

DATE: 13 February 2005

I.T.L. (PRODUCT TESTING) LTD.

EMC Test
for
TADLYS Ltd.

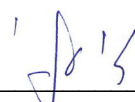
Equipment under test:
Bluetooth ID Tag
(Transmitter Section)

Radioos Personal Tag*

* See customer's declaration on page 7.

Written by: 
D. Shidlow, Documentation

Approved by: 
E. Pitt, Test Engineer

Approved by: 
I. Raz, EMC Laboratory Manager

This report must not be reproduced, except in full, without the written permission of I.T.L. (Product Testing) Ltd.

This report relates only to items tested.

Measurement/Technical Report for TADLYS Ltd.

Bluetooth ID Tag

(For Transmitter Section)

Radioos Personal Tag

FCC ID: SMM-TD01

13 February 2005

This report concerns: Original Grant x Class II change

Class B verification Class A verification Class I change

Equipment type: Radio Telemetry Transmitter

Request Issue of Grant:

 x Immediately upon completion of review

Limits used:

CISPR 22 Part 15 x

Measurement procedure used is ANSI C63.4-2003.

Application for Certification

prepared by:

Ishaishou Raz
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail Sraz@itl.co.il

Applicant for this device:

(different from "prepared by")

Micha Wissberg
TADLYs Ltd.
3 Shimon Yisraeli St.
Rishon Letzion 75461
Israel
Tel: +972-3-941-4201
Fax: +972-3-941-4210
e-mail: micha@tadlys.com

TABLE OF CONTENTS

1.	GENERAL INFORMATION	5
1.1	Administrative Information	5
1.2	List of Accreditations	7
1.3	Product Description	8
1.4	Test Methodology	8
1.5	Test Facility	9
1.6	Measurement Uncertainty	9
2.	PRODUCT LABELING	10
3.	SYSTEM TEST CONFIGURATION	11
3.1	Justification	11
3.2	EUT Exercise Software	11
3.3	Special Accessories	11
3.4	Equipment Modifications	11
3.5	Configuration of Tested System	12
4.	BLOCK DIAGRAM	13
4.1	Schematic Block/Connection Diagram	13
4.2	Theory of Operation	14
5.	CUSTOMER'S DECLARATION	15
6.	RADIATED MEASUREMENT PHOTOS	16
7.	SPURIOUS RADIATED EMISSION, BELOW 1 GHZ	17
7.1	Test Specification	17
7.2	Test Procedure	17
7.3	Measured Data	18
7.4	Test Instrumentation Used, Radiated Measurements	19
7.5	Field Strength Calculation	20
8.	SPURIOUS RADIATED EMISSION ABOVE 1 GHZ	21
8.1	Radiated Emission Above 1 GHz	21
8.2	Test Data	21
8.3	Test Instrumentation Used, Radiated Measurements Above 1 GHz	34
9.	NUMBER OF HOPPING FREQUENCIES	35
9.1	Test procedure	35
9.2	Results table	39
9.3	Test Equipment Used	40
10.	CHANNEL FREQUENCY SEPARATION	41
10.1	Test procedure	41
10.2	Results table	42
10.3	Test Equipment Used	42
11.	MAXIMUM TRANSMITTED PEAK POWER OUTPUT	43
11.1	Test procedure	43
11.2	Results table	45
11.3	Test Equipment Used	45
12.	PEAK POWER OUTPUT OUT OF 2400-2480 MHZ BAND	46
12.1	Test procedure	46
12.2	Results table	63
12.3	Test Equipment Used	63
13.	20 DB BANDWIDTH	64
13.1	Test procedure	64
13.2	Results table	66
13.3	Test Equipment Used	66

14.	BAND EDGE SPECTRUM	67
14.1	Test procedure	67
14.2	Results table	70
14.3	Test Equipment Used	71
15.	ANTENNA GAIN	72
16.	R.F EXPOSURE/SAFETY	73
17.	PHOTOGRAPHS OF TESTED E.U.T.	74
18.	APPENDIX A - CORRECTION FACTORS	78
18.1	Correction factors for CABLE	78
18.2	Correction factors for CABLE	79
18.3	Correction factors for CABLE	80
18.4	Correction factors for CABLE	81
18.5	Correction factors for CABLE	82
18.6	Correction factors for LOG PERIODIC ANTENNA	83
18.7	Correction factors for LOG PERIODIC ANTENNA	84
18.8	Correction factors for BICONICAL ANTENNA	85
18.9	Correction factors for BICONICAL ANTENNA	86
18.10	Correction factors for ACTIVE LOOP ANTENNA	87
17.11	Correction factors for Double-Ridged Waveguide Horn	88
17.12	Correction factors for Double-Ridged Waveguide Horn	89
17.13	Correction factors for Horn Antenna	90
17.14	Correction factors for BICONICAL ANTENNA	91
17.15	Correction factors for BICONICAL ANTENNA	92

1. General Information

1.1 Administrative Information

Manufacturer:	TADLYS Ltd.
Manufacturer's Address:	3 Shimon Israeli St. Rishon LeZiyyon 75654 Israel Tel: +972-3-941-4201 Fax: +972-3-941-4210
Manufacturer's Representative:	Micha Wissberg
Equipment Under Test (E.U.T):	Bluetooth ID Tag
Equipment Model No.:	Radioos Personal Tag (See customer's declaration on following page).
Equipment Serial No.:	5
Date of Receipt of E.U.T:	10.10.04
Start of Test:	10.10.04
End of Test:	12.10.04
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15, Sub-part C

Date 10/26/2004

Fax TADLYS Ltd.
3 Shimon Israel St., Ashdod BeZayon, 75254, Israel
Phone: (972)-3-6414201 Ext. 217
Fax: (972)-3-9414210
E-mail: micha_w@tadlys.com web site: www.tadlys.com



DECLARATION

I HEREBY DECLARE THAT THE FOLLOWING PRODUCT:

Radioos Personal Tag

IS IDENTICAL ELECTRONICALLY, PHYSICALLY, AND
MECHANICALLY TO:

Radioos Tag

Please relate to them all (from an EMC point of view) as the
same product.

Thank you,

Wissberg Micha
Project Manager

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The TAG is a wireless device based on Bluetooth technology .It is use for indoors location system and wireless panic button .The TAG is a highly integrated Bluetooth device that includes radio receiver transmitter and a base band processor. The TAG is part of Tadlys Bluetooth Networks that includes Bluetooth server and spreading Bluetooth Access Points.

The TAG can send several wireless messages to the Tadlys Bluetooth Networks like (panic button pressed, TAG strip opened or removed, men down).

The TAG can receive several wireless messages from the Tadlys Bluetooth Networks like transmit audio alert or Ir.

TAG Features:

Power - Internal Li-Ion battery.

Visual indication – Green LED blinking on status.

Red LED low battery.

Audio – Internal speaker for audio indication and audio location system

Switches – Blue button for turn on and off.

Red button for panic message.

Infra red LED – The IR LED is use for IR location system.

Battery charger connector - 1.2mm power connector for external charger.

External connection - Connector for TAG strip.

Options – Internal men dune sensor, movement's sensor.

1.4 Test Methodology

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

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing December 12, 2003).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ± 4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. Product Labeling

TADLYS RADIOS
LYS TAG CE
P/N: 3788-09129-00
S/N: 0001
Bluetooth Address:
000E15120001
FCC ID:SMM-TD01

Figure 1. Product/FCC Label

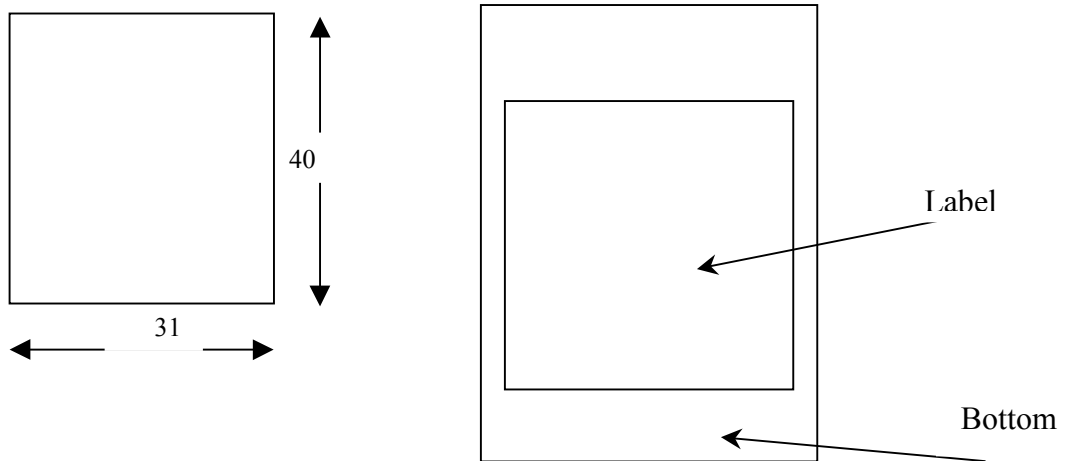


Figure 2. Label Size and Location of Label on EUT

3. System Test Configuration

3.1 Justification

The TAG was configured for testing in a typical mode (as a customer would normally use it). During the test process all the TAG functions operated and were configured for the maximum transmit power. The TAG transmits and receives messages in maximum data rate. In addition the TAG transmits Infra Red and sound beep indication. Activating all the TAG functions is the full operating mode.

3.2 EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was the original Radioos TAG software.

After power on, the program initializes the TAG to receive mode. The TAG waits for an "Inquiry" message from a Bluetooth Access Point. When it receives an inquiry, the TAG enters into transmit mode. The TAG respond by sending a confirmation message. The confirmation message includes the TAG parameters. The Bluetooth Access Point receives the TAG confirmation and can locate the TAG position.

3.3 Special Accessories

No special accessories were needed to achieve compliance.

3.4 Equipment Modifications

No modifications were needed to achieve compliance.

3.5 Configuration of Tested System

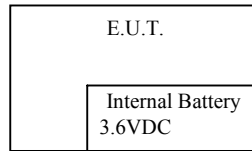
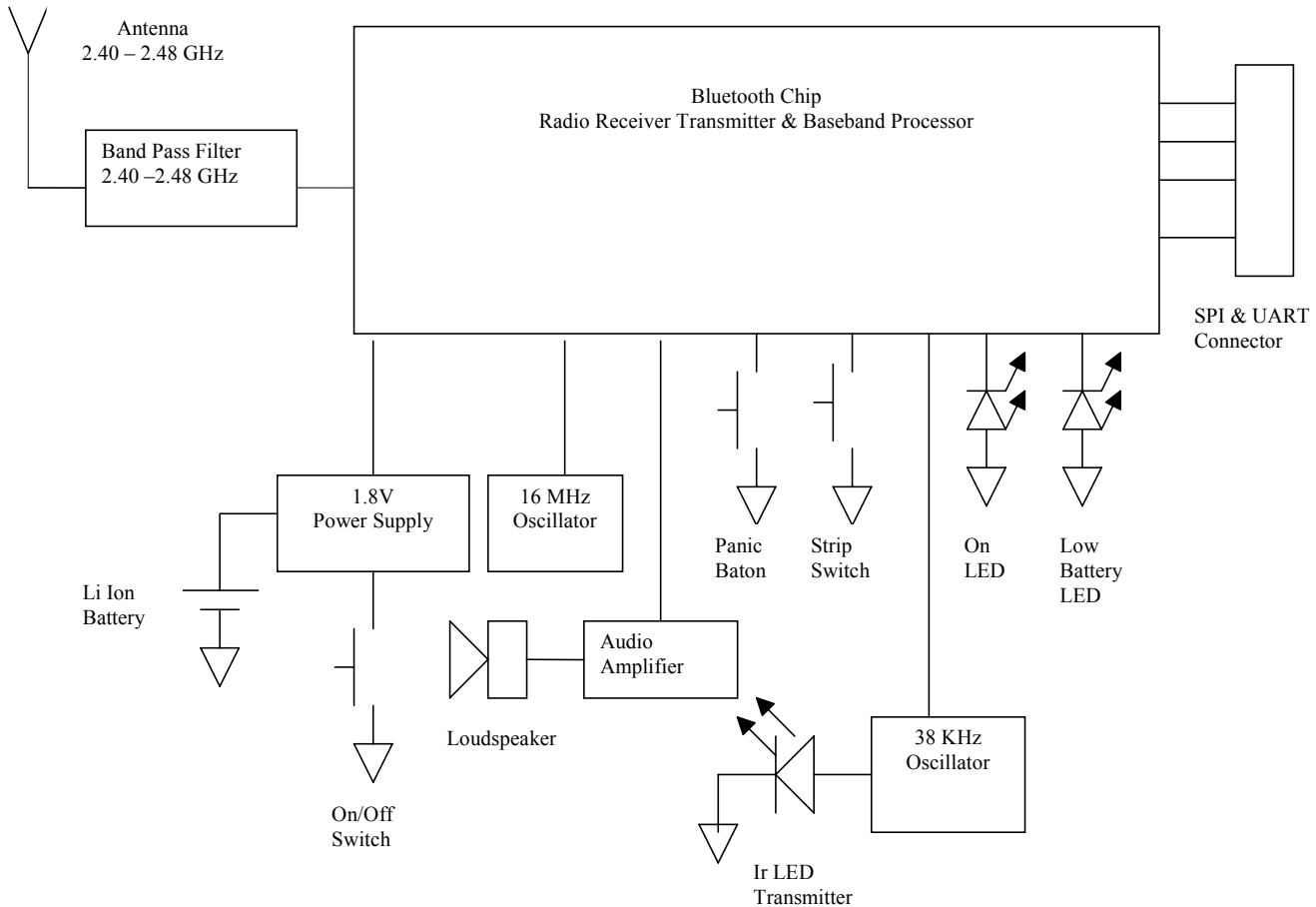


Figure 3. Configuration of Tested System

4. Block Diagram

4.1 Schematic Block/Connection Diagram



4.2 Theory of Operation

Receive mode

The TAG receives information in frequency hopping mode between 2.402 – 2.480 GHz and transmits every 1-second. Audio alarm beep and Infra Red Indication.

Transmit mode

Test mode - The TAG transmit in frequency between 2.402 – 2.480 GHz random data in the maximum data rate.

Normal operation mode - The TAG transmit in frequency hopping mode between 2.402 – 2.480 GHz, the transmit period is 0.625 m sec every 1.28 sec.

Radiated and Conducted test

A notebook computer with Bluetooth module sends "Inquiry" message to The EUT. The EUT replays back a confirmation message when it receives the message. The received confirmation message can be watched on the notebook screen. The complete cycle of receive and transmit takes about 3 seconds and it repeated continuously.

5. Customer's Declaration

Date 7/2/2005

Fax TADLYS Ltd.
3 Shimon Israeli St. ,Rishon EeZiyyon, 75654, Israel
Phone: (972)-3-9414201 Ext. 217
Fax: (972)-3-9414210
E-mail: micha_w@tadlys.com web site: www.tadlys.com



DECLARATION

To Whom It May Concern,

I hereby declare that the product, **Bluetooth ID Tag, Model Radioos TAG, FCC ID SMM-TD01**, complies with the following requirements of Part 15, Sub-part C, Section 15.247:

1. Channel average time occupancy, Section 15.247 (a) (1).
2. Receiver B.W. matching to transmitter B.W. and frequencies in synchronization with the transmitted signals, Section 15.247 (a) (1).
3. Non-coordination requirement, Section 15.247 (h).

Sincerely,
Wissberg Micha
Project Manager



6. Radiated Measurement Photos



Figure 4. Radiated Emission Test.

7. Spurious Radiated Emission, Below 1 GHz

7.1 Test Specification

30kHz-1000 MHz, FCC, Part 15, Subpart C

7.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane. The configuration tested is shown in Figure 3.1.

The frequency range 30kHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 30 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

In the frequency range 30-1000MHz, the readings were maximized by adjusting the antenna height between 1-4 meters. The turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

- Turning the E.U.T on and off.

- Using a frequency span less than 10 MHz.

- Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The E.U.T. was operated at the frequencies of 2402.00, 2440.00, and 2480.00 MHz

7.3 **Measured Data**

The signals in the band 30 kHz – 1.0 GHz were below the spectrum analyzer noise level which is at least 6dB below the specification limit.

The results for all three operating frequencies were the same.

TEST PERSONNEL:

Tester Signature: 

Date: 13.02.05

Typed/Printed Name: E. Pitt

7.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	February 28, 2004	1 year
RF Section	HP	85420E	3427A00103	February 28, 2004	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	April 11, 2004	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 21, 2004	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 17, 2003	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A

7.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS:	Field Strength [dB μ v/m]
RA:	Receiver Amplitude [dB μ v]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

8. Spurious Radiated Emission Above 1 GHz

8.1 Radiated Emission Above 1 GHz

The E.U.T operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane. The configuration tested is shown in Figure 3.1.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used. The test distance was 3 meters.

In the frequency range 2.9-25 GHz, a spectrum analyzer including a low noise amplifier was used. The test distance was 3 meters. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz. During average measurements, the I.F. bandwidth was 1 MHz and video bandwidth was 100 Hz. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The E.U.T. was operated in continuous mode.

8.2 Test Data

JUDGEMENT: Passed by 13.9 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.
The worst cases were:

for 2402.00 MHz, 13.9 dB margin at 4804.00 MHz frequency, horizontal polarization.

for 2440.00 MHz, 14.0 dB margin at 4880.00 MHz frequency, horizontal polarization

for 2480.00 MHz, 15.5 dB margin at 4960.00 MHz frequency, horizontal polarization

The details of the highest emissions are given in Figure 5 to Figure 16.

TEST PERSONNEL:

Tester Signature: 

Date: 13.02.05

Typed/Printed Name: E. Pitt

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 2402.00 MHz

Freq.	Peak Result	Peak. Specification	Peak. Margin
(MHz)	(dBμV/m)	(dB μV/m)	(dB)
4804.00	60.1*	74.0	-13.9
7206.00	49.2*	74.0	-24.8

**Figure 5. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Result” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Preamplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radios Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 2402.00 MHz

Freq.	Average Result	Average Specification	Avg. Margin
(MHz)	(dBμV/m)	(dB μV/m)	(dB)
4804.00	15.3*	54.0	-38.7
7206.00	-0.5*	54.0	-54.5

**Figure 6. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Average**

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Result” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain + Duty Cycle Factor

$$\text{Duty Cycle Factor} = 20\log\frac{0.625}{100} = -44.0\text{dB}$$

The maximum transmission “ON” time is 0.625 msec. within a 100 msec. window.

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 2402.00 MHz

Freq.	Peak Result	Peak. Specification	Peak. Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)
4804.00	53.0*	74.0	-21.0
7206.00	50.0*	74.0	-24.0

**Figure 7. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Result” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Preamplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radios Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 2402.00 MHz

Freq.	Average Result	Average Specification	Avg. Margin
(MHz)	(dBμV/m)	(dB μV/m)	(dB)
4804.00	7.0*	54.0	-47.0
7206.00	-3.0*	54.0	-57.0

**Figure 8. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Average**

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Result” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain +
 Duty Cycle Factor

$$\text{Duty Cycle Factor} = 20\log\frac{0.625}{100} = -44.0\text{dB}$$

The maximum transmission “ON” time is 0.625 msec. within a 100 msec. window.

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 2440.00 MHz

Freq.	Peak Result	Peak. Specification	Peak. Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)
4880.00	60.0*	74.0	-14.0
7320.00	51.3*	74.0	-22.7

**Figure 9. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Result” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Preamplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 2440.00 MHz

Freq.	Average Result	Average Specification	Avg. Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)
4880.00	15.5*	54.0	-38.5
7320.00	-1.3*	54.0	-55.3

**Figure 10. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Average**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Result” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain +
 Duty Cycle Factor

$$\text{Duty Cycle Factor} = 20\log\frac{0.625}{100} = -44.0\text{dB}$$

The maximum transmission “ON” time is 0.625 msec. within a 100 msec. window.

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 2440.00 MHz

Freq.	Peak Result	Peak. Specification	Peak. Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)
4880.00	55.0*	74.0	-19.0
7320.00	49.3*	74.0	-24.7

**Figure 11. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Result” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Preamplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 2440.00 MHz

Freq.	Average Result	Average Specification	Avg. Margin
(MHz)	(dBμV/m)	(dB μV/m)	(dB)
4880.00	10.5*	54.0	-43.5
7320.00	-3.1*	54.0	-57.1

**Figure 12. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Average**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Result” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain +
 Duty Cycle Factor

$$\text{Duty Cycle Factor} = 20\log\frac{0.625}{100} = -44.0\text{dB}$$

The maximum transmission “ON” time is 0.625 msec. within a 100 msec. window.

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 2480.00 MHz

Freq.	Peak Result	Peak. Specification	Peak. Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)
4960.00	58.5*	74.0	-15.5
7440.00	49.2*	74.0	-24.8

**Figure 13. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Result” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Preamplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 2480.00 MHz

Freq.	Average Result	Average Specification	Avg. Margin
(MHz)	(dBμV/m)	(dB μV/m)	(dB)
4960.00	12.7*	54.0	-41.3
7440.00	-1.6*	54.0	-55.6

**Figure 14. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Average**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Result” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain +
 Duty Cycle Factor

$$\text{Duty Cycle Factor} = 20\log\frac{0.625}{100} = -44.0\text{dB}$$

The maximum transmission “ON” time is 0.625 msec. within a 100 msec. window.

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical

Frequency range: 1.0 GHz to 25.0 GHz

Test Distance: 3 meters

Detector: Peak

Operating Frequency: 2480.00 MHz

Freq.	Peak Result	Peak. Specification	Peak. Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)
4960.00	51.2*	74.0	-22.8
7440.00	47.0*	74.0	-27.0

**Figure 15. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Result” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Preamplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Bluetooth ID Tag
 Type Radioos Personal Tag
 Serial Number: 5

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 2480.00 MHz

Freq.	Average Result	Average Specification	Avg. Margin
(MHz)	(dBμV/m)	(dB μV/m)	(dB)
4960.00	5.8*	54.0	-48.2
7440.00	-2.8*	54.0	-56.8

**Figure 16. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Average**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Result” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain +
 Duty Cycle Factor

$$\text{Duty Cycle Factor} = 20\log\frac{0.625}{100} = -44.0\text{dB}$$

The maximum transmission “ON” time is 0.625 msec. within a 100 msec. window.

8.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3411A00102	February 28, 2004	1 year
RF Section	HP	85420E	3427A00103	February 28, 2004	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet2225	2738508357	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 31,2003	2 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 17, 2004	1 year
Horn Antenna	ARA	SWH-28	1007	October 28, 2003	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	October 14, 2003	1 year
Low Noise Amplifier	Sophia Wireless	LNA-28-B	0232	February 18, 2004	1 year
Spectrum Analyzer	HP	8592L	3926A01204	February 28, 2004	1 year
Band Pass Filter	Planar Filter Company	8CL6G-4G-CD-SFF	PF253/0439	September 9, 2004	1 year

9. Number of Hopping Frequencies

9.1 Test procedure

The E.U.T. was set to hopping mode.

The E.U.T. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable.

The spectrum analyzer was set to the following parameters:

Span: Every 10 MHz Frequency

Band of Operation: 2402-2480 MHz

RBW: 100kHz

VBW: 100kHz

Detector Function: Peak

Trace: Maximum Hold

The number of hopping frequencies is $9+10+10+10+10+10+10+10=79$ (See plots).

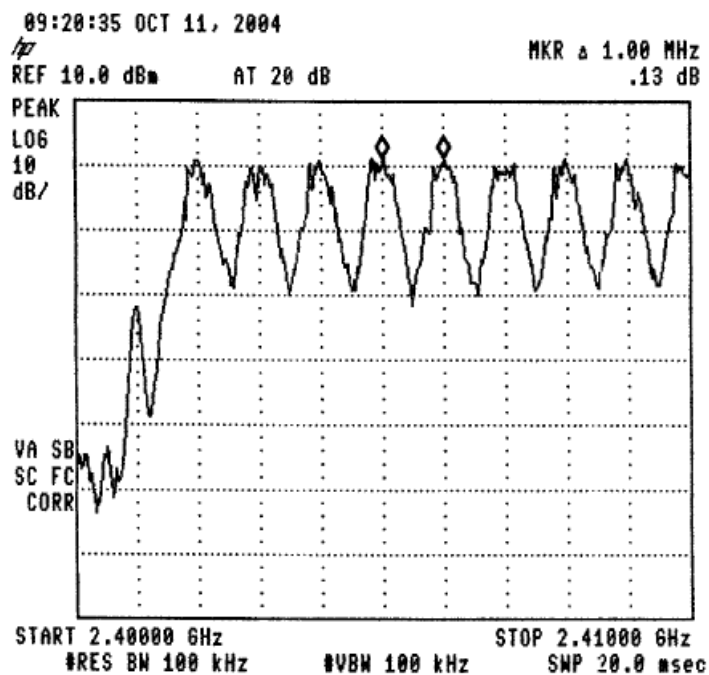


Figure 17.— 2400.0-2410.0 MHz

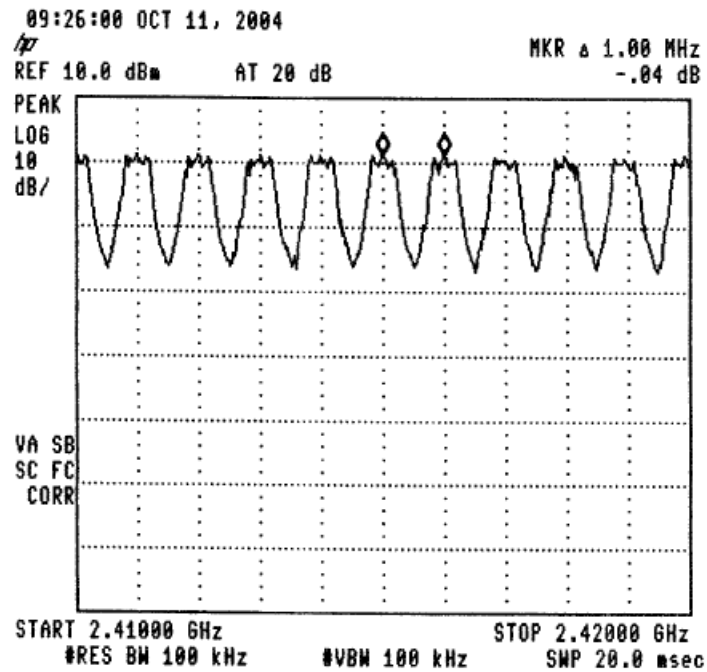


Figure 18.— 2410.0-2420.0 MHz

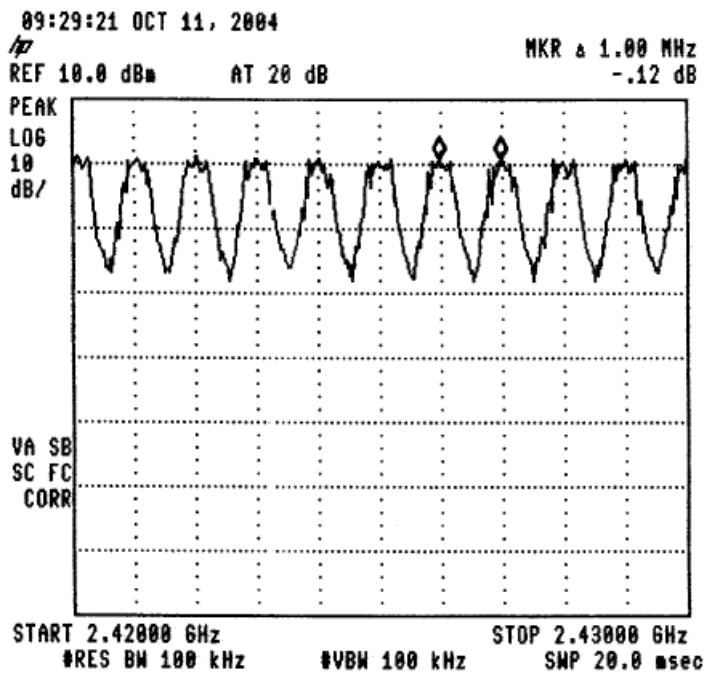


Figure 19.— 2420.0-2430.0 MHz

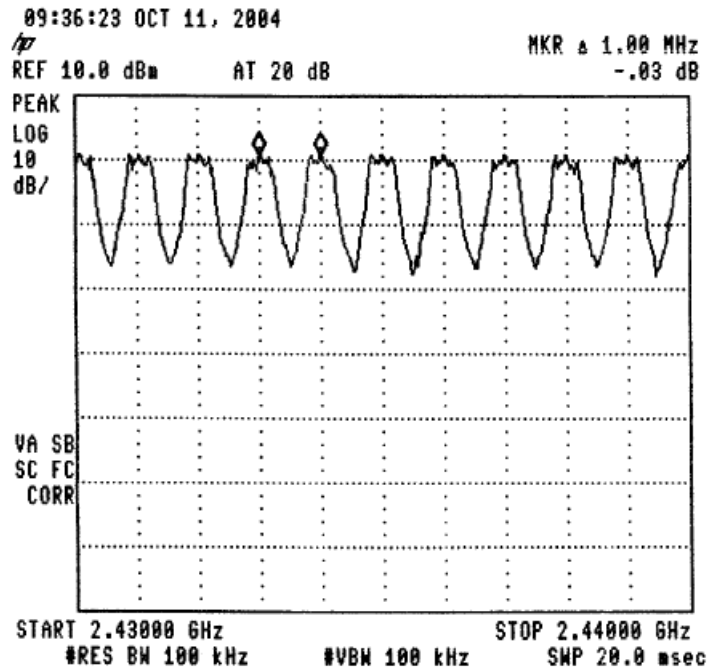


Figure 20.— 2430.0-2440.0 MHz

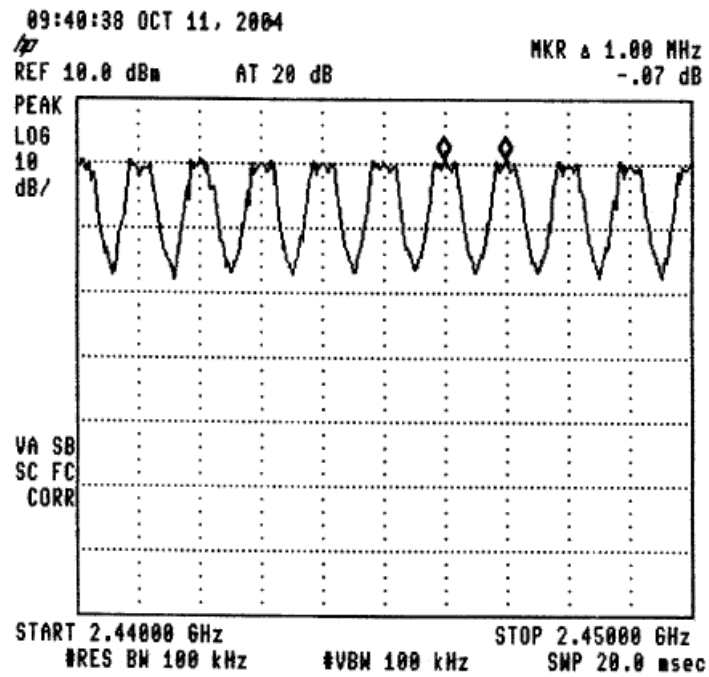


Figure 21.— 2440.0-2450.0 MHz

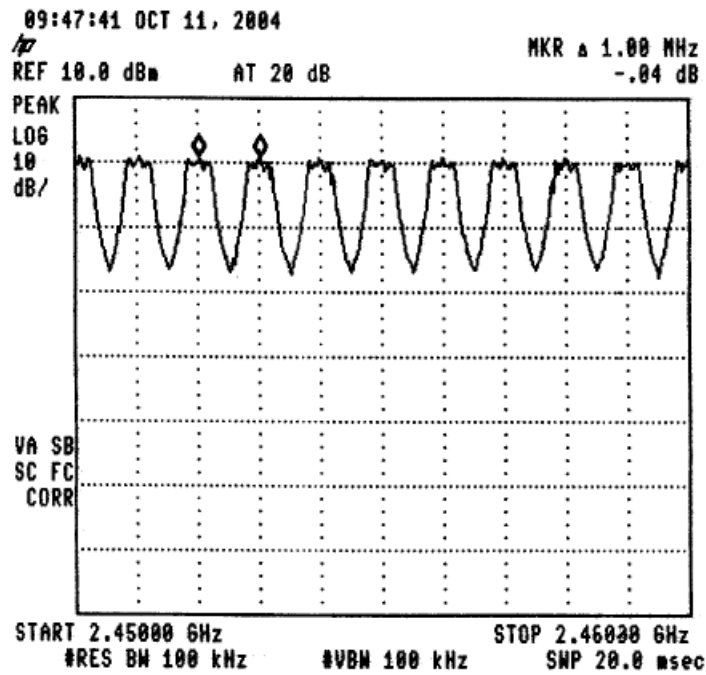


Figure 22.— 2450.0-2460.0 MHz

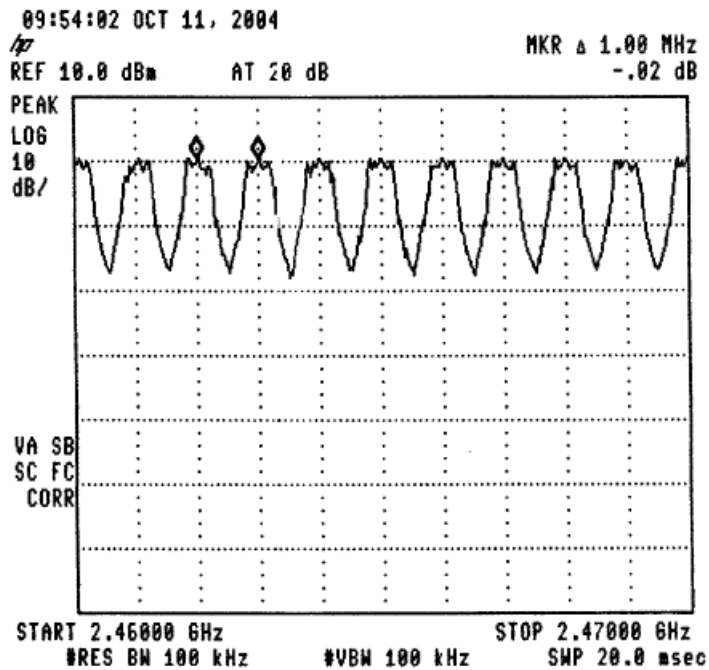


Figure 23.— 2460.0-2470.0 MHz

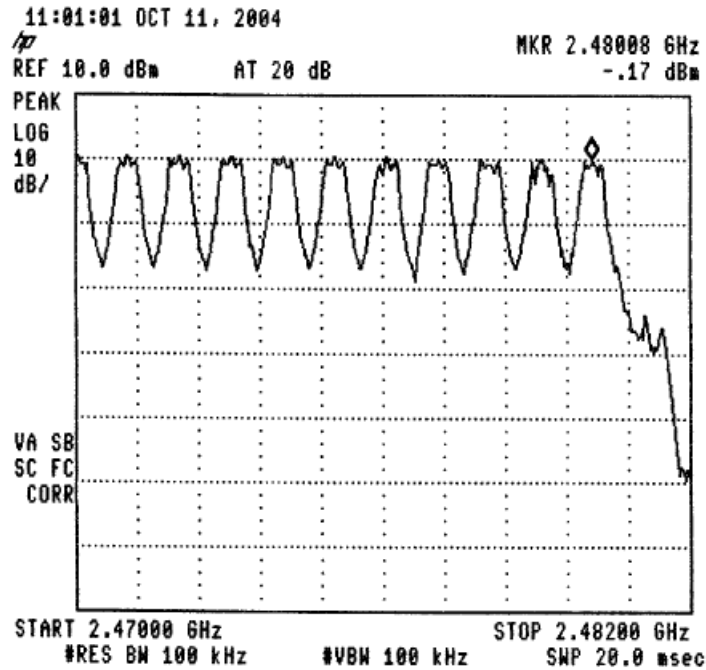


Figure 24.— 2470.0-2480.0 MHz

9.2 Results table

E.U.T. Description: Bluetooth ID Tag

Model No.: Radioos Personal Tag

Serial Number: 5

Specification: FCC Part 15, Subpart C (15.247(a) (1))

Number of Hopping Frequencies	Specification
79	>75

Figure 25 Number of Hopping Frequencies

TEST PERSONNEL:

Tester Signature: 

Date: 13.02.05

Typed/Printed Name: E. Pitt

9.3 Test Equipment Used.

Number of Hopping Frequencies

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	1 year
Cable	Avnet	MTS	N/A	September 9, 2003	1 year

Figure 26 Test Equipment Used

10. Channel Frequency Separation

10.1 Test procedure

The E.U.T. was set to hopping mode.

The E.U.T. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable.

The spectrum analyzer was set to the following parameters:

Span: 2 MHz

RBW: 30kHz

VBW: 30kHz

Detector Function: Peak

Trace: Maximum Hold

The marker delta function to determine the separation between the peaks of the adjacent channels was used.

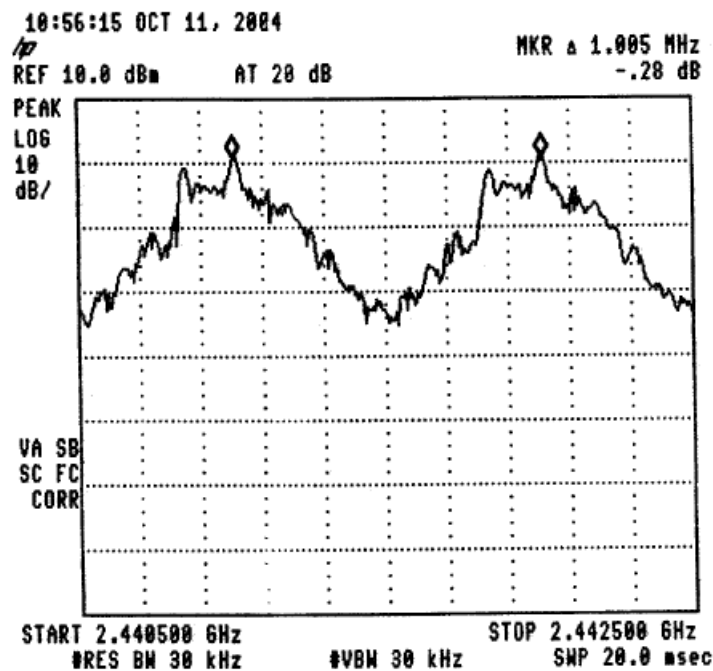


Figure 27.— 2441.0-2443.0 MHz

10.2 Results table

E.U.T. Description: Bluetooth ID Tag

Model No.: Radioos Personal Tag

Serial Number: 5

Specification: FCC Part 15, Subpart C (15.247(a) (1)

Channel Frequency Separation (kHz)	Specification (kHz)	Margin (kHz)
1005.0	>810	195

Figure 28 Channel Frequency Separation

JUDGEMENT: Passed by 195 kHz

TEST PERSONNEL:

Tester Signature: 

Date: 13.02.05

Typed/Printed Name: E. Pitt

10.3 Test Equipment Used.

Channel Frequency Separation

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	1 year
Cable	Avnet	MTS	N/A	September 9, 2003	1 year

Figure 29 Test Equipment Used

11. Maximum Transmitted Peak Power Output

11.1 Test procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an appropriate coaxial cable=0.8dB. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 3.0 MHz RBW. Peak power level was measured at selected operation frequencies.

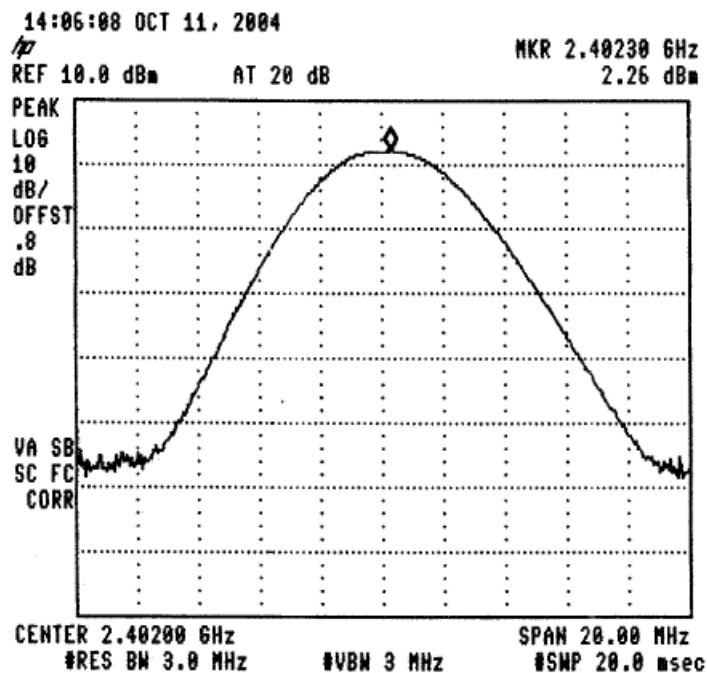


Figure 30.— 2402.0 MHz

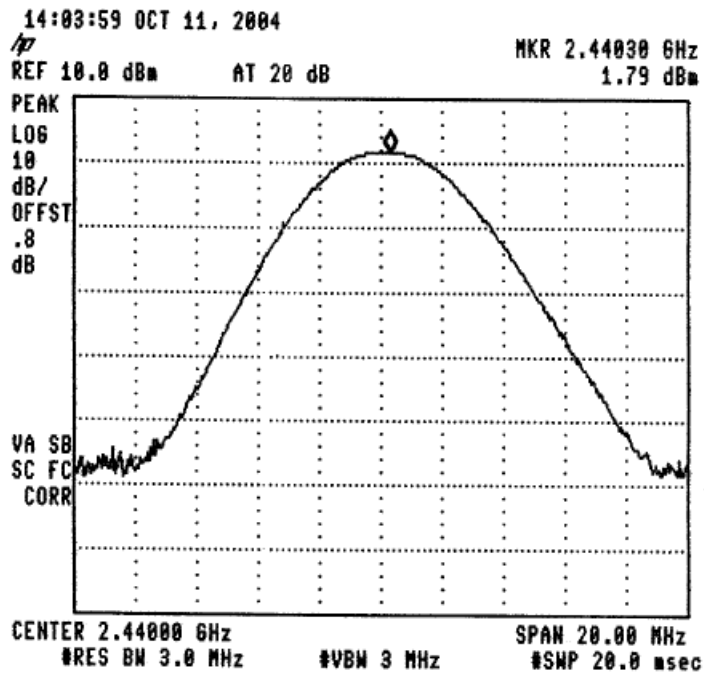


Figure 31.— 2440.0 MHz

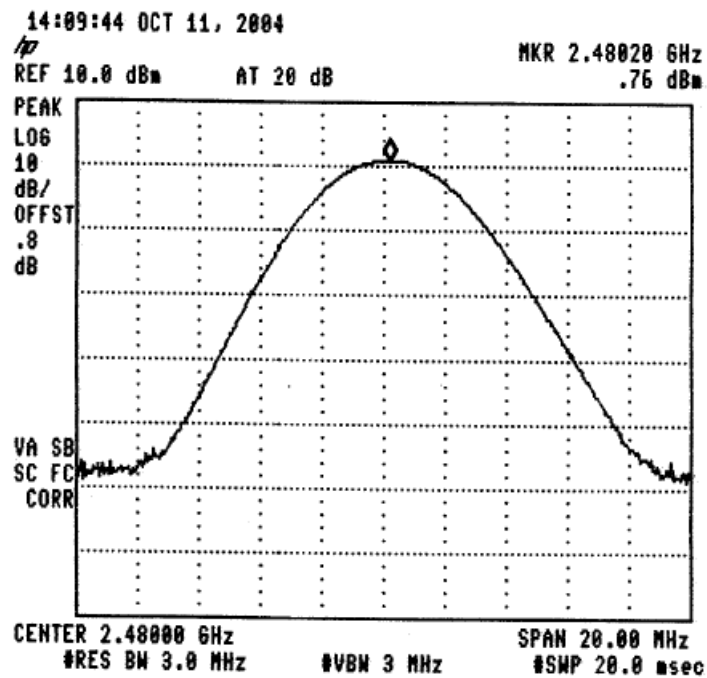


Figure 32.— 2480.0 MHz

11.2 Results table

E.U.T. Description: Bluetooth ID Tag

Model No.: Radioos Personal Tag

Serial Number: 5

Specification: FCC Part 15, Subpart C

Operation Frequency (MHz)	Peak Power Output (dBm)	Specification (dBm)	Margin (dB)
2402.0	+2.3	30.0	27.7
2440.0	+1.8	30.0	28.2
2480.0	+0.8	30.0	29.2

Figure 33 Maximum Power Output

JUDGEMENT: Passed by 27.7 dB

TEST PERSONNEL:

Tester Signature: 

Date: 13.02.05

Typed/Printed Name: E. Pitt

11.3 Test Equipment Used.

Peak Power Output

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	1 year
Cable	Avnet	MTS	N/A	September 9, 2003	1 year

Figure 34 Test Equipment Used

12. Peak Power Output Out of 2400-2480 MHz Band

12.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable. The spectrum analyzer was set to 1 kHz RBW for the frequency range 9 kHz to 150 kHz, 30 kHz RBW for the frequency range 150 kHz to 500 kHz, and 100 kHz RBW for the frequency range 500 kHz to 25.0 GHz. The frequency range from 9 kHz to 25.0 GHz was scanned. Level of spectrum components out of the 2400-2480 MHz was measured at the selected operation frequencies.

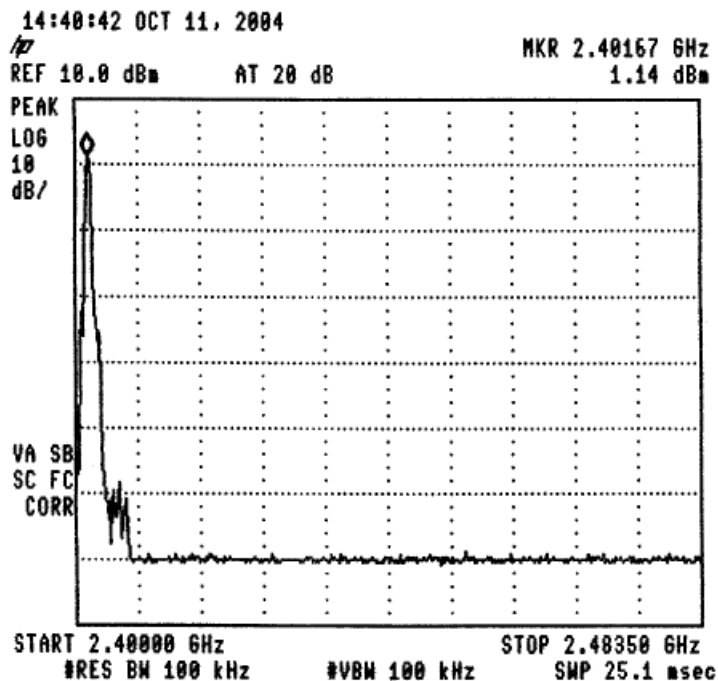


Figure 35.— 2402.0 MHz

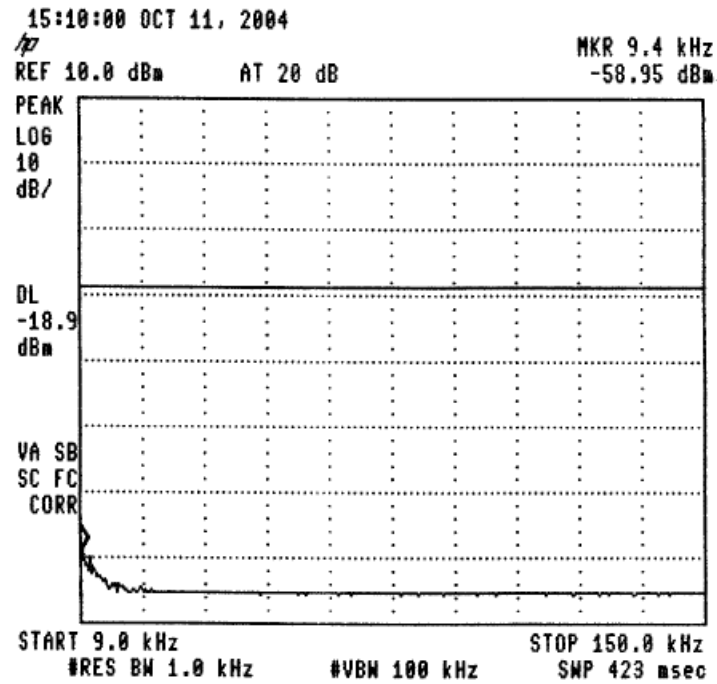


Figure 36.— 2402.0 MHz

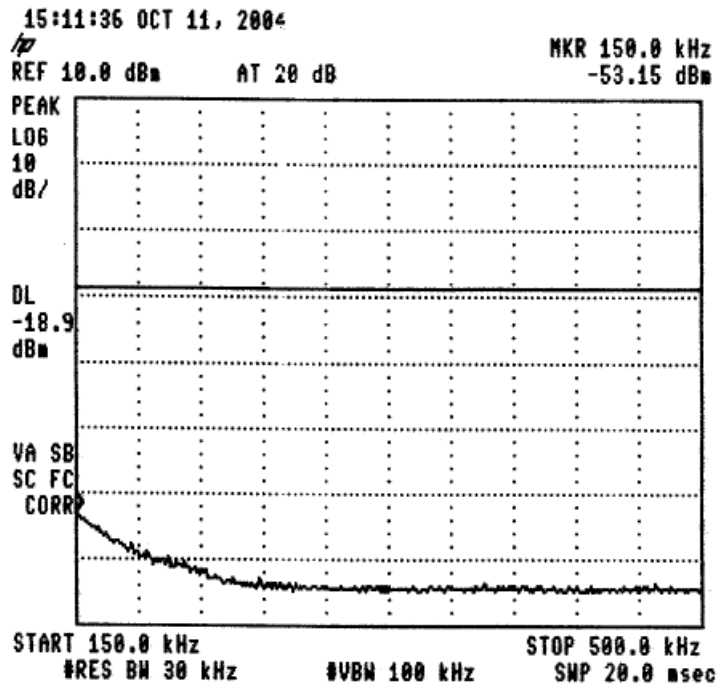


Figure 37.— 2402.0 MHz

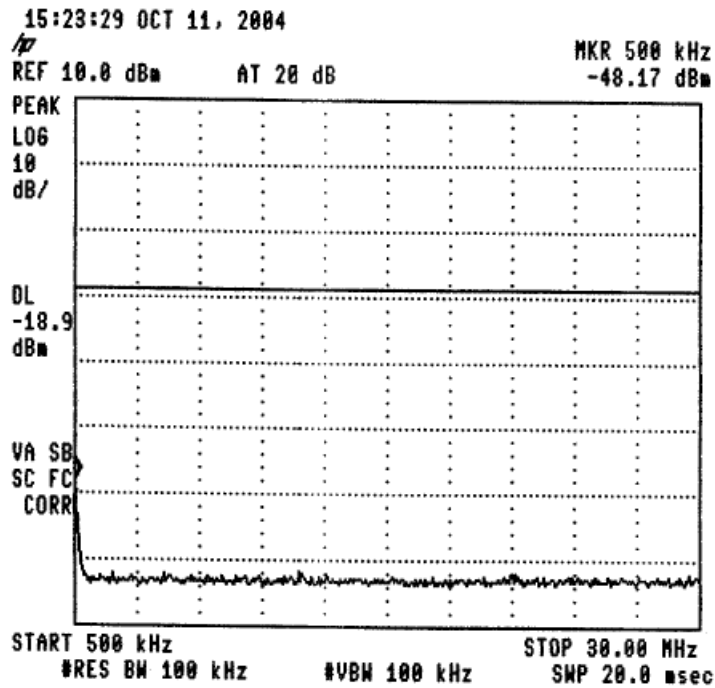


Figure 38.— 2402.0 MHz

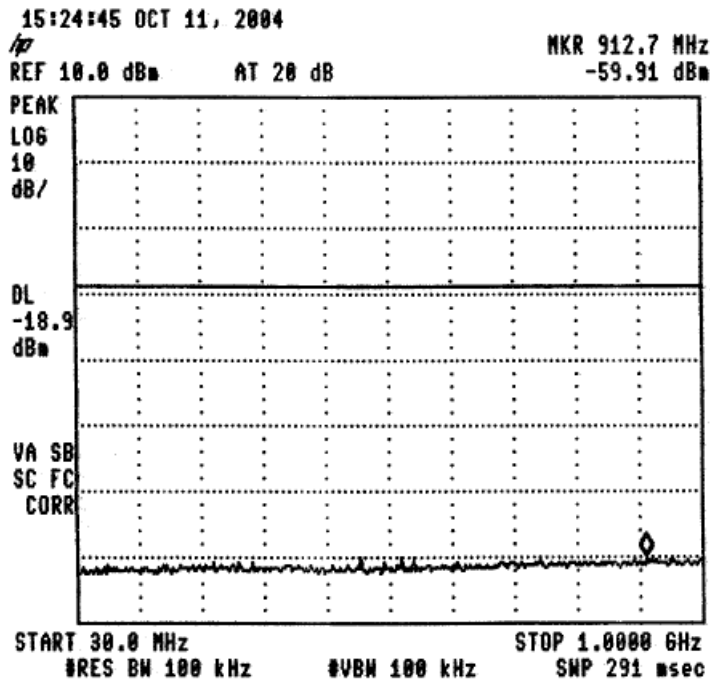


Figure 39.— 2402.0 MHz

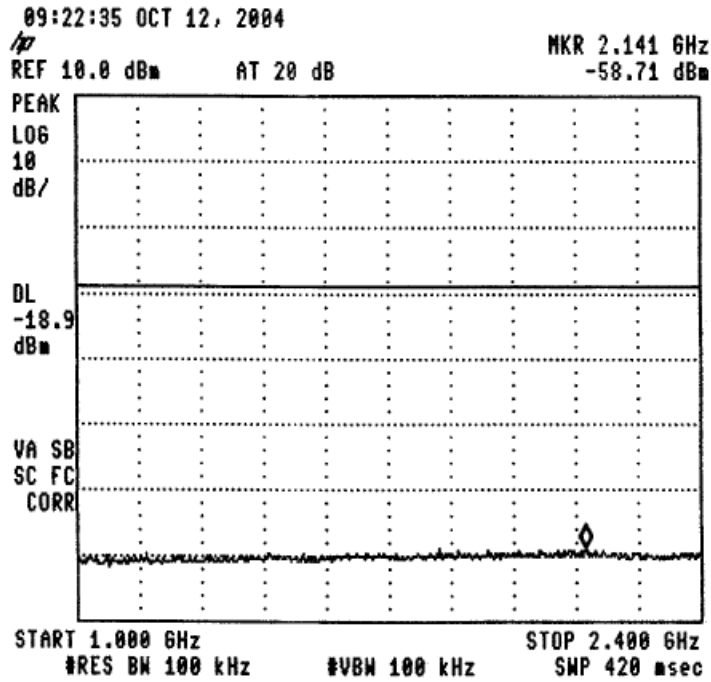


Figure 40.— 2402.0 MHz

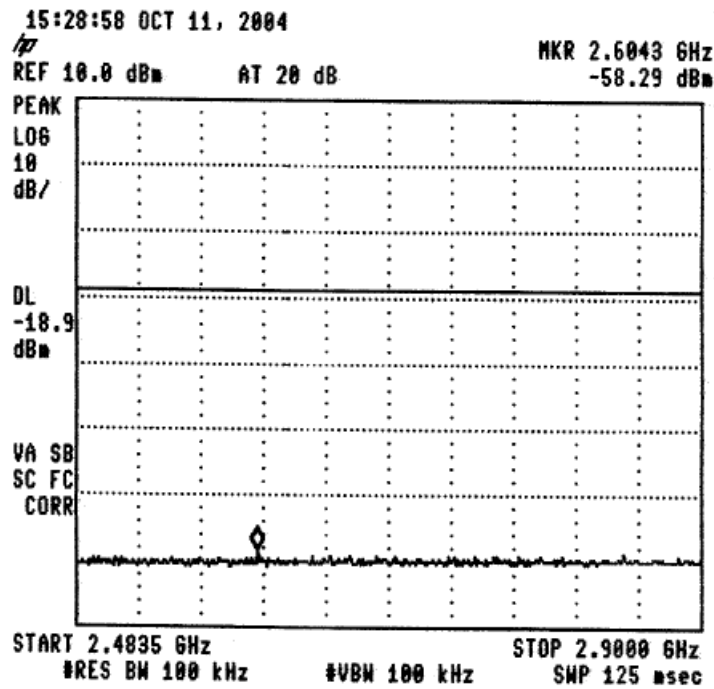


Figure 41.— 2402.0 MHz

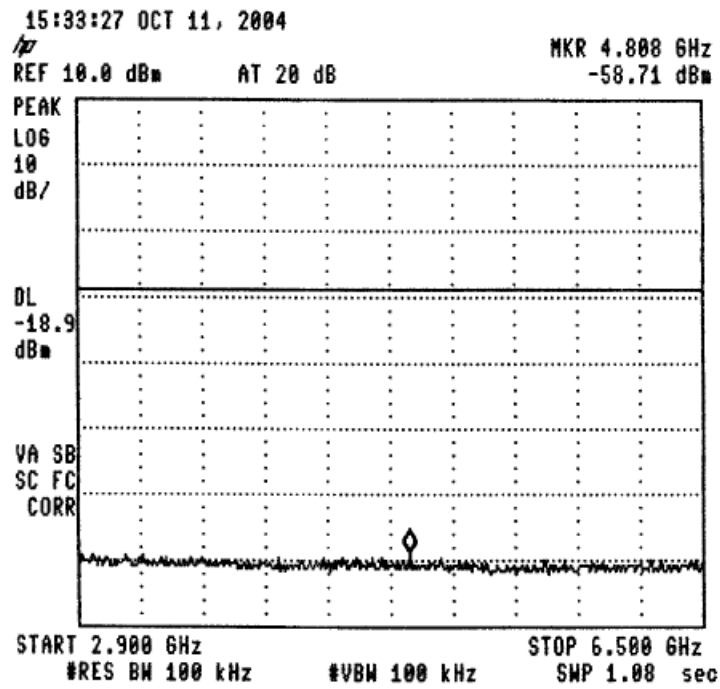


Figure 42.— 2402.0 MHz

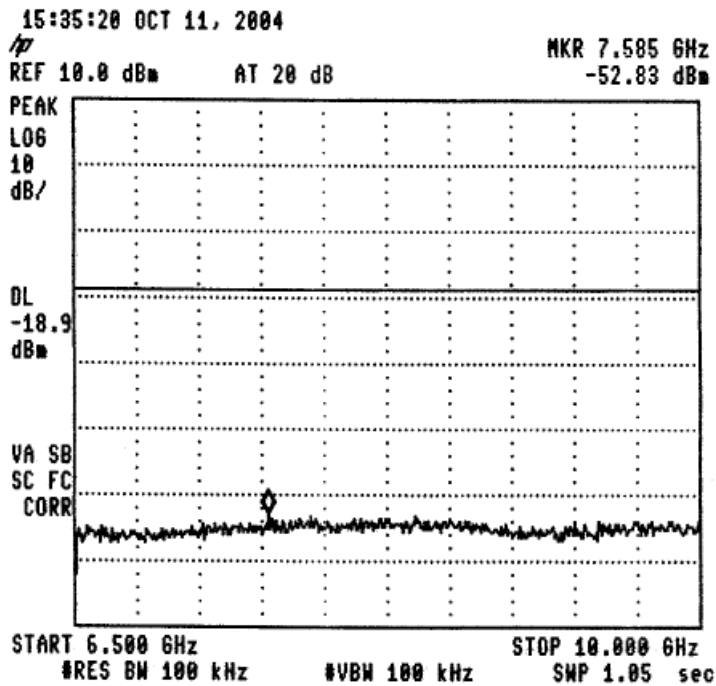


Figure 43.— 2402.0 MHz

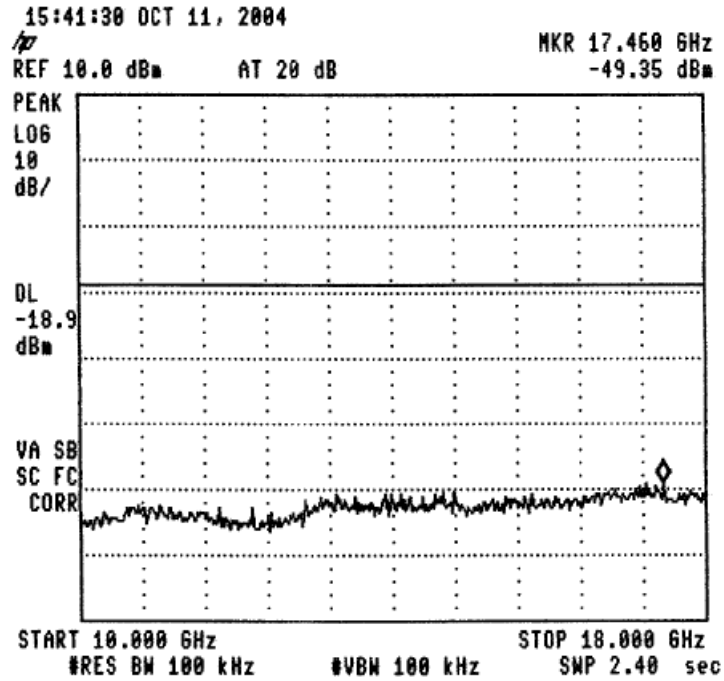


Figure 44.— 2402.0 MHz

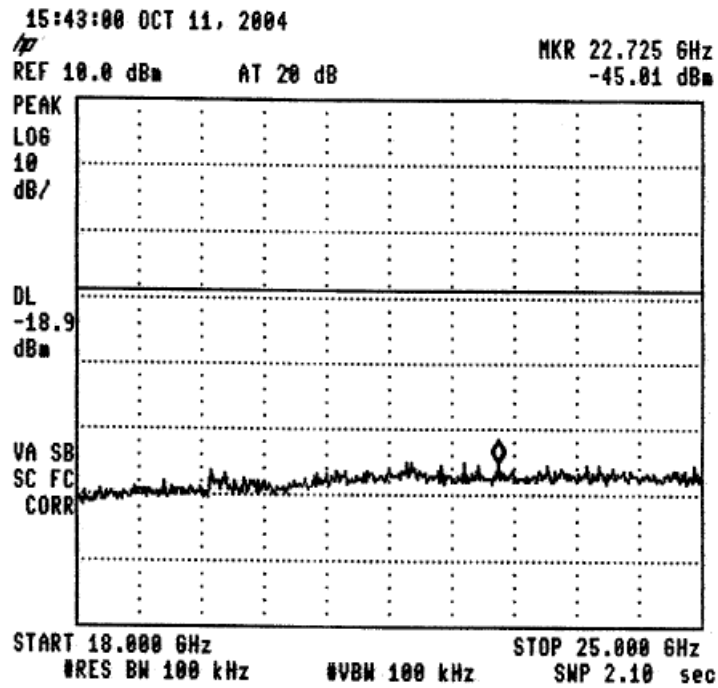


Figure 45.— 2402.0 MHz

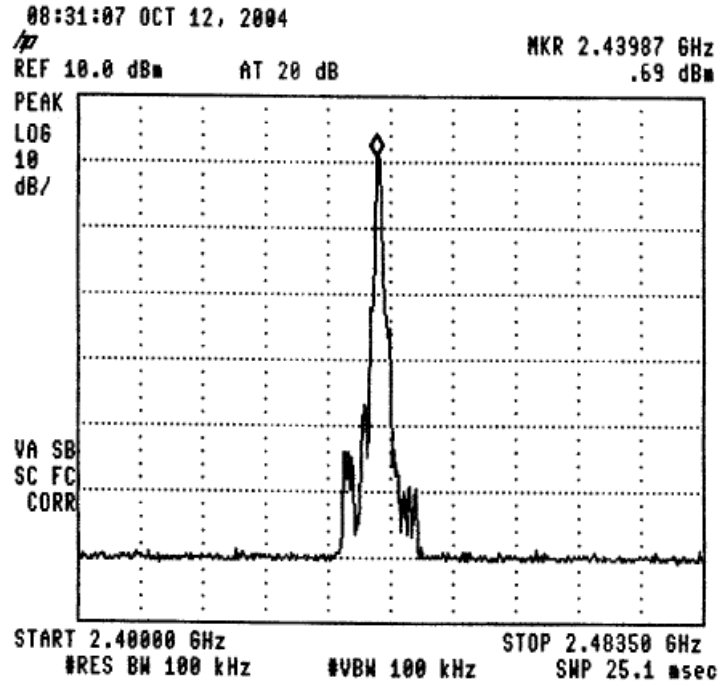


Figure 46.— 2440.0 MHz

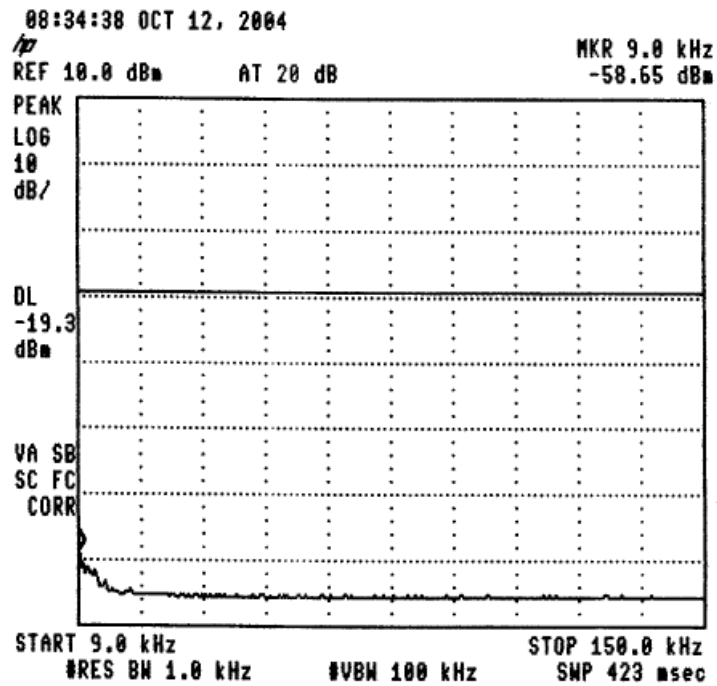


Figure 47.— 2440.0 MHz

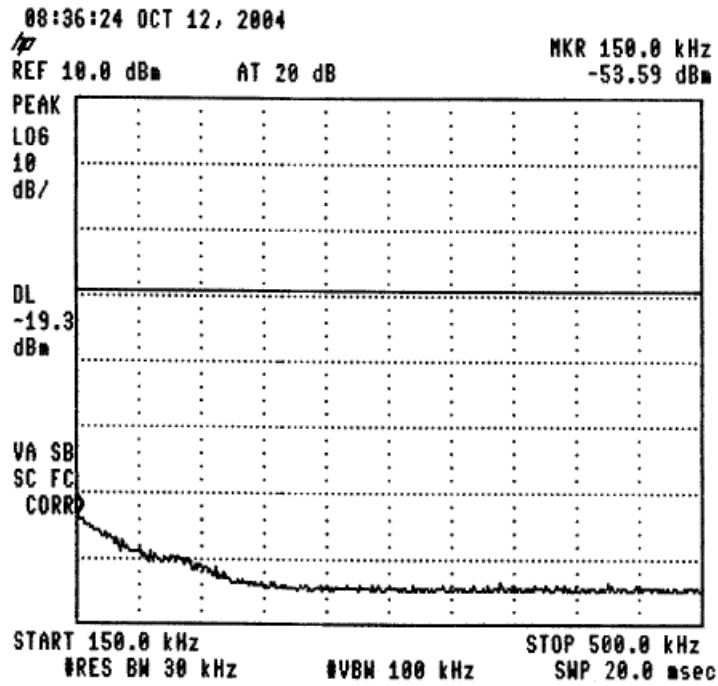


Figure 48.— 2440.0 MHz

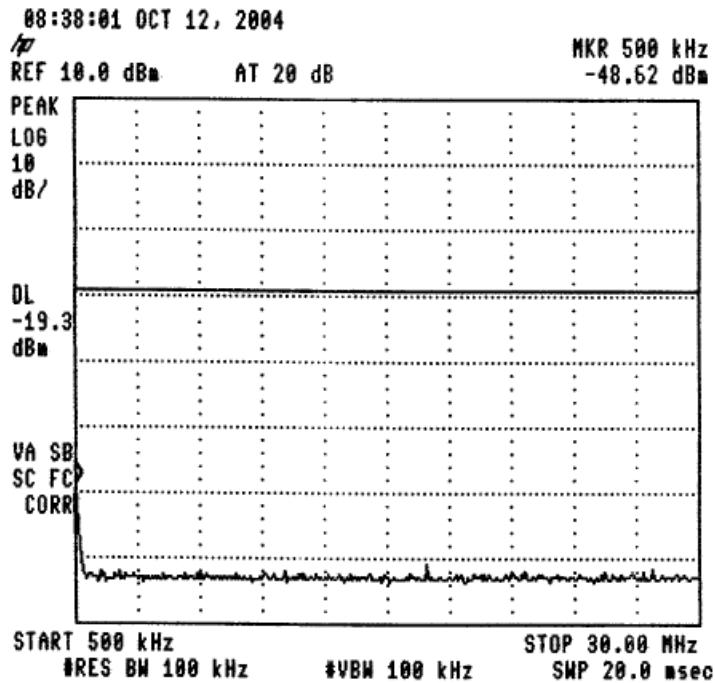


Figure 49.— 2440.0 MHz

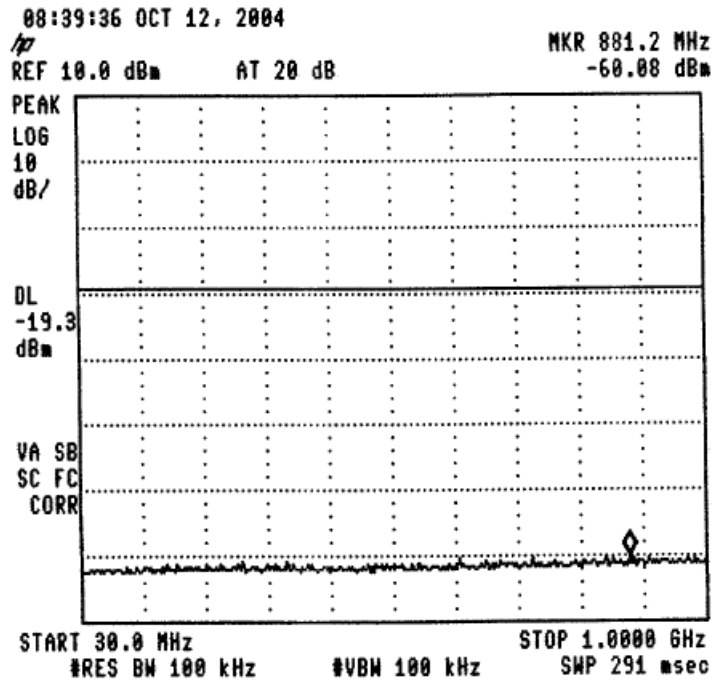


Figure 50.— 2440.0 MHz

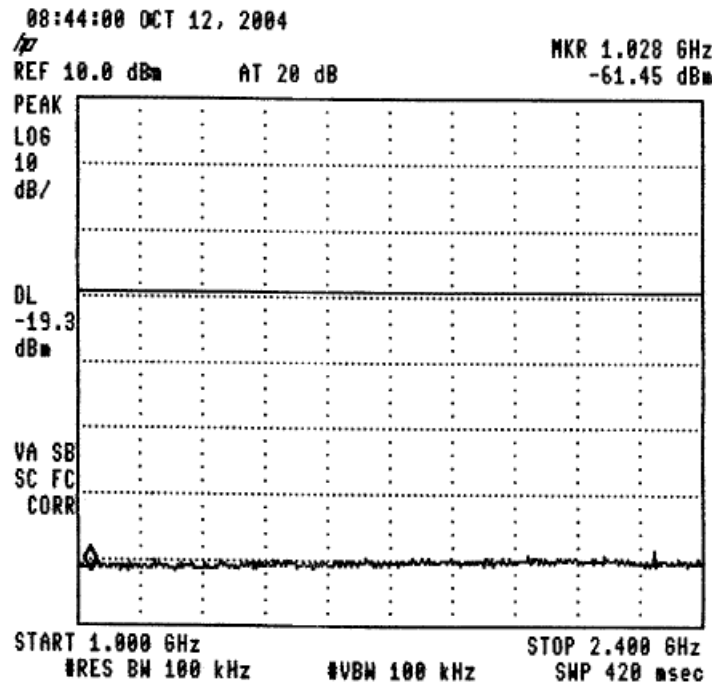


Figure 51.— 2440.0 MHz

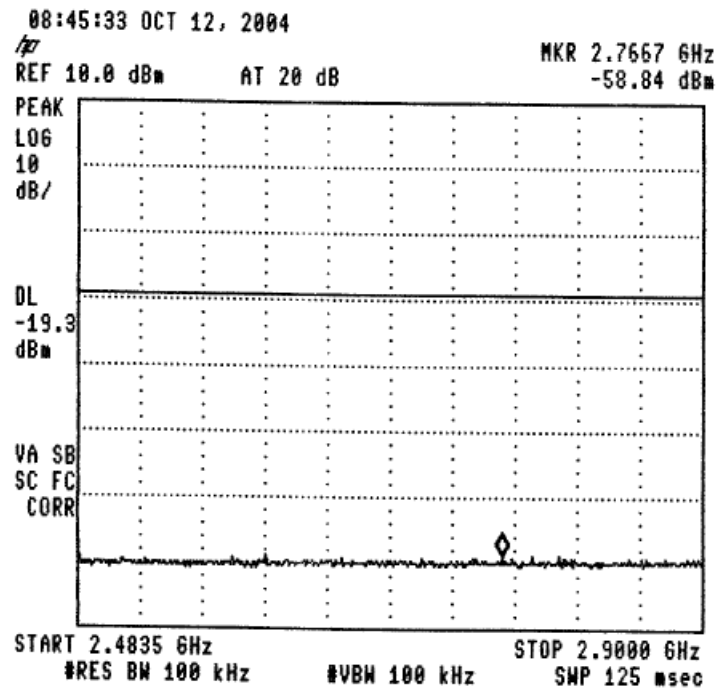


Figure 52.— 2440.0 MHz

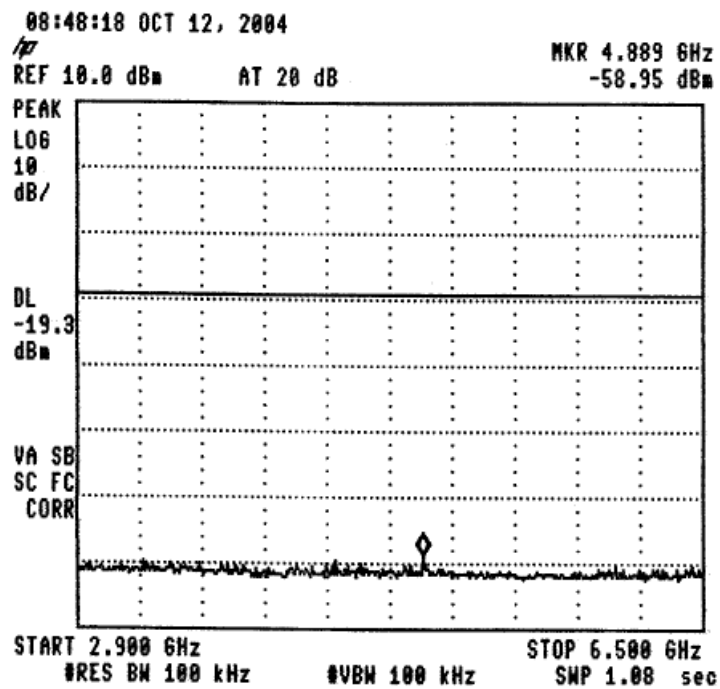


Figure 53.— 2440.0 MHz

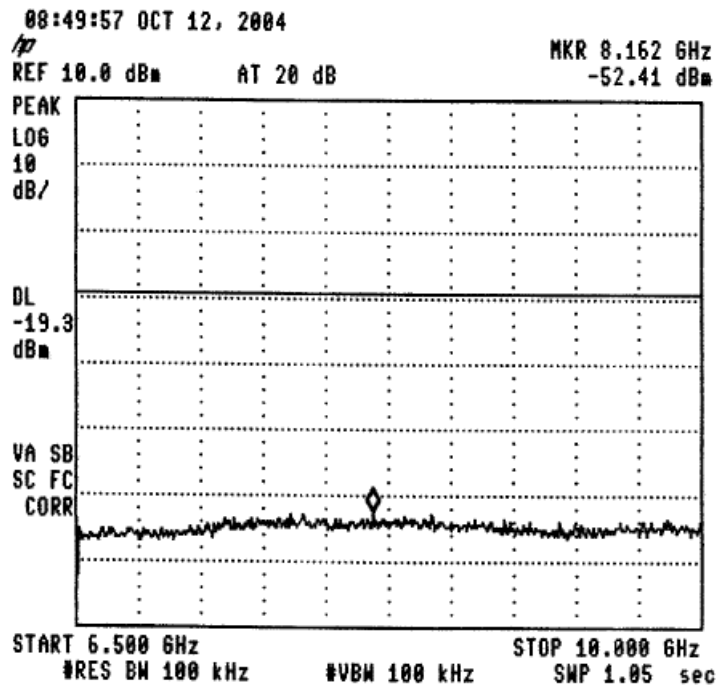


Figure 54.— 2440.0 MHz

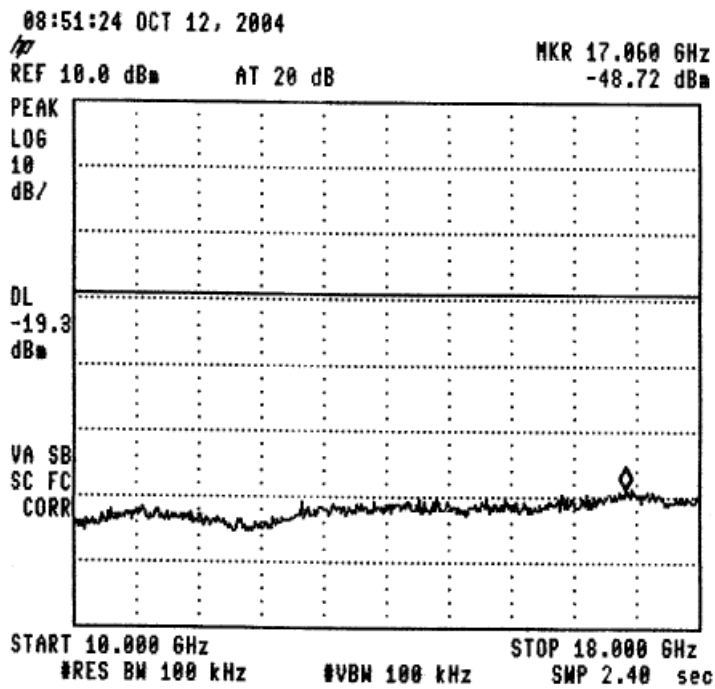


Figure 55.— 2440.0 MHz

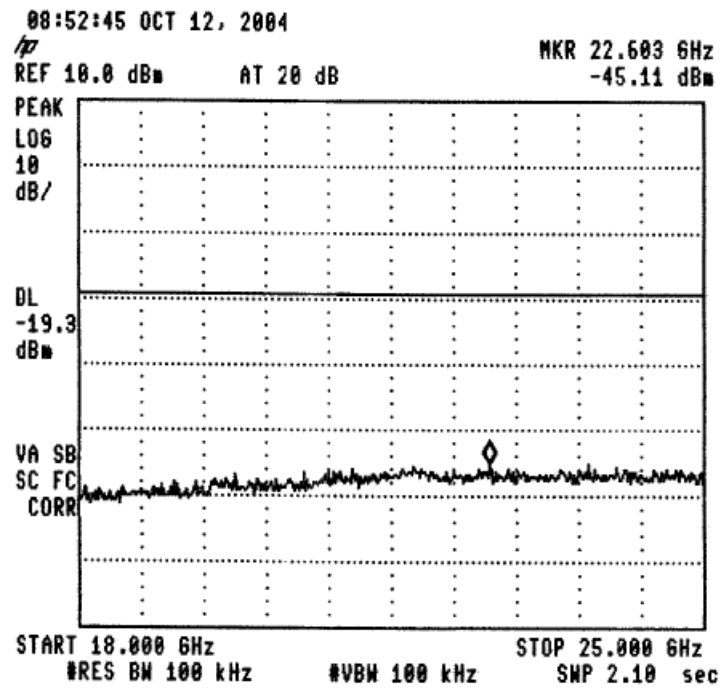


Figure 56.— 2440.0 MHz

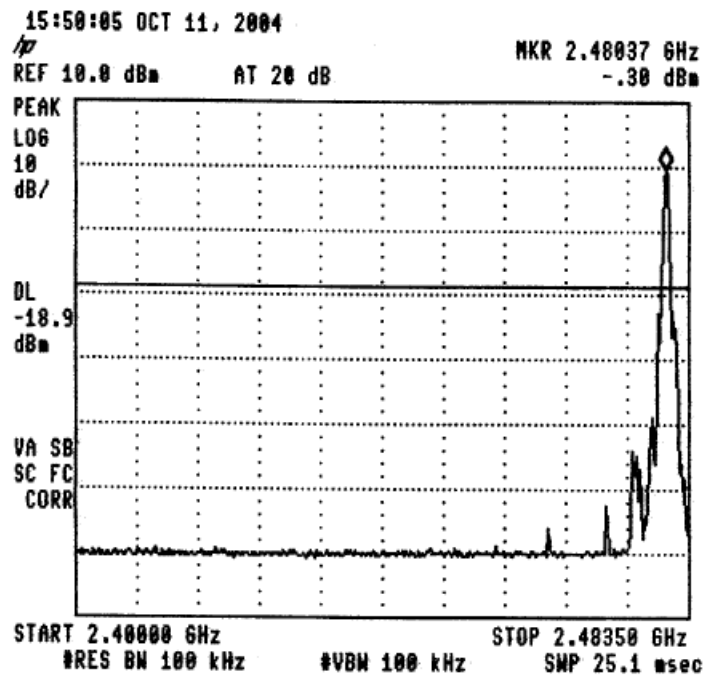


Figure 57.— 2480.0 MHz

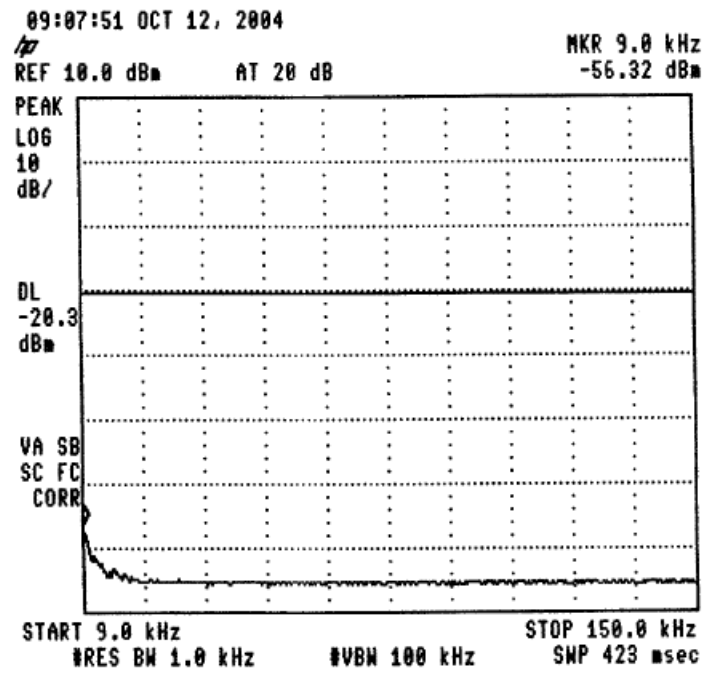


Figure 58.— 2480.0 MHz

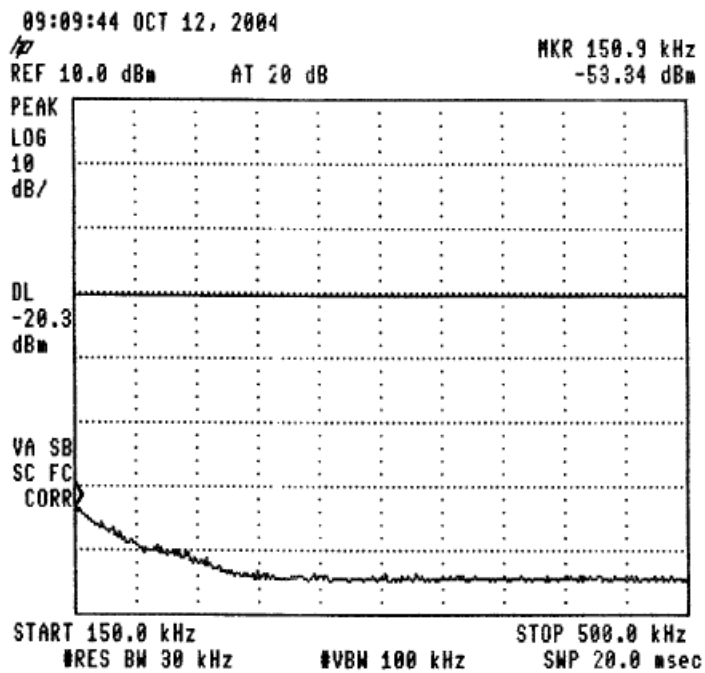


Figure 59.— 2480.0 MHz

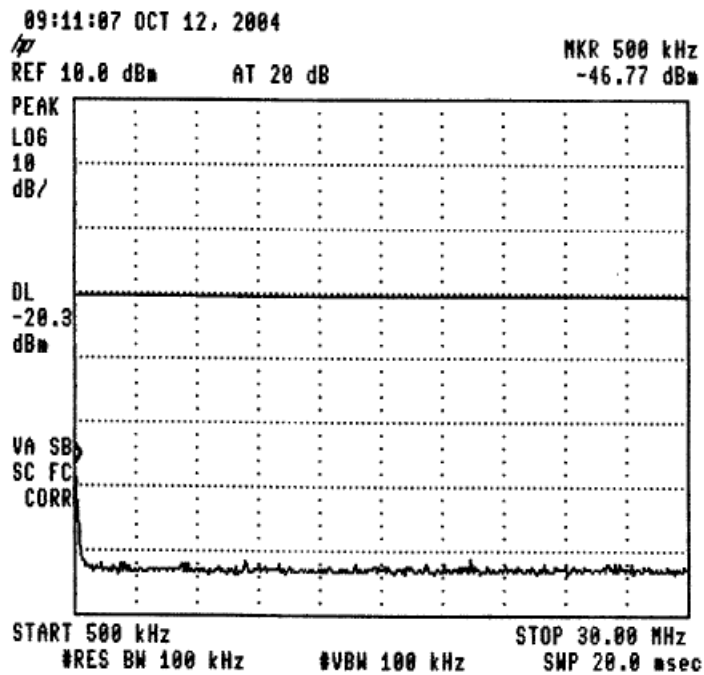


Figure 60.— 2480.0 MHz

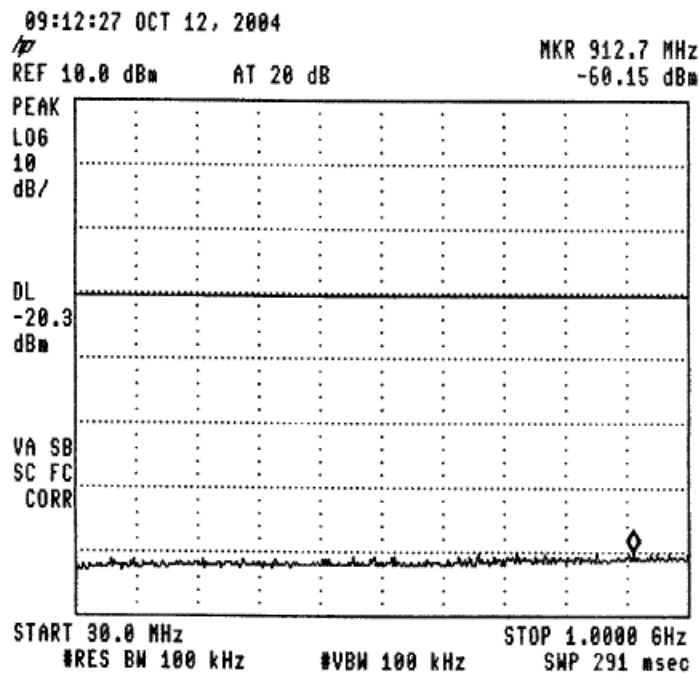


Figure 61.— 2480.0 MHz

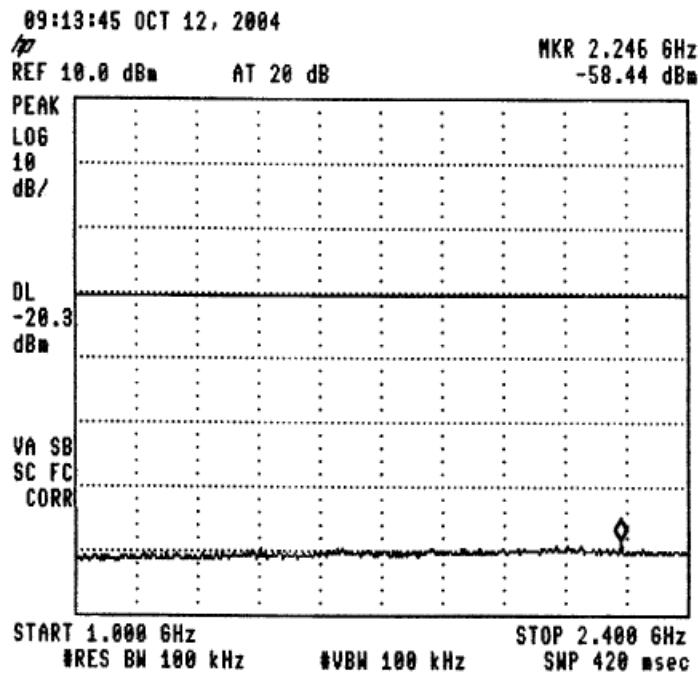


Figure 62.— 2480.0 MHz

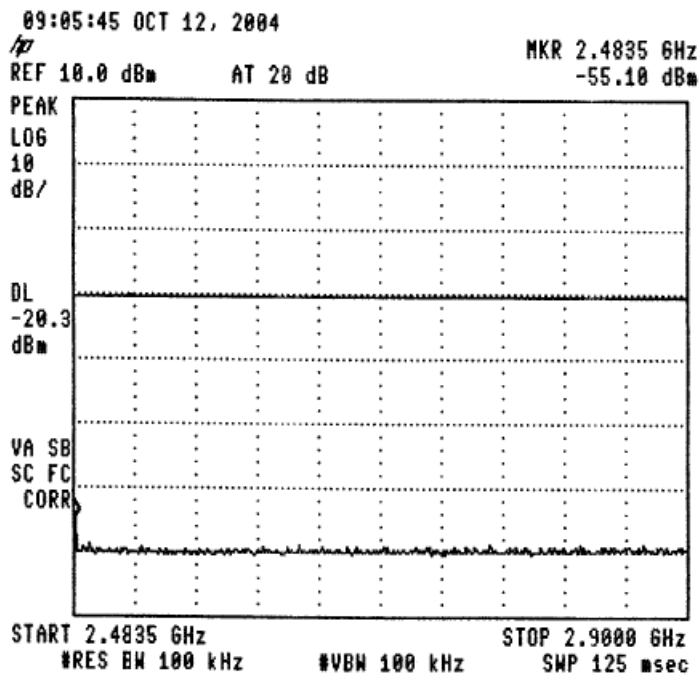


Figure 63.— 2480.0 MHz

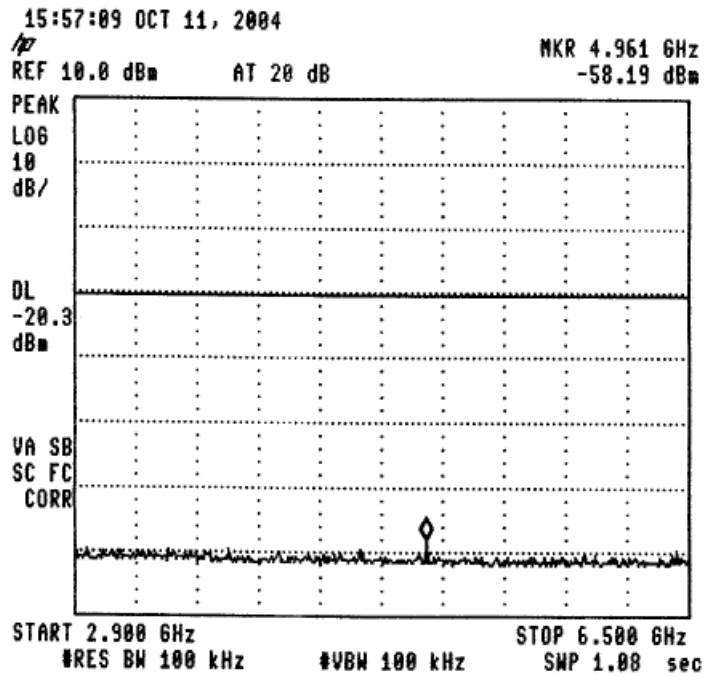


Figure 64.— 2480.0 MHz

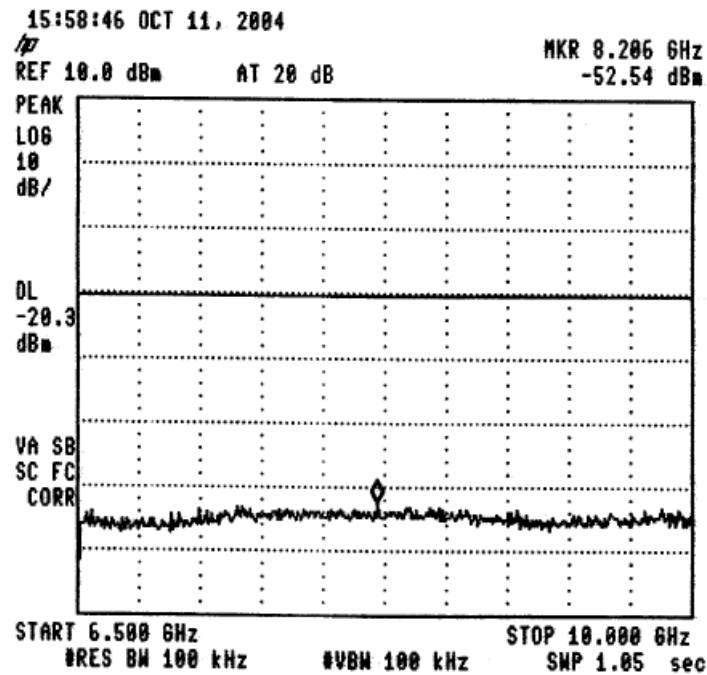


Figure 65.— 2480.0 MHz

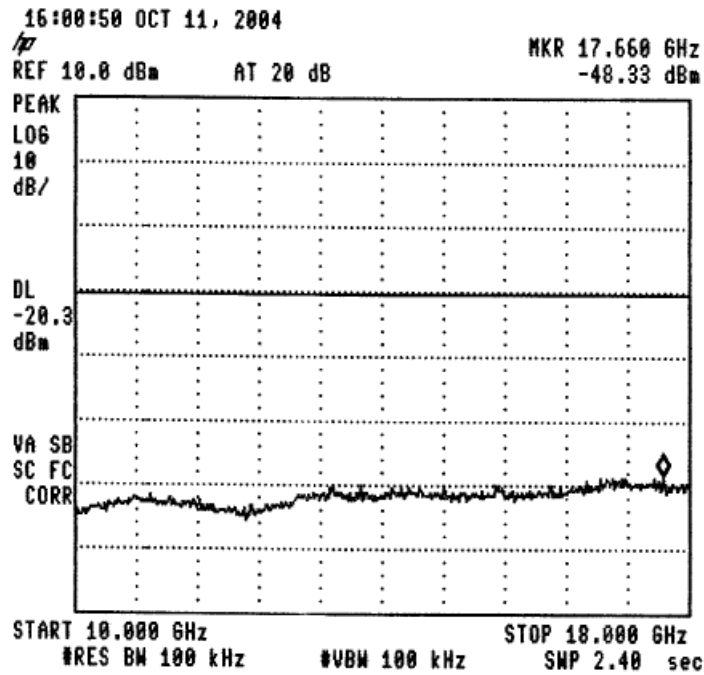


Figure 66.— 2480.0 MHz

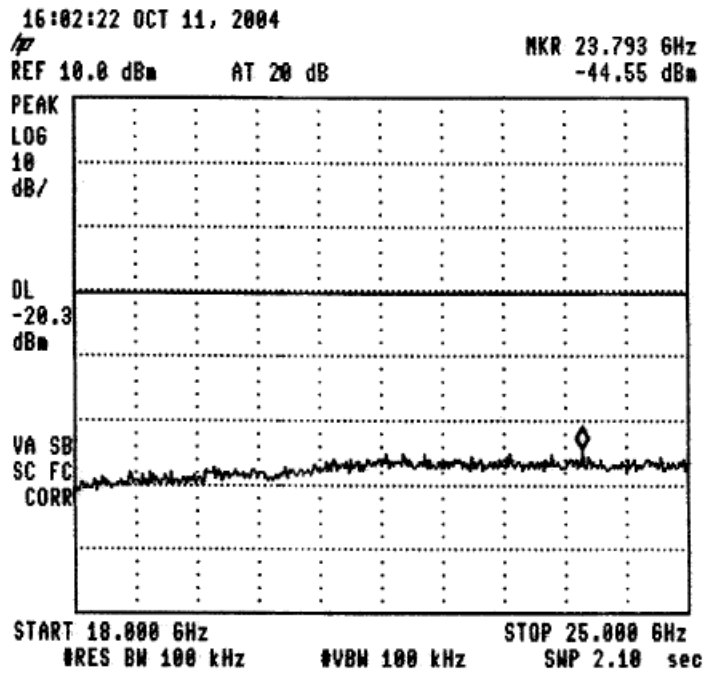


Figure 67.— 2480.0 MHz

12.2 Results table

E.U.T. Description: Bluetooth ID Tag

Model No.: Radioos Personal Tag

Serial Number: 5

Specification: FCC Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Reading (dBc)	Specification (dBc)	Margin (dB)
2402.0	43.9	20.0	23.9
2440.0	60.0	20.0	40.0
2480.0	49.3	20.0	29.3

Figure 68 Peak Power Output of 2400.0-2480.0 MHz Band

JUDGEMENT: Passed by 23.9 dB

TEST PERSONNEL:

Tester Signature: 

Date: 13.02.05

Typed/Printed Name: E. Pitt

12.3 Test Equipment Used.

Peak Power Output Out of 902-928 MHz Band

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	1 year
Cable	Avnet	MTS	N/A	September 20, 2003	1 year

Figure 69 Test Equipment Used

13. 20 dB Bandwidth

13.1 Test procedure

The E.U.T. was set to the applicable test frequency. The E.U.T. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable. The spectrum analyzer was set to 10 kHz resolution BW. The spectrum bandwidth of the E.U.T. at the point of 20 dB below maximum peak power was measured and recorded.

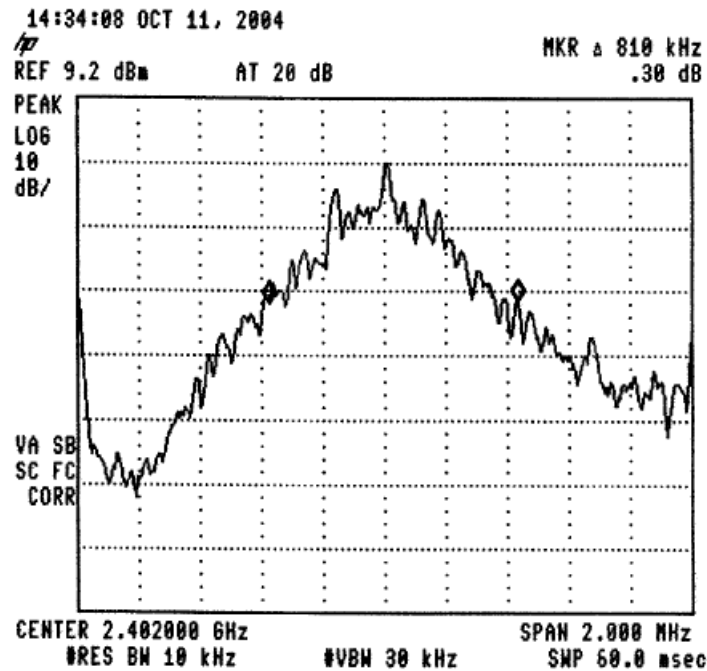


Figure 70 — 2402.0 MHz

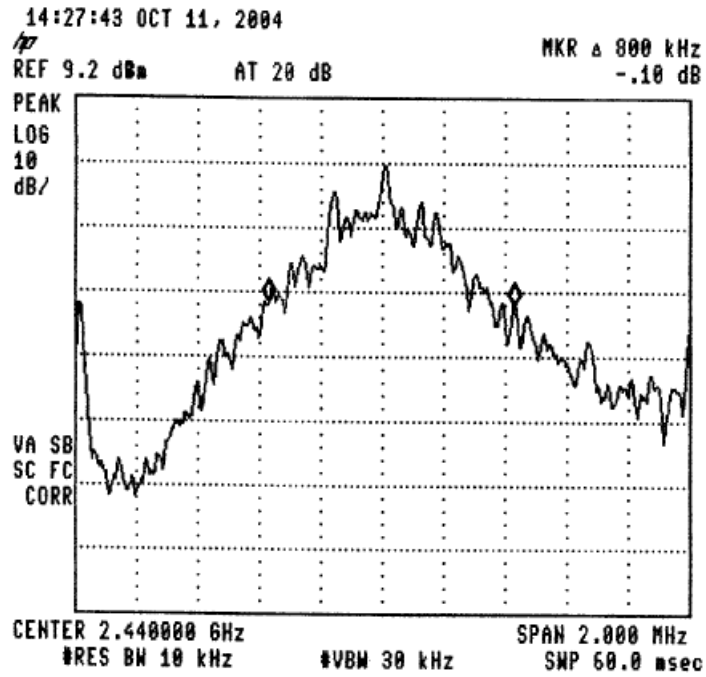


Figure 71 — 2440.0 MHz

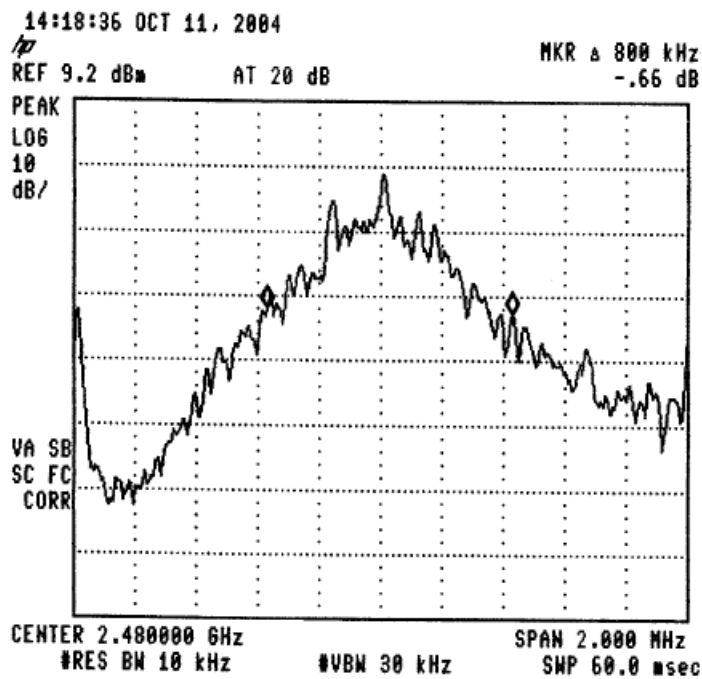


Figure 72 — 2480.0 MHz

13.2 Results table

E.U.T. Description: Bluetooth ID Tag

Model No.: Radioos Personal Tag

Serial Number: 5

Specification: FCC Part 15, Subpart C (15.247-a2)

Operation Frequency (MHz)	Reading (kHz)
2402.0	810
2440.0	800
2480.0	800

Figure 73 20 dB Bandwidth

TEST PERSONNEL:

Tester Signature: 

Date: 13.02.05

Typed/Printed Name: E. Pitt

13.3 Test Equipment Used.

20 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	1 year
Cable	Avnet	MTS	N/A	September 20, 2003	1 year

Figure 74 Test Equipment Used

14. Band Edge Spectrum

[In Accordance with section 15.247(c)]

14.1 Test procedure

Enclosed are spectrum analyzer plots for the lowest operation frequency (2402.0 MHz) the middle operation frequency (2440.0 MHz) and the highest operation frequency (2480.0 MHz) in which the E.U.T. is planned to be used.

The E.U.T. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution BW. Maximum power level below 2402 MHz and above 2480 MHz was measured relative to power level at 2402 MHz and 2480 MHz correspondingly.

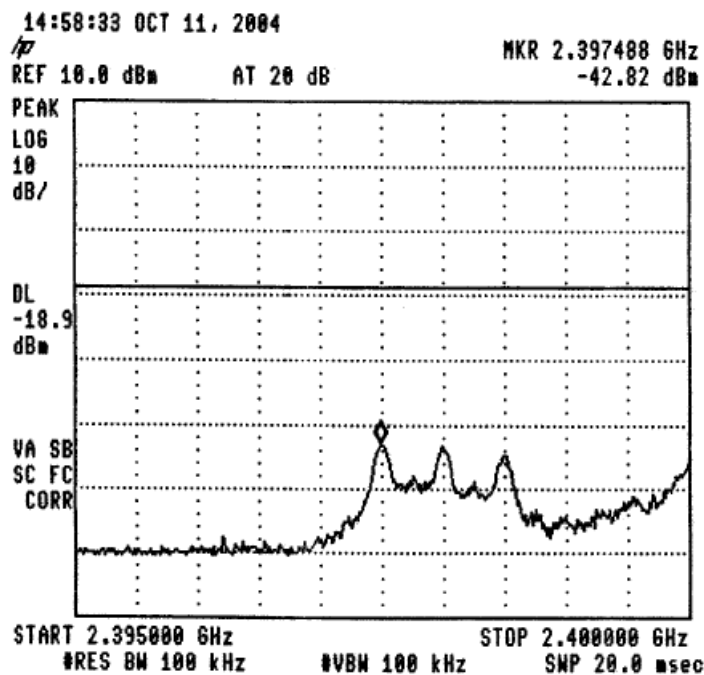


Figure 75 — 2402.0 MHz

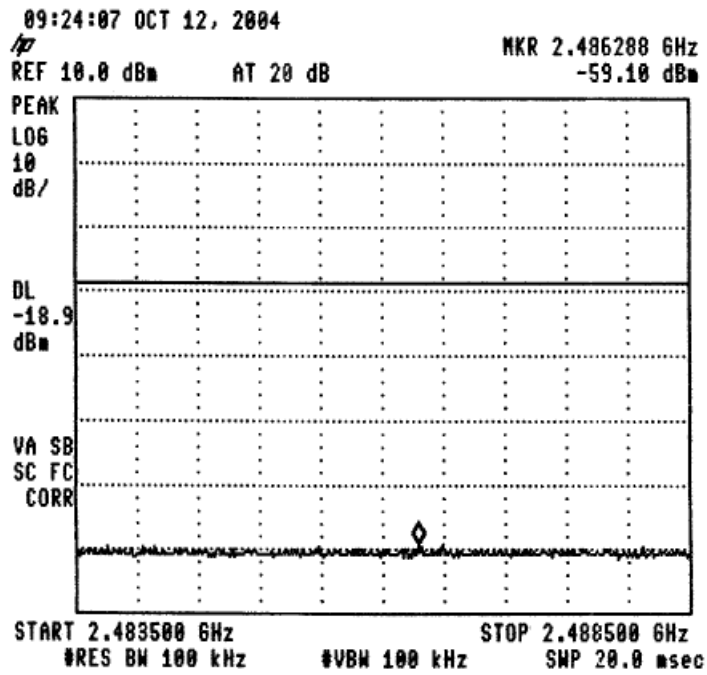


Figure 76 — 2402.0 MHz

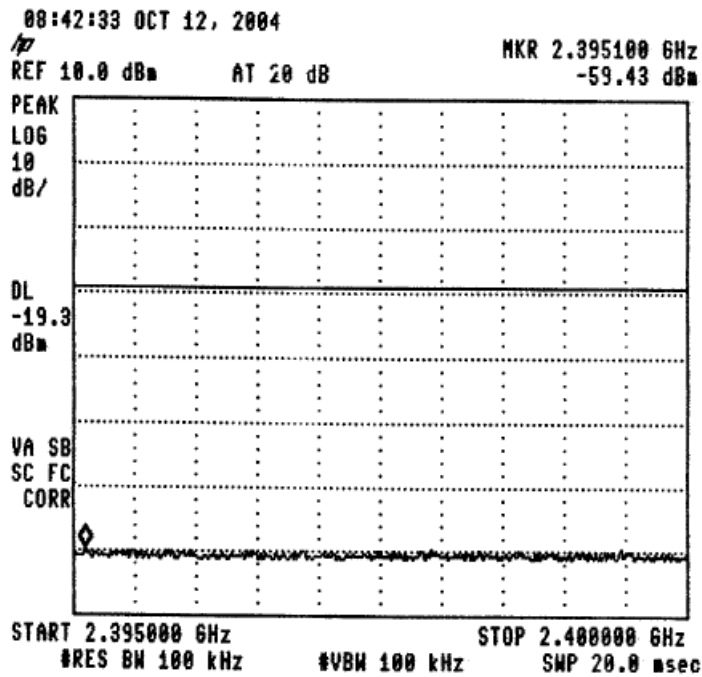


Figure 77 — 2440.0 MHz

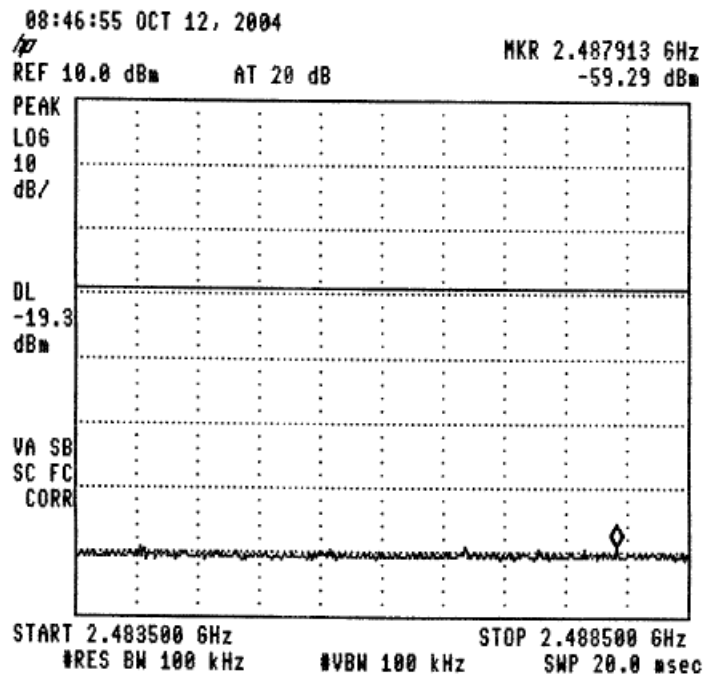


Figure 78 — 2440.0 MHz

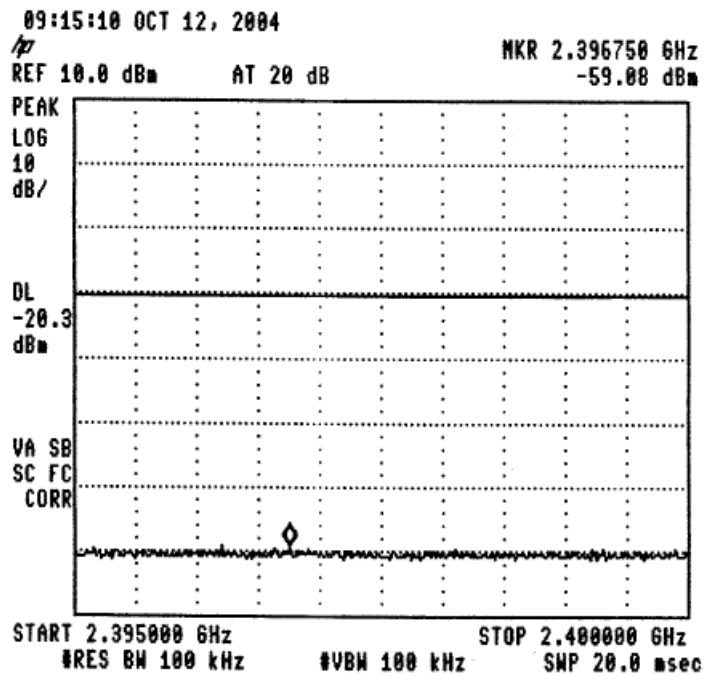


Figure 79 — 2480.0 MHz

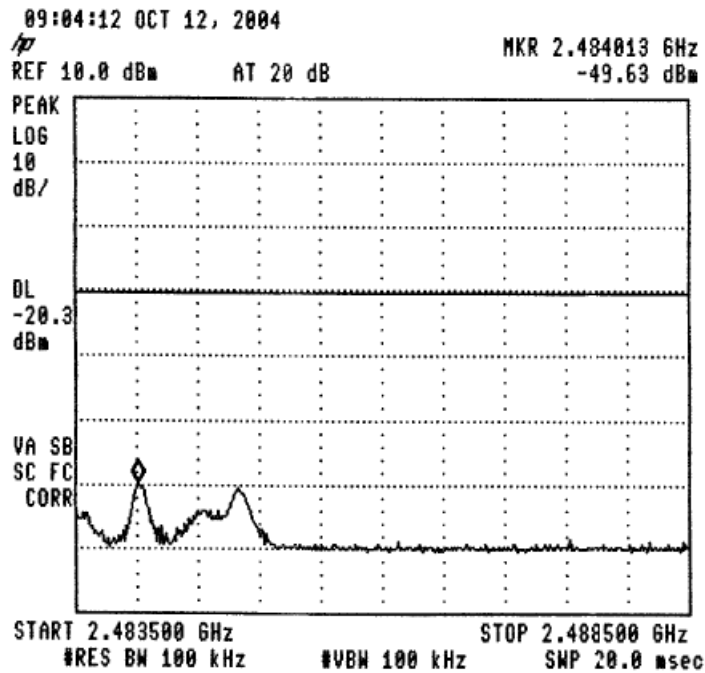


Figure 80 — 2480.0 MHz

14.2 Results table

E.U.T. Description: Bluetooth ID Tag
 Model No.: Radios Personal Tag
 Serial Number: Not Designated
 Specification: FCC Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBc)	Specification (dBc)	Margin (dB)
2402.0	2397.5	43.9	20.0	23.9
2440.0	2487.9	60.0	20.0	40.0
2480.0	2484.0	49.3	20.0	29.3

Figure 81 Band Edge Spectrum

JUDGEMENT: Passed by 23.9 dB

TEST PERSONNEL:

Tester Signature: 

Date: 13.02.05

Typed/Printed Name: E. Pitt

14.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	1 year
Cable	Avnet	MTS	N/A	September 20, 2003	1 year

Figure 82 Test Equipment Used

15. Antenna Gain

The gain of the antenna is 2 dBi.

16. R.F Exposure/Safety

The E.U.T. is worn on a wristband for application of collecting location data. Typical uses of the E.U.T. are child tracking in amusement parks, security personnel in enterprises, hospital patients and many more. The typical distance between the E.U.T. and the general population in the worst case application is <2.5cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

- (a) FCC limits at 2442 MHz is: $1 \frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

- (b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power 1.68 mW (Peak)

G_T- Antenna Gain, 2 dBi

R- Distance from Transmitter using 1cm worst case

- (c) The peak power density is :

$$S_p = \frac{1.68}{4\pi(1)^2} = 0.53 \frac{mW}{cm^2}$$

- (d) The duty cycle of transmission in actual worst case is 625 microsecond “on” within 3 seconds.

The average power over 30 minutes is:

$$P_{AV} = \frac{1.68 \times 0.625}{3000} = 3.5 \times 10^{-4} mW$$

- (e) The averaged power density of the E.U.T. is:

$$S_{AV} = \frac{3.5 \times 10^{-4}}{4\pi(1)^2} = 2.8 \times 10^{-5} \frac{mW}{cm^2}$$

- (f) This is 5 orders of magnitude below the FCC limit.

17. Photographs of Tested E.U.T.



Figure 83 Top View



Figure 84 Bottom View



Figure 85 PCB in Case



Figure 86 Battery in Case

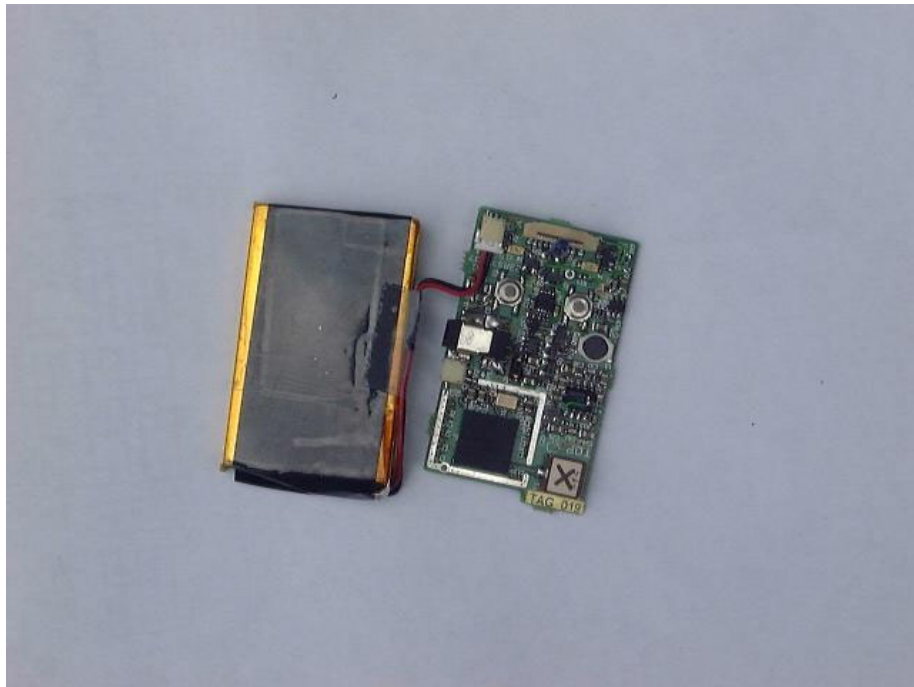


Figure 87 PCB and Battery Side 1

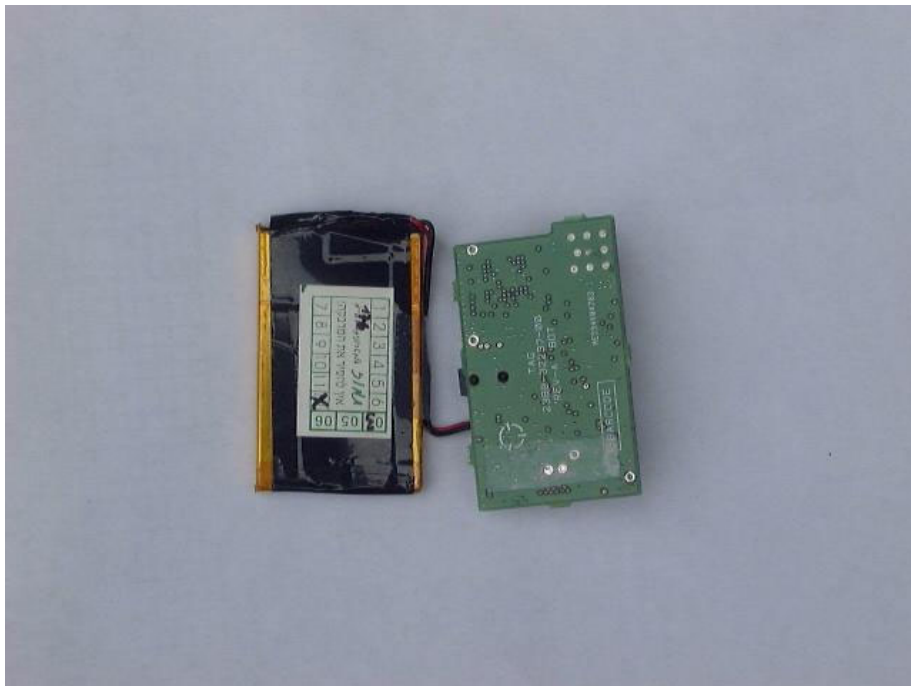


Figure 88 PCB and Battery Side 2

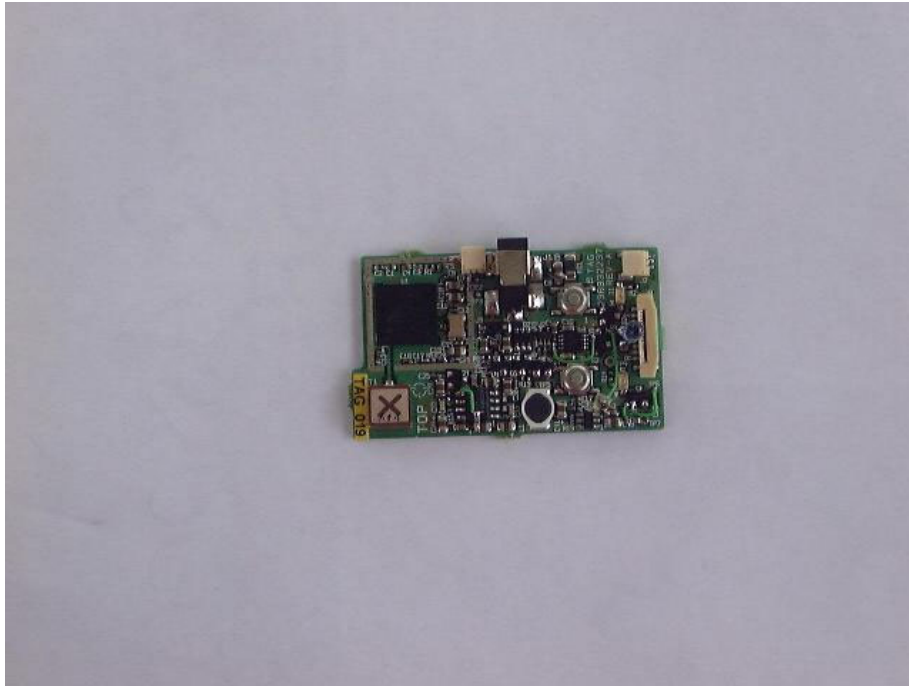


Figure 89 PCB Side 1

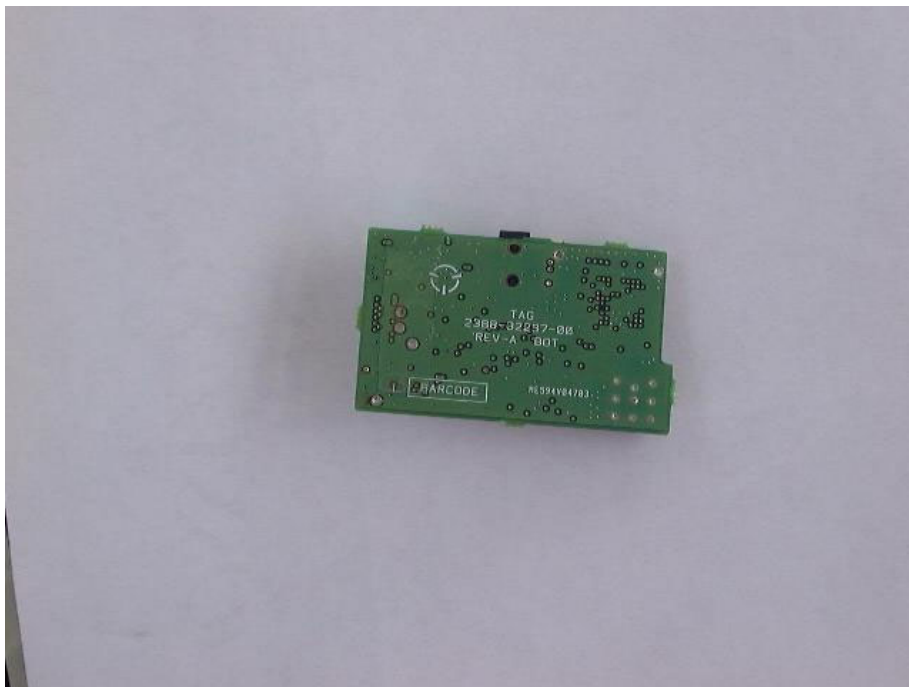


Figure 90 PCB Side 2

18. APPENDIX A - CORRECTION FACTORS

18.1 Correction factors for

CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.5	1200.0	7.5
20.0	0.7	1400.0	8.2
30.0	1.0	1600.0	9.0
40.0	1.2	1800.0	9.6
50.0	1.3	2000.0	10.7
60.0	1.5	2300.0	11.1
70.0	1.6	2600.0	11.8
80.0	1.7	2900.0	12.8
90.0	1.8		
100.0	1.9		
150.0	2.4		
200.0	2.7		
250.0	3.0		
300.0	3.3		
350.0	3.7		
400.0	4.0		
450.0	4.3		
500.0	4.7		
600.0	4.9		
700.0	5.4		
800.0	5.8		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

18.2 Correction factors for

CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.
2. The overall length of the cable is 10 meters.

18.3 Correction factors for

CABLE

from EMI receiver
to test antenna

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.1	1200.0	1.4
20.0	0.1	1400.0	1.5
30.0	0.2	1600.0	1.5
40.0	0.2	1800.0	1.7
50.0	0.2	2000.0	1.7
60.0	0.2	2300.0	2.0
70.0	0.3	2600.0	2.1
80.0	0.3	2900.0	2.2
90.0	0.3		
100.0	0.3		
150.0	0.4		
200.0	0.4		
250.0	0.4		
300.0	0.5		
350.0	0.6		
400.0	0.6		
450.0	0.6		
500.0	0.7		
600.0	0.8		
700.0	0.8		
800.0	1.0		
900.0	1.1		
1000.0	1.1		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 5.5 meters.

18.4 Correction factors for

CABLE

from EMI receiver
to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.
2. The cable is used for measurements above 2.9 GHz.
3. The overall length of the cable is 10 meters.

18.5 Correction factors for

CABLE

from EMI receiver
to test antenna
at 10 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.6	1200.0	9.7
20.0	1.1	1400.0	10.5
30.0	1.3	1600.0	11.5
40.0	1.6	1800.0	12.6
50.0	1.7	2000.0	13.5
60.0	1.9	2300.0	14.3
70.0	2.0	2600.0	15.5
80.0	2.2	2900.0	16.4
90.0	2.3		
100.0	2.4		
150.0	3.1		
200.0	3.6		
250.0	4.2		
300.0	4.5		
350.0	4.8		
400.0	5.2		
450.0	5.5		
500.0	6.2		
600.0	6.4		
700.0	7.0		
800.0	7.5		
900.0	8.1		
1000.0	8.6		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 34 meters.
3. The above data is located in file 34M10MO.CBL on the disk marked "Radiated Emissions Tests EMI Receiver".

18.6 Correction factors for

LOG PERIODIC ANTENNA

**Type LPD 2010/A
at 3 and 10 meter ranges.**

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	11.4
400.0	14.5
500.0	15.2
600.0	17.3
700.0	19.0
850.0	20.1
1000.0	22.2

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.2
400.0	14.4
500.0	15.2
600.0	17.2
700.0	19.0
850.0	20.1
1000.0	22.1

NOTES:

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".

18.7 Correction factors for

LOG PERIODIC ANTENNA

**Type SAS-200/511
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. Antenna serial number is 253.
2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.
3. The files mentioned above are located on the disk marked "Antenna Factors".

18.8 Correction factors for BICONICAL ANTENNA
Type BCD-235/B,
at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

18.9 Correction factors for BICONICAL ANTENNA
Type BCD-235/B,
10 meter range

FREQUENCY (MHz)	AFE (dB/m)
30.0	12.1
40.0	10.6
50.0	10.6
60.0	8.9
70.0	8.5
80.0	9.6
90.0	9.4
100.0	9.6
110.0	10.3
120.0	10.7
130.0	12.6
140.0	12.7
150.0	12.7
160.0	13.8
170.0	13.7
180.0	14.9
190.0	13.4
200.0	13.1
210.0	14.0
220.0	14.5
230.0	15.8
240.0	16.0
250.0	16.6
260.0	16.7
270.0	18.3
280.0	18.5
290.0	19.3
300.0	20.9

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 41BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

18.10 Correction factors for ACTIVE LOOP ANTENNA

Model 6502

S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2

17.11 Correction factors for Double-Ridged Waveguide Horn

**Model: 3115, S/N 29845
at 1 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENN A Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.5	5.8	10.0	37.9	12.3
1.5	25.8	8.0	10.5	38.0	12.6
2.0	27.8	8.5	11.0	38.2	12.8
2.5	28.5	9.7	11.5	38.8	12.6
3.0	30.1	9.6	12.0	38.7	13.1
3.5	31.3	9.8	12.5	38.7	13.5
4.0	32.8	9.5	13.0	39.7	12.8
4.5	32.4	10.8	13.5	40.0	12.8
5.0	33.8	10.4	14.0	40.8	12.4
5.5	34.3	10.8	14.5	40.3	13.1
6.0	34.6	11.1	15.0	39.0	14.8
6.5	34.9	11.5	15.5	37.4	16.6
7.0	35.9	11.2	16.0	37.6	16.7
7.5	37.0	10.7	16.5	39.0	15.5
8.0	36.9	11.3	17.0	41.3	13.5
8.5	37.3	11.5	17.5	44.3	10.8
9.0	37.5	11.8	18.0	46.7	8.6
9.5	37.4	12.3			

17.12 Correction factors for Double-Ridged Waveguide Horn

**Model: 3115, S/N 29845
at 3 meter range.**

FREQUENCY	ANTENNA	ANTENN	FREQUENCY	ANTENNA	ANTENNA
(GHz)	FACTOR	A Gain	(GHz)	FACTOR	Gain
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

17.13 Correction factors for

Horn Antenna
Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	APE (dB /m)	Gain (dBi)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

17.14 Correction factors for BICONICAL ANTENNA
Type 3109,
1.0 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	11.1
30.0	12.0
40.0	12.0
50.0	11.4
60.0	10.3
70.0	10.7
80.0	8.3
90.0	9.0
100.0	10.0
110.0	11.6
120.0	13.6
130.0	14.2
140.0	13.5
150.0	12.7
160.0	12.7
170.0	13.6
180.0	15.3
190.0	14.6
200.0	14.7
210.0	15.3
220.0	15.8
230.0	17.0
240.0	18.0
250.0	18.1
260.0	18.0
270.0	17.5
280.0	18.2
290.0	19.7
300.0	21.8

NOTES:

1. Antenna serial number is 3244.
2. The above list is located in file 44BIC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver"

17.15. Correction factors for BICONICAL ANTENNA
Type 3109,
3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	18.4
30.0	14.0
40.0	12.3
50.0	10.6
60.0	8.3
70.0	8.7
80.0	7.2
90.0	8.6
100.0	10.1
110.0	11.2
120.0	11.8
130.0	12.3
140.0	12.7
150.0	12.5
160.0	12.4
170.0	12.1
180.0	12.2
190.0	12.8
200.0	13.7
210.0	14.5
220.0	15.4
230.0	15.9
240.0	16.3
250.0	16.7
260.0	17.1
270.0	17.2
280.0	17.5
290.0	18.1
300.0	18.9

NOTES:

- 1. Antenna serial number is 3244.*
- 2. The above list is located in file 44BIC3M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver"*