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

FCC ID: EJE-WB0072
Industry Canada ID: 337J-WB0072

Test Sample: LifeBook ST Series
Model: ST6010

Radio Modules: AR5BHB92 Atheros 2x2 Half Mini-PCI WLAN Module
& EYSMJCS Bluetooth Module

Report Number: M080822_Cert_AR5BHB92_DTS_BT

Issue Date: 16th September 2008

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to
FCC PART 15 Subpart C (Section 15.247) & RSS-210**

EMC Technologies Report No. M080822_Cert_AR5BHB92_DTS_BT

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CONTENTS

**1.0 INTRODUCTION
2.0 GENERAL INFORMATION**

FCC 15.247 (DTS) RESULTS

**3.0 CONDUCTED EMI MEASUREMENTS
4.0 RADIATED SPURIOUS EMI MEASUREMENTS
5.0 PEAK OUTPUT POWER
6.0 CHANNEL BANDWIDTH
7.0 PEAK POWER SPECTRAL DENSITY
8.0 RADIO FREQUENCY EXPOSURE
9.0 ANTENNA REQUIREMENT
10.0 COMPLIANCE STATEMENT
11.0 MEASUREMENT UNCERTAINTIES
12.0 TEST REPORT APPENDICES**

APPENDIX A: MEASUREMENT INSTRUMENT DETAILS

**APPENDIX B: PHOTOGRAPHS
APPENDIX C: TECHNICAL DESCRIPTION
APPENDIX D: BLOCK DIAGRAM
APPENDIX E: ANTENNA INFORMATION
APPENDIX F: SCHEMATICS
APPENDIX G: FCC LABELLING DETAILS
APPENDIX H: USER MANUAL**

**Attachment 1: RF Exposure Information
Attachment 2: FCC DOC for LifeBook ST Series
Attachment 3: FCC Part 15B Test Report
Attachment 4: FCC Part 15.247 Test Report**

FCC 15.407 (U-NII) RESULTS - WLAN

Refer to Report No: M080822_Cert_AR5BHB92_NII_BT

FCC 15.247 (DSS) RESULTS - BT

Refer to Report No: M080822_Cert_EYSMJCS_AR5BHB92



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Report No. M080822_Cert_AR5BHB92_DTS_BT

Test Sample: LifeBook ST Series
Model: ST6010
Radio Modules: HB92 2x2 Half Mini-PCI WLAN Module, Model: AR5BHB92 (Atheros Communications)
 Bluetooth Module, Model: EYSMJCS (TAIYO YUDEN)

FCC ID: EJE-WB0072
Industry Canada ID: 337J-WB0072
Equipment Type: Intentional Radiator (Transceiver)

Manufacturer (LifeBook): Fujitsu Ltd
Address: 1-1 Kamikodanaka 4-Chome, Nakahara-Ku, Kawasaki, Japan
Contact: Mr. Tsuyoshi Uchihara, Mobile Computing Division

Test Standards: FCC Part 15 – Radio Frequency Devices (July 2008)
 FCC Part 15 Subpart C - Intentional Radiators
 Section 15.247: 2400 – 2483.5 MHz & 5725 – 5850 MHz Operation Bands
 ANSI C63.4 – 2003
 OET Bulletin No. 65
 RSS-210 Issue 7 Low Power Licence-Exempt RadioCommunication Devices Annex 8: 2400–2483.5 MHz & 5725–5850 MHz Operation Bands
 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: 25th to 28th August 2008

Senior 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:

Chieu Huynh
Senior EMC Engineer
EMC Technologies Pty Ltd



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

1.0 INTRODUCTION

EMI testing was performed on the Fujitsu notebook PC, Model: ST6010 with Atheros Half Mini-PCI Wireless LAN Module (HB92 802.11a/b/g/n 2x2), Model: AR5BHB92 & TAIYO YUDEN Bluetooth Module, Model: EYSMJCS.

The HB92 2x2 WLAN module was originally certified by Atheros Communications as a modular approval under FCC ID: PPD-AR5BHB92-F (Canada ID: 4104A-AR5BHB92). The Radio modules are installed in a controlled environment at the Fujitsu notebook production/assembly factory.

The Bluetooth module was originally certified by TAIYO YUDEN as a modular approval under FCC ID: RYYEYSMJCS (Canada ID: 4389B-EYSMJCS). The Radio modules are installed in a controlled environment at the Fujitsu notebook production/assembly factory.

The HB92 2x2 WLAN supports IEEE 802.11b, IEEE 802.11g, IEEE 802.11a and IEEE 802.11n (DTS & U-NII) configurations.

DTS results for configurations IEEE 802.11b, IEEE 802.11g, IEEE 802.11a and IEEE 802.11n are reported in this test report.

The U-NII and DSS results are reported separately.

Refer to EMC Technologies' test report: M080822_Cert_AR5BHB92_NII_BT (U-NII).

Refer to EMC Technologies' test report: M080822_Cert_EYSMJCS_AR5BHB92

This host notebook also contains a low power UWB transmitter which has been FCC certified by the UWB manufacturer under "FCC ID: TX2RTU7305BG1-HMC". This radio module is installed in a controlled environment at the Fujitsu notebook production/assemble factory.

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 7 - Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Annex 8 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.



1.1 Summary of Results

1.1.1 FCC Subpart C, Section 15.247

FCC Part 15 Subpart C Clauses	Industry Canada RSS-210 Issue 7 and RSS-Gen Clauses	Test Performed	Results
15.203	RSS-Gen (7.1.4)	Antenna Requirement	Complies
15.205	2.2 (Table 1)	Operation in Restricted Band	Complies
15.207	RSS-Gen (7.2.2)	Conducted Emissions	Note 1
15.209	RSS-Gen (6)	Radiated Emissions	Complies
15.247 (a)(2)	A8.1 (b) (d)	Channel Bandwidth	Note 2
15.247 (b)(3)	A8.4	Peak Output Power	Note 2
15.247 (c)	RSS-Gen (7.1.4)	Antenna Gain > 6 dBi	Not Applicable. Antenna gain < 6 dBi
15.247 (d)	A8.5	Out of Band Emissions	Complies
15.247 (e)	A8.2 (b)	Peak Power Spectral Density	Note 2
15.247 (f)	A8.3	Hybrid Systems (Note 3)	Not Applicable. EUT does not employ a hybrid system
15.247 (g)	A8.1	Frequency Hopping	Not Applicable. EUT does not employ frequency hopping
15.247 (h)	A8.1	Frequency Hopping	Not Applicable. EUT does not employ frequency hopping
15.247 (i)	RSS-Gen (5.5)	Radio Frequency Hazard	Complies

Note 1: Refer to Attachment 3, FCC Part 15B test report

Note 2: Refer to Attachment 4, FCC 15.247 test report

Note 3: Hybrid systems are those that employ a combination of both frequency hopping and digital modulations technique.

1.1.2 FCC Subpart E, Section 15.407 - WLAN

Refer to EMC Technologies Report No: M080822_Cert_AR5BHB92_NII_BT

1.1.3 FCC Subpart C, Section 15.247 - BT

Refer to EMC Technologies' test report: M080822_Cert_EYSMJCS_AR5BHB92

1.2 Modifications by EMC Technologies

No modifications were required.



2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 EUT (WLAN) Details

Transmitter:	Half Mini-Card Wireless LAN Module
Wireless Module:	HB92 (11a/b/g/n)
Model Number:	AR5BHB92
Manufacturer:	Atheros Communication Inc,
Modulation Type:	Direct Sequence Spread Spectrum (DSSS for 802.11b) Orthogonal Frequency Division Multiplexing (OFDM for 802.11a/g/n)
2.4 GHz (802.11b/g/n):	DBPSK, DQPSK, CCK, 16QAM and 64QAM
5 GHz (802.11a/n):	BPSK, QPSK, 16QAM and 64QAM
Maximum Data Rate:	802.11b = 11Mbps, 802.11g and 802.11a = 54Mbps 802.11n = 300 Mbps
Frequency Ranges:	2.412 – 2.462 GHz for 11b/g/n 5.18 - 5.32 GHz, 5.5 – 5.7 GHz and 5.745 - 5.825 GHz for 11a/n
Number of Channels:	11 channels for 11b/g/n 24 channels for 11a/n with 20 MHz bandwidth 18 channels for 11n with 40 MHz bandwidth
Antenna Types:	Yokowa Monopole (1 st , 2 nd), Model: refer to WLAN antenna data Location: Left Top edge of LCD screen(1 st), Right Top edge of LCD screen(2 nd)
Antenna gain:	Max antenna gain is less than 6 dBi. Refer antenna data provided separately
Power Supply:	3.3 VDC from PCI bus

Channels Tested and Output power setting:

Modes	Channels	Frequency MHz	Average Output Power (dBm)
802.11b/g	1, 6 and 11*	2412, 2437 and 2462	14.0
802.11a	36**	5180	8.5
	40 and 48**	5200 and 5240	13.0
	52, 60 and 64**	5260, 5300 and 5320	
	100, 120 and 140**	5500, 5600 and 5700	14.0
	149, 157 and 165*	5745, 5785 and 5825	
802.11n 20MHz Bandwidth	1 and 6*	2412 and 2437	14.0
	11*	2462	12.5
	36**	5180	10.0
	40 and 48**	5200 and 5240	13.5
	52, 60 and 64**	5260, 5300 and 5320	
	100, 120 and 140**	5500, 5600 and 5700	14.0
	149, 157 and 165*	5745, 5785 and 5825	
	3*	2422	12.0
802.11n 40MHz Bandwidth	6*	2437	14.0
	9*	2452	10.5
	38**	5190	12.5
	54 and 62**	5270 and 5310	14.0
	102, 118 and 134**	5510, 5590 and 5670	
	151 and 159*	5755 and 5795	

*Channels tested and reported in this report

**Channels tested and reported in the U-NII submission (M080822_Cert_AR5BHB92_NII_BT)

The AR5BHB92 is capable of using two antennas transmitting simultaneously (MCS8 DATA mode) the power level is 3dB lower (50%) than if a single antenna was transmitting.



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2.2 EUT (Bluetooth) Details

Transmitter:	Bluetooth
Model Number:	EYSMJCS
Manufacturer:	TAIYO YUDEN
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:	Included BT module Location: left side of hinge
Antenna gain:	Max antenna gain is less than 6 dBi. Refer antenna data provided separately
Max. Output Power:	4 dBm
Reference Oscillator:	16 MHz (Built-in)
Power Supply:	3.3 VDC from host.

Frequency allocation:

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

*Channels tested and reported in The DSS submission (M080822_Cert_EYSMJCS_AR5BHB92)

2.3 EUT (UWB) Details

Radio Modules:	UWB module
Model Number:	RTU7305 BG1 HMC V1-4
Manufacturer:	Realtek
Interface Type:	USB
FCC ID:	TX2RTU7305BG1-HMC



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2.4 EUT (Notebook PC) Details

Host notebook :	ST series
Model Name:	ST6010
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core2 Duo SU9400 1.4GHz
LCD	12.1"WXGA
Wired LAN:	Intel 82567LF : 10 Base-T/100 Base-TX/1000Base-T
Modem:	None
Port Replicator Model:	FPCPRxx (New)
AC Adapter Model:	60W: SED80N2-16.0(Sanken)
Voltage:	16 V
Current Specs:	3.75A
Watts:	60W

2.5 Test Configuration

The Atheros WLAN test software "ART" was used to transmit continuously during the tests.

Conducted tests were performed at the WLAN Antenna ports.

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

2.6 Support Equipment

Refer to Attachment 3 – FCC Part 15B Test Report

2.7 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.



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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 measurements at an antenna ports were performed at EMC Technologies' laboratory in Keilor Park, 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 3569B-1**.

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 emissions, 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 Institute (NMI) 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 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 Institute (NMI). All equipment calibration is traceable to Australia national standards at the National Measurements Institute. The reference antenna calibration was performed by NMI 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

2.10 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 15.247 (DTS) RESULTS

3.0 CONDUCTED EMISSION MEASUREMENTS

Refer to attachment 3 – FCC Part 15B test report

Testing was performed by Fujitsu General EMC Laboratory, JAPAN accredited by NVLAP (Lab Code: 200373-0).

4.0 RADIATED SPURIOUS EMISSION MEASUREMENTS

4.1 Test Procedure

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

Radiated emission measurements were performed to the limits as per section 15.209 and 15.247. The measurements were made at the open area test site. All measurements above 1 GHz were made over a distance of 3 and 1 metres.

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 Attachment 3 – FCC Part 15B

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 Peak/Average Detectors. The measurement data for each frequency range was corrected for cable losses, antenna factors and preamplifier gain. This process was performed for both horizontal and vertical antenna polarisations.

4.2 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 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:

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



4.3 Radiated Emissions (Spurious and Harmonics)

This transmitter module was originally tested and certified by the manufacturer as a stand-alone module outside a laptop (host) with higher gain antennas. Refer to manufacturer's original test report (Attachment 4) for full results showing compliance with the spurious and harmonics limits. The required configurations for harmonics and spurious measurement were determined by the worst case data rates and antenna chains results provided in the manufacturer's original report.

4.3.1 Frequency Band: 1 – 40 GHz

The 74 dB μ V/m @ 3m and 54 dB μ V/m @ 3m limits are applied for emissions fall in the restricted bands. The limits for emission outside the restricted band are 20 dB below the fundamental field strength.

Testing was performed while the WLAN transmitter continuously operated. Harmonics related to the WLAN transmitter operated in the frequency bands 2.4 – 2.4835 GHz and 5.725 – 5.850 GHz are reported below. Harmonics in the frequency bands 5.15 – 5.35 GHz and 5.47 – 5.725 GHz, refer to M080822_Cert_AR5BHB92_NII_BT.

4.3.1.1 Configuration 802.11b

Initial investigations were performed with all data rates: (1 Mbps to 11 Mbps). Final testing was performed while the transmitter continuously operated with the data rate of 1 Mbps.

Channel 1 - 2412 MHz

Frequency MHz	Peak Detector dB μ V/m	Average Detector dB μ V/m	Peak Limit dB μ V/m	Average Limit dB μ V/m	Result
2412	103.7	98.1	-	-	-
4824	52.5	44.3	74.0	54.0	Complies
7236	48.6	36.0	74.0	54.0	Complies
9648	53.3	45.9	83.7	78.1	Complies
3216	48.1	43.4	83.7	78.1	Complies
2390	50.0	35.9	74.0	54.0	Complies

Channel 6 - 2437 MHz

Frequency MHz	Peak Detector dB μ V/m	Average Detector dB μ V/m	Peak Limit dB μ V/m	Average Limit dB μ V/m	Result
2437	103.3	98.2	-	-	-
4874	51.5	43.2	74.0	54.0	Complies
7311	48.2	34.9	74.0	54.0	Complies
9748	54.0	47.1	83.3	78.2	Complies
3249	47.7	42.3	83.3	78.2	Complies

Channel 11 - 2462 MHz

Frequency MHz	Peak Detector dB μ V/m	Average Detector dB μ V/m	Peak Limit dB μ V/m	Average Limit dB μ V/m	Result
2462	103.3	98.0	-	-	-
4924	50.6	42.2	74.0	54.0	Complies
7386	47.4	34.1	74.0	54.0	Complies
9848	54.9	47.3	83.3	78.0	Complies
3283	47.9	43.2	83.3	78.0	Complies
2483.5	49.1	37.9	74.0	54.0	Complies



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Result: Harmonic and spurious emissions were recorded up to 25 GHz. Other harmonics were confirmed low with both RBW and VBW reduced. The worst case emissions complied with the FCC limits of sections 15.209 and 15.247 by a margin of 9.7 dB.

4.3.1.2 Configuration 802.11g and 802.11n

Measurements were performed with EUT operating in the worst case mode of single antenna transmitting and the data rate at 6Mbps or MCS0. For multiple antennas transmitting modes like MCS8 (two antennas transmitting), the power level is 3 dB lower (50%) with respect to single antenna mode.

Harmonics were measured for channels where the RF output power was highest.

Initial investigations were performed with all data rates: (6 Mbps to 54 Mbps and MCS0 to MCS7). Final testing was performed while the transmitter continuously operated in the worst case condition.

Channel 1 - 2412 MHz, Tx BW = 20 MHz

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11g	6 Mbps	2412	106.6	94.0	-	-	-
		4824	49.8	34.8	74.0	54.0	Complies
		7236	51.4	35.3	74.0	54.0	Complies
		9648	53.0	37.2	86.6	74.0	Complies
		3216	50.9	46.0	86.6	74.0	Complies
		2390	59.7	43.5	74.0	54.0	Complies
802.11n	MCS0	2412	105.4	93.5	-	-	-
		Harmonics are similar to the 6 Mbps					
		2390	61.6	45.1	74.0	54.0	Complies

Channel 6 - 2437 MHz, Tx BW = 20 MHz

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11g	6 Mbps	2437	106.2	93.9	-	-	-
		Harmonics and spurious are same or lower than channel 1 (2412 MHz)					
802.11n	MCS0	2437	106.0	93.8	-	-	-
		Harmonics are similar to the 6 Mbps					



Channel 11 - 2462 MHz, Tx BW = 20 MHz

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11g	6 Mbps	2462	106.3	94.1	-	-	-
		Harmonics and spurious are same or lower than channel 1 (2412 MHz)					
		2483.5	63.5	45.5	74.0	54.0	Complies
802.11n	MCS0	2462	104.2	92.1	-	-	-
		Harmonics are same or lower than 6 Mbps					
		2483.5	60.7	44.6	74.0	54.0	Complies

Channel 3 - 2422 MHz, Tx BW = 40 MHz

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11n	MCS0	2422	100.6	88.5	-	-	-
		Harmonics and spurious are same or lower than the 20 MHz bandwidth					
		2390	64.3	46.7	74.0	54.0	Complies

Channel 6 - 2437 MHz, Tx BW = 40 MHz

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11n	MCS0	2437	103.1	90.6	-	-	-
		Harmonics and spurious are same or lower than the 20 MHz bandwidth					

Channel 9 - 2452 MHz, Tx BW = 40 MHz

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11n	MCS0	2452	99.8	87.5	-	-	-
		Harmonics and spurious are same or lower than the 20 MHz bandwidth					
		2483.5	65.7	47.0	74.0	54.0	Complies

Result: Spurious emissions were recorded up to 25 GHz. Harmonics were confirmed low with both RBW and VBW reduced. The worst case emissions complied with the FCC limits of sections 15.209 and 15.247 by a margin of 7.0 dB.



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4.3.1.3 Configuration 802.11a and 802.11n

Measurements were performed with EUT operating in the worst case mode of single antenna transmitting and the data rate at 6Mbps or MCS0. For multiple antennas transmitting modes like MCS8 (two antennas transmitting), the power level is 3 dB lower (50%) with respect to single antenna mode.

Harmonics were measured for channels where the RF output power was highest.

Initial investigations were performed with all data rates: (6 Mbps to 54 Mbps and MCS0 to MCS7). Final testing was performed while the transmitter continuously operated in the worst case condition.

Channel 149 - 5745 MHz, Tx BW = 20 MHz

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11a	6 Mbps	5745	107.0	95.5	-	-	-
		11490	55.7	40.7	74.0	54.0	Complies
		5725	74.8	59.0	87.0	75.5	Complies
802.11n	MCS0	5745	106.9	95.1	-	-	-
		Harmonics are same as per 6 Mbps.					
		5725	76.0	59.8	86.9	75.1	Complies

Channel 157 - 5785 MHz, Tx BW = 20 MHz

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11a	6 Mbps	5785	106.8	95.0	-	-	-
		Harmonics are same or lower than channel 165 (5825 MHz).					
802.11n	MCS0	5785	106.6	94.8	-	-	-
		Harmonics are same or lower than channel 165 (5825 MHz).					

Channel 165 - 5825 MHz, Tx BW = 20 MHz

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11a	6 Mbps	5825	106.4	94.5	-	-	-
		11650	58.5	42.0	74.0	54.0	Complies
		5850	68.2	51.7	86.4	74.5	Complies
802.11n	MCS0	5825	106.5	94.4	-	-	-
		Harmonics are same as per 6 Mbps.					
		5850	69.1	52.6	86.5	74.4	Complies



Channel 151 - 5755 MHz, Tx BW = 40 MHz Wide

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11n	MCS0	5755	104.2	91.8	-	-	-
		Harmonics are same or lower than the 20 MHz bandwidth					
		5725	76.5	61.7	84.2	71.8	Complies

Channel 159 - 5795 MHz, Tx BW = 40 MHz Wide

Modes	Data Rates	Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
802.11n	MCS0	5795	103.9	91.6	-	-	-
		Harmonics are same or lower than the 20 MHz bandwidth					
		5850	66.3	50.8	83.9	71.6	Complies

Result: Harmonic and spurious emissions were recorded up to 40 GHz. Other harmonics were low and confirmed with both RBW and VBW reduced. Emissions complied with the FCC limits of section 15.209 and 15.247 by a margin of 7.7 dB.

4.3.2 Frequency Band: 30 - 1000 MHz

Refer to attachment 3 – FCC Part 15B test report

Testing was performed by Fujitsu General EMC Laboratory, JAPAN accredited by NVLAP (Lab Code: 200373-0).

4.3.3 RF Conducted Measurements at the Antenna Terminal

Refer to original approval under FCC ID: PPD-AR5BHB92 (Canada ID: 4104A-AR5BHB92) certified by Atheros.

Refer to attachment 4, FCC 15.247 test report number: 08U11571-1 dated March 13 2008

Testing was performed by Compliance Certification Services (CCS) CA, USA accredited by NVLAP (Lab Code: 200065-0).

4.3.4 Radiated Band Edge Measurements

Complied (refer to section 4.3 – radiated emissions).



5.0 PEAK OUTPUT POWER - Section 15.247 (b)(3)

Refer to original approval under FCC ID: PPD-AR5BHB92 (Canada ID: 4104A-AR5BHB92) certified by Atheros.

Refer to attachment 4, FCC 15.247 test report number: 08U11571-1 dated March 13 2008

Testing was performed by Compliance Certification Services (CCS) CA, USA accredited by NVLAP (Lab Code: 200065-0).

6.0 CHANNEL BANDWIDTH

Refer to original approval under FCC ID: PPD-AR5BHB92 (Canada ID: 4104A-AR5BHB92) certified by Atheros.

Refer to attachment 4, FCC 15.247 test report number: 08U11571-1 dated March 13 2008

Testing was performed by Compliance Certification Services (CCS) CA, USA accredited by NVLAP (Lab Code: 200065-0).

7.0 PEAK POWER SPECTRAL DENSITY

Refer to original approval under FCC ID: PPD-AR5BHB92 (Canada ID: 4104A-AR5BHB92) certified by Atheros.

Refer to attachment 4, FCC 15.247 test report number: 08U11571-1 dated March 13 2008

Testing was performed by Compliance Certification Services (CCS) CA, USA accredited by NVLAP (Lab Code: 200065-0).

8.0 RADIO FREQUENCY EXPOSURE (HAZARD) INFORMATION

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

Spread spectrum transmitters operating in the 2400 - 2483.5 MHz and 5725 – 5850 MHz 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 2.1093 this device has been defined as a portable device.

SAR testing was performed in accordance with OET Bulletin 65 and reported under EMC Technologies reports M080823_Cert_AR5BHB92_SAR_2.4 (2.4 GHz) and M080823_Cert_AR5BHB92_SAR_5.6 (5.18 – 5.825 GHz). SAR values of 0.420 mW/g (DTS) and 0.336 mW/g (NII) were measured which complied with the FCC human exposure requirements of 47 CFR 2.1093 (d).

9.0 ANTENNA REQUIREMENT

This intentional radiator was designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.



10.0 COMPLIANCE STATEMENT

The Fujitsu notebook PC, Model: ST6010 with Atheros Half Mini-PCI Wireless LAN Module (HB92 802.11a/b/g/n 2x2), Model: AR5BHB92 & TAIYO YUDEN Bluetooth Module, Model: EYSMJCS, **complied** 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 and 5725 – 5850 MHz.

The test sample also complied with the Industry Canada RSS-210 issue 7 - Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Annex 8 and the RF exposure requirements of RSS-102.

Results were as follows:

FCC Subpart C, Section 15.247

FCC Part 15 Subpart C Clauses	Industry Canada RSS-210 Issue 7 and RSS-Gen Clauses	Test Performed	Results
15.203	RSS-Gen (7.1.4)	Antenna Requirement	Complies
15.205	2.2 (Table 1)	Operation in Restricted Band	Complies
15.207	RSS-Gen (7.2.2)	Conducted Emissions	Note 1
15.209	RSS-Gen (6)	Radiated Emissions	Complies
15.247 (a)(2)	A8.1 (b) (d)	Channel Bandwidth	Note 2
15.247 (b)(3)	A8.4	Peak Output Power	Note 2
15.247 (c)	RSS-Gen (7.1.4)	Antenna Gain > 6 dBi	Not Applicable. Antenna gain < 6 dBi
15.247 (d)	A8.5	Out of Band Emissions	Complies
15.247 (e)	A8.2 (b)	Peak Power Spectral Density	Note 2
15.247 (f)	A8.3	Hybrid Systems (Note 3)	Not Applicable. EUT does not employ a hybrid system
15.247 (g)	A8.1	Frequency Hopping	Not Applicable. EUT does not employ frequency hopping
15.247 (h)	A8.1	Frequency Hopping	Not Applicable. EUT does not employ frequency hopping
15.247 (i)	RSS-Gen (5.5)	Radio Frequency Hazard	Complies

Note 1: Refer to Attachment 3, FCC Part 15B test report

Note 2: Refer to Attachment 4, FCC 15.247 test report

Note 3: Hybrid systems are those that employ a combination of both frequency hopping and digital modulations technique.

FCC Subpart E, Section 15.407 - WLAN

Refer to EMC Technologies Report No: M080822_Cert_AR5BHB92_NII_BT

FCC Subpart C, Section 15.247 - BT

Refer to EMC Technologies' test report: M080822_Cert_EYSMJCS_AR5BHB92



11.0 MEASUREMENT UNCERTAINTIES

EMC Technologies has evaluated the equipment and the methods used to perform the emissions testing. The estimated measurement uncertainties for emissions tests shown within this report are as follows:

Conducted Emissions:	9 kHz to 30 MHz	±3.2 dB
Radiated Emissions:	30 MHz to 300 MHz	±5.1 dB
	300 MHz to 1000 MHz	±4.7 dB
	1 GHz to 18 GHz	±4.6 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

12.0 TEST REPORT APPENDICES

APPENDIX A: MEASUREMENT INSTRUMENT DETAILS

APPENDIX B: PHOTOGRAPHS

APPENDIX C: TECHNICAL DESCRIPTION

APPENDIX D: BLOCK DIAGRAM

APPENDIX E: ANTENNA INFORMATION

APPENDIX F: SCHEMATICS

APPENDIX G: FCC LABELLING DETAILS

APPENDIX H: USER MANUAL

Attachment 1: RF Exposure Information

Attachment 2: FCC DOC for LifeBook ST Series

Attachment 3: FCC Part 15B Test Report

Attachment 4: FCC Part 15.247 Test Report

