located in Dunshaughlin, Co. Meath, Ireland to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

The EUT was connected to an AC2000 system comprising of a laptop running AC2000 firmware and a network switch / serial to Ethernet converter for communication to EUT. A Magnetic lock and Door simulator to mimic signals were also connected to the EUT to prove full functionality and simulate a complete system setup.

The EUT was centred on a motorized turntable, which allows 360 degree rotation. A measurement antenna was positioned at a distance of 3 metres as measured from the closest point of the EUT. The radiated emissions were maximised by configuring the EUT, by rotating the EUT and by raising and lowering the antenna from 1 to 4 meters.

Emissions below 30MHz were measured using a loop antenna. In this case the resolution bandwidth was 200Hz for frequencies below 150KHz and RBW was 9KHz for frequencies above 150KHz.

Emissions between 30MHz and 1GHz were measured using a bi-log antenna. In this case the resolution bandwidth was 100KHz.

Antenna Requirements

According to FCC 47 CFR 15.203:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

* The antennas of this E.U.T are permanently attached.

*The E.U.T Complies with the requirement of 15.203

3.0 Results for Conducted emissions

Mains Conducted Emissions results

Detector	Frequency MHz	Reading dBuV	Margin dB	Phase
Quasi-Peak	0.197	57.81	-6.84	Live
Average	0.197	42.26	-12.39	Live
Quasi-Peak	0.256	51.21	-11.77	Live
Average	0.339	36.81	-13.79	Live
Quasi-Peak	0.438	44.79	-12.98	Live
Average	0.512	35.37	-10.63	Live
Quasi-Peak	13.560	46.68	-13.32	Live

Detector	Frequency MHz	Reading dBuV	Margin dB	Phase
Quasi-Peak	0.197	56.50	-8.15	Neutral
Average	0.197	40.32	-14.33	Neutral
Quasi-Peak	0.258	49.69	-13.22	Neutral
Quasi-Peak	0.454	40.33	-16.99	Neutral
Quasi-Peak	13.560	47.29	-12.71	Neutral
Average	18.490	34.80	-15.2	Neutral

Ref Appendix 2 for scans

Result: Pass

4.0 Results for Radiated emissions

4.1 Carrier Power

Frequency	Level	Antenna Factor	Cable Loss	Final Field Strength	Detector	Average Limit +20 dB	Margin	Pass / Fail
MHz	dBuV	dB	dB	dBuV/m		dBuV/m	dB	P/F
13.56	68.25	8.25	0.1	76.6	Peak	144	67.4	Pass

Frequency	Level	Antenna Factor	Cable Loss	Detector	Duty Cycle Correction Factor	Final Field Strength Average	Emission Limit	Margin	Pass / Fail
MHz	dBuV	dB	dB		dB	dBuV/m	dBuV/m	dB	P/F
13.56	68.25	8.25	0.1	Peak	-15.99	60.61	124	63.39	Pass

One Period(mS)	Pulse Width (mS)	No of Pulses	Duty Cycle	20 log duty cycle (dB)	Pulse rate Hz
98.947	15.702	1	0.159	-15.99	10.1

Note as the pulse rate (1/period) is less than 20Hz , a peak detector measurement with pulse desensitisation as per 15.35a is used

4.2 Mask

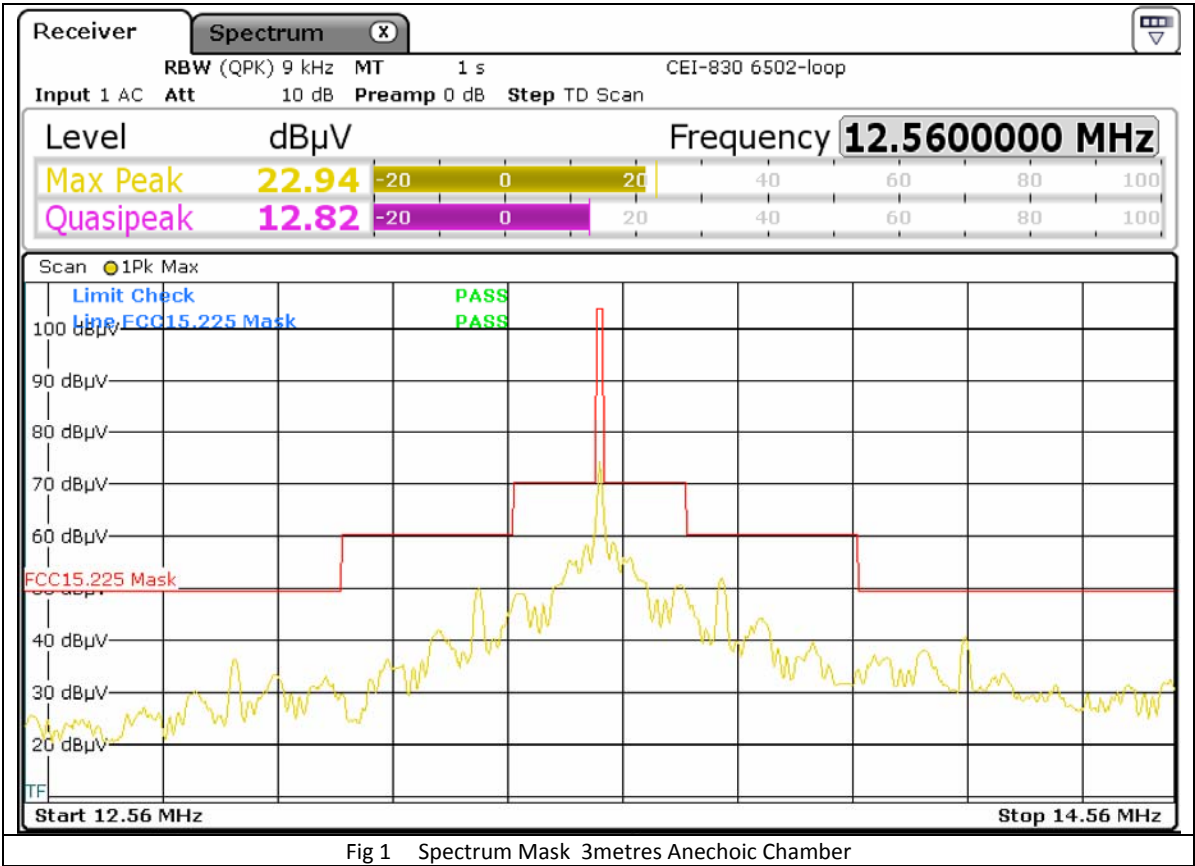
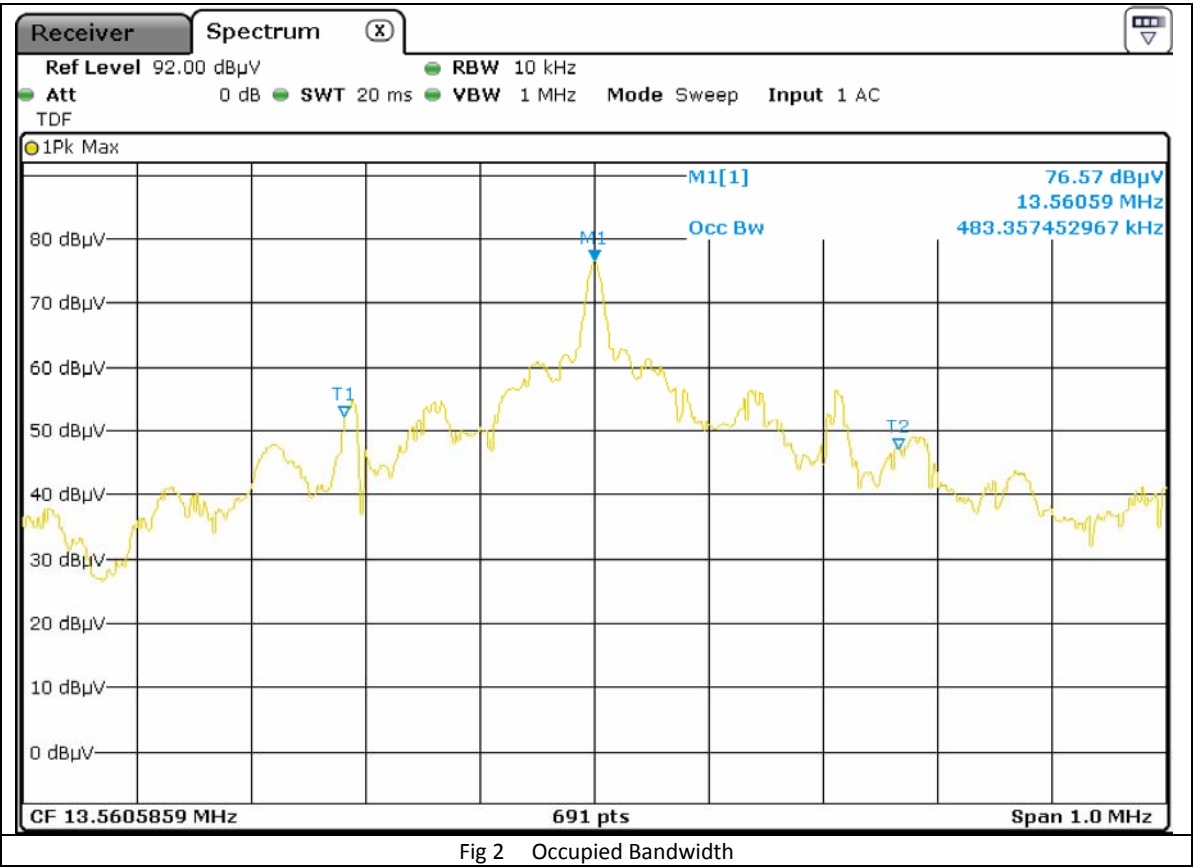


Fig 1 Spectrum Mask 3metres Anechoic Chamber

Test result Pass

4.3 99% Occupied Bandwidth



Occupied Bandwidth = 483.4 KHz

4.4 Frequency Stability Temperature Testing

(e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery

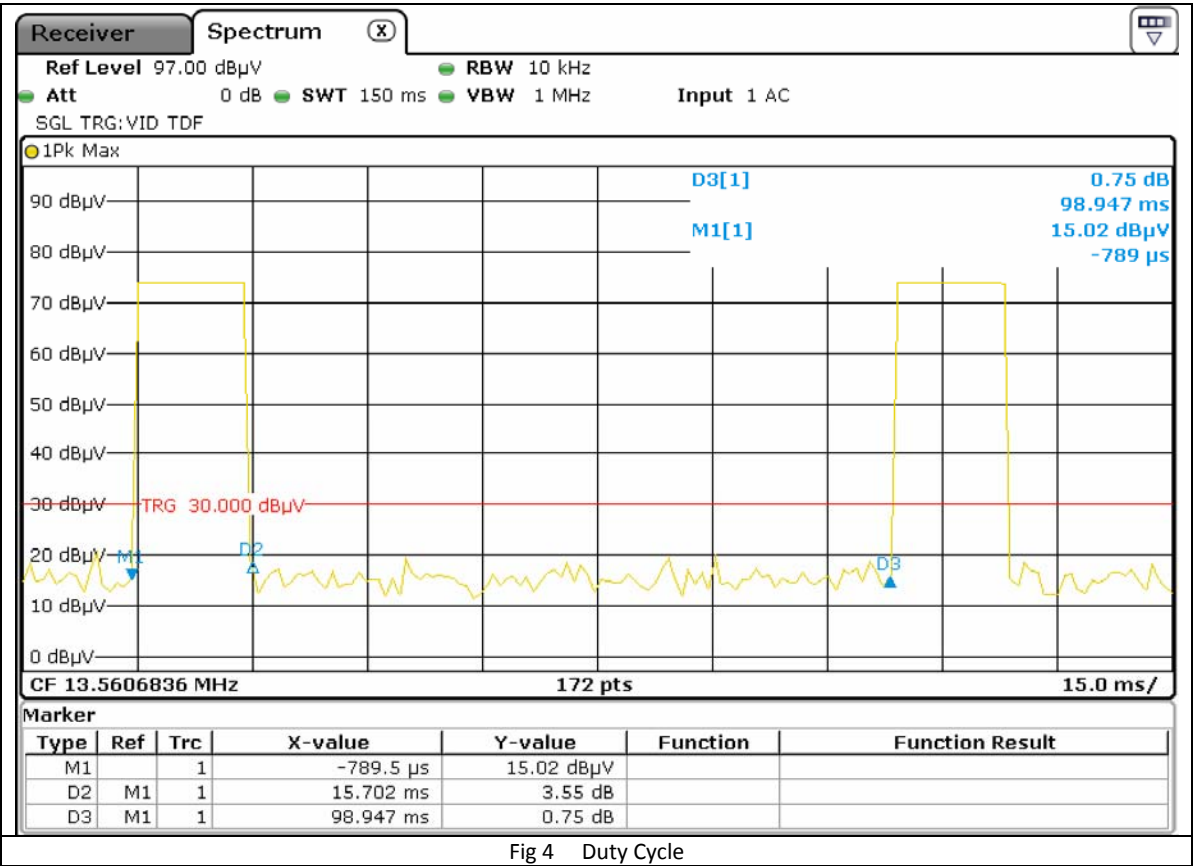
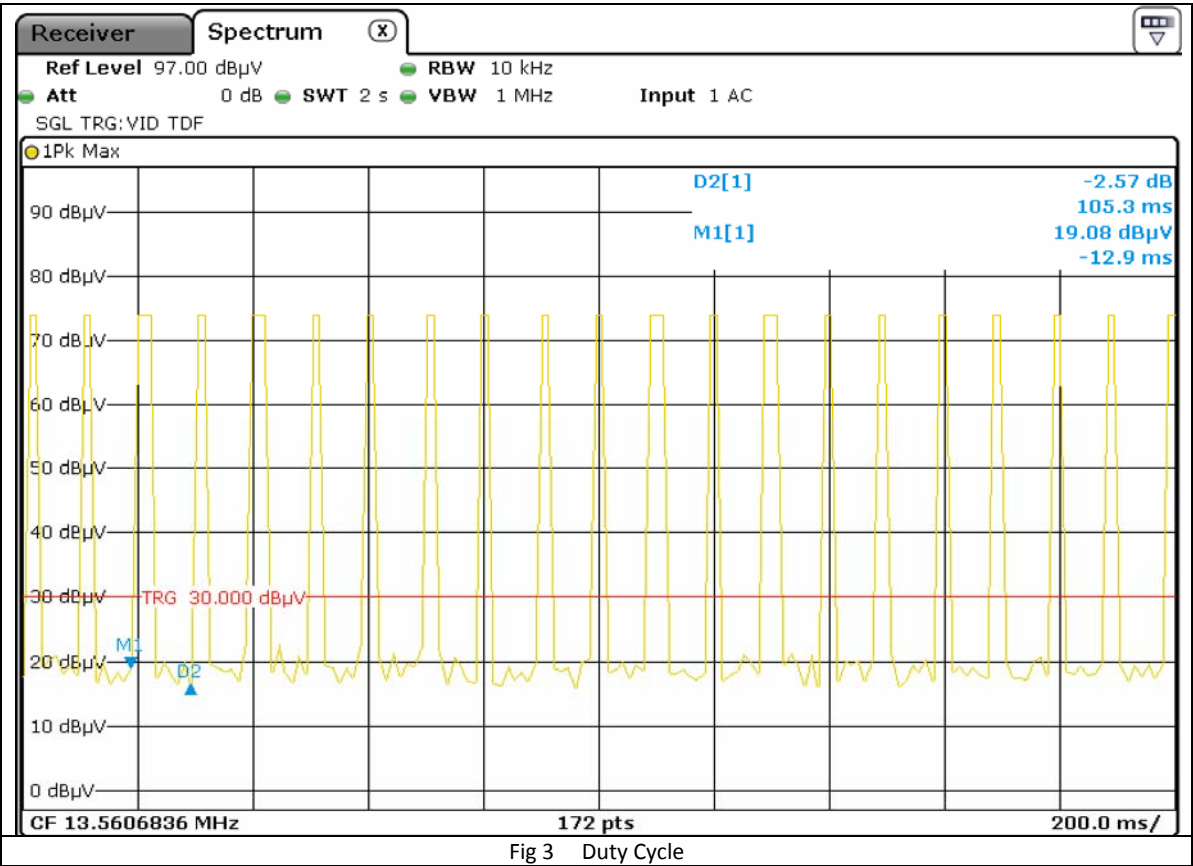
Nominal Frequency 13.560664 MHz

Temp	Supply	Frequency	Variation	Limit	Result
Deg C	V dc	MHz	%	%	
20	10.2	13.56065	-0.00010324	0.01	Pass
20	12	13.560664	0	0.01	Pass
20	13.8	13.560663	-7.37427E-06	0.01	Pass

Temp	Supply	Frequency	Variation	Limit	Result
Deg C	V dc	MHz	%	%	
50	12	13.5606445	-0.000143798	0.01	Pass
40	12	13.5606249	-0.000288334	0.01	Pass
35	12	13.5606445	-0.000143798	0.01	Pass
30	12	13.5606495	-0.000106927	0.01	Pass
20	12	13.560664	0	0.01	Pass
10	12	13.5606835	0.000143798	0.01	Pass
0	12	13.560722	0.000427708	0.01	Pass
-10	12	13.560742	0.000575193	0.01	Pass
-20	12	13.560742	0.000575193	0.01	Pass

Result: Pass

4.5 Duty Cycle



4.6 Spurious Emissions Measurements 9kHz -30MHz

4.6.1 Spurious Emissions which are not harmonics of the fundamental

Frequency	Level	Antenna Factor	Cable Loss	Final Field Strength	Detector	Spurious Emission Limit	Margin	Pass / Fail
MHz	dBuV	dB	dB	dBuV/m		dBuV/m	dB	P/F
0.00975	25.2	13.6	0.1	38.9	Average	127.82	88.92	Pass
0.01285	16.4	13.6	0.1	30	Average	125.43	95.43	Pass
0.0184	23.22	11.78	0.1	35	Average	122.31	87.31	Pass
0.251	51.51	9.49	0.1	61	Average	99.61	38.61	Pass

4.6.2 Spurious Emissions which are harmonics of the fundamental

Frequency	Level	Antenna Factor	Cable Loss	Final Field Strength Peak	Detector	Average Limit +20dB	Margin	Pass / Fail
MHz	dBuV	dB	dB	dBuV/m		dBuV/m	dB	P/F
27.12	14.18	6.32	0.1	20.6	Peak	89.54	68.94	Pass

Frequency	Level	Antenna Factor	Cable Loss	Detector	Duty Cycle Correction Factor	Final Field Strength Average	Spurious Emission Limit	Margin	Pass / Fail
MHz	dBuV	dB	dB		dB	dBuV/m	dBuV/m	dB	P/F
27.12	14.18	6.32	0.1	Peak	-15.99	4.61	69.54	64.93	Pass

One Period(mS)	Pulse Width (mS)	No of Pulses	Duty Cycle	20 log duty cycle (dB)	Pulse rate Hz
98.947	15.702	1	0.159	-15.99	10.1

Note as the pulse rate (1/period) is less than 20Hz , a peak detector measurement with pulse desensitisation as per 15.35a is used

4.7 Measurements with Bilog Antenna (30MHz to 1GHz)

4.7.1 Spurious Emissions which are not harmonics of the fundamental

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
50.01	17.9	Vertical	8.9	0.2	27	40.0	13.0
100.02	20	Vertical	10.7	0.2	30.9	43.5	12.6
150.03	10.4	Vertical	11.4	0.2	22	43.5	21.5
175.03	12.6	Vertical	9.7	0.2	22.5	43.5	21.0
250.05	13.5	Vertical	12.4	0.2	26.1	46.0	19.9
375.06	14.5	Vertical	14.3	1.2	30	46.0	16.0
500.07	17.31	Vertical	17.5	1.2	36.01	46.0	10.0
734.33	-3.4	Vertical	22	1.4	20	46.0	26.0
250.05	13.8	Horizontal	12.4	0.2	26.4	46.0	19.6
325.05	11.1	Horizontal	13.4	1.2	25.7	46.0	20.3
500.07	20.8	Horizontal	17.5	1.2	39.5	46.0	6.5

4.7.2 Spurious Emissions which are harmonics of the fundamental

Frequency MHz	Peak Level dBuV/m	Antenna Polarity	Antenna Factor dB	Cable loss dB	Final Field Strength Peak dBuV/m	Average Limit +20dB	Margin dB
MHz	dBuV/m		dB	dB	dBuV/m	dBuV/m	dB
40.68	25.8	Vertical	14.2	0.2	40.2	60.0	19.8
54.24	24	Vertical	7.2	0.2	31.4	60.0	28.6
67.8	24.5	Vertical	6.1	0.2	30.8	60.0	29.2
40.68	27.6	Horizontal	14.2	0.2	42	60.0	18.0
54.24	7.6	Horizontal	7.2	0.2	15	60.0	45.0
67.8	6.9	Horizontal	6.1	0.2	13.2	60.0	46.8

Frequency	Peak Level	Antenna Polarity	Antenna Factor	Cable loss	Duty Cycle Correction Factor	Final Field Strength Average	Average Limit	Margin
MHz	dBuV/m		dB	dB	dB	dBuV/m	dBuV/m	dB
40.68	25.8	Vertical	14.2	0.2	-15.99	24.21	40.0	15.8
54.24	24	Vertical	7.2	0.2	-15.99	15.41	40.0	24.6
67.8	24.5	Vertical	6.1	0.2	-15.99	14.81	40.0	25.2
40.68	27.6	Horizontal	14.2	0.2	-15.99	26.01	40.0	14.0
54.24	7.6	Horizontal	7.2	0.2	-15.99	-0.99	40.0	41.0
67.8	6.9	Horizontal	6.1	0.2	-15.99	-2.79	40.0	42.8

One Period(mS)	Pulse Width (mS)	No of Pulses	Duty Cycle	20 log duty cycle (dB)	Pulse rate Hz
98.947	15.702	1	0.159	-15.99	10.1

Note as the pulse rate (1/period) is less than 20Hz , a peak detector measurement with pulse desensitisation as per 15.35a is used

Appendix 2 shows the results of the scans in the anechoic chamber.

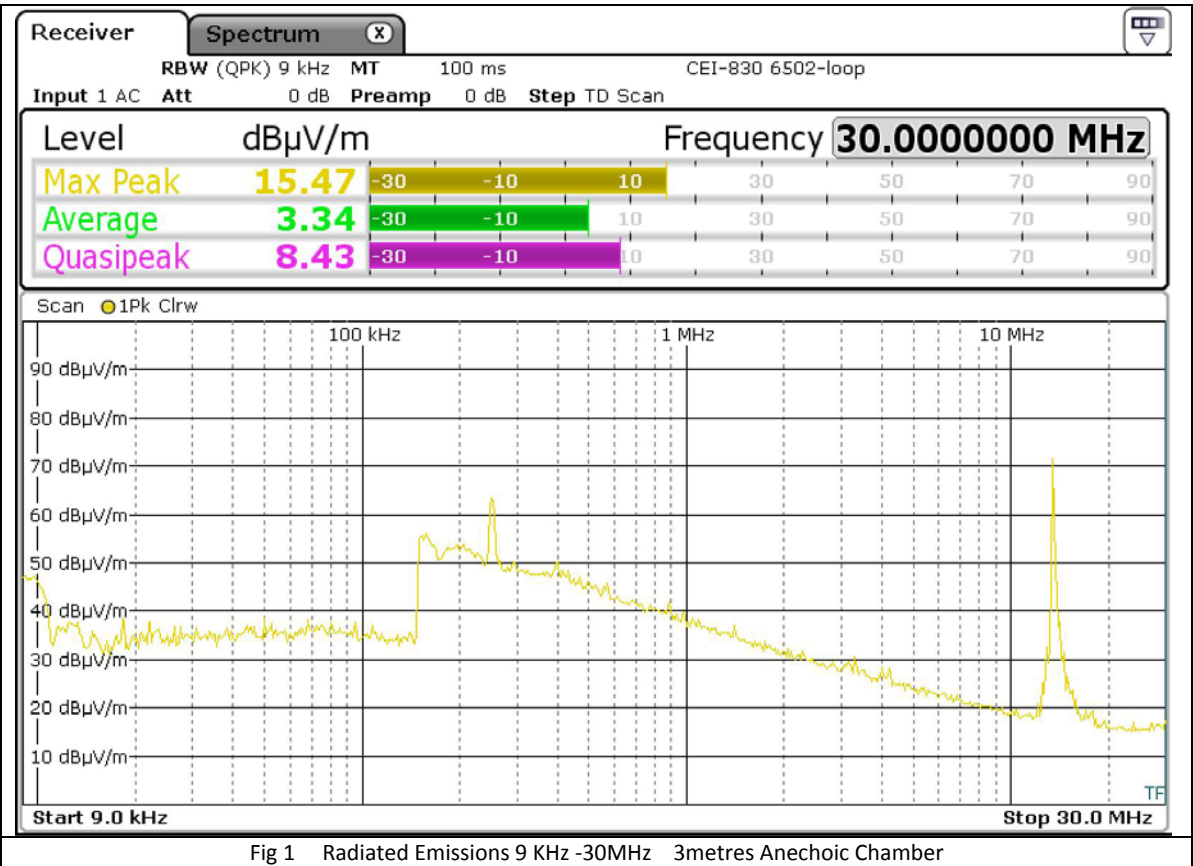
Result: Pass

Appendix 1**List of Test Equipment**

Instrument	Mfr.	Model	CEI Ref No.	Cal Due Date
Bilog Antenna	Chase	CBL 6140	690	03/10/2015
Loop Antenna	EMCO	6502	821	27/08/2016
Spectrum Analyser/Receiver	Rohde & Schwarz	ESR	869	03/06/2015
LISN	Rohde & Schwarz	ESH3-Z5	604	14/12/2015

Appendix 2:

Test Results



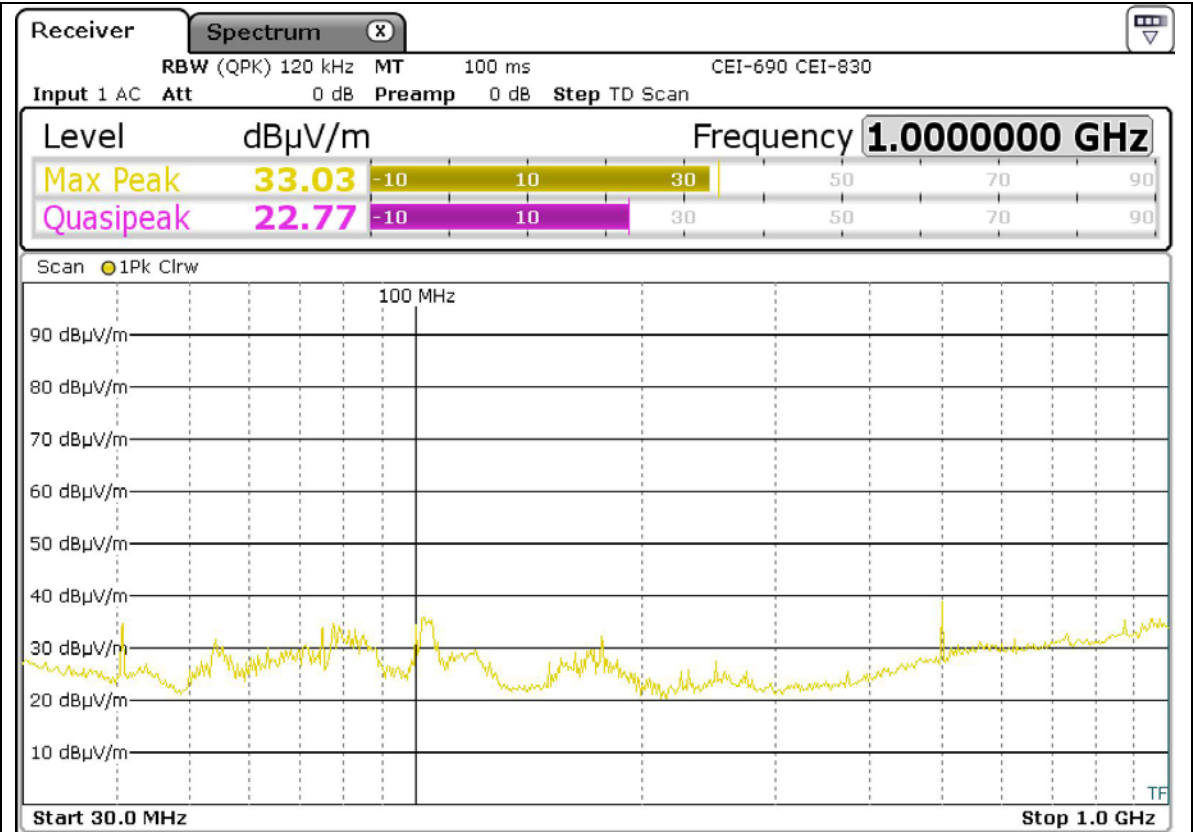


Fig 2 Radiated Emissions 30MHz-1GHz Vertical 3metres Anechoic Chamber

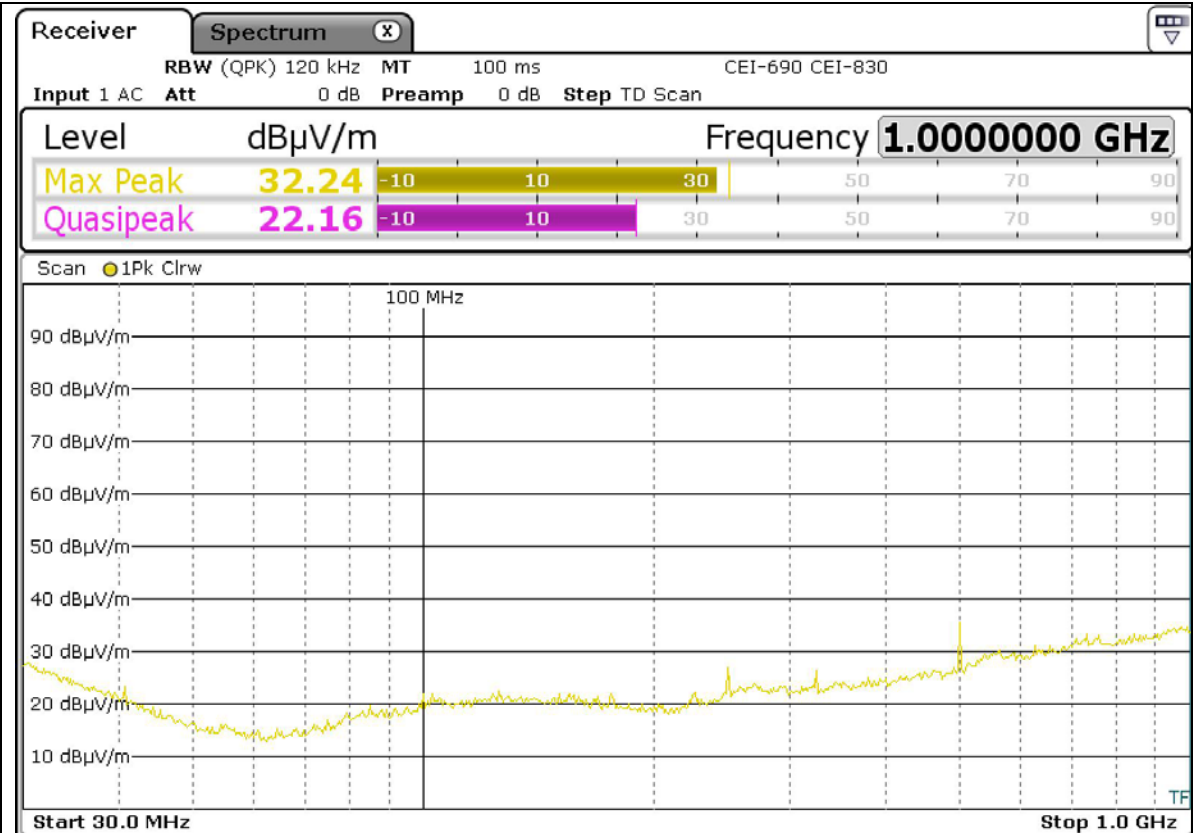


Fig 3 Radiated Emissions 30MHz-1GHz Horizontal 3metres Anechoic Chamber

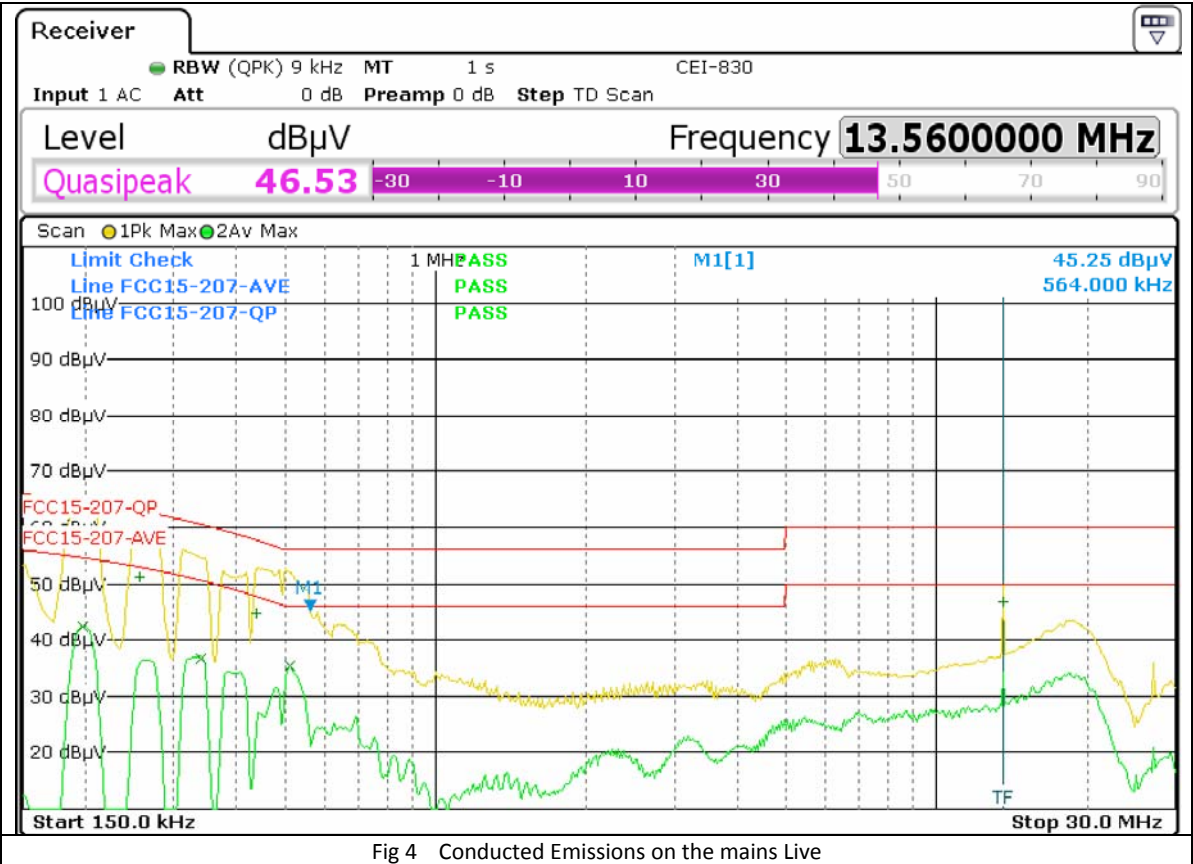


Fig 4 Conducted Emissions on the mains Live

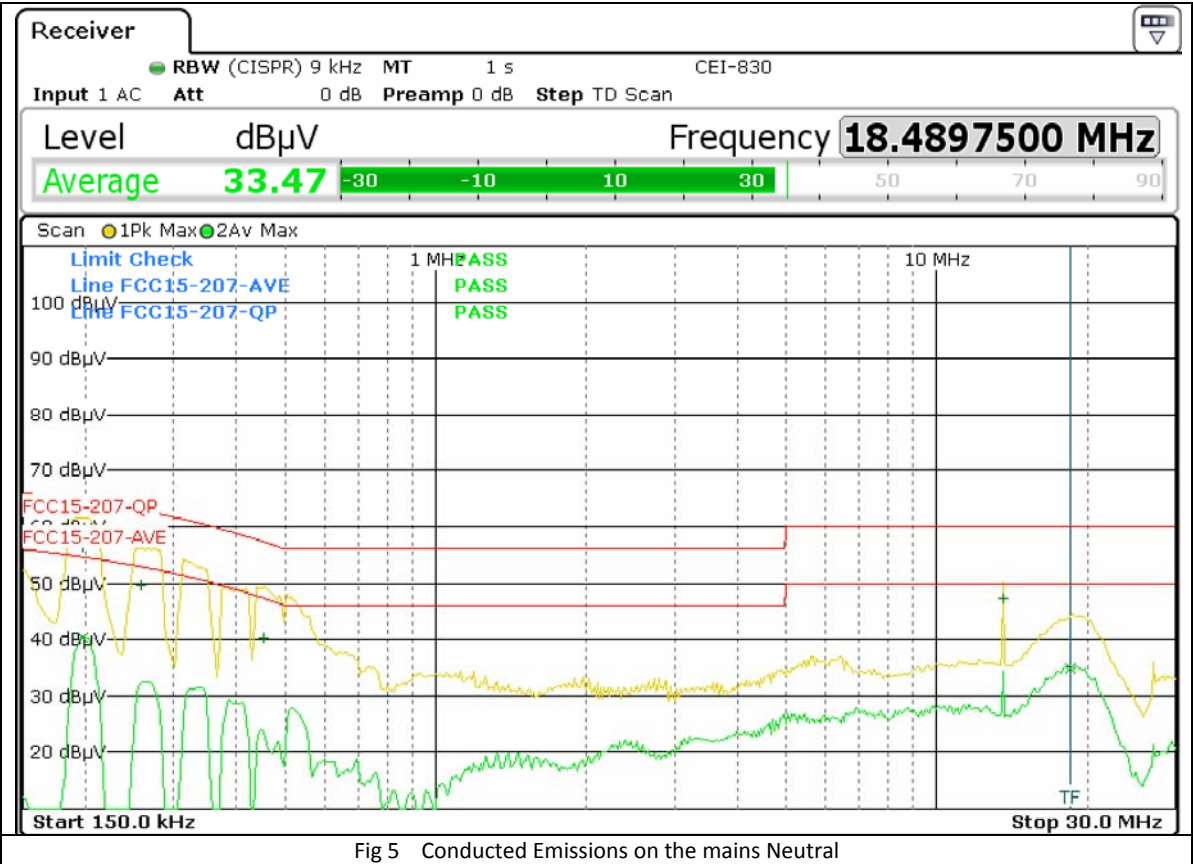


Fig 5 Conducted Emissions on the mains Neutral