ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

ACCREDITED
TESTING Cert No.1152.01

DATE: 08 February 2012

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

FCC Radio Test Report

for

Andante Medical Devices LTD

Equipment under test:

Bluetooth Adapter for iPod/iPhone

iSmartStep SSM2011

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
I. Siboni, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Measurement/Technical Report for

Andante Medical Devices LTD

Bluetooth Adapter for iPod/iPhone

iSmartStep SSM2011

FCC ID: TWMSMARTSTEP0107

This report concerns:	Original Grant:	X
	Class I Change:	
	Class II Change:	

Equipment type:

Limits used:
47CFR15 Section 15.247

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")

Ronit Friedman
Andante Medical Devices Ltd.
P.O.B. 3023
Building 8B Omer Industrial Park
Omer, 89465 Israel
Tel: +972- 8 - 690 - 0027
Fax: +972- 8 - 690 - 0319
e-mail: ronit@andante.co.il

TABLE OF CONTENTS

1. GENERAL INFORMATION ---------- 5
1.1 Administrative Information 5
1.2 List of Accreditations 6
1.3 Product Description 7
1.4 Test Methodology 7
1.5 Test Facility 7
1.6 Measurement Uncertainty 7

2. SYSTEM TEST CONFIGURATION ---------- 8
2.1 Justification 8
2.2 EUT Exercise Software 8
2.3 Special Accessories 8
2.4 Equipment Modifications 8
2.5 Configuration of Tested System 8

3. TEST SET-UP PHOTO ---------- 9

4. 6DB MINIMUM BANDWIDTH ---------- 10
4.1 Test Specification 10
4.2 Test procedure 10
4.3 Test Results 12
4.4 Test Equipment Used. 13

5. NUMBER OF HOPPING FREQUENCIES SECTION 15.247(A)(1)(III) ---------- 14
5.1 Test Specification 14
5.2 Test Procedure 14
5.3 Test Results 19
5.4 Test Instrumentation Used 20

6. CHANNEL FREQUENCY SEPARATION ---------- 21
6.1 Test Specification 21
6.2 Test procedure 21
6.3 Test Results 22
6.4 Test Instrumentation Used 22

7. RADIATED POWER OUTPUT ---------- 23
7.1 Test Specification 23
7.2 Test procedure 23
7.3 Test Results 25
7.4 Test Equipment Used. 26

8. DWELL TIME ON EACH CHANNEL ---------- 27
8.1 Test Specification 27
8.2 Test Procedure 27
8.3 Test Results 27
8.4 Test Equipment Used. 30

9. 26 DB BANDWIDTH ---------- 31
9.1 Test procedure 31
9.2 Test procedure 31
9.3 Test Results 33
9.4 Test Equipment Used. 33

10. BAND EDGE ---------- 34
10.1 Test procedure 34
10.2 Test Results 35
10.3 Test Equipment Used. 36

11. RADIATED EMISSION, 9 KHZ – 30 MHZ----------37
11.1 Test Specification 37
11.2 Test Procedure 37
11.3 Test Results....37
11.4 Test Instrumentation Used, Radiated Measurements 38
11.5 Field Strength Calculation 38

12. SPURIOUS RADIATED EMISSION 30 – 25000 MHZ----------39
12.1 Test Specification 39
12.2 Test Procedure 39
12.3 Test Results....40
12.4 Test Instrumentation Used, Radiated Measurements 43
12.5 Field Strength Calculation 30 – 1000 MHz 44

13. RADIATED POWER SPECTRAL DENSITY----------45
13.1 Test procedure 45
13.2 Test Results....47
13.3 Test Equipment Used. 48

14. ANTENNA GAIN/INFORMATION ----------49

15. R.F EXPOSURE/SAFETY----------50

16. APPENDIX B - CORRECTION FACTORS----------51
16.1 Correction factors for CABLE 51
16.2 Correction factors for CABLE 52
16.3 Correction factors for CABLE 53
12.6 Correction factors for LOG PERIODIC ANTENNA 54
16.4 Correction factors for LOG PERIODIC ANTENNA 55
16.5 Correction factors for BICONICAL ANTENNA 56
16.6 Correction factors for Double-Ridged Waveguide Horn 57
16.7 Correction factors for Horn Antenna....58
16.8 Correction factors for ACTIVE LOOP ANTENNA 59

1. General Information

1.1 Administrative Information

Manufacturer:	Andante Medical Devices LTD
Manufacturer's Address:	P.O.B. 3023, 8B Omer Industrial Park, Omer, 84965 Israel Tel: +972-8-690-0027 Fax: +972-8-690-0319
Manufacturer's Representative:	Dror Salah
Equipment Under Test (E.U.T):	Bluetooth Adapter for iPod/iPhone
Equipment Model No.:	iSmartStep SSM2011
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	18.01.12
Start of Test:	18.01.12
End of Test:	19.01.12
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15 Sub-part C

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), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.

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 Andante Medical Devices iSmartStep SSM2011 is a Bluetooth adaptor for iPod / iPhone, based on CSR's BlueCore5 chipset.

The product is connected to iPod/iPhones devices through the 30-pin connector The product uses Andante iSmartStep application (Apple iOS Application) to communicate with the SmartStep Control Unit

(SmartStep Control Unit FCC ID: TWMSMARTSTEP0106). It uses the Bluetooth SPP (Serial Port Profile) to communicate with SmartStep Control Unit.

The product includes iPod/iPhone interface firmware; this is used to communicate with the iOS App directly.

1.4 Test Methodology

Radiated testing was 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 September 3, 2009).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB

2. System Test Configuration

2.1 Justification

Radiated emission screening was performed in 3 orthogonal orientations. The worst case orientation was the vertical position.

2.2 EUT Exercise Software

Andante iSmartStep application (Apple iOS Application) was used.

2.3 Special Accessories

No special accessories were required to achieve compliance.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance

2.5 Configuration of Tested System

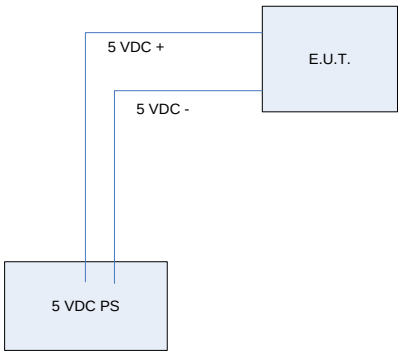

Figure 1. Configuration of Tested System

3. Test Set-up Photo

Figure 2. Radiated Emission Test

4. 6dB Minimum Bandwidth

4.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

4.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope.

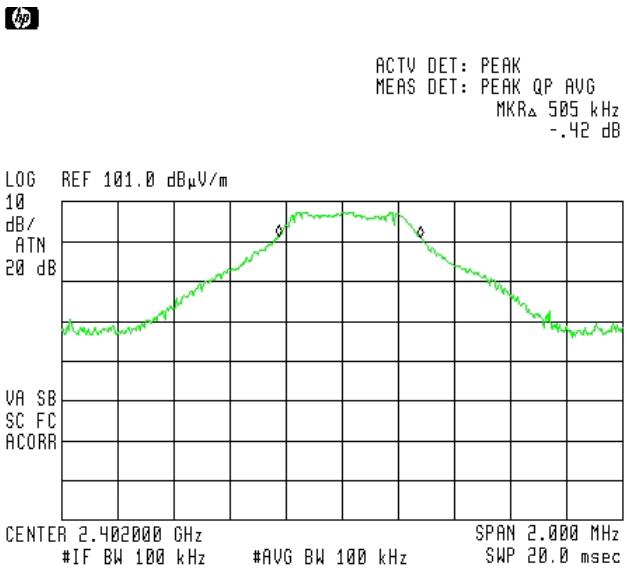

Figure 3. 2402 MHz

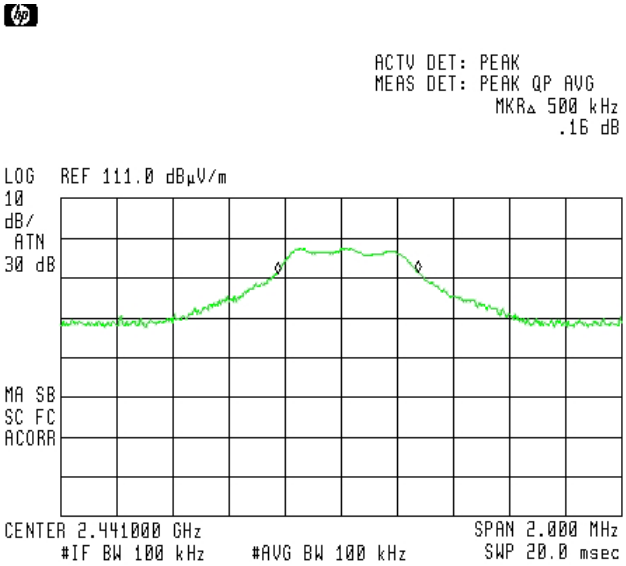

Figure 4. 2441 MHz

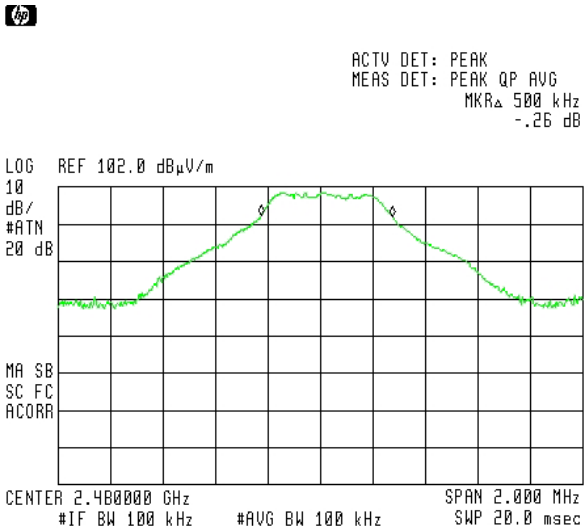

Figure 5. 2480 MHz

4.3 Test Results

E.U.T Description: Bluetooth Adapter for iPod/iPhone
Model: iSmartStep SSM2011
Serial Number: Not Designated

Operation Frequency (MHz)	Bandwidth Reading (MHz)	Specification (MHz)
2402	0.505	>0.5
2441	0.500	>0.5
2480	0.500	>0.5

Figure 6 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 08.02.12

Typed/Printed Name: I. Siboni

4.4 Test Equipment Used.

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	December 12, 2012	1 year
RF Section	HP	85420E	3705A00248	December 12, 2012	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 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	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 7 Test Equipment Used

5. Number of Hopping Frequencies Section 15.247(a)(1)(iii)

5.1 Test Specification

F.C.C., Part 15, Subpart C

5.2 Test Procedure

The E.U.T. was set to hopping mode.
The spectrum analyzer was set to the following parameters:

Span: Every 20 MHz Frequency
Band of Operation: 2400-2483.5 MHz
RBW: 30 kHz
VBW: 30 kHz
Detector Function: Peak
Trace: Maximum Hold

Number of Hopping Frequencies

E.U.T Description	Bluetooth Adapter for iPod/iPhone
Type	iSmartStep SSM2011
Serial Number:	Not Designated

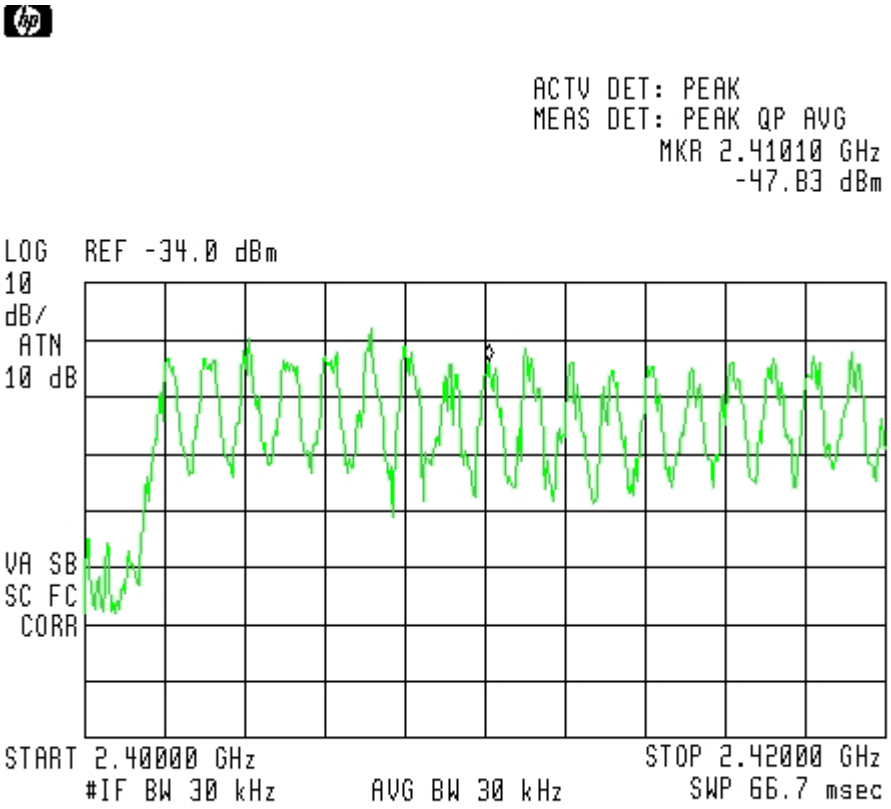

Figure 8. 2400-2420 MHz

Number of Hopping Frequencies

E.U.T Description	Bluetooth Adapter for iPod/iPhone
Type	iSmartStep SSM2011
Serial Number:	Not Designated

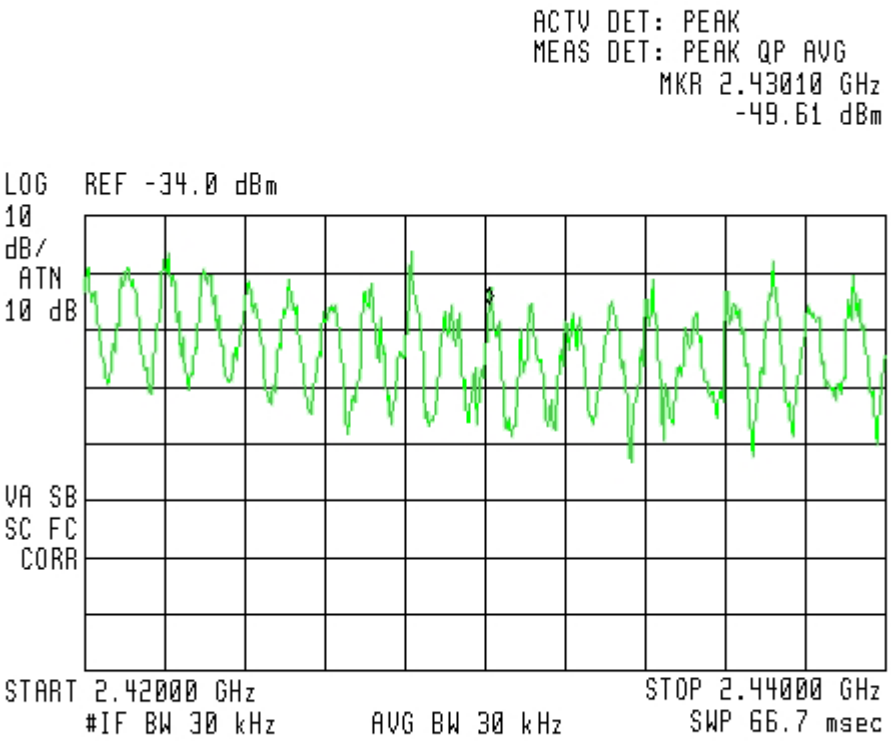

Figure 9. 2420 - 2440 MHz

Number of Hopping Frequencies

E.U.T Description	Bluetooth Adapter for iPod/iPhone
Type	iSmartStep SSM2011
Serial Number:	Not Designated

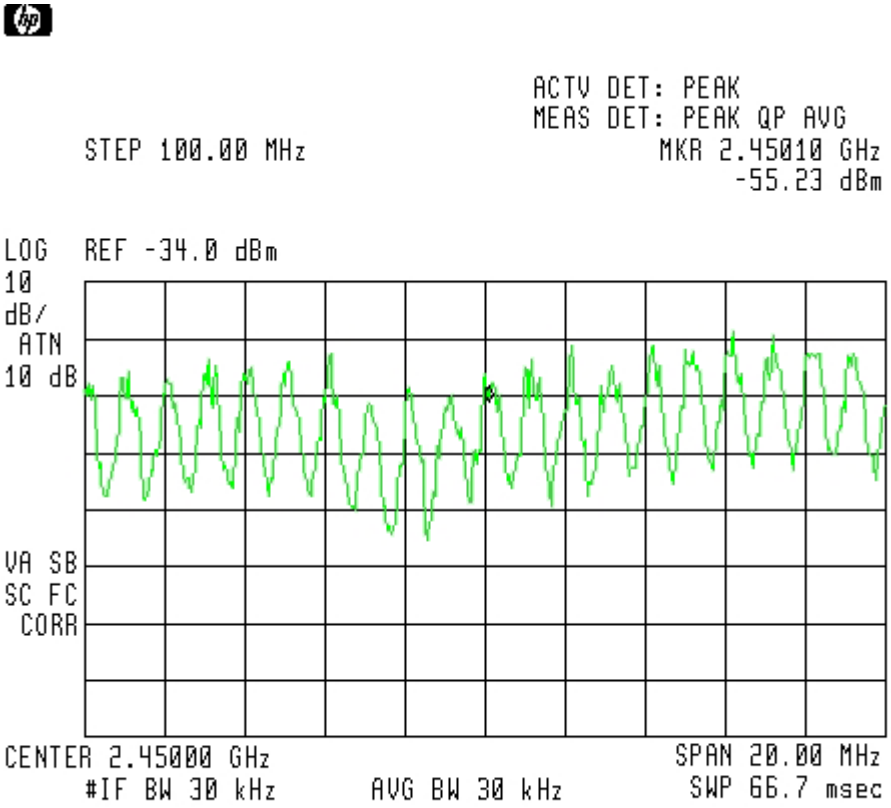

Figure 10. 2440 - 2406 MHz

Number of Hopping Frequencies

E.U.T Description	Bluetooth Adapter for iPod/iPhone
Type	iSmartStep SSM2011
Serial Number:	Not Designated

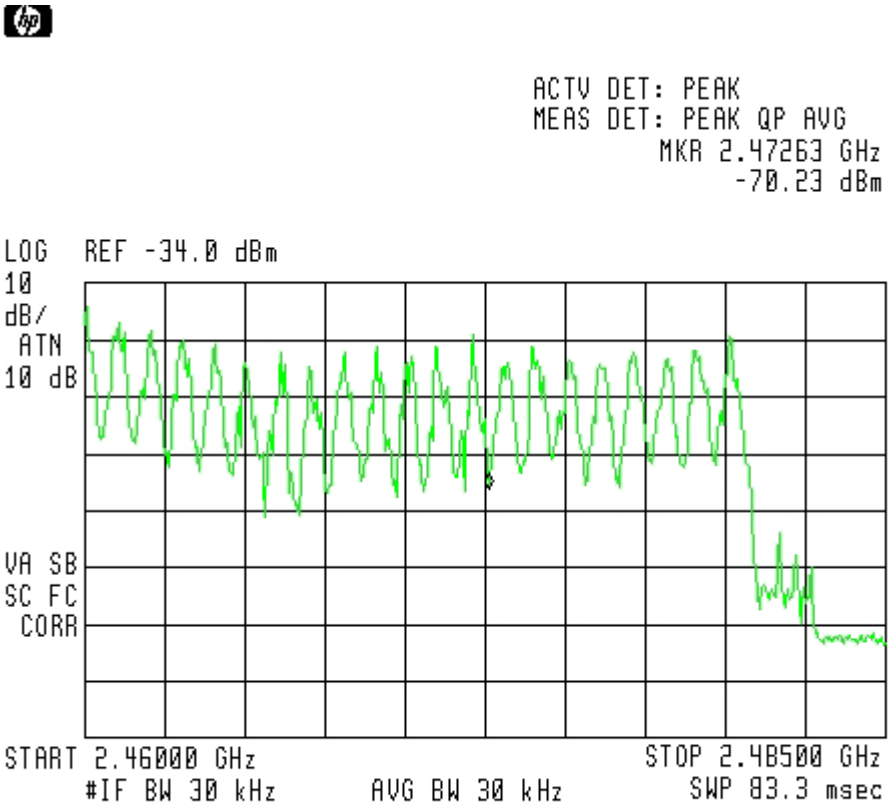

Figure 12. 2460 – 2483.5 MHz

Number of Hopping Frequencies

E.U.T Description	Bluetooth Adapter for iPod/iPhone
Type	iSmartStep SSM2011
Serial Number:	Not Designated

5.3 Test Results

E.U.T. Description: Bluetooth Adapter for iPod/iPhone

Model No.: iSmartStep SSM2011

Serial Number: Not Designated

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

Band1 = 2400 – 2420 (MHz) = 18
Band2 = 2420 – 2440 (MHz) = 20
Band3 = 2440 – 2460(MHz) = 20
Band4 = 2460 – 2483.5 (MHz) = 21

Number of Hopping Frequencies	Specification
79	>75

Figure 11 Number of Hopping Frequencies

TEST PERSONNEL:

Tester Signature: _____ Date: 08.02.12

Typed/Printed Name: I. Siboni

5.4 Test Instrumentation Used

EMI Receiver	HP	85422E	3906A00276	December 12, 2012	1 year
RF Section	HP	85420E	3705A00248	December 12, 2012	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 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	LaserJet 2200	JPKGC19982	N/A	N/A

6. Channel Frequency Separation

6.1 Test Specification

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

6.2 Test procedure

The E.U.T. was set to hopping mode.
The spectrum analyzer was set to the following parameters:
Span: 3 MHz
RBW: 30 kHz
VBW: 30 kHz
Detector Function: Peak
Trace: Maximum Hold
The marker delta function to determine the separation between the peaks of the adjacent channels was used.

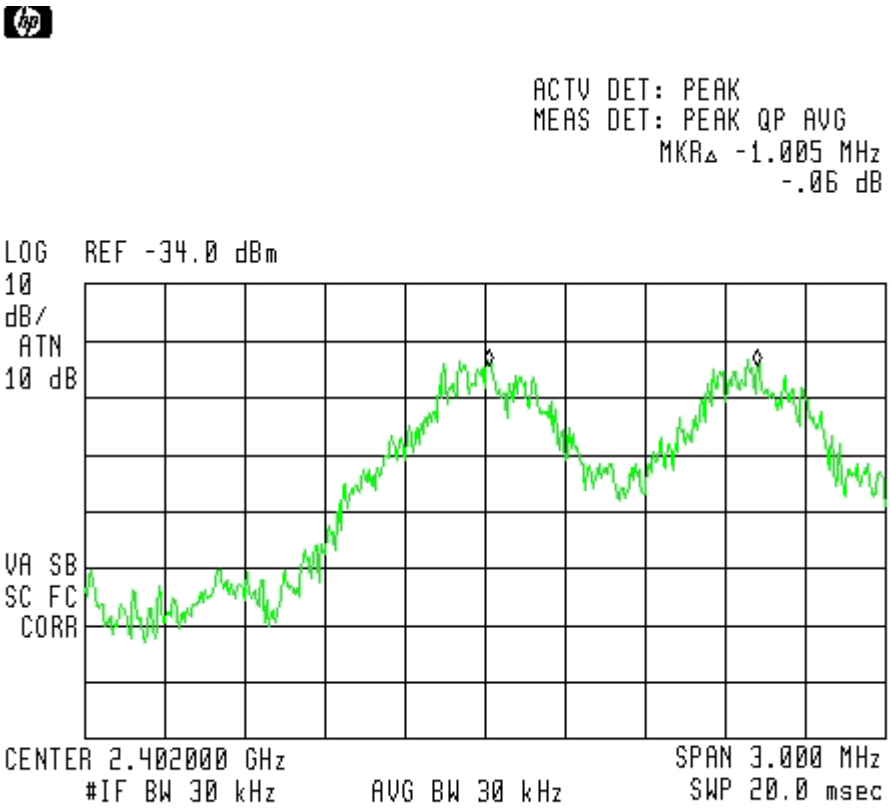

Figure 12. Frequency Separation

6.3 Test Results

E.U.T. Description: Bluetooth Adapter for iPod/iPhone
Model No.: iSmartStep SSM2011
Serial Number: Not Designated
Specification: FCC Part 15, Subpart C, 15.247(a) (1)

Channel Frequency Separation (kHz)	Specification (kHz)	Margin (kHz)
1005	1000	5

Figure 13 Channel Frequency Separation

JUDGEMENT: Passed by 5 kHz

TEST PERSONNEL:

Tester Signature: _____ Date: 08.02.12

Typed/Printed Name: I. Siboni

6.4 Test Instrumentation Used

EMI Receiver	HP	85422E	3906A00276	December 12, 2012	1 year
RF Section	HP	85420E	3705A00248	December 12, 2012	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 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	LaserJet 2200	JPKGC19982	N/A	N/A

7. Radiated Power Output

7.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(b)

7.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.
The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies
(1 (2.401 GHz); 8 (2.441 GHz); 14 (2.480 GHz)).

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

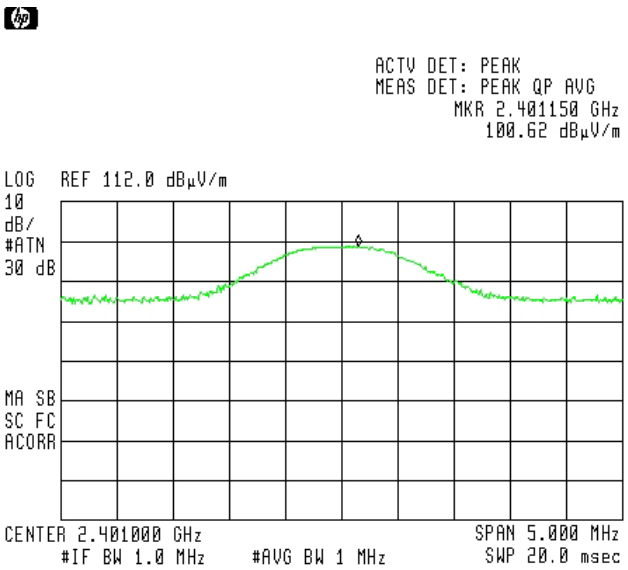

Figure 14 2401 MHz

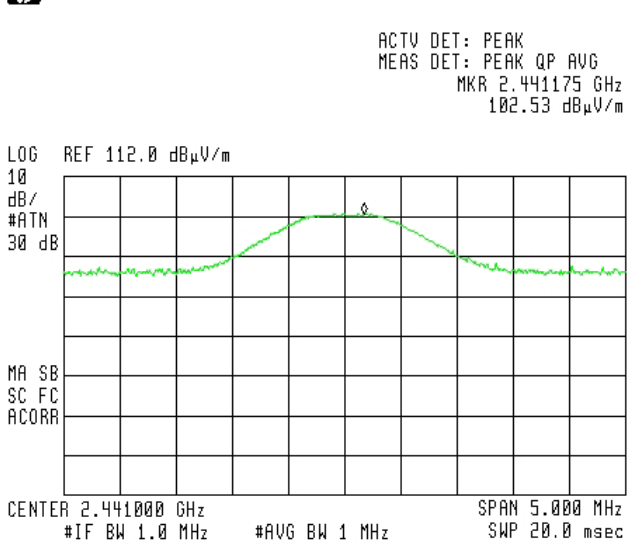

Figure 15 2441 MHz

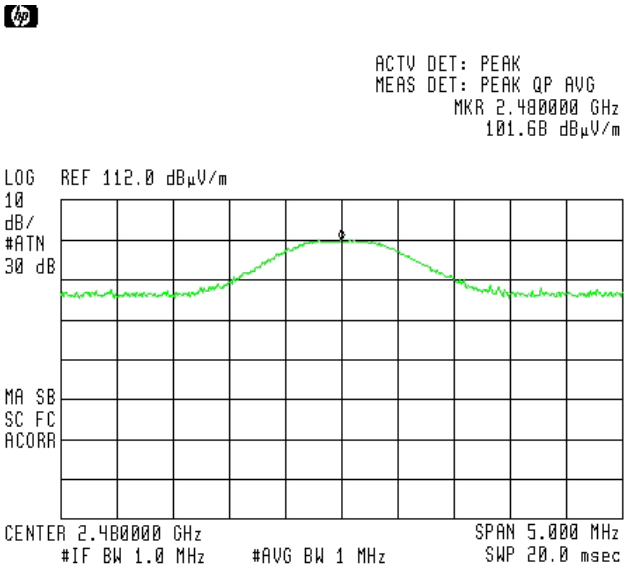

Figure 16 2480 MHz

7.3 Test Results

E.U.T. Description: Bluetooth Adapter for iPod/iPhone
Model No.: iSmartStep SSM2011
Serial Number: Not Designated
Specification: F.C.C. Part 15, Subpart C

Operation Frequency	Polarity	Peak Reading	Peak Reading	Transmitted Power	Limit
(MHz)	(H/V)	(dBµV/m)	(V/m)	(mW)	(mW)
2402	V	100.62	0.11	3.63	1000
2441	V	102.53	0.13	5.07	1000
2480	V	101.68	0.12	4.32	1000

The following calculations were used to determine maximum radiated power output.

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

JUDGEMENT: Passed

TEST PERSONNEL:
Tester Signature: _____ Date: 08.02.12
Typed/Printed Name: I. Siboni

7.4 Test Equipment Used.

Radiated Maximum Power Output

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	December 12, 2011	1 year
RF Section	HP	85420E	3705A00248	December 12, 2011	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	LaserJet 2200	JPKGC19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 27, 2011	2 years

Figure 17 Test Equipment Used

8. Dwell Time on Each Channel

8.1 Test Specification

FCC Part 15, Section 15.247(a)(1)(iii)

8.2 Test Procedure

The E.U.T. was tested in radiated mode using the substitution antenna. The spectrum analyzer was set to 10 kHz IF BW and 3 MHz AVG BW.

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

8.3 Test Results

The E.U.T met the requirements of the FCC Part 15, Section 15.247(a)(1)(iii).

Additional information of the results is given in *Figure 18* to *Figure 19*.

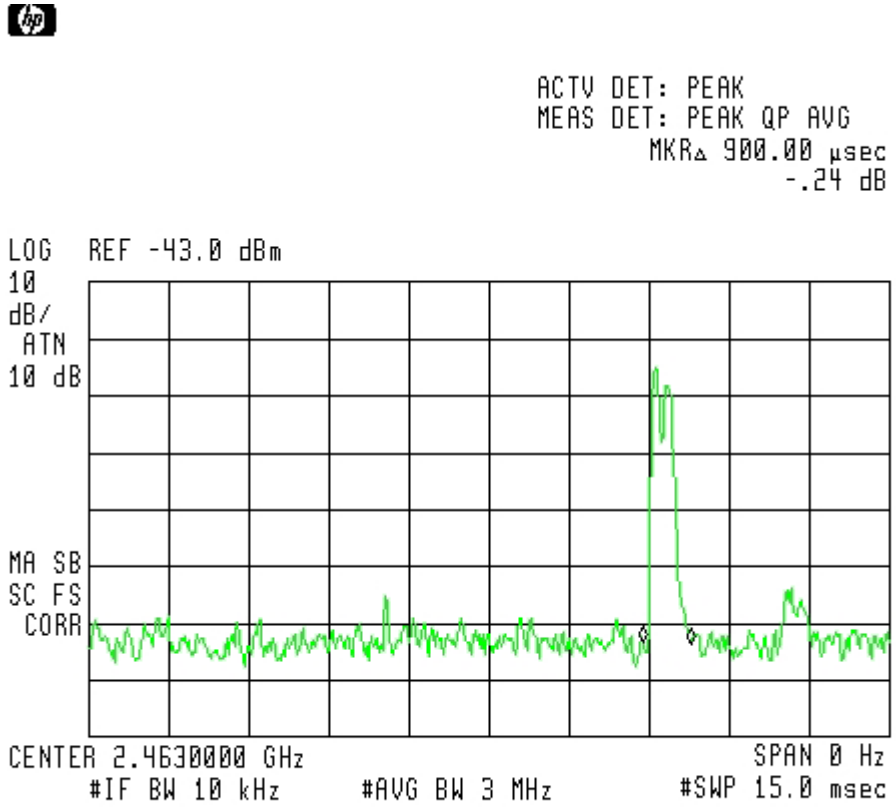

Figure 18 — Ton=0.9msec

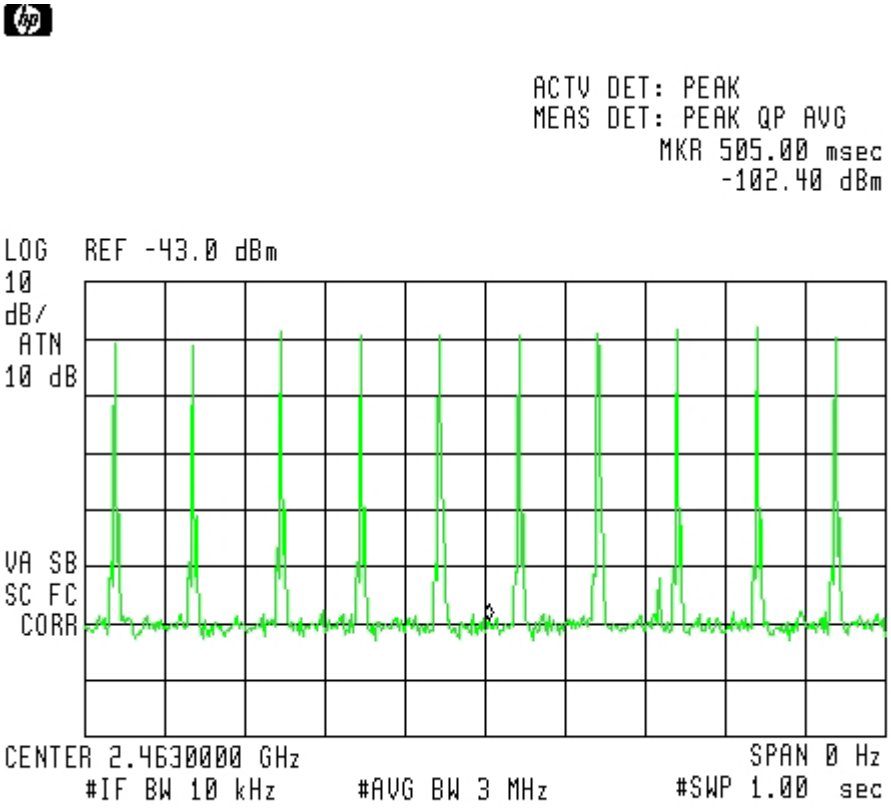

Figure 19 — Number of channels in 1 sec. =11

[31.6 x 11 = 347.6, 347.6 x 0.9 msec = 0.312sec , spec=0.4 sec]

8.4 Test Equipment Used.

EMI Receiver	HP	85422E	3906A00276	December 12, 2012	1 year
RF Section	HP	85420E	3705A00248	December 12, 2012	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 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	LaserJet 2200	JPKGC19982	N/A	N/A

9. 26 dB Bandwidth

9.1 Test procedure

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

9.2 Test procedure

The E.U.T. was set to the applicable test frequency. The spectrum analyzer was set to 100 kHz resolution BW. The spectrum bandwidth of the E.U.T. at the point of 26 dB below maximum peak power was measured and recorded.

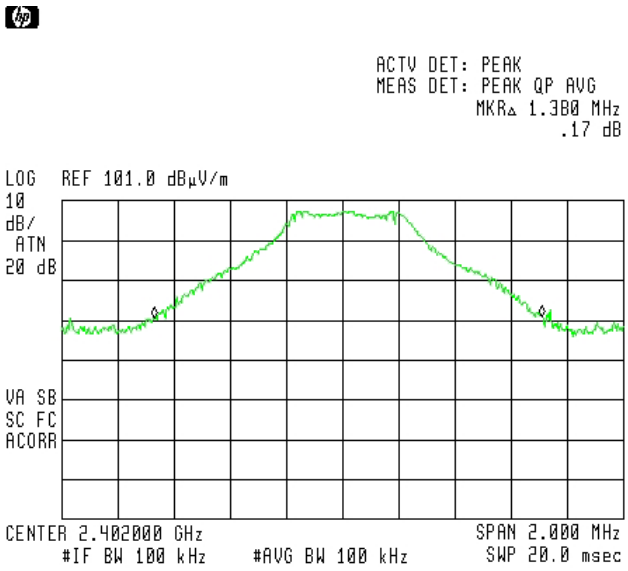

Figure 20 — 2402.0 MHz

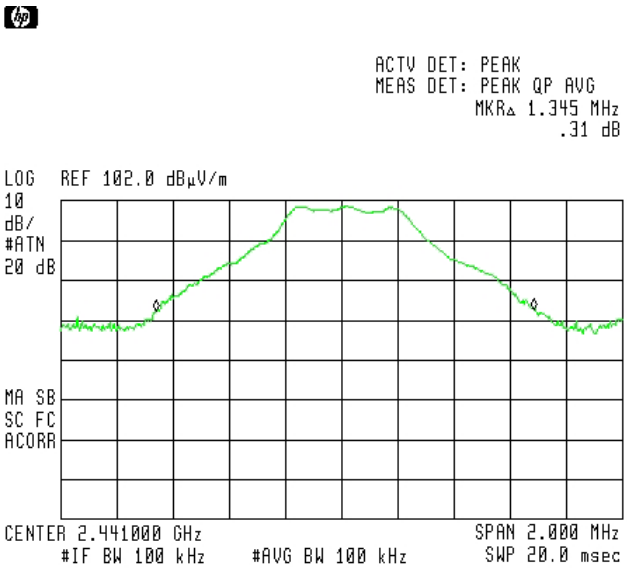

Figure 21 — 2441.0 MHz

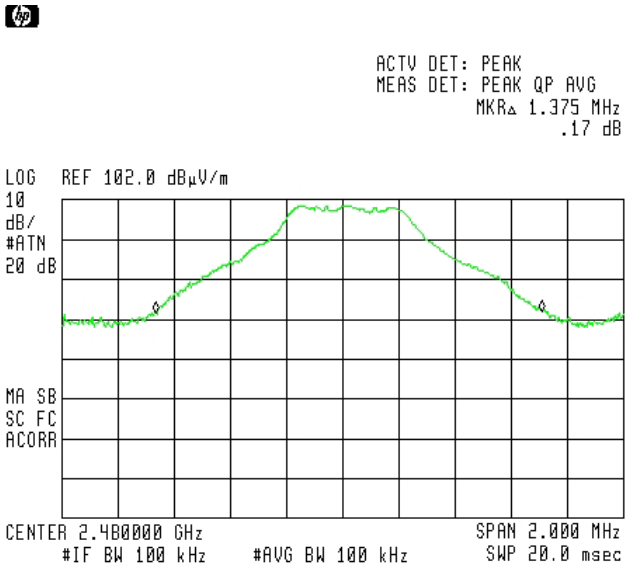

Figure 22 — 2480.0 MHz

9.3 Test Results

E.U.T Description: Bluetooth Adapter for iPod/iPhone
Model No.: iSmartStep SSM2011
Serial Number: Not Designated
Specification: FCC Part 15, Subpart C (15.247-a2)

Operation Frequency (MHz)	Reading (MHz)
2402	1.380
2441	1.345
2480	1.375

Figure 23 26 dB Bandwidth

TEST PERSONNEL:
Tester Signature: _____ Date: 08.02.12

Typed/Printed Name: I. Siboni

9.4 Test Equipment Used.

EMI Receiver	HP	85422E	3906A00276	December 12, 2012	1 year
RF Section	HP	85420E	3705A00248	December 12, 2012	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 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	LaserJet 2200	JPKGC19982	N/A	N/A

10. Band Edge

[In Accordance with section 15.247(d)]

10.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.
The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 1, and its proper operation was checked.

The EMI receiver was adjusted to the transmission channel at the maximum radiated level. The display line was set to 20 dBc and the EMI receiver was set to the band edge frequencies.
Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2410 MHz, and 2475 MHz correspondingly.

The E.U.T. was tested in 2 operating channels and frequencies
(1 (2.410 GHz); 14 (2.475 GHz)).

The E.U.T. was tested at 2410 and 2475 MHz with QPSK modulation.

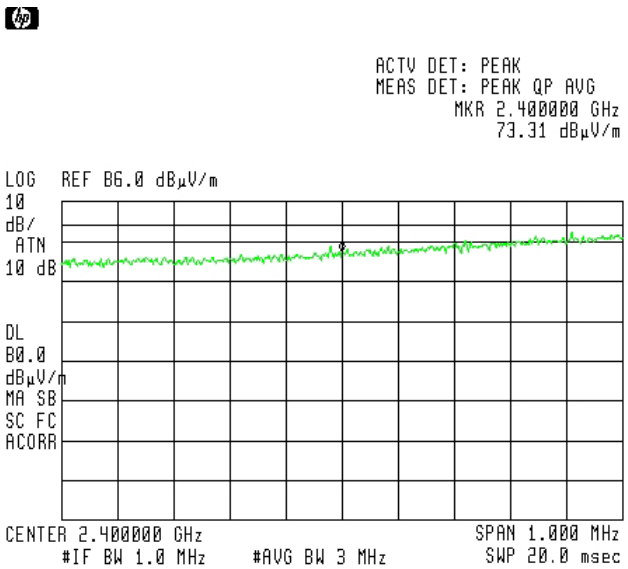

Figure 24 — 2402 MHz

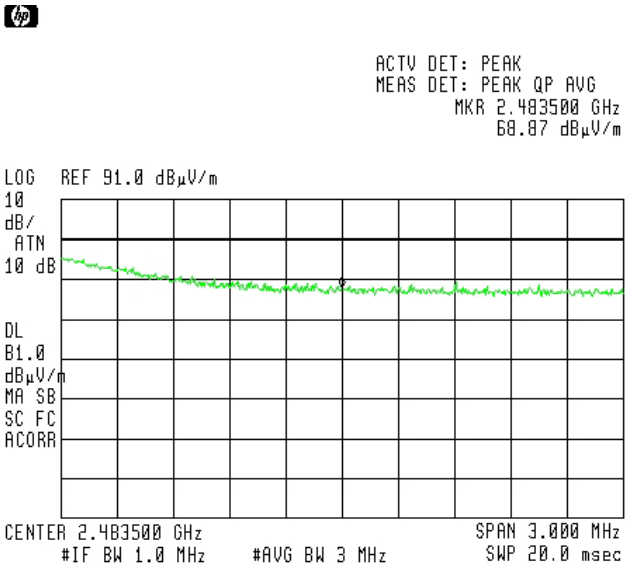

Figure 25 — 2483.5 MHz

10.2 Test Results

E.U.T. Description: Bluetooth Adapter for iPod/iPhone
Model No.: iSmartStep SSM2011
Serial Number: Not Designated
Specification: F.C.C. Part 15, Subpart C (15.247 (d))

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBuV/m)	Specification (dBuV/m)	Margin (dB)
2402	2400.0	73.31	80.0	-6.69
2480	2483.5	68.87	81.0	-12.13

Figure 26 Band Edge

JUDGEMENT: Passed by 12.13 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 08.02.12

Typed/Printed Name: I. Siboni

10.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	December 12, 2011	1 year
RF Section	HP	85420E	3705A00248	December 12, 2011	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	LaserJet 2200	JPKGC19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 27, 2011	2 years

Figure 27 Test Equipment Used

11. Radiated Emission, 9 kHz – 30 MHz

11.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

11.2 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. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

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 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was operated at the frequency of 2402, 2441 and 2480 MHz. These frequency were measured using a peak detector.

11.3 Test Results

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The results for all three operating frequencies were the same.

No signals were detected in the frequency range of 9 kHz – 30 MHz.

TEST PERSONNEL:

Tester Signature: _____ Date: 08.02.12

Typed/Printed Name: I. Siboni

11.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	December 12, 2011	1 year
RF Section	HP	85420E	3705A00248	December 12, 2011	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2011	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	LaserJet 2200	JPKGC19982	N/A	N/A

11.5 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 [dBμv/m]
RA: Receiver Amplitude [dBμv]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dBμV (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dBμV

No external pre-amplifiers are used.

12. Spurious Radiated Emission 30 – 25000 MHz

12.1 Test Specification

30 MHz- 25000 MHz, F.C.C., Part 15, Subpart C

12.2 Test Procedure

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

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

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..

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

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.
In the frequency range 2.9-25.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.
The test distance was 3 meters.
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 tested in three operating frequencies 2402, 2445, and 2480 MHz.

12.3 Test Results

JUDGEMENT: Passed by 6.8 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

In the frequency range of 30 MHz -1000 MHz, no signals were detected for all three operating frequencies.

For the operating frequency of 2402 MHz, the margin between the emission level and the specification limit is 9.5 in the worst case at the frequency of 2390.00 MHz, vertical polarization.

For the operating frequency of 2441 MHz, the margin between the emission level and the specification limit is 10.7 in the worst case at the frequency of 4882.00 MHz, vertical polarization.

For the operating frequency of 2480 MHz, the margin between the emission level and the specification limit is 6.8 in the worst case at the frequency of 2483.5 MHz, vertical polarization.

TEST PERSONNEL:

Tester Signature: _____ Date: 08.02.12

Typed/Printed Name: I. Siboni

Radiated Emission

E.U.T Description	Bluetooth Adapter for iPod/iPhone
Type	iSmartStep SSM2011
Serial Number:	Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Peak

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dBµV/m)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2402	2390.0	H	57.5	74.0	-16.5
2402	2390.0	V	57.5	74.0	-16.5
2402	4804.0	H	59.3	74.0	-14.7
2402	4804.0	V	63.0	74.0	-11.0
2441	4882.0	H	59.3	74.0	-14.7
2441	4882.0	V	60.5	74.0	-13.5
2480	2483.5	H	60.5	74.0	-13.5
2480	2483.5	V	61.3	74.0	-12.7
2480	4960.0	H	62.2	74.0	-11.8
2480	4960.0	V	66.0	74.0	-8.0

Figure 28. Radiated Emission. Antenna Polarization: HORIZONTAL / 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 Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Radiated Emission

E.U.T Description Bluetooth Adapter for iPod/iPhone
Type iSmartStep SSM2011
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Average

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Average Reading (dBµV/m)	Avg. Specification (dB µV/m)	Avg. Margin (dB)
2402	2390.0	H	44.4	54.0	-9.6
2402	2390.0	V	44.5	54.0	-9.5
2402	4804.0	H	42.8	54.0	-11.2
2402	4804.0	V	44.3	54.0	-9.7
2441	4882.0	H	42.3	54.0	-11.7
2441	4882.0	V	43.3	54.0	-10.7
2480	2483.5	H	46.1	54.0	-7.9
2480	2483.5	V	47.2	54.0	-6.8
2480	4960.0	H	43.6	54.0	-10.4
2480	4960.0	V	45.7	54.0	-8.3

Figure 29. Radiated Emission. Antenna Polarization: HORIZONTAL / 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 Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

12.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	December 12, 2011	1Year
RF Filter Section	HP	85420E	3705A00248	December 12, 2011	1Year
Antenna Biconical	ARA	BCD 235/B	1041	November 12, 2011	1Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 Years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 14, 2010	2 Years
Horn Antenna	ARA	SWH-28	1008	January 26, 2011	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2011	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 23, 2011	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	January 11, 2012	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	LaserJet 2200	JPKGC19982	N/A	N/A

12.5 Field Strength Calculation 30 – 1000 MHz

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

$$[dB\mu v/m]\ FS = RA + AF + CF$$

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

Example: FS = 30.7 dBμV (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dBμV

No external pre-amplifiers are used.

13. Radiated Power Spectral Density

[In accordance with section 15.247(d)]

13.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.
The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 1, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The E.U.T. was tested in three operating channels and frequencies
(1 (2.402 GHz); 8 (2.441 GHz); 14 (2.480 GHz)).

Then the EMI receiver was set to 3 kHz resolution BW, span of 300.0 kHz, and sweep time of 100 seconds. The spectrum peaks were located at each of the 3 operating frequencies.

Radiated peak output power levels were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

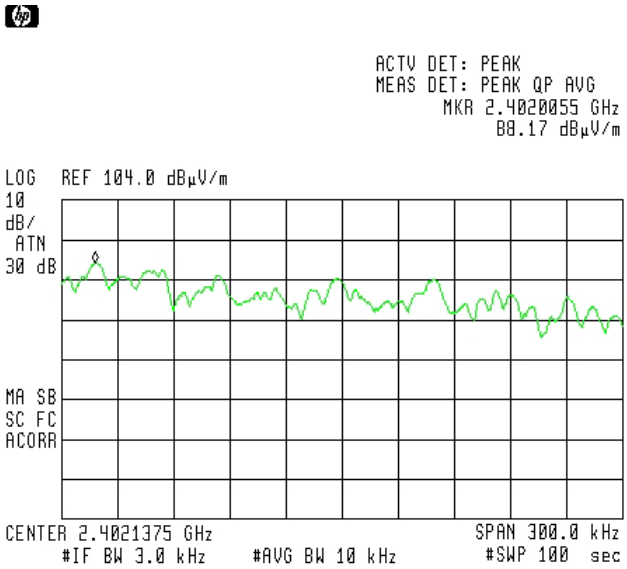

Figure 30 — 2402 MHz

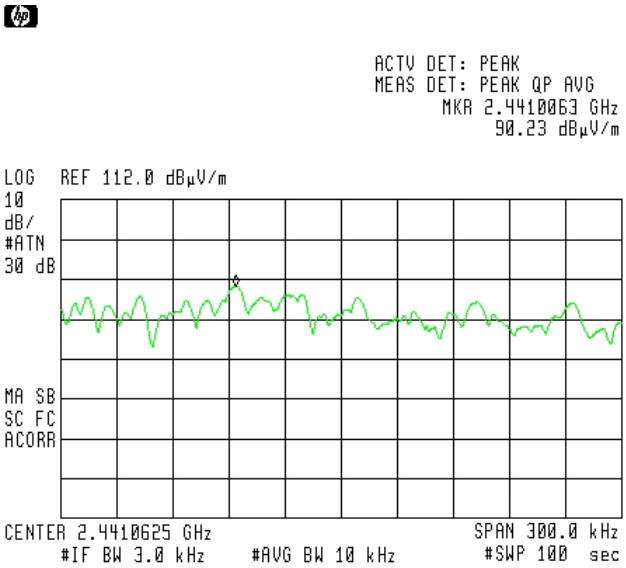

Figure 31 — 2441 MHz

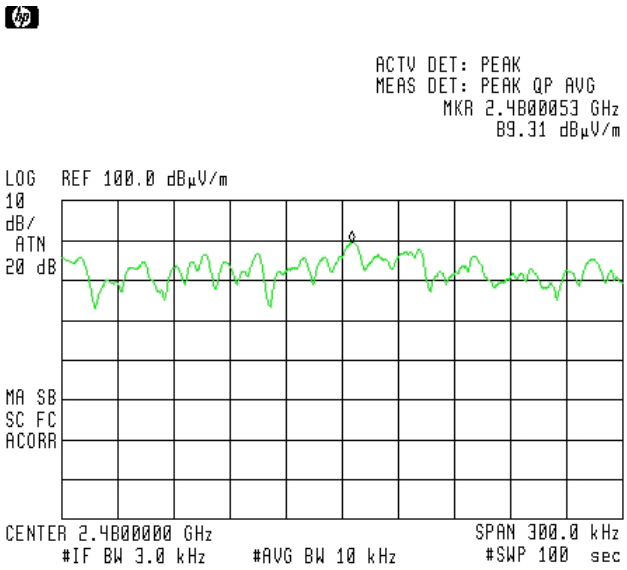

Figure 32 — 2480 MHz

13.2 Test Results

E.U.T. Description: Bluetooth Adapter for iPod/iPhone
Model No.: iSmartStep SSM2011
Serial Number: Not Designated
Specification: F.C.C. Part 15, Subpart C (15.247(d))

Operation Frequency (MHz)	Antenna Polarization	Spectral Density Result (dBm)	Specification (dBm)	Margin (dB)
2402	V	-5.68	8.0	-13.68
2440	V	-5.68	8.0	-13.68
2480	V	-5.68	8.0	-13.68

Figure 33 Test Results

JUDGEMENT: Passed by 13.68 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 08.02.12

Typed/Printed Name: I. Siboni

13.3 Test Equipment Used.

Transmitted Power Density

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	December 12, 2011	1 year
RF Section	HP	85420E	3705A00248	December 12, 2011	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 years
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	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 34 Test Equipment Used

14. Antenna Gain/Information

The antenna gain is 0 dBi.

15. R.F Exposure/Safety

Typical use of the E.U.T. is attached to an iPod or iPhone. The typical distance between the E.U.T. and the user in the worst case application, is 1 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 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

P_t- Transmitted Power 5.07 mw (Peak)

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

G_T- Antenna Gain, 0 dBi = 1 numeric

R- Distance from Transmitter using 1 cm worst case

(c) The peak power density is :

$$S_p = \frac{5.07 \times 1}{4\pi (1)^2} = 0.403 \frac{mW}{cm^2}$$

(d) This is below the FCC limit.

16. APPENDIX B - CORRECTION FACTORS

16.1 Correction factors for CABLE

**from EMI receiver
to test antenna
at 3 meter range.**

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
90.0	1.6
100.0	1.7
150.0	2.0
200.0	2.3
250.0	2.7
300.0	3.1
350.0	3.4
400.0	3.7
450.0	4.0
500.0	4.3
600.0	4.7
700.0	5.3
800.0	5.9
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

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".

16.2 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.

16.3 Correction factors for CABLE

**from spectrum analyzer
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.

12.6 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	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.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".*

16.4 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".*

16.5 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".

16.6 Correction factors for Double-Ridged Waveguide Horn

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

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
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			

16.7 Correction factors for ***Horn Antenna***

Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
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

16.8 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