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Project Number: 16E6335-1b

Prepared for:

Accessa Control Technologies Ltd

By

Compliance Engineering Ireland Ltd

Clonross Lane

Derrockstown

Dunshaughlin

Co. Meath

FCC Site Registration: 92592

FCC ID: 2AILRUSBRD

Date

22nd Jul 2016

FCC EQUIPMENT AUTHORISATION

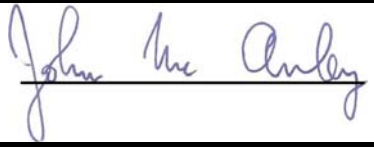
Test Report

EUT Description

USB RFID multiformat Reader

Authorised :

John McAuley



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
15.225	Spectrum Mask	Pass
15.225(d), 15.209	Limit outside band 13.11-14.01MHz	Pass
15.225e	Frequency Stability	Pass
15.207	Conducted Emissions	Pass
	Occupied Bandwidth	Pass

Exhibit A – Technical Report

Table of Contents

1.0 EUT Description

Model:	**USBRD**
Type:	USB RFID multi format reader
FCC ID:	**2AILRUSBRD**
Company:	Access Control Technology Ltd
Contact	Martin McNamara
Address:	Unit C1 South City Business Tallaght Dublin Ireland D24 PN28
Phone:	+353 1 4662570
e-mail:	martin.mcnamara@act.eu
Test Standards:	47 CFR, Part 15.225
Type of radio:	Stand-alone
Transmitter Type:	AM 13.56MHz , AM 125KHz
Operating Frequency Range(s):	125KHz,13.56MHz
Number of Channels:	13.56MHz (1) , 125KHz
Antenna:	Integral
Power configuration:	5 v dc
Oper. Temp Range:	5° C to +35° C
Classification:	DXX, DCD
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2013

1.1 EUT Operation

Operating Conditions during Test:

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

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

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 vica 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 an accumulated Ton of 101mS within the period.

This test report covers the 13.56MHz transmitter.

Ref Test report number 16E6355-2b 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 10th Jun and 21st 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 ±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 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 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	64.76	8.25	0.1	73.11	Peak	124	50.89	Pass

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

4.2 Mask

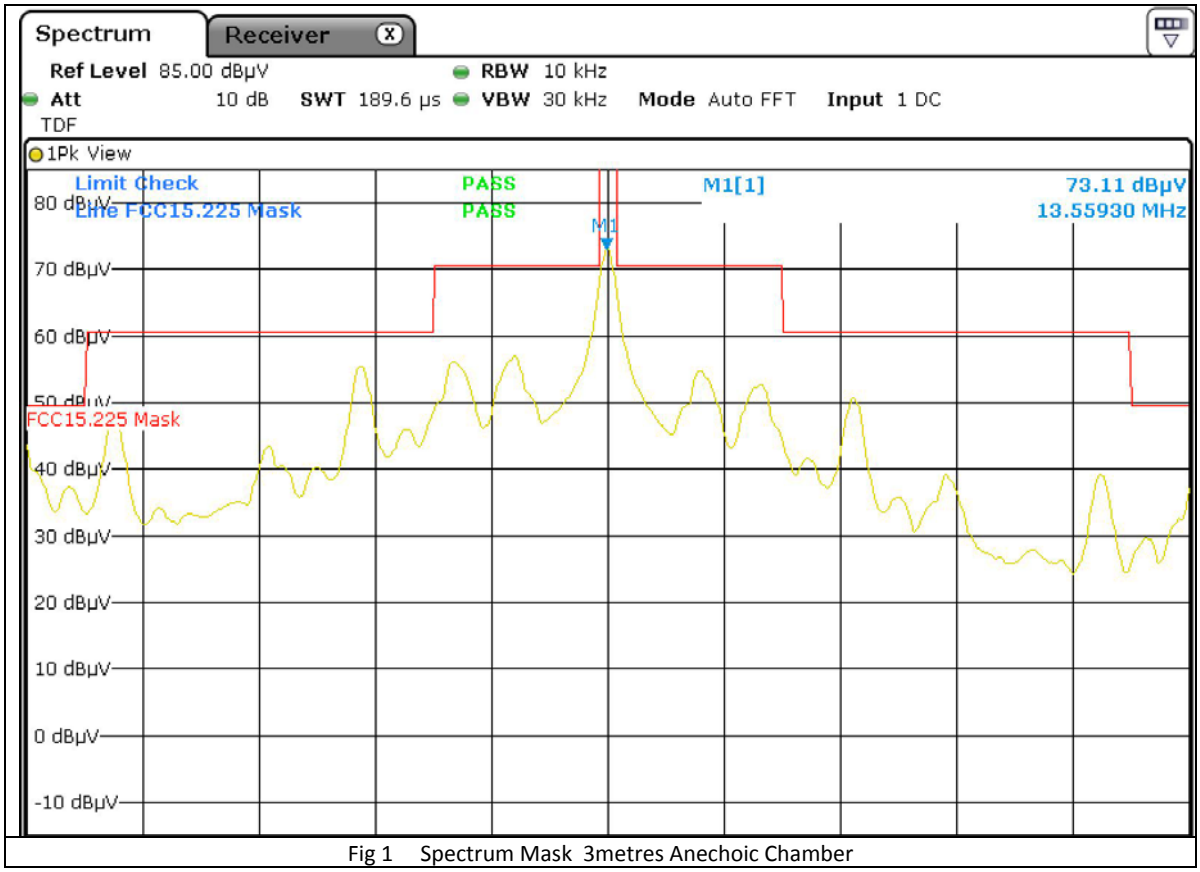


Fig 1 Spectrum Mask 3metres Anechoic Chamber

Test result Pass

4.3 Duty Cycle

4.3.1 Duty Cycle for 13.56MHz transmitter

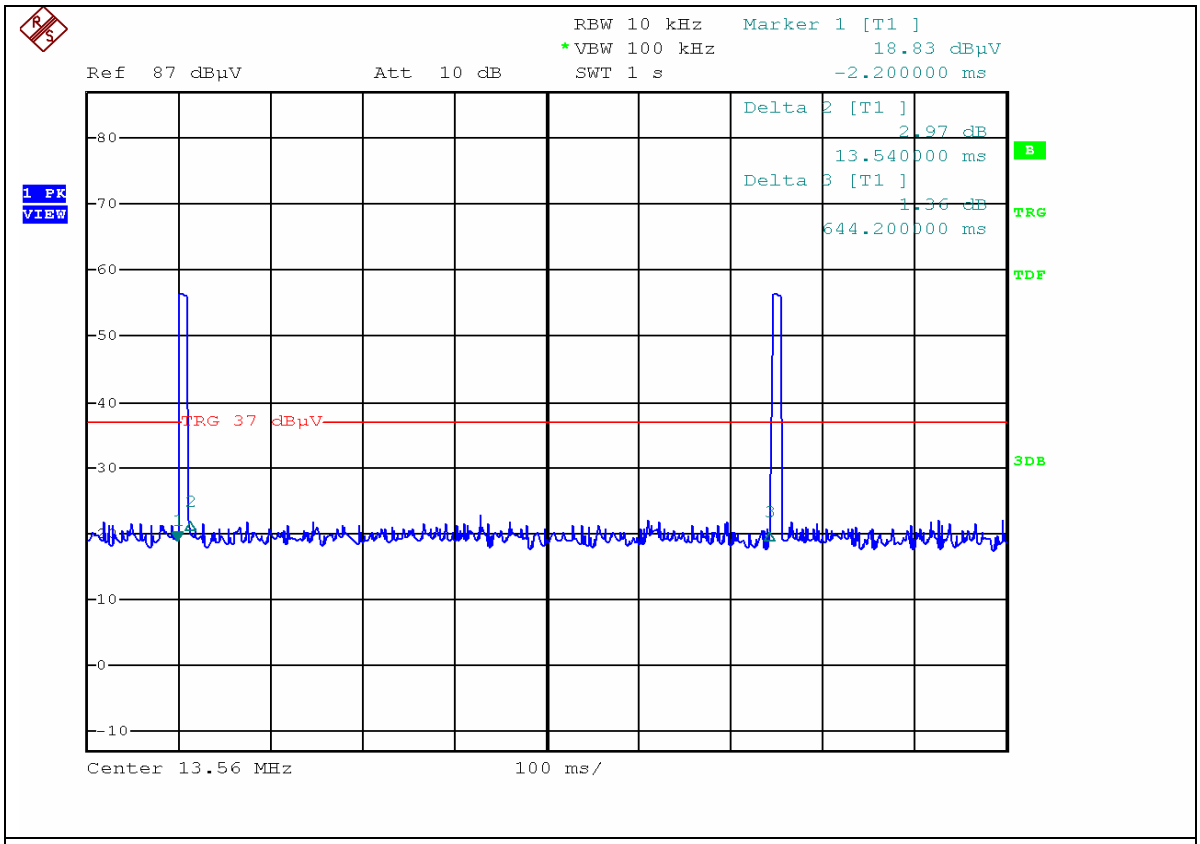


Fig 2 Duty Cycle 13.56 MHz

Pulse repetition rate =1/644mS = 1.6Hz

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
0.022	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

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

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

Result: Pass

4.6 Frequency Stability Temperature Testing

Ambient Temp 20deg C RH =54%

(e) The frequency tolerance of the carrier signal shall be maintained within ±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

Temp	Supply	Frequency	Variation	Limit	Result
Deg C	V dc	MHz	%	%	
20	5	13.5993158	0	0.01	Pass

Note it was not possible to operate the unit when it was removed from laptop and hence the dc voltage could not be varied so measurements were carried out at USB 5V nominal only.

Temp	Supply	Frequency	Variation	Limit	Result
Deg C	V dc	MHz	%	%	
50	5	13.599278	-0.000277955	0.01	Pass
40	5	13.599284	-0.000233835	0.01	Pass
30	5	13.5993013	-0.000106623	0.01	Pass
20	5	13.5993158	0	0.01	Pass
10	5	13.5993274	8.52984E-05	0.01	Pass
0	5	13.5993332	0.000127948	0.01	Pass
-10	5	13.5993187	2.13246E-05	0.01	Pass
-20	5	13.5992753	-0.000297809	0.01	Pass

Result: Pass

4.7 99% Occupied Bandwidth

4.7.1 99% Occupied Bandwidth 13.56MHz

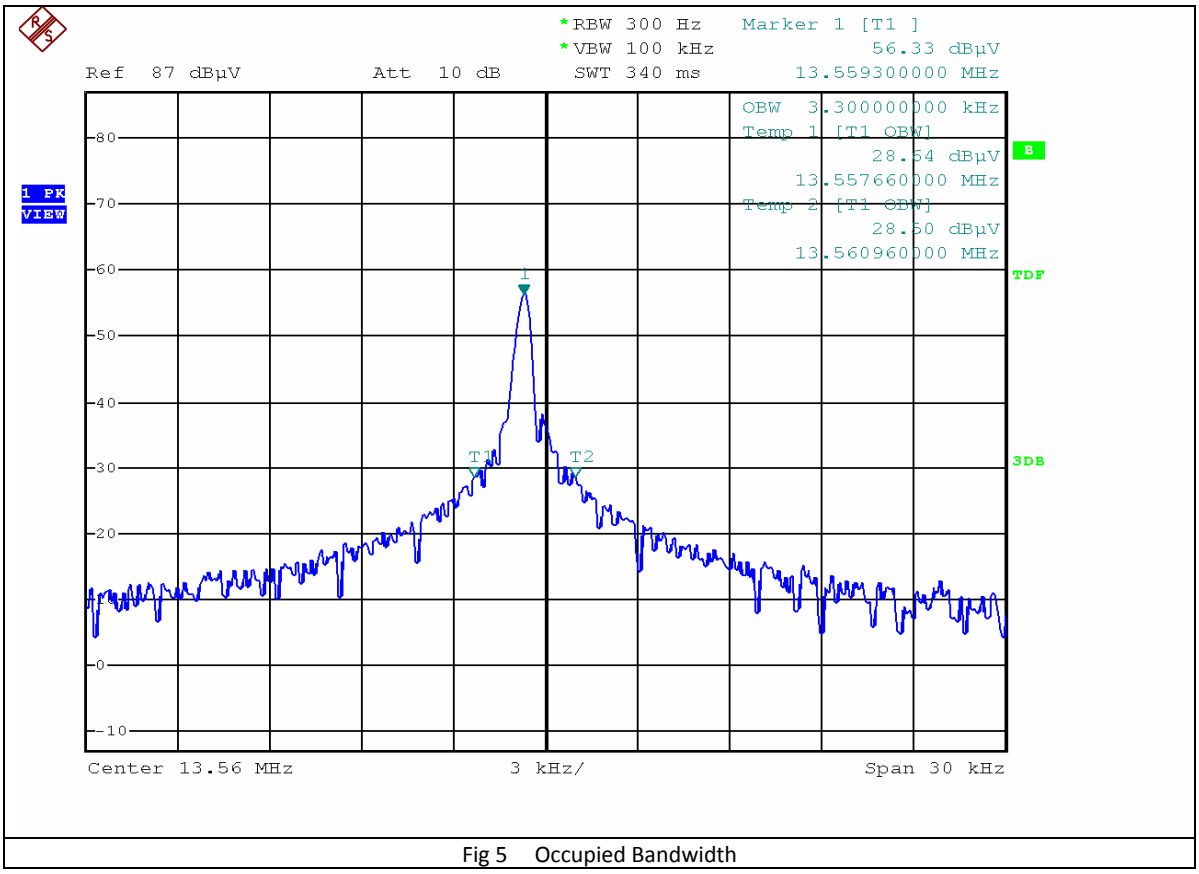


Fig 5 Occupied Bandwidth

13.56MHz Occupied Bandwidth = 3.3 KHz

Appendix 1

List of Test Equipment

Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Due Date	Cal Interval Months
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

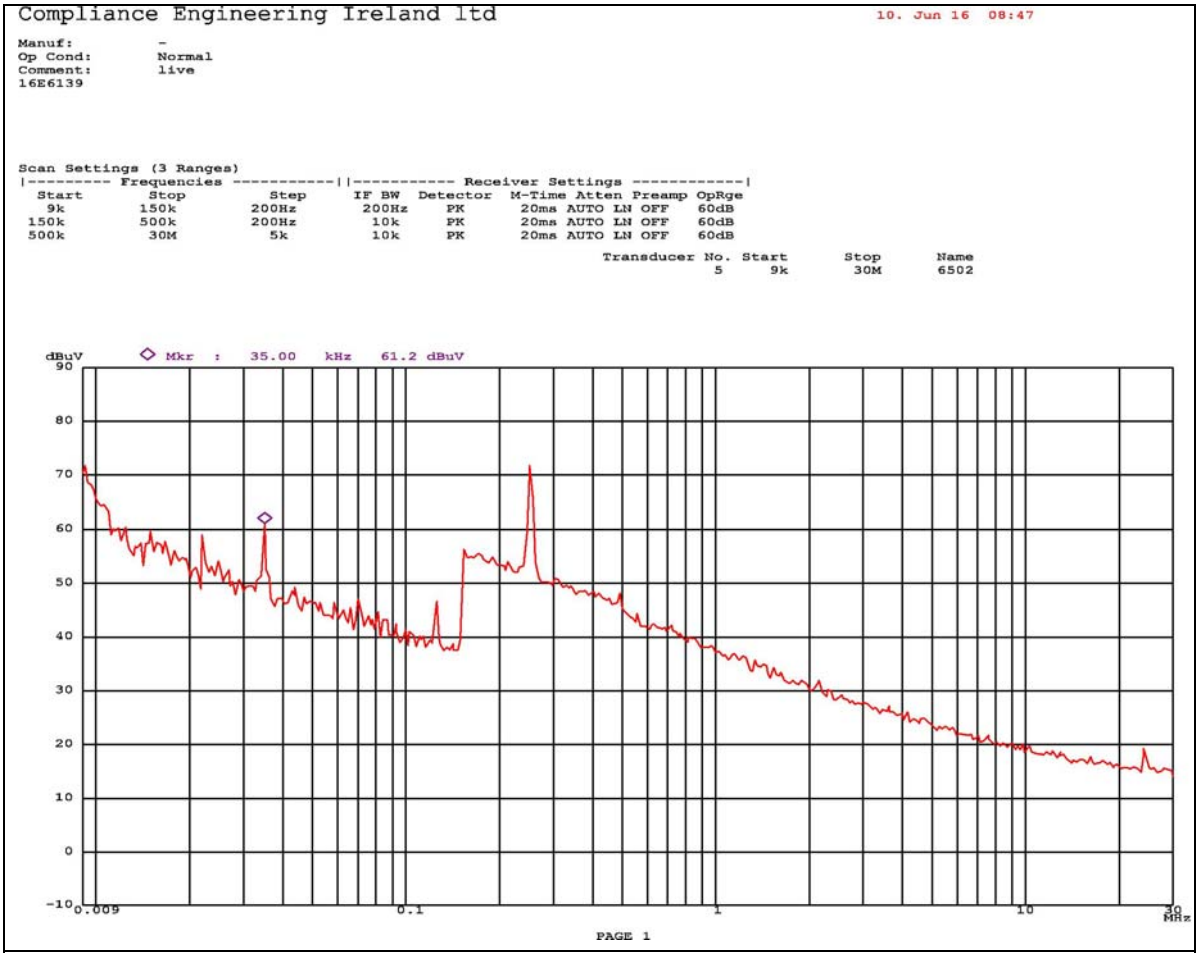


Fig 1 Radiated Emissions 9 KHz -30MHz 3metres Anechoic Chamber

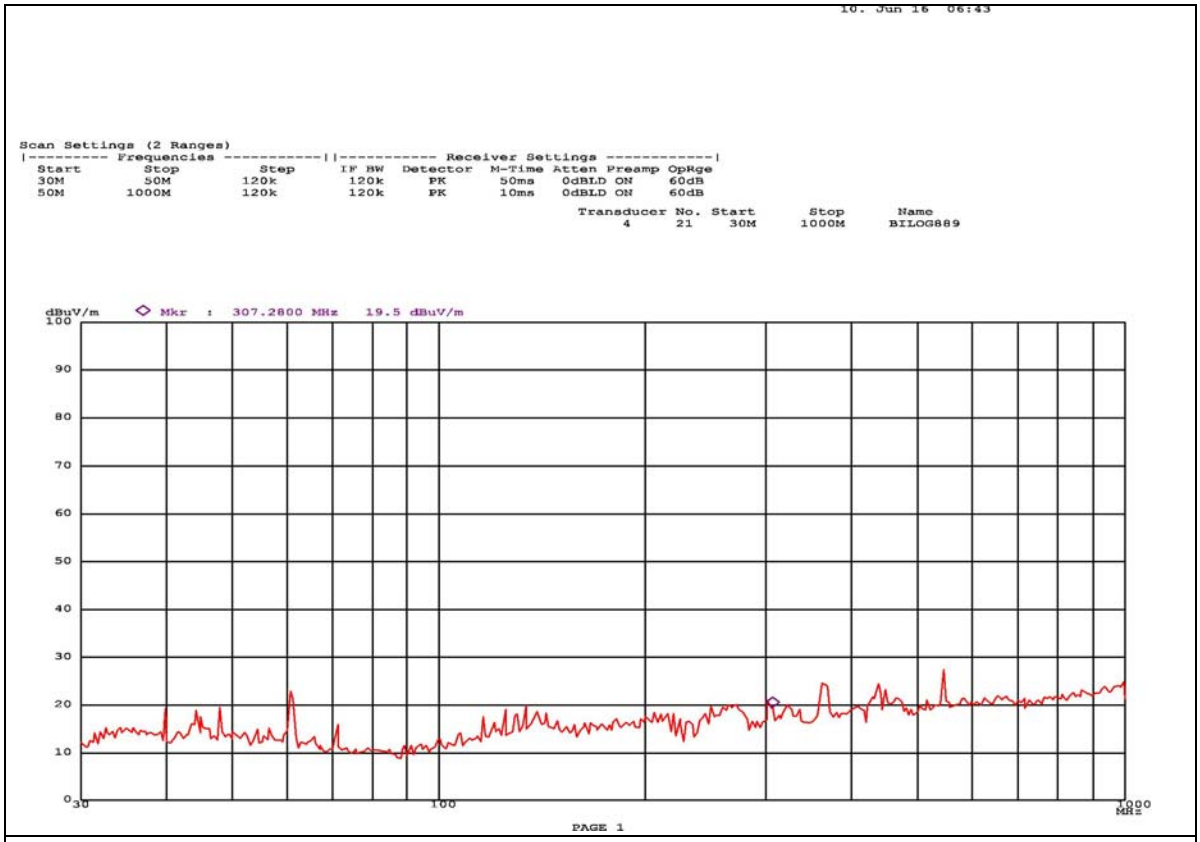


Fig 2 Radiated Emissions 30MHz-1GHz Vertical 3metres Anechoic Chamber

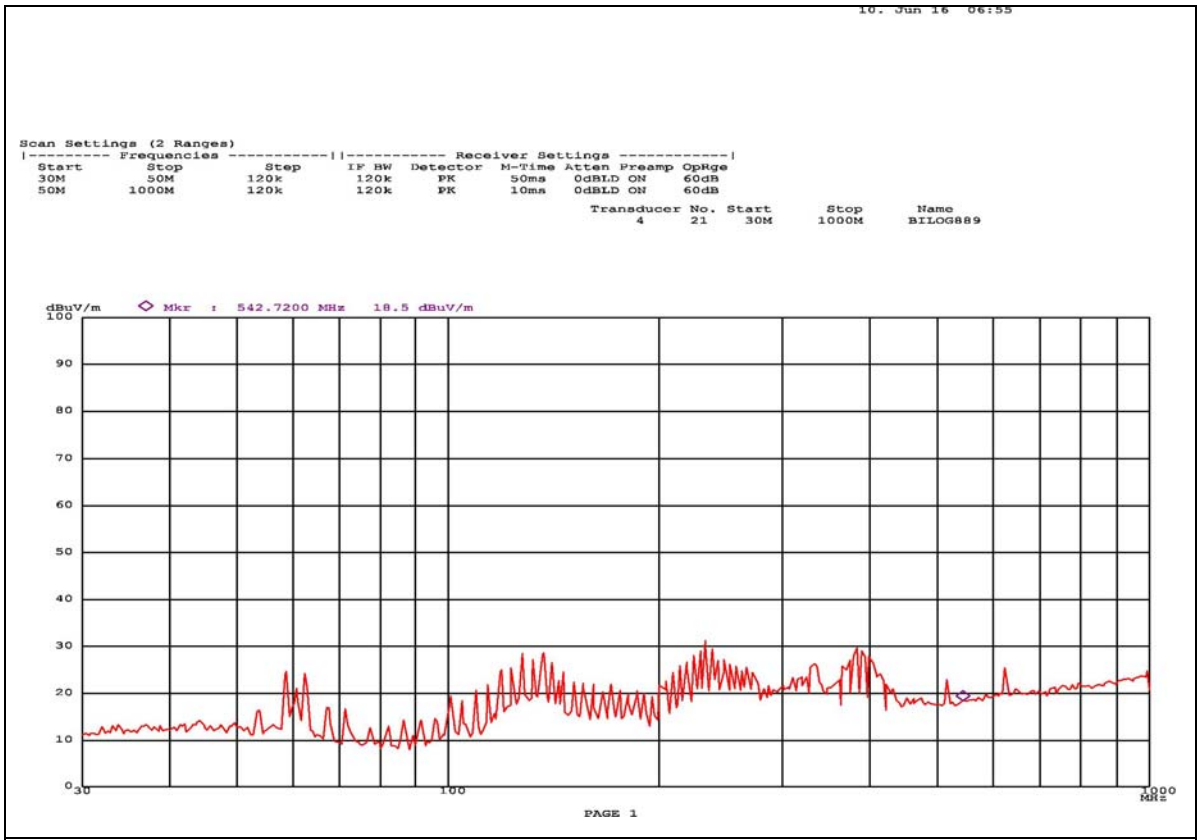


Fig 3 Radiated Emissions 30MHz-1GHz Horizontal 3metres Anechoic Chamber

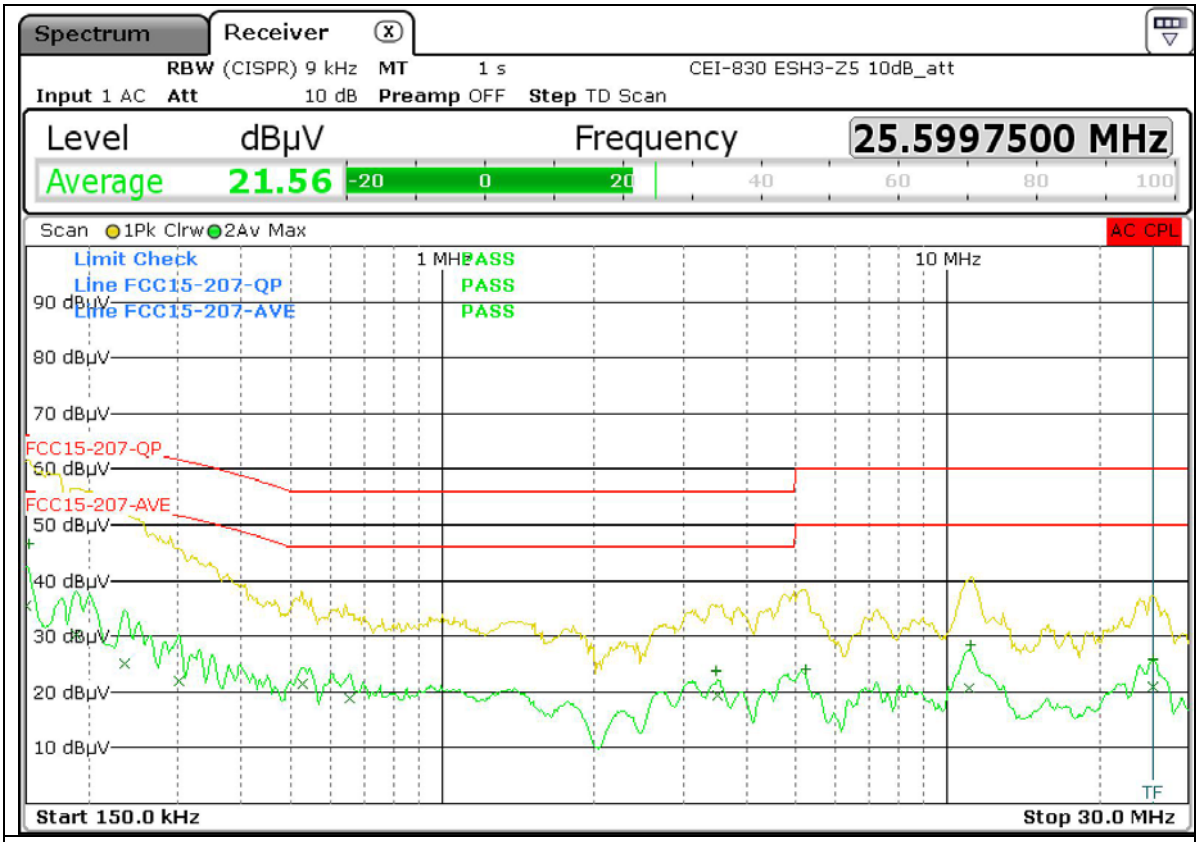


Fig 4 Conducted Emissions on the mains Live

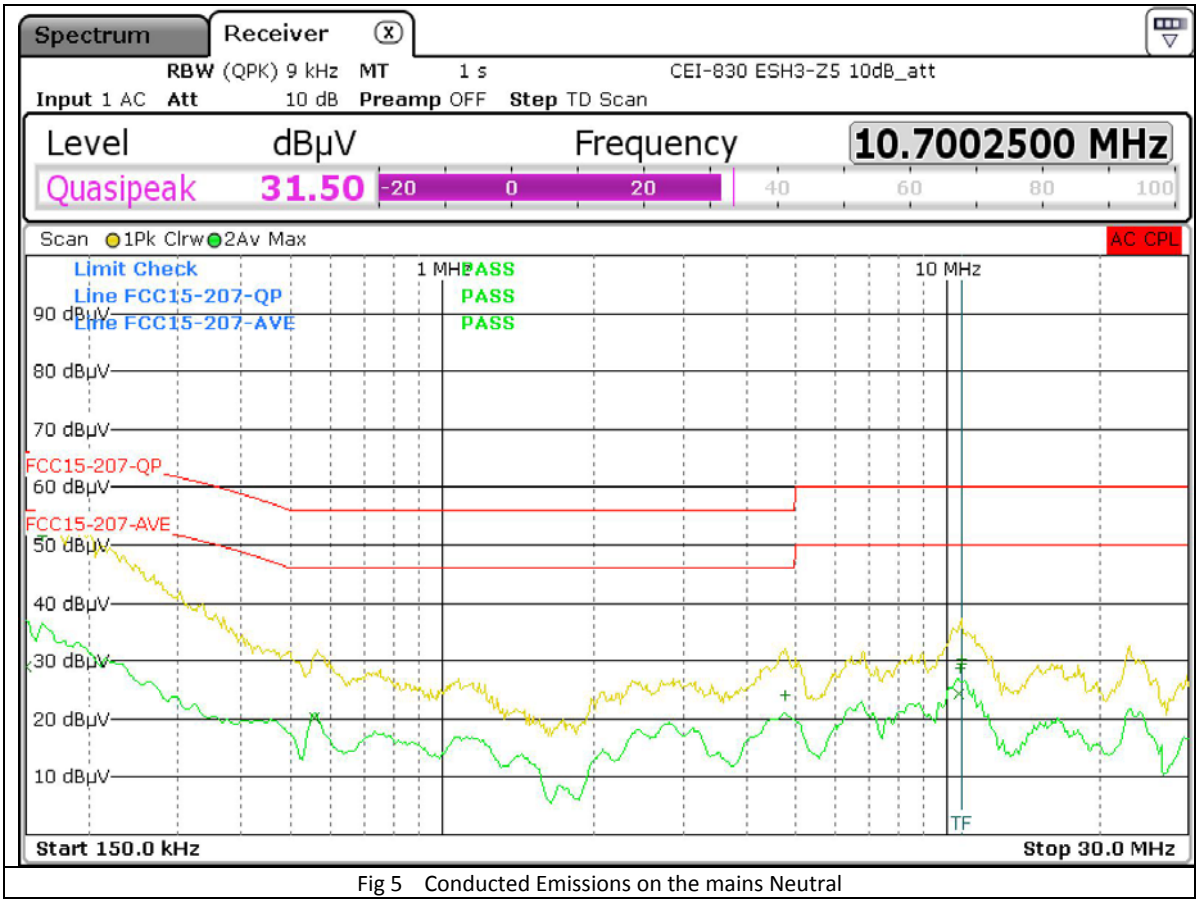


Fig 5 Conducted Emissions on the mains Neutral

End of Report