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EMC-EMF Safety Approvals

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

FCC ID: EJE-WB0061
Industry Canada ID: 337J-WB0061

Test Sample: LifeBook U Series
Model: U2010

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

Report Number: M080613_Cert_AR5BHB92_DTS_BT

Issue Date: 14th July 2008

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Refer to Report No: M080613_Cert_AR5BHB92_NII_BT**

**FCC 15.247 (DSS) RESULTS - BT
Refer to Report No: M080613_Cert_EYSMJCS_AR5BHB92**



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Report No. M080613_Cert_AR5BHB92_DTS_BT

Test Sample: LifeBook U Series
Model: U2010
Radio Modules: HB92 2x2 Half Mini-PCI WLAN Module, Model: AR5BHB92 (Atheros Communications)
Bluetooth Module, Model: EYSMJCS (TAIYO YUDEN)

FCC ID: EJE-WB0061
Industry Canada ID: 337J-WB0061
Equipment Type: Intentional Radiator (Transceiver)

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

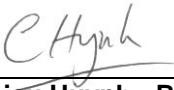
Test Standards: FCC Part 15 – Radio Frequency Devices (September 2007)
FCC Part 15 Subpart C - Intentional Radiators
Section 15.247: 2400 – 2483.5 MHz & 5725 – 5850 MHz Operation Bands
ANSI C63.4 – 2003
OET Bulletin No. 65

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: 6th June to 9th July 2008

Senior Engineer:


Chieu Huynh - B.Eng (Hons) Electronics
Lee Hopkins

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

1.0 INTRODUCTION

EMI testing was performed on the Fujitsu notebook PC, Model: U2010 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: M080613_Cert_AR5BHB92_NII_BT (U-NII).

Refer to EMC Technologies' test report: M080613_Cert_EYSMJCS_AR5BHB92

The low power FM transmitter is a single chip module which has also been FCC certified in other hosts under "FCC ID: S4LGO520". The frequency band of operation is reduced to 89MHz to 98MHz for use in this Fujitsu notebook. This radio module is installed in a controlled environment at the Fujitsu notebook production/assemble factory. The DXX results are reported separately. Refer to EMC Technologies' test report: M080613_Cert_FM_Tx

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: FG08-070EAL

Note 2: Refer to Attachment 4, FCC 15.247 test report: 08U11571-1

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: M080613_Cert_AR5BHB92_NII_BT

1.1.3 FCC Subpart C, Section 15.247 - BT

Refer to EMC Technologies' test report: M080613_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:	Tx: Nissei Electric Inverted F Antenna Location: Top edge of LCD screen
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 (M080613_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	

Power (Ext, Int) = 0, 96

*Channels tested and reported in The DSS submission (M080613_Cert_EYSMJCS_AR5BHB92)

2.3 EUT (Notebook PC) Details

EUT:	LifeBook U series
Model Name:	U2010
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED

CPU Type and Speed:	Intel(R) Atom(TM) processor Z530 (1.60 GHz)
LCD:	5.6"WXGA
Wired LAN:	Realtek 8101L : 10 Base-T/100 Base-TX
Modem:	Non
Port Replicator Model:	FPCPR86

AC Adapter Model:	40W: SEB55N2-16.0 60W: SED80N2-16.0
Voltage:	16 V
Current Specs:	2.5A / 3.75A
Watts:	40W / 60W



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2.4 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.

2.5 Support Equipment

Refer to Attachment 3 – FCC Part 15B Test Report (Report: FG08-070EAL)

2.6 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.

2.7 Test Facility

2.7.1 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**.

2.7.2 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).



2.8 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

2.9 Ambients at OATS

The Open Area Test Site (OATS) is an area of low background ambient signals. No significant broadband ambients are present however commercial radio and TV signals exceed the limit in the FM radio, VHF and UHF television bands. Radiated prescan measurements were performed in the shielded enclosure to check for possible radiated emissions at the frequencies where the OATS ambient signals exceeded the test limit.



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FCC 15.247 (DTS) RESULTS

3.0 CONDUCTED EMISSION MEASUREMENTS

Testing was performed in accordance with the requirements of FCC Part 15.207
Refer to Attachment 3 – FCC Part 15B Test Report (Report: FG08-070EAL)

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 Test Report (Report: FG08-070EAL).

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)

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 M080613_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	98.2	94.6	-	-	-
4824*	53.5	50.3	84.5	64.5	Complies
7236*	52.0	41.7	84.5	64.5	Complies
9648*	61.3	57.6	88.7	85.1	Complies
2390	50.1	40.2	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	98.0	93.9	-	-	-
4874*	53.8	50.7	84.5	64.5	Complies
7311*	52.1	42.0	84.5	64.5	Complies
9748*	61.7	58.2	88.5	84.4	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	97.9	94.0	-	-	-
4924*	54.3	50.0	84.5	64.5	Complies
7386*	51.4	41.5	84.5	64.5	Complies
9848*	60.6	57.1	88.4	84.5	Complies
2483.5	51.8	37.7	74.0	54.0	Complies

*Measurement was performed at 1 m distance.

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 13.8 dB.



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4.3.1.2 Configuration 802.11g and 802.11n

Initial investigations were performed with all data rates: (6 Mbps to 54 Mbps, MCS0 to MCS7 and MCS8 to MCS15). Final testing was performed while the transmitter continuously operated.

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	103.0	90.7	-	-	-
		Harmonics are same or lower than channel 6 (2437 MHz).					
		2390	59.0	42.7	74.0	54.0	Complies
802.11n	MCS0	2412	102.1	90.7	-	-	-
		Harmonics are same or lower than channel 6 (2437 MHz).					
		2390	59.8	43.6	74.0	54.0	Complies
802.11n	MCS8	2412	101.3	88.9	-	-	-
		Harmonics are lower than the 6 Mbps / MCS0 data rates.					

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	104.1	91.8	-	-	-
		4874*	48.9	32.1	84.5	64.5	Complies
		7311*	54.2	36.9	84.5	64.5	Complies
		9748*	59.7	45.2	94.6	82.3	Complies
802.11n	MCS0	2437	103.9	91.8	-	-	-
		Harmonics are same or lower than 6 Mbps.					
802.11n	MCS8	2437	101.6	89.4	-	-	-
		Harmonics are lower than the 6 Mbps / MCS0 data rates.					

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	104.2	92.3	-	-	-
		Harmonics are same or lower than channel 6 (2437 MHz).					
		2483.5	62.0	46.4	74.0	54.0	Complies
802.11n	MCS0	2462	104.0	91.8	-	-	-
		Harmonics are same or lower than channel 6 (2437 MHz).					
		2483.5	64.5	47.6	74.0	54.0	Complies
802.11n	MCS8	2462	101.8	89.7	-	-	-
		Harmonics are lower than the 6 Mbps / MCS0 data rates.					



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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	97.1	85.9	-	-	-
		Harmonics are lower than the 20 MHz bandwidth					
		2390	63.1	46.6	74.0	54.0	Complies
802.11n	MCS8	2422	97.8	79.6	-	-	-
		Harmonics are lower than the MCS0 data rates.					

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	99.9	88.2	-	-	-
		Harmonics are lower than the 20 MHz bandwidth					
		2437	99.7	82.5	-	-	-
802.11n	MCS8	Harmonics are lower than the MCS0 data rates.					

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	96.5	85.4	-	-	-
		Harmonics are lower than the 20 MHz bandwidth					
		2483.5	63.8	47.4	74.0	54.0	Complies
802.11n	MCS8	2462	96.1	80.0	-	-	-
		Harmonics are lower than the MCS0 data rates.					

*Measurement was performed at 1 m distance.

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 6.4 dB.



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4.3.1.3 Configuration 802.11a and 802.11n

Initial investigations were performed with all data rates: (6 Mbps to 54 Mbps, MCS0 to MCS7 and MCS8 to MCS15). Final testing was performed while the transmitter continuously operated.

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	103.5	92.9	-	-	-
		11490*	61.8	46.4	84.5	64.5	Complies
		17235*	62.7	45.1	94.0	83.4	Complies
		5725	71.5	56.0	83.5	72.9	Complies
802.11n	MCS0	5745	103.4	92.7	-	-	-
		Harmonics are same as per 6 Mbps.					
		5725	72.4	57.2	83.5	72.9	Complies
		5745	102.5	89.0	-	-	-
802.11n	MCS8	Harmonics are lower than the MCS0 data rates.					

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	103.3	92.1	-	-	-
		Harmonics are same as channel 149 (5745 MHz).					
802.11n	MCS0	5785	103.0	92.0	-	-	-
		Harmonics are same as channel 149 (5745 MHz).					
802.11n	MCS8	5785	101.2	88.7	-	-	-
		Harmonics are same as channel 149 (5745 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	102.1	91.4	-	-	-
		Harmonics are same as channel 149 (5745 MHz).					
		5850	66.0	49.7	82.1	71.4	Complies
802.11n	MCS0	5825	102.4	91.6	-	-	-
		Harmonics are same as channel 149 (5745 MHz).					
802.11n	MCS8	5825	101.0	88.6	-	-	-
		Harmonics are same as channel 149 (5745 MHz).					



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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	100.9	89.0	-	-	-
		11510*	58.2	42.3	84.5	64.5	Complies
		17265*	61.3	44.1	91.4	79.5	Complies
		5725	73.7	58.3	91.4	79.5	Complies
802.11n	MCS8	5755	99.1	85.6	-	-	-
		Harmonics are lower than the MCS0 data rates.					

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	MCS8	5795	100.2	89.1	-	-	-
		5850	62.1	48.7	80.2	69.1	Complies
802.11n	MCS8	5795	98.4	85.0	-	-	-
		Harmonics are lower than the MCS0 data rates.					

*Measurement was performed at 1 m distance.

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 15.7 dB.

4.3.2 Frequency Band: 30 - 1000 MHz

Refer to attachment 3 – FCC Part 15B test report number: FG08-070EAL dated: May 29 2008.

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).



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

Friss transmission formula: $P_d = (P \cdot G) / (4 \cdot \pi \cdot r^2)$

where: P_d = power density (mW/cm²)

P = power input to the antenna (mW)

G = antenna gain (numeric)

r = distance to the center of radiation of the antenna (cm)

The MPE calculations shown below are for the WLAN and BT modules.

Transmitter Modules	FCC ID	Frequency GHz	Peak Power dBm	Antenna Type	Antenna Gain (dBi)	Power Density @ 20 cm mW/cm ²	MPE Limit mW/cm ²
WLAN (802.11abgn)	EJE-WB0061	2.4	29.6	Inverted-F	1.94	0.284	1.0
		5.0	29.85		1.96	0.302	1.0
BT		2.4	1.0	Taiyo Yuden	2.0	0.001	1.0
Sum of Worst Case Power Densities of Co-located Transmitters						0.303	1.0

Calculations show that the radio modules with described antennas complied with Maximum Permissible Exposure (MPE) limit for the General Population/Uncontrolled Exposure.



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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: U2010 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: FG08-052EAL

Note 2: Refer to Attachment 4, FCC 15.247 test report: 08U11571-1

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: M080613_Cert_AR5BHB92_NII_BT

FCC Subpart C, Section 15.247 - BT

Refer to EMC Technologies' test report: M080613_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 U Series

Attachment 3: FCC Part 15B Test Report (Report: FG08-070EAL)

Attachment 4: Part 15.247 Test Report (Report: 08U11571-1)



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