

EMC Technologies (NZ) Ltd

Test Report No 100601.11

Report date: 8 July 2010

TEST REPORT

Swiftpoint SM300 Wireless Optical Mouse

tested to the

Code of Federal Regulations (CFR) 47

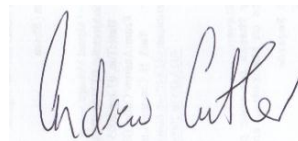
Part 15 – Radio Frequency Devices, Subpart C – Intentional Radiators

Section 15.249 – Operation in the band 2400 – 2483.5 MHz

for

Swiftpoint 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

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EMC Technologies (NZ) Ltd

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1. CLIENT INFORMATION

Company Name	Swiftpoint Ltd
Address	Unit 3, 7 Pilgram Place P.O. Box 80055 Riccarton
City	Christchurch
Country	New Zealand
Contact	Mr Simon Third

2. DESCRIPTION OF TEST SAMPLE

Brand Name	Swiftpoint
Model Number	SM300
Product	Wireless Optical Mouse
Manufacturer	Forth Corporation Public Company Ltd
Country of Origin	Thailand
System Serial Numbers	SA5-01013 (conducted dongle and mouse testing) SA5-01018 (radiated dongle and mouse testing)
FCC ID	X8Y300

The 300 Series System consists of two devices

A SM300 Optical Mouse transceiver and a SD300 Dongle transceiver that are linked together.

The optical mouse is powered using an internal 5 Vdc battery and is charged using the dongle.

The dongle is powered from a USB port on a computer at 5 Vdc.

When the mouse is detached from the dongle a 2.4 GHz link established between the two device which enables the mouse to control the cursor on the screen of the computer.

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3. COMPLIANCE STATEMENT

The **Swiftpoint SM300 Wireless Optical Mouse** 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	Description	Result
15.201	Equipment authorisation requirement	Applied
15.203	Antenna requirement	Complies
15.204	External power amplifiers	Not applicable
15.205	Operation in restricted bands	Complies
15.207	Conducted emissions	Complies
15.209	Radiated emissions	See below
15.215	Additional provisions	Complies
15.249 (a)	Field strength of fundamental	Complies
15.249 (a)	Field strength of harmonics	Complies
15.249 (b)	Fixed, point to point operations	Not applicable
15.249 (c)	3 metre measurement distance	Noted
15.249 (d)	Spurious emission levels except harmonics	Complies
15.249 (e)	Detectors above 1000 MHz	Noted
15.249 (f)	Reference to section 15.37(d)	Noted

4. TEST SAMPLE DESCRIPTION

The device tested is a Wireless Optical Mouse System consists of a Wireless Mouse Transceiver and a Dongle Transceiver that is attached to the USB port of a computer.

The Mouse operates on a single channel in the 2400 – 2483.5 MHz band.

The Mouse operates on a single channel in this band with the module being capable of operating on one of eighty two channels between 2402 MHz and 2481 MHz.

The Mouse usually operates on one of five default channels which are set by the manufacturer.

The default channels are 2403, 2423, 2440, 2461 and 2475 MHz.

The Mouse will operate on a default channel unless the system detects that that channel is in use or is subject to interference and it will then automatically change to the next default channel

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The mouse has the following RF specifications:

FCC band:	2400 MHz – 2483.5 MHz
Test Frequencies:	2402, 2442, 2481 MHz
Operating band:	2402 – 2480 MHz
Rated Conducted Power:	1.00 mW (+0 dBm)
Modulation Type:	GFSK, 2 Mbps data rate
Antenna Type:	Integral (quarter wave mono PCB print for both devices)
Mouse Power Supply:	Internal +5 Vdc rechargeable battery

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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.

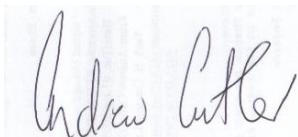
This report does not contain corrections or erasures.

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 15.201: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for this device as it contains a transmitter.

Certification is therefore sought for this system which contains a transmitter in the Optical Mouse and a Transmitter in the Dongle with separate certifications for each device.

Section 15.203 – Antenna requirement

The transmitter and receiver in the mouse uses a 2.4 GHz quarter wave mono PCB print pole antenna that is integral to the device

Result: Complies

Section 15.204: External radio frequency power amplifiers and antenna modifications

An external power amplifier is not supplied with this device and it is not possible to attach an external power amplifier to the mouse.

Result: Complies.

Section 15.205 – Restricted bands of operation

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

The mouse operates in the 2400 – 2483.5 MHz which is not a restricted band.

Result: Complies

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Section 15.207 – Conducted emissions

Conducted Emissions testing was carried out over the frequency range of 150 kHz to 30 MHz which 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

Testing was carried out when the Dongle was attached to the USB port of a laptop computer that was being powered at 110 Vac.

Testing was carried out when the Optical Mouse was docked with the Dongle and was being charged and when the Optical Mouse had been removed and was communicating continuously with the Dongle.

In this mode the cursor on the laptop screen was observed to be moving continuously.

The dongle and optical mouse transmitters in system operate in the 2400 – 2483.5 MHz band.

The device was placed on top of the emissions table, which is 1 m x 1.5 m, 80 cm above the screened room floor which acts as the horizontal ground plane.

In addition the device was positioned 40 cm away from the screened room wall which acts as the vertical ground plane.

The artificial mains network was bonded to the screened room floor.

At all times the device was kept more than 80 cm from the artificial mains network.

The supplied plot is combined plot showing the worst case quasi peak and average results of both the phase and neutral lines to the representative AC power supply.

Quasi peak and average detectors have been used with resolution bandwidths of 9 kHz.

The Class B limits have been applied.

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- AC Mains port (0.15-30 MHz) ± 2.8 dB

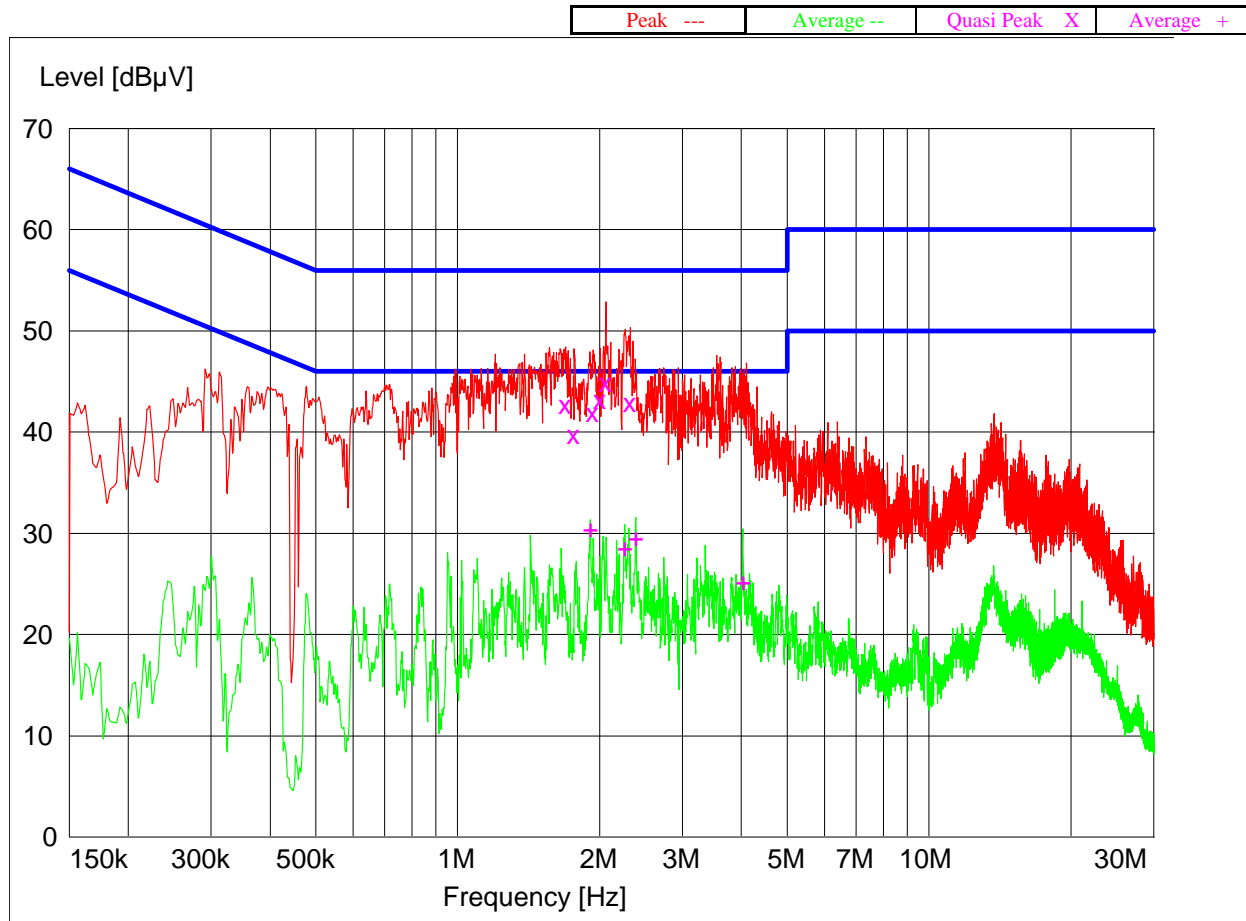
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Conducted Emissions – AC Mains Port

Setup: Device tested when the wireless mouse was being charged using the USB dongle the was attached to the USB port of a laptop computer that was powered at 110 Vac



Final Quasi-Peak Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
1.695000	42.70	56.0	13.3	L1	
1.767000	39.80	56.0	16.2	N	
1.941000	41.90	56.0	14.1	L1	
2.009000	43.20	56.0	12.8	N	
2.063000	44.90	56.0	11.1	L1	
2.324000	42.90	56.0	13.1	L1	

Final Average Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
1.914000	30.50	46.0	15.5	L1	
2.261000	28.60	46.0	17.4	L1	
2.387000	29.60	46.0	16.4	L1	
4.029500	25.30	46.0	20.7	L1	

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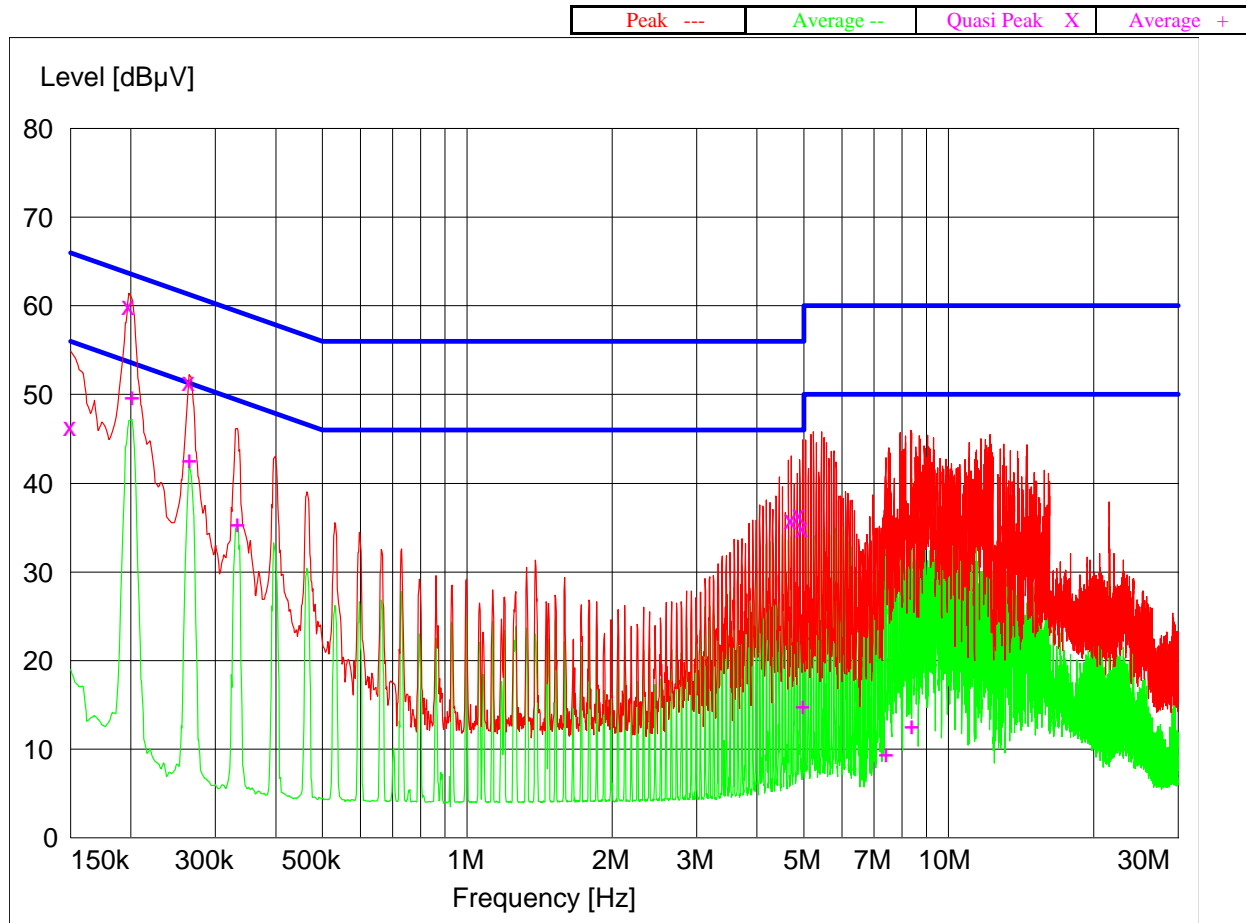
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Conducted Emissions – AC Mains Port

Setup: Device tested when the wireless mouse was detached from the USB dongle and the dongle was transmitting continuously when attached to the laptop computer that was powered at 110 Vac



Final Quasi-Peak Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
0.150000	46.40	66.0	19.6	N	
0.198000	60.10	63.7	3.6	N	
0.264000	51.50	61.3	9.8	L1	
4.713500	35.90	56.0	20.1	N	
4.911500	36.50	56.0	19.5	N	
4.979000	35.00	56.0	21.0	N	

Final Average Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
0.201000	49.80	53.6	3.8	L1	
0.264000	42.70	51.3	8.6	L1	
0.333000	35.40	49.4	14.0	N	
4.983500	14.90	46.0	31.1	N	
7.413500	9.50	50.0	40.6	N	
8.372000	12.70	50.0	37.3	N	

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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

The device operates in the 2400 – 2483.5 MHz band.

Spectrum mask measurements have been made at 2402 and 2480 MHz to ensure that the 20 dB bandwidth of the modulated signal is contained within the assigned frequency band.

Measurements have actually been made at the -23 dB which show compliance with the -20 dB requirements

Optical Mouse:

Frequency (MHz)	F low (MHz)	F high (MHz)
2402.000	2401.955	Not applicable
2481.000	Not applicable	2481.095

The Mouse can be seen to stay within the band of 2400 – 2483.5 MHz at the -20 dB points

The actual measurement plots are detailed below

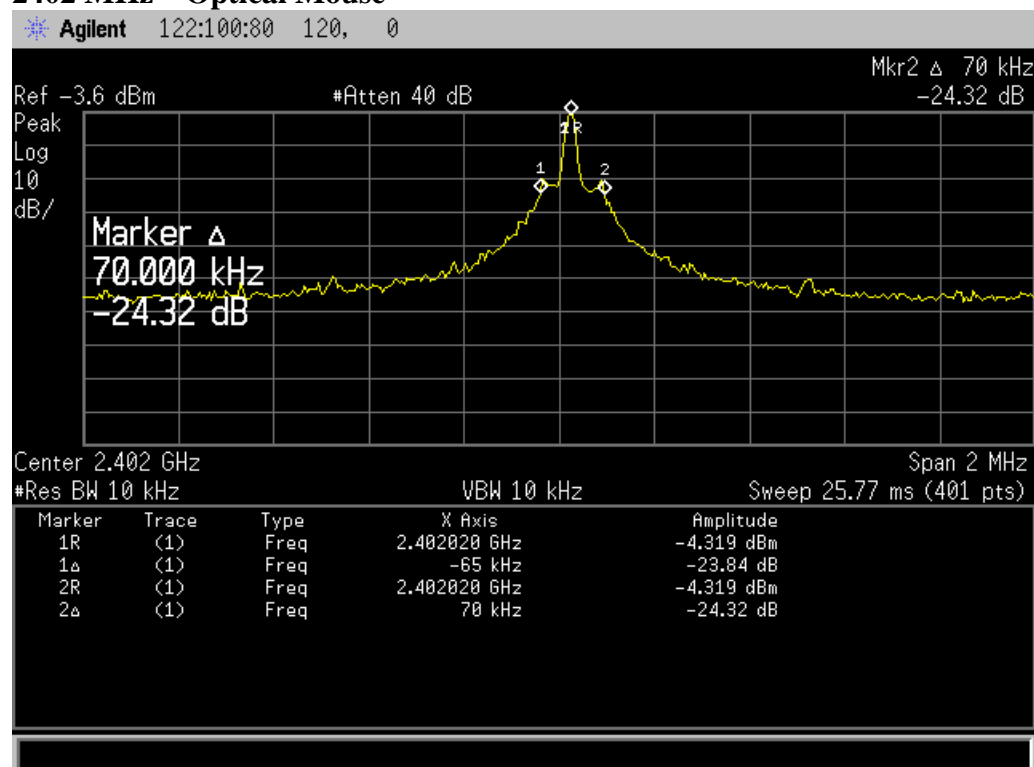
Results: Complies

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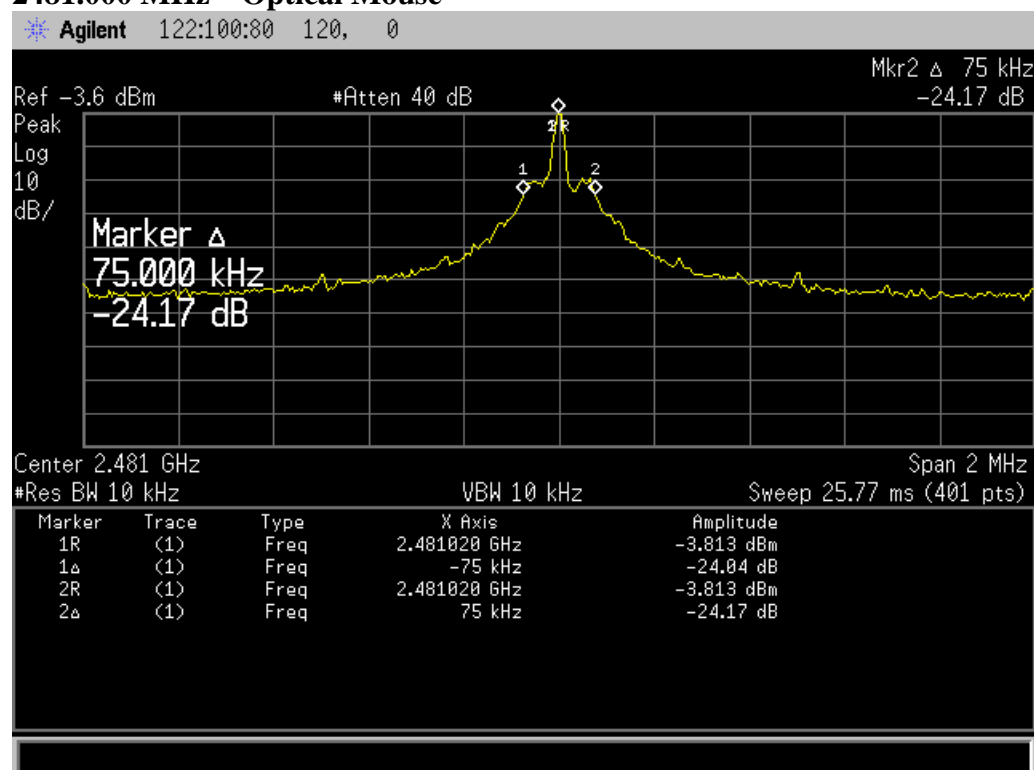
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2402 MHz – Optical Mouse



2481.000 MHz – Optical Mouse



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

Radiated emission measurements were carried out with the limits as per section 15.249 (a) being applied to the Fundamental and Harmonics of each transmitter.

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

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

Measurements of the radiated field were made 3 metres from the transmitting antenna.

Measurements below 1000 MHz were made using a 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.

The limit as specified section 15.249 was applied to the average detector levels with a factor of 20 dB being applied to these levels when they were then measured using a peak detector.

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.

All emissions were measured in both vertical and horizontal antenna polarisations.

The emission is measured in both vertical and horizontal antenna polarisations with no measurements were made above the 10th harmonic

The client supplied set up software that allowed control of the transmitters in order that they could operate continuously on a low, middle and top frequency of operation.

The Optical Mouse transmitter was tested with the power set to 0 dBm.

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) – Amplifier Gain (dB)

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Fundamental emission

Optical mouse transmitter

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Detector
2402.000	86.0	96.4	114.0	17.6	Horizontal	Peak
2402.000	84.5	91.4	94.0	2.6	Horizontal	Average
2442.000	97.5	98.1	114.0	15.9	Horizontal	Peak
2442.000	92.9	93.2	94.0	0.8	Horizontal	Average
2481.000	96.1	95.1	114.0	17.9	Vertical	Peak
2481.000	90.9	88.3	94.0	3.1	Vertical	Average

Section 15.249 specifies a limit of 50 mV/m when an average detector is used for devices operating the band 2400 – 2483.5 MHz with a factor of +20 dB being applied when a peak detector is used.

This limit has been converted to dBuV/m using the formula $20 * (\log 0.050 / 0.000001)$

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

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

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Spurious emissions

Optical mouse transmitting on 2402 MHz

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Detector
4804.000	-	-	74.0	-	Vert/Hort	Peak
4804.000	-	-	54.0	-	Vert/Hort	Average
7206.000	-	-	74.0	-	Vert/Hort	Peak
7206.000	-	-	54.0	-	Vert/Hort	Average
9608.000	-	-	74.0	-	Vert/Hort	Peak
9608.000	-	-	54.0	-	Vert/Hort	Average
12010.000	-	-	74.0	-	Vert/Hort	Peak
12010.000	-	-	54.0	-	Vert/Hort	Average
14412.000	-	-	74.0	-	Vert/Hort	Peak
14412.000	-	-	54.0	-	Vert/Hort	Average
16814.000	-	-	74.0	-	Vert/Hort	Peak
16814.000	-	-	54.0	-	Vert/Hort	Average
19216.000	-	-	74.0	-	Vert/Hort	Peak
19216.000	-	-	54.0	-	Vert/Hort	Average
21618.000	-	-	74.0	-	Vert/Hort	Peak
21618.000	-	-	54.0	-	Vert/Hort	Average
24020.000	-	-	74.0	-	Vert/Hort	Peak
24020.000	-	-	54.0	-	Vert/Hort	Average

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Optical mouse transmitting on 2442 MHz

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Detector
4884.000	-	-	74.0	-	Vert/Hort	Peak
4884.000	-	-	54.0	-	Vert/Hort	Average
7326.000	-	-	74.0	-	Vert/Hort	Peak
7326.000	-	-	54.0	-	Vert/Hort	Average
9768.000	-	-	74.0	-	Vert/Hort	Peak
9768.000	-	-	54.0	-	Vert/Hort	Average
12210.000	-	-	74.0	-	Vert/Hort	Peak
12210.000	-	-	54.0	-	Vert/Hort	Average
14652.000	-	-	74.0	-	Vert/Hort	Peak
14652.000	-	-	54.0	-	Vert/Hort	Average
17094.000	-	-	74.0	-	Vert/Hort	Peak
17094.000	-	-	54.0	-	Vert/Hort	Average
19536.000	-	-	74.0	-	Vert/Hort	Peak
19536.000	-	-	54.0	-	Vert/Hort	Average
21978.000	-	-	74.0	-	Vert/Hort	Peak
21978.000	-	-	54.0	-	Vert/Hort	Average
24420.000	-	-	74.0	-	Vert/Hort	Peak
24420.000	-	-	54.0	-	Vert/Hort	Average

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Optical mouse transmitting on 2481 MHz

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Detector
4962.000	-	-	74.0	-	Vert/Hort	Peak
4962.000	-	-	54.0	-	Vert/Hort	Average
7443.000	-	-	74.0	-	Vert/Hort	Peak
7443.000	-	-	54.0	-	Vert/Hort	Average
9924.000	-	-	74.0	-	Vert/Hort	Peak
9924.000	-	-	54.0	-	Vert/Hort	Average
12405.000	-	-	74.0	-	Vert/Hort	Peak
12405.000	-	-	54.0	-	Vert/Hort	Average
14886.000	-	-	74.0	-	Vert/Hort	Peak
14886.000	-	-	54.0	-	Vert/Hort	Average
17367.000	-	-	74.0	-	Vert/Hort	Peak
17367.000	-	-	54.0	-	Vert/Hort	Average
19848.000	-	-	74.0	-	Vert/Hort	Peak
19848.000	-	-	54.0	-	Vert/Hort	Average
22329.000	-	-	74.0	-	Vert/Hort	Peak
22329.000	-	-	54.0	-	Vert/Hort	Average
24810.000	-	-	74.0	-	Vert/Hort	Peak
24810.000	-	-	54.0	-	Vert/Hort	Average

No emissions were detected from either device when measurements were attempted at a distance of 3 metres using vertical and horizontal polarisations using both an average and peak detector with a bandwidth of 1 MHz.

The antenna was moved closer to the device with emissions starting to be observed at a distance of approximately 50 cm.

As per section 15.249 a limit of 500 uV/m has been applied to the harmonic emissions when an average detector and a factor of +20 dB has been applied with a peak detector was used.

This limit has been converted to dBuV/m using the formula $20 * (\log 500)$

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No other emissions were detected when the Optical Mouse was being operated in transmit mode and no emissions were detected when it was being operated in standby / receive mode.

When Optical Mouse was attached the Dongle and was being operated in charge mode the following emissions were observed.

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Detector
240.000		36.4	46.0	9.6	Horizontal	Quasi Peak
336.000	36.7	37.2	46.0	8.8	Horizontal	Quasi Peak
500.000	35.3		46.0	10.7	Vertical	Quasi Peak
528.000	34.1		46.0	11.9	Vertical	Quasi Peak

The limits as per section 15.209 between 216 – 960 MHz have been applied

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) – Microwave Preamplifier Gain (dB)

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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7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applic
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applic
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applic
Receiver	R & S	ESHS 10	828404/005	3728	21 Aug 2010
Mains Network	R & S	ESH2-Z5	881362/032	3628	21 Aug 2010
Receiver	R & S	ESCS 30	847124/020	E1595	21 Feb 2011
Receiver	R & S	ESIB 40	100171	R-27-1	21 Aug 2010
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3771	20 April 2011
Microwave Preamp	Hewlett Packard	8349B	2644A01659	-	20 April 2011
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603	7 Feb 2011
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612	7 Feb 2011
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	7 Feb 2011
Horn Antenna	EMCO	3115	9511-4629	E1526	10 May 2011
Horn Antenna	EMCO	3116	92035	-	10 May 2011

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 in January, 2010.

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 17025:2005.

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: 2005.

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.

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9. PHOTOGRAPHS

Label on Mouse



Mouse External Photos



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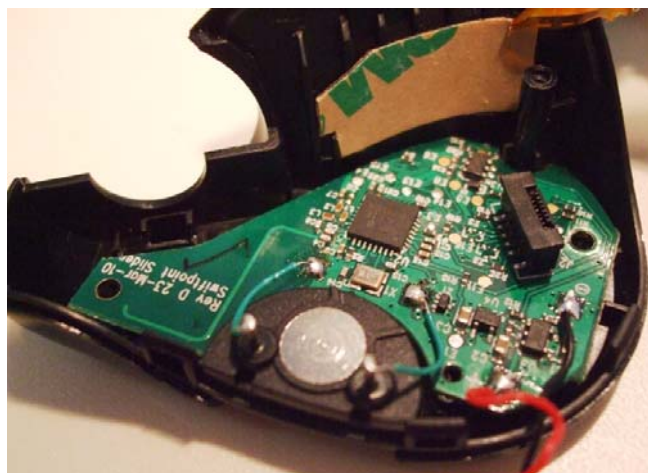
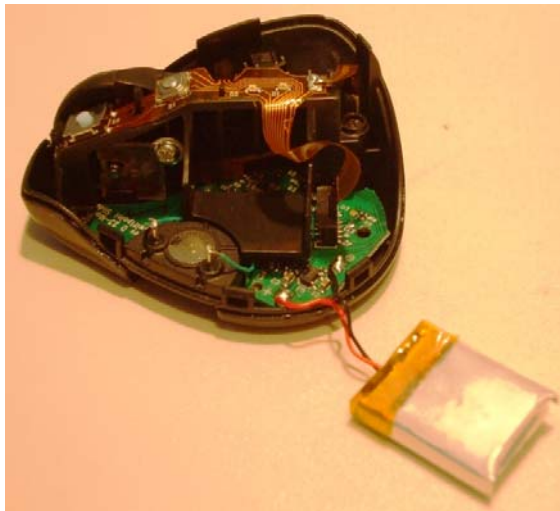
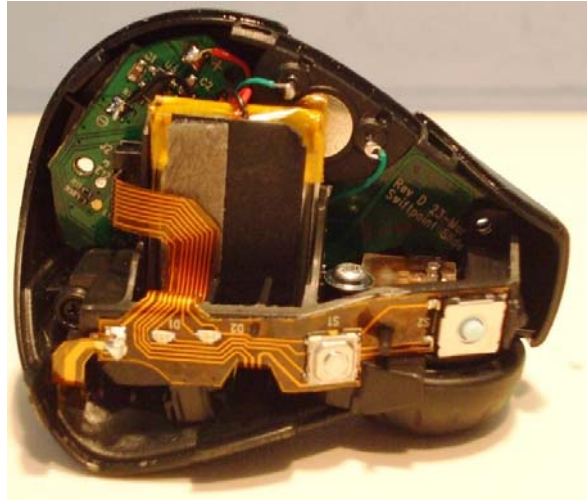
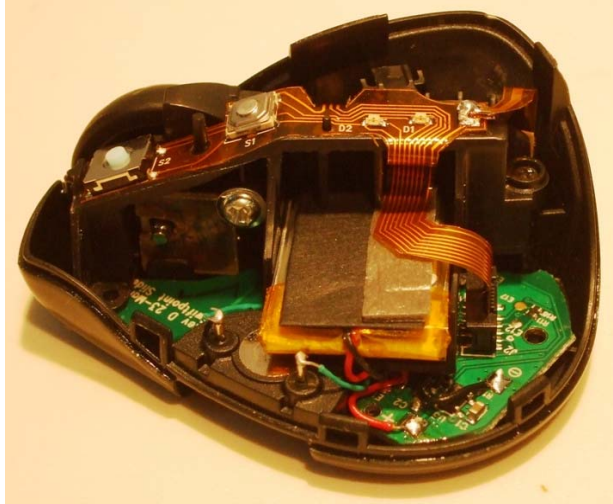
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Test Report No 100601.11

Report date: 8 July 2010

Mouse Internal Photos



EMC Technologies (NZ) Ltd

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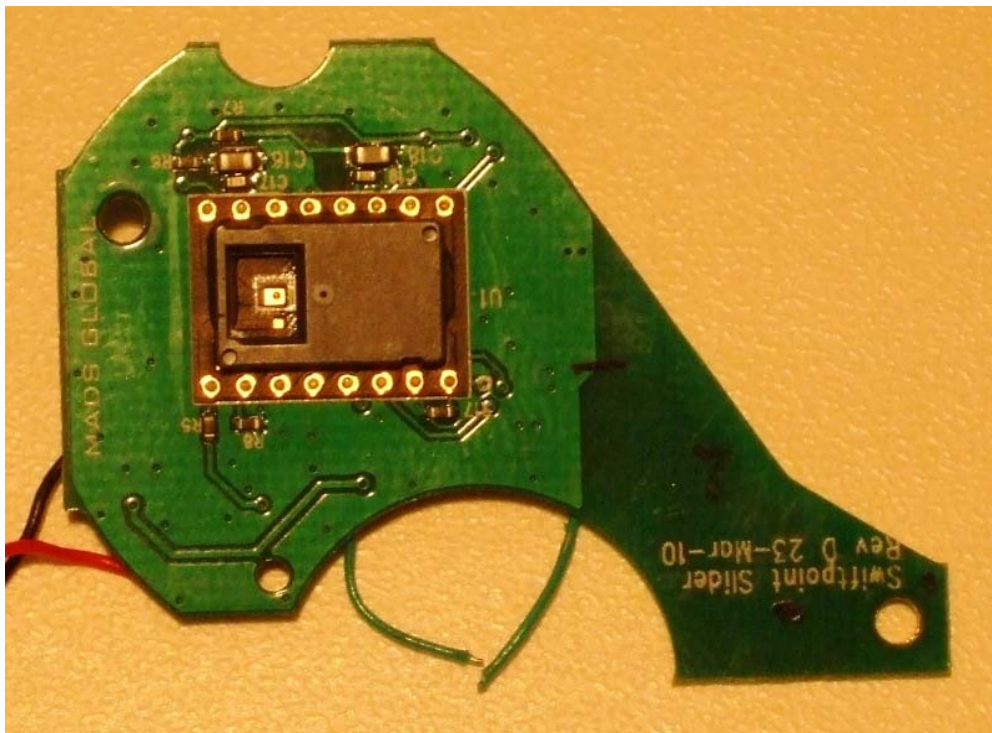
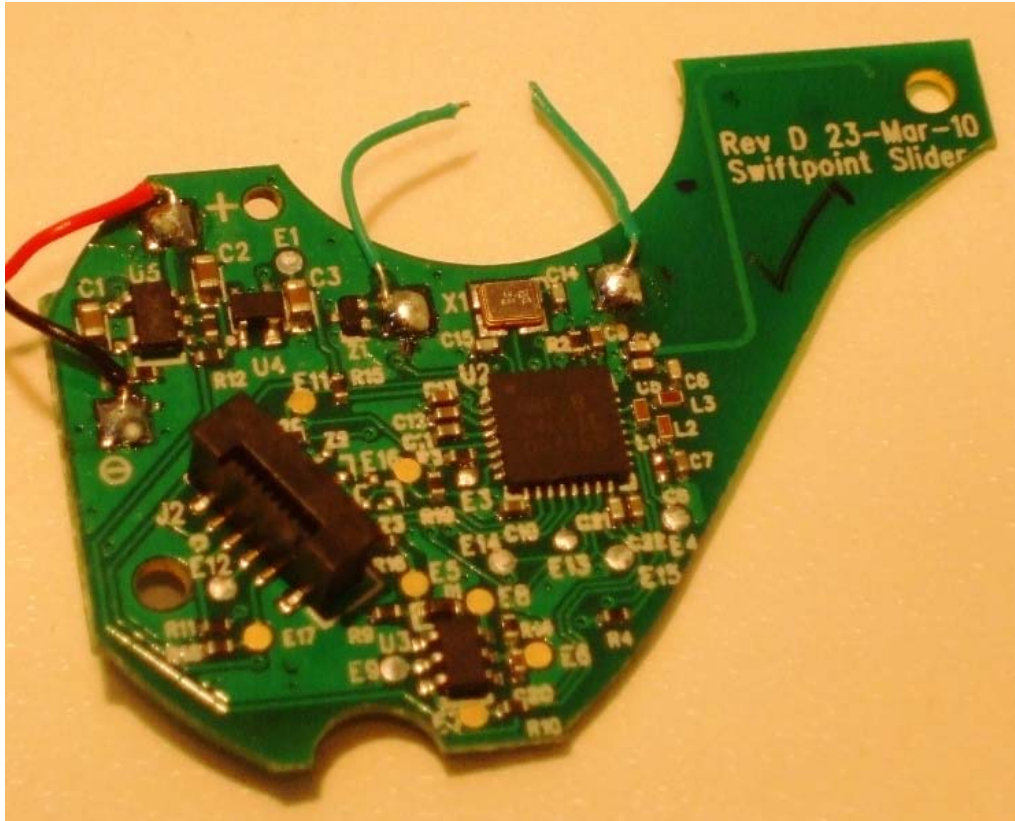
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Radiated emissions test set up photographs



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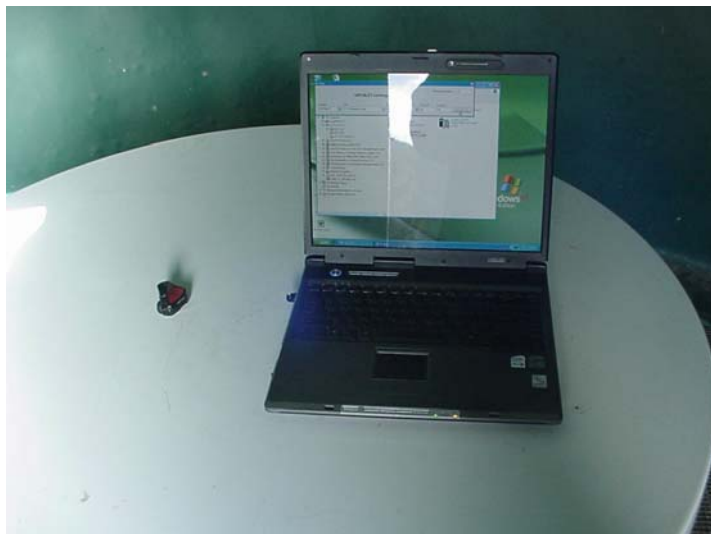
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Conducted emissions test set up photos – Mouse and Dongle as they would be used



Mouse being charged by the Dongle



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