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Project Number: 16E6335-2b

Prepared for:

Access Control Technology Ltd

By

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Co. Meath

**FCC Site Registration: 92592**

FCC ID: 2AILRUSBRD

**Date**

22<sup>nd</sup> Jul 2016

FCC EQUIPMENT AUTHORISATION

Test Report

**EUT Description**

USB multiformat RFID Reader

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**Authorised :**

**John McAuley**

A handwritten signature in blue ink, reading 'John McAuley', is 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)	TEST PARAMETERS	Test Result
15.203	Antenna Requirement	Pass
15.209	Radiated Emissions	Pass
15.207	Conducted Emissions	Pass
	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**

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## 1.0 EUT Description

<b>Model:</b>	<b>USBRD</b>
<b>Type:</b>	USB RFID multiformat reader
<b>FCC ID:</b>	<b>2AILRUSBRD</b>
<b>Company:</b>	Access Control Technology Ltd
<b>Contact</b>	Martin McNamara
<b>Address:</b>	Unit C1 South City Business Tallaght Dublin Ireland D24 PN28
<b>Phone:</b>	+353 1 4662570
<b>e-mail:</b>	martin.mcnamara@act.eu
<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>	5 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 C63.10-2013

## 1.1 EUT Operation

### Operating Conditions during Test:

The EUT was operated in normal modulated mode for all tests ( i.e. both transmitters always operational )

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 644mS and Ton of approx 11.54mS.and the 125KHz is transmitted with a period of 644mS with a Ton of 105mS within the period.

This test report covers the 125KHz transmitter.

Ref Test report number 16E6355-1b for 13.56 MHz transmitter

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

The EUT was connected to a laptop (HP 15 Notebook Pc 15-r150sa sn4390D9Q ) for all tests. The laptop was connected to its power adapter HP model 740015-003.for the conducted emissions on the mains test

### **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 10<sup>th</sup> Jun and 21<sup>st</sup> Jun 2016 .

## **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 C63.4-2014.

### **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 was connected to a laptop (HP 15 Notebook Pc 15-r150sa sn4390D9Q ) for all tests. The laptop was connected to its power adapter HP model 740015-003

The Laptop power 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

Ambient Temp 21deg C RH =57.3%

#### Mains Conducted Emissions results

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Average	0.1500	29.47	-26.53	Live
Quasi-Peak	0.1523	44.23	-21.71	Live
Quasi-Peak	1.2165	26.73	-29.27	Live
Quasi-Peak	3.1313	28.17	-27.83	Live
Quasi-Peak	17.750	32.95	-27.05	Live
Quasi-Peak	21.320	35.33	-24.67	Live

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1500	42.31	-23.69	Neutral
Average	0.1500	26.83	-29.17	Neutral
Quasi-Peak	0.1793	41.02	-24.14	Neutral
Quasi-Peak	0.4763	33.97	-22.71	Neutral
Average	0.4785	26.08	-20.53	Neutral
Quasi-Peak	0.7575	25.24	-30.76	Neutral
Average	0.7643	18.88	-27.12	Neutral
Average	2.2920	20.34	-25.66	Neutral
Quasi-Peak	2.7758	25.65	-30.35	Neutral
Quasi-Peak	4.2225	25.37	-30.63	Neutral
Average	4.2473	20.89	-25.11	Neutral
Average	21.0458	33.23	-16.77	Neutral
Quasi-Peak	21.0975	36.17	-23.83	Neutral

Ref Appendix 2 for scans

**Result: Pass**

## 4.0 Results for Radiated emissions

Ambient Temp 21.2deg C RH =57.6%

### 4.1 Carrier Power

#### 4.1.1 Carrier Power 125 kHz

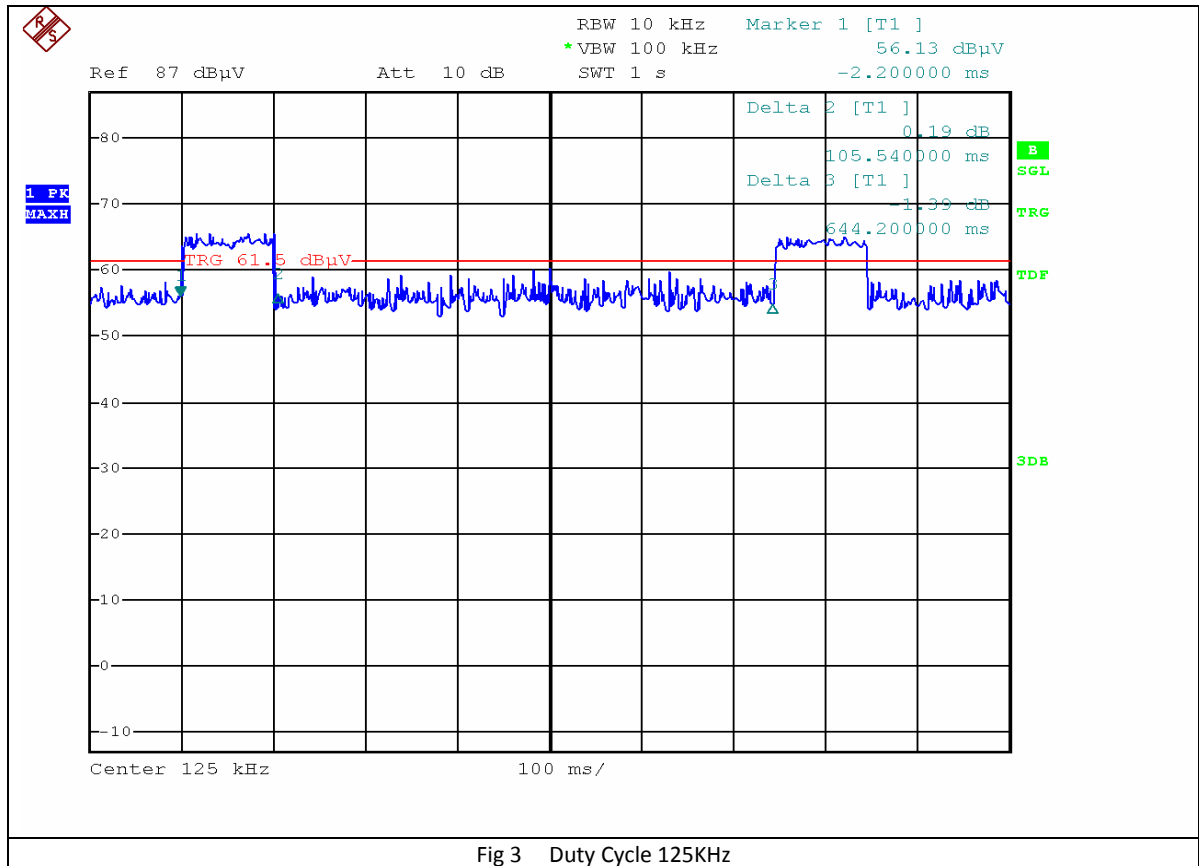
Limit as per 15.209

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
0.125	69.78	9.55	0.1	79.43	Peak	105.67	26.24	Pass

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

### 4.3 Duty Cycle

#### 4.3.1 Duty Cycle for 125KHz transmitter



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

#### .4 Spurious Emissions Measurements 9kHz -30MHz

Ambient Temp 21.2deg C RH =57.6%

##### 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
0.022	42.04	10.86	0.1	53	Average	120.76	67.76	Pass
0.035	47.94	10.66	0.1	58.6	Average	116.72	58.12	Pass
0.252	53.21	9.49	0.1	62.7	Average	99.58	36.88	Pass
24.003	2.59	7.31	0.1	9.9	Quasi Peak	69.54	59.64	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	9.48	6.32	0.1	15.9	Peak	69.54	53.64	Pass

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

Note as both 125KHz and 13.56MHz transmitters are always transmitting the spurious emissions from the 13.56MHz transmitter are reported here.

## 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
39.96	-5.5	Vertical	14.2	0.2	8.9	40.0	31.1
44.988	-2.1	Vertical	12.1	0.2	10.2	40.0	29.8
60.68	14.7	Vertical	5.9	0.2	20.8	40.0	19.2
71.36	10.1	Vertical	6.3	0.2	16.6	40.0	23.4
361.64	-3.7	Vertical	14.1	1.2	11.6	46.0	34.4
438.44	-4.5	Vertical	16.1	1.2	12.8	46.0	33.2
545.24	-5.6	Vertical	18.8	1.2	14.4	46.0	31.6
60.12	28.3	Horizontal	5.9	0.2	34.4	40.0	5.6
63.376	30	Horizontal	5.9	0.2	36.1	40.0	3.9
128.124	14.9	Horizontal	12.1	0.2	27.2	43.5	16.3
140.872	16.2	Horizontal	12	0.2	28.4	43.5	15.1
233.872	15.9	Horizontal	9.8	0.2	25.9	46.0	20.1
335.996	8.7	Horizontal	13.8	1.2	23.7	46.02	22.32
384.248	4.5	Horizontal	14.6	1.2	20.3	46.02	25.72
403.496	4.3	Horizontal	15.6	1.2	21.1	46.02	24.92
514.7	-5.9	Horizontal	17.5	1.2	12.8	46.02	33.22
623.732	9	Horizontal	19.6	1.2	29.8	46.02	16.22

**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	Margin dB
40.68	18.72	Vertical	14.2	0.2	33.12	40.0	6.9
54.12	23.9	Horizontal	7.2	0.2	31.3	40.0	8.7
67.8	23.5	Vertical	6.1	0.2	29.8	40.0	10.2
40.68	20.25	Horizontal	14.2	0.2	34.65	40.0	5.4
54.12	25.4	Horizontal	7.2	0.2	32.8	40.0	7.2
67.8	24.1	Horizontal	6.1	0.2	30.4	40.0	9.6

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

Note as both 125KHz and 13.56MHz transmitters are always transmitting the spurious emissions from the 13.56MHz transmitter are reported here.

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

**Result: Pass**

#### 4.7 99% Occupied Bandwidth

#### 4.7.1 99% Occupied Bandwidth 125KHz

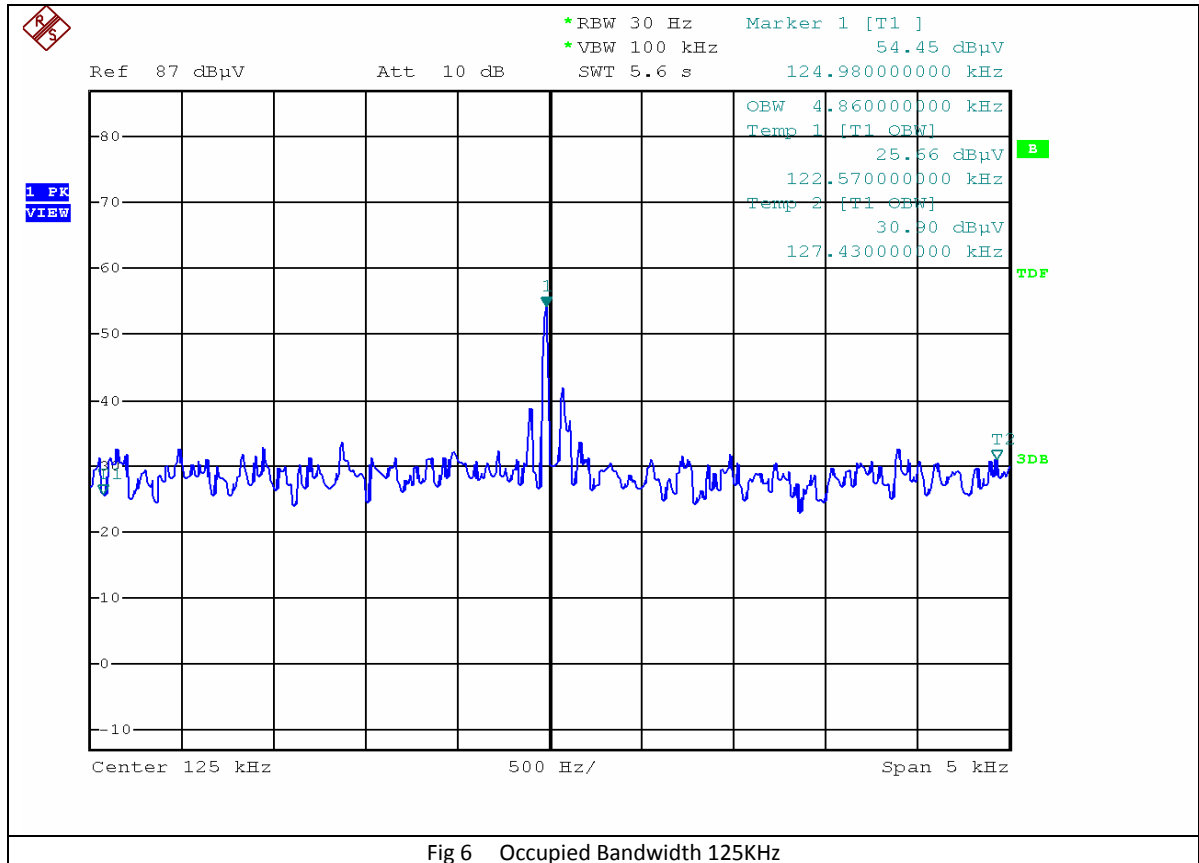


Fig 6 Occupied Bandwidth 125KHz

125KHz Occupied Bandwidth = 4.86 KHz

**Appendix 1**

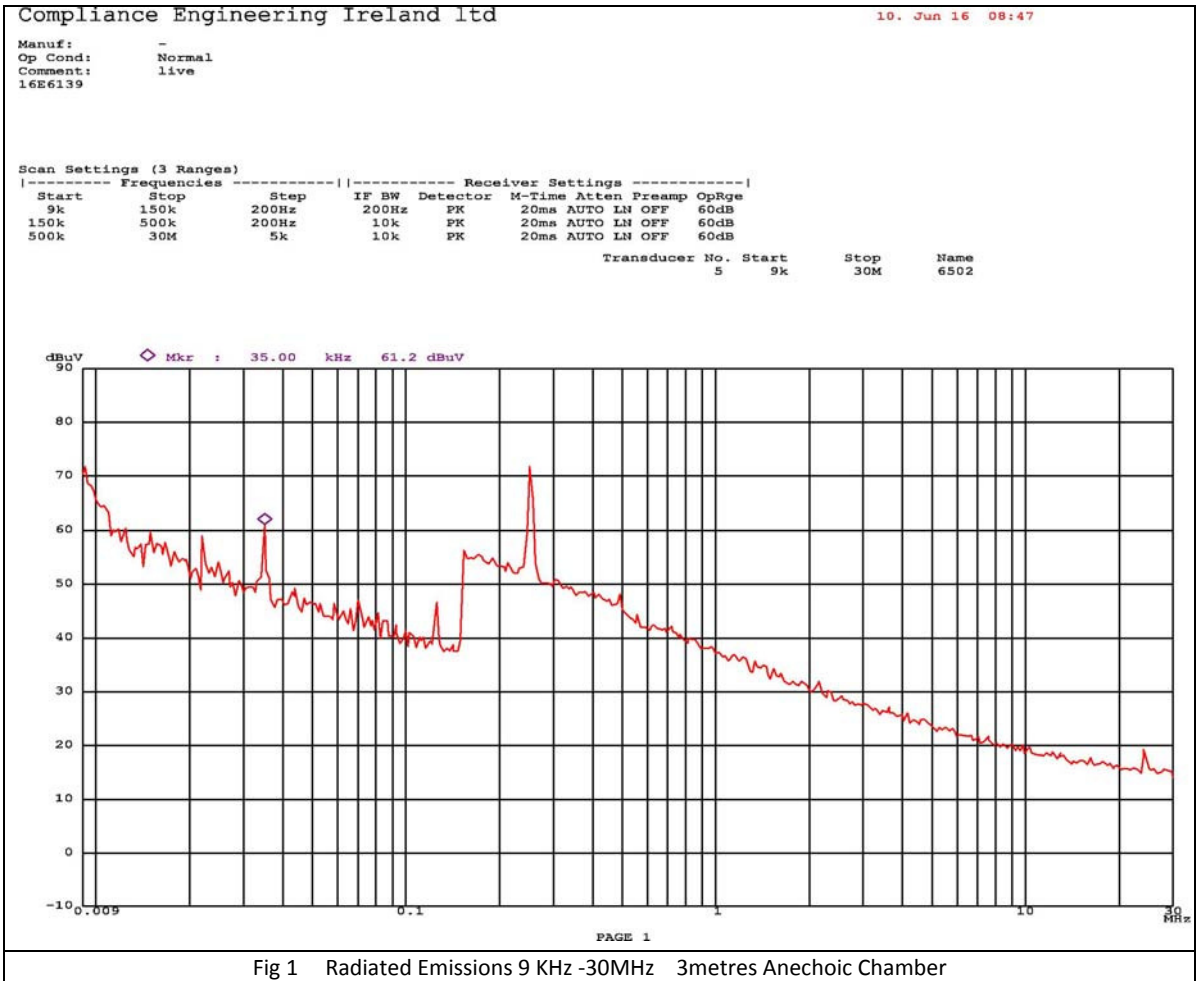
**List of Test Equipment**

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Num</b>	<b>CEI Ref</b>	<b>Cal Due Date</b>	<b>Cal Interval Months</b>
Spectrum Analyser 30Hz-40GHz	Rohde& Schwarz	FSP40	100053	850	09/11/2018	36
Test Receiver 3.6GHz	Rohde& Schwarz	ESR	1316.3003k03-101625-s	869	06/06/2017	36
Anechoic Chamber	CEI	SAR 10M	845	845	23/09/2016	36
Antenna Trilog	Schwarzbeck	VULB 9160	9160-3361	889	29/07/2016	24
LISN	Rohde& Schwarz	ESH3-Z5	825460/003	604	21/01/2019	36
Loop Antenna	EMCO	6502	9609-3099	821	27/08/2016	36
Barometric Pressure Humidity & Temp Datalogger	Extech	SD700	Q752722	181	11/09/2016	24



**Appendix 2:**

**Test Results**



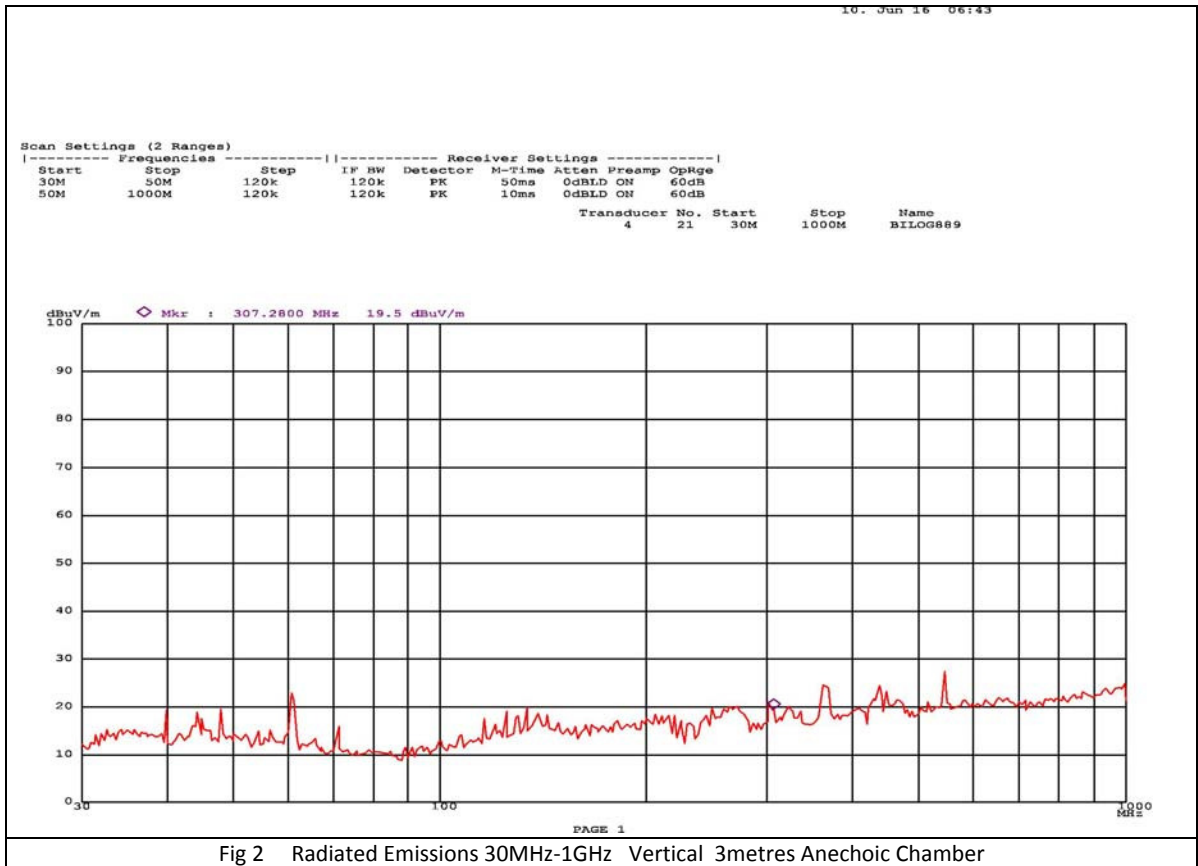


Fig 2 Radiated Emissions 30MHz-1GHz Vertical 3metres Anechoic Chamber

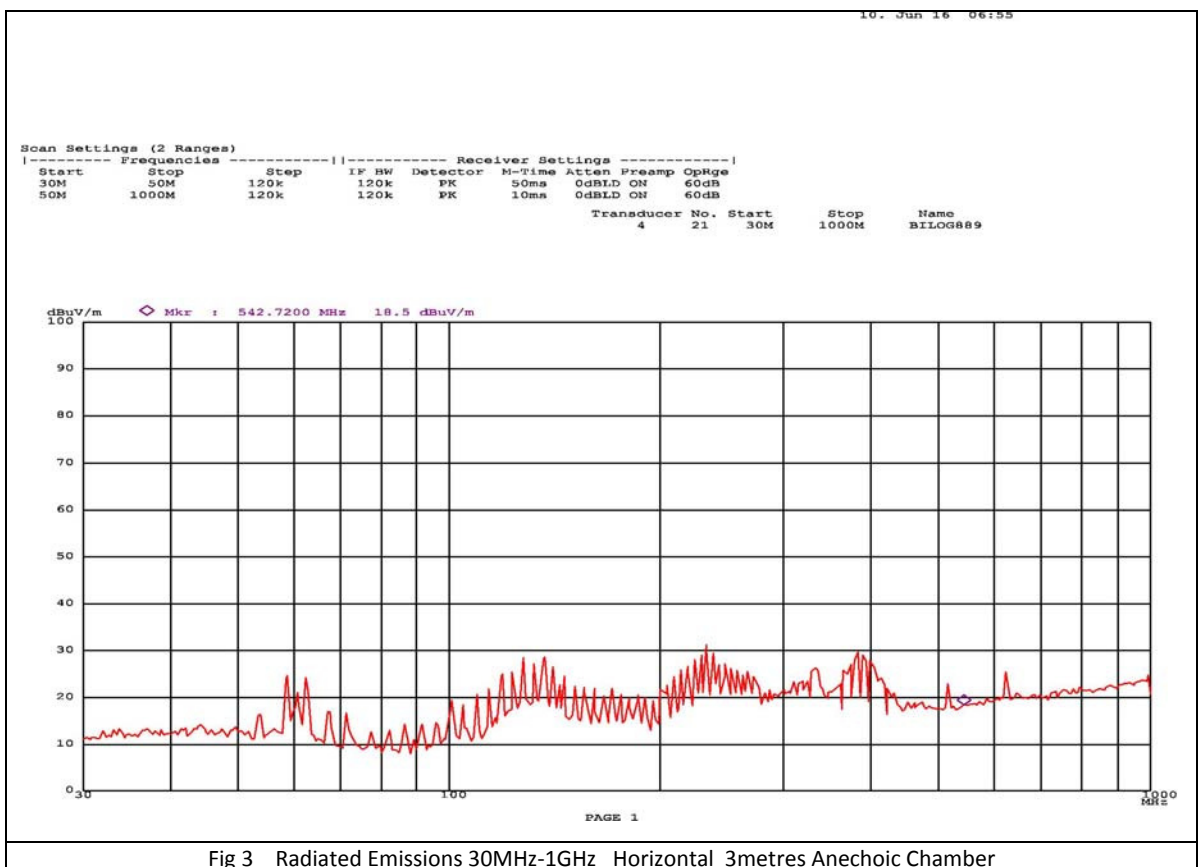
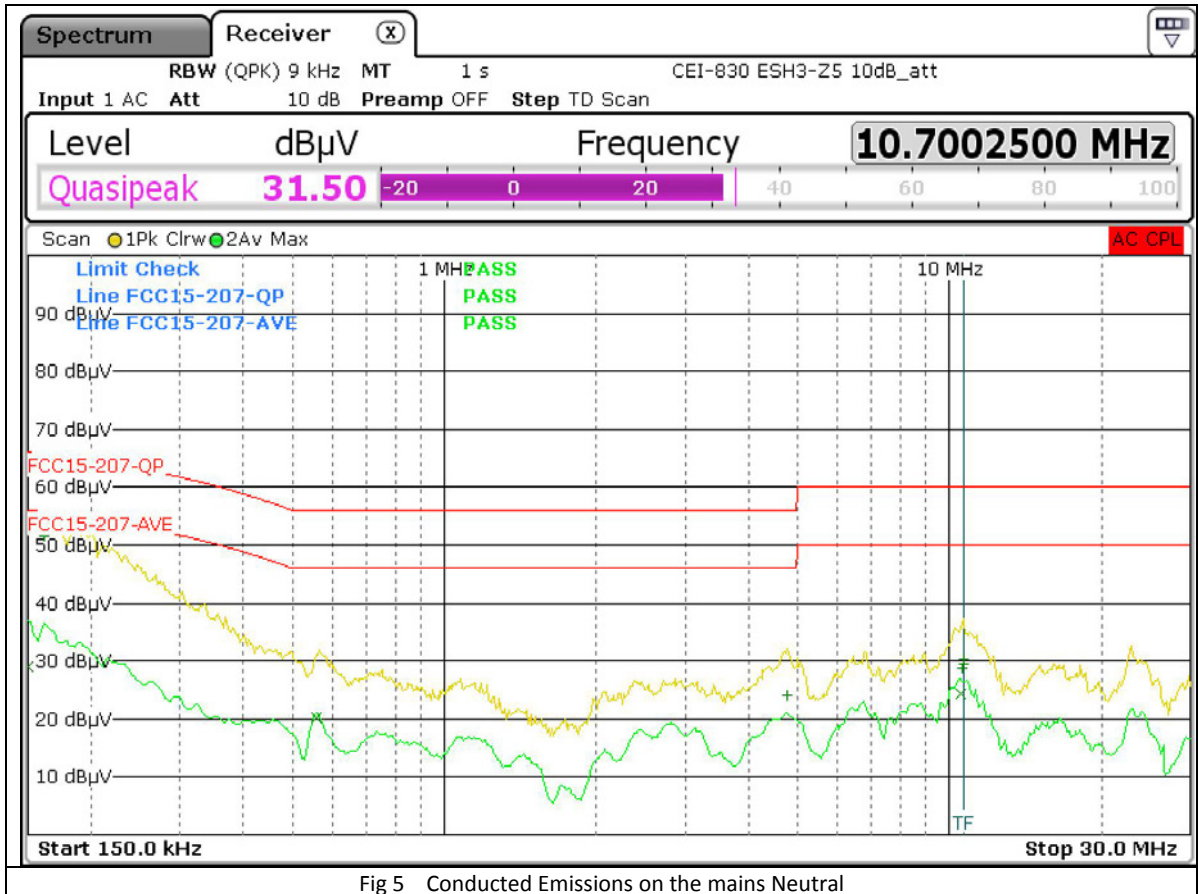
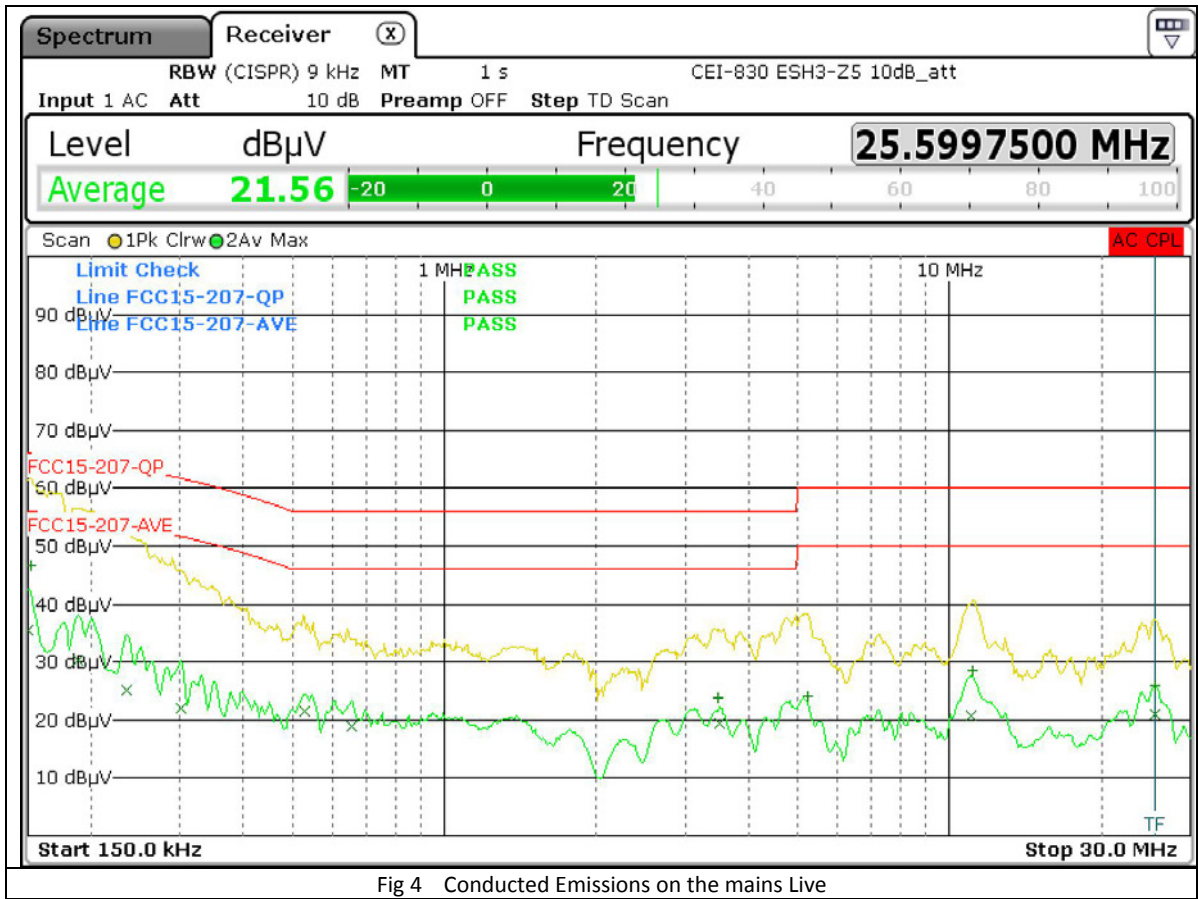


Fig 3 Radiated Emissions 30MHz-1GHz Horizontal 3metres Anechoic Chamber



End of Report