

**DATE: 09 June 2011**

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

**FCC Radio Test Report**

**for**

**Home Free Systems Ltd.**

**Equipment under test:**

**Universal Transmitter**

**UTX-830-2 AC**

Written by:



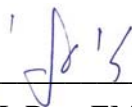
D. Shidlow, Documentation

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 Home Free Systems Ltd.

### Universal Transmitter

UTX-830-2 AC

**FCC ID: QUX-UTX-830-2**

This report concerns:                      Original Grant:                      x  
Class I change:  
Class II change:

Equipment type:                      Part 15 Security/Remote Control Transceiver

47CFR15 Section 15.231 (a-d)

Measurement procedure used is ANSI C63.4-2003.

Application for Certification:

prepared by:

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## 1. General Information

### 1.1 Administrative Information

Manufacturer:	Home Free Systems Ltd.
Manufacturer's Address:	2 Habarzel St. Tel-Aviv 61131 Israel Tel: +972-3-647-8871 Fax: +972-3-647-8872
Manufacturer's Representative:	Lev Rusman
Equipment Under Test (E.U.T):	Universal Transmitter
Equipment Model No.:	UTX-830-2 AC
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	25/05/2011
Start of Test:	25/05/2011
End of Test:	26/05/2011
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.

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 Universal Transmitter (UTX) is a small, permanently fixed transmitting device that alerts care center Staff members whenever a connected sensor is activated. The UTX830-2AC can be connected to any sensor that can open or close a dry contact. For example, it can be connected to a door status sensor (e.g., magnetic door sensor) that is located close to a monitored door or exit (e.g., monitored door is opened). The UTX830-2AC comes in two versions. One features an external power supply with a backup battery and the other is powered by battery only. The Universal Transmitter is not for use outside the monitored area.

The unit was tested operating at 433 MHz and powered from an external AC/DC power supply.

### **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 September 3, 2009).

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

### **1.6 Measurement Uncertainty**

#### **Conducted Emission**

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) 0.15 – 30 MHz:

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

$\pm 3.44$  dB

#### **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):

$\pm 4.96$  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 Special Accessories

No special accessories were needed.

### 2.3 Equipment Modifications

No modifications were needed in order to achieve compliance

### 2.4 Configuration of Tested System

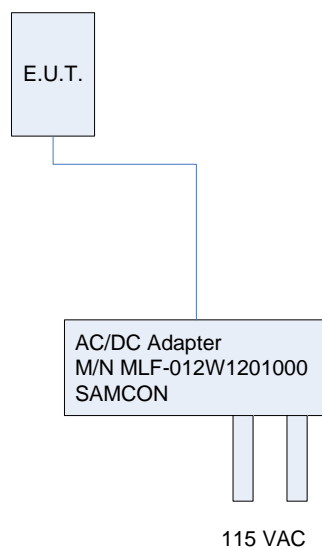


Figure 1. Configuration of Tested System



### 3. Conducted and Radiated Measurement Test Set-up Photo



Figure 2. Conducted Emission Test

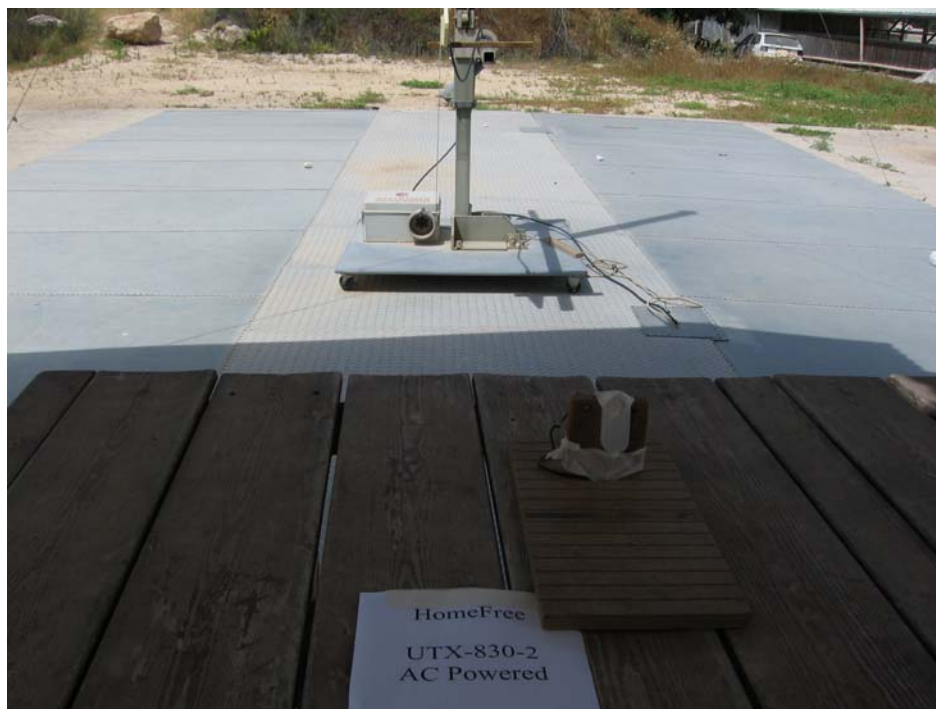


Figure 3. Radiated Emission above 1000MHz



**Figure 4. Radiated Emission Test 9kHz – 30 MHz**



**Figure 5. Radiated Emission Test 30 - 1000MHz**

## 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 3.1. 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 26.1 dB

The margin between the emission levels and the specification limit is, in the worst case, 28.2 dB for the phase line at 0.167 MHz and 26.1 dB at 0.461 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 6* to *Figure 9*.

TEST PERSONNEL:

Tester Signature: 

Date: 19.06.11

Typed/Printed Name: A. Sharabi

## Conducted Emission

E.U.T Description      Universal Transmitter  
Type                      UTX-830-2 AC  
Serial Number:        Not Designated

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	0.167618	40.3	36.9	-28.2	18.4	-36.8	0.0
2	0.194905	38.2	35.3	-28.5	17.1	-36.8	0.0
3	0.464493	33.1	25.9	-30.8	17.5	-29.1	0.0
4	2.890250	24.5	17.9	-38.1	6.2	-39.8	0.0
5	4.468500	22.7	15.4	-40.6	5.5	-40.5	0.0
6	9.493729	15.8	11.3	-48.7	-3.4	-53.4	0.0

**Figure 6. 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.*

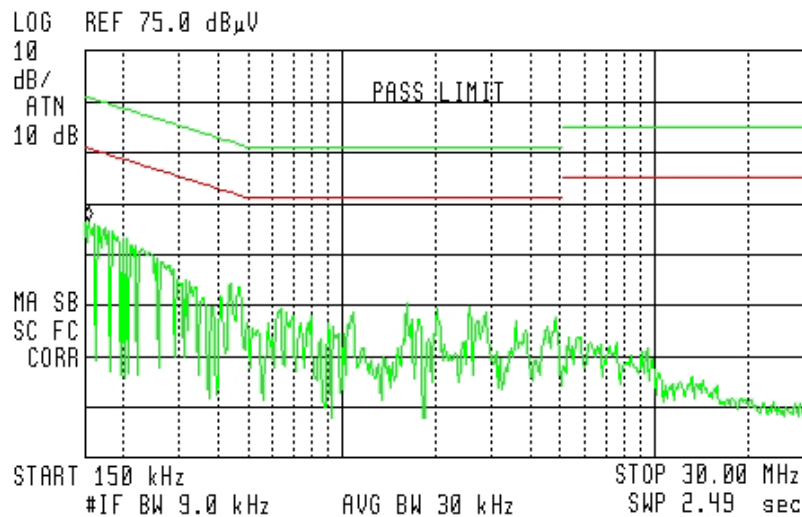
## Conducted Emission

E.U.T Description      Universal Transmitter  
 Type                      UTX-830-2 AC  
 Serial Number:        Not Designated

Specification:    F.C.C., Part 15, Subpart C  
 Lead:              Phase  
 Detectors:        Peak, Quasi-peak, Average



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



**Figure 7. Detectors: Conducted Emission: PHASE**  
**Peak, Quasi-peak, AVERAGE .**

## Conducted Emission

E.U.T Description    Universal Transmitter  
Type                    UTX-830-2 AC  
Serial Number:        Not Designated

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	0.180337	40.1	36.3	-28.2	18.4	-36.1	0.0
2	0.328788	29.5	25.9	-33.7	12.1	-37.5	0.0
3	0.461423	37.3	30.7	-26.1	17.6	-29.1	0.0
4	0.640901	29.7	22.9	-33.1	9.6	-36.4	0.0
5	2.639296	29.3	22.2	-33.8	9.6	-36.4	0.0
6	4.823215	26.3	18.5	-37.5	6.7	-39.3	0.0

**Figure 8. 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.*



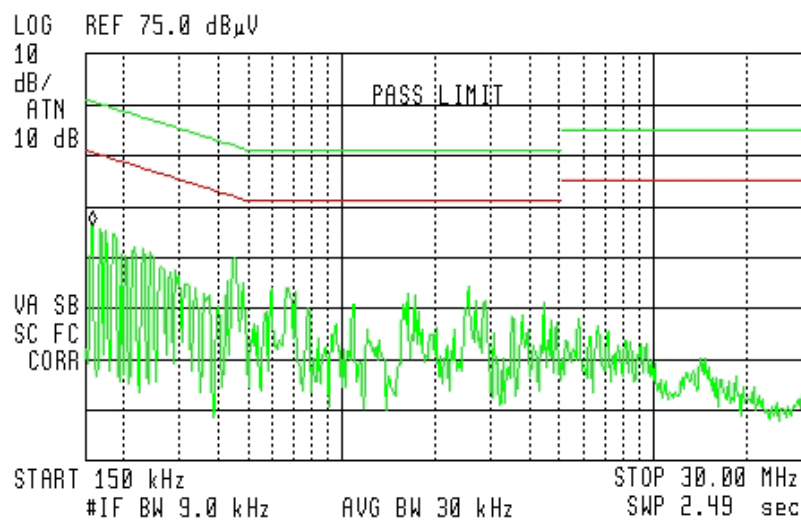
## Conducted Emission

E.U.T Description    Universal Transmitter  
Type                    UTX-830-2 AC  
Serial Number:        Not Designated

Specification:    F.C.C., Part 15, Subpart C  
Lead:                Neutral  
Detectors:        Peak, Quasi-peak, Average



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 160 kHz  
41.20 dBμV



**Figure 9. Detectors: Conducted Emission: NEUTRAL**  
**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.*

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

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Last Calibration Date</b>	<b>Period</b>
LISN	Fischer	FCC-LISN-2A	127	March 3, 2011	1 Year
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 Year
RF Filter Section	HP	85420E	3705A00248	November 24, 2010	1 Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A



## 5. Average Factor Calculation

1. Burst duration = 5.67msec
2. Time between bursts = 255msec, >100ms
3. Average Factor =  $20 \log \left[ \frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100\text{msec}} \times \text{Num of burst within 100msec} \right]$

Note Pulse duration and pulse period was considered worst case always ON sins unit transmits randomly.

$$\text{Average Factor} = 20 \log \left[ 1 \times \frac{5.67}{100} \times 1 \right] = -24.92\text{dB}$$

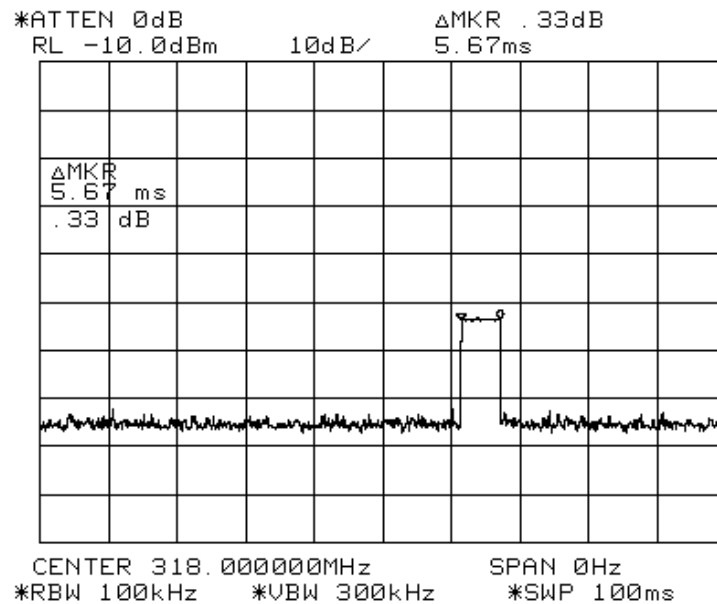
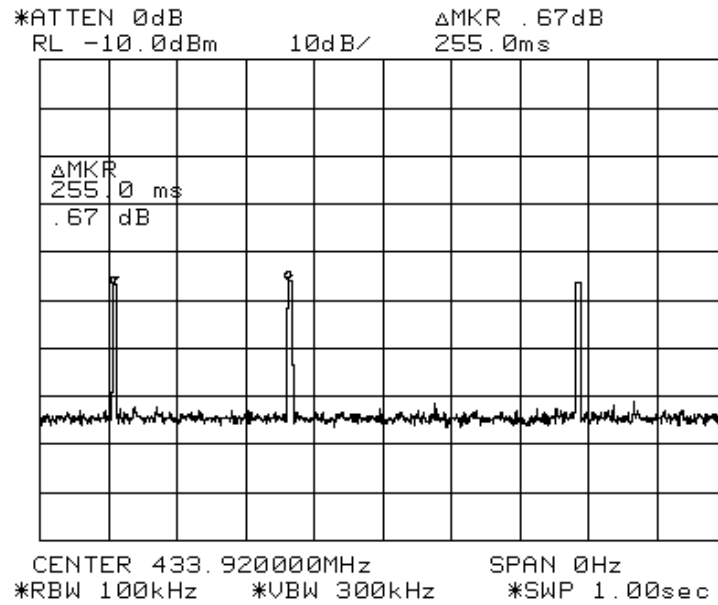


Figure 10. Transmission pulse duration



**Figure 11. Time between bursts(worst case) = 255msec , >100ms**

### 5.1 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 21, 2011	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	August 1, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 year
Antenna-Log Periodic	A.H.System	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

## 6. Periodic Operation

### 6.1 Specification

F.C.C., Part 15, Subpart C, Section 15.231(a)

### 6.2 Requirements

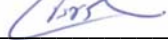
Requirement	Rationale	Verdict
Continuous transmissions are not permitted.	N/A	Complies
A manually operated transmitter shall be deactivated within not more than 5 seconds after releasing the switch.	N/A	Complies
An automatically operated transmitter shall cease operation within 5 seconds after activation.	See plots in Figure 12 to Figure 15	Complies
Periodic transmissions at regular predetermined intervals are not permitted.	N/A	Complies
Polling or supervised transmissions to determine system integrity of transmitter used in security or safety applications shall not exceed more than 2 seconds per hour.	See plots in Figure 12	Complies

### 6.3 Results

JUDGEMENT: Passed

The EUT met the FCC Part 15, Subpart C, Section 15.231(a) specification requirements.

TEST PERSONNEL:

Tester Signature: 

Date: 19.06.11

Typed/Printed Name: A. Sharabi

## Periodic Operation

E.U.T Description    Universal Transmitter  
Type                    UTX-830-2 AC  
Serial Number:        Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(a)

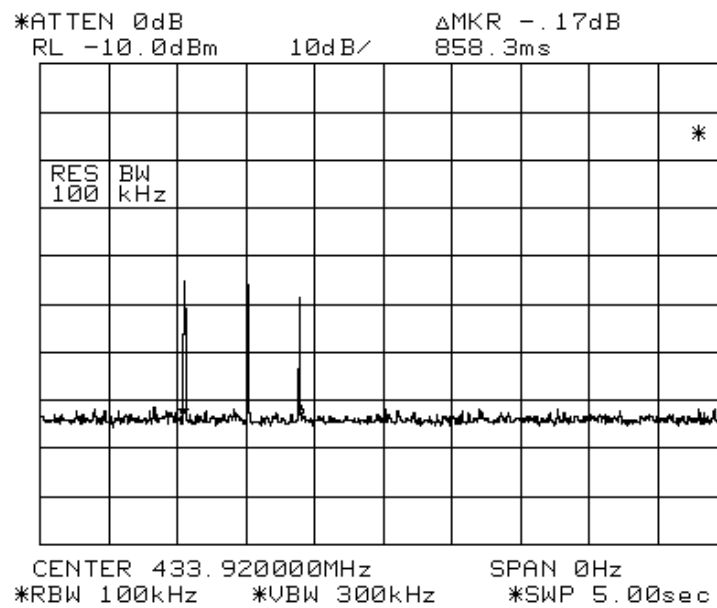


Figure 12. Automatic operated transmitter close door situation

## Periodic Operation

E.U.T Description    Universal Transmitter  
Type                    UTX-830-2 AC  
Serial Number:        Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(a)

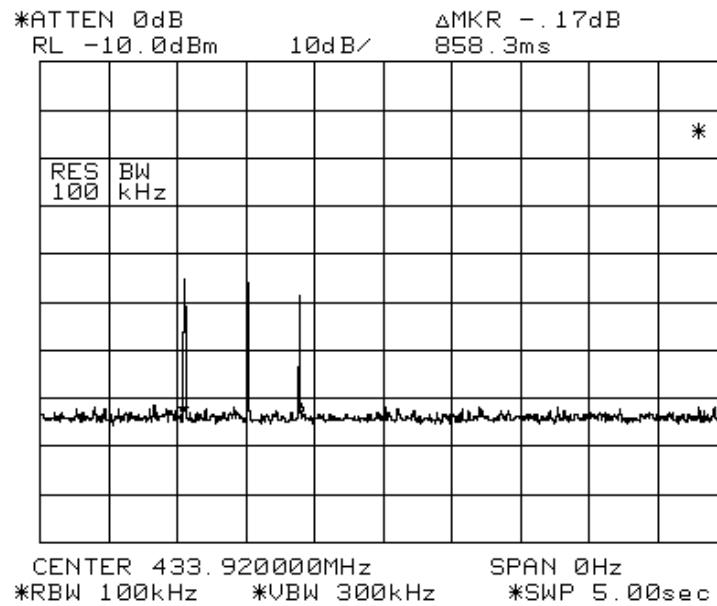


Figure 13. Automatic operated transmitter open door situation



## Periodic Operation

E.U.T Description    Universal Transmitter  
Type                    UTX-830-2 AC  
Serial Number:        Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(a)

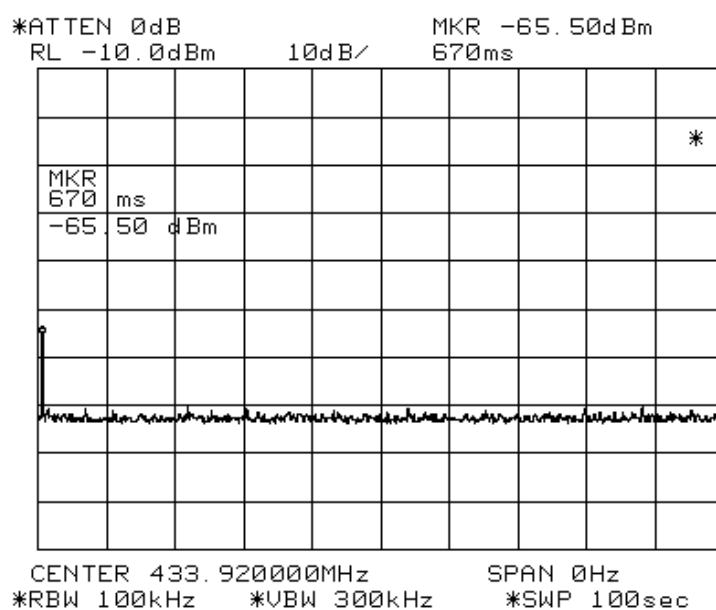


Figure 15. Supervision signal once every one hour (5.67 single burst)



#### **6.4     *Test Instrumentation Used***

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration</b>	<b>Period</b>
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 Year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year

## 7. Field Strength of Fundamental

### 7.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.231(b)

### 7.2 Test Procedure

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

The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.

The EMI receiver was set to the E.U.T. Fundamental Frequency and Peak Detection.

The turntable and antenna mast were adjusted for maximum level reading on the EMI receiver.

The measurement was performed for vertical and horizontal polarizations of the test antenna.

The average result is:

Peak Level(dB $\mu$ V/m) + E.U.T. Duty Cycle Factor, in 100msec time window (dB)

### 7.3 Measured Data

JUDGEMENT: Passed by 11.61dB

The EUT met the FCC Part 15, Subpart C, Section 15.231(b) specification requirements.

The details of the highest emissions are given in Figure 16 to Figure 18.

TEST PERSONNEL:

Tester Signature: \_\_\_\_\_

Date: 19.06.11

Typed/Printed Name: A. Sharabi

## Field Strength of Fundamental

E.U.T Description    Universal Transmitter  
Type                      UTX-830-2 AC  
Serial Number:        Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(b)

Antenna Polarization: Horizontal/Vertical

Test Distance: 3 meters

Detector: Peak

Freq. (MHz)	Pol. V/H	Peak Reading (dBμV/m)	Average Factor (dB)	AVG Result (dBμV/m)	AVG Specification (dBμV/m)	Margin (dB)
433.95	H	94.14	-24.92	69.22	80.83	-11.61
433.885	V	91.738	-24.92	66.81	80.83	-14.02

**Figure 16. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL/VERTICAL.  
Detector: Peak**

Notes:

1. 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.
2. "Peak Reading." (dBμV/m) included the "Correction Factors".
3. "Correction Factors" (dB) = Test Antenna Correction Factor(dB) + Cable Loss.
4. "Average Factor =  $20 \log [(burst\ duration/100msec)*Num\ of\ burst\ within\ 100msec]$  =  $20 \log [ (1* 5.67/100)*1]$  = -24.92
5. "Average Result" (dBμV/m)=Peak Reading (dBμV/m) + Average Factor (dB)

## Field Strength of Fundamental

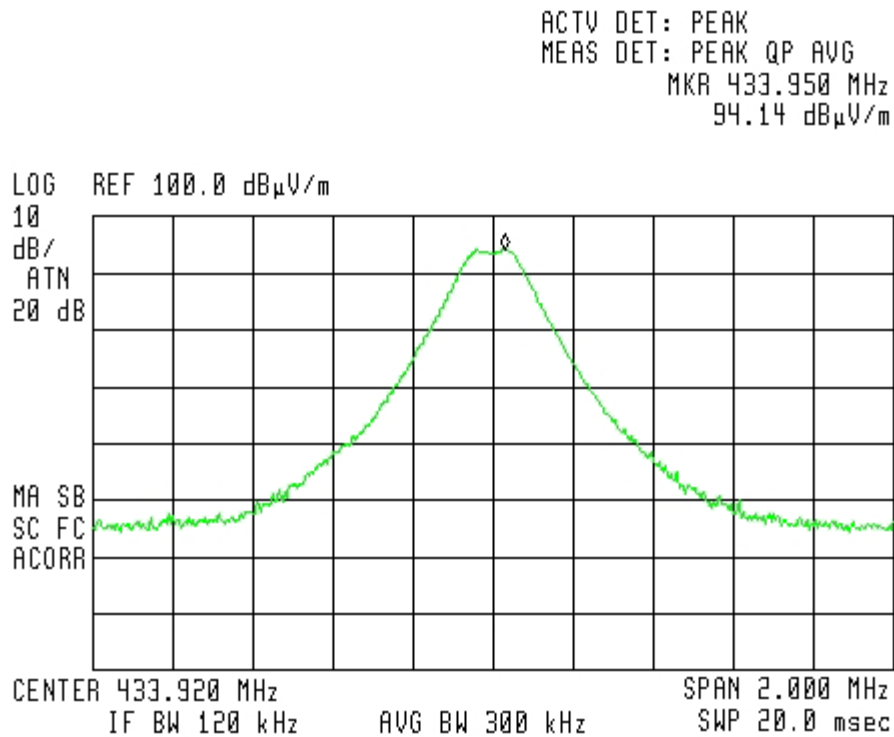
E.U.T Description Universal Transmitter  
Type UTX-830-2 AC  
Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(b)

Antenna Polarization: Horizontal

Test Distance: 3 meters

Detector: Peak



**Figure 17. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL.  
Detector: Peak**

## Field Strength of Fundamental

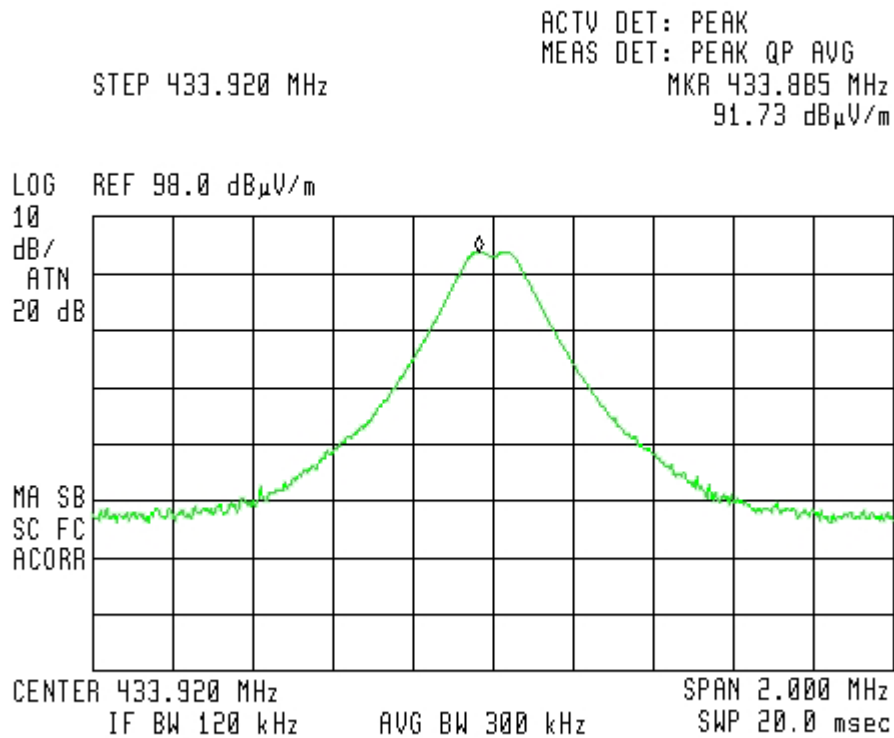
E.U.T Description Universal Transmitter  
Type UTX-830-2 AC  
Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(b)

Antenna Polarization: Vertical

Test Distance: 3 meters

Detector: Peak



**Figure 18. Field Strength of Fundamental. Antenna Polarization: VERTICAL.  
Detector: Peak**

#### **7.4 Test Instrumentation Used, Field Strength of Fundamental**

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration</b>	<b>Period</b>
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 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	JPKG19982	N/A	N/A

## 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..

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 kHz. This frequency was measured using a peak detector.

### 8.3 Measured Data

JUDGEMENT: Passed

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

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C, specification.

TEST PERSONNEL:

Tester Signature: 

Date: 19.06.11

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 24, 2010	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 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

#### 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 dB $\mu$ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB $\mu$ V

No external pre-amplifiers are used.



## 9. Radiated Emission 30 MHz -4330 MHz

### 9.1 Test Specification

30 - 4330 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 configuration tested is shown in

Figure 1.

The signals from the list of the highest emissions were verified and the list was 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 2.9 – 4.33 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 emissions were measured at a distance of 3 meters.

### 9.3 **Test Data**

JUDGEMENT: Passed by 34.95dB

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

The margin between the emission level and the specification limit was 29.15dB in the worst case at the frequency of 1301.76 MHz, vertical polarization.

TEST PERSONNEL:

Tester Signature: \_\_\_\_\_

Date: 19.06.11

Typed/Printed Name: A. Sharabi

## Radiated Emission

E.U.T Description    Universal Transmitter  
Type                    UTX-830-2 AC  
Serial Number:        Not Designated

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 30 MHz to    MHz  
Antenna: 3 meters distance                      Detectors: Peak, Quasi-peak

Frequency (MHz)	Antenna Polarity (H/V)	Peak Reading (dB $\mu$ V/m)	Average Factor (dB $\mu$ V/m)	Average Result dB $\mu$ V/m)	Average Specification (dB $\mu$ V/m)	Margin (dB)
867.84	V	43.1	-24.92	18.18	60.83	-42.65
867.84	H	45.6	-24.92	20.68	60.83	-40.15
1301.76	V	56.6	-24.92	31.68	60.83	-29.15
1301.76	H	56.2	-24.92	-31.28	60.83	-29.55

**Figure 19. Radiated Emission. Antenna Polarization: HORIZONTAL/VERTICAL.  
Detectors: Peak, Quasi-peak**

Notes:

1. 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.
2. "Peak Reading." (dB $\mu$ V/m) included the "Correction Factors".
3. "Correction Factors" (dB) = Test Antenna Correction Factor(dB) + Cable Loss.
4. "Average Result" (dB $\mu$ V/m)=Peak Reading (dB $\mu$ V/m)+ Average Factor (dB)

#### 9.4 *Test Instrumentation Used, Radiated Measurements*

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 05, 2010	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 21, 2010	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	August 01, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 year
Antenna-Log Periodic	A.H.System	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	JPKG19982	N/A	N/A

## 10. Bandwidth

### 10.1 Test procedure

The transmitter unit operated with normal modulation. The spectrum analyzer was set to 30 kHz resolution BW and center frequency of the transmitter fundamental. The spectrum bandwidth of the transmitter unit was measured and recorded. The BW was measured at 20 dBc points.

The EUT was set up as shown in Figure 1, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on the modulation envelope.

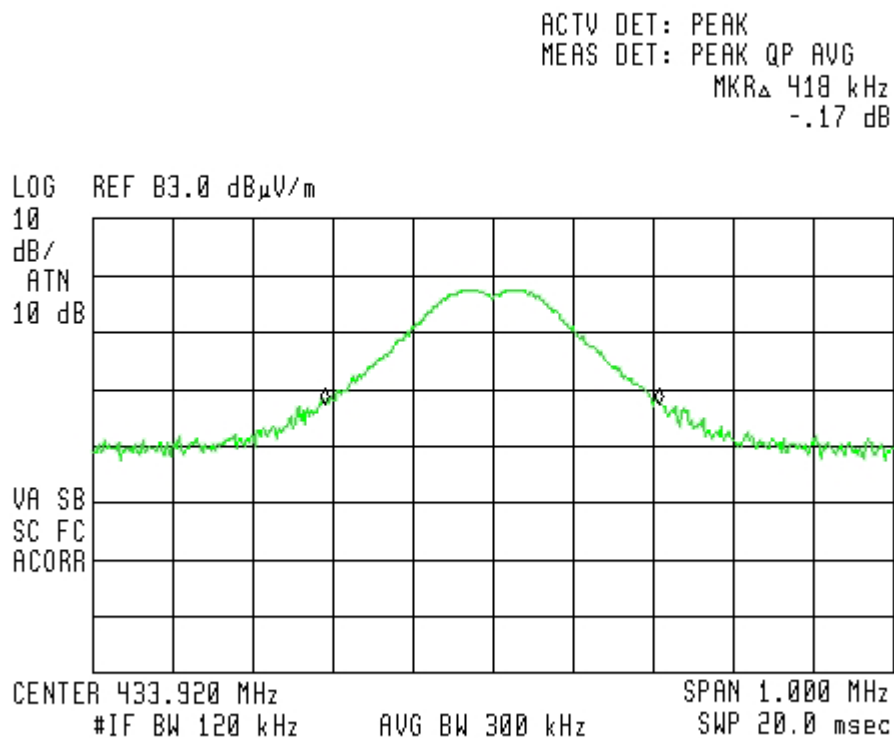


Figure 20 Bandwidth

## 10.2 Results table

E.U.T Description: Universal Transmitter

Model: UTX-830-2 AC

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C: (15.231(c))

Bandwidth Reading (kHz)	Specification (1) (kHz)	Margin (kHz)
418	1084.8	-666.8

**Figure 21 Bandwidth**

JUDGEMENT: Passed by 666.8 kHz

TEST PERSONNEL:

Tester Signature: \_\_\_\_\_

Date: 19.06.11

Typed/Printed Name: A. Sharabi

(1) 0.25% of the E.U.T. fundamental frequency, Section 15.231(c).

### 10.3 Test Equipment Used.

Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 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

**Figure 22 Test Equipment Used**

## 11. APPENDIX A - CORRECTION FACTORS

### 11.1 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".



**11.2 Correction factors for CABLE**  
**from EMI receiver**  
**to test antenna**  
**at 3 meter range.**

FREQUENCY	CORRECTION
(GHz)	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.*

### 11.3 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 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".

#### 11.4 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".

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

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

## 11.6 Correction factors for **ACTIVE LOOP ANTENNA**

**Model 6502**

**S/N 9506-2950**

<b>FREQUENCY</b>	<b>Magnetic Antenna Factor</b>	<b>Electric Antenna Factor</b>
(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