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**EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart E (Section 15.407) & RSS-210**

FCC ID: EJE-WB0042
Industry Canada ID: 337J-WB0042

Test Sample: Stylistic ST Series
Model: ST5110

Radio Modules: WM3945ABG GOLAN INTEL Mini-PCI WLAN Module
& EYTF3CSFT Bluetooth Module

Report Number M060762_Cert_WM3945ABG_NII_BT

Tested for: Fujitsu Australia Ltd.

Issue Date: 5th September 2006

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NATA Accredited Laboratory Number:
5292

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EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart E (Section 15.407) & RSS-210

Report Number: M060762_Cert_WM3945ABG_NII_BT

Test Sample: Stylistic ST Series
Model: ST5110
Radio Modules: GOLAN INTEL Mini-PCI WLAN Module, Model: WM3945ABG (Intel Corp.)
Bluetooth Module, Model: EYTF3CSFT (TAIYO YUDEN)

FCC ID: EJE-WB0042
Industry Canada ID: 337J-WB0042
Equipment Type: Intentional Radiator (Transceiver)

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

Tested for: Fujitsu Australia Ltd

Test Standards: FCC Part 15, Subpart E – Unlicensed National Information, Infrastructure Devices
FCC Part 15.407, General Technical Requirements
ANSI C63.4 – 2003
OET Bulletin No. 65

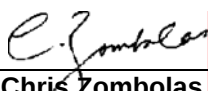
RSS-210 Issue 6 Low Power Licence-Exempt RadioCommunication Devices:
6.2.2 (q1) 5150 - 5350 MHz, 5470 – 5725 MHz & 5725-5825 MHz Local Area Network Devices

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: 7th August to 4th September 2006

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

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

Authorised Signatory: 
Chris Zombolas
Technical Director
EMC Technologies Pty Ltd



EMI TEST REPORT FOR CERTIFICATION to FCC PART 15 Subpart E (Section 15.407) & RSS-210

1.0 INTRODUCTION

EMI testing was performed on the Fujitsu Stylistic ST Series, Model: ST5110 with INTEL Mini-PCI Wireless LAN Module (GOLAN 11a+b/g), Model: WM3945ABG & TAIYO YUDEN Bluetooth Module, Model: EYTF3CSFT.

The GOLAN WLAN module was originally certified by INTEL as a modular approval under FCC ID: PD9WM3945ABG (Canada ID: 1000M-WM3945ABG). The Radio modules are installed in a controlled environment at the Fujitsu notebook production/assembly factory.

The Bluetooth module was originally certified by TAIYO YUDEN as a modular approval under FCC ID: RYYEYTF3CSFT (Canada ID: 4389AEYTF3CSFT). The Radio modules are installed in a controlled environment at the Fujitsu notebook production/assembly factory.

The GOLAN WLAN supports IEEE 802.11b, IEEE 802.11g and IEEE802.11a (DTS & U-NII) configurations. Tests were performed in all three configurations and also on the Bluetooth.

The results for configuration IEEE 802.11a (U-NII: 5150 – 5350 MHz) are reported in this test report.

The results for configurations IEEE 802.11b, IEEE 802.11g and IEEE802.11a (DTS: 5725 – 5850 MHz) and Bluetooth are reported separately.

Refer to EMC Technologies' test report: M060762_Cert_WM3945ABG_DTS_BT (DTS) and M060762_Cert_EYTF3CSFT_WLAN (Bluetooth).

Test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations:

47 CFR, Part 15, Subpart E:	Unlicensed National Information Infrastructure Devices (U-NII) operating in the 5.15-5.35 GHz, 5.47-5.725 GHz and 5.725-5.825 GHz frequency bands
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 15.407:	General Technical Requirements

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 E - Section 15.407.

The test sample also complies with the Industry Canada RSS-210 issue 6 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(q1) requirements and the RF exposure requirements of RSS-102.



1.1 Summary of Results

1.1.1 FCC Subpart E, Section 15.407 - WLAN (802.11a)

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) (a)(2)	Annex A9.2	Peak Transmit Power	Complies
15.407 (a)(5)	Annex A9.2	Peak Power Spectral Density	Complies
15.407 (a)(6)		Peak Excursion	Complies
15.407 (b)	Annex A9.3	Undesirable Emission	Complies
15.407 (f)		Radio Frequency Hazard	**Complies with SAR requirements
15.407 (g)	Annex A9.5(e)	Frequency Stability	Complies
15.407 (h)	Annex A9.4	Dynamic Frequency Selection	Complies (Note 1)

Note 1: Testing was performed by CCS USA. Refer to attachment 4 for results.

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

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 with SAR requirements
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: M060762_Cert_WM3945ABG_DTS_BT

1.1.3 FCC Subpart C, Section 15.247 - Bluetooth

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 with SAR requirements
15.247 (d)	6.2.2(o)(e1)	Out of Band Emissions	Complies

Refer to EMC Technologies Report No: M060762_Cert_EYTF3CSFT_WLAN

*Refer to EMC Technologies' report M060763_Cert_WM3945ABG_SAR_DTS_2.4G_5.8G

**Refer to EMC Technologies' report M060763_Cert_WM3945ABG_SAR_NII_5.2G

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 Modifications by EMC Technologies



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No modifications were required.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 EUT (WLAN) Details

Transmitter:	Mini-PCI Wireless LAN Module
Wireless Module:	GOLAN (11a+b/g)
Model Number:	WM3945ABG
Manufacturer:	Intel Corporation
Modulation Type:	Direct Sequence Spread Spectrum (DSSS for 802.11b) Orthogonal Frequency Division Multiplexing (OFDM for 802.11g) Orthogonal Frequency Division Multiplexing (OFDM for 802.11a)
802.11a and 802.11g	BPSK – 6Mbps, 9Mbps QPSK – 12Mbps, 18Mbps 16QAM – 24Mbps, 36Mbps 64QAM – 48Mbps, 54Mbps
802.11b	DBPSK – 1Mbps DQPSK – 2Mbps CCK – 5.5Mbps, 11Mbps
Frequency Range:	2.4 – 2483.5 GHz for 11b/g 5.15 - 5.35 GHz and 5.725 - 5.850 GHz for 11a
Number of Channels:	11 channels for 11b or 11g 13 channels for 11a
Antenna Types:	Yokowo Monopole Antenna - Model: YCE-5008 Location: one is above SD card opening; another is below WLAN on/off switch.
Antenna gain:	Refer antenna data provided separately
Power Supply:	3.3 VDC from PCI bus

Frequency Allocation Table:

Band	Channel	Lower Frequency	Upper Frequency	Americas	Europe	Japan	High Band
				SKU #1 MOW1	SKU #2 MOW2	SKU #3 Japan	SKU #4 ROW
802.11b/g	1-11	2.401 GHz	2.473 GHz	X	X	X	X
802.11b/g	12-13	2.467 GHz	2.483 GHz		X	X	X
802.11a	34-46	5.08 GHz	5.22 GHz		X	X	
802.11a	36-48	5.150 GHz	5.250 GHz	X	X		
802.11a	52-64	5.250 GHz	5.350 GHz	X	X		
802.11a	100-140	5.470 GHz	5.725 GHz		X		
802.11a	149-161	5.725 GHz	5.825 GHz	X			X
802.11a	165	5.815 GHz	5.835 GHz	X			X

Channels Tested and Output power setting:

Channel and Mode:	Output Power setting (average, dBm)
802.11b mode	
*Channel 1	16
*Channels 6 and 11	18
802.11g mode	
*Channel 1	16
*Channel 6	17
*Channel 11	15
802.11a mode	
**Channel 36	16
**Channels 52 and 64	17
*Channels 149, 157 and 165	17

**Channels tested and reported in this report

*Channels tested and reported in the DTS submission (M060762_Cert_WM3945ABG_DTS_BT)



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2.2 EUT (Bluetooth) Details

Transmitter: Bluetooth Module
Model Number: EYTF3CSFT
Manufacturer: TAIYO YUDEN
Network Standard: Bluetooth™ RF Test Specification
Modulation Type: Frequency Hopping Spread Spectrum (FHSS)
Frequency Range: 2402 MHz to 2480 MHz
Number of Channels: 79
Carrier Spacing: 1.0 MHz
Interface Type: USB
Antenna Types: Nissei Electric Inverted F Antenna, Model: CP115458
 Location: below FN button
 Refer antenna data provided separately
Antenna gain:
Max. Output Power: 4 dBm
Reference Oscillator: 16 MHz (Built-in)
Power Supply: 3.3 VDC from host.

Frequency allocation:

Channel Number	Frequency (MHz)	Bluetooth Utility power setting
1*	2402	Power (Ext, Int) = 0, 96
2	2403	
3	2404	
.	.	
.	.	
.	.	
39	2440	
40*	2441	
41	2442	
.	.	
.	.	
.	.	
77	2478	
78	2479	
79*	2480	

*Channels tested and reported in the Bluetooth submission (M060762_Cert_EYTF3CSFT_WLAN)

2.3 EUT (Notebook PC) Details

EUT: Stylistic ST series
Model Name: ST5110
Serial Number: Pre-production Sample
Manufacturer: FUJITSU LIMITED

CPU Type and Speed: Core Dual U2500 1.2GHz
LCD 12.1"XGA / 10.4"XGA
Wired LAN: Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem: Agere MDC1.5 modem Model: D40
Port Replicator Model: FPCPR67

AC Adapter Model: 60W:SEC80N2-16.0(Sanken)
Voltage: 16 V
Current Specs: 3.75A
Watts: 60W



2.4 Operational Description

The Intel WLAN test software "CRTU" was used to transmit continuously during the tests. For Spurious and Harmonics tests both radio modules (WLAN and Bluetooth) were simultaneously transmitting.

2.5 Test Configuration

Conducted tests were performed at the WLAN Antenna ports.

Radiated tests were performed for measuring the harmonics and spurious from the transmitters.

2.6 Technical Specifications

Refer to Appendix G for details

2.7 Block Diagram

Refer to Appendix D - Block Diagram

2.8 Support Equipment

Refer to Attachment 3 – FCC Part 15B Test Report (Report: FG06-085EAL)

2.9 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.

2.10 Test Facility

2.10.1 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.

2.10.2 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 (A²LA).

2.11 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

2.12 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.



RESULTS

WLAN Module – WM3945ABG (802.11a (NII))

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: FG06-085EAL)

4.0 RADIATED EMISSION MEASUREMENTS

4.1 Test Procedure

Testing was performed in accordance with the requirements of FCC Part 15.407(b).

Radiated emission measurements were performed to the limits as per section 15.209 and 15.407. 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: FG06-085EAL).

The measurement of emissions above 1000 MHz, appearing in the restricted bands, was made using an average detector with a resolution 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 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 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 Results - Out of Band 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 μ V/m limit at 3 metres has been converted to 64 dB μ V/m at 1 metre using a factor of 20 dB per decade where emissions were located in the restricted bands.

The peak limits for undesirable emission outside of the restricted bands are –27 dBm (68.3 dB μ V/m @ 3m).

Testing was performed while both the WLAN transmitter and Bluetooth transmitter continuously operated. Harmonics related to the WLAN transmitter (5.15 – 5.35 GHz) are reported below. Harmonics in the frequency band 2.4 – 2.4835 GHz and 5.725 – 5.850 GHz, refer to M060762_Cert_WM3945ABG_DTS_BT. Harmonics related to the Bluetooth transmitter, refer to M060762_Cert_EYTF3CSFT_WLAN.

Measurements were performed on frequency band (5.15 - 5.35 GHz)

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). Emissions (peak) with 64QAM modulation (54 Mbps) were observed to be slightly worst. Final testing was performed while the transmitter continuously operated with the modulation rate of 54 Mbps (64QAM).

Channel 36 - 5180 MHz

Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5180	105.1	82.4	-	-	-
10360	66.5	49.8	68.3	-	Pass
15540	66.1	49.3	74.0	54.0	Pass
20720	63	50	84.0*	64.0*	Pass
25900	68	55	78.3*	-	Pass
31080	78	66**	78.3*	-	Pass
36260	80**	69	78.3*	-	Pass

*Limits were corrected for 1 metre measurement.

**Refer to results

Channel 52 - 5260 MHz

Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5260	106.2	83.7	-	-	-
10520	62.4	44.0	68.3	-	Pass
15780	63.7	47.5	74.0	54.0	Pass
21040	63	50	84.0*	64.0*	Pass
26300	68	55	78.3*	-	Pass
31560	78	66**	84.0*	64.0*	Pass
36820	80**	69	78.3*	-	Pass

*Limits were corrected for 1 metre measurement.

**Refer to results

Channel 64 - 5320 MHz

Frequency MHz	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5320	107.4	84.3	-	-	-
10640	64.1	45.4	74.0	54.0	Pass
15960	63.3	47.1	74.0	54.0	Pass
21280	63	50	84.0*	64.0*	Pass
26600	68	55	78.3*	-	Pass
31920	78	66**	78.3*	-	Pass
37240	80**	69	78.3*	-	Pass

*Limits were corrected for 1 metre measurement.

**Refer to results

Result: Harmonics were recorded within the restricted bands of up to 40 GHz. Harmonics were low and confirmed with both RBW and VBW reduced (the peak and average levels listed in the above tables were noise floor readings). Emissions were complied with the FCC limits in section 15.209 and 15.407 by a margin of 1.8 dB. The measurement uncertainty for radiated emissions in this band was ± 4.1 dB.

4.3.2 Both WLAN and Bluetooth Transmitters Transmitting

Result: IM spurious emissions were recorded within the restricted bands of up to 40 GHz. Emissions were complied with the FCC limits in section 15.209 and 15.407. The measurement uncertainty for radiated emissions in this band was ± 4.1 dB.

4.3.3 Frequency Band: 30 - 1000 MHz

Refer to Attachment 3 – FCC Part 15B Test Report (Report: FG06-085EAL).

4.3.4 RF Conducted Measurements at the antenna terminal

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

The resolution bandwidth of 300 kHz and the video bandwidth of 1000 kHz were utilised.

Refer to Appendix K for Harmonics plots

D1 indicates the limit line for undesirable emission outside the operation frequency band.

Result: Complies.

4.3.5 Band Edge Measurements

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

The resolution bandwidth of 1000 kHz and the video bandwidth of 1000 kHz were utilised.

Testing was performed while transmitter continuously transmitted on a low and high frequency channel.

BE Frequency (MHz) within the restricted band	Peak Detector dBuV/m	Average Detector dBuV/m	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5150	66.7	41.8	74.0	54.0	Pass
5350	69.9	42.5	74.0	54.0	Pass

Refer to Appendix L for Band Edge plots

D1 indicates the limit line for undesirable emission outside the operation frequency band.

Result: Complies.

5.0 PEAK OUTPUT POWER - Section 15.407(a)

Testing was performed in accordance with the requirements of FCC Part 15.407(a)(1)(2)

Measurements were performed while the WLAN transmitter continuously transmitted.

The peak output power measurement was performed using the integration method as per test method # 3 of DA 02-2138. The resolution bandwidth of 1 MHz was used. The video bandwidth of 30 kHz was used ($VBW \geq 1/T$, where T (worst case) = 230 μ S).

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in peak power were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 54Mbps (64QAM).

Variation by +/- 15% of the supply voltage, in accordance with Section 15.31(e), to the computer power supply did not vary the output power observed.

Frequency MHz	P dBm	Limit dBm	P mW	Limit mW	Result
5180	16.5	17	44.7	50	Complies
5260	17.3	24	53.7	250	Complies
5320	17.6	24	57.5	250	Complies

6.0 CHANNEL BANDWIDTH

Testing was performed in accordance with the requirements of FCC Part 15.407(a)

The 26 dB bandwidth was measured while the transmitter continuously transmitted.

The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 300 kHz and the video bandwidth of 1000 kHz were utilised

Measurements were performed on frequency band (5.150 – 5.350 GHz)

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in bandwidth were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 54 Mbps (64QAM).

Channel	Frequency MHz	Bandwidth MHz	26 dB Bandwidth Plots
36	5180	22.3	Appendix J
52	5260	22.6	Appendix J
64	5320	23.3	Appendix J

7.0 PEAK POWER SPECTRAL DENSITY - Section 15.407 (a)

Testing was performed in accordance with the requirements of FCC Part 15.407(a)(5)

The peak power spectral density measurement was performed as per test method #2 of DA 02-2138. The resolution bandwidth of 1 MHz and the video bandwidth of 3 MHz were utilised.

Measurements were performed on frequency bands (5.15 – 5.35 GHz)

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). Peak power spectral density with BPSK modulation (rate = 6 Mbps) was observed to be slightly worst. Final testing was performed while the transmitter continuously operated with the modulation rate of 6 Mbps (BPSK).

Frequency MHz	Peak Power Spectral Density (dBm)	Limit (dBm)	Result	Spectral Density plots
5180	0.9	4.0	Complies	Appendix M
5260	1.7	11.0	Complies	Appendix M
5320	2.3	11.0	Complies	Appendix M

8.0 PEAK EXCURSION - Section 15.407 (a)

Testing was performed in accordance with the requirements of FCC Part 15.407(a)(6)

The transmitter output was connected to the spectrum analyser with a span setting to capture the entire emission bandwidth of the signal.

The peak transmit power was measured over an interval of continuous transmission using a calibrated spectrum analyser with the resolution bandwidth of 1 MHz and the video bandwidth of 3 MHz for Trace 1 and video bandwidth of 30 kHz for Trace 2. The difference between Trace 1 and Trace 2 was recorded.

Measurements were performed on frequency bands (5.15 – 5.35 GHz)

Frequency MHz	Peak Power Excursion (dB)	Limit (dB)	Result	Peak Excursion plots
5180	7.8	13.0	Complies	Appendix N
5260	8.3	13.0	Complies	Appendix N
5320	6.6	13.0	Complies	Appendix N

9.0 FREQUENCY STABILITY

Testing was performed in accordance with the requirements of FCC Part 15.407(g)

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

The measurements were made at ambient room temperature and extreme (-20 to +55 °C) test conditions.

The AC supply voltage to the computer was varied by $\pm 15\%$. This was observed to have no effect on the results obtained.

Measurements were performed on frequency bands (5.150 – 5.350 GHz)

Testing was performed while the transmitter continuously operated with the modulation rate of 54 Mbps (64QAM).

Channel	Frequency MHz	Maximum Frequency Deviation kHz	Maximum Deviation %	$\pm 0.02\%$ Limit kHz	Result
36	5180	98	0.002	1036	Complies
52	5260	115	0.003	1052	Complies
64	5320	90	0.002	1064	Complies

The worst case transmitter frequency stability was ± 3 ppm. As per RSS 210 Annex A9.5(e) the frequency stability limit was ± 10 ppm. Therefore, the EUT was complied with RSS 210 Annex A9.5(e).

10.0 DYNAMIC FREQUENCY SELECTION

The EUT is a Client Device without Radar Interference Detection Function.

Testing was performed by Compliance Certification Services (CCS) CA, USA.

Complied – refer to attachment 4, CCS test report number: 06U10569-1.

11.0 DISCONTINUE TRANSMISSION

Data Transmission is always initiated by software, which is then passed down through the MAC, through the digital and analog baseband, finally to the RF chip. Several special packets (ACKs, CTS, PSpoll, etc) are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which then turns off at the end of the packet. Therefore, the transmitter will be ON only while one of the four mentioned packets is being transmitted.

12.0 RADIO FREQUENCY EXPOSURE (HAZARD) INFORMATION

Testing was performed in accordance with the requirements of FCC Part 15.407(f)

Spread spectrum transmitters operating in the 2400 - 2483.5 MHz and 5.150 – 5.350 GHz 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 (WLAN): The antennas location: one is above SD card opening; another is below WLAN on/off switch and projected distance of less than 20cm from user.

Transmitter # 2 (Bluetooth): The antenna is located below FN button and projected distance of less 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.

In accordance with this section and also section 2.1093 this device has been defined as a portable device.

SAR testing was performed in accordance with OET Bulletin 65 and reported under EMC Technologies reports M060763_Cert_WM3945ABG_SAR_DTS_2.4G_5.8G and M060763_Cert_WM3945ABG_SAR_NII_5.2G. The highest SAR value is 1.47 mW/g which complies with the FCC human exposure requirements of 47 CFR 2.1093 (d).



13.0 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.

14.0 COMPLIANCE STATEMENT

The Fujitsu Stylistic ST Series, Model: ST5110 with INTEL Mini-PCI Wireless LAN Module (GOLAN 11a+b/g), Model: WM3945ABG and Bluetooth Module, Model: EYTF3CSFT, tested on behalf of Fujitsu Australia Ltd, **comply** with the requirements of 47 CFR, Part 15 Subpart E - Section 15.407 (5.15-5.35 GHz band).

The test sample also complies with the Industry Canada RSS-210 issue 6 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(q1) 5150-5350 MHz Local Area Network Devices requirements and the RF exposure requirements of RSS-102.

Results were as follows:

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) (a)(2)	Annex A9.2	Peak Transmit Power	Complies
15.407 (a)(5)	Annex A9.2	Peak Power Spectral Density	Complies
15.407 (a)(6)		Peak Excursion	Complies
15.407 (b)	Annex A9.3	Undesirable Emission	Complies
15.407 (f)		Radio Frequency Hazard	*Complies with SAR requirements
15.407 (g)	Annex A9.5(e)	Frequency Stability	Complies
15.407 (h)	Annex A9.4	Dynamic Frequency Selection	Complies (Note 1)

Note 1: Testing was performed by CCS USA. Refer to attachment 4 for results.

*Refer to EMC Technologies' report M060763_Cert_WM3945ABG_SAR_NII_5.2G.

The results for 802.11b, 802.11g, 802.11a (U-NII) and Bluetooth are reported separately.

Refer to EMC Technologies' test report: M060762_Cert_WM3945ABG_DTS_BT (DTS) and M060762_Cert_EYTF3CSFT_WLAN (Bluetooth).



TEST REPORT APPENDICES

APPENDIX A: MEASUREMENT INSTRUMENTATION DETAILS
APPENDIX B: REPORT PHOTOGRAPHS
APPENDIX C: OPERATIONAL DESCRIPTION
APPENDIX D: BLOCK DIAGRAM
APPENDIX E: SCHEMATICS
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APPENDIX N: PEAK EXCURSION PLOTS

Attachment 1: RF Exposure Information
Attachment 2: FCC DOC for Stylistic ST Series
Attachment 3: FCC Part 15B Test Report (Report: FG06-085EAL)
Attachment 4: Dynamic Frequency Selection Results

