

EMC Technologies (NZ) Ltd

Test Report No 80602.1a
Report date: 26 September 2008

TEST REPORT

Gallagher HR3 Hand Held Animal Tag Reader

tested to

47 Code of Federal Regulations

Code of Federal Regulations (CFR) 47

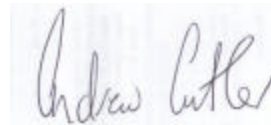
Part 15 – Radio Frequency Devices, Subpart C – Intentional Radiators

Section 15.247 – Operation in the band 2400 – 2483.5 MHz

for

Gallagher Group Ltd

This Test Report is issued with the authority of:



Andrew Cutler - General Manager



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1. STATEMENT OF COMPLIANCE

The **Gallagher HR3 Hand Held Animal Tag Reader** complies with FCC Part 15 Subpart C as an Intentional Radiator when the methods described in ANSI C63.4 - 2003 are applied.

2. RESULTS SUMMARY

<u>CLAUSE</u>	<u>TEST PERFORMED</u>	<u>RESULT</u>
15.203	Antenna requirement	Complies
15.205	Operation in restricted bands	Complies
15.207	Conducted emissions	Complies
15.209	Radiated emissions	Complies
15.247:		
(a)(1)	FHSS channel bandwidth	Complies
(a)(1)(iii)	FHSS channel occupancy	Complies
(a)(2)	Digital modulation bandwidth	Not applicable
(b)(1)	FHSS peak output power	Complies
(b)(3)	Digital peak output power	Not applicable
(c)	Antenna gains exceeding 6 dBi	Not applicable
(d)	Spurious emissions	Complies
(e)	Digital modulation power spectral density	Not applicable
(f)	Hybrid systems	Noted
(g)	Hopping systems	Noted
(h)	Hopping systems intelligence	Noted
(i)	Radio frequency hazard	Complies

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3. INTRODUCTION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification.

The client selected the test sample.

This report relates only to the sample tested.

This report contains no corrections or erasures.

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

This report replaces report number 80602.1 in order to assess a number of TCB related issues.

4. CLIENT INFORMATION

Company Name Gallagher Group Ltd

Address Private Bag 3026

City Hamilton

Country New Zealand

Contact Mr Paul Young

5. DESCRIPTION OF TEST SAMPLE

Brand Name Gallagher

Model Number HR3 (G03301)

Product Hand Held Animal Tag Reader

Manufacturer Gallagher Group Ltd

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Country of Origin New Zealand

Serial Number 0815200011

FCC ID M5VG03301A

Ancillary equipment

Sony PCG-983P Laptop Computer.
Serial number: GCL-PC0619

Bluetooth USB Dongle Transmitter. FCC ID:RU5AWBC50.
Serial number 0011F602D66C

The device tested contains a 134.2 kHz RFID animal tag reader which then transmits this to a data storage device, often a weigh scale unit, using a Bluetooth transmitter.

Testing has been carried out to ensure that this device still complies as a new Bluetooth transmitter has been installed

Bluetooth Modulation system used

Frequency hopping spread spectrum (GFSK) at 1 Mbps

Bluetooth Rated Module Output Power

+0 dBm (1.0 mW)

Antenna type and gain

Circuit board antenna with gain assumed to be 0 dB

Test frequencies

2402 MHz, 2440 MHz, 2480 MHz

Power supply

The device is powered at 12 Vdc using either internal or external batteries.

In addition the device can be charged but not operated using an external AC/DC adaptor.

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6. RESULTS

Standard

The sample was tested in accordance with 47 CFR Part 15 Subpart C.

Methods and Procedures

The measurement methods and procedures as described in ANSI C63.4 - 2003 were used.

Section 15.201: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for this device.

Section 15.203: Antenna requirement

As can be seen from the attached photographs the device has an internal unique antenna that cannot be easily accessed and therefore cannot be easily modified.

Result: Complies.

Section 15.204: External radio frequency power amplifiers and antenna modifications

From the attached photographs it can be seen that it is not possible to attach an external power amplifier to this transmitter.

Result: Complies.

Section 15.205: Restricted bands of operation

The device contains a RFID transmitter that transmits on 134.2 kHz.

This falls between the restricted bands of 90 – 110 kHz and 495 – 505 kHz

The device also contains a Bluetooth transmitter that operates in the band 2400 – 2483.5 MHz and is covered by Section 15.247 of these rules.

Result: Complies.

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Section 15.207: Conducted limits

Conducted emission testing has been carried out as the device has provisions to allow charging of the internal batteries using a 110 Vac charger.

The device cannot be operated when the charger is attached.

Testing has been carried out using a supplied 110 Vac charger.

Conducted emissions testing was carried out over the frequency range of 150 kHz to 30 MHz at the Laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 m screened room.

Measurements on both the phase and neutral lines were made using either a Quasi Peak or an Average detector with a 9 kHz bandwidth.

The supplied conducted emission plot is a combined plot showing the worst case of the Peak, Quasi Peak and Average levels for both phase and neutral.

Result: Complies with an 8.5 dB margin at 190.0 kHz (Quasi Peak).

Measurement uncertainty with a confidence interval of 95% is:

- Mains terminal tests (0.15 - 30 MHz) \pm 2.2 dB

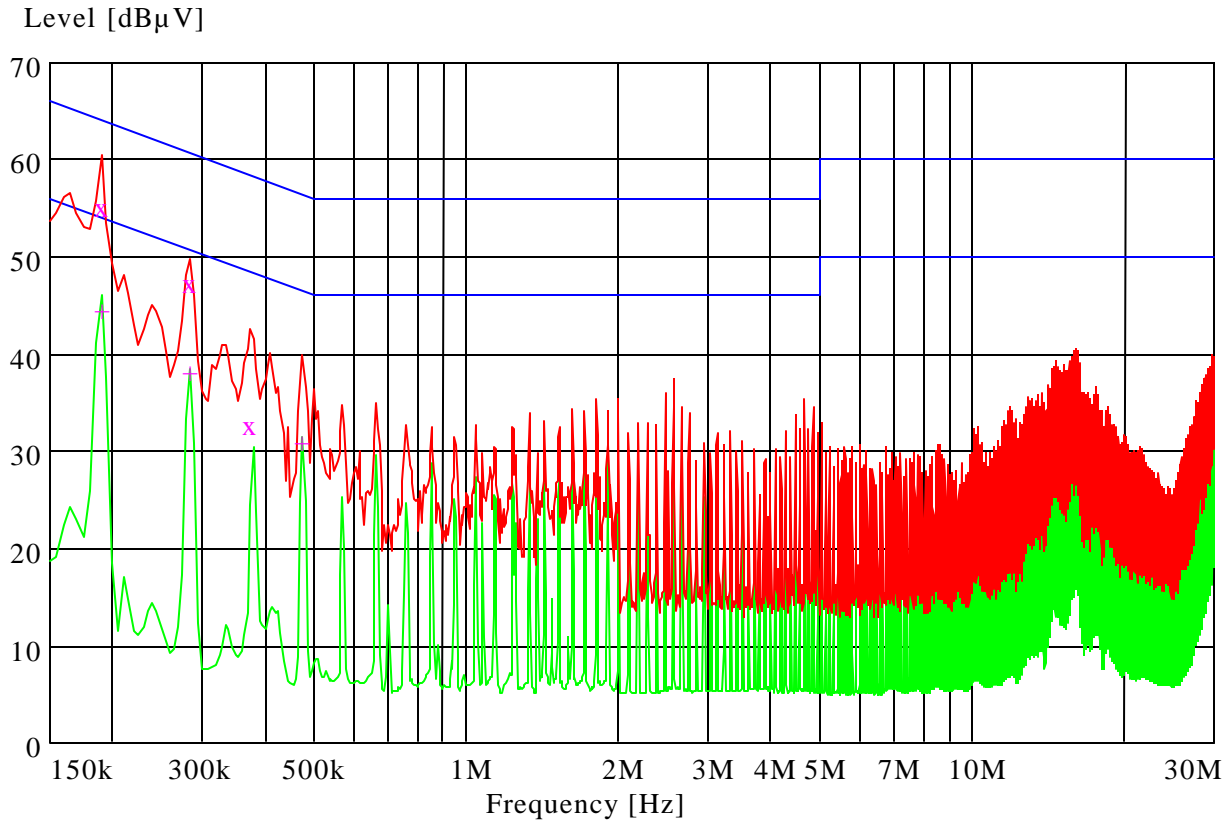
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Conducted emissions

Comments:	The device was powered at 110Vac using a supplied AC adaptor to charge the internal batteries of an HR3 device.
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Peak -----	Average -----	Quasi Peak X	Average +
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Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
0.190000	55.50	64.0	8.5	N	
0.285000	47.80	60.6	12.8	N	
0.375000	33.20	58.3	25.1	N	
2.570000	34.90	56.0	21.1	N	
16.060000	36.40	60.0	23.6	N	
16.160000	35.30	60.0	24.7	N	

Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
0.190000	45.20	54.0	8.7	N	
0.285000	38.70	50.6	11.9	N	
0.475000	31.50	46.4	14.8	L1	
2.570000	31.50	46.0	14.5	N	
15.750000	31.10	50.0	18.9	L1	
16.060000	30.90	50.0	19.1	N	

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Section 15.209: Radiated emission limits, general requirements

Radiated emissions testing was carried out over the frequency range of 100 kHz to 1000 MHz for all other emissions other than the fundamental emission.

The 134.2 kHz emission is covered by the general requirements in this section.

Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was last updated on January 27th, 2007.

Testing was carried out at the laboratory's open area test site - located at Driving Creek, Orere Point, Auckland, New Zealand.

This site conforms to the requirements of CISPR 16, Part 1, Clause 16, and ANSI C63.4 - 2003.

The device was placed on the fibreglass test table that has a dielectric constant near 1 which is a total of 0.8 m above the test site ground plane.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height, where appropriate, with an automated antenna tower.

As the device is portable it was pre scanned in each of the three orthogonal polarities and was then formally tested in the worst case polarisation.

Above 30 MHz emissions are measured in both vertical and horizontal antenna polarisations.

Below 30 MHz measurements were made using a magnetic loop antenna that was orientated for the worst-case emission level.

The emission level was determined in field strength by taking the following into consideration:

Level(dB μ V/m)= Receiver Reading(dB μ V) + Antenna Factor(dB) + Coax Loss(dB)

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Fundamental emission:

Measurements were made using a magnetic loop antenna and a receiver with an average detector and a peak detector both using a 9 kHz bandwidth.

Measurements were made at a distance of 10 metres.

The average limit at 300 metres (25 dBuV/m) has been extrapolated using a factor of 40 dB per decade that is defined in section 15.31 (f)(2).

The peak limit is the average limit plus 20 dB

The test set up was identical to the original test so the original photographs have been used.

Before making a final measurement the device was manually rotated to determine the worst case orientation and then the antenna orientation was maximised.

Measurements were made while the device was being powered at 12 Vdc using an external battery that was fully charged.

Frequency (kHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
Laying Flat				
134.200	66.0	85.0	19.0	Average
134.200	73.4	105.0	31.6	Peak
Upright				
134.200	67.8	85.0	17.2	Average
134.200	74.1	105.0	30.9	Peak
Vertical				
134.200	59.6	85.0	25.4	Average
134.200	63.2	105.0	41.8	Peak

Field strength variation when the external battery supply was varied.

10.2 Vdc	12.0 Vdc	13.8 Vdc	Limit	Detector
67.7	67.8	67.9	85.0	Average
74.0	74.1	74.2	105.0	Peak

Result: Complies with a 17.2 dB margin when using an average detector.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB

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Section 15.209: Spurious Emissions (below 30 MHz)

Frequency kHz	Level dBuV/m	Limit dBuV/m	Result	Detector
268.400	< 41.0	79.0	Pass	Average
268.400	< 41.0	99.0	Pass	Peak
402.600	< 36.0	75.5	Pass	Average
402.600	< 36.0	95.5	Pass	Peak
536.800	< 42.1	53.0	Pass	Quasi Peak
671.000	< 28.0	51.1	Pass	Quasi Peak
805.200	< 33.0	49.5	Pass	Quasi Peak
939.400	< 34.8	48.1	Pass	Quasi Peak
1073.600	< 32.0	49.5	Pass	Quasi Peak
1207.800	< 35.0	49.5	Pass	Quasi Peak
1342.000	< 29.0	49.5	Pass	Quasi Peak

Magnetic loop measurements were made at a distance of 10metres.

Measurements were made while the device was being powered using an external 12 Vdc battery that was fully charged.

No spurious emissions were detected when the device was operated in the various modes tested.

Before making a final measurement the device was manually rotated in each of the three axis tested and then the antenna orientation was maximised.

A receiver with an average and peak detector with a 9 kHz bandwidth was used between 110 – 490 kHz and a quasi peak detector with a 9 kHz bandwidth was used between 490 kHz – 30.0 MHz.

The 300 metre limit between 125 – 490 kHz has been scaled by a factor of 40 dB per decade, as per section 15.31 (f) (2) and the 30 metre limit between 490 – 1705 kHz has been scaled by a factor of 40 dB per decade, as per section 15.31 (f) (2).

The spurious emissions observed do not exceed the level of the fundament emission.

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (100 kHz – 30 MHz) \pm 4.8 dB

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15.209: Spurious Emissions (above 30 MHz)

Measurements between 30 – 1000 MHz have been made at a distance of 3 metres.

Measurements were made while the device was being powered using an external 12 Vdc battery.

A receiver with a quasi peak detector with a 120 kHz bandwidth was used between 30 – 1000 MHz.

The limits as described in Section 15.209 have been applied as follows:

30.0 – 88.0 MHz	100 uV/m	40 dBuV/m
88.0 – 216.0 MHz	150 uV/m	43.5 dBuV/m
216.0 – 960.0 MHz	200 uV/m	46.0 dBuV/m

All emissions observed were below the level of the fundamental emission.

The results below are a combined table of all three axis showing the worst case results shown.

Result: Complies with a 16.8 dB margin at 206.130 MHz (Horizontal).

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 – 1000 MHz) \pm 4.1 dB

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Spurious Emissions

Frequency MHz	Level		Limit dBuV/m	Margin dB	Result	Worst Case Antenna
	Vertical dBuV/m	Hort dBuV/m				
68.708		10.5	43.5	33.0	Pass	Horizontal
101.590	12.4	10.1	43.5	31.1	Pass	Vertical
101.860		10.0	43.5	33.5	Pass	Horizontal
103.068	10.2	17.1	43.5	26.4	Pass	Horizontal
103.200	10.2	17.0	43.5	26.5	Pass	Horizontal
106.690		13.1	43.5	30.4	Pass	Horizontal
108.030		11.1	43.5	32.4	Pass	Horizontal
120.243		12.6	43.5	30.9	Pass	Horizontal
137.420	23.4	21.8	43.5	20.1	Pass	Vertical
154.600	15.1	24.6	43.5	18.9	Pass	Horizontal
171.800	13.5	25.7	43.5	17.8	Pass	Horizontal
206.130	15.2	26.7	43.5	16.8	Pass	Horizontal
240.485	21.4	29.1	46.0	16.9	Pass	Horizontal
274.840	15.6	17.1	46.0	28.9	Pass	Horizontal
309.200	17.1	27.8	46.0	18.2	Pass	Horizontal
326.378		28.3	46.0	17.7	Pass	Horizontal
343.555		25.1	46.0	20.9	Pass	Horizontal
360.733		22.7	46.0	23.3	Pass	Horizontal
377.910		25.9	46.0	20.1	Pass	Horizontal
395.088		25.1	46.0	20.9	Pass	Horizontal
412.265		27.4	46.0	18.6	Pass	Horizontal

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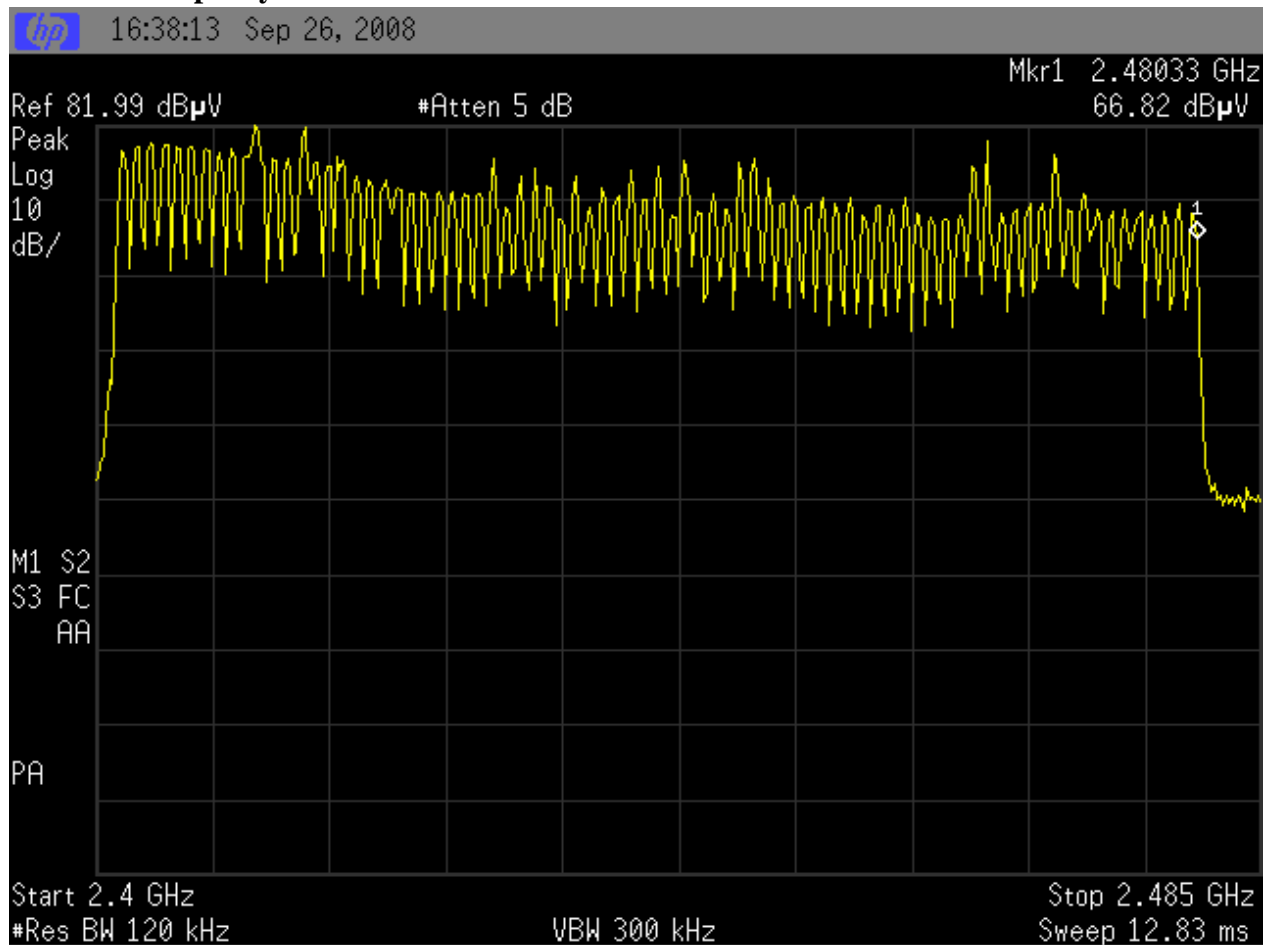
Section 15.247 (a) (1) – Frequency hopping systems channel bandwidth.

The frequency hopping system tested was a Bluetooth device.

The plots for these tests were difficult to obtain as the device was very slow to hop so it was a very time consuming process.

79 channels were observed in operation between 2402 MHz and 2480 MHz which equates to a channel spacing of 1 MHz.

Channel occupancy



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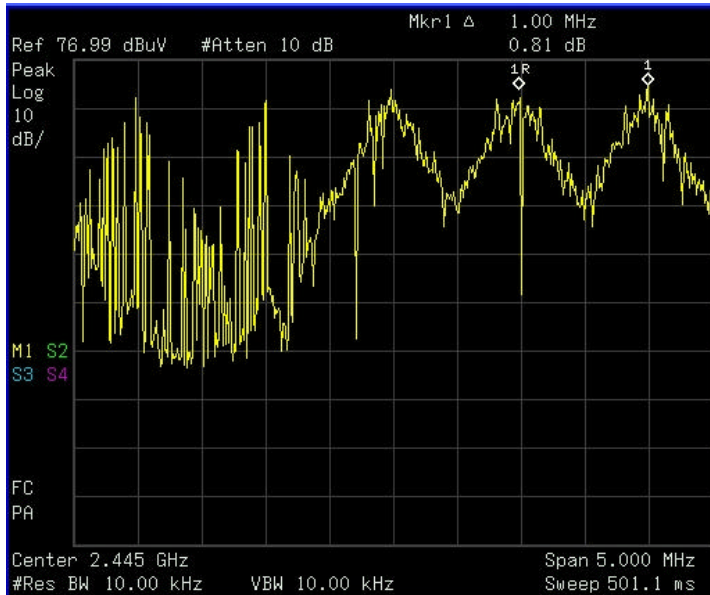
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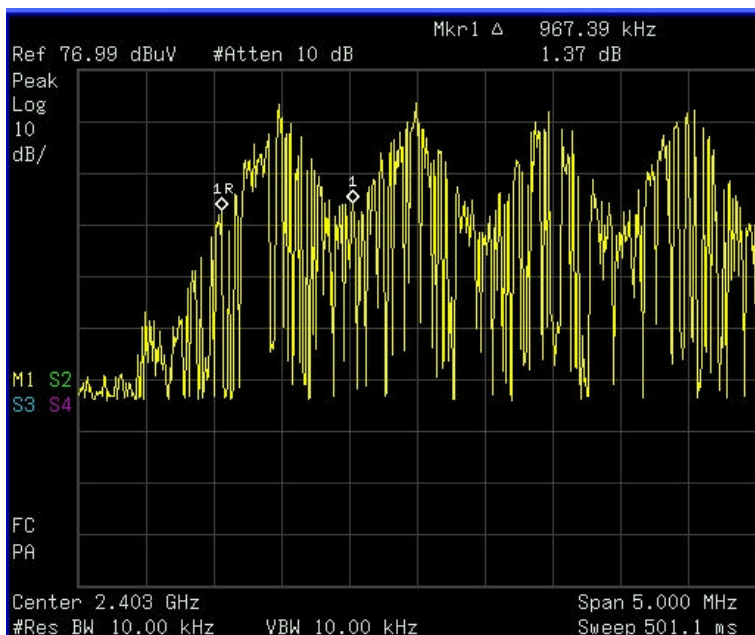
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Channel spacing while hopping



The 20 dB bandwidth has been determined at 2402 MHz, 2446 MHz and 2480 MHz using a spectrum analyser with a resolution bandwidth of 10 kHz which shows that the -20 dB bandwidth at each frequency is less than 1 MHz. This is difficult to show as measurements had to be made when the device was hopping.

2402 MHz



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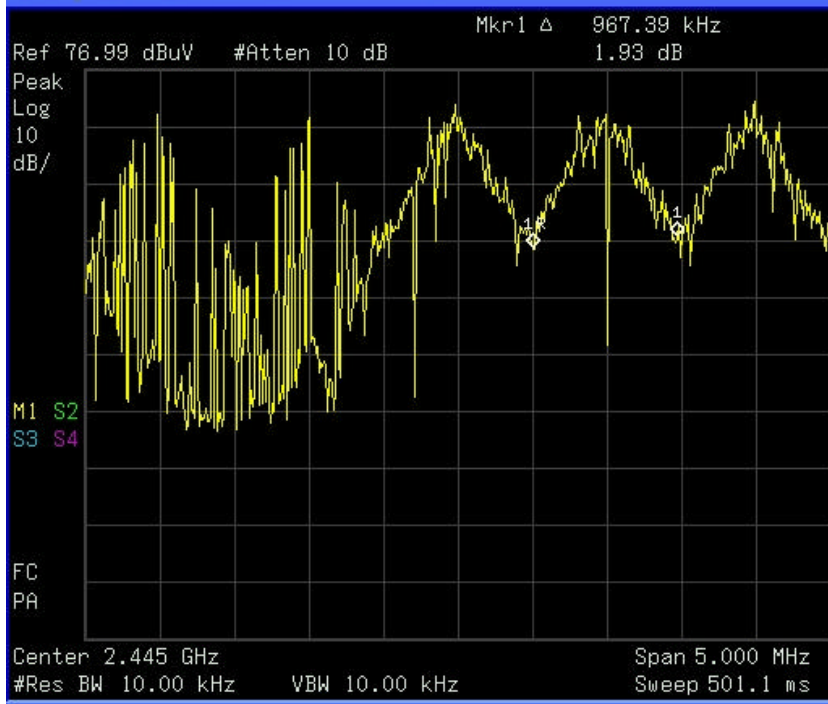
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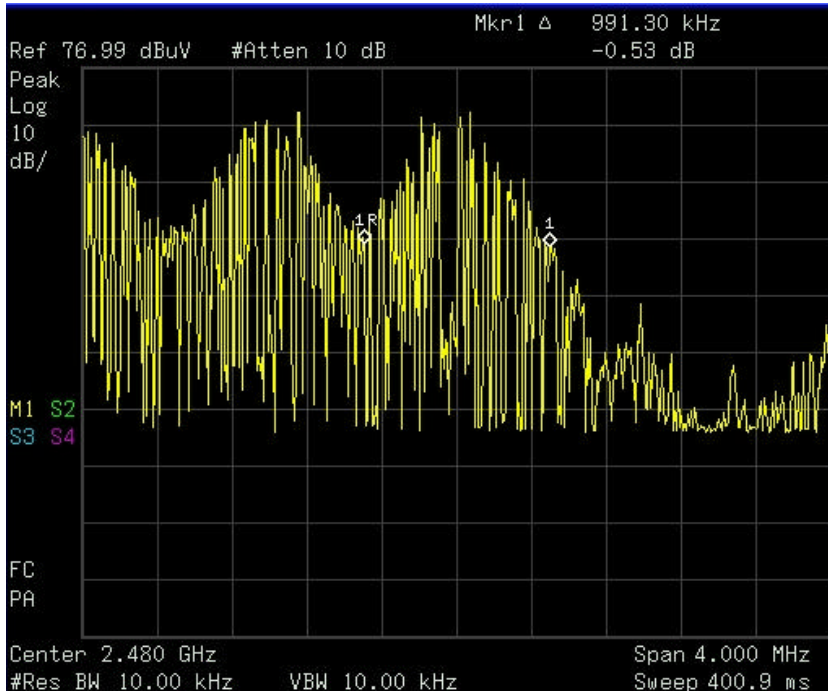
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2446 MHz



2480 MHz



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Section 15.247 (a) (1) (iii) – Channel occupancy

As detailed previously 79 channels are used between 2402 – 2480 MHz.

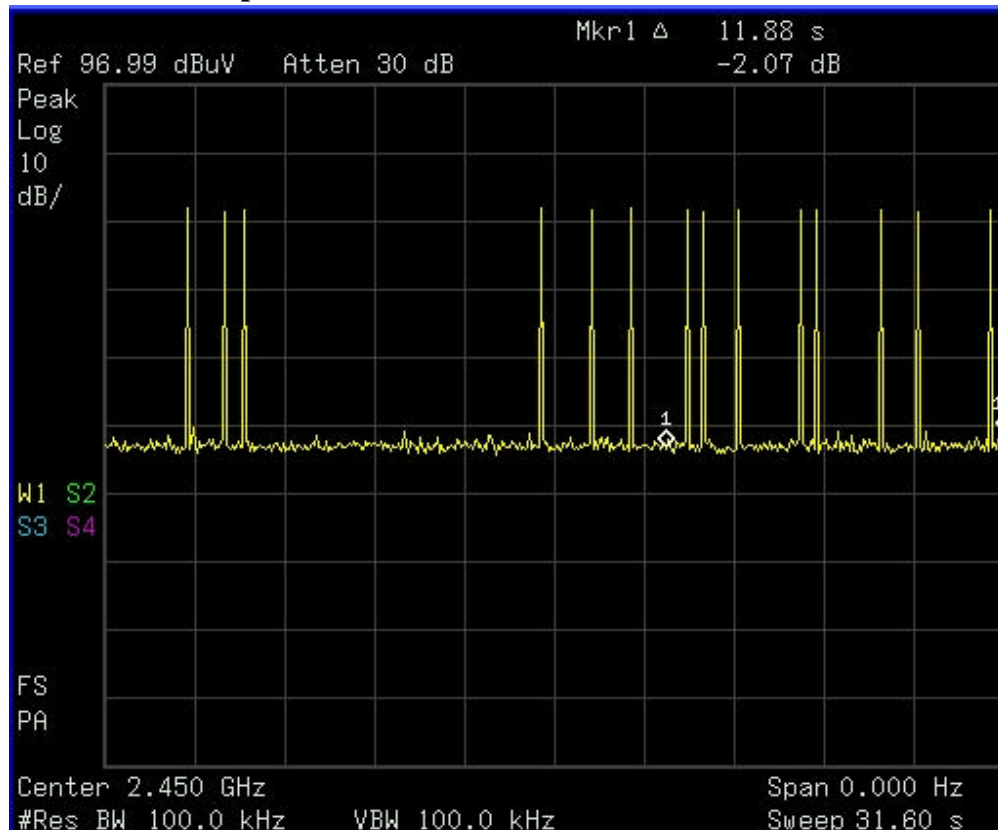
The average time of occupancy on any channel shall not exceed 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels utilised.

400 ms x 79 channels = 31.6 seconds.

Testing was carried out while the handheld reader was continuously reading an animal tag and then sending this tag information to a laptop computer.

When tuned to 2450 MHz with a 0 Hz span the transmitter was observed to operate at the most 15 times in a 31.6 second period.

31.6 second sweep



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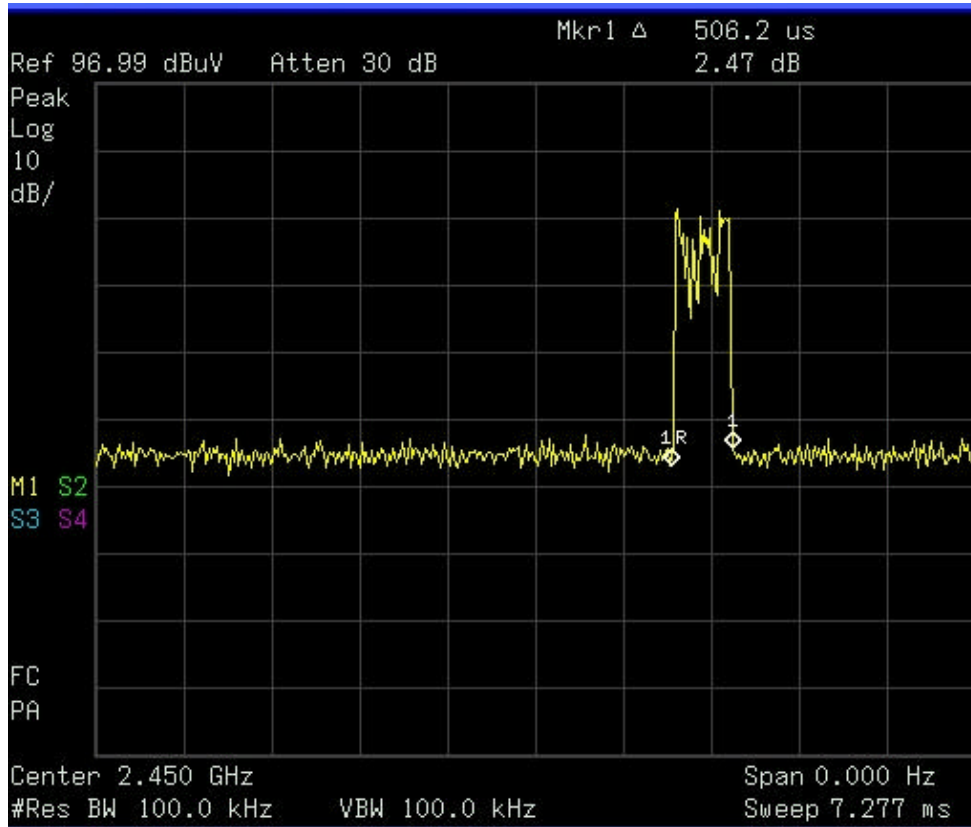
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Transmit dwell time



The transmitter was observed to transmit for approximately 510 us.

Therefore each channel was occupied on average for a period of:

15 times x 510 uS = 7.65 ms.

The specification limit is 0.4 seconds or 400 mS in a 31.5 second observation period.

Result: Complies

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Section 15.247 (b) (1) & (3) – Peak output power

As this device has no external antenna port, with the antenna being located internally; radiated measurements were made to determine the peak output power.

The device was placed on the test table, being 80 cm above the ground plane, with the peak power output being determined in each of the 3 orthogonal angles with the worst case levels being recorded when measurements were made on a high, low and middle channel.

Measurements were made with a peak detector and a bandwidth of 1 MHz when the device was transmitting continuously in vertical and horizontal polarisations.

Frequency MHz	Field Strength dBuV/m	Radiated Power dBm	Antenna Gain dB	Conducted Power dBm	Conducted Limit dBm	Polarity	Axis
2402.0	88.8	-6.4	0.0	-6.4	30.0	Vertical	3
2402.0	93.9	-1.3	0.0	-1.3	30.0	Horizontal	2
2442.0	89.3	-5.9	0.0	-5.9	30.0	Vertical	1
2442.0	91.1	-4.1	0.0	-4.1	30.0	Horizontal	2
2480.0	88.9	-6.3	0.0	-6.3	30.0	Vertical	1
2480.0	94.3	-0.9	0.0	-0.9	30.0	Horizontal	2

The radiated power was derived from the field strength using the formula:
Power (watts) = (Field Strength (V/m)*Distance(m))^2 / 30 * Antenna Gain

The specification limit is a peak conducted power of 30 dBm (1.0 W) as more than 75 non overlapping channels have been used.

The conducted power has been determined using the customer supplied antenna gain subtracted from the calculated radiated power that has been derived from the measured maximum field strength at 3 metres.

The information supplied by the client is very minimal so the antenna gain has been assumed.

The specification states that the module output power is less than 4 dBm which these results confirm.

Result: Complies.

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Section 15.247 (i) – Radio Frequency Hazard Information

As per Section 1.1310 and Section 2.1091 certification of this transmitter is sought using the Uncontrolled / General Public Exposure limits as detailed in OST/OET Bulletin Number 65.

Minimum safe distances have been calculated below.

$$\text{Power density, } W/m^2 = E^2/3770$$

General Population / Uncontrolled exposure limit will be 1.0 mW/cm² as the device operates in the band 2400 – 2483.5 MHz.

The minimum distance from the antenna at which the MPE is met is calculated from the equation relating field strength in V/m, transmit power in watts, transmit antenna gain, transmitter duty cycle and separation distance in metres:

$$E, V/m = (\sqrt{(30 * P * G)}) / d$$

$$E = 1.0 \text{ mW/cm}^2 = E^2/3770$$

$$E = \sqrt{1.0 * 3770}$$

$$E = 61.4 \text{ V/m}$$

The rated measured transmitter power = -0.9 dBm which approximates 0 dBm (1 mW).

Calculations have been made based upon the assumed rated power of 1 mW.

The antenna for this device is integral.

The safe distance has been calculated as follows.

$$d = \sqrt{(30 * P * G * DC)} / E$$

$$d = \sqrt{(30 * 0.001)} / 61.4$$

$$d = \underline{0.0003 \text{ metres or } 0.3 \text{ cm}}$$

Result: Complies. This device will comply with the 20 cm safe distance requirement.

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Section 15.247 (c) – Out of band emissions

As the transmitter does not have an external antenna port radiated measurements were made at the open area test site.

The device was placed on the test table, being 0.8 m above the ground plane, with the front display facing the test antenna.

Measurements were made using a resolution bandwidth of 100 kHz where an emission fell outside of a restricted band.

When an emission fell within a restricted band, above 1 GHz, a peak detector and an average detector with a resolution bandwidth of 1 MHz were utilised in accordance with section 15.209.

Below 1 GHz a quasi peak detector with a resolution bandwidth of 120 kHz was utilised.

All measurements were initially made over a distance of 3 metres.

In the unrestricted bands measurements were made to determine if the field strength of the emissions observed were more than 20 dB down on the highest in band emission level.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height with an automated antenna tower. The emission is measured in both vertical and horizontal antenna polarisations.

The emission level is determined in field strength by taking the following into consideration:

Level (dB μ V/m) = Receiver Reading (dB μ V) + Antenna Factor (dB) + Coax Loss (dB) – Amplifier Gain (dB)

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Transmitting on 2402 MHz

Frequency MHz	Level dBuV/m	Limit dBuV/m (dB)	Antenna Pol	Detector	Bandwidth	Result
2402	93.9	-	Hort	peak	100 kHz	Pass
4804	< 42.5	54.0	Vert/Hort	average	1 MHz	Pass
7206	< 44.9	(-20.0)	Vert/Hort	peak	100 kHz	Pass
9608	< 45.2	(-20.0)	Vert/Hort	peak	100 kHz	Pass
12010	< 47.6	54.0	Vert/Hort	average	1 MHz	Pass
14412	< 47.9	(-20.0)	Vert/Hort	peak	100 kHz	Pass
16814	< 48.8	(-20.0)	Vert/Hort	peak	100 kHz	Pass
19216	< 50.8	54.0	Vert/Hort	average	1 MHz	Pass
21618	< 51.3	(-20.0)	Vert/Hort	peak	100 kHz	Pass
24020	< 52.3	(-20.0)	Vert/Hort	peak	100 kHz	Pass

Transmitting on 2442 MHz

Frequency MHz	Level dBuV/m	Limit dBuV/m (dB)	Antenna Pol	Detector	Bandwidth	Result
2440	91.1	-	Hort	peak	100 kHz	Pass
4884	< 42.5	54.0	Vert/Hort	average	1 MHz	Pass
7326	< 44.9	54.0	Vert/Hort	average	1 MHz	Pass
9768	< 45.2	(-20.0)	Vert/Hort	peak	100 kHz	Pass
12210	< 47.6	54.0	Vert/Hort	average	1 MHz	Pass
14652	< 47.9	(-20.0)	Vert/Hort	peak	100 kHz	Pass
17094	< 48.8	(-20.0)	Vert/Hort	peak	100 kHz	Pass
19536	< 50.8	54.0	Vert/Hort	average	1 MHz	Pass
21978	< 51.3	(-20.0)	Vert/Hort	peak	100 kHz	Pass
24420	< 52.3	(-20.0)	Vert/Hort	peak	100 kHz	Pass

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Transmitting on 2480 MHz

Frequency MHz	Level dBuV/m	Limit dBuV/m	Antenna Pol	Detector	Bandwidth	Result
2480	94.3	-	Hort	peak	100 kHz	Pass
4960	< 42.5	54.0	Vert/Hort	average	1 MHz	Pass
7440	< 44.9	54.0	Vert/Hort	average	1 MHz	Pass
9920	< 45.2	(-20.0)	Vert/Hort	peak	100 kHz	Pass
12400	< 47.6	54.0	Vert/Hort	average	1 MHz	Pass
14880	< 47.9	(-20.0)	Vert/Hort	peak	100 kHz	Pass
17360	< 48.8	(-20.0)	Vert/Hort	peak	100 kHz	Pass
19840	< 50.8	54.0	Vert/Hort	average	1 MHz	Pass
22320	< 51.3	54.0	Vert/Hort	average	1 MHz	Pass
24800	< 52.3	(-20.0)	Vert/Hort	peak	100 kHz	Pass

No transmitter spurious emissions were detected when the device was operating in hop mode.

The noise floor levels listed above are those recorded when a peak detector was used.

As the external preamplifier is only specified up to 20 GHz, measurements between 18 GHz and 25 GHz were carried out with the horn antenna placed at approximately 10 cm from the device.

At this distance no emissions were detected when measurements were attempted using a peak detector

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 – 18,000 MHz) \pm 4.1 dB

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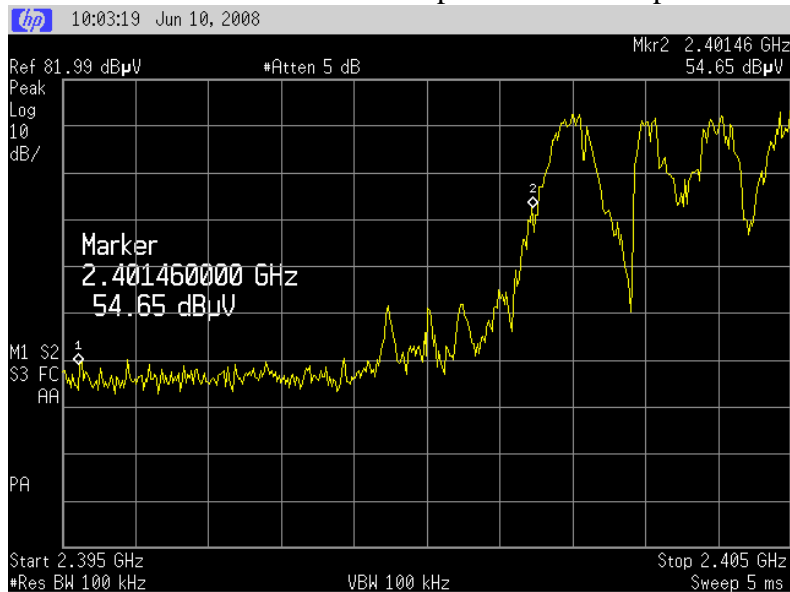
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Band edge measurements

The Bluetooth device is required to operate in the band 2400 MHz to 2483.5 MHz.

Initially relative measurements were made in the laboratory using a 100 kHz resolution bandwidth with the -20 dB limit being applied at both band edges. As measurements were made in the laboratory several low level ambient emissions were observed that were not present when the same measurement was attempted but not completed at the test site



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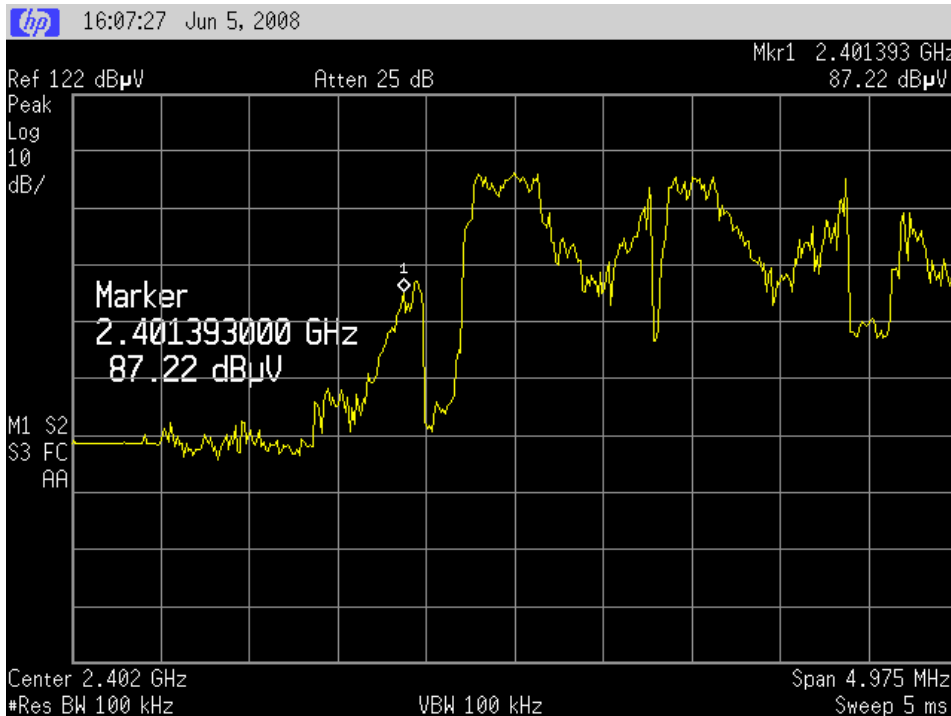
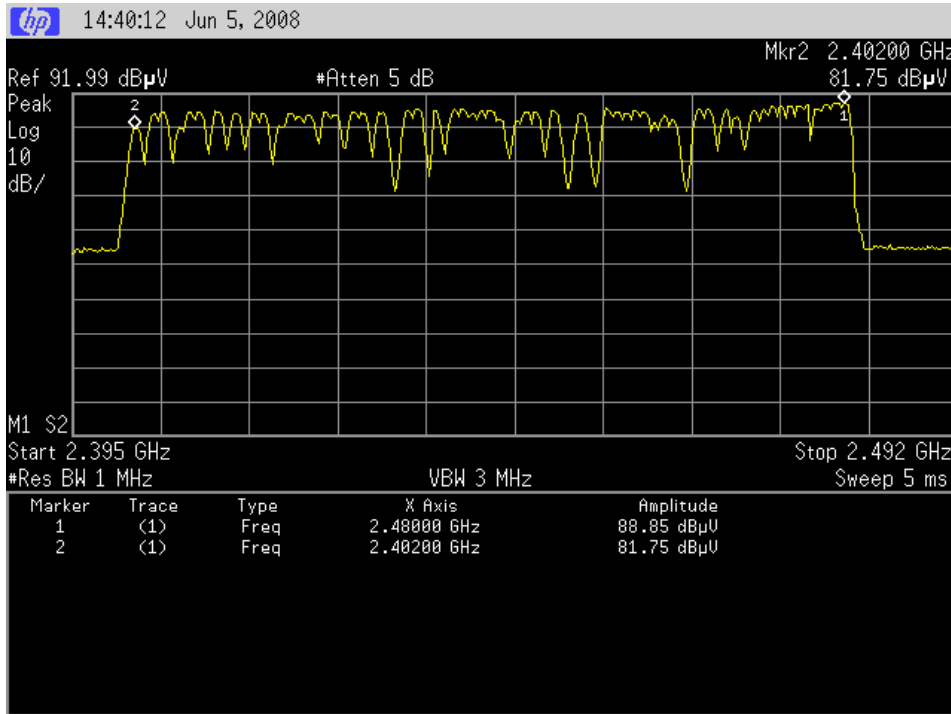
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Attempts at the test site which were abandoned as time was up !



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Test site measurements were made in the 2310 – 2390 MHz and 2483.5 – 2500 MHz restricted bands using a peak detector and an average detector with a 1 MHz bandwidth while the Bluetooth device was transmitting continuously

Restricted band 2310 – 2390 MHz: No emissions detected

Restricted band 2483.5 – 2500.0 MHz: No emissions detected

Result: Complies

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7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applicable
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applicable
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applicable
Receiver	R & S	ESHS 10	828404/005	3728	21 Aug 2008
Mains Network	R & S	ESH2-Z5	881362/032	3628	21 Aug 2008
Receiver	R & S	ESCS 30	847124/020	E1595	21 Feb 2009
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3771	20 April 2009
Microwave Preamp	Hewlett Packard	8349B	2644A01659	-	20 April 2009
Spectrum Analyser	Hewlett Packard	N9320A	CN0163000567	-	20 April 2009
Loop Antenna	EMCO	6502	9311-2801	A-231	11 July 2008
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603	7 Feb 2009
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612	7 Feb 2009
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	7 Feb 2009
Horn Antenna	Electrometrics	RGA-60	6234	E1492	10 May 2009
Horn Antenna	EMCO	3116	2276	-	10 May 2009

8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was last updated on January 27th, 2007.

All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025, 2005.

All measurement equipment has been calibrated in accordance with the terms of the EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025, 2005.

International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with 46 accreditation bodies in 34 economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

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9. PHOTOGRAPHS

Below 30 MHz set up (Worst Case) Set up identical to original test so photos are the same



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Above 30 MHz test set up – Axis 1



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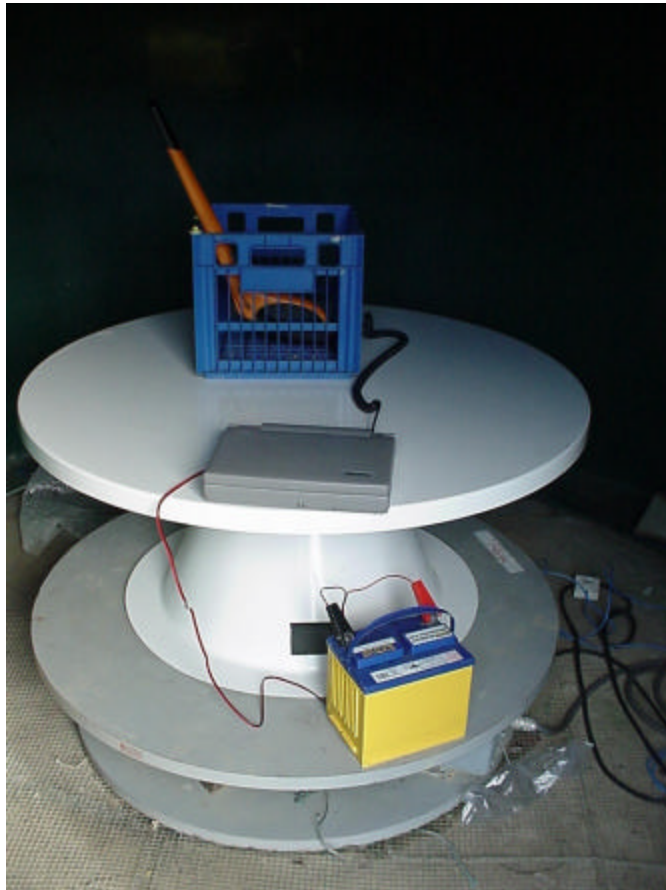
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Axis 3



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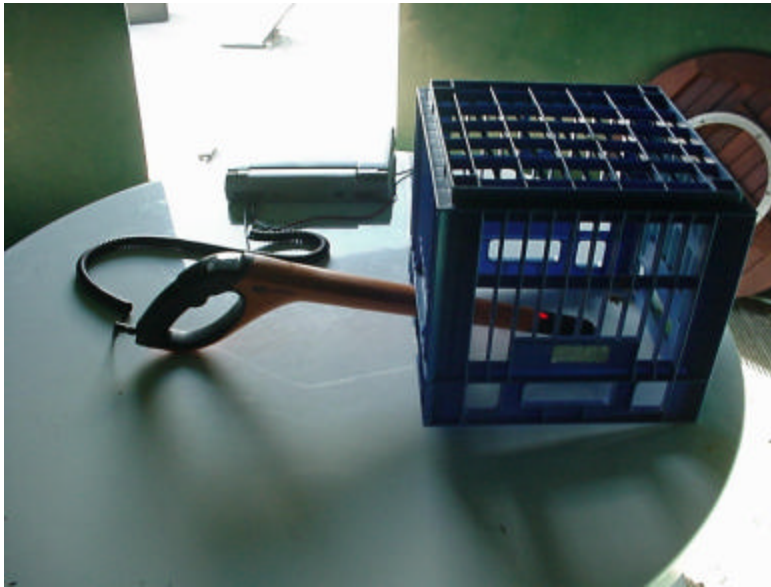
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Axis 2



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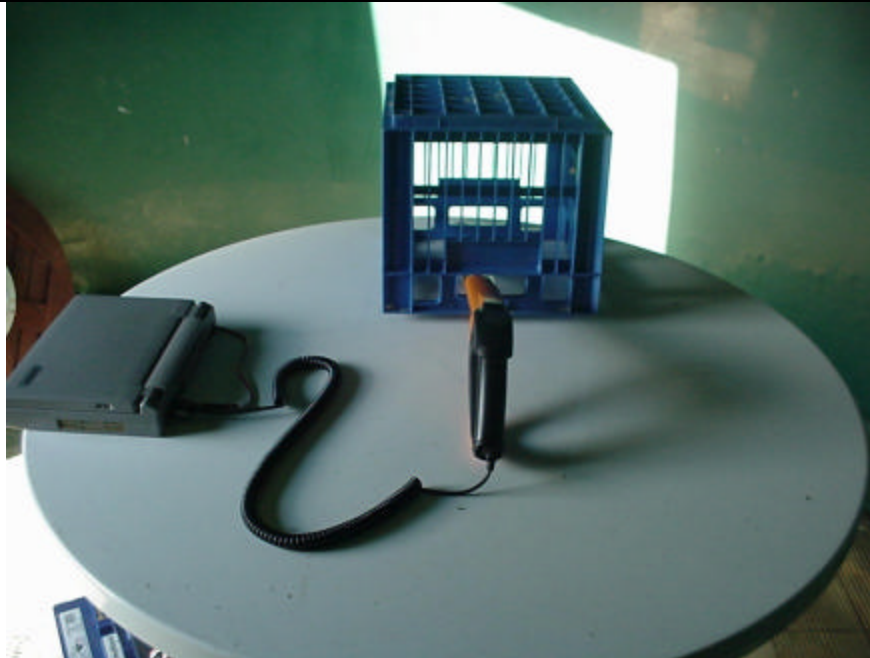
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Ancillary Equipment



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