

EMC Technologies (NZ) Ltd

Test Report No **60224.3**
Report date: 14th March 2006

TEST REPORT

Navman iCN720 / iCN750 2.4GHz Remote Control Transceiver

tested to the

Code of Federal Regulations (CFR) 47

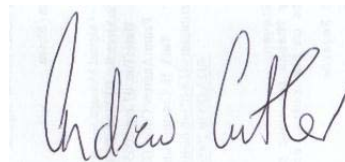
Part 15 – Radio Frequency Devices, Subpart C – Intentional Radiators

Section 15.249 – Operation in the band 2400 – 2483.5 MHz

for

Navman New Zealand

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

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1. CLIENT INFORMATION

Company Name Navman New Zealand

Address PO Box 68-155
Newton

City Auckland

Country New Zealand

Contact Mr Dominic Cranfield

2. DESCRIPTION OF TEST SAMPLE

Brand Name Navman

Model Number iCN 720 / iCN 750

Product 2.4GHz Remote Control Transceiver

Manufacturer Navman New Zealand

Country of Origin New Zealand

FCC ID RAY-ICN700

Sample Details

Unit	Serial No.	PCB	Firmware
iCN750	BD01-QA3-0198	QA3	V4.00.0012
iCN720	BD00-QA3-0217	QA3	V4.00.0012

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3. COMPLIANCE STATEMENT

The **Navman iCN 720 / iCN 750 2.4GHz Remote Control Transceiver** complies with 47 CFR Part 15 and in particular Sections, 15.205, 15.207, 15.209, 15.215 and 15.249 as detailed below.

<u>CLAUSE</u>	<u>TEST PERFORMED</u>	<u>RESULT</u>
15.109	Radiated emission limits	Complies
15.203	Antenna requirement	Complies
15.205	Operation in restricted bands	Complies
15.207	Conducted emissions	Complies
15.209	Radiated emissions	Complies
15.215	Additional provisions	Complies
15.249:		
(a)	Field strength of fundamental	Complies
(a)	Field strength of harmonics	Complies
(b)	Fixed, point to point operations	Not applicable
(c)	3 metre measurement distance	Noted
(d)	Spurious emission levels except harmonics	Complies
(e)	Detectors above 1000 MHz	Noted
(f)	Reference to section 15.37(d)	Noted

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4. TEST SAMPLE DESCRIPTION

The Navman iCN720 / iCN750 are in-car GPS navigation devices.

These units will be sold with a RF Remote Control that can remotely control various operating functions.

When the iCN device receives a message from the remote control unit it replies to the remote control unit and therefore the iCN device contains both a transmitter and a receiver.

Frequency Range:	2.4 GHz – 2.483 GHz
Test Frequencies:	2414.9 MHz, 2448.9 MHz, 2470.9 MHz
Operating Frequencies:	2414.9 MHz, 2426.0 MHz, 2437.0 MHz, 2448.9 MHz, 2460.0 MHz, 2470.9 MHz.
Rated RF Power (max):	1 mW (0 dBm)
Modulation Type:	FSK
Antenna Type:	Integral
Power Supply:	Lithium battery or external 5V supply
Nominal Voltage:	5 Vdc
Category:	Indoor use not below 0 degrees

The two models incorporate the same RF transceiver and are identical except for the following features:

Feature	iCN720	iCN750
Labels	ICN720	ICN750
Mass Storage	CF card	Hard drive
Battery	1350mAh	1890mAh
USB 2.0	No (only USB 1.1)	Yes

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5. ATTESTATION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification with the following conditions:

The client selected the test sample.

The report relates only to the sample tested.

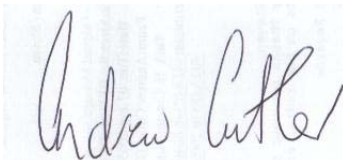
This report does not contain corrections or erasures.

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.

In addition this equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations.

To the best of my knowledge, these tests were performed using measurement procedures that are consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards.

I further certify that the necessary measurements were made by EMC Technologies NZ Ltd, 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand.



Andrew Cutler
General Manager
EMC Technologies NZ Ltd

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6. TRANSMITTER TEST RESULTS

Section 15.203 – Antenna requirement

The iCN devices contain a permanently attached whip antenna.

Section 15.205 – Restricted bands of operation

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

Section 15.207 – Conducted emissions

The iCN devices are powered using internal batteries.

Provision has been made for an external charger to be attached for charging purposes.

Testing was carried out on both the iCN 720 and iCN 750 devices in standby mode and in transmit mode when powered using 110 Vac.

Terminal disturbance voltage testing was carried out over the frequency range of 150 kHz to 30 MHz.

Testing for conducted emissions was carried out at the laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 m screened room.

The device was placed 0.8 m away from the artificial mains terminal network on the emissions test table which is 1 m x 1.5 m, and is 0.8 m above the screened room floor which acts as the horizontal ground plane and is 0.4 m away from the screened room wall which acts as the vertical ground plane.

Measurement uncertainty with a confidence interval of 95% is:

- Mains terminal tests $(0.15 - 30 \text{ MHz}) \pm 2.2 \text{ dB}$

Result: Complies

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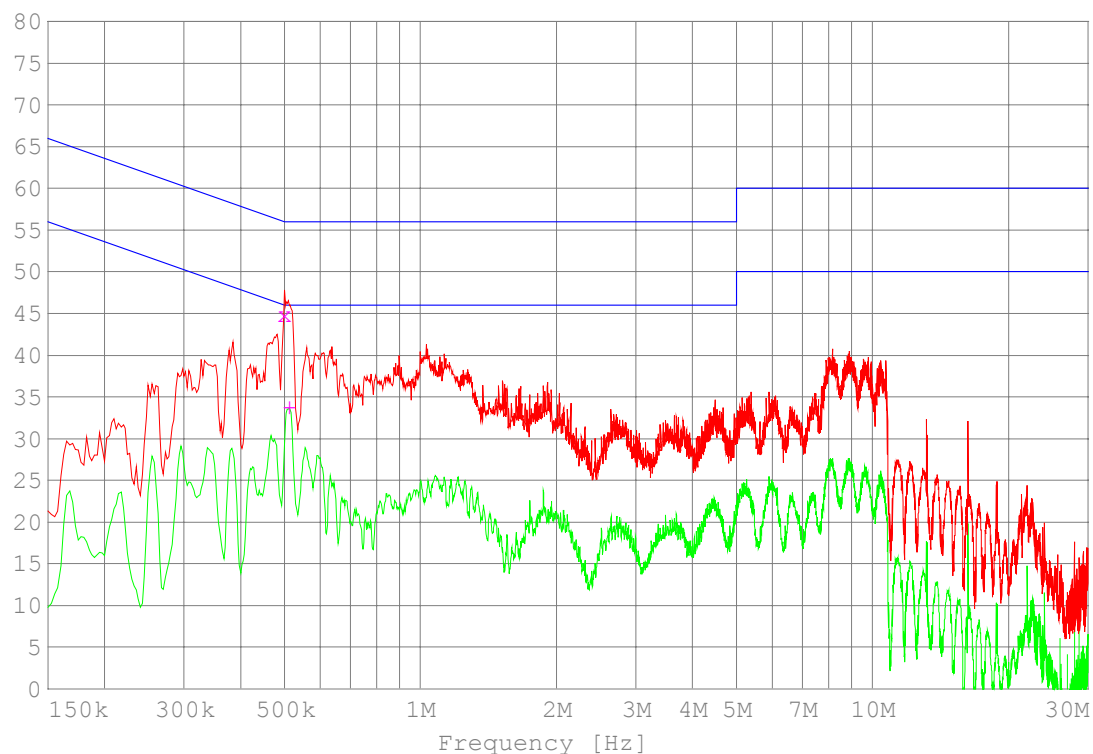
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Conducted Emissions – iCN 750

Comments:	Device tested using 110 Vac while operating in standby mode with headphones plugged in and while displaying GPS signal strength using an external GPS antenna.
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Level [dB μ V]



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

Quasi-Peak Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Exceed	Phase	Rechecks dB μ V
0.500000	44.86	56.00	11.14		L1	

Average Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Exceed	Phase	Rechecks dB μ V
0.512500	33.81	46.00	12.19		L1	

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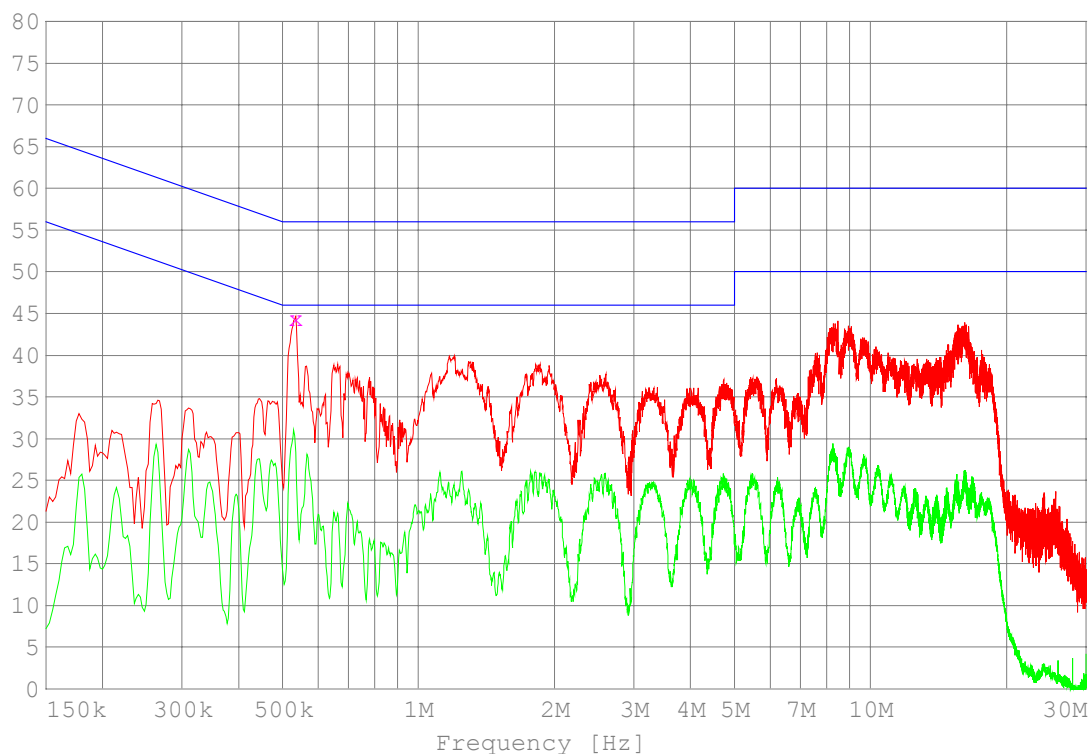
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Conducted Emissions – iCN 750

Comments:	Device tested using 110 Vac while operating under transmit conditions using a sample AC adapter.
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Level [dBμV]



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

Quasi-Peak Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Exceed	Phase	Rechecks dBμV
0.535000	44.37	56.00	11.63		L1	

Average Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Exceed	Phase	Rechecks dBμV
No results recorded within 12dB of the limit						

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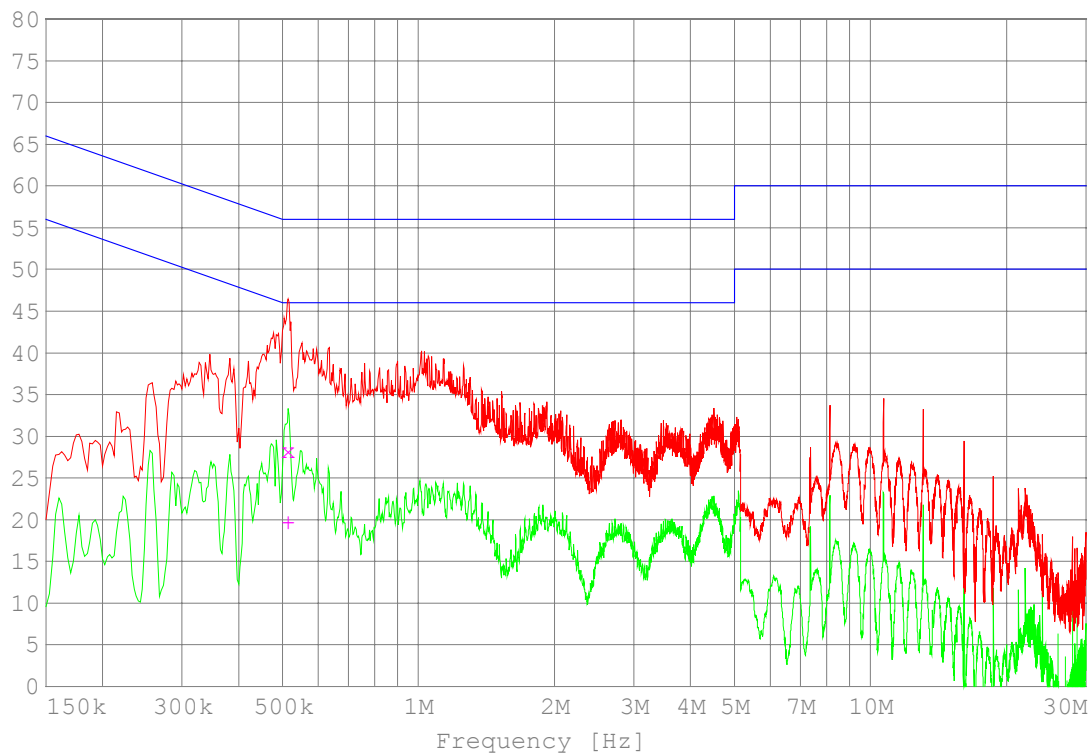
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Conducted Emissions – iCN 720

Comments:	Device tested using 110 Vac while operating in standby. Device operated with headphones plugged in while splaying GPS signal strength using an external GPS antenna.
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Level [dB μ V]



Quasi-Peak Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Exceed	Phase	Rechecks dB μ V
0.515000	28.29	56.00	27.71		L1	

Average Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Exceed	Phase	Rechecks dB μ V
0.515000	19.63	46.00	26.37		L1	

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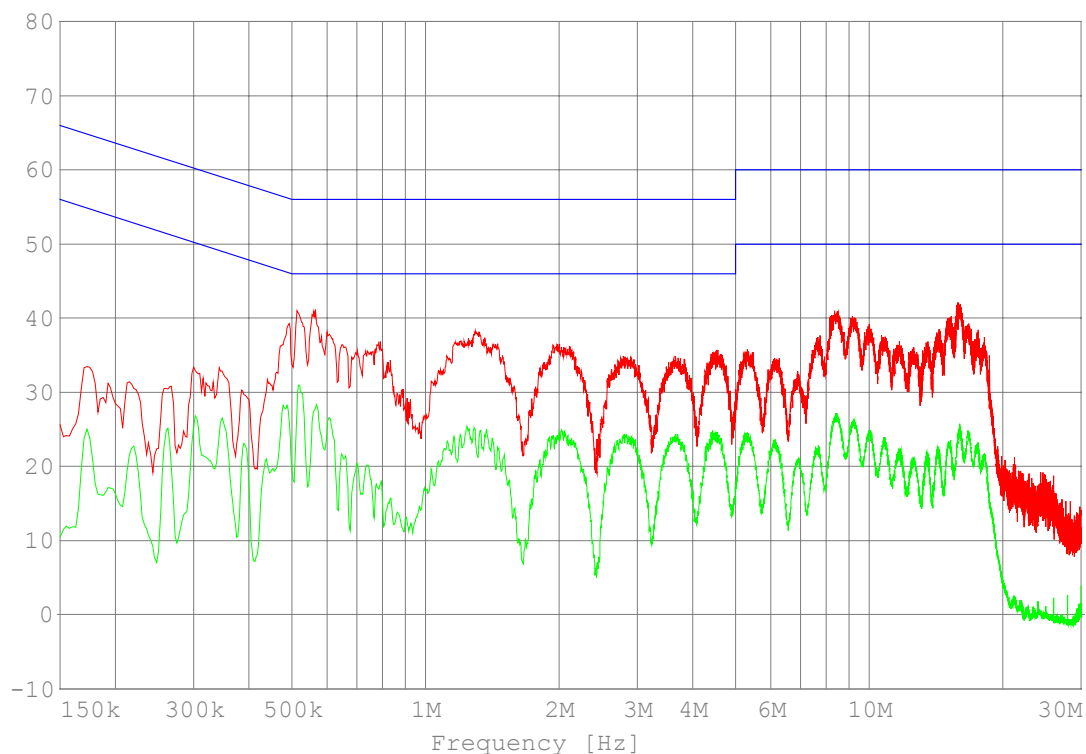
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Conducted Emissions - iCN 720

Comments:	Device tested using 110 Vac while operating under transmit conditions using a sample AC adapter and USB cable.
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Level [dB μ V]



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

Quasi-Peak Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Exceed	Phase	Rechecks dB μ V
No results recorded within 12dB of the limit						

Average Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Exceed	Phase	Rechecks dB μ V
No results recorded within 12dB of the limit						

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Section 15.209 – Radiated emissions

In accordance with section 15.249(d) the general emission limits specified in Section 15.209(a) have been applied to all emissions except the transmitter harmonics.

See Section 15.249(a) for further details.

Section 15.215 (c) – Additional provisions to the general radiated emission limitations

Spectrum mask measurements have been made at 2414.9 MHz and 2470.9 MHz to ensure that the 20 dB bandwidth of the emission from each iCN device is contained within the specified frequency band.

The iCN devices operate in the 2400 – 2483.5 MHz band.

Measurements were made at ambient temperature (20 degree centigrade) and this instance the 30 dB bandwidth was measured as an extreme case.

Device	Temperature	F low	F high
iCN 720	+20.0	2413.4 MHz	2472.1 MHz
iCN 750	+20.0	2412.8 MHz	2472.3 MHz

Result: Complies

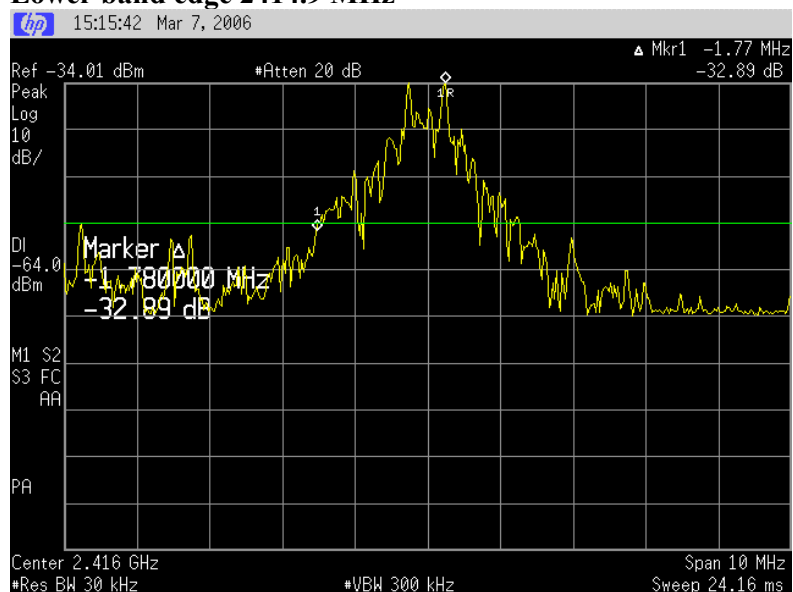
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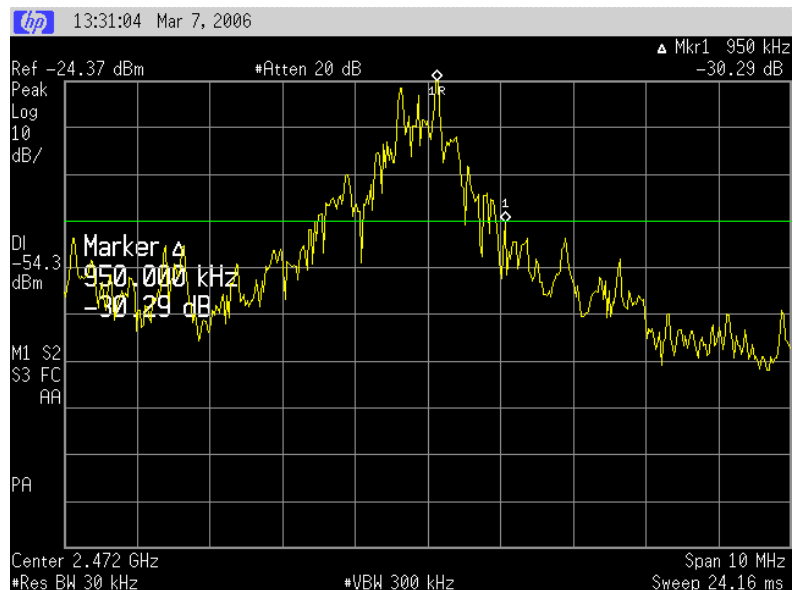
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iCN 750

Lower band edge 2414.9 MHz



Upper band edge 2470.9 MHz



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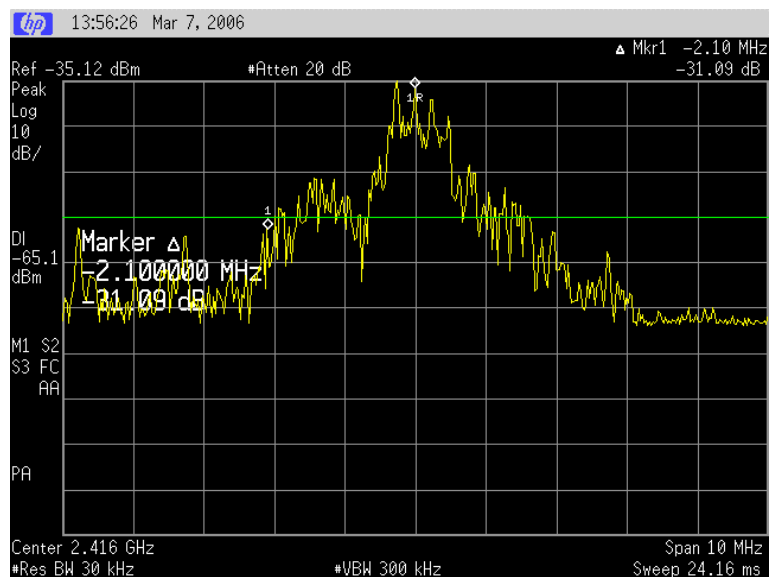
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iCN 720

Lower band edge 2414.9 MHz.



Upper band edge 2470.9 MHz.



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Section 15.249 (a) – Field strength of the Fundamental and Harmonics

Standby modes

iCN 720 in standby mode

Frequency	Level		Recheck	Limit	Margin	Result	Worst Case
	Vertical	Horizontal					Antenna
MHz	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB		
Mode : The device was placed in the centre of the test table and powered at 12 Vdc using a lead acid cell placed underneath the test table. Connected to the device was an in-car adaptor, external GPS antenna and headphones. Attached to the cradle was a FM antenna. The remote control transmitter was placed on the test table next to the device but was not transmitting. 3D GPS fix and satellite level strengths were displayed.							
66.070	14.5			40.0	25.5	Pass	Vertical
84.945	15.0			40.0	25.0	Pass	Vertical
110.120	14.6			43.5	28.9	Pass	Vertical
112.700	14.5			43.5	29.0	Pass	Vertical
141.580	15.8	13.6		43.5	27.7	Pass	Vertical
244.100	18.4	21.0		46.0	25.0	Pass	Horizontal
254.300	17.4	17.0		46.0	28.6	Pass	Vertical
258.055	19.5	17.2		46.0	26.5	Pass	Vertical
Note: No other emissions observed within a 20 dB margin of the limit when measurements were attempted up to 5000 MHz.							

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iCN 720 in standby mode

Frequency	Level		Recheck	Limit	Margin	Result	Worst Case Antenna
MHz	Vertical dBuV/m	Horizontal dBuV/m	dBuV/m	dBuV/m	dB		
Mode : The device was placed in the centre of the test table and powered at 110 Vac via an AC/DC adaptor. A USB cable was connected to the device and the shield of the cable was clamped to earth plane. The remote control transmitter was placed on the test table but was not transmitting. The device was operating in demonstrator mode.							
38.550	32.2	14.3		40.0	7.8	Pass	Vertical
43.450	25.7			40.0	14.3	Pass	Vertical
50.000	22.7			40.0	17.3	Pass	Vertical
54.650	21.0			40.0	19.0	Pass	Vertical
66.070	21.0			40.0	19.0	Pass	Vertical
78.000	23.7	11.0		40.0	16.3	Pass	Vertical
80.000	21.4			40.0	18.6	Pass	Vertical
82.000	15.6			40.0	24.4	Pass	Vertical
93.000	18.6	11.0		43.5	24.9	Pass	Vertical
122.500	18.4	11.8		43.5	25.1	Pass	Vertical
124.200	19.4	12.0		43.5	24.1	Pass	Vertical
127.000	19.3	12.3		43.5	24.2	Pass	Vertical
133.000	17.7	12.6		43.5	25.8	Pass	Vertical
Note: No other emissions observed within a 20 dB margin of the limit when measurements were attempted up to 5000 MHz.							

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iCN 750 in standby mode

Frequency	Level		Recheck	Limit	Margin	Result	Worst Case Antenna
MHz	Vertical	Horizontal					
	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB		
Mode : The device was placed in the centre of the test table and powered at 12 Vdc using a lead acid cell placed underneath the test table. Connected to the device was an in-car adaptor, external GPS antenna and headphones. Attached to the cradle was a FM antenna. The remote control transmitter was placed on test table next to the device but was not transmitting. 3D GPS fix and satellite level strengths were displayed.							
66.070	16.6			40.0	23.4	Pass	Vertical
110.117	15.3			43.5	28.2	Pass	Vertical
141.587	15.2			43.5	28.3	Pass	Vertical
250.000	17.8	16.7		46.0	28.2	Pass	Vertical
254.500	20.3	17.0		46.0	25.7	Pass	Vertical
265.500	18.3	18.3		46.0	27.7	Pass	Vertical
1163.800	26.1			54.0	27.9	Pass	Vertical
1248.062	35.6	34.8		54.0	18.4	Pass	Vertical
1352.073	36.0			54.0	18.0	Pass	Vertical
1456.071	35.1			54.0	18.9	Pass	Vertical
1560.100	38.1	35.1		54.0	15.9	Pass	Vertical
1957.700	29.4			54.0	24.6	Pass	Vertical
Note: No other emissions observed within a 20 dB margin of the limit when measurements were attempted up to 5000 MHz.							

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iCN 750 Standby mode

Frequency	Level		Recheck	Limit	Margin	Result	Worst Case Antenna
MHz	Vertical dBuV/m	Horizontal dBuV/m	dBuV/m	dBuV/m	dB		
Mode : The device was placed in the centre of the test table and powered at 110 Vac via an AC/DC adaptor. A USB cable was connected to the device and the shield of the cable was clamped to earth plane. The remote control transmitter was placed on the test table but was not transmitting. The device was operating in demonstrator mode.							
34.650	26.8	14.4		40.0	13.2	Pass	Vertical
38.550	25.4			40.0	14.6	Pass	Vertical
50.000	26.6	10.4		40.0	13.4	Pass	Vertical
54.650	19.2			40.0	20.8	Pass	Vertical
66.070	19.6			40.0	20.4	Pass	Vertical
76.800	21.2			40.0	18.8	Pass	Vertical
80.000	20.1			40.0	19.9	Pass	Vertical
82.000	11.5			40.0	28.5	Pass	Vertical
93.000	20.2	9.6		43.5	23.3	Pass	Vertical
124.200	16.0	11.8		43.5	27.5	Pass	Vertical
Note: No other emissions observed within a 20 dB margin of the limit when measurements were attempted up to 5000 MHz.							

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Transmit modes

iCN 750

Transmit frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polarity
2414.900	80.2	94.0	10.0	Vertical
2414.900	84.6	94.0	10.0	Horizontal
2448.900	72.8	94.0	10.0	Vertical
2448.900	85.4	94.0	10.0	Horizontal
2470.900	80.2	94.0	10.0	Vertical
2470.900	80.8	94.0	10.0	Horizontal

iCN 720

Transmit frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polarity
2414.900	78.3	94.0	15.7	Vertical
2414.900	77.5	94.0	16.5	Horizontal
2448.900	80.5	94.0	13.5	Vertical
2448.900	83.7	94.0	10.3	Horizontal
2470.900	79.8	94.0	14.2	Vertical
2470.900	80.1	94.0	13.9	Horizontal

No transmitter spurious emissions were detected up to 18 GHz when measurements were attempted using vertical and horizontal polarisations.

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

All measurements were initially made over a distance of 3 metres. Further investigations were carried out at a distance of 1 metre however no emissions were detected.

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.

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Below 1000 MHz a quasi peak detector was used with a bandwidth of 120 kHz.

Above 1000 MHz either an average or peak detector was used with a bandwidth of 1 MHz.

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)

Measurement uncertainty with a confidence interval of 95% is:

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

Result: Complies

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7. 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
VHF Balun	Schwarzbeck	VHA 9103	-	3603
Biconical Antenna	Schwarzbeck	BBA 9106	-	3612
Log Periodic Antenna	Schwarzbeck	VUSLP 9111	9111-228	3785
Measurement Receiver	Rohde & Schwarz	ESCS 30	839873/1	E1595
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3776
Coax Cable	Sucoflex	104PA	2736/4PA	-
Horn Antenna	Electrometrics	RGA-60	6234	E1494

8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies NZ Ltd registration with the Federal Communications Commission as a listed facility, Registration Number: 90838, which was updated on February 17th, 2004.

In addition 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: 1999.

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: 1999.

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

External views

iCN750



iCN720



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Internal views – iCN720



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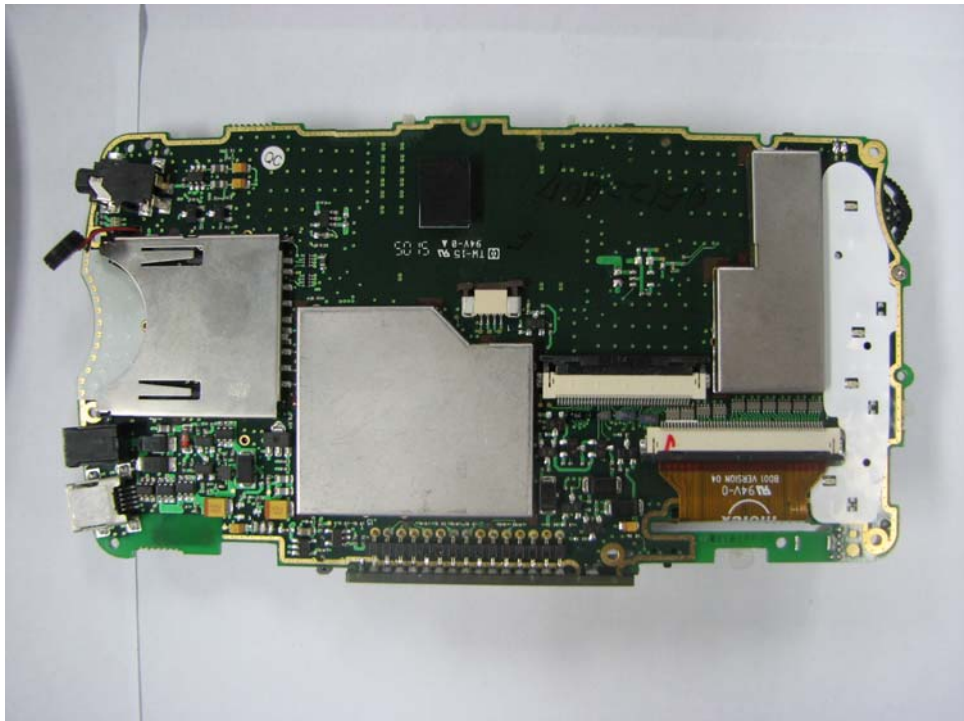
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Internal views – iCN750



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E-mail: aucklab@ihug.co.nz

Web Site: www.emctech.com.au

EMC Technologies (NZ) Ltd

Test Report No 60224.3

Report date: 14th March 2006



EMC Technologies (NZ) Ltd

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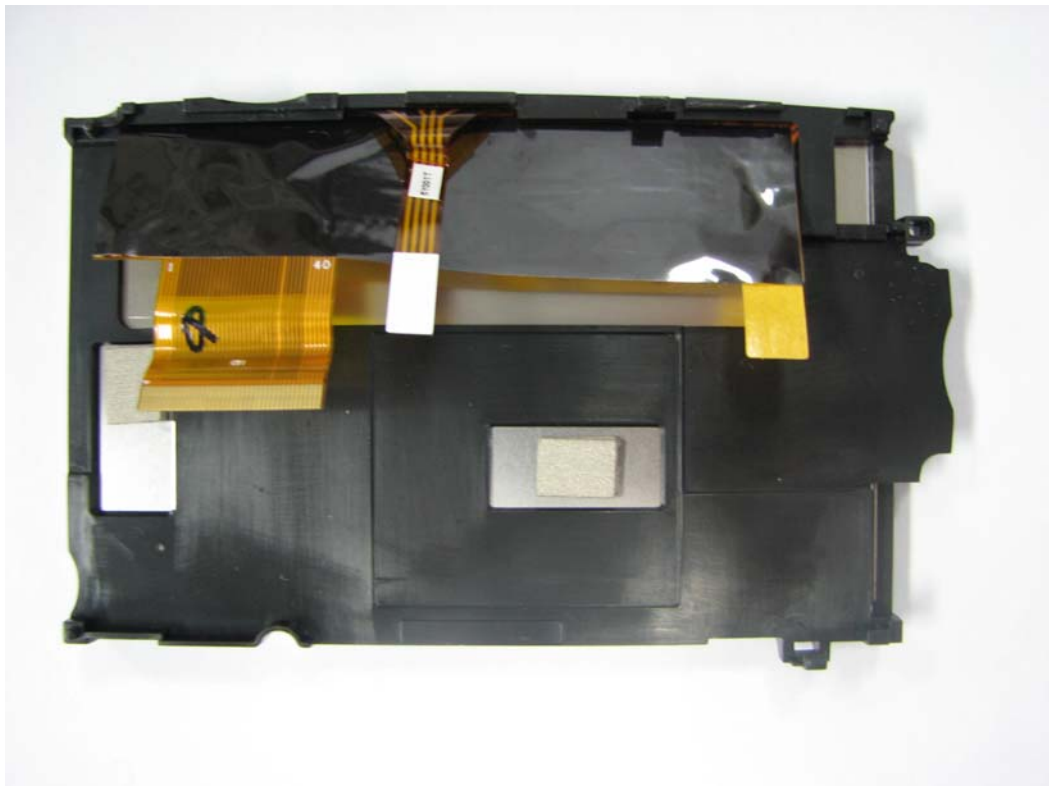
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Items common to both iCN720 and iCN750



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**Radiated emissions test set ups:
external battery powered, 110 Vac powered, internal battery powered.
Setup for the iCN720 was identical to the iCN750.**



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