

# Emission Test Report

## Standard: FCC Part 15 Subpart C / IC RSS-210

### Class II Permissive Change

Document Number : FCC 19-0292-0

Model Number: AR5BMB-44

measured with IBM ThinkPad X41 Tablet Series

**FCC ID: ANO20040600BTL**  
**IC: 349E-AR5BMB44**

February 18, 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

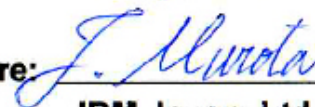
E-Mail: asano@jp.ibm.com

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

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

**Model: AR5BMB-44 (802.11a/b/g Wireless LAN Adapter)**  
with  
**IBM ThinkPad X41 Tablet**  
(Machine Type: 1866, 1867, 1868, 1869)

**FCC ID : ANO20040600BTL**

**February 18, 2005**

This report concerns: (check one)

Original Grant

Class I change

Class II change

Equipment type: Wireless LAN device

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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.

### *APPLICANT ANTI-DRUG ABUSE CERTIFICATION:*

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).

Yes or No

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Prepared by: Takeshi Asano

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

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## 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 C Industry Canada RSS-210 (Issue No.5)
MODEL NUMBER (Advertising Name)	: AR5BMB-44 (IBM 11a/b/g Wireless LAN Mini PCI Adapter II)
FCC ID	: ANO20040600BTL
IC Certification Number	: 349E-AR5BMB44
SERIAL NUMBER	: 00S0SIT005
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	: January 18, 19, 24, 25, 26, 27, 28, February 1, 2, 3, 7, 8, 9, 14 and 15, 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

<b>Model and S/N</b>	<b>FCC ID IC Certification Number</b>	<b>Description</b>
AR5BMB-44 (s/n 00S0SIT005)	FCC ID: ANO20040600BTL IC: 349E-AR5BMB44	<b>Applying modular transmitter</b> Built_in type IEEE802.11a/b/g Wireless LAN Mini-PCI card without antenna
ThinkPad X41 Tablet 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

## B. Summary of Test Results

Table-B presents the list of the measurement items for DTS (Digital Transmissions System) devices under FCC Part 15 Subpart C and Industry Canada RSS-210 (Issue 5).

The section numbers of upper portion are showing FCC number, and the other (lower) ones are for IC.

**Table-B** List of the measurements

Section(s)	Test Items : Transmit mode (TX):		Condition	Result
<a href="#">15.247(a)(2)</a> <a href="#">6.2.2(o)</a> *1	Bandwidth at 6 dB below	At least 500kHz. (*1: RSS-210 Issue5: Amendment)	Conducted	Pass
<a href="#">15.215(c)</a> <a href="#">5.9.1</a>	Occupied BW (Bandwidth at 20 dB below)	20 dB bandwidth of the emission to be within the allocation band.		Pass
<a href="#">15.247(c)</a> <a href="#">6.2.2(o)(e1)</a>	Out of Band Emissions	The radiated emission in any 100kHz of outband shall be at least 20dB below the highest inband spectral density.		Pass
<a href="#">15.247(b)(3)</a> <a href="#">6.2.2(o)(b)</a>	Conducted Transmit Output Power	Shall not exceed 1.0 W.		Pass
<a href="#">15.247(d)</a> <a href="#">6.2.2(o)(b)</a>	Transmitter power spectral Density	Shall not be greater than 8 dBm in any 3kHz band.		Pass
<a href="#">15.207</a> <a href="#">6.2.2(o)(e3)</a> / <a href="#">6.6</a>	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
<a href="#">15.205 / 209</a> <a href="#">6.2.1</a> / <a href="#">6.2.2(o)(e3)</a> / <a href="#">6.3</a>	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Shall not exceed the limits specified in FCC 15.209 or RSS-210 Table3.	Radiated (30MHz-1GHz)	Pass
			Radiated (1– 25GHz)	Pass

Test Items : Receive mode (RX):				
<a href="#">15.207</a> <a href="#">6.2.2(o)(e3)</a> / <a href="#">7.4</a>	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
<a href="#">15.205 / 209</a> <a href="#">6.2.1</a> / <a href="#">6.2.2(o)(e3)</a> / <a href="#">7.3</a>	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Shall not exceed the limits specified in FCC 15.209 or RSS-210 Table3.	Radiated (30MHz -1GHz)	Pass
			Radiated (1– 25GHz)	Pass

Other requirements				Result
<a href="#">15.247(b)(4)(i)</a> -	Antenna gain of the applying host device	Peak gain of the device : 1.82 dBi in 2.4GHz band, 0.84 dBi in 5.8GHz band		N/A
- <a href="#">5.2</a>	Supply Voltage	Main power source: Universal AC adapter 56W Mini-PCI PC bus to applying card : DC 3.3V ± 0.3V		N/A
<a href="#">15.203</a> <a href="#">6.2.2(o)(e2)</a>	Unique antenna connector	The device employs a unique electronic connector so called <b>Electronic Handshake</b> . Refer to “Confidential_e-Handshake exhibit.		complies

### C. Operation Mode of EUT

- All tests were performed using the “Atheros Radio Test” program. This tool supports the continuous transmission mode for the testing purpose.
- The following frequencies were chosen for the measurements of each 2.4GHz or 5.8GHz band.
  - 2412MHz (lowest), 2437MHz(middle), and 2462MHz (highest) for 2.4GHz band
  - 5745MHz (lowest), 5785MHz(middle), and 5825MHz (highest) for 5.8GHz band
- As for the RF receiving test, the middle channels (2437MHz or 5785MHz) 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]										
	IEEE802.11b			IEEE802.11g							
	1/2M bps	5.5M bps	11M bps	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
2.412 (Ch. 1)	17	17	17	14	14	14	14	14	14	14	14
2.417 (Ch. 2)	18	18	18	17	17	17	17	17	17	15	14
2.422 (Ch. 3)	18	18	18	18	18	18	18	18	17	15	14
2.427 (Ch. 4)	18	18	18	18	18	18	18	18	17	15	14
2.432 (Ch. 5)	18	18	18	18	18	18	18	18	17	15	14
2.437 (Ch. 6)	18	18	18	18	18	18	18	18	17	15	14
2.442 (Ch. 7)	18	18	18	18	18	18	18	18	17	15	14
2.447 (Ch. 8)	18	18	18	18	18	18	18	18	17	15	14
2.452 (Ch. 9)	18	18	18	18	18	18	18	18	17	15	14
2.457 (Ch. 10)	18	18	18	17	17	17	17	17	17	15	14
2.462 (Ch. 11)	17	17	17	14	14	14	14	14	14	14	14
			<b>IEEE802.11a</b>								
5.745 (Ch.149)	N/A			16	16	16	16	16	15	14	11
5.765 (Ch.153)				16	16	16	16	16	15	14	11
5.785 (Ch.157)				16	16	16	16	16	15	14	11
5.805 (Ch.161)				16	16	16	16	16	15	14	11
5.825 (Ch.165)				16	16	16	16	16	15	14	11

- 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 Series	Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>		
					2.4GHz band	Notebook Tablet	-1.37 dBi -0.15 dBi
Main antenna	91P6908 <sup>+2</sup>	Wistron NeWeb Corp. (R.O.C.)	Dual Band Meander Antenna	Coax 600 mm	5.8GHz band	Notebook Tablet	0.84 dBi -0.35 dBi
Auxiliary antenna	91P6909 <sup>+2</sup>				Coax 550 mm	2.4GHz band	Notebook Tablet
				5.8GHz band		Notebook Tablet	-0.28 dBi 0.37 dBi

### [Certified antenna systems]

**Granted on 07/26/2004**

IBM ThinkPad T40 Series	Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
					2.4GHz band	0.99 dBi
LCD 14 inch Model	Main	62P4204	Dual Band Meander Antenna	Coax 745 mm	5.725-5.85GHz	-0.23 dBi
		91P6900 <sup>+2</sup>			Foxconn Electronics Inc. (R.O.C.)	Dual-Band Coupled Floating Element Meander Antenna
	Auxiliary	62P4203	5.725-5.85GHz	-0.37 dBi		
		91P6898 <sup>+2</sup>				
LCD 15 inch Model	Main	91P6841 <sup>+2</sup>	Dual Band Meander Antenna	coax 755mm	2.4GHz band	1.24 dBi
		Auxiliary			Hitachi Cable Ltd. (Japan)	coax 580mm
	2.4GHz band		0.38 dBi			
	5.725-5.85GHz	-0.23 dBi				

**Granted on 07/26/2004**

IBM ThinkPad R50 Series	Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
					2.4GHz band	1.52 dBi
LCD 14 inch Model	Main	91P6810	Dual Band Meander Antenna	Coax 750 mm	5.725-5.85GHz	0.02 dBi
		Auxiliary			Hitachi Cable Ltd. (Japan)	Coax 635 mm
	5.725-5.85GHz		0.19 dBi			
	LCD 15 inch Model	Main	91P6812	Dual Band Meander Antenna	coax 775mm	2.4GHz band
Auxiliary			Hitachi Cable Ltd. (Japan)			coax 670mm
		2.4GHz band		1.71 dBi		
5.725-5.85GHz		1.51dBi				

**Granted on 09/10/2004**

IBM ThinkPad X30 Series	Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
					2.4GHz band	0.62 dBi
Main antenna	08K4083	Nissei Electric Co. Ltd. (Japan)	Dual Band Meander Antenna	Coax 394 mm	5.725-5.85GHz	0.32 dBi
Auxiliary antenna	08K4084				Coax 534 mm	2.4GHz band
						5.725-5.85GHz



**Granted on 09/10/2004**

IBM ThinkPad X40 Series	Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
					2.4GHz band	5.725-5.85GHz
Main antenna	13N5743	Nissei Electric Co. Ltd. (Japan)	Dual Band Meander Antenna	Coax 488 mm	0.39 dBi	1.74 dBi
Auxiliary antenna	13N5742			Coax 449 mm	1.67 dBi	2.04 dBi

**Granted on 09/10/2004**

IBM ThinkPad G40 Series	Antenna Designator	Manufacture	Antenna type	Cable type and length	Peak Gain <sup>+1</sup>	
					2.4GHz band	5.725-5.85GHz
Main	LCD 14 inch Model	R0222-099	Dual Band Meander Antenna	Coax 570 mm	-0.25 dBi	<b>3.15 dBi</b>
	LCD 15 inch Model				0.18 dBi	1.22 dBi
Auxiliary	LCD 14 inch Model	R0222-100	Dual Band Meander Antenna	coax 610mm	0.87dBi	2.11 dBi
	LCD 15 inch Model				0.52 dBi	-0.01 dBi

## E. Justification

The full testing results were already performed with the highest antenna gains (ThinkPad R50 Series in 2.4GHz, and ThinkPad G40 Series in 5.8GHz) as shown in the previous Table-D, then certified on July/26/2004 or September/10/2004.

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) has 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 that the emissions conform to the limits for both “Notebook” and “Tablet” operation modes.

- Conducted power (note: There is no change on 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 as follows.

IBM ThinkPad X41 Tablet	Peak Gain		
	Frequency	Mode	Gain
Main antenna	2.4GHz	Notebook	-1.37 dBi
		Tablet	-0.15 dBi
	5.8GHz	Notebook	<b>0.84 dBi</b>
		Tablet	-0.35 dBi
Auxiliary antenna	2.4GHz	Notebook	<b>1.77 dBi</b>
		Tablet	<b>1.82 dBi</b>
	5.8GHz	Notebook	-0.28 dBi
		Tablet	<b>0.27 dBi</b>

## 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	MITEQ AM-3A	898433	04/23/04	1 year
- for 200-1000MHz	MITEQ AM-3A	898432	04/23/04	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.	Length: 6 m	- EM206SCO	03/25/04	1 year
- RF Amp.<=>Spectrum Analyzer(<12GHz)	16m	- GEM0101	03/25/04	1 year
- RF Amp.<=>Spectrum Analyzer(>12GHz)	3m	- SF102-20166	04/08/04	1 year
Coaxial cables (18 – 40GHz): - Horn Ant <=> RF Amp.	3m	- SF102-20167	04/08/04	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

[ FCC 15.247(b)(3), RSS-210 6.2.2(o)(b) ]

## 1.1 Test Procedure

The test was performed with two different measurement methods as follows.

1. Conducted peak power measurement method to confirm the consistency with the original granted values. (the same measurement method as the original grant)
2. Conducted mean power measurement method in accordance with the ET Docket 03–201; FCC 04–165, July 12/2004 and Federal Register / Vol. 69, No. 172, September 7/2004 to confirm the consistency with the measurement result in SAR test report.

A spectrum analyzer was connected to the antenna terminal, while EUT was operating in continuous transmission mode at the appropriate center frequencies.

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

However, the spectrum analyzer setting for each peak or mean power measurement was different as follows.

- RBW: peak power = 1MHz,  
 mean power = 30kHz ( $\geq 1/T$ , where T is transmission pulse duration. See Plot 1-0 and 1-1)
- VBW =RBV or more
- 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 conducted transmission output power for each transmission mode. The analyzer computed each power by integrating the spectrum across the 26 dB emission bandwidth.

**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: Loss: 110 cm 2.4GHz 1.3 dB 5.8GHz 2.3 dB	

Notes: - R&S: Rohde & Schwarz

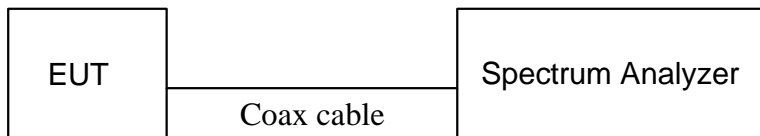


Figure 1-1 : Measurement setup of spectrum analyzer method

## 1.2 Measurement Results

Test Date: January 18, 19, 24 and 25, 2005

### 1.2.1 Peak conducted power measurement results

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

	2.4GHz DSSS mode	2.4GHz OFDM mode	5.8GHz OFDM mode
measurement results of the <b>original</b> grant	23.07dBm	24.72dBm	24.83dBm
measurement results in this <b>Class II</b> application	22.92dBm (-0.15dB)	24.54dBm (-0.18dB)	24.73dBm (-0.1dB)

**Table 1-2** 2.4GHz DSSS mode

Measured Frequency (MHz)	Tx Rate (Mb/s)	Analyzer reading (dBm)	Trace number	Cable Loss (dB)	Results (dBm)	Limit		Margin to limit (dBm)
						FCC (dBm)	IC (dBm)	
2412	1	17.62	omitted	1.3	18.92	30	30	11.08
	5.5	19.31	omitted	1.3	20.61	30	30	9.39
	11	20.83	omitted	1.3	22.13	30	30	7.87
2437	1	18.58	omitted	1.3	19.88	30	30	10.12
	5.5	20.10	omitted	1.3	21.40	30	30	8.60
	11	21.62	Plot 1-2b	1.3	<b>22.92</b>	30	30	7.08
2462	1	17.28	omitted	1.3	18.58	30	30	11.42
	5.5	19.01	omitted	1.3	20.31	30	30	9.69
	11	20.52	omitted	1.3	21.82	30	30	8.18

**Table 1-3** 2.4GHz OFDM mode

Measured Frequency (MHz)	Tx Rate (Mb/s)	Analyzer reading (dBm)	Trace number	Cable Loss (dB)	Results (dBm)	Limit		Margin to limit (dBm)
						FCC (dBm)	IC (dBm)	
2412	6	19.83	omitted	1.3	21.13	30	30	8.87
	18	19.56	omitted	1.3	20.86	30	30	9.14
	24	19.77	omitted	1.3	21.07	30	30	8.93
	54	19.75	omitted	1.3	21.05	30	30	8.95
2437	6	23.24	Plot 1-3b	1.3	<b>24.54</b>	30	30	5.46
	18	22.74	omitted	1.3	24.04	30	30	5.96
	24	23.23	omitted	1.3	24.53	30	30	5.47
	54	19.79	omitted	1.3	21.09	30	30	8.91
2462	6	19.65	omitted	1.3	20.95	30	30	9.05
	18	19.46	omitted	1.3	20.76	30	30	9.24
	24	19.57	omitted	1.3	20.87	30	30	9.13
	54	19.59	omitted	1.3	20.89	30	30	9.11

**Table 1-4** 5.8GHz OFDM mode

Measured Frequency (MHz)	Tx Rate (Mb/s)	Analyzer reading (dBm)	Trace number	Cable Loss (dB)	Results (dBm)	Limit		Margin to limit (dBm)
						FCC (dBm)	IC (dBm)	
5745	6	22.42	omitted	2.3	24.72	30	30	5.28
	18	22.16	omitted	2.3	24.46	30	30	5.54
	24	22.36	omitted	2.3	24.66	30	30	5.34
	54	17.51	omitted	2.3	19.81	30	30	10.19
5785	6	22.43	Plot 1-4b	2.3	<b>24.73</b>	30	30	5.27
	18	22.23	omitted	2.3	24.53	30	30	5.47
	24	22.35	omitted	2.3	24.65	30	30	5.35
	54	17.53	omitted	2.3	19.83	30	30	10.17
5825	6	22.40	omitted	2.3	24.70	30	30	5.30
	18	22.25	omitted	2.3	24.55	30	30	5.45
	24	22.38	omitted	2.3	24.68	30	30	5.32

### 1.2.2 Mean conducted power measurement results (reference only)

( ) means the difference of the results between the Class II and SAR report.

	2.4GHz DSSS mode	2.4GHz OFDM mode	5.8GHz OFDM mode
measurement results in this <b>Class II</b> application	17.40dBm (-0.22B)	17.16dBm (-0.09dB)	17.43dBm(+0.17dB)
measurement results in the separate <b>SAR</b> report	17.62dBm	17.25dBm	17.26dBm

**Table 1-5** 2.4GHz DSSS mode

Measured Frequency (MHz)	Tx Rate (Mb/s)	Analyzer reading (dBm)	Trace number	Cable Loss (dB)	Results (dBm)	Limit		Margin to limit (dBm)
						FCC (dBm)	IC (dBm)	
2412	1	14.51	omitted	1.3	15.81	30	30	14.19
	5.5	15.61	omitted	1.3	16.91	30	30	13.09
	11	15.67	omitted	1.3	16.97	30	30	13.03
2437	1	15.70	omitted	1.3	17.00	30	30	13.00
	5.5	16.08	omitted	1.3	17.38	30	30	12.62
	11	16.10	Plot 1-5b	1.3	<b>17.40</b>	30	30	12.60
2462	1	14.42	omitted	1.3	15.72	30	30	14.28
	5.5	15.19	omitted	1.3	16.49	30	30	13.51
	11	15.24	omitted	1.3	16.54	30	30	13.46

**Table 1-6** 2.4GHz OFDM mode

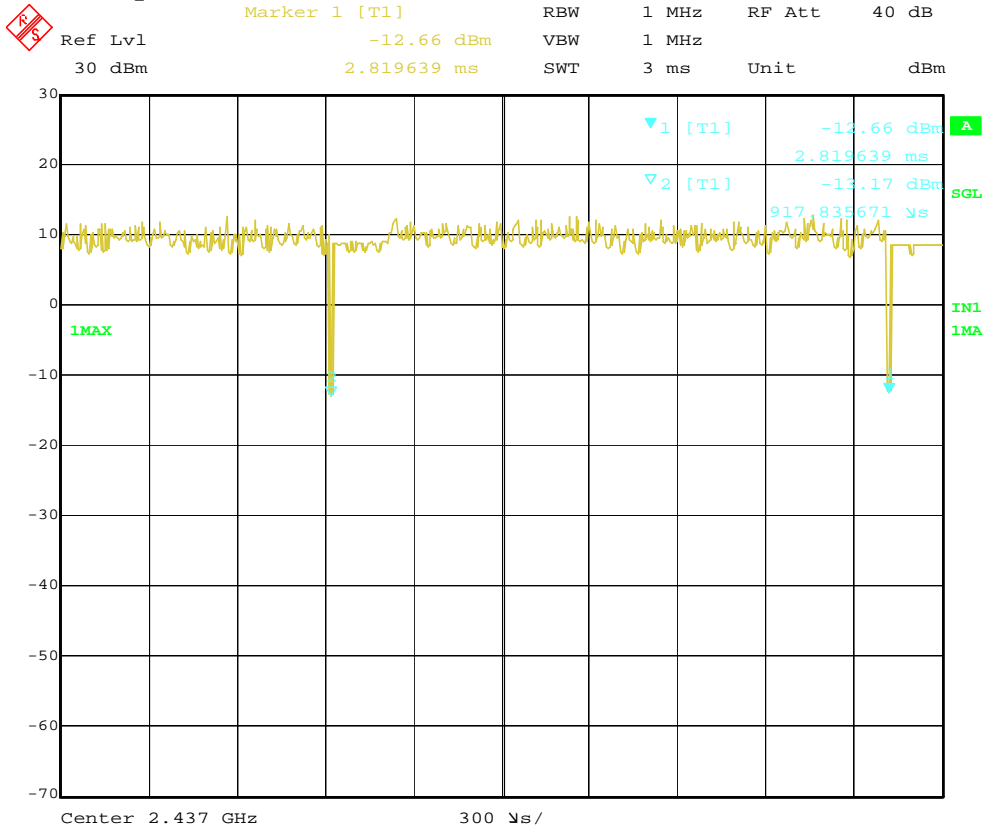
Measured Frequency (MHz)	Tx Rate (Mb/s)	Analyzer reading (dBm)	Trace number	Cable Loss (dB)	Results (dBm)	Limit		Margin to limit (dBm)
						FCC (dBm)	IC (dBm)	
2412	6	12.75	omitted	1.3	14.05	30	30	15.95
	18	12.50	omitted	1.3	13.80	30	30	16.20
	24	12.70	omitted	1.3	14.00	30	30	16.00
	54	12.71	omitted	1.3	14.01	30	30	15.99
2437	6	15.86	Plot 1-6b	1.3	<b>17.16</b>	30	30	12.84
	18	15.65	omitted	1.3	16.95	30	30	13.05
	24	15.83	omitted	1.3	17.13	30	30	12.87
	54	12.88	omitted	1.3	14.18	30	30	15.82
2462	6	12.71	omitted	1.3	14.01	30	30	15.99
	18	12.48	omitted	1.3	13.78	30	30	16.22
	24	12.65	omitted	1.3	13.95	30	30	16.05
	54	12.68	omitted	1.3	13.98	30	30	16.02

**Table 1-7** 5.8GHz OFDM mode

Measured Frequency (MHz)	Tx Rate (Mb/s)	Analyzer reading (dBm)	Trace number	Cable Loss (dB)	Results (dBm)	Limit		Margin to limit (dBm)
						FCC (dBm)	IC (dBm)	
5745	6	15.08	omitted	2.3	17.38	30	30	12.62
	18	14.94	omitted	2.3	17.24	30	30	12.76
	24	15.06	omitted	2.3	17.36	30	30	12.64
	54	9.88	omitted	2.3	12.18	30	30	17.82
5785	6	15.10	omitted	2.3	17.40	30	30	12.60
	18	14.97	omitted	2.3	17.27	30	30	12.73
	24	15.10	omitted	2.3	17.40	30	30	12.60
	54	9.90	omitted	2.3	12.20	30	30	17.80
5825	6	15.09	omitted	2.3	17.39	30	30	12.61
	18	15.04	omitted	2.3	17.34	30	30	12.66
	24	15.13	Plot 1-7b	2.3	<b>17.43</b>	30	30	12.57
	54	9.95	omitted	2.3	12.25	30	30	17.75

### 1.3 Trace Data

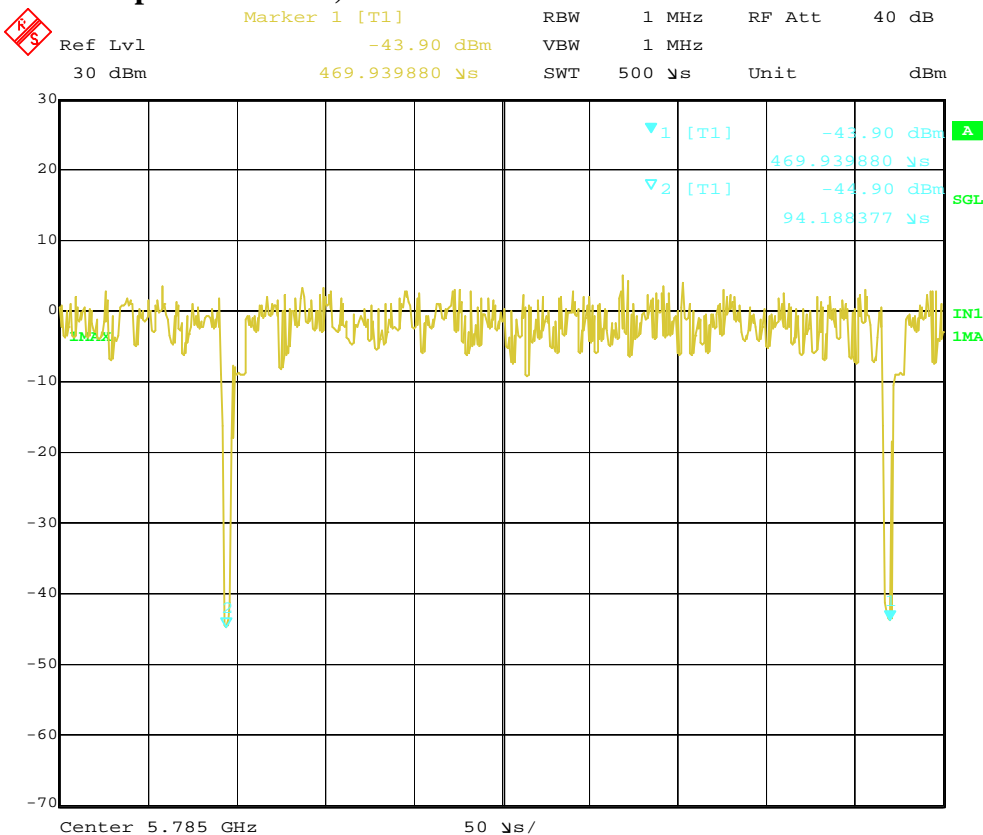
**T (transmission pulse duration) = 2819.6 – 917.8 = 1901.8 mS**



Date: 18.JAN.2005 14:23:01

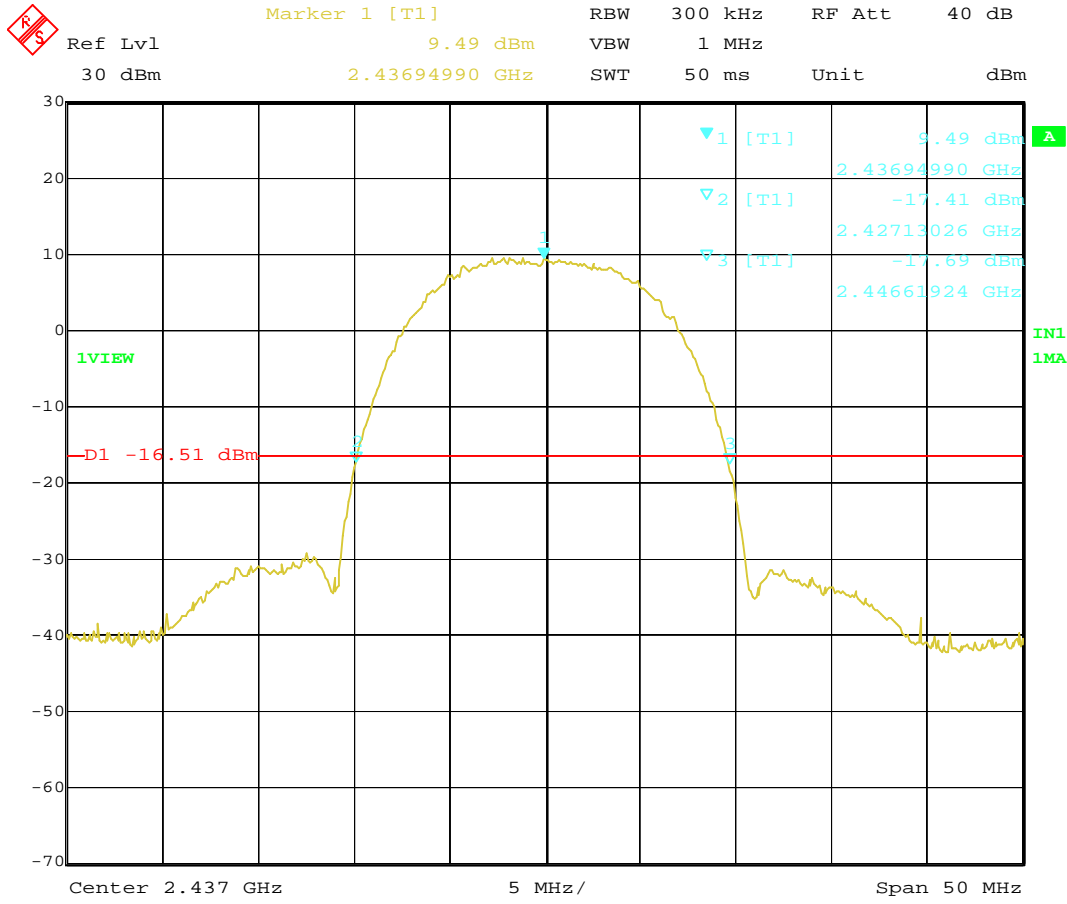
Plot 1-0 Transmission Pulse Duration of DSSS Tx mode

**T (transmission pulse duration) = 469.9 – 94.2 = 375.7 mS**



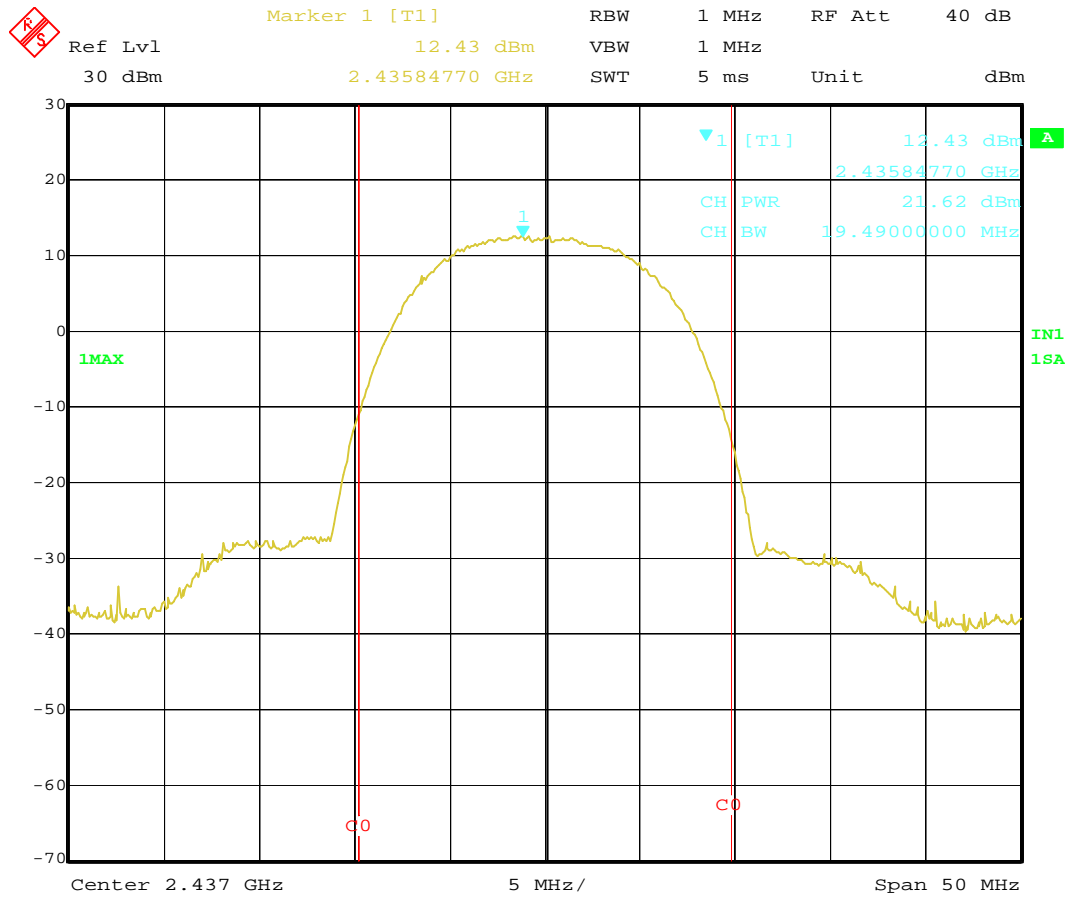
Date: 24.JAN.2005 13:32:24

Plot 1-1 Transmission Pulse Duration of OFDM Tx mode



Date: 18.JAN.2005 15:01:54

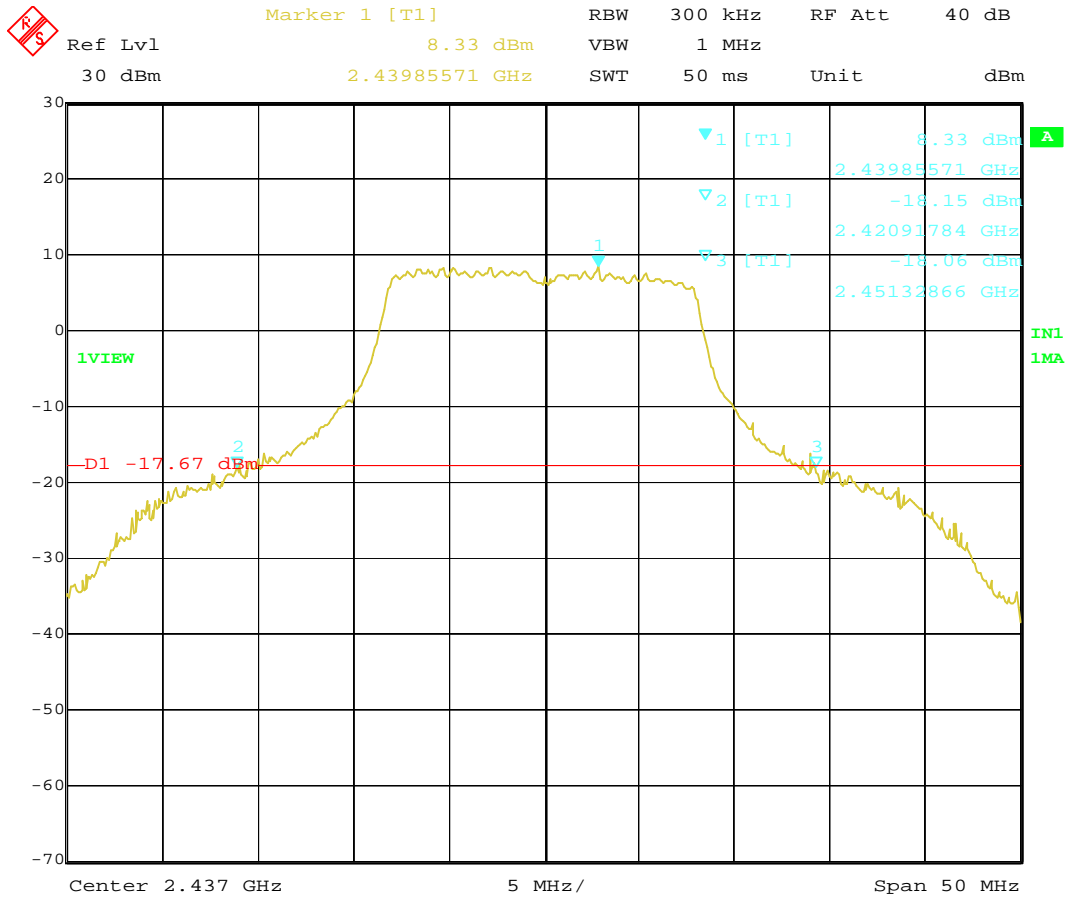
Plot 1-2a. 26dB Bandwidth of 2437MHz (DSSS, 11Mbps)



Date: 18.JAN.2005 15:58:53

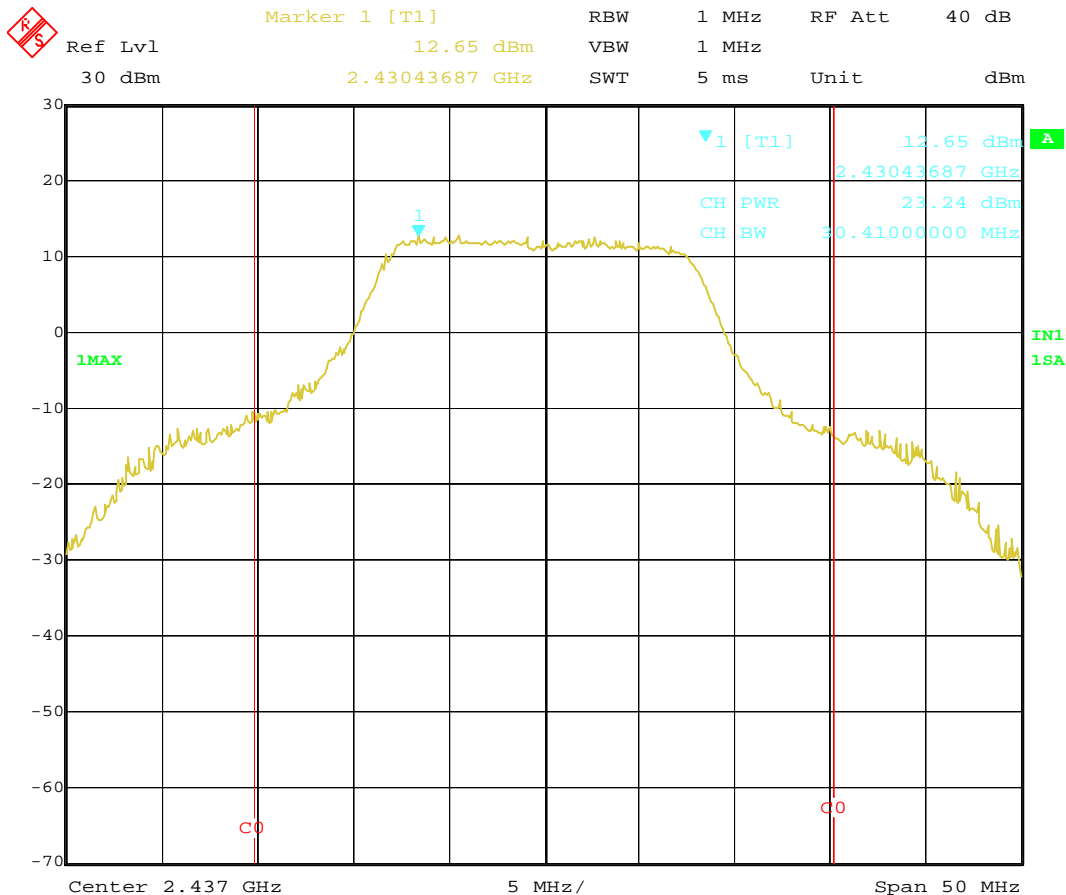
Plot 1-2b. Conducted Peak Output Power of 2437MHz (DSSS, 11Mbps, peak power)





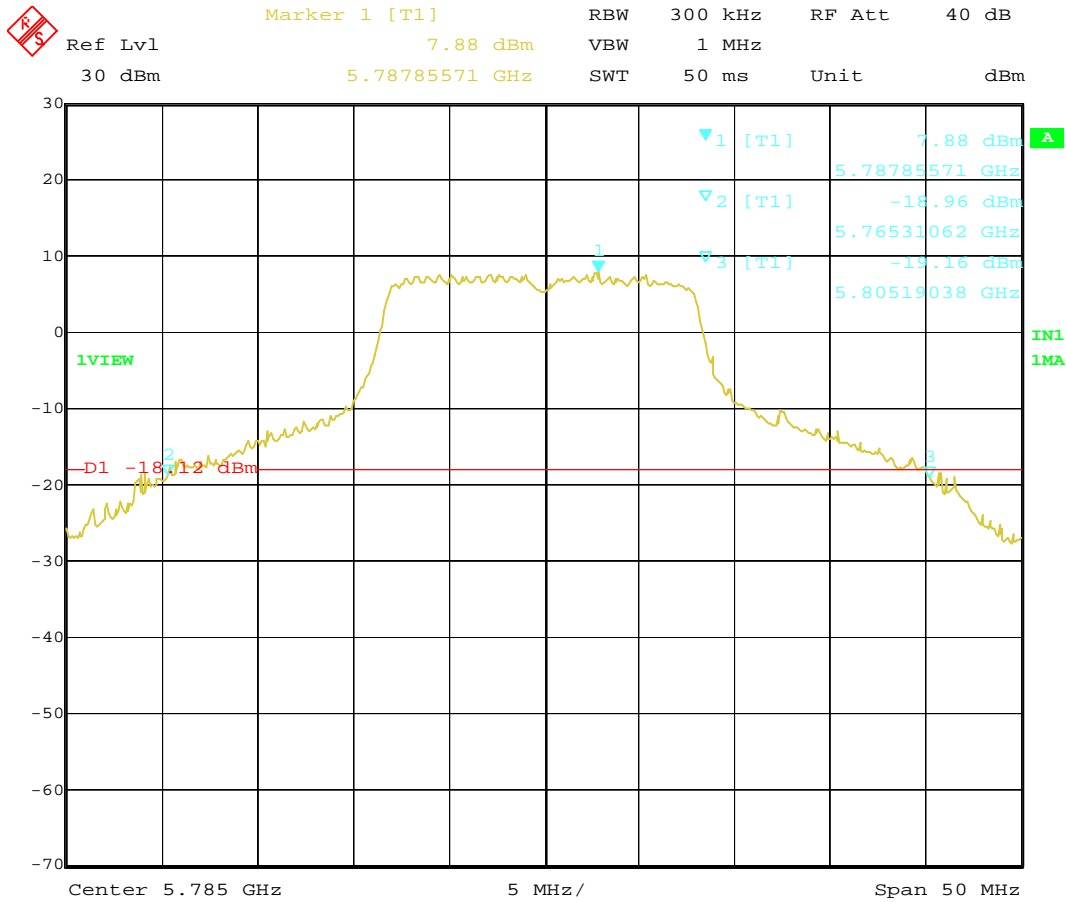
Date: 18.JAN.2005 17:58:52

Plot 1-3a. 26dB Bandwidth of 2437MHz (OFDM, 6Mbps)



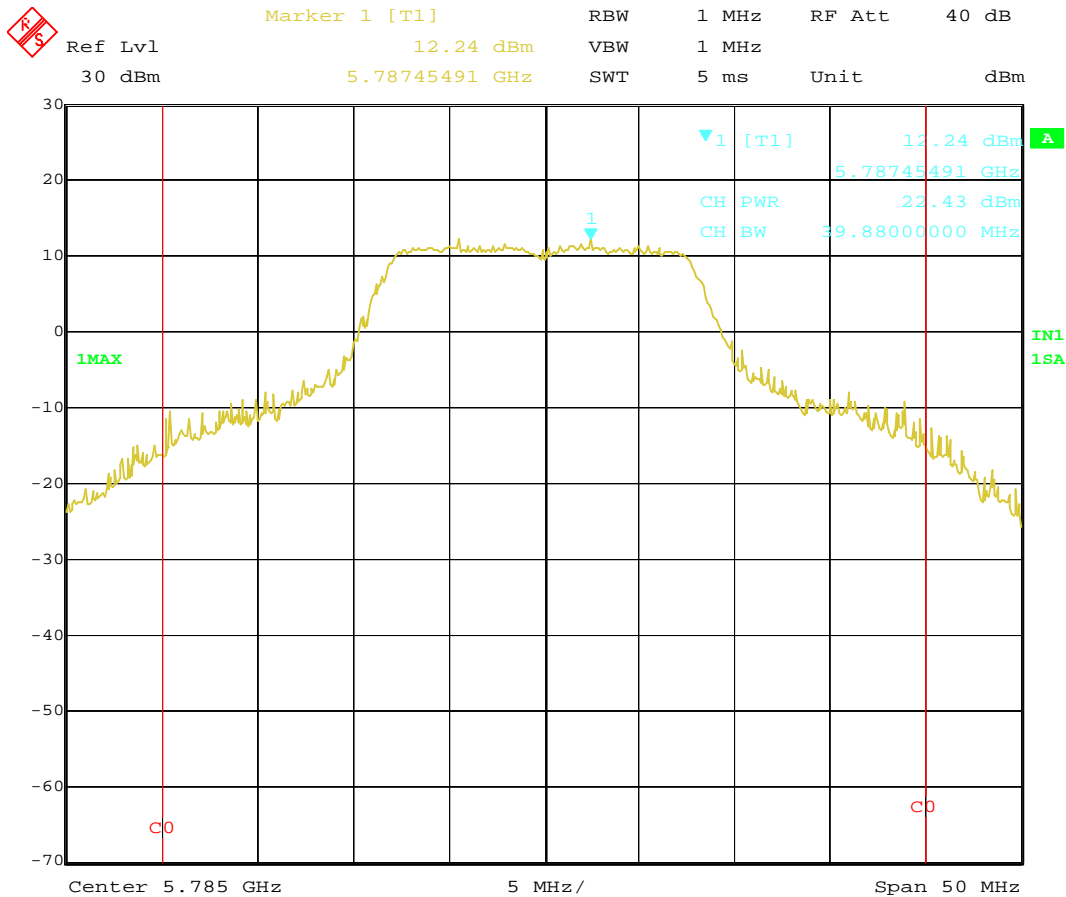
Date: 25.JAN.2005 16:13:58

Plot 1-3b. Conducted Peak Output Power of 2437MHz (OFDM, 6Mbps, peak power)



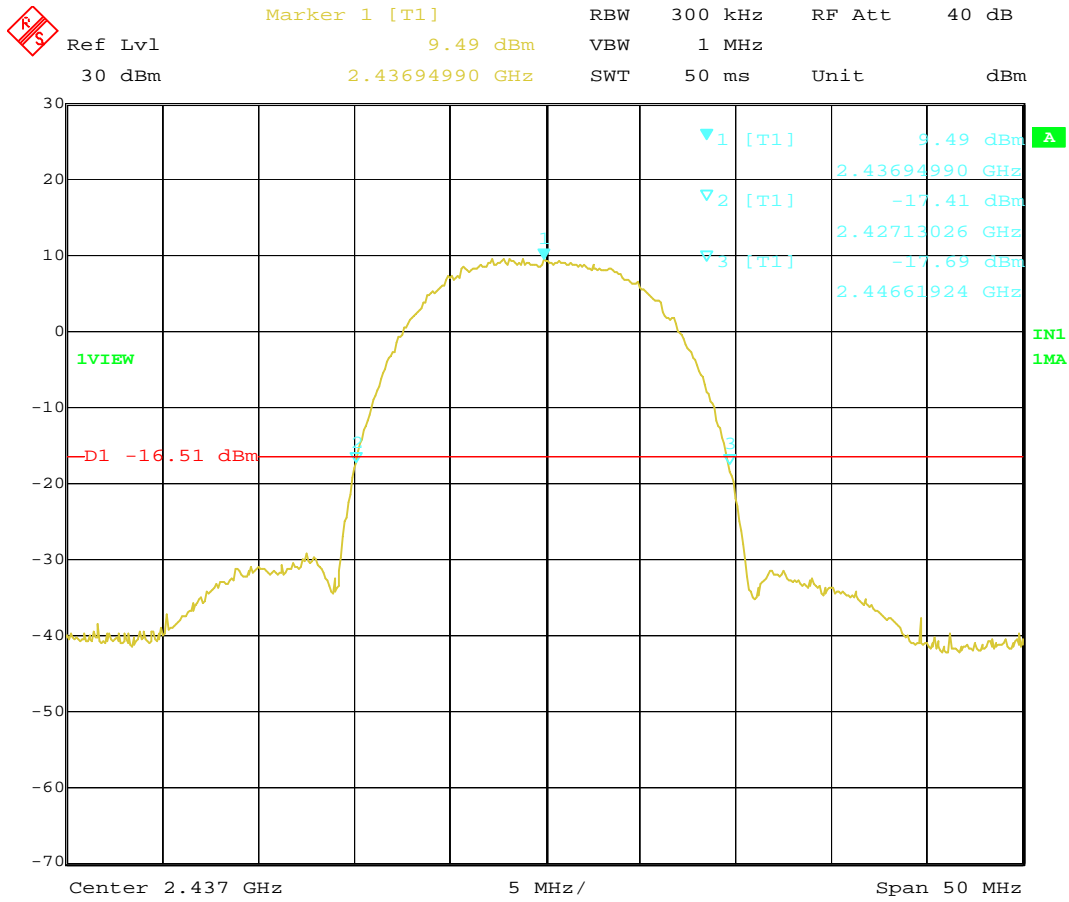
Date: 24.JAN.2005 14:45:21

Plot 1-4a. 26dB Bandwidth of 5785MHz (OFDM, 6Mbps)



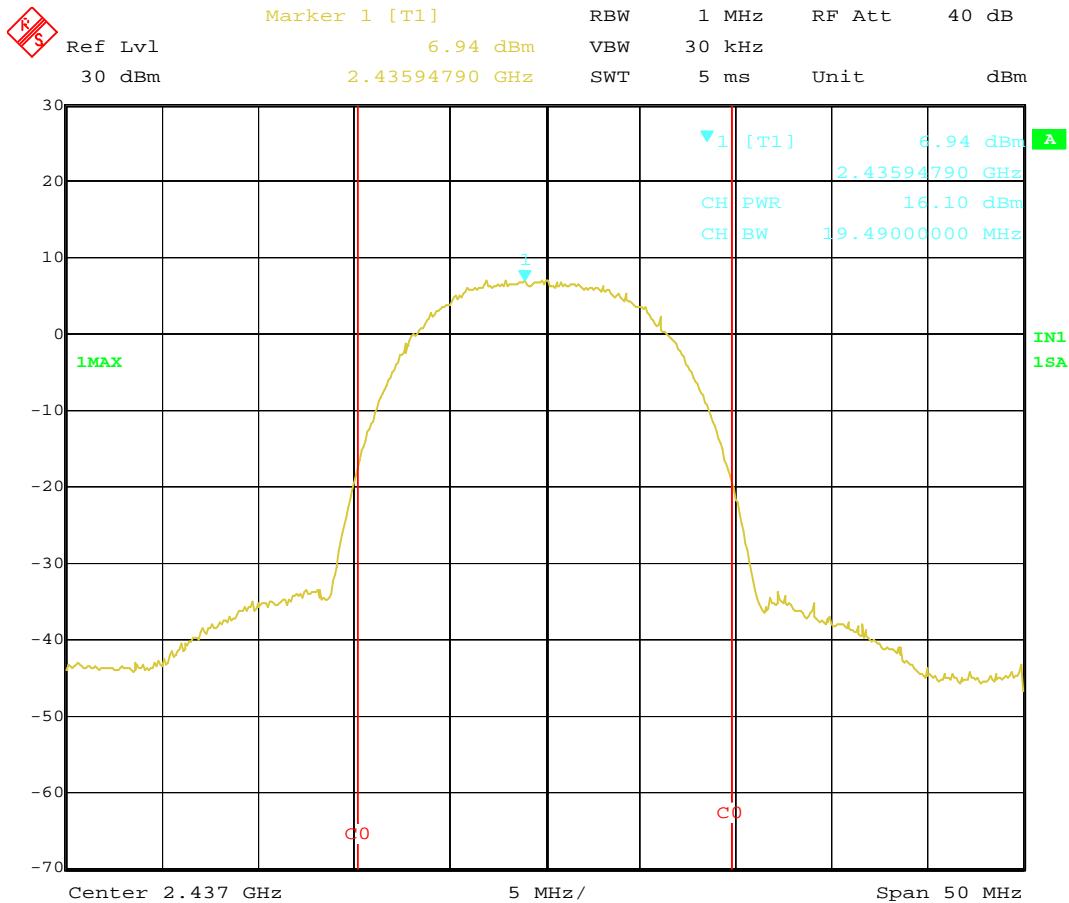
Date: 24.JAN.2005 18:51:27

Plot 1-4b. Conducted Peak Output Power of 5785MHz (OFDM, 6Mbps, peak power)



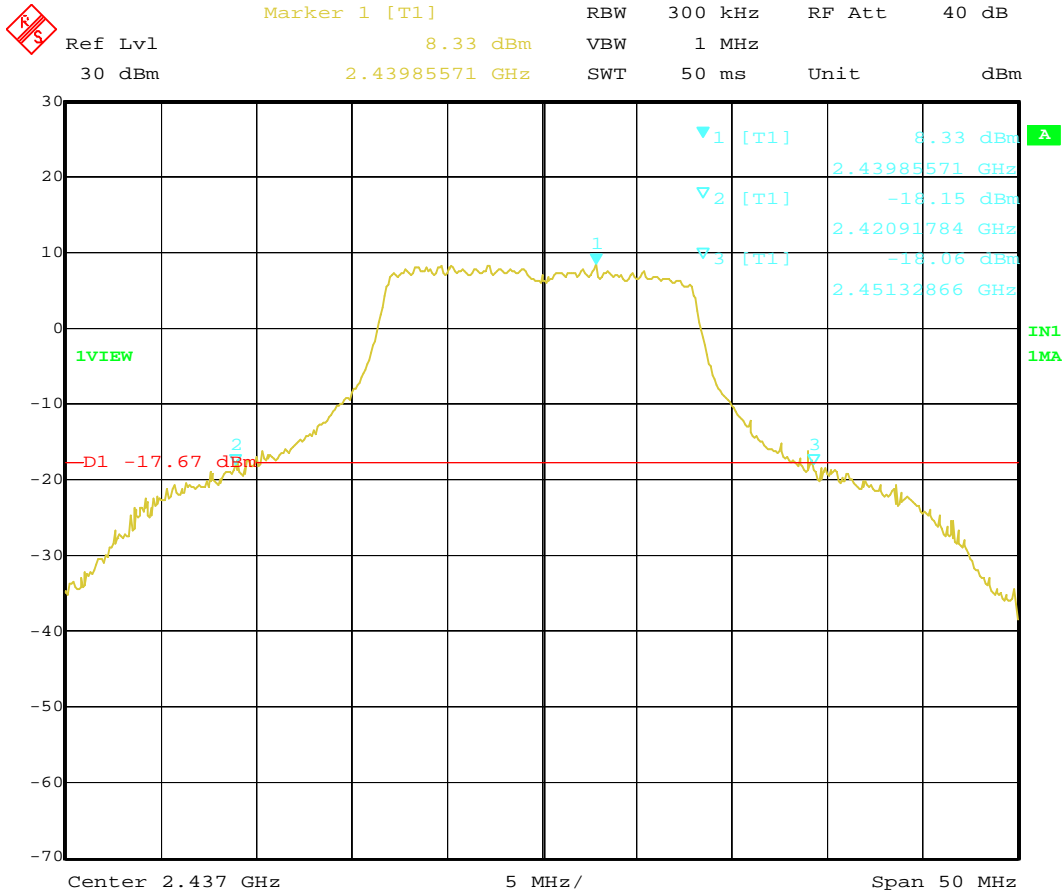
Date: 18.JAN.2005 15:01:54

Plot 1-5a. 26dB Bandwidth of 2437MHz (DSSS, 11Mbps)



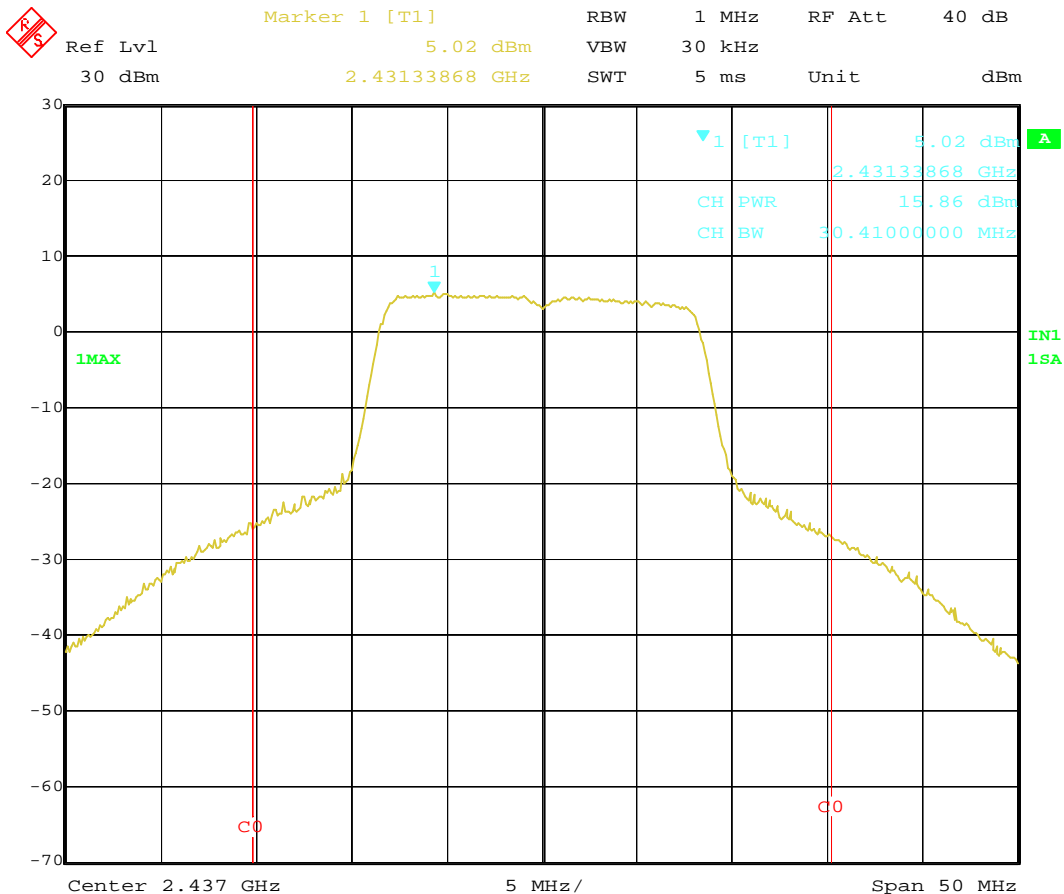
Date: 25.JAN.2005 13:20:56

Plot 1-5b. Conducted Peak Output Power of 2437MHz (DSSS, 11Mbps, mean power)



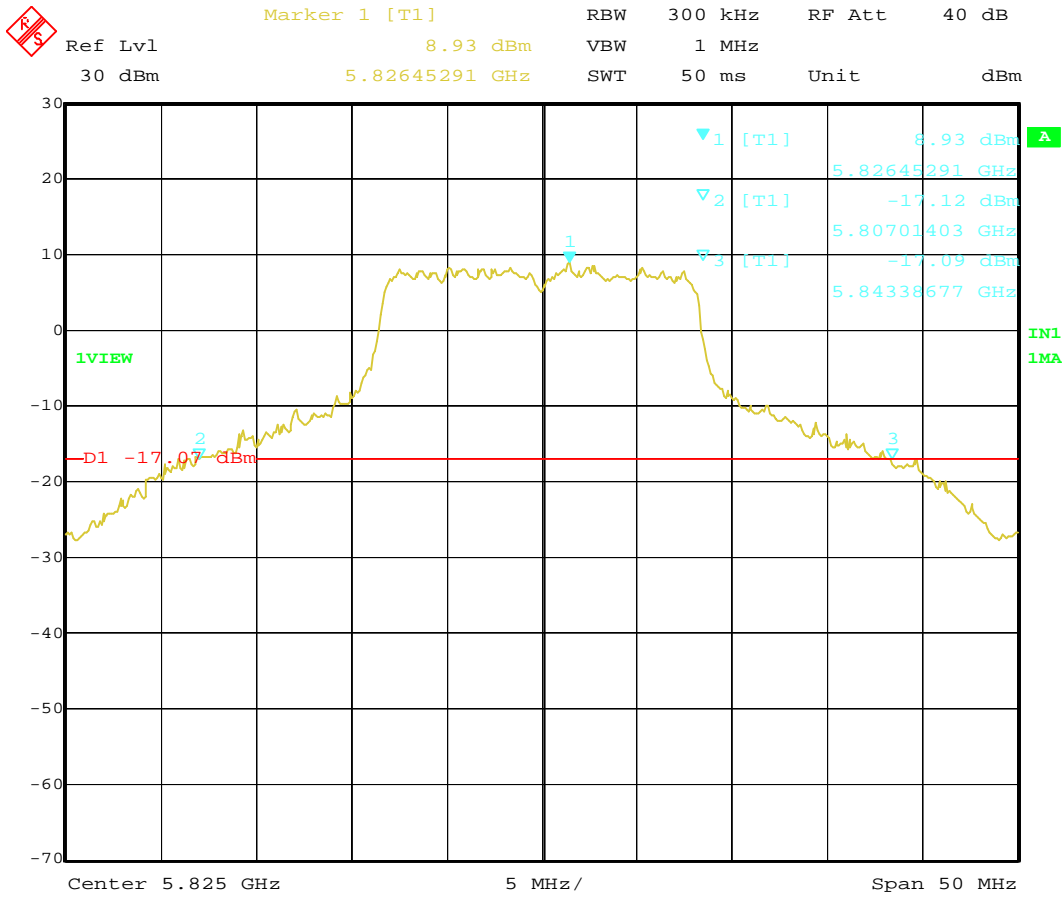
Date: 18.JAN.2005 17:58:52

Plot 1-6a. 26dB Bandwidth of 2437MHz (OFDM, 6Mbps)



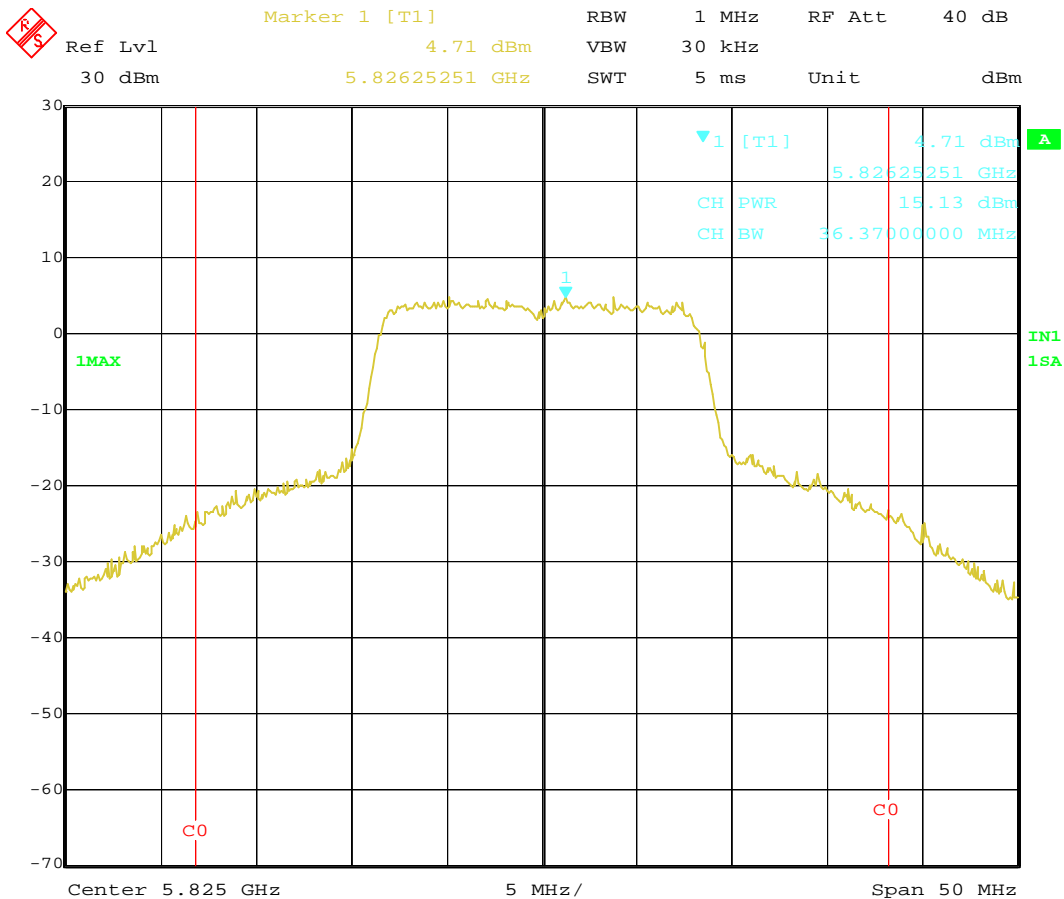
Date: 19.JAN.2005 13:49:36

Plot 1-6b. Conducted Peak Output Power of 2437MHz (OFDM, 6Mbps, mean power)



Date: 24.JAN.2005 17:42:12

Plot 1-7a. 26dB Bandwidth of 5825MHz (OFDM, 24Mbps)



Date: 24.JAN.2005 20:30:22

Plot 1-7b. Conducted Peak Output Power of 5825MHz (OFDM, 24Mbps, mean power)

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

[ FCC 15.205 / 209, RSS-210 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

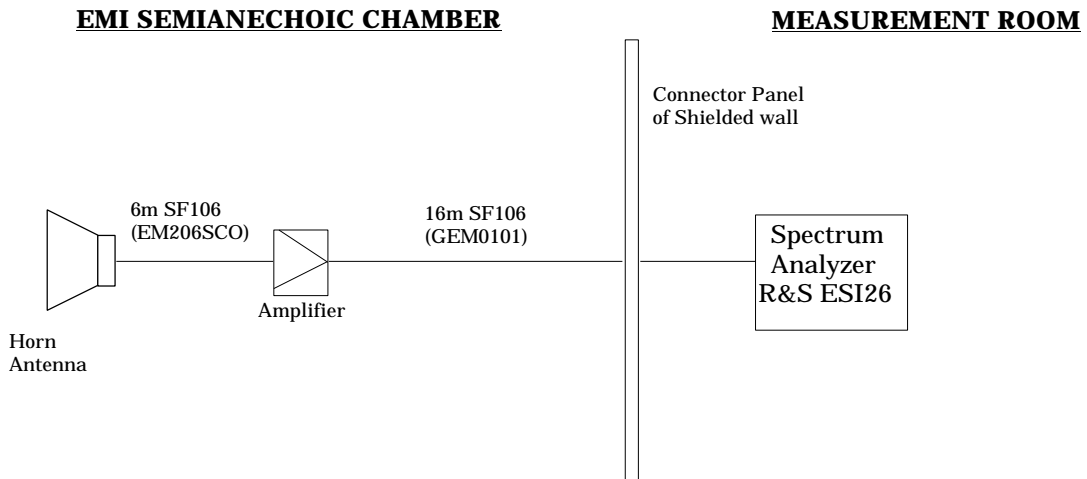


Figure 2-1. Cables for Radiated Emission Test (1 – 12.4 GHz)

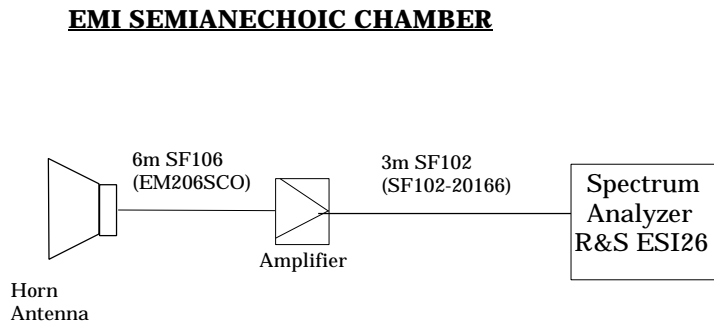


Figure 2-2. Cables for Radiated Emission Test (12.4 - 18GHz)

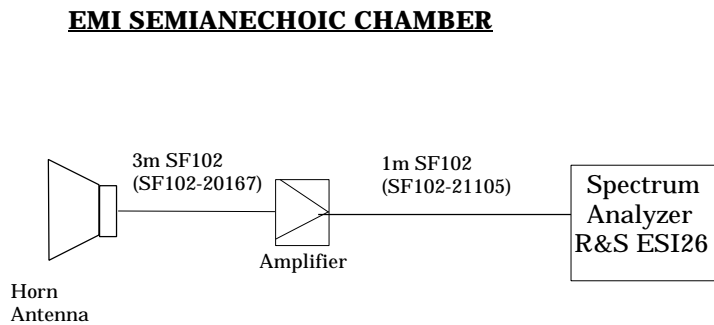
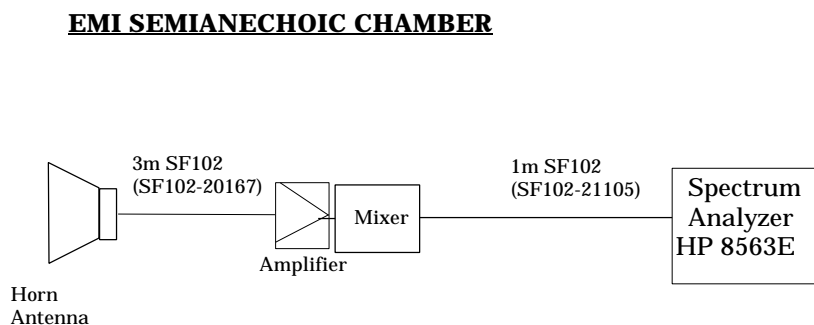


Figure 2-3. Cables for Radiated Emission Test (18 – 26.5GHz)



## 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 dB $\mu$ V; 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 dB $\mu$ V/m (or dB $\mu$ V) and  $\mu$ V/m (or  $\mu$ V) 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 Bandedge Measurement plots

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

Test Date: January 26, 2005

**Table 2-2** “Notebook” operation in 2.4GHz DSSS/OFDM transmission mode

D: DSSS mode O: OFDM 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)
1	D: 1	2.386	H	56.8	47.3	28.2	-29.2	0.0	55.8	18.2	46.3	7.7
	5.5	2.390	H	54.9	44.2	28.2	-29.2	0.0	53.9	20.1	43.2	10.8
	11	2.387	H	56.7	44.6	28.2	-29.2	0.0	55.7	18.3	43.6	10.4
	O: 6	2.390	H	63.2	46.0	28.2	-29.2	0.0	62.2	11.8	45.0	9.0
	18	2.390	H	63.2	46.6	28.2	-29.2	0.0	62.2	11.8	45.6	8.4
	24	2.390	H	61.8	46.7	28.2	-29.2	0.0	60.8	13.2	45.7	8.3
	54	2.390	H	63.0	45.8	28.2	-29.2	0.0	62.0	12.0	44.8	9.2
11	D: 1	2.488	H	52.5	43.2	28.4	-29.1	0.0	51.8	22.2	42.5	11.5
	5.5	2.486	H	52.0	41.3	28.4	-29.1	0.0	51.3	22.7	40.6	13.4
	11	2.487	V	52.8	42.3	28.4	-29.1	0.0	52.1	21.9	41.6	12.4
	O: 6	2.484	H	60.7	43.0	28.4	-29.1	0.0	60.0	14.0	42.3	11.7
	18	2.484	H	59.5	42.7	28.4	-29.1	0.0	58.8	15.2	42.0	12.0
	24	2.484	H	59.7	42.9	28.4	-29.1	0.0	59.0	15.0	42.2	11.8
	54	2.484	H	61.9	42.9	28.4	-29.1	0.0	61.2	12.8	42.2	11.8

**Table 2-3** “Tablet” operation in 2.4GHz DSSS/OFDM transmission mode

D: DSSS mode O: OFDM mode

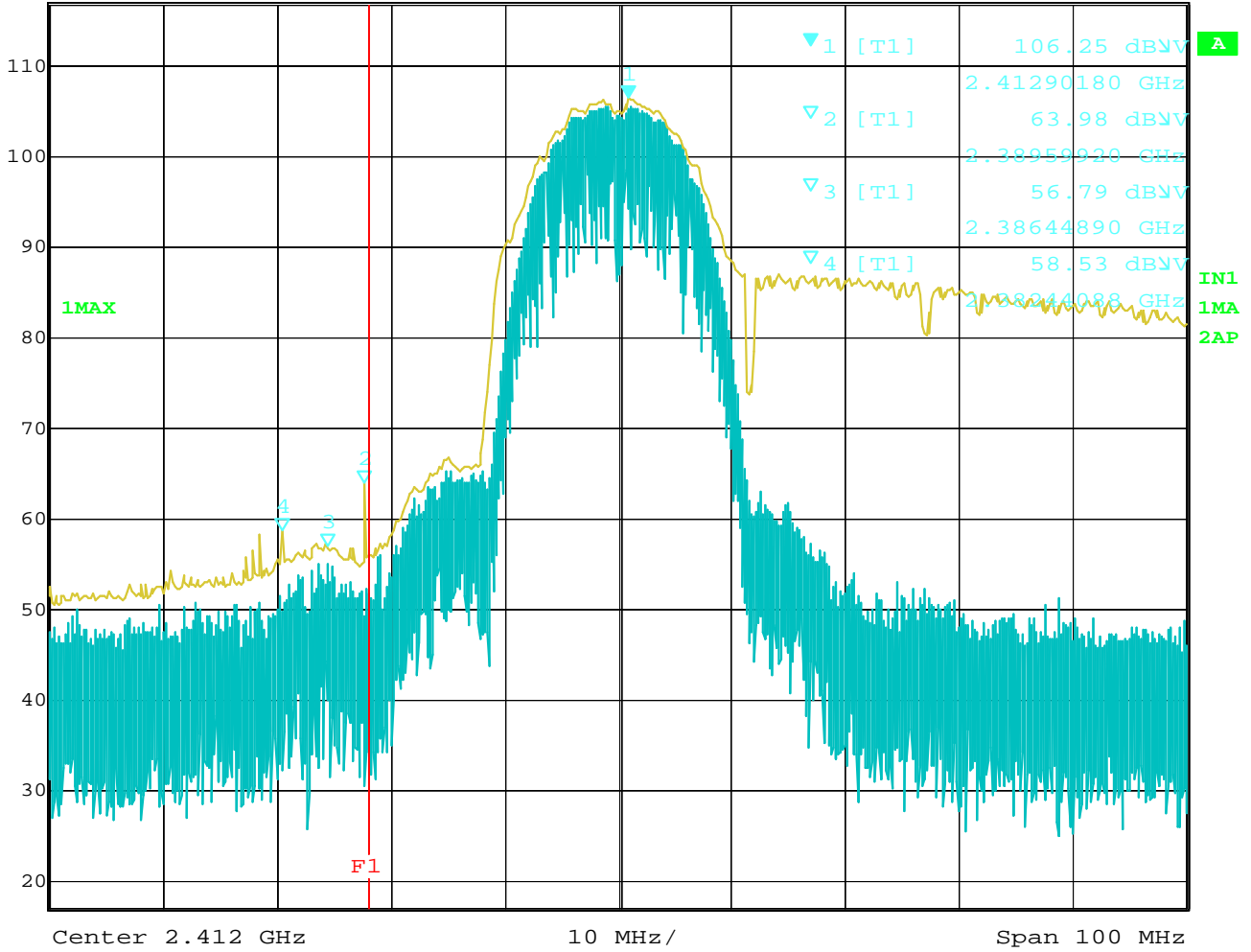
Ch.	Tx rate (Mb/s)	Frequency (GHz)	Polarity (H/V)	Reading (dBμV) (peak)	Rading (dBμV) (average)	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBμV/m) (peak)	Margin to Limit (dB) (peak)	Field Strength (dBμV/m) (average)	Margin to Limit (dB) (average)
1	D: 1	2.386	H	65.6	47.0	28.2	-29.2	0.0	64.6	9.4	46.0	8.0
	5.5	2.389	H	66.4	44.3	28.2	-29.2	0.0	65.4	8.6	43.3	10.7
	11	2.387	H	64.2	45.4	28.2	-29.2	0.0	63.2	10.8	44.4	9.6
	O: 6	2.390	V	64.7	47.6	28.2	-29.2	0.0	63.7	10.3	46.6	7.4
	18	2.390	V	64.1	47.4	28.2	-29.2	0.0	63.1	10.9	46.4	7.6
	24	2.390	V	64.1	47.9	28.2	-29.2	0.0	63.1	10.9	46.9	7.1
	54	2.390	V	66.3	47.6	28.2	-29.2	0.0	65.3	8.7	46.6	7.4
11	D: 1	2.487	V	57.9	45.6	28.4	-29.1	0.0	57.2	16.8	44.9	9.1
	5.5	2.485	V	60.3	43.3	28.4	-29.1	0.0	59.6	14.4	42.6	11.4
	11	2.487	V	54.9	44.0	28.4	-29.1	0.0	54.2	19.8	43.3	10.7
	O: 6	2.484	V	63.4	44.9	28.4	-29.1	0.0	62.7	11.3	44.2	9.8
	18	2.484	V	60.6	44.4	28.4	-29.1	0.0	59.9	14.1	43.7	10.3
	24	2.484	V	60.4	44.2	28.4	-29.1	0.0	59.7	14.3	43.5	10.5
	54	2.484	V	63.8	44.1	28.4	-29.1	0.0	63.1	10.9	43.4	10.6

Note) These is no measurement result for 5.8GHz OFDM transmission mode thanks to no restricted band near

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



	Marker 1 [T1]	RBW	1 MHz	RF Att	20 dB
Ref Lvl	106.25 dBμV	VBW	1 MHz		
117 dBμV	2.41290180 GHz	SWT	5 ms	Unit	dBμV

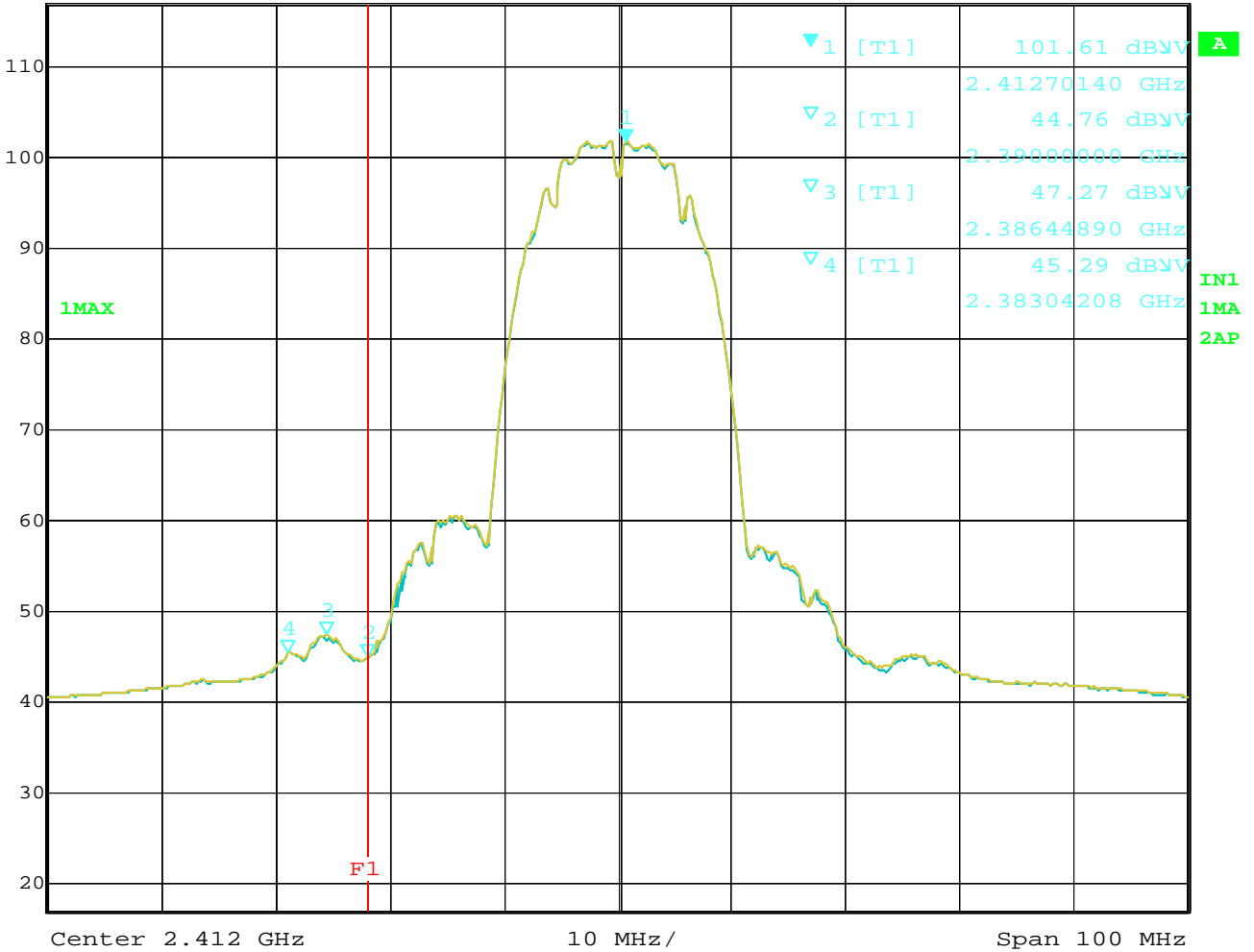


Date: 26.JAN.2005 13:16:12

Plot-2-1 Ch.1 2412MHz TX, DSSS 1Mbps (Peak) in normal operation mode



Ref Lvl	117 dBμV	Marker 1 [T1]	101.61 dBμV	RBW	1 MHz	RF Att	20 dB
			2.41270140 GHz	VBW	10 Hz	Unit	dBμV
				SWT	25 s		

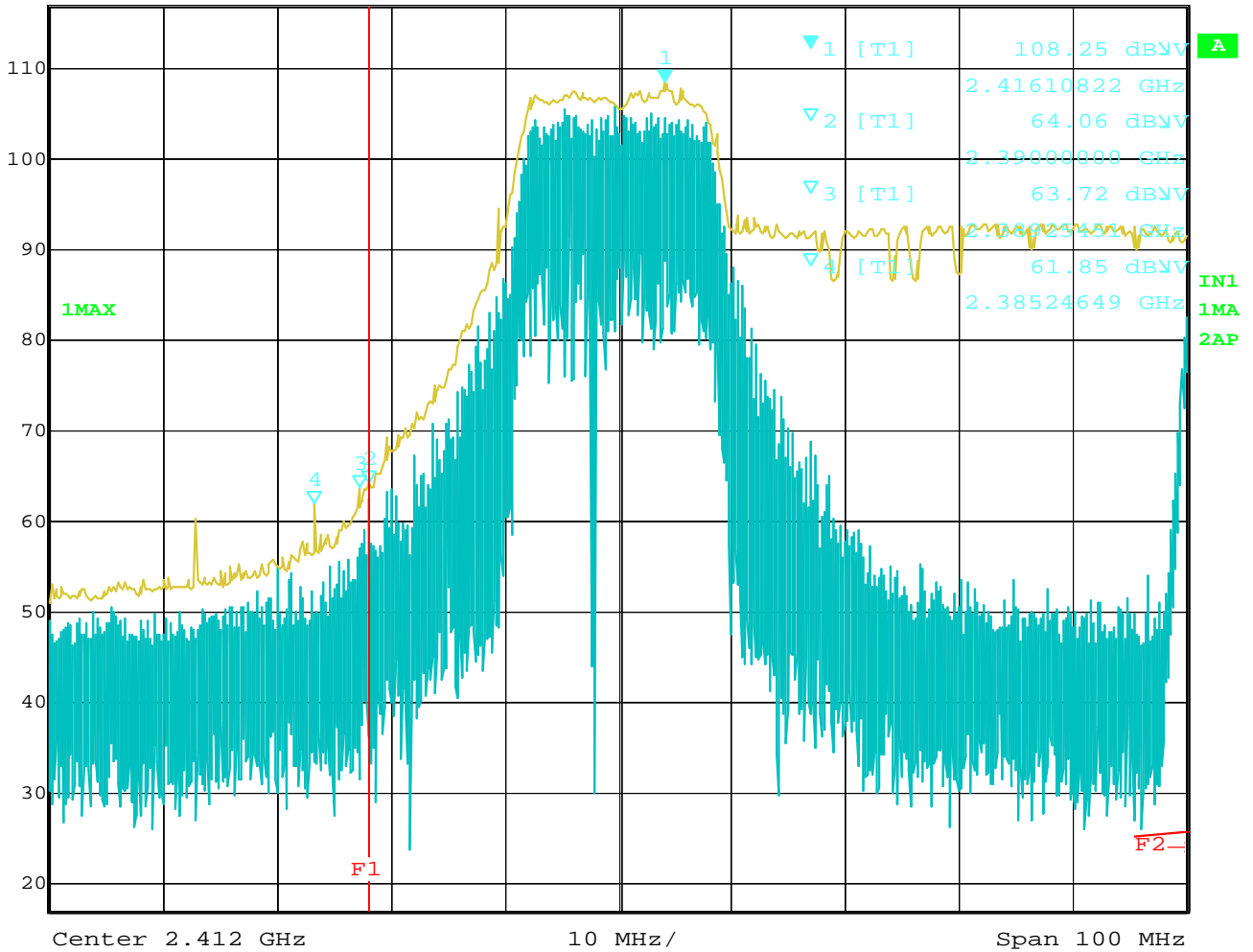


Date: 26.JAN.2005 13:18:25

Plot 2-2 Ch.1 2412MHz TX, DSSS 1Mbps (Average) in normal operation mode



Ref Lvl	117 dBμV	Marker 1 [T1]	108.25 dBμV	RBW	1 MHz	RF Att	20 dB
			2.41610822 GHz	VBW	1 MHz		
				SWT	5 ms	Unit	dBμV

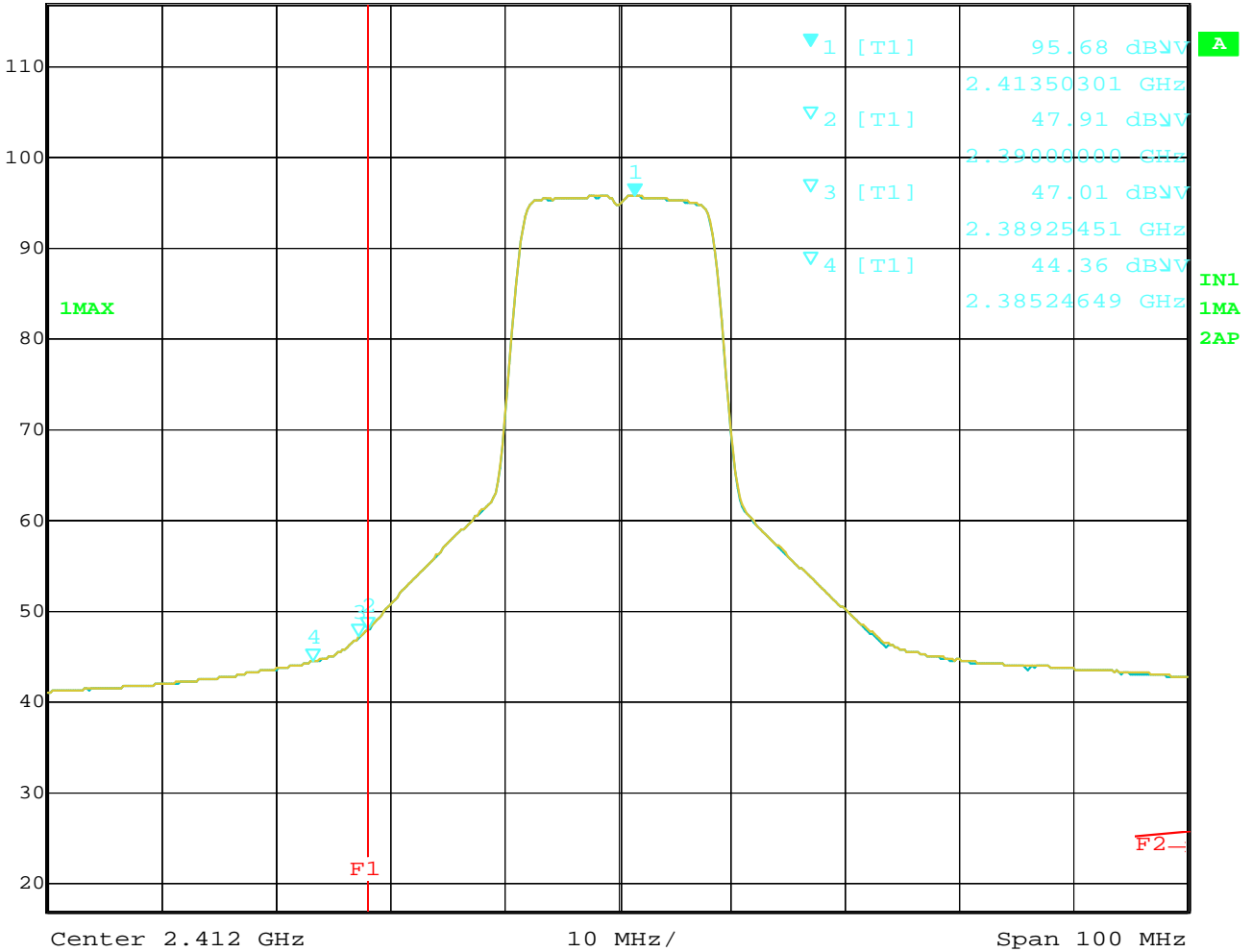


Date: 26.JAN.2005 17:21:50

Plot 2-3 Ch.1 2412MHz TX, OFDM 24Mbps (Peak) in Tablet operation mode



Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
 Ref Lvl 95.68 dBµV VBW 10 Hz  
 117 dBµV 2.41350301 GHz SWT 25 s Unit dBµV



Date: 26.JAN.2005 17:23:03

Plot 2-4 Ch.1 2412MHz TX, OFDM 24Mbps (Average) in tablet operation mode

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

The EUT was found to comply to the limits of FCC Part 15 Subpart C and RSS-210 with a margin of 7.1 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: January 26, February 1, 2, 7, 8, 9 and 15, 2005

### 2.5.1 EUT in 2.4GHz “Notebook” operation mode

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

\*Note1: OB means “operation band” (2400-2483.5MHz); in this case limit is 1W (measured conducted with power meter)

\*Note2: NR means “Non-Restricted band” (just reference only for EU compliance)

**Table 2-4.** Ch.1 (2412MHz) DSSS 1Mbps TX mode

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength	FCC Limit	Margin to limit (dB)	Field Strength	FCC Limit	Margin to limit (dB)
		(dBμV) <i>(peak)</i>	(dBμV) <i>(average)</i>				(dBμV/m) <i>(peak)</i>	(dBμV/m) <i>(average)</i>				
Inband												
2.413	H	106.3	101.6	28.3	-29.1	0.0	105.5	OB*1	-	100.8	OB*1	-
2.382	H	58.5	45.3	28.2	-29.2	0.0	57.5	74.0	16.5	44.3	54.0	9.7
2.386	H	56.8	47.3	28.2	-29.2	0.0	55.8	74.0	18.2	46.3	54.0	7.7
2.390	H	64.0	44.8	28.2	-29.2	0.0	63.0	74.0	11.0	43.8	54.0	10.2
1.098	V	51.0	-	24.4	-31.5	0.0	43.9	74.0	30.1	-	54.0	-
1.196	V	55.4	-	25.2	-31.3	0.0	49.3	74.0	24.7	-	54.0	-
1.396	V	51.9	-	25.8	-30.7	0.0	47.0	74.0	27.0	-	54.0	-
1.594	V	56.0	-	25.6	-30.3	0.0	51.3	74.0	22.7	-	54.0	-
1.816	V	43.4	29.8	26.9	-29.9	0.0	40.4	NR*2	-	26.8	NR*2	-
2.353	H	51.1	-	28.1	-29.2	0.0	50.0	74.0	24.0	-	54.0	-
2.378	H	51.3	-	28.2	-29.2	0.0	50.3	74.0	23.7	-	54.0	-
4.832	V	56.8	29.7	27.0	-26.5	0.0	57.3	74.0	16.7	30.2	54.0	23.8
4.880	V	57.6	26.2	27.0	-26.6	0.0	58.0	74.0	16.0	26.6	54.0	27.4
4.938	V	61.8	26.3	27.1	-26.4	0.0	62.5	74.0	11.5	27.0	54.0	27.0
4.958	V	62.2	26.2	27.1	-26.6	0.0	62.7	74.0	11.3	26.7	54.0	27.3
5.238	H	39.4	26.3	27.1	-26.0	0.0	40.5	NR*2	-	27.4	NR*2	-
5.272	H	39.3	26.3	27.1	-25.9	0.0	40.5	NR*2	-	27.5	NR*2	-
7.250	V	38.0	-	30.0	-24.5	0.0	43.5	74.0	30.5	-	54.0	-
7.263	V	38.5	-	29.9	-24.6	0.0	43.8	74.0	30.2	-	54.0	-

**Table 2-5. Ch.6 (2437MHz) DSSS 1Mbps 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 2.436 bandedge	H	105.3	100.8	28.4	-29.2	0.0	104.5	OB*1	-	100.0	OB*1	-
2.381	H	57.9	42.4	28.2	-29.2	0.0	56.9	74.0	17.1	41.4	54.0	12.6
2.390	H	57.9	43.2	28.2	-29.2	0.0	56.9	74.0	17.1	42.2	54.0	11.8
2.484	H	49.8	-	28.4	-29.1	0.0	49.1	74.0	24.9	-	54.0	-
1.100	V	51.9	-	24.4	-31.5	0.0	44.8	74.0	29.2	-	54.0	-
1.196	V	54.3	-	25.2	-31.3	0.0	48.2	74.0	25.8	-	54.0	-
1.400	V	51.4	-	25.8	-30.7	0.0	46.5	74.0	27.5	-	54.0	-
1.597	V	55.8	-	25.6	-30.3	0.0	51.1	74.0	22.9	-	54.0	-
1.818	V	42.8	29.8	26.9	-29.9	0.0	39.8	NR*2	-	26.8	NR*2	-
2.354	H	51.5	-	28.1	-29.2	0.0	50.4	74.0	23.6	-	54.0	-
2.367	H	51.6	-	28.1	-29.2	0.0	50.5	74.0	23.5	-	54.0	-
2.376	H	52.3	-	28.2	-29.2	0.0	51.3	74.0	22.7	-	54.0	-
2.387	H	54.1	-	28.2	-29.2	0.0	53.1	74.0	20.9	-	54.0	-
4.848	V	57.7	26.3	27.0	-26.5	0.0	58.2	74.0	15.8	26.8	54.0	27.2
4.876	V	58.0	30.5	27.0	-26.6	0.0	58.4	74.0	15.6	30.9	54.0	23.1
4.934	V	61.9	26.2	27.1	-26.4	0.0	62.6	74.0	11.4	26.9	54.0	27.1
4.956	V	64.1	26.2	27.1	-26.6	0.0	64.6	74.0	9.4	26.7	54.0	27.3
5.245	V	39.3	26.2	27.1	-26.0	0.0	40.4	NR*2	-	27.3	NR*2	-
5.285	V	39.0	26.1	27.1	-25.9	0.0	40.2	NR*2	-	27.3	NR*2	-
7.274	H	40.6	-	29.9	-24.6	0.0	45.9	74.0	28.1	-	54.0	-
7.311	V	38.7	-	29.9	-24.8	0.0	43.8	74.0	30.2	-	54.0	-

**Table 2-6. Ch.11 (2462MHz) DSSS 1Mbps 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 2.461 bandedge	H	103.7	99.5	28.4	-29.2	0.0	102.9	OB*1	-	98.7	OB*1	-
2.484	H	51.3	-	28.4	-29.1	0.0	50.6	74.0	23.4	-	54.0	-
2.488	H	52.5	-	28.4	-29.1	0.0	51.8	74.0	22.2	-	54.0	-
2.490	H	51.2	-	28.4	-29.1	0.0	50.5	74.0	23.5	-	54.0	-
1.098	V	50.8	-	24.4	-31.5	0.0	43.7	74.0	30.3	-	54.0	-
1.196	V	54.1	-	25.2	-31.3	0.0	48.0	74.0	26.0	-	54.0	-
1.396	V	49.9	-	25.8	-30.7	0.0	45.0	74.0	29.0	-	54.0	-
1.594	V	56.2	-	25.6	-30.3	0.0	51.5	74.0	22.5	-	54.0	-
1.817	V	43.1	29.8	26.9	-29.9	0.0	40.1	NR*2	-	26.8	NR*2	-
2.345	H	51.1	-	28.1	-29.3	0.0	49.9	74.0	24.1	-	54.0	-
2.375	H	52.7	-	28.2	-29.2	0.0	51.7	74.0	22.3	-	54.0	-
2.384	H	53.8	-	28.2	-29.2	0.0	52.8	74.0	21.2	-	54.0	-
2.388	H	54.6	-	28.2	-29.2	0.0	53.6	74.0	20.4	-	54.0	-
4.826	V	57.9	26.2	27.1	-26.6	0.0	58.4	74.0	15.6	26.7	54.0	27.3
4.906	V	59.1	26.2	27.0	-26.6	0.0	59.5	74.0	14.5	26.6	54.0	27.4
4.924	V	61.2	29.8	27.0	-26.4	0.0	61.8	74.0	12.2	30.4	54.0	23.6
4.958	V	63.5	26.3	27.1	-26.6	0.0	64.0	74.0	10.0	26.8	54.0	27.2
5.238	H	38.3	26.2	27.1	-26.0	0.0	39.4	NR*2	-	27.3	NR*2	-
7.261	V	40.8	-	30.0	-24.5	0.0	46.3	74.0	27.7	-	54.0	-

**Table 2-7. Ch.6 (2437MHz) DSSS RX mode**

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBµV/m)	FCC Limit (dBµV/m)	Margin to limit (dB)	Field Strength (dBµV/m)	FCC Limit (dBµV/m)	Margin to limit (dB)
		(dBµV) <i>(peak)</i>	(dBµV) <i>(average)</i>				<i>(peak)</i>			<i>(average)</i>		
1.096	V	51.0	-	24.4	-31.5	0.0	43.9	74.0	30.1	-	54.0	-
1.196	V	52.2	-	25.2	-31.3	0.0	46.1	74.0	27.9	-	54.0	-
1.396	V	49.4	-	25.8	-30.7	0.0	44.5	74.0	29.5	-	54.0	-
1.596	V	53.5	-	25.6	-30.3	0.0	48.8	74.0	25.2	-	54.0	-
1.816	V	43.0	29.8	26.9	-29.9	0.0	40.0	NR*2	-	26.8	NR*2	-
1.879	V	43.3	29.6	27.5	-29.7	0.0	41.1	NR*2	-	27.4	NR*2	-
5.226	H	37.6	25.9	27.1	-26.0	0.0	38.7	NR*2	-	27.0	NR*2	-
5.285	H	37.4	26.0	27.1	-25.9	0.0	38.6	NR*2	-	27.2	NR*2	-

### 2.5.2 EUT in 5.8GHz “Notebook” operation mode

The representative worst case of conducted peak transmission power in previous Table 1-4 was selected and tested with the co-located Bluetooth device (FCC ID: [ANO20040700HER](#)) in active and transmitting simultaneously.

\*Note1: OB means “operation band” (5725-5850MHz); in this case limit is 1W (measured conducted with power meter)

**Table 2-8 Ch.149 (5745MHz) OFDM 6Mbps TX mode**

Frequency (GHz)	Polarity (H/V)	Measured	Measured	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBµV/m)	FCC Limit (dBµV/m)	Margin to limit (dB)	Field Strength (dBµV/m)	FCC Limit (dBµV/m)	Margin to limit (dB)
		(dBµV) <i>(peak)</i>	(dBµV) <i>(average)</i>				<i>(peak)</i>			<i>(average)</i>		
Inband 5.743	H	101.2	90.7	34.0	-25.6	0.0	109.6	OB*1	-	99.1	OB*1	-
1.136	V	58.6	-	24.6	-31.4	0.0	51.8	74.0	22.2	-	54.0	-
1.200	V	49.8	-	25.2	-31.3	0.0	43.7	74.0	30.3	-	54.0	-
1.339	V	55.4	-	25.2	-30.9	0.0	49.7	74.0	24.3	-	54.0	-
1.599	V	54.7	-	25.6	-30.3	0.0	50.0	74.0	24.0	-	54.0	-
4.807	V	58.2	27.0	27.1	-26.7	0.0	58.6	74.0	15.4	27.4	54.0	26.6
4.883	V	58.5	26.8	27.0	-26.6	0.0	58.9	74.0	15.1	27.2	54.0	26.8
4.937	V	62.9	26.9	27.1	-26.4	0.0	63.6	74.0	10.4	27.6	54.0	26.4
4.960	V	63.7	27.0	27.1	-26.6	0.0	64.2	74.0	9.8	27.5	54.0	26.5
7.275	V	41.0	-	29.9	-24.6	0.0	46.3	74.0	27.7	-	54.0	-
11.489	V	41.6	29.0	33.5	-20.2	0.0	54.9	74.0	19.1	42.3	54.0	11.7



**Table 2-9** Ch.157 (5785MHz) OFDM 6Mbps **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 5.788	H	100.9	90.1	34.0	-25.5	0.0	109.4	OB*1	-	98.6	OB*1	-	
1.198	V	51.2	-	25.2	-31.3	0.0	45.1	74.0	28.9	-	54.0	-	
1.595	V	57.2	-	25.6	-30.3	0.0	52.5	74.0	21.5	-	54.0	-	
4.807	V	59.1	26.6	27.1	-26.7	0.0	59.5	74.0	14.5	27.0	54.0	27.0	
4.891	V	58.7	26.5	27.0	-26.6	0.0	59.1	74.0	14.9	26.9	54.0	27.1	
4.937	V	61.8	26.5	27.1	-26.4	0.0	62.5	74.0	11.5	27.2	54.0	26.8	
4.960	V	64.1	26.6	27.1	-26.6	0.0	64.6	74.0	9.4	27.1	54.0	26.9	
7.275	V	39.7	-	29.9	-24.6	0.0	45.0	74.0	29.0	-	54.0	-	
11.569	V	42.1	30.8	33.5	-19.7	0.0	55.9	74.0	18.1	44.6	54.0	9.4	

**Table 2-10** Ch.165 (5825MHz) OFDM 6Mbps **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 5.827	H	101.0	90.8	34.0	-25.6	0.0	109.4	OB*1	-	99.2	OB*1	-	
1.190	V	57.7	-	25.2	-31.3	0.0	51.6	74.0	22.4	-	54.0	-	
1.549	V	47.9	-	25.2	-30.9	0.0	42.2	74.0	31.8	-	54.0	-	
1.597	V	56.8	-	25.6	-30.3	0.0	52.1	74.0	21.9	-	54.0	-	
4.817	V	58.0	26.6	27.1	-26.6	0.0	58.5	74.0	15.5	27.1	54.0	26.9	
4.889	V	59.4	26.5	27.0	-26.6	0.0	59.8	74.0	14.2	26.9	54.0	27.1	
4.935	V	63.0	26.5	27.1	-26.4	0.0	63.7	74.0	10.3	27.2	54.0	26.8	
4.950	V	63.8	26.5	27.1	-26.4	0.0	64.5	74.0	9.5	27.2	54.0	26.8	
7.291	V	38.7	-	29.9	-24.4	0.0	44.2	74.0	29.8	-	54.0	-	
11.649	V	44.8	33.0	33.6	-20.0	0.0	58.4	74.0	15.6	46.6	54.0	7.4	

**Table 2-11** Ch.157 (5785MHz) 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>		
1.196	V	49.0	-	25.2	-31.3	0.0	42.9	74.0	31.1	-	54.0	-	
1.232	V	57.8	-	25.1	-31.1	0.0	51.8	74.0	22.2	-	54.0	-	
1.395	V	55.3	-	25.8	-30.7	0.0	50.4	74.0	23.6	-	54.0	-	
1.595	V	50.8	-	25.6	-30.3	0.0	46.1	74.0	27.9	-	54.0	-	

### 2.5.3 EUT in 2.4GHz “Tablet” 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” (2400-2483.5MHz); in this case limit is 1W (measured conducted with power meter)

\*Note2: NR means “Non-Restricted band” (just reference only for EU compliance)

**Table 2-12** Ch.1 (2412MHz) OFDM 24Mbps TX mode

Frequency (GHz)	Polarity (H/V)	Measured (dBμV) <i>(peak)</i>	Measured (dBμV) <i>(average)</i>	Antenna Factor (dB/m)	Corr. Factor (dB)	Falloff Factor (dB)	Field Strength (dBμV/m)	FCC Limit (dBμV/m)	Margin to limit (dB)	Field Strength (dBμV/m)	FCC Limit (dBμV/m)	Margin to limit (dB)
							<i>(peak)</i>			<i>(average)</i>		
Inband 2.416 bandedge	V	108.3	95.7	28.3	-29.1	0.0	107.5	OB*1	-	94.9	OB*1	-
2.385	V	61.9	44.4	28.2	-29.2	0.0	60.9	74.0	13.1	43.4	54.0	10.6
2.389	V	63.7	47.0	28.2	-29.2	0.0	62.7	74.0	11.3	46.0	54.0	8.0
2.390	V	64.1	47.9	28.2	-29.2	0.0	63.1	74.0	10.9	46.9	54.0	7.1
1.088	V	49.8	-	24.5	-31.5	0.0	42.8	74.0	31.2	-	54.0	-
1.196	V	55.7	-	25.2	-31.3	0.0	49.6	74.0	24.4	-	54.0	-
1.497	V	53.0	-	25.5	-30.5	0.0	48.0	74.0	26.0	-	54.0	-
1.596	V	56.1	-	25.6	-30.3	0.0	51.4	74.0	22.6	-	54.0	-
1.817	V	43.1	29.7	26.9	-29.9	0.0	40.1	NR*2	-	26.7	NR*2	-
2.269	H	50.2	-	27.7	-29.3	0.0	48.6	74.0	25.4	-	54.0	-
2.365	H	50.7	-	28.1	-29.2	0.0	49.6	74.0	24.4	-	54.0	-
4.824	H	50.6	-	27.1	-26.6	0.0	51.1	74.0	22.9	-	54.0	-
4.932	H	54.3	26.2	27.1	-26.4	0.0	55.0	74.0	19.0	26.9	54.0	27.1
4.944	H	53.4	26.2	27.1	-26.4	0.0	54.1	74.0	19.9	26.9	54.0	27.1
4.958	H	56.4	26.1	27.1	-26.6	0.0	56.9	74.0	17.1	26.6	54.0	27.4
5.217	V	39.0	25.9	27.1	-26.0	0.0	40.1	NR*2	-	27.0	NR*2	-
5.235	V	39.1	26.0	27.1	-26.0	0.0	40.2	NR*2	-	27.1	NR*2	-
7.266	V	38.9	-	29.9	-24.6	0.0	44.2	74.0	29.8	-	54.0	-

**Table 2-13** Ch.6 (2437MHz) OFDM 24Mbps 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 2.441 bandedge	V	111.1	98.8	28.4	-29.2	0.0	110.3	OB*1	-	98.0	OB*1	-
2.387	V	60.9	44.4	28.2	-29.2	0.0	59.9	74.0	14.1	43.4	54.0	10.6
2.390	V	55.7	44.8	28.2	-29.2	0.0	54.7	74.0	19.3	43.8	54.0	10.2
2.484	V	52.3	-	28.4	-29.1	0.0	51.6	74.0	22.4	-	54.0	-
1.098	V	50.0	-	24.4	-31.5	0.0	42.9	74.0	31.1	-	54.0	-
1.196	V	55.7	-	25.2	-31.3	0.0	49.6	74.0	24.4	-	54.0	-
1.490	V	49.5	-	25.3	-30.5	0.0	44.3	74.0	29.7	-	54.0	-
1.597	V	56.2	-	25.6	-30.3	0.0	51.5	74.0	22.5	-	54.0	-
1.821	V	43.9	29.6	26.9	-29.9	0.0	40.9	NR*2	-	26.6	NR*2	-
2.273	H	48.9	-	27.8	-29.3	0.0	47.4	74.0	26.6	-	54.0	-
2.349	H	50.8	-	28.1	-29.3	0.0	49.6	74.0	24.4	-	54.0	-
2.373	H	52.0	-	28.2	-29.2	0.0	51.0	74.0	23.0	-	54.0	-
4.808	H	50.5	-	27.1	-26.7	0.0	50.9	74.0	23.1	-	54.0	-
4.874	H	50.5	-	27.0	-26.6	0.0	50.9	74.0	23.1	-	54.0	-
4.936	H	55.1	26.1	27.1	-26.4	0.0	55.8	74.0	18.2	26.8	54.0	27.2
4.962	H	56.6	26.3	27.1	-26.6	0.0	57.1	74.0	16.9	26.8	54.0	27.2
5.285	H	37.8	25.9	27.1	-25.9	0.0	39.0	NR*2	-	27.1	NR*2	-

**Table 2-14** Ch.11 (2462MHz) OFDM 24Mbps 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 2.454 bandedge	V	107.4	95.6	28.4	-29.2	0.0	106.6	OB*1	-	94.8	OB*1	-
2.484	V	60.4	44.2	28.4	-29.1	0.0	59.7	74.0	14.3	43.5	54.0	10.5
2.485	V	59.1	43.0	28.4	-29.1	0.0	58.4	74.0	15.6	42.3	54.0	11.7
1.096	V	50.6	-	24.4	-31.5	0.0	43.5	74.0	30.5	-	54.0	-
1.198	V	54.2	-	25.2	-31.3	0.0	48.1	74.0	25.9	-	54.0	-
1.502	V	49.7	-	25.5	-30.5	0.0	44.7	74.0	29.3	-	54.0	-
1.594	V	56.6	-	25.6	-30.3	0.0	51.9	74.0	22.1	-	54.0	-
1.822	V	42.8	29.8	26.9	-29.9	0.0	39.8	NR*2	-	26.8	NR*2	-
2.323	H	49.5	-	28.0	-29.3	0.0	48.2	74.0	25.8	-	54.0	-
2.343	H	50.6	-	28.1	-29.3	0.0	49.4	74.0	24.6	-	54.0	-
2.375	H	51.8	-	28.2	-29.2	0.0	50.8	74.0	23.2	-	54.0	-
2.387	H	52.5	-	28.2	-29.2	0.0	51.5	74.0	22.5	-	54.0	-
4.816	H	49.7	-	27.1	-26.6	0.0	50.2	74.0	23.8	-	54.0	-
4.878	H	50.5	-	27.0	-26.6	0.0	50.9	74.0	23.1	-	54.0	-
4.944	H	55.4	26.2	27.1	-26.4	0.0	56.1	74.0	17.9	26.9	54.0	27.1
4.960	H	56.3	26.2	27.1	-26.6	0.0	56.8	74.0	17.2	26.7	54.0	27.3
5.245	V	37.4	25.9	27.1	-26.0	0.0	38.5	NR*2	-	27.0	NR*2	-

**Table 2-15** Ch.6 (2437MHz) 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>		
1.088	V	49.4	-	24.5	-31.5	0.0	42.4	74.0	31.6	-	54.0	-
1.193	V	51.2	-	25.2	-31.3	0.0	45.1	74.0	28.9	-	54.0	-
1.503	V	49.2	-	25.5	-30.5	0.0	44.2	74.0	29.8	-	54.0	-
1.596	V	51.3	-	25.6	-30.3	0.0	46.6	74.0	27.4	-	54.0	-
1.875	H	43.2	29.7	27.5	-29.7	0.0	41.0	NR*2	-	27.5	NR*2	-
1.893	H	42.7	29.6	27.6	-29.7	0.0	40.6	NR*2	-	27.5	NR*2	-
5.245	H	37.8	25.9	27.1	-26.0	0.0	38.9	NR*2	-	27.0	NR*2	-
5.285	H	38.5	25.9	27.1	-25.9	0.0	39.7	NR*2	-	27.1	NR*2	-

### 2.5.4 EUT in 5.8GHz “Tablet” operation mode

The representative worst case of conducted peak transmission power in previous Table 1-4 was selected and tested with the co-located Bluetooth device (FCC ID: [ANO20040700HER](#)) in active and transmitting simultaneously.

\*Note1: OB means “operation band” (5725-5850MHz); in this case limit is 1W (measured conducted with power meter)

**Table 2-16** Ch.149 (5745MHz) OFDM 6Mbps **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 5.739	V	99.3	88.8	34.0	-25.6	0.0	107.7	OB*1	-	97.2	OB*1	-
1.074	V	55.0	-	24.5	-31.5	0.0	48.0	74.0	26.0	-	54.0	-
1.196	V	52.0	-	25.2	-31.3	0.0	45.9	74.0	28.1	-	54.0	-
1.595	V	56.7	-	25.6	-30.3	0.0	52.0	74.0	22.0	-	54.0	-
4.831	H	51.5	-	27.0	-26.5	0.0	52.0	74.0	22.0	-	54.0	-
4.879	H	51.2	-	27.0	-26.6	0.0	51.6	74.0	22.4	-	54.0	-
4.937	H	56.0	26.6	27.1	-26.4	0.0	56.7	74.0	17.3	27.3	54.0	26.7
4.958	H	56.2	26.6	27.1	-26.6	0.0	56.7	74.0	17.3	27.1	54.0	26.9
7.279	V	38.4	-	29.9	-24.6	0.0	43.7	74.0	30.3	-	54.0	-
11.489	V	39.3	-	33.5	-20.2	0.0	52.6	74.0	21.4	-	54.0	-

**Table 2-17** Ch.157 (5785MHz) OFDM 6Mbps 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 5.782	V	97.4	86.9	34.0	-25.5	0.0	105.9	OB*1	-	95.4	OB*1	-	
1.198	V	54.4	-	25.2	-31.3	0.0	48.3	74.0	25.7	-	54.0	-	
1.597	V	59.0	34.6	25.6	-30.3	0.0	54.3	74.0	19.7	29.9	54.0	24.1	
4.813	H	51.2	-	27.1	-26.6	0.0	51.7	74.0	22.3	-	54.0	-	
4.893	H	51.8	-	27.0	-26.6	0.0	52.2	74.0	21.8	-	54.0	-	
4.935	H	55.0	26.4	27.1	-26.4	0.0	55.7	74.0	18.3	27.1	54.0	26.9	
4.948	H	56.3	26.5	27.1	-26.4	0.0	57.0	74.0	17.0	27.2	54.0	26.8	
7.251	V	39.0	-	30.0	-24.5	0.0	44.5	74.0	29.5	-	54.0	-	
11.567	V	40.0	-	33.5	-19.7	0.0	53.8	74.0	20.2	-	54.0	-	

**Table 2-18** Ch.165 (5825MHz) OFDM 6Mbps 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 5.820	V	97.4	86.5	34.0	-25.6	0.0	105.8	OB*1	-	94.9	OB*1	-	
1.198	V	52.9	-	25.2	-31.3	0.0	46.8	74.0	27.2	-	54.0	-	
1.595	V	56.0	-	25.6	-30.3	0.0	51.3	74.0	22.7	-	54.0	-	
4.815	H	49.7	-	27.1	-26.6	0.0	50.2	74.0	23.8	-	54.0	-	
4.893	H	52.2	-	27.0	-26.6	0.0	52.6	74.0	21.4	-	54.0	-	
4.927	H	54.5	26.2	27.0	-26.4	0.0	55.1	74.0	18.9	26.8	54.0	27.2	
4.944	H	56.6	26.2	27.1	-26.4	0.0	57.3	74.0	16.7	26.9	54.0	27.1	
7.279	V	38.8	-	29.9	-24.6	0.0	44.1	74.0	29.9	-	54.0	-	
11.657	V	42.2	29.9	33.6	-20.0	0.0	55.8	74.0	18.2	43.5	54.0	10.5	

**Table 2-19** Ch.157 (5785MHz) 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>		
1.110	V	46.2	-	24.5	-31.5	0.0	39.2	74.0	34.8	-	54.0	-	
1.196	V	47.9	-	25.2	-31.3	0.0	41.8	74.0	32.2	-	54.0	-	
1.230	V	46.1	-	25.1	-31.1	0.0	40.1	74.0	33.9	-	54.0	-	
1.597	V	50.2	-	25.6	-30.3	0.0	45.5	74.0	28.5	-	54.0	-	

### 3. Restricted Bands Radiation (30MHz – 1GHz) [ FCC 15.205 / 209, RSS-210 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

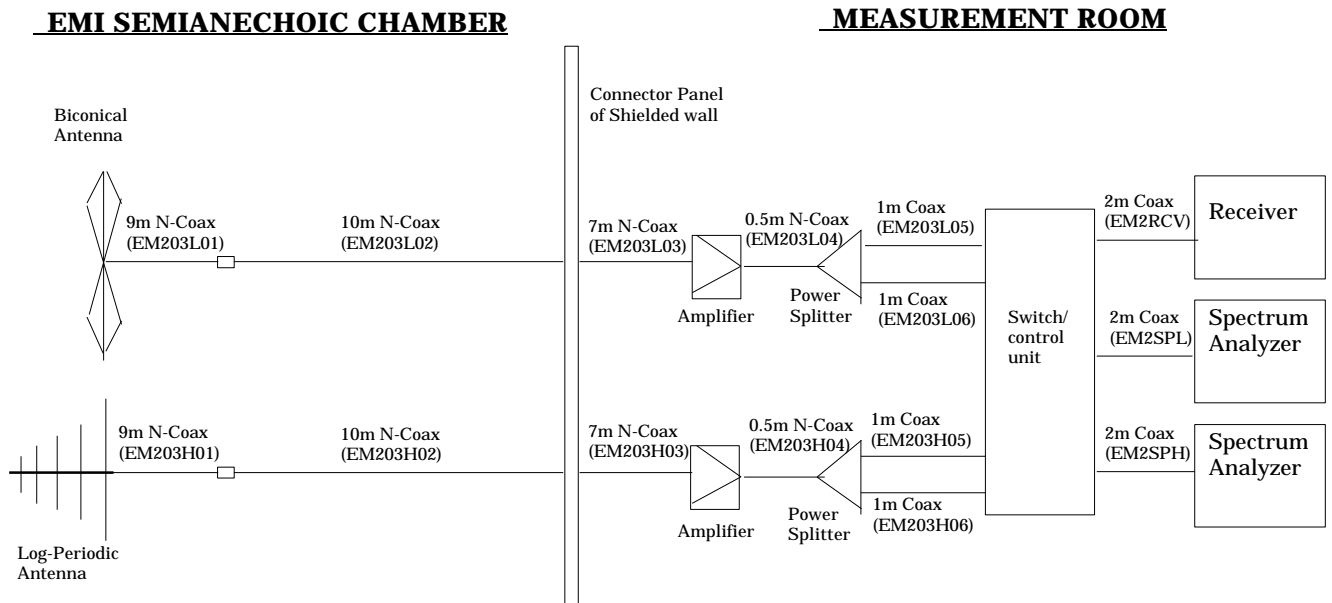


Figure 3 Cables for Radiated Emission Test

### 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:

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

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

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

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

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

### 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 C and RSS-210 with a margin of 9.9dB at 30MHz - 1000MHz band.

The 6 highest emissions relative to the limits are reported.

Test Date: January 27 and February 3, 2005

#### 3.4.1 EUT in 2.4GHz “Notebook” operation mode

**Table 3-2.** Ch.1 (2412MHz) DSSS 1Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
59.999	V	49.2	9.3	-28.7	29.8	40.0	10.2	30.9	100
133.429	H	46.1	12.0	-27.4	30.7	43.5	12.8	34.3	150
226.884	H	42.5	10.5	-24.5	28.5	46.0	17.5	26.6	200
269.998	H	42.7	12.5	-23.9	31.3	46.0	14.7	36.7	200
509.998	V	30.5	18.6	-20.5	28.6	46.0	17.4	26.9	200
799.464	H	32.5	21.1	-18.3	35.3	46.0	10.7	58.2	200

**Table 3-3.** Ch.6 (2437MHz) DSSS 1Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
132.000	H	45.7	12.0	-27.5	30.2	43.5	13.3	32.4	150
227.009	H	41.7	10.5	-24.5	27.7	46.0	18.3	24.3	200
269.999	H	42.4	12.5	-23.9	31.0	46.0	15.0	35.5	200
356.282	V	36.7	14.4	-22.4	28.7	46.0	17.3	27.2	200
509.997	V	30.5	18.6	-20.5	28.6	46.0	17.4	26.9	200
798.189	H	33.3	21.1	-18.4	36.0	46.0	10.0	63.1	200

**Table 3-4.** Ch.11 (2462MHz) DSSS 1Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
131.020	H	45.5	11.9	-27.5	29.9	43.5	13.6	31.3	150
227.009	V	40.8	10.5	-24.5	26.8	46.0	19.2	21.9	200
269.999	H	42.0	12.5	-23.9	30.6	46.0	15.4	33.9	200
355.990	V	39.3	14.4	-22.3	31.4	46.0	14.6	37.2	200
509.996	V	30.8	18.6	-20.5	28.9	46.0	17.1	27.9	200
799.448	H	33.3	21.1	-18.3	36.1	46.0	9.9	63.8	200



**Table 3-5.** Ch.6 (2437MHz) DSSS RX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
132.000	H	45.6	12.0	-27.5	30.1	43.5	13.4	32.0	150
174.000	H	41.5	12.6	-26.9	27.2	43.5	16.3	22.9	150
269.999	H	41.9	12.5	-23.9	30.5	46.0	15.5	33.5	200
356.661	V	38.0	14.4	-22.4	30.0	46.0	16.0	31.6	200
509.997	V	30.5	18.6	-20.5	28.6	46.0	17.4	26.9	200
799.380	H	31.4	21.1	-18.3	34.2	46.0	11.8	51.3	200

### 3.4.2 EUT in 5.8GHz “Notebook” operation mode

**Table 3-6.** Ch.149 (5745MHz) OFDM 6Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
224.120	H	40.6	10.5	-24.4	26.7	46.0	19.3	21.6	200
263.999	H	40.8	12.1	-23.9	29.0	46.0	17.0	28.2	200
269.999	H	42.2	12.5	-23.9	30.8	46.0	15.2	34.7	200
291.913	H	35.6	13.5	-23.7	25.4	46.0	20.6	18.6	200
453.831	V	32.9	16.5	-21.6	27.8	46.0	18.2	24.5	200
797.745	H	32.8	21.1	-18.4	35.5	46.0	10.5	59.6	200

**Table 3-7.** Ch.157 (5785MHz) OFDM 6Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
220.685	H	39.8	10.5	-24.5	25.8	46.0	20.2	19.5	200
269.998	H	42.8	12.5	-23.9	31.4	46.0	14.6	37.2	200
355.288	V	35.8	14.4	-22.3	27.9	46.0	18.1	24.8	200
454.047	V	32.6	16.5	-21.6	27.5	46.0	18.5	23.7	200
509.997	V	30.4	18.6	-20.5	28.5	46.0	17.5	26.6	200
799.126	H	33.3	21.1	-18.5	35.9	46.0	10.1	62.4	200

**Table 3-8.** Ch.165 (5825MHz) OFDM 6Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
200.001	H	36.1	11.4	-25.1	22.4	43.5	21.1	13.2	150
227.785	H	40.1	10.5	-24.5	26.1	46.0	19.9	20.2	200
269.998	H	42.7	12.5	-23.9	31.3	46.0	14.7	36.7	200
453.644	V	33.3	16.5	-21.6	28.2	46.0	17.8	25.7	200
509.996	V	30.4	18.6	-20.5	28.5	46.0	17.5	26.6	200
798.186	H	33.2	21.1	-18.4	35.9	46.0	10.1	62.4	200

**Table 3-9.** Ch.157 (5785MHz) OFDM RX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
173.999	H	39.6	12.6	-26.9	25.3	43.5	18.2	18.4	150
257.999	H	39.6	12.0	-23.9	27.7	46.0	18.3	24.3	200
269.999	H	43.2	12.5	-23.9	31.8	46.0	14.2	38.9	200
358.629	V	38.1	14.4	-22.2	30.3	46.0	15.7	32.7	200
509.998	V	30.6	18.6	-20.5	28.7	46.0	17.3	27.2	200
797.929	H	32.3	21.1	-18.4	35.0	46.0	11.0	56.2	200

### 3.4.3 EUT in 2.4GHz “Tablet” operation mode

**Table 3-10.** Ch.1 (2412MHz) OFDM 24Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
480.000	H	30.1	17.2	-21.2	26.1	46.0	19.9	20.2	200
499.055	H	31.5	17.8	-20.8	28.5	46.0	17.5	26.6	200
565.094	H	32.4	18.2	-20.1	30.5	46.0	15.5	33.5	200
598.540	V	29.0	18.7	-19.9	27.8	46.0	18.2	24.5	200
632.283	H	25.4	19.2	-19.5	25.1	46.0	20.9	18.0	200
798.730	H	31.5	21.1	-18.5	34.1	46.0	11.9	50.7	200

**Table 3-11.** Ch.6 (2437MHz) OFDM 24Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
212.444	V	37.0	10.8	-24.9	22.9	43.5	20.6	14.0	150
449.122	H	29.3	16.4	-21.3	24.4	46.0	21.6	16.6	200
499.158	H	30.9	17.8	-20.8	27.9	46.0	18.1	24.8	200
565.263	H	32.0	18.2	-20.1	30.1	46.0	15.9	32.0	200
598.041	H	29.4	18.7	-19.9	28.2	46.0	17.8	25.7	200
797.407	H	30.8	21.1	-18.7	33.2	46.0	12.8	45.7	200

**Table 3-12.** Ch.11 (2462MHz) OFDM 24Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
292.225	H	34.1	13.6	-23.7	24.0	46.0	22.0	15.8	200
498.607	H	32.0	17.8	-20.8	29.0	46.0	17.0	28.2	200
564.797	H	31.5	18.2	-20.0	29.7	46.0	16.3	30.5	200
598.691	H	31.4	18.7	-19.9	30.2	46.0	15.8	32.4	200
631.884	H	25.2	19.1	-19.4	24.9	46.0	21.1	17.6	200
797.841	H	30.3	21.1	-18.4	33.0	46.0	13.0	44.7	200

**Table 3-13.** Ch.6 (2437MHz) OFDM RX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
349.712	H	32.5	14.4	-22.8	24.1	46.0	21.9	16.0	200
498.970	H	28.1	17.8	-20.8	25.1	46.0	20.9	18.0	200
564.666	H	26.5	18.2	-20.0	24.7	46.0	21.3	17.2	200
598.337	H	28.1	18.7	-19.9	26.9	46.0	19.1	22.1	200
615.683	V	26.3	18.9	-19.5	25.7	46.0	20.3	19.3	200
798.598	V	30.1	21.1	-18.5	32.7	46.0	13.3	43.2	200

### 3.4.4 EUT in 5.8GHz “Tablet” operation mode

**Table 3-14.** Ch.149 (5745MHz) OFDM 6Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
108.000	V	36.2	9.9	-27.9	18.2	43.5	25.3	8.1	150
218.244	H	37.5	10.7	-24.6	23.6	46.0	22.4	15.1	200
450.004	H	28.8	16.4	-21.3	23.9	46.0	22.1	15.7	200
485.967	H	32.1	17.2	-20.9	28.4	46.0	17.6	26.3	200
565.008	H	28.5	18.2	-20.1	26.6	46.0	19.4	21.4	200
798.135	H	31.4	21.1	-18.4	34.1	46.0	11.9	50.7	200

**Table 3-15.** Ch.157 (5785MHz) OFDM 6Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
212.428	H	36.6	10.8	-24.9	22.5	43.5	21.0	13.3	150
485.968	H	31.1	17.2	-20.9	27.4	46.0	18.6	23.4	200
499.048	H	28.9	17.8	-20.8	25.9	46.0	20.1	19.7	200
565.059	H	31.7	18.2	-20.1	29.8	46.0	16.2	30.9	200
632.069	V	28.6	19.2	-19.5	28.3	46.0	17.7	26.0	200
799.013	H	31.4	21.1	-18.5	34.0	46.0	12.0	50.1	200

**Table 3-16.** Ch.165 (5825MHz) OFDM 6Mbps TX mode

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
216.000	H	37.2	10.7	-24.7	23.2	43.5	20.3	14.5	150
448.994	H	28.5	16.4	-21.3	23.6	46.0	22.4	15.1	200
499.053	H	28.7	17.8	-20.8	25.7	46.0	20.3	19.3	200
565.193	H	29.2	18.2	-20.1	27.3	46.0	18.7	23.2	200
631.981	H	25.5	19.1	-19.4	25.2	46.0	20.8	18.2	200
799.425	H	30.9	21.1	-18.3	33.7	46.0	12.3	48.4	200

**Table 3-17. Ch.157 (5785MHz) OFDM RX mode**

Frequency (MHz)	Polarity (H/V)	Measured (dB $\mu$ V)	Antenna Factor (dB/m)	Corr. Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin to limit (dB)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
218.609	H	36.9	10.6	-24.6	22.9	46.0	23.1	14.0	200
454.016	H	27.6	16.5	-21.6	22.5	46.0	23.5	13.3	200
498.971	H	30.7	17.8	-20.8	27.7	46.0	18.3	24.3	200
514.887	H	25.6	18.6	-20.6	23.6	46.0	22.4	15.1	200
630.001	H	24.8	19.1	-19.5	24.4	46.0	21.6	16.6	200
797.839	H	31.2	21.1	-18.4	33.9	46.0	12.1	49.5	200

## 4. AC Wireline Conducted Emissions (150KHz – 30MHz) [ FCC 15.207, RSS-210 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: - Lisn-L <=> SW/Con.unit (SW100) - Lisn-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

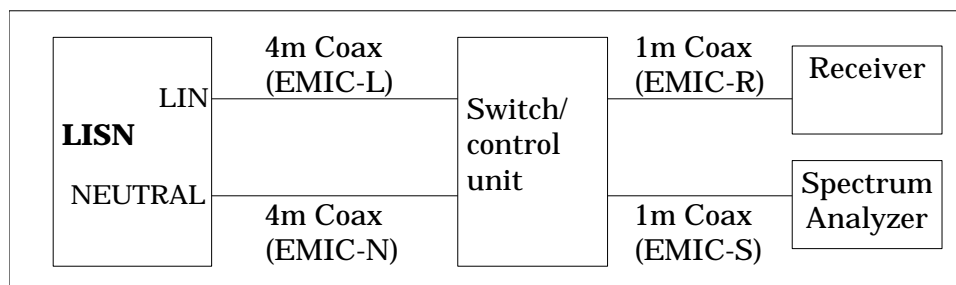


Figure 4. Cables for Conducted Emission Test

### 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:

$$\begin{aligned} PV &= \text{Powerline Voltage (dB}\mu\text{V)} \\ R &= \text{Measured Receiver Input Amplitude (dB}\mu\text{V)} \\ CORR &= \text{Correction Factor (dB) = LL+CL+SWL+PLL} \\ LL &= \text{Insertion loss of LISN (dB)} \\ CL &= \text{Insertion loss of Cable (dB)} \\ SWL &= \text{Insertion loss of Switch control unit (dB)} \\ PLL &= \text{Insertion loss of Pulse Limiter (dB)} \end{aligned}$$

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:

$$\begin{aligned} CORR &= 0.6 + 0.1 + 0.1 + 0.2 = 1.0 \text{ (dB)} \\ PV &= 50.0 + 1.0 = 51.0 \text{ (dB}\mu\text{V)} \end{aligned}$$

## 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 C and RSS-210 with a margin of 9.2dB. The 6 highest emissions relative to the limits are reported.

Test Date: January 28 and February 14, 2005

### 4.4.1 EUT in 2.4GHz “Notebook” operation mode

**Table 4-2.** Ch.1 (2412MHz) DSSS 1Mbps 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)					
0.1915	52.9	0.5	53.4	44.3	0.5	44.8	64.0	10.6	54.0	9.2	Line
0.2562	43.6	0.6	44.2	35.0	0.6	35.6	61.6	17.4	51.6	16.0	Neutral
0.3179	36.8	0.6	37.4	30.7	0.6	31.3	59.8	22.4	49.8	18.5	Line
0.4457	35.1	0.6	35.7	32.8	0.6	33.4	57.0	21.3	47.0	13.6	Neutral
0.5097	33.8	0.6	34.4	29.7	0.6	30.3	56.0	21.6	46.0	15.7	Neutral
0.5730	32.3	0.6	32.9	30.4	0.6	31.0	56.0	23.1	46.0	15.0	Line

**Table 4-3.** Ch.6 (2437MHz) DSSS 1Mbps 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	49.9	0.5	50.4	41.5	0.5	42.0	63.9	13.5	53.9	11.9	Line
0.2560	41.8	0.6	42.4	33.9	0.6	34.5	61.6	19.2	51.6	17.1	Neutral
0.3199	35.8	0.6	36.4	28.5	0.6	29.1	59.7	23.3	49.7	20.6	Neutral
0.4462	35.0	0.6	35.6	31.8	0.6	32.4	56.9	21.3	46.9	14.5	Neutral
0.5076	33.9	0.6	34.5	30.6	0.6	31.2	56.0	21.5	46.0	14.8	Neutral
0.5688	33.3	0.6	33.9	30.1	0.6	30.7	56.0	22.1	46.0	15.3	Neutral

**Table 4-4.** Ch.11 (2462MHz) DSSS 1Mbps 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	48.6	0.5	49.1	40.0	0.5	40.5	63.9	14.8	53.9	13.4	Line
0.2555	41.6	0.6	42.2	33.9	0.6	34.5	61.6	19.4	51.6	17.1	Neutral
0.3192	35.8	0.6	36.4	28.7	0.6	29.3	59.7	23.3	49.7	20.4	Neutral
0.4450	34.9	0.6	35.5	32.7	0.6	33.3	57.0	21.5	47.0	13.7	Neutral
0.5087	33.8	0.6	34.4	30.3	0.6	30.9	56.0	21.6	46.0	15.1	Neutral
0.5691	33.5	0.6	34.1	30.8	0.6	31.4	56.0	21.9	46.0	14.6	Neutral

**Table 4-5. Ch.6 (2437MHz) DSSS 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)					
0.1919	49.8	0.5	50.3	41.7	0.5	42.2	64.0	13.7	54.0	11.8	Line
0.2561	40.5	0.6	41.1	33.2	0.6	33.8	61.6	20.5	51.6	17.8	Neutral
0.3199	34.5	0.6	35.1	28.0	0.6	28.6	59.7	24.6	49.7	21.1	Neutral
0.4465	34.9	0.6	35.5	31.9	0.6	32.5	56.9	21.4	46.9	14.4	Neutral
0.5089	34.1	0.6	34.7	30.6	0.6	31.2	56.0	21.3	46.0	14.8	Neutral
0.5691	34.1	0.6	34.7	31.4	0.6	32.0	56.0	21.3	46.0	14.0	Neutral

### 4.4.2 EUT in 5.8GHz “Notebook” operation mode

**Table 4-6. Ch.149 (5745MHz) OFDM 6Mbps 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)					
0.1931	47.9	0.5	48.4	39.7	0.5	40.2	63.9	15.5	53.9	13.7	Neutral
0.2560	39.4	0.6	40.0	32.3	0.6	32.9	61.6	21.6	51.6	18.7	Line
0.4470	32.5	0.6	33.1	30.2	0.6	30.8	56.9	23.8	46.9	16.1	Line
0.5053	32.6	0.6	33.2	29.3	0.6	29.9	56.0	22.8	46.0	16.1	Neutral
0.5688	31.9	0.6	32.5	30.2	0.6	30.8	56.0	23.5	46.0	15.2	Line
1.9050	25.8	0.7	26.5	23.0	0.7	23.7	56.0	29.5	46.0	22.3	Line

**Table 4-7. Ch.157 (5785MHz) OFDM 6Mbps 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	48.3	0.5	48.8	40.0	0.5	40.5	63.9	15.1	53.9	13.4	Neutral
0.2565	39.2	0.6	39.8	31.9	0.6	32.5	61.5	21.7	51.5	19.0	Line
0.3190	35.0	0.6	35.6	28.4	0.6	29.0	59.7	24.1	49.7	20.7	Line
0.4459	33.8	0.6	34.4	31.6	0.6	32.2	57.0	22.6	47.0	14.8	Line
0.5088	32.9	0.6	33.5	29.3	0.6	29.9	56.0	22.5	46.0	16.1	Neutral
0.5679	32.1	0.6	32.7	29.3	0.6	29.9	56.0	23.3	46.0	16.1	Neutral

**Table 4-8. Ch.165 (5825MHz) OFDM 6Mbps 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	48.3	0.5	48.8	39.7	0.5	40.2	63.9	15.1	53.9	13.7	Neutral
0.2565	39.1	0.6	39.7	31.8	0.6	32.4	61.5	21.8	51.5	19.1	Line
0.3216	29.8	0.6	30.4	22.2	0.6	22.8	59.7	29.3	49.7	26.9	Line
0.4459	33.1	0.6	33.7	30.9	0.6	31.5	57.0	23.3	47.0	15.5	Line
0.5084	32.7	0.6	33.3	29.1	0.6	29.7	56.0	22.7	46.0	16.3	Neutral
0.5688	32.5	0.6	33.1	29.8	0.6	30.4	56.0	22.9	46.0	15.6	Neutral



**Table 4-9.** Ch.157 (5785MHz) 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)					
0.1930	48.2	0.5	48.7	39.9	0.5	40.4	63.9	15.2	53.9	13.5	Neutral
0.2544	40.7	0.6	41.3	33.6	0.6	34.2	61.6	20.3	51.6	17.4	Line
0.4439	34.4	0.6	35.0	32.6	0.6	33.2	57.0	22.0	47.0	13.8	Line
0.5081	32.7	0.6	33.3	29.9	0.6	30.5	56.0	22.7	46.0	15.5	Line
0.5702	32.6	0.6	33.2	31.3	0.6	31.9	56.0	22.8	46.0	14.1	Line
1.9049	26.2	0.7	26.9	24.9	0.7	25.6	56.0	29.1	46.0	20.4	Line

### 4.4.3 EUT in 2.4GHz “Tablet” operation mode

**Table 4-10.** Ch.1 (2412MHz) OFDM 24Mbps **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	48.1	0.5	48.6	39.8	0.5	40.3	63.9	15.3	53.9	13.6	Line
0.2560	39.7	0.6	40.3	32.6	0.6	33.2	61.6	21.3	51.6	18.4	Neutral
0.3150	35.7	0.6	36.3	29.0	0.6	29.6	59.8	23.5	49.8	20.2	Neutral
0.4462	34.6	0.6	35.2	31.5	0.6	32.1	56.9	21.7	46.9	14.8	Neutral
0.5097	32.0	0.6	32.6	28.7	0.6	29.3	56.0	23.4	46.0	16.7	Neutral
0.5699	32.6	0.6	33.2	30.9	0.6	31.5	56.0	22.8	46.0	14.5	Line

**Table 4-11.** Ch.6 (2437MHz) OFDM 24Mbps **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)					
0.1951	42.4	0.5	42.9	33.4	0.5	33.9	63.8	20.9	53.8	19.9	Line
0.2563	39.5	0.6	40.1	32.3	0.6	32.9	61.5	21.4	51.5	18.6	Neutral
0.3155	36.0	0.6	36.6	30.0	0.6	30.6	59.8	23.2	49.8	19.2	Neutral
0.4413	34.2	0.6	34.8	31.3	0.6	31.9	57.0	22.2	47.0	15.1	Line
0.5093	32.4	0.6	33.0	29.3	0.6	29.9	56.0	23.0	46.0	16.1	Neutral
0.5695	33.1	0.6	33.7	30.2	0.6	30.8	56.0	22.3	46.0	15.2	Neutral

**Table 4-12.** Ch.11 (2462MHz) OFDM 24Mbps **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)					
0.1950	43.1	0.5	43.6	34.1	0.5	34.6	63.8	20.2	53.8	19.2	Line
0.2573	38.8	0.6	39.4	31.0	0.6	31.6	61.5	22.1	51.5	19.9	Neutral
0.3187	35.7	0.6	36.3	28.6	0.6	29.2	59.7	23.4	49.7	20.5	Neutral
0.4481	30.4	0.6	31.0	27.3	0.6	27.9	56.9	25.9	46.9	19.0	Neutral
0.5091	32.5	0.6	33.1	29.2	0.6	29.8	56.0	22.9	46.0	16.2	Neutral
0.5712	33.0	0.6	33.6	30.1	0.6	30.7	56.0	22.4	46.0	15.3	Neutral

**Table 4-13.** Ch.6 (2437MHz) 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)					
0.1950	43.2	0.5	43.7	35.0	0.5	35.5	63.8	20.1	53.8	18.3	Line
0.2550	40.8	0.6	41.4	33.2	0.6	33.8	61.6	20.2	51.6	17.8	Neutral
0.3191	35.3	0.6	35.9	28.1	0.6	28.7	59.7	23.8	49.7	21.0	Neutral
0.4470	32.6	0.6	33.2	30.0	0.6	30.6	56.9	23.7	46.9	16.3	Line
0.5099	32.8	0.6	33.4	28.9	0.6	29.5	56.0	22.6	46.0	16.5	Neutral
0.5723	32.6	0.6	33.2	29.9	0.6	30.5	56.0	22.8	46.0	15.5	Neutral

### 4.4.4 EUT in 5.8GHz “Tablet” operation mode

**Table 4-14.** Ch.149 (5745MHz) OFDM 6Mbps **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	48.3	0.5	48.8	39.9	0.5	40.4	63.9	15.1	53.9	13.5	Neutral
0.2574	37.7	0.6	38.3	30.2	0.6	30.8	61.5	23.2	51.5	20.7	Line
0.3172	35.0	0.6	35.6	28.2	0.6	28.8	59.8	24.2	49.8	21.0	Line
0.4464	32.9	0.6	33.5	30.7	0.6	31.3	56.9	23.4	46.9	15.6	Line
0.5083	31.9	0.6	32.5	28.9	0.6	29.5	56.0	23.5	46.0	16.5	Line
0.5687	31.4	0.6	32.0	29.7	0.6	30.3	56.0	24.0	46.0	15.7	Line

**Table 4-15.** Ch.157 (5785MHz) OFDM 6Mbps **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)					
0.1931	48.1	0.5	48.6	39.5	0.5	40.0	63.9	15.3	53.9	13.9	Neutral
0.2580	34.1	0.6	34.7	27.0	0.6	27.6	61.5	26.8	51.5	23.9	Neutral
0.4450	33.8	0.6	34.4	31.7	0.6	32.3	57.0	22.6	47.0	14.7	Line
0.5059	31.9	0.6	32.5	29.0	0.6	29.6	56.0	23.5	46.0	16.4	Neutral
0.5731	30.9	0.6	31.5	28.6	0.6	29.2	56.0	24.5	46.0	16.8	Neutral
1.9655	24.6	0.7	25.3	22.1	0.7	22.8	56.0	30.7	46.0	23.2	Line

**Table 4-16.** Ch.165 (5825MHz) OFDM 6Mbps **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	48.3	0.5	48.8	39.8	0.5	40.3	63.9	15.1	53.9	13.6	Neutral
0.3192	34.4	0.6	35.0	27.3	0.6	27.9	59.7	24.7	49.7	21.8	Line
0.4433	35.1	0.6	35.7	31.9	0.6	32.5	57.0	21.3	47.0	14.5	Neutral
0.5078	31.8	0.6	32.4	28.9	0.6	29.5	56.0	23.6	46.0	16.5	Line
0.5698	32.6	0.6	33.2	30.1	0.6	30.7	56.0	22.8	46.0	15.3	Neutral
1.9059	24.9	0.7	25.6	22.0	0.7	22.7	56.0	30.4	46.0	23.3	Line

**Table 4-17.** Ch.157 (5785MHz) OFDM RX mode

Frq. (MHz)	QP			AV			CISPR22 QP Limit (dB $\mu$ V)	Margin to limit (dB)	CISPR22 AV Limit (dB $\mu$ V)	Margin to limit (dB)	Phase
	Measured Reading (dB $\mu$ V)	Corr. Factor (dB)	Powerline Voltage (dB $\mu$ V)	Measured Reading (dB $\mu$ V)	Corr. Factor (dB)	Powerline Voltage (dB $\mu$ V)					
0.1930	48.2	0.5	48.7	39.7	0.5	40.2	63.9	15.2	53.9	13.7	Neutral
0.2552	40.4	0.6	41.0	33.0	0.6	33.6	61.6	20.6	51.6	18.0	Line
0.3175	34.8	0.6	35.4	28.1	0.6	28.7	59.8	24.4	49.8	21.1	Line
0.4461	32.9	0.6	33.5	31.1	0.6	31.7	56.9	23.4	46.9	15.2	Line
0.5077	33.1	0.6	33.7	29.8	0.6	30.4	56.0	22.3	46.0	15.6	Neutral
0.5710	33.2	0.6	33.8	30.6	0.6	31.2	56.0	22.2	46.0	14.8	Neutral