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



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1. **CLIENT INFORMATION**

Company Name Navman New Zealand

PO Box 68-155 Address

Newton

City Auckland

Country New Zealand

Contact Mr Dominic Cranfield

DESCRIPTION OF TEST SAMPLE 2.

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.

CLAUSE	TEST PERFORMED	RESULT
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 is 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

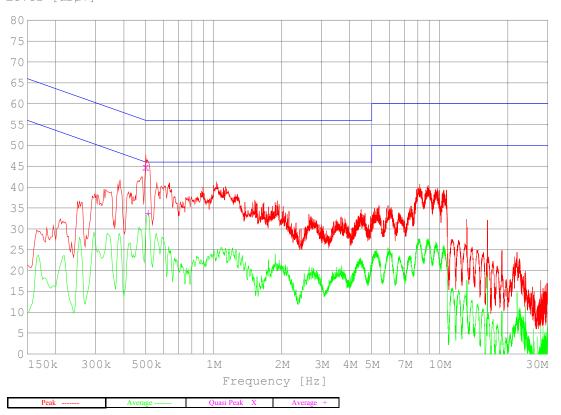
 $(0.15 - 30 \text{ MHz}) \pm 2.2 \text{ dB}$

Result: Complies

Conducted Emissions – iCN 750

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

Level [dBµV]



Quasi-Peak Measurements

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

Average Measurements

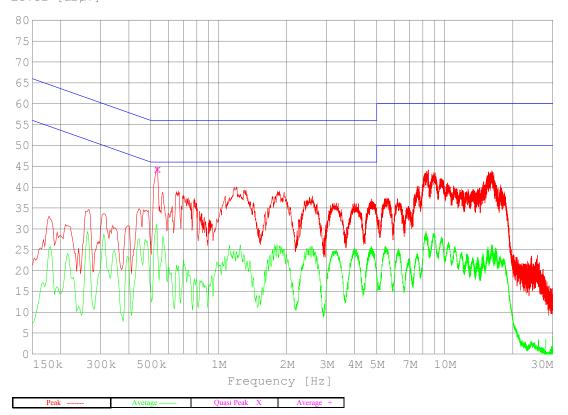
Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Exceed	Phase	Rechecks dBµV
0.512500	33.81	46.00	12.19		L1	

Telephone: +64 9 360 0862 Fax: +64 9 360 0861

Conducted Emissions - iCN 750

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

Level [dBµV]



Quasi-Peak Measurements

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

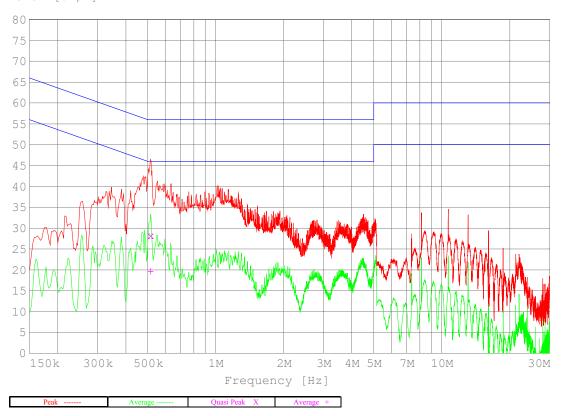
Average Measurements

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

Conducted Emissions - iCN 720

Device tested using 110 Vac while operating in standby. Device operated with headphones Comments: plugged in while splaying GPS signal strength using an external GPS antenna.

Level [dBµV]



Quasi-Peak Measurements

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

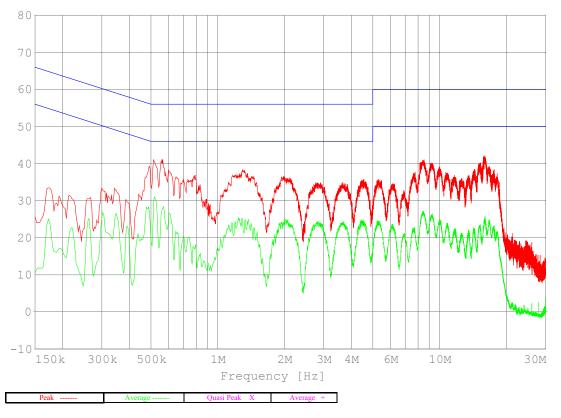
Average Measurements

Frequency	Level	Limit	Margin	Exceed	Phase	Rechecks
MHz	$dB\mu V$	dΒμV	dB			dBμV
0.515000	19.63	46.00	26.37		L1	

Conducted Emissions - iCN 720

Comments:	Device tested using 110 Vac while operating under transmit conditions using a sample AC
	adapter and USB cable.

Level [dBµV]



Quasi-Peak Measurements

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

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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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.

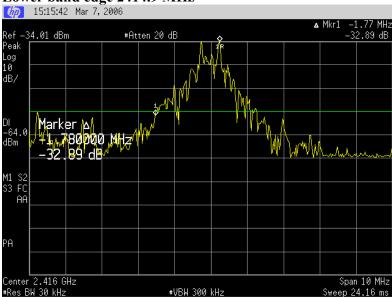
Measurements were made at ambient temperature (20 degree centigrade) and this instance the 30 dB bandwidth was measured as an extreme case.

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

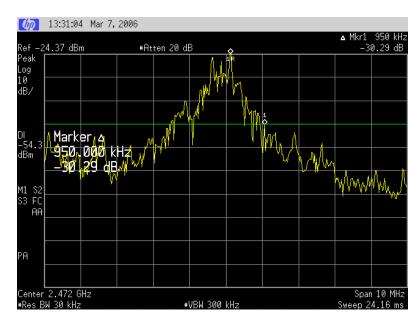
Result: Complies

iCN 750

Lower band edge 2414.9 MHz

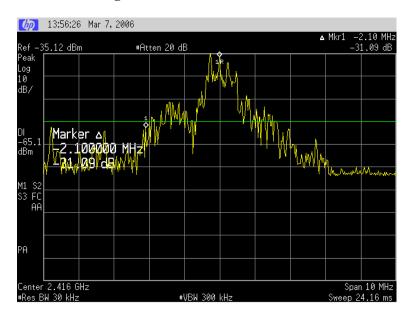


Upper band edge 2470.9 MHz

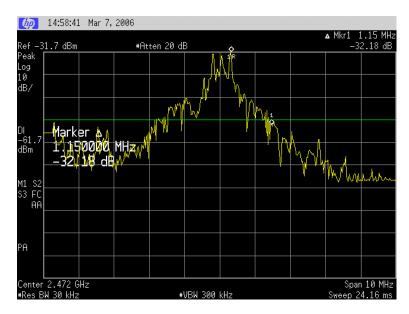


iCN 720

Lower band edge 2414.9 MHz.



Upper band edge 2470.9 MHz.



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

Standby modes

iCN 720 in standby mode

Frequency MHz	Vertical	vel Horizontal dBuV/m				Result	Worst Case Antenna
Mode:	using a le was an in Attached was place	ad acid cell -car adapto to the cradl	placed un r, external e was a FN st table nex	derneath GPS ant A antenn at to the o	the test ta enna and l a. The rea levice but	ble. Connote the control of the cont	vered at 12 Vdc ected to the device s. ol transmitter ansmitting.
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:		emissions on ents were a			_	in of the l	imit when

iCN 720 in standby mode

Frequency	Le	evel	Recheck	Limit	Margin	Result	Worst Case
	Vertical	Horizontal					Antenna
MHz	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB		
Mode:	The devic	e was place	ed in the c	entre of tl	ne test tab	le and pow	vered at 110 Vac
	via an AC	DC adapte	or. A USB	cable wa	s connect	ed to the d	evice and
	the shield	of the cabl	e was clar	nped to ea	arth plane	. The rem	ote control
	transmitte	r was place	ed on the t	est table b	out was no	t transmit	ting.
	The devic	e was oper	ating in de	emonstrate	or 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 o	bserved w	ithin a 20) dB marg	in of the li	imit when
	measurem	ents were	attempted	up to 500	0 MHz.		

iCN 750 in standby mode

Frequency MHz	Vertical	evel Horizontal dBuV/m			Margin dB	Result	Worst Case Antenna
Mode :	The device using a leaves an in Attached was place	ce was place ad acid cel a-car adapto to the crad	ed in the of the left of the l	centre of t nderneath I GPS ant M antenn o the devi	he test tab the test ta enna and l a. The res ce but wa	ible. Conn headphone mote contr	wered at 12 Vdc ected to the device es. rol transmitter mitting. 3D GPS
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:		emissions on ments were			-	gin of the l	imit when

iCN 750 Standby mode

Frequency MHz	Vertical	evel Horizontal dBuV/m	Recheck dBuV/m d		Margin dB	Result	Worst Case Antenna
Mode:	via an AG the shield transmitte	C/DC adapt l of the cab er was plac	tor. A USB	cable w ped to e st table	as connece earth plane but was n	ted to the e. The rer	note control
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:			observed wi attempted u			gin of the	limit when

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Transmit modes

iCN 750

Transmit frequency	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polarity
(MHz)			,	
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	Level	Limit	Margin	Polarity
frequency (MHz)	(dBuV/m)	(dBuV/m)	(dB)	
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 $(dB\mu V/m)$ = Receiver Reading $(dB\mu V)$ + Antenna Factor (dB) + Coax Loss (dB)

Measurement uncertainty with a confidence interval of 95% is:

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

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.

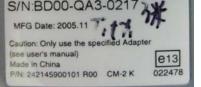
9. **PHOTOGRAPHS**

External views

iCN750













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

Internal views – iCN720









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



Internal views – iCN750



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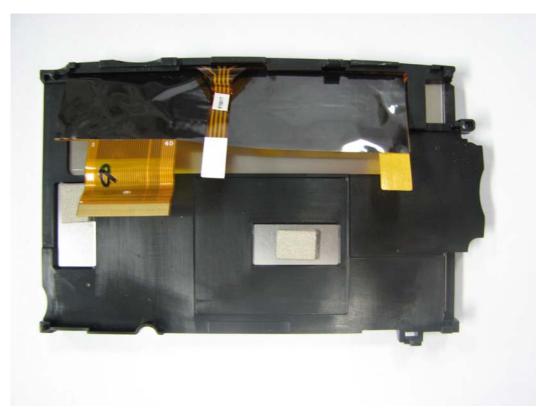
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Telephone: +64 9 360 0862 Fax: +64 9 360 0861

Items common to both iCN720 and iCN750





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Telephone: +64 9 360 0862 Fax: +64 9 360 0861



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







EMC Technologies (NZ) Ltd







EMC Technologies (NZ) Ltd

Telephone: +64 9 360 0862 Fax: +64 9 360 0861





EMC Technologies (NZ) Ltd

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Telephone: +64 9 360 0862 Fax: +64 9 360 0861