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EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart C (Section 15.239) & RSS-210

FCC ID:	EJE-WB0061
Industry Canada ID:	337J-WB0061
Test Sample:	LifeBook U Series
Model:	U2010
Transmitter:	FM Transmitter Chip
Model:	BU2682MUV
Report Number:	M080613_Cert_FM_Tx
Issue Date:	14th July 2008

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Test Sample:	LifeBook U Series
Model:	U2010
Transmitter:	FM Transmitter Chip
Model:	BU2682MUV
Manufacturer:	ROHM Co. Ltd
FCC ID:	EJE-WB0061
Industry Canada ID:	337J-WB0061
Equipment Type:	Intentional Radiator
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 15.239: Operation in the Band 88 – 108 MHz ANSI C63.4 – 2003 OET Bulletin No. 65 RSS-210 Issue 7 Low Power Licence-Exempt RadioCommunication Devices Annex 2 (A2.8): Operation in the Band 88 – 108 MHz
Test Dates:	23rd to 24th June 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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1.0 INTRODUCTION

EMI testing was performed on the Fujitsu notebook PC, Model: U2010 with FM Transmitter, Model: BU2682MUV.

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 in this test report.

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 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 WLAN and Bluetooth results are reported separately.
Refer to EMC Technologies' test report: M080613_Cert_AR5BHB92_DTS_BT (DTS).
Refer to EMC Technologies' test report: M080613_Cert_AR5BHB92_NII_BT (U-NII).
Refer to EMC Technologies' test report: M080613_Cert_EYSMJCS_AR5BHB92

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 15.239)
Section 15.203:	Antenna requirements
Section 15.207:	Conducted Emission Limits
Section 15.209:	Radiated Emission Limits (General requirements)
Section 15.239:	Operation in the bands 88 - 108 MHz

The test sample **complied** with the requirements of 47 CFR, Part 15 Subpart C - Section 15.239.

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 2 (A2.8).

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

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**
15.207	RSS-Gen (7.2.2)	Conducted Emissions	**Complies**
15.209	RSS-Gen (6)	Radiated Emissions	**Complies**
15.239 (a)	A2.8 (b)	Channel Bandwidth	**Complies**
15.239 (b)	A2.8 (a)	Fundamental	**Complies**
15.247 (c)	A2.8 (b)	Out of Band Emissions	**Complies**
15.247 (d)		Telemetry Intentional Radiator	**Not Applicable**

1.2 Modifications by EMC Technologies

No modifications were required.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 EUT (FM Transmitter) Details

Transmitter:	FM Transmitter Chip
Model:	BU2682MUV
Manufacturer:	ROHM Co. Ltd

2.2 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

2.3 Test Configuration

The FMT application and music source were used to configure the FM transmitter to transmit continuously.

2.4 Support Equipment

Refer to Attachment 2 – FCC Part 15B Test Report (Report: FG08-070EAL)

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 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 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.

2.6.2 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 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 (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 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

2.8 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 15.239 (DXX) RESULTS

3.0 CONDUCTED EMISSION MEASUREMENTS

Testing was performed in accordance with the requirements of FCC Part 15.207

3.1 Test Procedure

The arrangement specified in ANSI C63.4-2003 was adhered to for the conducted EMI measurements. The EUT was placed in the RF screened enclosure and a CISPR EMI Receiver as defined in ANSI C63.2-1996 was used to perform the measurements.

The EMI Receiver was operated under program control using the Max-Hold function and automatic frequency scanning, measurement and data logging techniques. The specified 0.15 MHz to 30 MHz frequency range was sub-divided into sub-ranges to ensure that all short duration peaks were captured.

3.2 Peak Maximising Procedure

The various operating modes of the system were investigated. For each of the sub-ranges, the EMI receiver was set to continuous scan with the Peak detector set to Max-Hold mode. The Quasi-Peak detector and the Average detector were then invoked to measure the actual Quasi-Peak and Average level of the most significant peaks, which were detected.

3.3 Calculation of Voltage Levels

The voltage levels were automatically measured in software and compared to the test limit. The method of calculation was as follows:

VEMI = **VRx + LBPF**

Where:
VEMI = the Measured EMI voltage in dBµV to be compared to the limit.
VRx = the Voltage in dBµV read directly at the EMI receiver.
LBPF = the insertion loss in dB of the cables and the Limiter and Pass Filter.

3.4 Plotting of Conducted Emission Measurement Data

The measurement data pertaining to each frequency sub-range were concatenated to form a single graph of (peak) amplitude versus frequency. This was performed for both Active and Neutral lines and the composite graph was subsequently plotted. A list of the highest relevant peaks and the respective Quasi-Peak and Average values were also plotted on the graph.

3.5 Results of Conducted Emission Measurement

All emissions complied with the FCC Class B, quasi peak and average limits by margins of greater than 10 dB. Refer to Appendix G, Graphs 1 & 2.

4.0 RADIATED EMISSION MEASUREMENTS

4.1 Test Procedure

Testing was performed in accordance with the requirements of FCC Part 15.239.

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 30 MHz to 1000 MHz test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of possible EMI peaks while also permitting fast frequency scan times. A calibrated Biconical antenna was used for measurements between 30 MHz and 232 MHz and a calibrated Logperiodic antenna used for measurements between 230 MHz and 1000 MHz.

Testing was performed at a distance of 3 metres for the frequency ranges 30 to 1000 MHz.

The measurement of emissions between 30 - 1000 MHz was measured with the resolution bandwidth of 120 kHz and the video bandwidth of 300 kHz.

The 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 Plotting of Measurement Data for Radiated Emissions

The stored measurement data was combined to form a single graph which comprised of all the frequency sub-ranges over the range 30 - 1000 MHz. The accumulated EMI (EUT ON) was plotted as the Red trace while the Ambient signals (AMBIENT) were plotted as Green trace. The worst case radiated EMI *peak* measurements as recorded using the Max-Hold data are presented as the upper or **RED** trace while the respective ambient signals are presented as the lower or **GREEN** trace. Occasionally, an intermittent ambient arose during the EUT ON measurement (RED trace) and could not be captured when the Ambient trace was being stored.

The ambient peaks of significant amplitude with respect to the limit are tagged with the "#" symbol while EMI peaks are identified with a numeral. Ambient peaks that were present during the EUT ON measurement (RED trace) and not captured during the AMBIENT measurement were also tagged with the "#" symbol.

The highest recorded EMI signals are shown on the Peaks List on the bottom right side of the graph. For radiated EMI, each numbered peak is listed as a frequency, peak field strength, quasi-peak field strength and the margin relative to the limit in dB. A negative margin is the deviation of the recorded value below the limit.

At times, the quasi peak level may appear to be higher than the peak level. This happens because the individual peak is further maximised with the QP detector. This will be apparent when the peaks list at the foot of the graphs shows the quasi peak level higher than the peak level.

4.3 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

4.4 Radiated EMI Results

4.4.1 FM Tuned to 89 MHz

Frequency MHz	Polarisation	Measured Level dBμV/m	LIMIT dBμV/m	Δ ±dB
88.98	Vertical	37.9	48.0	-10.1
564.07	Vertical	35.4	46.0	-10.6
424.77	Vertical	33.4	46.0	-12.6
634.84	Vertical	32.1	46.0	-13.9
705.09	Vertical	32.0	46.0	-14.0
283.15	Vertical	28.8	46.0	-17.2
211.54	Vertical	24.8	43.5	-18.8
318.50	Vertical	26.5	46.0	-19.5
741.21	Vertical	26.5	46.0	-19.5
354.07	Vertical	23.9	46.0	-22.1
30.13	Vertical	17.3	40.0	-22.7
53.60	Vertical	17.3	40.0	-22.7
88.00	Vertical	7.7	43.5	-35.8

Frequency MHz	Polarisation	Measured Level dBμV/m	LIMIT dBμV/m	Δ ±dB
89.01	Horizontal	38.6	48.0	-9.4
283.10	Horizontal	34.2	46.0	-11.9
317.30	Horizontal	33.8	46.0	-12.2
424.79	Horizontal	33.8	46.0	-12.2
564.07	Horizontal	32.1	46.0	-13.9
212.34	Horizontal	28.9	43.5	-14.6
775.69	Horizontal	27.6	46.0	-18.4
708.04	Horizontal	26.7	46.0	-19.3
132.79	Horizontal	18.4	43.5	-25.1
88.00	Horizontal	7.2	43.5	-36.4

* Fundamental Frequency
**Band-Edge

Results: Complied. Refer to Appendix G, Graphs 3 & 4

4.4.2 FM Tuned to 98 MHz

Frequency MHz	Polarisation	Measured Level dBµV/m	LIMIT dBµV/m	Δ ±dB
98.00	Vertical	40.4	48.0	-7.6
564.07	Vertical	35.4	46.0	-10.6
424.77	Vertical	33.4	46.0	-12.6
634.84	Vertical	32.1	46.0	-13.9
705.09	Vertical	32.0	46.0	-14.0
283.15	Vertical	28.8	46.0	-17.2
211.54	Vertical	24.8	43.5	-18.8
318.50	Vertical	26.5	46.0	-19.5
741.21	Vertical	26.5	46.0	-19.5
354.07	Vertical	23.9	46.0	-22.1
30.13	Vertical	17.3	40.0	-22.7
53.60	Vertical	17.3	40.0	-22.7
108.00	Vertical	9.6	43.5	-33.9

Frequency MHz	Polarisation	Measured Level dBµV/m	LIMIT dBµV/m	Δ ±dB
97.99	Horizontal	43.4	48.0	-4.6
283.10	Horizontal	34.2	46.0	-11.9
317.30	Horizontal	33.8	46.0	-12.2
424.79	Horizontal	33.8	46.0	-12.2
564.07	Horizontal	32.1	46.0	-13.9
212.34	Horizontal	28.9	43.5	-14.6
775.69	Horizontal	27.6	46.0	-18.4
708.04	Horizontal	26.7	46.0	-19.3
132.79	Horizontal	18.4	43.5	-25.1
108.00	Horizontal	16.7	43.5	-26.8

* Fundamental Frequency
**Band-Edge

Results: Complied. Refer to Appendix G, Graphs 5 & 6.

5.0 CHANNEL BANDWIDTH

Testing was performed in accordance with the requirements of FCC Part 15.239(a).

A resolution bandwidth of 10 kHz and the video bandwidth of 10 kHz were utilised.

Frequency MHz	Bandwidth kHz	Result	20 dB Bandwidth Plots
89	158.8	Complies	Appendix H
98	143.8	Complies	Appendix H

6.0 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.

7.0 COMPLIANCE STATEMENT

The Fujitsu notebook PC, Model: U2010 with FM Transmitter, Model: BU2682MUV **complied** with the requirements of 47 CFR, Part 15 Subpart C - Rules for Radio Frequency Devices (intentional radiators), Section 15.239 - Operation in the band 88 – 108 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 2 (A2.8).

Results were as follows:

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**
15.207	RSS-Gen (7.2.2)	Conducted Emissions	**Complies**
15.209	RSS-Gen (6)	Radiated Emissions	**Complies**
15.239 (a)	A2.8 (b)	Channel Bandwidth	**Complies**
15.239 (b)	A2.8 (a)	Fundamental	**Complies**
15.247 (c)	A2.8 (b)	Out of Band Emissions	**Complies**
15.247 (d)		Telemetry Intentional Radiator	**Not Applicable**

8.0 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%.

9.0 TEST REPORT APPENDICES

APPENDIX A: MEASUREMENT INSTRUMENT DETAILS
APPENDIX B: PHOTOGRAPHS
APPENDIX C: OPERATIONAL DESCRIPTION
APPENDIX D: BLOCK DIAGRAM
APPENDIX E: FCC LABELLING DETAILS
APPENDIX F: USER MANUAL
APPENDIX G: RADIATED AND CONDUCTED PLOTS
APPENDIX H: BANDWIDTH PLOTS

Attachment 1: FCC DOC for LifeBook U Series
Attachment 2: FCC Part 15B Test Report (Report: FG08-070EAL)