EMC Technologies (NZ) Ltd

Test Report No **70615.1**
Report date: 14 September 2007

TEST REPORT

IPICO IP3960 RFID System

tested to

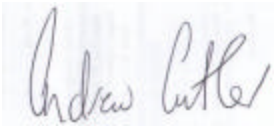
47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart C – Intentional Radiators

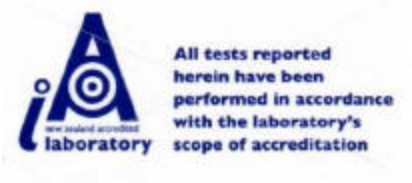
for

IPICO Australasia



This Test Report is issued with the authority of:

_____
Andrew Cutler - General Manager



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1. STATEMENT OF COMPLIANCE

The **IPICO IP3960 RFID System** complies with FCC Part 15 Subpart C as an Intentional Radiator when the methods, as described in ANSI C63.4 - 2003, are applied.

2. RESULTS SUMMARY

Clause	Parameter	Result
15.201	Equipment authorisation requirement	Certification required.
15.203	Antenna requirement	Antenna connector is unique.
15.204	External PA and antenna modifications	Not applicable. No external devices.
15.205	Restricted bands of operation	Complies. Device transmits on 125.0 kHz.
15.207	Conducted limits	Not applicable. Not intended to be AC mains powered.
15.209	Radiated emission limits - Fundamental	Complies.
15.209	Radiated emission limits - Spurious emissions <30 MHz	Complies.
15.209	Radiated emission limits – Spurious emissions >30 MHz	Complies with a 1.2 dB margin at 125.000 MHz (Vertical). Measurement falls within the window of uncertainty.

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.

4. CLIENT INFORMATION

Company Name	IPICO Australasia
Address	PO Box 19 Redcliffe
State	Queensland 4020
Country	Australia
Contact	Mr Roger Dunn

5. DESCRIPTION OF TEST SAMPLE

Brand Name	IPICO
Model Number	IP3960
Product	RFID System
Manufacturer	IPICO Australasia
Country of Origin	Australia
Serial Number	Not serialised
FCC ID	VHY-IP3960
Ancillary Equipment	Nil

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

The connector connecting the antenna to the transmitter was unique.

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 transmitter transmits on 125.0 kHz.

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

Result: Complies.

Section 15.207: Conducted limits

As can be seem from the intended us photographs this device is not intended to be used from an AC mains supply and provisions have only be made for operating this device using external batteries

Therefore testing AC mains conducted emission testing has not been carried out.

Section 15.209: Radiated emission limits, general requirements

Radiated emissions testing was carried out over the frequency range of 100 kHz to 1000 MHz.

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 test tabletop, 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.

The emission is measured in both vertical and horizontal antenna polarisations, where appropriate.

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

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

Fundamental emission:

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

Measurements were initially made at a distance of 10 metres then also at 30 metres.

Using these measurements a 300 metre extrapolated level has been determined as detailed in section 15.31(f)(2) as measurements were made at two distances on the radial that was determined to give the highest field strength.

The highest radial was determined during the pre screening of the device when it was rotated on the test site using a turntable.

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

Variation of the dc supply voltage to the device within the manufacturers specification did not cause the field strength of the fundamental emission to vary.

Testing was carried out using a ground mat antenna and a vertical free standing antenna both operating in high power opposing mode

The peak limit is the average limit plus 20 dB.

Ground mat antenna in high power antenna opposing mode

Average detector

Frequency (kHz)	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Distance
125.000	78.6	-	-	10 metres
125.000	58.8	-	-	30 metres
125.000	17.3	25.0	-7.7	300 metres

Peak detector

Frequency (kHz)	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Distance
125.000	85.1	-	-	10 metres
125.000	66.5	-	-	30 metres
125.000	27.5	45.0	-17.5	300 metres

Vertical antennas in high power opposing mode only

Average detector

Frequency (kHz)	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Distance
125.000	82.5	84.0	-1.5	10 metres
125.000	56.7	-	-	30 metres
125.000	2.6	25.0	-22.4	300 metres

Peak detector

Frequency (kHz)	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Distance
125.000	88.5	105.0	-16.5	10 metres
125.000	65.9	-	-	30 metres
125.000	18.5	45.0	-26.5	300 metres

Sample calculation (Average detector):

10 metre to 30 metre roll off = 82.5 – 56.7 = 25.8 dB
10 metres to 30 metres is 0.477 of a decade
30 metres to 300 metres is 1 decade.
Therefore 10 metres to 300 metres is 1.477 of a decade
10 metres to 300 metres roll off is 25.8 dB x (1.477 / 0.477) = 79.9 dB
10 metre measurement 82.5 dBuV/m – 79.9 dB = 2.6 dBuV/m at 300 metres

Result: Comply when operated in high power antenna mode when using the ground mat and vertical antennas.

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB

Section 15.209: Spurious Emissions (below 30 MHz)

Ground mat in high power opposing mode

Frequency kHz	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Result
250.000	39.6	79.6	-40.0	Average	Pass
250.000	46.3	99.6	-53.3	Peak	Pass
375.000	31.3	76.1	-44.8	Average	Pass
375.000	39.0	96.1	-57.1	Peak	Pass
500.000	40.1	53.6	-13.5	Quasi Peak	Pass
625.000	-	51.7	-	Quasi Peak	Pass
750.000	39.6	50.1	-10.5	Quasi Peak	Pass
875.000	-	48.8	-	Quasi Peak	Pass
1000.000	-	49.5	-	Quasi Peak	Pass
1125.000	-	49.5	-	Quasi Peak	Pass
1250.000	-	49.5	-	Quasi Peak	Pass

Vertical antenna in high power opposing mode

Frequency kHz	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Result
250.000	34.6	79.6	-45.0	Average	Pass
250.000	43.2	99.6	-56.4	Peak	Pass
375.000	25.7	76.1	-50.4	Average	Pass
375.000	34.5	96.1	-61.6	Peak	Pass
500.000	36.9	53.6	-16.7	Quasi Peak	Pass
625.000	-	51.7	-	Quasi Peak	Pass
750.000	-	50.1	-	Quasi Peak	Pass
875.000	-	48.8	-	Quasi Peak	Pass
1000.000	-	49.5	-	Quasi Peak	Pass
1125.000	-	49.5	-	Quasi Peak	Pass
1250.000	-	49.5	-	Quasi Peak	Pass

No other emissions detected from the transmitter that were within 20 dB of the applicable limit.

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.

A receiver with an average detector and 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.

Transmitter operated in the various modes as previously described

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB

Section 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 that was fully charged.

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

Measurements were carried out as the device contains several digital devices.

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
216.9 – 960.0 MHz	200 uV/m	46.0 dBuV/m

Testing was carried out with the ground matt antenna connected as pre-screening showed that this antenna gave the worst case configuration

Result: Complies with a 1.2 dB margin at 125.000 MHz (Vertical). Measurement falls within the window of uncertainty for this test method.

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (30 – 1000 MHz) ± 4.1 dB

Spurious Emissions

Device tested when being powered using an external 12 Vdc battery.

Frequency	Level		Limit	Margin	Result	Worst Case
	Vertical	Hort				Antenna
MHz	dBuV/m	dBuV/m	dBuV/m	dB		
30.000	18.1		40.0	21.9	Pass	Vertical
32.000	18.2		40.0	21.8	Pass	Vertical
36.000	23.3		40.0	16.7	Pass	Vertical
71.490	18.4		40.0	21.6	Pass	Vertical
78.490	21.8		40.0	18.2	Pass	Vertical
85.742	31.8	15.5	40.0	8.2	Pass	Vertical
93.000	28.0	14.3	43.5	15.5	Pass	Vertical
94.742	31.2	17.7	43.5	12.3	Pass	Vertical
96.992	29.7	15.4	43.5	13.8	Pass	Vertical
106.242	34.0	22.6	43.5	9.5	Pass	Vertical
106.990	34.0	24.2	43.5	9.5	Pass	Vertical
108.742	32.6	25.0	43.5	10.9	Pass	Vertical
111.242	34.3	29.6	43.5	9.2	Pass	Vertical
111.490	34.6	30.2	43.5	8.9	Pass	Vertical
113.492	33.2	27.4	43.5	10.3	Pass	Vertical
115.992	34.3	24.9	43.5	9.2	Pass	Vertical
118.242	33.8	22.6	43.5	9.7	Pass	Vertical
119.997	38.2	23.9	43.5	5.3	Pass	Vertical
122.242	34.0	25.5	43.5	9.5	Pass	Vertical
124.742	35.8	26.2	43.5	7.7	Pass	Vertical
125.000	42.3	30.4	43.5	1.2	Uncert	Vertical
130.000	38.7	29.2	43.5	4.8	Pass	Vertical
134.500	29.9	27.0	43.5	13.6	Pass	Vertical
150.000	29.7	32.1	43.5	11.4	Pass	Horizontal
154.500	27.3	25.7	43.5	16.2	Pass	Vertical
160.000	26.3	27.3	43.5	16.2	Pass	Horizontal
172.450	19.0	18.4	43.5	24.5	Pass	Vertical
190.150	34.6	18.3	43.5	8.9	Pass	Vertical
200.000	32.3	33.4	43.5	10.1	Pass	Horizontal
207.300	34.7	39.3	43.5	4.2	Pass	Horizontal
220.000	24.1	29.3	46.0	16.7	Pass	Horizontal
224.550	34.2	36.0	46.0	10.0	Pass	Horizontal
235.000	26.4	32.6	46.0	13.4	Pass	Horizontal

Radiated spurious emissions continued

Frequency	Level		Limit	Margin	Result	Worst Case
	Vertical	Hort				Antenna
MHz	dBuV/m	dBuV/m	dBuV/m	dB		
240.000	31.2	33.7	46.0	12.3	Pass	Horizontal
243.050	34.8	31.6	46.0	11.2	Pass	Vertical
245.000	37.9	32.4	46.0	8.1	Pass	Vertical
255.000	35.7	35.7	46.0	10.3	Pass	Vertical
260.600	36.6	36.5	46.0	9.4	Pass	Vertical
278.650	19.0	22.3	46.0	23.7	Pass	Horizontal
285.000	19.6	36.5	46.0	9.5	Pass	Horizontal
290.000	23.3	35.2	46.0	10.8	Pass	Horizontal
300.000	31.5	33.1	46.0	12.9	Pass	Horizontal
315.000	26.0	31.7	46.0	14.3	Pass	Horizontal
355.000	22.3	27.1	46.0	18.9	Pass	Horizontal
400.000	26.8	33.0	46.0	13.0	Pass	Horizontal
425.000	27.3	33.9	46.0	12.1	Pass	Horizontal
440.000	23.6	24.9	46.0	21.1	Pass	Horizontal
480.000	22.7	23.6	46.0	22.4	Pass	Horizontal
595.000	25.5	29.6	46.0	16.4	Pass	Horizontal
640.000	23.7	19.7	46.0	22.3	Pass	Vertical

No further emissions detected within 20 dB of the applicable limit.

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
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612	7 Feb 2009
Receiver	R & S	ESCS 30	847124/020	E1595	21 Dec 2007
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	7 Feb 2009
Loop Antenna	EMCO	6502	9003-2485	-	11 July 2008
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applicable
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603	7 Feb 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 updated on January 23rd, 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.

9. PHOTOGRAPH (S)

Radiated emissions test set up over 30 MHz

Radiated emissions test setup below 30 MHz – Ground Mat Antenna

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Radiated emissions test setup below 30 MHz – Vertical Panel Antenna