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Project Number: 14E4910-1b

Prepared for:

Controlled Electronic Management Systems Ltd

By

Compliance Engineering Ireland Ltd

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**FCC Site Registration: 92592**

**Industry Canada Assigned Site Code: 8517A-2**

FCC ID: QABS3040RH

IC ID: 12009A-S3040RH

**Date**

28 Oct 2014

FCC EQUIPMENT AUTHORISATION

Test Report

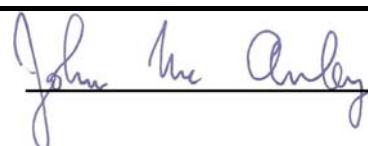
**EUT Description**

RFID Reader module

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**Authorised :**

**John McAuley**

A handwritten signature in blue ink that reads 'John McAuley'. The signature is fluid and cursive, with 'John' on the top line and 'McAuley' on the bottom 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
	RSS Gen 4.6	Occupied Bandwidth	Pass

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

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**Exhibit A – Technical Report****Table of Contents**

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## 1.0 EUT Description

<b>Model:</b>	<b>S3040 READ HEAD</b>
<b>Type:</b>	RFID reader module
<b>FCC ID:</b>	<b>QABS3040RH</b>
<b>IC ID:</b>	<b>12009A-S3040RH</b>
<b>Company:</b>	Controlled Electronic Management Systems Ltd
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<b>Test Standards:</b>	47 CFR, Part 15.225
<b>Type of radio:</b>	Stand-alone
<b>Transmitter Type:</b>	AM 13.56MHz , AM 125KHz
<b>Operating Frequency Range(s):</b>	125KHz,13.56MHz
<b>Number of Channels:</b>	13.56MHz (1) , 125KHz
<b>Antenna:</b>	Integral
<b>Power configuration:</b>	12 v dc
<b>Oper. Temp Range:</b>	5° C to +35° C
<b>Classification:</b>	DXX, DCD
<b>Test Methodology:</b>	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 fitted on a host (Getac PS336 ) which was powered from a 12v dc mains adapter (Asian Power Devices model WA-24/12R ) for all tests.

The module was operated in normal modulated mode for all tests.

In this mode the EUT transmitted with 2 carrier frequencies 13.56MHz and 125KHz

Note the 13.56MHz transmitter is off when the 125KHz transmitter is operating and vice versa.

The 13.56MHz is transmitted with period of 98.5mS and Ton of approx 14.6mS.and the 125KHz is transmitted with a period of 98.5mS with an accumulated Ton of 37.8mS within the period.

This test report covers the 13.56MHz transmitter.

Ref Test report number 14E4910-2a for 125kHz transmitter.

### **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 dates between 25<sup>th</sup> May and 10th July 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  $\pm 3.5$  dB.

The measurement uncertainty (with a 95% confidence level) for the radiated emissions test was  $\pm 5.3$  dB (from 30 to 100 MHz),  $\pm 4.7$  dB (from 100 to 300 MHz),  $\pm 3.9$  dB (from 300 to 1000 MHz) and  $\pm 3.8$  dB (from 1 GHz to 40 GHz).

## **2.0 Emissions Measurements**

### **2.1 Conducted Emissions Measurements**

The EUT host mains adapter 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 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	0.184	54.10	-10.21	Live
Average	0.188	41.83	-12.28	Live
Quasi-Peak	0.242	50.21	-11.81	Live
Average	0.249	37.34	-14.45	Live
Quasi-Peak	0.265	49.01	-12.27	Live
Quasi-Peak	0.312	48.26	-11.66	Live
Average	0.312	35.31	-14.61	Live
Quasi-Peak	0.546	44.99	-11.01	Live
Average	0.600	35.12	-10.88	Live
Average	0.665	34.01	-11.99	Live
Quasi-Peak	0.742	36.37	-19.63	Live
Quasi-Peak	1.070	39.40	-16.6	Live
Quasi-Peak	1.541	38.12	-17.88	Live
Quasi-Peak	2.265	36.04	-19.96	Live
Quasi-Peak	3.491	33.08	-22.92	Live
Quasi-Peak	3.629	34.81	-21.19	Live
Quasi-Peak	13.560	22.85	-37.15	Live
Average	13.560	16.71	-33.29	Live

Detector	Frequency MHz	Reading dBuV	Margin dB	Phase
Quasi-Peak	0.182	56.16	-8.26	Neutral
Average	0.188	42.26	-11.85	Neutral
Quasi-Peak	0.240	49.72	-12.38	Neutral
Average	0.247	36.59	-15.28	Neutral
Quasi-Peak	0.256	49.82	-11.75	Neutral
Quasi-Peak	0.301	47.21	-13.01	Neutral
Average	0.562	31.65	-14.35	Neutral
Quasi-Peak	0.578	47.14	-8.86	Neutral
Average	0.665	32.33	-13.67	Neutral
Quasi-Peak	0.744	36.45	-19.55	Neutral
Quasi-Peak	1.075	40.38	-15.62	Neutral
Quasi-Peak	1.478	38.85	-17.15	Neutral
Quasi-Peak	3.577	35.60	-20.4	Neutral
Quasi-Peak	3.633	35.37	-20.63	Neutral
Quasi-Peak	13.560	51.47	-8.53	Neutral
Average	13.560	37.24	-12.76	Neutral

Ref Appendix 2 for scans

**Result: Pass**

## 4.0 Results for Radiated emissions

### 4.1 Carrier Power

#### 4.1.1 Carrier Power 13.56 MHz

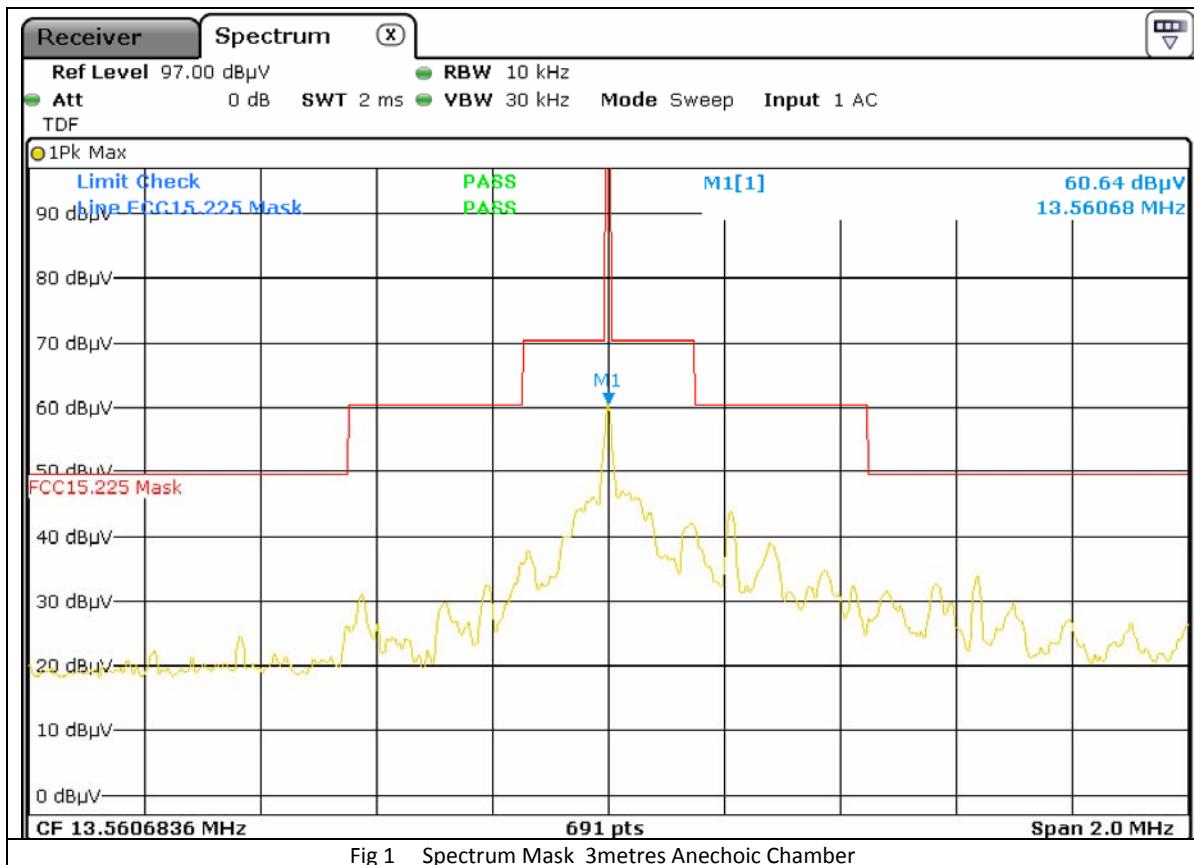
Limit as per 15.225

Frequency	Level	Antenna Factor	Cable Loss	Final Field Strength	Detector	Emission Limit	Margin	Pass / Fail
MHz	dBuV	dB	dB	dBuV/m		dBuV/m	dB	P/F
13.56	53.65	8.25	0.1	62	Peak	124	62	Pass

One Period(mS)	Pulse Width (mS)	No of Pulses	Duty Cycle	20 log duty cycle (dB)	Pulse rate Hz
98.5	14.6	1	0.148	-16.58	10.2

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

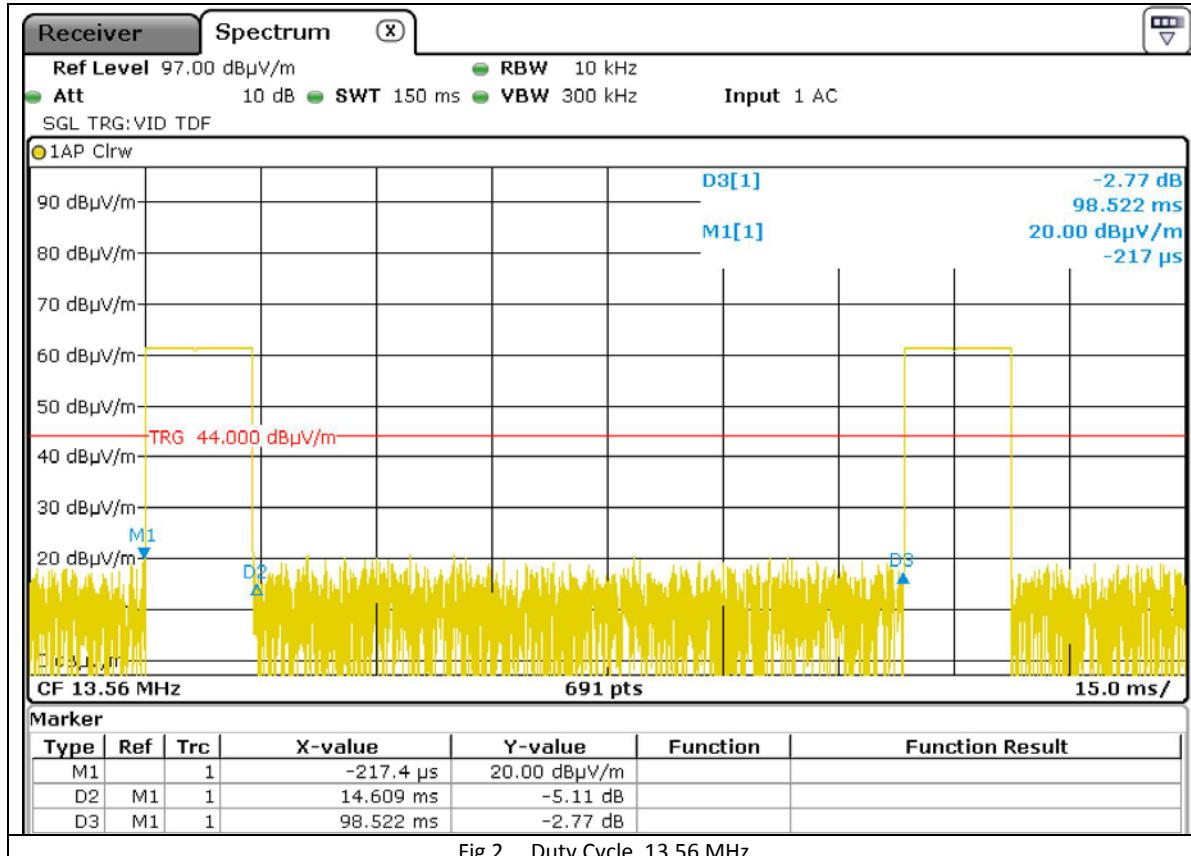
## 4.2 Mask



Test result Pass

## 4.3 Duty Cycle

### 4.3.1 Duty Cycle for 13.56MHz transmitter



## 4.4 Spurious Emissions Measurements 9kHz -30MHz

### 4.4.1 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
0.0235	28.11	10.86	0.1	39.07	Average	120.18	81.11	Pass
0.252 *	64.51	9.49	0.1	74	Average	99.58	25.58	Pass
15.08	17.65	8.35	0.1	26	Quasi Peak	69.54	43.54	Pass

\* background due to local radio transmitter at 252 KHz

### 4.4.2 Spurious Emissions which are harmonics of the fundamental at 13.56MHz

Frequency	Level	Antenna Factor	Cable Loss	Final Field Strength Peak	Detector	Limit	Margin	Pass / Fail
MHz	dBuV	dB	dB	dBuV/m		dBuV/m	dB	P/F
27.12	18.58	6.32	0.1	25	Peak	69.54	44.54	Pass

One Period(mS)	Pulse Width (mS)	No of Pulses	Duty Cycle	20 log duty cycle (dB)	Pulse rate Hz
98.5	14.6	1	0.148	-16.58	10.2

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

## 4.5 Measurements with Bilog Antenna (30MHz to 1GHz)

### 4.5.1 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
97.26	14.3	Vertical	10.3	0.2	24.8	43.5	18.7
734.1	6.3	Vertical	22	1.4	29.7	46.0	16.3
399.017	15.3	Horizontal	15.2	1.2	31.7	46.0	14.3
366.139	5.35	Horizontal	14.1	1.2	20.65	46.0	25.4

#### 4.5.2 Spurious Emissions which are harmonics of the fundamental at 13.56MHz

Frequency MHz	Peak Level dBuV/m	Antenna Polarity	Antenna Factor dB	Cable loss dB	Final Field Strength Peak dBuV/m	Limit dBuV/m	Margin dB
40.68	12.6	Vertical	14.2	0.2	27	40.0	13.0
54.24	17.6	Vertical	7.2	0.2	25	40.0	15.0
67.8	12.7	Vertical	6.1	0.2	19	40.0	21.0
40.68	11.6	Horizontal	14.2	0.2	26	40.0	14.0
54.24	11.6	Horizontal	7.2	0.2	19	40.0	21.0
67.8	11.2	Horizontal	6.1	0.2	17.5	40.0	22.5

One Period(mS)	Pulse Width (mS)	No of Pulses	Duty Cycle	20 log duty cycle (dB)	Pulse rate Hz
98.5	14.6	1	0.148	-16.58	10.2

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

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

**Result: Pass**

## 4.6 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 13.5606836 MHz

Temp	Supply	Frequency	Variation	Limit	Result
Deg C	V dc	MHz	%	%	
20	12	13.5606836	0	0.01	Pass

Note it was not possible to remove the battery on the host to vary the dc supply voltage so measurements were carried out at 12V nominal only.

Temp	Supply	Frequency	Variation	Limit	Result
Deg C	V dc	MHz	%	%	
50	12	13.560645	-0.000284646	0.01	Pass
40	12	13.560664	-0.000144535	0.01	Pass
35	12	13.5606724	-8.25917E-05	0.01	Pass
30	12	13.560662	-0.000159284	0.01	Pass
20	12	13.5606836	0	0.01	Pass
10	12	13.5606864	2.06479E-05	0.01	Pass
0	12	13.5606872	2.65473E-05	0.01	Pass
-10	12	13.560725	0.000305294	0.01	Pass
-20	12	13.560751	0.000497025	0.01	Pass

**Result: Pass**

## 4.7 99% Occupied Bandwidth

### 4.7.1 99% Occupied Bandwidth 13.56MHz

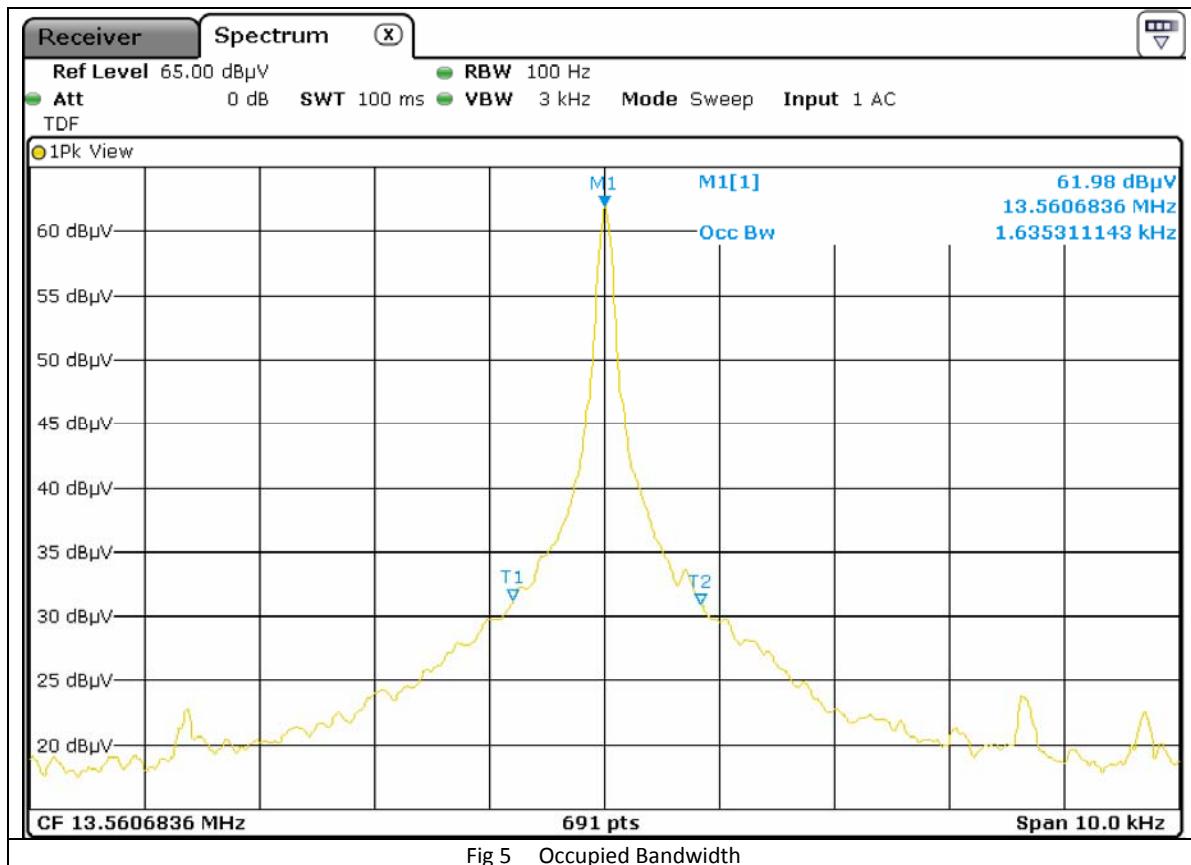


Fig 5 Occupied Bandwidth

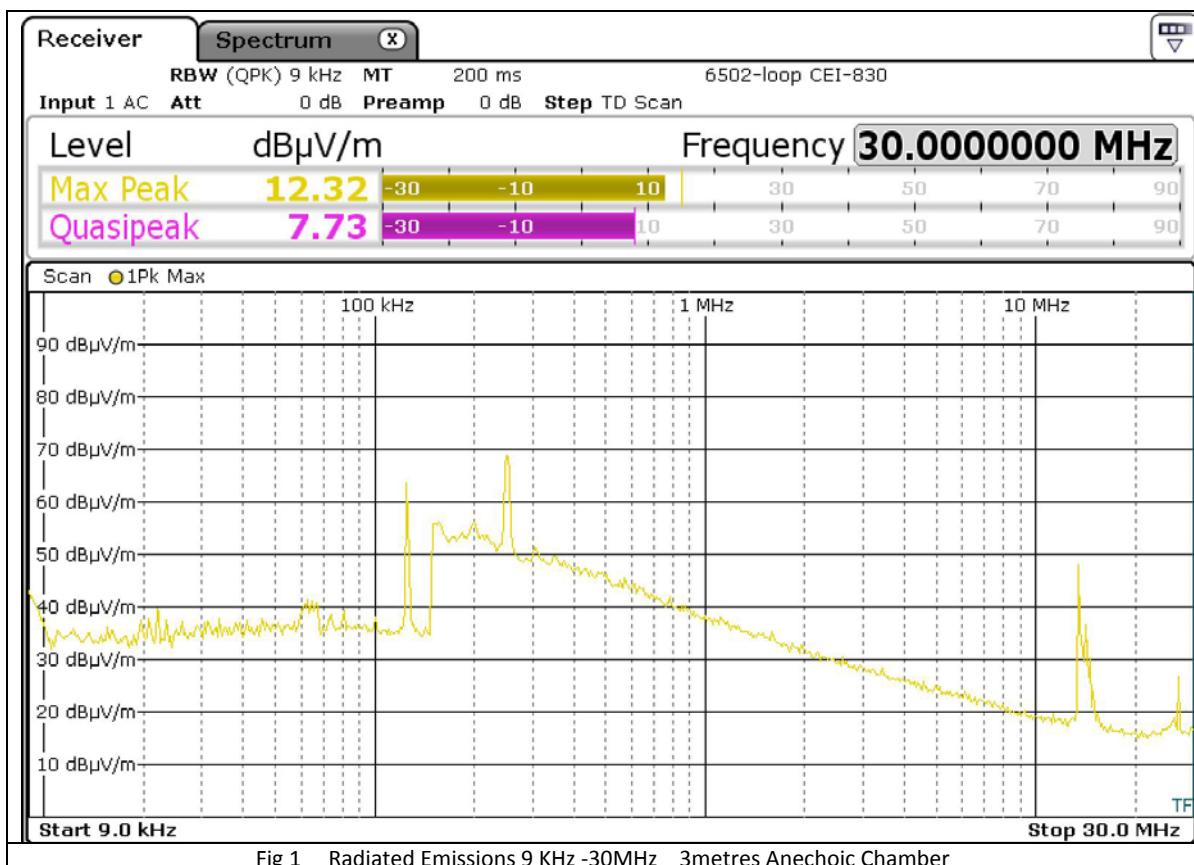
13.56MHz Occupied Bandwidth = 1.635 KHz

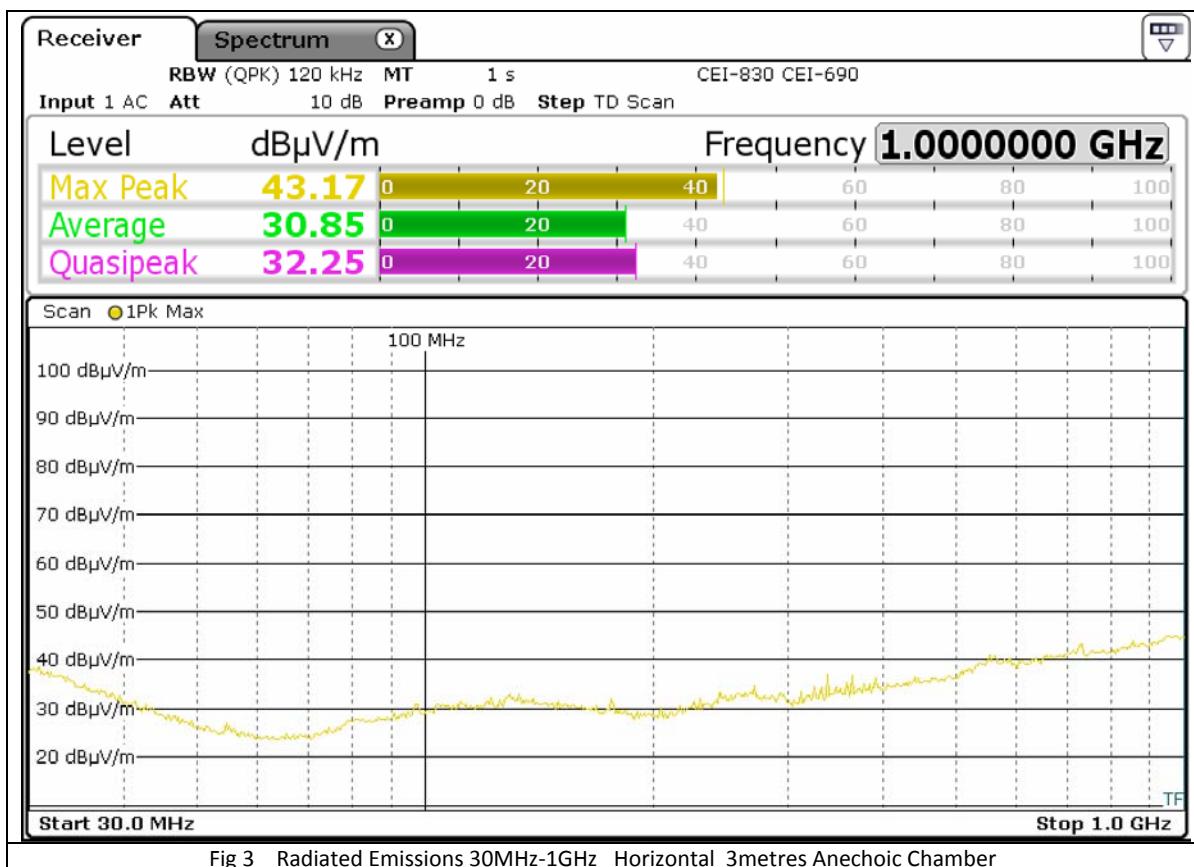
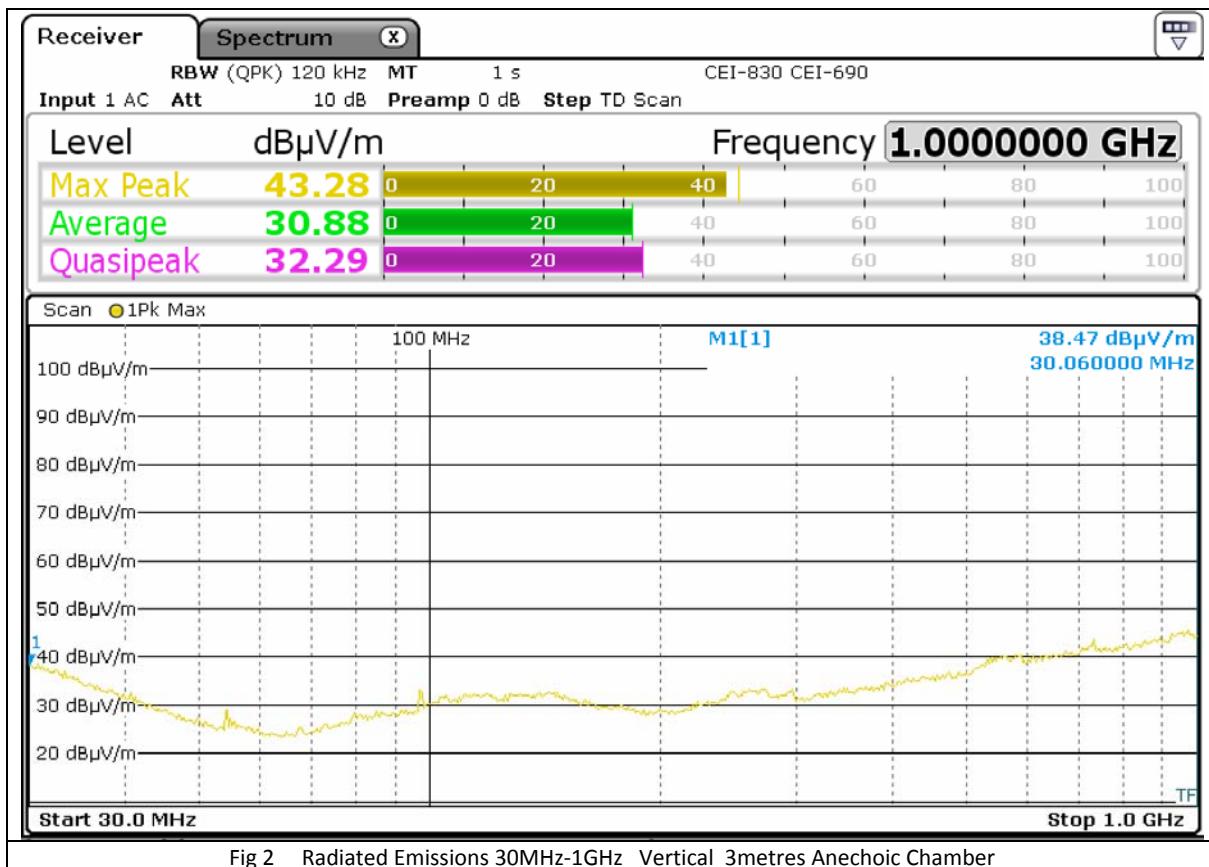
**Appendix 1****List of Test Equipment**

Instrument	Mftr.	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**





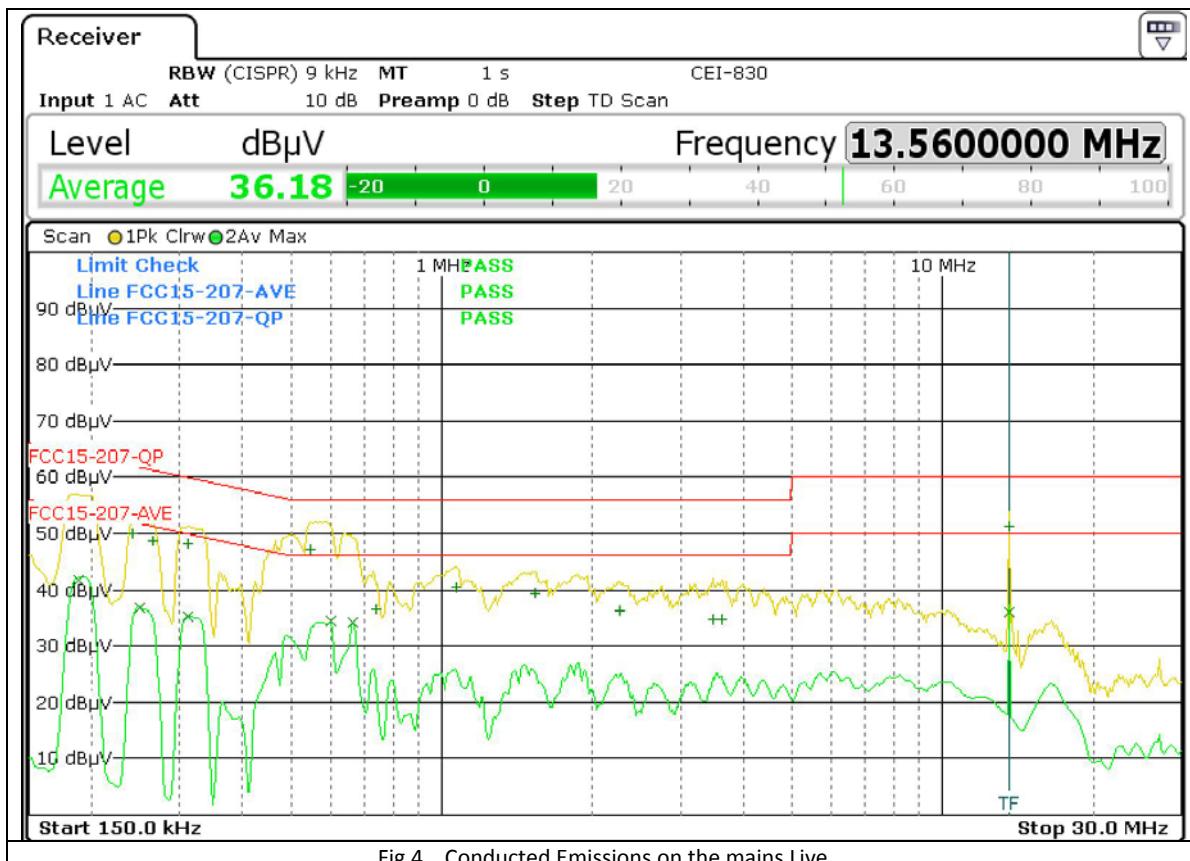


Fig 4 Conducted Emissions on the mains Live

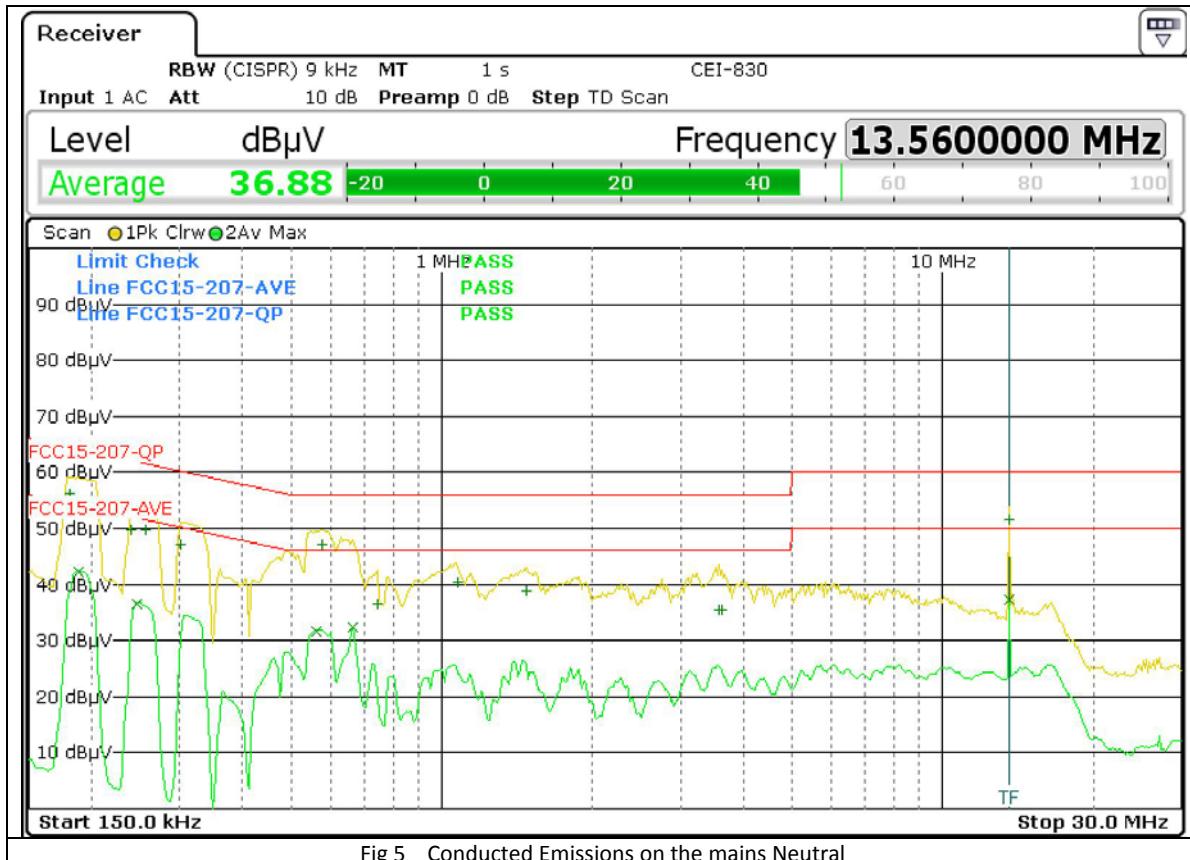


Fig 5 Conducted Emissions on the mains Neutral