

DATE: 14 March 2011

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

FCC Radio Test Report

for

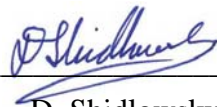
ElmoTech Ltd.

Equipment under test:

Repeater

iDEU-830FS-US

Written by:



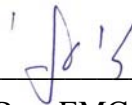
D. Shidlow, Documentation

Approved by:



A. Sharabi, Test Engineer

Approved by:



I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

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1. General Information

1.1 Administrative Information

Manufacturer:	ElmoTech Ltd.
Manufacturer's Address:	P.O.B. 13236 2 Habarzel St., Tel-Aviv, 61132 Israel Tel: +972-3-767-1700 Fax: +972-3-767-1701
Manufacturer's Representative:	Arad Dudkevitz
Equipment Under Test (E.U.T):	Repeater
Equipment Model No.:	iDEU-830FS-US
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	02.02.11
Start of Test:	02.02.11
End of Test:	14.03.11
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 Improved Data Extended Unit iDEU-830FS-US is used as repeater of electronic bracelets for area and home monitoring systems.

This model receives transmissions from electronic bracelets on the frequency 433.92cMHz and repeats these transmissions to the area monitoring center or to the home receiver on the frequency 318 MHz.

The repeating message consists, except completed transmission data, the identical number of iDEU-830FS-US for location of the electronic bracelet.

The transmitters do not transmit simultaneously.

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

The uncertainty for this test is ± 2 dB.

Radiated Emission

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

2. System Test Configuration

2.1 Justification

Radiated emission screening was performed in 2 orthogonal orientations as the E.U.T. can be operated either as desktop devices or wall mounted. The worst case orientation was the wall mounted position.

The E.U.T. was operated on both frequencies in typical way in order to determine average factor and for timing tests.

The E.U.T. cannot transmit at the same time from both transmitters

2.2 Special Accessories

No special accessories were needed.

2.3 Equipment Modifications

RF output power of each transmitter was reduced via software.

2.4 Configuration of Tested System

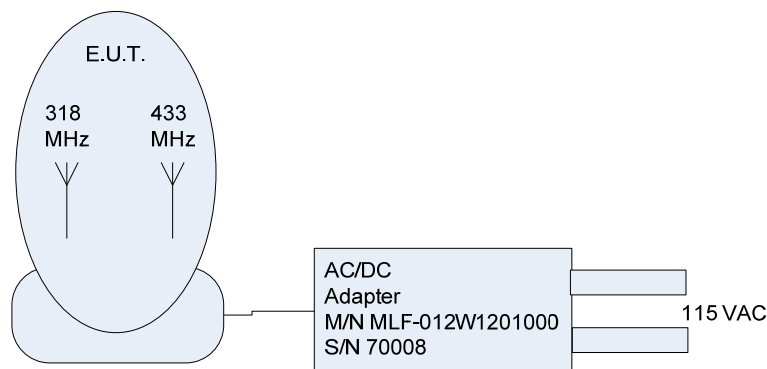


Figure 1. Configuration of Tested System

3. Conducted and Radiated Measurement Test Set-up Photo



Figure 2. Conducted Emission Test



Figure 3. Radiated Emission Test 9 kHz -30 MHz



Figure 4. Radiated Emission Test 30 – 1000 MHz



Figure 5. Radiated Emission Test 1-4.33 GHz

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 μ 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 9.2 dB

The margin between the emission levels and the specification limit is, in the worst case, 9.2 dB for the phase line at 0.15 MHz and 11.6 dB at 0.15 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: 03.03.11

Typed/Printed Name: A. Sharabi

Conducted Emission

E.U.T Description Repeater
 Type iDEU-830FS-US
 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	0.151000	59.1	56.8	-9.2	45.9	-10.1	0.0
2	0.214263	44.3	40.8	-22.4	17.3	-35.8	0.0
3	0.789228	31.9	28.2	-27.8	4.3	-41.7	0.0
4	2.083800	26.8	24.5	-31.5	9.4	-36.6	0.0
5	5.475314	24.4	17.7	-42.3	4.2	-45.8	0.0
6	12.338299	14.0	9.3	-50.7	1.0	-49.0	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 Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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 160 kHz
 53.44 dB μ V

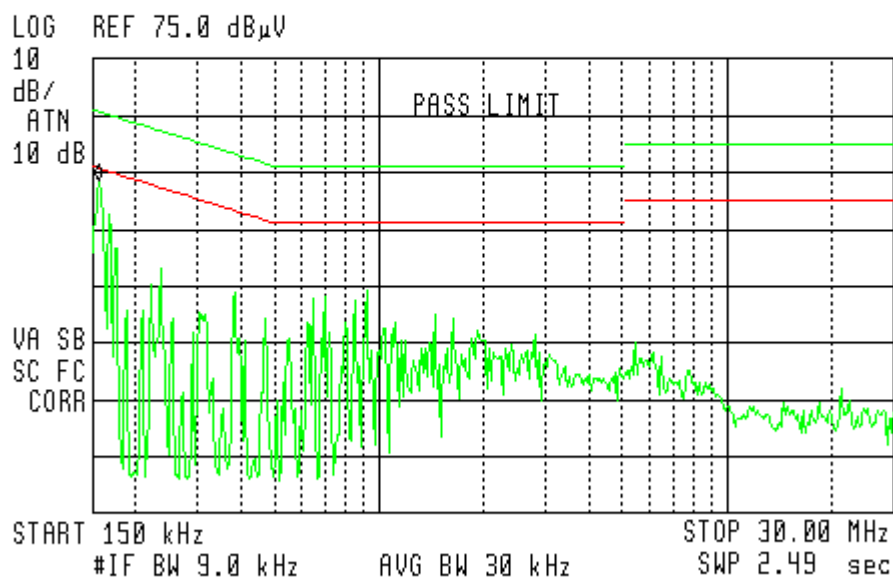


Figure 7. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description Repeater
 Type iDEU-830FS-US
 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	0.152894	56.6	54.3	-11.6	41.0	-14.8	0.0
2	0.228681	41.4	37.3	-25.3	18.2	-34.4	0.0
3	0.302535	37.1	31.7	-28.5	15.5	-34.7	0.0
4	0.624099	32.5	31.2	-24.8	20.4	-25.6	0.0
5	1.298678	30.1	25.2	-30.8	2.7	-43.3	0.0
6	5.819141	26.7	19.9	-40.1	3.6	-46.4	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 Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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
 56.79 dB μ V

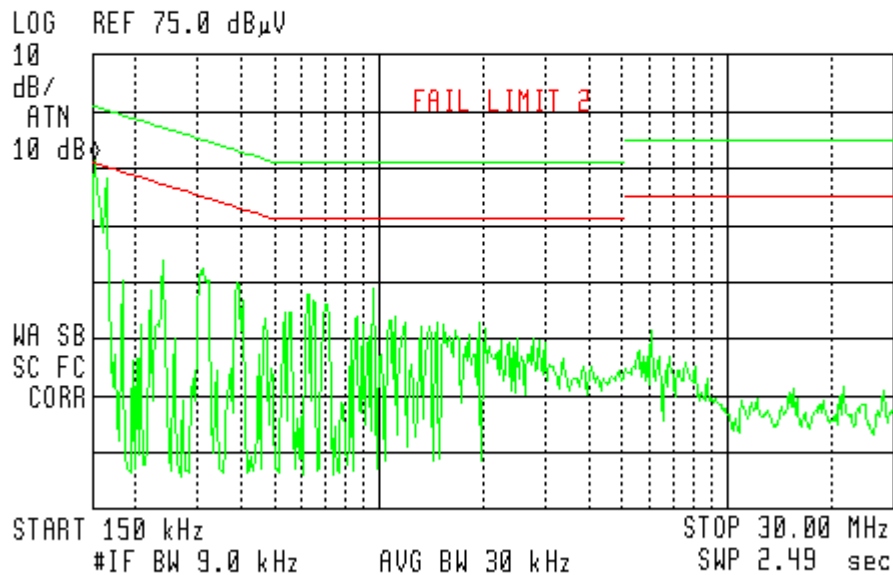


Figure 9 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.

4.4 Test Instrumentation Used, Conducted Measurement


Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 3, 2010	1 Year
LISN	Fischer	FCC-LISN-2A	128	March 3, 2010	1 Year
EMI Receiver	HP	85422E	3906A00276	November 25, 2010	1 Year
RF Filter Section	HP	85420E	3705A00248	November 25, 2010	1 Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

5. Average Factor Calculation, 318 MHz Transmitter

1. Burst duration = 1.25msec
2. Time between bursts = >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 cines unit transmits randomly.

$$\text{Average Factor} = 20 \log \left[1 \times \frac{1.25}{100} \times 1 \right] = -38.06\text{dB}$$

 12:57:02 FEB 02, 2011

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 1.2500 msec
5.90 dB

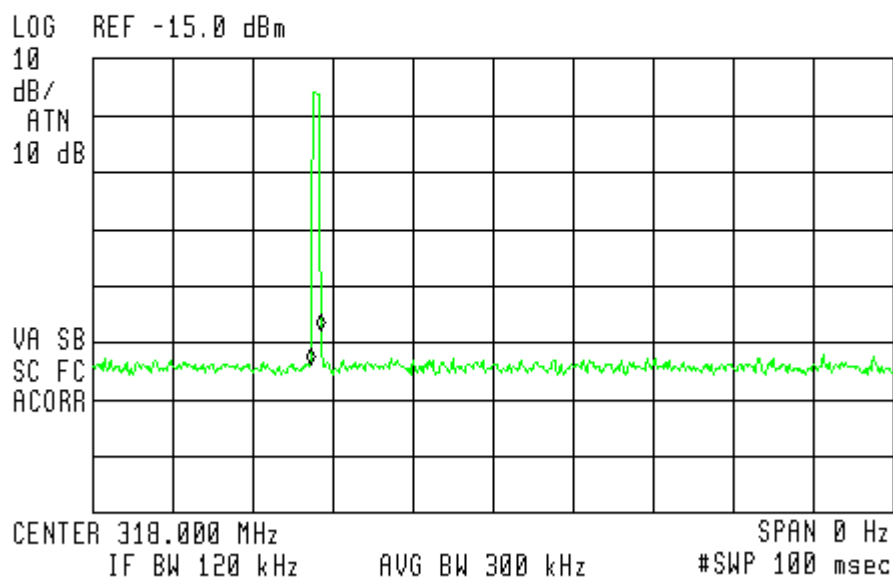


Figure 10. Transmission pulse duration = 1.252 msec

5.1 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	August 1, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 24, 2010	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, 318 MHz Transmitter

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 plot in Figure 11.	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 plot 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: 03.03.11

Typed/Printed Name: A. Sharabi

Periodic Operation

E.U.T Description Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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

 09:30:34 FEB 08, 2011

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 3.9625 sec
 -43.42 dBm

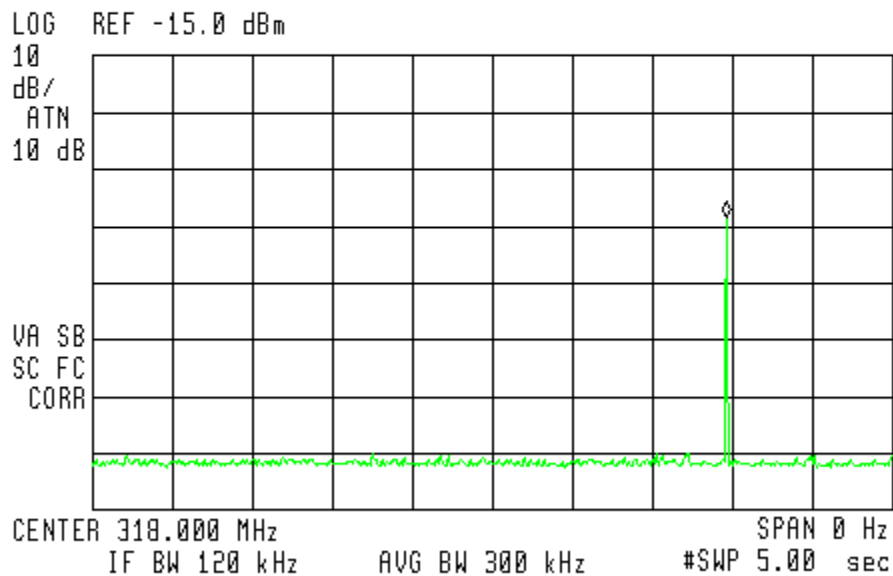



Figure 11. Automatic transmission within 5 sec (Burst of 1.25msec).

Periodic Operation

E.U.T Description Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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

 09:27:02 FEB 08, 2011

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG

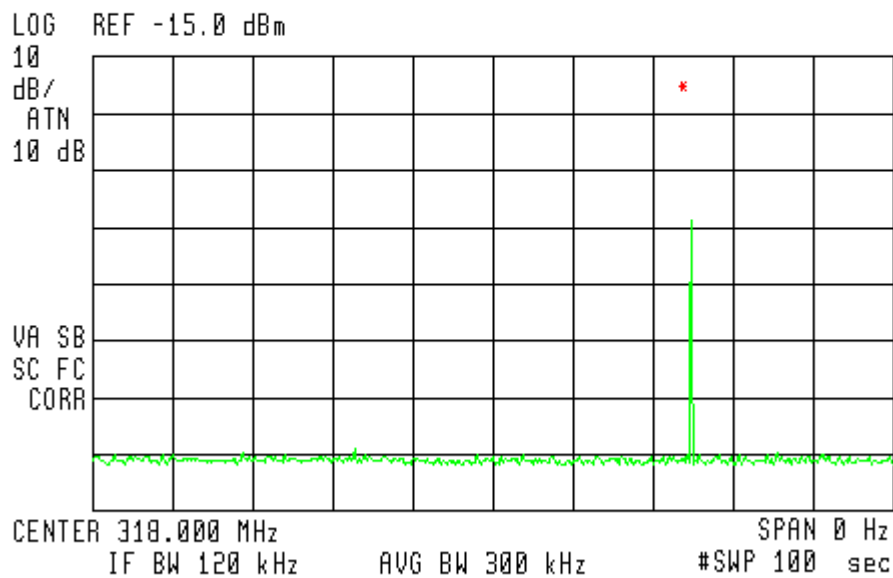


Figure 12. Supervision signal once every 100sec (1.25msec single burst)

$$3600\text{sec}/100\text{sec}=36*1.25\text{msec}=0.045\text{sec}<2\text{sec}$$

7. Field Strength of Fundamental, 318 MHz Transmitter

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 μ V/m) + E.U.T. Duty Cycle Factor, in 100msec time window (dB)

7.3 Measured Data

JUDGEMENT: Passed by 22.67 dB

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 13 to Figure 15.

TEST PERSONNEL:

Tester Signature: _____



Date: 14.03.11

Typed/Printed Name: A. Sharabi

Field Strength of Fundamental

E.U.T Description Repeater
 Type iDEU-830FS-US
 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 (dB μ V/m)	Average Factor (dB)	AVG Result (dB μ V/m)	AVG Specification (dB μ V/m)	Margin (dB)
318.00	H	91.19	-38.06	53.13	75.8	-22.67
318.00	V	89.99	-38.06	51.93	75.8	-23.87

Figure 13. 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." (dB μ V/m) included the "Correction Factors".
3. "Correction Factors" (dB) = Test Antenna Correction Factor(dB) + Cable Loss.
4. "Average Factor = $20 \log [(burst\ duration/100msec)*Num\ of\ burst\ within\ 100msec]$ = $20 \log [(2/100)*1]$ = -34.0
5. "Average Result" (dB μ V/m) = Peak Reading (dB μ V/m) + D.C.F. (dB)

Field Strength of Fundamental


E.U.T Description Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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

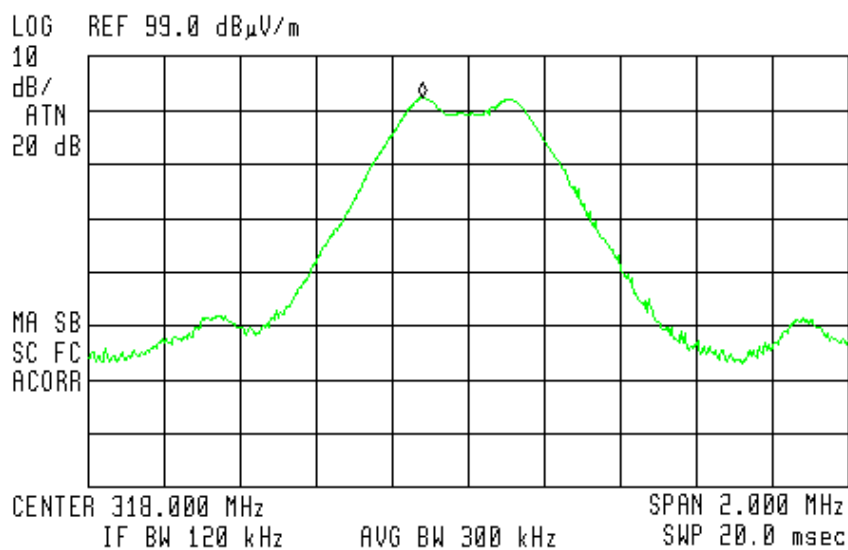
Antenna Polarization: Horizontal

Test Distance: 3 meters

Detector: Peak

 09:17:38 MAR 14, 2011

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 317.880 MHz
 91.19 dB μ V/m



**Figure 14. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL.
 Detector: Peak**

Field Strength of Fundamental


E.U.T Description Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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

Antenna Polarization: Vertical

Test Distance: 3 meters

Detector: Peak

 09:50:39 MAR 14, 2011

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 317.875 MHz
 89.99 dB μ V/m

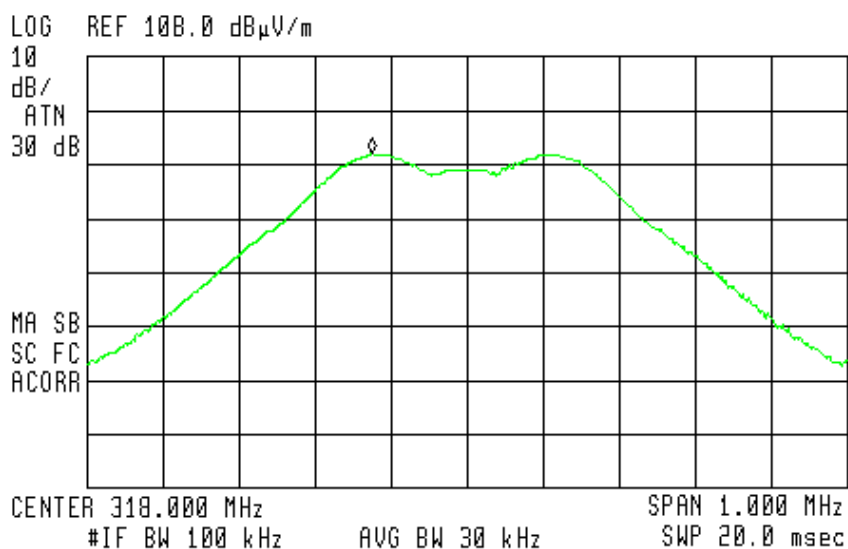


Figure 15. Field Strength of Fundamental. Antenna Polarization: VERTICAL.
 Detector: Peak

7.4 Test Instrumentation Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 25, 2010	1 year
RF Section	HP	85420E	3705A00248	November 25, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 24, 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	JPKG19982	N/A	N/A

8. Radiated Emission, 9 kHz – 30 MHz, 318 MHz Transmitter

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 operated at the frequency of 318 MHz. This frequency was measured using a peak detector.

8.3 Measured Data

JUDGEMENT: Passed

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

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

TEST PERSONNEL:

Tester Signature: _____

Date: 03.03.11

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 25, 2010	1 year
RF Section	HP	85420E	3705A00248	November 25, 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 μ v/m]

RA: Receiver Amplitude [dB μ v]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

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

No external pre-amplifiers are used.

9. Radiated Emission 30 MHz – 3.180 GHz, 318 MHz Transmitter

9.1 Test Specification

30 MHz – 3.180 GHz, 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 – 3.18 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 38.1 dB

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 38.1 dB in the worst case at the frequency of 2251.63 MHz, vertical polarization.

TEST PERSONNEL:

Tester Signature: _____ 

Date: 14.03.11

Typed/Printed Name: A. Sharabi

Radiated Emission

E.U.T Description Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 30 MHz to 3.18 GHz
 Antenna: 3 meters distance Detectors: Peak, Quasi-peak

Frequency (MHz)	Antenna Polarity (H/V)	Peak Reading (dB μ V/m)	Average Factor (dB μ V/m)	Average Result dB μ V/m)	Average Specification (dB μ V/m)	Margin (dB)
635.755	H	41.30	-38.06	3.24	55.8	-52.56
635.755	V	41.15	-38.06	3.09	55.8	-52.71
954.033	H	42.02	-38.06	3.42	55.8	-52.38
954.033	V	47.75	-38.06	9.69	55.8	-46.11
2251.63	H	51.81	-38.06	13.74	54.0	-40.26
2251.63	V	53.96	-38.06	15.90	54.0	-38.10

**Figure 16. Radiated Emission. Antenna Polarization: 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 μ V/m) included the "Correction Factors".
3. "Correction Factors" (dB) = Test Antenna Correction Factor(dB) + Cable Loss.
4. "Average Result" (dB μ V/m)=Peak Reading (dB μ 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 25, 2010	1 year
RF Section	HP	85420E	3705A00248	November 25, 2010	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS- 0411N313	013	January 13, 2010	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	August 1, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 24, 2010	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, 318 MHz Transmitter

10.1 Test procedure

The transmitter unit operated with normal modulation. The spectrum analyzer was set to 120 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.

 10:52:22 FEB 02, 2011

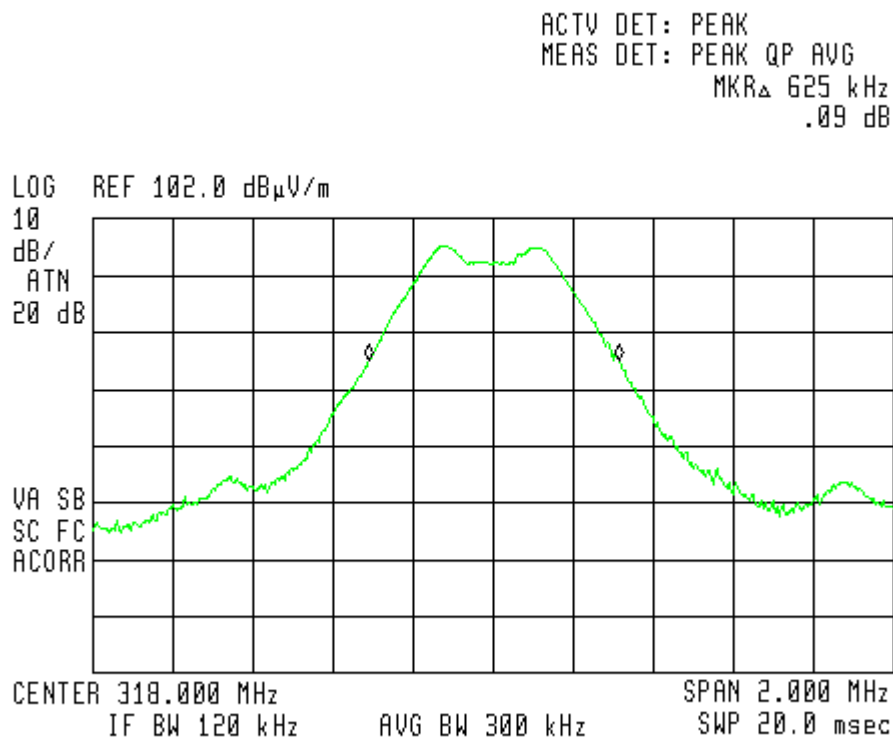


Figure 17 Bandwidth

10.2 Results table

E.U.T Description: Repeater
 Model: iDEU-830FS-US
 Serial Number: Not Designated
 Specification: F.C.C. Part 15, Subpart C: (15.231(c))

Bandwidth Reading (kHz)	Specification (1) (kHz)	Margin (kHz)
625	795	170

Figure 18 Bandwidth

JUDGEMENT: Passed by 170 kHz

TEST PERSONNEL:

Tester Signature: _____ 

Date: 03.03.11

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 25, 2010	1 year
RF Section	HP	85420E	3705A00248	November 25, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 24, 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	JPKG19982	N/A	N/A


Figure 19 Test Equipment Used

11. Average Factor Calculation, 433 MHz Transmitter

1. Burst duration = 3.0msec
2. Time between bursts = >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 cines unit transmits randomly.

$$\text{Average Factor} = 20 \log \left[1 \times \frac{3}{100} \times 1 \right] = -30.45 \text{ dB}$$

 09:36:52 FEB 08, 2011

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 3.0000 msec
.48 dB

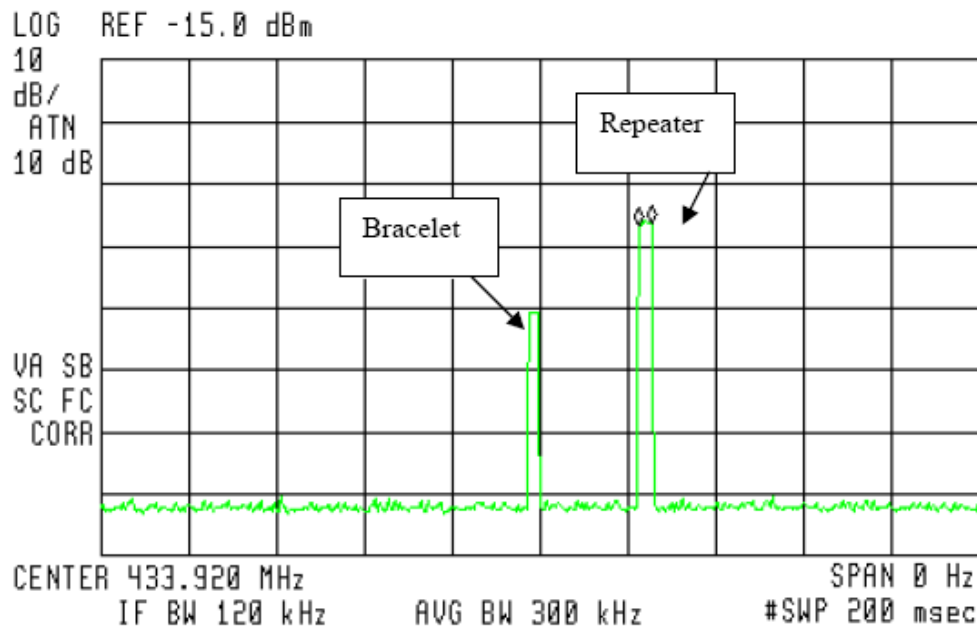


Figure 20. Burst duration = 3.0msec

11.1 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	August 1, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 24, 2010	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

12. Periodic Operation, 433 MHz Transmitter

12.1 Specification

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

12.2 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 plot in Figure 21.	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 plot in Figure 22.	Complies

12.3 Results

JUDGEMENT: Passed

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

TEST PERSONNEL:

Tester Signature: 


Date: 03.03.11

Typed/Printed Name: A. Sharabi

Periodic Operation

E.U.T Description Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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

 09:44:54 FEB 08, 2011

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 2.2000 sec
 -32.16 dBm

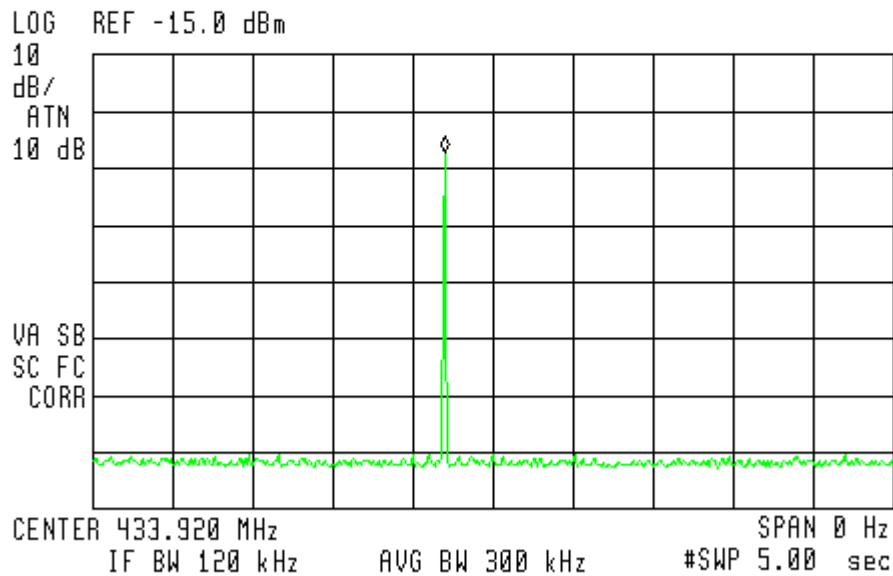



Figure 21. Automatic transmission within 5 sec (3.0msec single burst)

Periodic Operation

E.U.T Description Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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

 09:41:29 FEB 08, 2011

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 9.0629 sec
 -86.12 dBm

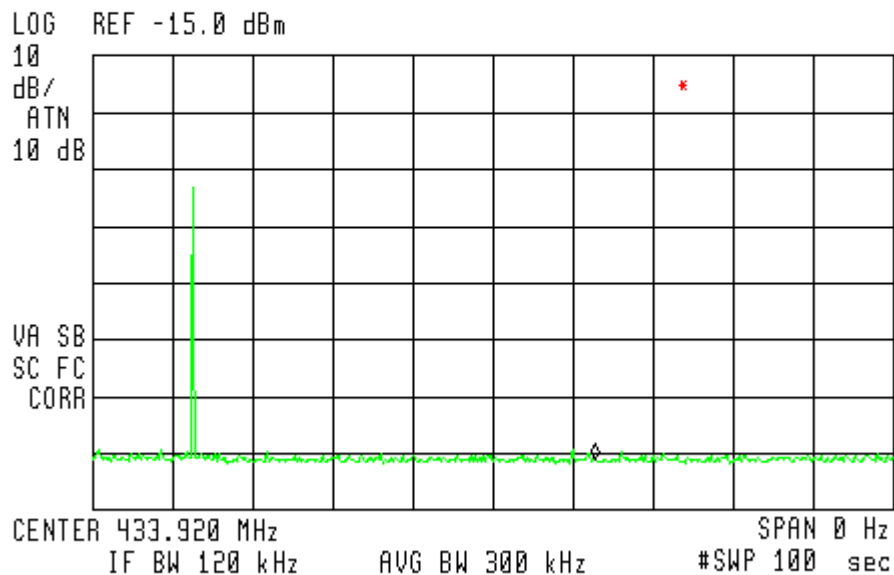


Figure 22. Supervision signal once every 100sec (3.0msec single burst)
 $3600\text{sec}/100\text{sec}=36*3.0\text{msec}=0.108\text{sec}<2\text{sec}$

13. Field Strength of Fundamental, 433 MHz Transmitter

13.1 Test Specification

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

13.2 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 μ V/m) + E.U.T. Duty Cycle Factor, in 100msec time window (dB)

13.3 Measured Data

JUDGEMENT: Passed by 13.07 dB

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 23 to Figure 25.

TEST PERSONNEL:

Tester Signature: _____

Date: 14.03.11

Typed/Printed Name: A. Sharabi

Field Strength of Fundamental

E.U.T Description Repeater
 Type iDEU-830FS-US
 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 (dB μ V/m)	Average Factor (dB)	AVG Result (dB μ V/m)	AVG Specification (dB μ V/m)	Margin (dB)
433.92	H	88.80	-30.45	58.35	80.83	-22.48
433.92	V	98.21	-30.45	67.76	80.83	-13.07

Figure 23. 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." (dB μ V/m) included the "Correction Factors".
3. "Correction Factors" (dB) = Test Antenna Correction Factor(dB) + Cable Loss.
4. "Average Factor = $20 \log [(burst\ duration/100msec)*Num\ of\ burst\ within\ 100msec]$ = $20 \log [(2/100)*1]$ = -34.0
5. "Average Result" (dB μ V/m) = Peak Reading (dB μ V/m) + D.C.F. (dB)

Field Strength of Fundamental


E.U.T Description Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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

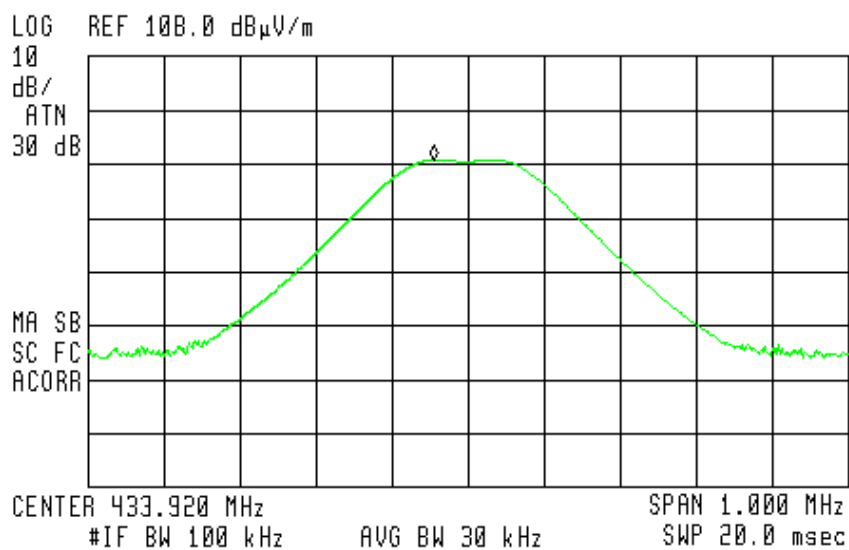
Antenna Polarization: Horizontal

Test Distance: 3 meters

Detector: Peak

 09:58:53 MAR 14, 2011

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 433.875 MHz
 88.80 dB μ V/m



**Figure 24. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL.
 Detector: Peak**

Field Strength of Fundamental


E.U.T Description Repeater
 Type iDEU-830FS-US
 Serial Number: Not Designated

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

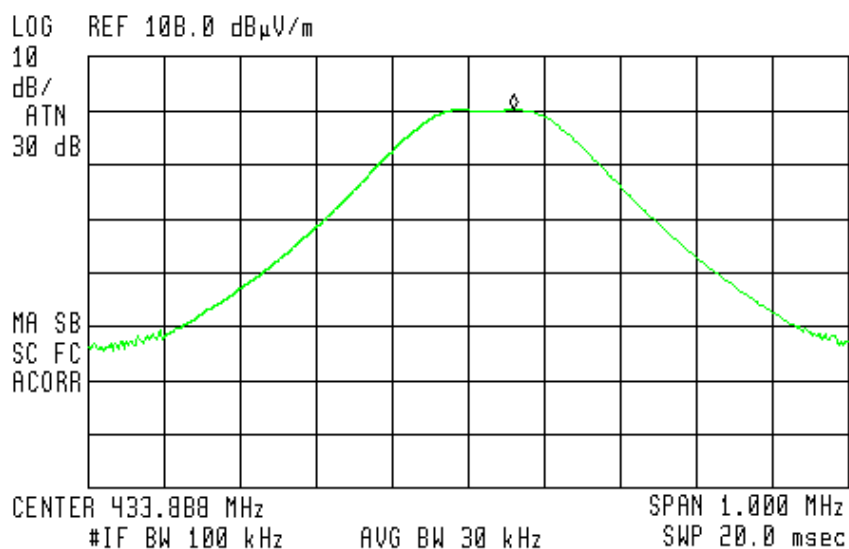
Antenna Polarization: Vertical

Test Distance: 3 meters

Detector: Peak

 09:48:21 MAR 14, 2011

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 433.948 MHz
 98.21 dB μ V/m



**Figure 25. Field Strength of Fundamental. Antenna Polarization: VERTICAL.
 Detector: Peak**

13.4 Test Instrumentation Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 25, 2010	1 year
RF Section	HP	85420E	3705A00248	November 25, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 24, 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	JPKG19982	N/A	N/A

14. Radiated Emission, 9 kHz – 30 MHz, 433 MHz Transmitter

14.1 Test Specification

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

14.2 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 433.92 MHz. This frequency was measured using a peak detector.

14.3 Measured Data

JUDGEMENT: Passed

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

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

TEST PERSONNEL:

Tester Signature: _____

Date: 03.03.11

Typed/Printed Name: A. Sharabi

14.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 25, 2010	1 year
RF Section	HP	85420E	3705A00248	November 25, 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

14.5 Field Strength Calculation

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

$$FS = RA + AF + CF$$

FS: Field Strength [dB μ v/m]

RA: Receiver Amplitude [dB μ v]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

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

No external pre-amplifiers are used.

15. Radiated Emission 30 MHz – 4.339 GHz, 433 MHz Transmitter

15.1 Test Specification

30 MHz – 4.339 GHz, F.C.C., Part 15, Subpart C

15.2 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 – 4.339 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.


15.3 Test Data

JUDGEMENT: Passed by 26.9 dB

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 26.92 dB in the worst case at the frequency of 2169.50 MHz, horizontal polarization.

TEST PERSONNEL:

Tester Signature:  _____

Date: 14.03.11

Typed/Printed Name: A. Sharabi

Radiated Emission

E.U.T Description Repeater
Type iDEU-830FS-US
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 30 MHz to 4.339 GHz
Antenna: 3 meters distance Detectors: Peak, Quasi-peak

Frequency (MHz)	Antenna Polarity (H/V)	Peak Reading (dB μ V/m)	Average Factor (dB μ V/m)	Average Result dB μ V/m)	Average Specification (dB μ V/m)	Margin (dB)
867.77	H	41.87	-30.45	11.42	60.83	-49.41
867.77	V	46.67	-30.45	16.22	60.83	-44.61
1301.75	H	56.90	-30.45	26.45	54.0	-27.55
1301.75	V	56.44	-30.45	25.99	54.0	-28.01
2169.50	H	64.36	-30.45	-33.91	60.83	-26.92
2169.50	V	59.27	-30.45	28.82	60.83	-32.01

**Figure 26. Radiated Emission. Antenna Polarization: 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 μ V/m) included the "Correction Factors".
3. "Correction Factors" (dB) = Test Antenna Correction Factor(dB) + Cable Loss.
4. "Average Result" (dB μ V/m)=Peak Reading (dB μ V/m)+ Average Factor (dB)

15.4 Test Instrumentation Used, Radiated Measurements


Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 25, 2010	1 year
RF Section	HP	85420E	3705A00248	November 25, 2010	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS- 0411N313	013	January 13, 2010	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	August 1, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 24, 2010	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

16. Bandwidth, 433 MHz Transmitter

16.1 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.

 11:56:58 FEB 02, 2011

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 365 kHz
-.33 dB

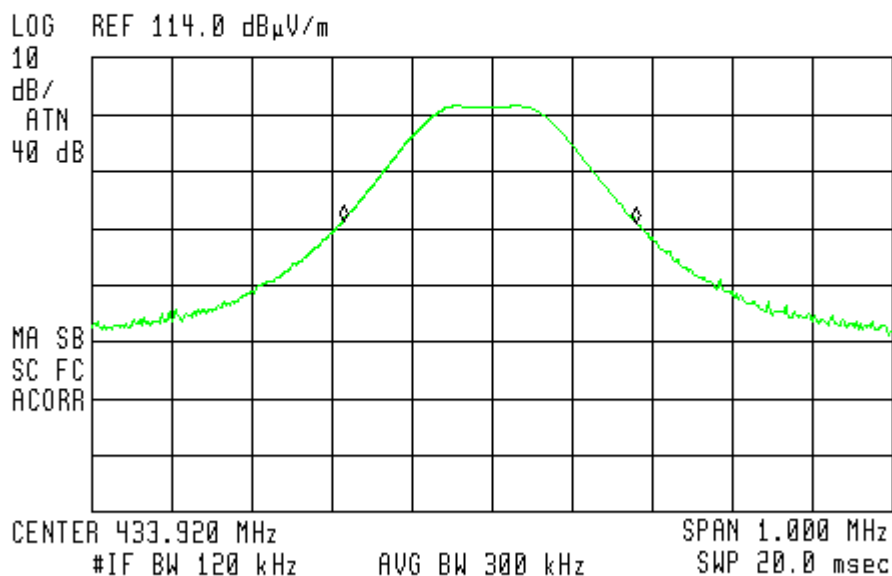


Figure 27 Bandwidth

16.2 Results table

E.U.T Description: Repeater
 Model: iDEU-830FS-US
 Serial Number: Not Designated
 Specification: F.C.C. Part 15, Subpart C: (15.231(c))

Bandwidth Reading (kHz)	Specification (1) (kHz)	Margin (kHz)
365	1084	-719

Figure 28 Bandwidth

JUDGEMENT: Passed by 719 kHz

TEST PERSONNEL:

Tester Signature: _____ 

Date: 03.03.11

Typed/Printed Name: A. Sharabi

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

16.3 Test Equipment Used.

Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 25, 2010	1 year
RF Section	HP	85420E	3705A00248	November 25, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 24, 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	JPKG19982	N/A	N/A

Figure 29 Test Equipment Used

17. 11. APPENDIX A - CORRECTION FACTORS

17.1 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".

17.2 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.*

17.3 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".

17.4 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".

**17.5 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".

17.6 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