

**DATE: 22 October 2008**

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

# **FCC Radio Test Report**

**for**

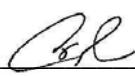
**Precyse Technologies Inc**

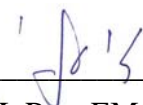
**Equipment under test:**

**SA Tag 2.4 GHz Smart Agent Tag**

**SA24003000**

Written by:   
D. Shidlow, Documentation

Approved by:   
A. Sharabi, Test Engineer

Approved by:   
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

**Measurement/Technical Report for**  
**Precyse Technologies Inc**  
**SA Tag 2.4 GHz Smart Agent Tag**

**SA24003000**

**FCC ID: WONSA24003000**

**22 October 2008**

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

Equipment type:

Limits used:  
47CFR15 Section 15.247

Measurement procedure used is ANSI C63.4-2003.

Application for Certification  
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Applicant for this device:  
(different from "prepared by")  
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# 1. General Information

## 1.1 Administrative Information

Manufacturer:	Precyse Technologies Inc
Manufacturer's Address:	94 Em Hamoshavot St. Petach Tikva 49527 Israel Tel: +972-3-922-7093 Fax: +972-3-922-7515
Manufacturer's Representative:	Lior Bilia
Equipment Under Test (E.U.T):	SA Tag 2.4 GHz Smart Agent Tag
Equipment Model No.:	SA24003000
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	05.08.08
Start of Test:	05.08.08
End of Test:	12.08.08
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15 Sub-part C

## **1.2 List of Accreditations**

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

### **1.3     *Product Description***

The SAT is used to track assets in real time. It is based on an RF transceiver and a microcontroller. It uses the iLocate proprietary protocol which provides a 2 way, half duplex communication with the base station. The unit is powered by 2x 2/3 AA lithium thionyl chloride (Li-SOCl<sub>2</sub>) batteries and is hermetically sealed with no connectors available to the end user.

### **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 August 22, 2006).  
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

### **1.6     *Measurement Uncertainty***

#### **Radiated Emission**

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

## 2. Product Labeling


Model: SA Tag	CID: 3081
P/N: SA24003000	
UID: 1000002557	
FCC ID: WOMSA24003000	
 <b>PRECYSE</b> TECHNOLOGIES	Smart Agent tag CID: _____

Figure 1. FCC Label

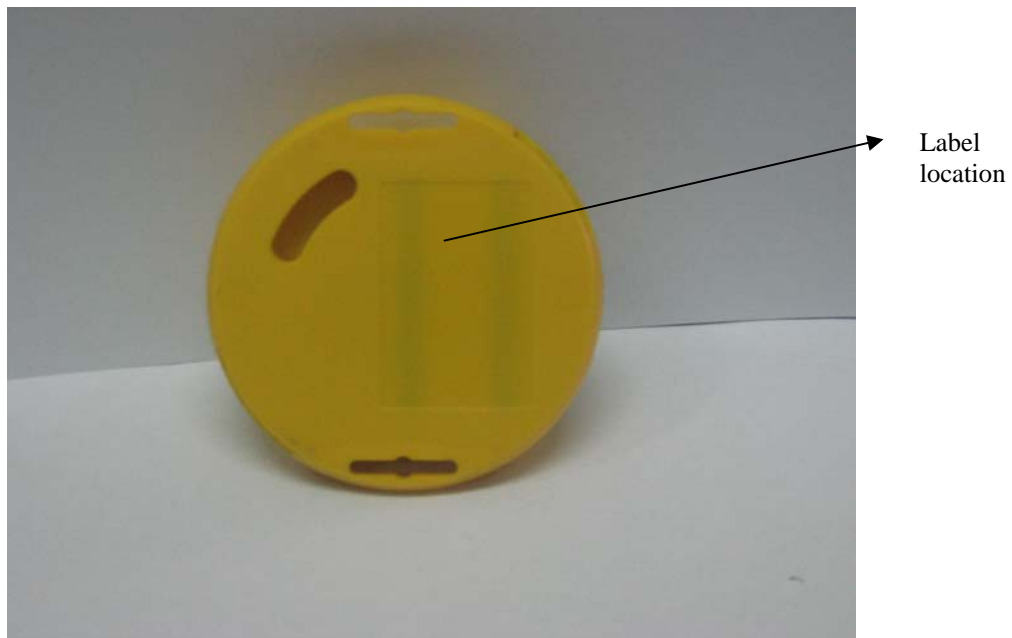


Figure 2. Location of Label on EUT



### 3. System Test Configuration

#### 3.1 *Justification*

The E.U.T. can be either wall-mounted or ceiling mounted. To determine the E.U.T. antenna orientation for all tests, the product carrier field level was measured with the E.U.T. in simulated wall-mounted and ceiling-mounted positions.

The ceiling-mounted position of the E.U.T. was selected as the worst case final position.

#### 3.2 *EUT Exercise Software*

The unit tested was configured with all hardware options present (Motion sensor M1 and keypad connectors J2 and J3). Since the unit, under its normal operation, does not transmit data periodically, for emissions measurements, the SAT was programmed with a special test software to transmit packets continuously at maximum output power, maximum duty cycle (20%) with power amplifier enabled. Normal duty cycle, assuming worst case, one event per second is 0.5% (5msec transmit time per 1 second).

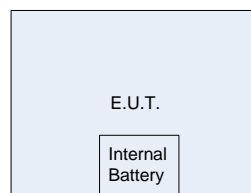
#### 3.3 *Special Accessories*

N/A

#### 3.4 *Equipment Modifications*

No modifications were needed in order to achieve compliance

#### 3.5 *Configuration of Tested System*



E.U.T. contains integral antenna.

**Figure 3. Configuration of Tested System**

## 4. Theory of Operation

### 4.1 *Theory of Operation*

The SAT method of communication is synchronized event based reporting, the SAT spends most of its time in low power sleep mode. When an event happens, the SAT sends a report to the base station. In order to avoid packet collisions and associated detection methods, the system uses a synchronous protocol, that is, An SAT can transmit data only after receiving a synchronization signal from the base station.

## 5. 6dB Minimum Bandwidth

### 5.1 Test Specification

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

### 5.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope. The E.U.T. was tested at 2410 and 2475 MHz.

The E.U.T. was tested in three operating channels and frequencies (1 (2.410 GHz); 8 (2.445 GHz); 14 (2.475 GHz)).

15:27:40 AUG 07, 2008

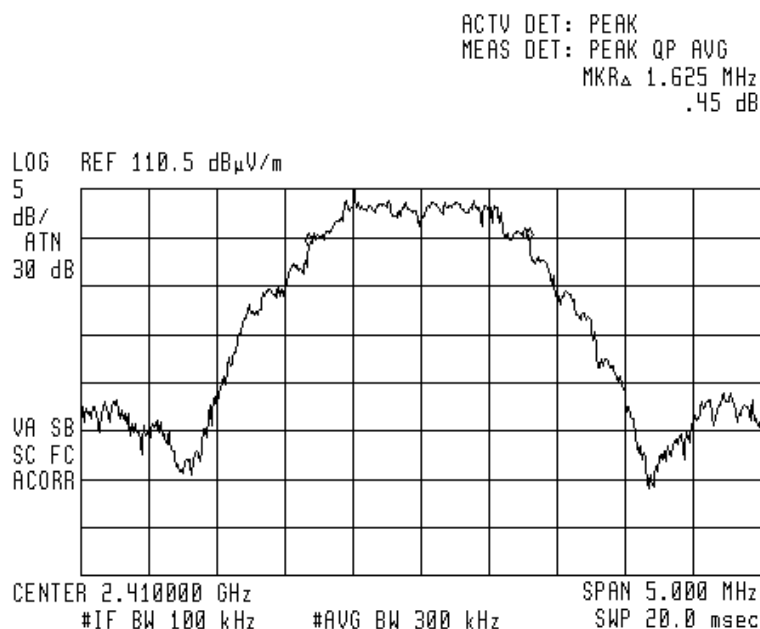


Figure 4. 2410 MHz

10:50:11 AUG 11, 2008

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.538 MHz  
-.12 dB

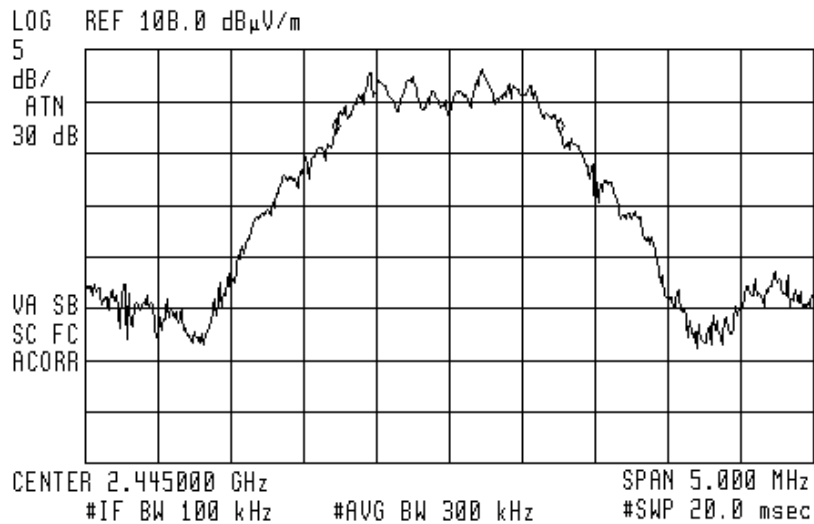


Figure 5 —2475 MHz

16:53:58 AUG 11, 2008

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.575 MHz  
-.11 dB

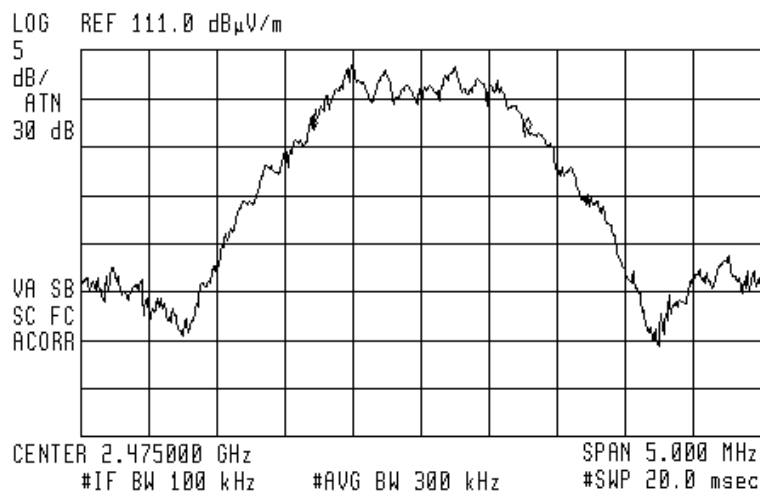


Figure 6 —2475 MHz

### 5.3 Test Results

E.U.T Description: SA Tag 2.4 GHz Smart Agent Tag

Model: SA24003000

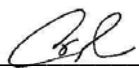
Serial Number: Not Designated

Operation Frequency (MHz)	Bandwidth Reading (MHz)	Specification (MHz)
2410.00	1.625	>0.5
2445.00	1.575	>0.5
2475.00	1.575	>0.5

**Figure 7 Test Results**

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 02.10.08

Typed/Printed Name: A. Sharabi

#### 5.4 Test Equipment Used.

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	November 22, 2007	1 year
RF Section	HP	85420E	3427A00103	November 22, 2007	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	February 4, 2007	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 8 Test Equipment Used**

## 6. Radiated Power Output

### 6.1 Test Specification

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

### 6.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

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

The E.U.T. was tested in three operating channels and frequencies (1 (2.410 GHz); 8 (2.445 GHz); 14 (2.475 GHz)).

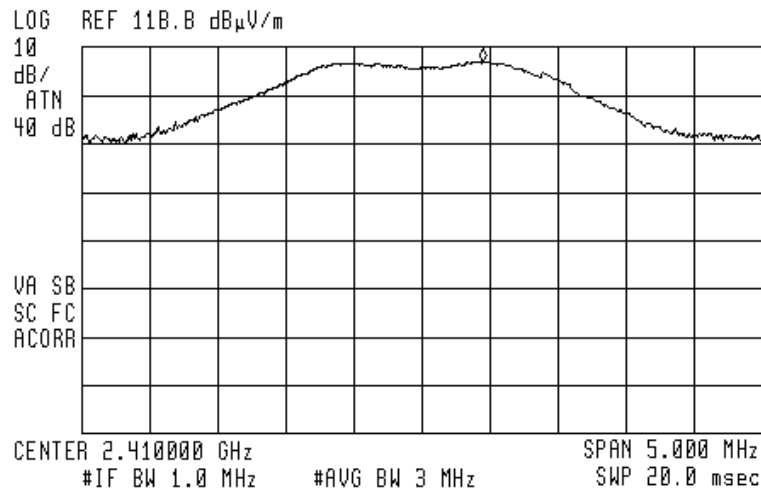
Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

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

The E.U.T. was tested at 2410, 2445, and 2475 MHz with QPSK modulation.

15:16:41 AUG 07, 2008

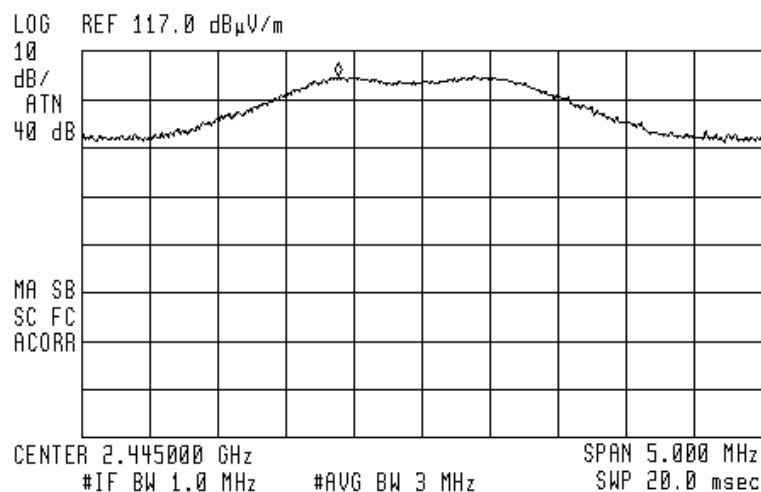
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.410450 GHz  
115.79 dB $\mu$ V/m



**Figure 9 2410 MHz**

10:36:44 AUG 11, 2008

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.444388 GHz  
111.61 dB $\mu$ V/m



**Figure 10 2445 MHz**



16:40:23 AUG 11, 2008

ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 2.475563 GHz  
 113.88 dB $\mu$ V/m

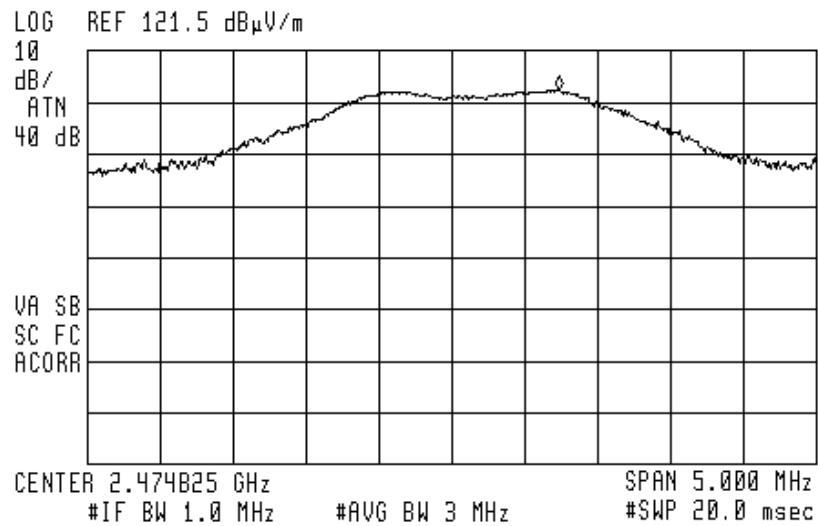


Figure 11 2475 MHz

### 6.3 Results Calculation

E.U.T. Description: SA Tag 2.4 GHz Smart Agent Tag

Model No.: SA24003000

Serial Number: Not Designated

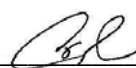
Specification: F.C.C. Part 15, Subpart C

Frequency	E	E	Antenna Gain	Antenna Distance	Calculated Results	Limit	Margin
(MHz)	(dBμV/m)	(V/m)	(dBi)	(m)	(mW)	(W)	(mW)
2410.00	115.79	0.61	1	3	113.0	1.0	887.0
2445.00	111.61	0.38	1	3	43.0	1.0	957.0
2475.00	113.88	0.49	1	3	72.0	1.0	928.0

**Figure 12 Test Results**

JUDGEMENT: Passed by 887.0 mW

TEST PERSONNEL:

Tester Signature: 

Date: 02.10.08

Typed/Printed Name: A. Sharabi

#### 6.4 Test Equipment Used.

##### Radiated Maximum Power Output

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	February 4, 2007	2 years

**Figure 13 Test Equipment Used**

## 7. Band Edge

[In Accordance with section 15.247(c)]

### 7.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The EMI receiver was adjusted to the transmission channel at the maximum radiated level. The display line was set to 20 dBc and the EMI receiver was set to the band edge frequencies.

Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2410 MHz, and 2475 MHz correspondingly.

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

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

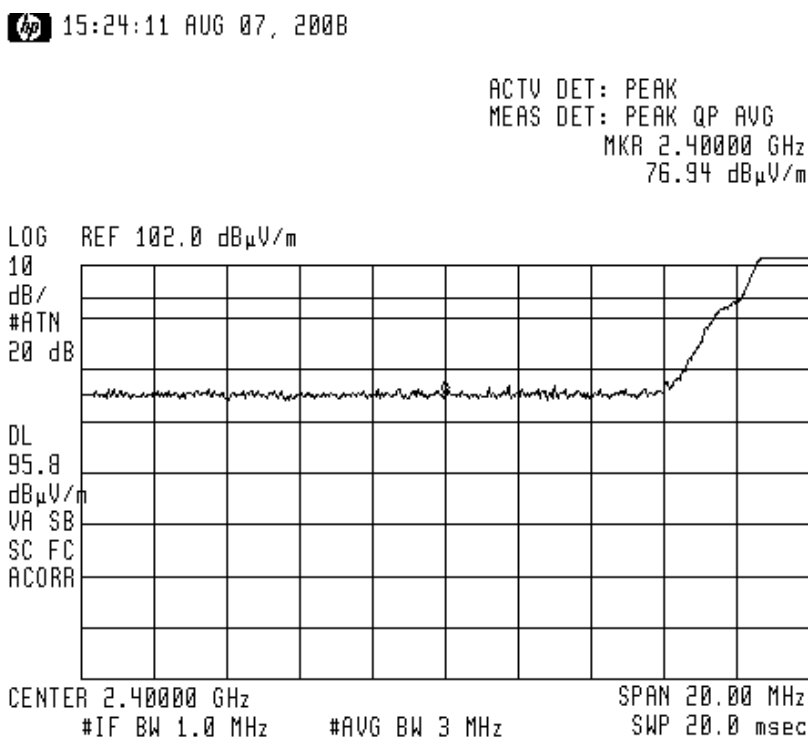


Figure 14 —2410 MHz

16:48:43 AUG 11, 2008

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKA 2.48285 GHz  
77.19 dB $\mu$ V/m

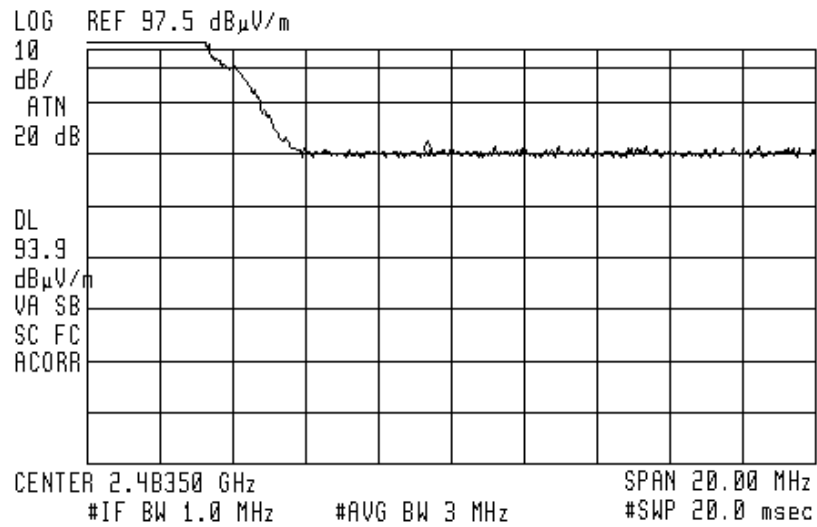


Figure 15 —2475 MHz

## 7.2 Results table

E.U.T. Description: SA Tag 2.4 GHz Smart Agent Tag

Model No.: SA24003000

Serial Number: Not Designated

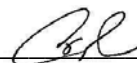
Specification: F.C.C. Part 15, Subpart C (15.247 (c))

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBuV/m)	Specification (dBuV/m)	Margin (dB)
2410	2400.00	76.94	95.8	-18.86
2475	2483.50	77.19	93.9	-16.71

**Figure 16 Band Edge**

JUDGEMENT: Passed by 16.71 dB

TEST PERSONNEL:

Tester Signature: 

Date: 02.10.08

Typed/Printed Name: A. Sharabi

### 7.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	February 4, 2007	2 years

**Figure 17 Test Equipment Used**

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

### 8.1 Test Specification

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

### 8.2 Test Procedure

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

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

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

The E.U.T. was operated at the frequency of kHz. This frequency was measured using a peak detector.

The E.U.T. was tested in three operating channels and frequencies (1 (2.410 GHz); 8 (2.445 GHz); 14 (2.475 GHz)).

### 8.3 Measured Data

JUDGEMENT: Passed

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

The results for all three channels were the same.

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

TEST PERSONNEL:

Tester Signature:  Date: 02.10.08

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 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

#### 8.5 Field Strength Calculation

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

$$FS = RA + AF + CF$$

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

No external pre-amplifiers are used.

## **9. Spurious Radiated Emission 30 – 1000 MHz**

### **9.1 Test Specification**

30 MHz-1000 MHz, F.C.C., Part 15, Subpart C

### **9.2 Test Procedure**

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

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

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

The frequency range 30 MHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

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

Verification of the E.U.T emissions was based on the following methods:

- Turning the E.U.T on and off.

- Using a frequency span less than 10 MHz.

- Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The E.U.T. was tested in three operating channels and frequencies (1 (2.410 GHz); 8 (2.445 GHz); 14 (2.475 GHz)).

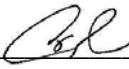
### 9.3 **Test Data**

JUDGEMENT: Passed

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

No signals were detected in the frequency range of 30 MHz – 1.0 GHz.

TEST PERSONNEL:

Tester Signature: 

Date: 02.10.08

Typed/Printed Name: A. Sharabi

#### 9.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 23, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

### **9.5     *Field Strength Calculation***

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

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

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

No external pre-amplifiers are used.

## 10. Spurious Radiated Emission Above 1 GHz

### 10.1 Radiated Emission Above 1 GHz

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, 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 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.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.

In the frequency range 2.9-25.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

The test distance was 3 meters.

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

Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The E.U.T. was tested in three operating channels and frequencies (1 (2.410 GHz); 8 (2.445 GHz); 14 (2.475 GHz)).

## 10.2 Test Data

JUDGEMENT: Passed by 19.4 dB

For the operation channel 1 (2.410 GHz), the margin between the emission level and the specification limit is 19.9 in the worst case at the frequency of 4820.00 MHz, horizontal polarization.

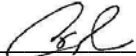
For the operation channel 8 (2.445 GHz), the margin between the emission level and the specification limit is 19.4 in the worst case at the frequency of 4889.00 MHz, horizontal polarization.

For the operation channel 14 (2.475 GHz), the margin between the emission level and the specification limit is 20.5 in the worst case at the frequency of 4950.00 MHz, horizontal and vertical polarizations.

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

The details of the highest emissions are given in *Figure 18* to *Figure 19*.

### TEST PERSONNEL:

Tester Signature:  Date: 02.10.08

Typed/Printed Name: A. Sharabi

## Radiated Emission Above 1 GHz

E.U.T Description    SA Tag 2.4 GHz Smart Agent Tag  
Type                      SA24003000  
Serial Number:        Not Designated

Specification: FCC, Part 15, Subpart C

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

Channel	Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Amp (dBμV/m)	Peak. Specification (dB μV/m)	Peak. Margin (dB)
1	2410.00	4820.00	H	53.1*	74.0	-20.9
1	2410.00	4820.00	V	49.9*	74.0	-24.1
8	2445.00	4889.00	H	54.6*	74.0	-19.4
8	2445.00	4889.00	V	51.2*	74.0	-22.8
14	2475.00	4950.00	H	53.5*	74.0	-20.5
14	2475.00	4950.00	V	52.6*	74.0	-21.4

**Figure 18. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Amp” includes correction factor.

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



## Radiated Emission Above 1 GHz

E.U.T Description    SA Tag 2.4 GHz Smart Agent Tag  
Type                      SA24003000  
Serial Number:        Not Designated

Specification: FCC, Part 15, Subpart C

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

Channel	Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Average Amp (dBμV/m)	Average Specification (dB μV/m)	Average Margin (dB)
1	2410.00	4820.00	H	34.1*	54.0	-19.9
1	2410.00	4820.00	V	33.5*	54.0	-20.5
8	2445.00	4889.00	H	33.7*	54.0	-20.3
8	2445.00	4889.00	V	33.4*	54.0	-20.6
14	2475.00	4950.00	H	33.1*	54.0	-20.9
14	2475.00	4950.00	V	33.5*	54.0	-20.5

**Figure 19. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Average**

### Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Amp” includes correction factor.

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

### 10.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 Year
RF Filter Section	HP	85420E	3705A00248	November 12, 2007	1 Year
Antenna Biconical	ARA	BCD 235/B	1041	March 23, 2008	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	February 4, 2007	2 Years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 Years
Horn Antenna	ARA	SWH-28	1008	December 8, 2006	2 Years
Horn Antenna	Narda	V637	0410	December 8, 2006	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 2, 2007	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 9, 2008	1 Year
Low Noise Amplifier	MK Milliwave	MKT6-3000 4000-30-13P	399	January 9, 2008	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	November 14, 2007	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

## 11. Radiated Power Spectral Density

[In accordance with section 15.247(e)]

### 11.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

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

The E.U.T. was tested in three operating channels and frequencies (1 (2.410 GHz); 8 (2.445 GHz); 14 (2.475 GHz)).

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

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

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

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.4104290 GHz  
101.62 dB $\mu$ V/m

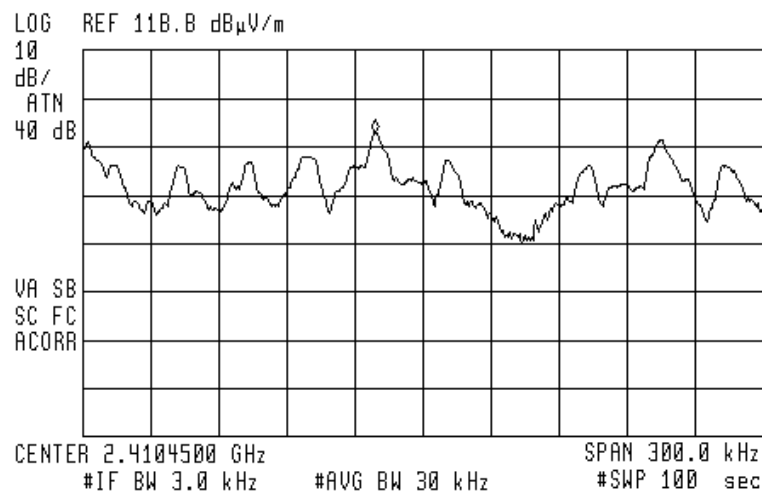


Figure 20 —2410 MHz

10:44:45 AUG 11, 2008

ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 2.4443658 GHz  
 95.05 dB $\mu$ V/m

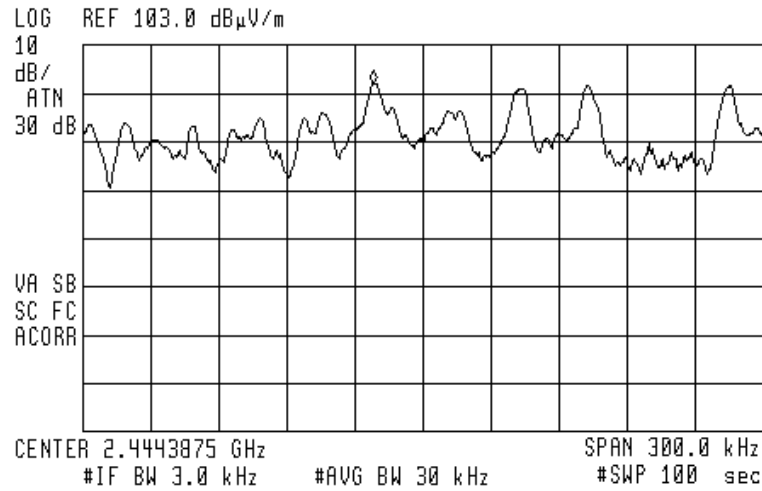


Figure 21 —2445 MHz

16:45:47 AUG 11, 2008

ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 2.4755528 GHz  
 98.75 dB $\mu$ V/m

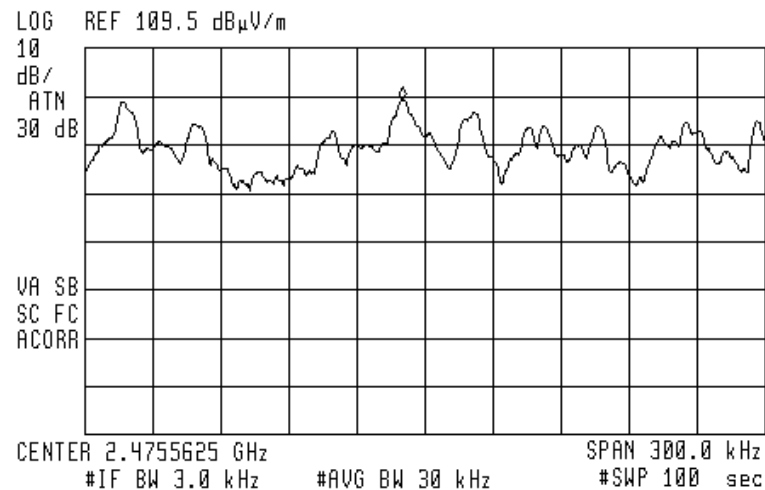


Figure 22 —2475 MHz

## 11.2 Results table

E.U.T. Description: SA Tag 2.4 GHz Smart Agent Tag

Model No.: SA24003000

Serial Number: Not Designated

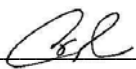
Specification: F.C.C. Part 15, Subpart C (15.247(e))

Frequency	E	Spectral Density Result	Antenna Gain	Antenna Distance	Calculated Results	Spec.	Margi n
(MHz)	(db $\mu$ V/m)	(V/m)	(dBi)	(m)	(mW)	(mW)	(mW)
2410.00	101.62	0.11	1	3	3	6.3	-3.3
2445.00	95.05	0.056	1	3	0.94	6.3	-5.36
2475.00	98.75	0.079	1	3	1.89	6.3	-4.41

**Figure 23 Test Results**

JUDGEMENT: Passed 3.3 mW

TEST PERSONNEL:

Tester Signature: 

Date: 02.10.08

Typed/Printed Name: A. Sharabi

### 11.3 Test Equipment Used.

Transmitted Power Density

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	November 22, 2007	1 year
RF Section	HP	85420E	3427A00103	November 22, 2007	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	February 4, 2007	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 24 Test Equipment Used**

## 12. Antenna Gain/Information

The antenna gain is 1 dBi simulated.



### 13. R.F Exposure/Safety Calculation

Typical use of the E.U.T. is to track assets in real time. The typical placement of the E.U.T. is wall or ceiling mounted. The typical distance between the E.U.T. and the user in the worst case application, is <1 m.

#### Calculation of Maximum Permissible Exposure (MPE)

##### Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 2437 MHz is:  $1 \frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

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

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

P<sub>t</sub>- Transmitted Power 113 mw Peak

G<sub>T</sub>- Antenna Gain, 1 dBi = 1.25 (Numeric)

R- Distance from Transmitter using 1 m worst case

(c) Transmitter peak power using source based time averaging of 0.5% maximum, 5 msec "ON" time, "OFF" + "ON" time 100 msec:

$$P_t = \frac{113 \times 5}{100} = 5.65 mW$$

(d) The peak power density (time averaging) is :

$$S_p = \frac{5.65 \times 1.25}{4\pi(100)^2} = 0.056 \times 10^{-3} \frac{mW}{cm^2}$$

## 14. APPENDIX B - CORRECTION FACTORS

### 14.1 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".

## 14.2 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".

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

<b>FREQUENCY</b> (MHz)	<b>AFE</b> (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

**NOTES:**

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".