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

FCC ID:	EJE-WL0011
Industry Canada ID:	337J-WL0011
Test Sample:	XB62 Atheros Mini-PCI WLAN Module
Model:	AR5BXB6
Report Number	M070317_Cert_AR5BXB6_NII_C2PC
Tested for:	Fujitsu Australia Ltd.
Issue Date:	23rd April 2007

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EMI TEST REPORT FOR CERTIFICATION
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Class II Permissive Change

Report Number:	M070317_Cert_AR5BXB6_NII_C2PC
Test Sample:	XB62 Mini-PCI WLAN Module
Model:	AR5BXB6
Manufacturer:	Atheros Communications
FCC ID:	EJE-WL0011
Industry Canada ID:	337J-WL0011
Equipment Type:	Intentional Radiator (Transceiver)
Host Notebook Manufacturer:	Fujitsu Ltd. Mobile Computing Division
Address:	1-1 Kamikodanaka 4-Chome, Nakahara-Ku, Kawasaki, Japan
Contact:	Mr. Tsuyoshi Uchihara
Tested for:	Fujitsu Australia Ltd
Test Standards:	FCC Part 15 – Radio Frequency Devices (August 2006) FCC Part 15, Subpart E – Unlicensed National Information, Infrastructure Devices FCC Part 15.407, General Technical Requirements ANSI C63.4 – 2003 OET Bulletin No. 65 RSS-210 Issue 5 and Issue 6 Low Power Licence-Exempt RadioCommunication Devices: 6.2.2 (q1) 5150 - 5350 MHz, 5470 – 5725 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:	12th to 23rd April 2007
Test Engineer:	**Chieu 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 Signatory:	**Chris Zombolas** **Technical Director** **EMC Technologies Pty Ltd**

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EMI TEST REPORT FOR CERTIFICATION
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Class II Permissive Change

1.0 INTRODUCTION

Testing was performed on the Atheros Mini-PCI Wireless LAN Module (XB62 11a+b/g), Model: AR5BXB6 installed in Fujitsu notebook PC.

The AR5BXB6 WLAN module has been certified by Fujitsu Australia Ltd under the FCC ID: EJE-WL0011 (IC: 337J-WL0011). The additional frequency band: 5500 – 5700 MHz was not approved under the same FCC ID. The intention of this application is to add host model (Fujitsu Notebook) and re-certify the AR5BXB6 WLAN module installed in host, models: E8410/ E8490 with an additional band: 5500 – 5700 MHz as a **Class II Permissive Change.**

Operation in the new channels (5500 – 5700 MHz) is enabled via factory programmed EEPROM settings that cannot be accessed or changed by end user. No hardware change is made to enable these new channels.

The Atheros WLAN module was originally certified by Atheros as a modular approval under FCC ID: PPD-AR5BXB6-M (Canada ID: 4104A-AR5BXB6). The intention of this application is to get a Limited Modular approval for this WLAN module for use in Fujitsu notebook PCs. The Radio modules are installed in a controlled environment at the Fujitsu notebook production/assembly factory.

The Atheros WLAN supports IEEE 802.11b, IEEE 802.11g and IEEE802.11a (DTS & U-NII) configurations. Tests were performed in all three configurations.

The results for configuration IEEE 802.11a (U-NII: 5150 – 5350 MHz and 5470 – 5725 MHz) are reported in this test report.

The results for configurations IEEE 802.11b, IEEE 802.11g and IEEE802.11a (DTS: 5725 – 5850 MHz) are reported separately.
Refer to EMC Technologies' test report: M070317_Cert_AR5BXB6_DTS_C2PC (DTS).

The second transmitter in the notebook is a Bluetooth module, model: EYTF3CSFT. This Bluetooth module has been recently certified by Fujitsu Australia Ltd under the FCC ID: EJE-BT0001 (IC: 337J-BT0001).

Test results and procedures were performed 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, 5.47-5.725 GHz and 5.725-5.825 GHz frequency bands
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 15.407:	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 6 for frequency band 5150 to 5350 MHz and 5470 to 5725 MHz (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(q1) requirements and the RF exposure requirements of RSS-102.

The measurement procedure used was in accordance with ANSI C63.4-2003 and OET Bulletin No. 65. The instrumentation conformed to the requirements of ANSI C63.2-1996.

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1.1 Summary of Results

1.1.1 FCC 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	**Note 1**
15.205	6.3	Operation in Restricted Band	**Complies**
15.207	6.6	Conducted Emissions	**Note 1**
15.209	6.3	Radiated Emissions	**Complies**
15.407 (a)(1) (a)(2)	Annex A9.2	Peak Transmit Power	**Note 1**
15.407 (a)(5)	Annex A9.2	Peak Power Spectral Density	**Note 1**
15.407 (a)(6)		Peak Excursion	**Note 1**
15.407 (b)	Annex A9.3	Undesirable Emission	**Complies**
15.407 (c)		Discontinue Transmission	**Note 1**
15.407 (d)		Reserved	**-**
15.407 (e)		Restricted to Indoor Operations	**Note 1**
15.407 (f)		Radio Frequency Hazard	**Complies**
15.407 (g)	Annex A9.5(e)	Frequency Stability	**Complies**
15.407 (h)		Transmit Power Control	**Not Applicable** E.I.R.P < 500 mW
15.407 (h)	Annex A9.4	Dynamic Frequency Selection	**Complies**

Note 1: Refer to EMC test report M060223_Cert_AR5BXB6_NII with FCC ID: EJE-WL0011 (IC ID: 337J-WL0011)

1.1.2 FCC Subpart C, Section 15.247

Refer to EMC Technologies Report M070317_Cert_ AR5BXB6_DTS_C2PC

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 EUT (WLAN) Details

Transmitter:	Mini-Card Wireless LAN Module
Wireless Module:	XB62 (11a+b/g)
Model Number:	AR5BXB6
Manufacturer:	Atheros
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 and 802.11g	BPSK – 6Mbps, 9Mbps QPSK – 12Mbps, 18Mbps 16QAM – 24Mbps, 36Mbps 64QAM – 48Mbps, 54Mbps Turbo mode: 12 Mbps - 108 Mbps
802.11b	DBPSK – 1Mbps DQPSK – 2Mbps CCK – 5.5Mbps, 11Mbps
Frequency Range:	2.4 –2483.5 GHz for 11b/g 5.15 - 5.35 GHz, 5.47 – 5.725 GHz and 5.725 - 5.850 GHz for 11a
Antenna gain:	Max antenna gain is less than 6 dBi.
Power Supply:	3.3 VDC from PCI bus

Frequency Allocation Table:

Band	Channel	Lower Freq.	Upper Freq.	WWF1	WWF2	JPF4	KRF1
802.11b/g	1-11	2.412GHz	2.462GHz	X	X	X	X
802.11b/g	12-13	2.467GHz	2.472GHz		X	X	X
802.11a	36-48	5.150GHz	5.250GHz	X	X	X(Note1)	X
802.11a	52-64	5.250GHz	5.350GHz	X	X	X	X
802.11a	100-140	5.470GHz	5.725GHz	X	X		X
802.11a	149-165	5.725GHz	5.850GHz	X	X		X

Note 1: Odd channel support

Channels Tested and Output power setting:

Channel and Mode:	Output Power setting (average, dBm)
802.11b mode	
*Channel 1, 6 and 11	17 (1 Mbps to 11 Mbps)
802.11g mode	
*Channel 1, 6 and 11	16 (6 Mbps to 48 Mbps)
*Channel 1, 6 and 11	15 (54 Mbps)
802.11a mode	
**Channel 36, 52, 64, 100, 120 and 140	16 (6 Mbps to 36 Mbps)
**Channel 36, 52, 64, 100, 120 and 140	14 (48 Mbps)
**Channel 36, 52, 64, 100, 120 and 140	13 (54 Mbps)
*Channels 149, 152, 157, 160 and 165	16 (6 Mbps to 36 Mbps)
*Channels 149, 152, 157, 160 and 165	14 (48 Mbps)
*Channels 149, 152, 157, 160 and 165	11 (54 Mbps)

**Channels tested and reported in this report

*Channels tested and reported in the DTS submission (M070317_Cert_AR5BXB6_DTS_C2PC)

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2.2 Operational Description

The Atheros WLAN Module was tested in Fujitsu host notebook E8410(80W) / E8490(100W).

The Atheros WLAN test software "CRTU" was used to transmit continuously during the tests. For Spurious and Harmonics tests both radio modules (WLAN and Bluetooth) were simultaneously transmitting.

2.3 Test Configuration

Radiated tests were performed for measuring the harmonics and spurious from the transmitters.

Limited Modular Approval (LMA) details to cover the following Fujitsu notebook configurations:

Fujitsu Notebook Model	WLAN Module	WLAN Antenna	FCC/IC CERTIFICATION STATUS
E8210	Atheros XB62	2 x Inverted F antenna	GRANT Issued FCC ID: EJE-WL0011
Q2010		2 x Inverted F antenna	
S7110		2 x Monopole Antenna	
Following NEW Model to be added			
E8410/E8490	Atheros XB62	2 x Inverted F antenna	Tested model in this application

Fujitsu Notebook Model	WLAN antenna type	WLAN antenna Peak gain [dBi]			
		2.4GHz band	5GHz low band	5GHz Mid band	5GHz High band
E8210	Inverted F	2.47	-0.44	0.38	0.38
S7110	Monopole	2.08	1.66	0.59	1.79
Q2010	Inverted F	2.32	3.23	3.36	1.48
E8410/E8490	Inverted F	1.65	3.96	3.24	3.36

The WLAN Module was tested in Fujitsu host notebook E8410/E8490 as this notebook has the highest antenna gain (5 GHz low band, 5 GHz mid band and 5 GHz high band).

Refer to Appendix_A_E8410/E8490 for details.

To qualify for a class 2 permissive change, the output power was re-measured on host E8410/E8490. The highest output powers are report below.

The highest output powers were granted:

Frequency MHz	Output Power Granted dBm
5200	17.1
5600	Not reported
2400	18.0

The highest new output powers are measured:

Frequency MHz	New Output Power Measured dBm
5200	17.2
5600	17.5
2400	17.8

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Data Transmission is always initiated by software, which is then passed down through the MAC, through the digital and analog baseband, finally to the RF chip. Several special packets (ACKs, CTS, PSPoll, etc) are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which then turns off at the end of the packet. Therefore, the transmitter will be ON only while one of the four mentioned packets is being transmitted.

2.4 Host PC Details

Host notebook :	LifeBook E series
Model Name:	E8410(80W) / E8490(100W)
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core2 Duo T7700 2.40GHz
LCD	15”WUXGA / 15”WSXGA+ / 15”WXGA
Wired LAN:	Intel 82566MM : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: D40
Port Replicator Model:	FPCPR63
AC Adapter Model:	80W: SEC100P2-19.0(Sanken), ADP-80NB A(Delta), SEC100P3-19.0(Sanken, 3pin) 100W: SED110P2-19.0(Sanken)
Voltage:	19 V
Current Specs:	4.22A / 5.27
Watts:	80W / 100W
	RADIO MODULES
Module # 1:	WLAN (XB62 IEEE802.11a+b/g)
WLAN Model Number:	AR5BXB6
WLAN Manufacturer:	Atheros
Interface Type:	Mini-Card Wireless LAN Module
Antenna Types:	Nissei Electric Inverted F Antenna Model: CP313551(T1:Left), CP313552(T2:Right) Location: Top edge of LCD screen
Antenna gain:	Refer antenna data provided separately (Appendix A)
Module # 2:	Bluetooth Module
Model Number:	EYTF3CS FT
Manufacturer:	TAIYO YUDEN
Interface Type:	USB
Antenna Types:	Taiyo Yuden Monopole Antenna, Model: CP331590 Location: Right hinge of LCD screen
Max. Output Power:	4 dBm

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2.5 Test Procedure

Emissions measurements were performed in accordance with the procedures of ANSI C63.4-2003. Radiated emissions tests were performed at a distance of 1 and 3 metres from the EUT. OET Bulletin 65 dated June 2001 was used for reference.

2.6 Test Facility

2.6.1 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 measurements at an antenna ports were performed at EMC Technologies' laboratory in Tullamarine, Victoria Australia.

The above test sites have been accepted for testing by the Federal Communications Commission (FCC) - **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.

2.6.2 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).

2.7 Test Equipment Calibration

All measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as 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.

2.8 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.

FCC 15.407 (U-NII) RESULTS

3.0 RADIATED EMISSION MEASUREMENTS

3.1 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. 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. Calibrated EMCO 3115, EMCO 3116 and ETS standard gain horn antennas were used for measurements between 1 to 40 GHz.

The measurement of emissions between 30 - 1000 MHz, refer to EMC test report M060223_Cert_AR5BXB6_NII with FCC ID: EJE-WL0011 (IC ID: 337J-WL0011).

The measurement of emissions above 1000 MHz was measured using a following setting:
Peak measurements setting: RBW = VBW = 1 MHz
Average measurements setting: RBW = 1 MHz and VBW = 10 Hz

The receiver bandwidth was set to 6 dB.

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.

3.2 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 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

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

3.3.1 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 74 dBμV/m @ 3m and 54 dBμV/m @ 3m limits are applied for emissions fall in the restricted bands. The peak limits for undesirable emission outside of the restricted bands are –27 dBm (68.3 dBuV/m @ 3m).

Measurements were performed on Fujitsu host notebook E8410/E8490 (5 GHz low and 5 GHz mid bands) and the test results are reported.

Testing was performed while both the WLAN transmitter and Bluetooth transmitter continuously operated. Emissions related to the WLAN transmitter (5.15 – 5.35 GHz and 5470 – 5725 GHz) is reported below. Emissions in the frequency band (5.725 – 5.850 GHz), refer to M070317_Cert_ AR5BXB6_DTS_C2PC. Emissions in the frequency band (2.4 – 2.4835 GHz, 802.11b/g) refer to EMC test report M060223_Cert_AR5BXB6_DTS with FCC ID: EJE-WL0011 (IC ID: 337J-WL0011)

Initial investigations were performed with all data rates: (6 Mbps to 54 Mbps). No significant differences in emissions were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 6 Mbps (BPSK).

Channel 36 - 5180 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5180	103.6	92.8	-	-	-
10360	66.7	51.2	68.3	-	Pass
15540	65.1	48.0	74.0	54.0	Pass

Channel 52 - 5260 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5260	105.4	94.7	-	-	-
10520	68.2	50.1	68.3	-	Pass
15780	64.7	48.8	74.0	54.0	Pass

Channel 64 - 5320 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5320	104.1	93.3	-	-	-
10640	67.5	51.9	74.0	54.0	Pass
15960	66.7	51.2	74.0	54.0	Pass

Channel 100 - 5500 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5500	104.0	92.8	-	-	-
11000	69.3	52.8	74.0	54.0	Pass
16500	62.2	47.7	68.3*	-	Pass

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Channel 120 - 5600 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5600	102.7	91.1	-	-	-
11200	70.9	53.5	74.0	54.0	Pass
16800	59.3	44.2	68.3*	-	Pass

Channel 140 - 5700 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5700	103.8	91.9	-	-	-
11400	68.1	53.0	74.0	54.0	Pass
17100	58.7	43.6	68.3*	-	Pass

Result: Harmonic emissions were recorded up to 40 GHz. Other harmonics were confirmed low with both RBW and VBW reduced. The worst case emissions were complied with the FCC limits in sections 15.209 and 15.407 by a margin of 0.1 dB. The measurement uncertainty for radiated emissions in this band was ±4.1 dB.

3.3.2 Both WLAN and Bluetooth Transmitters Transmitting

Result: IM spurious emissions were recorded within the restricted bands of up to 40 GHz. Emissions complied with the FCC limits of section 15.209 and 15.407.

3.3.3 RF Conducted Measurements at the antenna terminal

Frequency band (5.15 – 5.35 GHz) refers to EMC test report M060246_Cert_AR5BXB6_NII_BT with FCC ID: EJE-WB0039 (IC ID: 337J-WB0039)

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

Refer to Appendix D for Harmonics plots

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

Result: Complies.

3.3.4 Band Edge Measurements

BE Frequency (MHz) within the restricted band	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5150	56.3	42.9	74.0	54.0	Pass
5350	57.6	45.2	74.0	54.0	Pass
5470	58.9	-	68.3	-	Pass
5725	64.3	-	68.3	-	Pass

Refer to Appendix E for Band Edge plots

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

Result: Complies.

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4.0 PEAK OUTPUT POWER - Section 15.407(a)

Testing was performed in accordance with the requirements of FCC Part 15.407(a)(1)(2)

Measurements were performed while the WLAN transmitter continuously transmitted.

The peak output power measurement was performed using the integration method as per test method # 3 of DA 02-2138. The resolution bandwidth of 1 MHz was used. The video bandwidth (VBW) of 30 kHz was used.

VBW $\geq$ 1/T, where T (worst case) = 360 μS at 54 Mbps

Initial investigations were performed with all data rates: (6 Mbps to 54 Mbps). No significant differences in emissions were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 24 Mbps (16QAM).

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.

Frequency band (5.15 – 5.35 GHz) refers to EMC test report M060246_Cert_AR5BXB6_NII_BT with FCC ID: EJE-WB0039 (IC ID: 337J-WB0039)

Frequency MHz	Operating Mode	Power dBm	Limit dBm	Power mW	Limit mW	Result
5500	Normal	17.2	24	52.5	250	Complies
5600	Normal	17.1	24	51.3	250	Complies
5700	Normal	17.5	24	56.2	250	Complies

5.0 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

Initial investigations were performed with all data rates: (6 Mbps to 54 Mbps). No significant differences in emissions were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 6 Mbps (BPSK).

Frequency band (5.15 – 5.35 GHz) refers to EMC test report M060246_Cert_AR5BXB6_NII_BT with FCC ID: EJE-WB0039 (IC ID: 337J-WB0039)

Frequency MHz	Operating Mode	Bandwidth MHz	26 dB Bandwidth Plots
5500	Normal	24.4	Appendix C
5600	Normal	24.0	Appendix C
5700	Normal	24.1	Appendix C

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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 power spectral density measurement was performed as per test method #2 of DA 02-2138. The resolution bandwidth of 1 MHz and the video bandwidth of 3 MHz were utilised.

Initial investigations were performed with all data rates: (6 Mbps to 54 Mbps). No significant differences in emissions were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 24 Mbps (16QAM).

Frequency band (5.15 – 5.35 GHz) refers to EMC test report M060246_Cert_AR5BXB6_NII_BT with FCC ID: EJE-WB0039 (IC ID: 337J-WB0039)

Frequency MHz	Operating Mode	Spectral Density dBm	Limit dBm	Result	Spectral Density plots
5500	Normal	3.5	11	Complies	Appendix F
5600	Normal	3.6	11	Complies	Appendix F
5700	Normal	3.9	11	Complies	Appendix F

7.0 PEAK 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 30 kHz for Trace 2. The difference between Trace 1 and Trace 2 was recorded.

Frequency band (5.15 – 5.35 GHz) refers to EMC test report M060246_Cert_AR5BXB6_NII_BT with FCC ID: EJE-WB0039 (IC ID: 337J-WB0039)

Frequency MHz	Operating Mode	Peak Power Excursion dB	Limit dB	Result	Peak Power Excursion Plots
5500	Normal	8.7	13.0	Complies	Appendix G
5600	Normal	9.5	13.0	Complies	Appendix G
5700	Normal	8.7	13.0	Complies	Appendix G

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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 ±15%. This was observed to have no effect on the results obtained.

Testing was performed while the transmitter continuously operated with the modulation rate of 54 Mbps.

Frequency band (5.15 – 5.35 GHz) refers to EMC test report M060246_Cert_AR5BXB6_NII_BT with FCC ID: EJE-WB0039 (IC ID: 337J-WB0039)

Frequency MHz	Operating Mode	Maximum Frequency Deviation kHz	Maximum Deviation %	± 0.02 % Limit kHz	Result
5500	Normal	168	0.004	1100	Complies
5600	Normal	145	0.003	1120	Complies
5700	Normal	182	0.004	1140	Complies

9.0 DYNAMIC FREQUENCY SELECTION

The EUT is an RLAN device operating as a Slave without Radar Interference Detection Function.

Testing was performed by Compliance Certification Services (CCS) CA, USA.

Ad-hoc operation (not under control of a Master Device) is supported in the 2.4 GHz & 5.15 - 5.25 GHz & 5.725 - 5.825 GHz bands. This Ad-hoc capability is limited in hardware via factory programmed EEPROM settings that cannot be accessed or changed by end users. The Ad-hoc supported channels of operation cannot be modified – regardless of which client utility or operating system control is used.

Operation using 40 MHz channels is disabled in this device via factory programmed EEPROM settings that cannot be accessed or changed by end users.

Complied – refer to attachment 2, CCS test report number: 06U10337-1, Revision B

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10.0 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 2400 - 2483.5 MHz and 5.150 – 5.350 GHz 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).

Transmitter # 1: The WLAN antennas are located on the top edge of LCD screen (2 antennas left and right) and projected distance of greater than 20cm from user.

Transmitter # 2: The Bluetooth antenna is located right hinge of LCD screen and projected distance of less than 20cm from user.

The separation distance between the WLAN and BT antennas is less than 20cm. Therefore, they are co-located transmitters.

SAR is not required as the WLAN and BT transmitters are mobile devices.

The MPE calculation shown below is for the WLAN and BT power densities.

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)

Prediction frequency = **5260 MHz**
Maximum peak output power = 17.1 dBm = 51.3 mW
Antenna (Inverted F) gain (max) = 3.96 dBi = 2.49 numeric
The power density calculated = 0.03 mW/cm^2

MPE limit for uncontrolled exposure at prediction frequency = 1 mW/cm^2

Results: Calculations show that the Radio devices with described antennas complied with Maximum Permissible Exposure (MPE) limit for the General Population/Uncontrolled Exposure.

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11.0 COMPLIANCE STATEMENT

The Atheros Mini-PCI Wireless LAN Module (XB62 11a+b/g), Model: AR5BXB6 installed in Fujitsu notebook PCs tested on behalf of Fujitsu Australia Ltd, **comply** with the **Class II Permissive Change** requirements of 47 CFR, Part 15 Subpart E -Section 15.407 (5.15-5.35 GHz, 5.47-5.725 GHz and 5.725-5.825 GHz bands).

The test sample also complies with the Industry Canada RSS-210 Issue 6 for frequency band 5150 to 5350 MHz and 5470 to 5725 MHz (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(q1) requirements and the RF exposure requirements of RSS-102.

Results were as follows:

FCC Part 15, Subpart E Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	**Note 1**
15.205	6.3	Operation in Restricted Band	**Complies**
15.207	6.6	Conducted Emissions	**Note 1**
15.209	6.3	Radiated Emissions	**Complies**
15.407 (a)(1) (a)(2)	Annex A9.2	Peak Transmit Power	**Note 1**
15.407 (a)(5)	Annex A9.2	Peak Power Spectral Density	**Note 1**
15.407 (a)(6)		Peak Excursion	**Note 1**
15.407 (b)	Annex A9.3	Undesirable Emission	**Complies**
15.407 (c)		Discontinue Transmission	**Note 1**
15.407 (d)		Reserved	**-**
15.407 (e)		Restricted to Indoor Operations	**Note 1**
15.407 (f)		Radio Frequency Hazard	**Complies**
15.407 (g)	Annex A9.5(e)	Frequency Stability	**Complies**
15.407 (h)		Transmit Power Control	**Not Applicable** E.I.R.P < 500 mW
15.407 (h)	Annex A9.4	Dynamic Frequency Selection	**Complies**

Note 1: Refer to EMC test report M060223_Cert_AR5BXB6_NII with FCC ID: EJE-WL0011 (IC ID: 337J-WL0011)

FCC Subpart C, Section 15.247
Refer to EMC Technologies' test report: M070317_Cert_AR5BXB6_DTS_C2PC

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TEST REPORT APPENDICES

APPENDIX A: ANTENNA INFORMATION
APPENDIX B: WLAN and ANTENNA LOCATIONS PHOTOS
APPENDIX C: CHANNEL BANDWIDTH PLOTS
APPENDIX D: HARMONICS PLOTS
APPENDIX E: BANDEDGE PLOTS
APPENDIX F: PEAK POWER SPECTRAL DENSITY PLOTS
APPENDIX G: PEAK EXCURSION PLOTS

Attachment 1: RF Exposure Information

Attachment 2: Dynamic Frequency Selection Results

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