EMC Technologies (NZ) Ltd

Test Report No **71031.12**
Report date: 19 November 2007

TEST REPORT

Padl-R UFP-00-003 UHF Handheld RFID Reader
Bluetooth Transmitter

tested to the specification

Code of Federal Regulations (CFR) 47

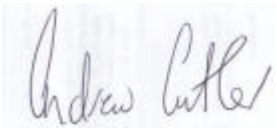
Part 15 – Radio Frequency Devices,
Subpart C – Intentional Radiators

Section 15.249 – Operation in the band
2400 – 2483.5 MHz

for

Tracient Technologies Ltd

This Test Report is issued with the authority of:



Andrew Cutler - General Manager

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

EMC Technologies (NZ) Ltd
STREET ADDRESS - 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand
POSTAL ADDRESS - PO Box 68 307, Newton, Auckland, New Zealand
Telephone: +64 9 360 0862 Fax: +64 9 360 0861
E-mail: aucklab@ihug.co.nz
Web Site: www.emctech.com.au

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1. STATEMENT OF COMPLIANCE

The **Padl-R UFP-00-003 UHF Handheld RFID Reader Bluetooth Transmitter** complies with FCC Part 15 section 15.249 when operating in the 2400 – 2483.5 MHz bands when tested in accordance with ANSI C63.4, 2003.

2. RESULTS SUMMARY

Testing was carried out in accordance with the test methods defined in 47 CFR Part 15 and in particular Sections 15.205, 15.207, 15.209 and 15.249.

CLAUSE	TEST PERFORMED	RESULT
15.203	Antenna requirement	Complies
15.205	Operation in restricted bands	Complies
15.207	Conducted emissions	Complies
15.209	Radiated emissions	Refer 15.249
15.247:		
(a)	Fundamental and Harmonics field strength	Complies
(b)	Fixed and point to point requirements	Not applicable
(c)	Field Strength at 3 metres	Applied
(d)	Spurious emissions other than harmonics	Applied
(e)	Detector bandwidths	Applied
(f)	Application of section 15.37(d)	Noted

3. CLIENT INFORMATION

Company Name	Tracient Technologies Ltd
Address	Unit 8 Amuri Park 404 Barbadoes Street
City	Christchurch 8013
Country	New Zealand
Contact	Mr Paul Reid

4. DESCRIPTION OF TEST SAMPLE

Brand Name	Padl-R
Model Number	UFP-00-003
Product	UHF Handheld RFID Reader Bluetooth Transmitter
Manufacturer	Tracient Technologies Ltd
Country of Origin	New Zealand
Serial Number	01008
FCC ID	VRJUFP001007
Ancillaries	ASUS A3F Laptop Computer. Sn# 65N0AG003012

This device is a Bluetooth Transmitter at is operated from within a UHF Handheld RFID Reader that operates in the 900 MHz band using frequency hopping spread spectrum techniques with a rated output power of 500 mW.

The Bluetooth module operates in the 2.4 GHz band using frequency hopping spread spectrum techniques and has a rated power of approximately 1 mW.

The Bluetooth transmitter uses an integral antenna.

The device has no operator controls and was supplied with set up software that allowed the device to be configured to operate.

5. RESULTS

Section 15.203 – Antenna requirement

Antenna integral to the device

Section 15.205 – Restricted bands of operation

Refer to measurements made with reference to Section 15.249 (a).

Section 15.207 – Conducted emissions

Conducted emission testing has been carried out as the device is charged and can be operated when attached to a computer using a USB port.

Testing was carried out when the device was attached to a representative Laptop computer that was powered at 110 Vac.

The device was tested while being charged from the USB port and while transmitting and reading a tag continuously where the tag identification was displayed on the computer using the supplied set up software.

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.

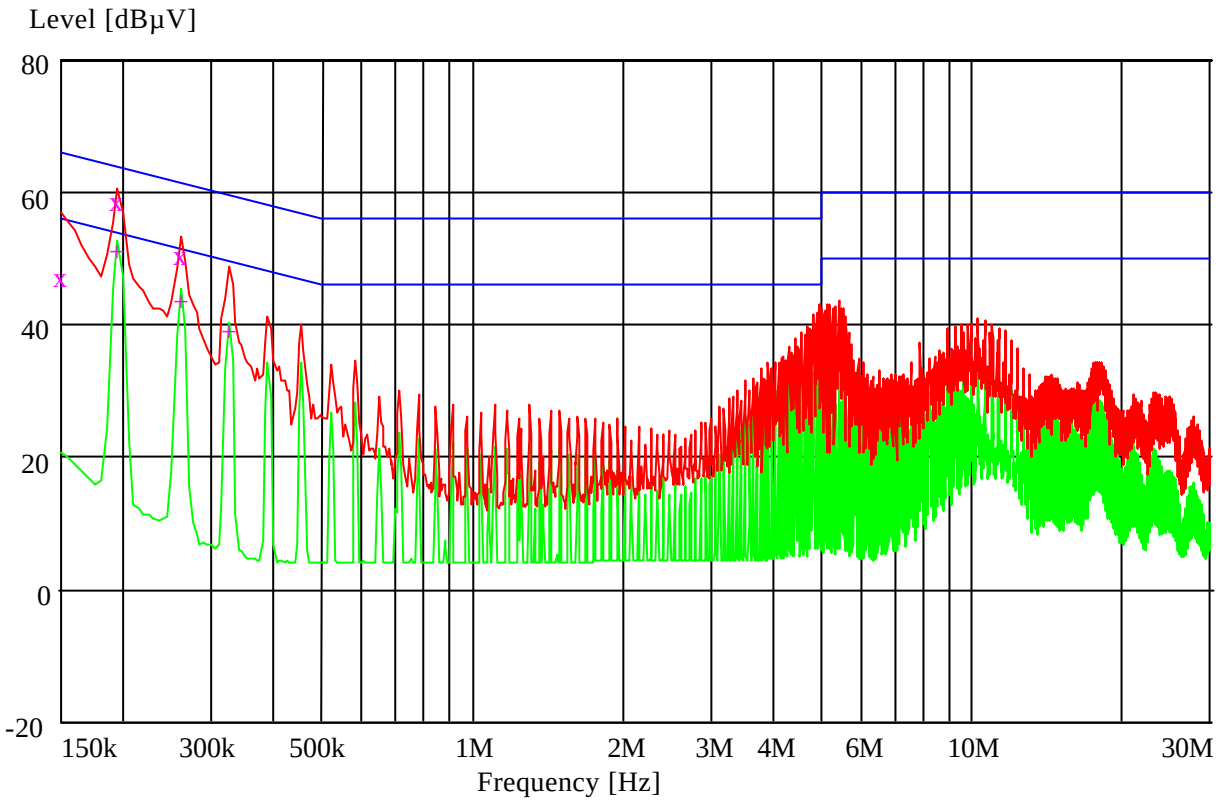
Measurements on both the phase and neutral lines were made using either a Quasi Peak or an Average detector with a 9 kHz bandwidth.

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 a 1.7 dB margin at 195 kHz (Average).
Measurement uncertainty: ± 2.2 dB

Conducted emissions

Comments:	Device tested when powered from the USB port of a representative laptop computer that was powered at 110 Vac while charging the device internal batteries.



Peak -------	Average -------	Quasi Peak X	Average +

Quasi-Peak Measurements

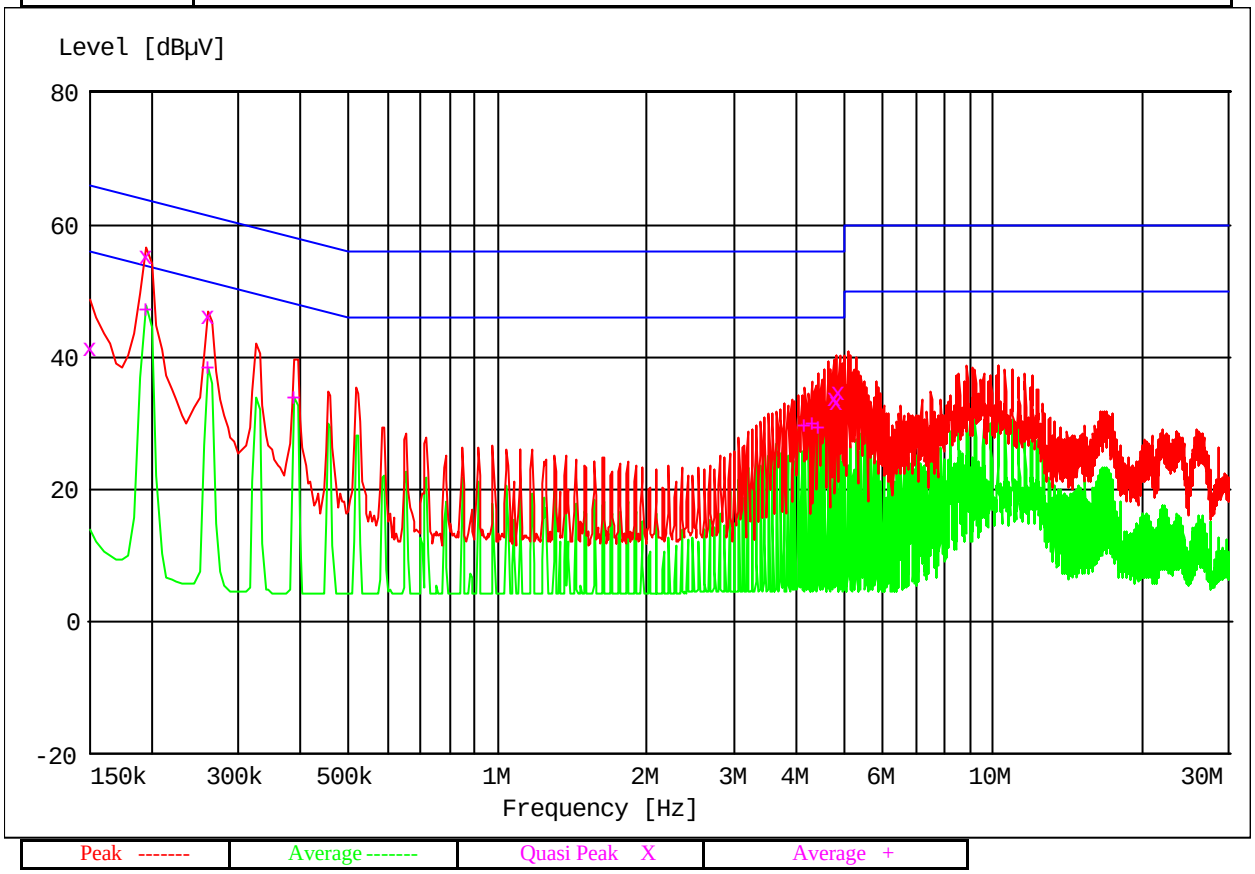
Frequency MHz	Level dBmV	Limit dBmV	Margin dB	Phase	Rechecks dBmV
0.150000	47.90	66.0	18.0	N	
0.195000	59.70	63.8	4.1	N	59.0
0.260000	51.30	61.4	10.0	N	
4.810000	19.20	56.0	36.8	N	
4.880000	19.30	56.0	36.6	N	
4.950000	25.60	56.0	30.3	L1	

Average Measurements

Frequency MHz	Level dBmV	Limit dBmV	Margin dB	Phase	Rechecks dBmV
0.195000	52.00	53.8	1.7	N	51.0
0.260000	44.40	51.4	6.9	N	
0.325000	39.70	49.5	9.8	N	
4.690000	16.30	46.0	29.6	L1	
4.750000	28.3	46.0	37.7	N	
4.880000	29.0	46.0	38.3	N	

Conducted emissions

Comments:	Device tested when powered from the USB port of a representative laptop computer that was powered at 110 Vac while transmitting continuously while reading a tag.



Quasi-Peak Measurements

Frequency MHz	Level dBmV	Limit dBmV	Margin dB	Phase	Rechecks dBmV
0.150000	41.50	66.0	24.4	L1	
0.195000	55.60	63.8	8.2	L1	55.9
0.260000	46.30	61.4	15.1	L1	
4.770000	34.10	56.0	21.8	N	
4.830000	33.30	56.0	22.6	N	
4.900000	34.80	56.0	21.1	N	

Average Measurements

Frequency MHz	Level dBmV	Limit dBmV	Margin dB	Phase	Rechecks dBmV
0.195000	47.40	53.8	6.4	N	47.0
0.260000	38.40	51.4	12.9	L1	
0.390000	34.00	48.0	14.0	N	
4.180000	29.90	46.0	16.0	L1	
4.310000	30.10	46.0	15.8	L1	
4.440000	29.40	46.0	16.5	L1	

Section 15.249(a) Fundamental Field Strength

When testing the Bluetooth transmitter it was not possible to control the transmitter frequencies so measurements were carried out in peak hold mode in continuous hopping mode.

Eventually 79 channels were observed in 1 MHz channels from 2402 MHz to 2479 MHz with measurements being made on a low, middle and high channel

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Polarity	Margin (dB)	Detector
2402.000	83.8	114.0	Vertical	30.2	Peak
2402.000	93.2	114.0	Horizontal	20.8	Peak
2402.000	80.8	94.0	Vertical	23.2	Average
2402.000	90.7	94.0	Horizontal	3.3	Average
2445.000	80.0	114.0	Vertical	34.0	Peak
2445.000	91.7	114.0	Horizontal	22.3	Peak
2445.000	79.1	94.0	Vertical	11.9	Average
2445.000	87.3	94.0	Horizontal	6.7	Average
2480.000	82.1	114.0	Vertical	31.9	Peak
2480.000	91.3	114.0	Horizontal	22.7	Peak
2480.000	77.1	94.0	Vertical	16.9	Average
2480.000	88.3	94.0	Horizontal	5.7	Average

The device was tested on an open area test site at a distance of 3.0 metres.

Measurements were made using peak and average detectors with a bandwidth of 1 MHz.

Testing was carried out at EMC Technologies NZ Ltd Open Area Test Site, which is located at Driving Creek, Orere Point, Auckland.

The power maximum level is determined by rotating the automated turntable and by varying the antenna height with an automated antenna tower with each emission measured in both vertical and horizontal antenna polarisations.

A field strength limit of 50 mV/m has been converted to dBuV/m and applied.

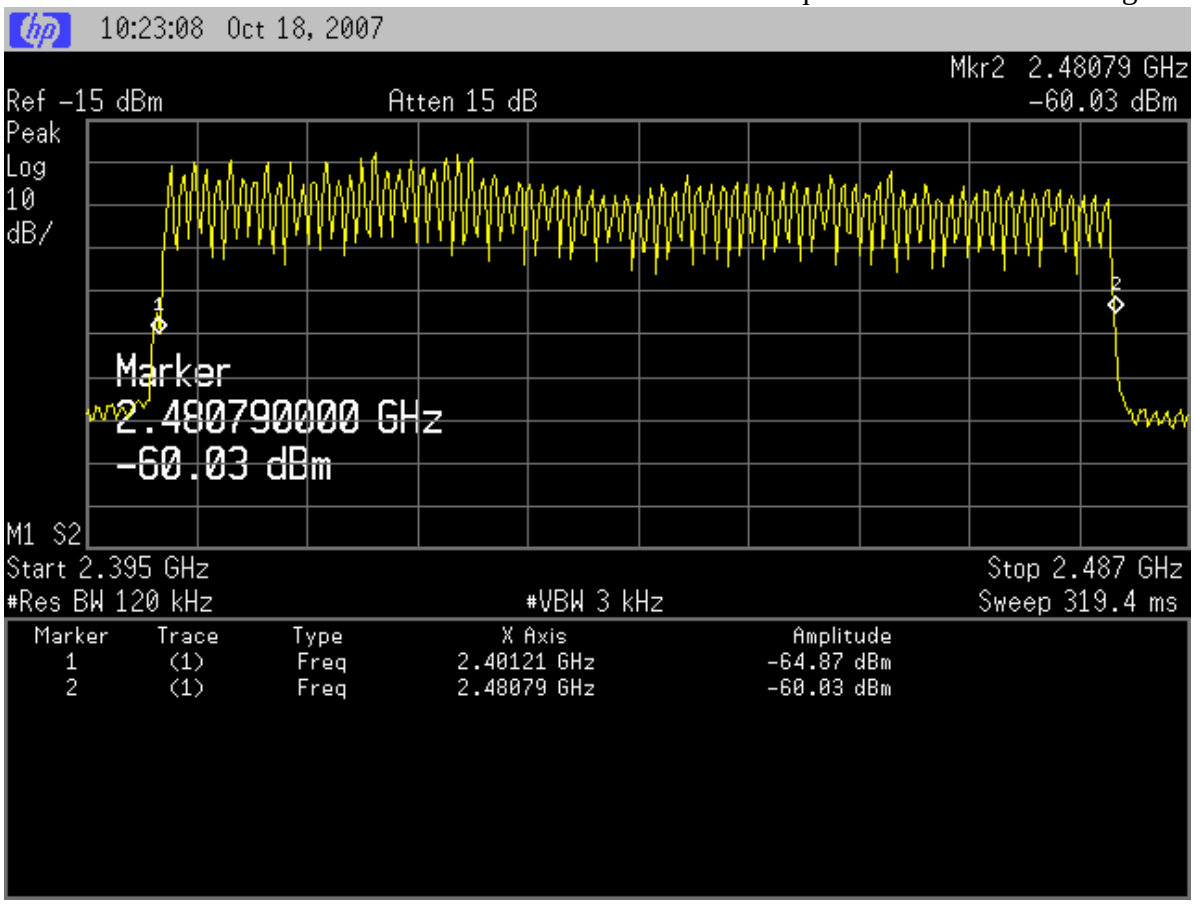
Result: Complies
Measurement Uncertainty: ±4.1 dB

Section 15.249(a) Harmonics Field Strength

Band edge measurements:

At the band edges of 2400.000 MHz and 2483.500 MHz all emissions are required to be attenuated by more than 20 dB relative to the highest emission level observed in the band of operation.

The device can be seen to meet the Section 15.247 -20 dBc requirements at the band edges.



Either side of the 2400 – 2483.5 MHz there are restricted bands which need to be considered.

These bands are from 2310 – 2390 MHz and 2483.5 – 2500 MHz where emissions are not allowed to exceed 54 dBuV/m when measured using an Average detector (74 dBuV/m in Peak).

Measurements were attempted in these restricted bands but no emissions were detected within 20 dB of the limits described above.

Spurious emissions

Radiated emission measurements were carried out with the limits as per section 15.209 being applied.

Testing was carried out at EMC Technologies NZ Ltd Open Area Test Site, which is located at Driving Creek, Orere Point, Auckland.

The device was placed on the test table top which was a total of 0.8 m above the test site ground plane.

The device was powered using an internal 3 Vdc Lithium Battery while attached to a laptop computer.

Measurements of the radiated field were made with the antenna located at a 3 m horizontal distance from the boundary of the device under test.

Measurements below 1000 MHz were made using an Quasi Peak Detector with a bandwidth of 120 kHz.

Measurements above 1000 MHz were made using an average detector with a bandwidth of 1.0 MHz and also a peak detector with a bandwidth of 1.0 MHz.

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 (dBµV/m) = Receiver Reading (dBµV) + Antenna Factor (dB) + Coax Loss (dB)

Standby emissions

Frequency (MHz)	Vertical (dBµV/m)	Horizontal (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Polarity	Detector
84.298		21.6	40.0	18.4	Horizontal	QP
110.278	28.0		43.5	15.5	Vertical	QP
112.640	28.6		43.5	14.9	Vertical	QP
114.490	28.4		43.5	15.1	Vertical	QP
122.860	30.1		43.5	13.4	Vertical	QP
123.988	30.1		43.5	13.4	Vertical	QP
125.165	29.5		43.5	14.0	Vertical	QP
125.335		25.3	43.5	18.2	Horizontal	QP
126.250	29.1		43.5	14.4	Vertical	QP
126.478		26.7	43.5	16.8	Horizontal	QP
129.703	29.1		43.5	14.4	Vertical	QP
138.815	24.5		43.5	19.0	Vertical	QP
245.398		22.5	46.0	23.5	Horizontal	QP
360.000	34.2		46.0	11.8	Vertical	QP
451.619	25.1		46.0	20.9	Vertical	QP

Testing was carried out when the device was in standby with the laptop computer attached and the device connected using the USB port but with no transmissions activated.

When the USB port is attached to a computer the Bluetooth transmitter is inhibited by default.

The general limits described in section 15.209 have been applied.

Transmitting on 2400 – 2483.5 MHz

It was not possible to control the transmitter frequencies so measurements were carried out in peak hold mode in continuous hopping mode centred about the centre frequency of 2445 MHz with observations being made between 2402 to 2480 MHz.

When transmitting on 2402 MHz

Frequency (MHz)	Vertical (dBµV/m)	Horizontal (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Polarity	Detector
4882.000	-	-	54.0	-	Vert/Hort	Peak
4882.000	-	-	74.0	-	Vert/Hort	Average
7323.000	-	-	54.0	-	Vert/Hort	Peak
7323.000	-	-	74.0	-	Vert/Hort	Average
9764.000	-	-	54.0	-	Vert/Hort	Peak
9764.000	-	-	74.0	-	Vert/Hort	Average
12205.000	-	-	54.0	-	Vert/Hort	Peak
12205.000	-	-	74.0	-	Vert/Hort	Average
14646.000	-	-	54.0	-	Vert/Hort	Peak
14646.000	-	-	74.0	-	Vert/Hort	Average
17087.000	-	-	54.0	-	Vert/Hort	Peak
17087.000	-	-	74.0	-	Vert/Hort	Average

When transmitting on 2445 MHz

Frequency (MHz)	Vertical (dBµV/m)	Horizontal (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Polarity	Detector
4890.000	-	-	54.0	-	Vert/Hort	Peak
4890.000	-	-	74.0	-	Vert/Hort	Average
7335.000	-	-	54.0	-	Vert/Hort	Peak
7335.000	-	-	74.0	-	Vert/Hort	Average
9780.000	-	-	54.0	-	Vert/Hort	Peak
9780.000	-	-	74.0	-	Vert/Hort	Average
12225.000	-	-	54.0	-	Vert/Hort	Peak
12225.000	-	-	74.0	-	Vert/Hort	Average
14670.000	-	-	54.0	-	Vert/Hort	Peak
14670.000	-	-	74.0	-	Vert/Hort	Average
17115.000	-	-	54.0	-	Vert/Hort	Peak
17115.000	-	-	74.0	-	Vert/Hort	Average

When transmitting on 2480 MHz

Frequency (MHz)	Vertical (dBµV/m)	Horizontal (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Polarity	Detector
4960.000	-	-	54.0	-	Vert/Hort	Peak
4960.000	-	-	74.0	-	Vert/Hort	Average
7440.000	-	-	54.0	-	Vert/Hort	Peak
7440.000	-	-	74.0	-	Vert/Hort	Average
9920.000	-	-	54.0	-	Vert/Hort	Peak
9920.000	-	-	74.0	-	Vert/Hort	Average
12400.000	-	-	54.0	-	Vert/Hort	Peak
12400.000	-	-	74.0	-	Vert/Hort	Average
14880.000	-	-	54.0	-	Vert/Hort	Peak
14880.000	-	-	74.0	-	Vert/Hort	Average
17360.000	-	-	54.0	-	Vert/Hort	Peak
17360.000	-	-	74.0	-	Vert/Hort	Average

No emissions were detected within 10 dB of the above limit when measurements were attempted up to 18 GHz.

Bluetooth Transmitter Inter-modulation

As the Bluetooth transmitter works in close proximity with the 900 MHz RFID transmitter a check was made to determine whether any inter modulation products were being generated.

The 900 MHz transmitter was operated in frequency hopping spread spectrum mode while continuously reading a tag.

The details of this tag were then continuously transmitted to a laptop computer using a Bluetooth data link.

No inter modulation products were observed within a 20 dB margin of the FCC general emission limits (Section 15.209) between 30 MHz and 18 GHz in either vertical or horizontal polarisations.

The only emissions observed were the 900 MHz and 2.4 GHz FHSS fundamental emissions and the associated harmonic spurious emissions.

Result: Complies
Measurement uncertainty: ± 4.1 dB

6. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Ref No
Aerial Controller	EMCO	1090	9112-1062	3710
Aerial Mast	EMCO	1070-1	9203-1661	3708
Turntable	EMCO	1080-1-2.1	9109-1578	3709
Environmental Chamber	Contherm	M180F	-	E1129
Thermometer	DSIR	RT200	035	E1049
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3776
VHF Balun	Schwarzbeck	VHA9103	-	3603
Biconical Antenna	Schwarzbeck	BBA 9106	-	3612
Log Periodic Antenna	Schwarzbeck	VUSLP 91111	9111-228	3785
Measurement Receiver	Rohde & Schwarz	ESCS-30	847124/020	E1595
Microwave Pre Amp	Hewlett Packard	8349B	2644A01659	-
Horn Antenna	Electrometrics	RGA -60	6234	E1494

7. ACCREDITATIONS

Testing was carried out at EMC Technologies NZ Ltd Open Area Test Site, which is located at Driving Creek, Orere Point, Auckland. Details of this site have been filed with the Commission, Registration Number: 90838, which was last updated on January 25th, 2007.

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

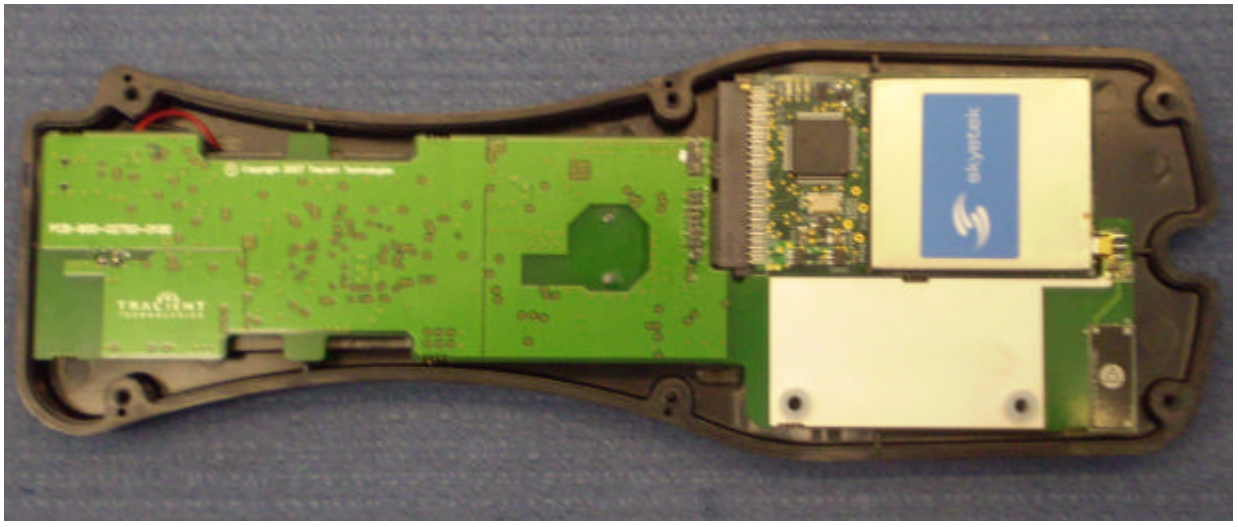
All measurement equipment has been calibrated in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/IEC/ISO 17025.

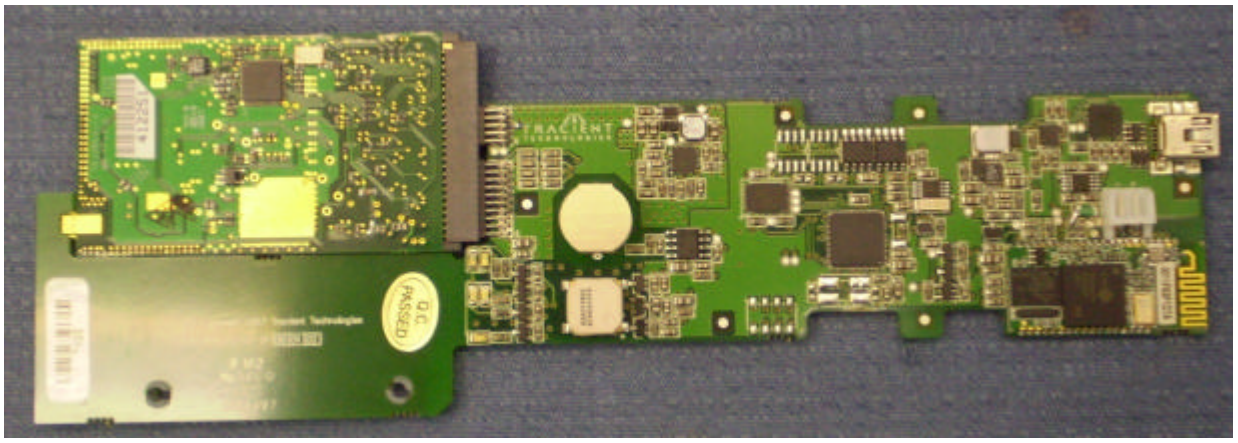
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with a number of accreditation bodies in various economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied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

8. PHOTOGRAPHS

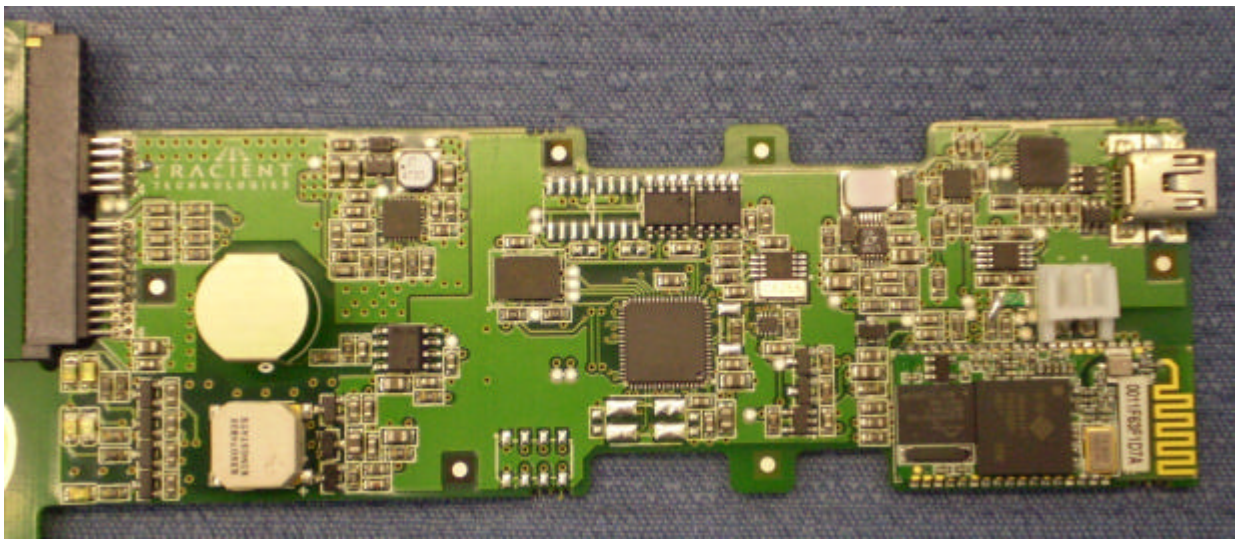
External photos

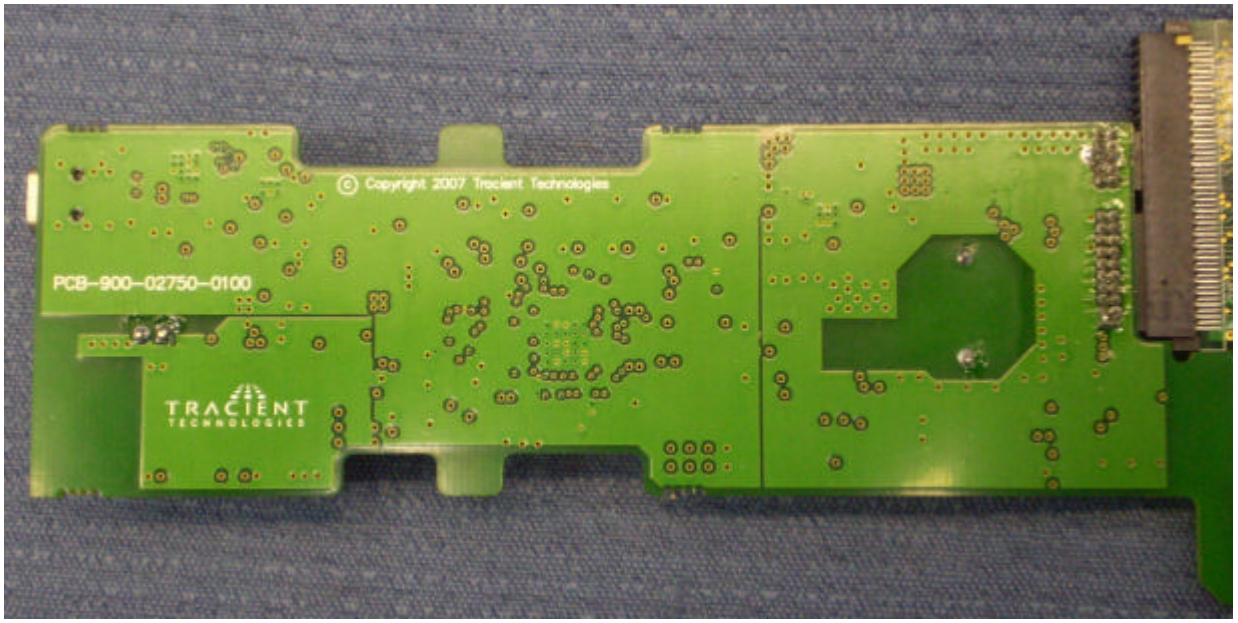
Internal Photos - Overall



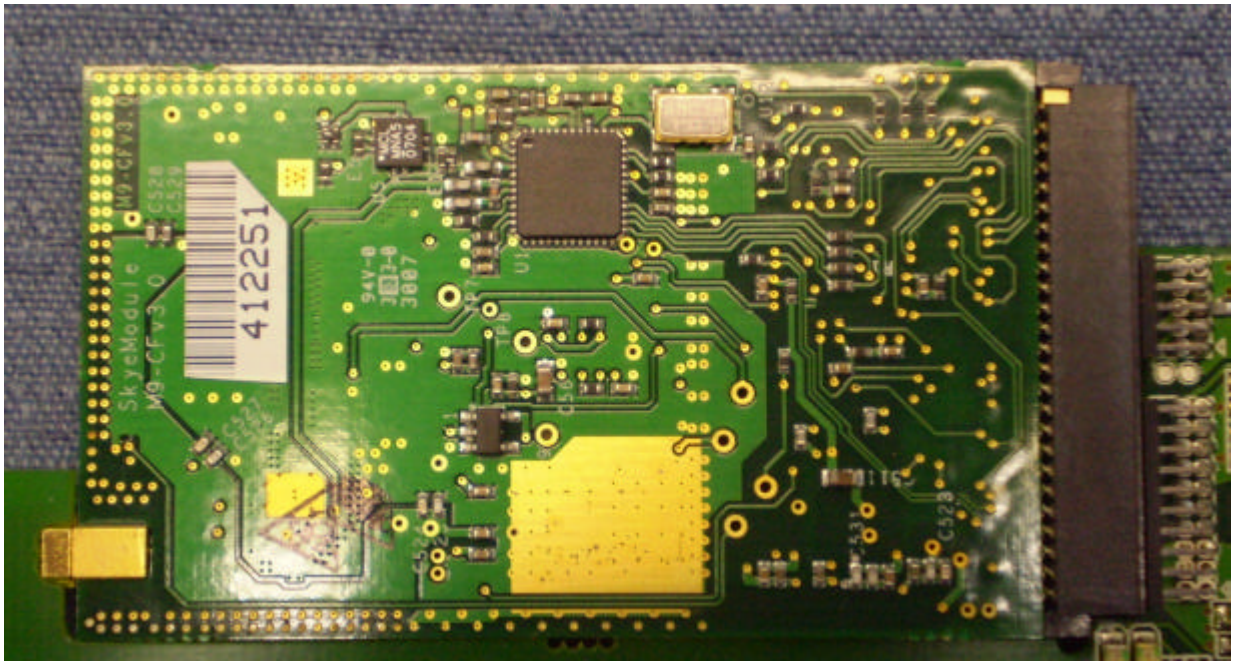


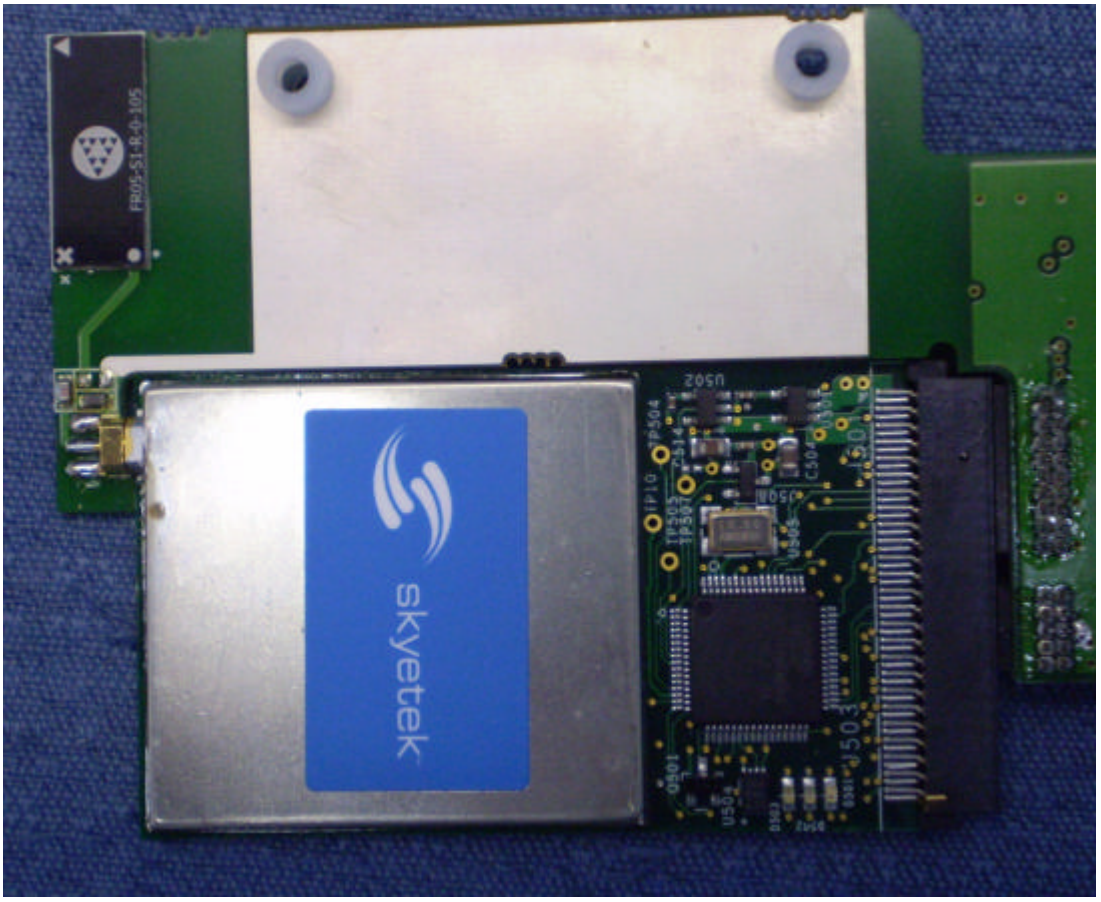
Main Board





RF Module Board





Radiated Emissions Test Set Up

Conducted emissions test set up