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

FCC ID: EJE-WB0022  
Industry Canada ID: 337J-WB0022

Test Sample: LifeBook B Series  
Model: B6110

Radio Modules: UGXZ5-102A Bluetooth &  
WM3B2915ABG Mini-PCI WLAN (Calexico2 11a+b/g)

Report Number: M050754\_Cert\_BT\_WM3B2915ABG

Tested for: Fujitsu Australia Ltd.

Issue Date: 12<sup>th</sup> September 2005

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Number: 5292

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**EMC Technologies Report No. M050754\_Cert\_BT\_WM3B2915ABG**  
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**to**  
**FCC PART 15 Subpart C (Section 15.247) & RSS-210**

**Report Number:** M050754\_Cert\_BT\_WM3B2915ABG

**Test Sample:** LifeBook B Series  
**Model:** B6110  
**Radio Modules:** Bluetooth, Model: UGXZ5-102A (Fujitsu Ltd)  
Mini-PCI WLAN, Model: WM3B2915ABG (Intel Corp.)

**FCC ID:** EJE-WB0022  
**Industry Canada ID:** 337J-WB0022  
**Equipment Type:** Intentional Radiator (Transceiver)

**LifeBook Manufacturer:** Fujitsu Ltd  
**Address:** 1405, Ohamaru, Inagi-shi, Tokyo 206-8503, Japan  
**Contact:** Mr. Tsuyoshi Uchihara

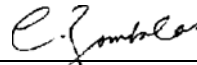
**Tested for:** Fujitsu Australia Ltd

**Test Standards:** FCC Part 15, Subpart C – Intentional Radiators  
FCC Part 15.247, 2400 – 2483.5 MHz Operation Band  
ANSI C63.4 – 2003  
OET Bulletin No. 65  
  
RSS-210 Issue 5 Low Power Licence-Exempt RadioCommunication  
Devices: 6.2.2 (o) 2400 – 2483.5 MHz Spread Spectrum  
  
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:** 30<sup>th</sup> August to 6<sup>th</sup> September 2005

**Test Officer:**   
**Chieu Huynh - B.Eng (Hons) Electronics**

**Attestation:** *I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*

**Authorised Signatory:**   
**Chris Zombolas**  
**Technical Director**  
**EMC Technologies Pty Ltd**



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

## 1.0 INTRODUCTION

EMI testing was performed on test sample LifeBook B Series, Model: B6110 with Mini-PCI Wireless LAN Module (Calexico2 11a+b/g), Model WM3B2915ABG & Bluetooth, Model UGXZ5-102A.

The WLAN supports IEEE 802.11b, IEEE 802.11g and IEEE 802.11a (DTS & U-NII) configurations. Tests were performed in all three configurations and also on the Bluetooth.

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

The results for the WLAN module are reported separately. Refer to EMC Technologies' test reports: M050754\_Cert\_WM3B2915ABG\_DTS\_BT (DTS) and M050754\_Cert\_WM3B2915ABG\_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 5 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(o) and the RF exposure requirements of RSS-102.



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## 1.1 Summary of Results

### 1.1.1 Bluetooth - FCC Subpart C (Section 15.247)

| FCC Part 15, Subpart C Clauses | Industry Canada RSS-210 Clauses | Test Performed               | Result         |
|--------------------------------|---------------------------------|------------------------------|----------------|
| 15.203                         | 5.5                             | Antenna Requirement          | Not Applicable |
| 15.205                         | 6.3                             | Operation in Restricted Band | Complies       |
| 15.207                         | 6.6                             | Conducted Emissions          | Complies       |
| 15.209                         | 6.3                             | Radiated Emissions           | Complies       |
| 15.247 (a)(1)                  | 6.2.2(o)(ii)                    | Channel Occupancy/Bandwidth  | Complies       |
| 15.247 (b)(1)                  | 6.2.2(o)(b)                     | Peak Output Power            | Complies       |
| 15.247 (i)                     |                                 | Radio Frequency Hazard       | Complies       |
| 15.247 (d)                     | 6.2.2(o)(e1)                    | Out of Band Emissions        | Complies       |

### 1.1.2 WLAN, Atheros: 802.11b, 802.11g and 802.11a (DTS) - FCC Subpart C, Section 15.247

| FCC Part 15, Subpart C Clauses | Industry Canada RSS-210 Clauses | Test Performed               | Result         |
|--------------------------------|---------------------------------|------------------------------|----------------|
| 15.203                         | 5.5                             | Antenna Requirement          | Not Applicable |
| 15.205                         | 6.3                             | Operation in Restricted Band | Complies       |
| 15.207                         | 6.6                             | Conducted Emissions          | Complies       |
| 15.209                         | 6.3                             | Radiated Emissions           | Complies       |
| 15.247 (a)(2)                  | 6.2.2(o)(iv)                    | Channel Bandwidth            | Complies       |
| 15.247 (b)(3)                  | 6.2.2(o)(b)                     | Peak Output Power            | Complies       |
| 15.247 (i)                     |                                 | Radio Frequency Hazard       | Complies       |
| 15.247 (d)                     | 6.2.2(o)(e1)                    | Out of Band Emissions        | Complies       |
| 15.247 (e)                     | 6.2.2(o)(iv)                    | Peak Power Spectral Density  | Complies       |

Refer to EMC Technologies Report No: M050754\_Cert\_WM3B2915ABG\_DTS\_BT

### 1.1.3 WLAN, Atheros: 802.11a (U-NII) - FCC Subpart E, Section 15.407

| FCC Part 15, Subpart E Clauses | Industry Canada RSS-210 Clauses | Test Performed               | Result         |
|--------------------------------|---------------------------------|------------------------------|----------------|
| 15.203                         | 5.5                             | Antenna Requirement          | Not Applicable |
| 15.205                         | 6.3                             | Operation in Restricted Band | Complies       |
| 15.207                         | 6.6                             | Conducted Emissions          | Complies       |
| 15.209                         | 6.3                             | Radiated Emissions           | Complies       |
| 15.407 (a)(1)<br>(a)(2)        | 6.2.2(q1)                       | Peak Transmit Power          | Complies       |
| 15.407 (a)(5)                  | 6.2.2(q1)                       | Peak Power Spectral Density  | Complies       |
| 15.407 (a)(6)                  |                                 | Peak Excursion               | Complies       |
| 15.407 (b)                     | 6.2.2(q1)                       | Undesirable Emission         | Complies       |
| 15.407 (f)                     |                                 | Radio Frequency Hazard       | Complies       |
| 15.407 (g)                     | 6.4                             | Frequency Stability          | Complies       |

Refer to EMC Technologies Report No: M050754\_Cert\_WM3B2915ABG\_NII\_BT

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.

## 1.2 Modifications by EMC Technologies

No modifications were required.



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## 2.0 GENERAL INFORMATION

(Information supplied by the Client)

### 2.1 Product Details

|                                |                                                        |
|--------------------------------|--------------------------------------------------------|
| <b>Test Sample (LifeBook):</b> | LifeBook B Series                                      |
| <b>Model Number:</b>           | B6110                                                  |
| <b>Serial Number:</b>          | Pre-production Sample                                  |
| <b>Manufacturer:</b>           | Fujitsu Ltd                                            |
| <b>CPU Type and Speed:</b>     | Pentium-M 1.2 GHz ULV                                  |
| <b>Wired LAN:</b>              | Broadcom BCM5705 M : 10 Base-T/100 Base-TX/1000 Base-T |
| <b>Modem:</b>                  | Agere MDC 1.5, Model: AM2                              |
| <b>Port Replicator Model:</b>  | FPCPR52 / FPCPR56 / FMV-NPR8 / FMV-NPR9                |
| <b>AC Adapter Model:</b>       | SEC80N2-16.0 (Sanken) / US25 (Eastern)                 |
| <b>Voltage:</b>                | 16 V                                                   |
| <b>Current Specs:</b>          | 3.75A                                                  |
| <b>Watts:</b>                  | 60 W                                                   |
| <b>Radio Modules:</b>          | Bluetooth and WLAN (Calexico2 11a+b/g)                 |
| <b>Bluetooth Model Number:</b> | UGXZ5-102A                                             |
| <b>Bluetooth Manufacturer:</b> | Fujitsu Ltd                                            |
| <b>WLAN Model Number:</b>      | WM3B2915ABG                                            |
| <b>WLAN Manufacturer:</b>      | Intel Corporation                                      |
| <b>Interface Type:</b>         | Mini-PCI Wireless LAN Module                           |
| <b>FCC ID:</b>                 | EJE-WB0022                                             |
| <b>Industry Canada ID:</b>     | 337J-WB0022                                            |
| <b>Equipment Type:</b>         | Intentional Radiator (Transceiver)                     |



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## 2.2 Technical Specifications

### 2.2.1 Bluetooth Transmitter Specifications

|                              |                                          |
|------------------------------|------------------------------------------|
| <b>Transmitter:</b>          | Bluetooth                                |
| <b>Model Number:</b>         | UGXZ5-102A                               |
| <b>Manufacturer:</b>         | Fujitsu Ltd.                             |
| <b>Network Standard:</b>     | Bluetooth™ RF Test Specification         |
| <b>Modulation Type:</b>      | Frequency Hopping Spread Spectrum (FHSS) |
| <b>Frequency Range:</b>      | 2402 MHz to 2480 MHz                     |
| <b>Number of Channels:</b>   | 79                                       |
| <b>Carrier Spacing:</b>      | 1.0 MHz                                  |
| <b>Antenna Types:</b>        | Taiyo Yuden Monopole                     |
| <b>Model:</b>                | AH104N2450D2-T                           |
|                              | Located on top center of LCD screen      |
| <b>Antenna gain:</b>         | -1.3 dBi                                 |
| <b>Max. Output Power:</b>    | 12 dBm                                   |
| <b>Reference Oscillator:</b> | 16 MHz (Built-in)                        |
| <b>Power Supply:</b>         | 3.3 VDC from host.                       |

#### Frequency allocation:

| Channel Number | Frequency (MHz) | Bluetooth Utility power setting |
|----------------|-----------------|---------------------------------|
| <b>1*</b>      | <b>2402</b>     | Power (Ext, Int) = 180, 46      |
| 2              | 2403            |                                 |
| 3              | 2404            |                                 |
| .              | .               |                                 |
| .              | .               |                                 |
| .              | .               |                                 |
| 39             | 2440            |                                 |
| <b>40*</b>     | <b>2441</b>     |                                 |
| 41             | 2442            |                                 |
| .              | .               |                                 |
| .              | .               |                                 |
| .              | .               |                                 |
| 77             | 2478            |                                 |
| 78             | 2479            |                                 |
| <b>79*</b>     | <b>2480</b>     |                                 |

\*Channels tested and reported in this report



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## 2.2.2 WLAN Transmitter Specifications

|                            |                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transmitter:</b>        | Mini-PCI Wireless LAN Module                                                                                                                                                         |
| <b>Wireless Module:</b>    | Calexico2 (11a+b/g)                                                                                                                                                                  |
| <b>Model Number:</b>       | WM3B2915ABG                                                                                                                                                                          |
| <b>Manufacturer:</b>       | Intel Corporation                                                                                                                                                                    |
| <b>Modulation Type:</b>    | Direct Sequence Spread Spectrum (DSSS for 802.11b)<br>Orthogonal Frequency Division Multiplexing (OFDM for 802.11g)<br>Orthogonal Frequency Division Multiplexing (OFDM for 802.11a) |
| <b>802.11a</b>             | BPSK – 6Mbps, 9Mbps<br>QPSK – 12Mbps, 18Mbps<br>16QAM – 24Mbps, 36Mbps<br>64QAM – 48Mbps, 54Mbps                                                                                     |
| <b>802.11g</b>             | BPSK – 6Mbps, 9Mbps<br>QPSK – 12Mbps, 18Mbps<br>16QAM – 24Mbps, 36Mbps<br>64QAM – 48Mbps, 54Mbps                                                                                     |
| <b>802.11b</b>             | DBPSK – 1Mbps<br>DQPSK – 2Mbps<br>CCK – 5.5Mbps, 11Mbps                                                                                                                              |
| <b>Maximum Data Rate:</b>  | 802.11b = 11Mbps, 802.11g and 802.11a = 54Mbps                                                                                                                                       |
| <b>Frequency Range:</b>    | 2.4 – 2483.5 GHz for 11b/g<br>5.15 - 5.35 GHz and 5.725 - 5.850 GHz for 11a                                                                                                          |
| <b>Number of Channels:</b> | 11 channels for 11b or 11g<br>13 channels for 11a                                                                                                                                    |
| <b>Antenna Types:</b>      | 2 x Taiyo Yuden Monopole                                                                                                                                                             |
| <b>Models:</b>             | AH104N2450D2-T<br>Located on top edge (right and left) of LCD screen                                                                                                                 |
| <b>Antenna gain:</b>       | 802.11b/g = -1.3 dBi<br>802.11a (5.15 – 5.35 GHz) = -0.8 dBi<br>802.11a (5.725 – 5.825 GHz) = -0.8 dBi                                                                               |
| <b>Max. Output Power:</b>  | 802.11b = 15 dBm<br>802.11g = 14 dBm<br>802.11a = 10-14 dBm                                                                                                                          |
| <b>Power Supply:</b>       | 3.3 VDC from PCI bus                                                                                                                                                                 |
| <b>Chipset Used:</b>       | 82533MDE and 82533RGE                                                                                                                                                                |





**Frequency allocation and maximum output power setting for 802.11b/g:**

| Channel Number | Frequency (MHz) | EUT Power level setting dBm |           |
|----------------|-----------------|-----------------------------|-----------|
|                |                 | 802.11b                     | 802.11g   |
| <b>1</b>       | <b>2412*</b>    | <b>15</b>                   | <b>14</b> |
| 2              | 2417            | 15                          | 14        |
| 3              | 2422            | 15                          | 14        |
| 4              | 2427            | 15                          | 14        |
| 5              | 2432            | 15                          | 14        |
| <b>6</b>       | <b>2437*</b>    | <b>15</b>                   | <b>14</b> |
| 7              | 2442            | 15                          | 14        |
| 8              | 2447            | 15                          | 14        |
| 9              | 2452            | 15                          | 14        |
| 10             | 2457            | 15                          | 14        |
| <b>11</b>      | <b>2462*</b>    | <b>15</b>                   | <b>14</b> |

\*Channels tested and reported in the DTS submission (M050754\_Cert\_WM3B2915ABG\_DTS\_BT)

**Frequency allocation and maximum output power setting for 802.11a:**

| Channel Number                                                                             | Frequency (MHz) | Power level setting dBm |
|--------------------------------------------------------------------------------------------|-----------------|-------------------------|
| *Channels tested and reported in the DTS submission<br>(M050754_Cert_WM3B2915ABG_DTS_BT)   |                 |                         |
| <b>149</b>                                                                                 | <b>5745*</b>    | <b>14</b>               |
| 153                                                                                        | 5765            | 14                      |
| <b>157</b>                                                                                 | <b>5785*</b>    | <b>14</b>               |
| 161                                                                                        | 5805            | 14                      |
| <b>165</b>                                                                                 | <b>5825*</b>    | <b>14</b>               |
| *Channels tested and reported in the U-NII submission<br>(M050754_Cert_WM3B2915ABG_NII_BT) |                 |                         |
| <b>36</b>                                                                                  | <b>5180*</b>    | <b>10</b>               |
| 40                                                                                         | 5200            | 10                      |
| 44                                                                                         | 5220            | 10                      |
| 48                                                                                         | 5240            | 10                      |
| <b>52</b>                                                                                  | <b>5260*</b>    | <b>14</b>               |
| 56                                                                                         | 5280            | 14                      |
| 60                                                                                         | 5300            | 14                      |
| <b>64</b>                                                                                  | <b>5320*</b>    | <b>14</b>               |



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## 2.3 Operational Description

The EUT is a LifeBook B Series, Model: B6110 installed with a Mini-PCI Wireless LAN (WLAN) Module (Calexico2 11a+b/g, Model WM3B2915ABG) & Bluetooth, Model UGXZ5-102A.

The same WLAN radio module and Bluetooth combination has been previously certified by Fujitsu under FCC ID: EJE-WB0035 and IC: 337J-WB0035 in a different host.

The intention of this application is to re-certify this WLAN and Bluetooth with a different antenna combination in host – LifeBook B Series, Model: B6110.

## 2.4 Test Configuration

The Intel WLAN software and the BlueSuiteCasira software were used to set-up the WLAN module and Bluetooth devices respectively to continuously transmit during the tests. The LCD screen was observed for the transmitter status shown for the respective software.

### Antenna

The Calexico2 (11a+b/g) WLAN and ALPS Bluetooth devices are configured with Taiyo Yuden Monopole Antenna – Model: AH104N2450D2-T. The installation of the OEM WLAN module, Bluetooth Device and the Antennas in Fujitsu LifeBook B Series, Model: B6110 is in a controlled environment. The installation is performed during the production/assembly process at the Fujitsu factory.

Refer to Appendix F – Antenna Information.

There are three antennas: WLAN antennas (x2) are located on the top edge (left and right) of LCD screen. Bluetooth antenna is located on top center of LCD screen.

Refer to photos in Appendix B3 for BT Antenna location.

### AC Adapter

The AC adapter SEC80N2-16.0 was used for all the tests. Details of the AC adapter are supplied in section 2.1 of this report.

## 2.5 Block Diagram

Refer to Appendix D - Block Diagram

## 2.6 Support Equipment

Refer to Attachment 3 – FCC Part 15B Test Report (Report: FG05-042EAL)

## 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.



## 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 antenna ports were performed at EMC Technologies' laboratory in Tullamarine, Victoria Australia.

The above test sites have been accepted for testing by the Federal Communications Commission (FCC) - **FCC Registration Number 90560**.

EMC Technologies open area test site (OATS) has also been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS 212, Issue 1 (Provisional).

**Industry Canada File Number IC 4161.**

### 2.8.2 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](http://www.nata.asn.au)  
It also includes a large number of emission, immunity, SAR, EMR and Safety standards.

NATA is the Australian national laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Laboratory (NML) and an internal quality system to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A<sup>2</sup>LA).

## 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 Laboratory (NML). All equipment calibration is traceable to Australia national standards at the National Measurements Laboratory. The reference antenna calibration was performed by NML and the working antennas (biconical and log-periodic) calibrated by the NATA approved procedures. 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.



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## RESULTS

### Bluetooth Module, Model UGXZ5-102A

#### 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: FG05-042EAL)

#### 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. The measurements were made at the open area test site.

The EUT was set up on the table top (placed on turntable) of total height 80 cm above the ground plane, and operated as described in section 2 of this report. The EMI Receiver was operated under software control via the PC Controller through the IEEE.488 Interface Bus Card Adaptor. The test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of possible EMI peaks while also permitting fast frequency scan times. Calibrated EMCO 3115, EMCO 3116 and ETS standard gain horn antennas were used for measurements between 1 to 40 GHz.

The measurement of emissions between 30 - 1000 MHz, refer to Attachment 3 – FCC Part 15B Test Report (Report: FG05-042EAL).

The measurement of emissions above 1000 MHz, appearing in the restricted bands, was made using an average detector with a bandwidth of 1.0 MHz.

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 dBμV/m.
- V** = EMI Receiver Voltage in dBμV. (measured value)
- AF** = Antenna Factor in dB(m<sup>-1</sup>). (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:

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

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (1000 MHz – 18,000 MHz) ± 4.1 dB



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### 4.3 Radiated Emissions (Spurious and Harmonics)

#### 4.3.1 Frequency Band: 1 – 40 GHz

All measurements above 1 GHz were initially made over a distance of 3 metres. This was decreased to 1.0 metre as the emission levels from the device were very low.

The 54 dB $\mu$ V/m limit at 3 metres has been converted to 64 dB $\mu$ V/m at 1 metre using a factor of 20 dB per decade where emissions were located in the restricted bands.

Testing was performed while both the Bluetooth transmitter and WLAN transmitter continuously operated. Harmonics related to the Bluetooth transmitter are reported below. Harmonics related to the WLAN transmitter, Refer to EMC Technologies' test reports: M050754\_Cert\_WM3B2915ABG\_DTS\_BT and M050754\_Cert\_WM3B2915ABG\_NII\_BT.

Measurements were made on a low (channel 1, 2402 MHz), middle (channel 40, 2441 MHz) and high (Channel 79, 2480 MHz) frequency channel.

When the EUT was operating at its highest channel (2480 MHz), the field strength at 2483.5 MHz was 52.1 dB $\mu$ V/m peak & 36.9 dB $\mu$ V/m average and was > 20 dB below the maximum field strength of the in-band carrier.

When the EUT was operating at its lowest channel (2402 MHz), the field strength at 2400 MHz was 81.6 dB $\mu$ V/m peak & 45.2 dB $\mu$ V/m average and was > 20 dB below the maximum field strength of the in-band carrier.

#### Channel 1 - 2402 MHz

| Frequency<br>MHz | Level<br>dB $\mu$ V/m |                     | Antenna<br>Polarization | Peak<br>Limit<br>dB $\mu$ V/m | Average<br>Limit<br>dB $\mu$ V/m | Result |
|------------------|-----------------------|---------------------|-------------------------|-------------------------------|----------------------------------|--------|
|                  | Peak<br>Detector      | Average<br>Detector |                         |                               |                                  |        |
| 2402             | Transmitter           | Fundamental         |                         | -                             | -                                |        |
| 4804             | 51.3                  | 40.7                | Vert/Hort               | 74.0                          | 54.0                             | Pass   |
| 7206             | 46                    | 37                  | Vert/Hort               | -                             | -                                | Pass   |
| 9608             | 48                    | 39                  | Vert/Hort               | -                             | -                                | Pass   |
| 12010            | 51                    | 41                  | Vert/Hort               | 74.0                          | 54.0                             | Pass   |
| 14412            | 55                    | 46                  | Vert/Hort               | -                             | -                                | Pass   |
| 16814            | 56                    | 49                  | Vert/Hort               | -                             | -                                | Pass   |
| 19216            | 65                    | 52                  | Vert/Hort               | 84.0* (1m)                    | 64.0* (1m)                       | Pass   |
| 21618            | 67                    | 54                  | Vert/Hort               | -                             | -                                | Pass   |
| 24020            | 68                    | 55                  | Vert/Hort               | -                             | -                                | Pass   |

\*Measurement was performed at 1 metre distance and the limits were corrected accordingly.



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**Channel 40 - 2441 MHz**

| Frequency MHz | Level dBuV/m  |                  | Antenna Polarization | Peak Limit dBuV/m | Average Limit dBuV/m | Result |
|---------------|---------------|------------------|----------------------|-------------------|----------------------|--------|
|               | Peak Detector | Average Detector |                      |                   |                      |        |
| 2441          | Transmitter   | Fundamental      |                      | -                 | -                    |        |
| 4882          | 51.0          | 40.1             | Vert/Hort            | 74.0              | 54.0                 | Pass   |
| 7323          | 46            | 37               | Vert/Hort            | 74.0              | 54.0                 | Pass   |
| 9764          | 48            | 39               | Vert/Hort            | -                 | -                    | Pass   |
| 12205         | 51            | 41               | Vert/Hort            | 74.0              | 54.0                 | Pass   |
| 14646         | 55            | 46               | Vert/Hort            | -                 | -                    | Pass   |
| 17087         | 56            | 49               | Vert/Hort            | -                 | -                    | Pass   |
| 19528         | 65            | 52               | Vert/Hort            | 84.0* (1m)        | 64.0* (1m)           | Pass   |
| 21969         | 67            | 54               | Vert/Hort            | -                 | -                    | Pass   |
| 24410         | 68            | 55               | Vert/Hort            | -                 | -                    | Pass   |

\*Measurement was performed at 1 metre distance and the limits were corrected accordingly.

**Channel 79 - 2480 MHz**

| Frequency MHz | Level dBuV/m  |                  | Antenna Polarization | Peak Limit dBuV/m | Average Limit dBuV/m | Result |
|---------------|---------------|------------------|----------------------|-------------------|----------------------|--------|
|               | Peak Detector | Average Detector |                      |                   |                      |        |
| 2480          | Transmitter   | Fundamental      |                      | -                 | -                    |        |
| 4960          | 49.7          | 39.7             | Vert/Hort            | 74.0              | 54.0                 | Pass   |
| 7440          | 46            | 37               | Vert/Hort            | 74.0              | 54.0                 | Pass   |
| 9920          | 48            | 39               | Vert/Hort            | -                 | -                    | Pass   |
| 12400         | 51            | 41               | Vert/Hort            | 74.0              | 54.0                 | Pass   |
| 14880         | 55            | 46               | Vert/Hort            | -                 | -                    | Pass   |
| 17360         | 56            | 49               | Vert/Hort            | -                 | -                    | Pass   |
| 19840         | 65            | 52               | Vert/Hort            | 84.0* (1m)        | 64.0* (1m)           | Pass   |
| 22320         | 67            | 54               | Vert/Hort            | 84.0* (1m)        | 64.0* (1m)           | Pass   |
| 24800         | 68            | 55               | Vert/Hort            | -                 | -                    | Pass   |

\*Measurement was performed at 1 metre distance and the limits were corrected accordingly.

**Result:** Harmonics were recorded within the restricted bands of up to 25 GHz. Other harmonics were confirmed low with both RBW and VBW reduced (the peak and average levels listed in the above tables were noise floor readings). Harmonics were complied with the FCC limits in sections 15.209 and 15.247 by a margin of 13.3 dB. The measurement uncertainty for radiated emissions in this band was  $\pm 4.1$  dB.

**4.3.2 Spurious Emissions Generated When Both (WLAN and BT) Transmitters Transmitting**

**Result:** No spurious emissions were recorded within the restricted bands of up to 40 GHz. Spurious emissions were confirmed low with both RBW and VBW reduced. Emissions were complied with the FCC limits in sections 15.209 and 15.247. The measurement uncertainty for radiated emissions in this band was  $\pm 4.1$  dB.

**4.3.3 Frequency Band: 30 - 1000 MHz**

Refer to Attachment 3 – FCC Part 15B Test Report (Report: FG05-042EAL).



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**4.3.4 RF Conducted Measurements at the antenna terminal**

In the 100 kHz bandwidth within the operating band, the highest emissions (spurious/harmonics) level that is produced by the intentional radiator shall be at least 20 dB below.

The transmitter output was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised.

D1 line indicates the 20 dB limit below the highest level of the transmitter

Refer to Appendix K for Harmonics plots

**Result:** Complies.

**4.3.5 Band Edge Measurements**

In the 100 kHz bandwidth within the operating band, the highest emissions (spurious/harmonics) level that is produced by the intentional radiator shall be at least 20 dB below.

Testing was performed while the transmitter continuously transmitted on a low (2402 MHz) and high frequency (2480 MHz) channel.

The transmitter output was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised.

D1 line indicates the 20 dB limit below the highest level of the transmitter

Refer to Appendix L for Band Edge plots

**Result:** Complies.

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

Testing was performed in accordance with the requirements of FCC Part 15.247(b)(1).

Measurements were performed while the Bluetooth transmitter continuously transmitted.

The transmitter output was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 1 MHz and the video bandwidth of 3 MHz were utilised.

Variation by +/- 15% of the supply voltage, in accordance with section 15.31(e), to the computer power supply power did not cause any variations to the RF output power.

| Frequency MHz | Power dBm | Limit dBm | Power mW | Limit mW | Power Plots |
|---------------|-----------|-----------|----------|----------|-------------|
| 2402          | 10.0      | 30        | 10.0     | 1000     | Appendix M  |
| 2441          | 10.2      | 30        | 10.5     | 1000     | Appendix M  |
| 2480          | 10.0      | 30        | 10.0     | 1000     | Appendix M  |

**Result:** Complies.



## 6.0 CHANNEL BANDWIDTH & CHANNEL OCCUPANCY

Testing was carried out in accordance with the requirements of FCC Part 15.247(a)(1)(iii)

The EUT was a Frequency Hopping Spread Spectrum transmitter and operated as described in section 2 of this report.

### 6.1 Channel Bandwidth

In the band 2400 - 2483.5 MHz the hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

The transmitter output was connected to the spectrum analyser in peak hold mode.

A resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised.

| Frequency<br>MHz | Bandwidth<br>kHz | Result   | 20 dB Bandwidth<br>Plots |
|------------------|------------------|----------|--------------------------|
| 2402             | 751              | Complies | Appendix J               |
| 2441             | 771              | Complies | Appendix J               |
| 2480             | 771              | Complies | Appendix J               |

### 6.2 Channel Occupancy

79 channels were observed operating between 2400 to 2483.5 MHz. Refer to Appendix N for number of channel plot.

The channel separation of 1 MHz was recorded. Refer to Appendix N for number of channel separation plot.

The device was observed to have a dwell time of 411.9 uS. This measurement was made on a channel using a spectrum analyser with a 0 Hz span and a sweep time of 5 mS. Refer to Appendix N for dwell time plot.

The specification allows for a dwell time not exceeding 0.4 seconds.

The maximum period is 79 channels x 0.4 seconds = 31.6 seconds.

During the test the transmitter was observed to activate on average 315 times in 31.6 seconds.

The transmitter therefore occupies in one channel for  $315 \times 411.9 \text{ uS} = 0.130 \text{ seconds}$ .

**Result:** Complies.





## 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).

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

Transmitter # 2: The Bluetooth is a mobile device. The antenna is located on the top center of LCD screen projected distance of greater than 20cm from user.

The separation distance between the WLAN and BT antennas is less than 20cm. Therefore, they are co-located transmitters. Testing was performed with both WLAN and BT transmitters transmitting continuously.

SAR is not required as both transmitters are mobile devices.

The MPE calculation shown below is the aggregate of WLAN and BT power densities for mobile devices for a separation distance of greater than 20cm.

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  $1\text{mW}/\text{cm}^2$ .

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

where:  $P_d$  = power density ( $\text{mW}/\text{cm}^2$ )

$P$  = power input to the antenna (mW)

$G$  = antenna gain (numeric)

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

### The result was extracted from section 5.0 of this report (BT):

Maximum peak output power = 10.2 dBm = 10.5 mW

Antenna (Taiyo Yuden Monopole) gain (max) = -1.3 dBi = 0.741 numeric

Prediction distance = 20 cm

Prediction frequency = 2441 MHz

MPE limit for uncontrolled exposure at prediction frequency =  $1\text{mW}/\text{cm}^2$

The power density calculated =  $0.0016\text{mW}/\text{cm}^2$

### The result was extracted from section 5.0 of M050754\_Cert\_WM3B2915ABG\_DTS\_BT (WLAN report):

Maximum peak output power = 14.8 dBm = 30.2 mW

Antenna (Taiyo Yuden Monopole) gain (max) = -1.3 dBi = 0.741 numeric

Prediction distance = 20 cm

Prediction frequency = 2412 MHz

MPE limit for uncontrolled exposure at prediction frequency =  $1\text{mW}/\text{cm}^2$

The power density calculated =  $0.0045\text{mW}/\text{cm}^2$

Therefore, the power density (WLAN + BT) =  $0.0061\text{mW}/\text{cm}^2$

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



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## 8.0 ANTENNA REQUIREMENT

Testing to the requirements of FCC Part 15.203 was not applicable as this intentional radiator was designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

## 9.0 COMPLIANCE STATEMENT

The LifeBook B Series, Model: B6110 with Mini-PCI Wireless LAN Module (Calexico2 11a+b/g, Model WM3B2915ABG) & Bluetooth, Model UGXZ5-102A, tested on behalf of Fujitsu Australia Ltd, **comply** 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 complies with the Industry Canada RSS-210 issue 5 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(o) 2400 – 2483.5 MHz Spread Spectrum requirements and the RF exposure requirements of RSS-102.

Results were as follows:

### Bluetooth - FCC Subpart C (Section 15.247)

| FCC Part 15, Subpart C Clauses | Industry Canada RSS-210 Clauses | Test Performed               | Result         |
|--------------------------------|---------------------------------|------------------------------|----------------|
| 15.203                         | 5.5                             | Antenna Requirement          | Not Applicable |
| 15.205                         | 6.3                             | Operation in Restricted Band | Complies       |
| 15.207                         | 6.6                             | Conducted Emissions          | Complies       |
| 15.209                         | 6.3                             | Radiated Emissions           | Complies       |
| 15.247 (a)(1)                  | 6.2.2(o)(ii)                    | Channel Occupancy/Bandwidth  | Complies       |
| 15.247 (b)(1)                  | 6.2.2(o)(b)                     | Peak Output Power            | Complies       |
| 15.247 (i)                     |                                 | Radio Frequency Hazard       | Complies       |
| 15.247 (d)                     | 6.2.2(o)(e1)                    | Out of Band Emissions        | Complies       |

The results for the WLAN module are reported separately.

Refer to EMC Technologies' test reports: M050754\_Cert\_WM3B2915ABG\_DTS\_BT (DTS) and M050754\_Cert\_WM3B2915ABG\_NII\_BT (U-NII).



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## TEST REPORT APPENDICES

**APPENDIX A: MEASUREMENT INSTRUMENT DETAILS**  
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**Attachment 1: RF Exposure Information**  
**Attachment 2: FCC DOC for LifeBook B Series**  
**Attachment 3: FCC Part 15B Test Report (Report: FG05-042EAL)**



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