



**DATE: 14 August 2014**

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

# **FCC Radio Test Report**

**for**

**SuperCom Ltd.**

**Equipment under test:**

**HealthCare Tag v2.0**

**Wrist Tag PRF-HCT20WT  
Lock Alert PRF-HCT20LA**

Written by:

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Approved by:

I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



## Measurement/Technical Report for SuperCom Ltd.

### HealthCare Tag v2.0

### Wrist Tag PRF-HCT20WT

### Lock Alert PRF-HCT20LA

### FCC ID: W5P-PRF-HCT20

This report concerns:

Original Grant: X

Class I change:

Class II change:

Equipment type:

Part 15 Security/Remote Control Transmitter

Limits used:

47CFR15 Section 15.231 (a-d)

Measurement procedure used is ANSI C63.4-2003.

Application for Certification

prepared by:

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Applicant for this device:

(different from "prepared by")

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# 1. General Information

## 1.1 Administrative Information

|                                |                                                                                                  |
|--------------------------------|--------------------------------------------------------------------------------------------------|
| Manufacturer:                  | SuperCom Ltd.                                                                                    |
| Manufacturer's Address:        | 1 Arie Shenkar St.<br>Herzeliya, 4672501<br>Israel<br>Tel: 972-9-889-0800<br>Fax: 972-9-889-0814 |
| Manufacturer's Representative: | Ehud Bachman                                                                                     |
| Equipment Under Test (E.U.T):  | HealthCare Tag v2.0                                                                              |
| Equipment Model No.:           | Wrist Tag PRF-HCT20WT<br>Lock Alert PRF-HCT20LA                                                  |
| Equipment Serial No.:          | Not Designated                                                                                   |
| Date of Receipt of E.U.T:      | 23.07.2014                                                                                       |
| Start of Test:                 | 23.07.2014                                                                                       |
| End of Test:                   | 06.08.2014                                                                                       |
| Test Laboratory Location:      | I.T.L (Product Testing) Ltd.<br>Kfar Bin Nun,<br>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.

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 HC (HealthCare) tag is SuperCom's next generation super-mini RFID tags, with a mission to be integrated in application like Anti-Wandering systems and LockAlert system (smart security locking system).

**The Anti-Wandering system** can give peace of mind for your loved ones to maintain their dignity and security. With our new Companion Anti-Wandering System (Based on PRF-MFT10 and PRF-HCT20) you can now rest easy. The system helps Alzheimers or Dementia patients who may be prone to wandering you know the importance of keeping them safe and secure in your home or facility.

Once they come within a set proximity of the doorway the local alarm will sound until they move from the area. You can easily set the distance for the warning allowing you the time needed to secure your loved one before they can exit.

**The LockAlert™ system** offers a complete tracking and monitoring via a secured and reliable locking mechanism. The system is based on a well-established Radio Frequency Identification technology, a reliable and secured solution.

The LockAlert™ system monitors all activity and provides real-time alerts when a lock has been breached.

### 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 November 21, 2012). 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):

± 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):

± 4.96 dB

## 2. System Test Configuration

### 2.1 Justification

Both models incorporate the same PCB with different plastic enclosures.

The antennas differ in both models: Wrist Tag consist of an antenna trace and the LockAlert is a simple wire connected internally to the PCB.

Both models have 2 optional modulation modes: ASK and FSK.

Testing was done for each configuration mode after radiated emission screening was performed in 3 orthogonal orientations. The worst case orientation was the vertical position.

### 2.2 EUT Exercise Software

No special exercise software was needed.

### 2.3 Special Accessories

No special accessories were needed.

### 2.4 Equipment Modifications

No modifications were needed in order to achieve compliance

### 2.5 Configuration of Tested System

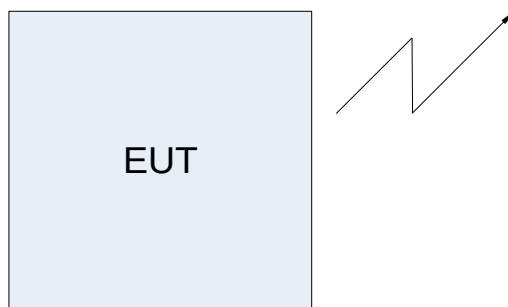


Figure 1. Configuration of Tested System

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



Figure 2. Radiated Emission Test – Lock Alert PRF-HCT20LA



Figure 3. Radiated Emission Test - Lock Alert PRF-HCT20LA



**Figure 4. Radiated Emission Test - Lock Alert PRF-HCT20LA**



**Figure 5. Radiated Emission Test - Lock Alert PRF-HCT20LA**



**Figure 6. Radiated Emission Test – Wrist Tag PRF-HCT20WT**



**Figure 7. Radiated Emission Test – Wrist Tag PRF-HCT20WT**



**Figure 8. Radiated Emission Test – Wrist Tag PRF-HCT20WT**

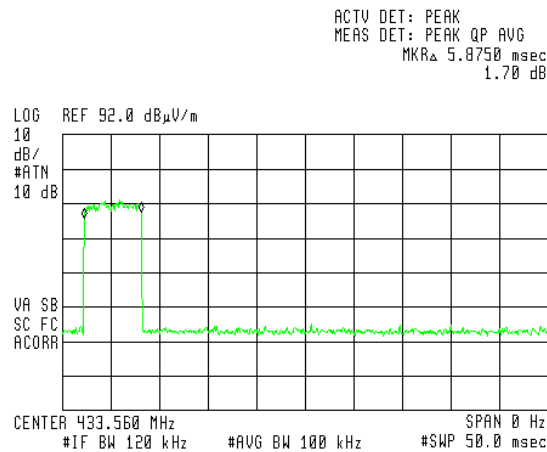


**Figure 9. Radiated Emission Test – Wrist Tag PRF-HCT20WT**

## 4. Average Factor Calculation

1. Transmission pulse duration = n/a
2. Transmission pulse period = n/a
3. Burst duration = 5.87msec
4. Time between bursts = 300 msec , >100ms
5. Average Factor =  $20 \log \left[ \frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100 \text{msec}} \times \text{Num of burst within 100msec} \right]$

$$\text{Average Factor} = 20 \log \left[ 1 \times \frac{5.87}{100} \times 1 \right] = -24.7 \text{dB}$$



**Figure 10. Burst duration = 5.875msec**

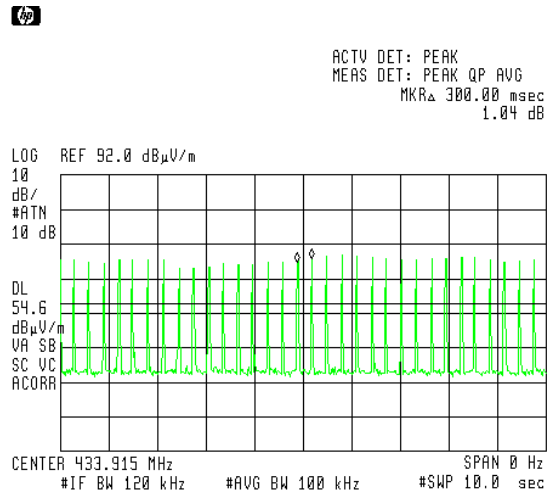


Figure 11. Time between bursts = 300msec , >100ms

#### 4.1 Test Instrumentation Used; Average Factor Calculation

| Instrument              | Manufacturer | Model      | Serial Number | Calibration       | Period  |
|-------------------------|--------------|------------|---------------|-------------------|---------|
| Spectrum Analyzer       | HP           | 8592L      | 3826A01204    | February 28, 2014 | 1 Year  |
| Antenna Biconical       | EMCO         | 3104       | 2606          | August 30, 2012   | 2 years |
| Antenna Log Periodic    | ARA          | LPD-2010/A | 1038          | April 2, 2013     | 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     |

Figure 12 Test Equipment Used



## 5. Periodic Operation

### 5.1 Specification

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

### 5.2 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.                                                         | See plot in Figure 13                | Complies |
| An automatically operated transmitter shall cease operation within 5 seconds after activation.                                                                          | N/A                                  | 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 16 and Figure 17 | Complies |

### 5.3 Results

JUDGEMENT: Passed

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

TEST PERSONNEL:

Tester Signature: 

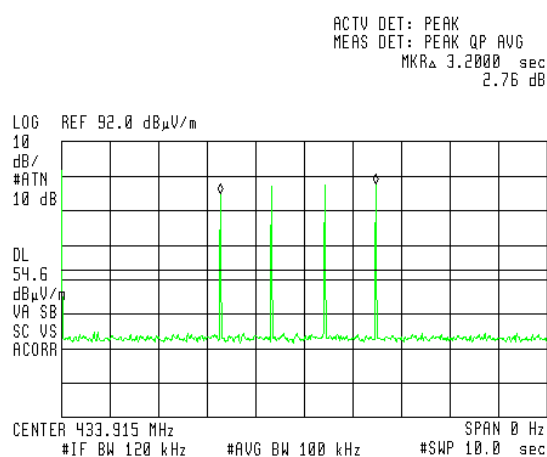
Date: 25.08.14

Typed/Printed Name: M. Zohar

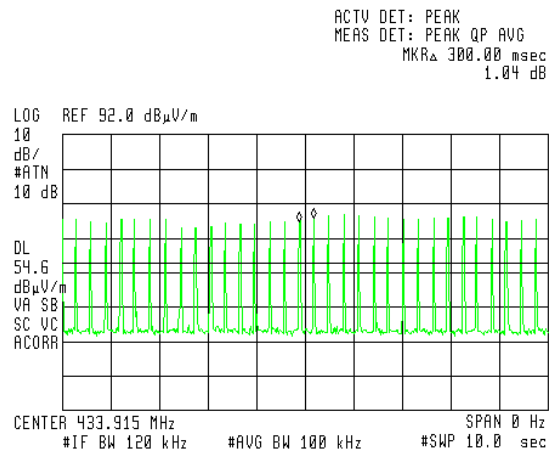
## Periodic Operation

E.U.T Description    HealthCare Tag v2.0  
Type                    Wrist Tag PRF-HCT20WT  
                             Lock Alert PRF-HCT20LA  
Serial Number:        Not Designated

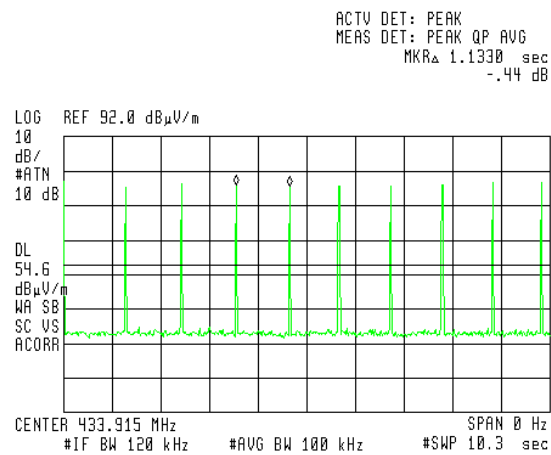
Specification: F.C.C., Part 15, Subpart C, 15.231(a)



**Figure 13. Manual transmission tamper switch (Lock Alert)**



**Figure 14. Alarm - Activator Mode (Lock Alert/Wrist Tag)**



**Figure 15. Alarm - Motion Mode (Lock Alert)**

## Periodic Operation

E.U.T Description    HealthCare Tag v2.0  
Type                    Wrist Tag PRF-HCT20WT  
                            Lock Alert PRF-HCT20LA  
Serial Number:        Not Designated

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

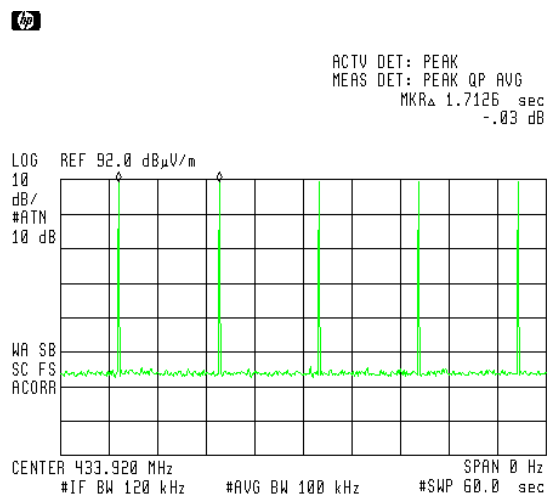


Figure 16. Supervision Within 1 min (Lock Alert/Wrist Tag)

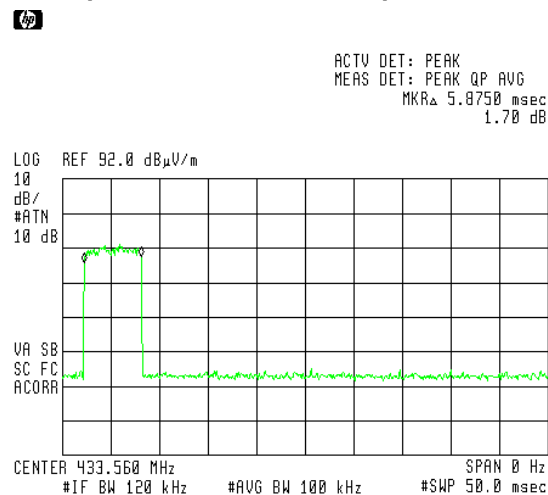


Figure 17. Supervision, burst duration (Lock Alert/Wrist Tag)  
(5.875 milliseconds X 300 = 1761 milliseconds)



#### 5.4 Test Instrumentation Used; Periodic Operation

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period  |
|-------------------------|--------------|---------------|---------------|------------------|---------|
| EMI Receiver            | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 Year  |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year  |
| Antenna Log Periodic    | ARA          | LPD-2010/A    | 1038          | April 2, 2013    | 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 | JPKG19982     | N/A              | N/A     |

**Figure 18 Test Equipment Used**

## 6. Field Strength of Fundamental

### 6.1 Test Specification

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

### 6.2 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 test was performed for 2 TAG types: Lock Alert and Wrist Tag.

2 modulation modes were tested for each TAG: ASK and FSK.

The average result is:

Peak Level(dBμV/m) + E.U.T. Duty Cycle Factor in 100msec time window (dB)

### 6.3 Measured Data

JUDGEMENT: Passed by 12.8 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 19 to Figure 27.

TEST PERSONNEL:

Tester Signature: 

Date: 25.08.14

Typed/Printed Name: M. Zohar



## Field Strength of Fundamental

E.U.T Description HealthCare Tag v2.0  
Type Wrist Tag PRF-HCT20WT  
Lock Alert PRF-HCT20LA  
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

| TAG                   | Modulation | Freq.<br>(MHz) | Pol.<br>V/H | Peak<br>Reading<br>(dBμV/m) | Average<br>Factor<br>(dB) | AVG<br>Result<br>(dBμV/m) | AVG<br>Specification<br>(dBμV/m) | Margin<br>(dB) |
|-----------------------|------------|----------------|-------------|-----------------------------|---------------------------|---------------------------|----------------------------------|----------------|
| <b>Lock<br/>Alert</b> | <b>FSK</b> | 433.92         | H           | 91.8                        | -24.7                     | 67.1                      | 80.8                             | -13.7          |
|                       | <b>FSK</b> | 433.92         | V           | 91.2                        | -24.7                     | 66.5                      | 80.8                             | -14.3          |
|                       | <b>ASK</b> | 433.92         | H           | 92.7                        | -24.7                     | 68.0                      | 80.8                             | -12.8          |
|                       | <b>ASK</b> | 433.92         | V           | 91.2                        | -24.7                     | 66.5                      | 80.8                             | -14.3          |
| <b>Wrist</b>          | <b>FSK</b> | 433.92         | H           | 72.3                        | -24.7                     | 47.6                      | 80.8                             | -33.2          |
|                       | <b>FSK</b> | 433.92         | V           | 73.0                        | -24.7                     | 48.3                      | 80.8                             | -32.5          |
|                       | <b>ASK</b> | 433.92         | H           | 70.7                        | -24.7                     | 46.0                      | 80.8                             | -34.8          |
|                       | <b>ASK</b> | 433.92         | V           | 73.1                        | -24.7                     | 48.4                      | 80.8                             | -32.4          |

**Figure 19. AVG Test Results - Field Strength of Fundamental**

**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 =  $20 \log [(burst\ duration/100msec)*Num\ of\ burst\ within\ 100msec]$  =  $20 \log [(5.87/100)*1]$  = -24.7
5. "Average Result" (dBμV/m)=Peak Reading (dBμV/m)+D.C.F. (dB)

## Field Strength of Fundamental

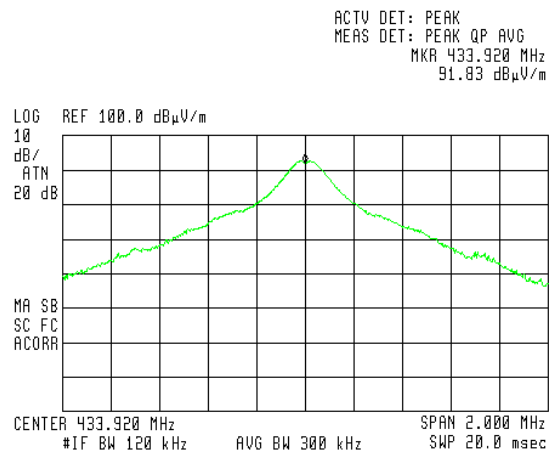
E.U.T Description HealthCare Tag v2.0  
Type Lock Alert PRF-HCT20LA  
Serial Number: Not Designated

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

Antenna Polarization: Horizontal

Test Distance: 3 meters

Detector: Peak



**Figure 20. Lock Alert - Field Strength of Fundamental; Antenna Polarization: HORIZONTAL.  
Detector: Peak (FSK MODULATION)**

## Field Strength of Fundamental

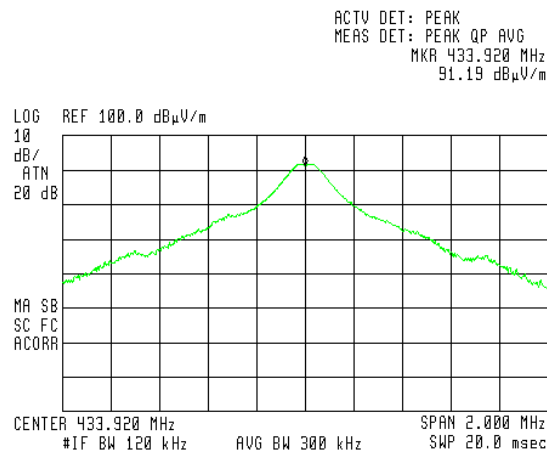
E.U.T Description HealthCare Tag v2.0  
Type Lock Alert PRF-HCT20LA  
Serial Number: Not Designated

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

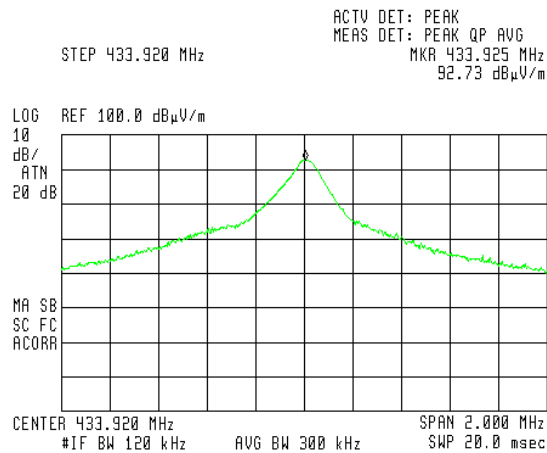
Antenna Polarization: Vertical

Test Distance: 3 meters

Detector: Peak



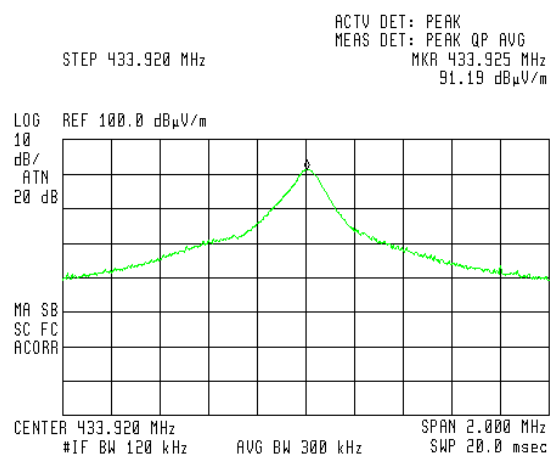
**Figure 21. Lock Alert - Field Strength of Fundamental. Antenna Polarization: VERTICAL. Detector: Peak (FSK MODULATION)**



**Figure 22. Lock Alert - Field Strength of Fundamental. Antenna Polarization: HORIZONTAL. Detector: Peak (ASK MODULATION)**

## Field Strength of Fundamental

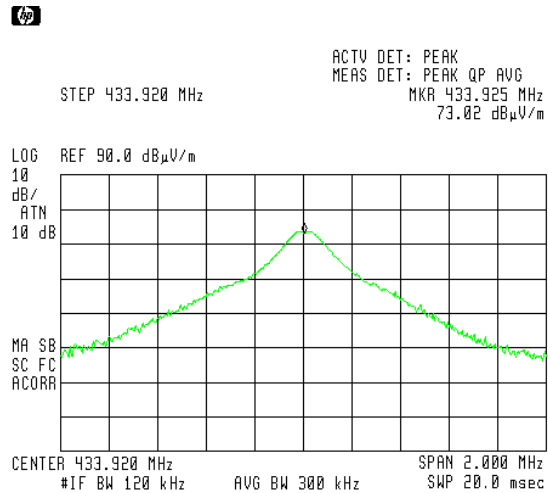
E.U.T Description    HealthCare Tag v2.0  
Type                    Lock Alert PRF-HCT20LA  
Serial Number:        Not Designated



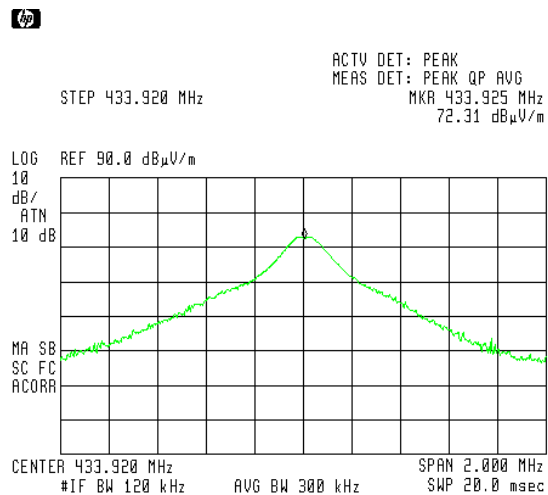
**Figure 23. Lock Alert - Field Strength of Fundamental. Antenna Polarization: VERTICAL.  
Detector: Peak (ASK MODULATION)**

## Field Strength of Fundamental

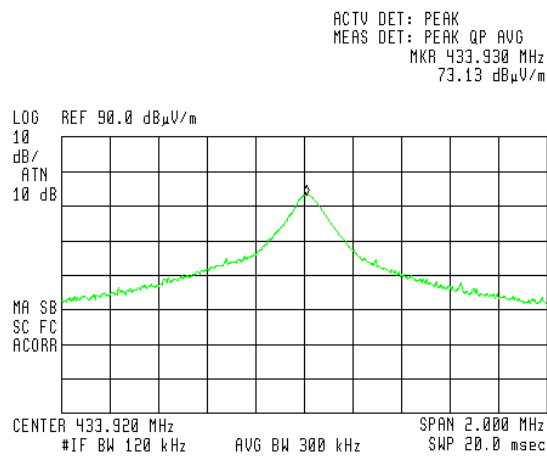
E.U.T Description HealthCare Tag v2.0  
Type Wrist Tag PRF-HCT20WT  
Serial Number: Not Designated



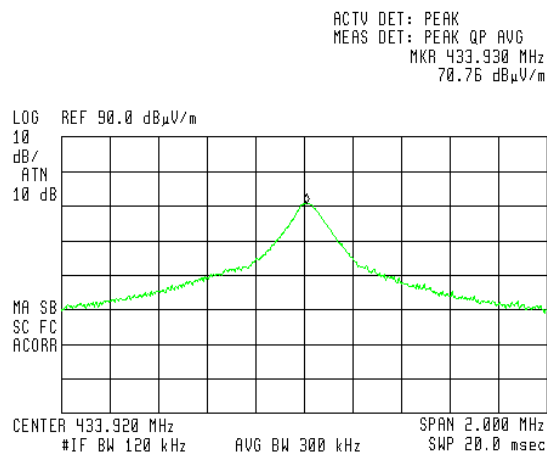
**Figure 24. Wrist Tag - Field Strength of Fundamental. Antenna Polarization: VERTICAL. Detector: Peak (FSK MODULATION)**



**Figure 25. Wrist Tag - Field Strength of Fundamental. Antenna Polarization: HORIZONTAL. Detector: Peak (FSK MODULATION)**



**Figure 26. Wrist Tag - Field Strength of Fundamental. Antenna Polarization: VERTICAL.  
Detector: Peak (ASK MODULATION)**



**Figure 27. Wrist Tag - Field Strength of Fundamental. Antenna Polarization: HORIZONTAL.  
Detector: Peak (ASK MODULATION)**



#### 6.4 Test Instrumentation Used; Field Strength of Fundamental

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period  |
|-------------------------|--------------|---------------|---------------|------------------|---------|
| EMI Receiver            | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 year  |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year  |
| Antenna Log Periodic    | ARA          | LPD-2010/A    | 1038          | April 2, 2013    | 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 28 Test Equipment Used

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

### 7.1 Test Specification

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

### 7.2 Test Procedure

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

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. 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 with 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 433.9 kHz. This frequency was measured using a peak detector.

### 7.3 Measured Data

JUDGEMENT: Passed

No unwanted emission spurious was detected in 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: 25.08.14

Typed/Printed Name: M. Zohar

#### 7.4 Test Instrumentation Used, Radiated Measurements

| Instrument              | Manufacturer | Model      | Serial Number | Calibration      | Period |
|-------------------------|--------------|------------|---------------|------------------|--------|
| EMI Receiver            | HP           | 85422E     | 3906A00276    | January 15, 2014 | 1 year |
| RF Section              | HP           | 85420E     | 3705A00248    | January 15, 2014 | 1 year |
| Active Loop Antenna     | EMCO         | 6502       | 9506-2950     | November 4, 2013 | 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    |

Figure 29 Test Equipment Used

#### 7.5 Field Strength Calculation

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

$$FS = RA + AF + CF$$

FS: Field Strength [dB $\mu$ 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.

## 8. Radiated Emission 30 MHz -4.5 GHz

### 8.1 Test Specification

30 MHz-4.5 GHz, F.C.C., Part 15, Subpart C

### 8.2 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 frequency range 30 MHz to 4.5 GHz was scanned and the list of the highest emissions was verified and updated accordingly.

The emissions in the frequency range 30MHz – 1000 MHz were measured using a computerized EMI receiver complying with 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 2.9GHz – 4.5 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.



### 8.3 Test Data

JUDGEMENT: Passed by 49.4 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 49.4 dB in the worst case at the frequency of 867.8 MHz, vertical polarization.

For additional information see Figure 30.

TEST PERSONNEL:

Tester Signature: 

Date: 25.08.14

Typed/Printed Name: M. Zohar



## Radiated Emission

E.U.T Description HealthCare Tag v2.0  
Type Wrist Tag PRF-HCT20WT  
Lock Alert PRF-HCT20LA  
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Antenna Polarization: Vertical

Frequency range: 30 MHz to 6GHz

Antenna: 3 meters distance

Detectors: Peak

| TAG               | Frequency | Pol. | Peak Reading   | Average Factor | AVG Result     | AVG Specification | Margin |
|-------------------|-----------|------|----------------|----------------|----------------|-------------------|--------|
|                   | MHz       |      | (dB $\mu$ V/m) | (dB)           | (dB $\mu$ V/m) | (dB $\mu$ V/m)    | (dB)   |
| <b>Lock Alert</b> | 867.8     | V    | 56.1           | -24.7          | 31.4           | 80.8              | -49.4  |
|                   | 1301.7    | V    | 52.8           | -24.7          | 28.1           | 80.8              | -52.7  |
| <b>Wrist</b>      | 867.8     | V    | 47.0           | -24.7          | 22.3           | 80.8              | -58.5  |
|                   | 1301.7    | V    | 54.6           | -24.7          | 29.9           | 80.8              | -50.9  |

**Figure 30. Radiated Emission. Antenna Polarization: VERTICAL.  
Detectors: 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)

#### 8.4 Test Instrumentation Used, Radiated Measurements

| Instrument                           | Manufacturer     | Model                | Serial Number | Calibration       | Period  |
|--------------------------------------|------------------|----------------------|---------------|-------------------|---------|
| EMI Receiver                         | HP               | 85422E               | 3906A00276    | January 15, 2014  | 1 year  |
| RF Section                           | HP               | 85420E               | 3705A00248    | January 15, 2014  | 1 year  |
| Low Noise Amplifier                  | DBS<br>MICROWAVE | LNA-DBS-<br>0411N313 | 013           | August 21, 2013   | 1 year  |
| Spectrum Analyzer                    | HP               | 8592L                | 3826A01204    | February 28, 2014 | 1 year  |
| Antenna Biconical                    | EMCO             | 3104                 | 2606          | August 30, 2012   | 2 years |
| Antenna Log Periodic                 | ARA              | LPD-2010/A           | 1038          | April 2, 2013     | 2 years |
| Double Ridged Waveguide Horn Antenna | EMCO             | 3115                 | 29845         | March 14, 2012    | 3 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 31 Test Equipment Used**

## 9. 20dB Bandwidth

### 9.1 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. The E.U.T was tested in 2 modulation modes: ASK and FSK.

### 9.2 Results Table

E.U.T Description: HealthCare Tag v2.0

Model: Lock Alert PRF-HCT20LA

Serial Number: Not Designated

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

| Modulation | Bandwidth Reading<br>(kHz) | Specification*<br>(kHz) | Margin<br>(kHz) |
|------------|----------------------------|-------------------------|-----------------|
| FSK        | 380                        | <1082                   | -702            |
| ASK        | 235                        | <1082                   | -847            |

**Figure 32 20dB Bandwidth Test Results**

JUDGEMENT: Passed by 702 kHz

For additional information see Figure 33 and Figure 34.

TEST PERSONNEL:

Tester Signature: 

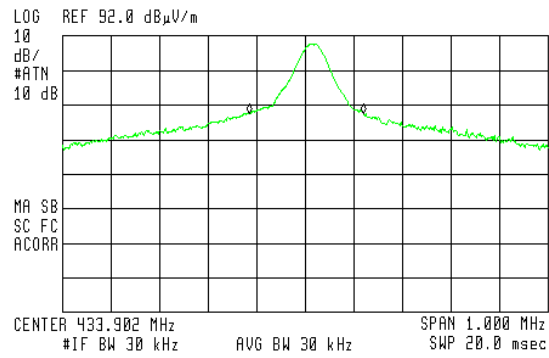
Date: 25.08.14

Typed/Printed Name: M. Zohar

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



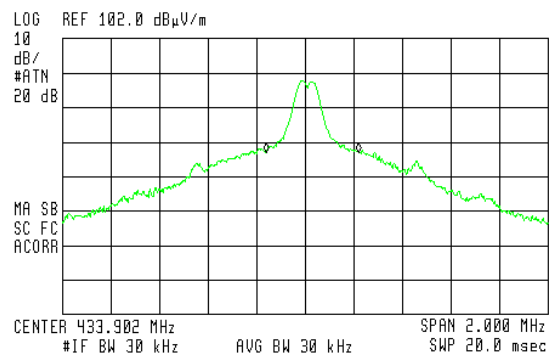
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 235 kHz  
.07 dB



**Figure 33 20dB ASK MODULATION**



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 300 kHz  
.05 dB



**Figure 34 20dB FSK MODULATION**

### 9.3 Test Equipment Used; 20dB Bandwidth

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period  |
|-------------------------|--------------|---------------|---------------|------------------|---------|
| EMI Receiver            | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 year  |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year  |
| Antenna Log Periodic    | ARA          | LPD-2010/A    | 1038          | April 2, 2013    | 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 35 Test Equipment Used**

## 10. 26dB 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 26 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. The E.U.T was tested in 2 modulation modes: ASK and FSK.

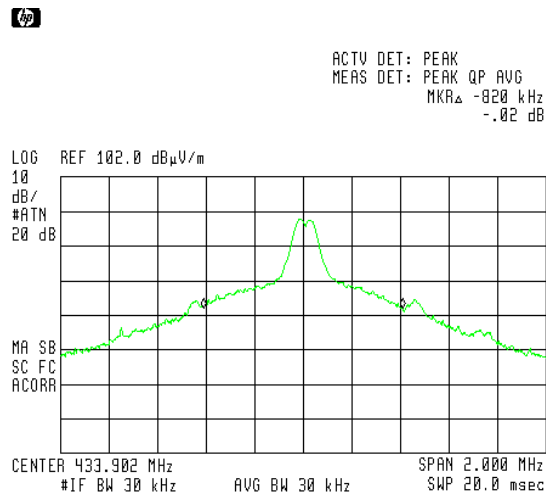
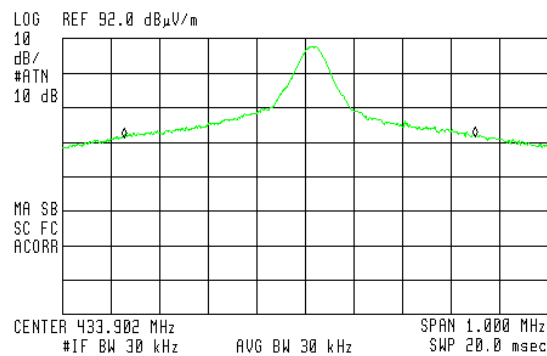


Figure 36 26dB FSK Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR  $\Delta$  723 kHz  
.09 dB



**Figure 37 26dB ASK Modulation**

## 10.2 Results Table

E.U.T Description: HealthCare Tag v2.0  
Model: Wrist Tag PRF-HCT20WT  
Lock Alert PRF-HCT20LA  
Serial Number: Not Designated  
Specification: F.C.C. Part 15, Subpart C: (15.231(c))

| Modulation | Bandwidth Reading (kHz) |
|------------|-------------------------|
| FSK        | 820                     |
| ASK        | 723                     |

**Figure 38 26dB Test Results**

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 25.08.014

Typed/Printed Name: M. Zohar



### 10.3 Test Equipment Used; 26dB Bandwidth

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period |
|-------------------------|--------------|---------------|---------------|------------------|--------|
| EMI Receiver            | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 year |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year |
| Antenna Log Periodic    | ARA          | LPD-2010/A    | 1038          | April 2, 2013    | 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 39 Test Equipment Used**

## 11. R.F Exposure/Safety

The typical placement of the E.U.T. is as a personal tag. The typical distance between the E.U.T. and the user is 0.5 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on 47CFR1 Section 1.1310 Requirements

- (a) FCC Limit at 433.92 MHz is:

$$\frac{f}{1500} = 0.289 \frac{mW}{cm^2}$$

Using Table 1 of 47CFR1 Section 1.1310 limit for general population/uncontrolled exposures, the above levels are an average over 30 minutes.

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

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

$P_t$  = Calculated Transmitted Power (includes  $G_t$ ) =  $2.18 \times 10^{-5}$

$G_t$  = Antenna Gain

$R$  = Distance From Transmitter = 0.5cm

- (c) The peak power density produced by the E.U.T. is:

$$S_p = \frac{2.18 \times 10^{-5}}{4\pi(0.5)^2} = 6.93 \times 10^{-6} \frac{mW}{cm^2}$$

- (d) This value is below the FCC limit.

## 12. APPENDIX A - CORRECTION FACTORS

### 12.1 Correction factors for CABLE from EMI receiver to test antenna at 3 meter range.

| FREQUENCY<br>(MHz) | CORRECTION<br>FACTOR<br>(dB) | FREQUENCY<br>(MHz) | CORRECTION<br>FACTOR<br>(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".

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

| FREQUENCY<br>(GHz) | CORRECTION<br>FACTOR<br>(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.

**12.3 Correction factors for CABLE**  
**from spectrum analyzer**  
**to test antenna above 2.9 GHz**

| FREQUENCY<br>(GHz) | CORRECTION<br>FACTOR<br>(dB) | FREQUENCY<br>(GHz) | CORRECTION<br>FACTOR<br>(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.

**12.4      12.6      Correction factors for      LOG PERIODIC  
ANTENNA**

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

**Distance of 3 meters**

| <b>FREQUENCY<br/>(MHz)</b> | <b>AFE<br/>(dB/m)</b> |
|----------------------------|-----------------------|
| 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<br/>(MHz)</b> | <b>AFE<br/>(dB/m)</b> |
|----------------------------|-----------------------|
| 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".

## 12.5 Correction factors for

## LOG PERIODIC ANTENNA

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

| FREQUENCY<br>(GHz) | ANTENNA<br>FACTOR<br>(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<br>(GHz) | ANTENNA<br>FACTOR<br>(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".

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

| FREQUENCY<br>(MHz) | AFE<br>(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".



## 12.7 Correction factors for Double-Ridged Waveguide Horn

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

| FREQUENCY<br>Y<br>(GHz) | ANTENNA<br>FACTOR<br>(dB 1/m) | ANTENNA<br>Gain<br>(dBi) | FREQUENCY<br>(GHz) | ANTENNA<br>FACTOR<br>(dB 1/m) | ANTENNA<br>Gain<br>(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                     |                    |                               |                          |



**12.8 Correction factors for**

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

| <b>FREQUENCY</b><br>(GHz) | <b>APE</b><br>(dB /m) | <b>Gain</b><br>(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                 |



**12.9 Correction factors for**

**Horn Antenna  
Model: V637**

| <b>FREQUENCY</b><br><b>(GHz)</b> | <b>APE</b><br><b>(dB /m)</b> | <b>Gain</b><br><b>(dB1)</b> |
|----------------------------------|------------------------------|-----------------------------|
| 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                        |

## 12.10 Correction factors for ACTIVE LOOP ANTENNA

**Model 6502**

**S/N 9506-2950**

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