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EMI TEST REPORT
for
CERTIFICATION to
FCC PART 15.247 and RSS-210

FCC ID: **QK3-BT0001**
Industry Canada ID: **IC-337H-BT0001**

Test Sample: LIFEBOOK Ginger Bluetooth

Tested for: Fujitsu Australia Ltd

Report Number: M030235R_FCC_Ginger_BT
(Replacement for Report Number M030235_FCC_Ginger_BT)

Issue Date: 9th April 2003

NATA Accredited Laboratory
Number: 5292

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Test Sample:	LIFEBOOK Ginger Bluetooth
FCC ID:	QK3-BT0001
Industry Canada ID:	IC-337H-BT0001
LifeBook Manufacturer:	Fujitsu Ltd.
Tested for:	Fujitsu Australia Ltd
Address:	5 Lakeside Drive, Burwood East, VIC 3151 Australia
Phone:	+613 9845 4300
Fax:	+613 9845 4600
Responsible Party:	Mr Praveen Rao Senior Compliance Engineer
Equipment Type:	Intentional Radiator (Transmitter)
Test Standards:	FCC Part 15, Subpart C - Intentional Radiators FCC Part 15.247 2400 - 2483.5 MHz Operation Band FCC Part 15.205 Operation in Restricted Bands FCC Part 15.207 Conducted Emissions FCC Part 15.209 Radiated Emissions ANSI C63.4-1992 OET Bulletin No. 63 RSS 210 Issue 5 Low Power Licence-Exempt RadioCommunication Devices 6.2.2 (o) 2400 – 2483.5 MHz Spread Spectrum Devices
Test Dates:	3rd - 27th March 2003
Test Officers:	**Chieu Huynh B. Eng (Hons)** **Kevin Hansen Assoc. Diploma (Electronics)** **Steven Kolar B. Eng**
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 Signature:	**Chris Zombolas** **Technical Director** **EMC Technologies Pty Ltd**

EMI TEST REPORT FOR CERTIFICATION to FCC PART 15.247 and RSS-210

1.0 INTRODUCTION

This report details the results of EMI tests and measurements performed on LifeBook Ginger Bluetooth, in accordance with the Federal Communications Commission (FCC) regulations as detailed in Title 47 CFR, Part 15 Subpart C Rules for intentional radiators, particularly Section 15.247 (Operation in the frequency band 2400 - 2483.5 MHz).

The results and technical details of the test sample are detailed in this report. The test sample **complies** with the requirements of 47 CFR, Part 15 Subpart C - Radio Frequency Devices (intentional radiators), Section 15.247.

It also complies with the Industry Canada RSS-210 issue 5 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clauses 6.2.2(o) requirements.

1.1 Summary of Results

FCC Part 15, Subpart C Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	**Not Applicable Integral antenna**
15.205	6.3	Operation in Restricted Bandwidth	**Complies**
15.207	6.6	Conducted Emissions	**Complies**
15.209	6.3	Radiated Emissions	**Complies**
15.247 (a)(1)&(3)	6.2.2(o)(ii)	Channel Occupancy/Bandwidth	**Complies**
15.247 (b)(1)	6.2.2(o)(b)	Peak Output Power	**Complies**
15.247 (b)(5)		Radio Frequency Hazard	**Complies**
15.247 (c)	6.2.2(o)(e1)	Out of Band Transmissions	**Complies**

The measurement procedure used was in accordance with ANSI C63.4-1992 and OET Bulletin No. 96-43. The instrumentation conformed to the requirements of ANSI C63.2-1987.

1.2 Modifications by EMC Technologies

No modifications were required.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 Product Details

Test Sample:	LifeBook Ginger Bluetooth (Transceiver)
LifeBook Manufacturer:	Fujitsu Ltd
FCC ID:	QK3-BT0001
IC ID:	IC-337H-BT0001
Equipment Type:	Intentional Radiator (Transceiver)

2.2 Test Sample Operational Description

The EUT is a Bluetooth device permanently installed in Fujitsu Notebook PC (LifeBook) model Ginger (S6120/S6120D). Refer to Appendix K for further details.

2.3 Technical Specifications

Module:	ALPS Bluetooth Module
Network Standard:	Bluetooth™ RF Test Specification
Modulation Type:	Frequency Hopping Spread Spectrum (FHSS)
Frequency Range:	2402 -2480 MHz
Number of Channels:	79
Carrier Spacing:	1 MHz
Antenna Types:	Monopole Ceramic Chip Antenna
Reference Oscillator:	16 MHz (Built-in)
Power Supply:	3.3 VDC from Host

EUT Host Details:	
Test Sample:	LIFEBOOK S Series
Model Name:	S6120, S6120D
Codename:	Ginger
CPU Speed:	1.6 GHz
Manufacturer:	Fujitsu Ltd.
AC Adapter Model:	CA01007-0850 16VDC, 3.75A, 60W

2.4 Test sample configuration

The Bluetooth device was configured to continuously transmit using the Bluetooth utility software

Refer to Appendix B - Test Setup Photographs.

2.5 Test Sample Block Diagram

Refer to Appendix C – EUT Block Diagram

2.6 Test Sample Support Equipment

Printer/s:	
Conducted EMI	HP Deskjet 850c Model: C2145A FCC ID: B94C2145X
Radiated EMI	Diconix, Model 150, (Radiated emissions) FCC ID E759WG-RBCN150
External Monitor/s:	
Conducted EMI	Videocom Model: DCM-1588VA FCC ID: H79DCM-1588
Radiated EMI	Tatung, Model No. CMITMC5, S/N 23490103 FCC ID: BJMCM15MC
Keyboards:	
Conducted EMI	Diamond Touch Model: 6511-B
Radiated EMI	Genius Model: KWD-805, S/N 9B17800073
USB Floppy Drives:	Fujitsu Model: FPCFDD11, P/N CP032173-01 Fujitsu Model: FPCFDD12, P/N CP078720-01
Headphones:	Verbatim Multimedia Stereo headset
Modem:	Maestro Companion Series 3
PS2 Mouse:	Microsoft Intellimouse, S/N 00723014, FCC ID: C3KKS9
LAN Hub:	Kingston SOHO Hub Model: KNE8TP/H (FCC ID: JICKNE8TP-HO)
Scanner:	Rapidscan Mobile Colour scanner, M/N FPCSCN01, S/N DF1700100
USB Ext HDD:	Datastor Model: 2500TA
PCMCIA Slot:	8 MB flash card, kingmax ATA008M
PSTN Line Simulator:	National Communications, S/N 31654

2.7 Test Procedure

Emissions measurements were performed in accordance with the procedures of ANSI C63.4-1992. Radiated emissions tests were performed at a distance of 3 and 10 metres from the EUT. OET Bulletin 63 dated October 1993 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 emission measurements were performed at EMC Technologies' laboratory in Tullamarine, Victoria Australia.

The above sites have been fully described in a report submitted to the FCC office, and accepted in a letter dated June 14, 2002, **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, (Registration Date - November 5th 2001).

2.8.2 NATA Accreditation

EMC Technologies is accredited in Australia to test to the following standards by the National Association of Testing Authorities (NATA).

"FCC Part 15 unintentional and intentional emitters in the frequency range 9kHz to 18 GHz excluding TV receivers (15.117 and 15.119), TV interface devices (15.115), cable ready consumer electronic equipment (15.118), cable locating equipment (15.213) and unlicensed national information infrastructure devices (Sub part E)."

The current full scope of accreditation can be found on the NATA website: www.nata.asn.au
It also includes a large number of 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^2LA).

2.9 Units of Measurements

2.9.1 Conducted Emissions

Measurements are reported in units of dB relative to one microvolt. (dBμV).

2.9.2 Radiated Emissions

Measurements are reported in units of dB relative to one microvolt per metre (dBμV/m).

2.10 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 of this report.

2.11 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.

3.0 CONDUCTED EMISSION MEASUREMENTS

Testing was carried out in accordance with the requirements of FCC Part 15.207

3.1 Test Procedure

The arrangement specified in ANSI C63.4-1992 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 C63.2-1987 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 then 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 Measurements (AC Mains Ports)

Frequency MHz	Line	Measured QP Level dBµV	QP Limit dBµV	∆QP ±dB	Measured AV Level dBµV	AV Limit dBµV	∆AV ±dB
0.56	Active	46.7	56.0	-9.3	40.6	46.0	-5.4
0.42	Active	45.6	57.4	-11.8	39.5	47.4	-7.9
0.56	Neutral	45.5	56.0	-10.5	37.2	46.0	-8.8
0.21	Active	49.3	63.1	-13.8	43.3	53.1	-9.8
0.50	Neutral	43.2	56.0	-12.8	36.1	46.0	-9.9
0.28	Neutral	47.2	60.7	-13.5	40.5	50.7	-10.2

The worst case conducted EMI occurred at 0.56 MHz and complied with the quasi peak and average limits by margins of 9.3 dB and 5.4 dB respectively. The measurement uncertainty was ±2.0 dB. Refer to graphs 1 and 2 in Appendix H for plots of the conducted EMI measurements.

4.0 RADIATED EMISSION MEASUREMENTS

4.1 Test Procedure

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. A calibrated Biconical antenna was used for measurements between 30 MHz to 232 MHz and a calibrated Logperiodic antenna used for measurements between 230 MHz to 1000 MHz. Calibrated EMCO 3115 and EMCO 3116 Horn antennas and HP8449B preamplifier were used for measurements between 1 to 25 GHz.

Testing was performed at a distance of 10 metres for the frequency ranges 30 to 1000 MHz and 3 metres for the frequency range 1 to 25 GHz.

The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. Each significant peak was then investigated and maximised with the Quasi-Peak detector. The measurement data for each frequency range was automatically corrected by the software for cable losses, 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^{-1}). (stored as a data array)
G = Preamplifier Gain in dB. (stored as a data array)
L = Cable insertion 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

4.3 Section 15.247(c)- Out of Band Emissions (Spurious and Harmonics)

Testing was carried out in accordance with the requirements of FCC Part 15.247(c).
As the transmitter has no external connections measurements were made at the open area test site.

Testing was carried while transmitter continuously on a low, middle and high frequency channel.

The device was placed on the test table, being 0.8 m above the ground plane, with the front display facing the test antenna.

Measurements were made using a resolution bandwidth of 100 kHz where an emission fell outside of a restricted band.

When an emission fell within a restricted band an average detector with a resolution bandwidth of 1 MHz was utilised.

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

All measurements have been made in absolute field strength uV/m which has been converted to dBuV/m.

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

In the unrestricted bands measurements were made to determine if the field strength of the emissions observed were more than 20 dB down on the fundamental.

Radiated emission measurements are required to be carried out with the limits as per section 15.209 applied.

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

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height.

The emission is measured in both vertical and horizontal antenna polarisations.

The emission level is determined in field strength by taking the following into consideration:

Level (dBμV/m) = Receiver Reading (dBμV) + Antenna Factor (dB) + Coax Loss (dB)

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (1000 MHz – 18,000 MHz) ± 4.1 dB
  (30 MHz – 1,000 MHz) ± 3.7 dB

4.3.1 Frequency Band: 1 – 25 GHz

All recorded emissions complied with the FCC average limit by a margin of greater than 20 dB. No harmonics were recorded within the restricted bands of up to 25 GHz. Harmonics were below the limit in section 15.209. The measurement uncertainty for radiated emissions in this band was ± 4.1 dB.

Frequency MHz	Level dBuV/m	Limit dBuV/m (dB)	Antenna Pol	Detector	Bandwidth	Result
2402	88.80	-	Vert	peak	100 kHz	Pass
4804	-	54.0	Vert/Hort	average	1 MHz	Pass
7206	-	54.0	Vert/Hort	average	1 MHz	Pass
9608	-	(-20.0)	Vert/Hort	peak	100 kHz	Pass
12010	-	54.0	Vert/Hort	average	1 MHz	Pass
14412	-	(-20.0)	Vert/Hort	peak	100 kHz	Pass
16814	-	54.0	Vert/Hort	average	1 MHz	Pass
19216	-	54.0	Vert/Hort	average	1 MHz	Pass
21618	-	(-20.0)	Vert/Hort	peak	100 kHz	Pass
24020	-	54.0	Vert/Hort	average	1 MHz	Pass

Frequency MHz	Level dBuV/m	Limit dBuV/m (dB)	Antenna Pol	Detector	Bandwidth	Result
2441	89.19	-	Vert	peak	100 kHz	Pass
4882	-	54.0	Vert/Hort	average	1 MHz	Pass
7323	-	54.0	Vert/Hort	average	1 MHz	Pass
9764	-	(-20.0)	Vert/Hort	peak	100 kHz	Pass
12205	-	54.0	Vert/Hort	average	1 MHz	Pass
14646	-	(-20.0)	Vert/Hort	peak	100 kHz	Pass
17087	-	54.0	Vert/Hort	average	1 MHz	Pass
19258	-	54.0	Vert/Hort	average	1 MHz	Pass
21969	-	(-20.0)	Vert/Hort	peak	100 kHz	Pass
24410	-	54.0	Vert/Hort	average	1 MHz	Pass

Frequency MHz	Level dBuV/m	Limit dBuV/m (dB)	Antenna Pol	Detector	Bandwidth	Result
2480	88.84	-	Vert	peak	100 kHz	Pass
4960	-	54.0	Vert/Hort	average	1 MHz	Pass
7440	-	54.0	Vert/Hort	average	1 MHz	Pass
9920	-	(-20.0)	Vert/Hort	peak	100 kHz	Pass
12400	-	54.0	Vert/Hort	average	1 MHz	Pass
14880	-	(-20.0)	Vert/Hort	peak	100 kHz	Pass
17360	-	54.0	Vert/Hort	average	1 MHz	Pass
19840	-	54.0	Vert/Hort	average	1 MHz	Pass
22320	-	(-20.0)	Vert/Hort	peak	100 kHz	Pass
24800	-	54.0	Vert/Hort	average	1 MHz	Pass

Result: Complies

4.3.2 Frequency Band: 30 - 1000 MHz

The highest radiated emission peak occurred at 500.5 MHz (Horizontal polarity) and complied with FCC quasi peak limit by a margin of 2.1 dB. The measurement uncertainty in this band was ± 3.7 dB.
Refer to tables below for results.

Vertical Polarity

Frequency MHz	Polarisation	QP Measured dBμV/m	QP Limit dBμV/m	ΔQP ± dB
600.63	Vertical	30.1	36.0	-5.9
30.15	Vertical	22.7	30.0	-7.3
120.00	Vertical	25.6	33.5	-7.9
210.00	Vertical	25.5	33.5	-8.0
184.34	Vertical	24.9	33.5	-8.6
137.24	Vertical	23.7	33.5	-9.8
570.00	Vertical	25.8	36.0	-10.2
385.07	Vertical	25.1	36.0	-10.9
195.44	Vertical	22.0	33.5	-11.5
144.09	Vertical	21.6	33.5	-11.9
160.00	Vertical	20.6	33.5	-12.9
41.94	Vertical	16.7	30.0	-13.3
285.00	Vertical	22.5	36.0	-13.5
216.01	Vertical	22.2	36.0	-13.8
39.77	Vertical	16.1	30.0	-13.9
43.41	Vertical	13.7	30.0	-16.3

Horizontal Polarity

Frequency MHz	Polarisation	QP Measured dBμV/m	QP Limit dBμV/m	ΔQP ± dB
500.50	Horizontal	33.9	36.0	-2.1
270.00	Horizontal	33.6	36.0	-2.4
600.60	Horizontal	32.6	36.0	-3.4
400.41	Horizontal	30.5	36.0	-5.5
709.74	Horizontal	29.5	36.0	-6.5
583.30	Horizontal	28.0	36.0	-8.0
232.51	Horizontal	25.6	36.0	-10.4
120.00	Horizontal	20.8	33.5	-12.7
144.52	Horizontal	20.3	33.5	-13.2
54.75	Horizontal	16.0	30.0	-14.0
210.00	Horizontal	19.2	33.5	-14.3
160.00	Horizontal	19.1	33.5	-14.4
571.90	Horizontal	21.2	36.0	-14.8
477.93	Horizontal	20.5	36.0	-15.5
42.08	Horizontal	13.0	30.0	-17.0
132.00	Horizontal	13.3	33.5	-20.2

Result: Complies.

4.4 Section 15.247 (a)(1)(i) & (iii) - Channel Occupancy/Bandwidth

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

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

4.4.1 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.

A resolution bandwidth of 300 kHz was utilised.

The channel separation of 1 MHz was recorded.

The 20 dB bandwidth was measured at 2402, 2441 and 2480 MHz which equated to low, middle and top frequencies using a spectrum analyser in peak hold mode and a horn antenna

The 20 dB bandwidth for these 3 frequencies was determined to be:

Frequency MHz	Bandwidth kHz	Result
2402	888	Complies
2441	838	Complies
2480	825	Complies

Refer to Appendix I for Channel Bandwidth plots.

The field strength at 2483.5 MHz when the EUT is operating at its highest channel (2480 MHz) is < 38 dBuV/m (noise floor) and is > 20 dB below the maximum field strength of the in-band carrier.

4.4.2 Channel Occupancy

This measurement was made on a channel using a spectrum analyser with a 0 Hz span and a sweep speed of 5 mS.

79 channels were observed operating between 2400 – 2483.5 MHz

The specification allows for a dwell time not exceeding 400 mS.

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

The device was observed to have a dwell time of 625 uS.

During the test the transmitter was observed to activate on average 90 times in 31.6 seconds.

The transmitter therefore occupies in one channel for 90 x 625uS = 0.05625 seconds

Result: Complies.

4.5 Section 15.247 (b)(3)& (4) - Peak Output Power

Testing was carried out in accordance with the requirements of FCC Part 15.247(b)(3)
The device was placed on the test table, being 80 cm above the ground plane, with the computer screen display facing the test antenna located 3 metre away.

Measurements were made with the spectrum analyser operating in peak hold mode with a resolution bandwidth of 3 MHz.
The power envelope of the device was determined with the antenna using vertical and horizontal polarisations,
The power envelope was maximised by rotating the device using a turntable and by height scanning between 1 – 4 metres using the automated antenna tower.
The emissions were recorded in dBuV and were then converted to dBm and subsequently into an absolute power level (mW).

The radiated power was then determined by adding factors for the cable losses, antenna gains, path loss and the preamplifier gain.

Example calculation - Middle Channel – 2441 MHz

Freq MHz	Level dBuV	Level dBm	Level μW	Ant Gain dB	Coax Loss dB	Preamp Gain dB	Path Loss dB	Power dBm	Power mW
2441	106.67	-0.33	93	9.8	9.5	35	49.6	14.0	24.9

The specification limit is 30 dBm (1.0W).

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.
This device has no external antenna port with the antenna being located internally.

Measurements were made on a low (channel 1), middle (channel 39) and high (Channel 79) frequency channel.

Frequency MHz	Level mW	Limit mW	Result
2402.0	22.8	1000	Complies
2441.0	24.9	1000	Complies
2480.0	23.0	1000	Complies

The specification limit is 1W (30 dBm).

Result: Complies.

4.6 Section 15.247 (b)(5) - Radio Frequency Exposure Information

Testing was carried out in accordance with the requirements of FCC Part 15.247(b)(5)
Spread spectrum transmitters operating in the 2400 - 2483.5 MHz band 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 2.1091 this device has been defined as a mobile device whereby a distance of 20 cm can normally be maintained between the user and the device.

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 1.0mW/cm^2

The maximum distance from the antenna at which the MPE is met or exceeded is calculated from the equation relating field strength in (E V/m), transmit power (P) in watts, transmit antenna gain (G) and separation distance (d) in metres:

E, V/m = (√ (30 * P *G)) / d

Power density, $mW/m^2 = E^2/3770$
E for MPE: = $E^2/3770$
$E = \sqrt{1*3770}$
E = 61.4 V/m

The maximum transmitter power measured = 14.0 dBm or 24.9 milliwatts.

d = √ (30 * P *G) / E
= √ (30 * 0.0249) / 61.4
= 0.0141 metres or 1.4 cm

Calculations show that this device with described antenna meets the MPE requirements for mobile devices falling below the 20 cm clearance required.

Result: Complies.

5.0 COMPLIANCE STATEMENT

The LIFEBOOK Ginger Bluetooth tested on behalf of Fujitsu Australia Ltd, **complies** 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.

It also complies with the Industry Canada RSS-210 Issue 5 section 6.2.2 (o) requirements.

Results were as follows:

FCC Part 15, Subpart C Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	**Not Applicable, Integral antenna**
15.205	6.3	Operation in Restricted Bandwidth	**Complies**
15.207	6.6	Conducted Emissions	**Complies**
15.209	6.3	Radiated Emissions	**Complies**
15.247 (a)(1)&(3)	6.2.2(o)(ii)	Channel Occupancy/Bandwidth	**Complies**
15.247 (b)(1)	6.2.2(o)(b)	Peak Output Power	**Complies**
15.247 (b)(5)		Radio Frequency Hazard	**Complies**
15.247 (c)	6.2.2(o)(e1)	Out of Band Transmissions	**Complies**

APPENDIX A

MEASUREMENT INSTRUMENTATION DETAILS

EQUIPMENT TYPE	MAKE/MODEL SERIAL NUMBER	LAST CAL. DD/MM/YY	DUE DATE DD/MM/YY	CAL. INTERVAL
EMI RECEIVER	HP 8546A Sn.3549A00290 EMI Receiver	13/01/03	13/03/04	1 YEAR *2
EMI RECEIVER	HP 8574B System Components	12/02/03	12/02/04	1 YEAR *2
SPECTRUM ANALYSER	HP8593EM Sn. 3146A-01297 9 kHz –26 GHz	23/05/02	23/05/03	1 YEAR *2
ANTENNAS	EMCO 93110B BICONICAL	07/08/02	07/08/03	1 YEAR *3
	20 - 300 MHz Sn. 9804-3092			
	EMCO 93146A LOG PERIODIC	26/07/02	26/07/03	1 YEAR *3
	300 -1000MHz Sn. 5033			
	EMCO 3115 DOUBLE RIDGED HORN 1 - 18 GHz Sn: 8908-3282	29/01/03	29/01/04	1 YEAR *3
	EMCO 3116 Double Ridged Guide Horn	22/08/02	22/01/04	2 YEARS *1
	18 – 40 GHz Sn 2276			
PREAMPLIFIER	HP 8449B PREAMPLIFIER	29/05/02	29/05/03	1 YEAR *3
	1 - 26.5 GHz (30 dB Gain) Sn: 3008A01113			
LISN	EMCO 3825/2 50ohm / 50 microH	10/04/02	10/04/03	1 YEAR *3
	0.009 – 30MHz Sn.9607-2567			

Note *1. National Measurements Laboratory calibration.
Note *2. NATA calibration by Agilent Technologies (Aust) Pty Ltd
Note *3. In-house calibration. Refer to Quality Manual.

TEST SITES

Shielded Room Test Laboratory	**Melbourne** 11m x 8m x 4m Chamber-semi-anechoic 8.8m x 5.8m x 3.1m Test Chamber 3.4m x 6.1m x 2.5m Test Chamber 3.4m x 7.3m x 7.5m Test Chamber	Feb 03 N/A N/A N/A	Feb 04 N/A N/A N/A	1 Year *1 N/A N/A N/A
Open Area Test Site	**Melbourne** 3/10 Metre site. 1-4 metre antenna mast. 1.2 metre/400 kg Turntable. (Situated at Lerderderg Gorge, near Bacchus Marsh, Victoria)	21/01/03	21/01/04	1 Year *1

Note *1. In-house calibration. Refer to Quality Manual.

APPENDIX B

TEST SAMPLE PHOTOGRAPHS

SUBMITTED AS ATTACHMENT

APPENDIX C

EUT RADIO SPECIFICATIONS

SUBMITTED AS ATTACHMENT

APPENDIX D

EUT BLOCK DIAGRAM

SUBMITTED AS ATTACHMENT

APPENDIX E

FCC ID LABELING

SUBMITTED AS ATTACHMENT

APPENDIX F

TEST SAMPLE SCHEMATICS

SUBMITTED AS ATTACHMENT

APPENDIX G

PCB LAYOUTS

SUBMITTED AS ATTACHMENT

APPENDIX H

GRAPHS OF EMI MEASUREMENTS

SUBMITTED AS ATTACHMENT

APPENDIX I

CHANNEL BANDWIDTH PLOTS

SUBMITTED AS ATTACHMENT

APPENDIX J

ANTENNA INFORMATION (MONOPOLE)

SUBMITTED AS ATTACHMENT

APPENDIX K

GINGER SPECIFICATION

SUBMITTED AS ATTACHMENT

APPENDIX L

USER MANUAL

SUBMITTED AS ATTACHMENT