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Project Number: 13E4717-1c

Prepared for:

Resmed Sensor Technologies

By

Compliance Engineering Ireland Ltd

Clonross Lane

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Co. Meath

FCC Site Registration: 92592

Industry Canada Assigned Site Code: 8517A-2

FCC ID: YAKBM14

IC: 11415A-BM14

Date

20 September 2013

FCC EQUIPMENT AUTHORISATION

Test Report

EUT Description

10.525 GHz field disturbance sensor .

Authorised :

John McAuley

A handwritten signature in blue ink, appearing to read 'John McAuley', is written over a horizontal line.

TEST SUMMARY

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

FCC Part Section(s)	IC Section	TEST PARAMETERS	Test Result
15.245	RSS-210 A.7	RADIATED EMISSIONS	PASS
15.245	RSS-210 A.7	RADIATED SPURIOUS EMISSIONS	PASS
15.207	RSS GEN 7.2.4	CONDUCTED EMISSIONS ON THE MAINS	PASS

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Exhibit A – Technical Report

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1.0 EUT Description

The EUT was a module operating at 10.525GHz used for motion detection.

Model:	BM14
Type:	10.525GHz Field Disturbance Sensor
FCC ID:	YAKBM14
Company:	Resmed Sensor Technologies
Contact	Paul Philips
Address:	Blocks 9&10,NexusUCD Building,Belfield Office Park,Clonskeagh,Dublin 4. Ireland.
Phone:	0035312096400
e-mail:	Paul.philips@resmed.com
Test Standards:	47 CFR, Part 15.245 ; 47 CFR, Part 15.207(a)
Type of radio:	Stand alone Transmitter
Transmitter Type:	Pulse Modulation
Operating Frequency Range(s):	10.525 GHz
Number of Channels:	1
Antenna:	Integral
Transmitter power configuration:	5v dc
Oper. Temp Range:	5° C to +35° C
Classification:	FDS
Test Methodology:	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 powered from a 5v dc adaptor (Stontronics P/N T4108ST Model 3A-055WE05) except for spurious emissions test in the range 30MHz to 1GHz, where it was powered from a 9v PP3 battery.

The EUT was operated in normal operation mode for all tests.

Environmental conditions

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

Normal

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 during on the 27th and 28th August 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 ± 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 60 GHz).

2.0 Emissions Measurements

2.1 Conducted Emissions Measurements

The EUT was powered from a mains to 5v 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 between 1GHz and 26.5GHz 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.

Emissions between 26.5 GHz and 40GHz were measured using a horn antenna (connected to a harmonic mixer through a high frequency cable), located at 0.3 metres distance from the EUT. In this case the resolution bandwidth was 1MHz.

Emissions between 40 GHz and 60GHz were measured using a horn antenna (mounted directly on a harmonic mixer), located at 0.3 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 :- 15.245 (a) & IC RSS-210 A2.9

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

Fundamental Frequency	Field Strength of fundamental	Field Strength of fundamental		Field Strength of Harmonics	Field Strength of Harmonics
GHz	mV/m	dB μ V/m		mV/m	dB μ V/m
10.5 -10.55	2500	128.0		25	88.0

TEST PROCEDURE

EUT was tested in normal operation mode.

RESULTS

Frequency GHz	Measured Peak Level dBuV/m	Antenna Loss dB	Preamp Gain dB	Cable Loss	Antenna Polarity	Final Peak Level dBuV/m	Average Limit +20dB
10.524	98.2	38.8	37	7.7	Vertical	107.7	148
10.524	80.6	38.8	37	7.7	Horizontal	90.1	148

Frequency GHz	Final Peak Level dBuV/m	Duty Cycle Correction	Average Level	Average Limit	Margin dBuV
10.524	107.7	-4.4	103.31	128.0	24.65
10.524	90.1	-4.4	85.77	128.0	42.19

Test Result Pass

3.0 Duty Cycle

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

TEST PROCEDURE

EUT was tested in normal operation mode.

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 1MHz and the VBW is set to 3MHz. The sweep time is coupled and the span is set to 0 Hz.

RESULTS

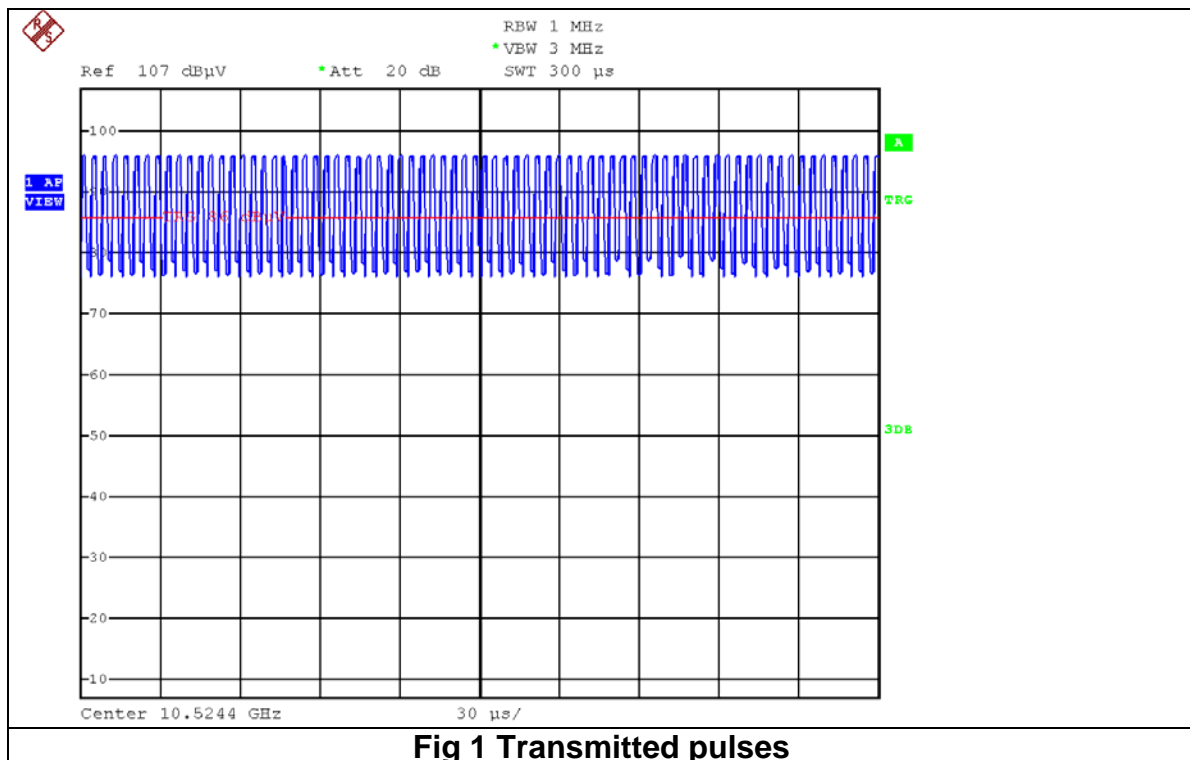




Fig 2 Individual pulse width

One Period(mS)	Pulse Width (mS)	No of Pulses	Duty Cycle	Duty Cycle %	Test Result
100	0.00243	24900	0.605	60.5	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)
-4.4

3.1 Occupied Bandwidth

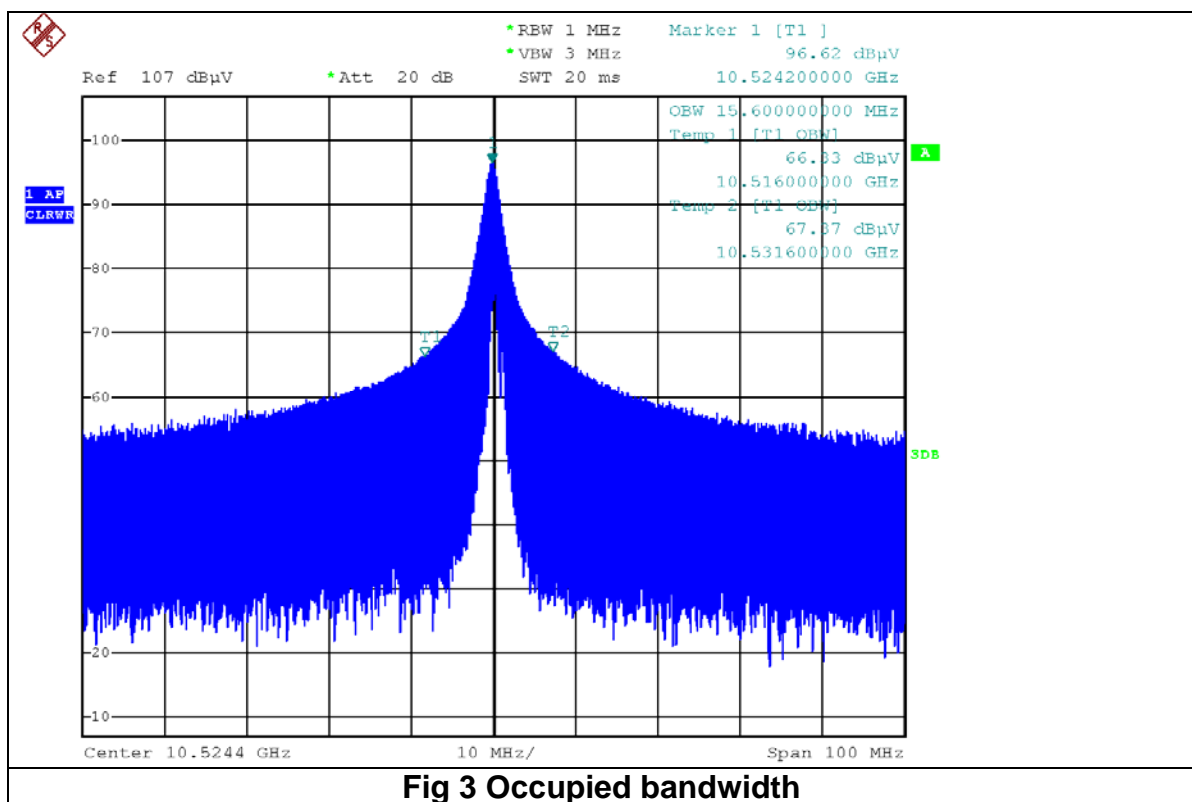
Test Criteria

Requirement :-IC RSS-Gen 4.6.1

TEST PROCEDURE

The result was obtained from the 99% OBW option on the spectrum analyser

RESULTS



Operating Frequency (GHz)	99% Occupied Bandwidth (MHz)	Lower Frequency (GHz)	Upper Frequency (GHz)
10.5244	15.6	10.516	10.5316

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.

4.1 Results for Radiated emissions

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
32.94	-3.07	Vertical	18.3	0.2	15.43
31.96	-2.6	Horizontal	18.3	0.2	15.9

Frequency MHz	Quasi Peak Level dBuV/m	Antenna Polarity	Quasi Peak Limit dBuV/m	Margin dB
32.94	15.43	Vertical	40.00	24.6
31.96	15.9	Horizontal	40.00	24.1

Table 1 Radiated Emissions 30MHz -1GHz at 3 metres in anechoic chamber

Note pulse desensitization is not included for quasi peak measurements.

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

Result: Pass

4.1.2 Horn antenna measurements (1GHz – 20 GHz)

Frequency GHz	Measured Peak Level dBuV/m	Antenna Loss dB	Preamp Gain dB	Cable Loss	Antenna Polarity	Final Peak Level dBuV/m	Average Limit +20dB
1.000	50.0	23.6	40.8	2.6	Vertical	35.4	108
3.162	51.1	30.6	37.3	3.8	Vertical	48.2	108
5.263	50.9	34	37.7	5.4	Vertical	52.6	108
1.225	47.8	23.6	40.7	3.2	Horizontal	33.9	108
5.550	44.6	34.2	37.6	6.4	Horizontal	47.6	108
5.450	41.2	34.2	37.5	5.7	Horizontal	43.6	108

Table 2 Radiated Emissions Peak 1GHz -20GHz at 3 metres in anechoic chamber

Frequency GHz	Final Peak Level dBuV/m	Duty Cycle Correction	Average Level	Average Limit	Margin dBuV
1.000	35.4	-4.4	31.04	88.0	56.92
3.162	48.2	-4.4	43.86	88.0	44.10
5.263	52.6	-4.4	48.23	88.0	39.73
1.225	33.9	-4.4	29.50	88.0	58.46
5.550	47.6	-4.4	43.20	88.0	44.76
5.450	43.6	-4.4	39.28	88.0	48.68

Table 3 Radiated Emissions Average 1GHz -20GHz at 3 metres in anechoic chamber

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

Result: Pass

4.1.3 Horn antenna measurements (20GHz – 60 GHz)

Frequency GHz	Measured Peak Level dBuV/m	Antenna Loss dB	Preamp Gain dB	Cable Loss	Antenna Polarity	Final Peak Level dBuV/m	Average Limit +20dB
21.050	32.0	44.4	34.5	4.0	Vertical	45.9	108

Frequency GHz	Final Peak Level dBuV/m	Duty Cycle Correction	Average Level	Average Limit	Margin dBuV
21.050	45.9	-4.4	41.54	88.0	46.42

Table 4 level measured at 21.05 GHz at 3 Metres

Frequency GHz	Measured Peak Level dBuV/m	Antenna Loss dB	Correction for distance dB	Cable Loss	Antenna Polarity	Final Peak Level dBuV/m	Average Limit +20dB
31.575	30.0	49.1	20	4.6	Vertical	63.7	108

Frequency GHz	Final Peak Level dBuV/m	Duty Cycle Correction	Average Level	Average Limit	Margin dBuV
31.575	63.7	-4.4	59.34	88.0	28.62

Table 5 level measured at 31.575 GHz at 0.3 Metres with 20dB correction factor for distance

Frequency GHz	Measured Peak Level dBuV/m	Antenna Loss dB	Correction for distance dB	Cable Loss	Antenna Polarity	Final Peak Level dBuV/m	Average Limit +20dB
42.100	50.3	44	20	0.0	Vertical	74.3	108

Frequency GHz	Final Peak Level dBuV/m	Duty Cycle Correction	Average Level	Average Limit	Margin dBuV
42.100	74.3	-4.4	69.94	88.0	18.02

Table6 level measured at 42.1 GHz at 0.3 Metres with 20dB correction factor for distance
Note this was measured with horn antenna directly on the mixer so cable loss is 0dB.

Frequency GHz	Measured Peak Level dBuV/m	Antenna Loss dB	Correction for distance dB	Cable Loss	Antenna Polarity	Final Peak Level dBuV/m	Average Limit +20dB
52.620	43.0	44.1	20	0.0	Vertical	67.1	108

Frequency GHz	Final Peak Level dBuV/m	Duty Cycle Correction	Average Level	Average Limit	Margin dBuV
52.620	67.1	-4.4	62.74	88.0	25.22

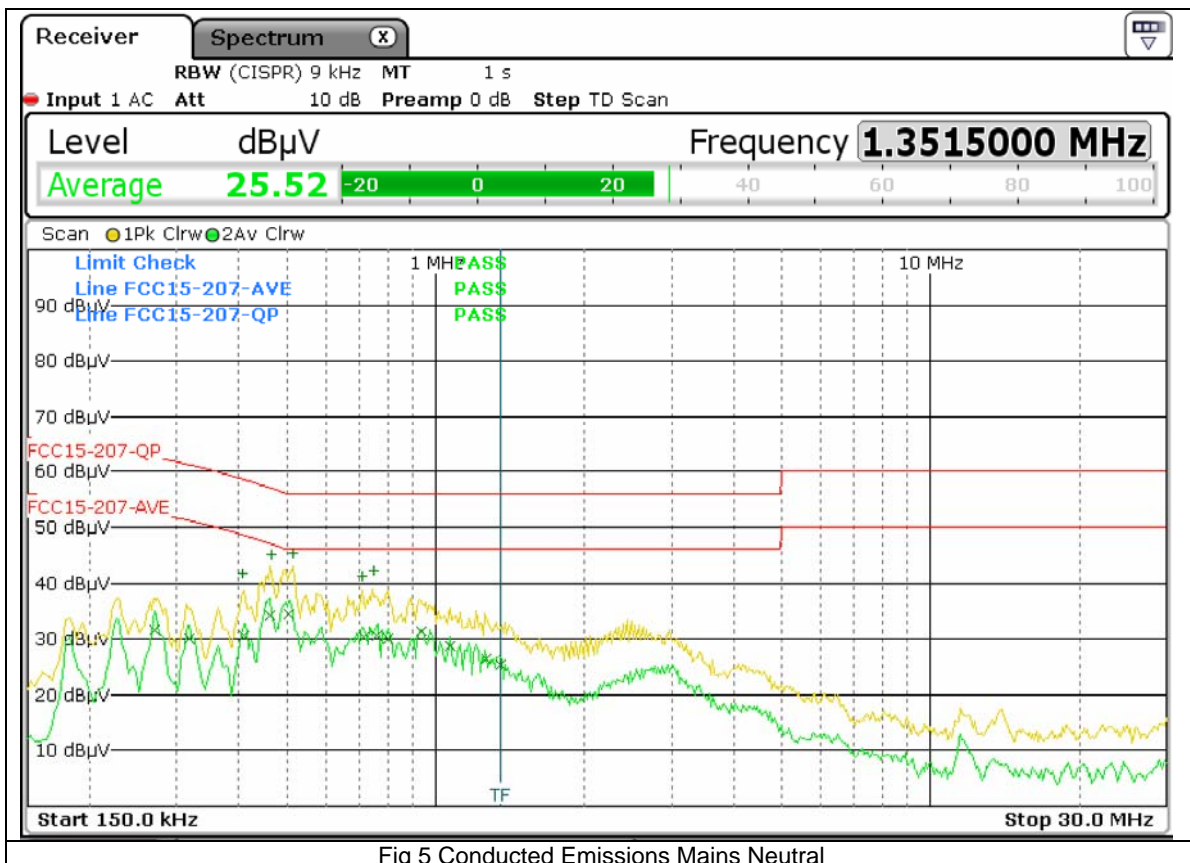
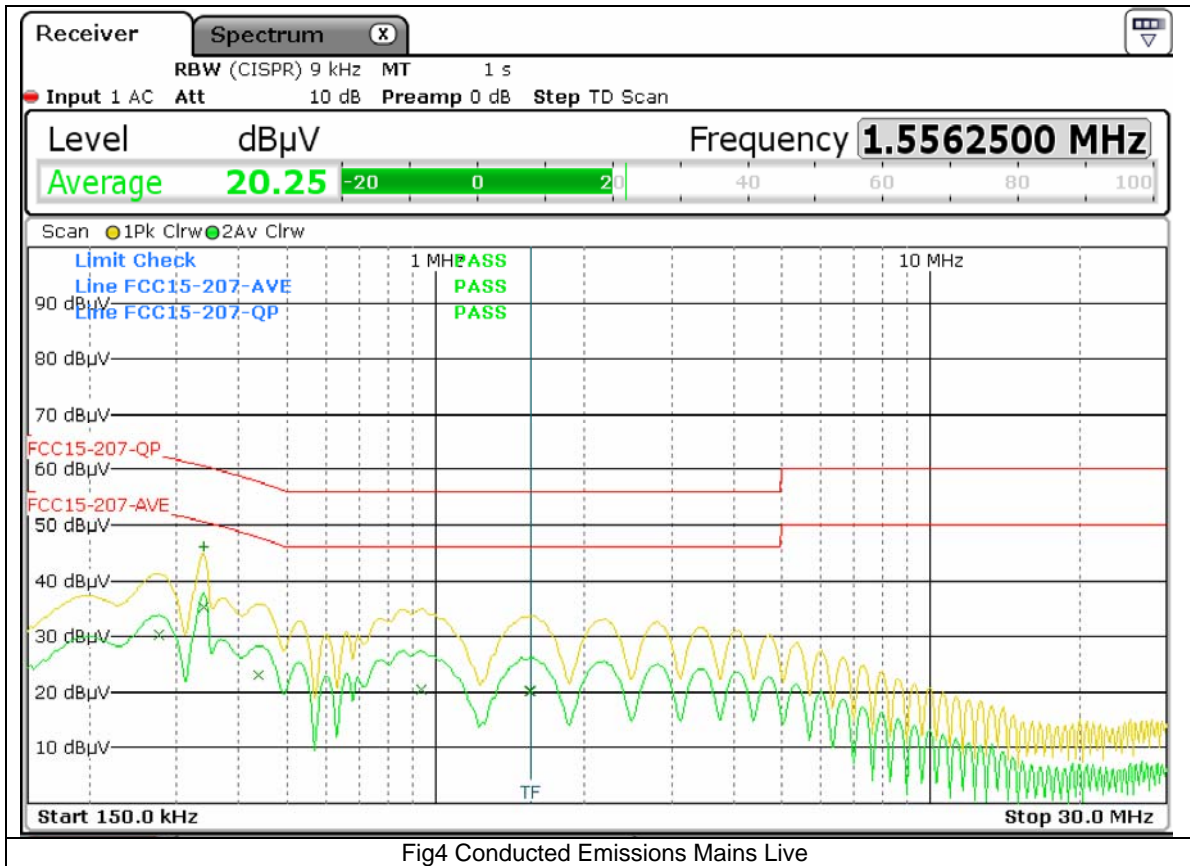
Table 7 level measured at 52.62 GHz at 0.3 Metres with 20dB correction factor for distance
Note this was measured with horn antenna directly on the mixer hence cable loss is 0dB.

Result: Pass

5.0 List of Test Equipment

Instrument	Mfr.	Model	CEI Ref No.	Cal Due Date
Bilog Antenna	Chase	CBL 6140	690	03/10/2015
Horn Antenna	EMCO	3115	655	26/10/2014
Preamplifier	Hewlett Packard	83017A	805	15/09/2014
Spectrum Analyser/Receiver	Rohde & Schwarz	ESR	869	25/05/2014
LISN	Rohde & Schwarz	ESH3-Z5	604	11/12/2013
Harmonic Mixer	Hewlett Packard	11970U	873	20/08/2014
Harmonic Mixer	Hewlett Packard	11970A	885	05/10/2014
Horn Antenna	EMCO	3116	840	14/05/2014
Horn Antenna	Q Par	QSH 40-60-F-20	872	20/08/2014
Horn Antenna	A-Inflow	LB-42-25-C-KF	877	04/09/2014
Horn Antenna	A-Inflow	LB-28-25-C-KF	878	04/09/2014
Low Noise Amplifier	CEI	883	883	05/10/2014
Preamplifier	Hewlett Packard	83017A	655	05/10/2014
Cable low loss	Micro-Coax	Utiflex UFA147A	705	18/05/2014
Spectrum Analyser	Agilent	8564EC	879	31/03/2014

Appendix A
Additional Test Results



Detector	Frequency MHz	Reading dBuV	Margin dB	Phase
Average	0.229	38.35	-15.4	Live
Quasi-Peak	0.231	46.94	-16.75	Live
Average	0.274	38.85	-13.61	Live
Average	0.319	36.63	-14.55	Live
Average	0.413	37.22	-11.26	Live
Quasi-Peak	0.422	46.60	-11.62	Live
Average	0.501	41.25	-4.75	Live
Quasi-Peak	0.503	51.02	-4.98	Live
Quasi-Peak	0.762	46.59	-9.41	Live
Average	0.938	37.32	-8.68	Live
Average	1.255	32.12	-13.88	Live
Quasi-Peak	1.271	42.59	-13.41	Live
Quasi-Peak	2.306	38.08	-17.92	Live
Average	2.776	28.68	-17.32	Live
Quasi-Peak	3.638	36.14	-19.86	Live

Table 8 Conducted Emissions Mains Live

Detector	Frequency MHz	Reading dBuV	Margin dB	Phase
Quasi-Peak	0.233	39.88	-23.74	Neutral
Quasi-Peak	0.411	41.95	-16.59	Neutral
Average	0.416	31.20	-17.21	Neutral
Average	0.501	35.17	-10.83	Neutral
Quasi-Peak	0.510	45.98	-10.02	Neutral
Quasi-Peak	0.715	41.69	-14.31	Neutral
Quasi-Peak	0.767	42.23	-13.77	Neutral
Average	0.938	31.43	-14.57	Neutral
Quasi-Peak	1.253	38.22	-17.78	Neutral
Average	1.257	26.63	-19.37	Neutral
Quasi-Peak	3.113	34.17	-21.83	Neutral

Table 9 Conducted Emissions Mains Neutral

Results for Conducted Emissions on the mains

Test Result Pass

