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EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart C (Section 15.247)

FCC ID: 2AALMPVU-G2NA

Test Sample: PowerVu G2
Model: PowerVu G2

Report Number: M130738

Tested for: Grey Innovation

Issue Date: 17th September 2013

EMC Technologies Pty Ltd reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. EMC Technologies Pty Ltd shall have no liability for any deductions, inferences or generalisations drawn by the client or others from EMC Technologies Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Technologies Pty Ltd.

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CONTENTS

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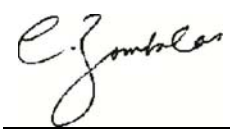
Report Number:	M130738 FCC
Sample:	PowerVu G2
Model:	PowerVu G2
Battery chargers:	Model: Groove Power Smart Model: SP5Q-NA Model: SF07-050150U
FCC ID:	2AALMPVU-G2NA
Equipment Type:	Intentional Radiator (Transceiver)
Manufacturer:	Percepscion Pty Ltd
Address:	Level 10, 99 Queen St Melbourne, VIC 3000, Australia
Contact:	support@percepscion.com
Tested for:	Grey Innovation 255 Mary St Richmond, VIC 3121, Australia
Standards:	FCC Part 15 – Radio Frequency Devices FCC Part 15 Subpart C – Intentional Radiators Section 15.247: 2400 – 2483.5 MHz Operation Bands ANSI C63.4 – 2009 558074 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
Test Dates:	29, 30 July and 6 August 2013
Test Engineer:	**Kevin Hansen**
Attestation:	*I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*
Authorised Signatory:	

Chris Zombolas
Technical Director
EMC Technologies Pty Ltd

EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart C (Section 15.247)

1.0 INTRODUCTION

EMI testing was performed on the PowerVu G2.

Test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations:

47 CFR, Part 15, Subpart C:	Rules for intentional radiators (particularly section 15.247)
Section 15.203:	Antenna requirements
Section 15.205:	Restricted bands of operation
Section 15.207:	Conducted Emission Limits
Section 15.209:	Radiated Emission Limits (General requirements)
Section 15.247:	Operation in the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz

The sample **complied** with the requirements of 47 CFR, Part 15 Subpart C - Section 15.247.

The measurement procedure used was in accordance with ANSI C63.4-2009. The instrumentation conformed to the requirements of ANSI C63.2-1996.

1.1 Summary of Results

FCC Part 15 Subpart C	Test Performed	Results
15.203	Antenna Requirement	**Not applicable**
15.205	Operation in Restricted Band	**Complied**
15.207	Conducted Emissions	**Complied**
15.209	Radiated Emissions	**Complied**
15.247 (a)(2)	Channel Bandwidth	**Complied**
15.247 (b)(3)	Peak Output Power	**Complied**
15.247 (c)	Antenna Gain > 6 dBi	**Not Applicable.** Antenna gain < 6 dBi
15.247 (d)	Out of Band Emissions	**Complied**
15.247 (e)	Peak Power Spectral Density	**Complied**
15.247 (f)	*Hybrid Systems	**Not Applicable.** EUT does not employ a hybrid system
15.247 (g)	Frequency Hopping System with Transmitter and Receiver	**Not Applicable.** EUT does not employ frequency hopping
15.247 (h)	Simultaneous occupancy of individual hopping frequencies	**Not Applicable.** EUT does not employ frequency hopping
15.247 (i)	Radio Frequency Hazard	**Complied**

*Hybrid systems are those that employ a combination of both frequency hopping and digital modulations technique.

1.2 Modifications by EMC Technologies

No modifications were performed.

2.0 GENERAL INFORMATION
(Information supplied by the Client)

2.1 EUT (Transmitter) Details

20 dBm Zigbee 802.15.4 transmitter

2.2 EUT (Host) Details

The PowerVu G2 is used to display household power consumption information to the user. Information is updated through a wireless 2.4 GHz DSSS IEEE802.15.4 Zigbee radio link.

Typically used in a private residence, it can be mounted to a fridge, in a cradle or it can be hand-held. The device is recharged through the micro USB connector on the device.

2.4 Test Configuration

Testing was performed with the sample in its active mode having all peripheral electronics exercised. The USB was connected to a PC. A diagnostic carrier transmitter mode was used to manipulate the carrier frequency and modulation as needed.

2.5 Operational Description
Refer to Appendix D for details

2.6 Block Diagram
Refer to Appendix B - Block Diagram

2.7 Support Equipment

A PC was used with test software provide by the customer for configuring the sample.

2.9 Test Facility

2.9.1 General
EMC Technologies Pty Ltd is listed by the FCC as a test laboratory able to perform compliance testing for the public. EMC Technologies is listed as an FCC part 47CFR2.948 test lab and may perform the testing required under Parts 15 and 18 – **FCC Registration Number 90560**

EMC Technologies Pty Ltd has also been accredited as a Conformity Assessment Body (CAB) by Australian Communications and Media Authority (ACMA) under the APECTEL MRA and is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) and Certification under Parts 15 & 18 of the FCC Commission's rules – **Registration Number 494713 & Designation number AU0001.**

EMC Technologies open area test site (OATS) & indoor open are test site (iOATS) have been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS 212, Issue 1 (Provisional) - **Industry Canada iOATS number - IC 3569B**

Measurements in this report were performed at EMC Technologies' laboratory in Keilor Park, Victoria Australia.

2.9.2 NATA Accreditation

NATA is the Australian National laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Institute (NMI) and an internal quality system to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A^2LA).

EMC Technologies is accredited in Australia by the National Association of Testing Authorities (NATA). All testing in this report has been conducted in accordance with EMC Technologies' scope of NATA accreditation.

The current full scope of accreditation can be found on the NATA website: www.nata.asn.au
It also includes a large number of emissions, immunity, SAR, EMR and Safety standards.

2.10 Test Equipment Calibration

Measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Agilent Technologies (Australia) Pty Ltd or the National Measurement Institute (NMI) or in-house. All equipment calibration is traceable to Australian national standards at the National Measurements Institute.

Equipment	Make/ Model/ Serial Number	Calibration Due dd/mm/yy	Calibration Interval
EMI Receivers	R&S ESU40 Sn: 100182 (R-037)	07/02/14	1 Year
	HP 8546A Sn: 3520A00249 (R-017)	14/11/13	1 Year
	HP 8546A Sn: 3549A00290 (R-009)	05/09/13	1 Year
Antennas	Sunol JB6 (A-363) 30 - 6000 MHz Sn: A012312	12/04/14	1 Year
	EMCO 3115 (A-004) 1 – 18 GHz Sn: 8908-3282	16/01/15	3 Year
	ETS-Lindgren 3160-06 (A-259) 5.85 - 8.2 GHz Sn: 29322	12/11/15	3 Year
	ETS-Lindgren 3160-07 (A-261) 8.2 - 12.4 GHz Sn: 29251	12/11/15	3 Year
	ETS-Lindgren 3160-08 (A-263) 12.4 - 18 GHz Sn: 29447	09/11/15	3 Year
Pre-Amplifier	Electronic Development Sales SG18-B3015 (A-288) Sn: 1	19/02/14	1 Year
LISN	EMCO 3825/2 (L-022) 10KHz - 100 MHz Sn: 9607-2567	07/09/14	2 Year
Limiter	HP 11947A Sn. 3107A02888 (L-017)	16/09/14	1 Year

3.0 TEST RESULTS

3.1 §15.203 Antenna Requirement

An internal, permanently attached antenna was incorporated within the PowerVU G2 ensuring that it could not be replaced.

3.2 §15.205 Restricted Bands of Operation

The restricted bands of operation limits were applied during testing of the spurious emissions. The PowerVu G2 emissions did not exceed these limits. Refer to 3.8 for emission test results.

3.3 §15.207 Conducted Limits

3.3.1 Test Procedure

The arrangement specified in ANSI C63.4-2009 was adhered to for the conducted EMI measurements. The EUT was placed in the RF screened enclosure and a CISPR EMI Receiver as defined in ANSI C63.2-1996 was used to perform the measurements.

The EMI Receiver was operated under program control using the Max-Hold function and automatic frequency scanning, measurement and data logging techniques. The specified 0.15 MHz to 30 MHz frequency range was sub-divided into sub-ranges to ensure that all short duration peaks were captured.

3.3.2 Peak Maximising Procedure

The various operating modes of the system were investigated. For each of the sub-ranges, the EMI receiver was set to continuous scan with the Peak detector set to Max-Hold mode. The Quasi-Peak detector and the Average detector were then invoked to measure the actual Quasi-Peak and Average level of the most significant peaks, which were detected.

3.3.3 Calculation of Voltage Levels

The voltage levels were automatically measured in software and compared to the test limit. The method of calculation was as follows:

$$\mathbf{V_{EMI} = V_{Rx} + LBPF}$$

Where:
V_{EMI} = the Measured EMI voltage in dBµV to be compared to the limit.
V_{Rx} = the Voltage in dBµV read directly at the EMI receiver.
LBPF = the loss in dB of the cables and the Limiter and Band pass Filter.

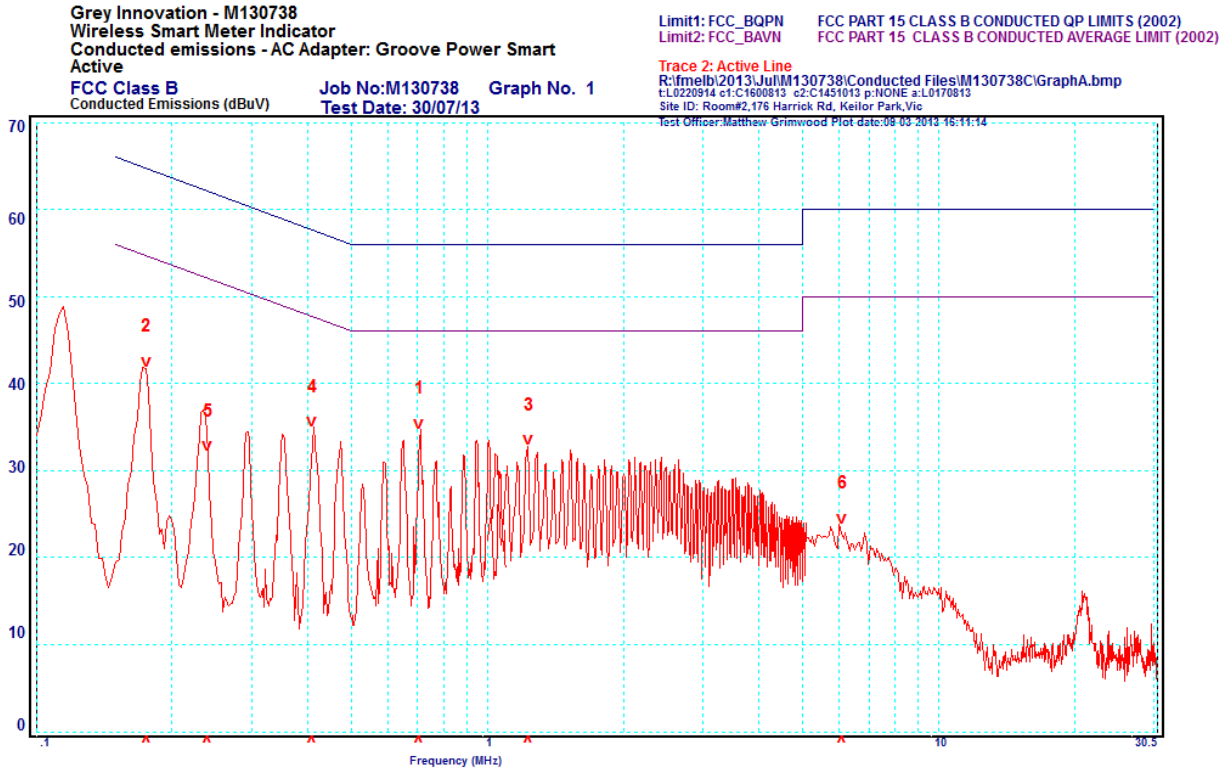
3.3.4 Plotting of Conducted Emission Measurement Data

The measurement data pertaining to each frequency sub-range were then concatenated to form a single graph of (peak) amplitude versus frequency. This was performed for both Active and Neutral lines and the composite graph were subsequently plotted. A list of the highest relevant peaks and the respective Quasi-Peak and Average values were also plotted on the graph.

3.3.5 Results of Conducted Emission Measurements (AC Mains Ports)

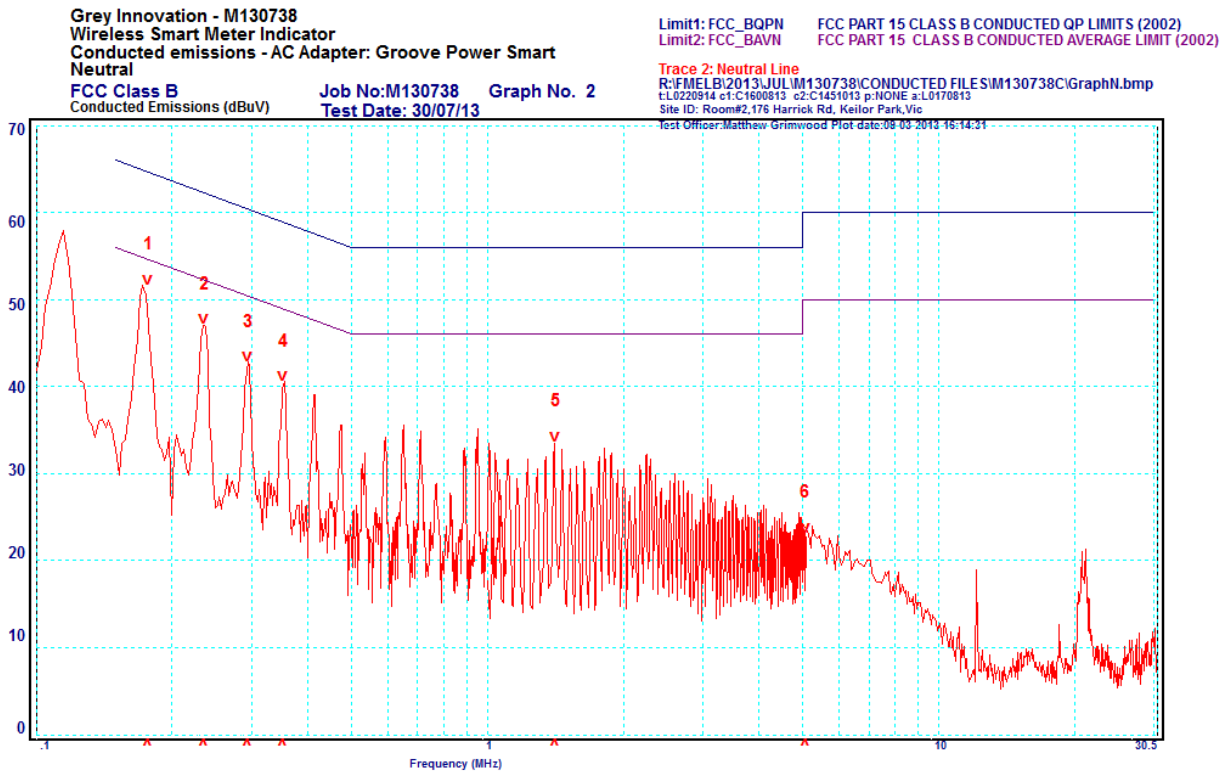
The conducted emission tests were made while the device was charging the internal battery. Three different power supplies were tested.

Groove Power Smart AC/DC Adaptor
Active line emissions



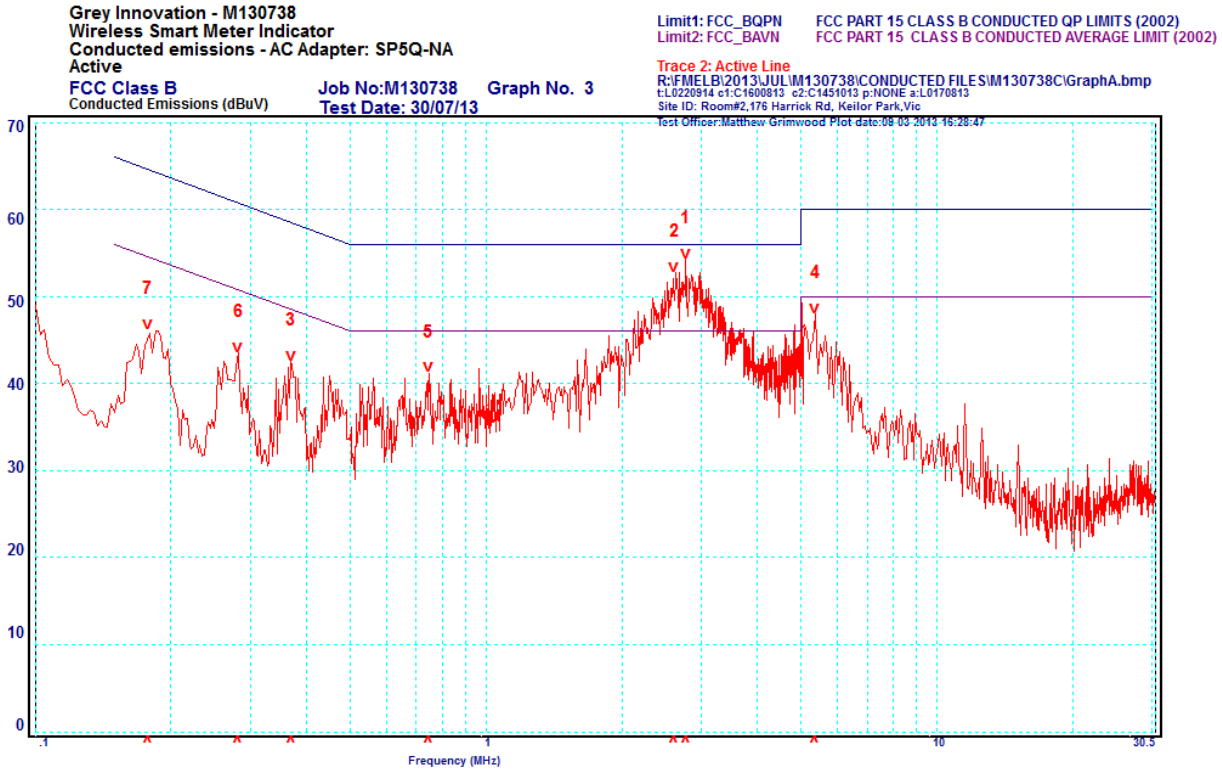
Peak	Frequency MHz	Line	Measured QP Level dBµV	QP Limit dBµV	ΔQP ±dB	Measured AV Level dBµV	AV Limit dBµV	ΔAV ±dB
1	0.705	Active	32.5	56.0	-23.5	30.4	46.0	-15.6
2	0.176	Active	39.3	64.7	-25.4	30.3	54.7	-24.4
3	1.233	Active	30.1	56.0	-25.9	21.7	46.0	-24.3
4	0.409	Active	30.7	57.7	-27.0	28.9	47.7	-18.8
5	0.240	Active	29.2	62.1	-32.9	23.5	52.1	-28.6
6	6.106	Active	19.3	60.0	-40.7	12.1	50.0	-37.9

Neutral line emissions



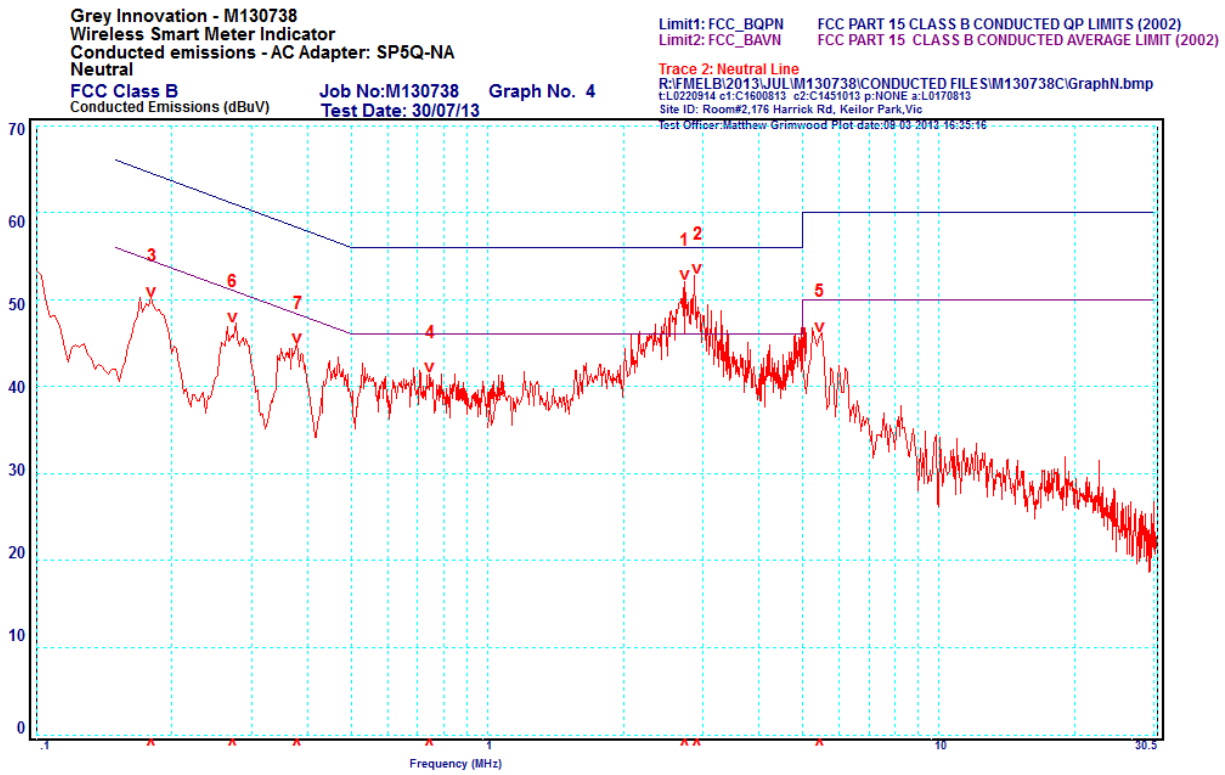
Peak	Frequency MHz	Line	Measured QP Level dBµV	QP Limit dBµV	ΔQP ±dB	Measured AV Level dBµV	AV Limit dBµV	ΔAV ±dB
1	0.177	Neutral	50.0	64.6	-14.6	33.4	54.6	-21.2
2	0.236	Neutral	44.5	62.2	-17.7	29.4	52.2	-22.8
3	0.294	Neutral	38.4	60.4	-22.0	28.0	50.4	-22.4
4	0.353	Neutral	34.4	58.9	-24.5	23.5	48.9	-25.4
5	1.412	Neutral	31.2	56.0	-24.8	25.3	46.0	-20.7
6	5.054	Neutral	21.5	60.0	-38.5	17.0	50.0	-33.0

SP5Q-NA AC/DC adaptor
Active line emissions



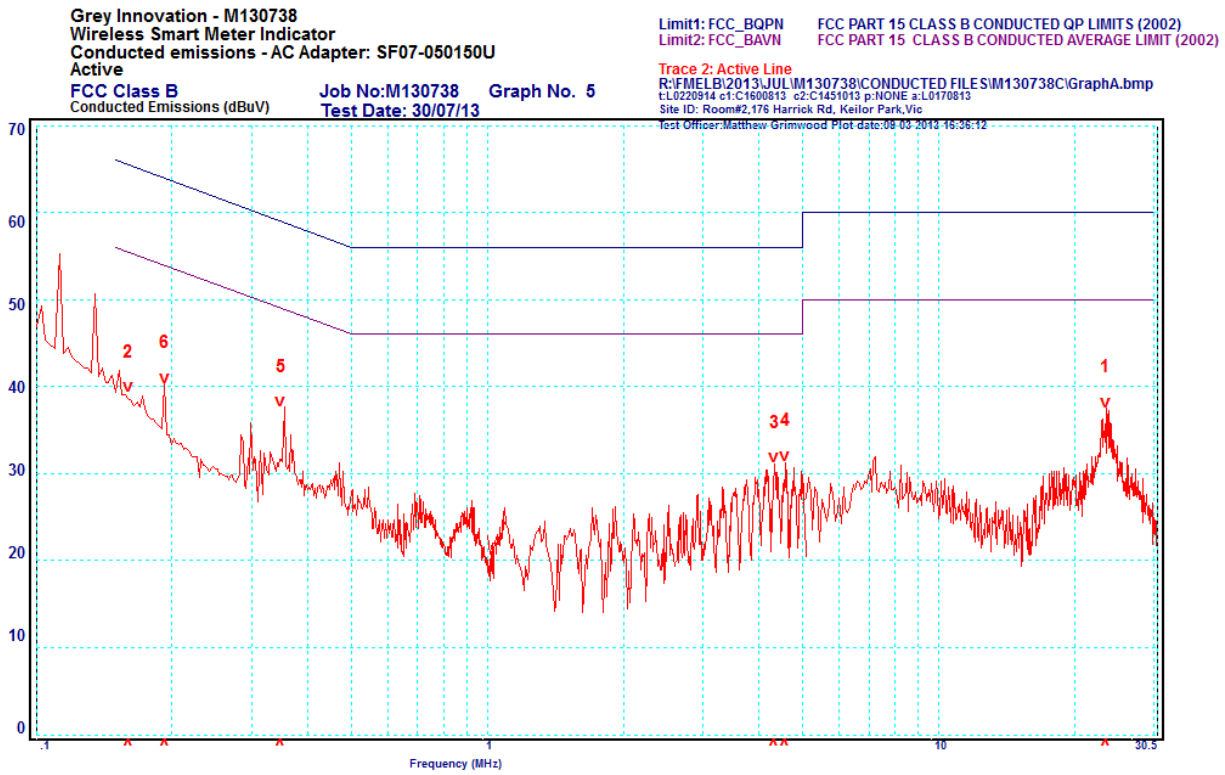
Peak	Frequency MHz	Line	Measured QP Level dBµV	QP Limit dBµV	ΔQP ±dB	Measured AV Level dBµV	AV Limit dBµV	ΔAV ±dB
1	2.770	Active	43.5	56.0	-12.5	27.4	46.0	-18.6
2	2.613	Active	42.2	56.0	-13.8	30.1	46.0	-15.9
3	0.369	Active	32.2	58.5	-26.3	8.2	48.5	-40.3
4	5.363	Active	33.5	60.0	-26.5	13.6	50.0	-36.4
5	0.743	Active	29.3	56.0	-26.7	9.5	46.0	-36.5
6	0.282	Active	33.6	60.8	-27.2	7.8	50.8	-43.0
7	0.177	Active	36.8	64.6	-27.8	7.6	54.6	-47.0

Neutral line emissions



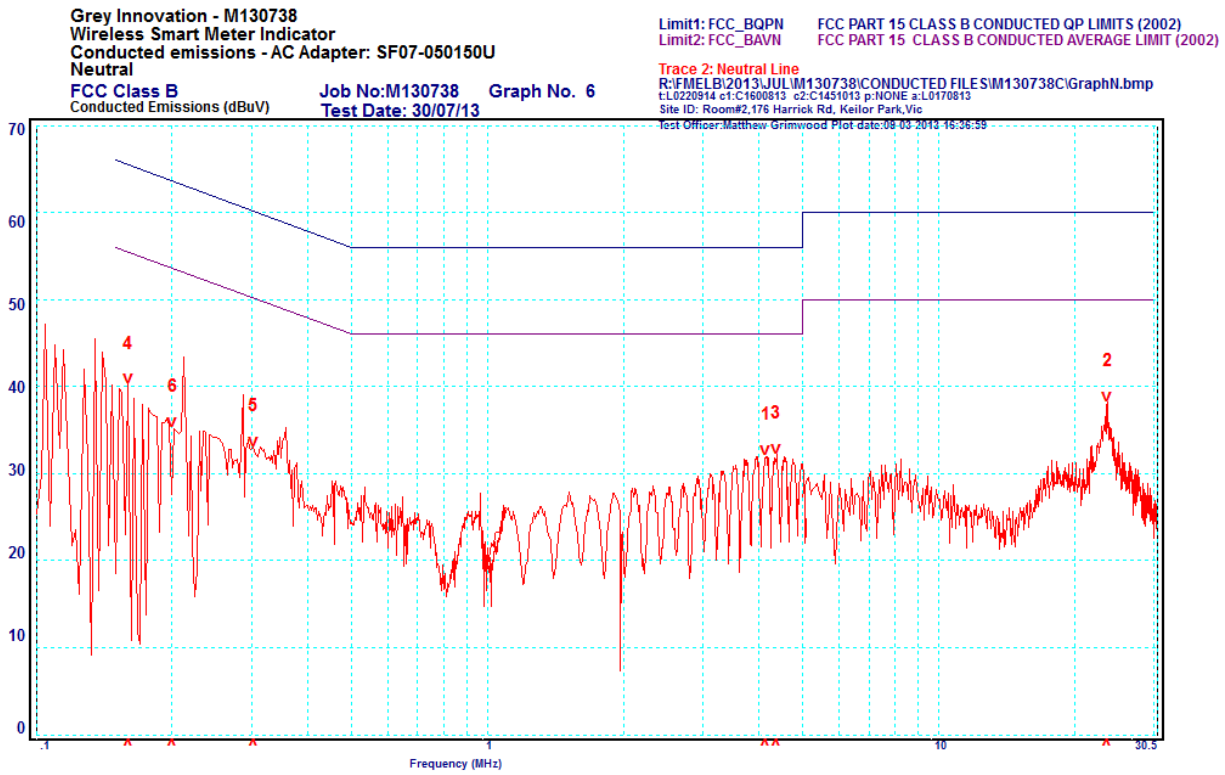
Peak	Frequency MHz	Line	Measured QP Level dBµV	QP Limit dBµV	ΔQP ±dB	Measured AV Level dBµV	AV Limit dBµV	ΔAV ±dB
1	2.739	Neutral	39.6	56.0	-16.4	24.7	46.0	-21.3
2	2.919	Neutral	37.3	56.0	-18.7	20.9	46.0	-25.1
3	0.180	Neutral	39.5	64.5	-25.0	18.8	54.5	-35.7
4	0.747	Neutral	30.7	56.0	-25.3	19.5	46.0	-26.5
5	5.454	Neutral	34.6	60.0	-25.4	14.0	50.0	-36.0
6	0.273	Neutral	35.2	61.0	-25.8	20.7	51.0	-30.3
7	0.379	Neutral	32.0	58.3	-26.3	15.4	48.3	-32.9

SF07-050150U AC/DC Adaptor
Active line emissions



Peak	Frequency MHz	Line	Measured QP Level dBµV	QP Limit dBµV	ΔQP ±dB	Measured AV Level dBµV	AV Limit dBµV	ΔAV ±dB
1	23.40	Active	28.5	60.0	-31.5	10.6	50.0	-39.4
2	0.160	Active	32.9	65.5	-32.6	3.3	55.5	-52.2
3	4.321	Active	22.9	56.0	-33.1	5.1	46.0	-40.9
4	4.558	Active	21.9	56.0	-34.1	4.3	46.0	-41.7
5	0.349	Active	24.1	59.0	-34.9	3.8	49.0	-45.2
6	0.193	Active	28.5	63.9	-35.4	8.4	53.9	-45.5

Neutral line emissions



Peak	Frequency MHz	Line	Measured QP Level dBµV	QP Limit dBµV	ΔQP ±dB	Measured AV Level dBµV	AV Limit dBµV	ΔAV ±dB
1	4.139	Neutral	25.6	56.0	-30.4	5.8	46.0	-40.2
2	23.60	Neutral	28.5	60.0	-31.5	7.6	50.0	-42.4
3	4.358	Neutral	23.7	56.0	-32.3	1.8	46.0	-44.2
4	0.160	Neutral	33.0	65.5	-32.5	-1.7	55.5	-57.2
5	0.303	Neutral	25.8	60.2	-34.4	-0.3	50.2	-50.5
6	0.200	Neutral	28.1	63.6	-35.5	22.2	53.6	-31.4

Results

No emissions measured with average or quasi-peak detectors were within 10 dB of the limits when the device was charging from any of the power supplies tested.

Groove Power Smart

SP5Q-NA

SF07-050150U

3.4 §15.209 Radiated emission limits; general requirements

The limits given in §15.247 applied, however attenuation below the general levels was not required.

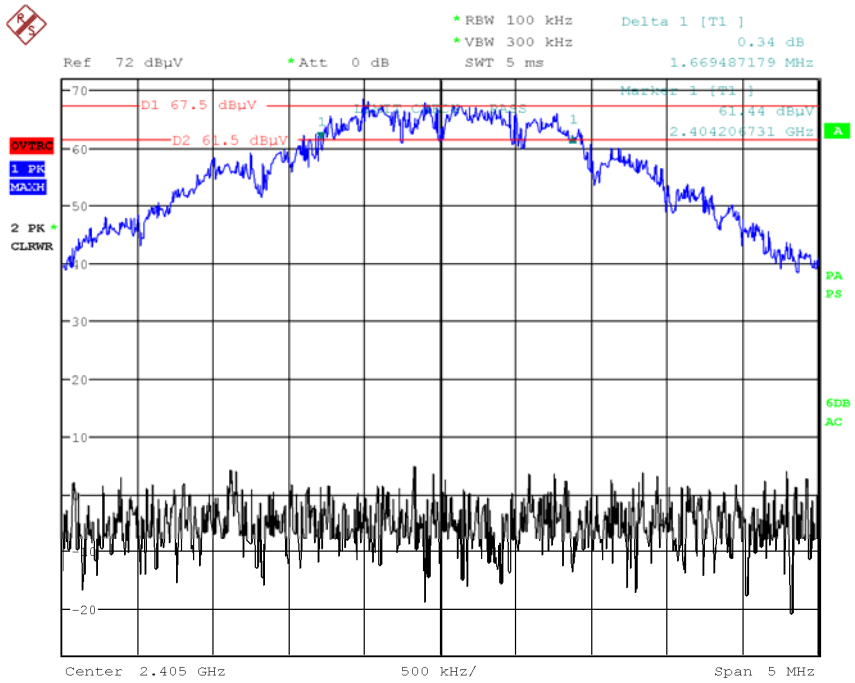
3.5 §15.247(a) Channel Bandwidth

In the bands 2400 - 2483.5 MHz and 5725 - 5850 MHz, the minimum 6 dB bandwidth is to be at least 500 kHz. The 6 dB bandwidth was measured while the device was transmitting with typical modulation applied.

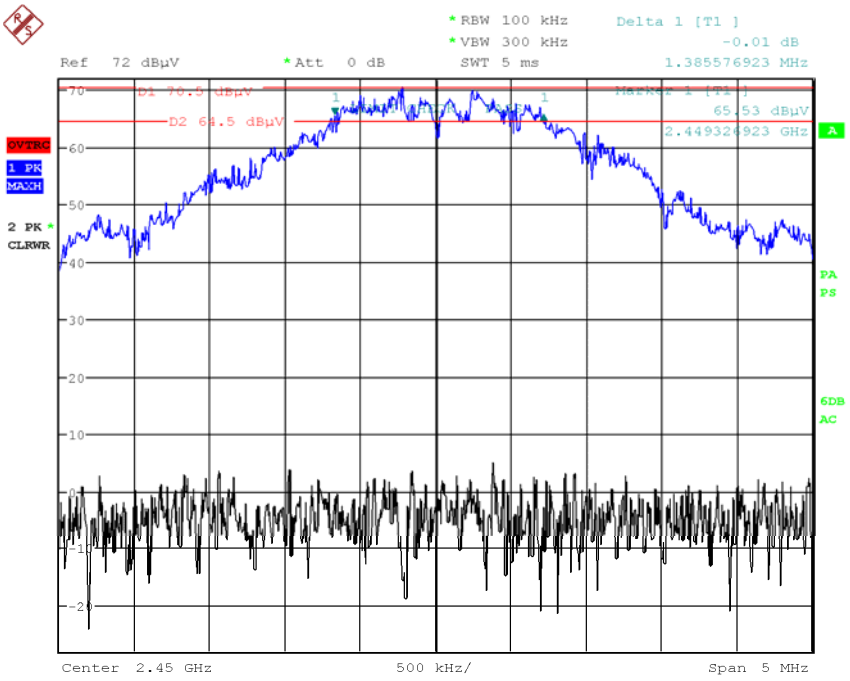
The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised when measuring the bandwidth.

Frequency MHz	Operating Mode	Bandwidth MHz	Result
2405	Normal	1.67	Complies
2450	Normal	1.39	Complies
2480	Normal	1.55	Complies

Channel 11, 2405 MHz:



Channel 20, 2450 MHz:



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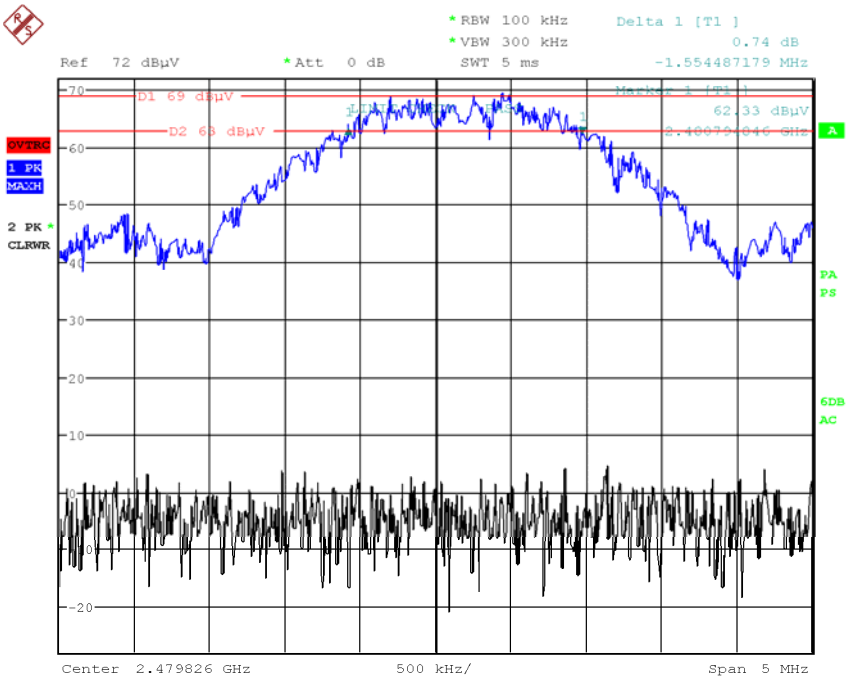
Channel 26, 2480 MHz:



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3.6 §15.247(b) Peak Output Power

There was no access to the internal antenna port, therefore the peak power was calculated from radiated measurements. The maximum antenna gain was less than 6 dBi.

Radiated EMI tests were performed inside a fully compliant CISPR16-1-4 semi-anechoic chamber for a 2m x 2m x 2m test volume up to 18 GHz. The EUT was positioned on a test table of height 0.8 metres. The EUT was rotated through 360° on the turntable and the highest emissions were maximised by scanning the measurement antenna over the 1 to 4 metres height. The following formula was used to convert the field strength in dBμV/m to EIRP in Watts:

$$E_{\lim} = 20 \times \log_{10}\left(\frac{\sqrt{30 P_{\lim}}}{d}\right) + 120$$

where

$E_{\lim}$ = electric field strength limit, in dB(μV/m)

$P_{\lim}$ = EIRP limit, in Watts

d = measurement distance, in metres

Frequency MHz	E dBμV/m	P mW	Limit mW	Result
2405	112.60	54.6	1000	Complies
2437	111.28	40.3	1000	Complies
2462	111.33	40.7	1000	Complies

3.7 §15.247(c) Directional Antenna with gain > 6dBi

Not applicable.

3.8 §15.247(d) Out of Band Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

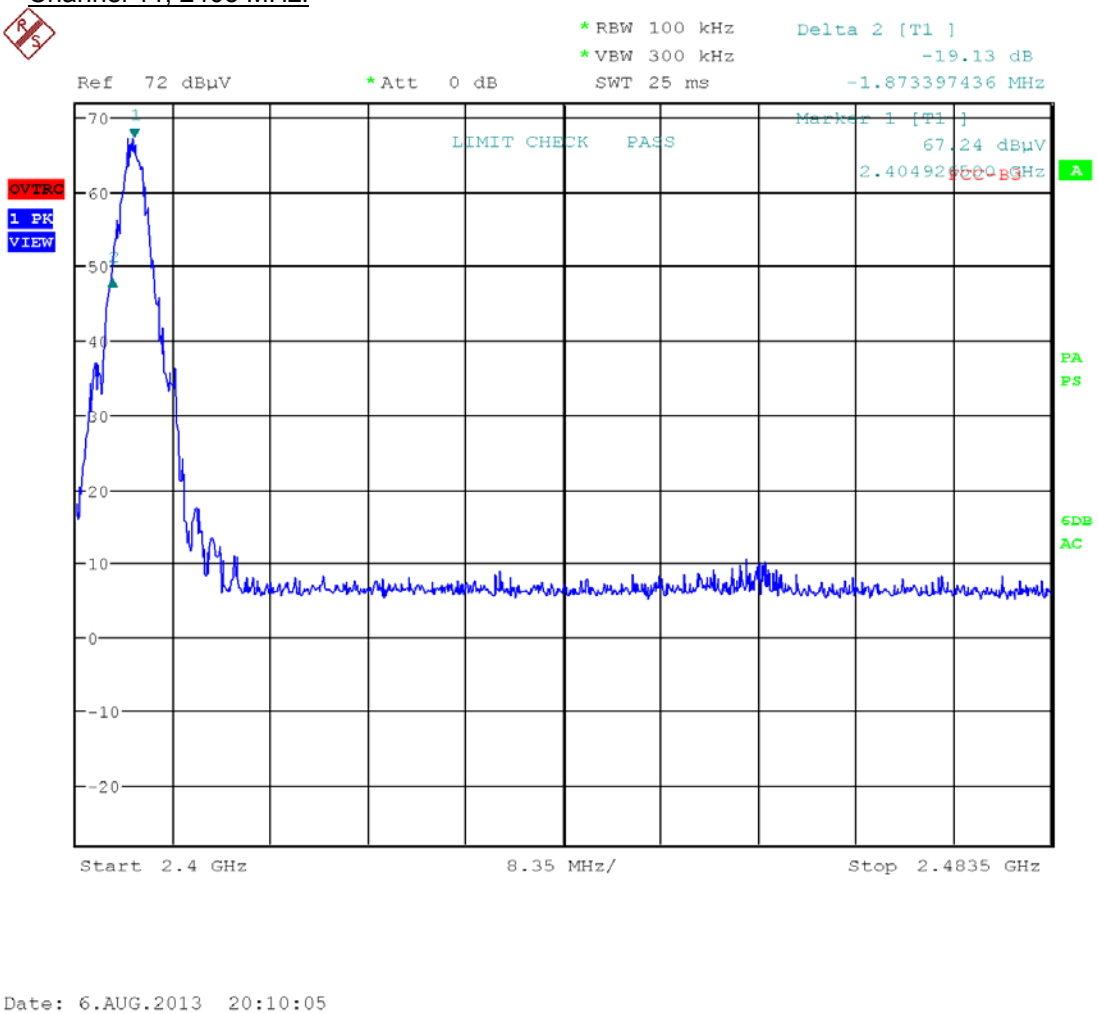
Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

3.8.1 Band Edge measurements

The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised when measuring the band edges. The 20 dB down points were measured with the transmitter set to the lowest and highest operating frequency (Channel 11 and 26 respectively).

Result:
The 20 dB down points fell within the allowed operating band.

Channel 11, 2405 MHz:



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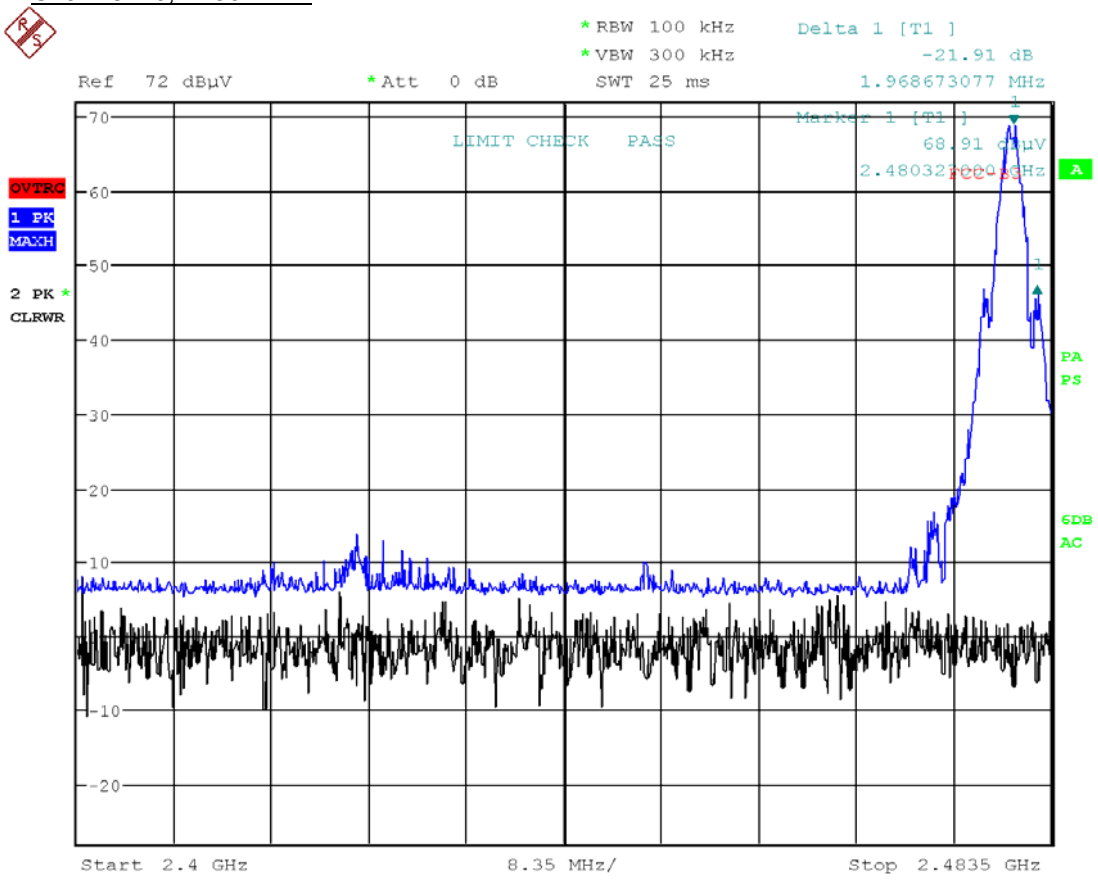
Channel 26, 2480 MHz:



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3.8.2 Spurious Emissions

The limits calculated from the peak power tests are as follows:

Channel	Maximum Power		Spurious Emission Limit	
2405 MHz	54.6 mW	112.6 dBµV/m	0.546 mW	92.6 dBµV/m
2450 MHz	40.3 mW	111.3 dBµV/m	0.403 mW	91.3 dBµV/m
2480 MHz	40.7 mW	111.3 dBµV/m	0.407 mW	91.3 dBµV/m

Radiated EMI tests were performed inside a fully compliant CISPR16-1-4 semi-anechoic chamber for a 2m x 2m x 2m test volume up to 18 GHz, at a test distance of 3 metres. The EUT was set up on the table top (placed on turntable) of total height 80 cm above the ground plane and operated as described in section 2 of this report. The test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of possible EMI peaks while also permitting fast frequency scan times. A calibrated Biconilog antenna was used for measurements between 30 MHz and 1000 MHz. Calibrated EMCO 3115, EMCO 3116 and ETS standard gain horn antennas were used for measurements between 1 to 25 GHz.

The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. When an emission was located, it was positively identified and its maximum level found by rotating the automated turntable and by varying the antenna height. The procedure was repeated with the device orientated in three orthogonal axis to further maximise the emission.

Each significant peak was investigated with the Peak/Average Detectors. The measurement data for each frequency range was corrected for cable losses, antenna factors and preamplifier gain. This process was performed for both horizontal and vertical antenna polarisations.

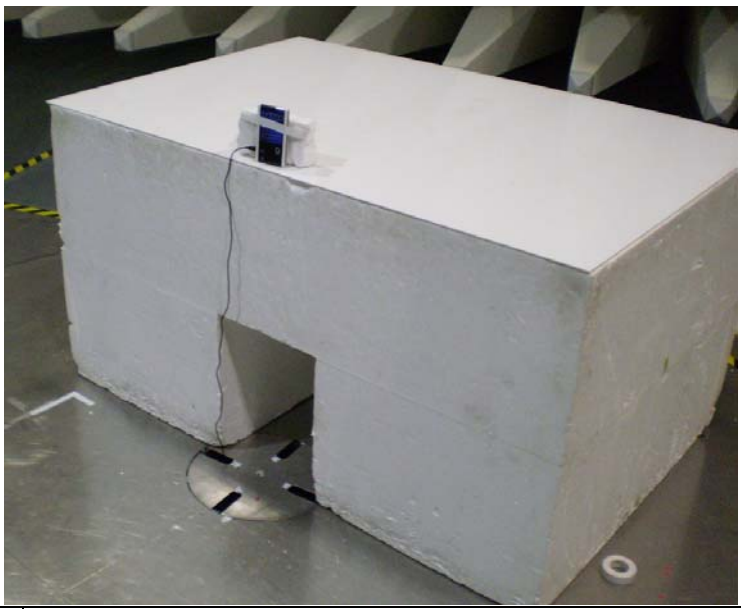
3.8.3 Calculation of field strength

The field strength was calculated automatically by the software using all the pre-stored calibration data. The method of calculation is shown below:

E = V + AF - G + L

Where:

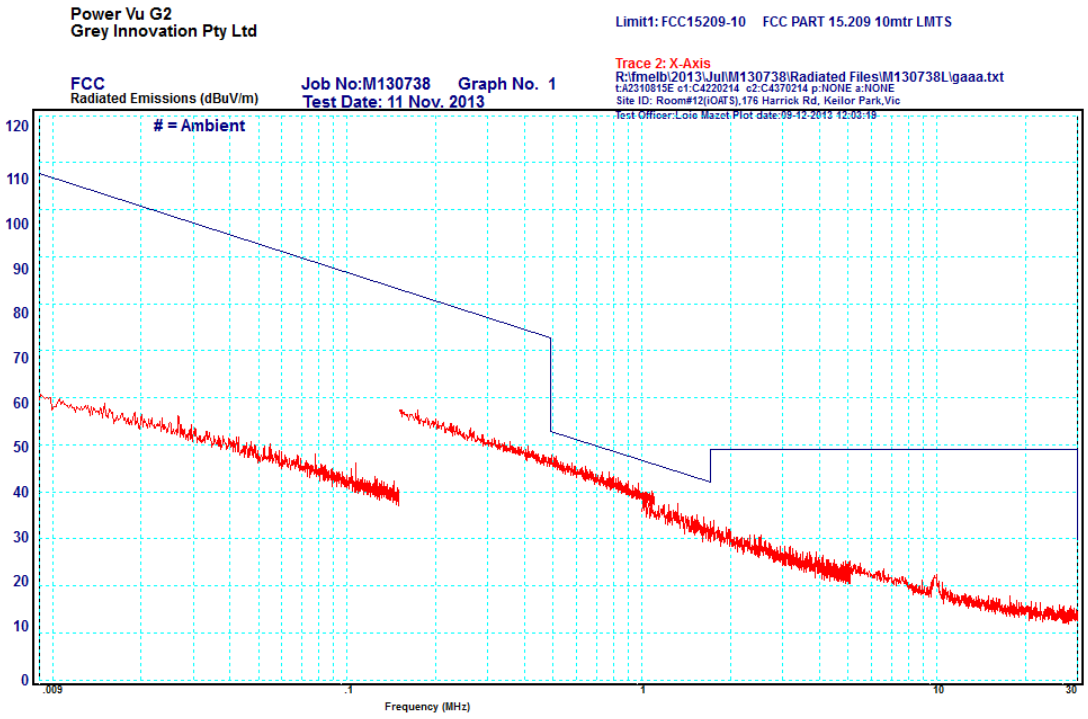
E = Radiated Field Strength in dBµV/m.
V = EMI Receiver Voltage in dBµV. (measured value)
AF = Antenna Factor in dB. (stored as a data array)
G = Preamplifier Gain in dB. (stored as a data array)
L = Cable loss in dB. (stored as a data array of Insertion Loss versus frequency)



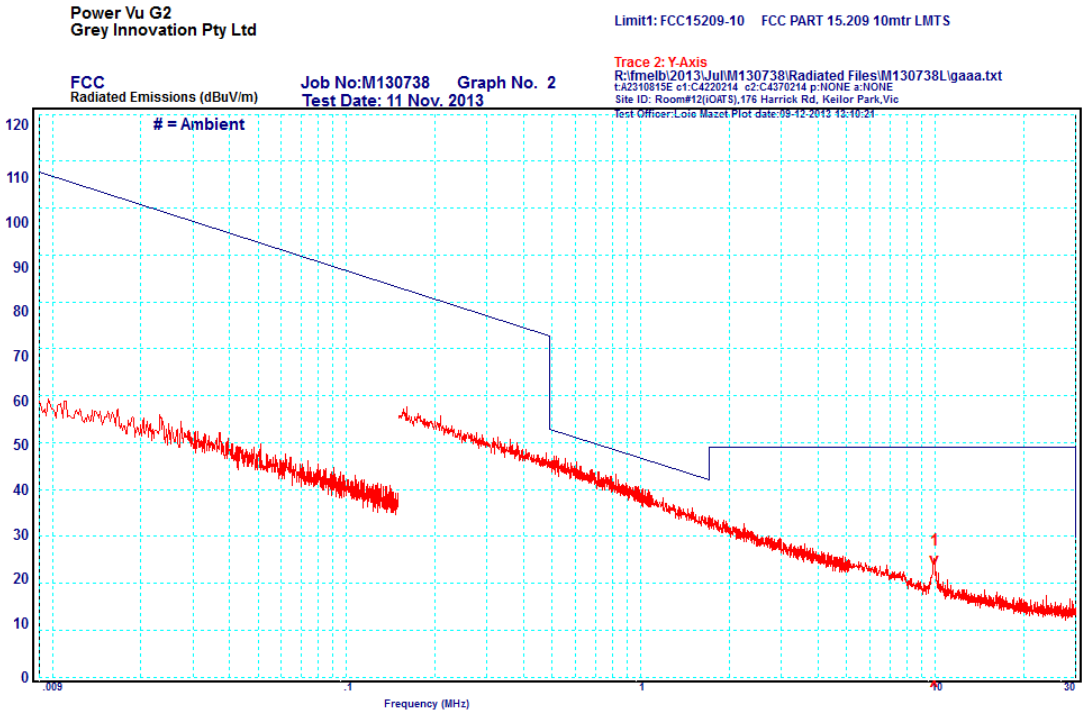
3.8.4 Frequency Band: 9 kHz - 30 MHz

Testing was performed at a distance of 10 metres. The measurement of emissions between 9 kHz - 30 MHz were measured with the resolution bandwidth (RBW) of 9 kHz and the video bandwidth (VBW) of 30 kHz. Measurements were made with EUT and antenna orientated so three orthogonal axis were measured.

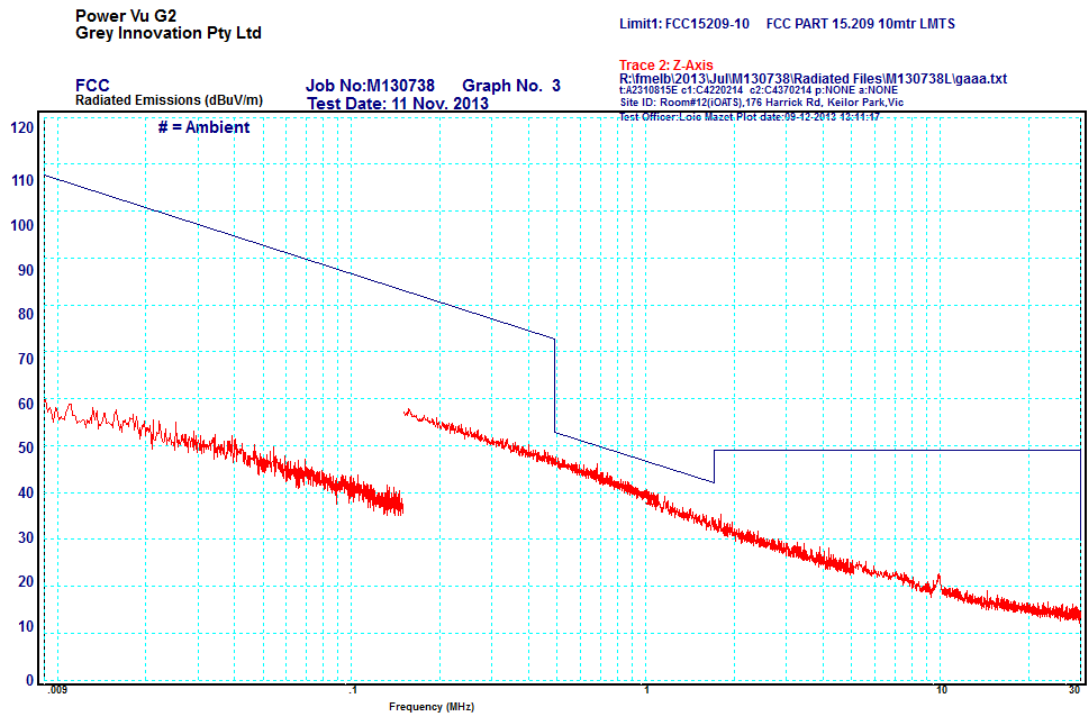
X Axis



Y Axis



Z Axis



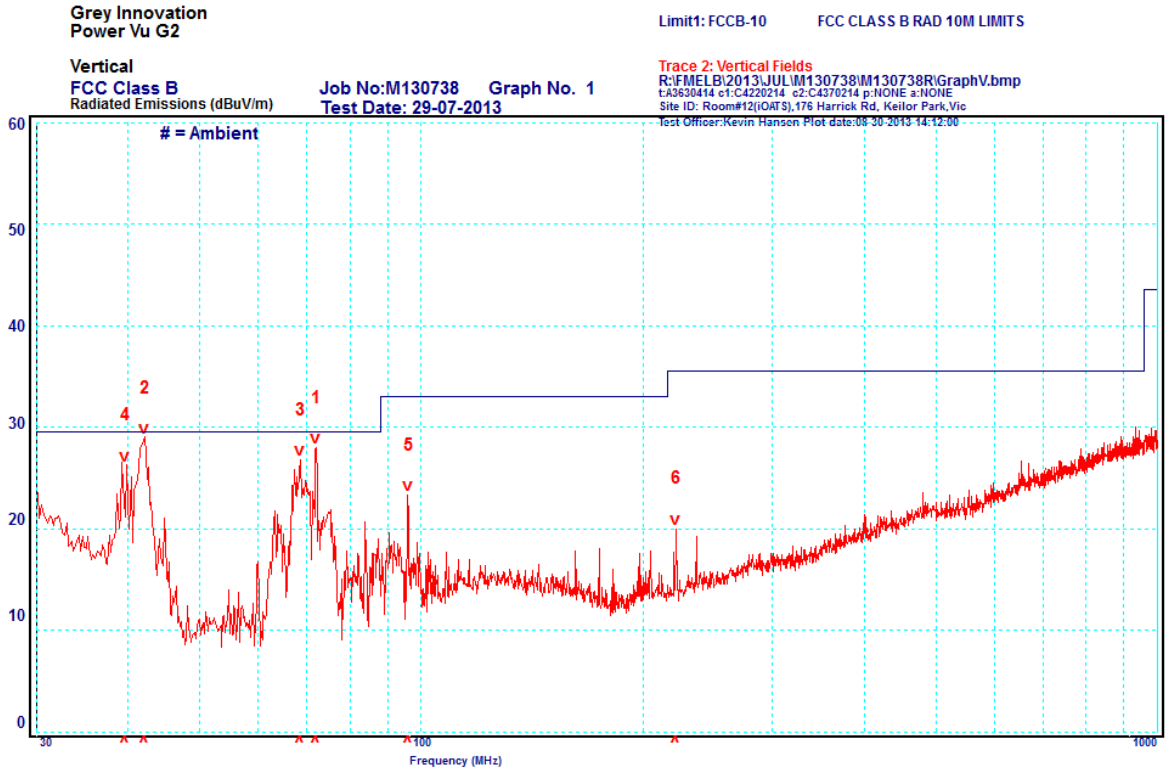
Result:

No emissions exceeded the FCC Part 15.209 limits.

3.8.5 Frequency Band: 30 - 1000 MHz

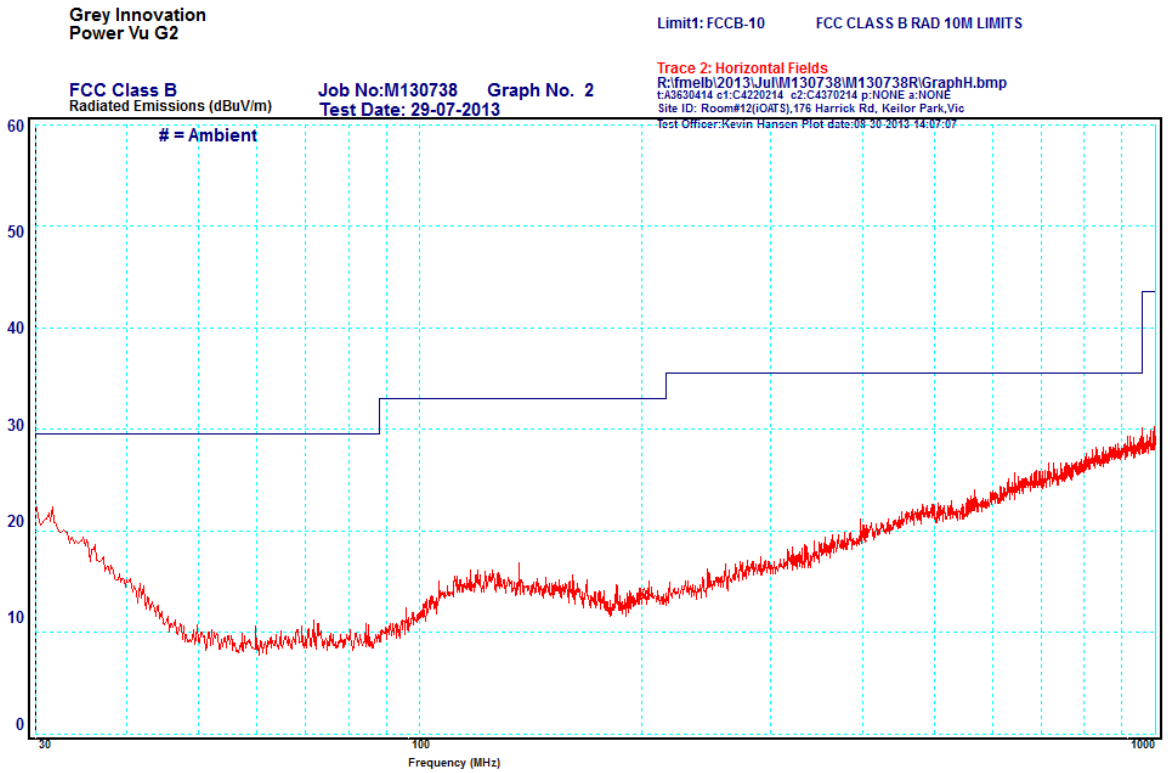
Testing was performed at a distance of 10 metres. The measurement of emissions between 30 - 1000 MHz was measured with the resolution bandwidth (RBW) of 120 kHz and the video bandwidth (VBW) of 300 kHz. To simplify presentation the limits of § 15.209(a) were applied to the whole range.

3.8.5.1 Vertical Polarisation



Point	Frequency [MHz]	Quasi-Peak Emission [dBµV/m]	Quasi-Peak Limit [dBµV/m]	Delta [dB]
1	72.00	22.2	29.5	-7.3
2	42.08	19.4	29.5	-10.1
3	68.52	18.2	29.5	-11.3
4	39.62	17.2	29.5	-12.3
5	96.01	17.9	33.0	-15.1
6	221.84	7.8	35.5	-27.7

3.8.5.2 Horizontal Polarisation



No emissions were detected within 10 dB of the limit line.

3.8.6 Frequency Band: 1 – 25 GHz

The upper frequency range was 10 times the highest operating frequency:
10 x 2.4835 GHz = 24.835 GHz

Testing was performed at a distance of 3 metres. The measurement of emissions above 1000 MHz was measured using a following setting: Average measurement setting: RBW = 1 MHz and VBW = 10 Hz.

The unit was configured to transmit with no modulation, however some harmonic emissions exceeded the limits so the measurements were repeated with modulation switched on.

3.8.6.1 Channel 11, 2405 MHz

Frequency [MHz]	Antenna Polarisation	Average Emission [dBµV/m]	Average Limit [dBµV/m]	Margin [dB]
19240.03	Vertical	51.4	54	-2.6
4809.99	Vertical	48.5	54	-5.5
19239.97	Horizontal	47.8	54	-6.2
16835.06	Horizontal	46.3	54	-7.7
4809.96	Horizontal	46.1	54	-7.9
16834.88	Vertical	41.9	54	-12.1
12024.95	Vertical	28.1	54	-25.9
7215.04	Horizontal	64.2	92.6	-28.4
14430.03	Horizontal	61.5	92.6	-31.1
7214.97	Vertical	60.9	92.6	-31.7
9619.89	Horizontal	58.0	92.6	-34.6
9619.88	Vertical	56.3	92.6	-36.3
14429.80	Vertical	55.3	92.6	-37.3
12025.00	Horizontal	13.2	54	-40.8

Frequency [MHz]	Antenna Polarisation	Peak Emission [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]
4809.97	Vertical	70.2	74	-3.8
19239.96	Horizontal	65.8	74	-8.2
4809.89	Horizontal	63.1	74	-10.9
12025.07	Vertical	62.7	74	-11.3
12024.98	Horizontal	61.4	74	-12.6
16835.00	Horizontal	50.8	74	-23.2
16835.04	Vertical	48.5	74	-25.5

3.8.6.2 Channel 20, 2450 MHz

Frequency [MHz]	Antenna Polarisation	Average Emission [dBµV/m]	Average Limit [dBµV/m]	Margin [dB]
14699.85	Horizontal	51.3	54	-2.7
4901.05	Vertical	48.8	54	-5.2
17149.88	Horizontal	48.2	54	-5.8
4899.97	Horizontal	46.6	54	-7.4
19600.00	Horizontal	47.3	54	-6.7
14699.82	Vertical	45.9	54	-8.1
17150.00	Vertical	44.7	54	-9.3
7350.00	Vertical	33.6	54	-20.4
12250.00	Vertical	31.8	54	-22.2
12250.00	Horizontal	27.4	54	-26.6
7349.98	Horizontal	22.6	54	-31.4
9799.95	Vertical	53.6	91.3	-37.7
9799.86	Horizontal	50.7	91.3	-40.6

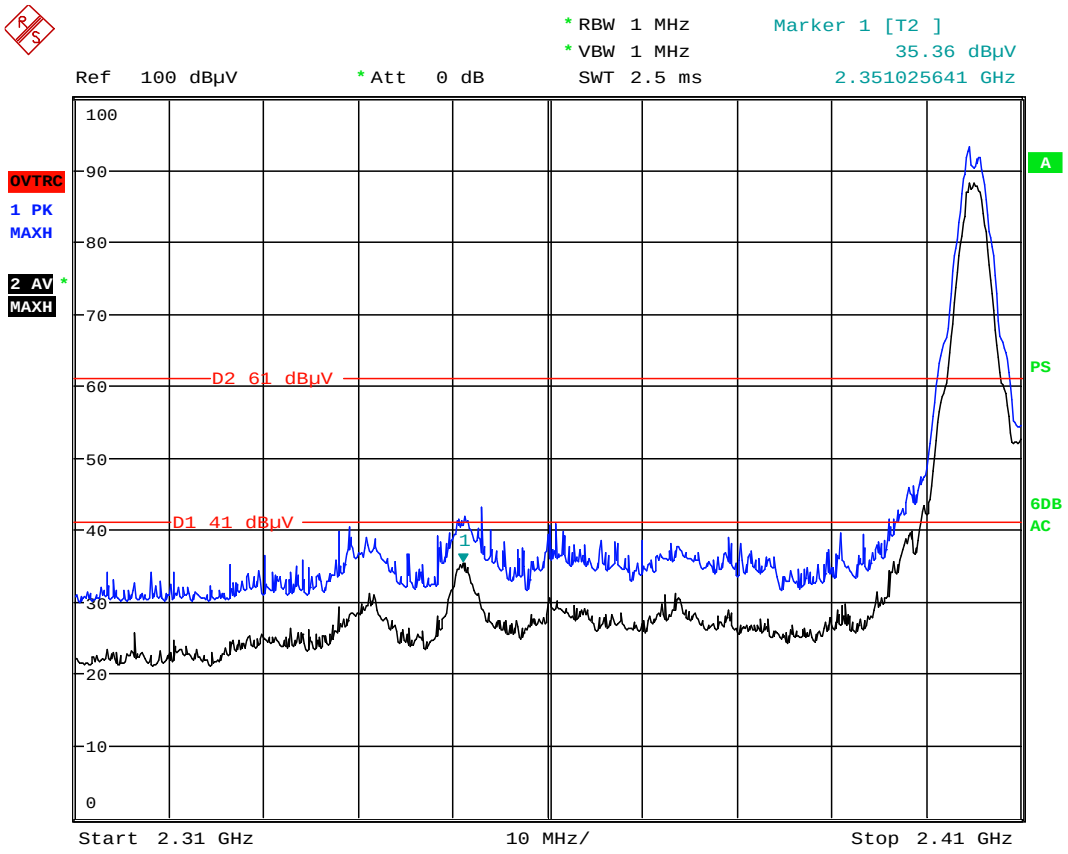
Frequency [MHz]	Antenna Polarisation	Peak Emission [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]
4900.09	Vertical	69.0	74	-5.0
7349.97	Vertical	65.3	74	-8.7
7349.98	Horizontal	65.3	74	-8.7
4899.92	Horizontal	63.5	74	-10.5
12250.00	Vertical	62.6	74	-11.4
12250.00	Horizontal	59.2	74	-14.8
14700.03	Horizontal	53.9	74	-20.1
17150.13	Horizontal	51.7	74	-22.3
14700.08	Vertical	50.2	74	-23.8
17149.82	Vertical	49.7	74	-24.3

3.8.6.3 Channel 26, 2480MHz

Frequency [MHz]	Antenna Polarisation	Average Emission [dBµV/m]	Average Limit [dBµV/m]	Margin [dB]
9920.02	Vertical	52.0	54	-2.0
9920.00	Horizontal	50.2	54	-3.8
4959.98	Vertical	48.1	54	-5.9
17360.00	Horizontal	47.8	54	-6.2
4959.95	Horizontal	46.8	54	-7.2
14879.95	Horizontal	44.0	54	-10.0
12400.00	Horizontal	38.7	54	-15.3
12400.00	Vertical	38.3	54	-15.7
7439.98	Vertical	31.9	54	-22.1
7440.01	Horizontal	31.7	54	-22.3

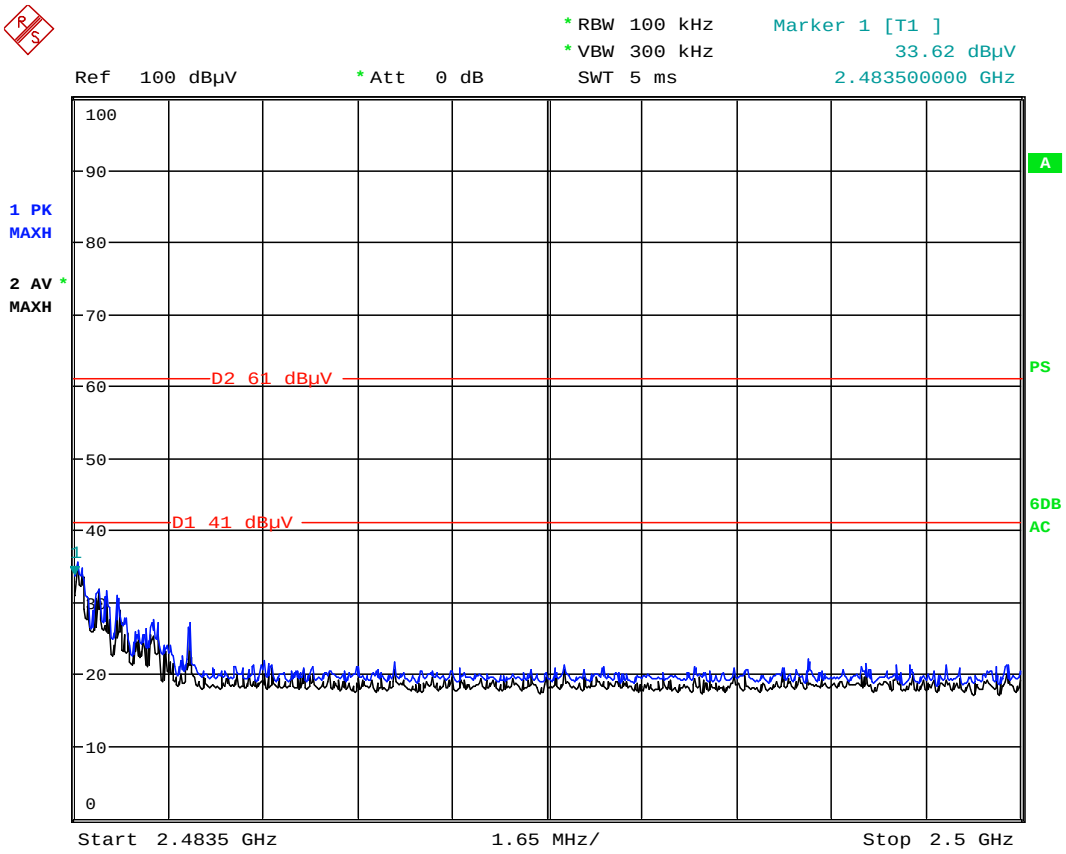
Frequency [MHz]	Antenna Polarisation	Peak Emission [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]
4959.91	Vertical	72.0	74	-2.0
7439.99	Vertical	67.1	74	-6.9
7440.00	Horizontal	66.4	74	-7.6
4959.91	Horizontal	64.9	74	-9.1
12399.90	Vertical	62.8	74	-11.2
9919.95	Vertical	55.4	74	-18.6

3.8.7 Restricted Frequency Band: 2.31 GHz to 2.39 GHz



The transmit frequency was set to the lowest channel, 2405 MHz. The emissions over the restricted frequency range were maximised (EUT orientation and antenna polarisation) and measured at a distance of 1 metre. Trace 1 (blue) is made with a peak detector, trace 2 (black) is made with an average detector. The limit lines have been adjusted to incorporate the worst case antenna and cable factors, D1 is the average limit and D2 is the peak limit. The worst case emission was at 2.351 GHz and passed by a margin of 5.6 dB.

3.8.8 Restricted Frequency Band: 2.4835 GHz to 2.5 GHz

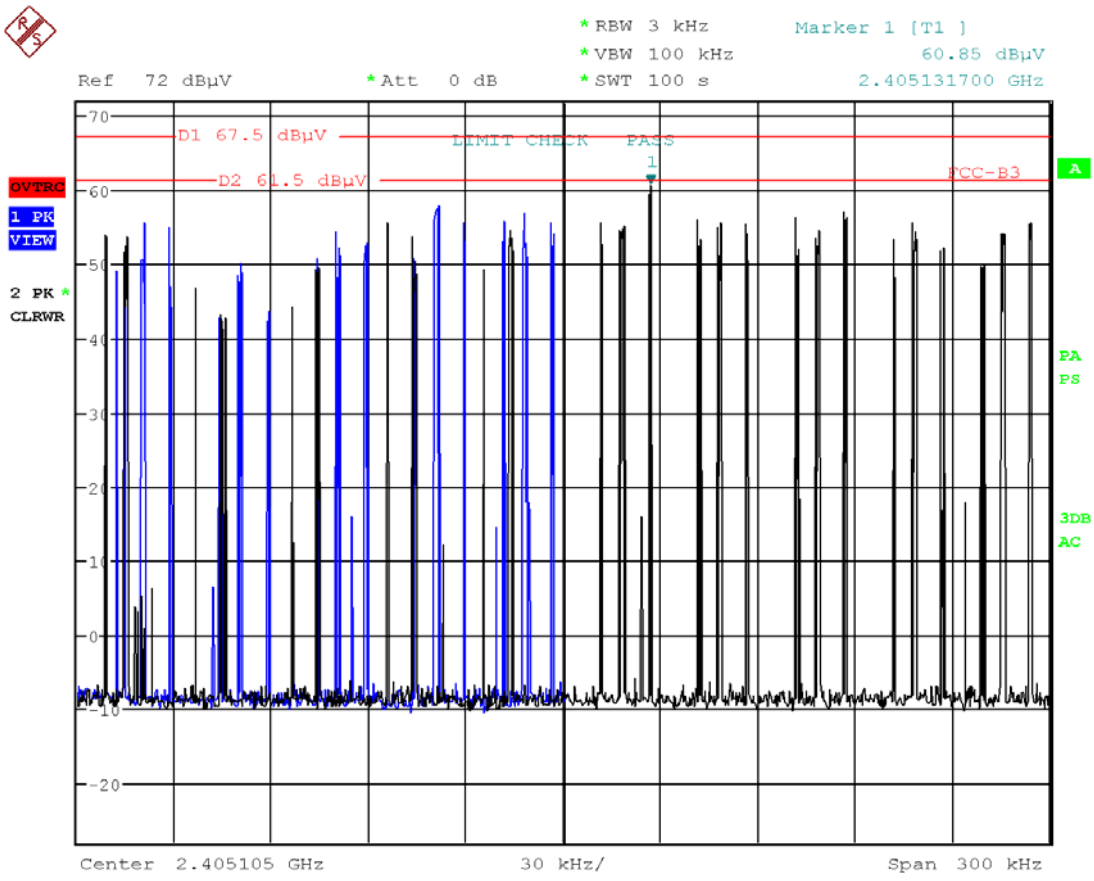


The transmit frequency was set to the highest channel, 2480 MHz. The emissions over the restricted frequency range were maximised (EUT orientation and antenna polarisation) and measured at a distance of 1 metre. Trace 1 (blue) is made with a peak detector, trace 2 (black) is made with an average detector. The limit lines have been adjusted to incorporate the worst case antenna and cable factors, D1 is the average limit and D2 is the peak limit. The worst case emission was at 2.4835 GHz and passed by a margin of 7.4 dB.

3.9 §15.247(e) Power Spectral Density

The power spectral density was measured with the transmitter set to the channel having the highest power output and with normal modulation applied.

The resolution bandwidth of 3 kHz and the video bandwidth of 100 kHz were utilised.



Result:

Channel	Power Spectral Density [dBm/3kHz]	Limit [dBm/3kHz]
2405 MHz	-0.33	8

3.10 §15.247(f) Hybrid systems

Not applicable.

3.11 §15.247(g) Frequency Hopping System with Transmitter and Receiver

Not applicable.

3.12 §15.247(h) Simultaneous occupancy of individual hopping frequencies

Not applicable.

3.13 §15.247(i) Radio Frequency Exposure (Hazard) Information

Spread spectrum transmitters operating in the 2400 - 2483.5 MHz and 5725 – 5850 MHz bands are required to be operated in a manner that ensures that the public is not exposed to RF energy levels in accordance with CFR 47, Section 1.1307(b)(1).

The Power Vu G2 was excluded from SAR testing per section 4.3 of KDB 447498 D01 General RF Exposure Guidance v05r01. The following equation is applicable:

[Max power mW ÷ separation distance mm] × [√f GHz] ≤ 7.5 for 10-g extremity SAR.

Where:
Max power = 20 dBm (highest possible by EUT, actual was less than this) with actual worst case duty cycle of 5%.
= 5 mW

Separation distance = 5mm

f = 2.480 GHz, highest transmission frequency.

The equation is then:

(5mW ÷ 5mm) × 1.6 = 1.6, which is less than 7.5 and hence excluded from testing.

4.0 COMPLIANCE STATEMENT

The Power Vu G2, tested on behalf of Grey Innovations **complied** with the requirements of 47 CFR, Part 15 Subpart C - Rules for Radio Frequency Devices (intentional radiators), Section 15.247 - Operation in the frequency band 2400 - 2483.5 MHz.

Results were as follows:

FCC Subpart C, Section 15.247

FCC Part 15 Subpart C Clauses	Test Performed	Results
15.203	Antenna Requirement	**Not Applicable**
15.205	Operation in Restricted Band	**Complied**
15.207	Conducted Emissions	**Complied**
15.209	Radiated Emissions	**Complied**
15.247 (a)(2)	Channel Bandwidth	**Complied**
15.247 (b)(3)	Peak Output Power	**Complied**
15.247 (c)	Antenna Gain > 6 dBi	**Not Applicable.** Antenna gain < 6 dBi
15.247 (d)	Out of Band Emissions	**Complied**
15.247 (e)	Peak Power Spectral Density	**Complied**
15.247 (f)	*Hybrid Systems	**Not Applicable.** EUT does not employ a hybrid system
15.247 (g)	Frequency Hopping	**Not Applicable.** EUT does not employ frequency hopping
15.247 (h)	Frequency Hopping	**Not Applicable.** EUT does not employ frequency hopping
15.247 (i)	Radio Frequency Hazard	**Complied**

*Hybrid systems are those that employ a combination of both frequency hopping and digital modulations technique.

5.0 UNCERTAINTIES

EMC Technologies has evaluated the equipment and the methods used to perform the emissions testing. The estimated measurement uncertainties for emissions tests shown within this report are as follows:

Conducted Emissions:	9 kHz to 30 MHz	±3.2 dB
Radiated Emissions:	9 kHz to 30 MHz	±4.1 dB
	30 MHz to 300 MHz	±5.1 dB
	300 MHz to 1000 MHz	±4.7 dB
	1 GHz to 18 GHz	±4.6 dB
Peak Output Power:		±1.5 dB
Peak Power Spectral Density:		±1.5 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TEST REPORT APPENDICES

APPENDIX B: BLOCK DIAGRAM
APPENDIX C: SCHEMATICS
APPENDIX D: OPERATIONAL DESCRIPTION
APPENDIX E: PHOTOGRAPHS
APPENDIX F: FCC LABEL DETAILS
APPENDIX G: USER MANUAL