

**Emission Test Report**  
**Standard: FCC Part 15 Subpart E / IC RSS-210**  
**Class II Permissive Change**

Document Number : FCC 19-0293-0

**Model Number: WM3B2915ABG**


measured with **IBM ThinkPad X41 Tablet Series**

**FCC ID: ANO20040601CX2**  
**IC: 349E-WM3B29AG**

March 2, 2005

**Prepared :**  
**EMC R&D Staff Engineer**

**Takeshi Asano**

Signature:   
IBM Japan, Ltd.  
EMC Engineering  
LAB-S59

1623-14, Shimotsuruma,  
Yamato-shi Kanagawa-ken 242, Japan  
Phone: +81-46-215-4779  
Fax: +81-46-273-7420  
E-Mail: asano@jp.ibm.com

**Reviewed and Checked :**  
**EMC Advisory R&D Engineer**


**Toshiya Murota**

Signature:   
IBM Japan, Ltd.  
EMC Engineering  
LAB-S59

1623-14, Shimotsuruma,  
Yamato-shi Kanagawa-ken 242, Japan  
Phone: +81-46-215-6574  
Fax: +81-46-273-7420  
E-Mail: murota@jp.ibm.com

**Approved :**  
**Manager, EMC Engineering**  
**/ NVLAP signatory**

**Akihisa Sakurai**

Signature:   
IBM Japan, Ltd.  
EMC Engineering  
LAB-S59

1623-14, Shimotsuruma,  
Yamato-shi Kanagawa-ken 242, Japan  
Phone: +81-46-215-2613  
Fax: +81-46-273-7420  
E-Mail: akihisa@jp.ibm.com

## MEASUREMENT / TECHNICAL REPORT – Part 15 Subpart E (Intentional Radiator)

**Model: WM3B2915ABG (802.11a/b/g Wireless LAN Adapter)**  
with  
**IBM ThinkPad X41 Tablet Series**  
(Machine Type: 1866, 1867, 1868, 1869)

**FCC ID : ANO20040601CX2**

**March 2, 2005**

This report concerns: (check one) Original Grant    _____ Class I change    _____ Class II change    _____ <input checked="" type="checkbox"/>
Equipment type: <u>Wireless LAN device</u>
This report shall not be reproduced except in full, without the written permission of this test lab.
The measurement results contained in this report relate only to the item which was tested.
Measurement procedure used is ANSI C63.4-2003 unless otherwise specified. Other test procedure: _____
The FCC has issued provisional acceptance of this test laboratory for Declaration of Conformity testing per letter dated 1997.
<b>APPLICANT ANTI-DRUG ABUSE CERTIFICATION:</b> By checking yes, the applicant certifies that, in the case of an individual applicant, he or she is not subject to a denial of federal benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse of 1988, 21 U.S.C. 853(a), or, in the case of a non-individual applicant (e.g. corporation, partnership or other unincorporated association), no party to the application is subject to a denial of federal benefits, that includes FCC benefits, pursuant to that section. For the definition of a “party” for these purposes, see 47 CFR 1.2002(b).  <div style="text-align: center;"> <input checked="" type="radio"/> Yes    or    No                 </div>
“Report shall not be reproduced except in full, without the written approval of the laboratory” “the report must not be used by the client to claim product endorsement by NVLAP or any agency of the US government”
Prepared by: Takeshi Asano  <div style="text-align: right;">                     IBM Japan Corporation, Yamato EMC Engineering                      LAB-S59, 1623-14, Shimotsuruma, Yamato-shi Kanagawa-ken 242-8502, Japan                      Tel: +81-46-215-4779    Fax: +81-46-273-7420                 </div>

**- Index -**

- A. General Information .....4**
  - A.1 Test Methodology ..... 4
  - A.2 Test Facility / NVLAP Accreditation..... 4
  - A.3 EUT details..... 5
- B. Summary of Test Results..... 6**
- C. Operation Mode of EUT ..... 8**
- D. Antenna Information ..... 9**
- E. Justification..... 10**
- F. Test Instruments..... 11**
- G. Measurement Uncertainty ..... 12**
- H. Temperature and Humidity ..... 12**
- I. Related Submittal(s)/Grant(s)/Notes ..... 12**
  
- 1. Conducted Transmit Output Power ..... 13**
  - 1.1 Test Procedure ..... 13
  - 1.2 Measurement Results ..... 14
  - 1.3 Trace Data..... 15
- 2. Restricted Bands Radiatio (1GHz – 40GHz) ..... 18**
  - 2.1 Test Procedure ..... 18
  - 2.2 Test Instruments and Measurement Setup..... 18
  - 2.3 Field Strength Calculation..... 20
  - 2.4 Limits..... 20
  - 2.5 Bandedge Measurement plots ..... 21
  - 2.6 Radiated Emission Measurement Results (above 1GHz)..... 26
- 3. Restricted Bands Radiation (30MHz – 1GHz) ..... 31**
  - 3.1 Test Procedure ..... 31
  - 3.2 Test Instruments and Measurement Setup..... 31
  - 3.3 Field Strength Calculation..... 32
  - 3.4 Measurement Results ..... 33
- 4. AC Wireline Conducted Emissions (150KHz – 30MHz) ..... 36**
  - 4.1 Test Procedure ..... 36
  - 4.2 Test Instruments and Measurement Setup..... 36
  - 4.3 Powerline Voltage Calculation ..... 37
  - 4.4 Measurement Results ..... 38

## A. General Information

APPLICANT	: IBM Japan, Ltd.
TEST SITE	: IBM Japan, Ltd., Yamato Semi-anechoic chamber #1
TEST SITE ADDRESS	: 1623 – 14 Shimotsuruma, Yamato-shi, Kanagawa 242-8502 Japan Tel: +81-46-215-4779, Fax: +81-46-273-7420
REGULATION	: FCC Part 15 Subpart E Industry Canada RSS-210 (Issue No.5)
MODEL NUMBER (Advertising Name)	: WM3B2915ABG (Intel PRO/Wireless 2915 ABG Mini-PCI Adapter)
FCC ID IC Certification Number	: ANO20040601CX2 : 349E-WM3B29AG
SERIAL NUMBER	: Z9H949X09G
PHYSICAL CONDITION	: the applying card ; Production level, Host PC device; Preproduction
KIND OF EQUIPMENT	: Personal computer with a IEEE802.11a, 11b & 11g Wireless LAN Mini-PCI Combo Card ( <a href="#">Composite application</a> )
TESTED DATE	: February 15, 21, 22, 23, 24, 25, 28 and March 1, 2005

### A.1 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4-2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

### A.2 Test Facility / NVLAP Accreditation

The semi-anechoic chamber #1 and measurement facility used to collect the data are located in Yamato Laboratory, IBM Japan.

- This facility has been fully described in a report dated September 1998, submitted to the FCC office, and accepted in a letter, dated Nov. 2, 1998(31040/SIT).

IBM Yamato EMC Engineering is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with Criteria established in Title 15, Part 285 Code of Federal Regulations. (**NVLAP Lab code: 200198-0**, effective through June 30, 2005)

- These facilities are accepted by **Industry Canada** as number **IC 4221** for chamber #1 (expiry date: December 22, 2007), and as number **IC 4221-1** for chamber #2 (expiry date: February 16, 2007).

### A.3 EUT details

**Table A** EUT details

Model and S/N	FCC ID IC Certification Number	Description
WM3B2915ABG (s/n Z9H949X09G)	FCC ID: ANO20040601CX2 IC: 349E-WM3B29AG	<b>Applying modular transmitter</b> Built-in type IEEE802.11a/b/g Wireless LAN Mini-PCI card without antenna
ThinkPad X41 Tablet Series M/T 1866-17U (s/n AA-GH1DP)	N/A	IBM Tablet type PC with built-in antennas CPU: Intel® Pentium M Processor, 1.2 GHz
J07M067 (s/n 05S5ARM4SIT023)	FCC ID: ANO20040700HER IC: 349E-J07M067	Co-located built-in type Bluetooth modular transmitter device without antenna
P/N 02K6810	N/A	Universal AC adapter 56W, Unshielded power cord for ThinkPad X41 Tablet Series

## B. Summary of Test Results

Table-B presents the list of the measurement items for U-NII devices under FCC Part 15 Subpart E, and for LELAN devices under Industry Canada RSS-210. The section numbers of upper portion are showing FCC codes, and the lower ones are for IC RSS-210.

**Table-B** List of the measurements

Section(s)	Test Items		Condition	Result
	Transmit mode (TX):			
15.407(a)(1), (2) 6.2.2 (q1)(i)(ii)	Bandwidth at 26 dB below	26dB BW was also taken for IC instead of 99% BW, according to RSS-210 6.2.2q(iv)(b).	Conducted	Pass
	Conducted transmit output power or EIRP for IC	5150-5250MHz: FCC: 50mW or (4+10logB)dBm IC : 200mW* or (10+10logB)dBm* *: EIRP  5250-5350MHz: FCC: 250mW or (11+10logB)dBm IC : 250mW or (11+10logB)dBm IC : 1W* or (17+10logB)dBm* *: EIRP B: 26dB BW in MHz		Pass
	Peak Power Spectral Density	5150-5250MHz: FCC: 4 dBm in any 1MHz IC : 10 dBm in any 1MHz (EIRP)  5250-5350MHz: FCC: 11 dBm in any 1MHz IC : 11 dBm in any 1MHz		Pass
N/A 6.2.2 (q1)(iv)(b)	Peak Spectral Density	IC: 3 + 10logB dBm/MHz		Pass
15.407(a)(6) N/A	Peak Excursion	The ratio of the peak excursion of the modulation envelope to the peak transmit shall not exceed 13 dB across any 1 MHz .		Pass
15.207 / 407(b)(5) 6.2.2 (q1)(v) / 6.6	AC Wireline Conducted Emissions 150kHz- 30MHz	Class B: Freq.(MHz) QP(dBμV) Ave.(dBμV) 0.15 - 0.5 66 - 56 56 - 46 0.5 - 5 56 46 5 - 30 60 50		Pass
15.205 & 209 / 407(b)(1)(2)(5)(6)  6.2.1 / 6.2.2(q1)(i)(ii)(v) / 6.3	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Shall not exceed the limits specified in FCC 15.209 or RSS-210 Table3. Ave. 54dBμV/m, peak 74dBμV/m and	Radiated (30MHz - 1GHz)	Pass
		FCC 15.407(b)(1)(2) or RSS-210 6.2.2(q1)(i)(ii) : EIRP -27dBm/MHz	Radiated (1G - 40GHz)	Pass

		Receive mode (RX):			
15.207 / 407(b)(5) 6.2.2(q1)(v) / 7.4	AC Wireline Conducted Emissions 150kHz - 30MHz	Class B: Freq.(MHz) QP(dBµV) Ave.(dBµV) 0.15 - 0.5 66 - 56 56 - 46 0.5 - 5 56 46 5 - 30 60 50	Conducted	Pass	
15.205 & 209 / 407(b)(1)(2)(5)(6)  6.2.1 / 6.2.2(q1)(i)(ii)(v) / 7.3	General Field Strength Limits (Radiated Emission Limits)	Shall not exceed the limits specified in FCC 15.209 or RSS-210 Table3. Ave. 54dBµV/m, peak 74dBµV/m and FCC 15.407(b)(1)(2) or RSS-210 6.2.2(q1)(i)(ii) : EIRP -27dBm/MHz	Radiated (30MHz - 1GHz)	Pass	
			Radiated (1G - 25GHz)	Pass	

Other general requirements			Result
15.407(a)(1)(2) -	Antenna gain of the applying host device	Peak : 2.75 dBi in 5150-5350GHz band	N/A
- 5.2	Supply Voltage	Main power source: Universal AC adapter 56W Mini-PCI PC bus to applying card : DC 3.3V ± 0.3V	N/A
- 6.2.2(q1)(iv)(a)	Digital modulation	Applying equipment employs IEEE802.11a, 11g(OFDM) or 11b(CCK) digital modulation technology.	complies
15.407(c) 6.2.2(q1)(iv)(d)	Automatic link disconnection in no transaction state	Refer to “Circuitry Description” document of the original submission.	complies
N/A 6.2.2(q1)(i)	Integral antenna in the 5150M -5250MHz band	The device employs an unique electronic connector so called <b>Electronic Handshake</b> . Refer to “Confidential_e-Handshake” exhibit.	complies
15.407(e) 6.2.2(q1)(i) (q1)(iv)(g)	Indoor use in the 5150M -5250MHz band, and interference from radar.	Refer to the manual (Regulatory Notice).	complies
15.407(f) 6.2.2(q1)(iv)(g)	RF Exposure Requirement	Refer to “RF Exposure Evaluation” or “Exposure of Humans to Radio Frequency Fields“ documents.	complies
15.407(g) 6.2.2(q1)(iv)(e)	Frequency stability	Refer to “Circuitry Description” document of the original submission.	complies

### C. Operation Mode of EUT

1. All tests were performed using the “CRTU III, version 3.2.15.0000” test program provided by Intel Corporation. This tool supports the continuous or burst transmission mode for the testing purpose. The parameter GAIN of the test software was set to the Intel’s power specification shown in Table-C below.
2. Three kinds of frequencies were chosen for the measurement. i.e. 5180MHz (lowest), 5260MHz(middle), and 5320MHz (highest).
3. As for the RF receiving test, the middle channels (5260MHz) were selected representatively.

**Table-C** Transmission mode of EUT

Note) The table shows the specification of **average** power for the applying device in ‘dBm’.

Operation Frequency [GHz]	Designed average output power (conducted) [dBm]							
	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
5.180 (Ch. 36)	12	12	12	12	12	12	12	12
5.200 (Ch. 40)	12	12	12	12	12	12	12	12
5.220 (Ch. 44)	12	12	12	12	12	12	12	12
5.240 (Ch. 48)	12	12	12	12	12	12	12	12
5.260 (Ch. 52)	16	16	16	16	16	16	16	16
5.280 (Ch. 56)	16	16	16	16	16	16	16	16
5.300 (Ch. 60)	16	16	16	16	16	16	16	16
5.320 (Ch. 64)	16	16	16	16	16	16	16	16

4. The power values of some higher transmission rates are reduced by the driver for the best performance according EVM (Error Vector Magnitude) factor.  
The test was performed with each higher transmission power.
5. The measurements were performed for EUT in both “Notebook” and “Tablet” operation modes.

“Notebook” operation mode



“Tablet” operation mode





## D. Antenna Information

The Table-D indicates the applicable host antenna systems that are used for the applying modular transmitter.

**Table-D** EUT Information

\*1: including cable loss, Omni directional

\*2: Non-lead soldering antenna according to RoHS environmental direction (others are not applied yet or being withdrawn.)

**[New antenna system in this Class II application]**

IBM ThinkPad X41 Tablet		Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
Main antenna		91P6908 <sup>+2</sup>	Wistron NeWeb Corp. (R.O.C.)	Dual Band Meander Antenna	Coax 600 mm	5.15 - 5.35 GHz	Notebook 2.75 dBi
Auxiliary antenna		91P6909 <sup>+2</sup>					Tablet 2.11 dBi
							Notebook 1.36 dBi
							Tablet 1.71 dBi

**[Certified antenna systems]**

**Granted on 10/07/2004**

IBM ThinkPad T40 Series		Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
LCD 14 inch Model	Main	62P4204	Foxconn Electronics Inc. (R.O.C.)	Dual Band Meander Antenna	Coax 745 mm	5.15-5.35GHz	0.83 dBi
	Auxiliary	91P6900 <sup>+2</sup>					
LCD 15 inch Model	Main	62P4203	Hitachi Cable Ltd. (Japan)	Dual Band Meander Antenna	Coax 845 mm	5.15-5.35GHz	0.36 dBi
	Auxiliary	91P6898 <sup>+2</sup>					
LCD 15 inch Model	Main	91P6841 <sup>+2</sup>	Hitachi Cable Ltd. (Japan)	Dual Band Meander Antenna	coax 755mm	5.15-5.35GHz	2.00 dBi
	Auxiliary	91P6840 <sup>+2</sup>			coax 580mm		

**Granted on 10/07/2004**

IBM ThinkPad R50 Series		Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
LCD 14 inch Model	Main	91P6810	Hitachi Cable Ltd. (Japan)	Dual Band Meander Antenna	Coax 750 mm	5.15-5.35GHz	2.66 dBi
	Auxiliary	91P6811			Coax 635 mm		
LCD 15 inch Model	Main	91P6812	Hitachi Cable Ltd. (Japan)	Dual Band Meander Antenna	coax 775mm	5.15-5.35GHz	1.68 dBi
	Auxiliary	91P6813			coax 670mm		

**Granted on 12/17/2004**

IBM ThinkPad X30 Series		Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
Main antenna		08K4083	Nissei Electric Co. Ltd. (Japan)	Dual Band Meander Antenna	Coax 394 mm	5.15-5.35GHz	1.42 dBi
Auxiliary antenna		08K4084			Coax 534 mm		

**Granted on 12/17/2004**

IBM ThinkPad X40 Series		Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
Main antenna		13N5743	Nissei Electric Co. Ltd. (Japan)	Dual Band Meander Antenna	Coax 488 mm	5.15-5.35GHz	1.45 dBi
Auxiliary antenna		13N5742			Coax 449 mm		

## E. Justification

The full testing results were already performed with the highest antenna gain (ThinkPad R50 Series) shown in the previous Table-D, then certified on October/07/2004.

The new antenna used for ThinkPad X41 Tablet PC is very similar meander type to the existing granted antenna systems and the gain of it does not exceed the certified values.

Therefore, the applying new antenna conforms with the FCC rule Part 15 Subpart C pursuant to the ET Docket 03–201; FCC 04–165, July 12/2004 and Federal Register / Vol. 69, No. 172, September 7/2004.

However, the new host PC (X41 Tablet) supports the additional usage than the existing PC models. i.e. “Tablet” operation mode.

With the above back ground, this test report includes the following measurement items to prove the emissions conform to the limits for both “Notebook” and “Tablet” operation modes.

- Conducted power (note: There is no change on the other conducted measurements, since no hardware nor electrical modification was made to the applying modular transmitter itself.)
- Restricted Bands Radiation
- AC Wireline Conducted Emissions

The tests were performed with the higher gain antenna (i.e. Main antenna) for each operation mode as below.

IBM ThinkPad X41 Tablet	Peak Gain	
	Notebook operation mode	Main antenna
	Auxiliary antenna	1.36 dBi
Tablet operation mode	Main antenna	<b>2.11 dBi</b>
	Auxiliary antenna	1.71 dBi

## F. Test Instruments

**Table-F** List of Measuring Instruments

Description	Model	Serial Number	Calibration Date	Calibration Interval
Computer	IBM 6868-30J	97-901X3	N/A	N/A
Computer	IBM 6589-13J	97-15613	N/A	N/A
Spectrum Analyzer (100Hz-1.5GHz)	HP 85680B	2732A03651	07/21/04	1 year
Spectrum Analyzer (100Hz-1.5GHz)	HP 85680B	2841A04254	08/25/04	1 year
Spectrum Analyzer (100Hz-1.5GHz)	HP 85680B	3019A05156	08/05/04	1 year
Spectrum Analyzer Display	HP 85662A	2648A15255	07/21/04	1 year
Spectrum Analyzer Display	HP 85662A	2816A16831	08/25/04	1 year
Spectrum Analyzer Display	HP 85662A	3026A19366	08/05/04	1 year
Quasi-Peak Adapter	HP 85650A	2521A00968	07/20/04	1 year
Quasi-Peak Adapter	HP 85650A	2811A01156	08/25/04	1 year
Quasi-Peak Adapter	HP 85650A	2811A01433	08/05/04	1 year
Amplifier (100KHz - 1.3GHz) - for 30-200MHz - for 200-1000MHz	MITEQ AM-3A MITEQ AM-3A	898433 898432	04/23/04 04/23/04	1 year 1 year
Amplifier (1GHz - 18GHz)	HP 8449B	3008A00582	06/01/04	1 year
Amplifier (18 – 40GHz)	Agilent 83051A	3950M00193	01/18/05	1 year
Spectrum Analyzer EMI Test Receiver	R&S ESI26	836119/003	05/10/04	1 year
Spectrum Analyzer	HP 8563E	3416A02248	09/10/04	1 year
Harmonic Mixer	Agilent 11970A	011269-001	08/04/04	1 year
Receiver (9kHz-30MHz)	R&S ESH3	891806/012	11/04/04	1 year
Receiver (20MHz-1.3GHz)	R&S ESVP	892111/026	11/04/04	1 year
Biconical Antenna (30-200MHz)	EMCO 3108	2536	04/23/04	1 year
Log-Periodic Antenna (200-1000MHz)	EMCO 3146	2849	04/23/04	1 year
Horn Antenna (1- 18GHz)	EMCO 3115	9903-5774	07/20/04	1 year
Horn Antenna (3.95- 5.85GHz)	EMCO 3160-5	1099	07/20/04	1 year
Horn Antenna (5.85- 8.20GHz)	EMCO 3160-6	9712-1044	07/20/04	1 year
Horn Antenna (8.20- 12.4GHz)	EMCO 3160-7	1156	07/20/04	1 year
Horn Antenna (12.4- 18GHz)	EMCO 3160-8	1143	07/20/04	1 year
Horn Antenna (18- 26.5GHz)	EMCO 3160-9	0004-1202	07/20/04	1 year
Horn Antenna (26.5- 40GHz)	EMCO 3160-10	1175	07/20/04	1 year
LISN	EMCO 3810/2NM	00022007	06/15/04	1 year
Switch/control unit	HP 3488A	2719A17226 2719A17228	N/A N/A	N/A N/A
Plotter	HP 7550A	2631A33619	N/A	N/A
Coaxial cables (1 – 18GHz): - Horn Ant <=> RF Amp. - RF Amp.<=>Spectrum Analyzer(<12GHz) - RF Amp.<=>Spectrum Analyzer(>12GHz)	Length: 6 m 16m 3m	- EM206SCO - GEM0101 - SF102-20166	03/25/04 03/25/04 04/08/04	1 year 1 year 1 year
Coaxial cables (18 – 40GHz): - Horn Ant <=> RF Amp. - RF Amp.<=>Spectrum Analyzer	3m 1m	- SF102-20167 - SF102-21105	04/08/04 04/08/04	1 year 1 year

N-Coax cables:				
- Bi-coni Ant <=> 10m Cable	9 m	- EM103L01	04/23/04	1 year
- 10m Cable <=> Shield Panel	10 m	- EM103L02	04/23/04	1 year
- Shield Panel <=> RF Amp	7 m	- EM103L03	04/23/04	1 year
- RF Amp <=> Power Splitter	0.5m	- EM103L04	04/23/04	1 year
- Log-peri Ant <=> 10m Cable	9 m	- EM103H01	04/23/04	1 year
- 10m Cable <=> Shield Panel	10 m	- EM103H02	04/23/04	1 year
- Shield Panel <=> RF Amp	7 m	- EM103H03	04/23/04	1 year
- RF Amp <=> Power Splitter	0.5m	- EM103H04	04/23/04	1 year
Coax cables:				
- Power Splitter <=> SW/Con.unit (SW110)	1 m	- EM103L05	04/23/04	1 year
- Power Splitter <=> SW/Con.unit (SW300)	1 m	- EM103L06	04/23/04	1 year
- Power Splitter <=> SW/Con.unit (SW100)	1 m	- EM103H05	04/23/04	1 year
- Power Splitter <=> SW/Con.unit (SW301)	1 m	- EM103H06	04/23/04	1 year
- SW/Con.unit <=> Receiver (Input)	2 m	- EM1RCV	04/23/04	1 year
- SW/Con.unit <=> Spe Ana.(Signal In) for 30- 200MHz	2 m	- EM1SPL	04/23/04	1 year
- SW/Con.unit <=> Spe Ana.(Signal In) for 200-1000MHz	2 m	- EM1SPH	04/23/04	1 year

Notes. - The above equipment calibration is traceable to National standards.

- HP: Hewlett Packard, R&S: Rohde & Schwarz

## G. Measurement Uncertainty

Uncertainties of the both, the Yamato EMI radiated test facilities (EMI chambers, #1 and #2) and the Yamato EMI conducted test facility are derived with the NIS 81 "Treatment of uncertainty in EMC measurements" 1994.

Estimated site uncertainty values are as follows.

EMI chamber #1 : 4.39dB

EMI chamber #2 : 4.40dB

EMI conducted measurement system : 2.4dB

Detail should be referred to "Treatment of Uncertainty, Calculations and Policy" report, document number TCR 10-0015.

## H. Temperature and Humidity

The temperature is controlled within range of 17° to 28°

The relative humidity is controlled within range of 40% to 70%.

## I. Related Submittal(s)/Grant(s)/Notes

During the applying modular device stops RF transmission, the host unit with full peripheral devices including the applying modular device is classified as an unintentional radiator, Digital Device under the FCC Part 15 Subpart B or the Industry Canada Class B Emission Compliance (ICES-003), and subject to DoC.

# 1. Conducted Transmit Output Power

[5150-5250MHz: FCC 15.407(a)(1), RSS 6.2.2q1(i) / q1(iV)(b)]  
 [5250-5350MHz: FCC 15.407(a)(2), RSS 6.2.2q1(ii) / q1(iV)(b)]

## 1.1 Test Procedure

The test was performed with a spectrum analyzer in accordance with the Method #3 of the FCC Public Notice, DA 02-2138, August/30/2002.

The spectrum analyzer was connected to the antenna terminal, while EUT was operating in continuous transmission mode (shown in the Plot 1-0 below) at the appropriate center frequencies.

The spectrum analyzer was set to :

- VBW= 30kHz ( $\geq 1/T$ , where T is transmission pulse duration. See Plot 1-0.), RBW=1MHz,
- Span= 50MHz encompassing the entire 26dB emission bandwidth of the transmission signal,
- Mode= sample detector, Trigger= free run

The band power measurement function was used to measure the peak power for each transmission mode (the lowest=6Mb/s, middle=18Mb/s and 24Mb/s, the highest=54Mb/s). The analyzer computed the peak power by integrating the spectrum across the 26 dB emission bandwidth given by the previous chapter.

**Table 1-1:** Test instruments of spectrum analyzer method

Description	Model	Serial Number
Spectrum Analyzer EMI Test Receiver	R&S ESI26	836119/003
Coax cables: - Spectrum Analyzer <=> EUT	Length: 110 cm Loss: 2.2 dB	

Notes: - R&S: Rohde & Schwarz

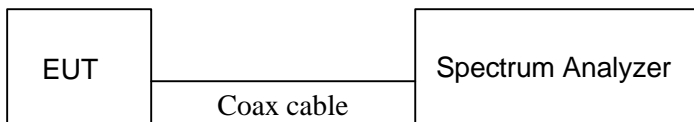


Figure 1-1 : Measurement setup of spectrum analyzer method

## 1.2 Measurement Results

Test Date: February 15, 21, 22 and 24, 2005

**Table 1-2** Measurement results of conducted transmit output power

Measured Frequency (MHz)	Tx Rate (Mb/s)	Analyzer reading (dBm)	Trace number	Cable Loss (dB)	Results (dBm)	Limit		Peak antenna gain of EUT (dBi)	EIRP (dBm)	IC limit (dBm)
						FCC (dBm)	IC (dBm)			
5180	6	9.56	omitted	2.2	11.76	17	N/A	2.75	14.51	23
	9	9.54	omitted	2.2	11.74	17	N/A		14.49	23
	18	9.38	omitted	2.2	11.58	17	N/A		14.33	23
	24	9.53	omitted	2.2	11.73	17	N/A		14.48	23
	54	9.50	omitted	2.2	11.70	17	N/A		14.45	23
5240	6	9.61	Plot 1-1b	2.2	11.81	17	N/A		14.56	23
	9	9.54	omitted	2.2	11.74	17	N/A		14.49	23
	18	9.29	omitted	2.2	11.49	17	N/A		14.24	23
	24	9.56	omitted	2.2	11.76	17	N/A		14.51	23
	54	9.53	omitted	2.2	11.73	17	N/A		14.48	23
5260	6	13.60	Plot 1-2b	2.2	15.80	24	24	18.55	30	
	9	13.56	omitted	2.2	15.76	24	24	18.51	30	
	18	13.33	omitted	2.2	15.53	24	24	18.28	30	
	24	13.58	omitted	2.2	15.78	24	24	18.53	30	
	54	11.15	omitted	2.2	13.35	24	24	16.10	30	
5320	6	13.50	omitted	2.2	15.70	24	24	18.45	30	
	9	13.39	omitted	2.2	15.59	24	24	18.34	30	
	18	12.90	omitted	2.2	15.10	24	24	17.85	30	
	24	13.40	omitted	2.2	15.60	24	24	18.35	30	
	54	10.57	omitted	2.2	12.77	24	24	15.52	30	

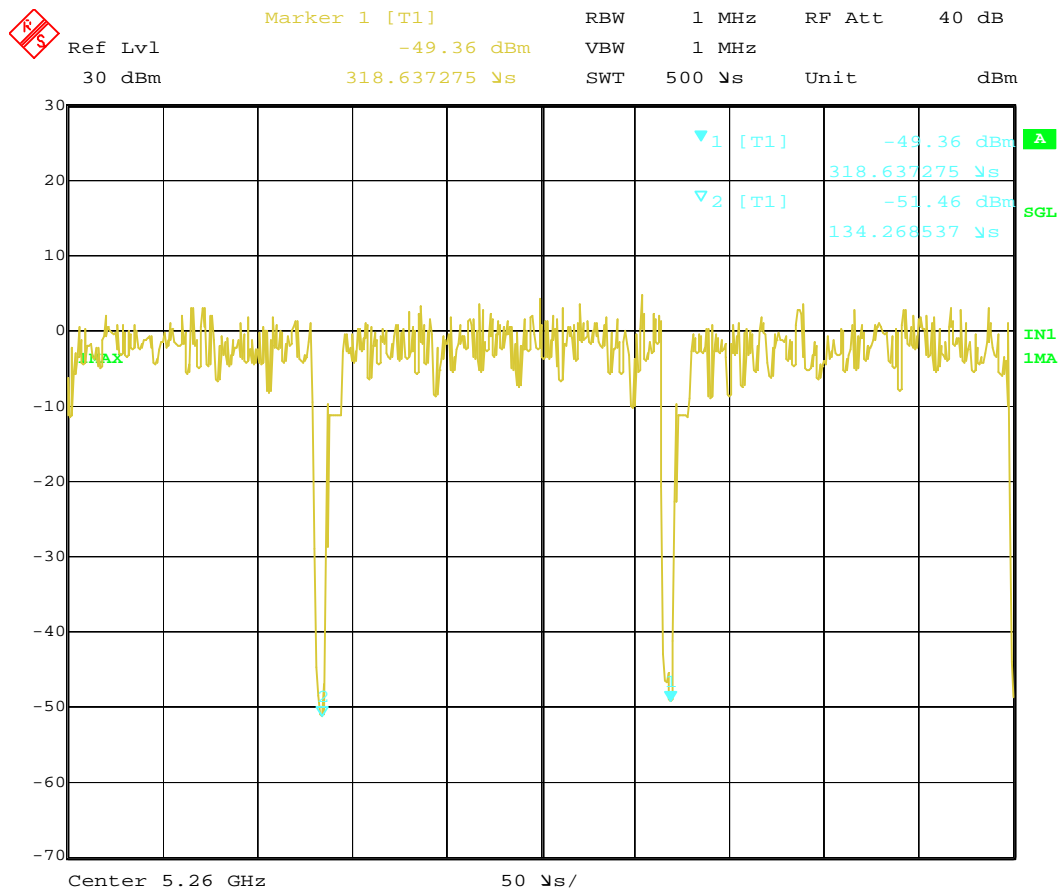
[Reference only]

( ) means the deviation of the results from the original grant.

The highest measurement result of the <b>original</b> grant	15.76 dBm
The highest measurement result in this <b>Class II</b> application	15.80 dBm (+0.04 dB)
The highest measurement result in the separate <b>SAR</b> report	16.26 dBm (+0.50 dB)

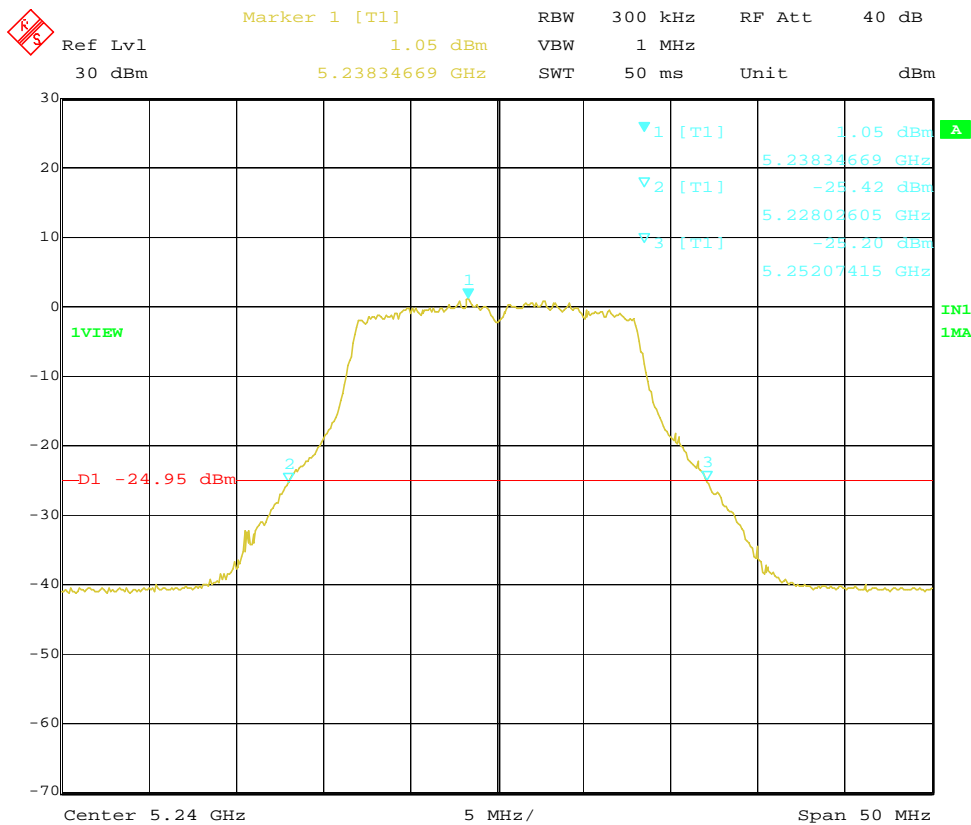
### 1.3 Trace Data

$T$  (transmission pulse duration) = 318.6 – 134.3 = 184.3 mS



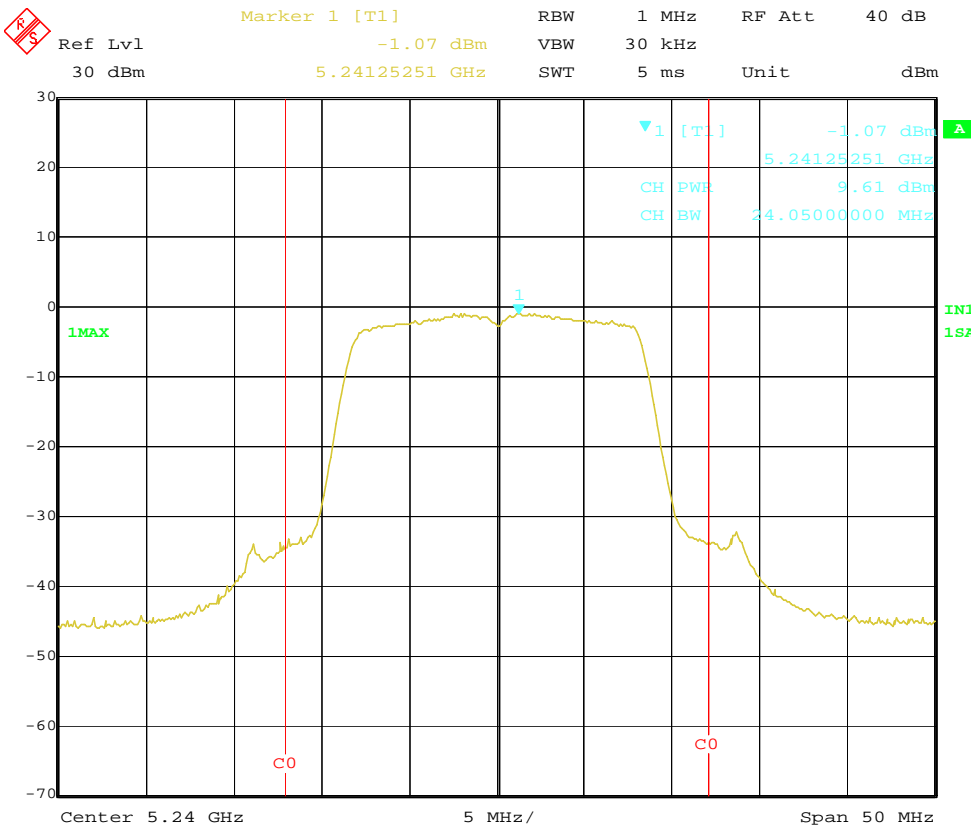
Date: 15.FEB.2005 11:50:42

Plot 1-0 Transmission Pulse Duration



Date: 21.FEB.2005 14:41:35

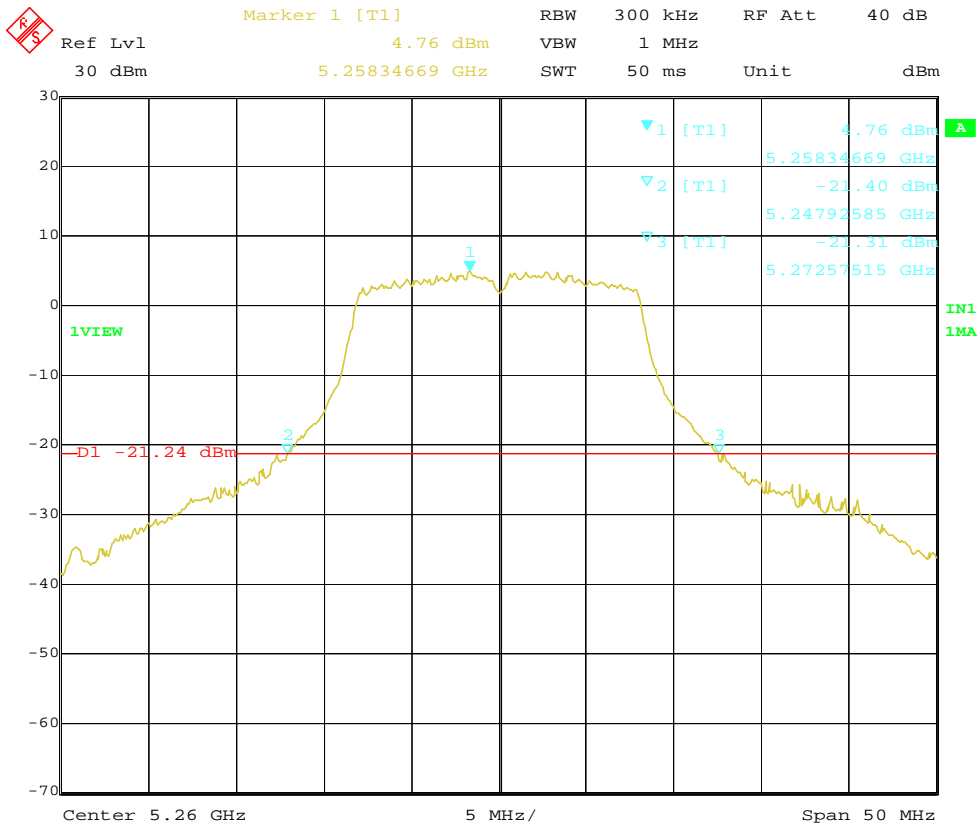
Plot 1-1a. 26dB Bandwidth of 5240MHz (OFDM, 6Mbps)



Date: 24.FEB.2005 10:18:51

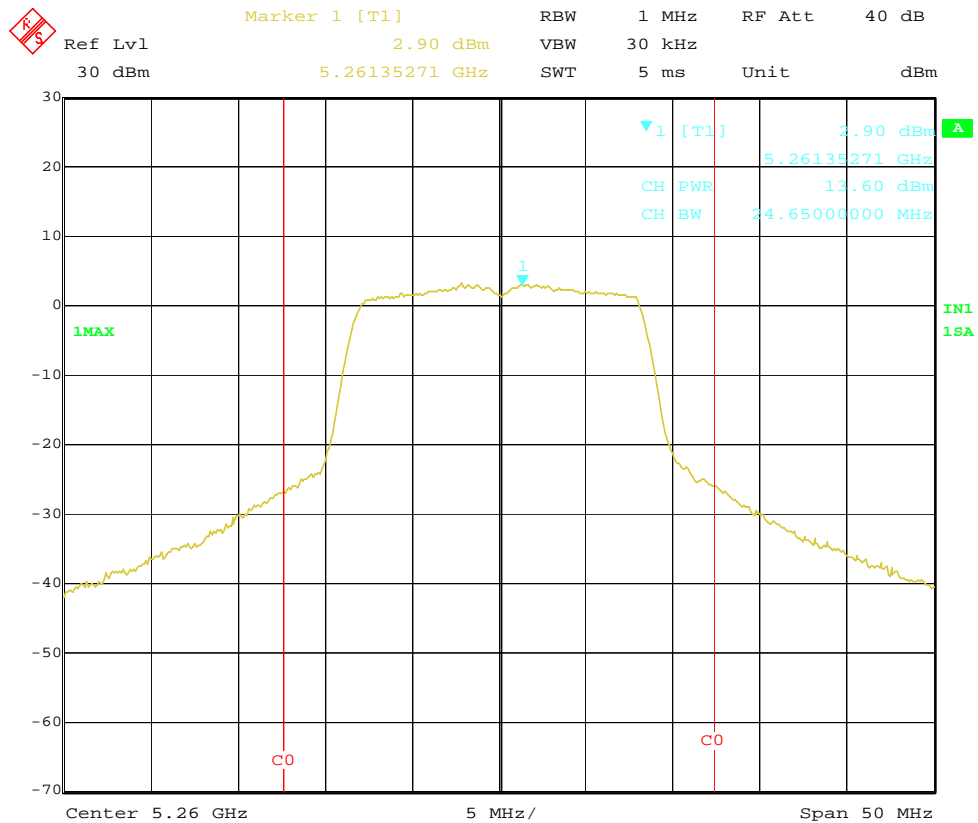
Plot 1-1b. Conducted Transmit Output Power of 5240MHz (OFDM, 6Mbps)





Date: 21.FEB.2005 15:21:11

Plot 1-2a. 26dB Bandwidth of 5260MHz (OFDM, 6Mbps)



Date: 21.FEB.2005 20:27:46

Plot 1-2b. Conducted Transmit Output Power of 5260MHz (OFDM, 6Mbps)

## 2. Restricted Bands Radiatio (1GHz – 40GHz)

[ FCC 15.205&209 / 15.407(b)(1),(2),(5),(6) ]  
 [ RSS-210 6.2.1 / 6.2.2(q1)(i),(ii),(v) / 6.3 / 7.3 ]

### 2.1 Test Procedure

Radiated emissions were measured in the frequency range with 1 GHz to 40GHz in transmitting mode and 1 GHz to 25GHz in receiving mode. All tests were performed in the semi-anechoic chamber at a 3-meter distance (except for the frequency range with 18 GHz to 40 GHz where test distance was reduced to 1 meter) on both horizontal and vertical polarities. The antenna was also scanned in height. The emissions are recorded with a spectrum analyzer in peak hold mode. The identified emissions are further maximized as a function of cable manipulation, azimuth, and antenna height. The emissions closest to the limits are measured in the peak mode with the tuned spectrum analyzer using resolution bandwidth of 1MHz / video bandwidth of 1MHz, and the average setting mode with the tuned spectrum analyzer using resolution bandwidth of 1MHz / video bandwidth of 100Hz or 10Hz. The highest emissions relative to the limit are listed.

### 2.2 Test Instruments and Measurement Setup

**Table 2-1** Radiated Emission Test Instrumentation (1GHz – 40GHz)

Description	Model	Serial Number
Spectrum Analyzer EMI Test Receiver	R&S ESI26	836119/003
Spectrum Analyzer	HP 8563E	3416A02248
Harmonic Mixer (26.5 – 40GHz)	Agilent 11970A	011269-001
Amplifier (1 - 18GHz)	HP 8449B	3008A00582
Amplifier (18 – 40GHz)	Agilent 83051A	3950M00193
Horn Antenna (1 - 18GHz)	EMCO 3115	9903-5774
Horn Antenna (3.95 – 5.85GHz)	EMCO 3160-5	1099
Horn Antenna (5.85 – 8.2GHz)	EMCO 3160-6	9712-1044
Horn Antenna (8.2 – 12.4GHz)	EMCO 3160-7	1156
Horn Antenna (12.4 – 18GHz)	EMCO 3160-8	1143
Horn Antenna (18 - 26.5GHz)	EMCO 3160-9	0004-1202
Horn Antenna (26.5 - 40GHz)	EMCO 3160-10	1175
Coaxial cables:	Length:	
- Horn Ant <=> RF Amp. (1-18GHz)	6 m	- EM206SCO
- RF Amp.<=>Spectrum Analyzer (1-12.4GHz)	16 m	- GEM0101
- RF Amp.<=>Spectrum Analyzer (12.4-18GHz)	3m	- SF102-20166
- Horn Ant <=> RF Amp. (18-40GHz)	3m	- SF102-20167
- RF Amp.<=>Spectrum Analyzer (18-40GHz)	1m	- SF102-21105

Notes: HP: Hewlett Packard, R&S: Rohde & Schwarz

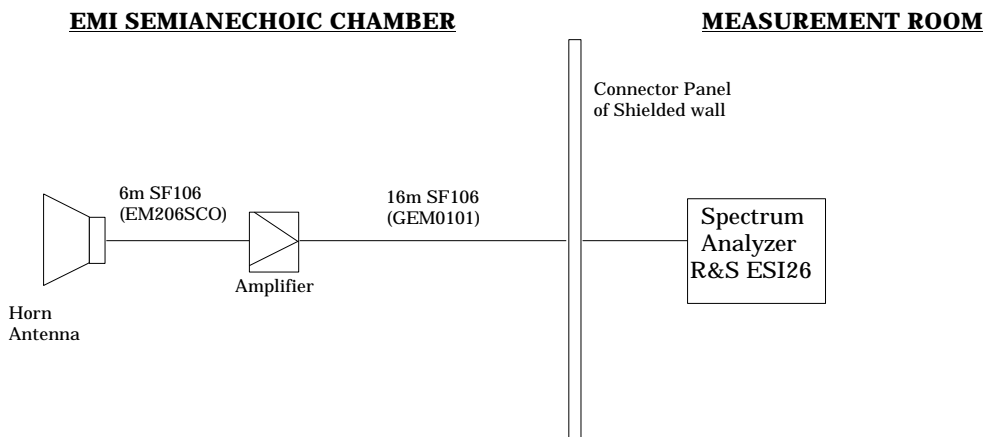


Figure 2-1. Cables for Radiated Emission Test (1 – 12.4 GHz)

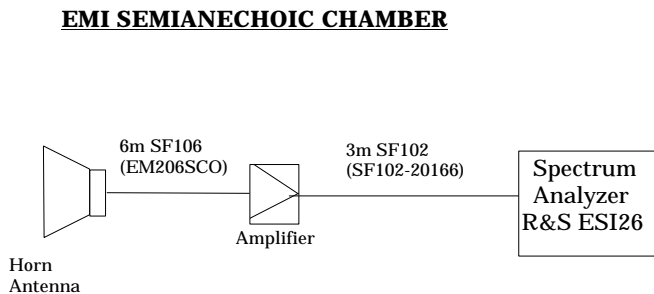


Figure 2-2. Cables for Radiated Emission Test (12.4 - 18GHz)

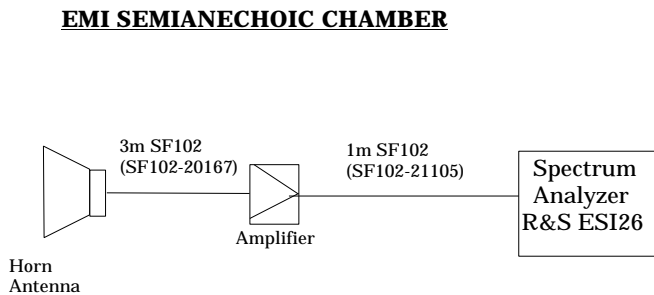


Figure 2-3. Cables for Radiated Emission Test (18 – 26.5GHz)

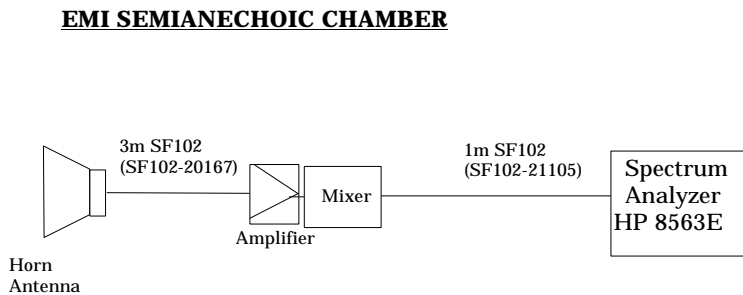


Figure 2-4. Cables for Radiated Emission Test (26.5 - 40GHz)

## 2.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

$$FS = R + AF + CORR - FO$$

where:

FS = Field Strength

R = Measured Spectrum analyzer Input Amplitude

AF = Antenna Factor

CORR = Correction Factor = CL-AG

CL = Cable Loss

AG = Amplifier Gain

FO = Distance Falloff Factor

For example:

Given a Spectrum Analyzer input reading of 51.5 dBμV; Antenna Factor of 8.5 dB/m; Cable Loss of 1.3 dB; Falloff Factor of 0 dB; and an Amplifier Gain of 26 dB. The Field Strength of the measured emission is:

$$FS = 51.5 + 8.5 + 1.3 - 26 - 0.0 = 35.6 \text{ dB}\mu\text{V/m}$$

Conversions between dBμV/m (or dBμV) and μV/m (or μV) are done as :

$$\text{Level(dB}\mu\text{V/m)} = 20 \times \text{Log} (\text{Level}(\mu\text{V/m}))$$

$$40 \text{ dB}\mu\text{V/m} = 100 \mu\text{V/m}$$

$$48 \text{ dB}\mu\text{V/m} = 250 \mu\text{V/m}$$

## 2.4 Limits

**Table 2-2** Limits for EIRP emissions

Limit for emissions in restricted bands <b>FCC 15.205&amp;209 / RSS-210 6.3&amp;7.3</b>	54 dBμV/m (average)	74 dBμV/m (peak)
Limit for emissions in non_restricted bands <b>FCC 15.407(b)(1)&amp;(2) / RSS-210 (q1)(i)&amp;(ii)</b>	EIRP 68.2 dBμV/m ( -27 dBm/MHz )	

## 2.5 Bandedge Measurement plots

The test was performed with the co-located Bluetooth device (FCC ID: ANO20040700HER) in active and transmitting simultaneously.

Test Date: February 23, 2005

**Table 2-3** EUT in “Notebook” operation mode

Ch.	Tx rate (Mb/s)	Frequency (GHz)	Polarity (H/V)	Reading (dBµV) (peak)	Rading (dBµV) (average)	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBµV/m) (peak)	Margin to Limit (dB) (peak)	Field Strength (dBµV/m) (average)	Margin to Limit (dB) (average)
36	6	5.140	H	46.5	33.9	33.6	-26.1	0.0	54.0	20.0	41.4	12.6
	9	5.140	H	45.0	33.9	33.6	-26.1	0.0	52.5	21.5	41.4	12.6
	18	5.140	H	44.8	33.9	33.6	-26.1	0.0	52.3	21.7	41.4	12.6
	24	5.140	H	44.1	33.8	33.6	-26.1	0.0	51.6	22.4	41.3	12.7
	54	5.140	H	45.5	33.7	33.6	-26.1	0.0	53.0	21.0	41.2	12.8
64	6	5.350	H	57.6	39.8	33.9	-25.6	0.0	65.9	8.1	48.1	5.9
	9	5.350	H	58.2	40.2	33.9	-25.6	0.0	66.5	7.5	48.5	5.5
	18	5.350	H	58.0	40.1	33.9	-25.6	0.0	66.3	7.7	48.4	5.6
	24	5.350	H	55.3	39.9	33.9	-25.6	0.0	63.6	10.4	48.2	5.8
	54	5.400	H	50.1	38.4	33.9	-25.6	0.0	58.4	15.6	46.7	7.3

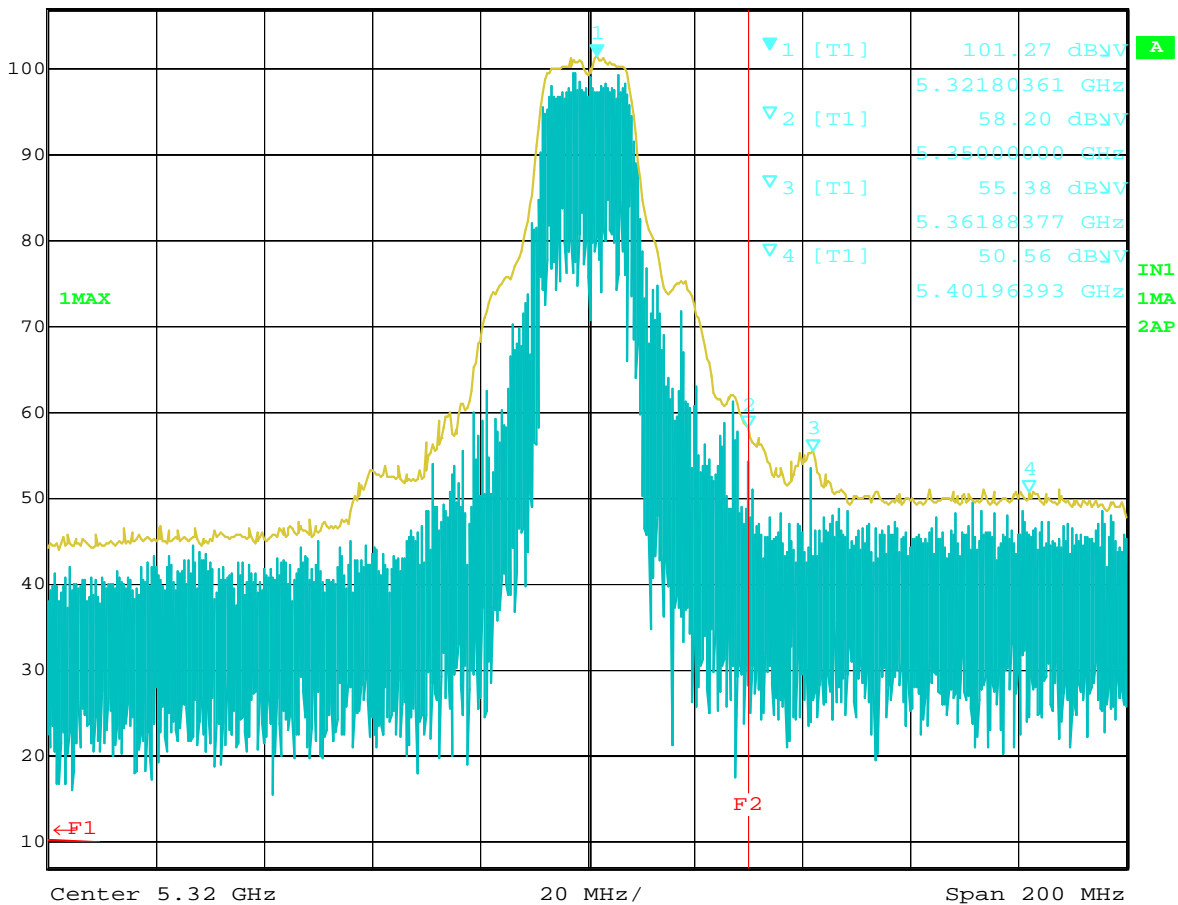
**Table 2-4** EUT in “Tablet” operation mode

Ch.	Tx rate (Mb/s)	Frequency (GHz)	Polarity (H/V)	Reading (dBµV) (peak)	Rading (dBµV) (average)	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBµV/m) (peak)	Margin to Limit (dB) (peak)	Field Strength (dBµV/m) (average)	Margin to Limit (dB) (average)
36	6	5.140	H	42.5	31.6	33.6	-26.1	0.0	50.0	24.0	39.1	14.9
	9	5.140	H	42.7	31.7	33.6	-26.1	0.0	50.2	23.8	39.2	14.8
	18	5.140	H	42.5	31.7	33.6	-26.1	0.0	50.0	24.0	39.2	14.8
	24	5.140	H	42.5	31.8	33.6	-26.1	0.0	50.0	24.0	39.3	14.7
	54	5.140	H	42.1	31.7	33.6	-26.1	0.0	49.6	24.4	39.2	14.8
64	6	5.350	H	53.7	37.6	33.9	-25.6	0.0	62.0	12.0	45.9	8.1
	9	5.350	H	54.1	37.9	33.9	-25.6	0.0	62.4	11.6	46.2	7.8
	18	5.350	H	54.4	37.4	33.9	-25.6	0.0	62.7	11.3	45.7	8.3
	24	5.350	H	53.8	37.1	33.9	-25.6	0.0	62.1	11.9	45.4	8.6
	54	5.400	H	47.7	36.4	33.9	-25.6	0.0	56.0	18.0	44.7	9.3

Note) The traces hereafter are the worst cases in each Table 2-3 or Table 2-4.



	Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
Ref Lvl	101.27 dBμV	VBW	1 MHz		
107 dBμV	5.32180361 GHz	SWT	5 ms	Unit	dBμV

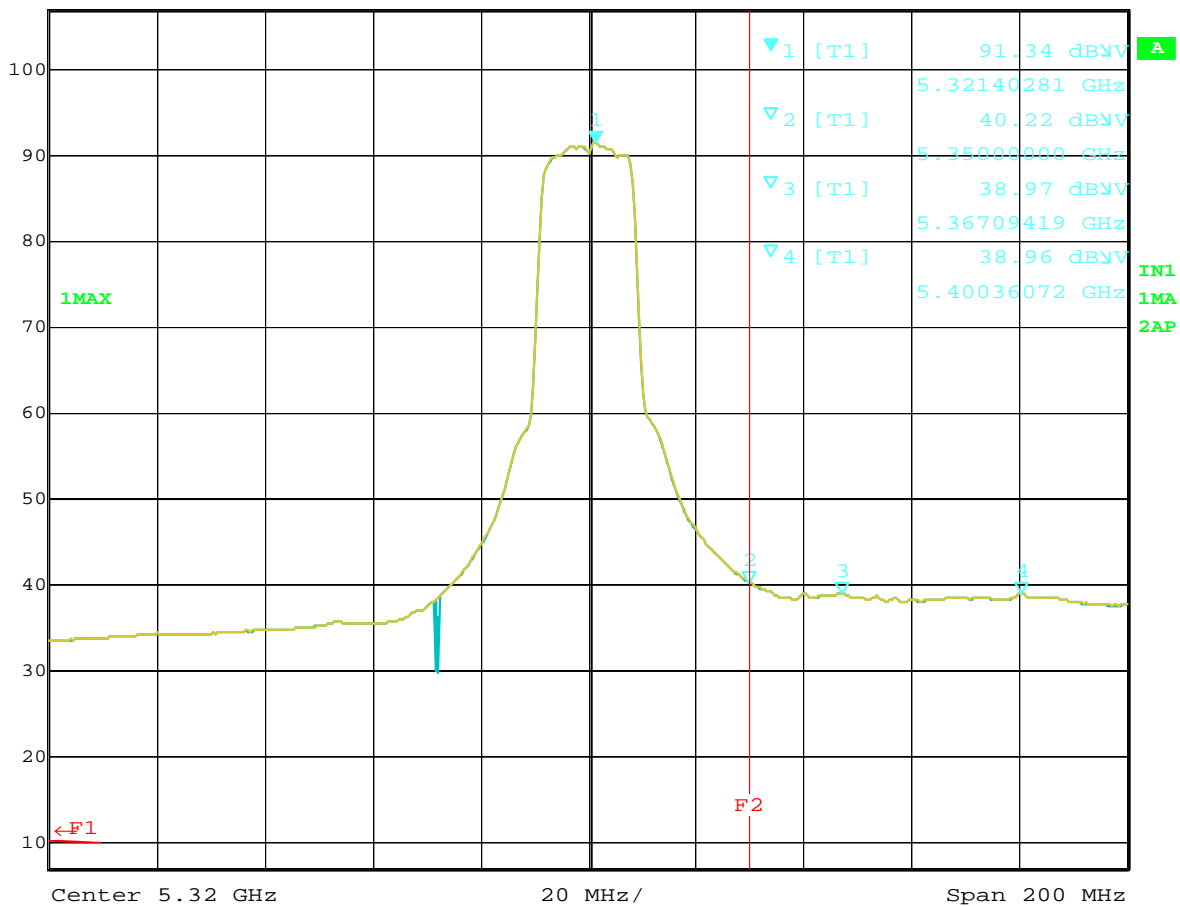


Date: 23.FEB.2005 18:46:14

Plot-2-1 Ch.64 5320MHz TX, OFDM 9Mbps (Peak) in "Notebook" operation mode



Marker 1 [T1] RBW 1 MHz RF Att 10 dB  
 Ref Lvl 91.34 dBμV VBW 10 Hz  
 107 dBμV 5.32140281 GHz SWT 50 s Unit dBμV

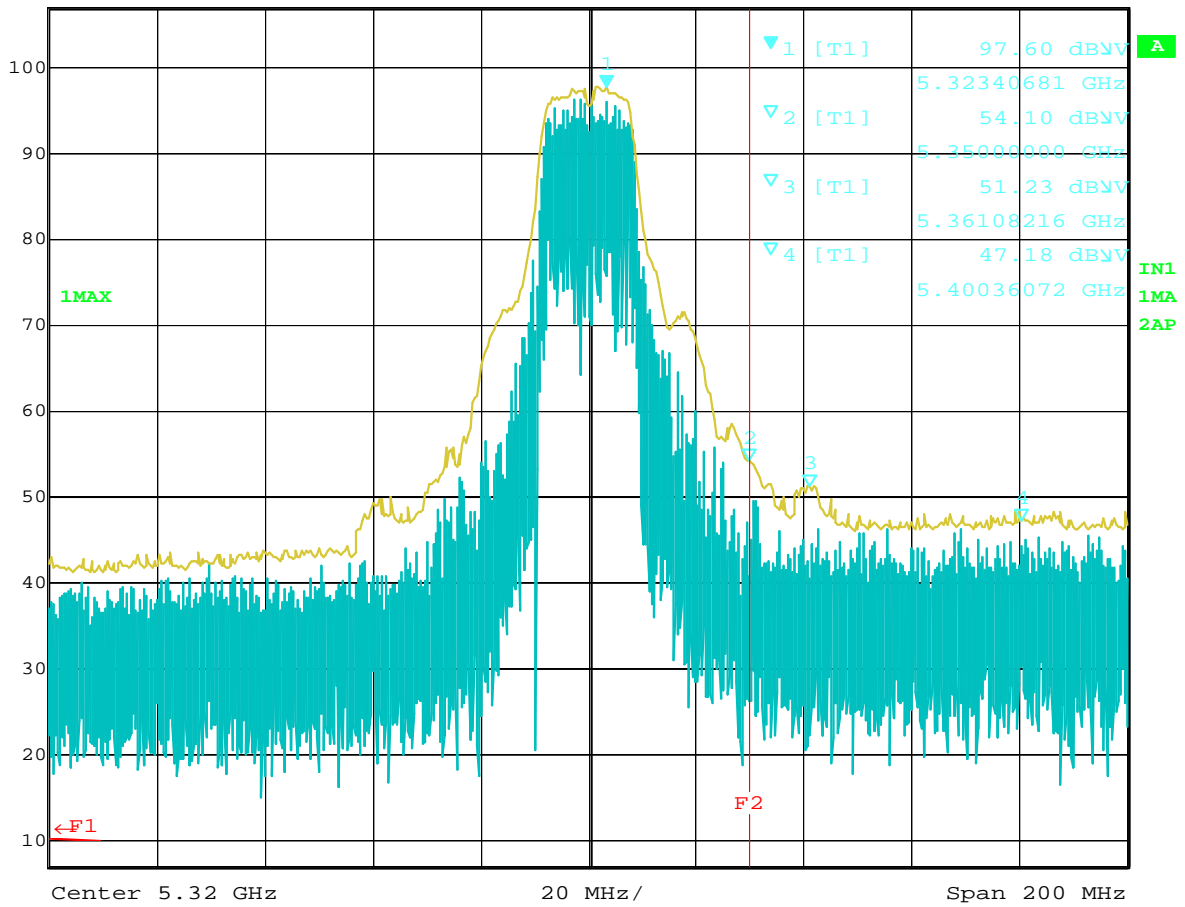


Date: 23.FEB.2005 18:48:19

Plot-2-2 Ch.64 5320MHz TX, OFDM 9Mbps (Average) in "Notebook" operation mode



Marker 1 [T1] RBW 1 MHz RF Att 10 dB  
 Ref Lvl 97.60 dBμV VBW 1 MHz  
 107 dBμV 5.32340681 GHz SWT 5 ms Unit dBμV

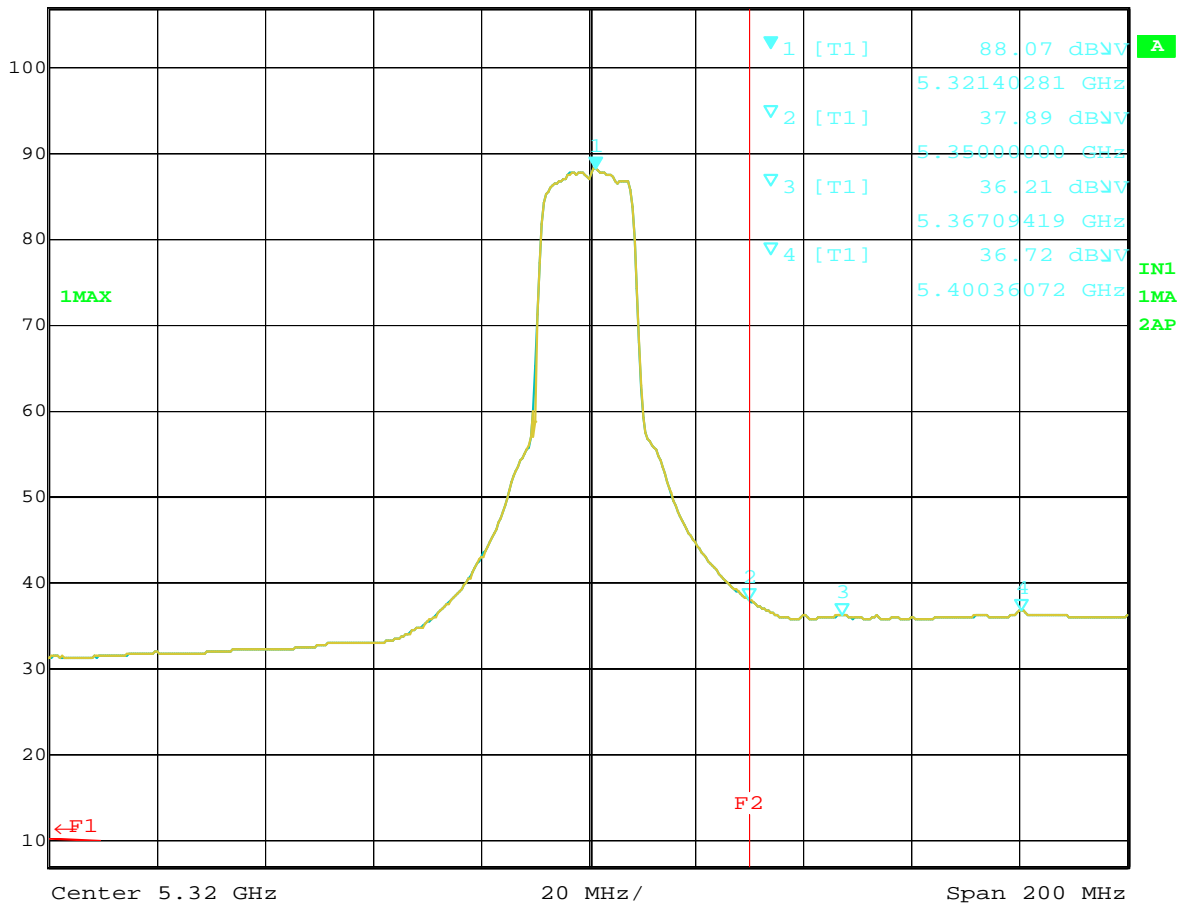


Plot-2-3 Ch.64 5320MHz TX, OFDM 9Mbps (Peak) in "Tablet" operation mode





Marker 1 [T1] RBW 1 MHz RF Att 10 dB  
 Ref Lvl 88.07 dBμV VBW 10 Hz  
 107 dBμV 5.32140281 GHz SWT 50 s Unit dBμV



Date: 23.FEB.2005 20:02:46

Plot-2-4 Ch.64 5320MHz TX, OFDM 9Mbps (Average) in "Tablet" operation mode

## 2.6 Radiated Emission Measurement Results (above 1GHz)

The EUT was found to comply to the limits of FCC Part 15 Subpart E and RSS-210 with a margin of 5.5 dB. The measurement was done for the frequency range of 1 GHz to 40GHz in TX mode and 1 GHz to 25GHz in RX mode.

Test Date: February 23, 24 and 25, 2005

### 2.6.1 EUT in “Notebook” operation mode

The representative worst case in previous Table-2-3 was selected and tested with the co-located Bluetooth device (FCC ID: ANO20040700HER) in active and transmitting simultaneously.

\*Note1: OB means “operation band” (5150-5350MHz); in this case limit is 1W (measured conducted with power meter)

\*Note2: NRB means “non restricted band”: The limit of FCC Part 15.407(b)(1),(2) and RSS-210 6.2.2(q1)(I),(ii) apply.

**Table 2-5** Ch.36 (5180MHz) OFDM 9Mbps TX mode

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field	FCC	Margin to limit (dB)	Field	FCC	Margin to limit (dB)	
		(dBμV) <i>(peak)</i>	(dBμV) <i>(average)</i>				Strength (dBμV/m)	Limit (dBμV/m)		Strength (dBμV/m)	Limit (dBμV/m)		
								<i>(peak)</i>			<i>(average)</i>		
Inband													
5.183	H	97.9	88.1	33.7	-26.1	0.0	105.5	OB*1	-	95.7	OB*1	-	-
bandedge													
5.119	H	44.2	-	33.7	-26.0	0.0	51.9	74.0	22.1	-	54.0	-	-
5.140	H	45.0	-	33.6	-26.1	0.0	52.5	74.0	21.5	-	54.0	-	-
5.150	H	47.7	33.4	33.6	-26.1	0.0	55.2	74.0	18.8	40.9	54.0	13.1	-
1.196	V	53.8	-	25.2	-31.3	0.0	47.7	74.0	26.3	-	54.0	-	-
1.427	V	49.2	-	25.5	-30.7	0.0	44.0	74.0	30.0	-	54.0	-	-
1.481	V	51.2	-	25.3	-30.5	0.0	46.0	74.0	28.0	-	54.0	-	-
1.597	V	57.8	-	25.6	-30.3	0.0	53.1	74.0	20.9	-	54.0	-	-
4.814	V	56.3	27.7	27.1	-26.6	0.0	56.8	74.0	17.2	28.2	54.0	25.8	-
4.856	V	56.6	29.2	27.0	-26.6	0.0	57.0	74.0	17.0	29.6	54.0	24.4	-
4.932	V	60.7	28.7	27.1	-26.4	0.0	61.4	74.0	12.6	29.4	54.0	24.6	-
4.961	V	62.2	28.4	27.1	-26.6	0.0	62.7	74.0	11.3	28.9	54.0	25.1	-
5.369	H	47.4	36.1	33.9	-25.8	0.0	55.5	74.0	18.5	44.2	54.0	9.8	-
5.457	H	48.6	36.5	34.2	-25.7	0.0	57.1	74.0	16.9	45.0	54.0	9.0	-
5.611	H	44.6	-	34.3	-25.5	0.0	53.4	68.2	14.8	-	NRB*2	-	-
6.029	V	39.5	-	29.8	-25.3	0.0	44.0	68.2	24.2	-	NRB*2	-	-
6.906	V	50.2	-	29.9	-24.9	0.0	55.2	68.2	13.0	-	NRB*2	-	-
7.291	V	39.1	-	29.9	-24.4	0.0	44.6	74.0	29.4	-	54.0	-	-

**Table 2-6** Ch.52 (5260MHz) OFDM 9Mbps **TX** mode

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field	FCC	Margin to limit (dB)	Field	FCC	Margin to limit (dB)
		(dBμV) <i>(peak)</i>	(dBμV) <i>(average)</i>				Strength (dBμV/m)	Limit (dBμV/m)		Strength (dBμV/m)	Limit (dBμV/m)	
							<i>(peak)</i>			<i>(average)</i>		
Inband												
5.262	H	101.5	91.6	33.7	-26.0	0.0	109.2	OB*1	-	99.3	OB*1	-
bandedge												
5.150	H	42.6	-	33.6	-26.1	0.0	50.1	74.0	23.9	-	54.0	-
5.360	H	49.0	36.9	33.9	-25.6	0.0	57.3	74.0	16.7	45.2	54.0	8.8
5.387	H	49.4	37.1	33.9	-25.8	0.0	57.5	74.0	16.5	45.2	54.0	8.8
1.196	V	52.7	-	25.2	-31.3	0.0	46.6	74.0	27.4	-	54.0	-
1.397	V	50.6	-	25.8	-30.7	0.0	45.7	74.0	28.3	-	54.0	-
1.487	V	49.6	-	25.3	-30.5	0.0	44.4	74.0	29.6	-	54.0	-
1.595	V	57.5	-	25.6	-30.3	0.0	52.8	74.0	21.2	-	54.0	-
4.806	V	56.3	27.8	27.1	-26.7	0.0	56.7	74.0	17.3	28.2	54.0	25.8
4.898	V	58.9	30.2	27.0	-26.6	0.0	59.3	74.0	14.7	30.6	54.0	23.4
4.948	V	61.2	29.7	27.1	-26.4	0.0	61.9	74.0	12.1	30.4	54.0	23.6
4.959	V	62.0	29.1	27.1	-26.6	0.0	62.5	74.0	11.5	29.6	54.0	24.4
5.415	H	48.8	36.5	34.1	-25.6	0.0	57.3	74.0	16.7	45.0	54.0	9.0
5.465	H	47.5	-	34.3	-25.7	0.0	56.1	68.2	12.1	-	NRB*2	-
5.559	H	45.0	-	34.3	-25.7	0.0	53.6	68.2	14.6	-	NRB*2	-
6.009	H	39.0	-	29.8	-25.3	0.0	43.5	68.2	24.7	-	NRB*2	-
7.014	V	43.6	-	30.0	-24.5	0.0	49.1	68.2	19.1	-	NRB*2	-
7.251	V	39.9	-	30.0	-24.5	0.0	45.4	74.0	28.6	-	54.0	-

**Table 2-7** Ch.64 (5320MHz) OFDM 9Mbps **TX** mode

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field	FCC	Margin to limit (dB)	Field	FCC	Margin to limit (dB)
		(dBμV) <i>(peak)</i>	(dBμV) <i>(average)</i>				Strength (dBμV/m)	Limit (dBμV/m)		Strength (dBμV/m)	Limit (dBμV/m)	
							<i>(peak)</i>			<i>(average)</i>		
Inband												
5.322	H	101.3	91.3	33.7	-25.7	0.0	109.3	OB*1	-	99.3	OB*1	-
bandedge												
5.350	H	58.2	40.2	33.9	-25.6	0.0	66.5	74.0	7.5	48.5	54.0	5.5
5.362	H	55.4	39.0	33.9	-25.6	0.0	63.7	74.0	10.3	47.3	54.0	6.7
5.402	H	50.6	39.0	33.9	-25.6	0.0	58.9	74.0	15.1	47.3	54.0	6.7
1.196	V	52.8	-	25.2	-31.3	0.0	46.7	74.0	27.3	-	54.0	-
1.347	V	43.9	-	25.2	-30.9	0.0	38.2	74.0	35.8	-	54.0	-
1.485	V	48.4	-	25.3	-30.5	0.0	43.2	74.0	30.8	-	54.0	-
1.595	V	57.4	-	25.6	-30.3	0.0	52.7	74.0	21.3	-	54.0	-
4.820	V	57.1	28.0	27.1	-26.6	0.0	57.6	74.0	16.4	28.5	54.0	25.5
4.892	V	57.8	30.0	27.0	-26.6	0.0	58.2	74.0	15.8	30.4	54.0	23.6
4.942	V	61.4	29.0	27.1	-26.4	0.0	62.1	74.0	11.9	29.7	54.0	24.3
4.953	V	61.8	28.7	27.1	-26.6	0.0	62.3	74.0	11.7	29.2	54.0	24.8
5.431	H	48.7	37.1	34.1	-25.6	0.0	57.2	74.0	16.8	45.6	54.0	8.4
5.473	H	46.9	-	34.3	-25.7	0.0	55.5	68.2	12.7	-	NRB*2	-
5.537	H	45.6	-	34.3	-25.6	0.0	54.3	68.2	13.9	-	NRB*2	-
6.020	H	39.7	-	29.8	-25.3	0.0	44.2	68.2	24.0	-	NRB*2	-
7.094	V	41.5	-	30.0	-24.8	0.0	46.7	68.2	21.5	-	NRB*2	-
7.271	V	40.3	-	29.9	-24.6	0.0	45.6	74.0	28.4	-	54.0	-

**Table 2-8** Ch.52 (5260MHz) OFDM **RX** mode

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field	FCC	Margin to limit (dB)	Field	FCC	Margin to limit (dB)
		(dBμV) <i>(peak)</i>	(dBμV) <i>(average)</i>				Strength (dBμV/m)	Limit (dBμV/m)		Strength (dBμV/m)	Limit (dBμV/m)	
							<i>(peak)</i>			<i>(average)</i>		
1.050	V	49.5	-	24.6	-31.7	0.0	42.4	74.0	31.6	-	54.0	-
1.198	V	55.0	-	25.2	-31.3	0.0	48.9	74.0	25.1	-	54.0	-
1.495	V	45.3	-	25.5	-30.5	0.0	40.3	74.0	33.7	-	54.0	-
1.597	V	58.0	-	25.6	-30.3	0.0	53.3	74.0	20.7	-	54.0	-

### 2.6.2 EUT in “Tablet” operation mode

The representative worst case in previous Table-2-4 was selected and tested with the co-located Bluetooth device (FCC ID: ANO20040700HER) in active and transmitting simultaneously.

\*Note1: OB means “operation band” (5150-5350MHz); in this case limit is 1W (measured conducted with power meter)

\*Note2: NRB means “non restricted band”: The limit of FCC Part 15.407(b)(1),(2) and RSS-210 6.2.2(q1)(I),(ii) apply.

**Table 2-9** Ch.36 (5180MHz) OFDM 9Mbps **TX** mode

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field	FCC	Margin to limit (dB)	Field	FCC	Margin to limit (dB)
		(dBμV) <i>(peak)</i>	(dBμV) <i>(average)</i>				Strength (dBμV/m)	Limit (dBμV/m)		Strength (dBμV/m)	Limit (dBμV/m)	
							<i>(peak)</i>			<i>(average)</i>		
Inband												
5.182	H	93.8	83.8	33.7	-26.1	0.0	101.4	OB*1	-	91.4	OB*1	-
bandedge												
5.120	H	41.6	-	33.7	-26.0	0.0	49.3	74.0	24.7	-	54.0	-
5.139	H	42.7	-	33.6	-26.1	0.0	50.2	74.0	23.8	-	54.0	-
5.150	H	46.2	-	33.6	-26.1	0.0	53.7	74.0	20.3	-	54.0	-
1.028	V	49.9	-	24.3	-31.9	0.0	42.3	74.0	31.7	-	54.0	-
1.196	V	56.7	-	25.2	-31.3	0.0	50.6	74.0	23.4	-	54.0	-
1.481	V	47.7	-	25.3	-30.5	0.0	42.5	74.0	31.5	-	54.0	-
1.593	V	59.4	34.1	25.6	-30.3	0.0	54.7	74.0	19.3	29.4	54.0	24.6
4.806	H	50.5	-	27.1	-26.7	0.0	50.9	74.0	23.1	-	54.0	-
4.890	H	49.8	-	27.0	-26.6	0.0	50.2	74.0	23.8	-	54.0	-
4.942	H	55.4	28.5	27.1	-26.4	0.0	56.1	74.0	17.9	29.2	54.0	24.8
4.961	H	54.3	28.2	27.1	-26.6	0.0	54.8	74.0	19.2	28.7	54.0	25.3
5.411	V	45.5	-	33.9	-25.6	0.0	53.8	74.0	20.2	-	54.0	-
5.507	V	45.6	-	34.3	-25.6	0.0	54.3	68.2	13.9	-	NRB*2	-
5.635	V	43.7	-	34.3	-25.1	0.0	52.9	68.2	15.3	-	NRB*2	-
6.049	V	38.8	-	29.8	-25.3	0.0	43.3	68.2	24.9	-	NRB*2	-
6.906	V	47.3	-	29.9	-24.9	0.0	52.3	68.2	15.9	-	NRB*2	-
7.238	V	38.5	-	29.9	-24.4	0.0	44.0	68.2	24.2	-	NRB*2	-

**Table 2-10** Ch.52 (5260MHz) OFDM 9Mbps **TX** mode

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field	FCC	Margin to limit (dB)	Field	FCC	Margin to limit (dB)
		(dBµV) <i>(peak)</i>	(dBµV) <i>(average)</i>				Strength (dBµV/m)	Limit (dBµV/m)		Strength (dBµV/m)	Limit (dBµV/m)	
							<i>(peak)</i>			<i>(average)</i>		
Inband												
5.263	H	97.8	88.1	33.7	-26.0	0.0	105.5	OB*1	-	95.8	OB*1	-
bandedge												
5.150	H	41.7	-	33.6	-26.1	0.0	49.2	74.0	24.8	-	54.0	-
5.360	H	46.0	34.8	33.9	-25.6	0.0	54.3	74.0	19.7	43.1	54.0	10.9
5.387	H	46.3	35.3	33.9	-25.8	0.0	54.4	74.0	19.6	43.4	54.0	10.6
1.198	V	55.5	-	25.2	-31.3	0.0	49.4	74.0	24.6	-	54.0	-
1.365	V	46.8	-	25.2	-30.9	0.0	41.1	74.0	32.9	-	54.0	-
1.495	V	47.7	-	25.5	-30.5	0.0	42.7	74.0	31.3	-	54.0	-
1.595	V	59.7	34.9	25.6	-30.3	0.0	55.0	74.0	19.0	30.2	54.0	23.8
4.806	H	48.4	-	27.1	-26.7	0.0	48.8	74.0	25.2	-	54.0	-
4.880	H	50.7	-	27.0	-26.6	0.0	51.1	74.0	22.9	-	54.0	-
4.938	H	55.3	28.6	27.1	-26.4	0.0	56.0	74.0	18.0	29.3	54.0	24.7
4.957	H	55.3	28.3	27.1	-26.6	0.0	55.8	74.0	18.2	28.8	54.0	25.2
5.467	V	45.3	-	34.3	-25.7	0.0	53.9	68.2	14.3	-	NRB*2	-
5.477	V	45.8	-	34.3	-25.7	0.0	54.4	68.2	13.8	-	NRB*2	-
5.661	V	42.2	-	34.2	-25.5	0.0	50.9	68.2	17.3	-	NRB*2	-
6.024	V	38.4	-	29.8	-25.3	0.0	42.9	68.2	25.3	-	NRB*2	-
7.014	V	42.1	-	30.0	-24.5	0.0	47.6	68.2	20.6	-	NRB*2	-
7.271	V	37.9	-	29.9	-24.6	0.0	43.2	74.0	30.8	-	54.0	-

**Table 2-11** Ch.64 (5320MHz) OFDM 9Mbps **TX** mode

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field	FCC	Margin to limit (dB)	Field	FCC	Margin to limit (dB)
		(dBµV) <i>(peak)</i>	(dBµV) <i>(average)</i>				Strength (dBµV/m)	Limit (dBµV/m)		Strength (dBµV/m)	Limit (dBµV/m)	
							<i>(peak)</i>			<i>(average)</i>		
Inband												
5.323	H	97.6	88.1	33.7	-25.7	0.0	105.6	OB*1	-	96.1	OB*1	-
bandedge												
5.350	H	54.1	37.9	33.9	-25.6	0.0	62.4	74.0	11.6	46.2	54.0	7.8
5.361	H	51.2	36.2	33.9	-25.6	0.0	59.5	74.0	14.5	44.5	54.0	9.5
5.400	H	47.2	36.7	33.9	-25.6	0.0	55.5	74.0	18.5	45.0	54.0	9.0
1.024	V	51.5	-	24.3	-31.9	0.0	43.9	74.0	30.1	-	54.0	-
1.198	V	53.3	-	25.2	-31.3	0.0	47.2	74.0	26.8	-	54.0	-
1.483	V	52.0	-	25.3	-30.5	0.0	46.8	74.0	27.2	-	54.0	-
1.595	V	57.0	-	25.6	-30.3	0.0	52.3	74.0	21.7	-	54.0	-
4.826	H	49.6	-	27.1	-26.6	0.0	50.1	74.0	23.9	-	54.0	-
4.906	H	52.1	-	27.0	-26.6	0.0	52.5	74.0	21.5	-	54.0	-
4.948	H	55.5	28.0	27.1	-26.4	0.0	56.2	74.0	17.8	28.7	54.0	25.3
4.961	H	56.1	27.8	27.1	-26.6	0.0	56.6	74.0	17.4	28.3	54.0	25.7
5.411	H	45.7	33.5	33.9	-25.6	0.0	54.0	74.0	20.0	41.8	54.0	12.2
5.443	H	45.6	34.1	34.2	-25.7	0.0	54.1	74.0	19.9	42.6	54.0	11.4
5.513	H	43.8	-	34.3	-25.6	0.0	52.5	68.2	15.7	-	NRB*2	-
6.009	V	38.3	-	29.8	-25.3	0.0	42.8	68.2	25.4	-	NRB*2	-
6.946	V	37.5	-	29.9	-24.6	0.0	42.8	68.2	25.4	-	NRB*2	-
7.094	V	40.0	-	30.0	-24.8	0.0	45.2	68.2	23.0	-	NRB*2	-

**Table 2-12** Ch.52 (5260MHz) OFDM **RX** mode

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field	FCC	Margin to limit (dB)	Field	FCC	Margin to limit (dB)
		(dBμV) <i>(peak)</i>	(dBμV) <i>(average)</i>				Strength (dBμV/m)	Limit (dBμV/m)		Strength (dBμV/m)	Limit (dBμV/m)	
							<i>(peak)</i>			<i>(average)</i>		
1.048	V	49.0	-	24.6	-31.7	0.0	41.9	74.0	32.1	-	54.0	-
1.198	V	55.6	-	25.2	-31.3	0.0	49.5	74.0	24.5	-	54.0	-
1.505	V	46.5	-	25.5	-30.5	0.0	41.5	74.0	32.5	-	54.0	-
1.597	V	58.4	-	25.6	-30.3	0.0	53.7	74.0	20.3	-	54.0	-

### 3. Restricted Bands Radiation (30MHz – 1GHz)

[ FCC 15.205&209 / 15.407(b)(1),(2),(5),(6) ]  
 [ RSS-210 6.2.1 / 6.2.2(q1)(i),(ii),(v) / 6.3 / 7.3 ]

#### 3.1 Test Procedure

Preliminary radiated emissions are measured in the semi-anechoic chamber at a 3 meter distance on every azimuth in both horizontal and vertical polarity. The antennas are also scanned in height. The emissions are recorded with a spectrum analyzer in peak hold mode. The identified emissions are further maximized by a cable manipulation. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120kHz. The highest emissions relative to the limit are listed.

#### 3.2 Test Instruments and Measurement Setup

**Table 3-1** Radiated Emission Test Instrumentation

Description	Model	Serial Number
Computer	IBM 6868-30J	97-901X3
Spectrum Analyzer (100Hz-1.5GHz) for 30-200MHz	HP 85680B	2732A03651
Spectrum Analyzer Display for 30-200MHz	HP 85662A	2648A15255
Quasi-Peak Adapter for 30-200MHz	HP 85650A	2521A00968
Spectrum Analyzer (100Hz-1.5GHz) for 200-1000MHz	HP 85680B	2841A04254
Spectrum Analyzer Display for 200-1000MHz	HP 85662A	2816A16831
Quasi-Peak Adapter for 200-1000MHz	HP 85650A	2811A01156
Amplifier (100KHz-1.3GHz)		
- for 30-200MHz	MITEQ AM-3A	898433
- for 200-1000MHz	MITEQ AM-3A	898432
Biconical Antenna (30-200MHz)	EMCO 3108	2536
Log-Periodic Antenna (200-1000MHz)	EMCO 3146	2849
Receiver (20MHz-1.3GHz)	R&S ESVP	892111/026
Switch/control unit	HP 3488A	2719A17226
N-Coax cables:	Length:	
- Bi-coni Ant <=> 10m Cable	9 m	- EM103L01
- 10m Cable <=> Shield Panel	10 m	- EM103L02
- Shield Panel <=> RF Amp	7 m	- EM103L03
- RF Amp <=> Power Splitter	0.5m	- EM103L04
- Log-peri Ant <=> 10m Cable	9 m	- EM103H01
- 10m Cable <=> Shield Panel	10 m	- EM103H02
- Shield Panel <=> RF Amp	7 m	- EM103H03
- RF Amp <=> Power Splitter	0.5m	- EM103H04
Coax cables:		
- Power Splitter <=> SW/Con.unit (SW110)	1 m	- EM103L05
- Power Splitter <=> SW/Con.unit (SW300)	1 m	- EM103L06
- Power Splitter <=> SW/Con.unit (SW100)	1 m	- EM103H05
- Power Splitter <=> SW/Con.unit (SW301)	1 m	- EM103H06
- SW/Con.unit <=> Receiver (Input)	2 m	- EM1RCV
- SW/Con.unit <=> Spe Ana.(Signal In) for 30- 200MHz	2 m	- EM1SPL
- SW/Con.unit <=> Spe Ana.(Signal In) for 200-1000MHz	2 m	- EM1SPH

Notes: HP: Hewlett Packard, R&S: Rohde & Schwarz

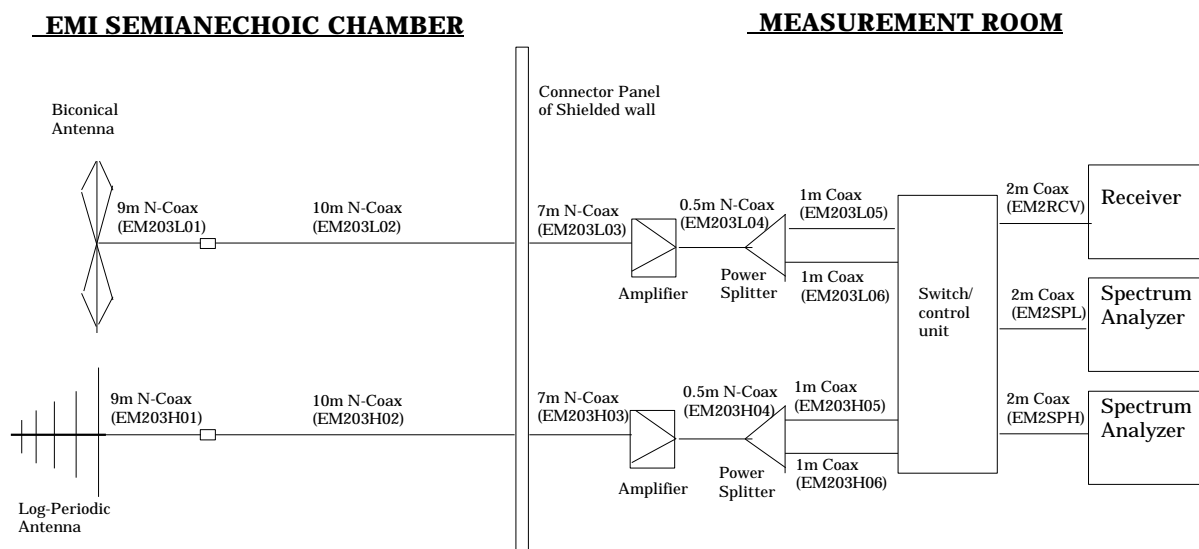


Figure 3 Cables for Radiated Emission Test

### 3.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver. All factors are included in the reported data.

$$FS = R + AF + CORR$$

where:

- FS = Field Strength
- R = Measured Receiver Input Amplitude
- AF = Antenna Factor
- CORR = Correction Factor = CL - AG
- CL = Cable Loss
- AG = Amplifier Gain

For example:  
 Given a Receiver input reading of 51.5dBμV; Antenna Factor of 8.5dB/m; Cable Loss of 1.3dB; and an Amplifier Gain of 26dB. The Field Strength of the measured emission is:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 = 35.3dB\mu V/m$$

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

$$Level(dB\mu V/m) = 20 \times \text{Log}( Level(\mu V/m) )$$

$$40dB\mu V/m = 100\mu V/m$$

$$48dB\mu V/m = 250\mu V/m$$



### 3.4 Measurement Results

The same worst cases selected for the previous Chapter 2 were tested with the co-located Bluetooth device (FCC ID: ANO20040700HER) in active and transmitting simultaneously.

The EUT was found to comply to the limits of FCC Part 15 Subpart E and RSS-210 with a margin of 7.4dB at 30MHz - 1000MHz band.

The 6 highest emissions relative to the limits are reported.

Test Date: March 1, 2005

#### 3.4.1 EUT in “Notebook” operation mode

**Table 3-2** Ch.36 (5180MHz) OFDM 9Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin to limit (dB)	Field Strength (μV/m)	Limit (μV/m)
61.440	V	52.0	9.1	-28.5	32.6	40.0	7.4	42.7	100
173.999	H	41.3	12.6	-26.9	27.0	43.5	16.5	22.4	150
226.884	H	40.8	10.5	-24.5	26.8	46.0	19.2	21.9	200
257.999	H	39.2	12.0	-23.9	27.3	46.0	18.7	23.2	200
270.000	H	38.5	12.5	-23.9	27.1	46.0	18.9	22.6	200
798.390	H	33.4	21.1	-18.4	36.1	46.0	9.9	63.8	200

**Table 3-3** Ch.52 (5260MHz) OFDM 9Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin to limit (dB)	Field Strength (μV/m)	Limit (μV/m)
61.691	V	51.6	9.1	-28.6	32.1	40.0	7.9	40.3	100
174.000	H	41.2	12.6	-26.9	26.9	43.5	16.6	22.1	150
226.885	H	41.5	10.5	-24.5	27.5	46.0	18.5	23.7	200
258.000	H	41.0	12.0	-23.9	29.1	46.0	16.9	28.5	200
509.992	V	29.4	18.6	-20.5	27.5	46.0	18.5	23.7	200
797.763	V	29.4	21.1	-18.4	32.1	46.0	13.9	40.3	200

**Table 3-4** Ch.64 (5320MHz) OFDM 9Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin to limit (dB)	Field Strength (μV/m)	Limit (μV/m)
61.925	V	51.5	9.1	-28.5	32.1	40.0	7.9	40.3	100
174.000	H	40.9	12.6	-26.9	26.6	43.5	16.9	21.4	150
226.885	H	41.5	10.5	-24.5	27.5	46.0	18.5	23.7	200
257.999	H	41.1	12.0	-23.9	29.2	46.0	16.8	28.8	200
269.999	V	41.5	12.5	-23.9	30.1	46.0	15.9	32.0	200
797.753	H	33.0	21.1	-18.4	35.7	46.0	10.3	61.0	200

**Table 3-5** Ch.52 (5260MHz) OFDM **RX** mode

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin to limit (dB)	Field Strength (μV/m)	Limit (μV/m)
61.724	V	49.8	9.1	-28.6	30.3	40.0	9.7	32.7	100
173.999	H	41.1	12.6	-26.9	26.8	43.5	16.7	21.9	150
257.999	H	41.7	12.0	-23.9	29.8	46.0	16.2	30.9	200
269.999	V	41.7	12.5	-23.9	30.3	46.0	15.7	32.7	200
356.816	V	36.9	14.4	-22.3	29.0	46.0	17.0	28.2	200
798.050	H	33.3	21.1	-18.4	36.0	46.0	10.0	63.1	200

### 3.4.2 EUT in “Tablet” operation mode

**Table 3-6** Ch.36 (5180MHz) OFDM 9Mbps **TX** mode

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin to limit (dB)	Field Strength (μV/m)	Limit (μV/m)
62.018	V	51.8	9.1	-28.6	32.3	40.0	7.7	41.2	100
167.999	V	40.9	12.4	-27.1	26.2	43.5	17.3	20.4	150
343.694	V	33.0	14.3	-22.7	24.6	46.0	21.4	17.0	200
599.997	H	29.6	18.7	-19.8	28.5	46.0	17.5	26.6	200
631.947	H	26.7	19.1	-19.4	26.4	46.0	19.6	20.9	200
797.955	H	29.7	21.1	-18.4	32.4	46.0	13.6	41.7	200

**Table 3-7** Ch.52 (5260MHz) OFDM 9Mbps **TX** mode

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin to limit (dB)	Field Strength (μV/m)	Limit (μV/m)
61.881	V	51.7	9.1	-28.5	32.3	40.0	7.7	41.2	100
167.999	V	41.2	12.4	-27.1	26.5	43.5	17.0	21.1	150
499.331	H	27.0	17.8	-20.9	23.9	46.0	22.1	15.7	200
565.299	V	26.0	18.2	-20.1	24.1	46.0	21.9	16.0	200
631.559	H	26.6	19.1	-19.4	26.3	46.0	19.7	20.7	200
798.424	H	30.9	21.1	-18.5	33.5	46.0	12.5	47.3	200

**Table 3-8** Ch.64 (5320MHz) OFDM 9Mbps **TX** mode

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin to limit (dB)	Field Strength (μV/m)	Limit (μV/m)
61.547	V	51.9	9.1	-28.6	32.4	40.0	7.6	41.7	100
167.999	V	40.8	12.4	-27.1	26.1	43.5	17.4	20.2	150
499.312	H	28.7	17.8	-20.9	25.6	46.0	20.4	19.1	200
564.820	V	26.6	18.2	-20.1	24.7	46.0	21.3	17.2	200
631.653	V	26.1	19.1	-19.4	25.8	46.0	20.2	19.5	200
797.477	H	30.6	21.1	-18.7	33.0	46.0	13.0	44.7	200

**Table 3-9** Ch.64 (5320MHz) OFDM **RX** mode

Frequency (MHz)	Polarity (H/V)	Measured (dBμV)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin to limit (dB)	Field Strength (μV/m)	Limit (μV/m)
61.552	V	50.9	9.1	-28.6	31.4	40.0	8.6	37.2	100
167.999	V	39.3	12.4	-27.1	24.6	43.5	18.9	17.0	150
499.063	H	28.6	17.8	-20.8	25.6	46.0	20.4	19.1	200
599.998	H	30.9	18.7	-19.8	29.8	46.0	16.2	30.9	200
631.724	V	27.3	19.1	-19.4	27.0	46.0	19.0	22.4	200
798.234	H	31.3	21.1	-18.4	34.0	46.0	12.0	50.1	200

## 4. AC Wireline Conducted Emissions (150KHz – 30MHz)

[ FCC 15.207/ 15.407(b)(5) ]  
 [ RSS-210 6.2.2(q1)(v) / 6.6 / 7.4 ]

### 4.1 Test Procedure

The conducted emissions are measured in the IBM shielded room with a spectrum analyzer in peak hold. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

### 4.2 Test Instruments and Measurement Setup

**Table 4-1.** Conducted Emission Test Instrumentation

Description	Model	Serial Number
Computer	IBM 6589-13J	97-15613
Spectrum Analyzer (100Hz-1.5GHz)	HP 85680B	3019A05156
Spectrum Analyzer Display	HP 85662A	3026A19366
Quasi-Peak Adapter	HP 85650A	2811A01433
Receiver (9kHz-30MHz)	R&S ESH3	891806/012
LISN	EMCO 3810/2NM	00022007
Switch/control unit	HP 3488A	2719A17228
Plotter	HP 7550A	2631A33619
Coax cables: - Lisen-L <=> SW/Con.unit (SW100) - Lisen-N <=> SW/Con.unit (SW101) - SW/Con.unit <=> RCVR (Input) - SW/Con.unit<=> Spe Ana.(Signal In)	Length: 4 m 4 m 1 m 1 m	- EMIC-L - EMIC-N - EMIC-R - EMIC-S

Notes: - HP: Hewlett Packard, R&S: Rohde & Schwarz

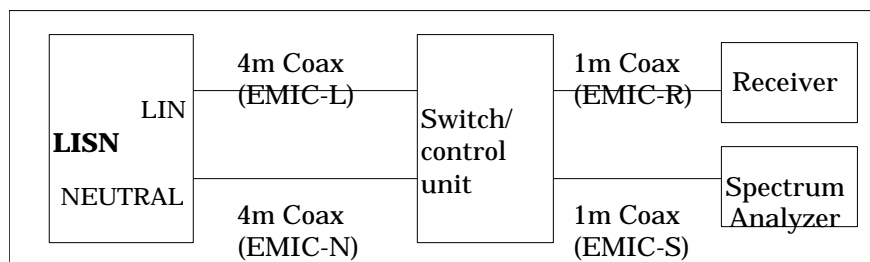


Figure 4. Cables for Conducted Emission Test

### 4.3 Powerline Voltage Calculation

The powerline voltage is calculated by adding insertion losses of LISN, Cable, Switch control unit and Pulse limiter to the measured reading. All factors are included in the reported data.

$$PV = R + CORR$$

where:

$$PV = \text{Powerline Voltage (dB}\mu\text{V)}$$

$$R = \text{Measured Receiver Input Amplitude (dB}\mu\text{V)}$$

$$CORR = \text{Correction Factor (dB) = LL+CL+SWL+PLL}$$

$$LL = \text{Insertion loss of LISN (dB)}$$

$$CL = \text{Insertion loss of Cable (dB)}$$

$$SWL = \text{Insertion loss of Switch control unit (dB)}$$

$$PLL = \text{Insertion loss of Pulse Limiter (dB)}$$

Given a Receiver input reading of 50.0 dB $\mu$ V, LISN loss of 0.6 dB, Cable loss of 0.1dB, Switch control unit loss of 0.1dB and Pulse limiter loss of 0.2dB. The Powerline Voltage of the measured emission is:

$$CORR = 0.6 + 0.1 + 0.1 + 0.2 = 1.0 \text{ (dB)}$$

$$PV = 50.0 + 1.0 = 51.0 \text{ (dB}\mu\text{V)}$$

## 4.4 Measurement Results

The same worst cases selected for the previous Chapter 2 were tested with the co-located Bluetooth device (FCC ID: ANO20040700HER) in active and transmitting simultaneously.

The EUT was found to comply to the limits of FCC Part 15 Subpart E and RSS-210 with a margin of 13.9dB. The 6 highest emissions relative to the limits are reported.

Test Date: February 28, 2005

### 4.4.1 EUT in “Notebook” operation mode

**Table 4-2** Ch.36 (5180MHz) OFDM 9Mbps TX mode

Frq. (MHz)	QP			AV			CISPR22 QP Limit (dBµV)	Margin to limit (dB)	CISPR22 AV Limit (dBµV)	Margin to limit (dB)	Phase
	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)					
0.1930	47.8	0.5	48.3	39.4	0.5	39.9	63.9	15.6	53.9	14.0	Line
0.2562	39.1	0.6	39.7	31.8	0.6	32.4	61.6	21.9	51.6	19.2	Neutral
0.3191	34.5	0.6	35.1	27.0	0.6	27.6	59.7	24.6	49.7	22.1	Neutral
0.4449	34.1	0.6	34.7	32.0	0.6	32.6	57.0	22.3	47.0	14.4	Neutral
0.5066	31.2	0.6	31.8	28.8	0.6	29.4	56.0	24.2	46.0	16.6	Neutral
0.5702	32.2	0.6	32.8	29.8	0.6	30.4	56.0	23.2	46.0	15.6	Neutral

**Table 4-3** Ch.52 (5260MHz) OFDM 9Mbps TX mode

Frq. (MHz)	QP			AV			CISPR22 QP Limit (dBµV)	Margin to limit (dB)	CISPR22 AV Limit (dBµV)	Margin to limit (dB)	Phase
	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)					
0.1929	47.6	0.5	48.1	39.1	0.5	39.6	63.9	15.8	53.9	14.3	Line
0.2580	34.0	0.6	34.6	25.2	0.6	25.8	61.5	26.9	51.5	25.7	Neutral
0.3202	33.1	0.6	33.7	25.5	0.6	26.1	59.7	26.0	49.7	23.6	Neutral
0.4453	34.7	0.6	35.3	31.6	0.6	32.2	57.0	21.7	47.0	14.8	Neutral
0.5080	32.5	0.6	33.1	27.4	0.6	28.0	56.0	22.9	46.0	18.0	Neutral
0.5709	31.0	0.6	31.6	29.4	0.6	30.0	56.0	24.4	46.0	16.0	Neutral

**Table 4-4** Ch.64 (5320MHz) OFDM 9Mbps TX mode

Frq. (MHz)	QP			AV			CISPR22 QP Limit (dBµV)	Margin to limit (dB)	CISPR22 AV Limit (dBµV)	Margin to limit (dB)	Phase
	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)					
0.1930	48.0	0.5	48.5	39.5	0.5	40.0	63.9	15.4	53.9	13.9	Line
0.2582	33.4	0.6	34.0	26.8	0.6	27.4	61.5	27.5	51.5	24.1	Neutral
0.3821	29.1	0.6	29.7	22.5	0.6	23.1	58.2	28.5	48.2	25.1	Neutral
0.4451	33.7	0.6	34.3	31.6	0.6	32.2	57.0	22.7	47.0	14.8	Line
0.5082	30.5	0.6	31.1	26.9	0.6	27.5	56.0	24.9	46.0	18.5	Neutral
0.5706	32.1	0.6	32.7	29.2	0.6	29.8	56.0	23.3	46.0	16.2	Neutral

**Table 4-5** Ch.52 (5260MHz) OFDM **RX** mode

Frq. (MHz)	QP			AV			CISPR22 QP Limit (dBµV)	Margin to limit (dB)	CISPR22 AV Limit (dBµV)	Margin to limit (dB)	Phase
	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)					
0.1951	37.2	0.5	37.7	25.9	0.5	26.4	63.8	26.1	53.8	27.4	Neutral
0.2546	39.4	0.6	40.0	32.6	0.6	33.2	61.6	21.6	51.6	18.4	Neutral
0.4424	31.7	0.6	32.3	27.9	0.6	28.5	57.0	24.7	47.0	18.5	Neutral
0.5041	34.2	0.6	34.8	30.6	0.6	31.2	56.0	21.2	46.0	14.8	Neutral
0.5646	30.7	0.6	31.3	28.2	0.6	28.8	56.0	24.7	46.0	17.2	Neutral
1.9546	26.4	0.7	27.1	24.1	0.7	24.8	56.0	28.9	46.0	21.2	Neutral

### 4.4.2 EUT in “Tablet” operation mode

**Table 4-6** Ch.36 (5180MHz) OFDM 9Mbps **TX** mode

Frq. (MHz)	QP			AV			CISPR22 QP Limit (dBµV)	Margin to limit (dB)	CISPR22 AV Limit (dBµV)	Margin to limit (dB)	Phase
	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)					
0.1929	47.5	0.5	48.0	39.0	0.5	39.5	63.9	15.9	53.9	14.4	Line
0.2564	37.9	0.6	38.5	31.4	0.6	32.0	61.5	23.0	51.5	19.5	Line
0.3200	32.8	0.6	33.4	25.0	0.6	25.6	59.7	26.3	49.7	24.1	Neutral
0.4450	34.2	0.6	34.8	31.1	0.6	31.7	57.0	22.2	47.0	15.3	Neutral
0.5074	30.5	0.6	31.1	26.9	0.6	27.5	56.0	24.9	46.0	18.5	Neutral
0.5720	29.9	0.6	30.5	27.7	0.6	28.3	56.0	25.5	46.0	17.7	Neutral

**Table 4-7** Ch.52 (5260MHz) OFDM 9Mbps **TX** mode

Frq. (MHz)	QP			AV			CISPR22 QP Limit (dBµV)	Margin to limit (dB)	CISPR22 AV Limit (dBµV)	Margin to limit (dB)	Phase
	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)					
0.1933	47.2	0.5	47.7	38.8	0.5	39.3	63.9	16.2	53.9	14.6	Line
0.3193	33.8	0.6	34.4	26.0	0.6	26.6	59.7	25.3	49.7	23.1	Neutral
0.4450	34.4	0.6	35.0	31.3	0.6	31.9	57.0	22.0	47.0	15.1	Neutral
0.5057	30.1	0.6	30.7	27.2	0.6	27.8	56.0	25.3	46.0	18.2	Neutral
0.5666	29.9	0.6	30.5	27.6	0.6	28.2	56.0	25.5	46.0	17.8	Neutral
1.8368	24.6	0.7	25.3	22.3	0.7	23.0	56.0	30.7	46.0	23.0	Neutral

**Table 4-8** Ch.64 (5320MHz) OFDM 9Mbps **TX** mode

Frq. (MHz)	QP			AV			CISPR22 QP Limit (dBµV)	Margin to limit (dB)	CISPR22 AV Limit (dBµV)	Margin to limit (dB)	Phase
	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)					
0.1930	47.6	0.5	48.1	39.2	0.5	39.7	63.9	15.8	53.9	14.2	Line
0.2548	40.0	0.6	40.6	32.9	0.6	33.5	61.6	21.0	51.6	18.1	Neutral
0.3194	33.5	0.6	34.1	25.7	0.6	26.3	59.7	25.6	49.7	23.4	Neutral
0.4453	34.1	0.6	34.7	30.9	0.6	31.5	57.0	22.3	47.0	15.5	Neutral
0.5067	30.2	0.6	30.8	27.2	0.6	27.8	56.0	25.2	46.0	18.2	Neutral
0.5710	30.4	0.6	31.0	28.5	0.6	29.1	56.0	25.0	46.0	16.9	Neutral

**Table 4-9** Ch.52 (5260MHz) OFDM **RX** mode

Frq. (MHz)	QP			AV			CISPR22 QP Limit (dBµV)	Margin to limit (dB)	CISPR22 AV Limit (dBµV)	Margin to limit (dB)	Phase
	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)	Measured Reading (dBµV)	Corr. Factor (dB)	Powerline Voltage (dBµV)					
0.1929	46.0	0.5	46.5	37.5	0.5	38.0	63.9	17.4	53.9	15.9	Line
0.2564	36.3	0.6	36.9	29.4	0.6	30.0	61.5	24.6	51.5	21.5	Line
0.5037	33.6	0.6	34.2	30.3	0.6	30.9	56.0	21.8	46.0	15.1	Neutral
0.5668	32.4	0.6	33.0	29.2	0.6	29.8	56.0	23.0	46.0	16.2	Neutral
1.9524	24.8	0.7	25.5	22.2	0.7	22.9	56.0	30.5	46.0	23.1	Neutral
25.1115	25.5	2.4	27.9	19.2	2.4	21.6	60.0	32.1	50.0	28.4	Neutral