

MEASUREMENT REPORT
of
Bluetooth Personal Digital Assistant

Applicant : ASUSTeK COMPUTER INC.
EUT : Pocket PC
Model : A620BT
FCC ID : MSQA620BT
Report No. : A5415780

Tested by :

Training Research Co., Ltd.

TEL : 886-2-26935155 FAX : 886-2-26934440

No. 255, Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C.

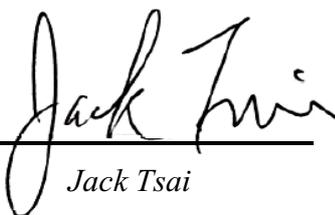
CERTIFICATION

We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ANSI C63.4 (1992) as a reference. All test were conducted by *Training Research Co., Ltd.*, No. 255, Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is **in compliance with** the technical requirements set forth in the FCC Rules Part 15 Subpart B (Declaration of Conformity) and C Section 15.247.

Applicant : ASUSTek Computer Inc.
Applicant address : 4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan, R.O.C.
Product name : Pocket PC
Model : A620BT
FCC ID : MSQA620BT
Report No. : A5415780
Test date : August 8, 2003

Prepared by:  Jack Tsai
Approved by:  Frank Tsai

Conditions of issue :

- (1) **This test report shall not be reproduced except in full, without written approval of TRC. And the test result contained within this report only relate to the sample submitted for testing.**
- (2) **This report must not be used by the client to claim product endorsement by NVLAP or any agency of U.S. Government.**

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Federal Communications Commission

Declaration of Conformity

(DoC)

For the Following Equipment:

Product name : Pocket PC

Model name : A620BT

Trade name : ASUS

Is herewith confirmed and found to comply with the requirements of CFR 47 part15 Subpart B - Unintentional Radiators regulation. The results of electromagnetic mission evaluation are shown in the report number : A5415780

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation

<i>Manufacturer</i>	<i>USA local representative</i>
Company name: ASUSTeK Computer Inc.	To be determined
Computer address: 4/F, 150, Li-Te Rd., Peitou, Taipei, Taiwan	
ZIP / Postal code 112	
Contact person: Lawrence Yu	
Title: R & D Engineer	
Internet e-mail address: lawrence_yu@asus.com.tw	
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I . GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of applicant in support that the certification in accordance with Part 2 Subpart J and Part 15 Subpart A, B and C of the Commission's Rules and Regulations.

1.2 Description of EUT

FCC ID : MSQA620BT

Product Name : Pocket PC

Model Name : A620BT

Frequency Range : 2402MHz to 2480MHz

Support Channel : 79 Channels

Channel Spacing : 1 MHz

Modulation Skill : GFSK

Power Type : (1) Battery-powered by the client' s device
(2) Power adapter
Mfg.: DELTA Electronics Inc.
Model: ADP-10SB REV.BH
I/P: 100-240VAC, 50-60Hz, 400mA ;
O/P: 5VDC, 2A
Power cable:
176cm length, non-shielded, with ferrite core

Data Cable : USB cable of cradle:
100cm length, shielded, no ferrite core

1.3 Test method

- (1) The POWER jack of charger is connected with the AC power source via a power adaptor.
- (2) The USB connector of charger is connected to the universal serial bus jack of PC.
- (3) Put the PDA into the charger.
- (4) The headphone jack of PDA is connected with the earphone.
- (5) Using the PC and software provided by the applicant to linking EUT. The software is operated to link the EUT in the unintentional test.
- (6) The applicant's software of PDA is setting continuous transmission or receiver in the intentional test.
- (7) Set different channel being tested
 - (a) Radiated for intentional test:
making EUT to the mode of continuous TX or RX
 - (b) Conducted and radiated for unintentional test:
making EUT to the linking mode with support equipments.

1.4 Description of Support Equipment

PC : **IBM 6840**
Model No. : 6840MJV
Serial No. : 96CC 0C1
FCC ID : N/A, DoC (Declaration of Confirmation) Approved
檢磁 : 3892I279
Power type : 100 ~ 127/ 200 ~ 240VAC, 4A/2A 50/60 Hz, Switching
Power cord : Non-shielded, 182cm length, Plastic hood, No ferrite core

Monitor : **HP 15' Color Monitor**
Model No. : D2827A, D2832A
Serial No. : KR91161719, KR91159981
FCC ID : C5F7NFCMC1518X, N/A (DoC Approved)
檢磁 : 3872B039, 4872A167
Power type : 110 ~ 240 VAC / 50 ~ 60 Hz, Switching
Power cord : Shielded, 1.83m long, No ferrite core
Data cable : Shielded, 1.46m long, with two ferrite cores

Keyboard : **HP; IBM**
Model No. : SK-2501K; KB-9910
Serial No. : MR80700789; 0129470
FCC ID : GYUR38SK; Doc Approved
檢磁 : 3862A621; 3882A133
Power type : By PC
Data cable : Shielded, 1.73m length, Plastic hood, with ferrite core

Mouse : **HP ; IBM**
Model No. : M-S34; M-SAU-IBM6
Serial No. : LZB90714106; 23-221383
FCC ID : DZL211029; Doc Approved
檢磁 : 4862A011; 4872A231
Power type : By PC
Power cord : Shielded, 1.88m length, Plastic hood, No ferrite core

USB

gamepad : **Rockfire; Padix**
Model No. : QF-337UV; QF-305u
Serial No. : KR91379759; 81100848
FCC ID : None (CE approval)
檢磁 : 3862A574; None
Data cable : Shielded, 1.80 (1.76)m long, No ferrite core

Printer : **HP**

Model No. : C6464A, C2642A
Serial No. : TH16LEB5PK, SG69A196GV
FCC ID : None (DoC Approved), B94C2642X
檢磁 : 3892H381, None
Power type : Switching adaptor
Power cord : Non-shielded, 173cm long, No ferrite core
(between adaptor and AC source)
Non-shielded, 180cm long, with ferrite core
(between printer and adaptor)
Data cable : Shielded, 1.70m long, No ferrite core

Modem : **ACEEX**

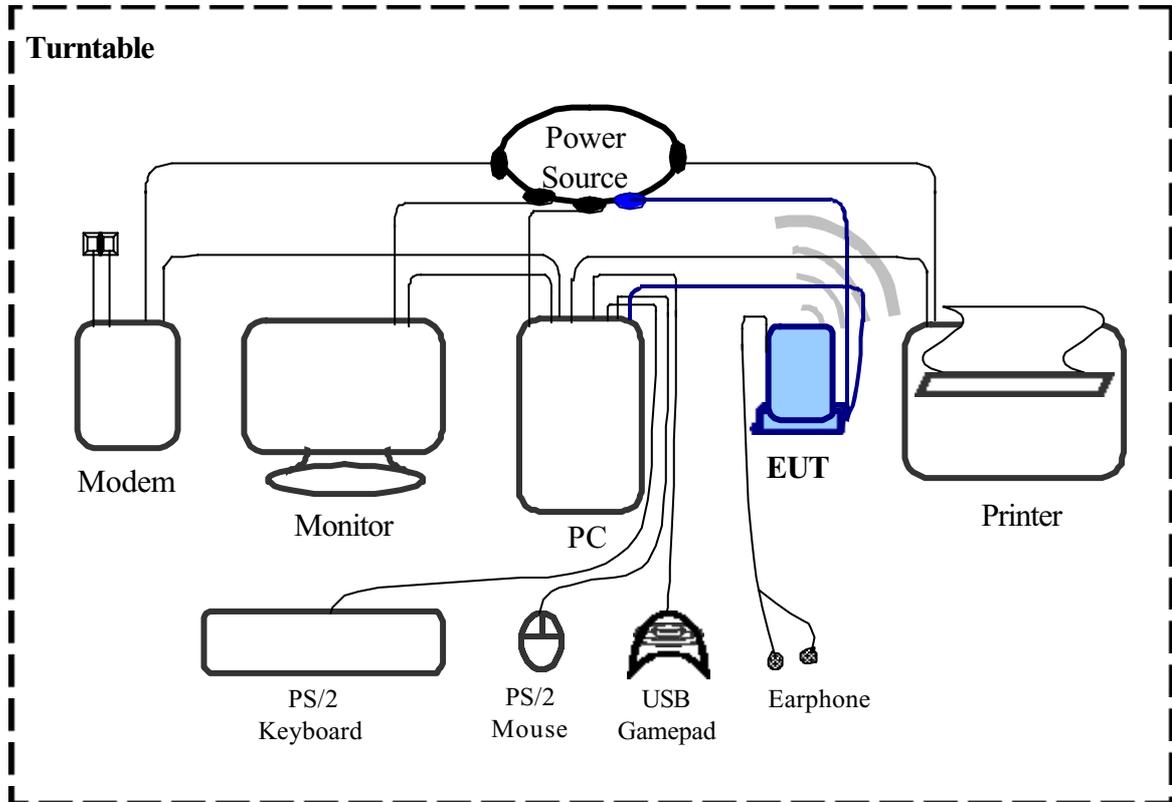
Model No. : XDM-56V14
FCC ID : IFAXDM-56V14
Power type : Linear
Power cord : Non-shielded, 1.9m long, No ferrite cord
Data cable : RS232, Shielded, 1.2m long, No ferrite core
RJ11C x 2, 7' long non-shielded, No ferrite core

Earphone : **God Information Technology Co., Ltd.**

Model No. : MIC-001
Serial No. : GIT-20011001
FCC ID : N/A, Doc Approved
Power type : By PDA
Power cord : Non-shielded, 118cm long, No ferrite core

1.5 Configuration of System Under Test

(Conducted and Radiated of unintentional)



Connections of Equipment

PC:

- *VGA Port --- a monitor
- *Serial Port --- an external modem
- *Parallel Port --- a printer
- *PS/2 Ports --- a PS/2 keyboard and PS/2 mouse
- *USB A-Port --- a USB gamepad
- *USB B-Port --- EUT

EUT:

USB Cradle:

- *USB Cable x 1 --- 100cm length, shielded, no ferrite core

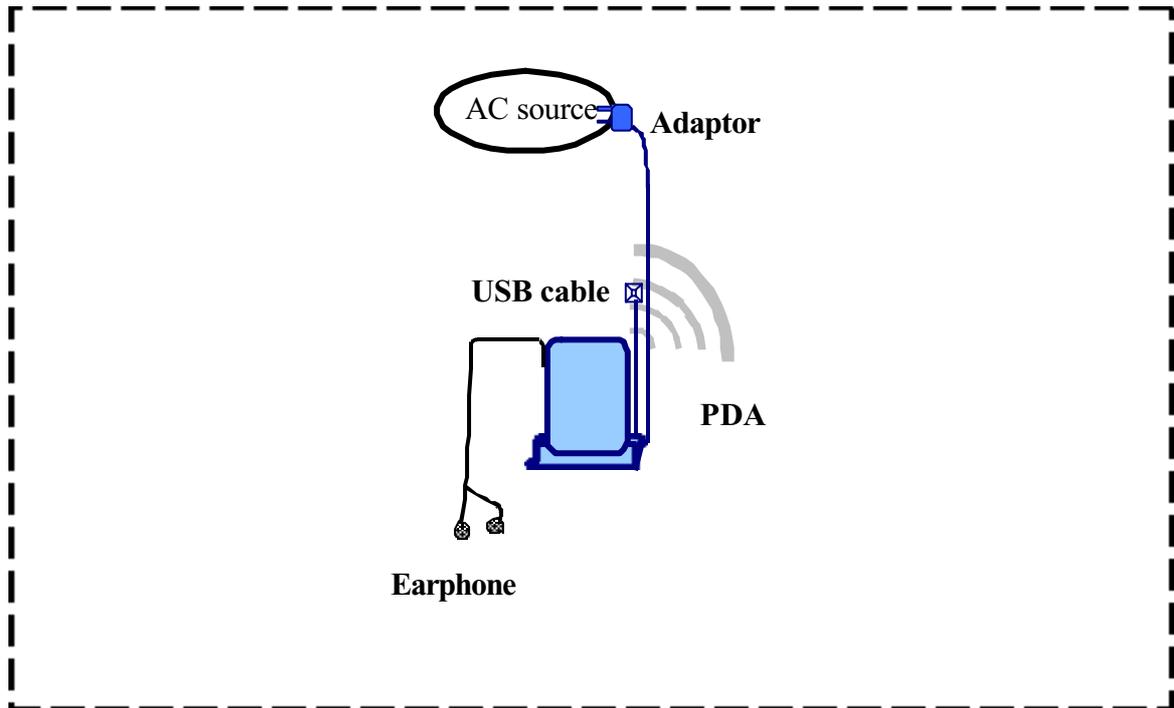
Switching Adaptor

- *Power Cable x 1 --- 176cm length, non-shielded, with ferrite core

Earphone

- *Data cable x 1 --- 118cm length, non-shielded, no ferrite core

(Radiated of intentional for USB interface)



1.6 Test Procedure

All measurements contained in this report were performed mainly according to the techniques described in ANSI C63.4 (1992) and the pre-setup was written 1.3 test method, the detail setup was written on each test item.

1.7 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter, Anechoic Chamber (Registration Number: 93906)** maintained by *Training Research Co., Ltd.* – No. 255, Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and other test items were performed in an anechoic chamber also located at Training Research Co., Ltd.

255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C., *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

1.8 General Test Condition

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions, which the EUT was considered likely to encounter in normal uses were investigated.

There is a test condition apply in this test item, the test procedure description as <1.3 test method>. Three channels were tested, one in the top (CH1), one in the middle (CH39) and the other in bottom (CH79).

II. Section 15.101(a): Equipment authorization of unintentional radiators

The EUT equipped with a USB interface and should be operated with the computer. It was categorized to *Class B personal computers and peripherals* as cannot be operated stand-alone. The authorization requires **Declaration of Conformity (DoC)** and the items required such as Sect.15.107 (Conducted limits) and Sect.15.109 (Radiated emission limits) is same as Sect.15.207 and 15.247(C).

III. Section 15.203: Antenna requirement

The EUT is equipped with an integral antenna, it is permanently installed inside its case. The antenna cannot be removed or modified without any tools from outside in order to prevent the un-authorized modification. This makes that complies with the antenna requirement stated in Sect.15.203.

IV. Section 15.207: Power Line Conducted Emissions for AC Powered Units

4.1 Test Condition & Setup

The power line conducted emission measurements were performed in an anechoic chamber. The EUT was assembled on a wooden table, which is 80 centimeters high, was placed 40 centimeters from the backwall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and Line Impedance Stabilization Networks (LISNs). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer (or EMI receiver) was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak and average detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.3

There is a test condition apply in this test item, the test procedure description as <1.3 test method>. Three channels were tested, one in the top (CH1), one in the middle (CH39) and the other in bottom (CH79).

4.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	<u>Calibration Date</u>	
				Last time	Next time
EMI Receiver	8546A	H P	3520A00242	07/28/03	07/28/04
RF Filter Section	85460A	H P	3448A00217	07/28/03	07/28/04
Pre-selector (>30MHz)	AMP-01	TRC	REP-001	10/20/02	10/20/03
LISN (EUT)	TRC-LISN-01	TRC	LISN-01	09/03/02	09/03/03
LISN (Support E.)	LISN-01	TRC	9912-05	06/21/03	06/21/04
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	11/20/02	11/20/03

The level of confidence of 95%, the uncertainty of measurement of conducted emission is ± 2.02 dB.

4.3 Test Results of Conducted Emissions

The following table shows a summary of the highest emissions of power line conducted emissions on the LIVE and NETURAL conductors of the EUT power cord.

Test Conditions: Temperature : 25.0 °C Humidity : 73.0 % RH

Test mode: Standby mode,

<i>Power Connected Emissions</i>					<i>Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBμV)</i>	<i>QP (dBμV)</i>	<i>Average (dBμV)</i>	<i>QP-limit (dBμV)</i>	<i>AVG-limit (dBμV)</i>	<i>Margin (dB)</i>
Line 1	205.000	47.71	---	---	64.43	54.43	-6.72
	377.000	40.81	---	---	59.51	49.51	-8.70
	759.000	34.98	---	---	56.00	46.00	-11.02
	824.000	33.58	---	---	56.00	46.00	-12.42
	928.000	34.87	---	---	56.00	46.00	-11.13
	1113.000	35.66	---	---	56.00	46.00	-10.34
	1713.000	39.92	---	---	56.00	46.00	-6.08
	1889.000	34.94	---	---	56.00	46.00	-11.06
	5000.000	37.27	---	---	60.00	50.00	-12.73
	7530.000	34.75	---	---	60.00	50.00	-15.25
Line 2	205.000	48.43	---	---	64.43	54.43	-6.00
	373.000	41.33	---	---	59.63	49.63	-8.30
	703.000	35.19	---	---	56.00	46.00	-10.81
	928.000	37.13	---	---	56.00	46.00	-8.87
	1346.000	34.20	---	---	56.00	46.00	-11.80
	1678.000	40.11	---	---	56.00	46.00	-5.89
	1854.000	40.30	---	---	56.00	46.00	-5.70
	5110.000	37.62	---	---	60.00	50.00	-12.38
	23960.000	28.13	---	---	60.00	50.00	-21.87

NOTE:

- (1) Margin = Peak Amplitude – Limit.
- (2) A "+" sign in the margin column means the emission is OVER the Class B Limit and "-" sign of means UNDER the Class B limit, The reading amplitudes are all under limit.

Test mode: Channel 1

<i>Power Connected Emissions</i>					<i>Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBμV)</i>	<i>QP (dBμV)</i>	<i>Average (dBμV)</i>	<i>QP-limit (dBμV)</i>	<i>AVG-limit (dBμV)</i>	<i>Margin (dB)</i>
Line 1	203.000	49.76	---	---	64.49	54.49	-4.73
	359.000	40.81	---	---	60.03	50.03	-9.22
	781.000	35.89	---	---	56.00	46.00	-10.11
	1102.000	33.79	---	---	56.00	46.00	-12.21
	1490.000	36.29	---	---	56.00	46.00	-9.71
	1661.000	38.54	---	---	56.00	46.00	-7.46
	1836.000	37.92	---	---	56.00	46.00	-8.08
	5080.000	35.07	---	---	60.00	50.00	-14.93
	5770.000	34.46	---	---	60.00	50.00	-15.54
Line 2	187.000	47.66	---	---	64.94	54.94	-7.28
	205.000	47.99	---	---	64.43	54.43	-6.44
	363.000	42.84	---	---	59.91	49.91	-7.07
	738.000	35.80	---	---	56.00	46.00	-10.20
	1091.000	37.24	---	---	56.00	46.00	-8.76
	1661.000	40.78	---	---	56.00	46.00	-5.22
	1836.000	40.30	---	---	56.00	46.00	-5.70
	5030.000	38.82	---	---	60.00	50.00	-11.18
	7690.000	36.08	---	---	60.00	50.00	-13.92

Test mode: Channel 39

<i>Power Connected Emissions</i>					<i>Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBµV)</i>	<i>QP (dBµV)</i>	<i>Average (dBµV)</i>	<i>QP-limit (dBµV)</i>	<i>AVG-limit (dBµV)</i>	<i>Margin (dB)</i>
Line 1	203.000	48.31	---	---	64.49	54.49	-6.18
	359.000	40.50	---	---	60.03	50.03	-9.53
	563.000	34.25	---	---	56.00	46.00	-11.75
	668.000	33.65	---	---	56.00	46.00	-12.35
	832.000	36.74	---	---	56.00	46.00	-9.26
	1017.000	36.15	---	---	56.00	46.00	-9.85
	1518.000	35.10	---	---	56.00	46.00	-10.90
	1661.000	37.85	---	---	56.00	46.00	-8.15
	1941.000	32.75	---	---	56.00	46.00	-13.25
	5030.000	36.77	---	---	60.00	50.00	-13.23
Line 2	187.000	48.03	---	---	64.94	54.94	-6.91
	329.000	41.24	---	---	60.89	50.89	-9.65
	377.000	43.0	---	---	59.51	49.51	-6.51
	563.000	33.35	---	---	56.00	46.00	-12.65
	767.000	34.32	---	---	56.00	46.00	-11.68
	850.000	35.42	---	---	56.00	46.00	-10.58
	1113.000	37.11	---	---	56.00	46.00	-8.89
	1503.000	37.29	---	---	56.00	46.00	-8.71
	1836.000	39.51	---	---	56.00	46.00	-6.49
	4952.000	37.97	---	---	56.00	46.00	-8.03

Test mode: Channel 79

<i>Power Connected Emissions</i>					<i>Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBμV)</i>	<i>QP (dBμV)</i>	<i>Average (dBμV)</i>	<i>QP-limit (dBμV)</i>	<i>AVG-limit (dBμV)</i>	<i>Margin (dB)</i>
Line 1	205.000	48.06	---	---	64.43	54.43	-6.37
	377.000	41.26	---	---	59.51	49.51	-8.25
	745.000	34.96	---	---	56.00	46.00	-11.04
	824.000	35.12	---	---	56.00	46.00	-10.88
	945.000	35.21	---	---	56.00	46.00	-10.79
	1017.000	35.92	---	---	56.00	46.00	-10.08
	1503.000	35.68	---	---	56.00	46.00	-10.32
	1713.000	38.35	---	---	56.00	46.00	-7.65
	1941.000	37.55	---	---	56.00	46.00	-8.45
	5130.000	36.58	---	---	60.00	50.00	-13.42
Line 2	203.000	47.71	---	---	64.49	54.49	-6.78
	384.000	42.62	---	---	59.51	49.51	-6.89
	563.000	36.46	---	---	56.00	46.00	-9.54
	688.000	35.17	---	---	56.00	46.00	-10.83
	954.000	36.86	---	---	56.00	46.00	-9.14
	1333.000	35.28	---	---	56.00	46.00	-10.72
	1661.000	40.16	---	---	56.00	46.00	-5.84
	1871.000	38.37	---	---	56.00	46.00	-7.63
	2222.000	33.70	---	---	56.00	46.00	-12.30
	5000.000	39.64	---	---	60.00	50.00	-10.36

V. Section 15.247 (a): Technical description of the EUT

Based on the Section 2.1, *Frequency Hopping Spectrum System* is a spread spectrum system in which the carrier has been modulated by a *high speed spreading code* and an *information data stream* with its *known hopping algorithm* and *avoidance method*. The high speed code sequence dominates the “modulating function” and is the direct cause of the wide spreading of the transmitted signal. In the *operational description* demonstrates the operation principles of the base-band processor employed by the EUT, shows that which is a complete FHSS base-band processor and meets the definition of the *Frequency Hopping Spectrum System*.

VI. Section 15.247(a)(1): Carrier Frequency Separation

6.1 Test Condition

The EUT must have its hopping function enabled. Use the following spectrum analyzer setting

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) bandwidth (RBW) \geq 1% of the span

Video (or Average) Bandwidth (VBW) \geq RBW

Sweep = Auto

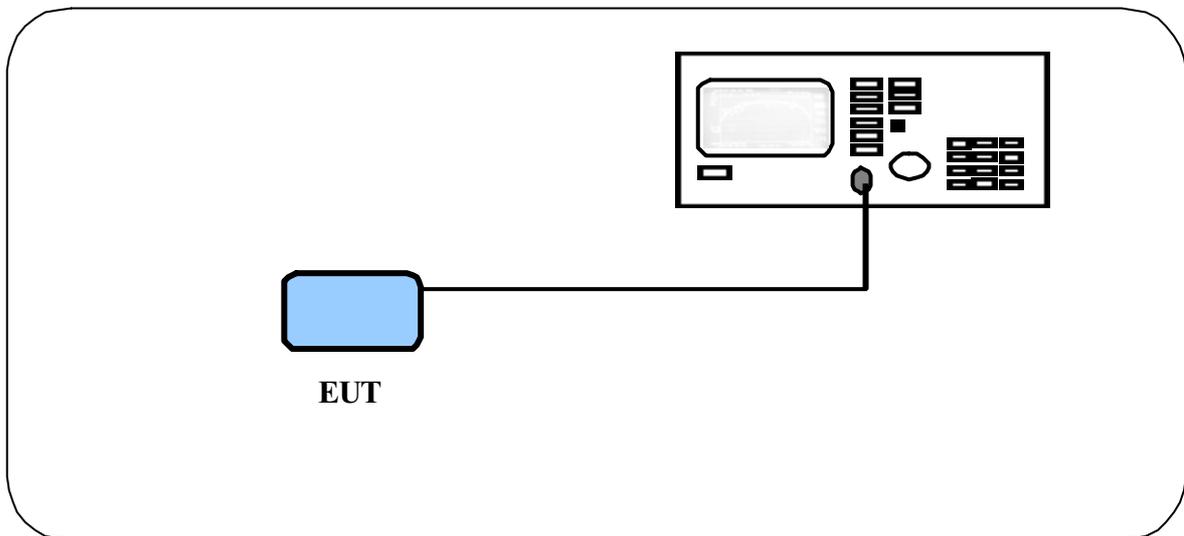
Detector Function = peak

Trace = max hold

Setting up procedure is written on 1.3 test method.

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channel. The limit is specified in one of the subparagraphs of this section. Submit this plot.

6.2 Test Instruments Configuration



Test Configuration of carrier frequency separation

6.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum Analyzer	8594EM	HP	3710A00279	12/26/02	12/26/03
Spectrum Analyzer	MS2665C	ANRITSU	6200175476	09/11/02	09/11/03

6.4 Test Results

Channel Separation: 1MHz



VII. Section 15.247(a)(1)(ii) Number of Hopping Frequencies

7.1 Test Condition

The EUT must have its Hopping function enabled. Use the following spectrum analyzer setting:

Span = the frequency band of operation

RBW \geq 1% of the span

VBW \geq RBW

Sweep = auto

Detector function = peak

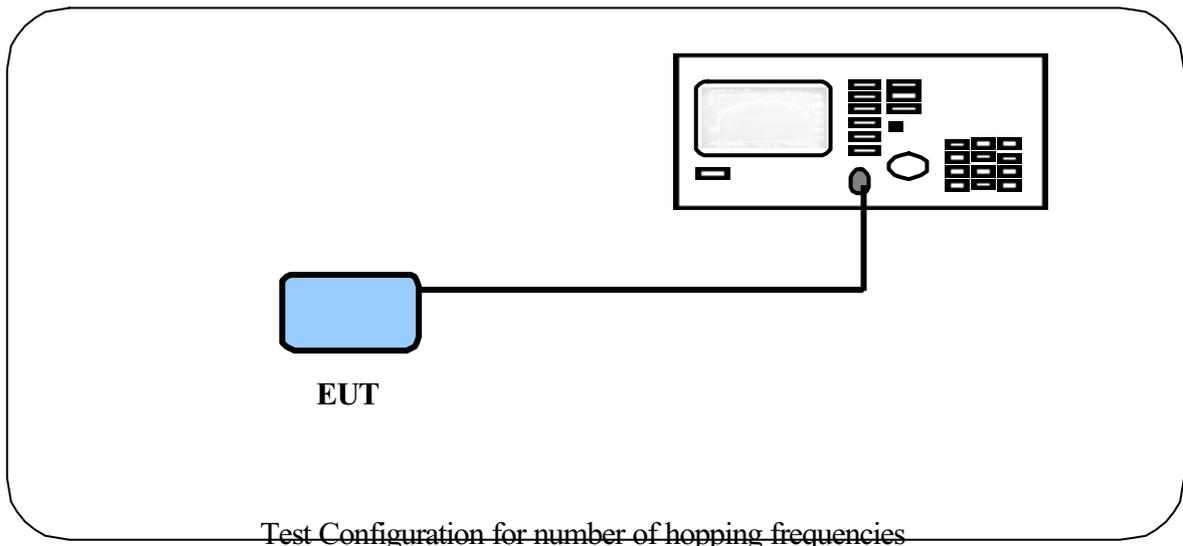
Trace = max hold

Allow the trace to stabilize. It may prove necessary to break the span up to sections. In order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this section. Submit this plots.

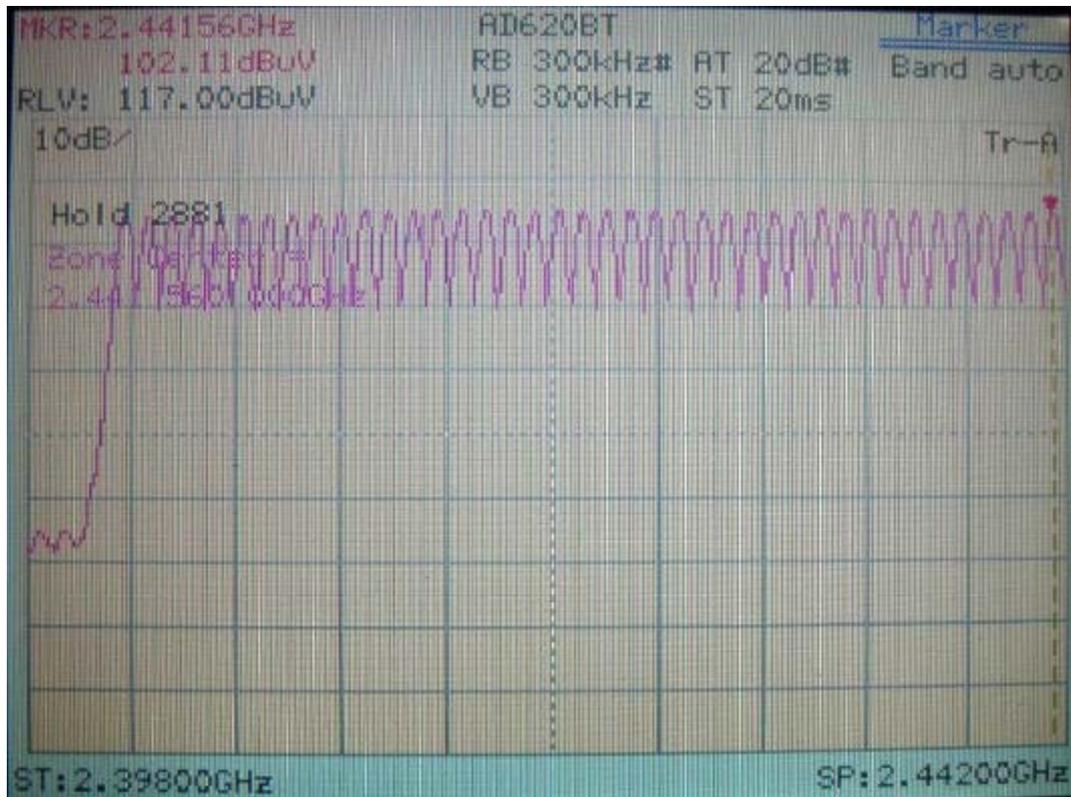
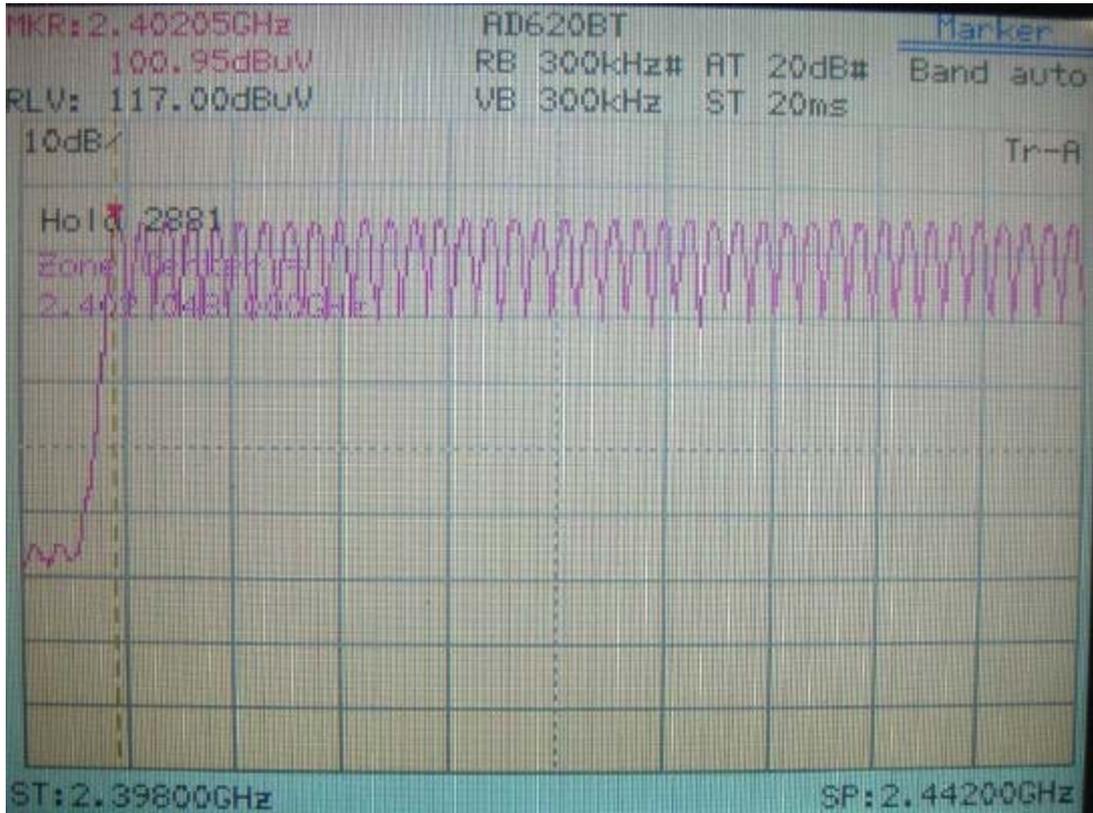
7.2 List of Test Instruments

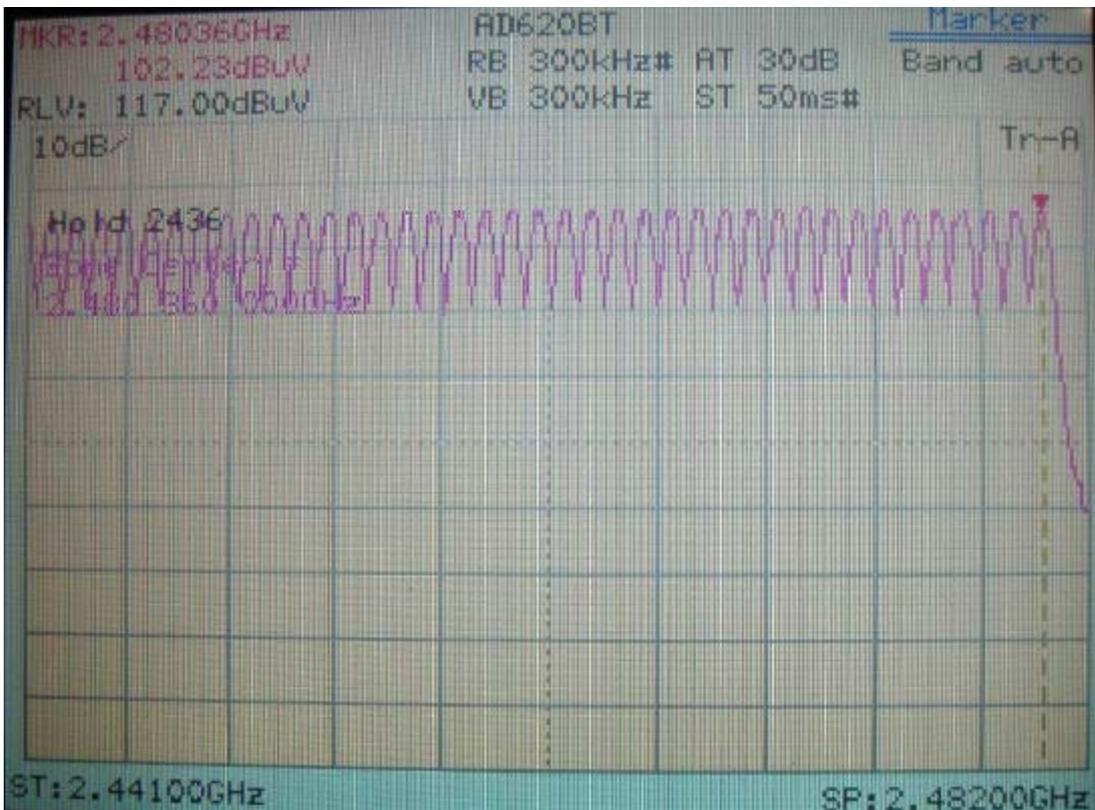
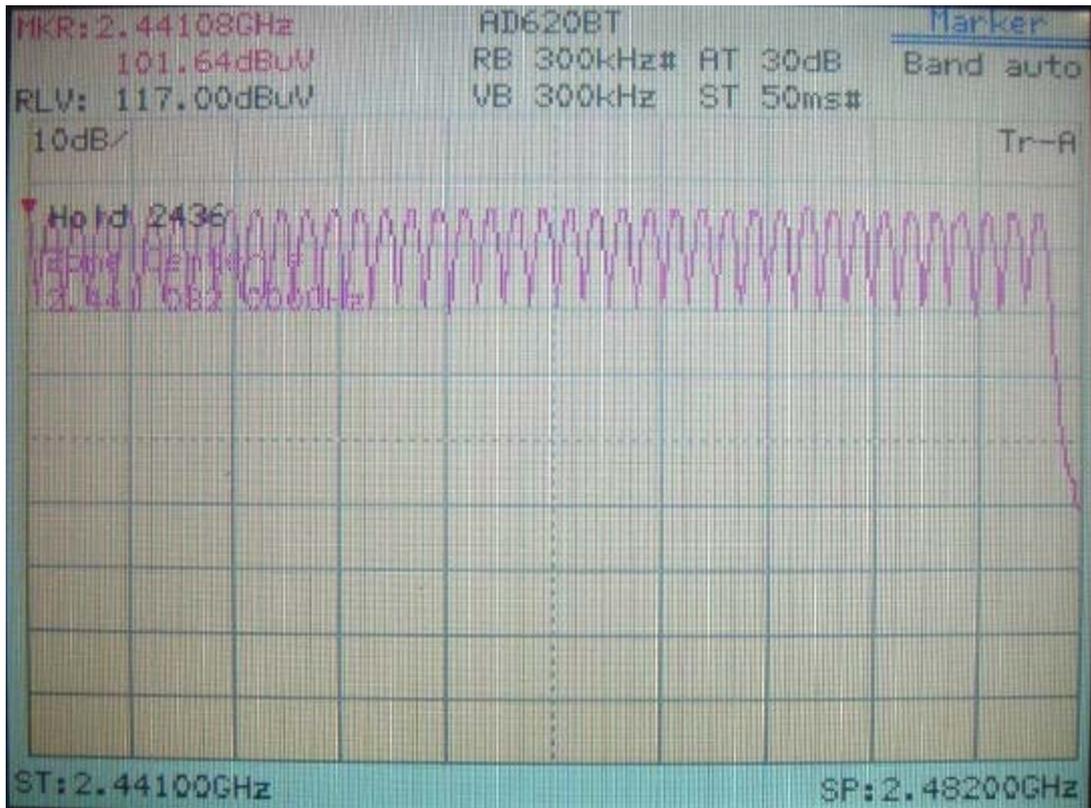
Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum Analyzer	MS2665C	ANRITSU	6200175476	09/11/02	09/11/03
Spectrum Analyzer	8594EM	HP	3710A00279	12/26/02	12/26/03

7.3 Test Instruments Configuration



7.4 Test Results





VIII. Section 15.247(a)(1)(ii) Time of Occupancy (Dwell Time)

8.1 Test Condition

The EUT must have its hopping function enabled. Use the following spectrum analyzer setting:

Span = zero span, centered on a hopping channel

RBW = 1M

VBW RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

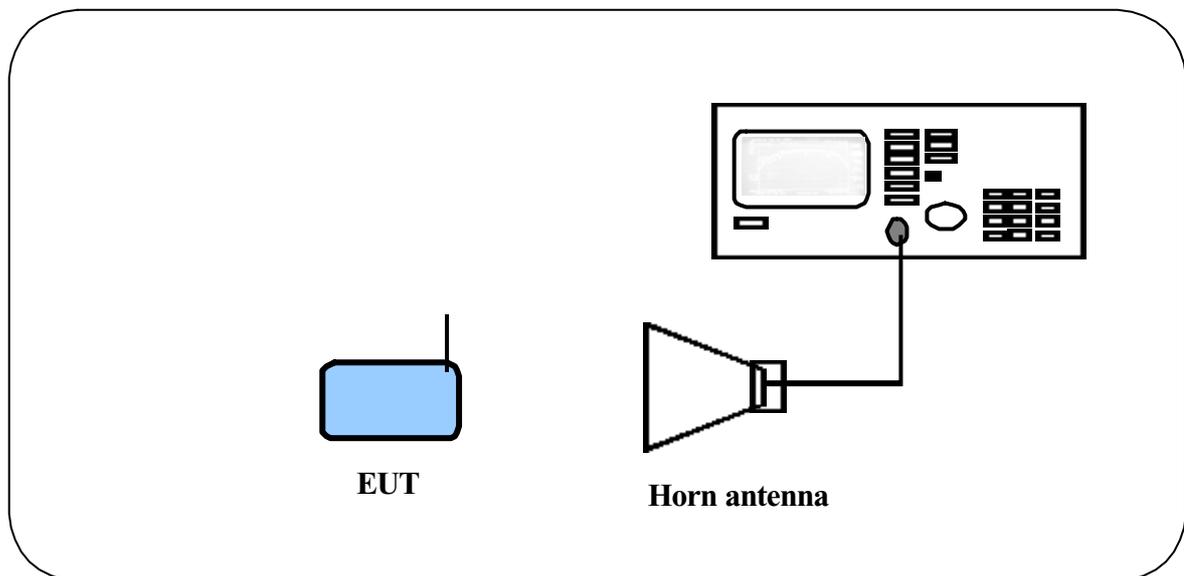
Trace = max hold

If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this section. Submit this plot(s). An oscilloscope may be used instead of a spectrum analyzer.

8.2 List of Test Instruments

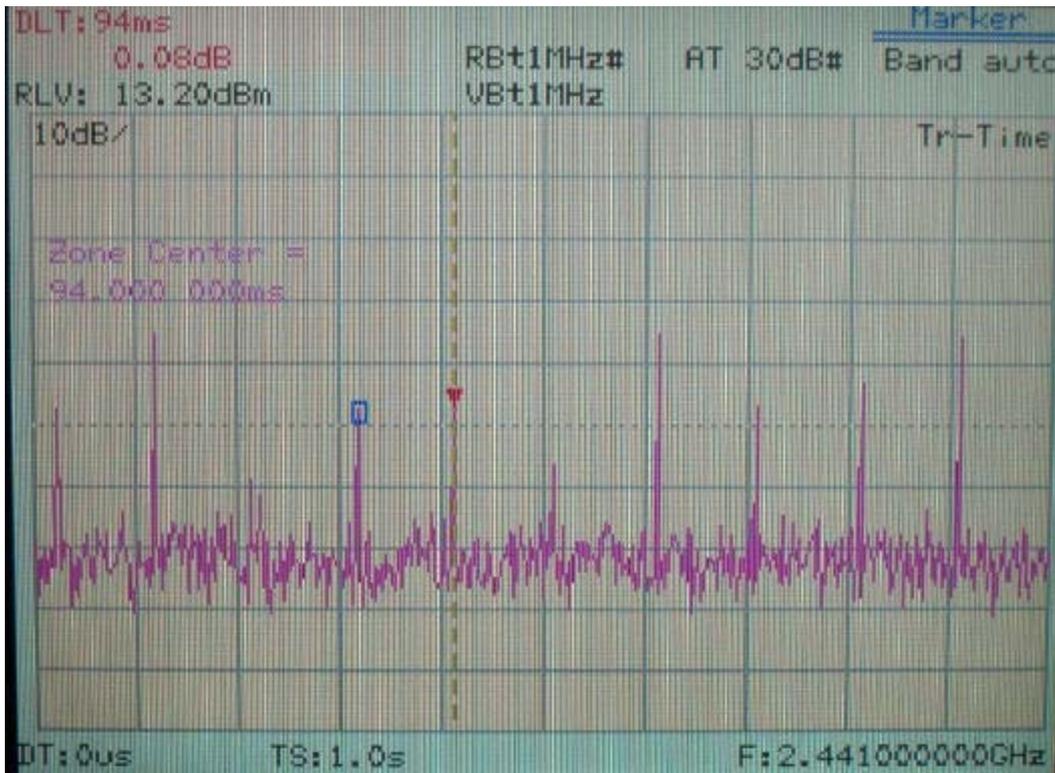
<u>Instrument Name</u>	<u>Model No</u>	<u>Brand</u>	<u>Serial No.</u>	<u>Last time</u>	<u>Next time</u>
Spectrum Analyzer	MS2665C	ANRITSU	6200175476	09/11/02	09/11/03
Microwave Preamplifier	83051A	H P	3232A00347	08/13/02	08/13/03
Horn Antenna	3115	EMCO	9704 – 5178	08/15/02	08/15/03

8.3 Test Instruments Configuration



8.4 Test Results

1. Pulse width of one slot measurement:
Results: 450 μ Sec
2. Dwell time measurement
Time period of each burst is 450 μ Sec in 1.0mSec sweep time.
There are 10 bursts in 1 second.
So, the occupancy time within 30 second is $(30/1) * 10 * 450 = 0.135$ Sec
Results: 0.135 second
3. Limits: The average time of occupancy is less than 0.4 second within a 30 second period.
4. The picture as following page.



IX. Section 15.247(a)(1)(ii) 20dB Bandwidth

9.1 Test Condition

Use the following spectrum analyzer setting:

Span = the frequency band of operation

RBW \geq 1% of the emission bandwidth

VBW \geq RBW

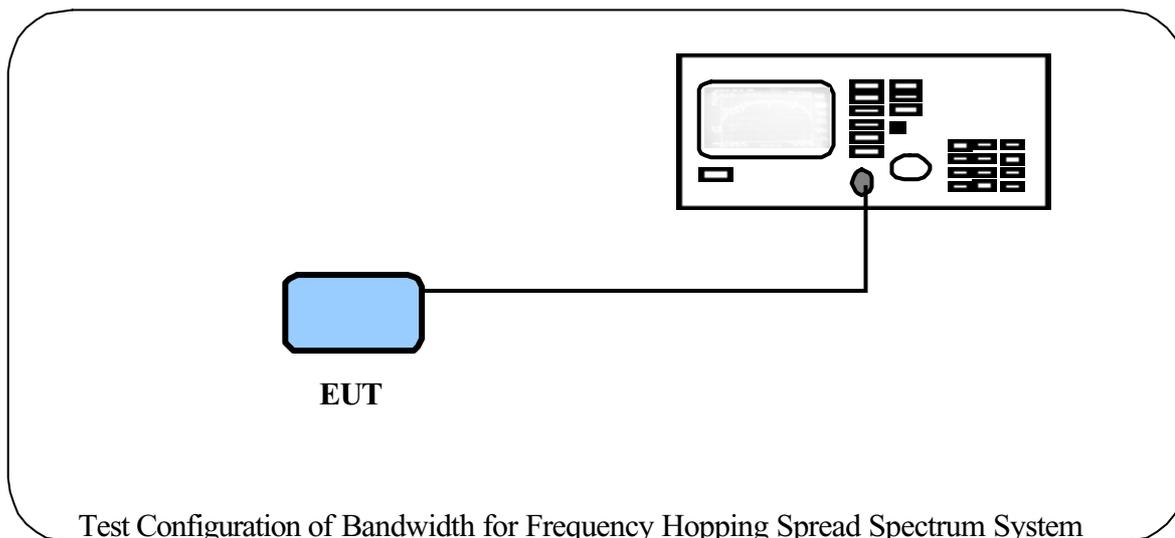
Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of emission. Use the marker-delta function to measure 20dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this section. Submit this plot(s).

9.2 Test Instruments Configuration



9.3 List of Test Instruments

<u>Instrument Name</u>	<u>Model No.</u>	<u>Brand</u>	<u>Serial No.</u>	<u>Last time</u>	<u>Next time</u>
Spectrum Analyzer	MS2665C	ANRITSU	6200175476	09/11/02	09/11/03
Spectrum Analyzer	8594EM	HP	3710A00279	12/26/02	12/26/03

9.4 Test Results

Channel	Bandwidth
Channel 01	856 kHz
Channel 39	812 kHz
Channel 79	824 kHz

Note: The data in the above table are summarizing the following attachment spectrum analyzer.

Bandwidth of Channel 1:



Bandwidth of Channel 39:

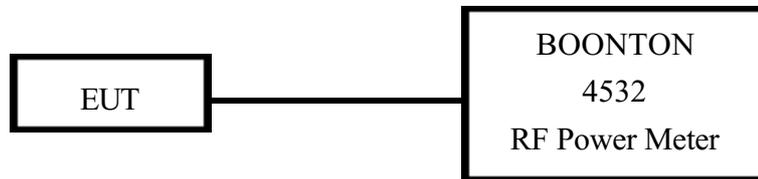


Bandwidth of Channel 79:



X. Section 15.247(b) Peak Output Power

10.1 Test Condition & Setup



1. The output of the transmitter is connected to the BOONTON RF Power Meter.
2. The calibration is performed before every test. The values of the output power of the EUT will shown in the dBm directly are the transmitter output peak power. Recording as follows.

10.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.
RF Power Meter	4532	BOONTON	117501

10.3 Test Result

Formula:
 Signal generator + |Cable loss| = Output peak power

Channel	Signal Generator	Cable Loss	Output peak power	
	dBm		dBm	dBm
CH 01	-0.62	0.70	0.08	1.019
CH 39	-0.97	0.70	-0.27	0.940
CH 79	-1.79	0.70	-1.09	0.779

XI. Section 15.247(c) Band-edge Compliance

11.1 Test Condition

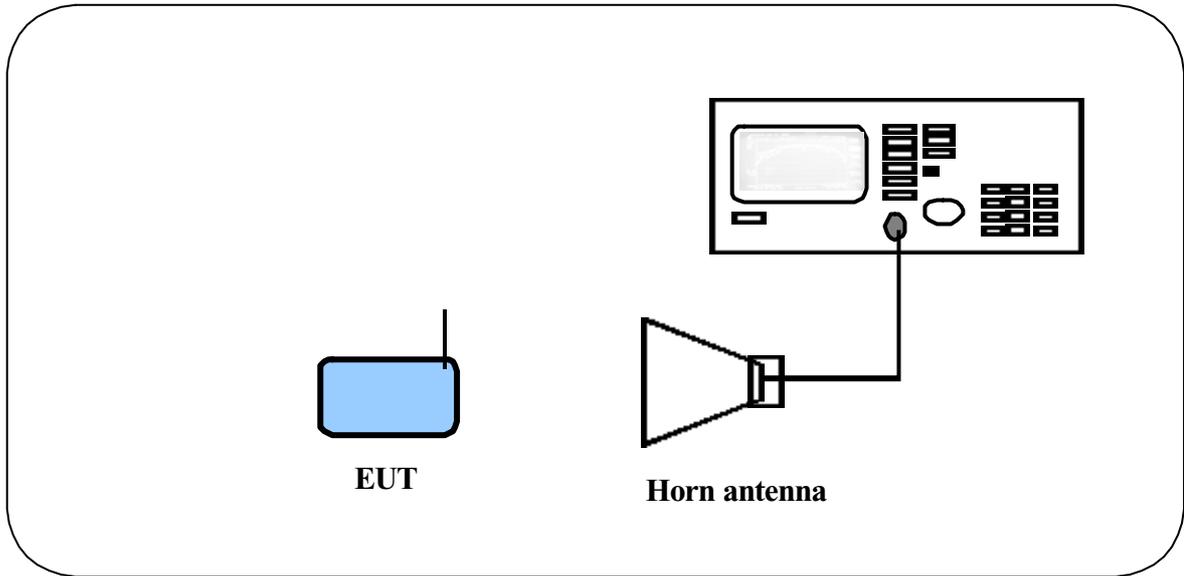
If any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either *at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a)*,

We perform this section by the *radiated manner*, the RBW is set to 100kHz and VBW>RBW. We'd made the observation *up to 10th harmonics and the criterion is all the harmonic/spurious emissions must be 20dB below the highest emission level measured*. If the emissions fall in the restricted bands stated in the Part15.205(a) must also *comply with the radiated emission limits specified in Part15.209(a)*. (*Peak mode: RBW=VBW=1MHz, Average mode: RBW=1MHz; VBW=10Hz*)

11.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum Analyzer	8564E	H P	US36433002	07/23/03	07/23/04
Microwave Preamplifier	83051A	H P	3232A00347	08/13/02	08/13/03
Horn Antenna	3115	EMCO	9704 – 5178	08/15/02	08/15/03

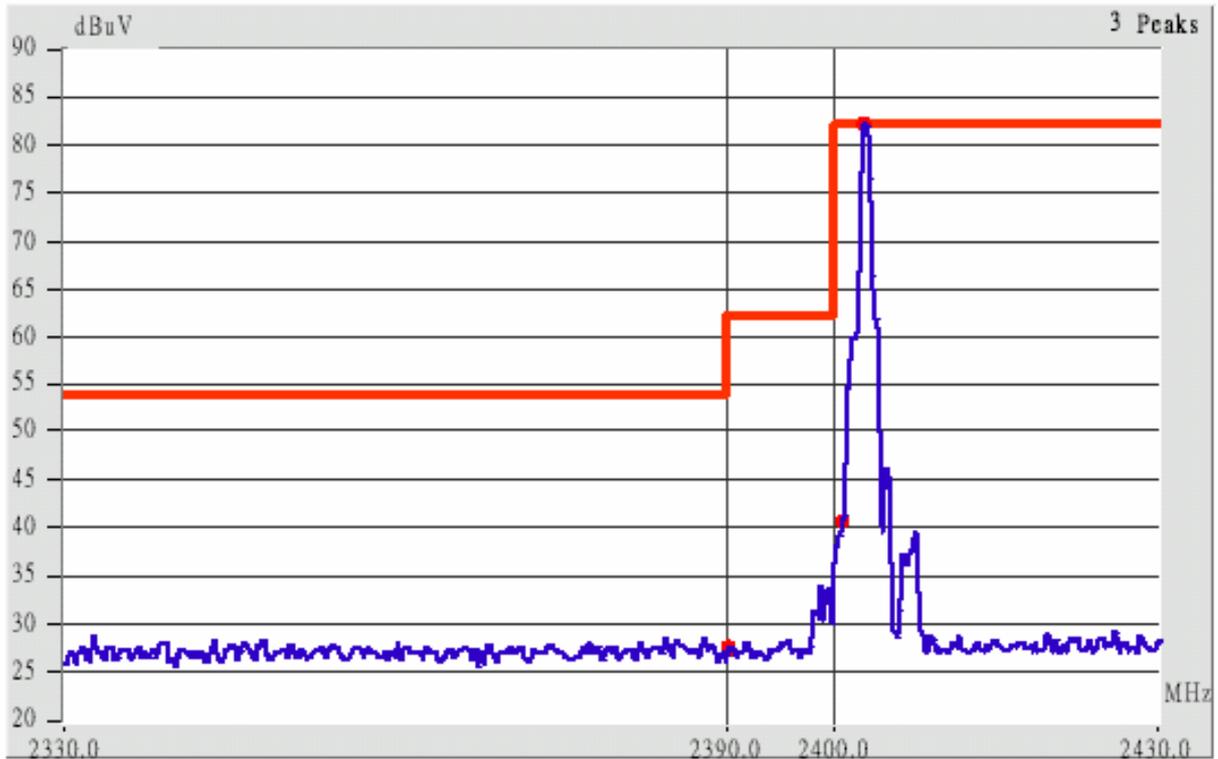
11.3 Test Instruments Configuration



11.4 Test Result of the Bandedge

The following pages show our observations referring to the channel 1 and 79 respectively.

Channel 1

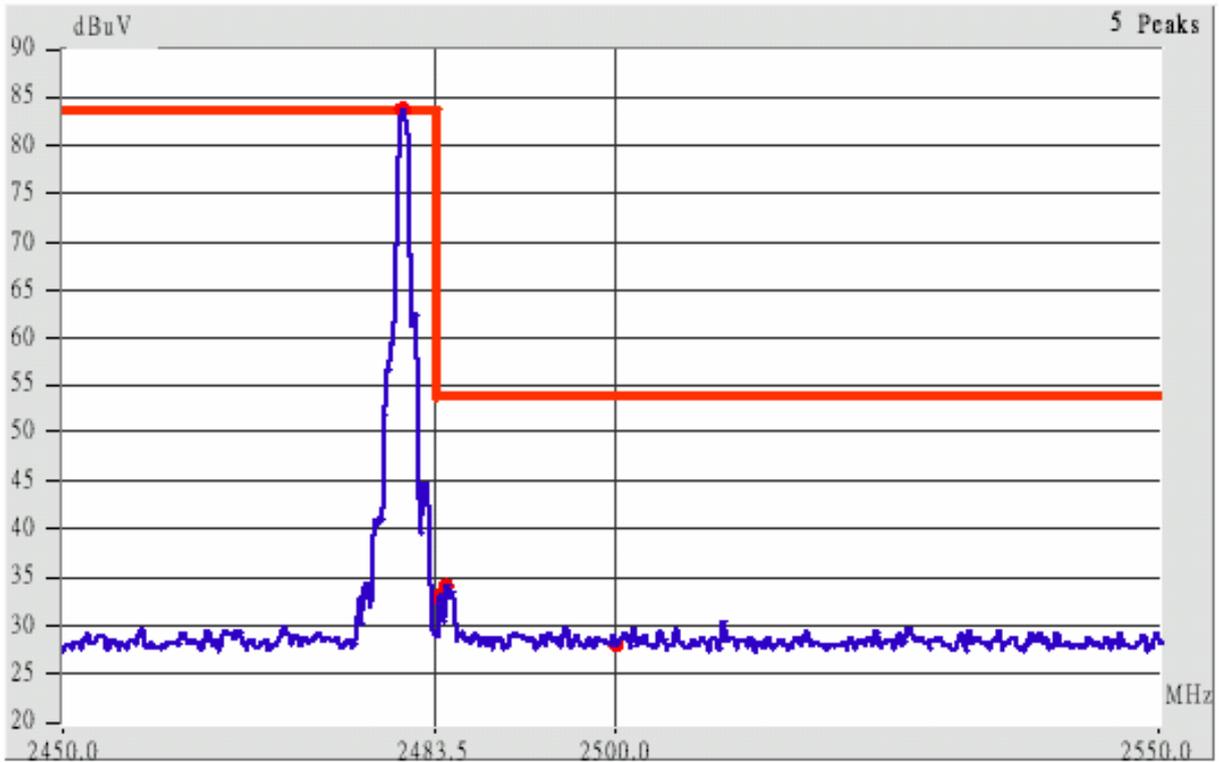


This is the hard copy of our bandedge measurement generated by our bandedge testing program. The plot shown above is the bandedge of channel 1.

1. The lobe left by the fundamental side is already 20dB below the highest emission level.
2. The emissions recorded in the restricted band is do comply with the Part 15.209(a) – as below.

<i>Radiated Emission</i>					<i>Corrected Amplitude (dBµV/m)</i>		<i>FCC Class B</i>		
<i>Frequency (MHz)</i>	<i>Ant. P.</i>	<i>Ant. H. (m)</i>	<i>Table (°)</i>	<i>Factors (dB)</i>			<i>Limit (dBµV/m)</i>		<i>Margin (dB)</i>
					<i>Peak</i>	<i>Average</i>	<i>Peak</i>	<i>Ave.</i>	
2376.84	Hor	1.00	151	6.25	41.58	---	74.00	53.96	-12.38
2389.97	Hor	1.00	166	6.32	39.82	---	74.00	53.96	-14.14
2383.96	Ver	1.00	309	6.29	41.62	---	74.00	53.96	-12.34
2389.97	Ver	1.00	22	6.32	39.99	---	74.00	53.96	-13.97

Channel 79



This is the hard copy of our bandedge measurement generated by our bandedge testing program. The plot shown above is the bandedge of channel 79.

3. The lobe left by the fundamental side is already 20dB below the highest emission level.
4. The emissions recorded in the restricted band is do comply with the Part 15.209(a) – as below.

<i>Radiated Emission</i>					<i>Corrected Amplitude (dBµV/m)</i>		<i>FCC Class B</i>		
<i>Frequency (MHz)</i>	<i>Ant. P.</i>	<i>Ant. H. (m)</i>	<i>Table (°)</i>	<i>Factors (dB)</i>			<i>Limit (dBµV/m)</i>		<i>Margin (dB)</i>
					<i>Peak</i>	<i>Average</i>	<i>Peak</i>	<i>Ave.</i>	
2484.49	Hor	1.00	33	6.84	40.00	---	74.00	53.96	-13.96
2499.85	Hor	1.00	170	6.92	42.42	---	74.00	53.96	-11.54
2499.99	Hor	1.00	52	6.92	40.25	---	74.00	53.96	-13.71
2534.67	Hor	1.00	167	7.16	42.49	---	74.00	53.96	-11.47
2483.47	Ver	1.00	228	3.45	40.28	---	74.00	53.96	-13.68
2488.63	Ver	1.00	60	3.46	38.80	---	74.00	53.96	-15.16
2499.99	Ver	1.00	146	3.50	36.83	---	74.00	53.96	-17.13
2531.55	Ver	1.00	338	3.54	39.54	---	74.00	53.96	-14.42

XII. Section 15.247(c) Spurious Radiated Emissions

12.1 Test Condition and Setup

We'd performed the test by the *radiated emission* skill: The EUT was placed in an anechoic chamber, and set the EUT transmitting continuously and scanned at 3-meter distance to determine its emission characteristics. The physical arrangement of the EUT was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude, directivity, and frequency. The exact system configuration, which produced the highest emissions was noted so it could be reproduced later during the final tests. For the measurement above 1GHz, according to the guidance we'd set the spectrum analyzer's 6dB bandwidth RBW to 1MHz.

This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT. Final radiation measurements were made on a three-meter, anechoic chamber. The EUT system was placed on a nonconductive turntable, which is 0.8 meters height, top surface 1.0 x 1.5 meter.

The spectrum was examined from 30 MHz to 1000 MHz using an Hewlett Packard 8546A EMI Receiver, CHASE whole range Bi-log antenna (Model No.: CBL 6141A) is used to measure frequency from 30 MHz to 1GHz. The final test is used the HP 85460A spectrum and 8564E spectrum was examined from 1GHz to 25GHz using an Hewlett Packard Spectrum Analyzer, EMCO/CMT Horn Antenna (Model 3115 / RA42-K-F-4B-C) for 1G - 25GHz.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. There are two spectrum analyzers use on this testing, HP 85460A for frequency 30MHz to 1000MHz, and 8564E for frequency 1GHz to 25GHz. No post-detector video filters were used in the test. The spectrum analyzer's 6dB bandwidth was set to 120KHz (spectrum was examined from 30 MHz to 1000 MHz), the spectrum analyzer's 6 dB bandwidth was set to 1 MHz (spectrum was examined from 1GHz to 25GHz) and the analyzer was operated in the maximum hold mode. There is a test condition applies in this test item, the test procedure description as the following:

Three channels were tested, one in the top (CH1), one in the middle (CH39) and the other in bottom (CH79). The setting up procedure is recorded on <1.3 test method >

With the transmitter operating from a AC source and using the internal of EUT, radiates spurious emissions falling within the restricted bands of 15.209 were measured at operating frequencies corresponding to upper, middle and bottom channels in the 2400 ~ 2483.5 MHz band.

The actual field intensity in decibels referenced to 1 microvolt per meter (dBµV/m) is determined by algebraically adding the measured reading in dBµV, the antenna factor (dB), and cable loss (dB) at the appropriate frequency. Since the EUT was set to transmit continuously, no *duty cycle* is present.

For frequency between 30MHz to 1000MHz

$$F_{Ia} \text{ (dB}\mu\text{V/m)} = F_{Ir} \text{ (dB}\mu\text{V)} + \text{Correction Factors}$$

F_{Ia} : Actual Field Intensity

F_{Ir} : Reading of the Field Intensity

$$\text{Correction Factors} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

For frequency between 1GHz to 25GHz

$$F_{Ia} \text{ (dB}\mu\text{V/m)} = F_{Ir} \text{ (dB}\mu\text{V)} + \text{Correction Factor}$$

F_{Ia} : Actual Field Intensity

F_{Ir} : Reading of the Field Intensity

$$\text{Correction Factors} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

12.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum analyzer	8594EM	H P	3710A00279	12/26/02	12/26/03
Pre-selector (>30MHz)	AMP-01	TRC	REP-001	10/20/02	10/20/03
Bi-log Antenna	CBL 6141A	CHASE	4206	05/27/03	05/27/04
Switch/Control Unit (>30MHz)	3488A	HP	N/A	11/20/02	11/20/03
Auto Switch Box (>30MHz)	ASB-01	TRC	9904-01	11/20/02	11/20/03
Spectrum Analyzer	8564E	HP	US36433002	08/01/02	08/01/03
Microwave Preamplifier	83051A	HP	3232A00347	08/01/02	08/01/03
Horn Antenna	3115	EMCO	9704 – 5178	08/01/02	08/01/03
Horn Antenna	RA42-K-F-4B-C	CMT	961505-003	02/01/03	02/01/04
Anechoic Chamber (cable calibrated together)				05/20/03	05/20/04

The level of confidence of 95% , the uncertainty of measurement of radiated emission is ± 3.44dB.

12.3 Test Result of Spurious Radiated Emissions

EUT's transmit only

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarizations, EUT orientation, etc. are recorded on the following.

Test Conditions: Temperature : 25.0 ° C Humidity : 73.0 % RH

30MHz to 1GHz , Standby mode [HITACHI LCD] [Antenna Polarity: Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dBμV/m)	Class B (3 m)	
Frequency (MHz)	Amplitude (dBμV)	Ant. H. (m)	Table (°)			Limit (dBμV/m)	Margin (dB)
199.75	34.05	1.00	308	-2.68	31.37	43.50	-12.13
269.47	43.82	1.00	126	-2.96	40.86	46.00	-5.14
299.18	44.67	1.00	211	-2.37	42.30	46.00	-3.70
405.87	33.81	1.00	112	0.71	34.52	46.00	-11.48
499.24	30.75	1.00	101	4.53	35.28	46.00	-10.72
598.06	24.28	1.00	138	8.64	32.92	46.00	-13.08

30MHz to 1GHz , Standby mode [HITACHI LCD] [Antenna Polarity: Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dBμV/m)	Class B (3 m)	
Frequency (MHz)	Amplitude (dBμV)	Ant. H. (m)	Table (°)			Limit (dBμV/m)	Margin (dB)
30.61	28.92	1.00	304	8.37	37.29	40.00	-2.71
66.98	29.56	1.00	66	2.42	31.98	40.00	-8.02
145.19	36.15	1.00	343	-2.02	34.13	43.50	-9.37
299.18	39.39	1.00	100	-2.37	37.02	46.00	-8.98
598.06	28.88	1.00	170	8.64	37.52	46.00	-8.48
697.48	27.14	1.00	191	11.67	38.81	46.00	-7.19

Note:

1. Margin = Amplitude – limit, if margin is minus means under limit.
2. Corrected Amplitude = Reading Amplitude + Correction Factors
3. Correction factor = Antenna factor + (Cable Loss – Amplitude gain)

30MHz to 1GHz , Tx mode [HITACHI LCD] [Antenna Polarity: Horizontal]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBμV)	Ant. H. (m)	Table (°)			Limit (dBμV/m)	Margin (dB)
200.36	33.65	1.00	92	-2.68	30.97	43.50	-12.53
250.67	36.82	1.00	277	-2.72	34.10	46.00	-11.90
279.17	41.17	1.00	71	-2.68	38.49	46.00	-7.51
299.18	46.35	1.00	225	-2.37	43.98	46.00	-2.02
454.98	31.13	1.00	166	2.94	34.07	46.00	-11.93
598.06	25.88	1.00	244	8.64	34.52	46.00	-11.48

30MHz to 1GHz , Tx mode [HITACHI LCD] [Antenna Polarity: Vertical]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBμV)	Ant. H. (m)	Table (°)			Limit (dBμV/m)	Margin (dB)
30.00	29.22	1.00	87	8.57	37.79	40.00	-2.21
48.19	27.40	1.00	283	4.76	32.16	40.00	-7.84
144.58	33.53	1.00	331	-2.00	31.53	43.50	-11.97
299.18	38.22	1.00	319	-2.37	35.85	46.00	-10.15
697.48	28.48	1.00	206	11.67	40.15	46.00	-5.85
796.91	25.54	1.00	182	13.67	39.21	46.00	-6.79

30MHz to 1GHz , Standby mode [TOPPOLY LCD] [Antenna Polarity: Horizontal]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBµV)	Ant. H. (m)	Table (°)			Limit (dBµV/m)	Margin (dB)
300.69	41.13	1.00	2.57	-2.35	38.78	46.00	-7.22
348.89	36.79	1.00	261	-1.38	35.41	46.00	-10.59
409.51	34.33	1.00	194	0.88	35.21	46.00	-10.79
432.55	35.23	1.00	252	1.95	37.18	46.00	-8.82
455.59	31.39	1.00	175	2.96	34.35	46.00	-11.65
556.23	27.13	1.00	28	7.10	34.23	46.00	-11.77

30MHz to 1GHz , Standby mode [TOPPOLY LCD] [Antenna Polarity: Vertical]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBµV)	Ant. H. (m)	Table (°)			Limit (dBµV/m)	Margin (dB)
399.81	32.21	1.00	12	0.43	32.64	46.00	-13.36
533.19	28.81	1.00	166	6.09	34.90	46.00	-11.10
556.23	28.62	1.00	166	7.10	35.72	46.00	-10.28
579.26	27.71	1.00	162	7.95	35.66	46.00	-10.34
698.09	26.92	1.00	199	11.69	38.61	46.00	-7.39
896.94	23.56	1.00	115	16.96	40.52	46.00	-5.48

30MHz to 1GHz , Tx mode [TOPPOLY LCD] [Antenna Polarity: Horizontal]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBµV)	Ant. H. (m)	Table (°)			Limit (dBµV/m)	Margin (dB)
300.39	42.77	1.00	269	-2.35	40.42	46.00	-5.58
317.36	37.79	1.00	269	-2.01	35.78	46.00	-10.22
409.51	36.73	1.00	165	0.88	37.61	46.00	-8.39
432.55	39.59	1.00	255	1.95	41.54	46.00	-4.46
455.59	36.27	1.00	165	2.96	39.23	46.00	-6.77
852.08	22.75	1.00	87	15.48	38.23	46.00	-7.77

30MHz to 1GHz , Tx mode [TOPPOLY LCD] [Antenna Polarity: Vertical]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBµV)	Ant. H. (m)	Table (°)			Limit (dBµV/m)	Margin (dB)
454.37	32.60	1.00	261	2.92	35.52	46.00	-10.48
499.24	29.39	1.00	264	4.53	33.92	46.00	-12.08
533.19	30.59	1.00	158	6.09	36.68	46.00	-9.32
556.23	29.97	1.00	162	7.10	37.07	46.00	-8.93
579.26	28.32	1.00	155	7.95	36.27	46.00	-9.73
698.09	25.53	1.00	148	11.69	37.22	46.00	-8.78

1GHz to 25GHz, Channel 1 [Antenna polarity: Horizontal]

Radiated Emission				Corrected Amplitude		Class B (3m)		
Frequency (MHz)	Ant. H. (m)	Table (°)	Correction Factors (dB)	(dBµV/m)		Limit (dBµV/m)		Margin (dB)
				Peak	Average	Peak	Ave.	
4809.83	1.00	241	-24.30	48.48	---	74.00	53.96	-5.48

1GHz to 25GHz, Channel 1 [Antenna polarity: Vertical]

Radiated Emission				Corrected Amplitude		Class B (3m)		
Frequency (MHz)	Ant. H. (m)	Table (°)	Correction Factors (dB)	(dBµV/m)		Limit (dBµV/m)		Margin (dB)
				Peak	Average	Peak	Ave.	
4814.67	1.00	71	-24.28	46.01	---	74.00	53.96	-7.95

Note:

1. Margin = Corrected - Limit.
2. The EUT utilizes a *permanently attached antenna*. In addition the spurious RF radiated emissions levels do comply with the *20dBc limit* both at its bandedges and other spurious emissions.
3. As stated in Section 15.35(b), for any frequencies above 1000MHz, radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. As the results of our test, the peak amplitudes are already below the FCC limit. Thus the average amplitudes of the rest are omitted.

1GHz to 25GHz , Channel 39 [Antenna polarity: Horizontal]

Radiated Emission				Corrected Amplitude		Class B (3m)		
Frequency (MHz)	Ant. H. (m)	Table (°)	Correction Factors (dB)	(dBμV/m)		Limit (dBμV/m)		Margin (dB)
				Peak	Average	Peak	Ave.	
4892.00	1.00	295	-23.84	47.68	---	74.00	53.96	-6.28

1GHz to 25GHz , Channel 39 [Antenna polarity: Vertical]

Radiated Emission				Corrected Amplitude		Class B (3m)		
Frequency (MHz)	Ant. H. (m)	Table (°)	Correction Factors (dB)	(dBμV/m)		Limit (dBμV/m)		Margin (dB)
				Peak	Average	Peak	Ave.	
4892.00	1.00	82	-23.84	46.18	---	74.00	53.96	-7.78

1GHz to 25GHz , Channel 79 [Antenna polarity: Horizontal]

Radiated Emission				Corrected Amplitude		Class B (3m)		
Frequency (MHz)	Ant. H. (m)	Table (°)	Correction Factors (dB)	(dBμV/m)		Limit (dBμV/m)		Margin (dB)
				Peak	Average	Peak	Ave.	
4969.33	1.00	227	-23.64	48.94	---	74.00	53.96	-5.02

1GHz to 25GHz , Channel 39 [Antenna polarity: Vertical]

Radiated Emission				Corrected Amplitude		Class B (3m)		
Frequency (MHz)	Ant. H. (m)	Table (°)	Correction Factors (dB)	(dBμV/m)		Limit (dBμV/m)		Margin (dB)
				Peak	Average	Peak	Ave.	
4969.33	1.00	108	-23.64	46.43	---	74.00	53.96	-7.53