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EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart C (Section 15.247) & RSS-210

FCC ID: **EJE-WB0007**
Industry Canada ID: **337J-WB0007**

Test Sample: Stylistic ST Series Pentablet PC
Model: ST5021D / ST5020D / ST5022D (Ocampa3)

Radio Modules: Bluetooth Model: UGXZ5-102A &
Mini-PCI WLAN (Atheros 11a+b/g), Model: WLL4030

Report Number M040603_Cert_Ocampa3_BT_Atheros

Tested for: Fujitsu Australia Ltd.

Issue Date: 2nd July 2004

NATA Accredited Laboratory
Number: 5292

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Test Sample:	Stylistic ST Series Pentablet PC
Model:	ST5021D / ST5020D / ST5022D (Ocampa3)
Radio Modules:	Bluetooth, Model: UGXZ5-102A (Fujitsu Ltd) Mini-PCI WLAN, Model: WLL4030 (Askey Computer Corp.)
FCC ID:	EJE-WB0007
Industry Canada ID:	337J-WB0007
Equipment Type:	Intentional Radiator (Transceiver)
Manufacturer (LifeBook):	Fujitsu Ltd
Address:	1405, Ohamaru, Inagi-shi, Tokyo 206-8503, Japan
Contact:	Mr. Hirotaka Yakame
Tested for:	Fujitsu Australia Ltd
Address:	5 Lakeside Drive, Burwood East, VIC 3151 Australia
Phone:	+613 9845 4300
Fax:	+613 9845 4600
Contact:	Mr Praveen Rao – Senior Compliance Engineer
Test Standards:	FCC Part 15, Subpart C – Intentional Radiators FCC Part 15.247, 2400 – 2483.5 MHz Operation Band ANSI C63.4 – 1992 OET Bulletin No. 63 RSS-210 Issue 5 Low Power Licence-Exempt RadioCommunication Devices: 6.2.2 (o) 2400 – 2483.5 MHz Spread Spectrum 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:	7th February to 21st June 2004
Test Officers:	**Chieu Huynh** **B.Eng (Hons) Electronics** **Janath Gunakesera** **BScEng., MTelcomEng, MIEEE** **Jorge Lara**
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 Signatory:	**Chris Zombolas** **Technical Director** **EMC Technologies Pty Ltd**

EMI TEST REPORT FOR CERTIFICATION
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FCC PART 15 Subpart C (Section 15.247) & RSS-210

1.0 INTRODUCTION

EMI testing was performed on test sample Stylistic ST Series Pentablet PC, Model: ST5021D / ST5020D / ST5022D (Ocampa3) with Mini-PCI Wireless LAN Module (Atheros 11a+b/g), Model WLL4030 & Bluetooth, Model UGXZ5-102A.

The Atheros WLAN supports IEEE 802.11a, IEEE 802.11b and IEEE 802.11g configurations. Tests were performed in all three configurations and also on the Bluetooth.

The results for the Bluetooth are reported in this test report.

The results for the Atheros module are reported separately.
Refer to EMC Technologies' test reports: M040603_Cert_Ocampa3_Atheros_2.4_BT and M040603_Cert_Ocampa3_Atheros_5.2_BT.

Test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations:

47 CFR, Part 15, Subpart C:	Rules for intentional radiators (particularly section 15.247)
Section 15.203:	Antenna requirements
Section 15.205:	Restricted bands of operation
Section 15.207:	Conducted Emission Limits
Section 15.209:	Radiated Emission Limits (General requirements)
Section 15.247:	Operation in the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz

The test sample **complied** with the requirements of 47 CFR, Part 15 Subpart C - Section 15.247.

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

1.1 Summary of Results

1.1.1 Bluetooth - FCC PART 15 Subpart C (Section 15.247)

FCC Part 15, Subpart C 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**
15.247 (a)(1)&(3)	6.2.2(o)(ii)	Channel Occupancy/Bandwidth	**Complies**
15.247 (b)(1)	6.2.2(o)(b)	Peak Output Power	**Complies**
15.247 (b)(5)		Radio Frequency Hazard	***Complies with SAR requirements**
15.247 (c)	6.2.2(o)(e1)	Out of Band Emissions	**Complies**

*Refer to EMC Technologies' report M040630_Ocampa3_Atheros_SAR_2.4

1.1.2 WLAN, Atheros 802.11b/g - FCC PART 15 Subpart C (Section 15.247)

FCC Part 15, Subpart C 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**
15.247 (a)(2)	6.2.2(o)(iv)	Channel Bandwidth	**Complies**
15.247 (b)(3)	6.2.2(o)(b)	Peak Output Power	**Complies**
15.247 (b)(5)		Radio Frequency Hazard	***Complies with SAR requirements**
15.247 (c)	6.2.2(o)(e1)	Out of Band Emissions	**Complies**
15.247 (d)	6.2.2(o)(iv)	Peak Power Spectral Density	**Complies**

Refer to EMC Technologies Report No: M040603_Cert_Ocampa3_Atheros_2.4_BT

1.1.3 WLAN, Atheros 802.11a - FCC PART 15 Subpart E (Section 15.407)

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 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 No: M040603_Cert_Ocampa3_Atheros_5.2_BT

*Refer to EMC Technologies' report M040630_Ocampa3_Atheros_SAR_2.4

**Refer to EMC Technologies' report M040630_Ocampa3_Atheros_SAR_5.2

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.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 Product Details

Test Sample (Host PC):	Stylistic ST Series Pentablet PC
Model Number:	ST5021D / ST5020D / ST5022D
Code Name:	Ocampa3
Serial Number:	Pre-production Sample
Manufacturer:	Fujitsu Ltd
CPU Type and Speed:	Banias 1.1 GHz ULV
SDRAM:	256
LCD Screen:	10.4”XGA (ST5021D) / 12.1”XGA (ST5020D / ST5022D)
Hard Disk Drive:	40GB
Wired LAN:	Giga-LAN/10/100Base-T
Modem:	MBH7MD33 / MBH7MD35
Wireless LAN (WLAN) Module:	Atheros 11a+b/g (WLL4030)
Bluetooth:	ALPS Bluetooth
Bluetooth Model Number:	UGXZ5-102A
Port Replicator Model:	FPCPR43xx and FPCPR44xx
AC Adapter Model:	SEC80N2-16.0
Alternate Models:	CP171180-01
Voltage:	16 V
Current Specs:	3.75 A
Watts:	60 W
Radio Modules:	Bluetooth and WLAN (Atheros 11a+b/g)
Bluetooth Model Number:	UGXZ5-102A
Bluetooth Manufacturer:	Fujitsu Ltd
WLAN Model Number:	WLL4030
WLAN Manufacturer:	Askey Computer Corp.
Interface Type:	Mini-PCI Wireless LAN Module
FCC ID:	EJE-WB0007
Industry Canada ID:	337J-WB0007
Equipment Type:	Intentional Radiator (Transceiver)

2.2 Technical Specifications

2.2.1 Bluetooth Transmitter Specifications

Transmitter#1: Bluetooth
Model Number: UGXZ5-102A
Manufacturer: Fujitsu Ltd
Network Standard: Bluetooth™ RF Test Specification
Modulation Type: Frequency Hopping Spread Spectrum (FHSS)
Frequency Range: 2402 MHz to 2480 MHz
Number of Channels: 79
Carrier Spacing: 1.0 MHz
Antenna Types: Monopole Ceramic Chip Antenna (YCE-5008)
Max. Output Power: 12 dBm
Reference Oscillator: 16 MHz (Built-in)
Power Supply: 3.3 VDC from host.

Frequency allocation:

Channel Number	Frequency (MHz)
1	2402
2	2403
3	2404
.	.
.	.
.	.
39	2440
40	2441
41	2442
.	.
.	.
.	.
77	2478
78	2479
79	2480

2.2.2 WLAN Transmitter Specifications

Transmitter #2:	Mini-PCI Wireless LAN Module
Wireless Module:	Atheros
Model Number:	WLL4030 (11a+b/g module)
Manufacturer:	Askey Computer Corp.
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 and 802.11a = 54Mbps
Frequency Range:	2.4 –2483.5 GHz for 11b/g 5.15 - 5.35 GHz and 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 = 15 dBm 802.11g = 14.5 dBm 802.11a Band 1 (5.15 to 5.25 GHz) = 13.5 dBm 802.11a Band 2 (5.25 to 5.35 GHz) = 14 dBm 802.11a Band 3 (5.725 to 5.825 GHz) = 14.5 dBm
Power Supply:	3.3 VDC from PCI bus
Chipset Used:	Atheros AR5212, AR5112
Turbo Mode:	For 802.11g & 802.11a only
Data rate (Turbo):	12 Mbps to 108 Mbps

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	--

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

2.3 Operational Description

The EUT is a Stylistic ST Series Pentablet PC, Model: ST5021D / ST5020D / ST5022D (Ocampa3) installed with a Mini-PCI Wireless LAN (WLAN) Module (Atheros 11a+b/g, Model WLL4030) & Bluetooth, Model UGXZ5-102A.

The WLAN module is an OEM product from Askey Computer Corp., which is already certified by the manufacturer FCC ID: H8NWLL4030 and IC: 1353A-WLL4030. The same WLAN radio module and antenna has been previously certified by Fujitsu for the same series host tablet PC (FCC ID: EJE-WL0004 and IC: 337J-WL0004). The radiating elements environment also is identical. The host CPU speed has been upgraded from 1.0GHz to 1.1GHz.

The same ALPS Bluetooth also has been previously certified by the manufacturer, Fujitsu Ltd under FCC ID: EJE-WB0002 and IC: 337J-WB0002 for a different host.

The intention of re-certifying is due to the addition of a Bluetooth transmitter module to this host and the host CPU upgrade.

The measurements reported in this test report are for (Atheros 11a+b/g, Model WLL4030) WLAN and Bluetooth (UGXZ5-102A) with Monopole Ceramic Chip antenna in Host PC, Stylistic ST Series Pentablet PC.

The model ST5021D is with 10.4” LCD screen and models ST5020D / ST5022D is with a 12.1” LCD screen. All models are identical except the screen size as indicated above. The transmitters / antenna locations, structure, operation, etc are identical on all models.

2.4 Test Configuration

The Askey software and the BlueSuiteCasira software were used to set-up the WLAN module and Bluetooth devices respectively to continuously transmit during the tests. The LCD screen was observed for the transmitter status shown for the respective software.

Antenna

The Atheros (11a+b/g) WLAN, Model WLL4030 and ALPS Bluetooth device, Model UGXZ5-102A are configured with Monopole Ceramic Chip Antenna – YCE 5008. The installation of the OEM WLAN module, Bluetooth Device and the Antenna in Fujitsu Stylistic ST Series Pentablet PC, (Ocampa3) is in a controlled environment. The installation is performed during the production/assembly process at the Fujitsu factory.

Refer to Appendix F – Antenna Information.

AC Adapter

The AC adapter SEC80N2-16.0 was used for all the tests. This adapter is also identified as CP171180-01. Details of the AC adapters are supplied in section 2.1 of this report. The manufacturer has stated that the alternate model number: CP171180-01 of this adapter is identical electrically and mechanically.

2.5 Block Diagram

Refer to Appendix D - Block Diagram

2.6 Support Equipment

External Monitor/s:	
Conducted EMI	IPEX, Model H566, FCC ID: GKR567
Radiated EMI	TATUNG Monitor, Model: CM15VDE Serial: 11470186
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
USB Scanner:	Rapidscan Mobile Colour scanner, M/N FPCSCN01, S/N DF1700100
Headphones:	Verbatim Multimedia Stereo headset
PCMCIA Slot:	6 MB Compact flash card with Adapter, Apacer P/N 88.10200030
Memory Card:	Secure Digital- 32 MB

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).

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 (A^2LA).

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

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.

RESULTS
Bluetooth Module, Model UGXZ5-102A

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 dBµV to be compared to the limit.
VRx = the Voltage in dBµV 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 were 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)

Conducted Emission Measurements were performed on the Stylistic ST Series Pentablet PC, (Ocampa3) with WLAN module (Atheros 11a+b/g, WLL4030) and Bluetooth (UGXZ5-102A).

Initial investigations were performed with the WLAN in both configurations (802.11b and 802.11g) and all modulation types: (BPSK, QPSK, 16QAM, 64QAM, DBPSK, DQPSK and CCK). No significant differences in emissions were observed. Final testing was performed while the WLAN transmitter continuously operated with configuration 802.11g on the high (Channel 11, 2462 MHz) frequency channel with the modulation rate of 6 Mbps (BPSK) and the Bluetooth transmitter continuously operated on the low (Channel 1, 2402 MHz) frequency channel.

Result: The worst case conducted EMI complied with the quasi peak and average limits by margins of >10 dB. The measurement uncertainty was ±2.0 dB. Refer to Appendix I for plots of the conducted EMI measurements.

2.0 SPURIOUS EMISSION MEASUREMENTS

2.1 Test Procedure

Testing was performed in accordance with the requirements of FCC Part 15.247(c).

Radiated emission measurements were performed to the limits as per section 15.209. 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 25 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 software for cable losses automatically corrected the measurement data for each frequency range, 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 dBµV/m.
V = EMI Receiver Voltage in dBµV. (measured value)
AF = Antenna Factor in dB(m^{-1}). (stored as a data array)
G = Preamplifier Gain in dB. (stored as a data array)
L = Cable insertion loss in dB. (stored as a data array of Insertion Loss versus frequency)

- **Example Field Strength Calculation**

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

34.0 + 9.2 + 1.9 - 20 = 25.1 dBµV/m

Measurement uncertainty with a confidence interval of 95% is:

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

2.3 Radiated Emissions (Spurious and Harmonics)

2.3.1 Frequency Band: 1 – 25 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 dBμV/m limit at 3 metres has been converted to 64 dBμV/m at 1 metre using a factor of 20 dB per decade where emissions were located in the restricted bands.

Testing was performed while both the Bluetooth transmitter and WLAN transmitter continuously operated. Harmonics related to the Bluetooth transmitter are reported below. For harmonics related to the WLAN transmitter, Refer to EMC Technologies' test reports: M040603_Cert_Ocampa3_Atheros_2.4_BT and M040603_Cert_Ocampa3_Atheros_5.2_BT.

The field strength at 2483.5 MHz when the EUT was operating at its highest channel (2480 MHz), was 43.5 dBμV/m peak (noise floor) and was > 20 dB below the maximum field strength of the in-band carrier.

The field strength at 2400 MHz when the EUT was operating at its lowest channel (2402 MHz), was 43.4 dBμV/m peak (noise floor) and was > 20 dB below the maximum field strength of the in-band carrier.

Measurements for the WLAN were made on a low (channel 1, 2402 MHz), middle (channel 40, 2441 MHz) and high (Channel 79, 2480 MHz) frequency channel.

Channel 1 - 2402 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
2402	Transmitter	Fundamental		-	-	
4804	52.7	38.9	Vert/Hort	74.0	54.0	Pass
7206	54.2	41.4	Vert/Hort	-	-	Pass
9608	55.9	42.6	Vert/Hort	-	-	Pass
12010	57.3	43.1	Vert/Hort	74.0	54.0	Pass
14412	61.0	47.8	Vert/Hort	-	-	Pass
16814	63.5	49.2	Vert/Hort	-	-	Pass
19216	65.4	51.7	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
21618	67.6	53.5	Vert/Hort	-	-	Pass
24020	69.8	55.6	Vert/Hort	-	-	Pass

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

Channel 40 - 2441 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
2441	Transmitter	Fundamental		-	-	
4882	52.8	38.3	Vert/Hort	74.0	54.0	Pass
7323	54.5	41.6	Vert/Hort	74.0	54.0	Pass
9764	56.2	43.1	Vert/Hort	-	-	Pass
12205	57.9	43.0	Vert/Hort	74.0	54.0	Pass
14646	61.0	47.5	Vert/Hort	-	-	Pass
17087	63.6	49.4	Vert/Hort	-	-	Pass
19528	65.7	51.9	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
21969	67.7	53.2	Vert/Hort	-	-	Pass
24410	69.8	55.1	Vert/Hort	-	-	Pass

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

Channel 79 - 2480 MHz

Frequency MHz	Level dBuV/m		Antenna Polarization	Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector				
2480	Transmitter	Fundamental		-	-	
4960	53.3	39.1	Vert/Hort	74.0	54.0	Pass
7440	54.8	41.4	Vert/Hort	74.0	54.0	Pass
9920	56.1	42.9	Vert/Hort	-	-	Pass
12400	57.7	43.5	Vert/Hort	74.0	54.0	Pass
14880	61.2	47.9	Vert/Hort	-	-	Pass
17360	63.8	49.2	Vert/Hort	-	-	Pass
19840	65.6	52.0	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
22320	67.9	53.4	Vert/Hort	84.0* (1m)	64.0* (1m)	Pass
24800	69.9	55.8	Vert/Hort	-	-	Pass

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

Result: Harmonics were recorded within the restricted bands of up to 25 GHz and complied with the FCC Class B average limits by a margin of >10 dB. Harmonics were below the limit in section 15.209. The measurement uncertainty for radiated emissions in this band was ±4.1 dB.

2.3.2 Frequency Band: 30 - 1000 MHz

Testing was performed at a distance of 10 metres.

Initial investigations were performed with the WLAN in both configurations (802.11b and 802.11g) and all modulation types: (BPSK, QPSK, 16QAM, 64QAM, DBPSK, DQPSK and CCK). No significant differences in emissions were observed. Final testing was performed while the WLAN transmitter continuously operated with configuration 802.11g on the high (Channel 11, 2462 MHz) frequency channel with the modulation rate of 6 Mbps (BPSK) and the Bluetooth transmitter continuously operated on the low (Channel 1, 2402 MHz) frequency channel.

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

Vertical Polarity

Frequency MHz	Polarisation	QP Measured dBμV/m	QP Limit dBμV/m	ΔQP ± dB
400.00	Vertical	29.4	36.0	-6.6
57.29	Vertical	23.3	30.0	-6.7
107.11	Vertical	24.7	33.5	-8.8
333.50	Vertical	26.6	36.0	-9.4
452.33	Vertical	25.4	36.0	-10.6
108.40	Vertical	22.9	33.5	-10.6
79.08	Vertical	18.8	30.0	-11.2
110.84	Vertical	22.0	33.5	-11.5
123.11	Vertical	20.9	33.5	-12.6
57.63	Vertical	16.7	30.0	-13.3
156.50	Vertical	19.2	33.5	-14.3

Horizontal Polarity

Frequency MHz	Polarisation	QP Measured dBμV/m	QP Limit dBμV/m	ΔQP ± dB
334.43	Horizontal	34.4	36.0	-1.7
601.39	Horizontal	31.2	36.0	-4.8
788.85	Horizontal	30.2	36.0	-5.8
787.12	Horizontal	29.9	36.0	-6.1
386.24	Horizontal	25.1	36.0	-11.0
108.02	Horizontal	17.8	33.5	-15.7
48.72	Horizontal	11.3	30.0	-18.7
111.34	Horizontal	14.6	33.5	-18.9

Result: The highest radiated emission peak occurred at 334.43 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.

2.3.3 RF Conducted Measurements at the antenna terminal

In the 100 kHz bandwidth within the operating band, the highest emissions (spurious/harmonics) level that is produced by the intentional radiator shall be at least 20 dB below.

Measurements for the WLAN were made on a low (channel 1, 2402 MHz), middle (channel 40, 2441 MHz) and high (Channel 79, 2480 MHz) frequency channel.

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

The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised.

Refer to Appendix K for Harmonics plots

Result: Complies.

2.3.4 Band Edge Measurements

In the 100 kHz bandwidth within the operating band, the highest emissions (spurious/harmonics) level that is produced by the intentional radiator shall be at least 20 dB below.

Testing was performed while the WLAN transmitter continuously transmitted on a low (2412 MHz) and high frequency (2462 MHz) channel.

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

The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were utilised.

Refer to Appendix L for Band Edge plots
NB: D1 line indicates the highest level of the transmitter
D2 line indicates 20 dB limit below D1.

Result: Complies.

3.0 PEAK OUTPUT POWER - Section 15.247 (b)(1) & (3)

Testing was performed in accordance with the requirements of FCC Part 15.247(b)(3).

Measurements were performed while the Bluetooth transmitter continuously transmitted.

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

The resolution bandwidth of 1 MHz and the video bandwidth of 3 MHz were utilised.

The Peak Output Power (P) was calculated as follows:

P = R + G + C where R is the recorded peak power
G is the antenna gain in dBi &
C is the cable loss

Testing was performed while the transmitter continuously transmitted on a low (channel 1, 2402 MHz), middle (channel 40, 2441 MHz) and high (Channel 79, 2480 MHz) frequency channel.

Variation by +/- 15% of the supply voltage, in accordance with section 15.31(e), to the computer power supply power did not cause any variations to the RF output power.

Frequency MHz	R dBm	Coax Loss dB	G dBi	P dBm	Limit dBm	P mW	Limit mW
2402.0	10.12	0.5	0.12	10.74	30	11.86	1000
2441.0	10.13	0.5	0.12	10.75	30	11.89	1000
2480.0	9.93	0.5	0.12	10.55	30	11.35	1000

The specification limit is 1W (30 dBm).

Refer to Appendix M for Peak Power plots

Result: Complies.

4.0 CHANNEL BANDWIDTH & CHANNEL OCCUPANCY

Testing was carried out in accordance with the requirements of FCC Part 15.247(a)(1)(i)&(iii)

The EUT was a Frequency Hopping Spread Spectrum transmitter and operated as described in section 2 of this report.

4.1 Channel Bandwidth

In the band 2400 - 2483.5 MHz the hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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

A resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised.

Testing was performed while the transmitter continuously transmitted on a low (channel 1, 2402 MHz), middle (channel 40, 2441 MHz) and high (Channel 79, 2480 MHz) frequency channel.

Frequency MHz	Bandwidth kHz	Result	20 dB Bandwidth Plots
2402	739	Complies	Appendix J
2441	733	Complies	Appendix J
2480	745	Complies	Appendix J

4.2 Channel Occupancy

This measurement was made on a channel using a spectrum analyser with a 0 Hz span and a sweep time of 5 mS.

79 channels were observed operating between 2400 – 2483.5 MHz. Refer to Appendix N for number of channel plot.

The channel separation of 1 MHz was recorded.

The device was observed to have a dwell time of 410.8 uS. Refer to Appendix N for dwell time plot.

The specification allows for a dwell time not exceeding 0.4 seconds.

The maximum period is 79 channels x 0.4 seconds = 31.6 seconds

During the test the transmitter was observed to activate on average 315 times in 31.6 seconds.

The transmitter therefore occupies in one channel for 315 x 410.8uS = 0.129 seconds

Result: Complies.

5.0 RADIO FREQUENCY EXPOSURE (HAZARD) INFORMATION

Testing was performed in accordance with the requirements of FCC Part 15.247(b)(5)

Spread spectrum transmitters operating in the 2400 - 2483.5 MHz band 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.

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/cm^2.

Friis transmission formula: $Pd = (P*G) / (4*\pi*r^2)$

where: Pd = power density (mW/cm^2)
P = power input to the antenna (mW)
G = antenna gain (numeric)
r = distance to the center of radiation of the antenna (cm)

The result was extracted from Part 1, section 3.0 of this report. (Bluetooth):
Maximum peak output power at the antenna port = 10.75dBm = 12.0mW
Antenna (Monopole Ceramic Chip) gain (typical) = 0.12 dBi = 1.03 numeric
Prediction distance = 3.88 cm
Prediction frequency = 2441 MHz
MPE limit for uncontrolled exposure at prediction frequency = 1 mW/cm^2

Therefore, the power density at prediction frequency (Pd) = 0.0646mW/cm^2

The result was extracted from section 3.0 of EMC Technologies Report No: M040603_Cert_Ocampa3_Atheros_2.4_BT (WLAN Module):
Maximum peak output power at the antenna port = 21.75dBm = 150mW
Antenna (Monopole Ceramic Chip) gain (typical) = 0.69 dBi = 1.17 numeric
Prediction distance = 3.88 cm
Prediction frequency = 2437 MHz
MPE limit for uncontrolled exposure at prediction frequency = 1 mW/cm^2

Therefore, the power density at prediction frequency (Pd) = 0.9271 mW/cm^2

The total power density (TPd) for WLAN and Bluetooth transmitters continuously operated:

TPd = 0.0646 (Bluetooth) + 0.9271 (WLAN) = 0.992mW/cm^2

Calculations show that this portable device with described antenna must have a minimum of 3.88 cm clearance between the user and the device.

SAR testing was performed in accordance with OET Bulletin 65 and reported under EMC Technologies M040630_Ocampa3_Atheros_SAR_2.4. The highest SAR value was 0.606 mW/g which complies with the FCC human exposure requirements of 47 CFR 2.1093 (d).

Refer to EMC Technologies' report - M040630_Ocampa3_Atheros_SAR_2.4 for details of SAR compliance.

Results: Complies

6. 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.

7.0 COMPLIANCE STATEMENT

The Stylistic ST Series Pentablet PC, Model: ST5021D / ST5020D / ST5022D (Ocampa3) with Mini-PCI Wireless LAN Module (Atheros 11a+b/g), Model WLL4030 & Bluetooth, Model UGXZ5-102A, tested on behalf of Fujitsu Australia Ltd, **comply** with the requirements of 47 CFR, Part 15 Subpart C - Rules for Radio Frequency Devices (intentional radiators), Section 15.247 -Operation in the frequency band 2400 - 2483.5 MHz.

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(o) 2400 – 2483.5 MHz Spread Spectrum requirements and the RF exposure requirements of RSS-102.

Results were as follows:

Bluetooth

FCC Part 15, Subpart C 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**
15.247 (a)(1)&(3)	6.2.2(o)(ii)	Channel Occupancy/Bandwidth	**Complies**
15.247 (b)(1)	6.2.2(o)(b)	Peak Output Power	**Complies**
15.247 (b)(5)		Radio Frequency Hazard	***Complies with SAR requirements**
15.247 (c)	6.2.2(o)(e1)	Out of Band Emissions	**Complies**

*Refer to EMC Technologies' report M040630_Ocampa3_Atheros_SAR_2.4

The results for the Atheros module are reported separately.
Refer to EMC Technologies' test report: M040603_Cert_Ocampa3_Atheros_2.4_BT and M040603_Cert_Ocampa3_Atheros_5.2_BT.

TEST REPORT APPENDICES

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Attachment 1: RF Exposure Information
Attachment 2: FCC DOC for Stylistic ST Series Pentablet PC (Ocampa3).