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

FCC ID: EJE-WB0059
Industry Canada ID: 337J-WB0059

Test Sample: LifeBook T Series
Model: Tx010

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

Report Number: M080414_Cert_EYSMJCS_AR5BHB92

Issue Date: 30th June 2008

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to
FCC PART 15 Subpart C (Section 15.247) & RSS-210
EMC Technologies Report No. M080414_Cert_EYSMJCS_AR5BHB92
Issue Date: 30th June 2008

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- Refer to Report No: M080414_Cert_AR5BHB92_NII_BT**

- FCC 15.247 (DTS) RESULTS – WLAN**
- Refer to Report No: M080414_Cert_AR5BHB92_DTS_BT**



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Report No. M080414_Cert_EYSMJCS_AR5BHB92

Test Sample: LifeBook T Series
Model: Tx010
Radio Modules: HB92 2x2 Half Mini-PCI WLAN Module, Model: AR5BHB92 (Atheros Communications)
Bluetooth Module, Model: EYSMJCS (TAIYO YUDEN)

FCC ID: EJE-WB0059
Industry Canada ID: 337J-WB0059
Equipment Type: Intentional Radiator (Transceiver)

LifeBook Manufacturer: 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 Date: 28th May 2008

Senior 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: **Chieu Huynh**
Senior EMC Engineer
EMC Technologies Pty Ltd



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: Tx010 with Atheros Half Mini-PCI Wireless LAN Module (HB92 802.11a/b/g/n 2x2), Model: AR5BHB92 & TAIYO YUDEN Bluetooth Module, Model: EYSMJCS.

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 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.

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

The U-NII and DTS (WLAN) results are reported separately.
Refer to EMC Technologies' test report: M080414_Cert_AR5BHB92_DTS_BT (DTS) and M080414_Cert_AR5BHB92_NII_BT (U-NII).

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 - Bluetooth

FCC Part 15, Subpart C Clauses	Industry Canada RSS-210 Issue 7 and RSS-Gen Clauses	Test Performed	Result
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)(1)	A8.1 (b) (d)	Channel Occupancy/Bandwidth	Note 2
15.247 (b)(1)	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	Not Applicable. EUT is not digital modulated system
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	Complies
15.247 (h)	A8.1	Frequency Hopping	Complies
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: 20072023301

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: M080414_Cert_AR5BHB92_NII_BT

1.1.3 FCC Subpart C, Section 15.247 – WLAN

Refer to EMC Technologies Report No: M080414_Cert_AR5BHB92_DTS_BT

1.2 Modifications by EMC Technologies

No modifications were required.



2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 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	Power (Ext, Int) = 0, 96
2	2403	
3	2404	
.	.	
.	.	
.	.	
39	2440	
40*	2441	
41	2442	
.	.	
.	.	
.	.	
77	2478	
78	2479	
79*	2480	

*Channels tested and reported in this report.



2.2 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 Model: CP405102 and CP405101 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	
802.11n 40MHz Bandwidth	3*	2422	12.0
	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 the DTS submission (M080414_Cert_AR5BHB92_DTS_BT)

**Channels tested and reported in the U-NII submission (M080414_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.



2.3 EUT (Notebook PC) Details

EUT:	LifeBook T series
Model Name:	Tx010
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core2 Duo T9600 2.8GHz
LCD:	13.3" WXGA (LED: T5010, CCFL: T1010)
Wired LAN:	Intel 82567LM : 10 Base-T/100 Base-TX/1000Base-T(T5010) Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T(T1010)
Modem:	Agere MDC1.5 modem Model: D40
Port Replicator Model:	FPCPR85
AC Adapter Model:	SEC100P2-19.0(Sanken) / SEC100P3-19.0(Sanken, 3pin) / ADP-80NB A(Delta) / SED100P2-19.0(Sanken)
Voltage:	19 V
Current Specs:	4.22A
Watts:	80W

2.4 Test Configuration

The Bluetooth test software "BlueTest" was used to transmit continuously during the tests.

Radiated harmonics and spurious emissions were performed on both T1010 and T5010 (Tx010) LifeBook models. No significant differences in emissions were observed. The T1010 results are reported.

2.5 Support Equipment

Refer to Attachment 3 – FCC Part 15B Test Report

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 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 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.



FCC 15.247 (DSS) 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

4.0 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 25 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 = 100 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 software for cable losses automatically corrected the measurement data for each frequency range, antenna factors and preamplifier gain and all data was then stored on disk in sequential data files. This process was performed for both horizontal and vertical antenna polarisations.

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.

Channel 1 - 2402 MHz

Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2402	90.6	50.9	-	-	-
4804	52.8	37.2	74.0	54.0	Complies
7206	49.1	33.7	74.0	54.0	Complies
2390	39.7	25.3	74.0	54.0	Complies

Channel 40 - 2441 MHz

Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2441	89.2	50.4	-	-	-
4882	51.6	36.1	74.0	54.0	Complies
7323	48.0	32.8	74.0	54.0	Complies

Channel 79 - 2480 MHz

Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2480	88.1	49.8	-	-	-
4960	51.4	35.5	74.0	54.0	Complies
7440	47.3	32.4	74.0	54.0	Complies
2483.5	45.8	29.0	74.0	54.0	Complies

Result: Harmonic emission was recorded up to 25 GHz. Other harmonics were confirmed low with both RBW and VBW reduced. Emissions complied with the FCC limits of sections 15.209 and 15.247 by a margin of 16.8 dB.

4.3.2 Frequency Band: 30 - 1000 MHz

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

Results: Complied - refer to attachment 3 – FCC Part 15B test report.

4.3.3 RF Conducted Measurements at the antenna terminal

Testing was performed by Telefication B.V, The Netherlands, and accreditation number: L 021.

Results: Complied – refer to attachment 4, Telefication test report number: 20072023301 with FCC ID: RYYEYSMJCS.

4.3.4 Band Edge Measurements

Complied (refer to section 4.3 – radiated emissions).



5.0 PEAK OUTPUT POWER - Section 15.247 (b)(1)

Testing was performed by Telefication B.V, The Netherlands, and accreditation number: L 021.

Results: Complied – refer to attachment 4, Telefication test report number: 20072023301 with FCC ID: RYYEYSMJCS.

6.0 CHANNEL BANDWIDTH & CHANNEL OCCUPANCY

Testing was performed by Telefication B.V, The Netherlands, and accreditation number: L 021.

Results: Complied – refer to attachment 4, Telefication test report number: 20072023301 with FCC ID: RYYEYSMJCS.

7.0 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 M080425_Cert_AR5BHB92_SAR_2.4 (2.4 GHz) and M080425_Cert_AR5BHB92_SAR_5.6 (5.18 – 5.825 GHz). SAR value of 0.225 mW/g is measured which complies with the FCC human exposure requirements of 47 CFR 2.1093 (d).

8.0 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.



Accreditation No. 5292

9.0 COMPLIANCE STATEMENT

The Fujitsu notebook PC, Model: Tx010 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.

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 - Bluetooth

FCC Part 15, Subpart C Clauses	Industry Canada RSS-210 Issue 7 and RSS-Gen Clauses	Test Performed	Result
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)(1)	A8.1 (b) (d)	Channel Occupancy/Bandwidth	Note 2
15.247 (b)(1)	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	Not Applicable. EUT is not digital modulated system
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	Complies
15.247 (h)	A8.1	Frequency Hopping	Complies
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: 20072023301

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: M080414_Cert_AR5BHB92_NII_BT

FCC Subpart C, Section 15.247 – WLAN

Refer to EMC Technologies Report No: M080414_Cert_AR5BHB92_DTS_BT



10.0 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%.

11.0 TEST REPORT APPENDICES

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