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Project Number: 13E4506-1a-2

Prepared for:

**Dimplex North America Ltd**

By

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**FCC Site Registration: 92592**

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

FCC ID: Z4900005

IC: 6592A-00005

**Date**

20 June 2013

FCC EQUIPMENT AUTHORISATION

Test Report

**EUT Description**

Radio Hub for heater control.

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**Authorised :**

**John McAuley**

A handwritten signature in blue ink that reads 'John McAuley'. The signature is written in a cursive style and is positioned to the right of the printed name 'John McAuley'.

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**TEST SUMMARY**

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

FCC Part Section(s)	RSS-210 Section	TEST PARAMETERS	Test Result
15.249(a)	A.2.9(a)	RADIATED EMISSIONS	PASS
15.249(d)	A.2.9(b)	RADIATED EMISSIONS	PASS
15.249(e)	A.2.9(b)	RADIATED EMISSIONS	PASS
15.207(a)		CONDUCTED EMISSIONS ON THE MAINS	PASS

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

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## 1.0 EUT Description

The EUT was a module using a short range 915 MHz band transceiver for heater control in buildings.

<b>Model:</b>	11123618
<b>Type:</b>	915 MHz Radio hub for heater control
<b>FCC ID:</b>	Z4900005
<b>Company:</b>	Dimplex North America
<b>Contact</b>	Kelly Stinton
<b>Address:</b>	1367 Industrial Road, Cambridge, ON N1R 7G8 Canada
<b>Phone:</b>	519-650-3630
<b>e-mail:</b>	kstinson@dimplex.com
<b>Test Standards:</b>	47 CFR, Part 15.249(a,d,e) ; 47 CFR, Part 15.207(a)
<b>Type of radio:</b>	Stand-alone
<b>Transmitter Type:</b>	GFSK
<b>Operating Frequency Range(s):</b>	915 MHz
<b>Number of Channels:</b>	1
<b>Antenna:</b>	Integral
<b>Transmitter power configuration:</b>	12v dc
<b>Oper. Temp Range:</b>	0° C to +40° C
<b>Classification:</b>	DXT
<b>Test Methodology:</b>	Measurements performed according to the procedures in ANSI C63.4-2003

## 1.1

## 1.2 EUT Operation

### **Operating Conditions during Test:**

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

The EUT was operated in CW mode for the Radiated power and Spurious Emissions tests.

The EUT was operated in normal operation mode for the duty cycle test.

### **Environmental conditions**

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

Normal

Temperature: +15 to +35 ° C

Humidity: 20-75 %

## 1.3 Modifications

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

## 1.4 Date of Test

The tests were carried out on one sample of the EUT during the months of May and June 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 15.207 and 15.209. Tests were carried out to the requirements of CISPR 16-4 and ANSI C63.4-2009.

#### **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 powered from a mains to 12v dc adapter which 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 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.

## 2.3 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



## 2.4 Test Criteria

### Requirement :- 15.249 (a) & IC RSS-210 Issue 6 A2.9

Operation within the bands 902-928 MHz

*The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:*

<b>Fundamental frequency</b>	<b>Field strength of fundamental (millivolts/meter)</b>	<b>Field strength of harmonics (microvolts/meter)</b>
902-928 MHz	50	500

## TEST PROCEDURE

EUT was tested in CW mode.

## RESULTS

<b>Frequency MHz</b>	<b>Peak Level dBuV/m</b>	<b>Antenna Polarity</b>	<b>Antenna Loss dB</b>	<b>Cable loss dB</b>	<b>Final Field Strength Peak dBuV/m</b>
914.962	76.24	Vertical	22.6	1.4	100.24
914.962	80.24	Horizontal	22.6	1.4	104.24

<b>Frequency MHz</b>	<b>Peak Level dBuV/m</b>	<b>Antenna Polarity</b>	<b>Average Level dBuV/m</b>	<b>Average Limit dBuV/m</b>	<b>Margin dB</b>
914.962	100.24	Vertical	76.83	94.0	17.15
914.962	104.24	Horizontal	80.83	94.0	13.15

Test Result Pass

### 3.0 Duty Cycle

#### 15.35 (c) & IC RSS-Gen Issue 3 4.3

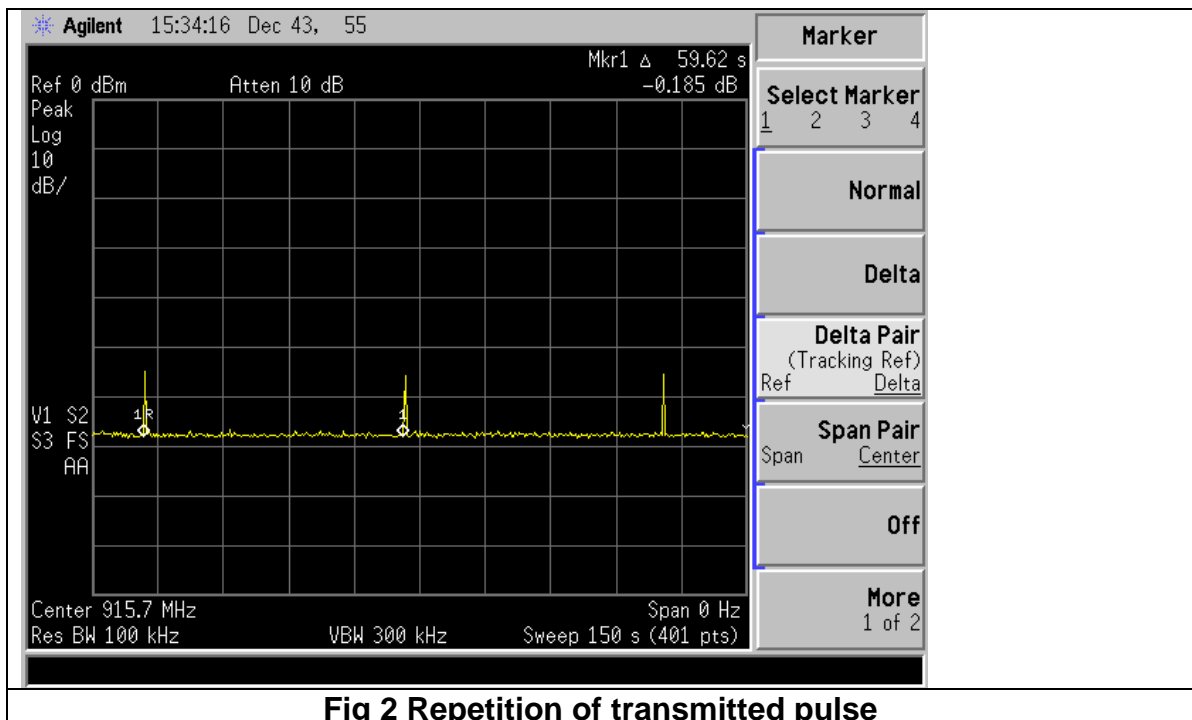
The measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 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 300 kHz. 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 2 Repetition of transmitted pulse**

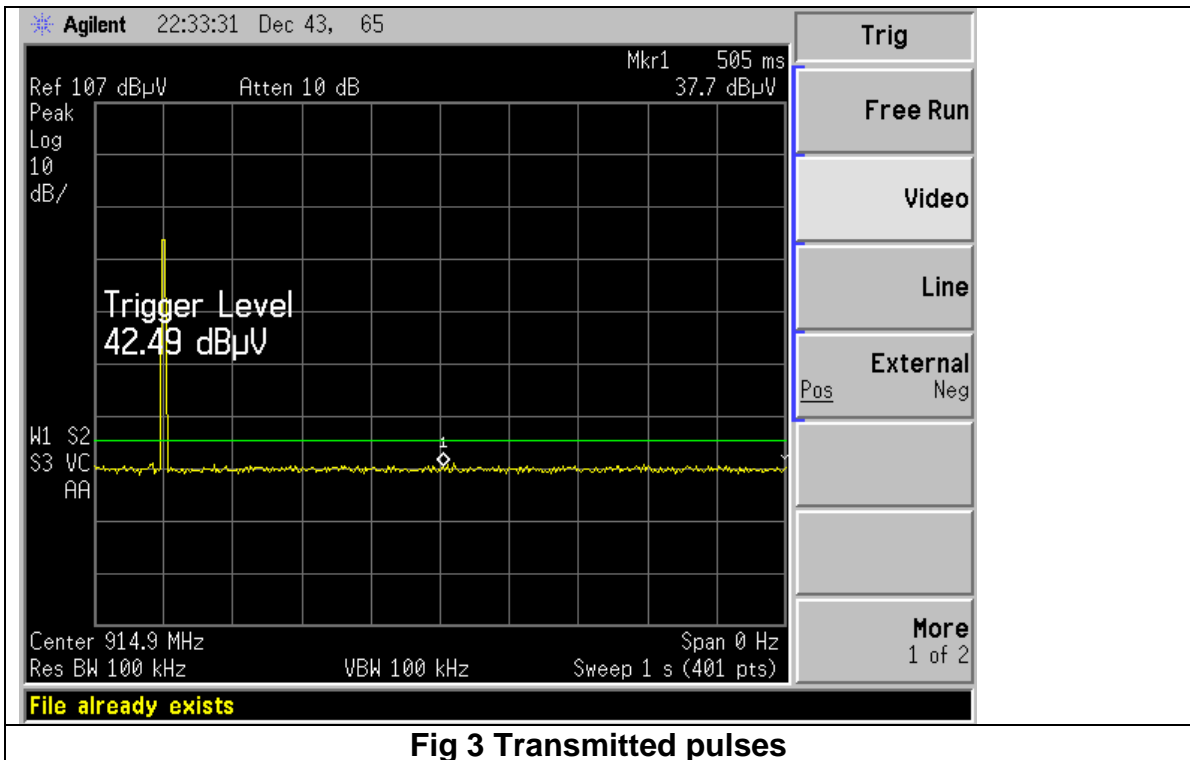


Fig 3 Transmitted pulses

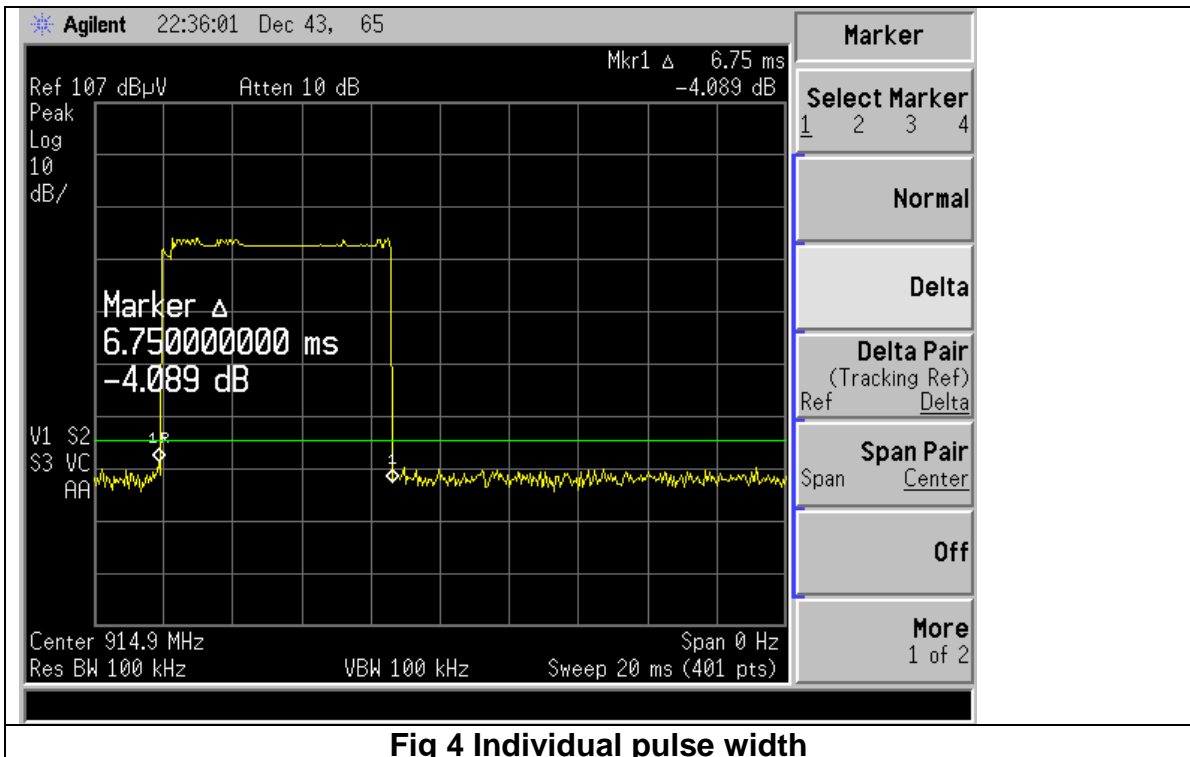


Fig 4 Individual pulse width

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( $\mu$ V/m) +20log (Duty Cycle),*

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

Note correction for pulse mode operation is

<b>20 log duty cycle (dB)</b>
<b>-23.4</b>

### 3.1 Occupied Bandwidth

#### Test Criteria

#### Requirement :-IC RSS-Gen

Bandwidth is determined at the points 20dB down from the modulated carrier.

#### TEST PROCEDURE

The resolution bandwidth was set to 10 kHz. The video bandwidth was set to 30 kHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

#### RESULTS



Fig 1 Occupied bandwidth

Operating Frequency (MHz)	20dB Bandwidth (kHz)
914.962	214.9

#### **4.0 Field Strength of Spurious Radiated Emissions**

##### **Test Specification: FCC PART 15, SECTION 47 CFR 15.249(d) & IC RSS-210 Issue 8 A2.9**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation

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.

## 4.1 Results for Radiated emissions

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

**Result: Pass**

### 4.1.1 Spurious Emissions Measurements with Bilog Antenna (30MHz to 1GHz)

Frequency MHz	Quasi Peak Level dBuV/m	Antenna Polarity	Antenna Loss dB	Cable loss dB	Final Field Strength Quasi Peak dBuV/m
50.3	24.7	Vertical	8.9	0.2	33.8
67.18	16.83	Vertical	5.9	0.2	22.93
97.27	30.07	Vertical	10.3	0.2	40.57
117.27	20	Vertical	11.8	0.2	32
194.37	10.54	Vertical	8.6	0.2	19.34
961.29	11.34	Vertical	24.2	1.4	36.94
868.489	11.4	Vertical	22.2	1.4	35
31.77	10.84	Horizontal	18.3	0.2	29.34
97.17	22.1	Horizontal	10.3	0.2	32.6
259.05	13.56	Horizontal	13	0.2	26.76
868.44	11.4	Horizontal	22.2	1.4	35

Frequency MHz	Quasi Peak Level dBuV/m	Antenna Polarity	Quasi Peak Limit dBuV/m	Margin dB
50.3	33.8	Vertical	40.00	6.2
67.18	22.93	Vertical	40.00	17.1
97.27	40.57	Vertical	43.52	3.0
117.27	32	Vertical	43.52	11.5
194.37	19.34	Vertical	43.52	24.2
961.29	36.94	Vertical	53.98	17.0
868.489	35	Vertical	46.02	11.0
31.77	29.34	Horizontal	40.00	10.7
97.17	32.6	Horizontal	43.52	10.9
259.05	26.76	Horizontal	46.02	19.3
868.44	35	Horizontal	46.02	11.0

**Result: Pass**

## 4.1.2 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	45.2	24.8	0	1.6	Vertical	71.6
2.745	35.5	29.4	0	3.8	Vertical	68.7
3.659	61.3	30.6	37.4	4.5	Vertical	59.0
4.570	50.7	32.3	37.1	5.1	Vertical	51.0
5.489	47.8	34.2	37.5	5.7	Vertical	50.2
6.408	51.8	34.2	36.8	6.8	Vertical	56.0
7.319	54.8	37.7	38	6.7	Vertical	61.2
1.830	43.6	24.8	0	1.6	Horizontal	70.0
2.745	35.1	29.4	0	3.8	Horizontal	68.3
3.659	59.1	30.6	37.4	4.5	Horizontal	56.8
4.574	51.2	32.3	37.1	5.1	Horizontal	51.5
5.489	47.0	34.2	37.5	5.7	Horizontal	49.4
6.408	55.6	34.2	36.8	6.8	Horizontal	59.8
7.319	54.1	37.7	38	6.7	Horizontal	60.5

Frequency GHz	Final Peak Level dBuV/m	Antenna Polarity	Average Level dBV/m	Average Limit dBuV/m	Margin dB
1.830	71.6	Vertical	48.2	54	5.8
2.745	68.7	Vertical	45.3	54	8.7
3.659	59.0	Vertical	35.6	54	18.4
4.570	51.0	Vertical	27.6	54	26.4
5.489	50.2	Vertical	26.8	54	27.2
6.408	56.0	Vertical	32.6	54	21.4
7.319	61.2	Vertical	37.8	54	16.2
1.830	70.0	Horizontal	46.6	54	7.4
2.745	68.3	Horizontal	44.9	54	9.1
3.659	56.8	Horizontal	33.4	54	20.6
4.574	51.5	Horizontal	28.1	54	25.9
5.489	49.4	Horizontal	26.0	54	28.0
6.408	59.8	Horizontal	36.4	54	17.6
7.319	60.5	Horizontal	37.1	54	16.9

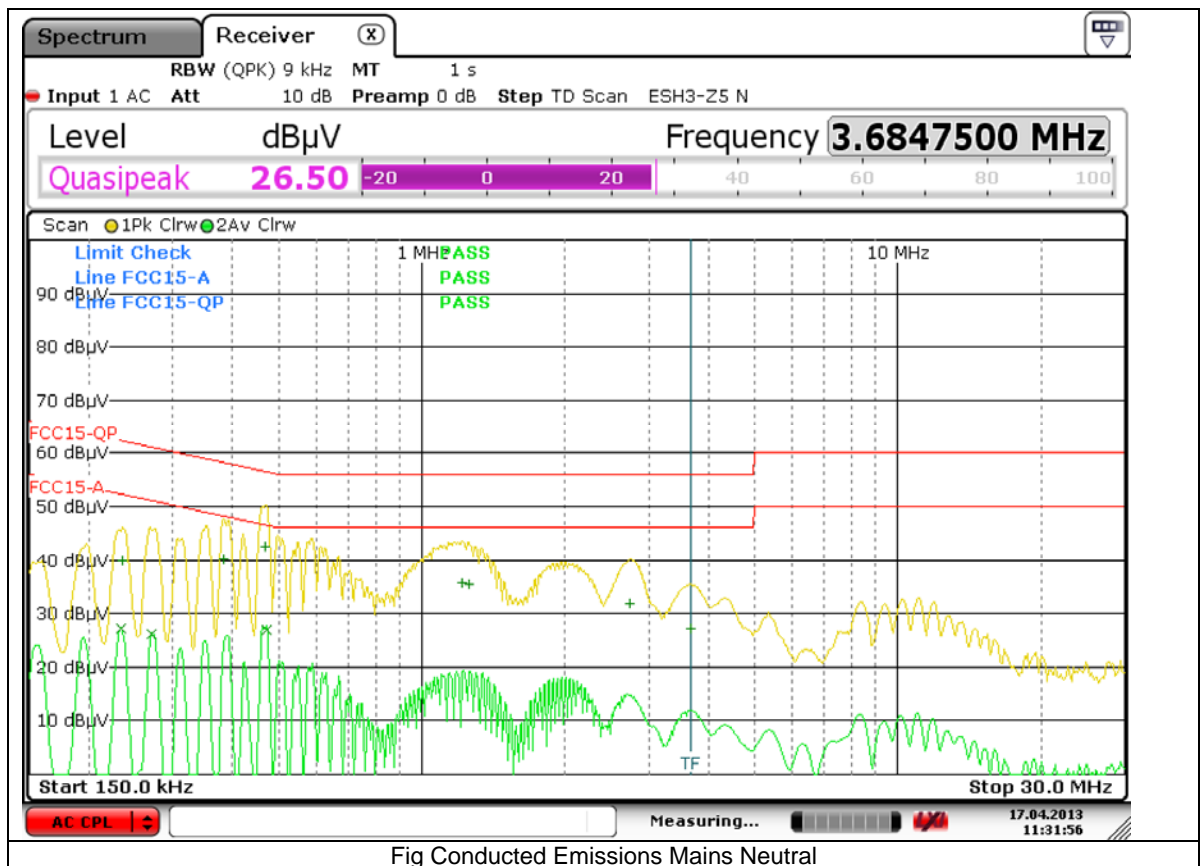
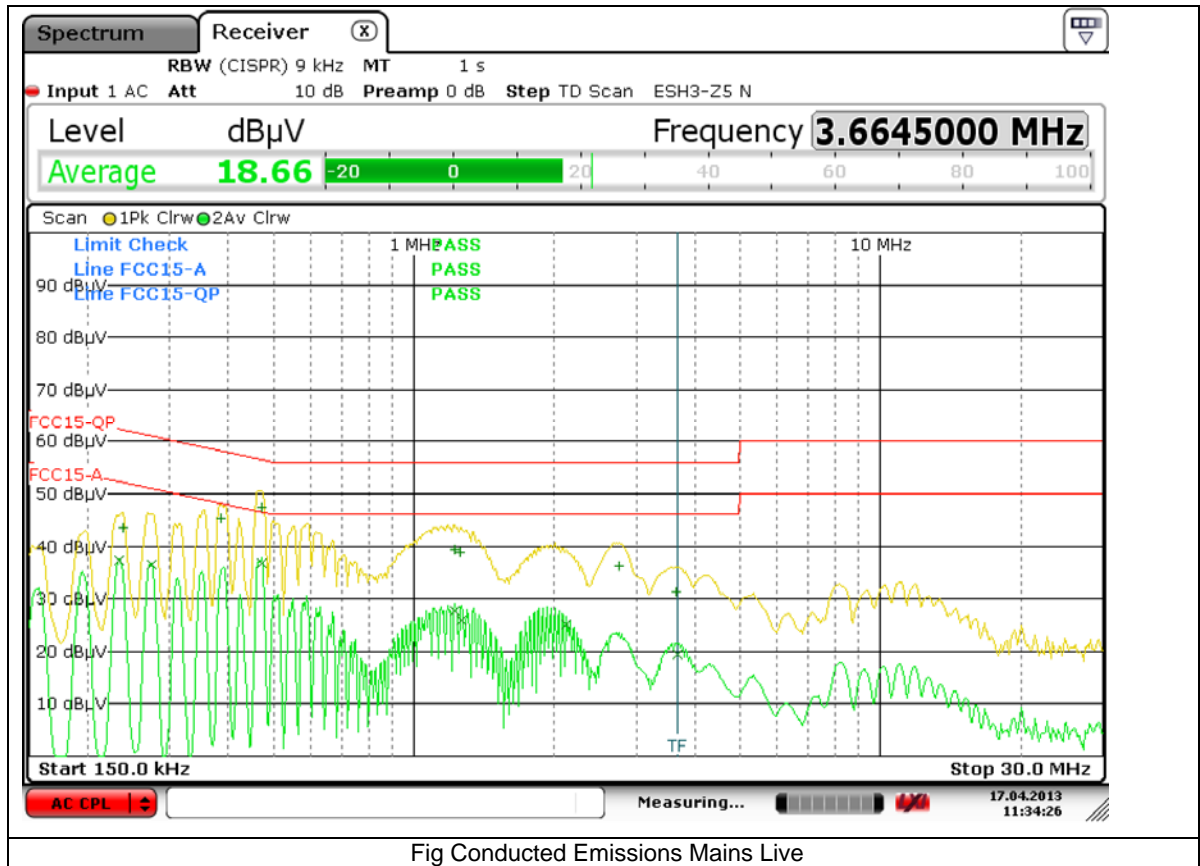
**Result: Pass**



## 5.0 List of Test Equipment

<b>Instrument</b>	<b>Mftr.</b>	<b>Model</b>	<b>CEI Ref No.</b>	<b>Cal Due Date</b>
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	25/05/2014
Spectrum Analyser	Agilent	E4408B	722	11/01/2014
LISN	Rohde & Schwarz	ESH3-Z5	604	11/12/2013

**Appendix A**  
**Additional Test Results**



Detector	Frequency MHz	Reading dBuV	Margin dB	Phase
Average	0.233	37.40	-14.93	Live
Quasi-Peak	0.238	43.61	-18.56	Live
Average	0.274	36.59	-14.41	Live
Quasi-Peak	0.386	45.23	-12.91	Live
Quasi-Peak	0.472	47.45	-9.03	Live
Average	0.472	36.69	-9.79	Live
Quasi-Peak	1.221	39.26	-16.74	Live
Average	1.221	27.81	-18.19	Live
Quasi-Peak	1.259	38.88	-17.12	Live
Average	1.262	25.83	-20.17	Live
Average	2.126	25.01	-20.99	Live
Quasi-Peak	2.758	36.30	-19.70	Live
Quasi-Peak	3.662	31.44	-24.56	Live
Average	3.665	19.51	-26.49	Live

Detector	Frequency MHz	Reading dBuV	Margin dB	Phase
Average	0.233	27.20	-25.13	Neutral
Quasi-Peak	0.236	39.78	-22.47	Neutral
Average	0.272	26.29	-24.78	Neutral
Quasi-Peak	0.384	40.22	-17.97	Neutral
Quasi-Peak	0.470	42.39	-14.13	Neutral
Average	0.472	26.86	-19.62	Neutral
Quasi-Peak	1.217	35.64	-20.36	Neutral
Quasi-Peak	1.255	35.47	-20.53	Neutral
Quasi-Peak	2.744	31.75	-24.25	Neutral
Quasi-Peak	3.685	27.09	-28.91	Neutral

Results for Conducted Emissions on the mains

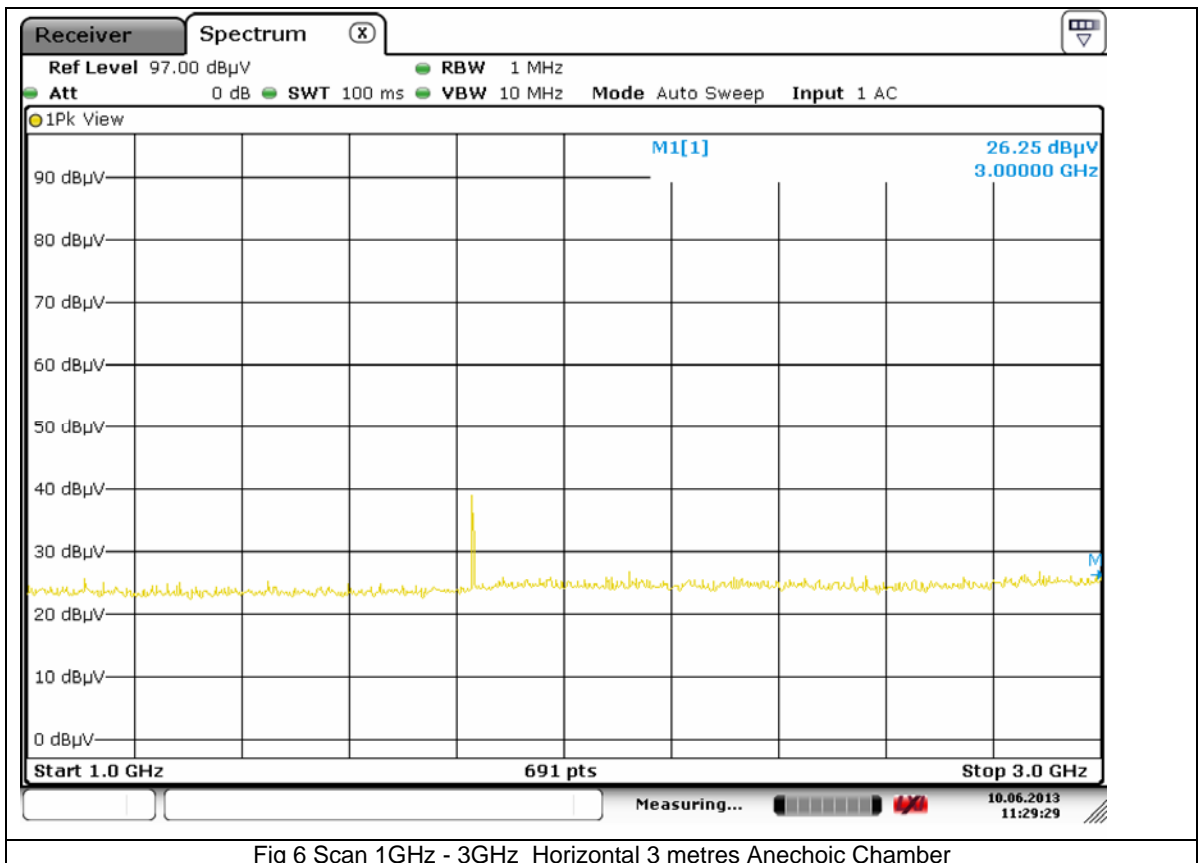
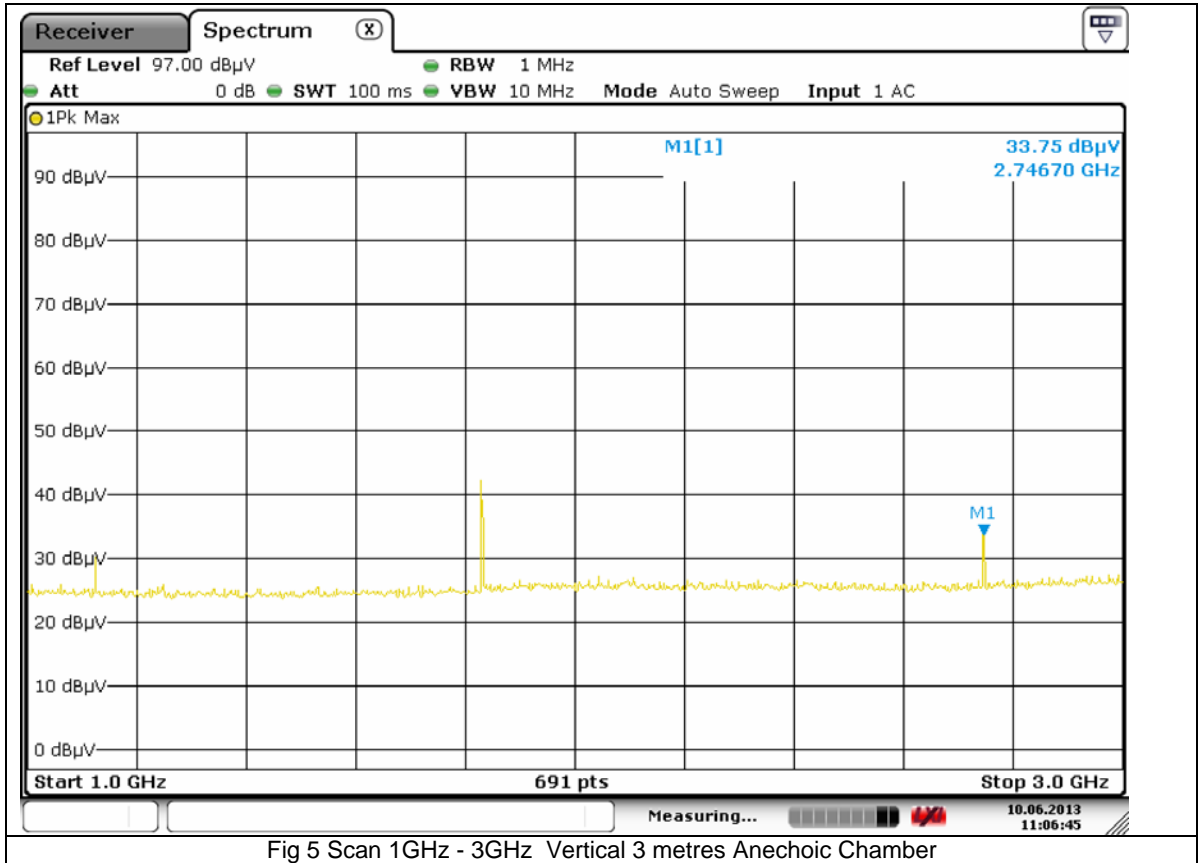
Test Result Pass

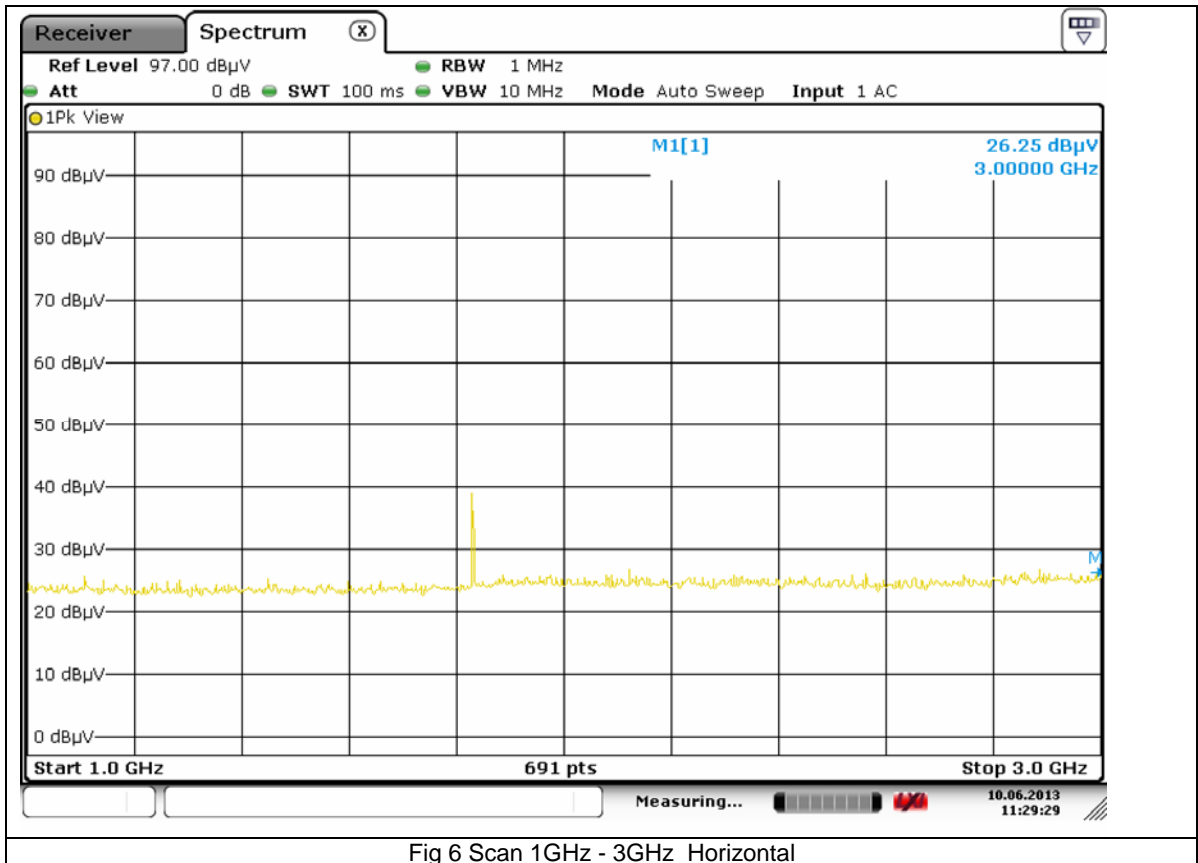
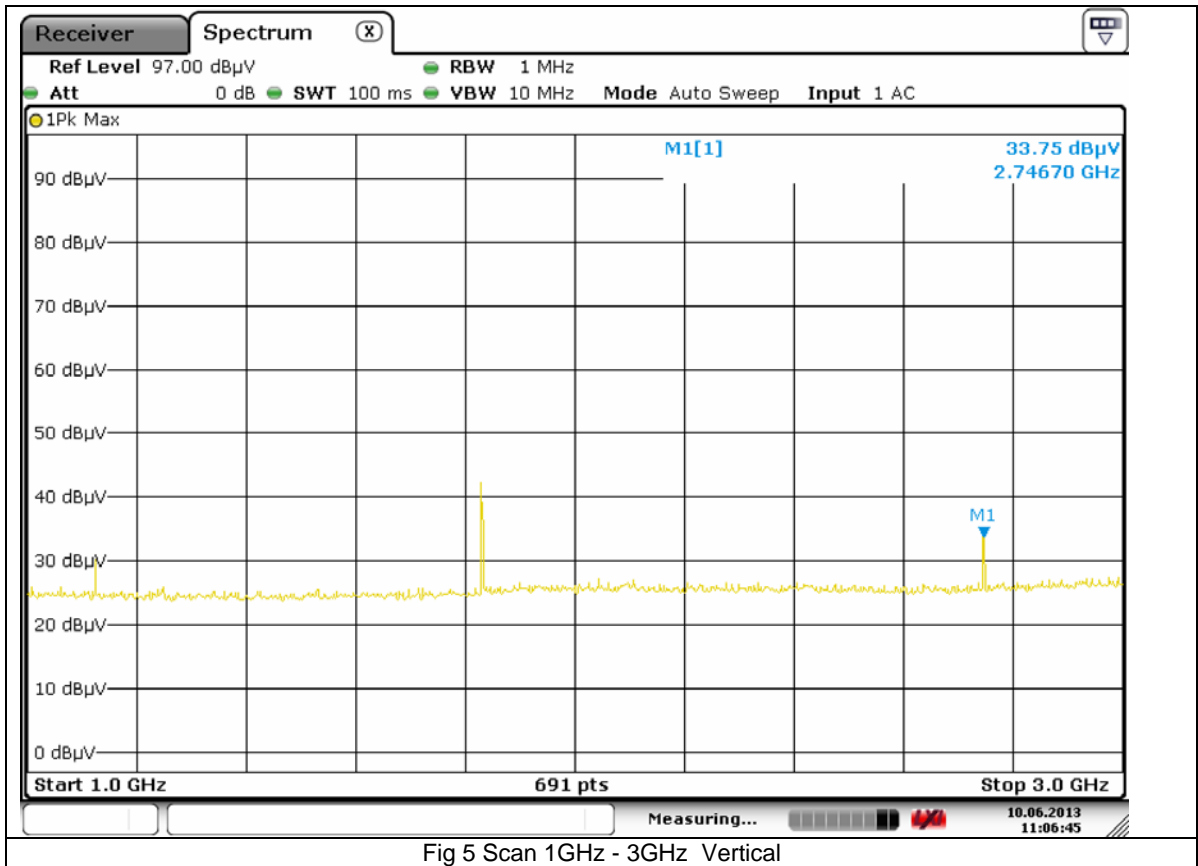


Fig 3 Scan 30 MHz - 1GHz Vertical 3 metres Anechoic Chamber



Fig 4 Scan 30 MHz- 1GHz Horizontal 3 metres Anechoic Chamber





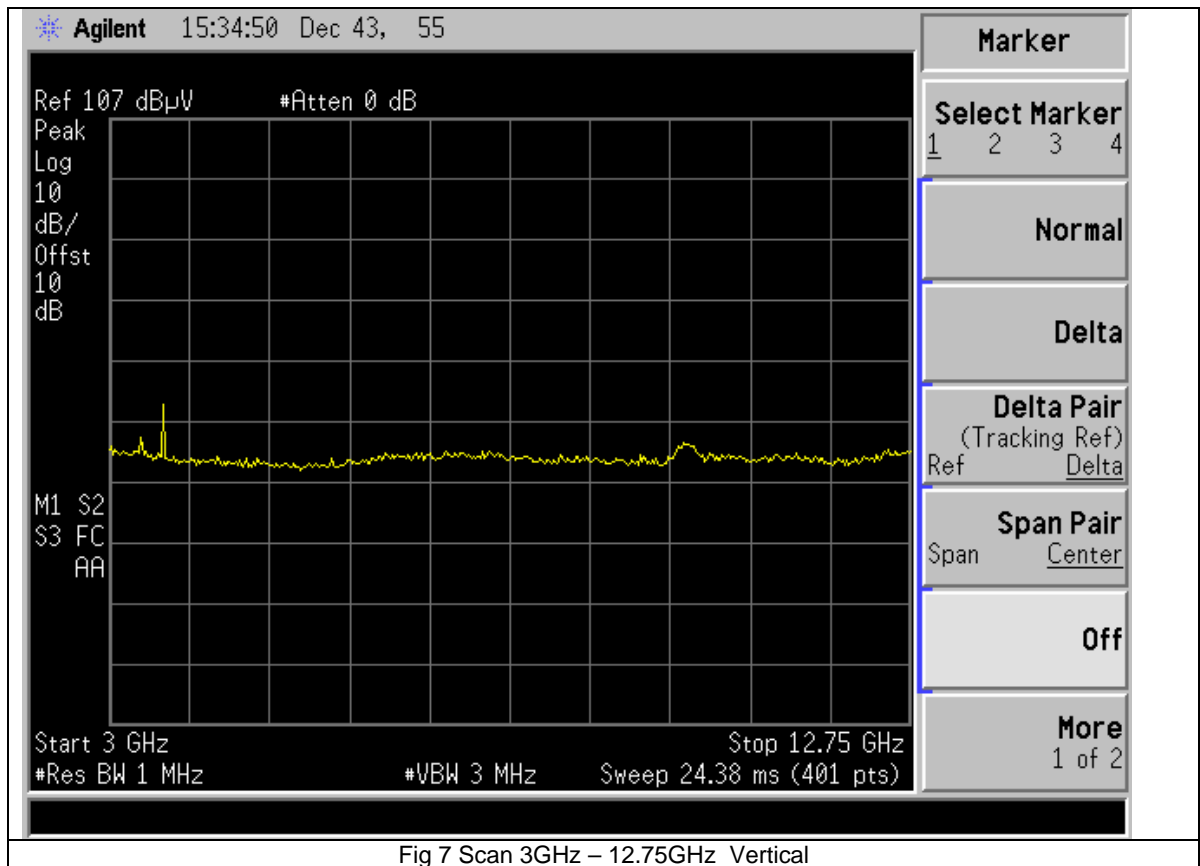


Fig 7 Scan 3GHz – 12.75GHz Vertical



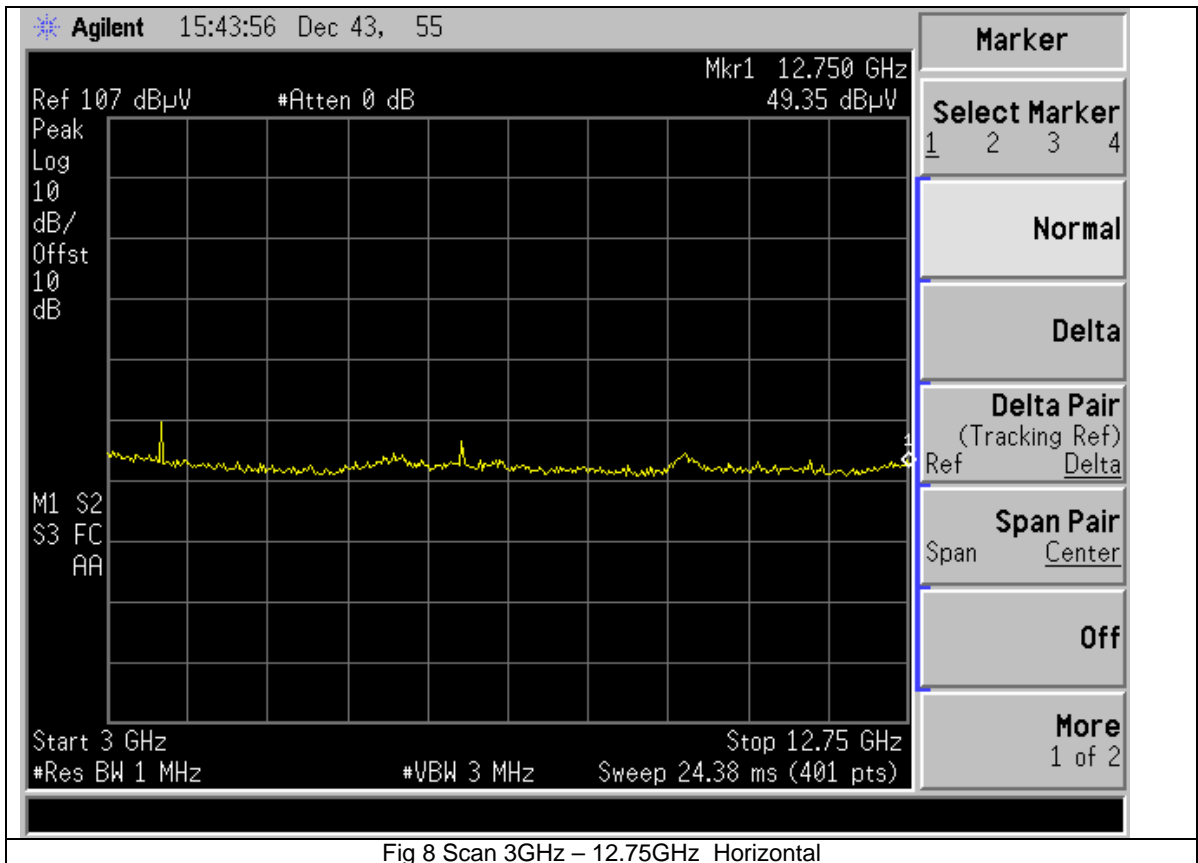


Fig 8 Scan 3GHz – 12.75GHz Horizontal