

**DATE: 20 September 2010**

**I.T.L. (PRODUCT TESTING) LTD.**  
**FCC Radio Test Report**  
for  
**Maytronics Ltd.**

**Equipment under test:**

**HG Power Supply for Dolphin Supreme M5**

**Dynamic DC**

Written by:



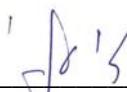
D. Shidowsky, Documentation

Approved by:



A. Sharabi, Test Engineer

Approved by:



I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

## Measurement/Technical Report for Maytronics Ltd.

### HG Power Supply for Dolphin Supreme M5

Dynamic DC

**FCC ID: WCH9995671-5**

This report concerns:                      Original Grant:              X

Class I Change:

Class II Change:

Equipment type:                      Digital Transmission System

Limits used:  
47CFR15 Section 15.247

Measurement procedure used is ANSI C63.4-2003.

Application for Certification  
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## 1. General Information

### 1.1 Administrative Information

Manufacturer: Maytronics Ltd.

Manufacturer's Address: Kibbutz Yizrael  
D.N. Emek Yizrael 19350  
Israel  
Tel: +972-4-659-8111  
Fax: +972-4-652-2485

Manufacturer's Representative: Yair Hadari

Equipment Under Test (E.U.T): HG Power Supply for Dolphin Supreme M5

Equipment Model No.: Dynamic DC

Equipment Serial No.: H34090357

Date of Receipt of E.U.T: 26.01.10

Start of Test: 26.01.10

End of Test: 29.01.10

Test Laboratory Location: I.T.L (Product Testing) Ltd.  
Kfar Bin Nun,  
ISRAEL 99780

Test Specifications: FCC Part 15 Subpart 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.
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 E.U.T. is a universal power supply operating between 100-250V for the Dolphin Supreme M5 pool cleaner.

### **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 conducted and 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 03, 2009).

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

### **1.6 Measurement Uncertainty**

#### **Conducted Emission**

The uncertainty for this test is  $\pm 2$  dB.

#### **Radiated Emission**

The Open Site complies with the  $\pm 4$  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. System Test Configuration

### 2.1 ***Justification***

The E.U.T. was placed in its normal operating position.

### 2.2 ***EUT Exercise Software***

pws\_9991260\_2010.hex software was used.

### 2.3 ***Special Accessories***

No special accessories were needed to achieve compliance.

### 2.4 ***Equipment Modifications***

Two 2.2nF capacitors, P/N H22\*14\*8(DN85H), manufactured by DMEGC were added on locations L01 and L01A.

### 2.5 ***Configuration of Tested System***

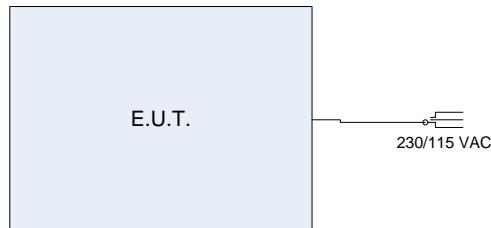


Figure 1. Configuration of Tested System

### 3. Test Setup Photographs



**Figure 2. Conducted Emission Test**



**Figure 3. Radiated Emission Test**

## 4. Conducted Emission Data

### 4.1 **Test Specification**

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

### 4.2 **Test Procedure**

The E.U.T operation mode and test set-up are as described in Section 3. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50  $\mu$ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

### 4.3 **Measured Data**

JUDGEMENT: Passed by 25.3 dB

The margin between the emission levels and the specification limit is, in the worst case, 25.3 dB for the phase line at 0.39 MHz and 26.4 dB at 0.36 MHz for the neutral line.

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

The details of the highest emissions are given in *Figure 4* to *Figure 7*.

TEST PERSONNEL:

Tester Signature:  Date: 07.11.10

Typed/Printed Name: A. Sharabi

## Conducted Emission

E.U.T Description: HG Power Supply for Dolphin Supreme M5  
 Type: Dynamic DC  
 Serial Number: H34090357

Specification: F.C.C., Part 15, Subpart C

Lead: Phase

Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.191926	46.5	37.2	-26.8	3.3	-50.6	0.0
2	0.247225	38.2	30.3	-31.5	7.0	-44.9	0.0
3	0.394747	36.7	32.7	-25.3	21.8	-26.2	0.0
4	0.628446	32.3	29.3	-26.7	14.1	-31.9	0.0
5	0.883405	29.9	24.9	-31.1	6.0	-40.0	0.0
6	1.847839	23.1	18.6	-37.4	-1.5	-47.5	0.0

**Figure 4. Detectors: Peak, Quasi-peak, AVERAGE .**

*Note: QP Delta/Av Delta refer 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.*

## Conducted Emission

E.U.T Description      HG Power Supply for Dolphin Supreme M5  
 Type                      Dynamic DC  
 Serial Number:           H34090357

Specification:      F.C.C., Part 15, Subpart C

Lead:                      Phase

Detectors:              Peak, Quasi-peak, Average

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ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 190 kHz  
 35.71 dB $\mu$ V

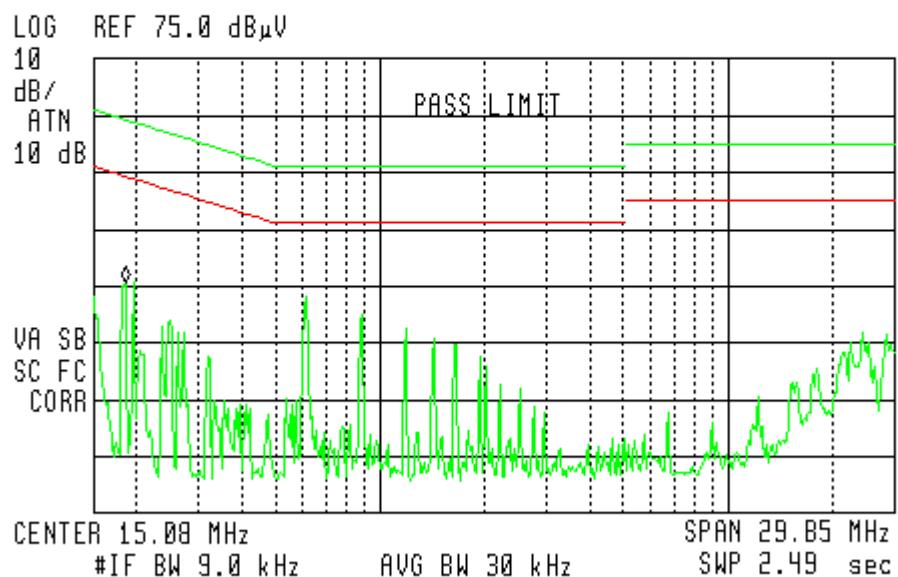


Figure 5. Detectors: Peak, Quasi-peak, Average

## Conducted Emission

E.U.T Description: HG Power Supply for Dolphin Supreme M5  
 Type: Dynamic DC  
 Serial Number: H34090357

Specification: F.C.C., Part 15, Subpart C

Lead: Neutral

Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.184321	45.8	33.8	-30.6	-1.5	-55.8	0.0
2	0.244263	39.2	31.0	-31.0	5.9	-46.1	0.0
3	0.360790	36.6	32.4	-26.4	21.1	-27.6	0.0
4	0.634878	29.6	25.7	-30.3	10.4	-35.6	0.0
5	0.894712	25.2	20.0	-36.0	2.4	-43.6	0.0
6	1.377964	21.2	13.9	-42.0	-3.8	-49.8	0.0

**Figure 6. Detectors: Peak, Quasi-peak, AVERAGE**

*Note: QP Delta/Avg Delta refer 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.*

## Conducted Emission

E.U.T Description: HG Power Supply for Dolphin Supreme M5  
 Type: Dynamic DC  
 Serial Number: H34090357

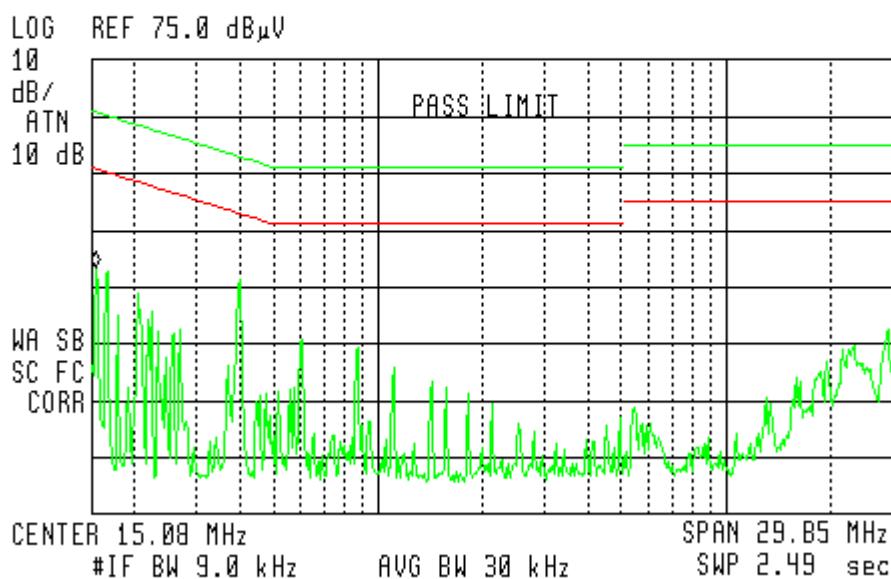
Specification: F.C.C., Part 15, Subpart C

Lead: Neutral

Detectors: Peak, Quasi-peak, Average

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ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 150 kHz  
 38.25 dB $\mu$ V



**Figure 7 Conducted Emission: NEUTRAL**  
**Detectors: Peak, Quasi-peak, Average**

#### 4.4 **Test Instrumentation Used, Conducted Measurement**

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 3, 2009	1 Year
LISN	Fischer	FCC-LISN-2A	128	March 3, 2009	1 Year
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 Year
RF Filter Section	HP	85420E	3705A00248	November 10, 2009	1 Year
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

## 5. 6dB Minimum Bandwidth

### 5.1 Test Specification

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

### 5.2 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 1.0 MHz IF 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. The E.U.T. was tested at 2433 MHz.

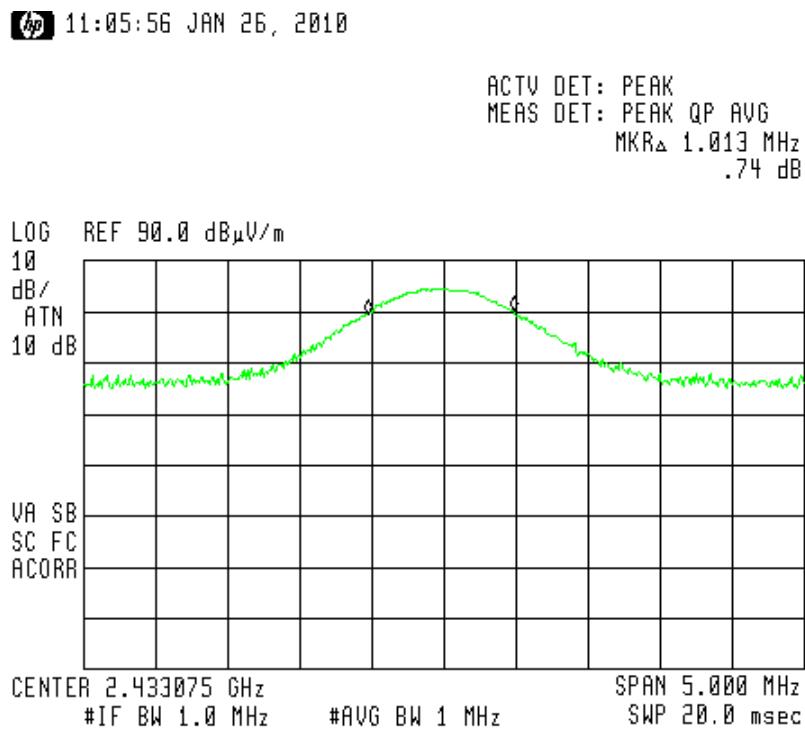


Figure 8. 2433 MHz

### 5.3 Test Results

E.U.T Description: HG Power Supply for Dolphin Supreme M5

Model: Dynamic DC

Serial Number: H34090357

Operation Frequency (MHz)	Bandwidth Reading (MHz)	Specification (MHz)
2433.075	1.013	>0.5

**Figure 9 Test Results**

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature:  Date: 07.11.10

Typed/Printed Name: A. Sharabi

#### 5.4 **Test Equipment Used.**

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	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 10 Test Equipment Used**

## 6. Radiated Power Output

### 6.1 ***Test Specification***

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

### 6.2 ***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  
2433 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:

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

11:19:20 JAN 26, 2010

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.433063 GHz  
96.11 dB $\mu$ V/m

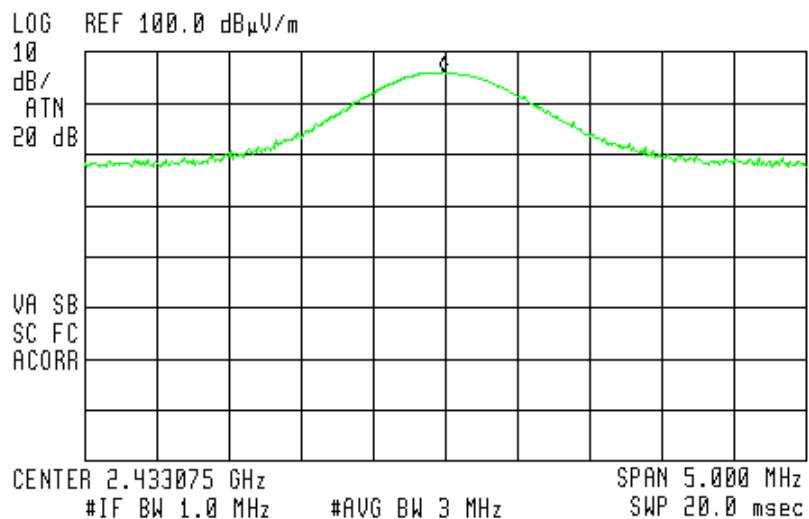


Figure 11 2433 MHz

### 6.3 Results Calculation

E.U.T. Description: HG Power Supply for Dolphin Supreme M5

Model No.: Dynamic DC

Serial Number: H34090357

Specification: F.C.C. Part 15, Subpart C

Frequency	E	E	Antenna Gain	Antenna Distance	Calculated Results	Limit	Margin
(MHz)	(dB $\mu$ V/m)	(V/m)	(dBi)	(m)	(mW)	(W)	(mW)
2433.00	96.11	0.06	1	3	1.08	1.0	-998.92

Figure 12 Test Results Table

JUDGEMENT: Passed by 998.92 mW

TEST PERSONNEL:

Tester Signature: A. Sharabi

Date: 07.11.10

Typed/Printed Name: A. Sharabi

#### 6.4 **Test Equipment Used.**

Radiated Maximum Power Output

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	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 13 Test Equipment Used**

## 7. Band Edge

[In Accordance with section 15.247(d)]

### 7.1 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 2433 MHz.

The E.U.T. was tested in 1 operating channel at the operating frequency of 2433 MHz.

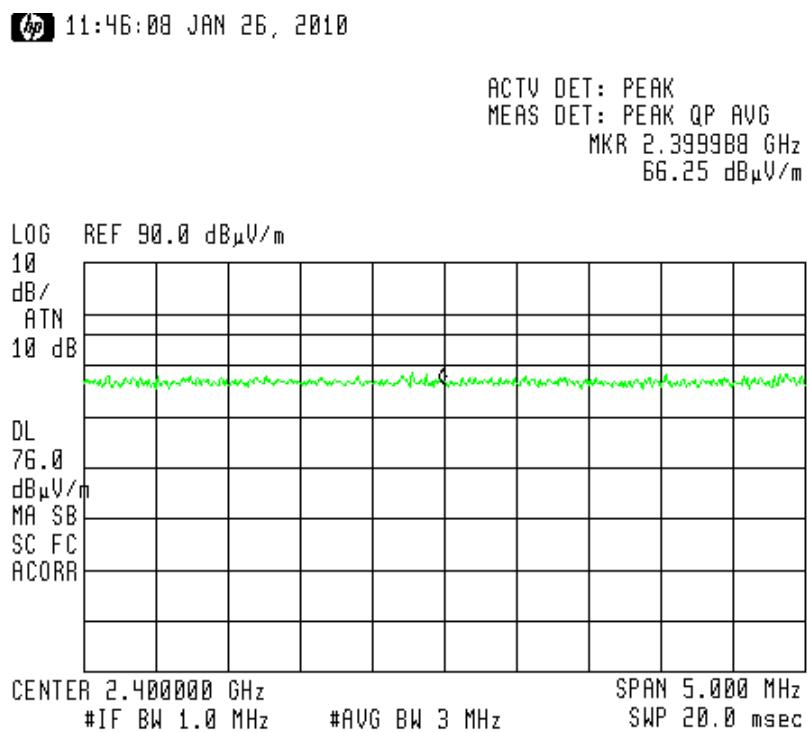
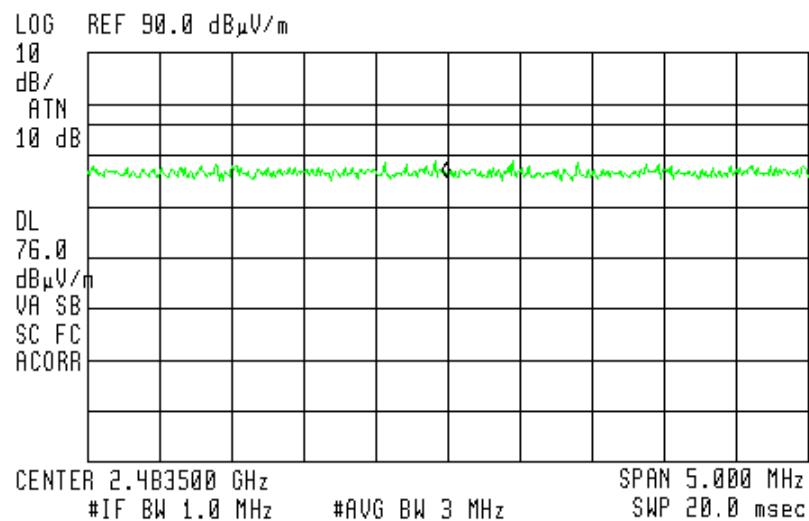


Figure 14 — 2433 MHz

11:47:10 JAN 26, 2010

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.483488 GHz  
65.65 dB $\mu$ V/m



**Figure 15 — 2433 MHz**

## 7.2 Results table

E.U.T. Description: HG Power Supply for Dolphin Supreme M5

Model No.: Dynamic DC

Serial Number: H34090357

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)
2433	2399.988	66.25	76.0	-9.75
2433	2483.488	65.65	76.0	-10.35

**Figure 16 Band Edge**

JUDGEMENT: Passed by 9.8 dB

TEST PERSONNEL:

Tester Signature:  Date: 07.11.10

Typed/Printed Name: A. Sharabi

### 7.3 **Test Equipment Used.**

Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	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 17 Test Equipment Used**

## 8. Radiated Emission, 9 kHz – 30 MHz

### 8.1 Test Specification

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

### 8.2 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 tested in 1 operating channels and operation frequency of 2433 MHz. This frequency was measured using a peak detector.

### 8.3 Measured Data

JUDGEMENT: Passed

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

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

TEST PERSONNEL:

Tester Signature: 

Date: 07.11.10

Typed/Printed Name: A. Sharabi

#### 8.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2009	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

#### 8.5 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 $\mu$ V/m]  
 RA: Receiver Amplitude [dB $\mu$ V]  
 AF: Receiving Antenna Correction Factor [dB/m]  
 CF: Cable Attenuation Factor [dB]

Example:  $FS = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.

## 9. Spurious Radiated Emission 30 – 25000 MHz

### 9.1 ***Test Specification***

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

### 9.2 ***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-25000 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 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.)

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.

The E.U.T. was tested in 1 operating channel and operation frequency of 2433 MHz.

### 9.3 **Test Data**

JUDGEMENT: Passed by 0.5 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification. The results for all three operation channels were the same.

The signals in the band 30 MHz – 1.0 GHz were below the spectrum analyzer noise level, at least 20 dB below the specification limit.

The margin between the emission level and the specification limit is 0.5 dB in the worst case at the frequency of 2433.00 MHz, horizontal polarization.

TEST PERSONNEL:

Tester Signature:  Date: 07.11.10

Typed/Printed Name: A. Sharabi

## Radiated Emission Above 1 GHz

E.U.T Description      HG Power Supply for Dolphin Supreme  
 M5

Type                      Dynamic DC

Serial Number:      H34090357

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

<b>Operation Frequency</b> (MHz)	<b>Freq.</b> (MHz)	<b>Polarity</b> (H/V)	<b>Peak Reading*</b> (dB $\mu$ V/m)	<b>Peak Specification</b> (dB $\mu$ V/m)	<b>Peak Margin</b> (dB)
2433.00	4866.00	H	73.5	74.0	-0.5
2433.00	4866.00	V	67.0	74.0	-7.0

**Figure 18. 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 Reading” includes correction factor.

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

## Radiated Emission Above 1 GHz

E.U.T Description: HG Power Supply for Dolphin Supreme  
 M5  
 Type: Dynamic DC  
 Serial Number: H34090357

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

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Average Reading* (dB $\mu$ V/m)	Average Specification (dB $\mu$ V/m)	Average Margin (dB)
2433.00	4866.00	H	53.3	54.0	-0.7
2433.00	4866.00	V	50.2	54.0	-3.8

**Figure 19. 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 Reading” includes correction factor.

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

#### 9.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 Year
RF Filter Section	HP	85420E	3705A00248	November 10, 2009	1 Year
Antenna Biconical	ARA	BCD 235/B	1041	March 25, 2009	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 6, 2009	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	2 Years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 Years
Horn Antenna	ARA	SWH-28	1008	December 23, 2008	2 Years
Horn Antenna	Narda	V637	0410	December 23, 2008	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	January 13, 2010	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 13, 2010	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	January 11, 2010	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

## 9.5 **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:

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

FS: Field Strength [dB $\mu$ v/m]

RA: Receiver Amplitude [dB $\mu$ v]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dB $\mu$ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB $\mu$ V

No external pre-amplifiers are used.

## 10. Radiated Power Spectral Density

[In accordance with section 15.247(e)]

### 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 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 1 operating channel and operation frequency of 2433 MHz.

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:

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

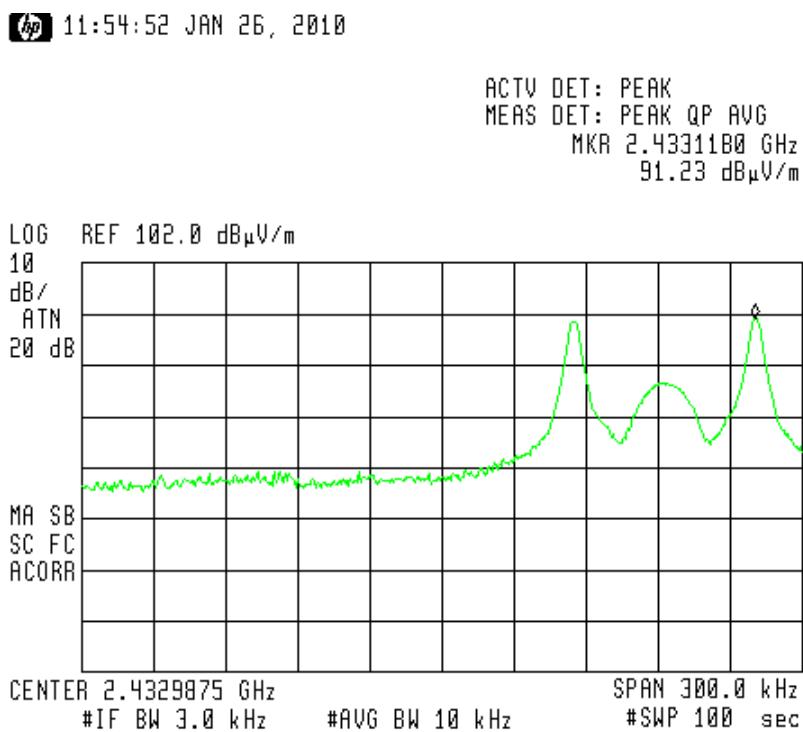


Figure 20 — 2433 MHz

## 10.2 Results table

E.U.T. Description: HG Power Supply for Dolphin Supreme M5

Model No.: Dynamic DC

Serial Number: H34090357

Specification: F.C.C. Part 15, Subpart C (15.247(e))

Frequency	E	Spectral Density Result	Antenna Gain	Antenna Distance	Calculated Results	Spec.	Margin
(MHz)	(db $\mu$ V/m)	(V/m)	(dBi)	(m)	(mW)	(mW)	(mW)
2433	91.23	0.04	1	3	0.48	6.3	-5.82

**Figure 21 Test Results**

JUDGEMENT: Passed by 5.82 mW

TEST PERSONNEL:

Tester Signature: 

Date: 07.11.10

Typed/Printed Name: A. Sharabi

### 10.3 Test Equipment Used.

Transmitted Power Density

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	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 22 Test Equipment Used**

## 11. Antenna Gain/Information

The antenna gain is 1 dBi simulated.

## 12. R.F Exposure/Safety

The E.U.T. is a handheld remote control.

### Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 2433 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

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

$P_t G_t$  - Transmitted Power + Antenna Gain = 1.08 mw (Peak)

R- Distance from Transmitter using 0.05 m worst case

(c) The peak power density is :

$$S_p = \frac{1.08}{4\pi(0.05)^2} = 0.343 \frac{mW}{cm^2}$$

(f) This is below the FCC limit.

## 13. APPENDIX B - CORRECTION FACTORS

### 13.1 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	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
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		

#### 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".

### 13.2 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.

### 13.3 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**

<b>FREQUENCY</b> (MHz)	<b>AFE</b> (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**

<b>FREQUENCY</b> (MHz)	<b>AFE</b> (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 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".

**13.4 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".

### 13.5 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".

**13.6 Correction factors for Double-Ridged Waveguide Horn**

**Model: 3115, S/N 29845  
at 3 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	24.8	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			

### 13.7 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

**13.8 Correction factors for**

**Horn Antenna  
Model: V637**

<b>FREQUENCY</b> (GHz)	<b>AFE</b> (dB /m)	<b>Gain</b> (dB1)
26.0	43.6	14.9
27.0	43.7	15.1
28.0	43.8	15.3
29.0	43.9	15.5
30.0	43.9	15.8
31.0	44.0	16.0
32.0	44.1	16.2
33.0	44.1	16.4
34.0	44.1	16.7
35.0	44.2	16.9
36.0	44.2	17.1
37.0	44.2	17.4
38.0	44.2	17.6
39.0	44.2	17.8
40.0	44.2	18.0

**13.9 Correction factors for ACTIVE LOOP ANTENNA**

**Model 6502**  
**S/N 9506-2950**

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (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