Compliance Engineering Ireland Ltd

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Project Number: 13E4506-5a

Prepared for:

Glen Dimplex Nordic

By

Compliance Engineering Ireland Ltd

Clonross Lane

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Dunshaughlin

Co. Meath

FCC Site Registration: 92592

Industry Canada Assigned Site Code: 8517A-2

Date

11 Sept 2013

FCC EQUIPMENT AUTHORISATION

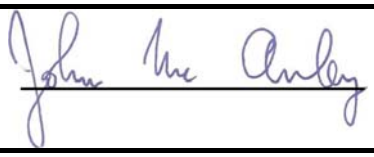
Test Report

EUT Description

Storage Heater with Radio Transceiver for heater control.

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	TEST PARAMETERS	Test Result
15.109	RADIATED EMISSIONS	PASS
15.107	CONDUCTED EMISSIONS ON THE MAINS	PASS

Exhibit A – Technical Report

Table of Contents

1.0 EUT Description

The EUT was a Storage Heater which contained a transceiver module as below.

The module used a short range 915 MHz band transceiver for heater control.

Storage Heater

Manufacturer:	Glen Dimplex
Make:	Quantum Heater
Model:	QM 070

Module

Model:	11123622
Type:	915 MHz Radio Transceiver for heater control
FCC ID:	Z4900006
IC ID:	6592A-00006

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 the mains.

The module was operated in CW mode for the Spurious Emissions tests.

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 11th September 2013.

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 powered from the mains through a LISN and measurements were carried out using a Receiver over the frequency range 150 KHz to 30 MHz.

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 1GHz were measured using a bi-log antenna. In this case the resolution bandwidth was 100kHz.

Emissions above 1GHz were measured using a horn antenna located at 3 metres distance from the EUT. In this case the resolution bandwidth was 1MHz and video bandwidth was 1MHz.

2 Duty Cycle

15.35 (c) & IC RSS-Gen Issue 1 4.3

The measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative(provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 seconds interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

TEST PROCEDURE

EUT was tested in modulated mode.

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 100 kHz and the VBW is set to 1MHz. The sweep time is coupled and the span is set to 0 Hz. The number of pulses is measured and calculated in a 100 ms scan.

RESULTS

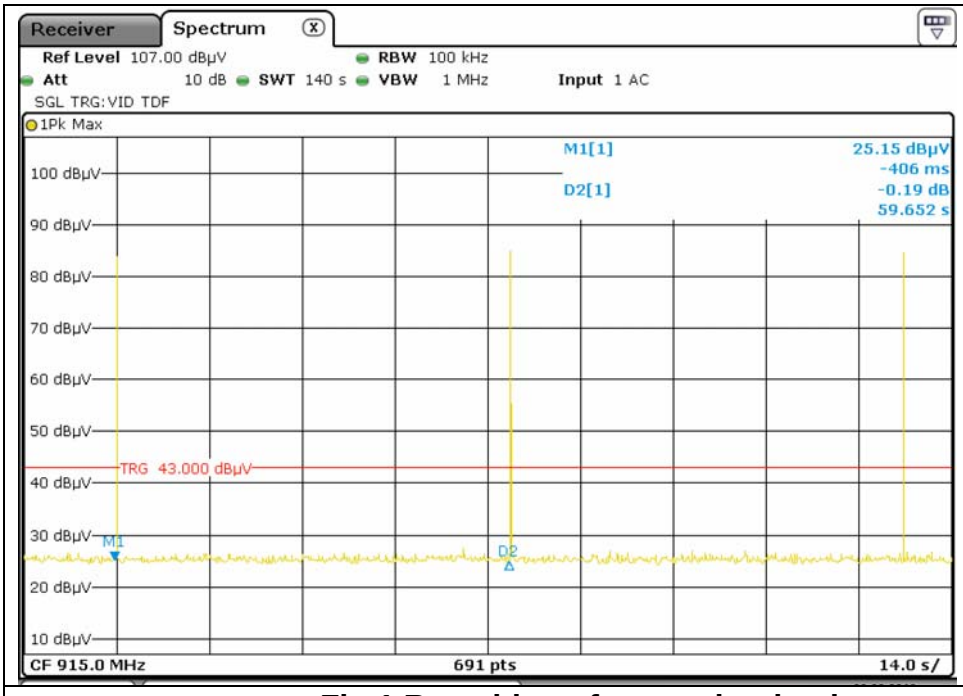


Fig 1 Repetition of transmitted pulse

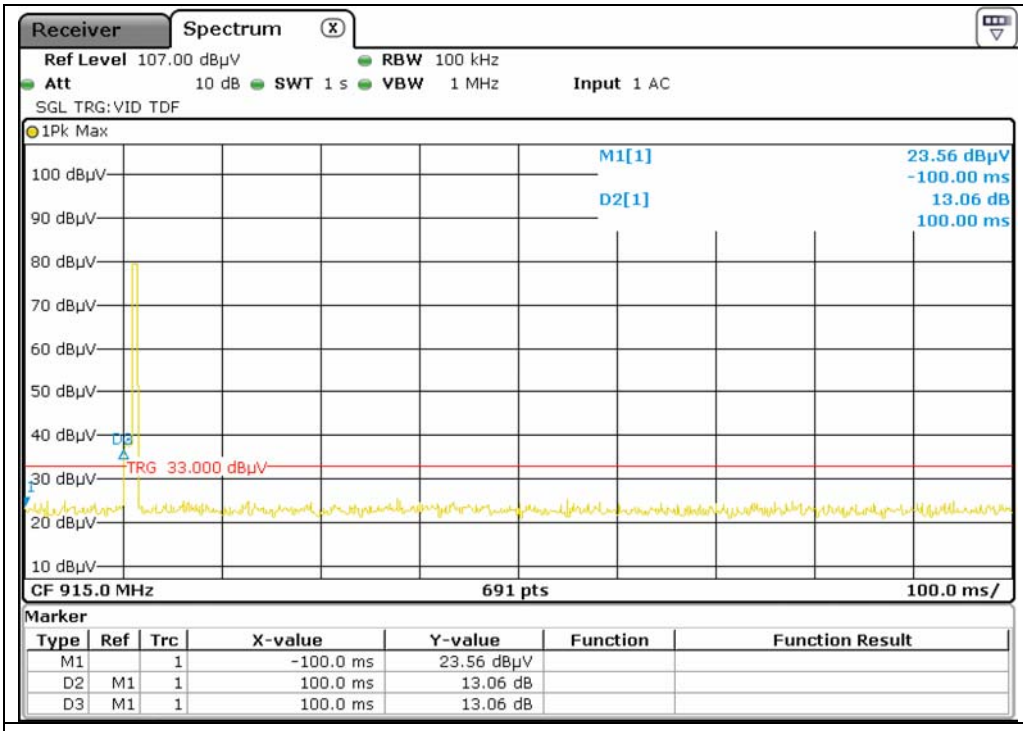


Fig 2 Transmitted pulses

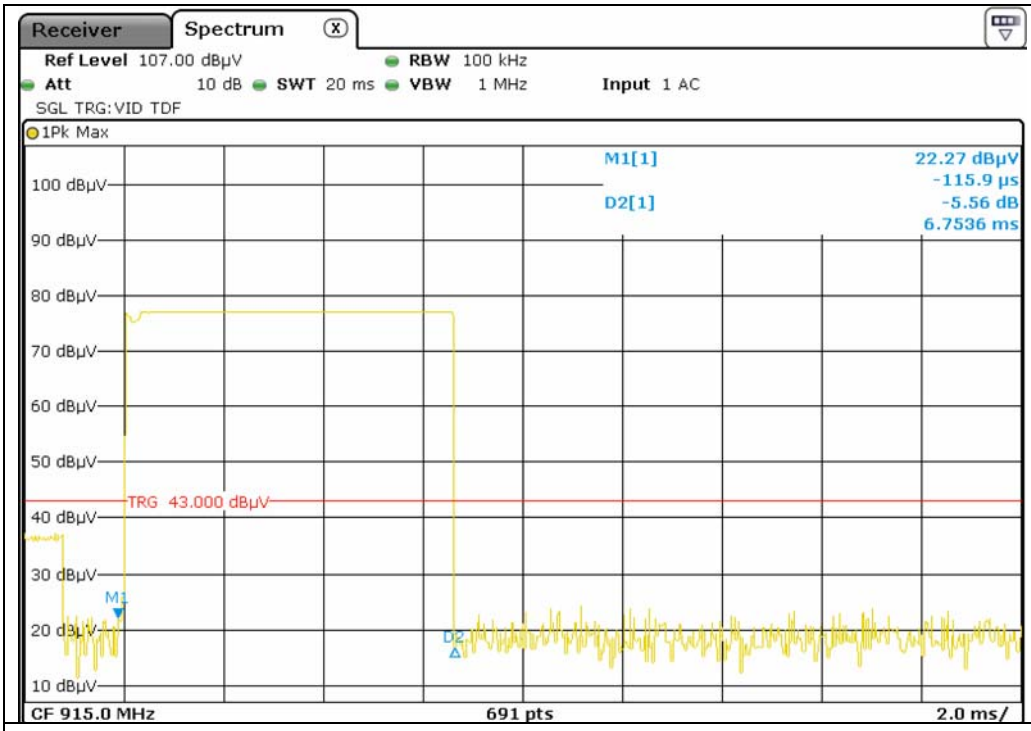


Fig 3 Individual pulse width

One Period(mS)	Pulse Width (mS)	No of Pulses	Duty Cycle	Duty Cycle %	Test Result
100	6.75	1	0.0675	6.8	Pass

CALCULATION

Average Reading = Peak Reading dB(µV/m) +20log (Duty Cycle),

*where Duty Cycle is (No of pulses*pulse width)/100 or T*

Note correction for pulse mode operation is

20 log duty cycle (dB)
-23.4

3 Field Strength of Spurious Radiated Emissions

Note this is the Average limit for 3 metre measurement.

For the spurious and harmonics measurements, the EUT was set up in an anechoic chamber. The EUT was rotated 360 degrees azimuth and the search antenna height was varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT were then recorded to determine margin to the limits. Distance of EUT to the measurement antenna was 3m.

The EUT was tested in CW mode.

4.0 Results for Radiated emissions

Appendix 3 shows the results of the scans in the anechoic chamber.

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

Frequency MHz	Peak Level dBuV/m	Antenna Polarity	Antenna Loss dB	Cable loss dB	Final Field Strength Peak dBuV/m
61.53	20.7	Vertical	5.9	0.2	26.8
72.96	20.45	Vertical	6.8	0.2	27.45
112.38	13.4	Vertical	11.4	0.2	25
150	14	Vertical	11.4	0.2	25.6
457.48	27.1	Vertical	16.5	1.2	44.8
457.48	20.63	Horizontal	16.5	1.2	38.33

Frequency MHz	Peak Level dBuV/m	Antenna Polarity	Quasi Peak Limit dBuV/m	Margin limit dB
61.53	26.8	Vertical	40.0	13.20
72.96	27.45	Vertical	40.0	12.55
112.38	25	Vertical	43.5	18.50
150	25.6	Vertical	43.5	17.90
457.48	44.8	Vertical	46.0	1.20
457.48	38.33	Horizontal	46.0	7.67

Note the tests were carried out with the Transceiver in CW mode.

Note the duty cycle measurements for 457.48MHz are identical to the carrier frequency measurements in Section 3

Peak levels are under than the Quasi Peak limit.

Result: Pass

4.2 Horn antenna measurements (1GHz – 12.75 GHz)

Frequency GHz	Measured Peak Level dBuV/m	Antenna Loss dB	Preamp Gain dB	Cable Loss	Antenna Polarity	Final Peak Level dBuV/m
1.830	74.0	25.4	38.6	1.6	Vertical	62.4
2.745	78.0	28.7	38.4	3.8	Vertical	72.1
3.660	65.0	31.3	37.4	4.5	Vertical	63.4
4.570	57.0	32.4	37.1	5.1	Vertical	57.4
5.489	47.0	34.3	37.5	5.7	Vertical	49.5
1.830	66.0	25.4	38.6	1.6	Horizontal	54.4
2.745	78.9	28.7	38.4	3.8	Horizontal	73.0
3.660	61.0	31.3	37.4	4.5	Horizontal	59.4
4.574	56.0	32.4	37.1	5.1	Horizontal	56.4
5.489	54.0	34.3	37.5	5.7	Horizontal	56.5

Frequency GHz	Final Peak Level dBuV/m	Antenna Polarity	Average Level dBV/m	Average Limit dBuV/m	Margin dB
1.830	62.4	Vertical	39.0	54	15.0
2.745	72.1	Vertical	48.7	54	5.3
3.660	63.4	Vertical	40.0	54	14.0
4.570	57.4	Vertical	34.0	54	20.0
5.489	49.5	Vertical	26.1	54	27.9
1.830	54.4	Horizontal	31.0	54	23.0
2.745	73.0	Horizontal	49.6	54	4.4
3.660	59.4	Horizontal	36.0	54	18.0
4.574	56.4	Horizontal	33.0	54	21.0
5.489	56.5	Horizontal	33.1	54	20.9

Note the tests were carried out with the Transceiver in CW mode.

Test Result Pass

4.3 Conducted Emissions on the Mains

Appendix 3 shows the results of the scans for Conducted Emissions

Detector	Freq	Reading	Margin	Phase
	MHz	dBuV	dB	
Quasi-Peak	9.569	26.72	-33.28	Live
Average	9.569	21.97	-28.03	Live

Results for Conducted Emissions on the Mains Live

Detector	Freq	Reading	Margin	Phase
	MHz	dBuV	dB	
Quasi-Peak	9.560	27.09	-32.91	Neutral
Average	9.665	23.57	-26.43	Neutral

Results for Conducted Emissions on the Mains Neutral

Test Result Pass

Appendix 1

List of Test Equipment

Instrument	Mftr.	Model	CEI Ref No.	Cal Due Date
Measuring Receiver	Rohde & Schwarz	ESVS30	607	19/04/2014
Bilog Antenna	Chase	CBL 6140	690	03/10/2015
Preamplifier	Hewlett Packard	83017A	805	10/04/2014
Horn Antenna	AH Systems	SAS 200 571	839	12/10/2013
Spectrum Analyser/Receiver	Rohde & Schwarz	ESR	869	28/05/2014
Spectrum Analyser	Agilent	E4408B	722	11/01/2014
LISN	Rohde & Schwarz	ESH3-Z5	604	11/12/2013

Appendix 2

Test Configurations

Fig 1 Radiated Emissions -

Fig 2 Radiated Emissions

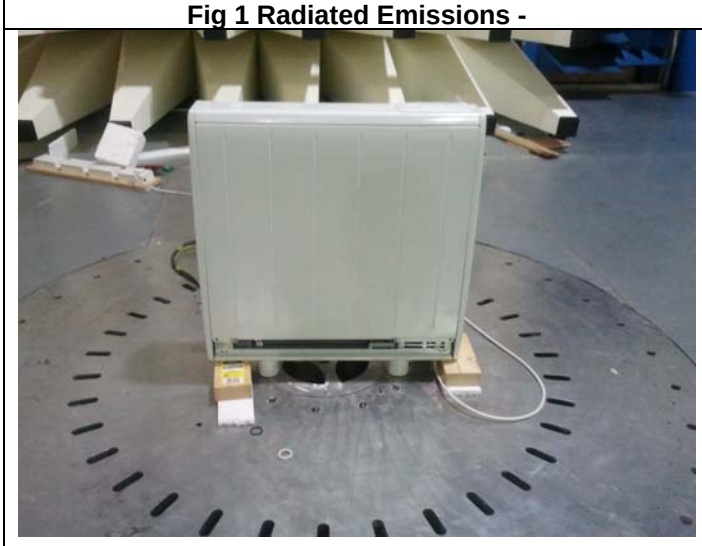


Fig 3 Radiated Emissions -

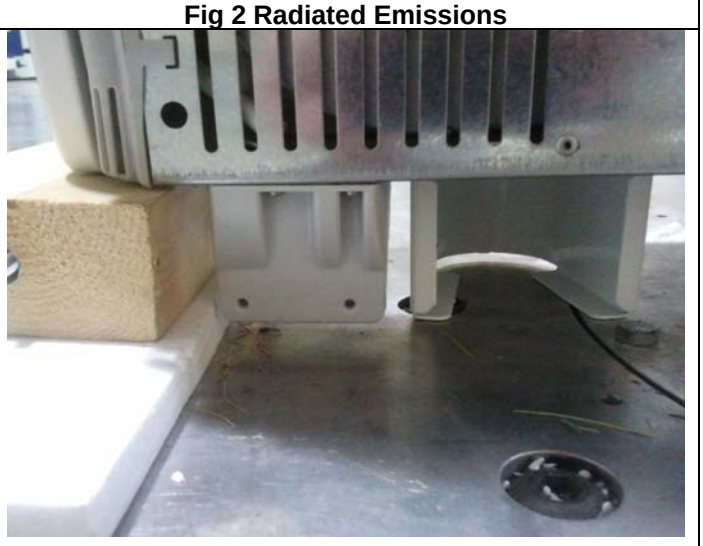


Fig 4Transceiver fitted

Fig 5 Conducted Emissions -

Appendix 3:

Test Results

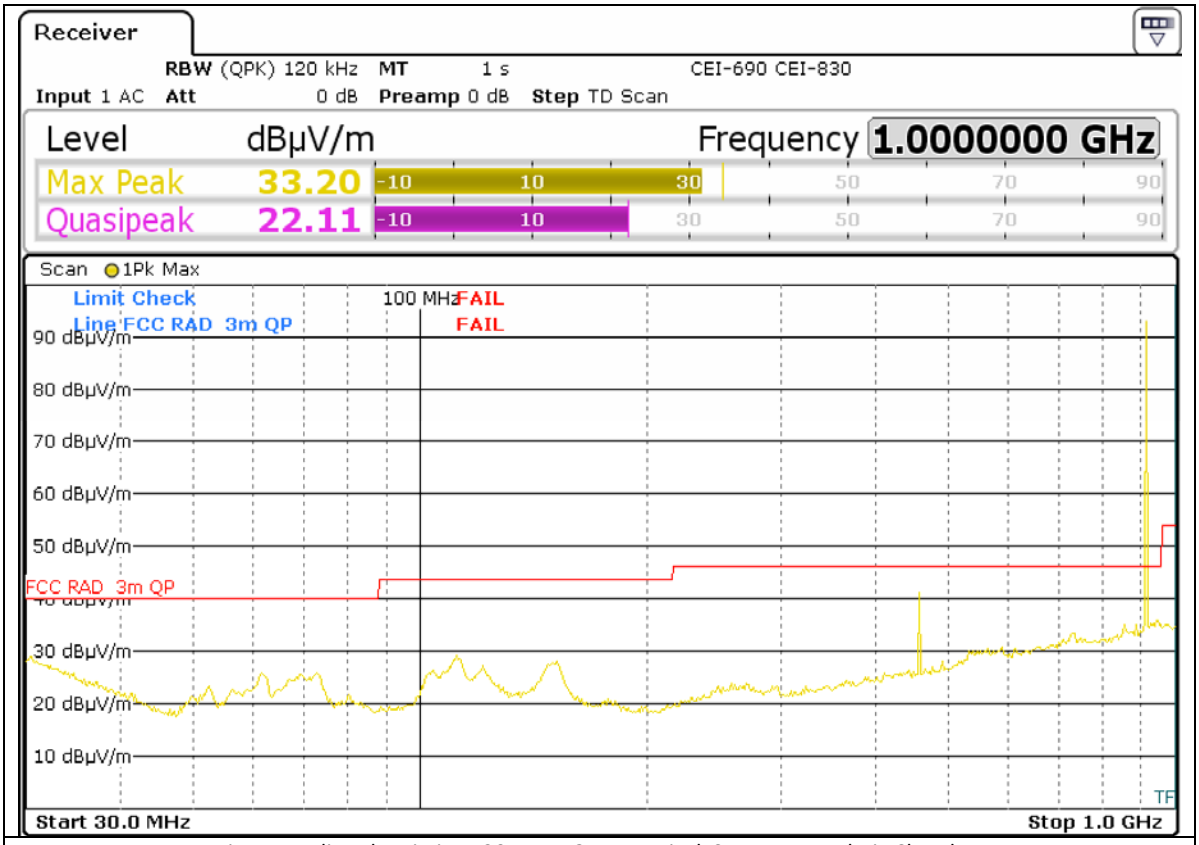


Fig 1 Radiated Emissions 30MHz-1GHz Vertical 3metres Anechoic Chamber

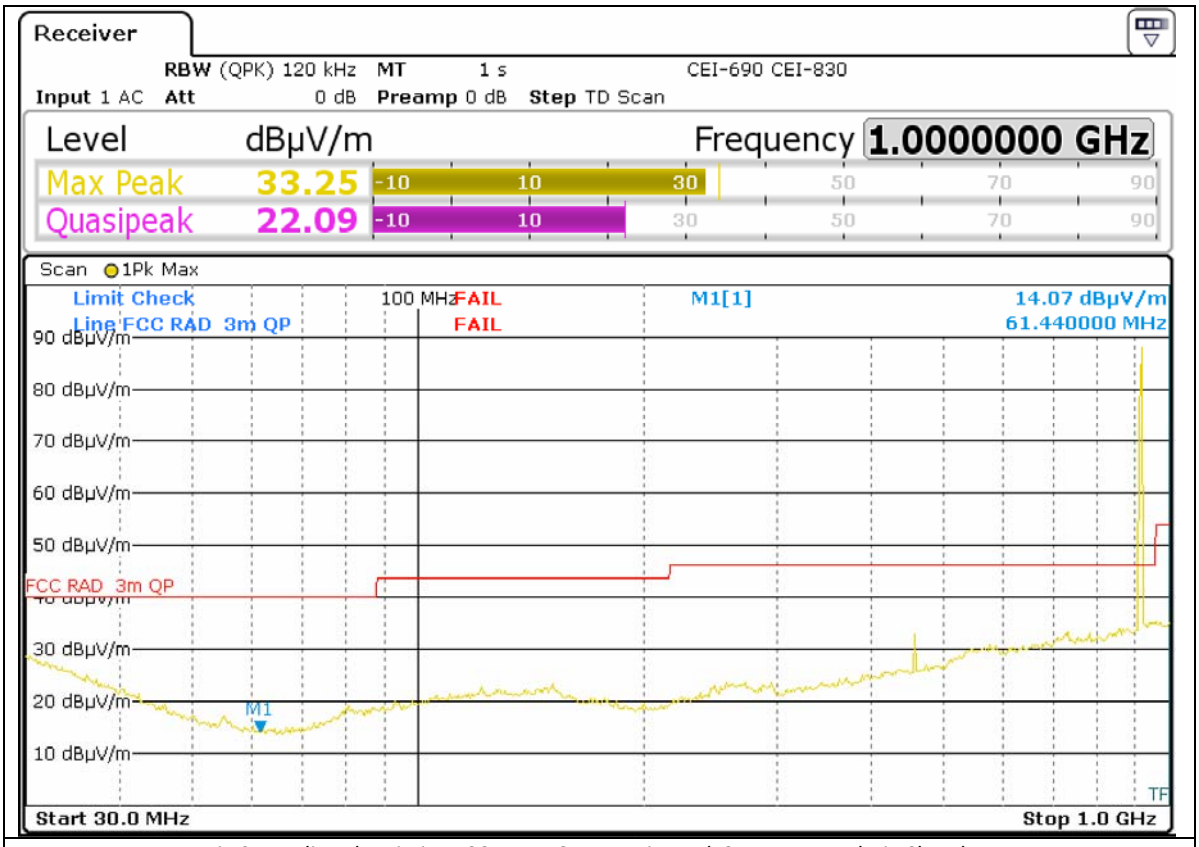


Fig 2 Radiated Emissions 30MHz-1GHz Horizontal 3metres Anechoic Chamber

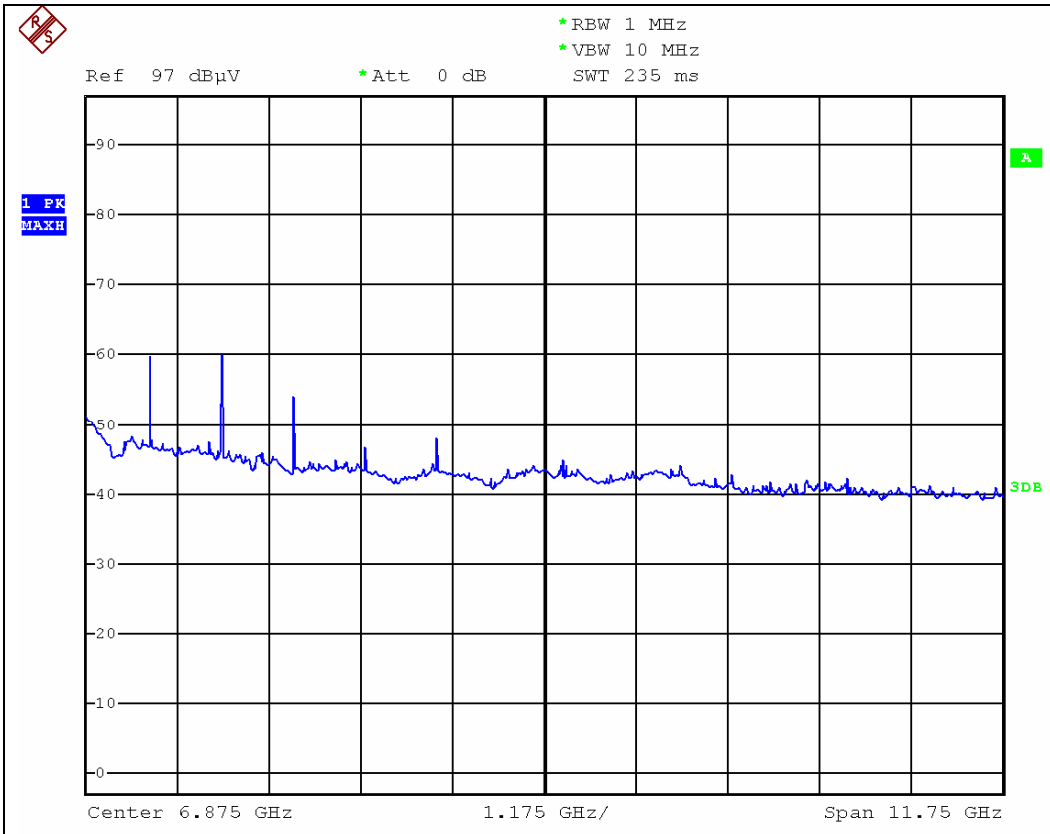


Fig 3 Radiated Emissions 1GHz -12.75GHz Vertical 3metres Anechoic Chamber

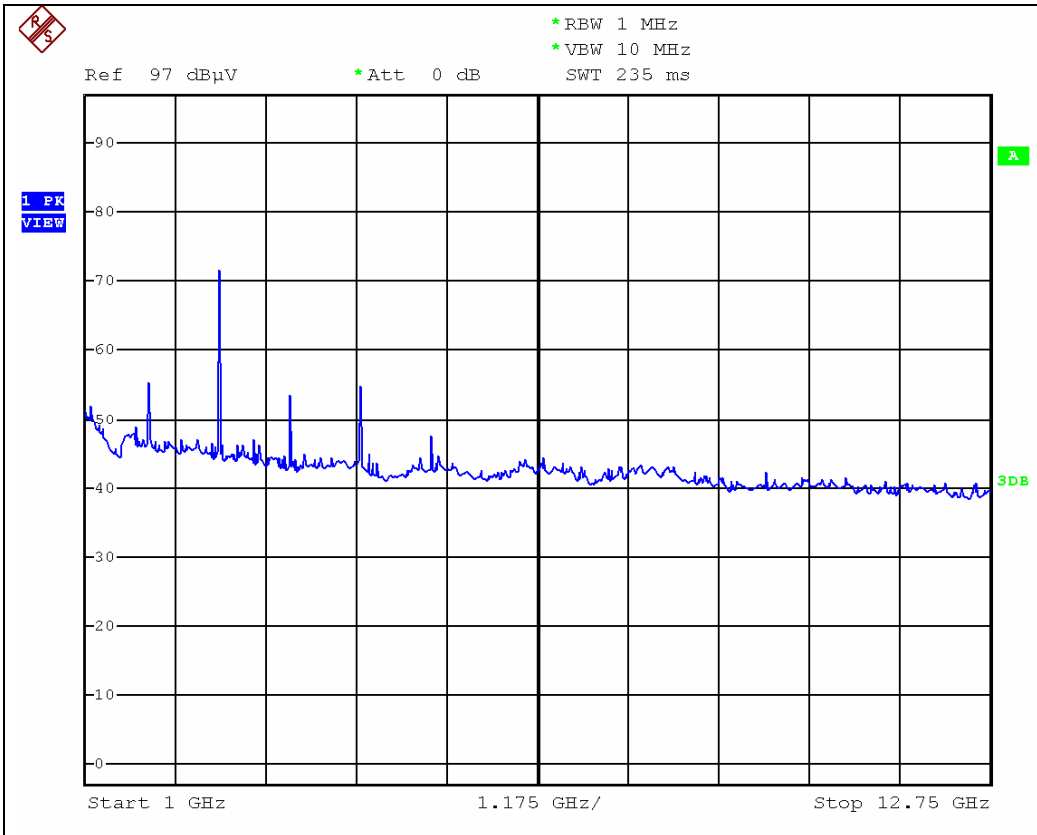


Fig 4 Radiated Emissions 1GHz -12.75GHz Horizontal 3metres Anechoic Chamber

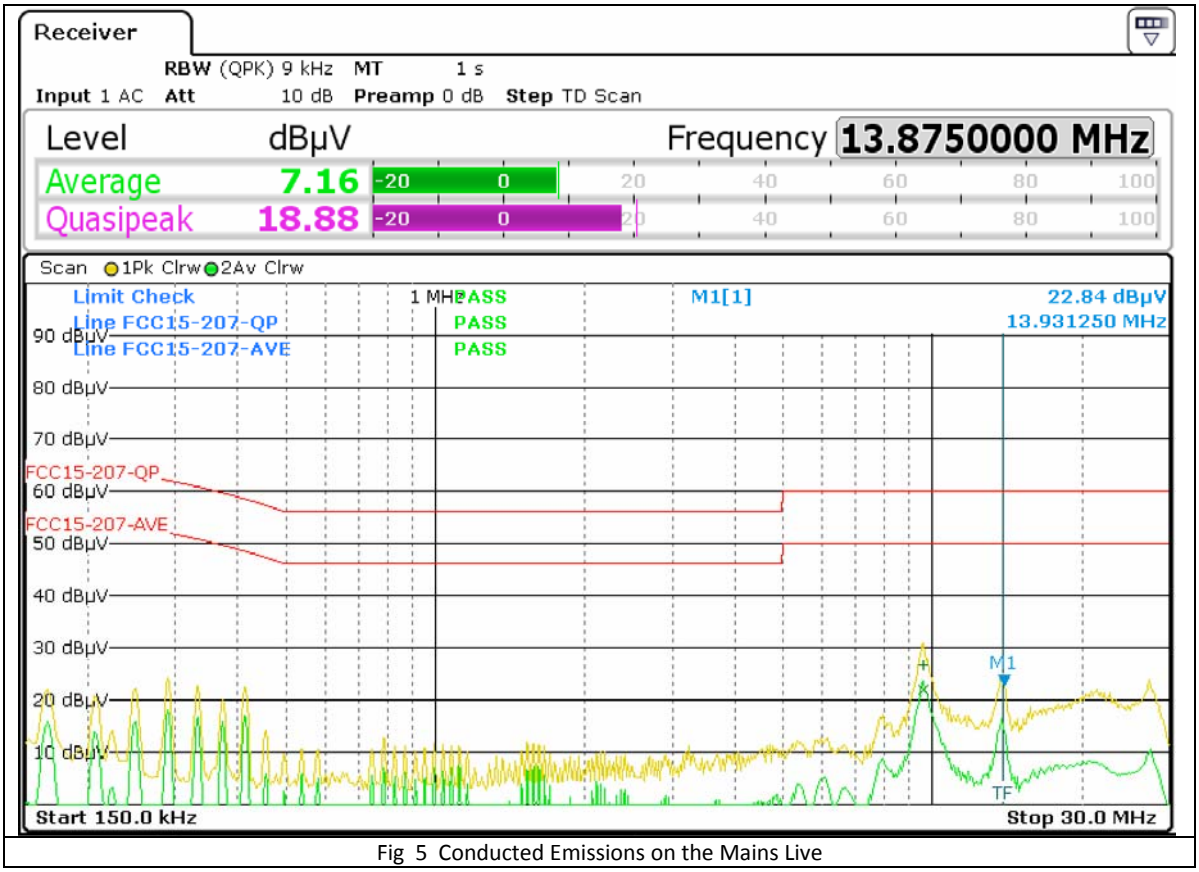


Fig 5 Conducted Emissions on the Mains Live

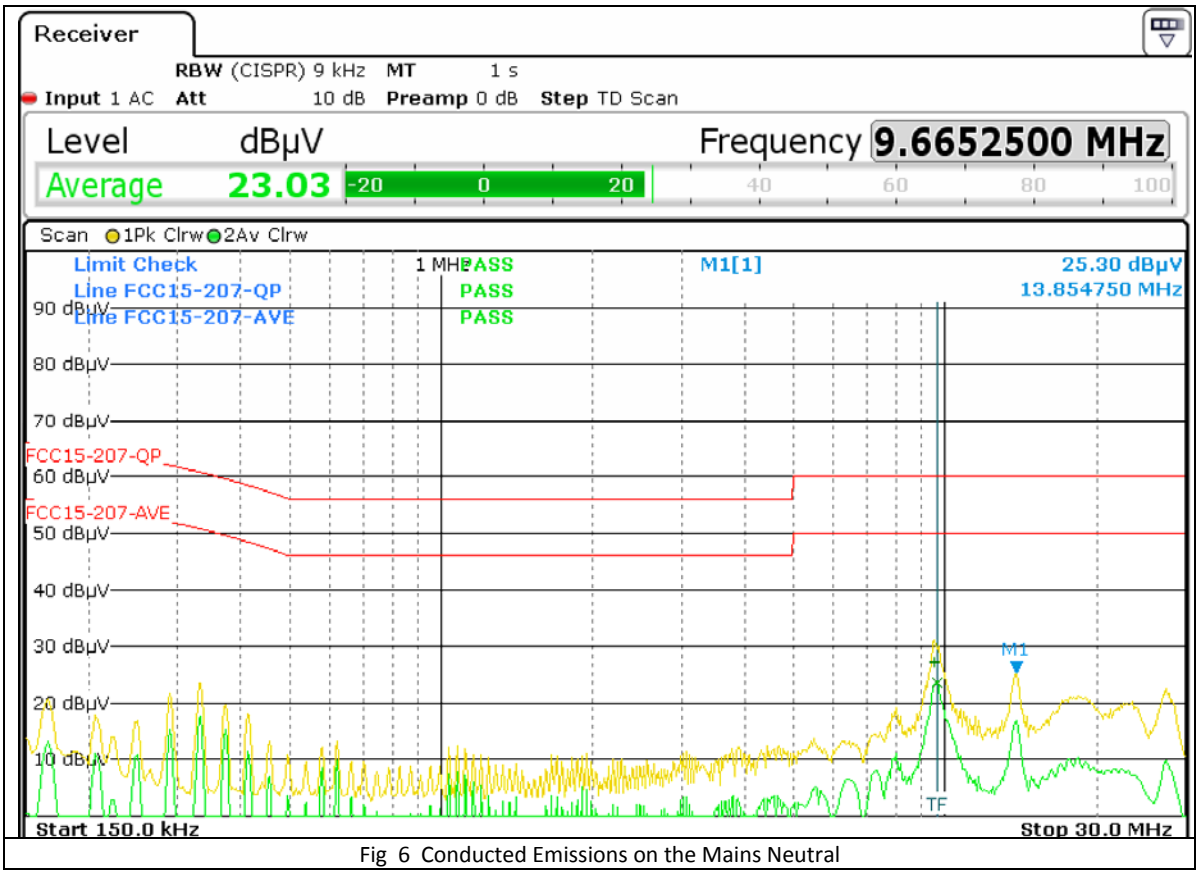


Fig 6 Conducted Emissions on the Mains Neutral