



Global Product Certification

Page 1 of 3

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Attn:	Mr Rich Fabina	731 Confirmation No	EA89960
From:	Praveen Rao	Date:	6 th August 1998

EMC Ref:	M80449 fcc letter	Total Pages:	7
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Subject:	Reply to additional information requested
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FCC ID : HNL-WREXT**731 Confirmation Number : EA 89960. Also emailed to rfabina@fcc.gov**

Dear Mr Fabina

*Also, please refer similar details provided for**FCC ID: HNL-WINRADIO fax dated 16-07-98 for FCC Query No. 1861***• ITEM 1 OF YOUR QUERY**

We apologise for making the calculation error of 0.5 dB to show 50.5 dB μ V, as the limit for antenna conduction measurements instead of 50 dB μ V. This was caused by using the HP spectrum analyser to perform the conversion from 2nW to dB μ V.

Since the graphs for conducted Emissions at Antenna port are shown between 30 MHz and 2500 MHz, all results in the foot of the graph are shown in Peak values as read by the Peak detector in Max hold.

In accordance with Section 15.33 and 15.35, Quasi peak (QP) measurements were performed below 1000 MHz and Average measurements above 1000 MHz and the graphs for the respective frequency measurements are now attached.

All our measurements below 1000 MHz are first performed with a Peak detector and each individual peak is selected for Quasi Peak measurement. For frequencies above 1000 MHz Average measurements are performed instead of QP. The results for radiated field strength are plotted to show both Peak and QP or Average levels on the graphs.

A/C FCC CE CISPR EN VCCI IEC MIL STD

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Table 1 : WR1500e (Graph 12 attached)

Frequency MHz	Peak level Measured dBμV	Average Level Measured dBμV	Average Limit dBμV	ΔAv $\pm$ dB
1669.46	50.4	49.6	50.0	-0.4

Table 2 : WR1000e (Graph 14 attached)

Frequency MHz	Peak level Measured dBμV	Quasi Peak Level Measured dBμV	Quasi Peak Limit dBμV	ΔQP $\pm$ dB
743.69	50.1	49.8	50.0	-0.2

In this case (for antenna port conducted emissions) we inadvertently omitted to show the QP and Average results, when we plotted the graphs. The QP levels and Average levels recorded during the test were actually below the 2nW (50.0dB μ V) limit. (Refer to table 1 and 2 above and graph 12 and 14 attached).

As a result of our error we have performed a thorough evaluation of our Test software, EMI Receiver calibration and the applicable FCC rules, we have found the following pertinent details:

1. The indicated peak detector readout in log mode is 0.5dB higher than when using the peak detector in the linear mode.
2. The QP and Average detectors readout is measured in linear mode, zero span and always reads 0.5dB lower than the peak detector for a CW signal.
3. Our test software plots the (log detector) peak data as a screen dump. **Note that these plotted levels are actually below the 50dB μ V limits as shown on the original plots supplied with the application.** When the test software zooms in to perform the QP and Average measurement, it will update the peak measurement (as originally read in log-mode with wide span). Because the dwell time is longer as it is searching for the worst case peak, the Peak detector may actually record a value higher than the swept scan. (The swept scan is plotted).
4. In accordance with the following note from *Item 5 of Appendix H of ANSI C63.4*,

" Note: These measurements are required only for receivers that are tested for radiated emissions with a terminating resistor instead of an antenna connected to the antenna input terminals. "

Also referring to *section 15.111(a) of the FCC rules* " connection of an external receiving antenna may be tested to demonstrate compliance "

We therefore believe that the conducted emissions test at antenna port is exempted if the radiated emissions were performed with a normal antenna connected to the EUT. (which is true in this case)

Summary :

- a) The conducted emissions at the antenna port are below the 2nW (50dB μ V) limit by 0.4 dB and 0.2dB respectively. Refer to attached graphs which now shows Quasi Peak and Average levels.
- b) FCC Rules Part 15.111(a) (and ANSI C63.4 Appendix H) call this test as optional if the radiated field strength measurements pass with the antenna connected. The submitted test data shows compliance with radiated EMI.
- c) We apologise for the error in the nW to dB μ V conversion and for the omission of the QP and Average recorded levels.

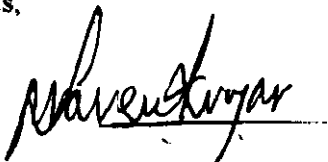
- **ITEM 2 OF YOUR QUERY :** A copy of the DOC and a letter of assurance to include the DOC in the user's manual.

Please refer to the following two pages of information. DOC and Letter of assurance.

I hope, the information provided will assist you in proceeding with the assessment of the applications.

If you need further details, please do not hesitate to contact me.

Regards,



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FCC Class B

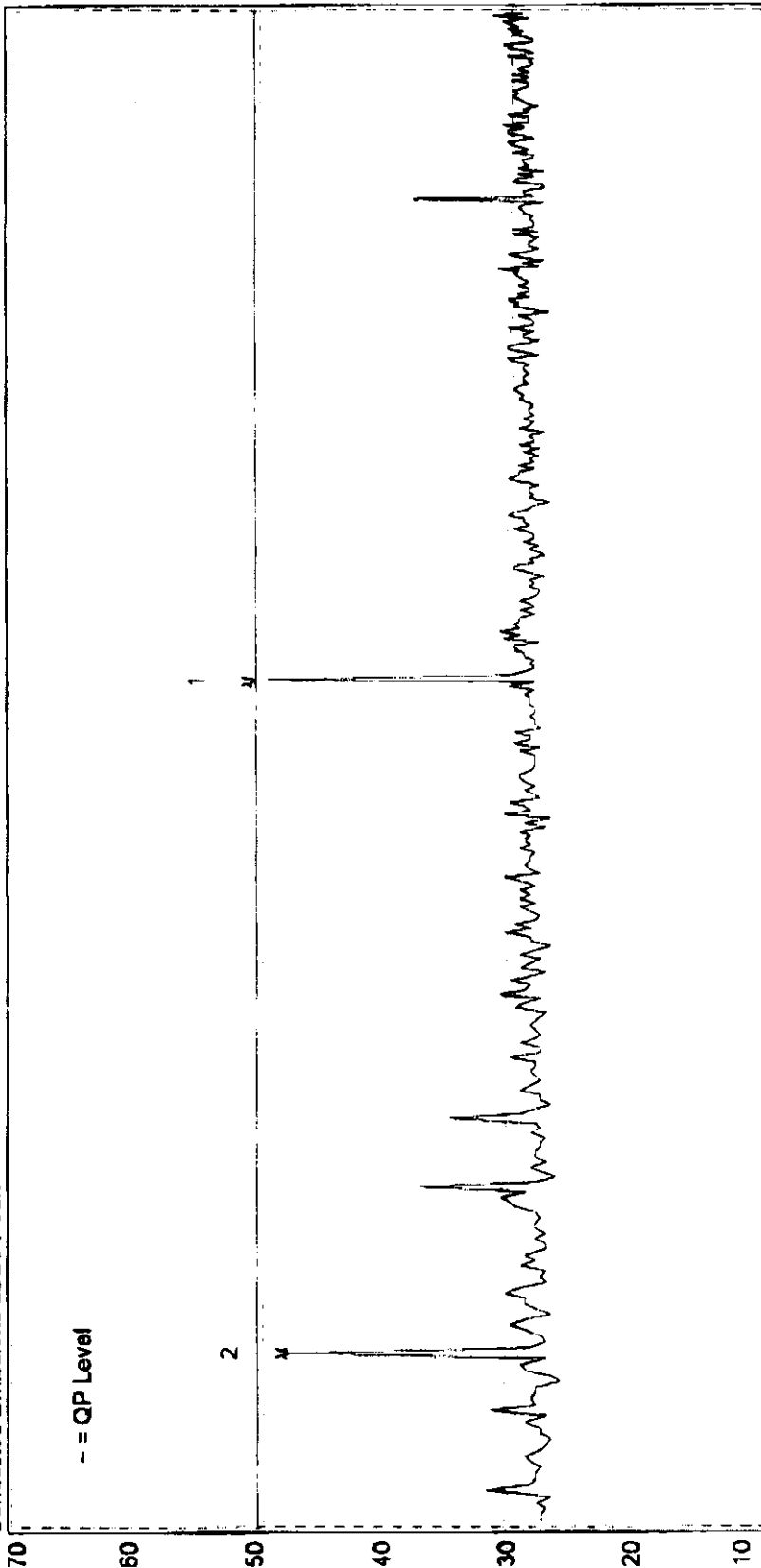
Project No: M80446

Conducted Emissions dBuV Peak

Test Date: 6-05-98

c:\pc\Ncc\46_12.PCF

GRAPH No. 12



No	Freq (MHz)	Peak (dBuV)	Op Val (dBuV)	dL1 (dB)	Av Val (dBuV)	FCRX-AE dL2 (dB)
1	150.0	46.50	46.50	49.6	49.6	50.5
2	1112.96	47.8	47.8	47.2	47.2	50.5

Re-plotted the graph from 1000 mHz to show average values.

Limits not change

Average Values.

Legend

Equipment: HP8548A TST97F
Transducers: N
Site ID: M80446
Test Cell: Emission Room

Equipment: HP8548A TST97F
Transducers: N
Site ID: M80446
Test Cell: Emission Room

ROBOTRON
CONDUCTED EMISSIONS ANTENNA PORT
WINRADIO WR1500e TUNED TO 150 KHz

The limits are not changed 50dBuV

SHOULD READ

Legend

FCRX-AE FCC antenna terminal limits 2 nW

As PORT50 Ohms

Equipment: HP8548A TST97F
Transducers: N
Site ID: M80446
Test Cell: Emission Room

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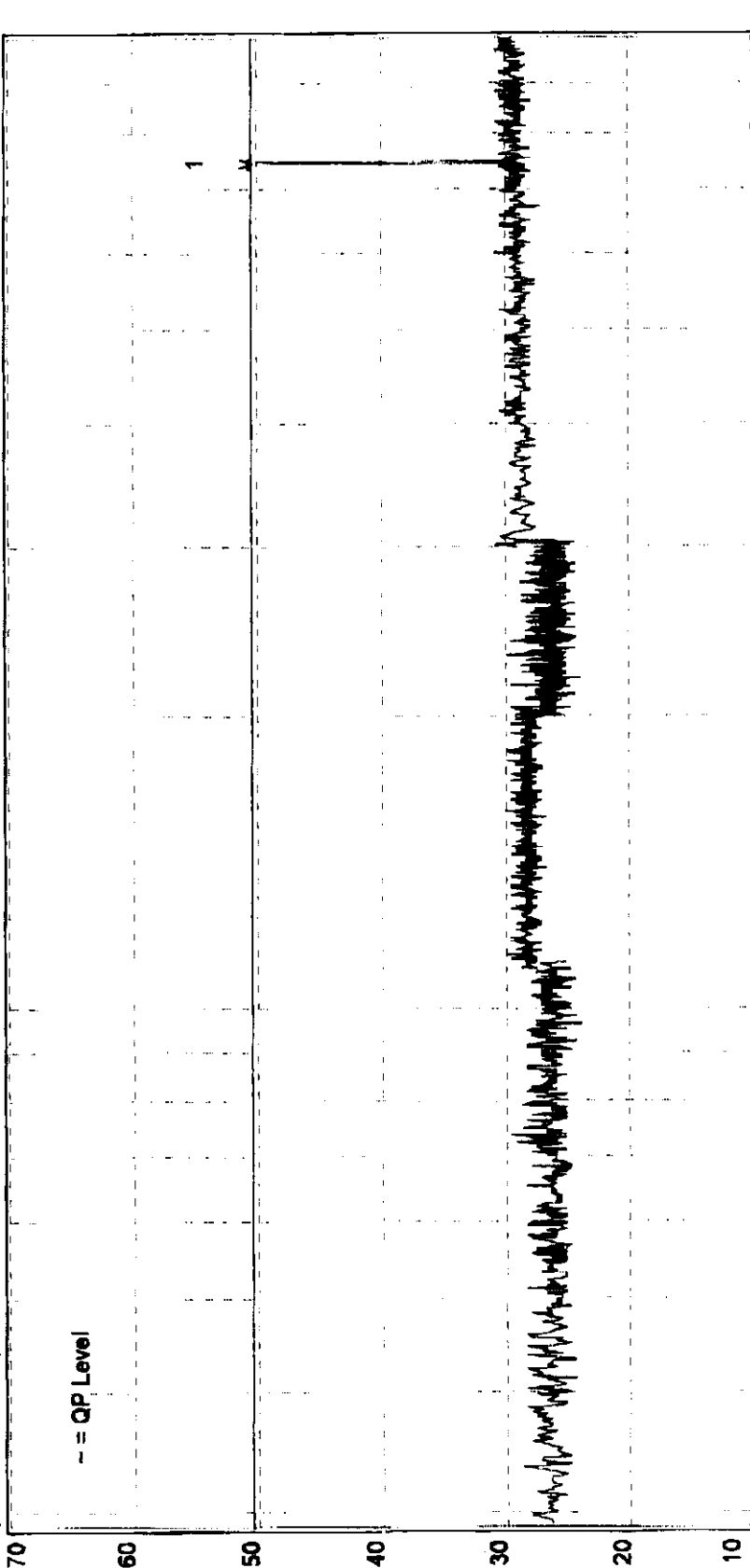
Project No: M80449

c:\pcfiles\cc49_14.pcf

FCC Class B

Test Date: 6-05-98

GRAPH No. 14



29 100 1000

ROBOTRON
CONDUCTED EMISSIONS ANTENNA PORT
WINRADIO WR1000e TUNED TO 1300 MHz
The limits are not changed 50 dBuV SHOULD READ

Legend:
--- Ae PORT50 Ohms

Equipment: HP8546A TSD7F
Transducers: N
Site ID: M80449
Test Cell: Emission Room

Source: C:\M80449 84 85 86 89

Malbourne 57 Assembly Drv Tullamarine 3043 Vic Australia Ph+(613) 8336 3333 Fax+(613) 9338 9280
Sydney 16.6 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9888 4588 Fax+(612) 9838 4019

Peaks:

No	Freq (MHz)	Peak (dBuV)	Qp Val (dBuV)	FOCRX-AE (dBuV)	dL1 (dB)	AV Val (dBuV)	dL2 (dB)
1	743.88	50.1	49.6	50.5	-7		

↑ limits not changed
↑ Quasi Peak Values.

Re-plotted The Same Graph upto 1000 MHz to show AP values.



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**EMI TEST REPORT
for
CERTIFICATION
to
FCC PART 15.101 SCANNING RECEIVER**

FCC ID: HNL-WREXT

Manufacturer: Robotron Pty. Ltd.

Test Sample: WiNRADIO

Model: WR1000e and WR1500e

Report Number: M80449F-R

Date: 25th May 1998

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**EMI TEST REPORT FOR
CERTIFICATION
TO
FCC PART 15.101 Scanning Receiver**

FCC ID: HNL-WREXT

**CERTIFICATION of COMPLIANCE with FCC PART 15 REGULATIONS.
EMC Technologies Report Number: M80449F-R
Date: 25th May 1998**

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- 1. SUMMARY OF TEST RESULTS**
- 2. GENERAL INFORMATION**
- 3. CONDUCTED EMI MEASUREMENTS**
- 4. ANTENNA PORT CONDUCTION MEASUREMENTS**
- 5. RADIATED EMI MEASUREMENTS**
- 6. CONCLUSION**

APPENDIX A. INSTRUMENTATION CALIBRATION DETAILS

APPENDIX B1. to B12. TEST SAMPLE PHOTOGRAPHS

APPENDIX C1. AND C2. GRAPHS OF EMI MEASUREMENTS

APPENDIX D. LABELLING – DRAWING AND LOCATION

APPENDIX E. USER INSTRUCTION

APPENDIX F. MOBILE TELEPHONE BAND EXCLUSION

APPENDIX G. LOCAL OSCILLATOR FREQUENCIES

APPENDIX H. TEST SAMPLE CIRCUIT COMPONENT LISTING

APPENDIX I. TEST SAMPLE CIRCUIT ASSEMBLY DIAGRAMS

**EMI TEST REPORT FOR CERTIFICATION
TO
FCC PART 15.101 Scanning Receiver**

Report Number: M80449F-R

Test Sample: WiNRADIO
Model: WR1000e AND WR1500e

FCC ID: HNL-WREXT

Manufacturer: Robotron Pty. Ltd.
222 St. Kilda Road
St. Kilda 3182 Australia

Phone: +613 9525 5300
Fax: +613 9525 3560

Contact: Milan Hudecek
Managing Director

Equipment Type: Unintentional radiator, Scanning Radio Receiver

Test Standards: FCC Part 15 Section 101, Receivers.
ANSI C63.4-1992
OET Bulletin No. 63, October 1993

Tested for: Robotron Pty. Ltd.

Test Date/s: 22nd April to 18th May 1998

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 15.101 REQUIREMENTS
on the
WINRADIO 1000e and 1500e SCANNING RECEIVER

1.0 SUMMARY of RESULTS.

This report details the results of EMI tests and measurements performed on **WINRADIO 1000e and 1500e Scanning Receiver** in accordance with the Federal Communications Commission (FCC) regulations as detailed in **Title 47 CFR, Part 15 Rules for Scanning receivers**. WR1000e is the basic model and the WR1500e is a modified version. The differences in the models, test results and photographs of both models are detailed in this report. The EUTs complied with the requirements.

FCC Pt 15.109(a) Radiated EMI class B limits : Complied, margin of 0.3 dB
FCC Pt 15.107(a) Conducted EMI class B limits: Complied, margin of 2.6 dB
FCC Pt 15.33(b)(3) Radiated EMI Harmonics : Complied, margin of 1.1 dB
FCC Pt 15.111(a) Conducted EMI Antenna Port: Complied, margin of 0.1 dB

The WR1000e (external device) is an equivalent model of WR1000i (internal device) which has been FCC certified. FCC ID : HNL-WINRADIO.

The WR1500e model is an extended version of WR1000e. Both models were tested individually and the results are presented in this report.

The measurement procedure used was in accordance with ANSI C63.4-1992, and OET Bulletin No. 63. The instrumentation conformed to the requirements of ANSI C63.2-1987.

2.0 GENERAL INFORMATION

2.1 General Description of Test Setup

Test Sample: WINRADIO SCANNING RECEIVER
Model: WR1000e and WR1500e
FCC ID: HNL-WREXT

Equipment Type: Unintentional Radiator, Scanning Receiver

Cables Connected: Serial Interface, PCMCIA interface with the card installed in HP Vectra PC, Data Encryptor, headphones/speaker, antenna port and power cable.
(All standard cables supplied with the kit)

The whole system including the PCMCIA is certified through DOC route as a Computr peripheral.

Modifications of Test Sample

The modifications that were performed by the client, Mr Peter Neisbet prior to the tests are listed under Appendix I.

Support Equipment

Host PC:	HP Vectra XM 5/100	Keyboard:	IBM 82G2383
Model:	Series 3	Model:	M
Serial No.	FR53950387	Serial No.	P82G2383
FCC ID:	B94VECTRAXM5	FCC ID:	IYL60G3571
Monitor:	LYMIC MPRII	Mouse:	IBM
Model:	BMC-14SV4	Model:	06H4600
Serial No:	700001117	Serial No.:	23-057884
FCC ID:	I8TKY14SV34D	FCC ID:	DZL210429
Printer:	DI Conix		
Model:	150		
Serial:	AB6044883		
FCC ID:	E759WG-RBCN150		

Laptop: Slimnote – 9133TZ Twinhead Model : P79



2.2 Technical Specifications

	WR1000e	WR1500e
Type	Triple Superheterodyne	Triple Superheterodyne
Frequency Range	0.5 – 1300 MHz	0.15 – 1500 MHz
Modes	AM, FM-N, FM-W, SSB/CW	AM, FM-N, FM-W, USB, LSB, CW
Tuning Steps	100Hz (5 Hz BFO)	100Hz (1Hz USB/LSB/CW)
IF Shift	-	± 2 kHz
Audio Output	200mW into 8 Ohm load	200mW into 8 Ohm load
Antenna	50 Ohm BNC	50 Ohm BNC
PCBs	WA0201 Receiver Card WA0304 External Backplane	WA0201 Receiver Card WA0102 Crystal Switch WA0107 BFO Card WA0304 External Backplane

Power Supply : UniV Power SA-121A6F-11, 12VDC 1.6 Amps.

Microprocessor : MC68HC805 (Masked Programmed)

The Crystal Frequencies and local Oscillator frequency chart is listed in **Appendix G**

2.3 Test Sample Functional Description

WiNRADIO is a triple conversion superheterodyne receiver, with a nominal frequency range of 500kHz to 1300 MHz for WR1000e and 150 kHz to 1500 MHz for WR1500e.

The incoming signal is converted in a wideband mixer to an IF which may be at 58, 249 or 556 MHz, depending on the received frequency. A second mixer converts this down to 58 MHz, where the signal path splits between narrowband for AM, FM-N, SSB and CW; and wideband for FM-W.

After filtering, the narrowband signal is converted to 455 kHz by a crystal controlled mixer and passed either to the FM-N IF strip where it is limited and demodulated or a linear IF amplifier followed by either a diode detector (for AM) or product detector for SSB and CW. Further filtering is applied to AM, SSB and CW signals.

In the wideband mode, the signal is converted to 10.7 MHz, filtered and passed to the FM-W IF amplifier which also performs limiting and demodulation. After selection by a CMOS switch, the audio signal is amplified and passed to the audio jack via the backplane.

The main PLL is locked to a 12.8 MHz crystal reference and generates a frequency within the range of 550 to 943 MHz, depending on the specific receiver module. The 12.8 MHz reference is also fed to a frequency multiplier to produce either 307 or 614 MHz depending on the receiver frequency.

Power switching and control is performed by passive logic on the receiver card, which drives high current PNP switches. The receiver card is contained in a shielded case using a copper plated steel enclosure, covered with a tight fitting copper plated steel lid. A small brass shield covers the VCO on the underside of the PCB.

The receiver card, inside its shielding box plugs onto the backplane. To avoid groundloops and minimise radiation, all connections to the backplane are made through a single connector, with all pins filtered by RC or LC networks. The antenna-input connection is made separately through a coaxial cable with the outer shield bonded to the shield bonded to the shielding box at the point of entry.

Different backplanes are used for the internal and external versions although both are adoptions of the same basic design. The backplanes utilise a small microcontroller, which provides the necessary interfacing and signal conditioning to the PC bus in the internal units and the RS-232 and PCMCIA connectors in the external units. A small amount of additional logic provides address decoding in the internal units.

Additional cards are fitted to enhance various aspects of the receiver performance and are listed above under technical specification section 2.2.

The external units are powered from a small mains operated plugpack, in conjunction with a low-noise square wave oscillator on the backplane to provide the necessary negative supply. The system is completed with special software designed to run on windows, which provides a flexible and intuitive interface for the user.

The receivers are masked for the frequency bands allocated to the Domestic Public Cellular Radio Telecommunications Service in accordance with Section 15.121 of the FCC rules. *Refer APPENDIX F for description of masking method.*

2.4 Test Sample operating Conditions during the tests

The device can be controlled in one of the two possible modes, serial RS-232 via a PC or through an optional PCMCIA interface card installed in a PC/Laptop. The PCMCIA card is customised and sold as an optional interface with the kit. The operation of the device is exactly identical for both interfaces. Both interfaces were investigated and the worst case PCMCIA method was used for all tests. The serial cable was connected to the system during the tests.

The EUTs were tested in accordance with section 15.31(m) of the FCC rules for a frequency range more than 10 MHz. The top, middle and the bottom frequencies of the operating range were individually set for every test.

2.5 Test Procedure

Emission measurements were performed in accordance with the procedures of ANSI C63.4-1992. Radiated emission tests were performed at an EUT distance of 3 metres. OET Bulletin 63 dated October 1993 was used for reference.

2.6 Test Facility

- **FCC Registration**

Radiated Emission measurements were performed at EMC Technologies open area test site (OATS) situated near the town of Glenlyon, Victoria, Australia.

The above site has been fully described in a report submitted to the FCC office, and accepted in a letter dated September 24, 1996 FCC file reference **31040/SIT 1300F2**.

- **NATA Accreditation**

EMC Technologies is accredited to test to the following standards by the National Association of Testing Authorities (NATA).

- **CISPR 22, CISPR 11, CISPR 14, CISPR 15, EN50081-1 and MIL-STD-285.**

Accreditation pending for **CISPR 12,13,20 and MIL-STD 461/2**

NATA is the Australian national laboratory accreditation agency operating to the IEC25/ISO25 requirements. A major requirement for accreditation is the peer assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Laboratory (NML), an internal quality system equivalent to ISO 9002, participation in regular proficiency tests and regular audit of Quality system and test facilities per IEC/ISO 25. **NATA has a Mutual recognition agreement (MRA) with NVLAP and A2LA.**

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.

3.0 CONDUCTED EMISSION MEASUREMENTS: MAINS SUPPLY

3.1 Test Procedure

The arrangement specified in ANSI C63.4-1992 was adhered to for the conducted EMI measurements. The EUT was placed in the RF screened enclosure and a CISPR EMI Receiver as defined in ANSI C63.2-1987 was used to perform the measurements.

The EMI Receiver was operated under program control using the Max-Hold function and automatic frequency scanning, measurement and data logging techniques. The specified 0.45 MHz to 30 MHz frequency range was sub-divided into sub-ranges to ensure that all short duration peaks were captured.

3.2 Peak Maximising Procedure

The various operating modes of the system were investigated as described in section 2.4 of this report. For each of the sub-ranges, the EMI receiver was set to continuous scan with the Peak detector set to Max-Hold mode. The Quasi-Peak detector was then invoked to measure the actual Quasi-Peak level of the most significant peaks which were detected.

3.3 Calculation of Voltage Levels

The voltage levels were automatically measured in software and compared to the test limit. The method of calculation was as follows:

$$V_{EMI} = V_{Rx} + L_{BPF}$$

Where:

- V_{EMI} = the Measured EMI voltage in dB μ V to be compared to the limit.
- V_{Rx} = the Voltage in dB μ V read directly at the EMI receiver.
- L_{BPF} = The insertion loss in dB of the cables and the Limiter and Pass Filter.

3.4 Plotting of Conducted Emission Measurement Data

The measurement data pertaining to each frequency sub-range were then concatenated to form a single graph of (peak) amplitude versus frequency. This was performed for both Active and Neutral lines and the composite graph was subsequently plotted. A list of the highest relevant peaks and the respective Quasi-Peak values were also plotted on the graph.

3.5 Measurement Data-Conducted Emissions

Table I
Summary of Conducted Emissions Measurement Data

WR1000e

Frequency MHz	Line	Rx Level dB μ V	Limit DB μ V	Result $\pm$ dB
0.54	Active	45.1	48.0	-2.9
0.56	Active	44.8	48.0	-3.2
0.71	Active	42.4	48.0	-5.6
6.73	Neutral	41.6	48.0	-6.4
6.66	Neutral	41.6	48.0	-6.4

Refer to graphs 7 and 8 in Appendix C1 for plots of the conducted EMI measurements.
The measurement uncertainty was 2.0 dB.

WR1500e

Frequency MHz	Line	Rx Level dB μ V	Limit DB μ V	Result $\pm$ dB
0.55	Active	45.4	48.0	-2.6
0.55	Neutral	43.9	48.0	-4.1
1.29	Active	43.8	48.0	-4.2
0.73	Active	43.5	48.0	-4.5
2.58	Active	43.1	48.0	-4.9

Refer to graphs 7 and 8 in Appendix C2 for plots of the conducted EMI measurements.
The measurement uncertainty was 2.0 dB.

3.6 Results of Conducted Emission Measurement

All modes of the EUTs and all 3 frequencies of the receivers were investigated as per section 2.4 of this report and worst case recorded. The highest conducted emission level was 45.4 dB μ V at 0.55 MHz (refer to graph 7 in Appendix C2). The EUT complied with the FCC Part 15 Class B limits with a worst case margin of 2.6 dB.

WR1000e : Refer APPENDIX C1

Graph 7: Active Line, 0.45 to 30 MHz.

Graph 8: Neutral Line, 0.45 to 30 MHz.

WR1500e : Refer APPENDIX C2

Graph 7: Active Line, 0.45 to 30 MHz.

Graph 8: Neutral Line, 0.45 to 30 MHz.

4.0 ANTENNA POWER CONDUCTION MEASUREMENTS

4.1 Test Procedure

Conducted Emissions tests were performed at the Antenna port of the receivers in accordance with FCC rules Part 15.111(a). The output of the Antenna port (50 Ohms BNC connector) was connected via a co axial cable to the spectrum analyser through a 50 Ohms termination on a T piece and measurements recorded for three different tuned frequencies of the receivers as per section 15.31(m). The measurements were made between the frequency range 30 MHz to 2000 MHz..

4.2 Test Results

The WR 1000e and WR 1500e receivers complied with the 2 nW limits for Antenna Power Conduction tests.

The 2nW power limits are converted to dBμV for 50 Ohms shown on graphs.

The worst case results are shown in the table below.

Table II

Summary of Results for WR 1000e

EUT	Frequency MHz	Measured Peak Level dBμV	Limit(2nW) =dBμV	Result ±dB
WR 1000e	743.69	50.1	50.5	-0.4
	1670.46	49.3	50.5	-1.2
	708.11	48.6	50.5	-1.9
	1487.36	44.3	50.5	-6.2

Summary of Results for WR 1500e

EUT	Frequency MHz	Measured Peak Level dBμV	Limit(2nW) =dBμV	Result ±dB
WR 1500e	1669.46	50.4	50.5	-0.1
	943.66	48.3	50.5	-2.2
	1112.96	47.8	50.5	-2.7
	1616.15	47.2	50.5	-3.3

The results are plotted on graphs 12 through 14 in Appendix C1 for WR 1000e and Appendix C2 for WR 1500e .

5.0 RADIATED EMISSION MEASUREMENTS

5.1 Test Procedure 30-1000 MHz

Measurements are reported in units of dB relative to one microvolt per metre (dB μ V/m) at a distance of 3 metres from the EUT.

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 30 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 polarity.

The tests were performed with the receiver tuned to three different frequencies(Band edges and middle band frequencies). All three test results are reported.

5.2 Test Procedure 1000 - 2000 MHz

An EMCO 3115 Dual ridged guide horn antenna (1-18GHz) and a mini-circuit ZHL-42 preamplifier (0.7 - 4.2 GHz @ 30 dB gain) were used in conjunction with a HP8593E spectrum analyser (9 kHz - 22 GHz) to perform these measurements. Each of the harmonics between 1000 MHz and 2000 MHz were measured individually, for all three band frequencies in both vertical and horizontal polarisation. The EUT was rotated through 360° and the antenna height was varied from 1 metre to 4 metres to maximise the measured level. The results are shown on graphs 9 through 11 in APPENDIX C1 for WR1000e and APPENDIX C2 for WR1500e.

5.3 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 30-1000 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 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.

5.4 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:

$$E = V + AF - G + L$$

Where:

- E** = Radiated Field Strength in dB μ V/m.
- V** = EMI Receiver Voltage in dB μ V. (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 dB μ V 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:

$$34.0 + 9.2 + 1.9 - 20 = 25.1 \text{ dB}\mu\text{V/m}$$

5.5 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.

5.6 Radiated Field Strength Measurement Results

The receivers were tuned to three frequencies as per section 15.31(m) and results obtained for the frequency range 30 MHz to 2000 MHz. Most of the emissions measured were due to the Support PC. Special emphasis was given to identifying the Local Oscillator frequencies of the receivers and their harmonics.

Result: The highest radiated emission for WR 1000e was 2.5 dB below the limit at 300.69 MHz (Refer graph 6 in Appendix C1) and for WR1500e was 0.3 dB below the limit at 691.23 MHz (Refer graph 2 in Appensix C2).

Graphs Matrix

EUT Tuned to		Vertical Polarisation MHz		Horizontal Polarisation MHz	
		30-1000	1000-2000	30-1000	1000-2000
WR1000e Appendix C1	500 kHz	Graph 1	Graph 9-red trace	Graph 2	Graph 9-blue trace
	650 MHz	Graph 3	Graph 10- red trace	Graph 4	Graph 10-blue trace
	1300 MHz	Graph 5	Graph 11-red trace	Graph 6	Graph 11-blue trace
WR1500e Appendix C2	150 kHz	Graph 1	Graph 9-red trace	Graph 2	Graph 9-blue trace
	750 MHz	Graph 3	Graph 10- red trace	Graph 4	Graph 10-blue trace
	1500 MHz	Graph 5	Graph 11-red trace	Graph 6	Graph 11-blue trace

Highest Worst Case Emissions of the whole system are listed in the Table below

Table III

Summary of Results for WR 1000e

WR 1000e	Frequency MHz	Rx Level dBμV/m	Limit @ 3m DBμV/m	Result $\pm$dB
Horizontal Polarity	300.69	43.5	46.0	-2.5
Horizontal Polarity	329.32	43.0	46.0	-3.0
Vertical Polarity	1670.48	50.3	54.0	-3.7
Vertical Polarity	497.68	41.8	46.0	-4.2

Note : The measured harmonic levels above 1GHz are Peak values

Summary of Results for WR 1500e

WR 1500e	Frequency MHz	Rx Level dBμV/m	Limit @ 3m DBμV/m	Result $\pm$dB
Horizontal Polarity	691.23	45.7	46.0	-0.3
Vertical Polarity	1112.96	52.9	54.0	-1.1
Vertical Polarity	272.05	44.0	46.0	-2.0
Horizontal Polarity	614.39	43.7	46.0	-2.3

Note : The measured harmonic levels above 1GHz are Peak values

6.0 CONCLUSION

The WR 1000e and WR 1500e receivers (FCC ID: HNL-WREXT), complied with the requirements of the FCC Parts 2 and 15 Rules for Unintentional radiators : scanning receivers The results were as follows:

FCC Pt 15.109(a) Radiated EMI class B limits : Complied, margin of 0.3 dB
FCC Pt 15.107(a) Conducted EMI class B limits: Complied, margin of 2.6 dB
FCC Pt 15.33(b)(3) Radiated EMI Harmonics : Complied, margin of 1.1 dB
FCC Pt 15.111(a) Conducted EMI Antenna Port: Complied, margin of 0.1 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	21/11/97	21/11/98	1 YEAR *2
SPECTRUM ANAL	HP8593EM Sn. 3412A00105	05/02/98	05/02/99	1 YEAR *4
LISN:	EMCO 3825/2 Sn. 1967	01/10/96	01/10/99	3 YEARS *1
ANTENNAS	EMCO 3109 BICONICAL 20 - 300MHz Sn. 2660	30/09/97	30/09/98	1 YEAR *3
	EMCO 3146A LOG PERIODIC 300 -1000MHz Sn. 1205	30/09/97	30/09/98	1 YEAR *3
	EMCO 3115 HORN 1-18GHz Sn. 3282	14/10/97	14/10/98	1 YEAR *3
RF PRE-AMPLIFIER	MINI CIRCUITS 1-4GHz Model No. ZHL-42 Sn. 0831901	03/12/97	03/12/98	1 YEAR *3

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			Not required
Open Area Test Site	Melbourne 3/10 Metre site. 1-4 metre antenna mast. 1.2 metre/400 kG Turntable. (Situated at Glenlyon, near Daylesford, Victoria)	25-07-97	25-07-98	1 Year

APPENDIX C1

GRAPHS OF EMI MEASUREMENTS WR1000e

RADIATED EMI : 30 MHz to 1000 MHz

Graph 1:	Vertical polarisation	Tuned to 500 kHz
Graph 2:	Horizontal Polarisation	Tuned to 500 kHz
Graph 3:	Vertical polarisation	Tuned to 650 MHz
Graph 4:	Horizontal Polarisation	Tuned to 650 MHz
Graph 5:	Vertical polarisation	Tuned to 1300 MHz
Graph 6:	Horizontal Polarisation	Tuned to 1300 MHz

CONDUCTED EMI MAINS CABLE : 0.4 MHz to 30 MHz

Graph 7:	Active Line
Graph 8:	Neutral Line

RADIATED EMI : 1000 MHz to 2000 MHz

Graph 9:	Red Trace : Vertical polarisation Blue Trace : Horizontal polarisation	Tuned to 500 kHz
Graph 10:	Red Trace : Vertical polarisation Blue Trace : Horizontal polarisation	Tuned to 650 MHz
Graph 11:	Red Trace : Vertical polarisation Blue Trace : Horizontal polarisation	Tuned to 1300 MHz

CONDUCTED EMI ANTENNA PORT : 30 MHz to 2000 MHz

Graph 12:	Tuned to 500 kHz
Graph 13:	Tuned to 650 MHz
Graph 14:	Tuned to 1300 MHz

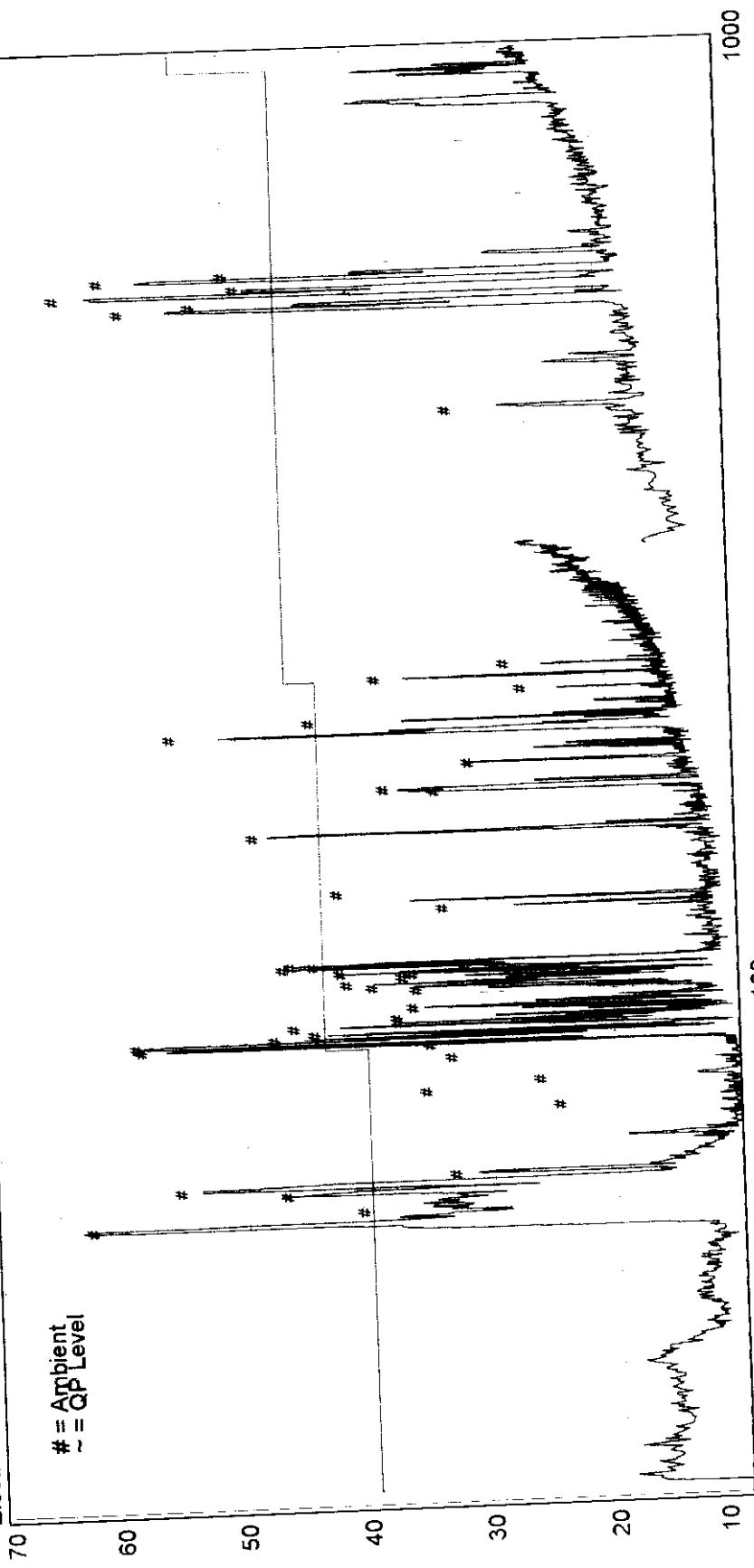
EMC Technologies Pty. Ltd. - Global Product Certification

Project No: M80449

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GRAPH No. 1

Test Date: 19-05-98

Electric Field Strength dBuV/m Peak



ROBOTRON		Peaks:	
No	Freq (MHz)	Peak (dBuV/m)	Qp Val FCC-B3 (dBuV/m)
Limits: FCC-B3		dL1	
FCC PT 15.209 CLASS B RAD 3M LIMITS		Vertical Ambients	
Equipment: HP8546A TST97F		Source: C:\M80449	
Transducers: SITE_CABa1103009 A_13		100101102103105	
Site ID: Glenlyon			
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	

FCC ID: HNL-WREXT

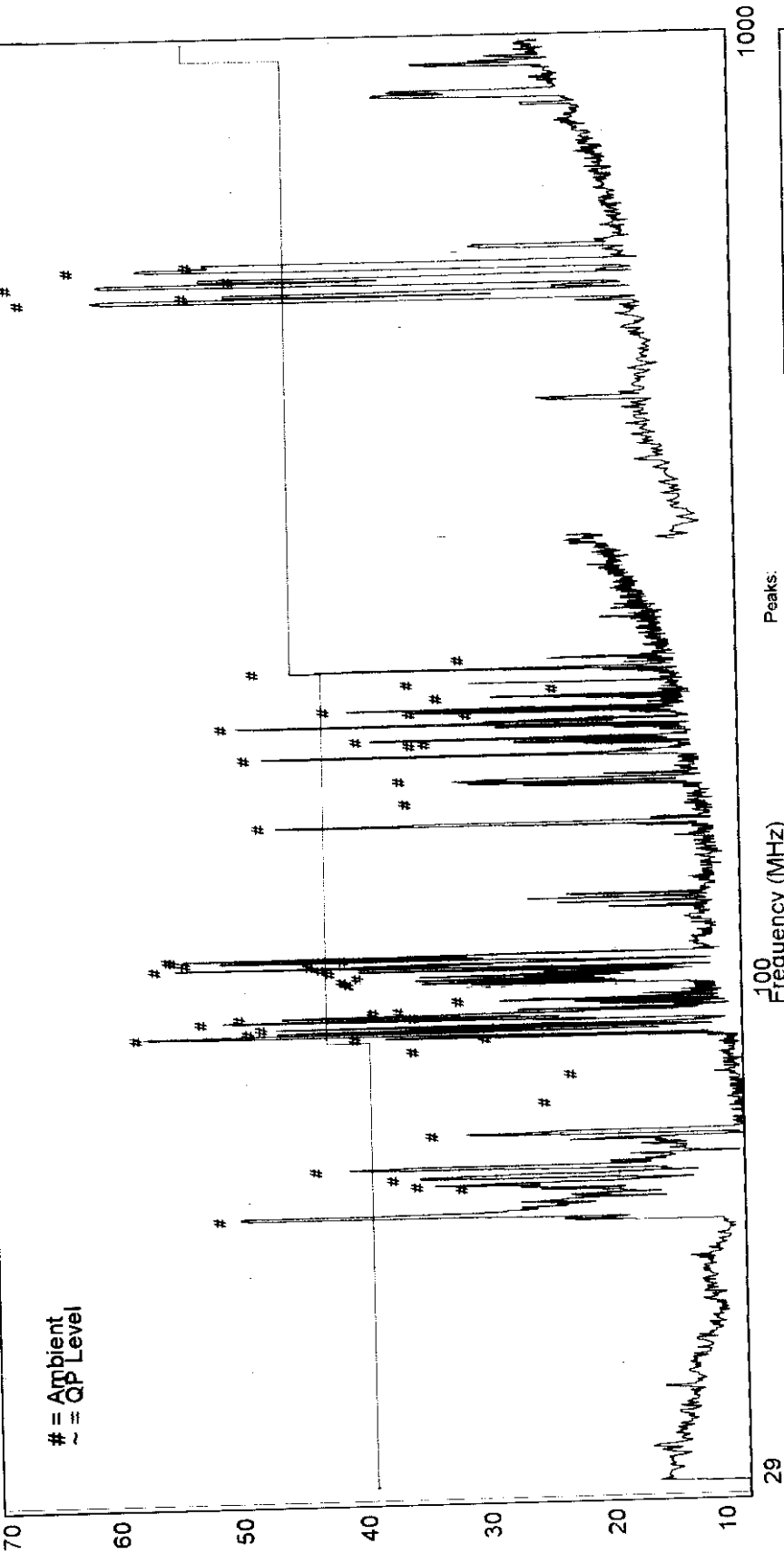
EMC Technologies Pty. Ltd. - Global Product Certification

Project No: M80449

c:\pc\FCC49_2.PCF
GRAPH No. 2

Test Date: 19-05-98

Electric Field Strength dBuV/m Peak



Peaks:

No	Freq (MHz)	Peak (dBuV/m)	Qp Val (dBuV/m)	FCC-B3 (dB)	dL1 (dB)
1	300	45	45	45	45
2	400	45	45	45	45
3	500	45	45	45	45
4	600	45	45	45	45
5	700	45	45	45	45
6	800	45	45	45	45
7	900	45	45	45	45
8	1000	45	45	45	45

ROBOTRON

Limits:	FCC-B3	FCC PT 15.209 CLASS B RAD 3M LIMITS	Legend:	Horizontal Ambients
Equipment:	HP8546A TST97F		Source:	C:\M80449
Transducers:	SITE_CABat103008 A0330C9 A_13			96 97 98 99 104
Site ID:	Glenlyon			
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				

FCC ID: HNL-WREXT

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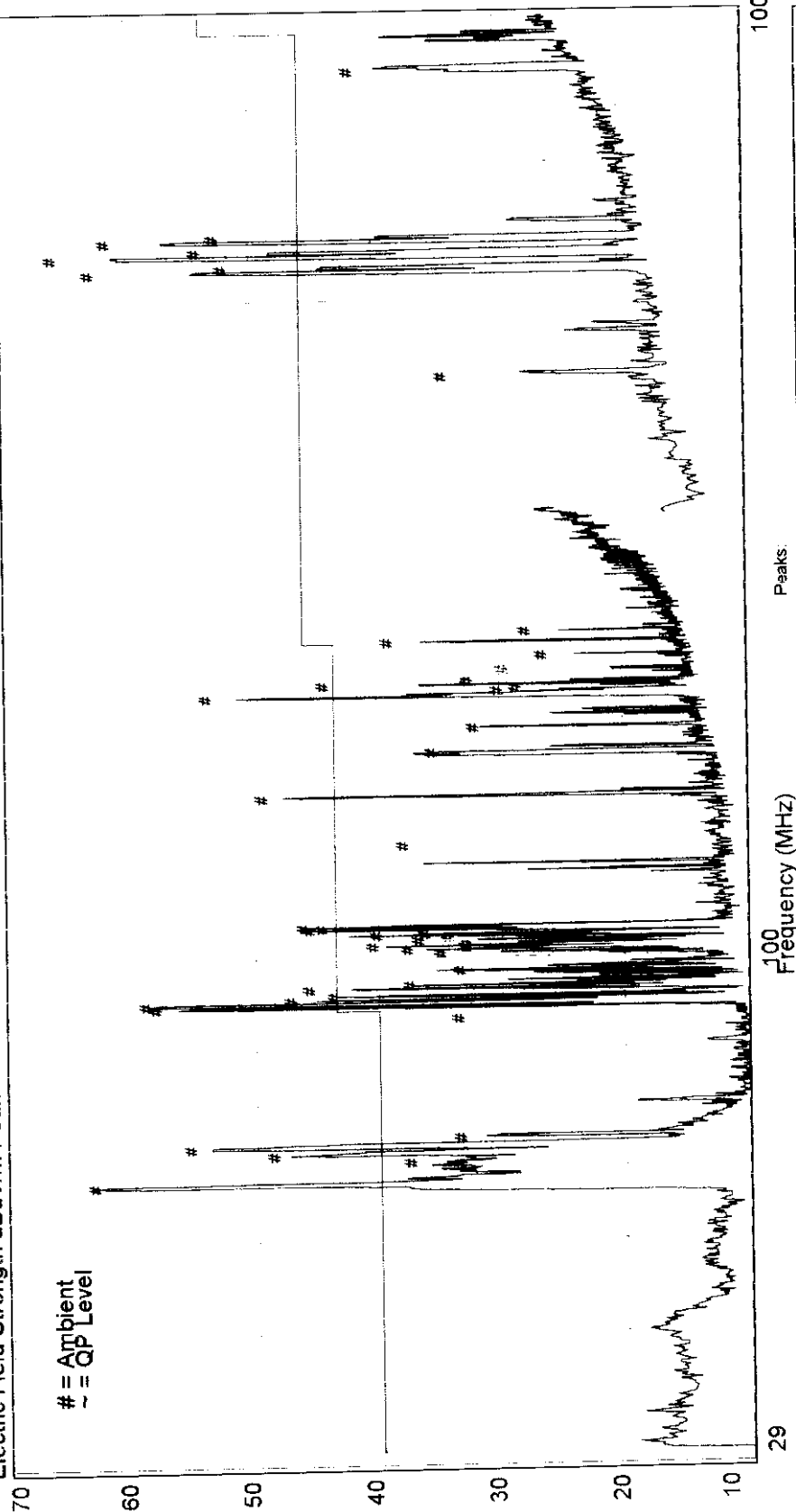
Project No: M80449

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GRAPH No. 3

Test Date: 19-05-98

Electric Field Strength dBuV/m Peak



Peaks:

No	Freq (MHz)	Peak (dBuV/m)	Qp Val (dBuV/m)	FCC-B3 dL1 (dB)
----	------------	---------------	-----------------	-----------------

ROBOTRON

Legend:
_ Vertical Ambients

Limits: FCC-B3 FCC PT 15 209 CLASS B RAD 3M LIMITS

Source: C:\M80449 100101102103105

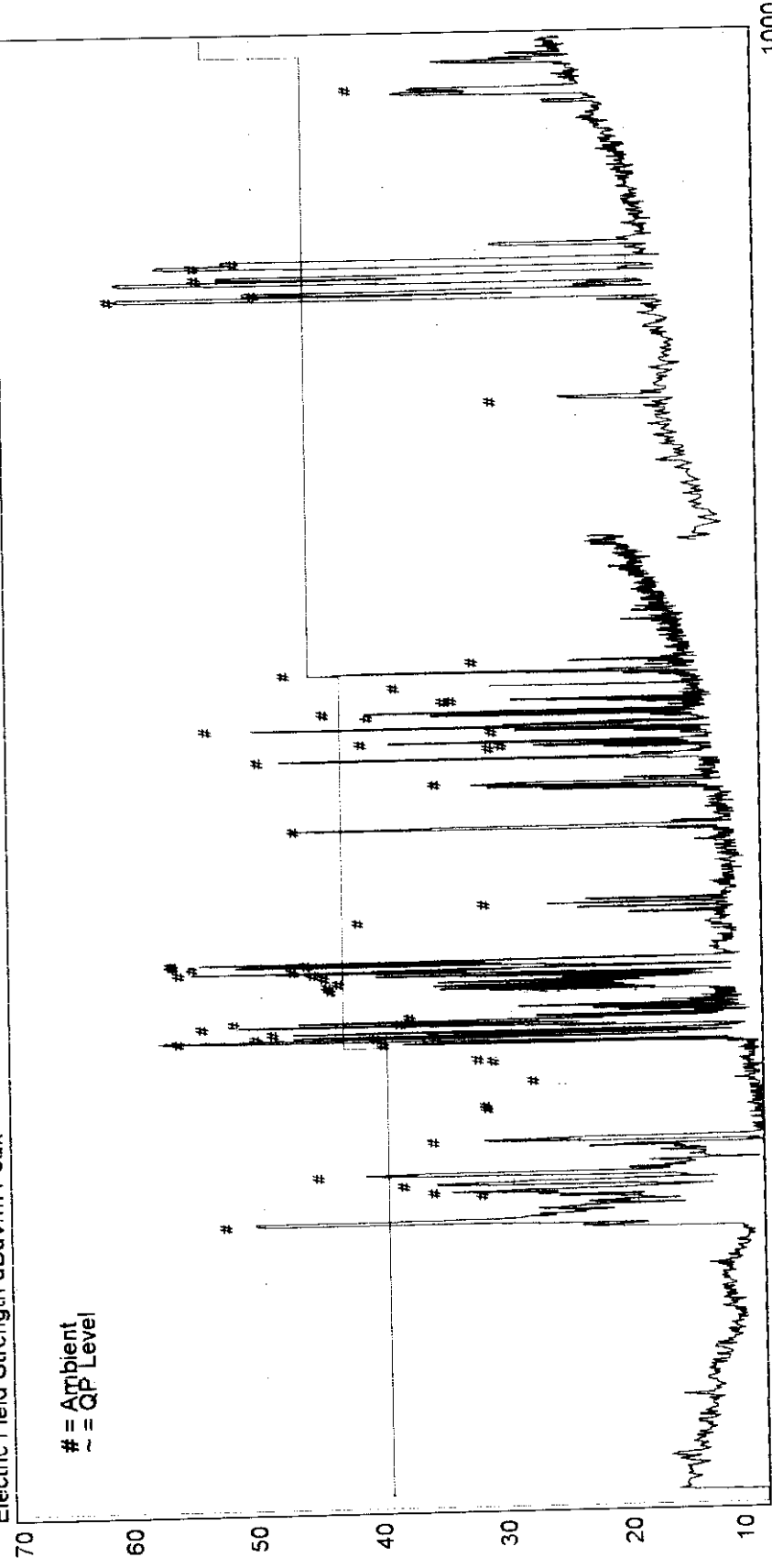
Equipment: HP8546A TS197F
Transducers: SITE_CABa1103009 A0330C9 A_13
Site ID: Glenlyon
Test Officer: Praveen Rao

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 4018

EMC Technologies Pty. Ltd. - Global Product Certification
 FCC Class B
 Electric Field Strength dBuV/m Peak

Project No: M80449
 Test Date: 19-05-98
 GRAPH No. 4

c:\pcf\FCC49_4.PCF



29 100 1000 Frequency (MHz)

ROBOTRON						
No Freq (MHz)	Peak (dBuV/m)	Qp Val (dBuV/m)	FCC-B3	dL1 (dB)		

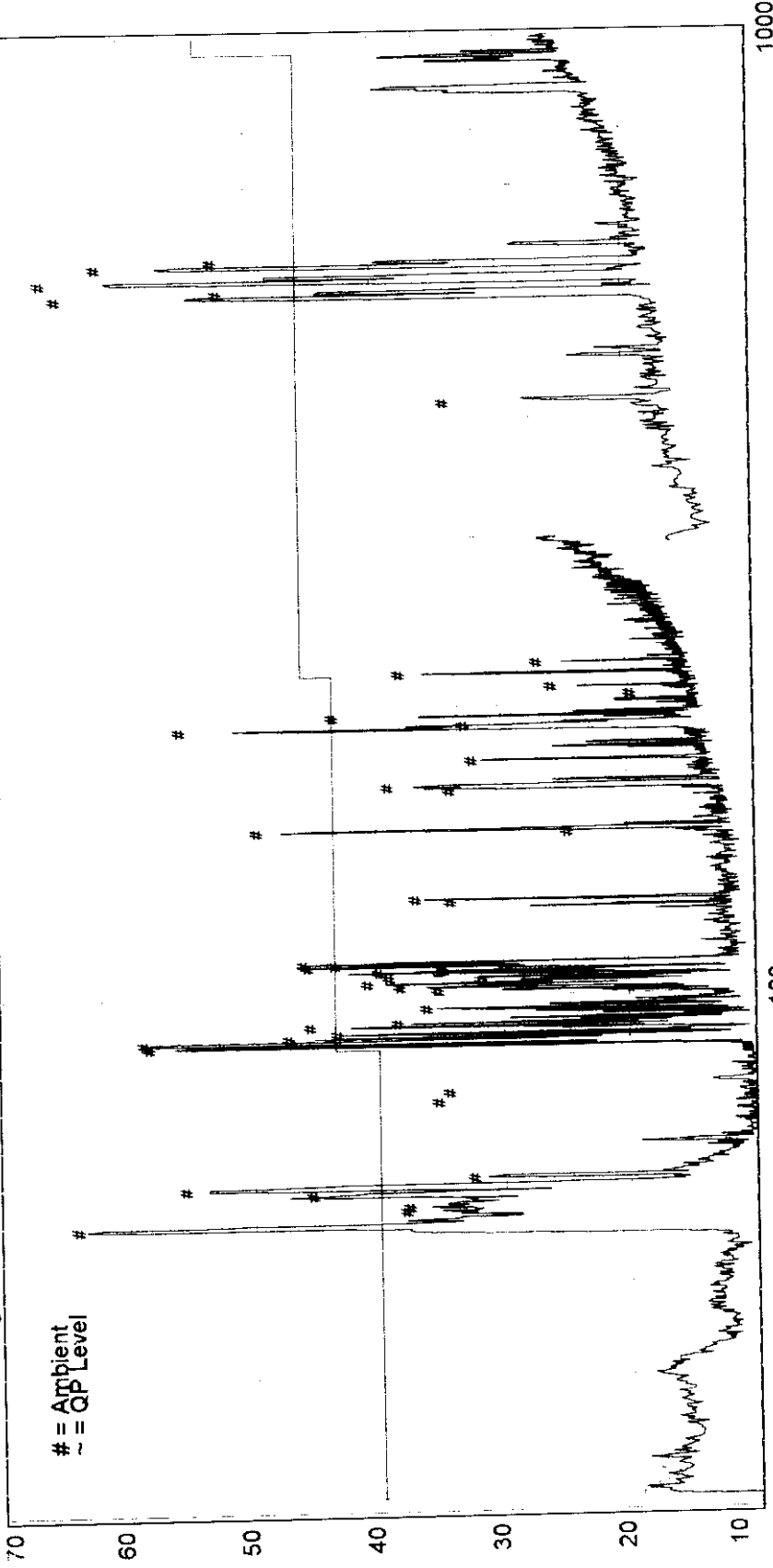
FCC ID: HNL-WREXT

EMC Technologies Pty. Ltd. - Global Product Certification
FCC Class B

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GRAPH No. 5

Test Date: 19-05-98

Electric Field Strength dBuV/m Peak



Peaks:

No Freq (MHz) Peak (dBuV/m) Qp Val FCC-B3 dL1 (dBuV/m) (dB)

ROBOTRON

Legend:
— Vertical Ambients

Limits:
FCC-B3 FCC PT 15 209 CLASS B RAD 3M LIMITS

Source:
C:\M80449 100101102103105

Equipment: HP8546A TST97F
Transducers: SITE_CABa1103008 A330C6 A_13

Site ID: Glenlyon

Test Officer: Praveen Rao

Melbourne- 57 Assembly Drv Tullamarine, 3043, Vic, Australia Ph: (613) 9335 3333 Fax: (613) 9338 9260
Sydney --- 16,6 Glacstone Rd Castle Hill, 2154, NSW, Australia Ph: (612) 9899 4599 Fax: (612) 9899 4018

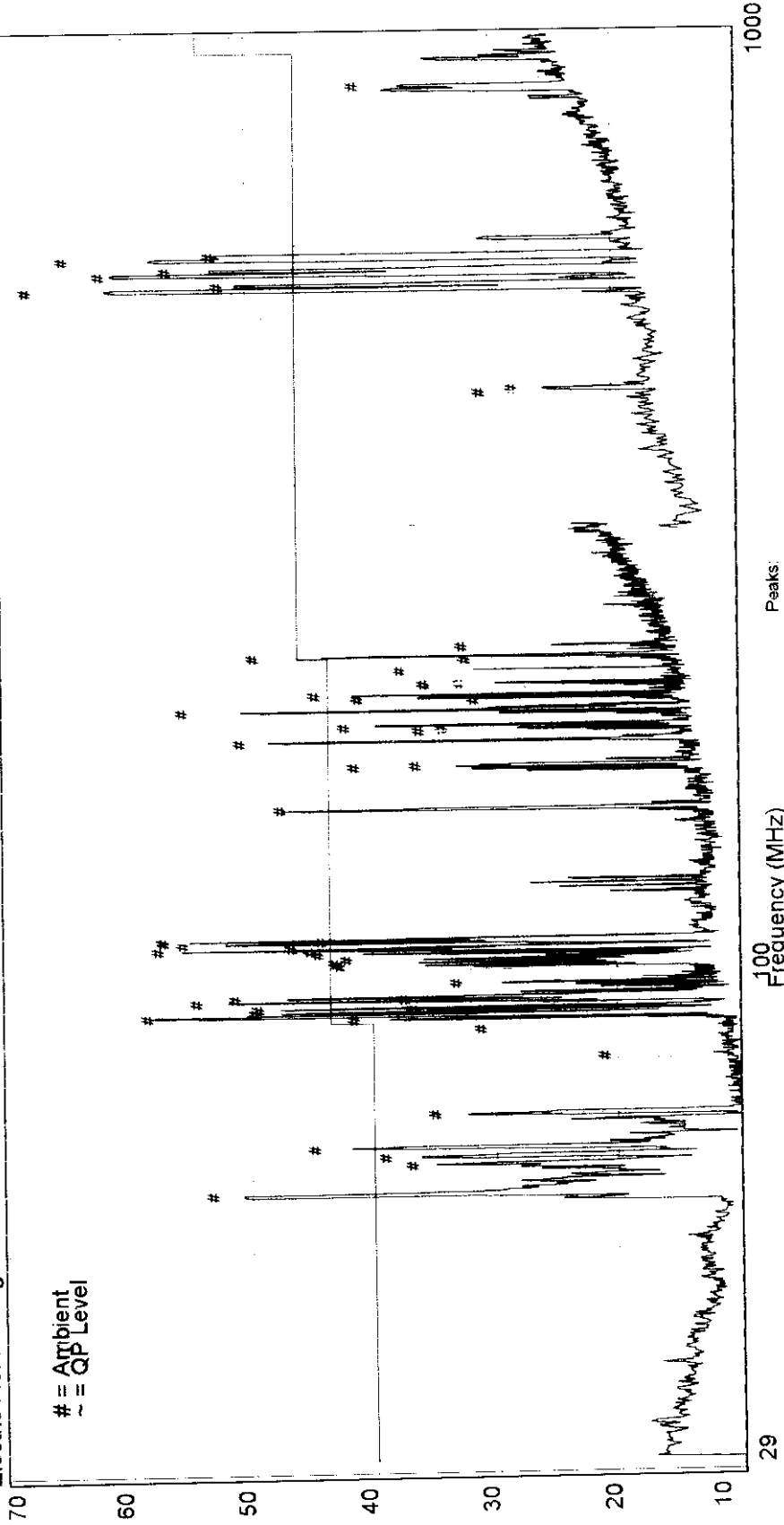
FCC ID: HNL-WREXT.

EMC Technologies Pty. Ltd. - Global Product Certification
FCC Class B
Project No. M80449

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GRAPH No. 6

Test Date: 19-05-98

Electric Field Strength dBuV/m Peak



Peaks:

No	Freq (MHz)	Peak (dBuV/m)	Qp Val (dBuV/m)	FCC-B3 (dB)	dL1 (dB)
1	29.1	45.0	45.0	45.0	45.0
2	29.2	45.0	45.0	45.0	45.0
3	29.3	45.0	45.0	45.0	45.0
4	29.4	45.0	45.0	45.0	45.0
5	29.5	45.0	45.0	45.0	45.0
6	29.6	45.0	45.0	45.0	45.0
7	29.7	45.0	45.0	45.0	45.0
8	29.8	45.0	45.0	45.0	45.0
9	29.9	45.0	45.0	45.0	45.0
10	30.0	45.0	45.0	45.0	45.0

ROBOTRON

Legend:
Horizontal Ambients

Limits:
FCC-B3 FCC PT 15.209 CLASS B RAD 3M LIMITS

Source:
C:\M80449 96 97 98 99 104

Equipment: HP8546A TST97F
Transducers: SITE_CABa1103008 A0330C9 A_13
Site ID: Glenlyon
Test Officer: Praveen Rao

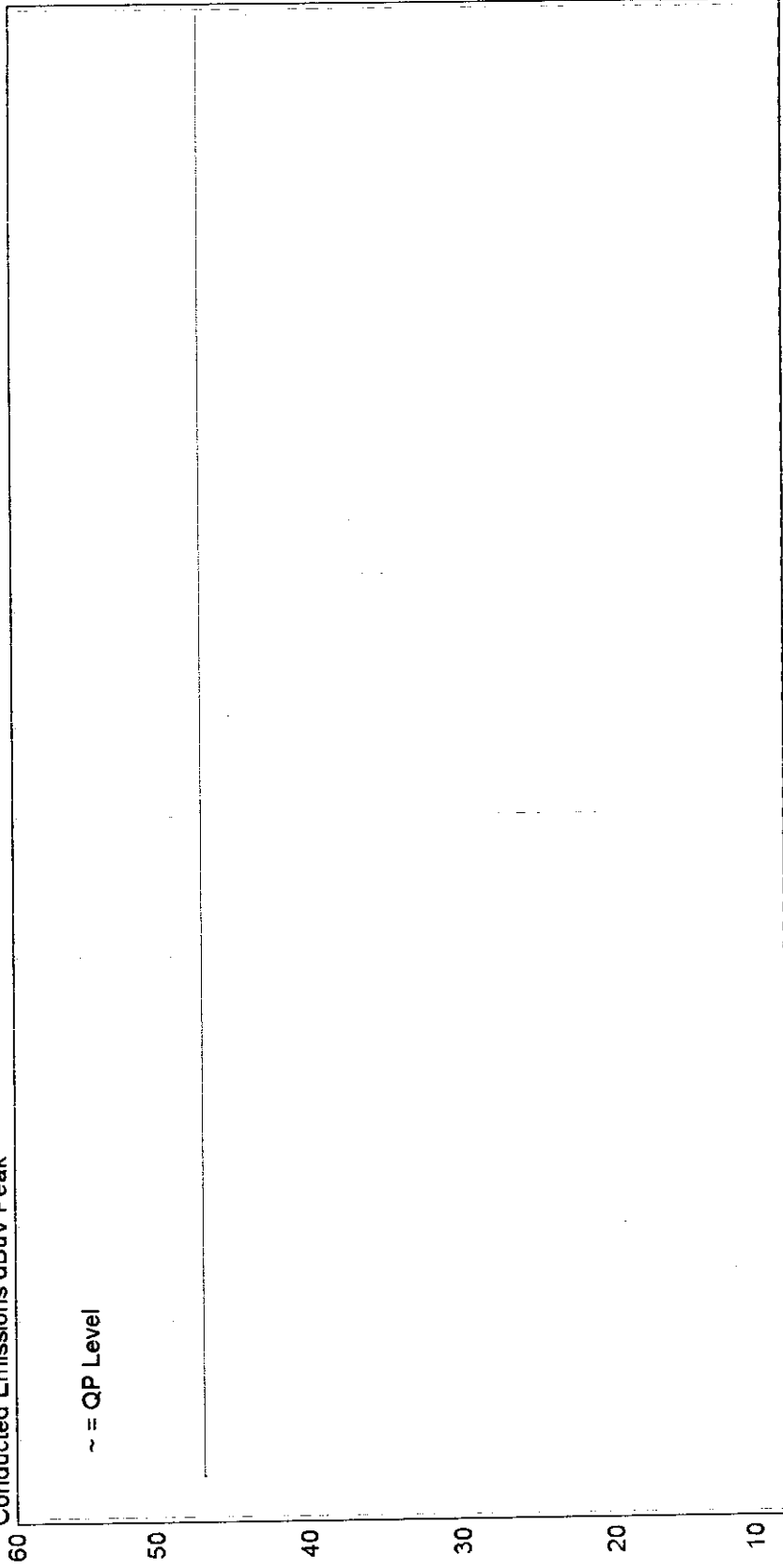
Melbourne: 57 Assembly Drv Tullamarine, 3043, Vic, Australia Ph: (613) 9335 3333 Fax: (613) 9338 9260
Sydney: 16.6 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph: (612) 9899 4599 Fax: (612) 9899 4018

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FCC Class B
Conducted Emissions dBuV Peak

Project No: M80449

Test Date: 22-04-98

c:\pc\ffcc49_7.PCF
GRAPH No. 7



4	1	Frequency (MHz)	Peaks:	10	30.5
ROBOTRON					
Limits: FCC_BQP FCC CLASS B CONDUCTED QP LIMITS					
Legend:					
Source:					
Equipment: HP8574B TST97F					
Transducers: C130997 N019612 NOPREAMP					
Site ID: Melb Room#2					
Test Officer: Praveen Rao					
Melbourne: 57 Assembly Drv Tullamarine, 3043, Vic, Australia Ph+(613) 9335 3333 Fax+(613) 9338 9260					
Sydney: 166 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9899 4599 Fax+(612) 9899 4019					

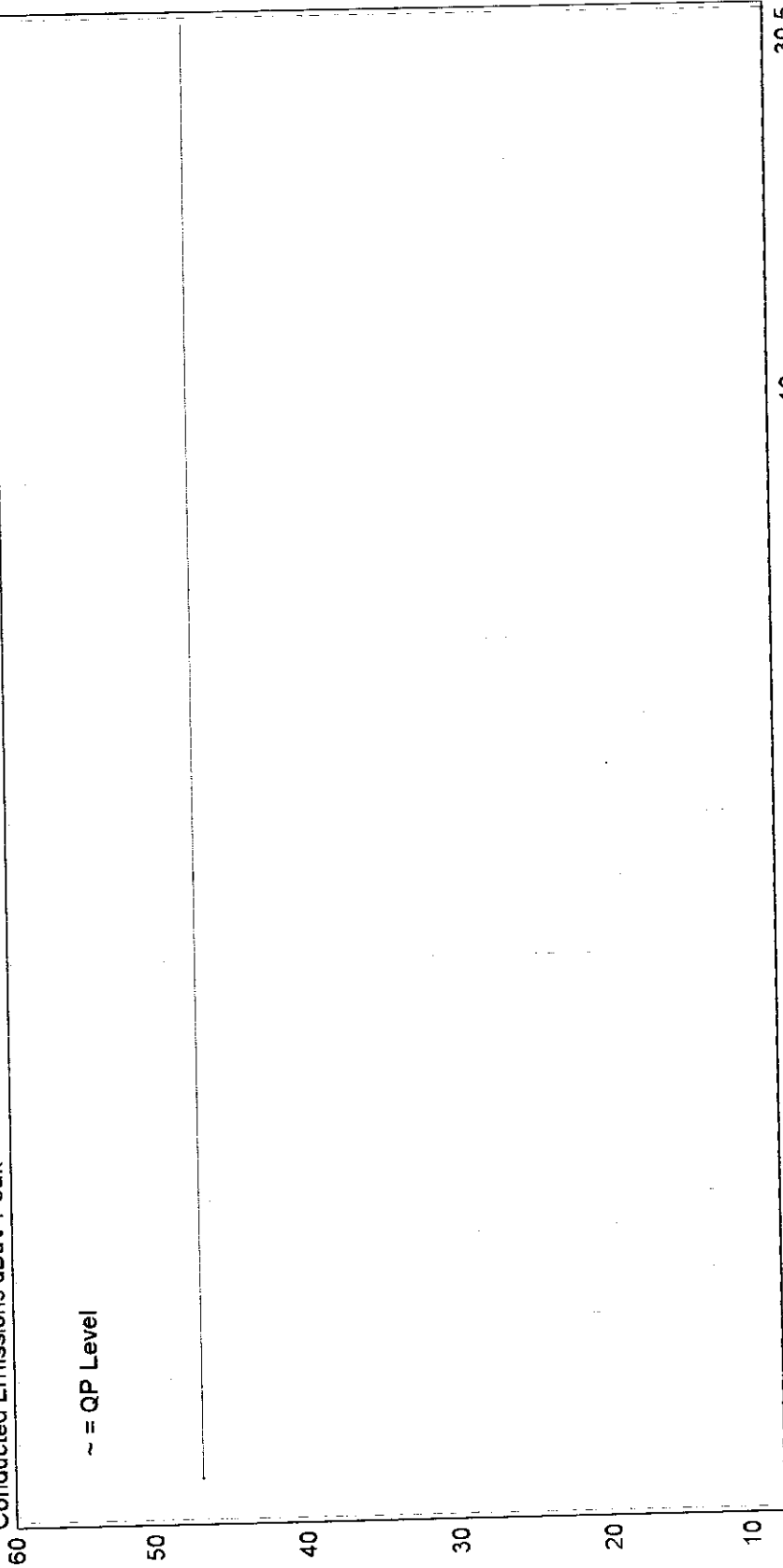
FCC ID: HNL-WREXT

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FCC Class B
Project No: M80449

c:\pcftfcc49_8.PCF
GRAPH No. 8

Test Date: 22-04-98

Conducted Emissions dBuV Peak



4		1		Frequency (MHz)		10		30.5	
ROBOTRON						Peaks:			
				No Freq (MHz)	Peak (dBuV)	Qp Val (dBuV)	FCC BQP dL1 (dB)	Av Val (dBuV)	dL2 (dB)
Limits: FCC_BQP FCC CLASS B CONDUCTED QP LIMITS									
Legend:									
Source:									
Equipment: HP8574B TST97F									
Transducers: C130887 N019612 NOPREAMP									
Site ID: Melb Room#2									
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 4018									

FCC ID: HNL-WREXT

EMC Technologies Pty. Ltd. - Global Product Certification

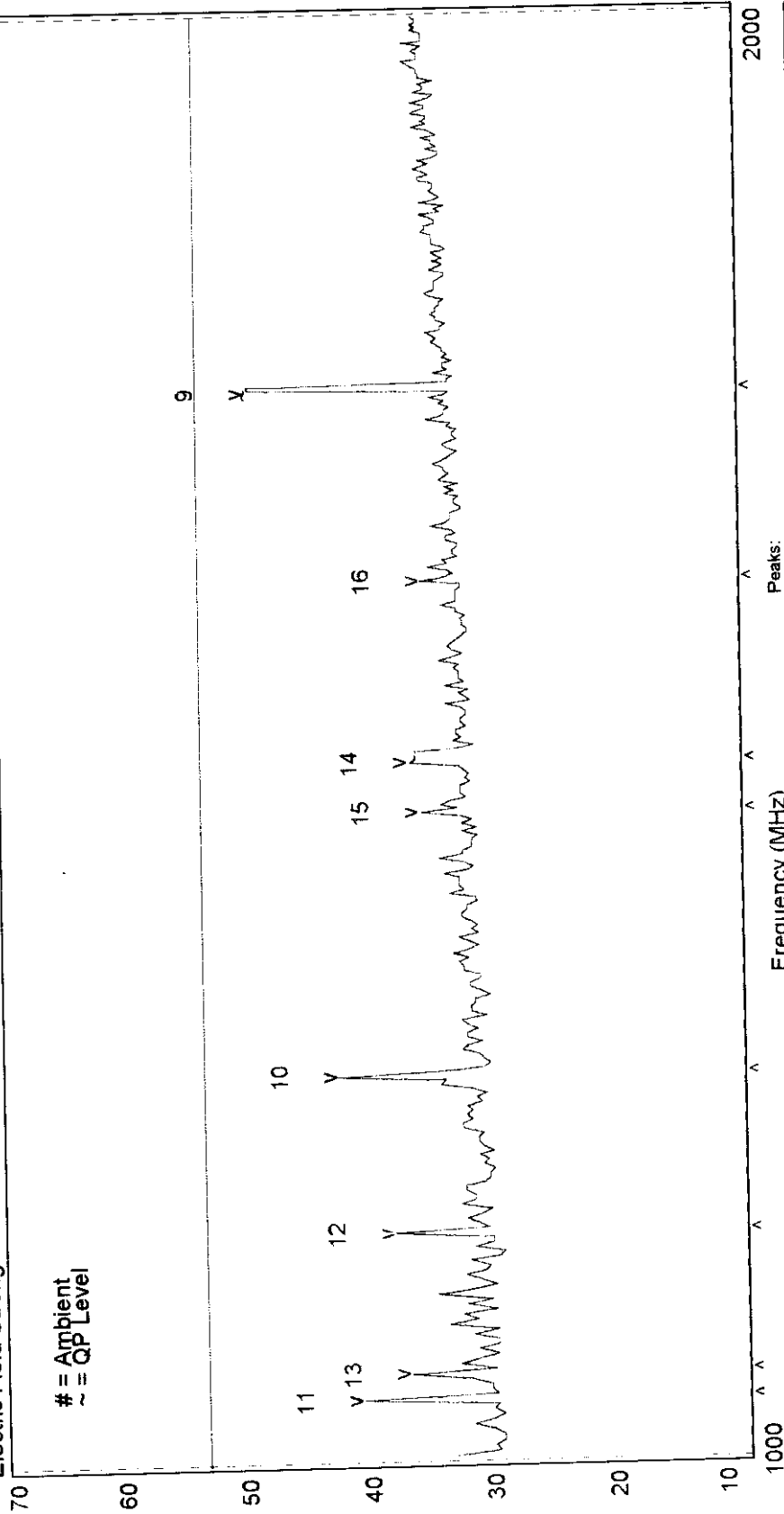
FCC Class B

Electric Field Strength dBuV/m Peak

Project No: M80449

Test Date: 07-05-98

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GRAPH No. 9



Peaks:

No	Freq (MHz)	Peak (dBuV/m)	FCC-B3 (dBuV/m)	dL1 (dB)
9	1670.4649.9		54.0	-4.1
10	1203.0043.0		54.0	-11.0
11	1030.0041.3		54.0	-12.7
12	1115.0038.5		54.0	-15.5
13	1043.0037.4		54.0	-16.6
14	1398.0036.9		54.0	-17.1
15	1365.0036.0		54.0	-16.0
16	1525.0035.7		54.0	-18.3

ROBOTRON

Legend:

Limits: FCC-B3 FCC PT 15.209 CLASS B RAD 3M LIMITS
Horizontal Emissions

Source:

Equipment: HP8546A TST97F
Transducers: MW, CAB9049710 NOPREAMP
Site ID: Melb Room#4
Test Officer: Praveen Rao

Melbourne- 57 Assembly Drv Tullamarine, 3043, Vic, Australia Ph+(613) 9335 3333 Fax+(613) 9338 9280
Sydney----- 16,6 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9899 4599 Fax+(612) 9899 4018

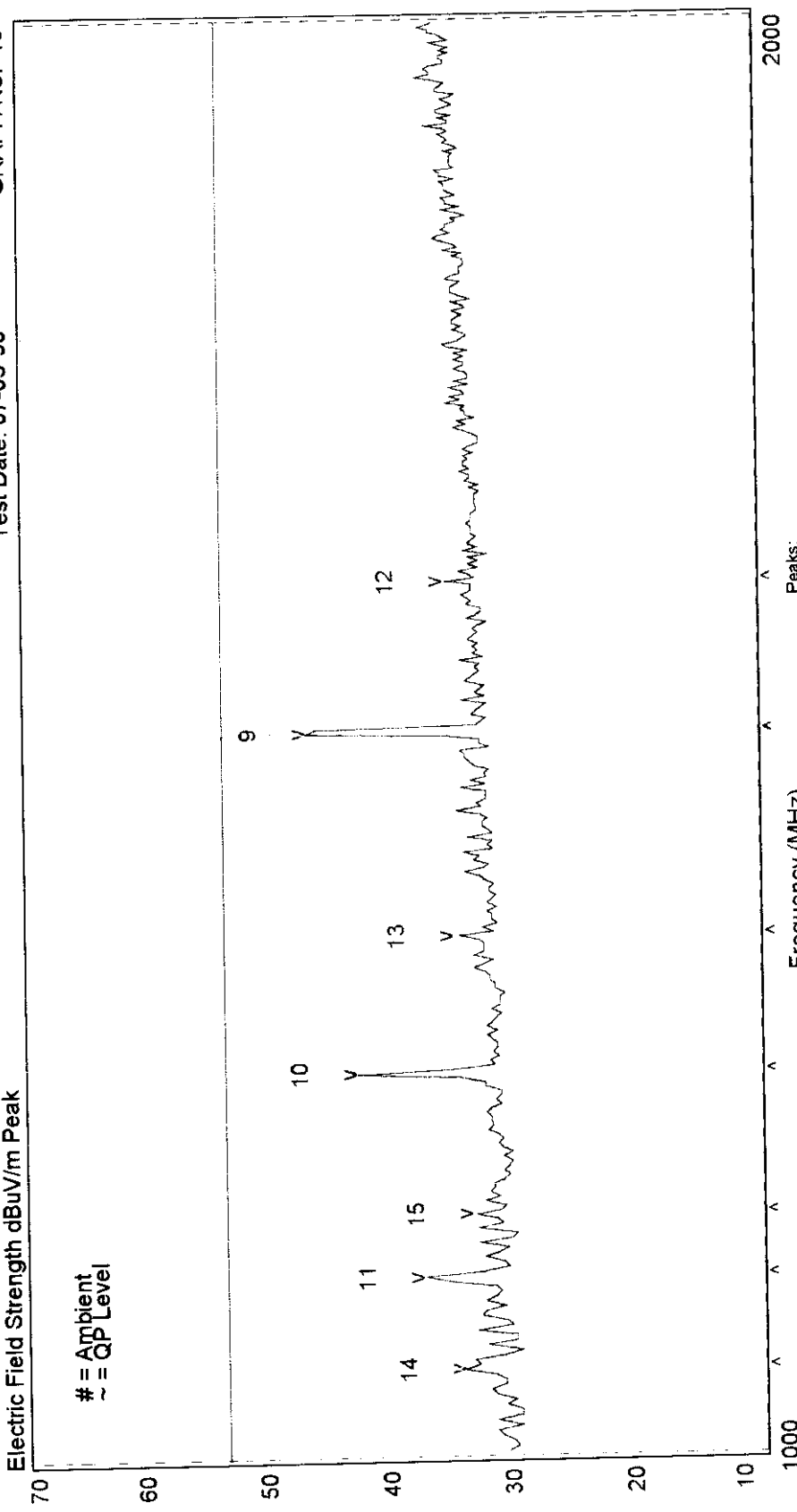
FCC ID: HNL-WREXT

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FCC Class B

Project No:M80449

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 Test Date: 07-05-98
 GRAPH No. 10



ROBOTRON			
Limits:	FCC-B3	FCC PT 15.209 CLASS B RAD 3M LIMITS	
Legend:			Horizontal Emissions
Equipment:	HP8546A TST97F		
Transducers:	MW CAB 9049710 NOPREAMP		
Site ID:	Melb Room#4		
Test Officer:	Praveen Rao		
Source:	c:\m80449	92	
Peaks:	No Freq (MHz)	Peak (dBuV/m)	FCC-B3 dL1 (dBuV/m) (dB)
	9	1418.00469	54.0 -7.1
	10	1203.00430	54.0 -11.0
	11	1090.00377	54.0 -16.3
	12	1525.00355	54.0 -18.5
	13	1285.00350	54.0 -19.0
	14	1043.00344	54.0 -19.6
	15	1123.00336	54.0 -20.4

Melbourne: 57 Assembly Drv Tullamarine, 3043, Vic, Australia Ph: (613) 9335 3333 Fax: (613) 9338 9260
 Sydney: 16 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph: (612) 9899 4599 Fax: (612) 9899 4018

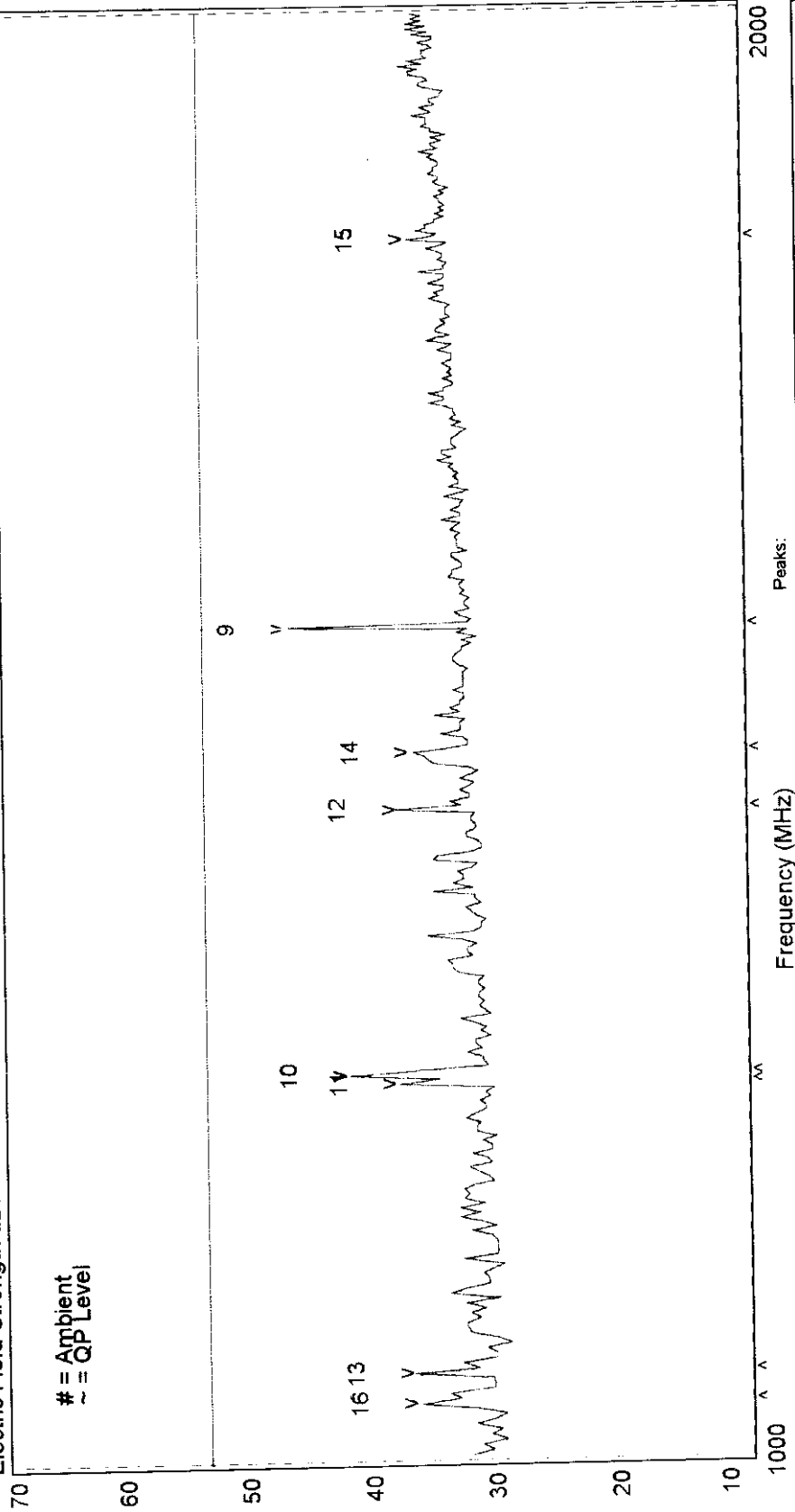
FCC ID: HNL-WREXT

EMC Technologies Pty. Ltd. - Global Product Certification
FCC Class B
Project No:M80449

c:\pcf\fcc49_11.PCF
GRAPH No. 11

Test Date: 07-05-98

Electric Field Strength dBuV/m Peak



ROBOTRON

Peaks:

No	Freq (MHz)	Peak (dBuV/m)	FCC-B3 (dBuV/m)	dL1 (dB)
----	------------	---------------	-----------------	----------

9	1490.0047	1	54.0	-6.9
10	1203.0042	4	54.0	-11.6
11	1198.0038	4	54.0	-15.6
12	1365.0038	2	54.0	-15.8
13	1043.0037	3	54.0	-16.7
14	1403.0037	1	54.0	-16.9
15	1793.0037	1	54.0	-16.9
16	1028.0037	0	54.0	-17.0

Legend:

Horizontal Emissions

Limits: FCC-B3 FCC PT 15.209 CLASS B RAD 3M LIMITS

Source:

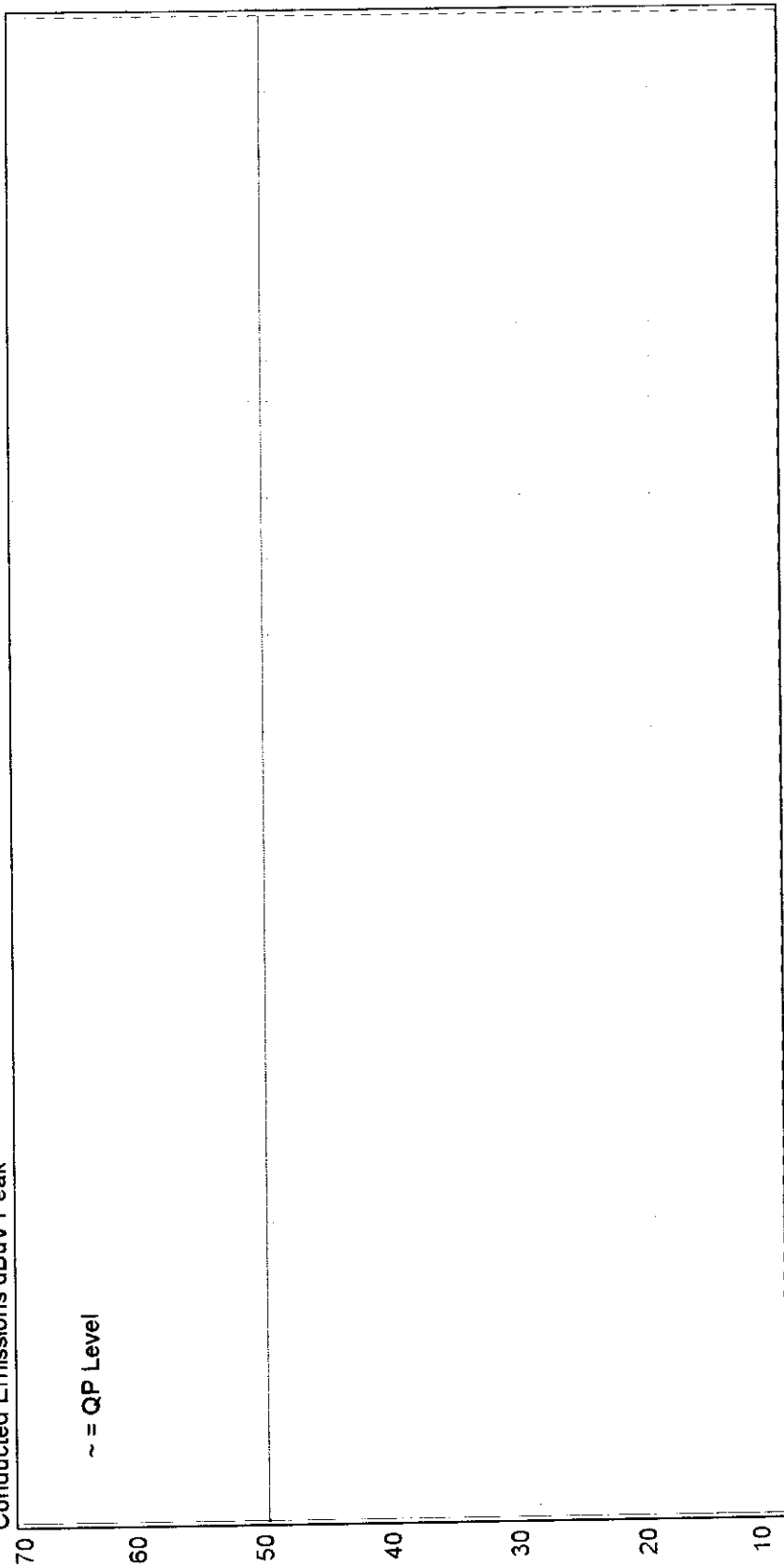
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Equipment: HP8546A TS197F
Transducers: MW_CAB9049710 NOPREAMP
Site ID: Melb Room#4
Test Officer: Praveen Rao

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 4018

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FCC Class B
Conducted Emissions dBuV Peak

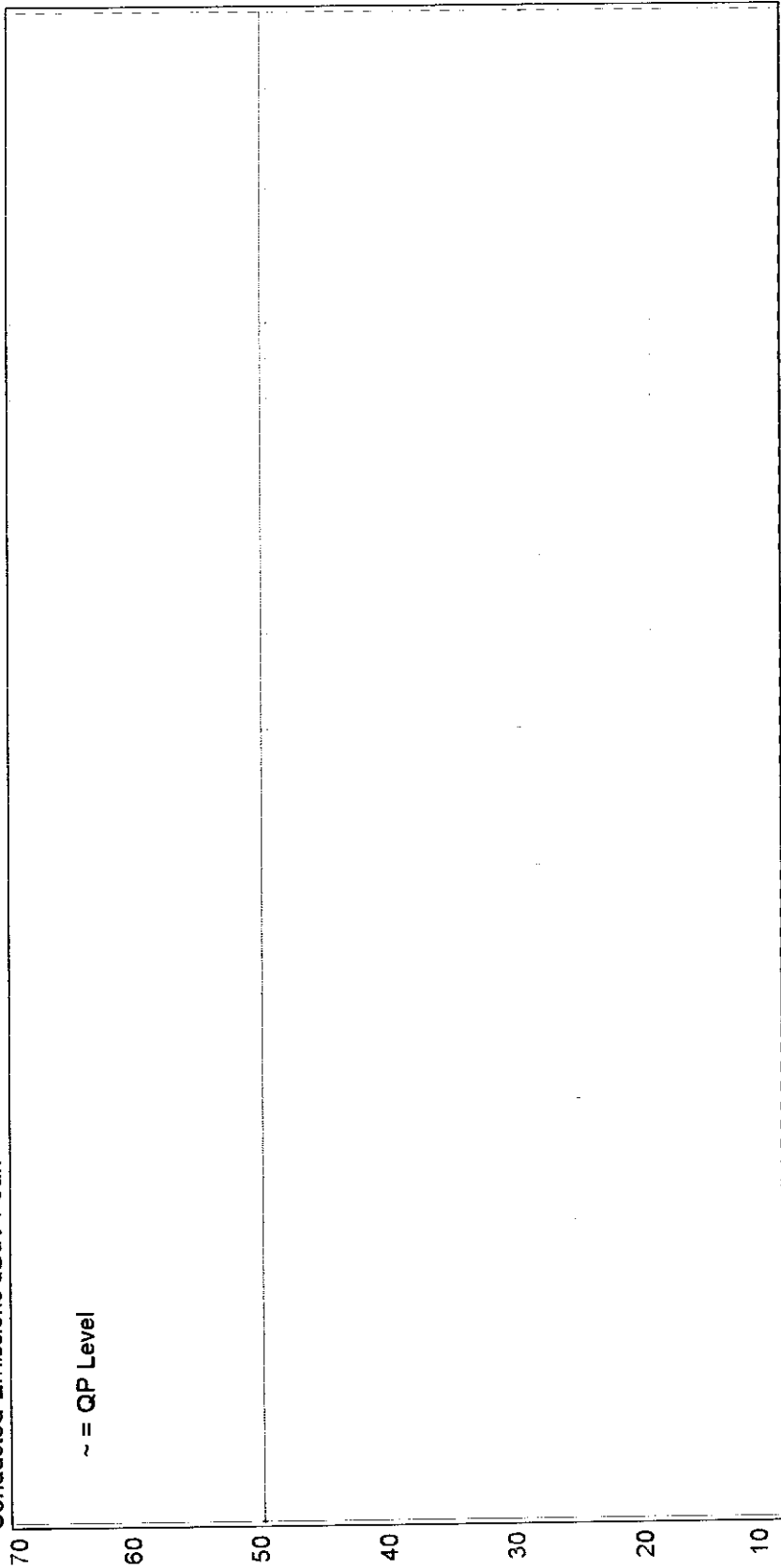
Project No: M80449
Test Date: 6-05-98
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GRAPH No. 12



29	100	Frequency (MHz)	1000	2500
ROBOTRON CONDUCTED EMISSIONS ANTENNA PORT				
Peaks:				
No Freq (MHz)	Peak (dBuV)	FCCR- AE dL1 (dBuV)	(dB)	(dBuV) (dBuV) (dB)
Limits:				
FCCR- AE FCC antenna terminal limits 2 nW				
Legend:				
Source:				
Equipment: HP8546A TST97F				
Transducers: N N NOPREAMP				
Site ID: Melb Room#4				
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				

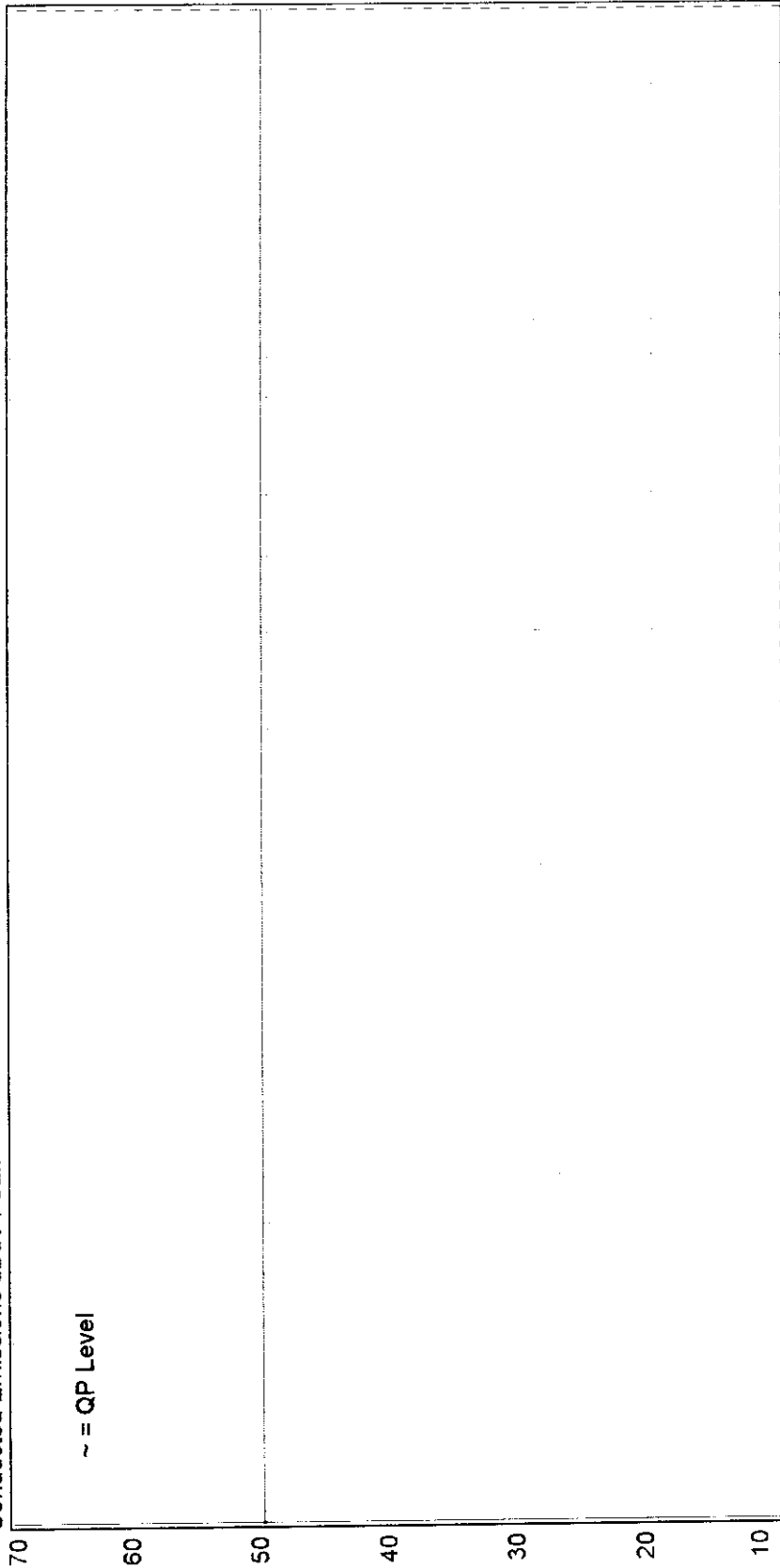
EMC Technologies Pty. Ltd. - Global Product Certification
FCC Class B
Conducted Emissions dBuV Peak

Test Date: 6-05-98
Project No: M80449
GRAPH No. 14



ROBOTRON CONDUCTED EMISSIONS ANTENNA PORT			
No Freq (MHz)	Peak (dBuV)	FCCRX-AE dL1 (dBuV)	(dB)
29			
100			
1000			
2500			
Legend:			
Limits: FCCRX-AE FCC antenna terminal limits 2 nW			
Equipment: HP8546A TST97F			
Transducers: N N NOPREAMP			
Site ID: Melb Room#4			
Test Officer: Praveen Rao			
Source:			
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 4018			

FCC ID: HNL-WREXT



Limits:		FCCRX-AE		FCCRX-AE d1.1	
FCCRX-AE		FCC antenna terminal limits 2 nW		FCCRX-AE d1.1	
Equipment: HP8546A		TST97F		Peak	
Transducers: N		N		dBuV	
Site ID: Melb Room#4		NOPREAMP		dBuV	
Test Officer: Praveen Rao		Legend:		dB	
Melbourne- 57 Assembly Drv Tullamarine, 3043, Vic, Australia		Source:		dB	
Sydney----- 16,6 Gladstone Rd Castle Hill, 2154, NSW, Australia				dB	

FCC ID: HNL-WREXT

APPENDIX C2

GRAPHS OF EMI MEASUREMENTS FOR WR 1500e

RADIATED EMI : 30 MHz to 1000 MHz

Graph 1:	Vertical polarisation	Tuned to 150 kHz
Graph 2:	Horizontal Polarisation	Tuned to 150 kHz
Graph 3:	Vertical polarisation	Tuned to 750 MHz
Graph 4:	Horizontal Polarisation	Tuned to 750 MHz
Graph 5:	Vertical polarisation	Tuned to 1500 MHz
Graph 6:	Horizontal Polarisation	Tuned to 1500 MHz

CONDUCTED EMI MAINS CABLE : 0.4 MHz to 30 MHz

Graph 7:	Active Line
Graph 8:	Neutral Line

RADIATED EMI : 1000 MHz to 2000 MHz

Graph 9:	Red Trace : Vertical polarisation Blue Trace : Horizontal polarisation	Tuned to 150 kHz
Graph 10:	Red Trace : Vertical polarisation Blue Trace : Horizontal polarisation	Tuned to 750 MHz
Graph 11:	Red Trace : Vertical polarisation Blue Trace : Horizontal polarisation	Tuned to 1500 MHz

CONDUCTED EMI ANTENNA PORT : 30 MHz to 2000 MHz

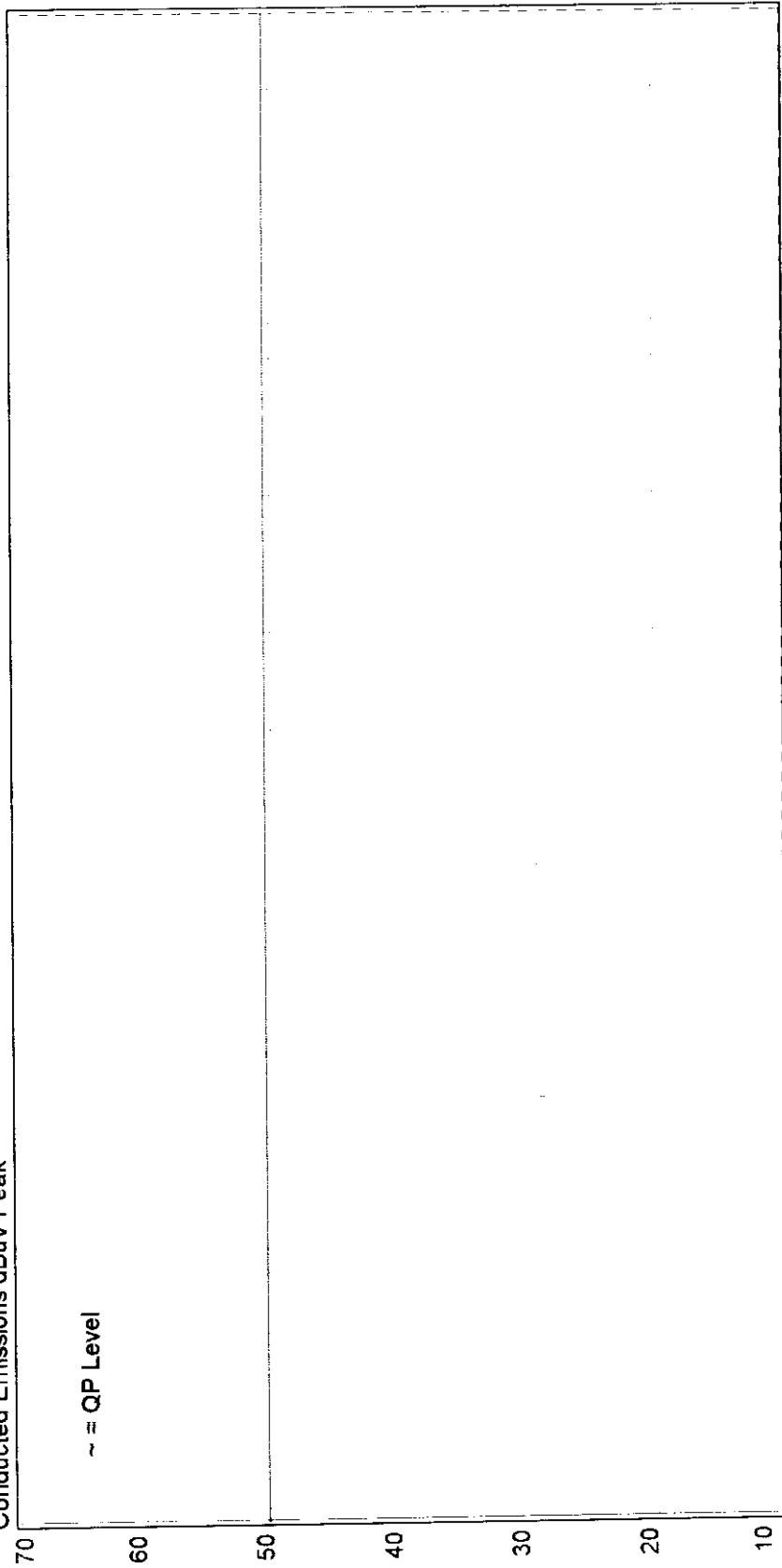
Graph 12:	Tuned to 150 kHz
Graph 13:	Tuned to 750 MHz
Graph 14:	Tuned to 1500 MHz

EMC Technologies Pty. Ltd. - Global Product Certification
Project No.:M80446
FCC Class B

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GRAPH No. 14

Test Date: 6-05-98

Conducted Emissions dBuV Peak



29	100	1000	2500
Frequency (MHz)			
Peaks:			

ROBOTRON
CONDUCTED EMISSIONS ANTENNA PORT

[illegible]

—

Limits:
FCCRX-AE FCC antenna terminal limits 2 nW

Legend:

Source:

Equipment: HP8546A TST97F
Transducers: N_N NOPREAMP

Site ID: Meib Room#4
Test Officer: Praveen Rao

Melbourne- 57 Assembly Drv Tullamarine. 3043, Vic, Australia Ph+(613) 9335 3333 Fax+(613) 9338 9260
Sydney----- 18,6 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9899 4599 Fax+(612) 9899 4018

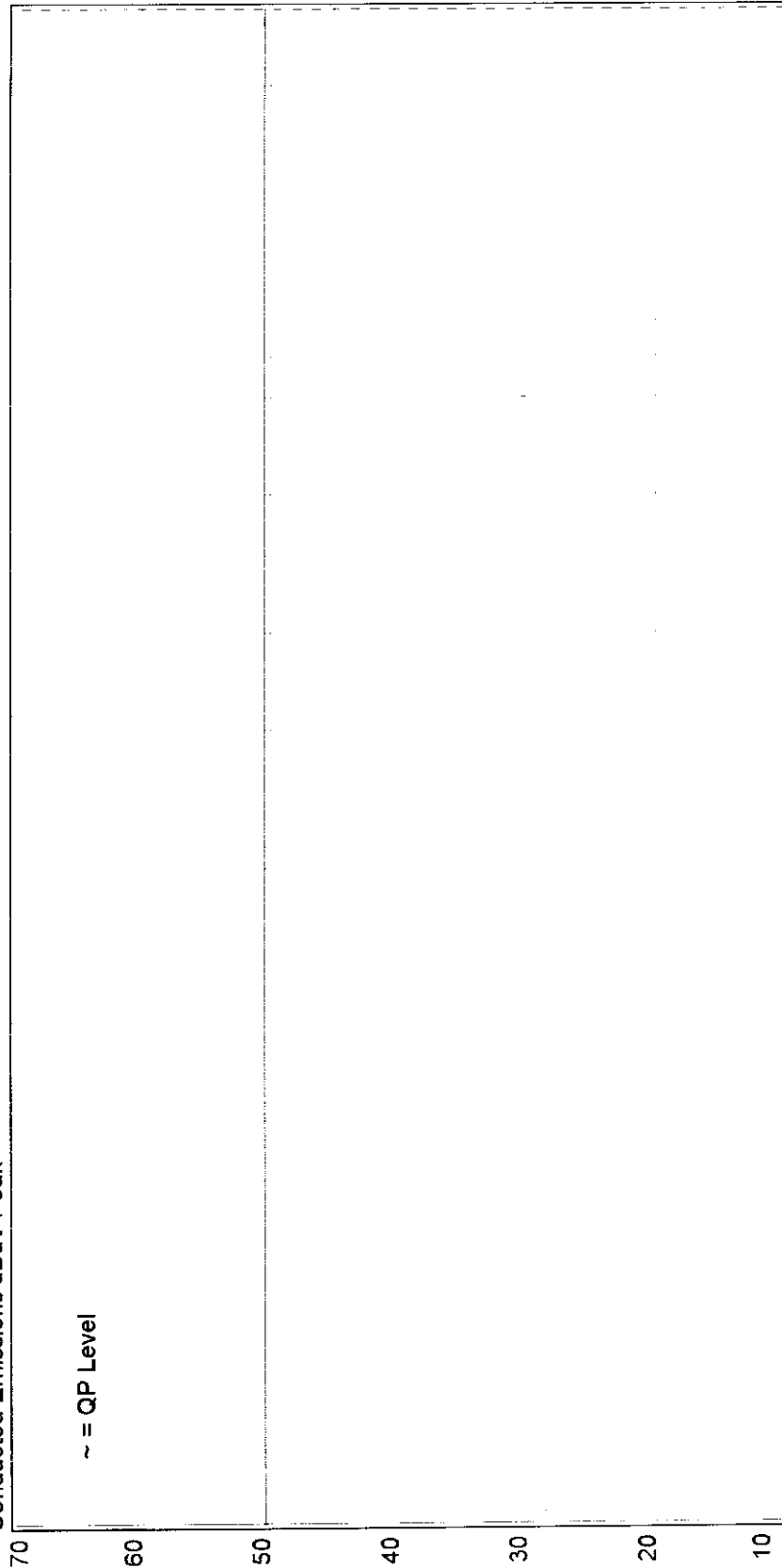
FCC ID: HNL-WREXT

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FCC Class B
Project No: M80446

Conducted Emissions dBuV Peak

Test Date: 6-05-98

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GRAPH No. 13

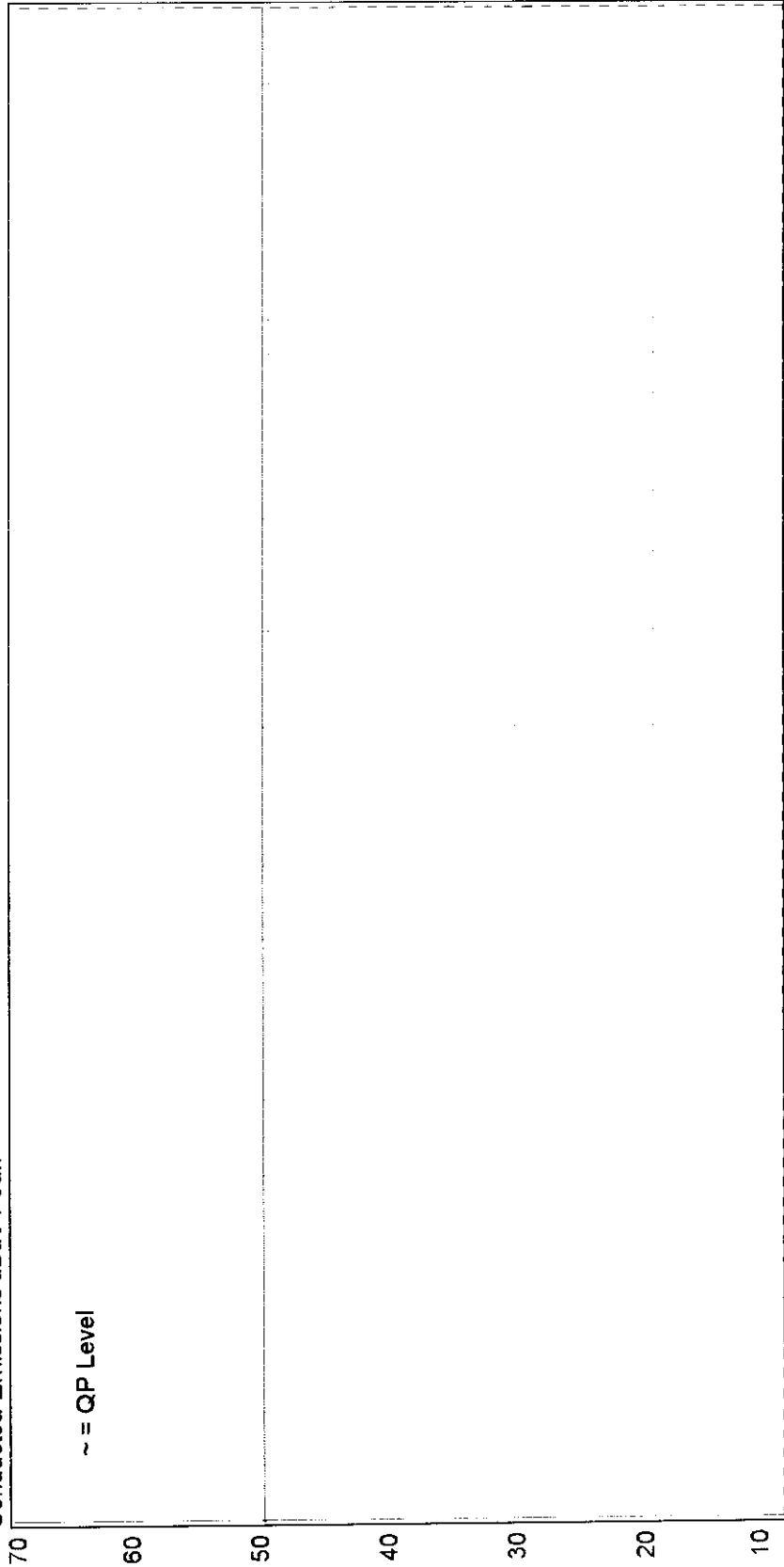


29		100		Frequency (MHz)		Peaks:		1000		2500	
ROBOTRON CONDUCTED EMISSIONS ANTENNA PORT											
Limits:											
FCCRX-AE FCC antenna terminal limits 2 nW											
Legend:											
Source:											
Equipment: HP8546A TST97F											
Transducers: N N NOPREAMP											
Site ID: Melb Room#4											
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 4018											

FCC ID: HNL-WREXT

EMC Technologies Pty. Ltd. - Global Product Certification
FCC Class B
Conducted Emissions dBuV Peak

Test Date: 6-05-98
Project No: M80446
c:\pc\ffcc46_12.PCF
GRAPH No. 12



29		100	Frequency (MHz)	1000	2500
ROBOTRON CONDUCTED EMISSIONS ANTENNA PORT					
Limits:		Legend:			
FCCRX-AE		FCC antenna terminal limits 2 nW			
Equipment: HP8546A		Source:			
Transducers: N		N			
Site ID: Melb Room#4		NOPREAMP			
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) 9699 4599 Fax+(612) 9699 4019			

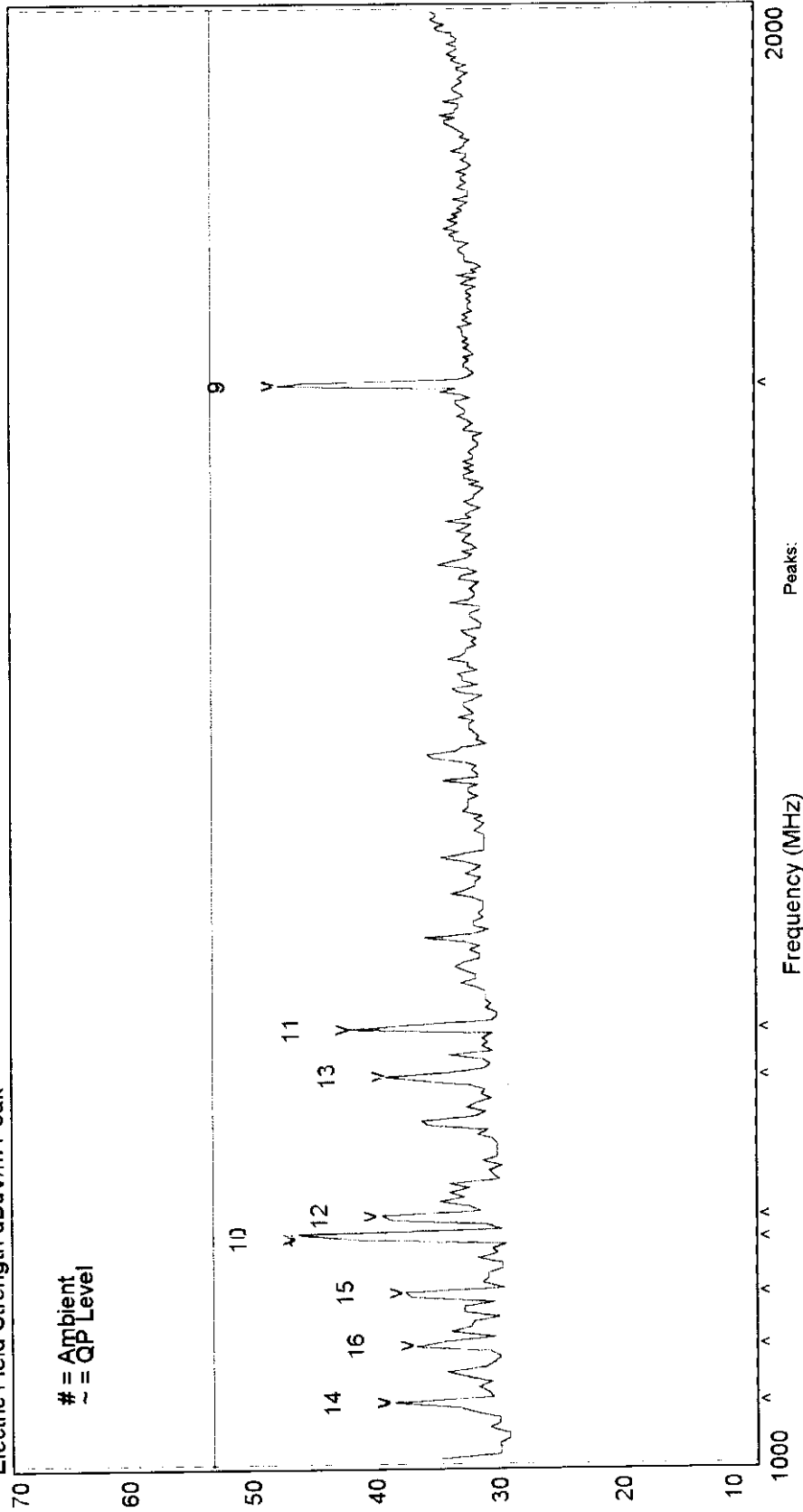
FCC ID: HNL-WREXT

ROBOTRON		No Freq (MHz)	Peak (dBuV/m)	FCC-B3 (dBuV/m)	dL1 (dB)
Limits:		Legend:			
FCC-B3	FCC PT 15.209 CLASS B RAD 3M LIMITS	----- Horizontal Emissions			
Equipment: HP8546A TST97F		Source:			
Transducers: MW_CAS9049710 NOPREAMP		c:\m80446 81			
Site ID: Melb Room#4		9	1203.0041.8	54.0	-12.2
Test Officer: Praveen Rao		10	1230.0041.0	54.0	-13.0
		11	1893.0040.1	54.0	-13.9
		12	1030.0038.0	54.0	-16.0
		13	1403.0038.0	54.0	-16.0
		14	1090.0037.9	54.0	-16.1
		15	1085.0037.8	54.0	-16.2
		16	1125.0037.5	54.0	-16.5
Melbourne: 57 Assembly Drv Tullamarine, 3043, Vic, Australia Ph+(613) 9335 3333 Fax+(613) 9338 9260					
Sydney:----- 16 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9899 4599 Fax+(612) 9899 4018					

ROBOTRON		No Freq (MHz)	Peak (dBuV/m)	FCC-B3 (dBuV/m)	dL1 (dB)
Limits:					
FCC-B3	FCC PT 15.209 CLASS B RAD 3M LIMITS				
Legend:					
	Horizontal Emissions				
Source:					
Equipment: HP8546A TS17FF					
Transducers: MW CAB9049710 NOPREAMP					
Site ID: Melb Room#4					
Test Officer: Praveen Rao					
		9	1620 00.43.3	54.0	-10.7
		10	1203 00.38.5	54.0	-15.5
		11	1123 00.35.5	54.0	-18.5
		12	1133 00.35.4	54.0	-18.6
		13	1520 00.34.7	54.0	-19.3
		14	1398 00.34.5	54.0	-19.5
		15	1178 00.34.4	54.0	-19.6
		16	1065 00.33.8	54.0	-20.2
Melbourne- 57 Assembly Dr/ 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 4015					

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FCC Class B
Electric Field Strength dBuV/m Peak

Test Date: 06-05-98
GRAPH No. 9



ROBOTRON

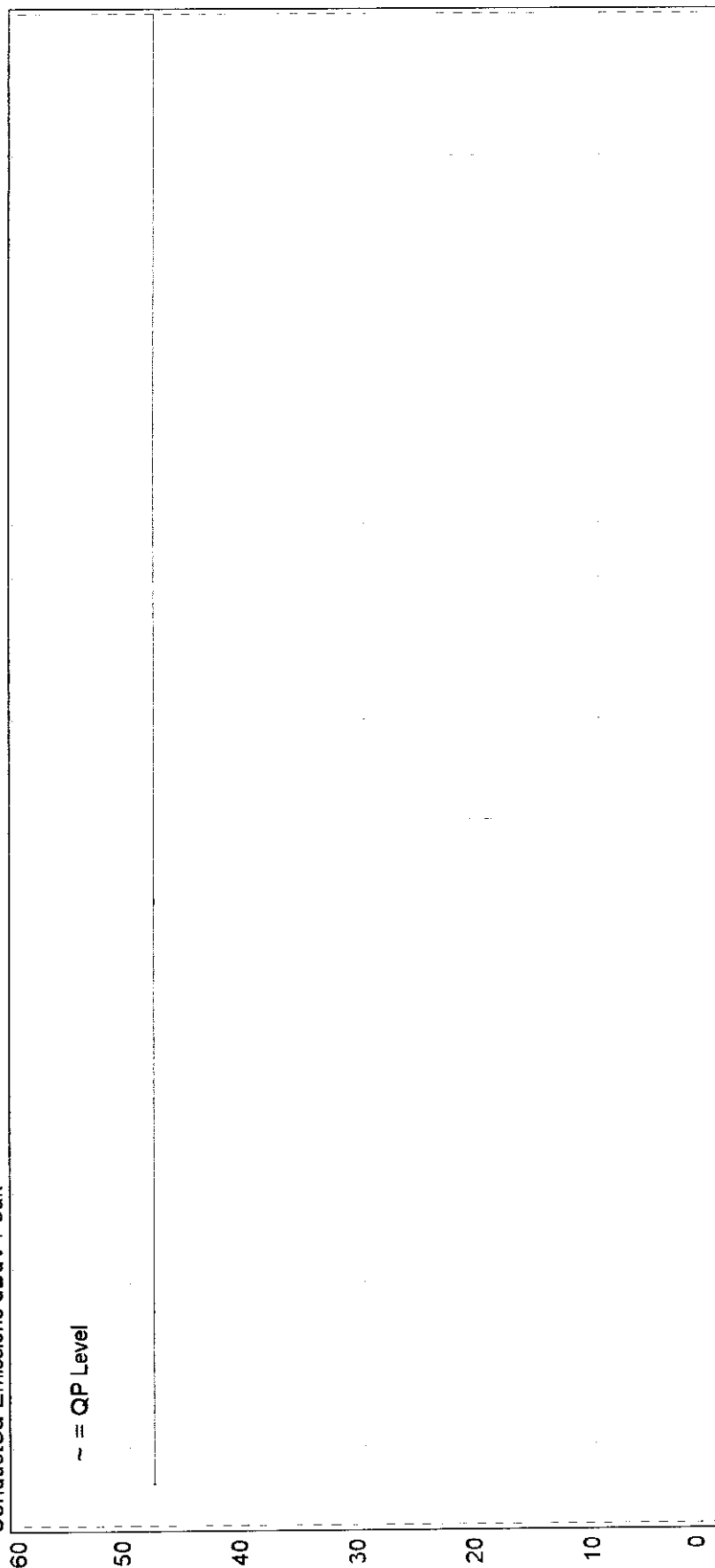
Limits: FCC-B3 FCC PT 15.209 CLASS B RAD 3M LIMITS
Legend: Horizontal Emissions
Source: c:\m80446 77
Equipment: HP8548A TST97F
Transducers: MW/CAB9049710 NOPREAMP
Site ID: Melb Room#4
Test Officer: Praveen Rao

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 4018

FCC ID: HNL-WREXT

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GRAPH No. 8

Test Date: 05/05/98



4		1		Frequency (MHz)		Peaks:		10		30		
WINRADIO 1500E						No Freq (MHz)	Peak (dBuV)	Qp Val (dBuV)	FCC BQP (dBuV)	dL1 (dB)	Av Val (dBuV)	dL2 (dB)
						Limits: FCC_BQP FCC CLASS B CONDUCTED QP LIMITS						
						Legend:						
						Source:						
Equipment: HP8574B TST97F												
Transducers: C130987 N019612 NOPREAMP												
Site ID: Glenlyon												
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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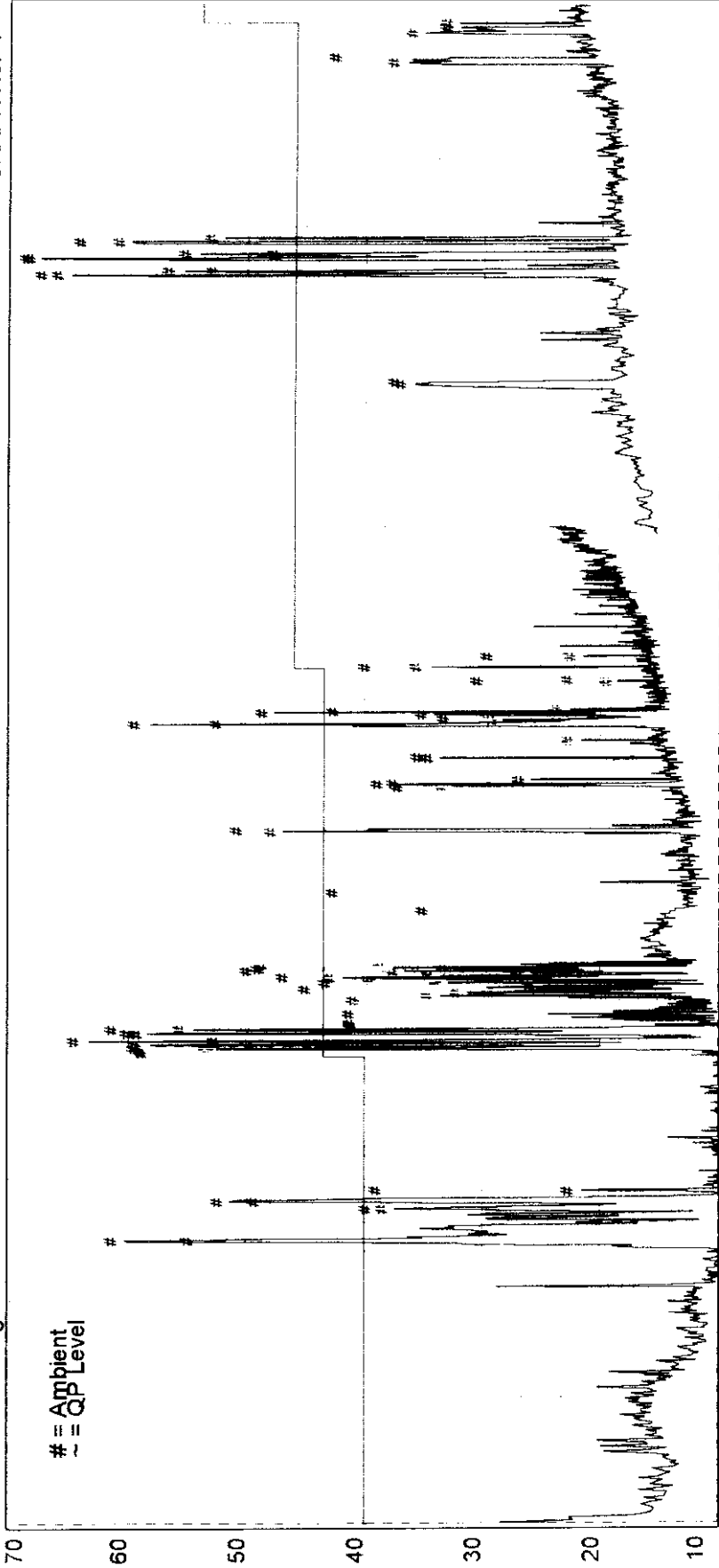
FCC Class B

Project No: M80446

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GRAPH No. 1

Test Date: 05/05/98

Electric Field Strength dBuV/m Peak



30

Frequency (MHz)

100

1000

Peaks:

No	Freq (MHz)	Peak (dBuV/m)	Op Val (dBuV/m)	FCC-B3 dL1 (dB)
1	30.0	65.0	40.0	25.0
2	30.5	65.0	40.0	25.0
3	31.0	65.0	40.0	25.0
4	31.5	65.0	40.0	25.0
5	32.0	65.0	40.0	25.0
6	32.5	65.0	40.0	25.0
7	33.0	65.0	40.0	25.0
8	33.5	65.0	40.0	25.0
9	34.0	65.0	40.0	25.0
10	34.5	65.0	40.0	25.0
11	35.0	65.0	40.0	25.0
12	35.5	65.0	40.0	25.0
13	36.0	65.0	40.0	25.0
14	36.5	65.0	40.0	25.0
15	37.0	65.0	40.0	25.0
16	37.5	65.0	40.0	25.0
17	38.0	65.0	40.0	25.0
18	38.5	65.0	40.0	25.0
19	39.0	65.0	40.0	25.0
20	39.5	65.0	40.0	25.0
21	40.0	65.0	40.0	25.0
22	40.5	65.0	40.0	25.0
23	41.0	65.0	40.0	25.0
24	41.5	65.0	40.0	25.0
25	42.0	65.0	40.0	25.0
26	42.5	65.0	40.0	25.0
27	43.0	65.0	40.0	25.0
28	43.5	65.0	40.0	25.0
29	44.0	65.0	40.0	25.0
30	44.5	65.0	40.0	25.0
31	45.0	65.0	40.0	25.0
32	45.5	65.0	40.0	25.0
33	46.0	65.0	40.0	25.0
34	46.5	65.0	40.0	25.0
35	47.0	65.0	40.0	25.0
36	47.5	65.0	40.0	25.0
37	48.0	65.0	40.0	25.0
38	48.5	65.0	40.0	25.0
39	49.0	65.0	40.0	25.0
40	49.5	65.0	40.0	25.0
41	50.0	65.0	40.0	25.0
42	50.5	65.0	40.0	25.0
43	51.0	65.0	40.0	25.0
44	51.5	65.0	40.0	25.0
45	52.0	65.0	40.0	25.0
46	52.5	65.0	40.0	25.0
47	53.0	65.0	40.0	25.0
48	53.5	65.0	40.0	25.0
49	54.0	65.0	40.0	25.0
50	54.5	65.0	40.0	25.0
51	55.0	65.0	40.0	25.0
52	55.5	65.0	40.0	25.0
53	56.0	65.0	40.0	25.0
54	56.5	65.0	40.0	25.0
55	57.0	65.0	40.0	25.0
56	57.5	65.0	40.0	25.0
57	58.0	65.0	40.0	25.0
58	58.5	65.0	40.0	25.0
59	59.0	65.0	40.0	25.0
60	59.5	65.0	40.0	25.0
61	60.0	65.0	40.0	25.0
62	60.5	65.0	40.0	25.0
63	61.0	65.0	40.0	25.0
64	61.5	65.0	40.0	25.0
65	62.0	65.0	40.0	25.0
66	62.5	65.0	40.0	25.0
67	63.0	65.0	40.0	25.0
68	63.5	65.0	40.0	25.0
69	64.0	65.0	40.0	25.0
70	64.5	65.0	40.0	25.0
71	65.0	65.0	40.0	25.0
72	65.5	65.0	40.0	25.0
73	66.0	65.0	40.0	25.0
74	66.5	65.0	40.0	25.0
75	67.0	65.0	40.0	25.0
76	67.5	65.0	40.0	25.0
77	68.0	65.0	40.0	25.0
78	68.5	65.0	40.0	25.0
79	69.0	65.0	40.0	25.0
80	69.5	65.0	40.0	25.0
81	70.0	65.0	40.0	25.0
82	70.5	65.0	40.0	25.0
83	71.0	65.0	40.0	25.0
84	71.5	65.0	40.0	25.0
85	72.0	65.0	40.0	25.0
86	72.5	65.0	40.0	25.0
87	73.0	65.0	40.0	25.0
88	73.5	65.0	40.0	25.0
89	74.0	65.0	40.0	25.0
90	74.5	65.0	40.0	25.0
91	75.0	65.0	40.0	25.0
92	75.5	65.0	40.0	25.0
93	76.0	65.0	40.0	25.0
94	76.5	65.0	40.0	25.0
95	77.0	65.0	40.0	25.0
96	77.5	65.0	40.0	25.0
97	78.0	65.0	40.0	25.0
98	78.5	65.0	40.0	25.0
99	79.0	65.0	40.0	25.0
100	79.5	65.0	40.0	25.0
101	80.0	65.0	40.0	25.0
102	80.5	65.0	40.0	25.0
103	81.0	65.0	40.0	25.0
104	81.5	65.0	40.0	25.0
105	82.0	65.0	40.0	25.0
106	82.5	65.0	40.0	25.0
107	83.0	65.0	40.0	25.0
108	83.5	65.0	40.0	25.0
109	84.0	65.0	40.0	25.0
110	84.5	65.0	40.0	25.0
111	85.0	65.0	40.0	25.0
112	85.5	65.0	40.0	25.0
113	86.0	65.0	40.0	25.0
114	86.5	65.0	40.0	25.0
115	87.0	65.0	40.0	25.0
116	87.5	65.0	40.0	25.0
117	88.0	65.0	40.0	25.0
118	88.5	65.0	40.0	25.0
119	89.0	65.0	40.0	25.0
120	89.5	65.0	40.0	25.0
121	90.0	65.0	40.0	25.0
122	90.5	65.0	40.0	25.0
123	91.0	65.0	40.0	25.0
124	91.5	65.0	40.0	25.0
125	92.0	65.0	40.0	25.0
126	92.5	65.0	40.0	25.0
127	93.0	65.0	40.0	25.0
128	93.5	65.0	40.0	25.0
129	94.0	65.0	40.0	25.0
130	94.5	65.0	40.0	25.0
131	95.0	65.0	40.0	25.0
132	95.5	65.0	40.0	25.0
133	96.0	65.0	40.0	25.0
134	96.5	65.0	40.0	25.0
135	97.0	65.0	40.0	25.0
136	97.5	65.0	40.0	25.0
137	98.0	65.0	40.0	25.0
138	98.5	65.0	40.0	25.0
139	99.0	65.0	40.0	25.0
140	99.5	65.0	40.0	25.0
141	100.0	65.0	40.0	25.0
142	100.5	65.0	40.0	25.0
143	101.0	65.0	40.0	25.0
144	101.5	65.0	40.0	25.0
145	102.0	65.0	40.0	25.0
146	102.5	65.0	40.0	25.0
147	103.0	65.0	40.0	25.0
148	103.5	65.0	40.0	25.0
149	104.0	65.0	40.0	25.0
150	104.5	65.0	40.0	25.0
151	105.0	65.0	40.0	25.0
152	105.5	65.0	40.0	25.0
153	106.0	65.0	40.0	25.0
154	106.5	65.0	40.0	25.0
155	107.0	65.0	40.0	25.0
156	107.5	65.0	40.0	25.0
157	108.0	65.0	40.0	25.0
158	108.5	65.0	40.0	25.0
159	109.0	65.0	40.0	25.0
160	109.5	65.0	40.0	25.0
161	110.0	65.0	40.0	25.0
162	110.5	65.0	40.0	25.0
163	111.0	65.0	40.0	25.0
164	111.5	65.0	40.0	25.0
165	112.0	65.0	40.0	25.0
166	112.5	65.0	40.0	25.0
167	113.0	65.0	40.0	25.0
168	113.5	65.0	40.0	25.0
169	114.0	65.0	40.0	25.0
170	114.5	65.0	40.0	25.0
171	115.0	65.0	40.0	25.0
172	115.5	65.0	40.0	25.0
173	116.0	65.0	40.0	25.0
174	116.5	65.0	40.0	25.0
175	117.0	65.0	40.0	25.0
176	117.5	65.0	40.0	25.0
177	118.0	65.0	40.0	25.0
178	118.5	65.0	40.0	25.0
179	119.0	65.0	40.0	25.0
180	119.5	65.0	40.0	25.0
181	120.0	65.0	40.0	25.0
182	120.5	65.0	40.0	25.0
183	121.0	65.0	40.0	25.0
184	121.5	65.0	40.0	25.0
185	122.0	65.0	40.0	25.0
186	122.5	65.0	40.0	25.0
187	123.0	65.0	40.0	25.0
188	123.5	65.0	40.0	25.0
189	124.0	65.0	40.0	25.0
190	124.5	65.0	40.0	25.0
191	125.0	65.0	40.0	25.0
192	125.5	65.0	40.0	25.0
193	126.0	65.0	40.0	25.0
194	126.5	65.0	40.0	25.0
195	127.0	65.0	40.0	25.0
196	127.5	65.0	40.0	25.0
197	128.0	65.0	40.0	25.0
198	128.5	65.0	40.0	25.0
199	129.0	65.0	40.0	25.0
200	129.5	65.0	40.0	25.0
201	130.0	65.0	40.0	25.0
202	130.5	65.0	40.0	25.0
203	131.0	65.0	40.0	25.0
204	131.5	65.0	40.0	25.0
205	132.0	65.0	40.0	25.0
206	132.5	65.0	40.0	25.0
207	133.0	65.0	40.0	25.0
208	133.5	65.0	40.0	25.0
209	134.0	65.0	40.0	25.0
210	134.5	65.0	40.0	25.0

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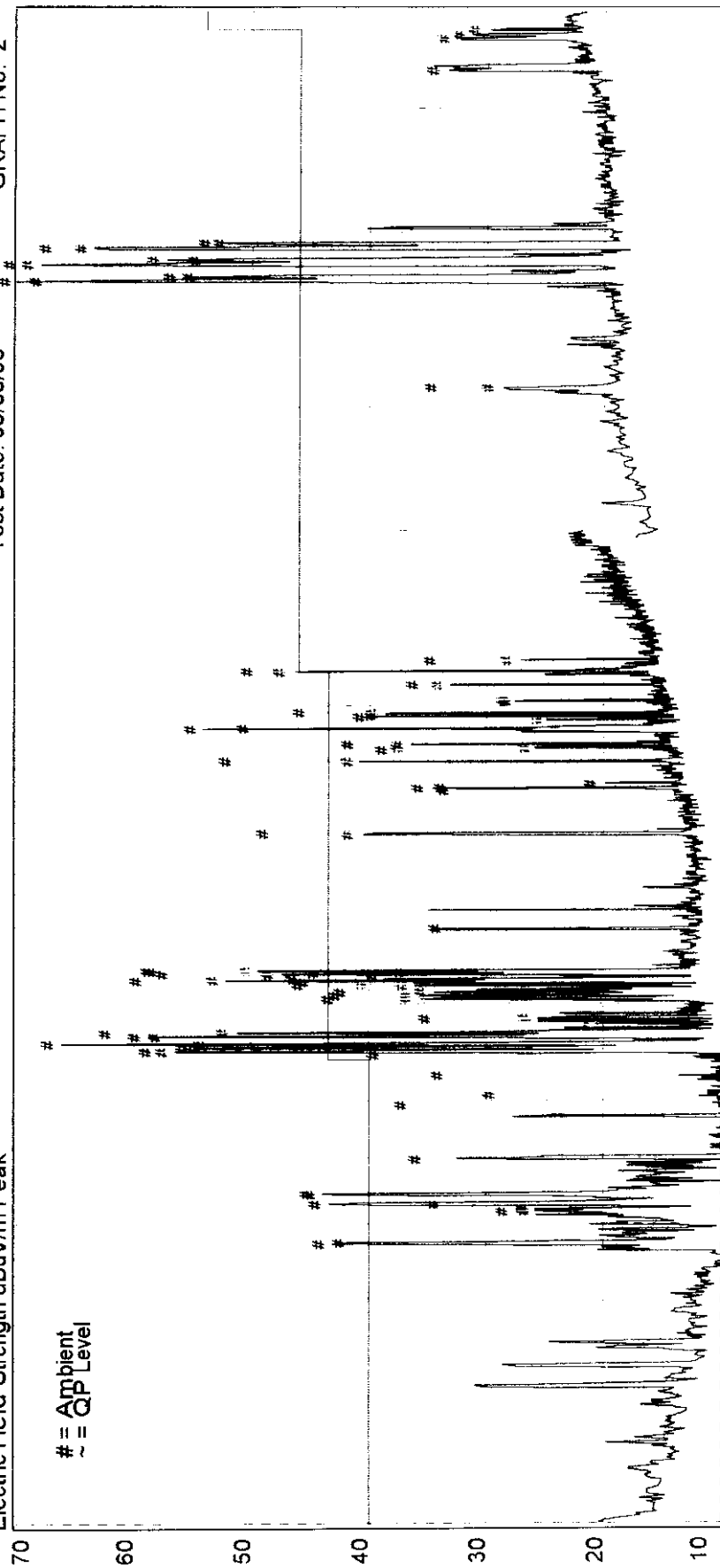
FCC Class B

Project No:M80446

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GRAPH No. 2

Test Date: 05/05/98

Electric Field Strength dBuV/m Peak



30 100 1000 Frequency (MHz)

WINRADIO 1500E
Tuned to 150kHz

Peaks:

No	Freq (MHz)	Peak (dBuV/m)	Qp Val (dBuV/m)	FCC-B3 (dB)	dL1 (dB)
1	30.1	65.0	65.0	65.0	65.0
2	30.2	65.0	65.0	65.0	65.0
3	30.3	65.0	65.0	65.0	65.0
4	30.4	65.0	65.0	65.0	65.0
5	30.5	65.0	65.0	65.0	65.0
6	30.6	65.0	65.0	65.0	65.0
7	30.7	65.0	65.0	65.0	65.0
8	30.8	65.0	65.0	65.0	65.0
9	30.9	65.0	65.0	65.0	65.0
10	31.0	65.0	65.0	65.0	65.0
11	31.1	65.0	65.0	65.0	65.0
12	31.2	65.0	65.0	65.0	65.0
13	31.3	65.0	65.0	65.0	65.0
14	31.4	65.0	65.0	65.0	65.0
15	31.5	65.0	65.0	65.0	65.0
16	31.6	65.0	65.0	65.0	65.0
17	31.7	65.0	65.0	65.0	65.0
18	31.8	65.0	65.0	65.0	65.0
19	31.9	65.0	65.0	65.0	65.0
20	32.0	65.0	65.0	65.0	65.0
21	32.1	65.0	65.0	65.0	65.0
22	32.2	65.0	65.0	65.0	65.0
23	32.3	65.0	65.0	65.0	65.0
24	32.4	65.0	65.0	65.0	65.0
25	32.5	65.0	65.0	65.0	65.0
26	32.6	65.0	65.0	65.0	65.0
27	32.7	65.0	65.0	65.0	65.0
28	32.8	65.0	65.0	65.0	65.0
29	32.9	65.0	65.0	65.0	65.0
30	33.0	65.0	65.0	65.0	65.0
31	33.1	65.0	65.0	65.0	65.0
32	33.2	65.0	65.0	65.0	65.0
33	33.3	65.0	65.0	65.0	65.0
34	33.4	65.0	65.0	65.0	65.0
35	33.5	65.0	65.0	65.0	65.0
36	33.6	65.0	65.0	65.0	65.0
37	33.7	65.0	65.0	65.0	65.0
38	33.8	65.0	65.0	65.0	65.0
39	33.9	65.0	65.0	65.0	65.0
40	34.0	65.0	65.0	65.0	65.0
41	34.1	65.0	65.0	65.0	65.0
42	34.2	65.0	65.0	65.0	65.0
43	34.3	65.0	65.0	65.0	65.0
44	34.4	65.0	65.0	65.0	65.0
45	34.5	65.0	65.0	65.0	65.0
46	34.6	65.0	65.0	65.0	65.0
47	34.7	65.0	65.0	65.0	65.0
48	34.8	65.0	65.0	65.0	65.0
49	34.9	65.0	65.0	65.0	65.0
50	35.0	65.0	65.0	65.0	65.0
51	35.1	65.0	65.0	65.0	65.0
52	35.2	65.0	65.0	65.0	65.0
53	35.3	65.0	65.0	65.0	65.0
54	35.4	65.0	65.0	65.0	65.0
55	35.5	65.0	65.0	65.0	65.0
56	35.6	65.0	65.0	65.0	65.0
57	35.7	65.0	65.0	65.0	65.0
58	35.8	65.0	65.0	65.0	65.0
59	35.9	65.0	65.0	65.0	65.0
60	36.0	65.0	65.0	65.0	65.0
61	36.1	65.0	65.0	65.0	65.0
62	36.2	65.0	65.0	65.0	65.0
63	36.3	65.0	65.0	65.0	65.0
64	36.4	65.0	65.0	65.0	65.0
65	36.5	65.0	65.0	65.0	65.0
66	36.6	65.0	65.0	65.0	65.0
67	36.7	65.0	65.0	65.0	65.0
68	36.8	65.0	65.0	65.0	65.0
69	36.9	65.0	65.0	65.0	65.0
70	37.0	65.0	65.0	65.0	65.0
71	37.1	65.0	65.0	65.0	65.0
72	37.2	65.0	65.0	65.0	65.0
73	37.3	65.0	65.0	65.0	65.0
74	37.4	65.0	65.0	65.0	65.0
75	37.5	65.0	65.0	65.0	65.0
76	37.6	65.0	65.0	65.0	65.0
77	37.7	65.0	65.0	65.0	65.0
78	37.8	65.0	65.0	65.0	65.0
79	37.9	65.0	65.0	65.0	65.0
80	38.0	65.0	65.0	65.0	65.0
81	38.1	65.0	65.0	65.0	65.0
82	38.2	65.0	65.0	65.0	65.0
83	38.3	65.0	65.0	65.0	65.0
84	38.4	65.0	65.0	65.0	65.0
85	38.5	65.0	65.0	65.0	65.0
86	38.6	65.0	65.0	65.0	65.0
87	38.7	65.0	65.0	65.0	65.0
88	38.8	65.0	65.0	65.0	65.0
89	38.9	65.0	65.0	65.0	65.0
90	39.0	65.0	65.0	65.0	65.0
91	39.1	65.0	65.0	65.0	65.0
92	39.2	65.0	65.0	65.0	65.0
93	39.3	65.0	65.0	65.0	65.0
94	39.4	65.0	65.0	65.0	65.0
95	39.5	65.0	65.0	65.0	65.0
96	39.6	65.0	65.0	65.0	65.0
97	39.7	65.0	65.0	65.0	65.0
98	39.8	65.0	65.0	65.0	65.0
99	39.9	65.0	65.0	65.0	65.0
100	40.0	65.0	65.0	65.0	65.0

Limits: FCC-B3 FCC PT 15.209 CLASS B RAD 3M LIMITS Legend: Horizontal Ambients

Equipment: HP8548A TST97F Source: c:\m80216 13 14 15 16 36
Transducers: SITE_CAB a1103008 a033009 NOPREAMP_13
Site ID: Glenilvon
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) 9699 4599 Fax+(612) 9699 4019

FCC ID: HNL-WREXT

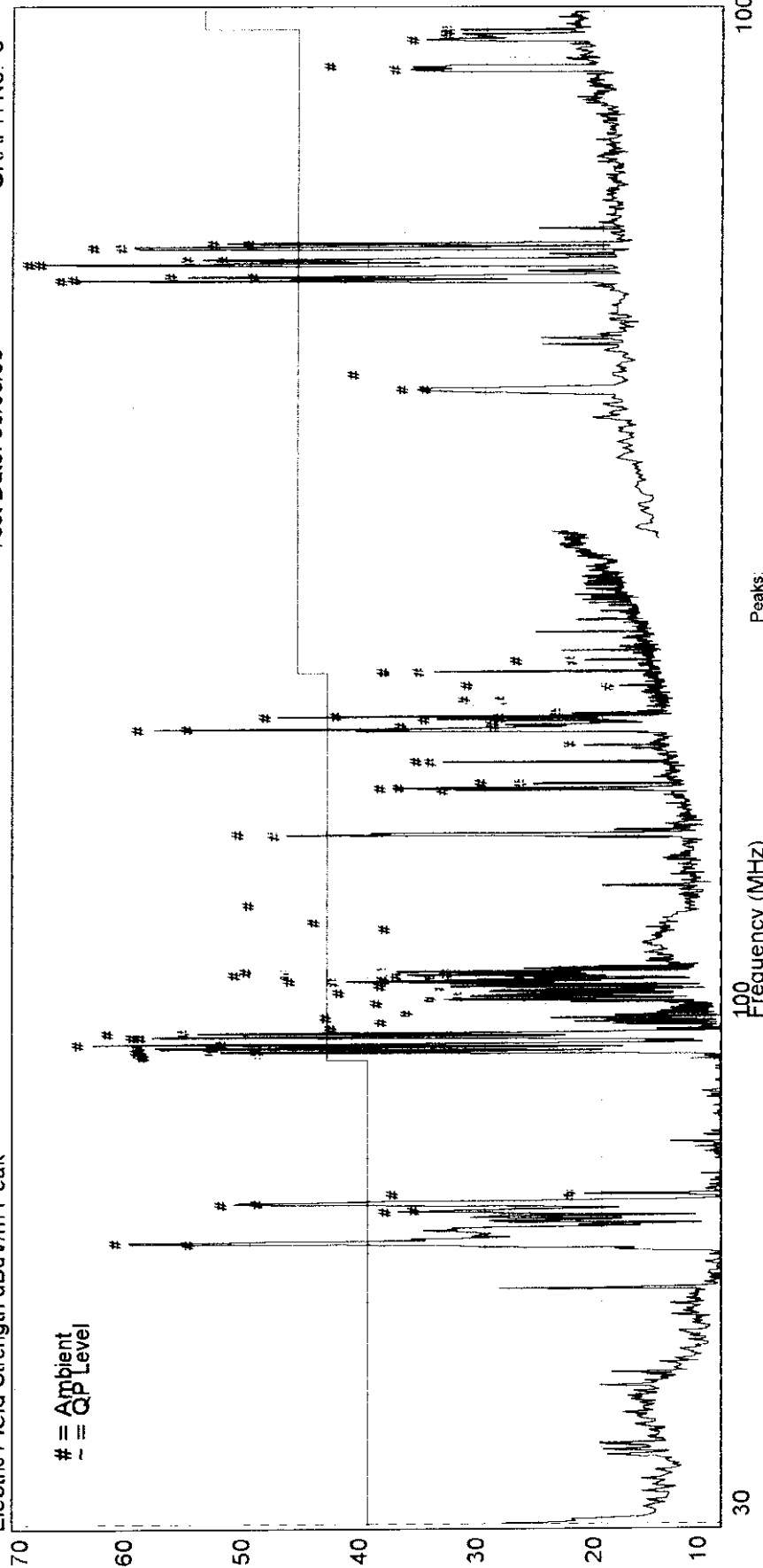
EMC Technologies Pty. Ltd. - Global Product Certification

Project No:M80446

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GRAPH No. 3

Test Date: 05/05/98

Electric Field Strength dBuV/m Peak



1000

Peaks:

Frequency (MHz)

30

WINRADIO 1500E
Tuned to 750MHz

No Freq (MHz) Peak (dBuV/m) Qp Val FCC-B3 dL1 (dB)

Legend:
— Vertical Ambients

Limits: FCC-B3 FCC PT 15.209 CLASS B RAD 3M LIMITS

Source:
c:\m80216 17 18 19 20 35

Equipment: HP8546A TST97F
Transducers: SITE_CAB a1103009 NOPREAMP_13
Site ID: Glenlyon
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

FCC ID: HNL-WREXT

EMC Technologies Pty. Ltd. - Global Product Certification

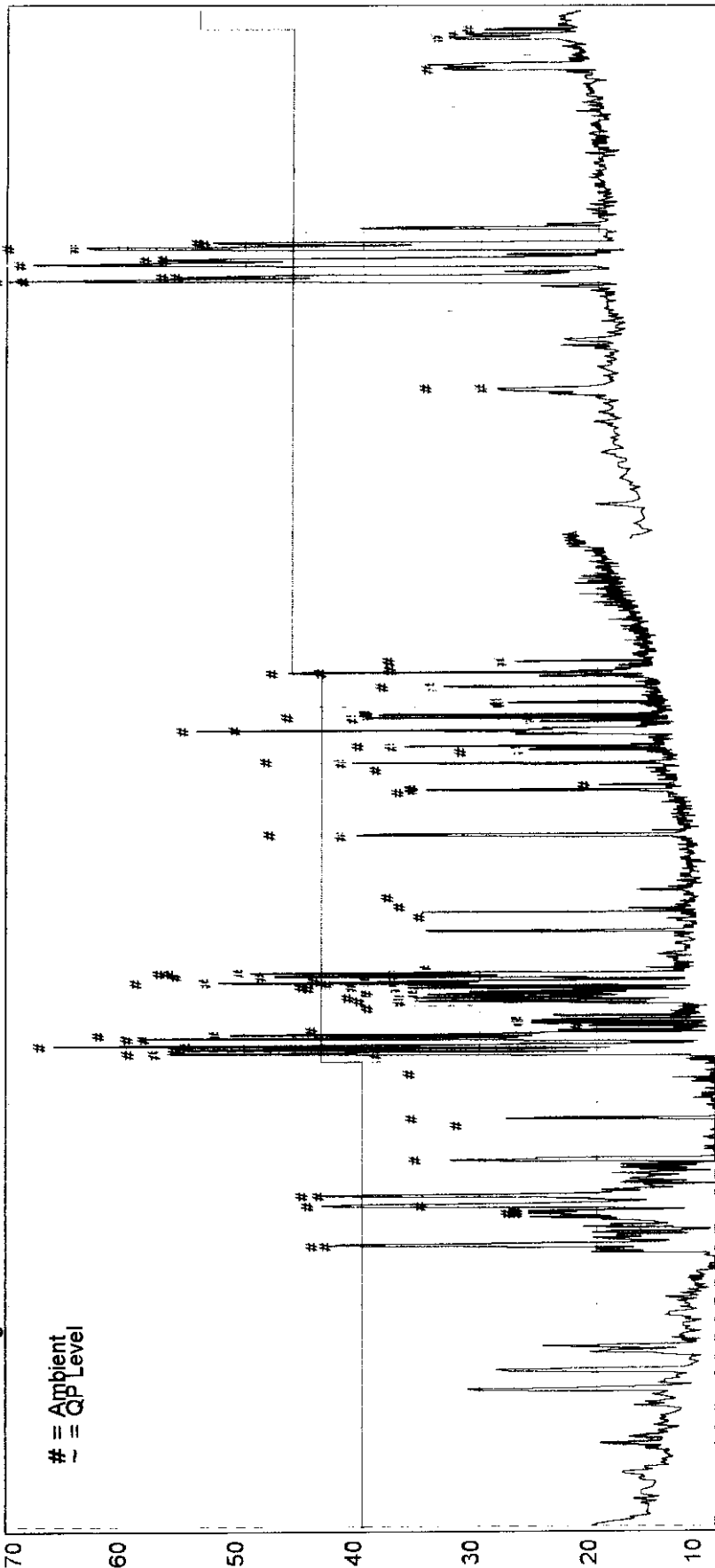
FCC Class B

Project No:M80446

Electric Field Strength dBuV/m Peak

Test Date: 05/05/98

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GRAPH No. 4



1000

Peaks:

No	Freq (MHz)	Peak (dBuV/m)	Qp Val (dBuV/m)	FCC-B3 (dB)	dL1 (dB)
1	30.1	45	45	45	45
2	30.5	48	48	48	48
3	31.2	52	52	52	52
4	32.1	55	55	55	55
5	33.5	58	58	58	58
6	34.2	60	60	60	60
7	35.1	62	62	62	62
8	36.5	65	65	65	65
9	37.2	68	68	68	68
10	38.1	70	70	70	70
11	39.5	65	65	65	65
12	40.2	62	62	62	62
13	41.1	60	60	60	60
14	42.5	58	58	58	58
15	43.2	55	55	55	55
16	44.1	52	52	52	52
17	45.5	50	50	50	50
18	46.2	48	48	48	48
19	47.1	45	45	45	45
20	48.5	42	42	42	42
21	49.2	40	40	40	40
22	50.1	38	38	38	38
23	51.5	35	35	35	35
24	52.2	32	32	32	32
25	53.1	30	30	30	30
26	54.5	28	28	28	28
27	55.2	25	25	25	25
28	56.1	22	22	22	22
29	57.5	20	20	20	20
30	58.2	18	18	18	18
31	59.1	15	15	15	15
32	60.5	12	12	12	12
33	61.2	10	10	10	10
34	62.1	8	8	8	8
35	63.5	5	5	5	5
36	64.2	3	3	3	3
37	65.1	2	2	2	2
38	66.5	1	1	1	1
39	67.2	0	0	0	0
40	68.1	0	0	0	0
41	69.5	0	0	0	0
42	70.2	0	0	0	0
43	71.1	0	0	0	0
44	72.5	0	0	0	0
45	73.2	0	0	0	0
46	74.1	0	0	0	0
47	75.5	0	0	0	0
48	76.2	0	0	0	0
49	77.1	0	0	0	0
50	78.5	0	0	0	0
51	79.2	0	0	0	0
52	80.1	0	0	0	0
53	81.5	0	0	0	0
54	82.2	0	0	0	0
55	83.1	0	0	0	0
56	84.5	0	0	0	0
57	85.2	0	0	0	0
58	86.1	0	0	0	0
59	87.5	0	0	0	0
60	88.2	0	0	0	0
61	89.1	0	0	0	0
62	90.5	0	0	0	0
63	91.2	0	0	0	0
64	92.1	0	0	0	0
65	93.5	0	0	0	0
66	94.2	0	0	0	0
67	95.1	0	0	0	0
68	96.5	0	0	0	0
69	97.2	0	0	0	0
70	98.1	0	0	0	0
71	99.5	0	0	0	0
72	100.2	0	0	0	0

100 Frequency (MHz)

WINRADIO 1500E
Tuned to 750MHz

Limits:		FCC PT 15 209 CLASS B RAD 3M LIMITS		Legend:	
FCC-B3				Horizontal Ambients	
Equipment: HP8546A TST97E		Source:		13 14 15 16 36	
Transducers: SITE_CAB a1103009 a033009 NOPREAMP_13		c:\m80216			
Site ID: Glenlyon					
Test Officer: Praveen Rao					
Melbourne- 57 Assembly Drv Tullamarine, 3043, Vic, Australia Ph+(613) 9335 3333 Fax+(613) 9335 9260					
Sydney----- 16,6 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9899 4599 Fax+(612) 9899 4019					

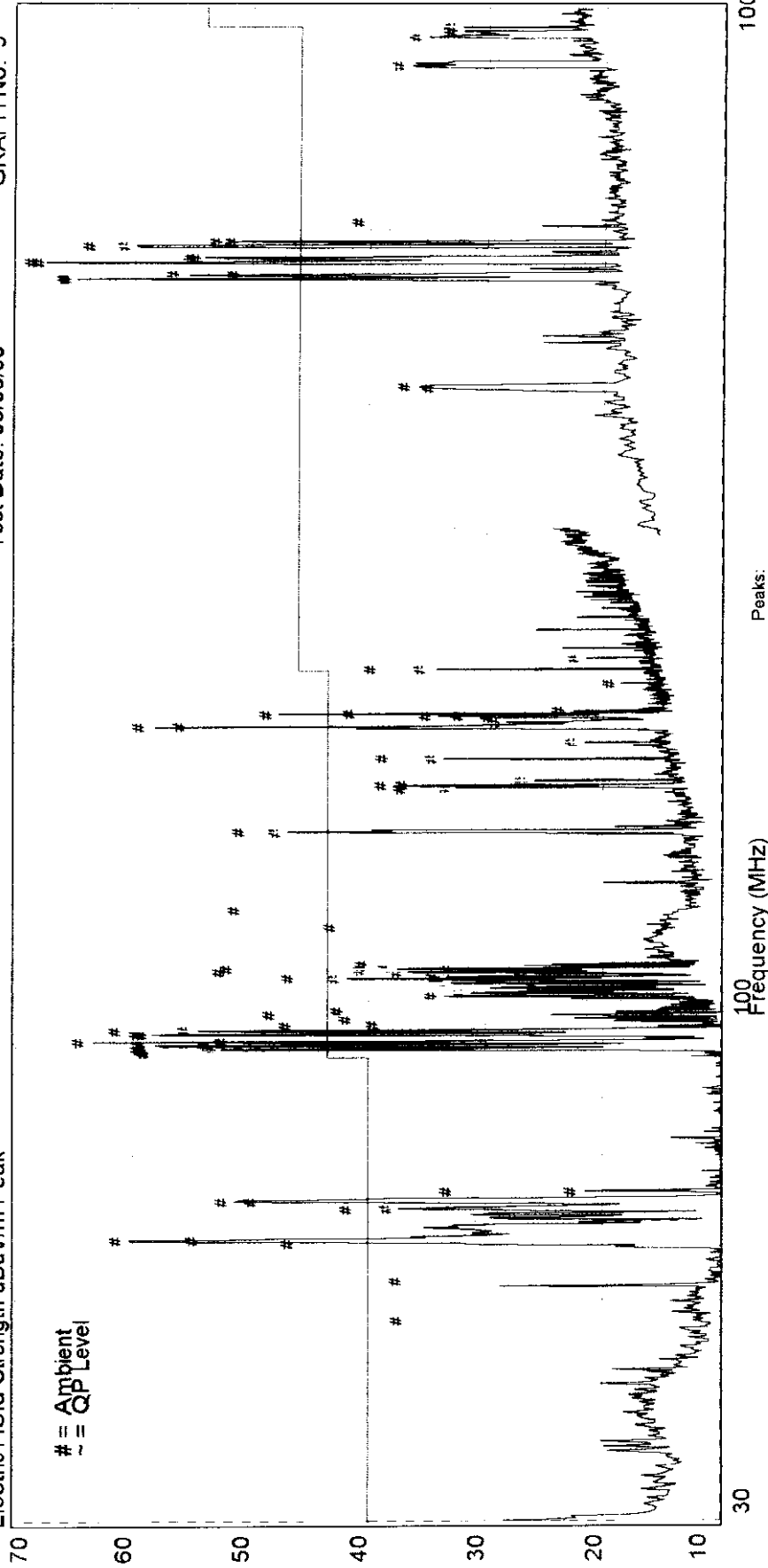
FCC ID: HNL-WREXT

EMC Technologies Pty. Ltd. - Global Product Certification
FCC Class B
Project No: M80446

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GRAPH No. 5

Test Date: 05/05/98

Electric Field Strength dBuV/m Peak



WINRADIO 1500E
Tuned to 1500MHz

Peaks:

No	Freq (MHz)	Peak (dBuV/m)	Qp Val (dBuV/m)	FCC-B3 (dB)	dL1 (dB)
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Limits:	FCC-B3	FCC PT 15 209 CLASS B RAD 3M LIMITS	Legend:	Vertical Ambients
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Equipment:	HP8546A TST97F	Source:	17 18 19 20 35
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Transducers:	SITE_CAB a103009 a033009	NOPREAMP_13	
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Site ID:	Glenlyon		
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Test Officer:	Praveen Rao		
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Melbourne - 57 Assembly Drv Tullamarine, 3043 Vic, Australia Ph+(613) 9338 9260			
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Sydney ---- 16,6 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9899 4599 Fax+(612) 9899 4019			
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EMC Technologies Pty. Ltd. - Global Product Certification

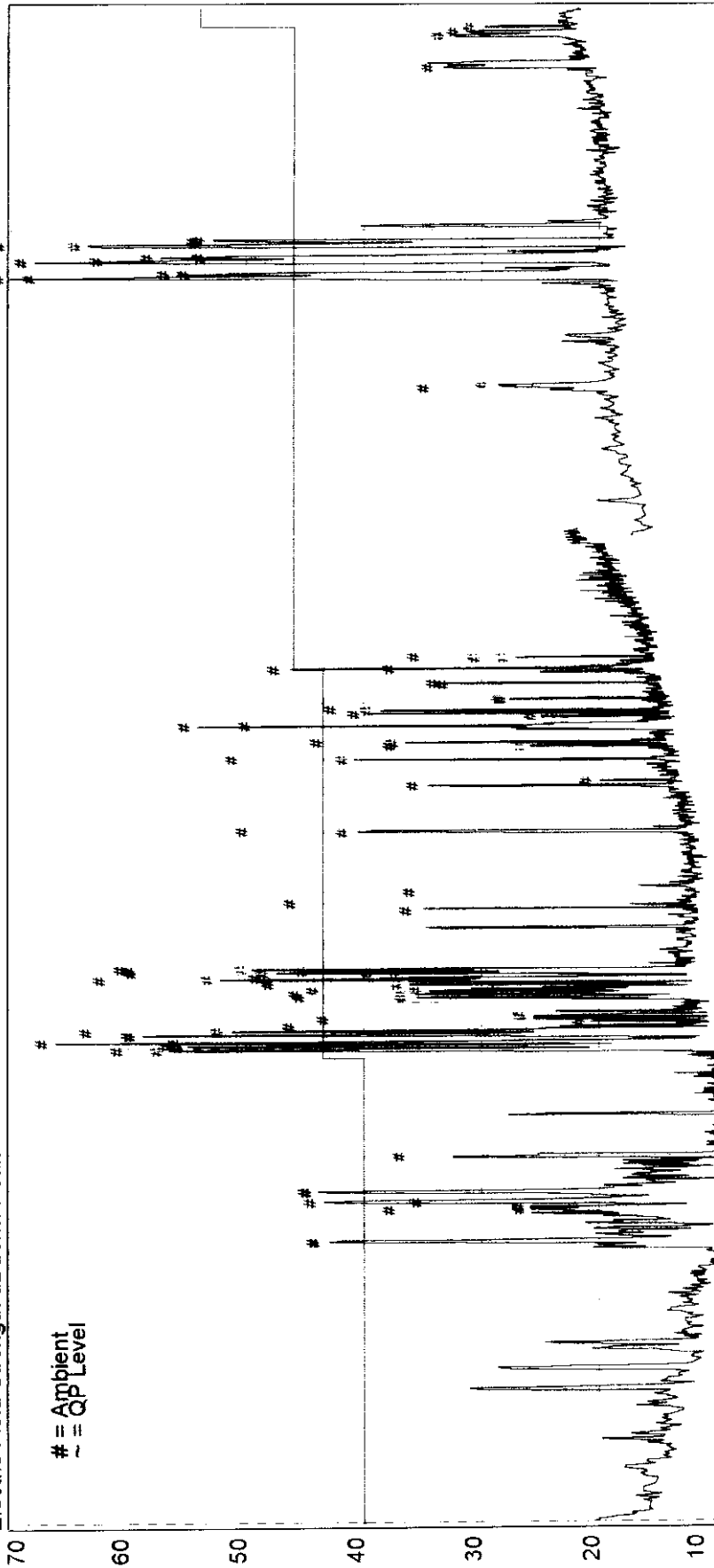
FCC Class B

Project No:M80446

Electric Field Strength dBuV/m Peak

Test Date: 05/05/98

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GRAPH No. 6



1000

Peaks:
No Freq Peak Qp Val FCC-B3 dL1
(MHz) (dBuV/m) (dB)

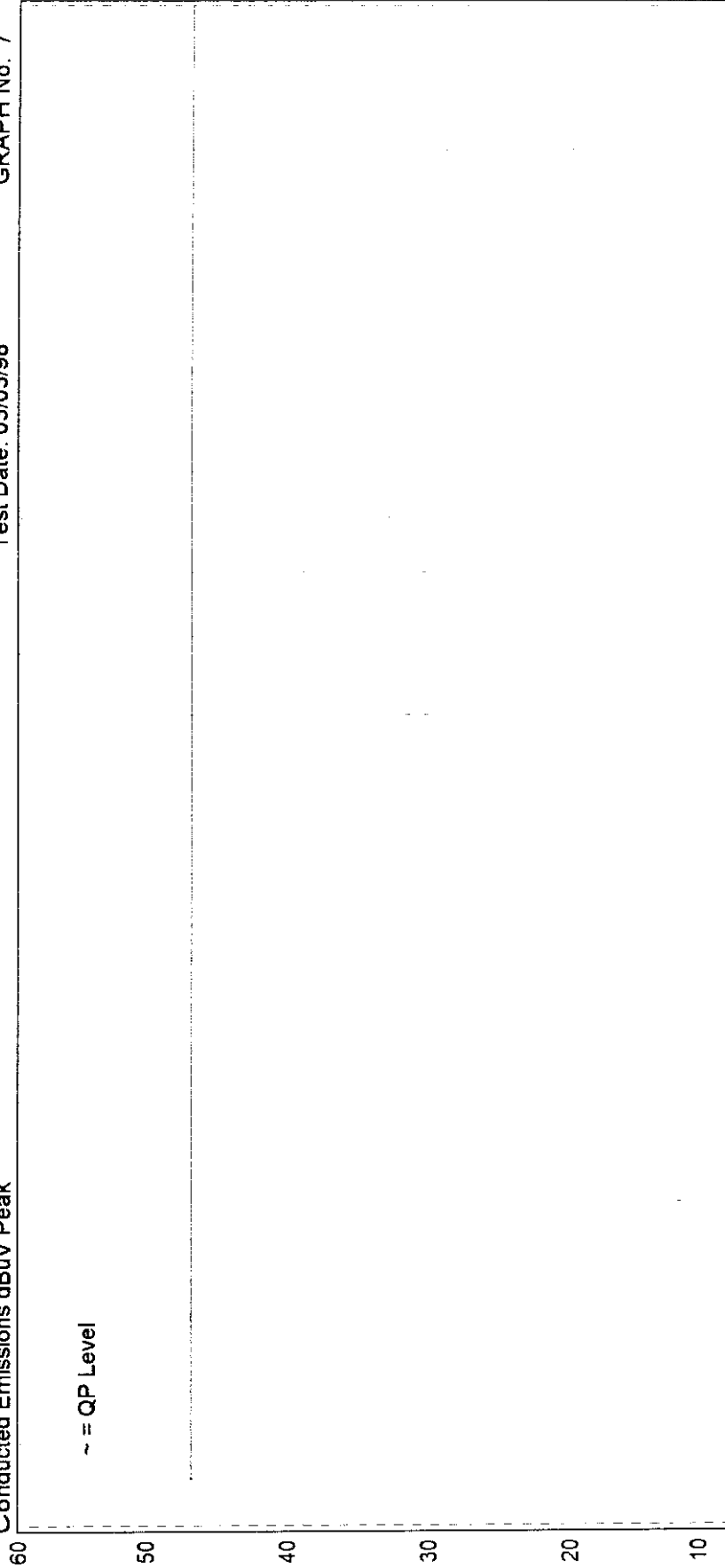
WINRADIO 1500E
Tuned to 1500MHz

Limits	FCC PT 15.209 CLASS B RAD 3M LIMITS	Legend	Horizontal Ambients
Equipment: HP8546A TST97F			
Transducers: SITE_CAB at103009 NOPREAMP_13		Source:	13 14 15 16 36
Site ID: Glenlyon		c:\m80216	
Test Officer: Praveen Rao			
Melbourne- 57 Assembly Div 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			

EMC Technologies Pty. Ltd. - Global Product Certification
FCC Class B
Conducted Emissions dBuV Peak

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GRAPH No. 7

Test Date: 05/05/98



Limits:		FCC CLASS B CONDUCTED QP LIMITS		Legend:	
WINRADIO 1500E					
Equipment: HP8574B TST97F					
Transducers: C130697 N016612 NOPREAMP					
Site ID: Glenlyon					
Test Officer: Praveen Rao					
Melbourne: 57 Assembly Drv Tullamarine, 3043 Vic, Australia Ph+(613) 9335 3333 Fax+(613) 9336 9260					
Sydney: 16,6 Gladstone Rd Castle Hill, 2154, NSW, Australia Ph+(612) 9899 4599 Fax+(612) 9899 4019					

FCC ID: HNL-WREXT

APPENDIX G

LOCAL OSCILLATOR FREQUENCIES

LIST OF PRINCIPAL FREQUENCIES USED IN WiNRADiO (WR1000, WR1500, WR3100)

1. MASTER OSCILLATOR:

12.800 MHz crystal locked.

2. FIRST & SECOND LOCAL OSCILLATORS:

RF FREQUENCY MHz	1st LO, MHz	2nd LO, MHz
0.150 - 299.999	RF + 556.325	614.4
300.000 - 512.999	RF + 249.125	307.2
513.000 - 797.999	RF + 58.075	Not used
798.000 - 1105.999	RF - 249.125	307.2
1106.000 - 1500.000	RF - 556.325	614.4

NOTE: The 2nd LO is derived from a harmonic of the 12.8 MHz master oscillator.

3. OTHER OSCILLATORS:

57.620 MHz crystal locked, continuous.

47.375 MHz crystal locked, active when FMW mode is selected.

APPENDIX H

TEST SAMPLE CIRCUIT COMPONENT LISTING