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**EMI TEST REPORT
for
CERTIFICATION to
FCC PART 15 Subpart E (Section 15.407)
& RSS-210**

FCC ID: EJE-WL0004
Industry Canada ID: 337J-WL0004
Test Sample: Stylistic Pentablet PC
Model Number: ST5010D
Codename: Ocampu
Wireless LAN Module: Atheros
Model Number: WLL4030 (11a+b/g module)
Tested for: Fujitsu Australia Ltd.

Issue Date: 18th December 2003

EMC Technologies Pty Ltd reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. EMC Technologies Pty Ltd shall have no liability for any deductions, inferences or generalisations drawn by the client or others from EMC Technologies Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Technologies Pty Ltd.



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**NATA Accredited Laboratory
Number: 5292**

**EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart E (Section 15.407)
& RSS-210**

EMC Technologies Report No. M030949_Certification_Ocampa_Atheros_5.2

Issue Date: 18th December 2003

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EMI TEST REPORT FOR CERTIFICATION to FCC PART 15 Subpart E (Section 15.407) & RSS-210

Report Number: M030949_Certification_Ocampa_Atheros_5.2
Test Sample: Stylistic Pentablet PC
Model Number: ST5010D
Codename: Ocampa
Wireless LAN Module: Atheros
Model Number: WLL4030 (11a+b/g module)
Equipment Type: Intentional Radiator (Transceiver)
Manufacturer: Askey Computer Corp.

Manufacturer (Stylistic PC): Fujitsu Limited
Address: 1405, Ohamaru, Inagi-shi, Tokyo 206-8503, Japan
Contact: Mr. Kanbe Katsuhito
FCC ID: EJE-WL0004
Industry Canada ID: 337J-WL0004

Tested for: Fujitsu Australia Ltd
Address: 5 Lakeside Drive,
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Phone: +613 9845 4300
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Contact: Mr Praveen Rao - Senior Compliance Engineer

Test Standards: FCC Part 15, Subpart E – Unlicensed National Information
 Infrastructure Devices
 FCC Part 15.407, General Technical Requirements
 ANSI C63.4-1992
 OET Bulletin No. 63

RSS-210 Issue 5 Low Power Licence-Exempt
 RadioCommunication Devices:
 6.2.2 (q1) 5150-5350 MHz & 5725-5825 MHz Local Area
 Network Devices

RSS-102 Issue 1 (Provisional), Evaluation Procedure for
 Mobile and Portable Radio Transmitters with respect to
 Health Canada's Safety Code 6 for Exposure of Humans to
 Radio Frequency Fields

Test Dates: 4th – 20th October 2003

Test Officer: 
Chien Huynh B. Eng (Hons) Electronics

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: 
Chris Zombolas
Technical Director
EMC Technologies Pty Ltd



EMI TEST REPORT FOR CERTIFICATION to FCC PART 15 Subpart E (Section 15.407) & RSS-210

1.0 INTRODUCTION

This report details the results of EMI tests and measurements performed on the Mini-PCI Wireless LAN Module (Atheros), Model WLL4030 installed in Stylistic Pentablet PC, Model ST5010D (Ocampa), in accordance with the following Federal Communications Commission (FCC) standards/regulations:

47 CFR, Part 15, Subpart E: Unlicensed National Information Infrastructure Devices (U-NII)
operating in the 5.15-5.35 GHz and 5.725-5.825 GHz frequency bands
Section 15.407: General Technical Requirements

The results and technical details of the test sample are detailed in this report. The test sample **complies** with the requirements of 47 CFR, Part 15 Subpart E - Section 15.407.

The test sample also complies with the Industry Canada RSS-210 issue 5 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(q1) requirements and the RF exposure requirements of RSS-102.

1.1 Summary of Results

FCC PART 15 Subpart E (Section 15.407: 5.15 - 5.35 GHz and 5.725 - 5.825 GHz bands)

FCC Part 15, Subpart E Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	Not Applicable
15.205	6.3	Operation in Restricted Bandwidth	Complies
15.207	6.6	Conducted Emissions	Complies
15.209	6.3	Radiated Emissions	Complies
15.407 (a)(4)	6.2.2(q1)	Peak Transmit Power	Complies
15.407 (a)(5)	6.2.2(q1)	Peak Power Spectral Density	Complies
15.407 (a)(6)		Peak Power Excursion	Complies
15.407 (b)	6.2.2(q1)	Undesirable Emission	Complies
15.407 (f)		Radio Frequency Hazard	*Complies with SAR requirements
15.407 (g)	6.4	Frequency Stability	Complies

*Refer to EMC Technologies' report M030949_Ocampa_Atheros_5.2 SAR Report

The measurement procedure used was in accordance with ANSI C63.4-1992 and OET Bulletin No. 96-43. The instrumentation conformed to the requirements of ANSI C63.2-1987.

1.2 Modifications by EMC Technologies

No modifications were required.



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2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 Product Details

Test Sample:	Stylistic Pentablet PC
Model Number:	ST5010D
Codename:	Ocampa
Wireless LAN Module:	Atheros
Model Number:	WLL4030 (11a+b/g module)
Interface Type:	Mini-PCI WLAN Module
FCC ID:	EJE-WL0004
Industry Canada ID:	337J-WL0004
Equipment Type:	Intentional Radiator (Transceiver)

2.2 Test Sample Operational Description

The EUT is a Mini-PCI Wireless LAN (WLAN) Module (Atheros WLL4030) installed in Fujitsu's Stylistic Pentablet PC, Model ST5010D (Ocampa). The Atheros WLAN module is an OEM product from ASKEY Computer Corporation. The 'Atheros WLL4030' design is based on the Atheros AR5002X chipset, which implements IEEE 802.11a and IEEE 802.11b/IEEE802.11g WLAN solutions.

The manufacturer has previously certified this module as an OEM device.

This pre-certified Atheros module is installed in Fujitsu Tablet PC and has been tested again for FCC and Industry Canada compliance.

Refer to the following appendices:

Appendix B: Test sample & setup photographs

Appendix C: Functional description

Appendix G: WLAN specifications

This report details the IEEE 802.11a and IEEE 802.11b/IEEE 802.11g configurations.



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2.3 Technical Specifications

Modulation Type:	Direct Sequence Spread Spectrum (DSSS for 802.11b) Orthogonal Frequency Division Multiplexing (OFDM for 802.11g) Orthogonal Frequency Division Multiplexing (OFDM for 802.11a)
802.11a	BPSK – 6Mbps, 9Mbps QPSK – 12Mbps, 18Mbps 16QAM – 24Mbps, 36Mbps 64QAM – 48Mbps, 54Mbps
802.11g	BPSK – 6Mbps, 9Mbps QPSK – 12Mbps, 18Mbps 16QAM – 24Mbps, 36Mbps 64QAM – 48Mbps, 54Mbps
802.11b	DBPSK – 1Mbps DQPSK – 2Mbps CCK – 5.5Mbps, 11Mbps
Maximum Data Rate:	802.11b = 11Mbps, 802.11g = 54 Mbps and 802.11a = 54Mbps
Frequency Range:	2.4 – 2.4835 GHz for 11b/g (operational range 2.412 – 2.462 GHz) 5.15 - 5.25 GHz, 5.25 – 5.35 GHz, 5.725 - 5.825 GHz for 11a
Number of Channels:	11 maximum (for 11b/11g) 12 maximum (for 11a) *Passive Scan only
Antenna Types:	Monopole Ceramic Chip Antenna – YCE 5008
Max. Output Power:	802.11b and 802.11g = 18 dBm 802.11a Band 1 (5.15 to 5.25 GHz) = 14 dBm 802.11a Band 2 (5.25 to 5.35 GHz) = 17 dBm 802.11a Band 3 (5.725 to 5.825 GHz) = 16 dBm
Power Supply:	3.3 VDC from PCI bus
Chipset Used:	Atheros AR5212, AR5112
Turbo Mode:	For 802.11g & 802.11a only
Output Power (Turbo):	16 dBm
Data rate (Turbo):	12 MBps to 108 Mbps

Frequency allocation for 802.11a:

Channel Number	Frequency (MHz)	Turbo mode Frequency (MHz):
36	5180	5210
40	5200	--
44	5220	--
48	5240	5250
52	5260	--
56	5280	5290
60	5300	
64	5320	
149	5745	
153	5765	5760
157	5785	--
161	5805	5800



Frequency allocation for 802.11b/g:

Channel Number	Frequency (MHz)	Turbo mode Frequency (MHz): FOR 802.11g ONLY
1	2412	--
2	2417	--
3	2422	--
4	2427	--
5	2432	--
6	2437	2437
7	2442	--
8	2447	--
9	2452	--
10	2457	--
11	2462	--

EUT Host Details:

Host PC: STYLISTIC ST Series (Tablet PC)
Model Number: ST5010D
Codename: Ocampa
Serial Number: Not supplied
Manufacturer: Fujitsu Ltd

CPU Type and Speed: Banias ULV 1.0 GHz
SDRAM: 256 MB
LCD Screen: 12.1 "XGA
Hard Disk Drive: 40 GB

LAN: Giga-LAN/10/100Base-T
Wireless LAN Module: Atheros 11a+b/g
Docking Station Model: FPCPR43xx (x: A-Z or blank)
 FPCPR44xx (x: A-Z or blank)

AC Adapter :

Adapter Spec			Model Number:	Alternate Model Number
Volts	Amps	Watts		
16	3.75	60	SEC80N2-16.0	CP171180-01

2.4 Test sample configuration

The Atheros module supports IEEE 802.11a, IEEE 802.11b and IEEE 802.11g configurations. Tests were performed in all three configurations and all modulation types were investigated. The results for IEEE 802.11a configuration is reported. The results for IEEE 802.11b and IEEE 802.11g configurations are reported separately. Refer to EMC test report: M030949_Certification_Ocampa_Atheros_2.4.

Antenna

The Atheros WLAN (WLL4030 (11a+b/g)) is configured with a Monopole Ceramic Chip antenna (refer to Appendix O for Antenna specifications). The installation of the OEM WLAN module and the Antenna in Fujitsu STYLISTIC pentablet PC is in a controlled environment. The installation is performed during the production/assembly process at the Fujitsu factory.

AC Adapter

The AC adapter SEC80N2-16.0 was used for all the tests. This adapter is also identified as CP171180-01. The manufacturer has stated that all these adapters are identical electrically and mechanically.

Refer to Appendix B - Test Setup Photographs.



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2.5 Test Sample Block Diagram

Refer to Appendix D - EUT Block Diagram

2.6 Test Sample Support Equipment

External Monitor/s:

Conducted EMI

Viewmaster, P/N CA64 150DL, S/N CN7610276

Radiated EMI

Hewlett Packard 15" Colour monitor, Model D2827A,
FCC ID: C5F7NFCMC1515X

IR Keyboard:

P/N N860-7628-T152

IR Mouse:

M2W883Z013-02, S/N 0806256M01A

USB Scanner:

Rapidscan Mobile Colour scanner, M/N FPCSCN01, S/N DF1700100

USB Floppy Drive/s:

Fujitsu Model: FPCFDD11, P/N CP032173-01

Fujitsu Model: FPCFDD12, P/N CP078720-01

USB OMNI Floppy Drive Model # USB F3501 SN W316000096

Headphones:

Verbatim Multimedia Stereo headset

LAN Hub:

Kingston SOHO Hub Model: KNE8TB/H (FCC ID: JICKNE8TP-HO)

PCMCIA Slot:

6 MB Compact flash card with Adapter, Apacer P/N 88.10200030

Memory Card:

Secure Digital- 32 MB

AC Adapter:

SEC80N2-16.0

2.7 Test Procedure

Emissions measurements were performed in accordance with the procedures of ANSI C63.4-1992. Radiated emissions tests were performed at a distance of 3 and 10 metres from the EUT. OET Bulletin 63 dated October 1993 was used for reference.

2.8 Test Facility

2.8.1 General

Radiated Emission measurements were performed at EMC Technologies open area test site (OATS) situated at Lerderderg Gorge, near the township of Bacchus Marsh in Victoria, Australia. Conducted emission measurements were performed at EMC Technologies' laboratory in Tullamarine, Victoria Australia.

The above sites have been fully described in a report submitted to the FCC office, and accepted in a letter dated June 14, 2002, **FCC Registration Number 90560**.

EMC Technologies open area test site (OATS) has also been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS 212, Issue 1 (Provisional).

Industry Canada File Number, IC 4161, (Registration Date - November 5th 2001).



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2.8.2 NATA Accreditation

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

“FCC Part 15 unintentional and intentional emitters in the frequency range 9kHz to 18 GHz excluding TV receivers (15.117 and 15.119), TV interface devices (15.115), cable ready consumer electronic equipment (15.118), cable locating equipment (15.213) and unlicensed national information infrastructure devices (Sub part E).”

The current full scope of accreditation can be found on the NATA website: www.nata.asn.au
It also includes a large number of emission, immunity, SAR, EMR and Safety standards.

NATA is the Australian national laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the 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) and an internal quality system to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A²LA).

2.9 Units of Measurements

2.9.1 Conducted Emissions

Measurements are reported in units of dB relative to one microvolt. (dBμV).

2.9.2 Radiated Emissions

Measurements are reported in units of dB relative to one microvolt per metre (dBμV/m).

2.10 Test Equipment Calibration

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

2.11 Ambients at OATS

The Open Area Test Site (OATS) 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.



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RESULTS

FCC PART 15 Subpart E

Section 15.407: General Technical Requirements



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1.0 CONDUCTED EMISSION MEASUREMENTS

Testing was performed in accordance with the requirements of FCC Part 15.207

1.1 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 0.15 MHz to 30 MHz frequency range was sub-divided into sub-ranges to ensure that all short duration peaks were captured.

1.2 Peak Maximising Procedure

The various operating modes of the system were investigated. 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 and the Average detector were then invoked to measure the actual Quasi-Peak and Average level of the most significant peaks, which were detected.

1.3 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:

$$VEMI = VRx + LBPF$$

Where: **VEMI** = the Measured EMI voltage in dB μ V to be compared to the limit.
VRx = the Voltage in dB μ V read directly at the EMI receiver.
LBPF = the insertion loss in dB of the cables and the Limiter and Pass Filter.

1.4 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 and Average values were also plotted on the graph.

1.5 Results of Conducted Emission Measurements (AC Mains Ports)

Frequency MHz	Line	Measured QP Level dB μ V	QP Limit dB μ V	Δ QP \pm dB	Measured AV Level dB μ V	AV Limit dB μ V	Δ AV \pm dB
0.202	Active	49.2	63.5	-14.3	30.5	53.5	-23.0
0.198	Neutral	49.3	63.7	-14.4	31.6	53.7	-22.1
0.154	Neutral	49.8	65.8	-16.0	23.7	55.8	-32.1
0.153	Active	49.8	65.8	-16.0	22.5	55.8	-33.3
16.01	Active	35.6	60.0	-24.4	29.2	50.0	-20.8
16.62	Neutral	33.5	60.0	-26.5	27.0	50.0	-23.0

All emissions complied with the Class B quasi peak and average limits by margins of greater than 10 dB. The measurement uncertainty was ± 2.0 dB.

Refer to Appendix J for plots of the conducted EMI measurements.



2.0 RADIATED EMISSION MEASUREMENTS

2.1 Test Procedure

Testing was performed in accordance with the requirements of FCC Part 15.407(b).

Radiated emission measurements were performed to the limits as per section 15.209 and 15.407.

Testing was performed while the transmitter continuously transmitted. The measurements were made at the open area test site.

The EUT was set up on the table top (placed on 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 PC Controller through the IEEE.488 Interface Bus Card Adaptor. The 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. A calibrated Biconical antenna was used for measurements between 30 MHz to 232 MHz and a calibrated Logperiodic antenna used for measurements between 230 MHz to 1000 MHz. Calibrated EMCO 3115 and EMCO 3116 Horn antennas were used for measurements between 1 to 40 GHz.

The measurement of emissions between 30 - 1000 MHz was measured with the resolution bandwidth of 120 kHz and the video bandwidth of 300 kHz.

The measurement of emissions above 1000 MHz, appearing in the restricted bands, was made using an average detector with a bandwidth of 1.0 MHz.

The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. When an emission was located, it was positively identified and its maximum level found by rotating the automated turntable, and by varying the antenna height. Each significant peak was investigated with the Quasi-Peak/Average Detectors. 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 polarisations.

2.2 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:

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

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (1000 MHz – 18,000 MHz) \pm 4.1 dB
(30 MHz – 1,000 MHz) \pm 3.7 dB



2.3 Results - Out of Band Emissions (Spurious and Harmonics)

2.3.1 Frequency Band: 1 – 40 GHz

All measurements above 1 GHz were initially made over a distance of 3 metres. This was decreased to 1.0 metre as the emission levels from the device were very low.

The 54 dB μ V/m limit at 3 metres has been converted to 64 dB μ V/m at 1 metre using a factor of 20 dB per decade where emissions were located in the restricted bands.

The peak limits for undesirable emission outside of the restricted bands are –27 dBm (68.3 dB μ V/m @ 3m), except emissions within 10MHz of operating frequency range of 5.725 – 5825 GHz are –17 dBm (78.3 dB μ V/m @ 3m).

Measurements were performed on two frequency bands (5.15 - 5.35 GHz and 5.725 - 5.825 GHz)

The field strength at 5825 MHz when the EUT was operating at its highest channel (5805 MHz), was 51.6 dB μ V/m peak (noise floor) and was > 20 dB below the maximum field strength of the in-band carrier.

The field strength at 5150 MHz when the EUT was operating at its lowest channel (5180 MHz), was 50.8 dB μ V/m peak (noise floor) and was > 20 dB below the maximum field strength of the in-band carrier.

2.3.1.1 Configuration 802.11a - Normal Operating Mode

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in emissions were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 9 Mbps (BPSK).

Channel 36 – 5180 MHz

Frequency MHz	Level dB μ V/m		Antenna Polarization	Peak Limit dB μ V/m	Average Limit dB μ V/m	Result
	Peak Detector	Average Detector				
5180	Transmitter	Fundamental				
10360	49.8	38.2	Vert/Hort	68.3	-	Pass
15540	54.0	43.4	Vert/Hort	74.0	54.0	Pass
20720	57.3	45.9	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
25900	59.6	47.7	Vert/Hort	78.3* (1m)	-	Pass
31080	68.1	56.5	Vert/Hort	78.3* (1m)	-	Pass
36260	67.7	55.6	Vert/Hort	78.3* (1m)	-	Pass

Channel 52 – 5260 MHz

Frequency MHz	Level dB μ V/m		Antenna Polarization	Peak Limit dB μ V/m	Average Limit dB μ V/m	Result
	Peak Detector	Average Detector				
5260	Transmitter	Fundamental				
10520	49.9	38.5	Vert/Hort	68.3	-	Pass
15780	53.8	43.8	Vert/Hort	74.0	54.0	Pass
21040	58.2	44.9	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
26300	60.4	47.7	Vert/Hort	78.3* (1m)	-	Pass
31560	68.6	53.9	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
36820	68.3	55.4	Vert/Hort	78.3* (1m)	-	Pass



Channel 64 – 5320 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
5320	Transmitter	Fundamental				
10640	50.3	39.1	Vert/Hort	74.0	54.0	Pass
15960	53.9	42.8	Vert/Hort	74.0	54.0	Pass
21280	56.6	45.4	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
26600	59.4	48.7	Vert/Hort	78.3* (1m)	-	Pass
31920	67.8	57.2	Vert/Hort	78.3* (1m)	-	Pass
37240	68.2	58.3	Vert/Hort	78.3* (1m)	-	Pass

Channel 149 – 5745 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
5745	Transmitter	Fundamental				
11490	51.4	39.7	Vert/Hort	74.0	54.0	Pass
17235	54.6	42.2	Vert/Hort	68.3	-	Pass
22980	60.7	50.0	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
28725	67.8	57.3	Vert/Hort	78.3* (1m)	-	Pass
34470	68.0	68.5	Vert/Hort	78.3* (1m)	-	Pass

Channel 157 – 5785 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
5785	Transmitter	Fundamental				
11570	52.3	39.4	Vert/Hort	74.0	54.0	Pass
17355	55.0	43.1	Vert/Hort	68.3	-	Pass
23140	59.6	48.7	Vert/Hort	78.3* (1m)	-	Pass
28925	67.7	57.7	Vert/Hort	78.3* (1m)	-	Pass
34710	67.4	67.6	Vert/Hort	78.3* (1m)	-	Pass



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Channel 161 – 5805 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
5805	Transmitter	Fundamental				
11610	51.7	40.2	Vert/Hort	74.0	54.0	Pass
17415	55.4	42.7	Vert/Hort	68.3	-	Pass
23220	60.3	48.5	Vert/Hort	78.3* (1m)	-	Pass
29025	68.3	56.9	Vert/Hort	78.3* (1m)	-	Pass
34830	68.3	67.1	Vert/Hort	78.3* (1m)	-	Pass

*Measurement was performed at 1 metre distance and the limits were corrected accordingly.

Harmonics were recorded within the restricted bands of up to 40 GHz and complied with the FCC Class B limits by a margin of greater than 10 dB. Harmonics were below the limit in section 15.209 and 15.407. The measurement uncertainty for radiated emissions in this band was ± 4.1 dB.

Result: Complies

2.3.1.2 Configuration 802.11a – Turbo Operating Mode

Testing was performed while the transmitter continuously operated with the modulation rate of 108 Mbps (Turbo).

Channel 36 – 5210 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
5210	Transmitter	Fundamental				
10420	50.2	38.7	Vert/Hort	68.3	-	Pass
15630	53.8	43.1	Vert/Hort	74.0	54.0	Pass
20840	56.7	46.6	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
26050	61.4	48.9	Vert/Hort	78.3* (1m)	-	Pass
31260	68.9	57.2	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
36470	68.5	57.3	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass

Channel 48 – 5250 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
5250	Transmitter	Fundamental				
10500	50.1	39.5	Vert/Hort	68.3	-	Pass
15750	52.9	43.0	Vert/Hort	74.0	54.0	Pass
21000	55.5	46.2	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
26250	61.2	49.0	Vert/Hort	78.3* (1m)	-	Pass
31500	69.0	57.8	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
36750	67.6	57.1	Vert/Hort	78.3* (1m)	-	Pass

Channel 56 – 5290 MHz

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Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
5290	Transmitter	Fundamental				
10580	51.1	39.3	Vert/Hort	68.3	-	Pass
15870	53.9	43.1	Vert/Hort	74.0	54.0	Pass
21160	55.6	46.0	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
26450	61.8	48.8	Vert/Hort	78.3* (1m)	-	Pass
31740	68.8	58.3	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
37030	68.2	58.1	Vert/Hort	78.3* (1m)	-	Pass

Channel 153 – 5760 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
5760	Transmitter	Fundamental				
11520	50.7	39.7	Vert/Hort	74.0	54.0	Pass
17280	52.7	43.0	Vert/Hort	68.3	-	Pass
23040	55.9	46.1	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
28800	62.3	49.7	Vert/Hort	78.3* (1m)	-	Pass
34560	68.3	58.3	Vert/Hort	78.3* (1m)	-	Pass

Channel 161 – 5800 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
5800	Transmitter	Fundamental				
11600	50.2	38.9	Vert/Hort	74.0	54.0	Pass
17400	52.7	41.6	Vert/Hort	78.3* (1m)	-	Pass
23200	56.5	45.8	Vert/Hort	78.3* (1m)	-	Pass
29000	61.9	48.8	Vert/Hort	78.3* (1m)	-	Pass
34800	68.0	57.5	Vert/Hort	78.3* (1m)	-	Pass

*Measurement was performed at 1 metre distance and the limits were corrected accordingly.

Harmonics were recorded within the restricted bands of up to 40 GHz and complied with the FCC Class B limits by a margin of greater than 10 dB. Harmonics were below the limit in section 15.209 and 15.407. The measurement uncertainty for radiated emissions in this band was ± 4.1 dB. Refer to tables above for results.

Result: Complies



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2.3.2 Frequency Band: 30 - 1000 MHz

Testing was performed at a distance of 10 metres.

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in emissions were observed. Final testing was performed while the transmitter continuously operated on channel 36, 5180 MHz normal operating mode with the modulation rate of 54 Mbps (64QAM).

The reported frequencies in the tables below are mainly concerned with the Host PC emissions and not directly related to the Atheros WLAN module emissions.

Vertical Polarity

Frequency MHz	Polarisation	QP Measured dB μ V/m	QP Limit dB μ V/m	Δ QP \pm dB
199.99	Vertical	29.3	33.5	-4.2
202.92	Vertical	28.6	33.5	-4.9
237.30	Vertical	30.6	36.0	-5.4
197.38	Vertical	27.2	33.5	-6.3
199.64	Vertical	27.1	33.5	-6.4
197.25	Vertical	26.6	33.5	-6.9
130.95	Vertical	25.8	33.5	-7.7
132.92	Vertical	25.5	33.5	-8.0
128.55	Vertical	25.2	33.5	-8.3
266.45	Vertical	27.4	36.0	-8.6
666.35	Vertical	26.9	36.0	-9.1
262.32	Vertical	26.6	36.0	-9.4
122.47	Vertical	21.9	33.5	-11.6
74.79	Vertical	15.1	30.0	-14.9
295.37	Vertical	20.9	36.0	-15.1
86.94	Vertical	14.6	30.0	-15.4

Horizontal Polarity

Frequency MHz	Polarisation	QP Measured dB μ V/m	QP Limit dB μ V/m	Δ QP \pm dB
266.46	Horizontal	34.3	36.0	-1.7
197.23	Horizontal	26.5	33.5	-7.0
696.19	Horizontal	27.2	36.0	-8.8
199.00	Horizontal	24.3	33.5	-9.2
202.89	Horizontal	23.4	33.5	-10.1
199.57	Horizontal	23.2	33.5	-10.3
275.05	Horizontal	24.4	36.0	-11.6
663.20	Horizontal	23.9	36.0	-12.1
115.00	Horizontal	20.8	33.5	-12.7
288.01	Horizontal	21.2	36.0	-14.8
263.49	Horizontal	19.6	36.0	-16.4
250.18	Horizontal	17.9	36.0	-18.1
82.11	Horizontal	10.4	30.0	-19.6
91.49	Horizontal	12.2	33.5	-21.3

The highest radiated emission peak occurred at 266.46 MHz (Horizontal polarity) and complied with FCC quasi peak limit by a margin of 1.7 dB. The measurement uncertainty in this band was ± 3.7 dB. Refer to tables above for results.

Result: Complies.



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2.3.3 Band Edge Measurements

The transmitter output was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 300 kHz and the video bandwidth of 1000 kHz were utilised.

Testing was performed while transmitter continuously transmitted on a low and high frequency channel of two frequency bands (5.150 – 5.350 GHz and 5.725 – 5.825 GHz)

2.3.3.1 Configuration 802.11a - Normal Operating Mode

Band1: 5.150 – 5.350 GHz

Refer to Appendix L for Band Edge plots

NB: D1 indicates the limit line for undesirable emission frequencies outside the operation frequency band.

Band2: 5.725 – 5.825 GHz

Refer to Appendix L for Band Edge plots

NB: D1 indicates the limit line for undesirable emission frequencies within 10 MHz above or below the band edge of the operation frequency band.

D2 indicates the limit line for undesirable emission frequencies 10 MHz or greater above or below the band edge of the operation frequency band.

2.3.3.2 Configuration 802.11a - Turbo Operating Mode

Band1: 5.150 – 5.350 GHz

Refer to Appendix L for Band Edge plots

NB: D1 indicates the limit line for undesirable emission frequencies outside the operation frequency band.

Band2: 5.725 – 5.825 GHz

Refer to Appendix L for Band Edge plots

NB: D1 indicates the limit line for undesirable emission frequencies within 10 MHz above or below the band edge of the operation frequency band.

D2 indicates the limit line for undesirable emission frequencies 10 MHz or greater above or below the band edge of the operation frequency band.

Result: Complies.



3.0 Peak Transmit Power - Section 15.407 (a)

Testing was performed in accordance with the requirements of FCC Part 15.407(a)(4)

Measurements were performed while the transmitter continuously transmitted.

The average output power (A in dBm) of the transmitter was measured with a calibrated RF power meter and a power sensor.

The e.i.r.p (P) was calculated as follows:

$$P = A + G + C \quad \text{where} \quad \begin{array}{l} G \text{ is the antenna gain in dBi} \& \\ C \text{ is the cable loss} \end{array}$$

Measurements were performed on two frequency bands (5.150 – 5.350 GHz and 5.725 – 5.825 GHz)

3.1 Configuration 802.11a – Normal Operating Mode

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). Peak power with BPSK modulation (rate = 9 Mbps) was observed to be slightly worst (approximately 0.5 dB). Final testing was performed while the transmitter continuously operated with the modulation rate of 9 Mbps (BPSK). The target output power was set to 16 dBm for frequency 5180 MHz and 18 dBm for all other frequencies.

Frequency MHz	A dBm	Coax Loss dB	G dBi	P dBm	Limit dBm	P mW	Limit mW
5180	14.6	0.5	0.69	15.8	17	38.0	50
5260	16.2	0.5	0.69	17.4	24	55.0	250
5320	15.2	0.5	0.69	16.4	24	43.7	250
5745	13.8	0.5	0.69	15.0	30	31.6	1000
5785	13.6	0.5	0.69	14.8	30	30.2	1000
5805	13.7	0.5	0.69	14.9	30	30.9	1000

Variation by +/- 15% of the supply voltage, in accordance with Section 15.31(e), to the computer power supply did not vary the output power observed.

Result: Complies.

3.2 Configuration 802.11a – Turbo Operating Mode

Testing was performed while the transmitter continuously operated with the modulation rate of 108 Mbps (Turbo). The target output power was set to 16 dBm for frequencies 5210 MHz and 5250 MHz and 18 dBm for all other frequencies.

Frequency MHz	A dBm	Coax Loss dB	G dBi	P dBm	Limit dBm	P mW	Limit mW
5210	14.3	0.5	0.69	15.5	17	35.5	50
5250	14.1	0.5	0.69	15.3	17	33.9	250
5290	16.3	0.5	0.69	17.5	24	56.2	250
5760	14.0	0.5	0.69	15.2	30	33.1	1000
5800	13.8	0.5	0.69	15.0	30	31.6	1000

Variation by +/- 15% of the supply voltage, in accordance with Section 15.31(e), to the computer power supply did not vary the output power observed.

Result: Complies.



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4.0 Channel Bandwidth

Testing was performed in accordance with the requirements of FCC Part 15.407(a)

The 26 dB bandwidth was measured while the transmitter continuously transmitted.

The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 300 kHz and the video bandwidth of 1000 kHz were utilised

Measurements were performed on two frequency bands (5.150 – 5.350 GHz and 5.725 – 5.825 GHz)

4.1 Configuration 802.11a – Normal Operating Mode

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in bandwidth were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 9 Mbps (BPSK).

Channel	Frequency MHz	Bandwidth MHz	26 dB Bandwidth Plots
36	5180	39.48	Appendix K
52	5260	37.37	Appendix K
64	5320	34.77	Appendix K
149	5745	37.47	Appendix K
157	5785	33.07	Appendix K
161	5805	33.07	Appendix K

4.2 Configuration 802.11a – Turbo Operating Mode

Testing was performed while the transmitter continuously operated with the modulation rate of 108 Mbps (Turbo).

Channel	Frequency MHz	Bandwidth MHz	26 dB Bandwidth Plots
36	5210	104.85	Appendix K
48	5250	106.16	Appendix K
56	5290	107.04	Appendix K
153	5760	46.29	Appendix K
161	5800	46.89	Appendix K



5.0 Radio Frequency Exposure (Hazard) Information

Testing was performed in accordance with the requirements of FCC Part 15.407(f)

Spread spectrum transmitters operating in the 5.150 – 5.350 GHz and 5.725 – 5.825 GHz bands are required to be operated in a manner that ensures that the public is not exposed to RF energy levels in accordance with CFR 47, Section 1.1307(b)(1).

In accordance with this section and also section 2.1091 this device has been defined as a portable device whereby a distance of 20 cm normally cannot be maintained between the user and the device.

In accordance with Section 1.1310, the Maximum Permissible Exposure (MPE) limit for the General Population/Uncontrolled Exposure of 1.0 has been applied, i.e 1mW/cm².

The maximum distance from the antenna at which the MPE is met or exceeded has been calculated from the equation relating field strength in V/m, transmit power in watts, transmit antenna gain and separation distance in metres:

$$E, \text{ V/m} = (\sqrt{30 * P * G}) / d$$

$$\text{Power density, mW/cm}^2 = E^2 / 3770$$

$$E \text{ for MPE: } = E^2 / 3770$$

$$E = \sqrt{1 * 3770}$$

$$E = 61.4 \text{ V/m}$$

The max Antenna (Monopole Ceramic Chip) gain = 0.69 dBi

Conducted Power

Highest output power was calculated. The result was extracted from section 3.0 of this report.

Frequency MHz	Operating Mode	Modulation	Maximum Conducted Output Power Measured
5260	Normal	OFDM (802.11a)	17.4 dBm (55.0mW)
5290	Turbo	OFDM (802.11a)	17.5 dBm (56.2mW)

The total power (P*G) measured at the Antenna of WLAN Module (Atheros, WLL4030-Ocampa)

The maximum transmitter power measured (normal mode) = 17.4 dBm or 55.0 milliwatts.

$$d = \sqrt{(30 * P * G) / E}$$

$$= \sqrt{(30 * 0.055) / 61.4}$$

$$= 0.0209 \text{ metres or } 2.09 \text{ cm}$$

The maximum transmitter power measured (turbo mode) = 17.5 dBm or 56.2 milliwatts.

$$d = \sqrt{(30 * P * G) / E}$$

$$= \sqrt{(30 * 0.0562) / 61.4}$$

$$= 0.0211 \text{ metres or } 2.11 \text{ cm}$$

Conclusion:

Calculations show that this device with described antenna does not meet the MPE requirements for portable devices falling below the 20 cm clearance required, however the SAR value of 1.29 mW/g complies with the FCC human exposure requirements of 47 CFR 2.1093 (d).

Refer to EMC Technologies' report - M030949_Ocampa_Atheros_5.2 SAR Report for details of SAR compliance.



6.0 Peak Power Spectral Density - Section 15.407 (a)

Testing was performed in accordance with the requirements of FCC Part 15.407(a)(5)

The peak transmit power was measured over an interval of continuous transmission using a calibrated spectrum analyser with the resolution bandwidth of 1 MHz and the video bandwidth of 3 MHz.

The transmitter output was connected to the spectrum analyser with a span setting to capture the entire emission bandwidth of the signal. The peak transmit power was recorded in dBm.

Measurements were performed on two frequency bands (5.150 – 5.350 GHz and 5.725 – 5.825 GHz)

6.1 Configuration 802.11a – Normal Operating Mode

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). Peak power spectral density with BPSK modulation (rate = 9 Mbps) was observed to be slightly worst (approximately 0.5 dB). Final testing was performed while the transmitter continuously operated with the modulation rate of 9 Mbps (BPSK). The target output power was set to 16 dBm for frequency 5180 MHz and 18 dBm for all other frequencies.

Channel	Frequency MHz	Peak Transmit Power (dBm)	Limit (dBm)	Result	Spectral Density plots
36	5180	1.70	4.0	Complies	Appendix M
52	5260	3.08	11.0	Complies	Appendix M
64	5320	2.67	11.0	Complies	Appendix M
149	5745	1.52	17.0	Complies	Appendix M
157	5785	0.64	17.0	Complies	Appendix M
161	5805	0.71	17.0	Complies	Appendix M

Result: Complies.

6.2 Configuration 802.11a – Turbo Operating Mode

Testing was performed while the transmitter continuously operated with the modulation rate of 108 Mbps (Turbo). The target output power was set to 16 dBm for frequency 5210 MHz and 18 dBm for all other frequencies.

Channel	Frequency MHz	Peak Transmit Power (dBm)	Limit (dBm)	Result	Spectral Density plots
36	5210	1.14	4.0	Complies	Appendix M
48	5250	2.16	4.0	Complies	Appendix M
56	5290	1.97	11.0	Complies	Appendix M
153	5760	-0.15	17.0	Complies	Appendix M
161	5800	-1.11	17.0	Complies	Appendix M

Result: Complies.



7.0 Peak Power Excursion - Section 15.407 (a)

Testing was performed in accordance with the requirements of FCC Part 15.407(a)(6)

The transmitter output was connected to the spectrum analyser with a span setting to capture the entire emission bandwidth of the signal.

The peak transmit power was measured over an interval of continuous transmission using a calibrated spectrum analyser with the resolution bandwidth of 1 MHz and the video bandwidth of 3 MHz for Trace 1 and video bandwidth of 300 kHz for Trace 2. The difference between Trace 1 and Trace 2 was recorded.

Measurements were performed on two frequency bands (5.150 – 5.350 GHz and 5.725 – 5.825 GHz)

7.1 Configuration 802.11a – Normal Operating Mode

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in peak excursion were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 9 Mbps (BPSK).

Channel	Frequency MHz	Peak Power Excursion (dB)	Limit (dB)	Result	Spectral Density plots
36	5180	4.17	13.0	Complies	Appendix N
52	5260	4.24	13.0	Complies	Appendix N
64	5320	3.64	13.0	Complies	Appendix N
149	5745	4.16	13.0	Complies	Appendix N
157	5785	3.03	13.0	Complies	Appendix N
161	5805	2.76	13.0	Complies	Appendix N

Result: Complies.

7.2 Configuration 802.11a – Turbo Operating Mode

Testing was performed while the transmitter continuously operated with the modulation rate of 108 Mbps (Turbo).

Channel	Frequency MHz	Peak Power Excursion (dB)	Limit (dB)	Result	Spectral Density plots
36	5210	4.18	13.0	Complies	Appendix N
48	5250	3.73	13.0	Complies	Appendix N
56	5290	3.27	13.0	Complies	Appendix N
153	5760	3.04	13.0	Complies	Appendix N
161	5800	3.77	13.0	Complies	Appendix N

Result: Complies.



8.0 Frequency Stability

Testing was performed in accordance with the requirements of FCC Part 15.407(g)

The transmitter output was connected to the spectrum analyser in peak hold mode.

The measurements were made at ambient room temperature and extreme (-20 to +55 °C) test conditions.

The AC supply voltage to the computer was varied by $\pm 15\%$. This was observed to have no effect on the results obtained.

Measurements were performed on two frequency bands (5.150 – 5.350 GHz and 5.725 – 5.825 GHz)

8.1 Configuration 802.11a – Normal Operating Mode

Testing was performed while the transmitter continuously operated with the modulation rate of 9 Mbps (BPSK).

Channel	Frequency MHz	Maximum Frequency Deviation kHz	Maximum Deviation %	$\pm 0.02\%$ Limit kHz	Result
36	5180	322	0.00622	1036	Complies
52	5260	359	0.00683	1052	Complies
64	5320	365	0.00686	1064	Complies
149	5745	418	0.00728	1149	Complies
157	5785	503	0.00869	1157	Complies
161	5805	517	0.00891	1161	Complies

Result: Complies.

8.2 Configuration 802.11a – Turbo Operating Mode

Testing was performed while the transmitter continuously operated with the modulation rate of 108 Mbps (Turbo).

Channel	Frequency MHz	Maximum Frequency Deviation kHz	Maximum Deviation %	$\pm 0.02\%$ Limit kHz	Result
36	5210	327	0.00628	1042	Complies
48	5250	355	0.00676	1050	Complies
56	5290	381	0.00720	1058	Complies
153	5760	416	0.00722	1152	Complies
161	5800	462	0.00797	1160	Complies

Result: Complies.

9.0. Antenna Requirement

Testing to the requirements of FCC Part 15.203 was not applicable as this intentional radiator was designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.



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10.0 COMPLIANCE STATEMENT

The Mini-PCI Wireless LAN Module (Atheros), Model WLL4030 installed in Fujitsu Stylistic Pentablet PC, Model ST5010D (Ocampa), tested on behalf of Fujitsu Australia Ltd, **complies** with the requirements of 47 CFR, Part 15 Subpart E -Section 15.407 (5.15-5.35 GHz and 5.725-5.825 GHz bands).

The test sample also complies with the Industry Canada RSS-210 issue 5 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(q1) 5150-5350 MHz and 5725-5825 MHz Local Area Network Devices requirements and the RF exposure requirements of RSS-102.

Results were as follows:

FCC PART 15 Subpart E (Section 15.407: 5.15 - 5.35 GHz and 5.725 - 5.825 GHz bands)

FCC Part 15, Subpart E Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	Not Applicable
15.205	6.3	Operation in Restricted Bandwidth	Complies
15.207	6.6	Conducted Emissions	Complies
15.209	6.3	Radiated Emissions	Complies
15.407 (a)(4)	6.2.2(q1)	Peak Transmit Power	Complies
15.407 (a)(5)	6.2.2(q1)	Peak Power Spectral Density	Complies
15.407 (a)(6)		Peak Power Excursion	Complies
15.407 (b)	6.2.2(q1)	Undesirable Emission	Complies
15.407 (f)		Radio Frequency Hazard	*Complies with SAR requirements
15.407 (g)	6.4	Frequency Stability	Complies

***Refer to EMC Technologies' report M030949_Ocampa_Atheros_5.2 SAR Report**



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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	HP 8546A Sn.3549A00290 EMI Receiver	13/03/03	13/03/04	1 YEAR *2
EMI RECEIVER	HP 8574B System Components	12/02/03	12/02/04	1 YEAR *2
EMI RECEIVER	HP8593EM, SN3146A-01297 9 kHz – 26 GHz	13/06/03	13/06/04	1 YEAR *2
EMI RECEIVER	Rohde & Schwarz, Model ESIB40 SN 1088 7490, 20 Hz – 40 GHz	09/07/03	09/07/04	1 YEAR *3
ANTENNAS	EMCO 93110B BICONICAL 20 - 300 MHz Sn. 9804-3092	20/08/03	20/08/04	1 YEAR *1
	EMCO 93146A LOG PERIODIC 200 -1000MHz Sn. 5033	11/07/03	11/07/04	1 YEAR *1
	EMCO 3115 DOUBLE RIDGED HORN 1 - 18 GHz Sn: 8908-3282	29/01/03	29/01/04	1 YEAR *1
	EMCO 3116 Double Ridged Guide Horn 18 – 40 GHz Sn 2276	-----	-----	*4
LISN	EMCO 3825/2 50ohm / 50 microH 0.009 – 30MHz Sn.9607-2567	10/02/03	10/02/04	1 YEAR *1
ENVIRONMENTAL CHAMBER	Heraeus votsch, Type: HT 4033 Order number: 60884376 Temperature range: -40 to +180 degrees	-----	-----	-----
POWER METER	HP 437B	24/05/03	24/05/04	1 YEAR *2
POWER SENSOR	HP8481H	04/06/03	04/06/04	1 YEAR *2

Note *1. In-house calibration. Refer to Quality Manual.

Note *2. NATA calibration by Agilent Technologies (Aust) Pty Ltd

Note *3. NATA calibration by Rohde & Schwarz

Note *4. Manufacturer's calibration

TEST SITES

Shielded Room Test Laboratory	Melbourne 11m x 8m x 4m Chamber-semi-anechoic 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	Feb 03 N/A N/A N/A	Feb 04 N/A N/A N/A	1 Year *1 N/A N/A N/A
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 Bacchus Marsh, Victoria)	21/01/03	21/01/04	1 Year *1

Note *1. In-house calibration. Refer to Quality Manual.



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. This document shall not be reproduced, except in full.

TEST REPORT APPENDICES

(Submitted as attachments)

APPENDIX B: REPORT PHOTOGRAPHS

B1: Test Sample

B2: Test Setup

B3: WLAN & Antenna Location

APPENDIX C: FUNCTIONAL DESCRIPTION

APPENDIX D: BLOCK DIAGRAM

APPENDIX E: TEST SAMPLE SCHEMATICS

APPENDIX F: PCB LAYOUTS

APPENDIX G: EUT (WLAN) SPECIFICATIONS

APPENDIX H: EUT (WLAN) BILL OF MATERIALS

APPENDIX I: FCC LABELLING DETAILS

APPENDIX J: GRAPHS of EMI MEASUREMENTS

APPENDIX K: CHANNEL BANDWIDTH PLOTS

APPENDIX L: BANDEDGE PLOTS

APPENDIX M: PEAK POWER SPECTRAL DENSITY PLOTS

APPENDIX N: PEAK POWER EXCURSION PLOTS

APPENDIX O: ANTENNA INFORMATION (MONOPOLE CERAMIC CHIP ANTENNA)

APPENDIX P: EUT USER MANUAL

