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EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart C (Section 15.247) & RSS-210
Class II Permissive Change

FCC ID:	EJE-WL0010
Industry Canada ID:	337J-WL0010
Test Sample:	GOLAN INTEL Mini-PCI WLAN Module
Model:	WM3945ABG
Report Number:	M060108_Cert_WM3945ABG_DTS_Class_2
Tested for:	Fujitsu Australia Ltd.
Issue Date:	6th April 2006

NATA Accredited Laboratory Number:
5292

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Report Number:	M060108_Cert_WM3945ABG_DTS_Class_2
Test Sample:	GOLAN INTEL Mini-PCI WLAN Module
Model:	WM3945ABG
Manufacturer:	INTEL Corp
FCC ID:	EJE-WL0010
Industry Canada ID:	337J-WL0010
Equipment Type:	Intentional Radiator (Transceiver)
Host Notebook Manufacturer:	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 C – Intentional Radiators FCC Part 15.247: 2400 – 2483.5 MHz & 5725 – 5850 MHz Operation Band ANSI C63.4 – 2003 OET Bulletin No. 65 RSS-210 Issue 6 Low Power Licence-Exempt RadioCommunication Devices: 6.2.2 (o) 2400 – 2483.5 MHz & 5725 – 5850 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:	14th and 15th March 2006
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**

EMI TEST REPORT FOR CERTIFICATION
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Class II Permissive Change

1.0 INTRODUCTION

Testing was performed on the INTEL Mini-PCI Wireless LAN Module (GOLAN 11a+b/g), Model: WM3945ABG installed in Fujitsu notebook PC.

The WM3945ABG WLAN module has been recently certified by Fujitsu Australia Ltd under the FCC ID: EJE-WL0010 (IC: 337J-WL0010). The intention of this application is to add host models (Fujitsu Notebooks) and re-certify the WM3945ABG WLAN module installed in, models: Q2010 and S6310 as a **Class II Permissive Change.**

The GOLAN WLAN module was originally certified by INTEL as a modular approval under FCC ID: PD9WM3945ABG (Canada ID: 1000M-WM3945ABG). The intention of this application is to get a Limited Modular approval for this WLAN module for use in Fujitsu notebook PCs. 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.

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

The results for IEEE 802.11a (U-NII) are reported separately.
Refer to EMC Technologies' test report: M060108_Cert_WM3945ABG_NII_Class_2 (U-NII)

The second transmitter in the notebook is a Bluetooth module, model: EYTF3CSFT. This Bluetooth module has been recently certified by Fujitsu Australia Ltd under the FCC ID: EJE-BT0001 (IC: 337J-BT0001).

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 6 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(o) and the RF exposure requirements of RSS-102.

1.1 Summary of Results

1.1.1 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	**Note 1**
15.205	6.3	Operation in Restricted Band	**Complies**
15.207	6.6	Conducted Emissions	**Note 1**
15.209	6.3	Radiated Emissions	**Complies**
15.247 (a)(2)	6.2.2(o)(iv)	Channel Bandwidth	**Note 1**
15.247 (b)(3)	6.2.2(o)(b)	Peak Output Power	**Note 1**
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	**Note 1**

Note 1: Refer to EMC test report M060108_Cert_WM3945ABG_DTS with FCC ID: EJE-WL0010 (IC ID: 337J-WL0010)

1.1.2 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	**Note 1**
15.205	6.3	Operation in Restricted Band	**Complies**
15.207	6.6	Conducted Emissions	**Note 1**
15.209	6.3	Radiated Emissions	**Complies**
15.407 (a)(1) (a)(2)	6.2.2(q1)	Peak Transmit Power	**Note 1**
15.407 (a)(5)	6.2.2(q1)	Peak Power Spectral Density	**Note 1**
15.407 (a)(6)		Peak Excursion	**Note 1**
15.407 (b)	6.2.2(q1)	Undesirable Emission	**Complies**
15.407 (f)		Radio Frequency Hazard	**Complies**
15.407 (g)	6.4	Frequency Stability	**Note 1**

Refer to EMC Technologies Report No: M060108_Cert_WM3945ABG_NII_Class_2
Note 1: Refer to EMC test report M060108_Cert_WM3945ABG_NII with FCC ID: EJE-WL0010 (IC ID: 337J-WL0010)

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.

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
Power Supply:	3.3 VDC from PCI bus

Frequency Allocation Table:

				Americas	Europe	Japan	High Band
Band	Channel	Lower Frequency	Upper Frequency	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	
*Channels 1	16
*Channel 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 U-NII submission (M060108_Cert_WM3945ABG_NII_Class_2)

2.2 Operational Description

The GOLAN WLAN Module was tested in Fujitsu host notebook Q2010.

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.

2.3 Test Configuration

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

Limited Modular Approval (LMA) details to cover the following Fujitsu notebook configurations:

Fujitsu Notebook Model	WLAN Module	WLAN Antenna	FCC/IC CERTIFICATION STATUS
E8110	GOLAN WM3945ABG	2 x Inverted F antenna	GRANT Issued FCC ID: EJE-WL0010
E8210		2 x Inverted F antenna	
S7110		2 x Monopole Antenna	
Following NEW Models to be added			
Q2010	GOLAN WM3945ABG	2 x Inverted F antenna	Tested model in this application
S6310		2 x Inverted F antenna	Low gain

Fujitsu Notebook Model	WLAN antenna type	WLAN antenna Peak gain [dBi]			
		2.4GHz band	5GHz low band	5GHz Mid band	5GHz High band
E8110	Inverted F	-0.99	-1.12	-0.56	-0.56
E8210	Inverted F	2.47	-0.44	0.38	0.38
S7110	Monopole	2.08	1.66	0.59	1.79
Q2010	Inverted F	2.32	3.23	3.36	1.48
S6310	Inverted F	-0.38	1.09	0.64	0.90

The WLAN Module was tested in Fujitsu host notebook Q2010 as this notebook has the highest antenna gain.

The location of the antennas and the design of the antennas (Inverted-F) are identical in both host Q2010 and S6310 notebooks. Refer to Appendix_A1_Q2010 and Appendix_A2_S6310 for details.

To qualify for a class 2 permissive change, the output power was re-measured on host Q2010. The highest output powers are report below.

The highest output powers were granted:

Frequency MHz	Output Power Granted dBm
5800	17.9
2400	17.1

The highest new output powers are measured:

Frequency MHz	New Output Power Measured dBm
5800	16.8
2400	16.7

2.4 Host PC Details

2.4.1 Q2010 Model Notebook

Host notebook :	LifeBook Q series
Model Name:	Q2010
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Yonah-SC(ULV) 1.2GHz
LCD	12"WXGA
Wired LAN:	Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	None
Port Replicator Model:	FPCPR64
AC Adapter Model:	SEC80N2-16.0(Sanken)
Voltage:	16 V
Current Specs:	3.75A
Watts:	60W
RADIO MODULES	
Module # 1:	WLAN (Golan IEEE802.11a+b/g)
WLAN Model Number:	WM3945ABG
WLAN Manufacturer:	Intel Corp.
Interface Type:	Mini-Card Wireless LAN Module
Antenna Types:	Nissei Electric Inverted F Antenna Model: CP115426(Left), CP115435(Right) Located on top edge of LCD screen
Antenna gain:	Refer antenna data provided separately (Appendix A)
Module # 2:	Bluetooth Module
Model Number:	EYTF3CS FT
Manufacturer:	TAIYO YUDEN
Interface Type:	USB
Antenna Types:	Nissei Electric Inverted F Antenna, Model: CP115428 Location: Right side of the [Back Space] key, above the connector
Antenna gain:	3.27 dBi
Max. Output Power:	4 dBm

2.4.2 S6310 Model Notebook

Host notebook :	LifeBook S series
Model Name:	S6310
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Yonah-DC 2.16GHz
LCD	13.3"XGA
Wired LAN:	Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: D40
Port Replicator Model:	FPCPR63
AC Adapter Model:	80W: SEC100P2-19.0(Sanken) / SQ2N80W19P-01(Nagano JRC) 64W: SED80N2-19.0(Sanken)
Voltage:	19 V
Current Specs:	4.22A, 3.37A
Watts:	80W, 64W
RADIO MODULES	
Module # 1:	WLAN (Golan IEEE802.11a+b/g)
WLAN Model Number:	WM3945ABG
WLAN Manufacturer:	Intel Corp.
Interface Type:	Mini-Card Wireless LAN Module
Antenna Types:	Nissei Electric Inverted F Antenna Model: CP115441(Left), CP115440(Right) Located on top edge of LCD screen
Antenna gain:	Refer antenna data provided separately (Appendix A)
Module # 2:	Bluetooth Module
Model Number:	EYTF3CS FT
Manufacturer:	TAIYO YUDEN
Interface Type:	USB
Antenna Types:	Yokowo Inverted F Antenna, Model: YCE-5250 Location: Right side of media card slot
Antenna gain:	0.38 dBi
Max. Output Power:	4 dBm

2.5 Test Procedure

Emissions measurements were performed in accordance with the procedures of ANSI C63.4-2003. Radiated emissions tests were performed at a distance of 1 and 3 metres from the EUT. OET Bulletin 65 dated June 2001 was used for reference.

2.6 Test Facility

2.6.1 General

Radiated Emission measurements were performed at EMC Technologies open area test site (OATS) situated at Lerderderg Gorge, near the township of Bacchus Marsh in Victoria, Australia. Conducted measurements at an antenna ports were performed at EMC Technologies' laboratory in 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.

2.6.2 NATA Accreditation

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

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

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

2.7 Test Equipment Calibration

All measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Agilent Technologies (Australia) Pty Ltd or the National Measurement 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.

2.8 Ambients at OATS

The Open Area Test Site (OATS) is an area of low background ambient signals. No significant broadband ambients are present however commercial radio and TV signals exceed the limit in the FM radio, VHF and UHF television bands. Radiated prescan measurements were performed in the shielded enclosure to check for possible radiated emissions at the frequencies where the OATS ambient signals exceeded the test limit.

RESULTS
WLAN Module – WM3945ABG (802.11b, 802.11g and 802.11a (DTS))

3.0 SPURIOUS EMISSION MEASUREMENTS

3.1 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 EMC test report M060108_Cert_WM3945ABG_DTS with FCC ID: EJE-WL0010 (IC ID: 337J-WL0010)

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.

3.2 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 dBµV/m

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

3.3 Radiated Emissions (Spurious and Harmonics)

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

Measurements were performed on Fujitsu host notebook Q2010 and the test results are reported.

Testing was performed while both the WLAN transmitter and Bluetooth transmitter continuously operated. Harmonics related to the WLAN transmitter (2.4 – 2.4835 GHz and 5.725 – 5.850 GHz) is reported below. Harmonics in the frequency band (5.15 – 5.35 GHz), refer to M060108_Cert_WM3945ABG_NII_Class_2.

3.3.1.1 Configuration 802.11b

Initial investigations were performed with three modulation types: (DBPSK, DQPSK and CCK). Emissions with CCK modulation (11 Mbps) were observed to be slightly worst. Final testing was performed while the transmitter continuously operated with the modulation rate of 11 Mbps (CCK).

The EUT was operating at its highest channel (2462 MHz), the field strength at 2483.5 MHz was:
53.6 dBμV/m peak and 42.1 dBμV/m average
The levels were > 20 dB below the maximum field strength of the in-band carrier.

The EUT was operating at its lowest channel (2412 MHz), the field strength at 2400 MHz was:
61.9 dBμV/m peak and 50.3 dBμV/m average
The levels were > 20 dB below the maximum field strength of the in-band carrier.

Channel 1 - 2412 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2412	**109.6**	**97.7**	-	-	-
4824	46	34	74.0	54.0	Pass
7236	**47.8**	**36.0**	-	-	-
9648	**54.6**	**46.2**	-	-	-
12060	53	41	74.0	54.0	Pass
14472	57	45	74.0	54.0	Pass
16884	56	45	-	-	-
19296	65	52	84.0*	64.0*	Pass
21708	69	56	-	-	-
24120	69	56	-	-	-
2425.7	**62.7**	**51.2**	-	-	-
2397.9	**57.5**	**48.4**	-	-	-
2371	**56.1**	**48.1**	74.0	54.0	Pass
2452	**55.7**	**46.3**	-	-	-

*Limits were corrected for 1 metre measurement.

Channel 6 - 2437 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2437	**110.2**	**97.5**	-	-	-
4874	46	34	74.0	54.0	Pass
7311	**49.4**	**37.1**	74.0	54.0	Pass
9748	**52.7**	**44.6**	-	-	-
12185	53	41	74.0	54.0	Pass
14622	57	45	-	-	-
17059	56	45	-	-	-
19496	65	52	84.0*	64.0*	Pass
21933	69	56	-	-	-
24370	69	56	-	-	-
2451.3	**62.8**	**50.3**	-	-	-
2422.3	**60.4**	**48.1**	-	-	-
2396	**54.2**	**43.6**	-	-	-
2476	**53.6**	**43.5**	-	-	-

*Limits were corrected for 1 metre measurement.

Channel 11 - 2462 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2462	**109.8**	**98.6**	-	-	-
4924	46	34	74.0	54.0	Pass
7386	**48.1**	**35.8**	74.0	54.0	Pass
9848	**56.3**	**47.9**	-	-	-
12310	53	41	74.0	54.0	Pass
14772	57	45	-	-	-
17234	56	45	-	-	-
19696	65	52	84.0*	64.0*	Pass
22158	69	56	84.0*	64.0*	Pass
24620	69	56	-	-	-
2476.3	**58.2**	**44.7**	-	-	-
2447	**61.5**	**47.4**	-	-	-

*Limits were corrected for 1 metre measurement

Result: Harmonic and spurious emissions 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). The worst case emissions were complied with the FCC limits in sections 15.209 and 15.247 by a margin of 5.9 dB. The measurement uncertainty for radiated emissions in this band was ±4.1 dB.

3.3.1.2 Configuration 802.11g

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in emissions were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 6 Mbps (BPSK).

The EUT was operating at its highest channel (2462 MHz), the field strength at 2483.5 MHz was:
70.6 dBμV/m peak and 53.8 dBμV/m average
The levels were > 20 dB below the maximum field strength of the in-band carrier.

The EUT was operating at its lowest channel (2412 MHz), the field strength at 2400 MHz was:
81.2 dBμV/m peak and 61.7 dBμV/m average
The levels were > 20 dB below the maximum field strength of the in-band carrier.

Channel 1 - 2412 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2412	**107.5**	**93.6**	-	-	-
4824	46	34	74.0	54.0	Pass
7236	**47.1**	**35.5**	-	-	-
9648	**53.4**	**41.7**	-	-	-
12060	53	41	74.0	54.0	Pass
14472	57	45	74.0	54.0	Pass
16884	56	45	-	-	-
19296	65	52	84.0*	64.0*	Pass
21708	69	56	-	-	-
24120	69	56	-	-	-
2390	**70.7**	**53.1**	74.0	54.0	Pass

*Limits were corrected for 1 metre measurement.

Channel 6 - 2437 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2437	**106.7**	**93.9**	-	-	-
4874	46	34	74.0	54.0	Pass
7311	**49.4**	**36.8**	74.0	54.0	Pass
9748	**50.6**	**40.6**	-	-	-
12185	53	41	74.0	54.0	Pass
14622	57	45	-	-	-
17059	56	45	-	-	-
19496	65	52	84.0*	64.0*	Pass
21933	69	56	-	-	-
24370	69	56	-	-	-

*Limits were corrected for 1 metre measurement.

Channel 11 - 2462 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2462	**107.4**	**94.3**	-	-	-
4924	46	34	74.0	54.0	Pass
7386	**48.3**	**36.4**	74.0	54.0	Pass
9848	**51.9**	**41.2**	-	-	-
12310	53	41	74.0	54.0	Pass
14772	57	45	-	-	-
17234	56	45	-	-	-
19696	65	52	84.0*	64.0*	Pass
22158	69	56	84.0*	64.0*	Pass
24620	69	56	-	-	-
2483.5	**70.6**	**53.8**	74.0	54.0	Pass

*Limits were corrected for 1 metre measurement

Result: Harmonic and spurious emissions 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). The worst case emissions were complied with the FCC limits in sections 15.209 and 15.247 by a margin of 0.2 dB. The measurement uncertainty for radiated emissions in this band was ±4.1 dB.

3.3.1.3 Configuration 802.11a (5.725 – 5.850 MHz)

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in emissions were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 6 Mbps (BPSK).

The EUT was operating at its highest channel (5825 MHz), the field strength at 5850 MHz was:
66.7 dBμV/m peak and 54.5 dBμV/m average
The levels were > 20 dB below the maximum field strength of the in-band carrier.

The EUT was operating at its lowest channel (5745 MHz), the field strength at 5725 MHz was:
78.9 dBμV/m peak and 59.2 dBμV/m average
The levels were > 20 dB below the maximum field strength of the in-band carrier.

Channel 149 - 5745 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5745	**106.3**	**94.1**	-	-	-
11490	**52.7**	**41.2**	74.0	54.0	Pass
17235	**56.5**	**45.3**	-	-	-
22980	69	56	84.0*	64.0*	Pass
28725	79	67	-	-	-
34470	80	68	-	-	-
5549	**54.4**	**42.1**	-	-	-
4935	**51.6**	**40.0**	74.0	54.0	Pass

*Limits were corrected for 1 metre measurement.

Channel 157 - 5785 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5785	**104.8**	**93.3**	-	-	-
11570	**52.2**	**40.8**	74.0	54.0	Pass
17355	**56.0**	**43.6**	-	-	-
23140	69	56	-	-	-
28925	79	67	-	-	-
34710	80	68	-	-	-
5583	**54.7**	**43.4**	-	-	-
4821	**54.0**	**43.3**	74.0	54.0	Pass

*Limits were corrected for 1 metre measurement.

Channel 165 - 5825 MHz

Frequency MHz	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
5825	**104.1**	**93.5**	-	-	-
11650	**54.0**	**41.7**	74.0	54.0	Pass
17475	**56.1**	**43.4**	-	-	-
23300	69	56	-	-	-
29125	79	67	-	-	-
34950	80	68	-	-	-
4856	**55.9**	**44.6**	74.0	54.0	Pass

*Limits were corrected for 1 metre measurement.

Result: Harmonic and spurious emissions 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 15.247 by a margin of 9.4 dB. The measurement uncertainty for radiated emissions in this band was ±4.1 dB.

4.3.4 Band Edge Measurements

Configuration 802.11b

BE Frequency (MHz) within the restricted band	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2390	54.8	47.9	74.0	54.0	Pass
2483.5	51.4	48.4	74.0	54.0	Pass

Configuration 802.11g

BE Frequency (MHz) within the restricted band	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2390	68.4	53.6	74.0	54.0	Pass
2483.5	66.8	53.5	74.0	54.0	Pass

Results: Complies.

4.0 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 antennas are located on the top edge of LCD screen (2 antennas left and right) and projected distance of greater than 20cm from user.

Transmitter # 2: The Bluetooth antenna is located under the keyboard and projected distance of less than 20cm from user.

SAR is not required as the WLAN transmitter is mobile device and the power for the Bluetooth transmitter is below the low threshold.

The separation distance between the WLAN and BT antennas is greater than 20cm. Therefore, they are not co-located transmitters.

The MPE calculation shown below is for the WLAN power density.

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 1mW/cm^2.

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

where: Pd = power density (mW/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 EMC report: M060108_Cert_WM3945ABG_DTS
Prediction frequency = **5785 MHz**
Maximum peak output power = 17.9 dBm = 61.7 mW
Antenna (Monopole) gain (max) = 1.79 dBi = 1.51 numeric
The power density calculated = 0.02 mW/cm^2

Prediction frequency = **2437 MHz**
Maximum peak output power = 17.1 dBm = 51.3 mW
Antenna (Inverted F) gain (max) = 2.47 dBi = 1.77 numeric
The power density calculated = 0.02 mW/cm^2

MPE limit for uncontrolled exposure at prediction frequency = 1 mW/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

5.0 COMPLIANCE STATEMENT

The INTEL Mini-PCI Wireless LAN Module (GOLAN 11a+b/g), Model: WM3945ABG installed in Fujitsu notebook PCs tested on behalf of Fujitsu Australia Ltd, **comply** with the **Class II Permissive Change** 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 and 5725 – 5850 MHz.

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(o) 2400 – 2483.5 MHz Spread Spectrum requirements and the RF exposure requirements of RSS-102.

Results were as follows:

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	**Note 1**
15.205	6.3	Operation in Restricted Band	**Complies**
15.207	6.6	Conducted Emissions	**Note 1**
15.209	6.3	Radiated Emissions	**Complies**
15.247 (a)(2)	6.2.2(o)(iv)	Channel Bandwidth	**Note 1**
15.247 (b)(3)	6.2.2(o)(b)	Peak Output Power	**Note 1**
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	**Note 1**

Note 1: Refer to EMC test report M060108_Cert_WM3945ABG_DTS with FCC ID: EJE-WL0010 (IC ID: 337J-WL0010)

The results for IEEE 802.11a (U-NII) is reported separately.
Refer to EMC Technologies' test report: M060108_Cert_WM3945ABG_NII_Class_2 (U-NII)

TEST REPORT APPENDICES

APPENDIX A: ANTENNA INFORMATION

Attachment 1: RF Exposure Information