EMI TEST REPORT
for
CERTIFICATION
to
FCC PART 15.227 TRANSMITTER

FCC ID: N5H0013T

Manufacturer: PP Multimedia SDn. Bhd.
Test Sample: g3 Cordless Computer Mouse

Report Number: M991242-FCC

Date: 15th January 2000

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation for FCC Part 15.

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EMI TEST REPORT FOR CERTIFICATION TO FCC PART 15.227 TRANSMITTER

FCC ID: N5H0013T

CERTIFICATION of COMPLIANCE with FCC PART 15 REGULATIONS.
EMC Technologies Report Number: M991242-FCC
Date: 15th January 2000

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Report Number:	M991242-FCC
Test Sample:	**g**3 Cordless Computer Mouse
FCC ID:	N5H0013T
Manufacturer:	PP Multimedia SDn. Bhd. 100M, Jalan SS21/39, Damasara Utama 47400 Petaling Jaya, Selangor, Malaysia
Phone:	+ 603 718 3606
Fax:	+ 603 576 6119
Responsible Party:	Kow Cheong Heng (Peter) Managing Director PP Multimedia Sdn. Bhd.
Equipment Type:	Intentional Radiator, Low Power Transmitter
Test Standards:	FCC Part 15 Section 227 Intentional Radiators. ANSI C63.4-1992 OET Bulletin No. 63, October 1993
Tested for:	Quality Assurance Services Locked Bag 2032 Strathfield NSW 2135 Australia Phone : +612 9746 4900 Fax : +612 9746 8460
Contact:	Greg Dockar
Test Dates:	7th January 2000
Test Officer:	Praveen Rao
Attestation:	*I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*
Authorised Signature:	**Praveen Rao** **Laboratory Manager** **EMC Technologies Pty Ltd**

EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15.227 REQUIREMENTS
on the
g3 Cordless Computer Mouse

1.0 SUMMARY of RESULTS.

This report details the results of EMI tests and measurements performed on the **G3 Cordless Mouse** in accordance with the Federal Communications Commission (FCC) regulations as detailed in **Title 47 CFR, Part 15 Rules for intentional radiators.** The results and photographs of all the EUT are detailed in this report. The EUT complied with requirements for 15.227 at fundamental frequencies and spurious emissions of section 15.209.

Transmitter Fundamental Frequency:	Complied, margin of 36.2 dB.
Transmitter Spurious:	Complied, margin of 1.9 dB.

The measurement procedure was in accordance with ANSI C63.4-1992, and OET Bulletin No. 63. The instrumentation conformed to these requirements.

2.0 GENERAL INFORMATION

2.1 General Description of Test Setup

Test Sample:	g3 Cordless Computer Mouse
FCC ID:	N5H0013T
Equipment Type:	Intentional Radiator, Low Power transmitter

2.2 Technical Specifications

Power Source	:	2x AAA Batteries
Frequency	:	Channel 1: 27.040 MHz Channel 2: 27.080 MHz Channel 3: 27.120 MHz Channel 4: 27.160 MHz Channel 5: 27.210 MHz
Deviation	:	4 kHz
Baud Rate	:	4800 bps
Modulation	:	FSK
Frequency Stability	:	± 20ppm
Accuracy	:	400 dpi
Operating Temperature	:	-5º C ~ 60º
Dimension	:	118.5 x 67 x 36.4 mm

2.3 Test Sample Functional Description.

The EUT is a 2 x AAA battery operated **short range remote wireless Mouse**. The Mouse uses frequency synthesizer technique and any one of the 5 channels can be selected by the user by pushing the channel selector button on the Mouse.
A receiver module is connected to the Mouse port of a personal computer. The Superheterodyne receiver is already FCC approved.

2.4 Test Procedure

Radiated emissions measurements were performed in accordance with the procedures of ANSI C63.4-1992. Radiated emission tests were performed at an EUT distance of 10 metres. OET Bulletin 63 dated October 1993 was used for reference.

2.5 Test Facility

- **FCC Registration**

Radiated Emission measurements were performed at EMC Technologies open area test site (OATS) situated at Lerderderg Gorge, near the town of Baccus Marsh, Victoria, Australia.
The above site has been fully described in a report submitted to the FCC office, and accepted in a letter dated June 24, 1999, **FCC Registration Number 90560**.

2.6 Units of Measurements

Radiated Emissions
Measurements are reported in units of dB relative to one microvolt per metre (dBμV/m) at a distance of 10 metres from the EUT.

2.7 Test Equipment Calibration

All measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Hewlett-Packard Australia Limited. All equipment calibration is traceable to Australia national standards at the National Measurements Laboratory (NML). The reference antenna calibration was performed by NML and the working antennas (biconical and log-periodic) calibrated by the direct comparison method. The complete list of test equipment used for the measurements, including calibration dates and traceability, is contained in Appendix A of this report.

2.8 Ambients at OATS.

The OATS site is an area of low background ambient signals. No significant broadband ambients are present however commercial radio and TV signals exceed the limit in the FM radio, VHF and UHF television bands. Radiated prescan measurements were performed in the shielded enclosure to check for possible radiated emissions at the frequencies where the OATS ambient signals exceeded the test limit.

3.0 System Test Configuration.

The transmitter was configured to continuously transmit during the tests. The PC was set up under the test bench continously responding to the transmitter during the tests.

4.0 RADIATED EMISSION MEASUREMENTS

4.1 Test Procedure 26-1000 MHz

The EUT was set up on the table top (placed flat on the turntable) of total height 80 cm above the ground plane, and operated as described in section 2 of this report. The EMI Receiver was operated under software control via the Portable PC Controller through the IEEE.488 Interface Bus Card Adapter. The 26 MHz to 1000 MHz test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of possible EMI peaks while also permitting fast frequency scan times. The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. Each significant peak was then investigated and maximised by scanning the height of the antenna between 1 to 4 metres with the Quasi-Peak detector ON. The measurement data for each frequency range was automatically corrected by the software for cable losses, antenna factors and preamplifier gain and all data was then stored on disk in sequential data files. This process was performed for both horizontal and vertical antenna polarisation.

4.2 Plotting of Measurement Data for Radiated Emissions.

The stored measurement data was combined to form a single graph which comprised of all the frequency sub-ranges over the range 26-1000 MHz. The accumulated EMI (EUT ON) was plotted as the Red trace while the Ambient signals (AMBIENT) were plotted as Green trace. The worst case radiated EMI *peak* measurements (as recorded using the Max-Hold data are presented as the upper or **RED** trace while the respective ambient signals are presented as the lower or **GREEN** trace. Occasionally, an intermittent ambient arose during the EUT ON measurement (RED trace) and could not be captured when the Ambient trace was being stored. The ambient peaks of significant amplitude with respect to the limit are tagged with the "#" symbol while EMI peaks are identified with a numeral. Ambient peaks that were present during the EUT ON measurement (RED trace) and not captured during the AMBIENT measurement were also tagged with the "#" symbol.

The highest recorded EMI signals are shown on the Peaks List on the bottom right side of the graph. For radiated EMI, each numbered peak is listed as a frequency, peak field strength, Quasi-peak field strength, turntable azimuth, antenna height and the margin relative to the limit in dB. A negative margin is the deviation of the recorded value below the limit.

At times, the quasi peak level may appear to be higher than the peak level. This happens because the individual peak is further maximised with the QP detector. This will be apparent when the peaks list at the foot of the graphs shows the quasi peak level higher than the peak level.

4.3 Calculation of Field Strength.

The field strength was calculated automatically by the software using all the pre-stored calibration data. The method of calculation is shown below:

$$\mathbf{E = V + AF - G + L}$$

Where: **E** = Radiated Field Strength in dBµV/m.

V = EMI Receiver Voltage in dBµV. (measured value)
AF = Antenna Factor in dB(m^{-1}). (stored as a data array)
G = Preamplifier Gain in dB. (stored as a data array)
L = Cable insertion loss in dB. (stored as a data array of Insertion Loss versus frequency)

Example Field Strength Calculation
Assuming a receiver reading of 34.0 dBµV is obtained at 90 MHz, the Antenna Factor at that frequency is 9.2 dB. The cable loss is 1.9 dB while the preamplifier gain is 20 dB. The resulting Field Strength is therefore as follows:

34.0 + 9.2 + 1.9 - 20 = 25.1 dBµV/m

5.0 Radiated Field Strength Measurement Results

The transmitter was tested together with the receiver connected to the PC. The PC was set up under the test bench continously responding to the transmitter during the tests.

Result: The highest radiated spurious emission was 1.9 dB below the limit at 770.5MHz for Horizontal Polarisation. The fundamental frequency was 36.2 dB below the specified limit at 27.04 MHz (peak level) for Vertical Polarisation.

Graph 1: Vertical Antenna Polarisation
Graph 2: Horizontal Antenna Polarisation

Table 1
Summary of Results

Antenna Polarisation	Frequency MHz	Rx QP Level dBµV/m	Limit @ 10m dBµV/m	Result ±dB
FUNDAMENTAL FREQUENCY				
Vertical	27.04	33.8 peak*	70.0	-36.2
Horizontal	27.04	30.4 peak*	70.0	-39.6
SPURIOUS EMISSIONS				
Horizontal	770.53	34.1	36.0	-1.9
Horizontal	757.05	33.3	36.0	-2.7
Horizontal	743.72	33.0	36.0	-3.0
Horizontal	594.96	32.7	36.0	-3.3
Horizontal	581.29	32.6	36.0	-3.4
Horizontal	608.36	32.3	36.0	-3.7
Horizontal	567.76	32.0	36.0	-4.0
Horizontal	554.26	31.6	36.0	-4.4
Horizontal	540.86	30.6	36.0	-5.4
Horizontal	202.76	25.8	33.5	-7.7
Vertical	200.67	25.2	33.5	-8.3

***Note :** The measured Fundamental Frequency levels reported here are Peak values
Refer graphs 1 and 2 in Appendix F

6.0 CONCLUSION

The g3 Cordless Computer Mouse (FCC ID: N5H0013T), complied with the requirements of the FCC Parts 2 and 15 Rules for low power transmitter tested in accordance with 15.227. The results were as follows:

Transmitter Fundamental	: complied, worst case margin of	36.2 dB.
Transmitter Spurious	: complied, worst case margin of	1.9 dB.

APPENDIX A

MEASUREMENT INSTRUMENTATION DETAILS

EQUIPMENT TYPE	MAKE/MODEL SERIAL NUMBER	LAST CAL. DD/MM/YY	DUE DATE DD/MM/YY	CAL. INTERVAL
EMI RECEIVER	HP8574B CISPR Receiver Sn.3146A01297 including MIL-STD-462 Bandwidths	02/02/99	02/02/00	1 YEAR *2
	HP 8546A Sn. 3549A00290 EMI Receiver	20/09/99	20/09/00	1 YEAR *2
ANTENNAS	EMCO 93110B BICONICAL	08/12/99	08/12/00	I YEAR *3
	20 - 300MHz Sn. 9804-3094			
	EMCO 93146A LOG PERIODIC	06/02/99	06/02/00	1 YEAR *3
	300 -1000MHz Sn. 9803-5033			

Note *1. National Measurements Laboratory calibration.
Note *2. NATA calibration by Hewlett-Packard (Aust) Ltd
Note *3. In-house calibration. Refer to Quality Manual.
Note *4 Calibration not required

TEST SITES

Shielded Room Test Laboratory	**Melbourne** 11m x 8m x 4m Test Chamber 8.8m x 5.8m x 3.1m Test Chamber 3.4m x 6.1m x 2.5m Test Chamber 3.4m x 7.3m x 7.5m Test Chamber			*4
Open Area Test Site	**Melbourne** 3/10 Metre site. 1-4 metre antenna mast. 1.2 metre/400 kG Turntable. (Situated at Lerderderg Gorge, near Baccus Marsh, Victoria)	30/07/99	30/07/00	1 Year *3

APPENDIX B

PHOTOGRAPHS OF TEST SAMPLE

SUBMITTED UNDER EXHIBITS
AS
Test Setup Photo.JPG
Internal Photo_1.JPG
Internal Photo_2.JPG

APPENDIX C

TEST SAMPLE CIRCUIT ASSEMBLY DIAGRAMS SUBMITTED UNDER EXHIBITS AS

Schematic_1.jpg
Schematic_2.jpg
Schematic_3.pdf
Block Diagram.jpg
PCB Layout_1.jpg
PCB Layout_2.jpg

APPENDIX D

FCC ID LABELLING
SUBMITTED UNDER EXHIBITS
AS
IDLABEL.DOC

APPENDIX E

USER INSTRUCTIONS
SUBMITTED UNDER EXHIBITS
AS
USERMAN1.jpg
USERMAN2.jpg
USERMAN3.jpg

APPENDIX F

GRAPHS OF EMI MEASUREMENTS

RADIATED EMI

26 MHz to 1000 MHz

Graph 1: Vertical Polarisation

Graph 2: Horizontal Polarisation

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FCC 15.227 Project No:M991242

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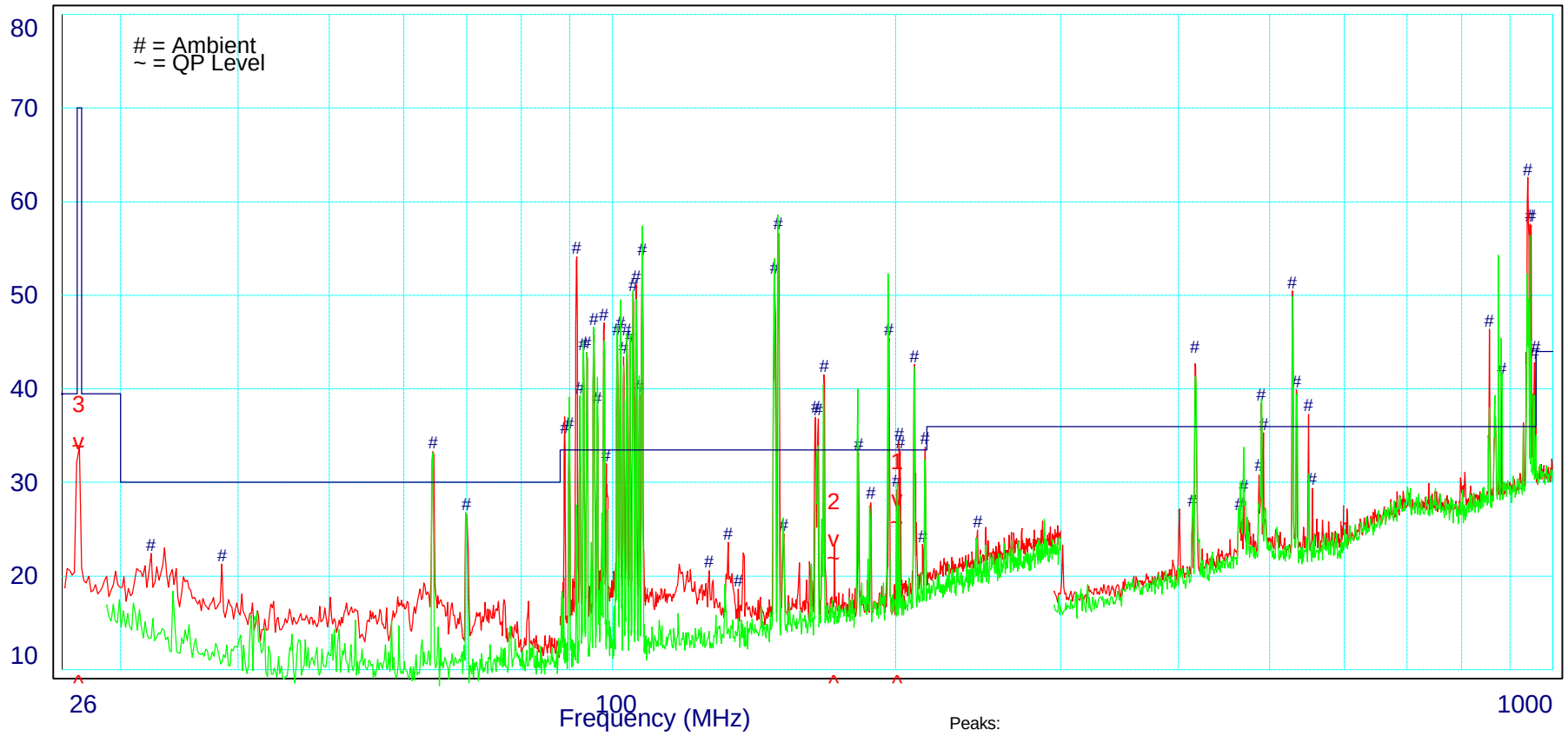
Electric Field Strength dBuV/m Peak Test Date: 07-01-00 GRAPH No. 1



g3 Cordless Mouse

Continiously Transmitting

Peaks:

No	Freq (MHz)	Peak (dBuV/m)	Qp Val	FCC15227 (dBuV/m)	dL1 (dB)
1	200.67	27.7	25.2	33.5	-8.3
2	171.84	23.4	21.4	33.5	-12.1
3	27.04	33.8	33.3	70.0	-36.7

Limits:
FCC15227 FCC 15.227 RAD 10M CLASS B LIMITS

Legend:
Vertical Ambients
Vertical Emissions

Source:
analdata 43 44 45 46 18 19
analdata 5 6 7 8 9 10

Equipment: HP8546A TST 99B
Transducers: LCABLE2 a1103009 A1360100 NOPREAMP
Site ID: Lerderderg OATS1
Test Officer:Praveen Rao

Melbourne- 57 Assembly Drv Tullamarine, 3043, Vic, Australia Ph+(613) 9335 3333 Fax+(613) 9338 9260
Sydney---- 16,6 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9899 4599 Fax+(612) 9899 4019

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FCC 15.227 Project No:M991242

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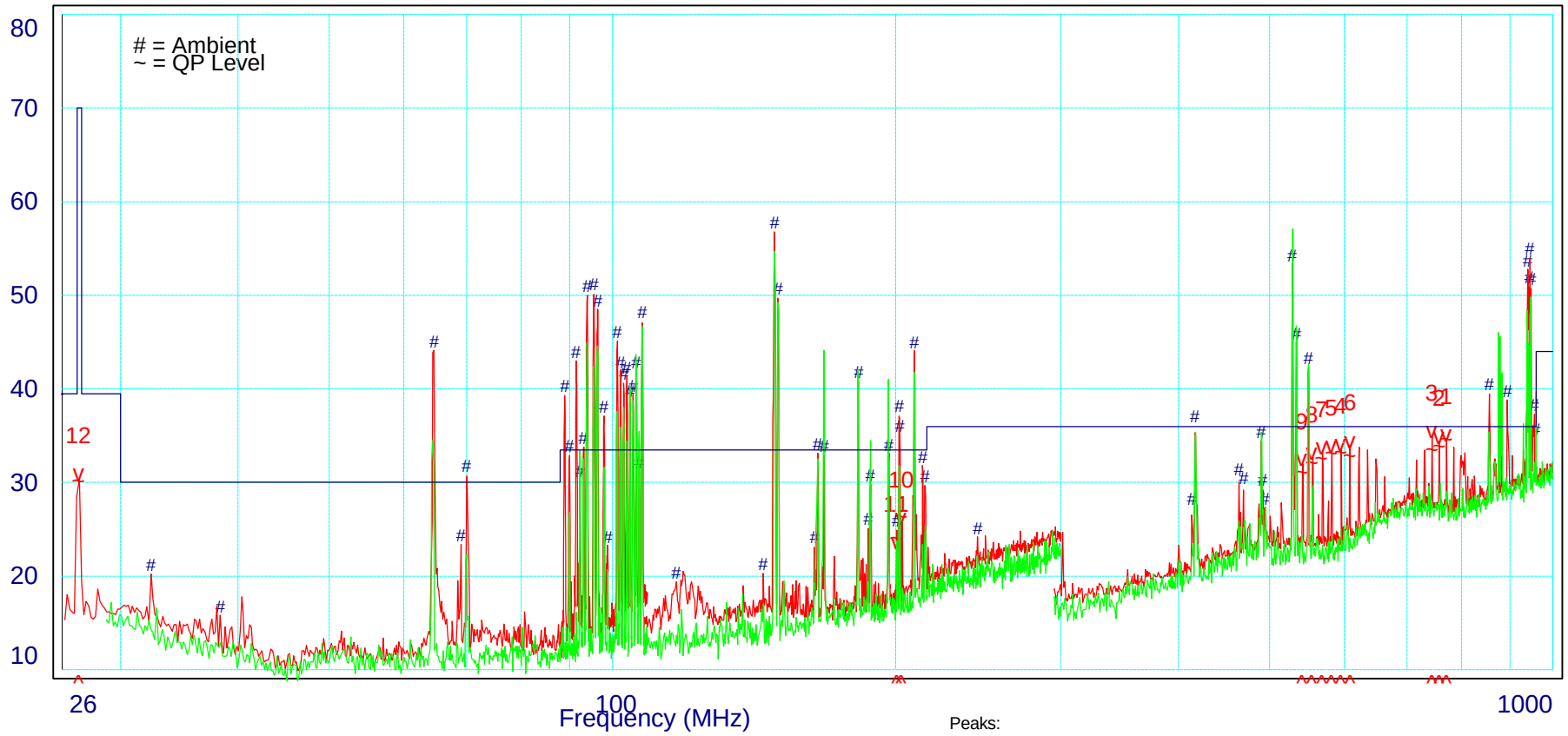
Electric Field Strength dBuV/m Peak Test Date: 07-01-00 GRAPH No. 2



g3 Cordless Mouse

Continiously Transmitting

Limits:
FCC15227 FCC 15.227 RAD 10M CLASS B LIMITS

Legend:
Horizontal Ambients
Horizontal Emissions

Equipment: HP8546A TST 99B
Transducers: LCABLE2 a1103009 A1360100 NOPREAMP
Site ID: Lerderderg OATS1
Test Officer:Praveen Rao

Source:						
analdata	22	23	24	25	20	21
analdata	1	2	3	4	11	12

Peaks:

No	Freq (MHz)	Peak (dBuV/m)	Qp Val	FCC15227 (dBuV/m)	dL1 (dB)
1	770.53	34.7	34.1	36.0	-1.9
2	757.05	34.4	33.3	36.0	-2.7
3	743.72	35.0	33.0	36.0	-3.0
4	594.96	33.6	32.7	36.0	-3.3
5	581.29	33.4	32.6	36.0	-3.4
6	608.36	33.9	32.3	36.0	-3.7
7	567.76	33.3	32.0	36.0	-4.0
8	554.26	32.7	31.6	36.0	-4.4
9	540.86	32.0	30.6	36.0	-5.4
10	202.76	25.7	25.8	33.5	-7.7
11	200.44	23.2	23.5	33.5	-10.0
12	27.04	30.4	29.6	70.0	-40.4

Melbourne- 57 Assembly Drv Tullamarine, 3043, Vic, Australia Ph+(613) 9335 3333 Fax+(613) 9338 9260
Sydney---- 16,6 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9899 4599 Fax+(612) 9899 4019