

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C (DSS) REQUIREMENT**

OF

Notebook with WLAN + Bluetooth module

MODEL No.: ZI2

FCC ID: HFSZI2WM3B2100BT

REPORT NO: 030049-RID

ISSUE DATE: April 24, 2003

Prepared for

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VERIFICATION OF COMPLIANCE

Applicant: Quanta Computer Inc.
No. 188, Wen Hwa 2nd Rd., Kuei Shan Hsiang,
Tao Yuan Hsien, Taiwan, R.O.C.

Equipment Under Test: Notebook with WLAN + Bluetooth module

BRAND NAME: acer

MODEL No.: ZI2

Serial Number: N/A

File Number: 030049-RID

Date of Test: Apr. 10 2003 ~Apr. 15, 2003

We hereby certify that:

The above equipment was tested by C&C Laboratory Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2001) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.

The test results of this report relate only to the tested sample identified in this report.

Approved by:



Jonson Lee / EMC Director

Reviewed by:



Susan Su / Section Manager



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1. GENERAL INFORMATION

1.1 Product Description

The Quanta Computer Inc.. Model: ZI2 (referred to as the EUT in this report) is a Notebook with WLAN + Bluetooth module.

The EUT is compliance with IEEE 802.11 b and Bluetooth Standard.

A major Bluetooth Module technical descriptions of EUT is described as following:

- A). Operation Frequency: 2402 MHz – 2483 MHz, 79 channels
- B). Rated output power: 4 dBm (Peak)
- C). Modulation type: Frequency Hopping Sequence Spread Spectrum (FHSS)
- D). Antenna Designation: Metal Antenna, 0.64 dBi, Non-User Replaceable (Fixed)

A major WLAN technical descriptions of EUT is described as following:

- A). Operation Frequency: 2.412GHz – 2.462GHz, 11 channels
- B). Transmit Power: 14 dBm (Peak)
- C). Modulation type: Direct Sequence Spread Spectrum, (CCK; DQPSK; DBPSK; DSSS)
- D). Transition Speed: 1/2/5.5/11Mbps
- E). Antenna Designation: PIFA Antenna; Non-User Embedded, two provided.
TX and RX diversity.

Power Supply: Input: AC 100-240V 50-60Hz 1.5A; Output: DC +19V, 3.95A

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: HFSZI2WM3B2100BT filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (Digital Device) is compliance with Subpart B is authorized under a DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (2001). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of C&C Laboratory, Co., Ltd. No. 81-1, 210 Lane, Pa-de 2nd Road, Lu-Chu Hsiang, Taoyuan, Taiwan, R.O.C.. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2001 and CISPR 22/EN 55022 requirements.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2001. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2001.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

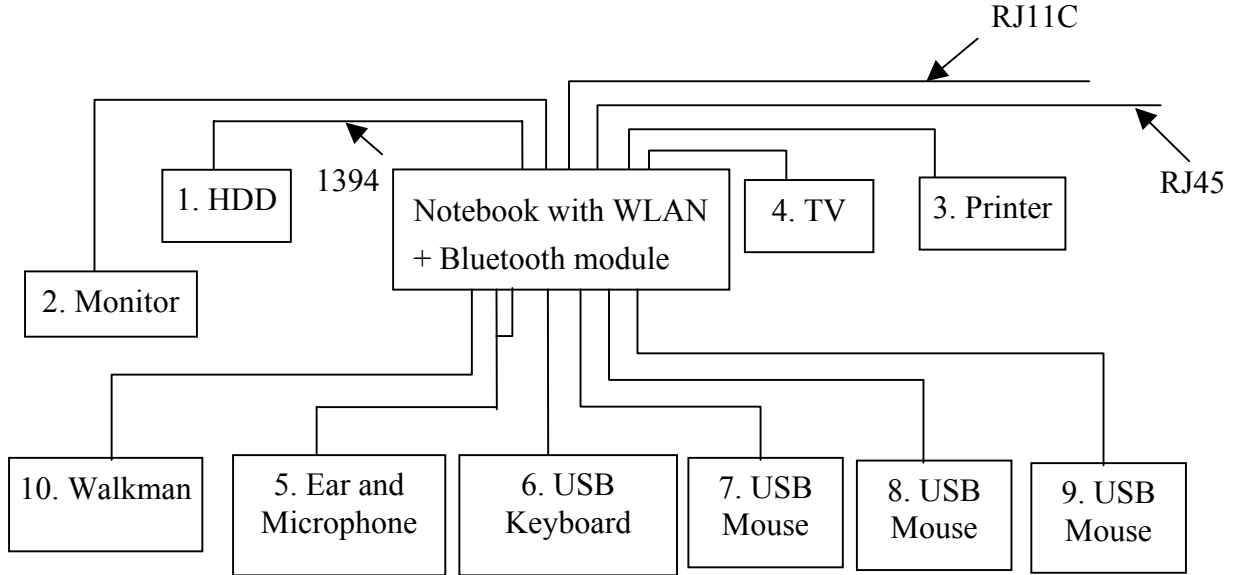


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Data Cable	Power Cord
1.	External HDD	IBM	N/A	N/A	DCAS-34330	Shielded, 1.8m	Unshielded, 1.8m
2.	Monitor	SONY	3882B102	2716043	CPD-G200	Shielded, 1.8m with a core	Shielded, 1.8m
3.	Printer	EPSON	EPSON STYLUS C20SX	N/A	DW4E130542	Shielded, 1.8m	Unshielded, 1.8m
4.	TV	PROTON	FT-21S	N/A	FT-21S00002CA00112	N/A	Unshielded, 1.8m
5.	Ear/Microphone	GITON	N/A	N/A	GT-2004V	Unshielded, 1.25m	N/A
6.	USB Keyboard	BTC	3872B597	G91400266	7932M	Shielded, 1.8m	N/A
7.	USB Mouse	Logitech	4872A221	LZE92250102	M-BB48	Shielded, 1.8m	N/A
8.	USB Mouse	Logitech	M-BB48	FCC DoC	LZE92250113	Shielded, 1.8m	N/A
9.	USB Mouse	Logitech	M-BB48	FCC DoC	LZE93300460	Shielded, 1.8m	N/A
10.	Walkman	Panasonic	RQ-L10	N/A	HB003029	Unshielded, 1.8m	N/A

3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(b)	Peak Output Power	Compliant
§ 15.247(a)(1)(ii)	20dB Bandwidth	Compliant
§ 15.247(c)	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§ 15.209(a) (f)	Spurious Emission	Compliant
§ 15.247(a)(1)	Frequency Separation	Compliant
§ 15.247(a)(1)(iii)	Number of hopping frequency	Compliant
§ 15.247(a)(1)(iii)	Time of Occupancy	Compliant
§ 15.247	Peak Power Density	Compliant
§ 15.203	Antenna Requirement	Compliant
§ 1.1307(b)(1)	RF Exposure	Compliant

4. DESCRIPTION OF TEST MODES

The EUT (Notebook with WLAN + Bluetooth module) has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting mode is programmed.

The worst case of WLAN output power is channel Low, the co-location test modes were defended as below for radiated spurious emission test and reported.

1. WLAN Channel Low + BT Channel Low
2. WLAN Channel Low + BT Channel Mid.
3. WLAN Channel Low + BT Channel High

Bluetooth module Channel low (2402MHz) 、mid (2441MHz) and high (2480MHz) with highest data rate are chosen for others test items.

5. CONDUCTED EMISSION TEST

5.1 Standard Applicable

According to § 15.207. frequency within 150KHz to 30MHz shall not exceed

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note:
 1.The lower limit shall apply at the transition frequencies
 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

5.2 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2001.
2. The EUT was plug-in the host PC via USB port. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host PC system was connected with 110Vac/60Hz power source.

5.3 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.4 Measurement Equipment Used:

Conducted Emission Test Site # 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCS30	847793/012	12/21/2002	12/20/2003
LISN	R&S	ESH2-Z5	843285/010	12/16/2002	12/15/2003
LISN	EMCO	3825/2	9003-1628	07/26/2002	07/25/2003
2X2 WIRE ISN	R&S	ENY22	100020	06/20/2002	06/19/2003
FOUR WIRE ISN	R&S	ENY41	100006	06/20/2002	06/19/2003

5.5 Measurement Result

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

LINE CONDUCTED TEST

Model Number: ZI2

Tested by: Jacky Hsiao

Test Mode: Co-location

Detector Function: Quasi-Peak

Temperature: 22⁰C

Humidity: 70%RH

(The chart below shows the highest readings taken from the final data)

FREQ MHz	P.K. Raw dBuV	Q.P. Raw dBuV	AVG Raw dBuV	Q.P. Limit dBuV	AVG Limit dBuV	Q.P. Margin dB	AVG Margin dB	NOTE
0.159	65.60	52.10	30.40	65.52	55.52	-13.42	-25.12	L1
0.247	60.00	44.30	22.60	61.86	51.86	-17.56	-29.26	L1
0.377	51.00	36.70	17.40	58.35	48.35	-21.65	-30.95	L1
0.451	47.40	32.20	13.10	56.86	46.86	-24.66	-33.76	L1
0.511	41.20	---	---	56.00	46.00	---	---	L1
0.613	41.40	---	---	56.00	46.00	---	---	L1
0.157	65.60	54.10	31.80	65.62	55.62	-11.52	-23.82	L2
0.270	56.20	44.80	23.10	61.12	51.12	-16.32	-28.02	L2
0.354	50.20	38.60	16.40	58.87	48.87	-20.27	-32.47	L2
0.412	46.80	34.70	15.10	57.61	47.61	-22.91	-32.51	L2
0.490	44.20	---	---	56.17	46.17	---	---	L2
0.576	38.00	---	---	56.00	46.00	---	---	L2

Remark :

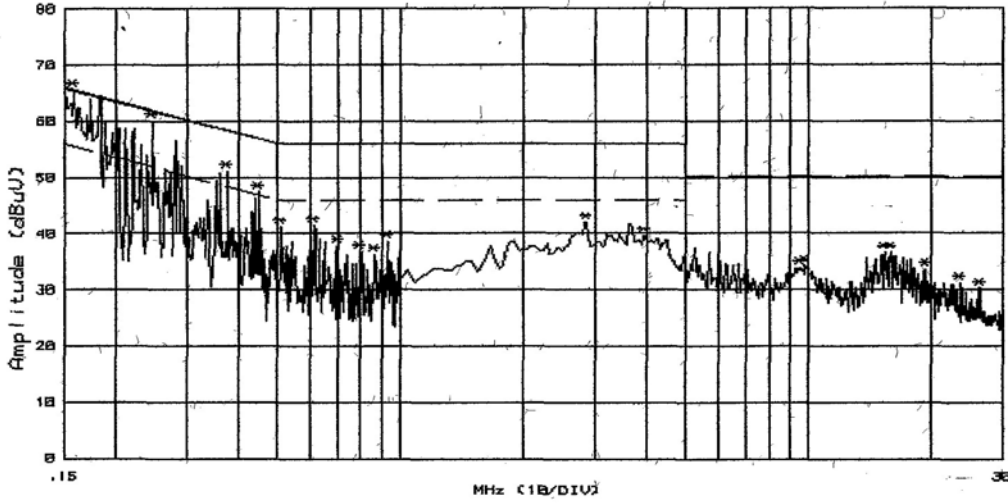
- (1) Measuring frequencies from 0.15 MHz to 30MHz ◦
- (2) The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Qusia-Peak detector and Average detector.
- (3) “---” denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.
- (4) The IF bandwidth of SPA between 0.15MHz to 30MHz was 10KHz;
The IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9KHz;
- (5) L1 = Line One (Hot side) / L2 = Line Two (Neutral side)



Conducted Emission Test Plot

Line 1

C&C Lab. Co. Shielded Room3
EN 55022 - Class B QP/AU Limit



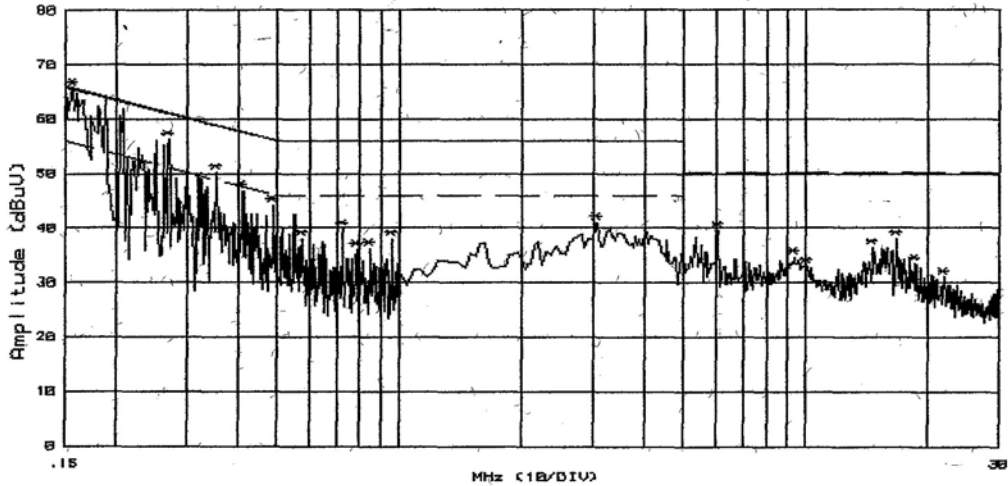
Customer:QUENTA
 Model :W+B
 Mode :
 Reading :Peak(R3261C SPA)
 Remark :110V

File#: 2341
 Humd.:70 (%)
 Port :L1

Date :11 Apr 2003 22:46:58
 Temp. :22 (C)
 Tested by:JACKY

Line 2

C&C Lab. Co. Shielded Room3
EN 55022 - Class B QP/AU Limit



Customer:QUENTA
 Model :W+B
 Mode :
 Reading :Peak(R3261C SPA)
 Remark :110V

File#: 2345
 Humd.:70 (%)
 Port :L2

Date :11 Apr 2003 22:53:01
 Temp. :22 (C)
 Tested by:JACKY

6. PEAK OUTPUT POWER MEASUREMENT

6.1 Standard Applicable

According to § 15.247(b)(1), for frequency hopping systems in the 2400-2483.5MHz band employing at least 75 hopping channels, and all frequency hopping systems in 5725-5850 MHz band: 1Watt, for all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125watts.

6.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Channel power function, RBW, VBW = 1MHz)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

6.3 Measurement Result

CH	Frequency (MHz)	Reading Power dBm	Cable Loss	Output Power dBm	Output Power W	Limit (W)
LOW	2402.00	2.61	1.50	4.11	0.00258	1
MID	2441.00	4.09	1.50	5.59	0.00362	1
HIGH	2480.00	4.18	1.50	5.68	0.00370	1

6.4 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	Model No.	Serial No.	Last Cal.	Cal. Due.
Power Meter	HP	436A	2709A29027	03/16/2002	03/15/2003
Power Sensor	HP	8481A	2702A61366	03/16/2002	03/15/2003
low loss cable	Huber + Suhner	Sucoflex 104	N/A	N/A	N/A

7. 20dB BAND WIDTH

7.1 Standard Applicable

According to § 15.247(a)(1), Frequency hopping systems operating in the 2400MHz-2483.5 MHz and 5725MHz – 5850MHz bands. The Maximum 20dB bandwidth of the hopping channel is 1MHz.

7.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10KHz (1 % of Bandwidth.), Span= 2MHz, Sweep=auto
4. Mark the peak frequency and –20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

7.3 Measurement Result

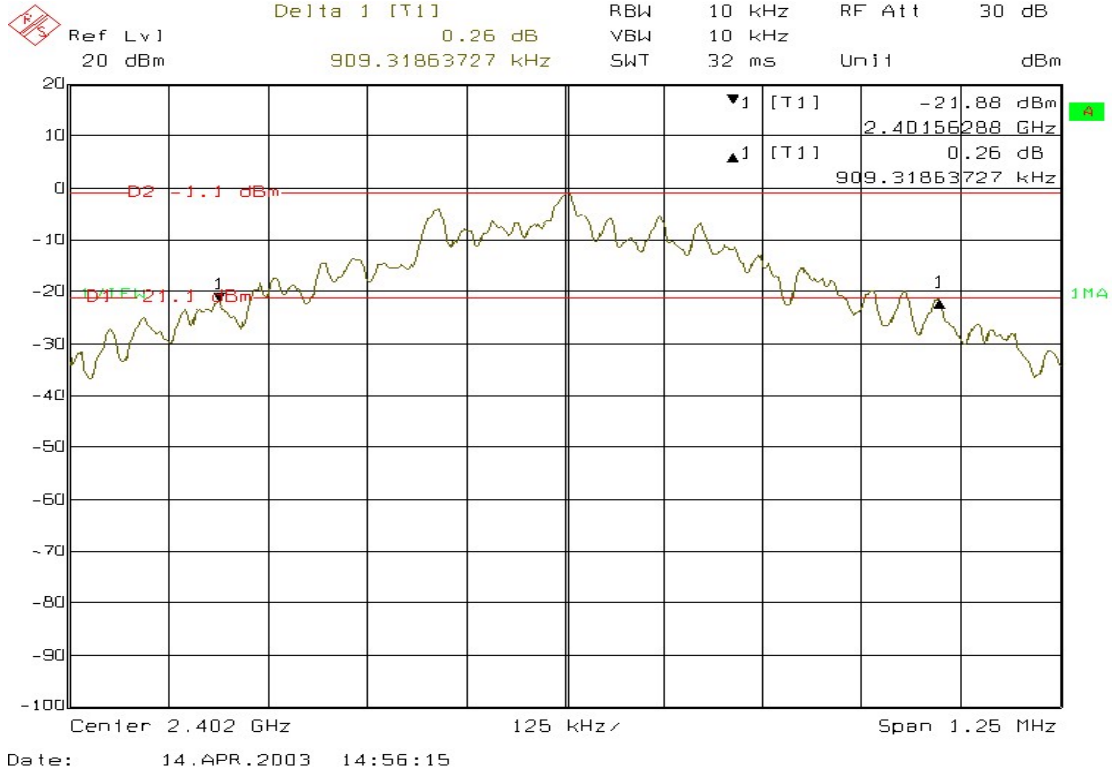
Channel	Bandwidth (MHz)	Bandwidth Limit (MHz)	Result
Lower	0.91	1	PASS
Mid	0.91	1	PASS
Higher	0.91	1	PASS

7.4 Measurement Equipment Used:

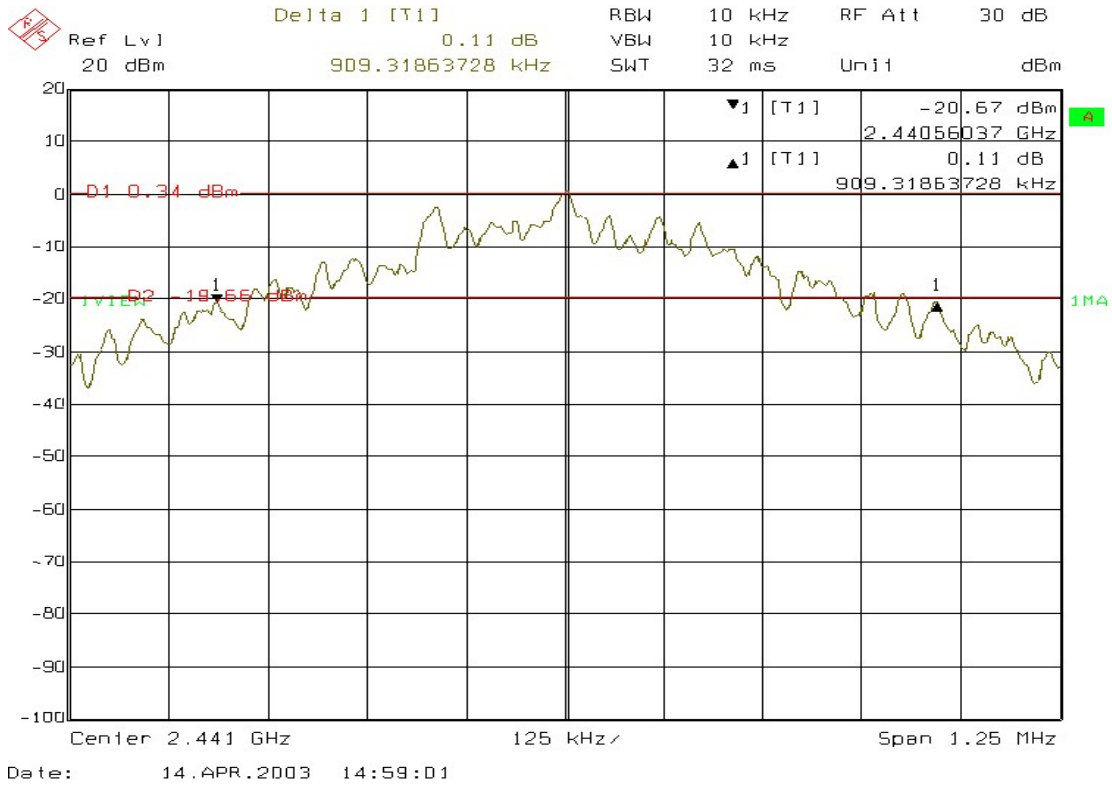
EQUIPMENT TYPE	MFR	Model No.	Serial No.	Last Cal.	Cal. Due.
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003
low loss cable	Huber + Suhner	Sucoflex 104	N/A	N/A	N/A



20dB Band Width Test Data CH-Low

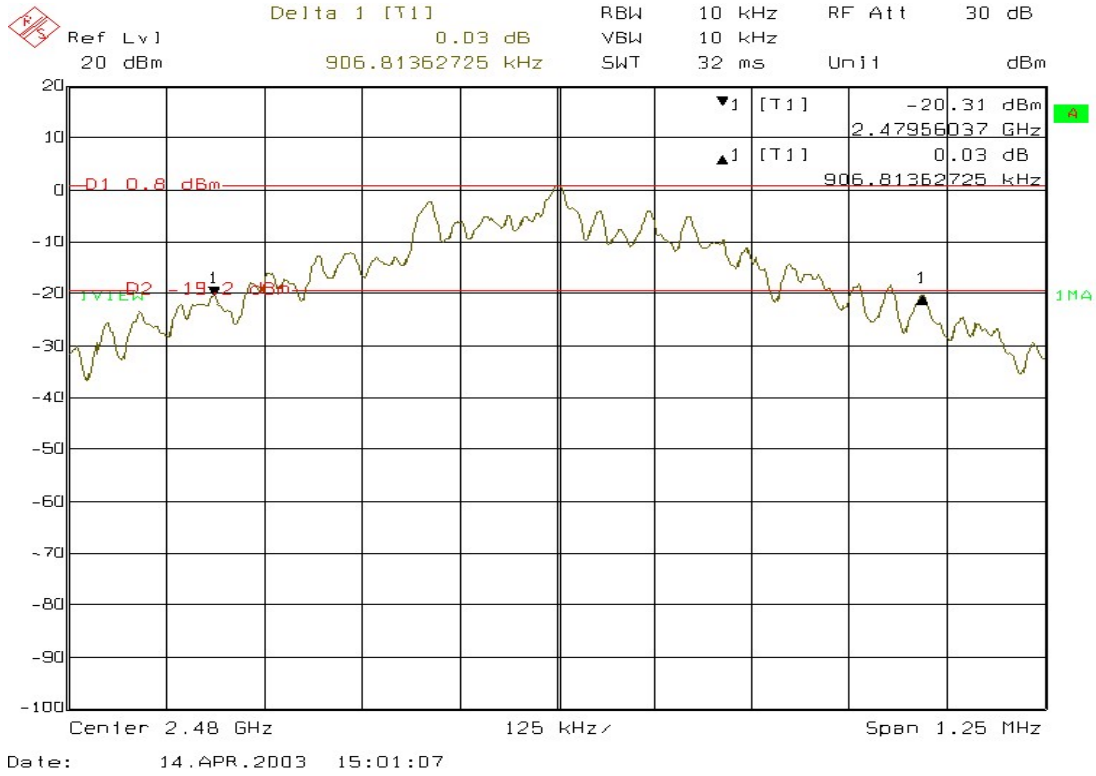


20dB Band Width Test Data CH-Mid





20dB Band Width Test Data CH-High



8. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

8.1. Standard Applicable

According to § 15.247(c), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

8.2. Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=30MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.

8.3. Measurement Result

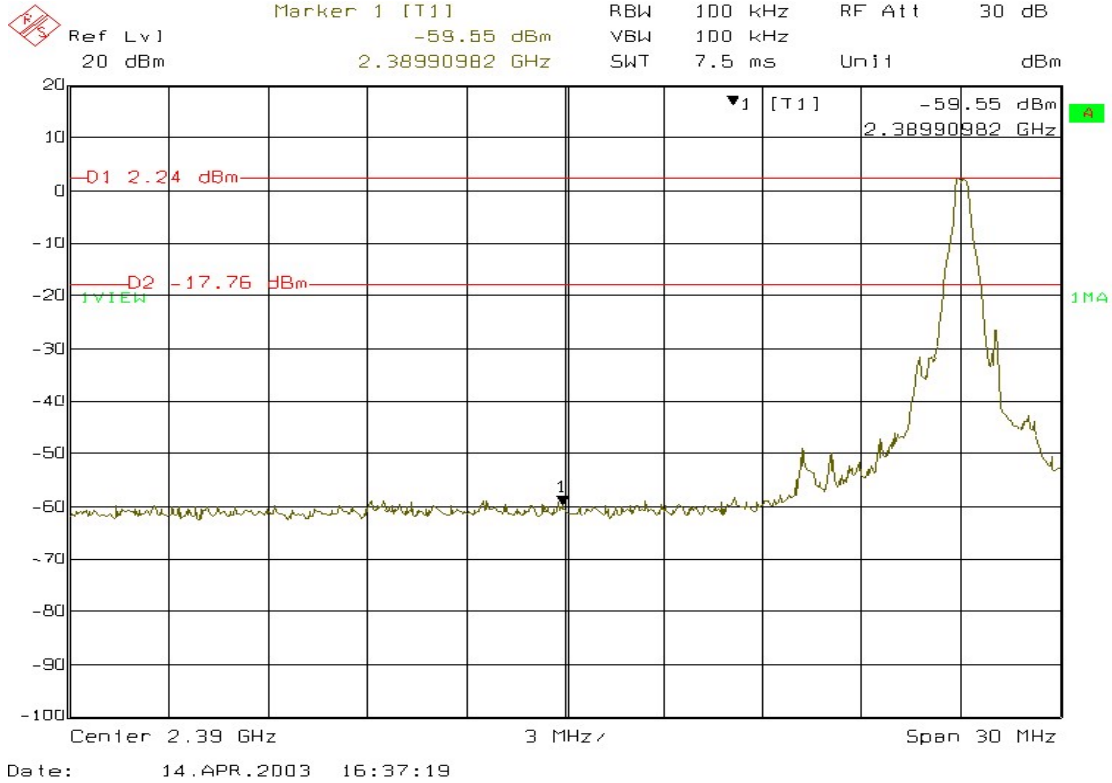
Refer to attach spectrum analyzer data chart.

8.4. Measurement Equipment Used:

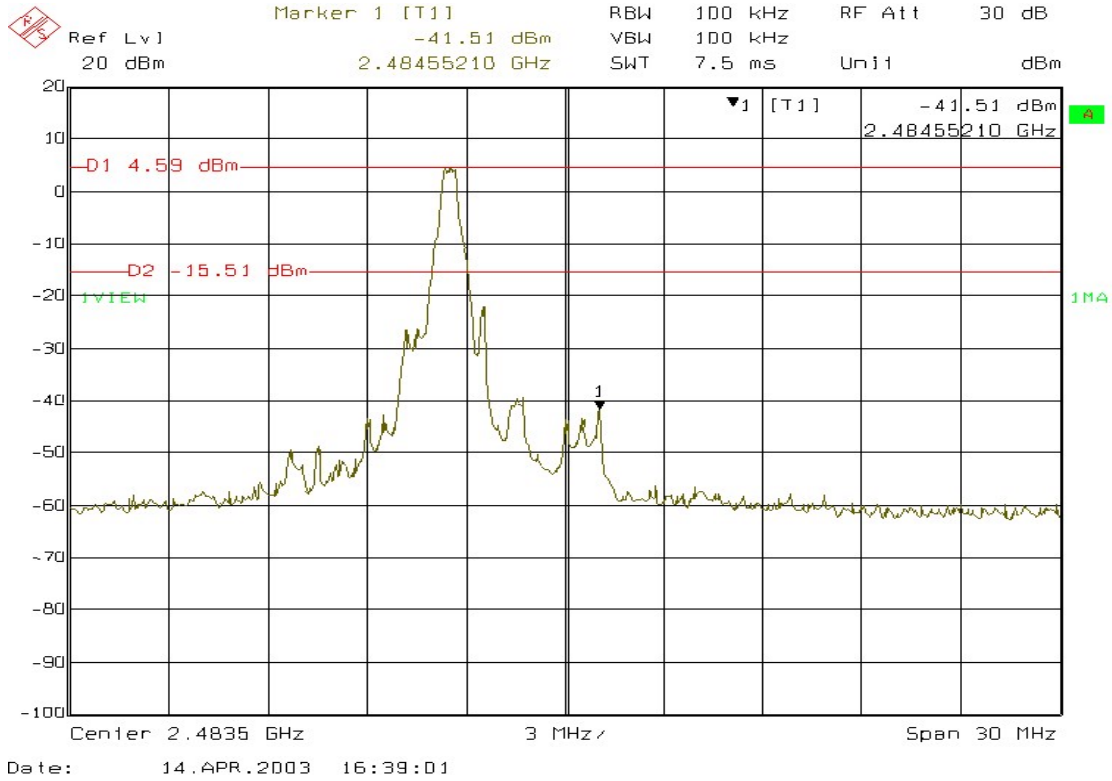
EQUIPMENT TYPE	MFR	Model No.	Serial No.	Last Cal.	Cal. Due.
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003
low loss cable	Huber + Suhner	Sucoflex 104	N/A	N/A	N/A



Band Edges Test Data CH-Low



Band Edges Test Data CH-High



9. SPURIOUS RADIATED EMISSION TEST

9.1 Standard Applicable

According to § 15.247(c), all other emissions outside these bands shall not exceed the general radiated emission limits specified in § 15.209(a). And according to § 15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

9.2 EUT Setup

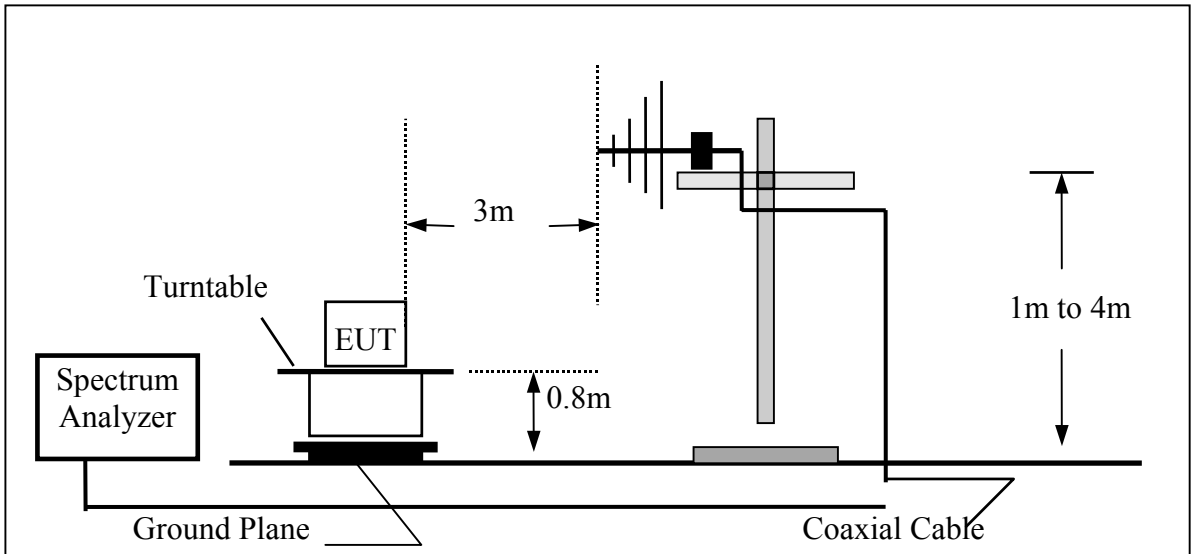
1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-2001.
2. The EUT was put in the front of the test table. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host PC system was connected with 110Vac/60Hz power source.

9.3 Measurement Procedure

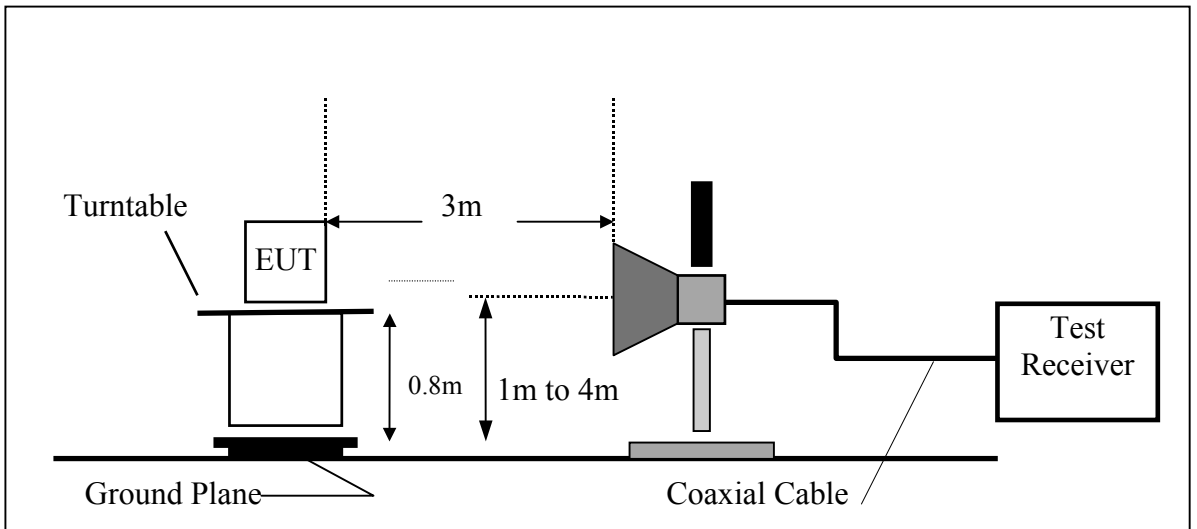
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until all frequency measured were complete.

9.4 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



9.5 Measurement Equipment Used:

Open Area Test Site # 3					
EQUIPMENT TYPE	MFR	Model No.	Serial No.	Last Cal.	Cal. Due.
Spectrum Analyzer	ADVANTEST	R3261A	N/A	03/19/2003	03/18/2004
Spectrum Analyzer	ADVANTEST	R3182	110600647	11/16/2002	11/15/2003
Spectrum Analyzer	ROHDE & SCHWARZ	FSP30	100112	06/29/2002	06/28/2003
EMI Test Receiver	R&S	ESVS20	838804/004	01/09/2003	01/08/2004
Pre-Amplifier	HP	8447D	2944A09173	03/03/2003	03/02/2004
Bilog Antenna	SCHWAZBECK	VULB9163	145	07/06/2002	07/05/2003
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R	N.C.R
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R	N.C.R
RF Switch	ANRITSU	MP59B	M53867	N.C.R	N.C.R
Site NSA	C&C	N/A	N/A	09/07/2002	09/06/2003
Horn Antenna	Schwarzbeck	BBHA 9120	D210	3/17/2003	3/16/2004
Pre-Amplifier	HP	8449B	3008A00965	10/15/2002	10/14/2003

9.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

9.7 Measurement Result

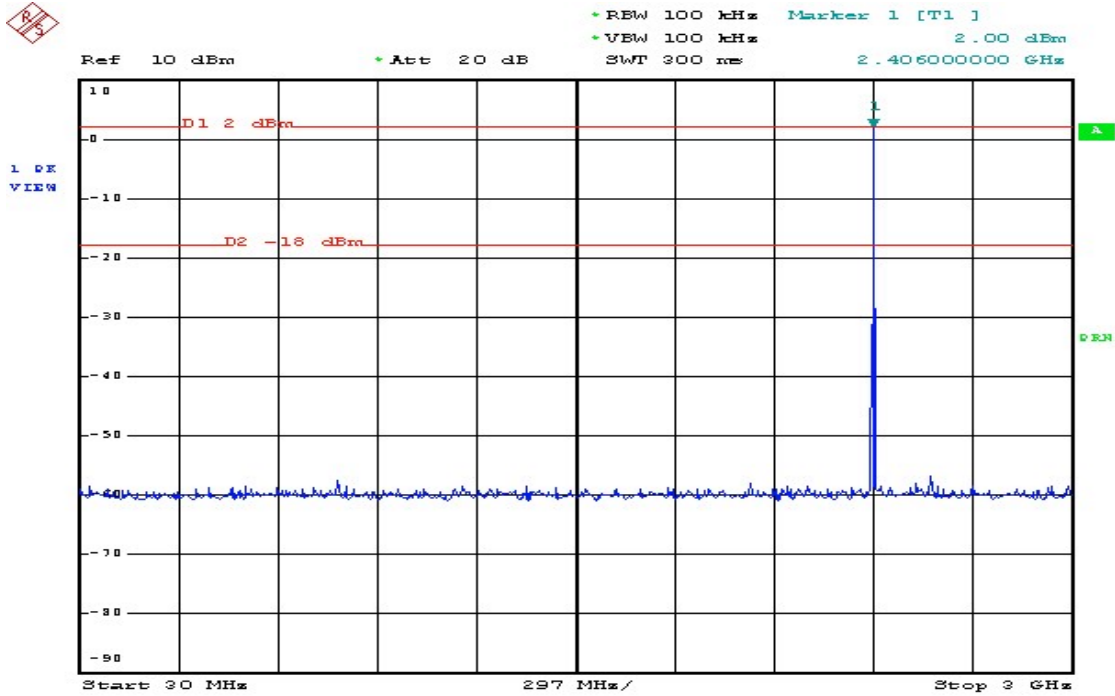
Refer to attach tabular data sheets.

NOTE:

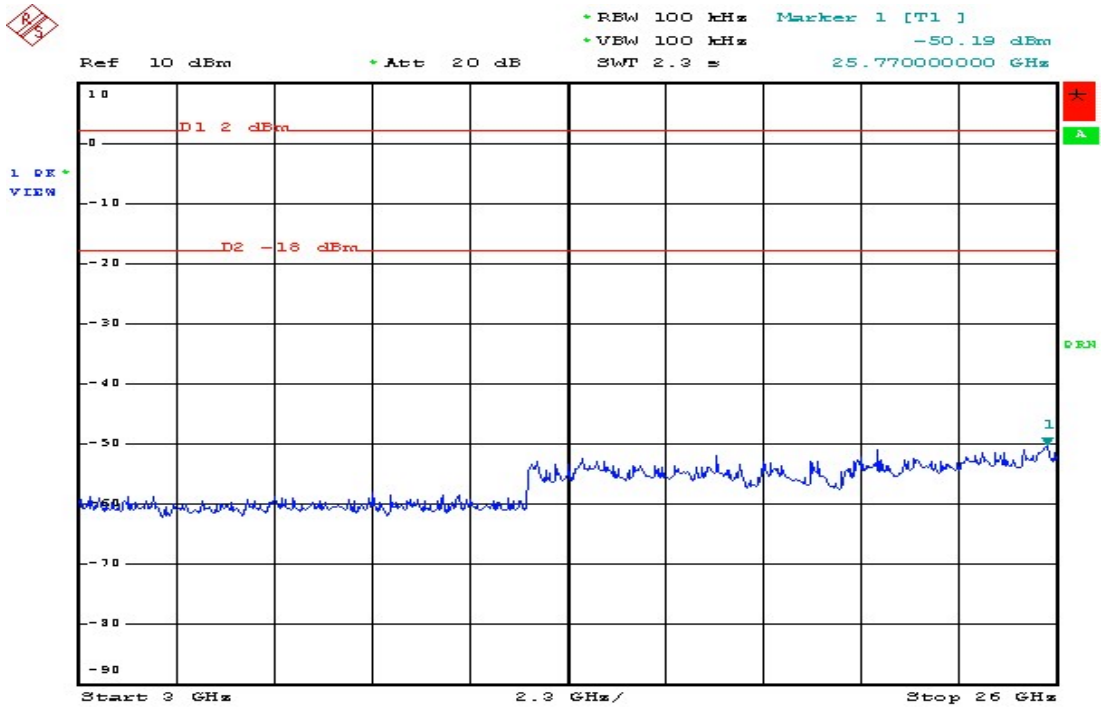
The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 100kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.



Conducted Spurious Emission Measurement Result - Ch Low



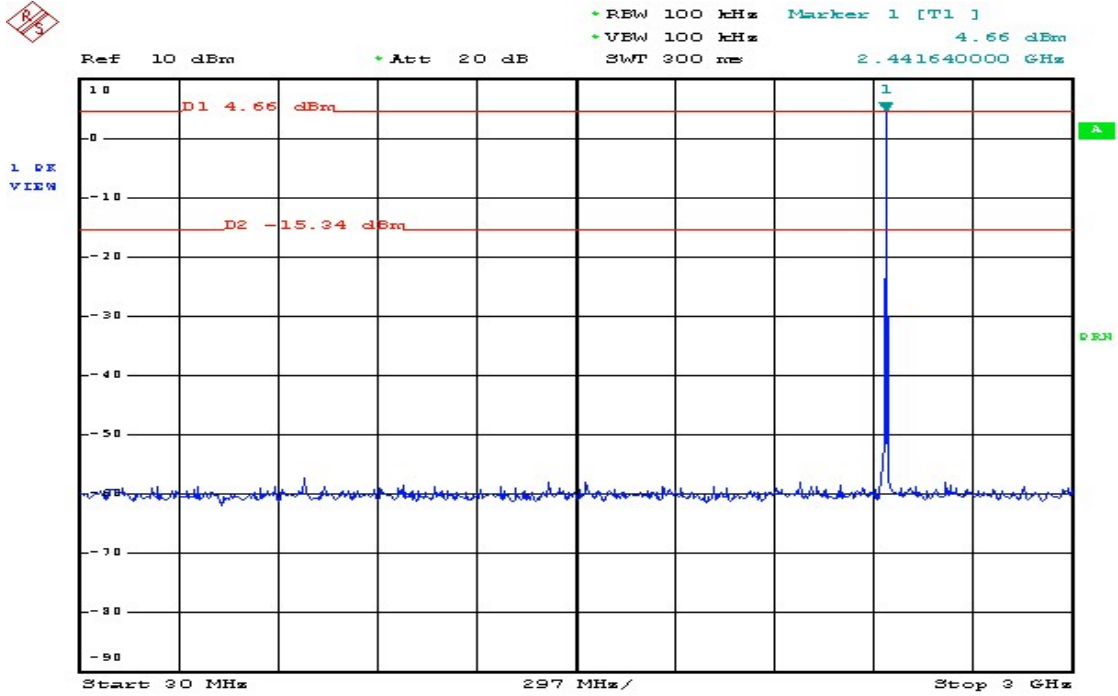
Date: 15.APR.2003 04:42:23



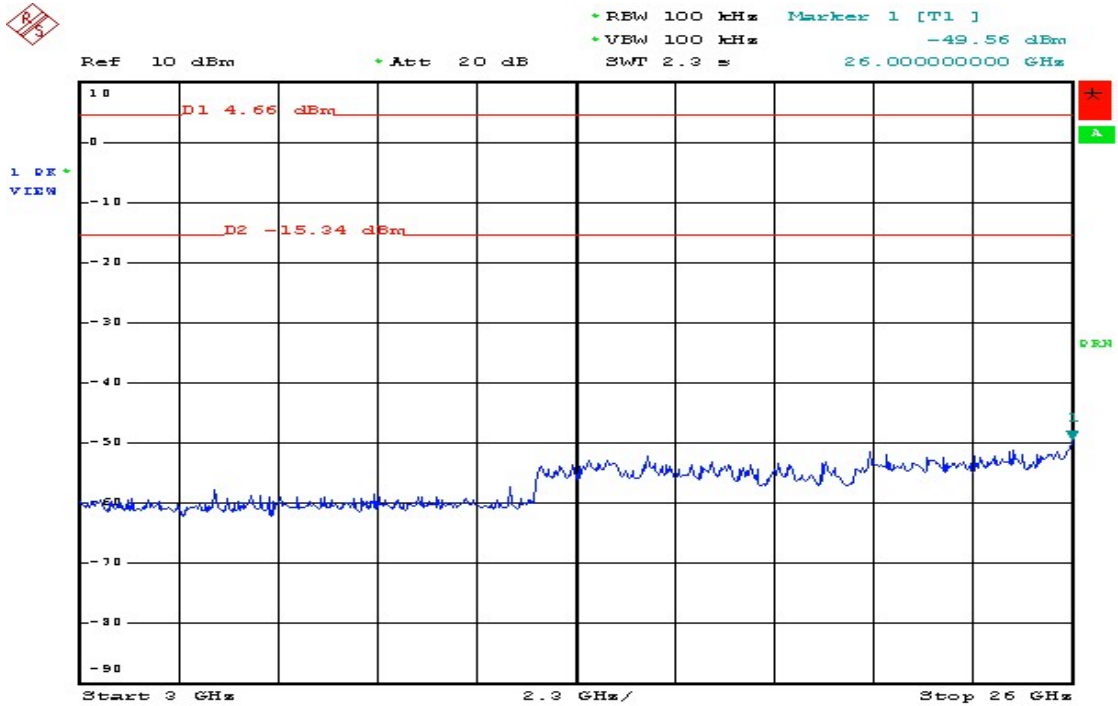
Date: 15.APR.2003 04:43:03



Ch Mid



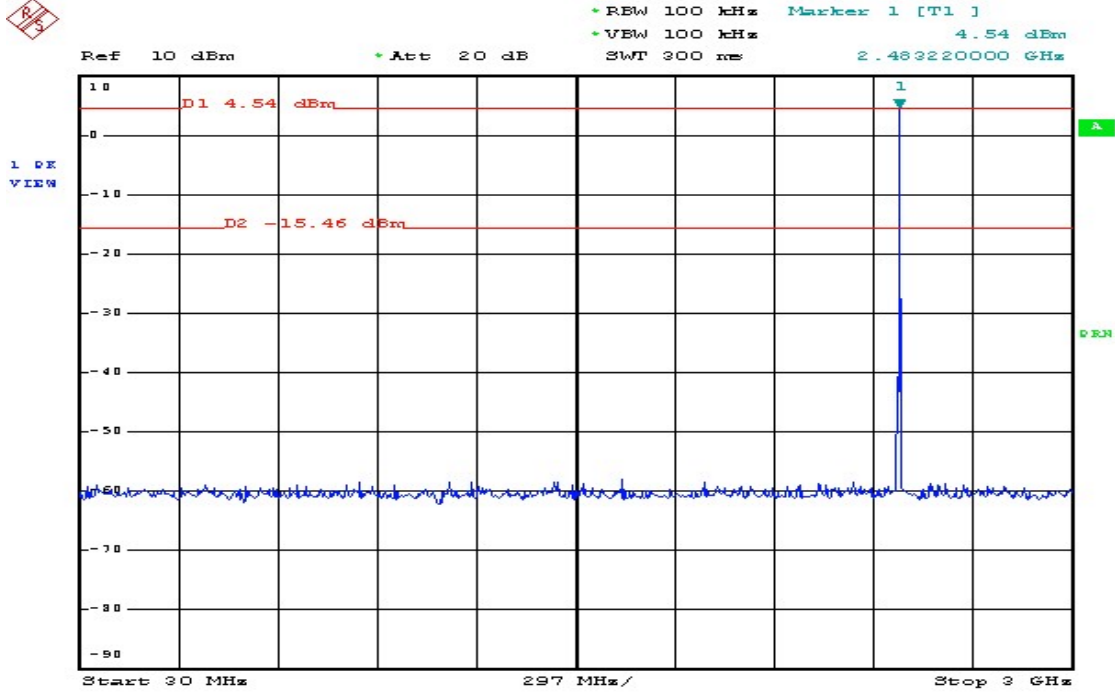
Date: 15.APR.2003 04:47:02



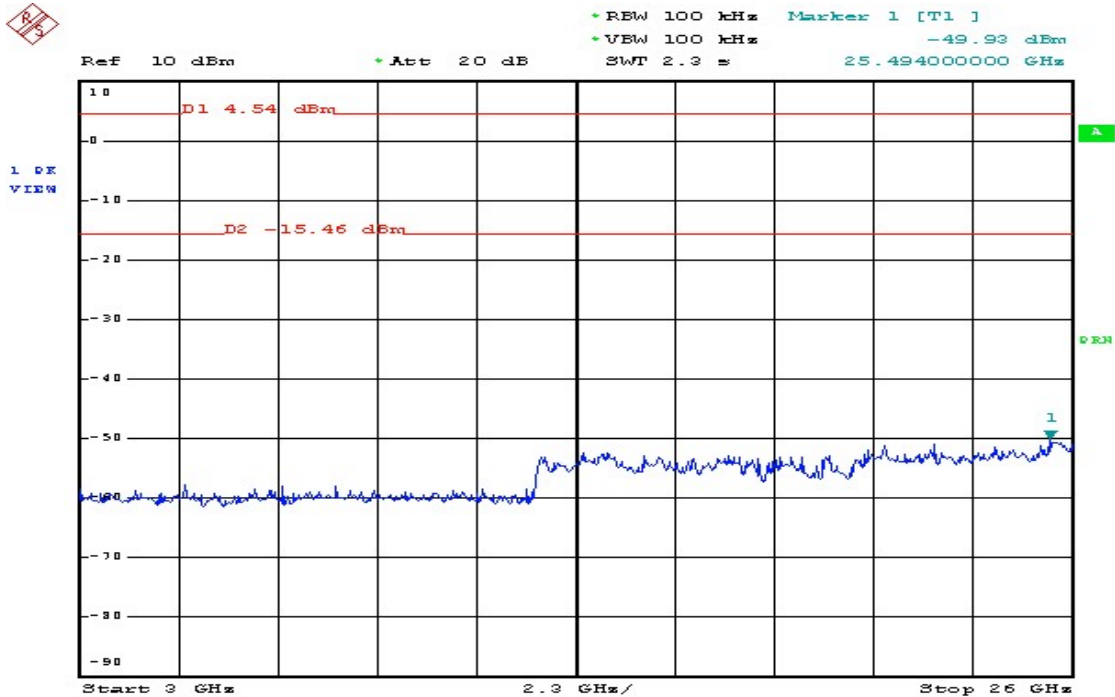
Date: 15.APR.2003 04:47:41



Ch High



Date: 15.APR.2003 04:49:24



Date: 15.APR.2003 04:50:07

Radiated Spurious Emission Measurement Result (below 1GHz) - (Bluetooth)

Operation Mode: TX CH Low Mode Test Date: 04 14, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Ver./Hor

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
72.44	V	Peak	26.55	10.00	36.55	40.00	-3.45
85.74	V	Peak	22.14	10.68	32.82	40.00	-7.18
258.44	V	Peak	22.78	16.04	38.82	46.00	-7.18
299.50	V	Peak	22.85	16.68	39.53	46.00	-6.47
325.40	V	Peak	18.87	17.40	36.27	46.00	-9.73
388.65	V	Peak	16.24	20.24	36.48	46.00	-9.52
72.44	H	Peak	28.85	10.00	38.85	40.00	-1.15
85.74	H	Peak	25.12	10.68	35.80	40.00	-4.20
168.12	H	Peak	26.08	11.85	37.93	43.50	-5.57
299.97	H	Peak	24.55	16.68	41.23	46.00	-4.77
334.60	H	Peak	18.14	17.66	35.80	46.00	-10.20
364.60	H	Peak	16.24	18.88	35.12	46.00	-10.88

Remark :

- (1) Measuring frequencies from 30 MHz to the 1GHz °
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

Radiated Spurious Emission Measurement Result (below 1GHz) - (Bluetooth)

Operation Mode: TX CH Mid Mode Test Date: 04. 14, 2003
 Temperature: 20 °C Test By: Jacky
 Humidity: 70 % Pol: Ver./Hor

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
72.44	V	Peak	22.34	10.00	32.34	40.00	-7.66
85.74	V	Peak	21.54	10.68	32.22	40.00	-7.78
168.12	V	Peak	23.47	11.85	35.32	43.50	-8.18
258.44	V	Peak	20.68	16.04	36.72	46.00	-9.28
299.96	V	Peak	22.28	16.68	38.96	46.00	-7.04
325.40	V	Peak	19.13	17.40	36.53	46.00	-9.47
72.44	H	Peak	25.12	10.00	35.12	40.00	-4.88
85.74	H	Peak	22.88	10.68	33.56	40.00	-6.44
168.14	H	Peak	27.55	11.85	39.40	43.50	-4.10
232.87	H	Peak	20.25	15.66	35.91	46.00	-10.09
299.98	H	Peak	25.43	16.68	42.11	46.00	-3.89
338.60	H	Peak	17.44	17.66	35.10	46.00	-10.90

Remark :

- (1) Measuring frequencies from 30 MHz to the 1GHz °
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

Radiated Spurious Emission Measurement Result (below 1GHz) - (Bluetooth)

Operation Mode: TX CH High Mode Test Date: 04. 14, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Ver./Hor

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
72.44	V	Peak	22.75	10.00	32.75	40.00	-7.25
85.74	V	Peak	21.24	10.68	31.92	40.00	-8.08
168.08	V	Peak	23.56	11.85	35.41	43.50	-8.09
258.44	V	Peak	20.08	16.04	36.12	46.00	-9.88
300.00	V	Peak	21.47	16.64	38.11	46.00	-7.89
326.80	V	Peak	18.38	17.40	35.78	46.00	-10.22
72.44	H	Peak	24.50	10.00	34.50	40.00	-5.50
85.74	H	Peak	21.14	12.79	33.93	40.00	-6.07
168.12	H	Peak	26.37	11.89	38.26	43.50	-5.24
234.76	H	Peak	19.58	15.66	35.24	46.00	-10.76
300.00	H	Peak	24.17	16.64	40.81	46.00	-5.19
338.60	H	Peak	17.47	17.66	35.13	46.00	-10.87

Remark :

- (1) Measuring frequencies from 30 MHz to the 1GHz °
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

Radiated Spurious Emission Measurement Result (Above 1GHz) - (Bluetooth)

Operation Mode: TX CH Low Mode Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Vertical

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1064	53.05	---	-9.98	43.07	---	74.00	54.00	-10.93
1260	47.40	---	-8.80	38.60	---	74.00	54.00	-15.40
4804	--					74.00	54.00	
7206	--					74.00	54.00	
9608	--					74.00	54.00	
12010	--					74.00	54.00	
14412	--					74.00	54.00	
16814	--					74.00	54.00	
19216	--					74.00	54.00	
21618	--					74.00	54.00	
24020	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency ◦
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column ◦
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
 Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (Above 1GHz) - (Bluetooth)

Operation Mode: TX CH Low Mode Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Horizontal

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1064	49.35	---	-9.98	39.37	---	74.00	54.00	-14.63
4804	--					74.00	54.00	
7206	--					74.00	54.00	
9608	--					74.00	54.00	
12010	--					74.00	54.00	
14412	--					74.00	54.00	
16814	--					74.00	54.00	
19216	--					74.00	54.00	
21618	--					74.00	54.00	
24020	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
 Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (Above 1GHz) - (Bluetooth)

Operation Mode: TX CH Mid Mode Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Vertical

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1060	54.12	---	-10.01	44.11	---	74.00	54.00	-9.89
4882	--					74.00	54.00	
7323	--					74.00	54.00	
9764	--					74.00	54.00	
12205	--					74.00	54.00	
14646	--					74.00	54.00	
17087	--					74.00	54.00	
19528	--					74.00	54.00	
21969	--					74.00	54.00	
24410	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
 Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (Above 1GHz) - (Bluetooth)

Operation Mode: TX CH Mid Mode Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Horizontal

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1064	49.87	---	-9.98	39.89	---	74.00	54.00	-14.11
4882	--					74.00	54.00	
7323	--					74.00	54.00	
9764	--					74.00	54.00	
12205	--					74.00	54.00	
14646	--					74.00	54.00	
17087	--					74.00	54.00	
19528	--					74.00	54.00	
21969	--					74.00	54.00	
24410	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
 Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (Above 1GHz) - (Bluetooth)

Operation Mode: TX CH High Mode Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Vertical

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1060	53.24	---	-10.01	43.23	---	74.00	54.00	-10.77
4960	--					74.00	54.00	
7440	--					74.00	54.00	
9920	--					74.00	54.00	
12400	--					74.00	54.00	
14880	--					74.00	54.00	
17360	--					74.00	54.00	
19840	--					74.00	54.00	
22320	--					74.00	54.00	
24800	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
 Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (Above 1GHz) - (Bluetooth)

Operation Mode: TX CH High Mode Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Horizontal

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1060	49.89	---	-10.01	39.88	---	74.00	54.00	-14.12
4960	--					74.00	54.00	
7440	--					74.00	54.00	
9920	--					74.00	54.00	
12400	--					74.00	54.00	
14880	--					74.00	54.00	
17360	--					74.00	54.00	
19840	--					74.00	54.00	
22320	--					74.00	54.00	
24800	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
 Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (below 1GHz) – (Co-Location)

Operation Mode: WLAN (TX CH Low Mode) + Bluetooth (TX CH Low Mode) Test Date: 04. 14, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Ver./Hor

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)
72.12	V	Peak	28.24	10.00	38.24	40.00	-1.76
84.54	V	Peak	23.28	10.68	33.96	40.00	-6.04
261.12	V	Peak	23.56	16.04	39.60	46.00	-6.40
300.00	V	Peak	23.08	16.68	39.76	46.00	-6.24
326.60	V	Peak	19.67	17.40	37.07	46.00	-8.93
391.00	V	Peak	16.04	20.24	36.28	46.00	-9.72
72.12	H	Peak	29.94	10.00	39.94	40.00	-0.06
84.54	H	Peak	25.08	10.68	35.76	40.00	-4.24
166.08	H	Peak	26.18	11.85	38.03	43.50	-5.47
300.00	H	Peak	24.87	16.68	41.55	46.00	-4.45
336.40	H	Peak	19.28	17.66	36.94	46.00	-9.06
365.80	H	Peak	16.38	18.88	35.26	46.00	-10.74

Remark :

- (1) Measuring frequencies from 30 MHz to the 1GHz °
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

Radiated Spurious Emission Measurement Result (below 1GHz) – (Co-Location)

Operation Mode: WLAN (TX CH Low Mode) + Bluetooth (TX CH Mid Mode) Test Date: 04. 14, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Ver./Hor

Freq. (MHz)	Ant.Pol. H/V	Detector (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)
72.12	V	Peak	23.32	10.00	33.32	40.00	-6.68
84.54	V	Peak	21.18	10.68	31.86	40.00	-8.14
166.08	V	Peak	25.29	11.85	37.14	43.50	-6.36
261.12	V	Peak	20.79	16.04	36.83	46.00	-9.17
300.00	V	Peak	23.30	16.68	39.98	46.00	-6.02
326.60	V	Peak	19.33	17.40	36.73	46.00	-9.27
72.12	H	Peak	26.24	10.00	36.24	40.00	-3.76
84.54	H	Peak	23.57	10.68	34.25	40.00	-5.75
166.08	H	Peak	30.14	11.85	41.99	43.50	-1.51
233.58	H	Peak	20.85	15.66	36.51	46.00	-9.49
300.00	H	Peak	25.53	16.68	42.21	46.00	-3.79
336.40	H	Peak	18.59	17.66	36.25	46.00	-9.75

Remark :

- (1) Measuring frequencies from 30 MHz to the 1GHz °
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

Radiated Spurious Emission Measurement Result (below 1GHz) – (Co-Location)

Operation Mode: WLAN (TX CH Low Mode) + Bluetooth (TX CH High Mode) Test Date: 04. 14, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Ver./Hor

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)
72.12	V	Peak	23.20	10.00	33.20	40.00	-6.80
84.54	V	Peak	21.32	10.68	32.00	40.00	-8.00
166.08	V	Peak	24.64	11.85	36.49	43.50	-7.01
261.12	V	Peak	21.01	16.04	37.05	46.00	-8.95
298.92	V	Peak	23.42	16.64	40.06	46.00	-5.94
326.60	V	Peak	19.41	17.40	36.81	46.00	-9.19
72.12	H	Peak	26.70	10.00	36.70	40.00	-3.30
110.46	H	Peak	21.07	12.79	33.86	43.50	-9.64
166.62	H	Peak	28.23	11.89	40.12	43.50	-3.38
233.58	H	Peak	19.63	15.66	35.29	46.00	-10.71
298.92	H	Peak	26.05	16.64	42.69	46.00	-3.31
336.40	H	Peak	18.62	17.66	36.28	46.00	-9.72

Remark :

- (1) Measuring frequencies from 30 MHz to the 1GHz °
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

Radiated Spurious Emission Measurement Result (Above 1GHz) – (Co-Location)

Operation Mode: WLAN (TX CH Low Mode) + Bluetooth (TX CH Low Mode) Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Vertical

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1064	53.10	---	-9.98	43.12	---	74.00	54.00	-10.88
1260	48.02	---	-8.80	39.22	---	74.00	54.00	-14.78
4804	--					74.00	54.00	
7206	--					74.00	54.00	
9608	--					74.00	54.00	
12010	--					74.00	54.00	
14412	--					74.00	54.00	
16814	--					74.00	54.00	
19216	--					74.00	54.00	
21618	--					74.00	54.00	
24020	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
 Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (Above 1GHz) – (Co-Location)

Operation Mode: WLAN (TX CH Low Mode) + Bluetooth (TX CH Low Mode) Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Horizontal

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1064	49.69	---	-9.98	39.71	---	74.00	54.00	-14.29
4804	--					74.00	54.00	
7206	--					74.00	54.00	
9608	--					74.00	54.00	
12010	--					74.00	54.00	
14412	--					74.00	54.00	
16814	--					74.00	54.00	
19216	--					74.00	54.00	
21618	--					74.00	54.00	
24020	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
 Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (Above 1GHz) – (Co-Location)

Operation Mode: WLAN (TX CH Low Mode) + Bluetooth (TX CH Mid Mode) Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Vertical

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1060	54.38	---	-10.01	44.37	---	74.00	54.00	-9.63
4882	--					74.00	54.00	
7323	--					74.00	54.00	
9764	--					74.00	54.00	
12205	--					74.00	54.00	
14646	--					74.00	54.00	
17087	--					74.00	54.00	
19528	--					74.00	54.00	
21969	--					74.00	54.00	
24410	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency ◦
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column ◦
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Radiated Spurious Emission Measurement Result (Above 1GHz) – (Co-Location)

Operation Mode: WLAN (TX CH Low Mode) + Bluetooth (TX CH Mid Mode) Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Horizontal

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1064	50.42	---	-9.98	40.44	---	74.00	54.00	-13.56
4882	--					74.00	54.00	
7323	--					74.00	54.00	
9764	--					74.00	54.00	
12205	--					74.00	54.00	
14646	--					74.00	54.00	
17087	--					74.00	54.00	
19528	--					74.00	54.00	
21969	--					74.00	54.00	
24410	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Radiated Spurious Emission Measurement Result (Above 1GHz) – (Co-Location)

Operation Mode: WLAN (TX CH Low Mode) + Test Date: 04. 12, 2003
 Bluetooth (TX CH High Mode)

Temperature: 20°C Test By: Jacky

Humidity: 70 % Pol: Vertical

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1060	53.78	---	-10.01	43.77	---	74.00	54.00	-10.23
4960	--					74.00	54.00	
7440	--					74.00	54.00	
9920	--					74.00	54.00	
12400	--					74.00	54.00	
14880	--					74.00	54.00	
17360	--					74.00	54.00	
19840	--					74.00	54.00	
22320	--					74.00	54.00	
24800	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Radiated Spurious Emission Measurement Result (Above 1GHz) – (Co-Location)

Operation Mode: WLAN (TX CH Low Mode) + Bluetooth (TX CH High Mode) Test Date: 04. 12, 2003
 Temperature: 20°C Test By: Jacky
 Humidity: 70 % Pol: Horizontal

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	
1060	50.63	---	-10.01	40.62	---	74.00	54.00	-13.38
4960	--					74.00	54.00	
7440	--					74.00	54.00	
9920	--					74.00	54.00	
12400	--					74.00	54.00	
14880	--					74.00	54.00	
17360	--					74.00	54.00	
19840	--					74.00	54.00	
22320	--					74.00	54.00	
24800	--					74.00	54.00	

Remark :

- (1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency °
- (2) Datas of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.
Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

10. FREQUENCY SEPARATION

10.1 Standard Applicable

According to § 15.247(a), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 20dB bandwidth of the hopping channel, whichever is greater.

10.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel .
4. Set the spectrum analyzer as RBW,VBW=100KHz, Adjust Span to 4.0 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

10.3 Measurement Result

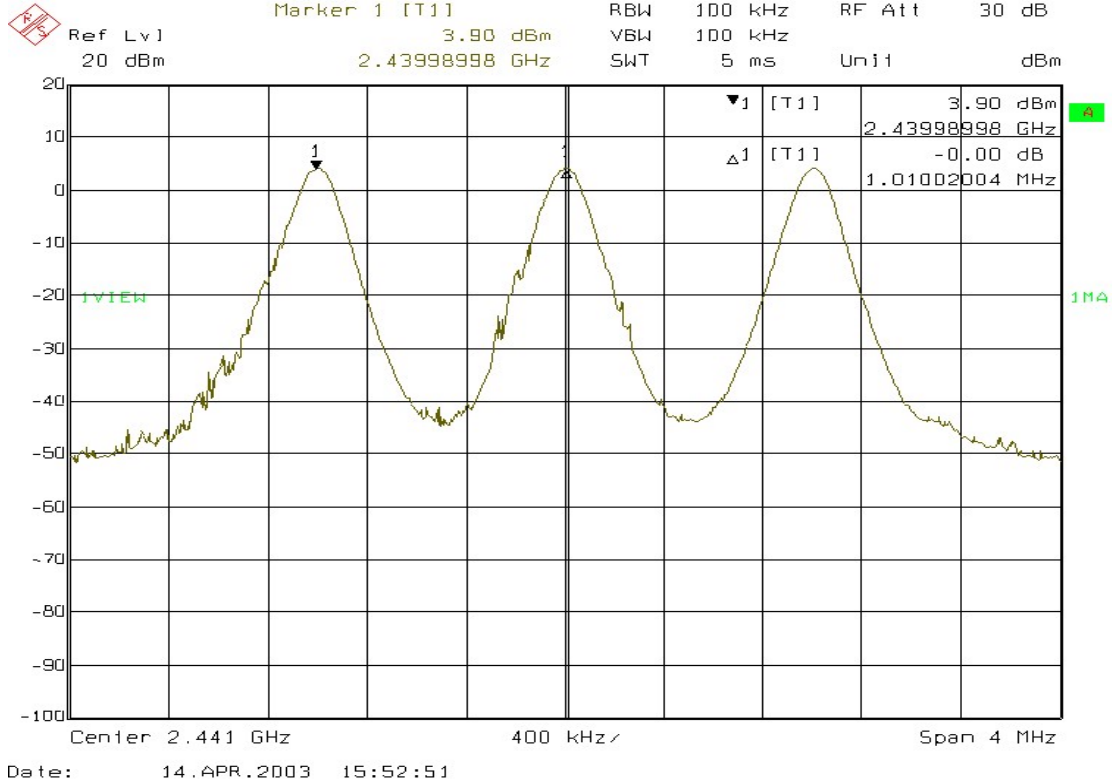
C h a n n e l s e p a r a t i o n M H z	L i m i t
1 . 0 1	> = 2 5 K H z / 2 0 d B B a n d w i d t h

10.4 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003
low loss cable	Huber + Suhner	Sucoflex 104	N/A	N/A	N/A



Frequency Separation Test Data



11. NUMBER OF HOPPING FREQUENCY

11.1 Standard Applicable

According to § 15.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 non-overlapping channels.

11.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW,VBW=100KHz,
5. Max hold, view and count how many channel in the band.

11.3 Measurement Result

Total no of hopping channel	Limit (CH)	Measurement result (CH)	Result
	75	79	PASS

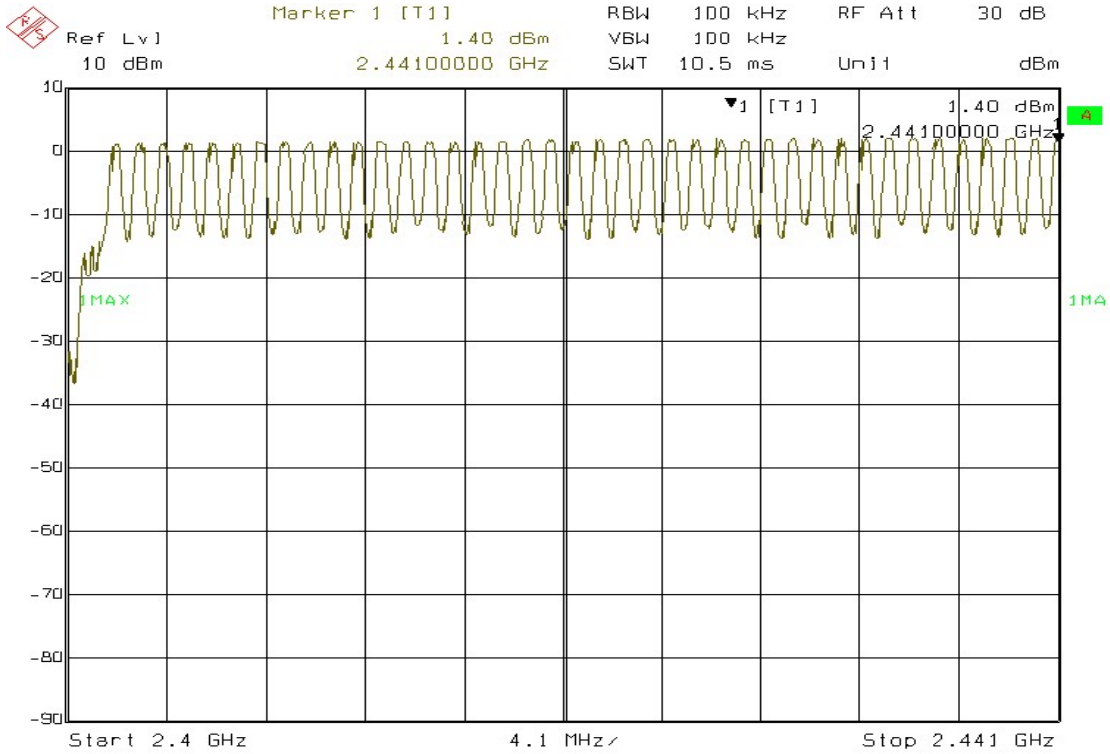
11.4 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003
low loss cable	Huber + Suhner	Sucoflex 104	N/A	N/A	N/A



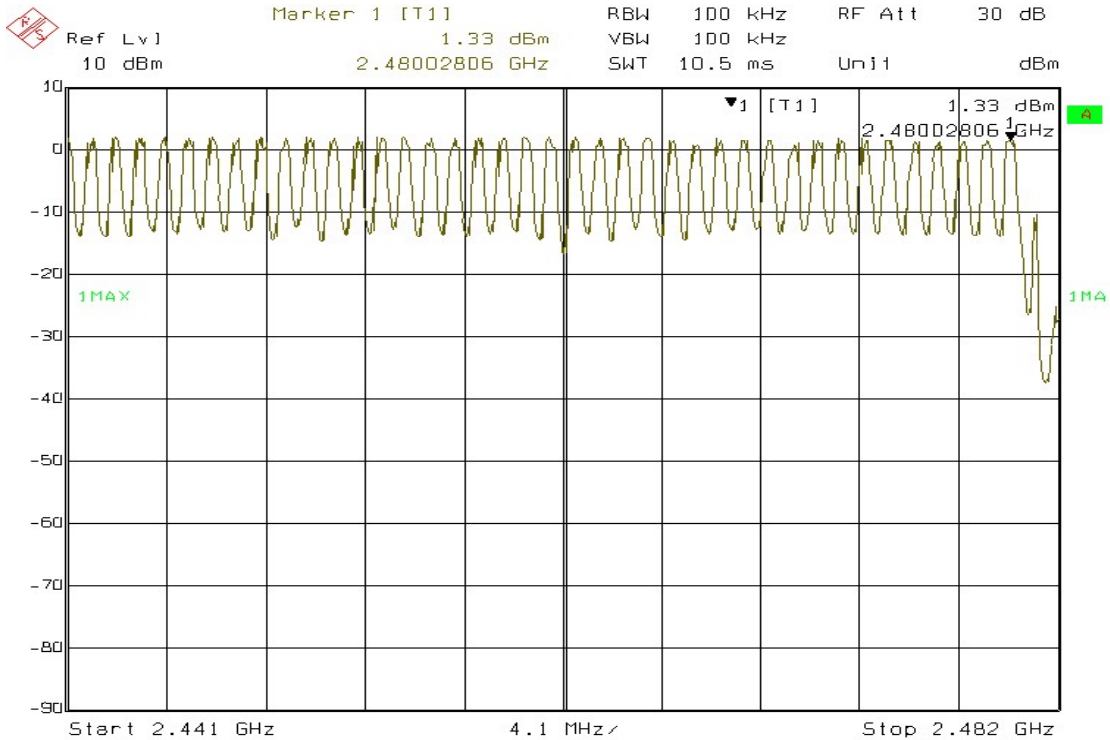
Channel Number

2.4 GHz – 2.442GHz



Date: 10.APR.2003 15:13:04

2.442 GHz – 2.4835GHz



Date: 10.APR.2003 15:18:56

12. TIME OF OCCUPANCY (DWELL TIME)

12.1 Standard Applicable

According to § 15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any frequency shall not be greater than 0.4 s within a period of 0.4 seconds multiplied by the number of hopping channels employed..

12.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW,VBW=100KHz, Span = 0Hz , Adjust Sweep = 30s.
5. Repeat above procedures until all frequency measured were complete.

12.3 Measurement Result

A period time = $0.4 * 79 = 31.6$ (s)

CH Low: $0.42 * 1600/79 * 31.6=268.80$ (ms)

CH Mid: $0.41 * 1600/79 * 31.6=262.40$ (ms)

CH High: $0.42 * 1600/79 * 31.6=268.80$ (ms)

CH	Pulse Time ms	Total of Dwell Time (ms)	Period time (ms)	Limit (ms)
Low	0.42	268.80	31.60	400.00
Mid	0.41	262.40	31.60	400.00
High	0.42	268.80	31.60	400.00

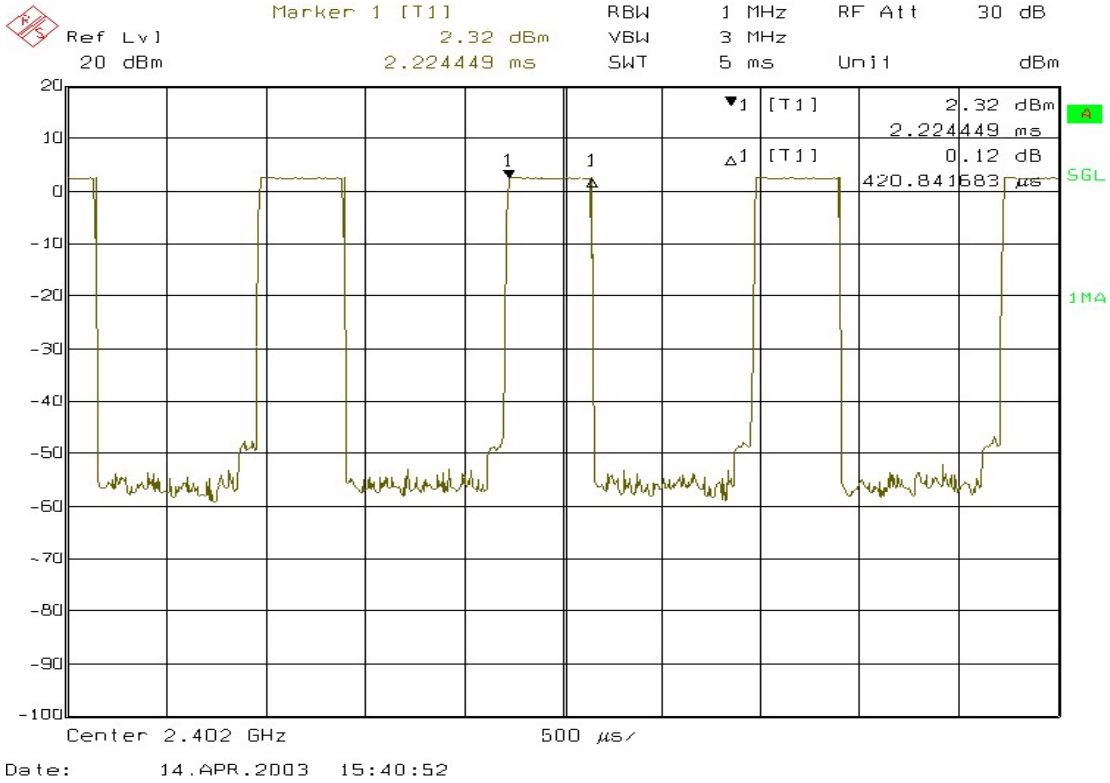
12.4 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003
low loss cable	Huber + Suhner	Sucoflex 104	N/A	N/A	N/A

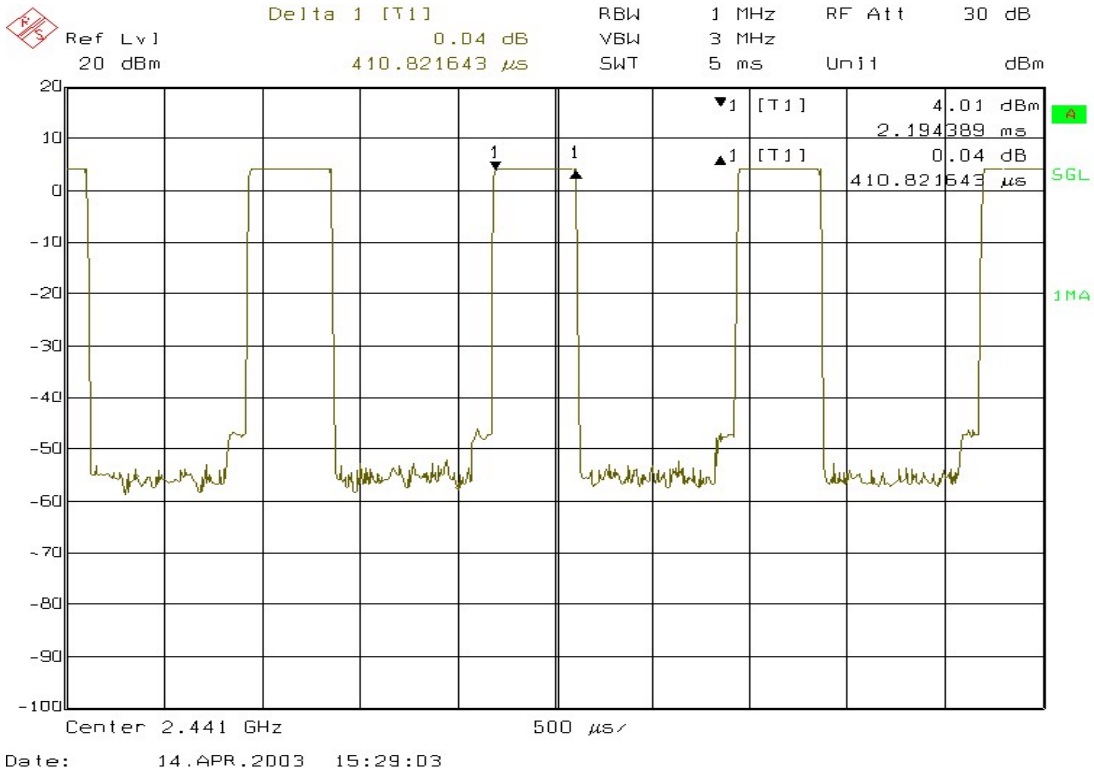


Dwell Time Test Data

CH LOW

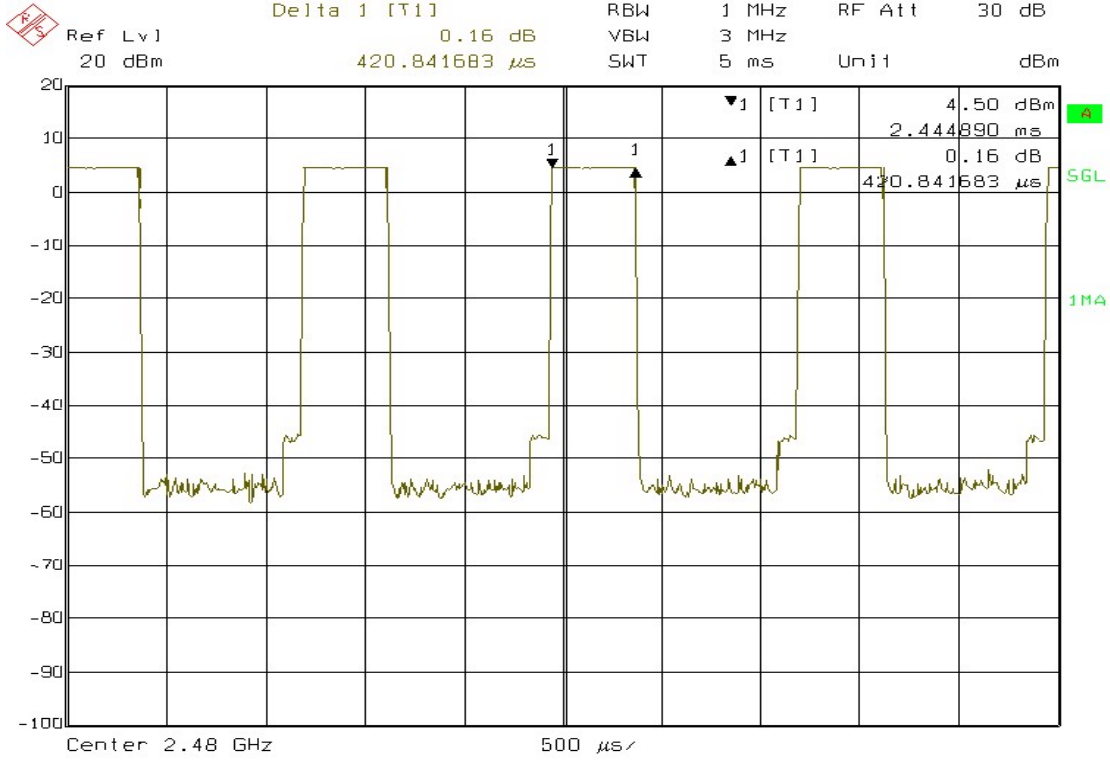


CH MID





CH HIGH



13. Peak Power Spectral Density

13.1 Standard Applicable

According to § 15.247(d), for direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3kHz band during any time interval of continuous transmission.

13.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 3KHz, VBW = 3KHz, Span = 300KHz, Sweep=100s
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

13.3 Measurement Result

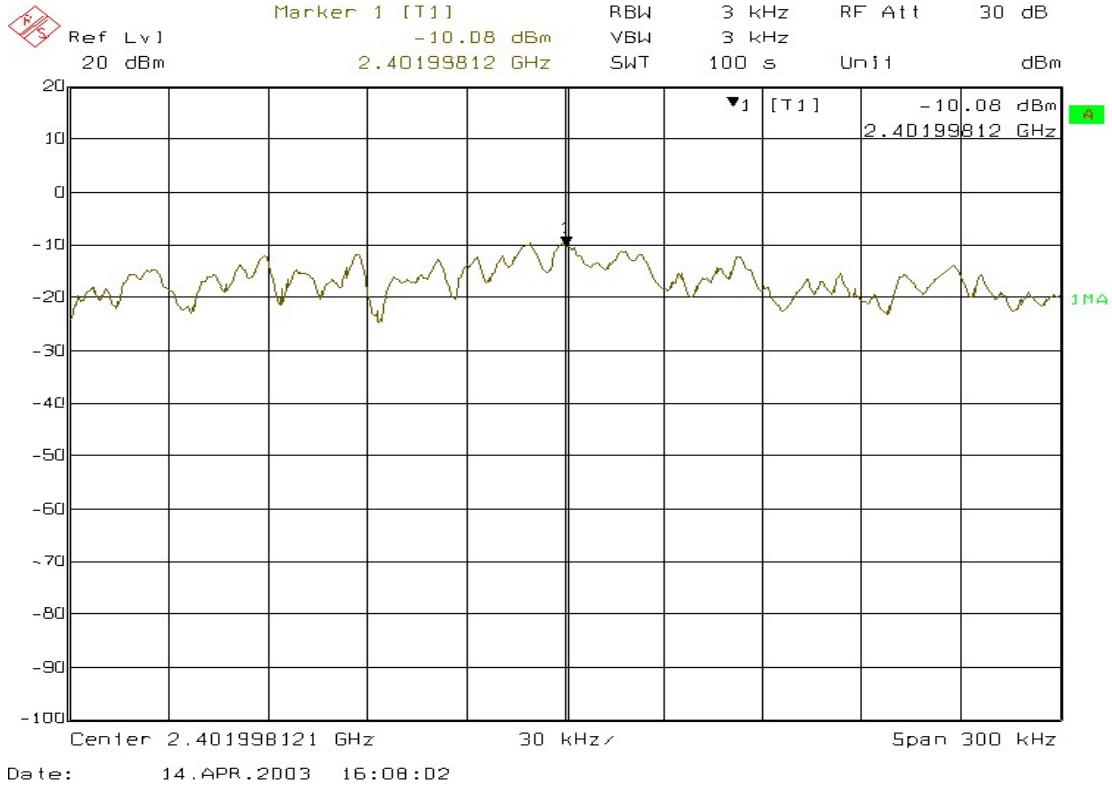
CH	RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm)	Maximum Limit (dBm)
Low	-10.08	1.50	-8.58	8
Mid	-8.53	1.50	-7.03	8
High	-7.97	1.50	-6.47	8

13.4 Measurement Equipment Used:

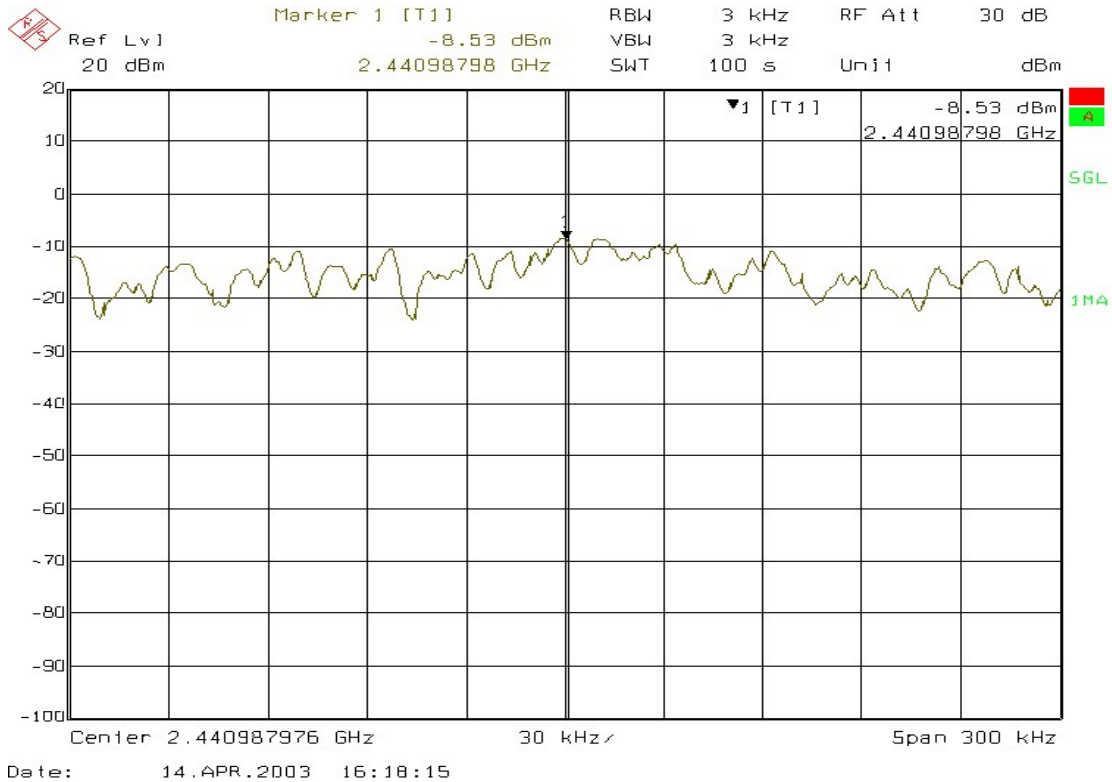
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003
Plotter	HP	7475A	2938A29027	N/A	N/A
Low loss cable	Huber + Suhner	Sucoflex 104	N/A	N/A	N/A



Power Spectral Density Test Plot (CH-Low)

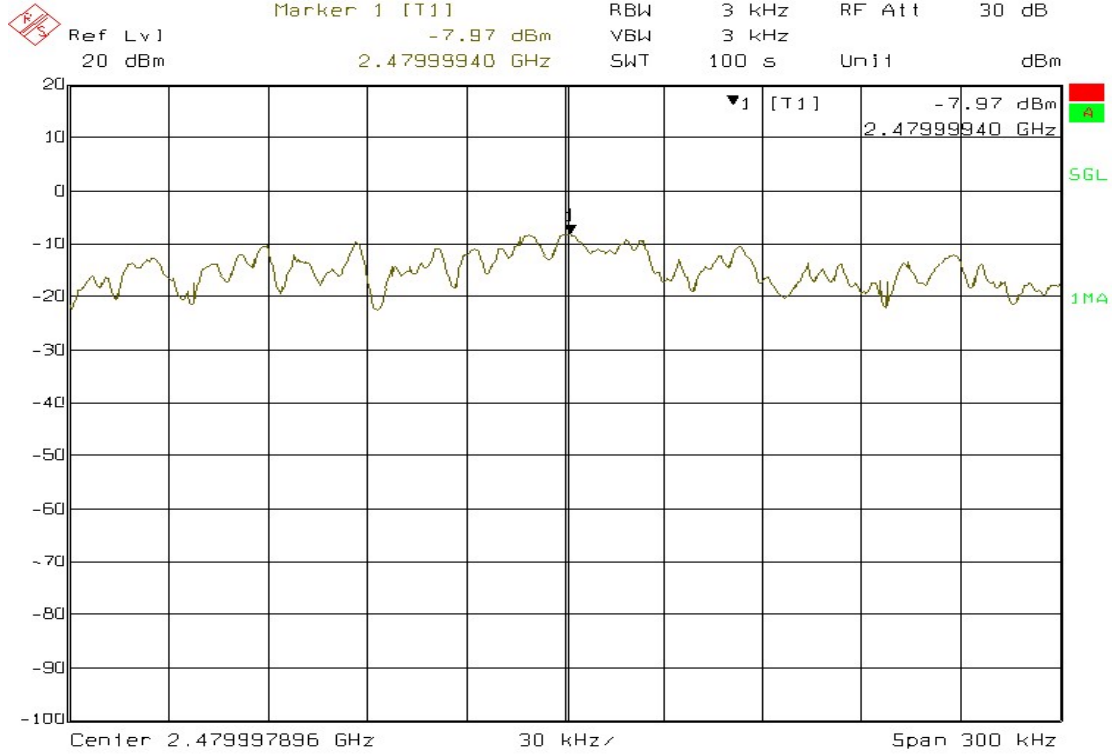


Power Spectral Density Test Plot (CH-Mid)





Power Spectral Density Test Plot (CH-High)



Date: 14.APR.2003 16:22:06

14. ANTENNA REQUIREMENT

14.1 Standard Applicable

For intentional device, according to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

And according to § 15.247(4)(i), system operating in the 2400-2483.5MHz band that are used exclusively for fixed, point to point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

14.2 Antenna Connected Construction

The directional gains of antenna used for transmitting is 0.64 dBi, and the antenna connector is designed as a unique connector and no consideration of replacement by user. Please see EUT photo for details.

15. RF EXPOSURE

15.1 Standard Applicable

According to § 15.247(b)(4) and § 1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

15.2 Test Result

Bluetooth mode:

The Max. output power is 5.68dBm (3.698mW) at 2480MHz, which is lower than general population low threshold $60/F(60/2.480=24.19\text{mW})$, The SAR is not required.

Co-Location Mode:

Refer to SAR test report.