



**DATE: 7 November 2013**

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

# **FCC Radio Test Report**

**for**

**Precyse Technologies Inc**

**Equipment under test:**

**PBS Base Station**

**BS91/103000**

Written by:

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Approved 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 Precyse Technologies Inc PBS Base Station

BS91/103000

**FCC ID: WONBS91103001**

This report concerns:

Original Grant: X

Class I Change:

Class II Change:

Equipment type:

Digital Transmission System

Limits used:

47CFR15 Section 15.247

Measurement procedure used is KDB 558074 D01 09 April 2013 and ANSI 6.34: 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:	Ha'amal 11 Rosh Ha'ayin, 48092 Israel Tel: +972-3-922-7093 Fax: +972-3-922-7515
Manufacturer's Representative:	Yossi Nurok
Equipment Under Test (E.U.T):	PBS Base Station
Equipment Model No.:	BS91/103000
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	27.10.2013
Start of Test:	27.10.2013
End of Test:	07.11.2013
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	47CFR15 Section 15.247



## **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 PBS is used to communicate between the asset agents and a personal computer. It also provides synchronization signal for the system.

It uses the iLocate proprietary protocol which provides a 2 way, half duplex communication with the tags and beacons.

The unit is DC powered, 12 VDC, up to 1A.

### **1.4 Test Methodology**

Radiated testing was performed according to the procedures in KDB 558074 D01 09 April 2013 and ANSI 6.34: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

### **1.5 Test Facility**

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing September 3, 2009).

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

### **1.6 Measurement Uncertainty**

#### **Conducted Emission**

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

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

$\pm 3.6$  dB

Note: See ITL Procedure No. PM 198.

#### **Radiated Emission**

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

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

$\pm 4.96$  dB

## 2. System Test Configuration

### 2.1 Justification

The E.U.T. is a wall-mounted unit and was tested in the vertical position simulating wall-mounting.

Modulation is 2-FSK

### 2.2 EUT Exercise Software

The Transmission mode facilitated higher packet rate (higher transmission duty cycle) in order to save tester time and effort. The normal duty cycle is 0.5%, 5msec out of 1sec of transmission time.

### 2.3 Special Accessories

No special accessories were needed to achieve compliance.

### 2.4 Equipment Modifications

No modifications were necessary in order to achieve compliance.

### 2.5 Configuration of Tested System

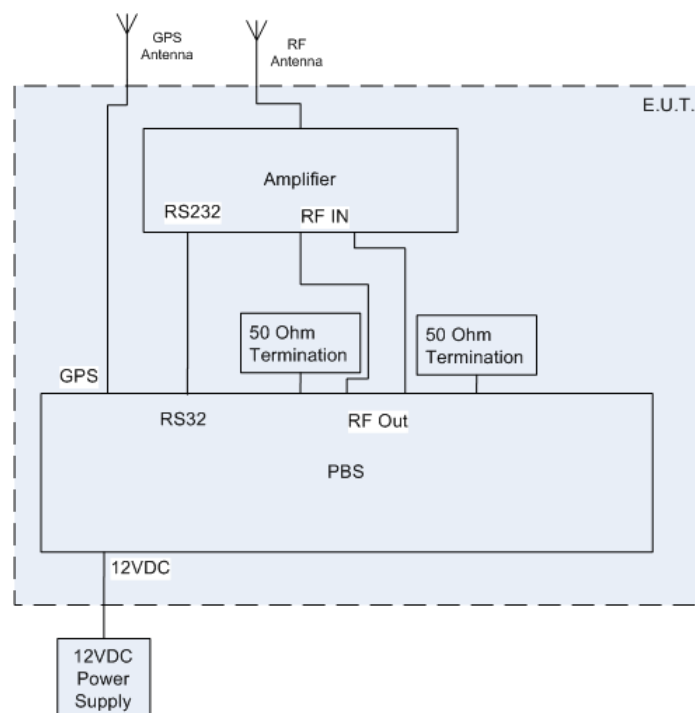
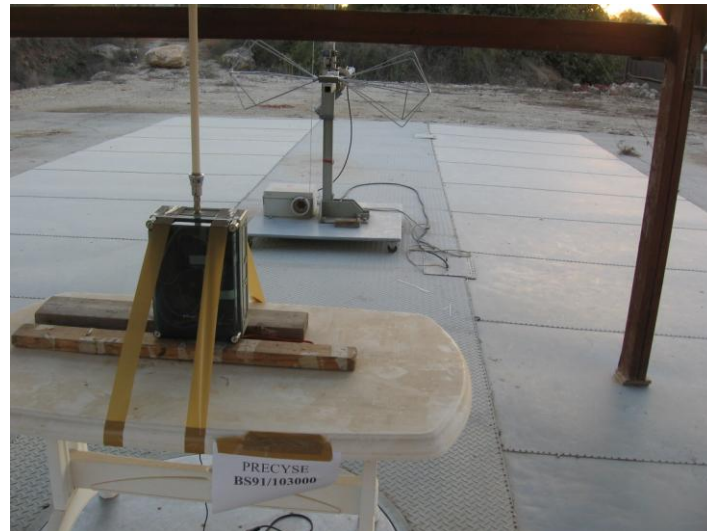


Figure 1. Configuration of Tested System



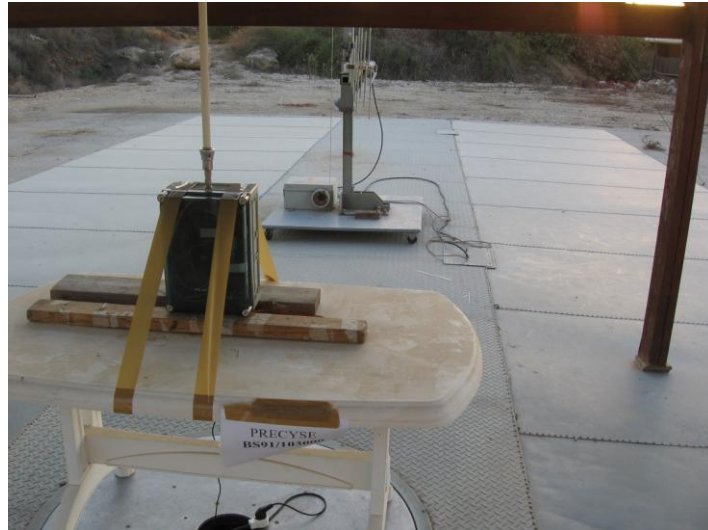
### 3. Test Setup Photos



**Figure 2. Radiated Emission Test**



**Figure 3. Radiated Emission Test**



**Figure 4. Radiated Emission Test**



**Figure 5. Conducted Emission From AC Mains**



**Figure 6. Conducted Emission From Antenna Ports Tests**

## 4. Conducted Emission From AC Mains

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

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

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

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

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

### 4.3 Measured Data

JUDGEMENT: Passed by 19.55dB

The margin between the emission levels and the specification limit is, in the worst case, 20.76dB for the phase line at 0.482MHz and 19.55dB at 4.778MHz 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 7* to

*Figure 10.*

TEST PERSONNEL:

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

Date: 07.11.13

Typed/Printed Name: A.Sharabi

## Conducted Emission

E.U.T Description      PBS Base Station  
Type                      BS91/103000  
Serial Number:        Not Designated

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

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	CE22BQP		
Trace2:	CE22BAP		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	150 kHz	43.86	-22.13
2 Average	150 kHz	28.83	-27.16
1 Quasi Peak	190 kHz	40.64	-23.39
2 Average	190 kHz	28.08	-25.94
1 Quasi Peak	238 kHz	36.05	-26.11
2 Average	242 kHz	27.17	-24.85
2 Average	386 kHz	27.34	-20.80
1 Quasi Peak	398 kHz	32.98	-24.90
1 Quasi Peak	426 kHz	32.98	-24.34
2 Average	430 kHz	25.34	-21.91
1 Quasi Peak	478 kHz	32.29	-24.07
2 Average	482 kHz	25.54	-20.76
2 Average	526 kHz	23.88	-22.11
1 Quasi Peak	1.158 MHz	29.94	-26.05
2 Average	3.098 MHz	21.48	-24.51
2 Average	3.338 MHz	19.84	-26.15
1 Quasi Peak	3.346 MHz	26.41	-29.59
2 Average	5.082 MHz	22.85	-27.14
1 Quasi Peak	5.178 MHz	27.24	-32.75
1 Quasi Peak	6.498 MHz	27.26	-32.73

Date: 7.NOV.2013 14:27:29

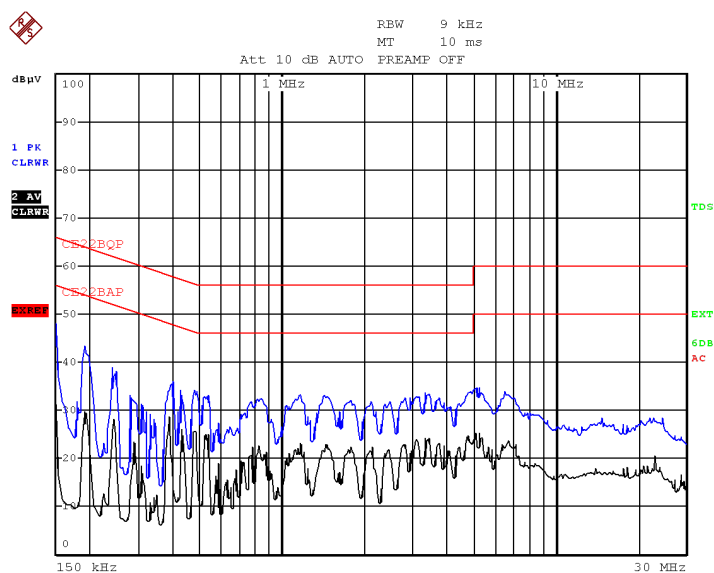
**Figure 7. Detectors: Quasi-peak, AVERAGE .**

*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    PBS Base Station  
Type                    BS91/103000  
Serial Number:        Not Designated

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



Date: 7.NOV.2013 14:21:07

**Figure 8. Detectors: Quasi-peak, Average**



## Conducted Emission

E.U.T Description    PBS Base Station  
Type                    BS91/103000  
Serial Number:        Not Designated

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

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	CE22BQP		
Trace2:	CE22BAP		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	150 kHz	42.53	-23.46
1 Quasi Peak	190 kHz	39.83	-24.20
2 Average	190 kHz	25.21	-28.82
2 Average	390 kHz	25.59	-22.47
2 Average	426 kHz	25.11	-22.21
2 Average	486 kHz	24.05	-22.18
1 Quasi Peak	514 kHz	30.26	-25.73
2 Average	526 kHz	24.54	-21.45
1 Quasi Peak	566 kHz	24.25	-31.74
1 Quasi Peak	598 kHz	21.20	-34.79
1 Quasi Peak	622 kHz	23.26	-32.73
1 Quasi Peak	666 kHz	25.04	-30.95
1 Quasi Peak	778 kHz	29.05	-26.94
1 Quasi Peak	810 kHz	30.58	-25.41
1 Quasi Peak	838 kHz	30.16	-25.83
2 Average	3.458 MHz	24.96	-21.03
2 Average	3.642 MHz	21.62	-24.37
2 Average	4.778 MHz	26.44	-19.55
2 Average	5.082 MHz	26.75	-23.24
2 Average	5.558 MHz	20.00	-29.99

Date: 7.NOV.2013 14:50:16

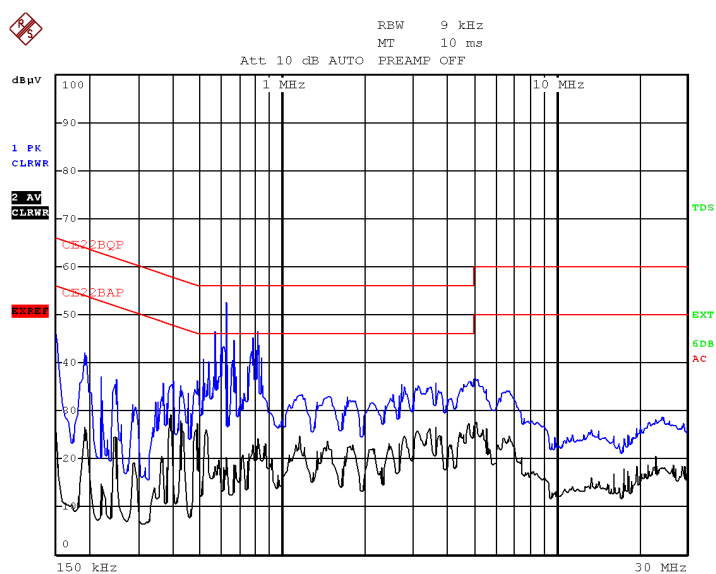
**Figure 9. Detectors: Quasi-peak, AVERAGE**

*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    PBS Base Station  
Type                    BS91/103000  
Serial Number:        Not Designated

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



Date: 7.NOV.2013 14:31:21

**Figure 10 Conducted Emission: NEUTRAL**  
**Detectors: Quasi-peak, Average**





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

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Last Calibration Date</b>	<b>Period</b>
LISN	Fischer	FCC-LISN-2A	127	December 9, 2012	1 Year
Transient Limiter	HP	11947A	3107A03041	February 25, 2013	1 Year
EMI Receiver	Rohde & Schwarz	ESCI7	100724	December 27, 2012	1 Year

## 5. 6 dB Minimum Bandwidth

### 5.1 Test Specification

FCC Part 15, Subpart C Section 15.247-a2

### 5.2 Test Procedure

The E.U.T. was set to the applicable test frequency. The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution BW. The spectrum bandwidth of the E.U.T. at the point of 6 dB below maximum peak power was measured and recorded.

The E.U.T. was tested at 904.9, 911.4, and 917.3 MHz.

### 5.3 Test Results

Operation Frequency (MHz)	Reading (MHz)	Specification (MHz)
904.9	0.625	0.5
911.4	0.640	0.5
917.3	0.645	0.5

**Figure 11 6 dB Minimum Bandwidth Test Results Table**

See additional information in Figure 12 to Figure 14.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 05.11.13

Typed/Printed Name: A.Sharabi

## 6 dB Minimum Bandwidth

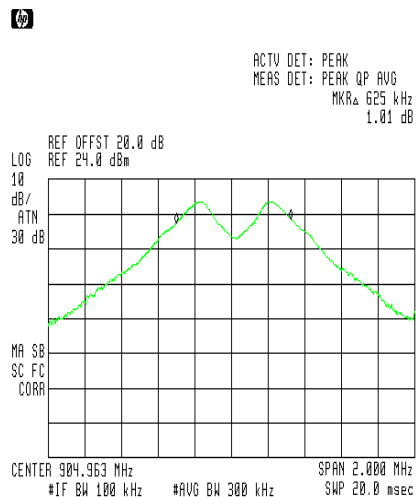


Figure 12 — 904.9 MHz

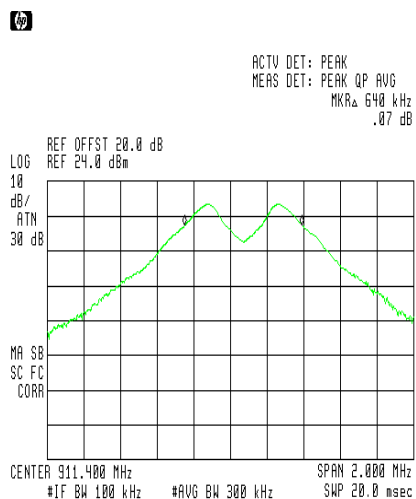


Figure 13 — 911.4 MHz

## 6 dB Minimum Bandwidth

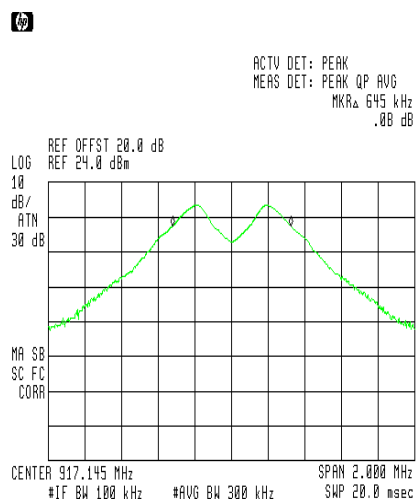


Figure 14 — 917.3 MHz

### 5.4 6 dB Minimum Bandwidth Test Equipment

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8542E	3705A00248	February 27, 2013	1 year
Attenuator	Mini-Circuits	20dB	-	October 27, 2013	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	October 27, 2013	1 year

Figure 15 Test Equipment Used

## 6. Maximum Transmitted Peak Power Output

### 6.1 Test Specification

FCC Part 15, Subpart C Section 15.247(b)

### 6.2 Test Procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (20 dB) and an appropriate coaxial cable. The Spectrum Analyzer was set to 1.0 MHz resolution BW. Peak power level was measured at selected operation frequencies.

The E.U.T. was tested at 904.9, 911.4, and 917.3 MHz.

### 6.3 Test Results

Operation Frequency (MHz)	Power (dBm)	Specification (dBm)	Margin (dB)
904.9	17.20	30.0	-12.80
911.4	16.87	30.0	-13.13
917.3	17.03	30.0	-12.97


**Figure 16 Maximum Peak Power Output**

See additional information in Figure 17 to Figure 19.

JUDGEMENT:

Passed by 12.80dB

TEST PERSONNEL:

Tester Signature: 

Date: 05.11.13

Typed/Printed Name: A.Sharabi

## Maximum Transmitted Peak Power Output

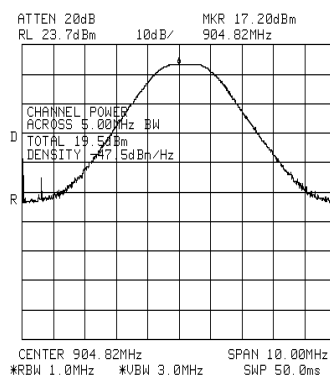


Figure 17 — 904.9 MHz

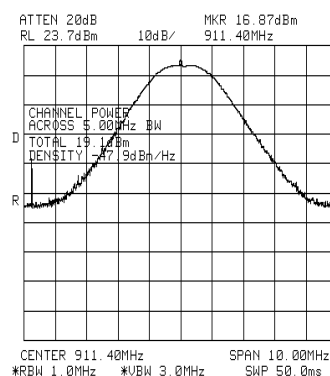


Figure 18 — 911.4 MHz



## Maximum Transmitted Peak Power Output

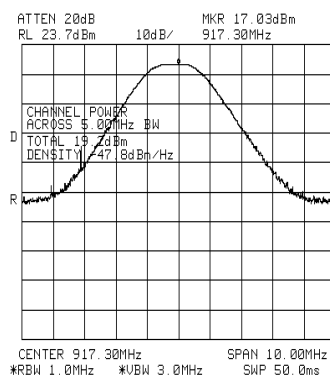


Figure 19 — 917.3 MHz

### 6.1 Maximum Transmitted Peak Output Power Test Equipment

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8564E	3442A002	February 27, 2013	1 year
Attenuator	Mini-Circuits	30dB		October 27, 2013	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	October 27, 2013	1 year

Figure 20 Test Equipment Used

## 7. Peak Power Output Out of Band

### 7.1 Test Specification

FCC Part 15, Subpart C, Section 15.247

### 7.2 Test Procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable. The spectrum analyzer was set to 1 MHz resolution BW except for the frequency range 9 kHz - 150 kHz where the RBW was set to 1 kHz, the frequency range 150 kHz-10 MHz where the RBW was set to 10 kHz, and the frequency range 1 MHz -1 GHz where the RBW was set to 100 kHz. The frequency range from 9 kHz to 10 GHz was scanned. Level of spectrum components out of the 904-918 MHz was measured at the selected operation frequencies.

The E.U.T. was tested at 904.9, 911.4, and 917.3 MHz.

### 7.3 Test Results

Operation Frequency (MHz)	Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
904.9	2123.0	-39.0	-3.0	-36.0
911.4	2157.0	-39.0	-3.0	-36.0
917.3	2132.0	-39.0	-3.0	-36.0

**Figure 21 Peak Power Output of 904-918 MHz Band Test results Table**

See additional information in *Figure 22* to *Figure 24*.

JUDGEMENT: Passed by 36.0dB

TEST PERSONNEL:

Tester Signature: 

Date: 05.11.13

Typed/Printed Name: A.Sharabi





## Peak Power Output Out of 902-918 MHz Band

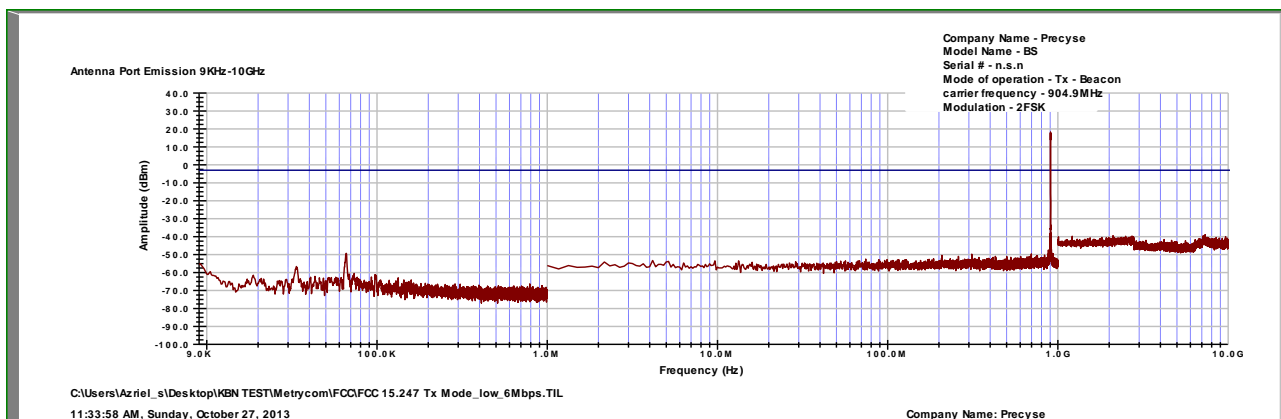


Figure 22 — 904.9 MHz

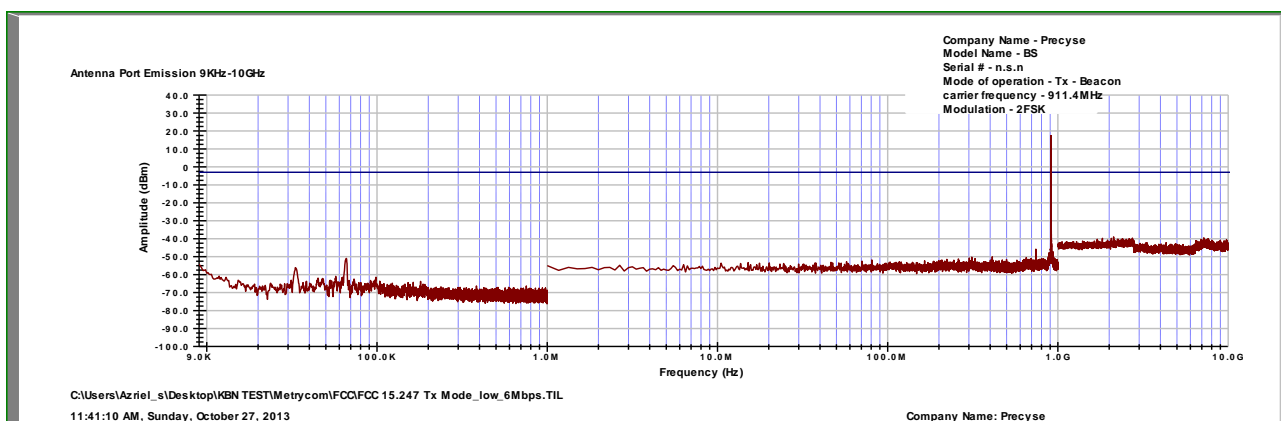


Figure 23 — 911.4 MHz

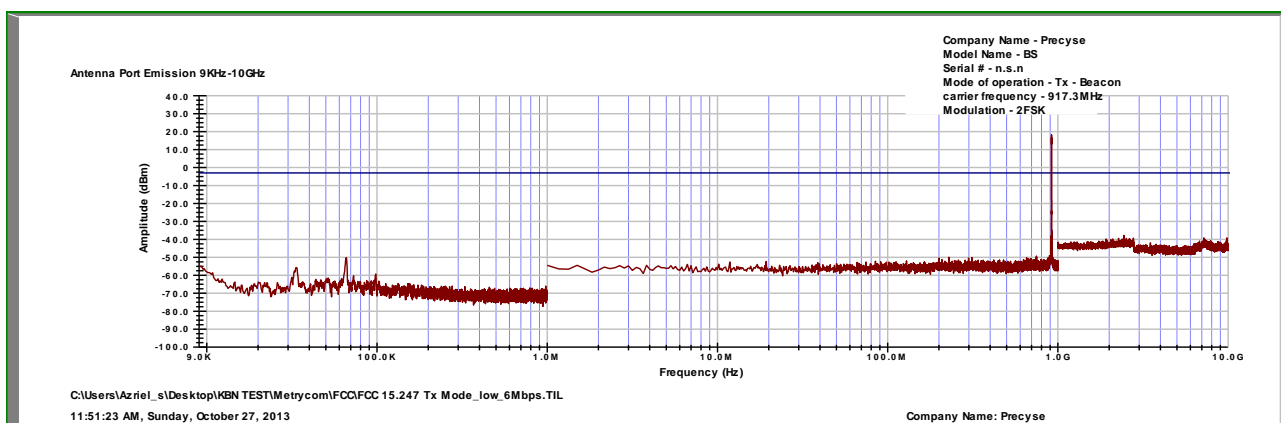


Figure 24 — 917.3 MHz



#### **7.4 Peak Power Output of 902-918 MHz Band Test Equipment**

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8564E	3442A002	February 27, 2013	1 year
Attenuator	Mini-Circuits	30dB		October 27, 2013	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	October 27, 2013	1 year

**Figure 25 Test Equipment Used**

## 8. Band Edge Spectrum

### 8.1 Test Specification

FCC Part 15, Subpart C, Section 15.247

### 8.2 Test Procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution BW. Maximum power level below 902 MHz and above 928 MHz was measured relative to power level at 904.9 MHz, and 917.3 MHz correspondingly.

### 8.3 Test Results

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBm)	Specification (dBm)	Margin (dB)
904.9	902	-37.38	-3.0	-34.38
917.3	928	-46.05	-3.0	-43.05

**Figure 26 Band Edge Spectrum Test Results Table**

See additional information in Figure 27 to Figure 28.

JUDGEMENT: Passed by 34.38dB

TEST PERSONNEL:

Tester Signature: 

Date: 05.11.13

Typed/Printed Name: A.Sharabi

## Band Edge Spectrum

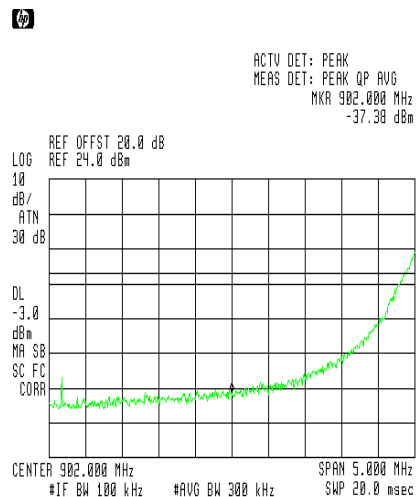


Figure 27 — 904.9 MHz

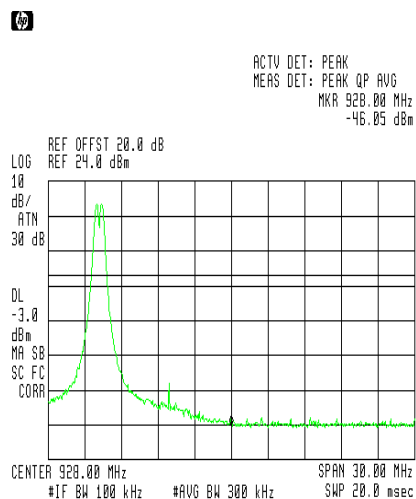


Figure 28 — 917.3 MHz



## Band Edge Spectrum

### 8.4 Band Edge Spectrum Test Equipment

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8542E	3705A00248	February 27, 2013	1 year
Attenuator	Mini-Circuits	20dB	-	October 27, 2013	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	October 27, 2013	1 year

Figure 29 Test Equipment Used

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

### 9.1 Test Specification

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

### 9.2 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 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 tested at the operating frequencies of 904.9, 911.4, and 917.3 MHz.

### 9.3 Test Results


JUDGEMENT: Passed

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

The results for all three operating frequencies were the same.

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

TEST PERSONNEL:

Tester Signature: 

Date: 05.11.13

Typed/Printed Name: A.Sharabi

## Spurious Radiated Emission, 9 kHz – 30 MHz

### 9.4 Spurious Radiated Emission, 9 kHz – 30 MHz Test Equipment

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 year
RF Section	HP	85420E	3705A00248	February 26, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 21, 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 30 Test Equipment Used**

### 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:

$$FS = RA + AF + CF$$

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.

## 10. Spurious Radiated Emission 30 – 10000 MHz

### 10.1 Test Specification

30 MHz-10000 MHz, F.C.C., Part 15, Subpart C

### 10.2 Test Procedure

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

See Section 2.1 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 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.

In the frequency range of 30 MHz – 2.9 MHz, 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 2.9-10.0 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 100 Hz. 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 at the operating frequencies of 904.9, 911.4, and 917.3 MHz.





## Spurious Radiated Emission 30 – 10000 MHz

### 10.3 Test Results

JUDGEMENT: Passed by 3.3dB

No signals were detected in the frequency range of 30 – 1000 MHz in all three operating frequencies.

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

For all three operating frequencies, no signals were detected below 1 GHz.

For the operation frequency of 904.9 MHz, the margin between the emission level and the specification limit is 3.3dB in the worst case at the frequency of 2715.61 MHz, horizontal polarization.

For the operation frequency of 911.4 MHz, the margin between the emission level and the specification limit is 9.5dB in the worst case at the frequency of 2733.90 MHz, horizontal polarization.

For the operation frequency of 917.3 MHz, the margin between the emission level and the specification limit is 3.7dB in the worst case at the frequency of 1833.82 MHz, vertical polarization.

The details of the highest emissions are given in Figure 31 to Figure 32.

TEST PERSONNEL:

Tester Signature: 

Date: 05.11.13

Typed/Printed Name: A.Sharabi

## Spurious Radiated Emission 30 – 10000 MHz

E.U.T Description    PBS Base Station  
Part Number            BS91/103000  
Serial Number:        Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical    Frequency range: 1.0 GHz to 10.0 GHz  
Test Distance: 3 meters                            Detector: Peak

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dBμV/m)	Peak Specification (dB μV/m)	Margin (dB)
904.9	1810.99	H	56.4	74.0	-17.6
904.9	1810.00	V	54.3	74.0	-19.7
904.9	2715.61	H	59.6	74.0	-14.4
904.9	2715.19	V	56.7	74.0	-17.3
911.4	1822.80	H	55.1	74.0	-18.9
911.4	1822.80	V	53.4	74.0	-20.6
911.4	2733.90	H	55.5	74.0	-18.5
911.4	2724.67	V	55.1	74.0	-18.9
917.3	1834.34	H	57.0	74.0	-17.0
917.3	1833.82	V	61.5	74.0	-12.5
917.3	2751.12	H	55.1	74.0	-18.9
917.3	2751.91	V	56.1	74.0	-17.9

**Figure 31. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Peak**

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

“Peak Reading” includes correction factor.

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



## Spurious Radiated Emission 30 – 10000 MHz

E.U.T Description    PBS Base Station  
Part Number            BS91/103000  
Serial Number:        Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical  
Test Distance: 3 meters

Frequency range: 1.0 GHz to 10.0 GHz  
Detector: Average

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Avg. Reading (dBμV/m)	Avg. Specification (dB μV/m)	Margin (dB)
904.9	1810.99	H	43.2	54.0	-10.8
904.9	1810.00	V	45.2	54.0	-8.8
904.9	2715.61	H	50.7	54.0	-3.3
904.9	2715.19	V	45.7	54.0	-8.3
911.4	1822.80	H	41.1	54.0	-12.9
911.4	1822.80	V	41.3	54.0	-12.7
911.4	2733.90	H	44.5	54.0	-9.5
911.4	2724.67	V	43.4	54.0	-10.6
917.3	1834.34	H	46.7	54.0	-7.3
917.3	1833.82	V	50.3	54.0	-3.7
917.3	2751.12	H	41.4	54.0	-12.6
917.3	2751.91	V	45.3	54.0	-8.7

**Figure 32. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Average**

**Notes:**

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

“Average Reading” includes correction factor.

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

## Spurious Radiated Emission 30 – 10000 MHz

### 10.4 Spurious Radiated Emission 30 – 10000 MHz Test Equipment

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 Year
RF Filter Section	HP	85420E	3705A00248	February 26, 2013	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2013	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	1 Year
Horn Antenna	ETS	3115	29845	March 14, 2012	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 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	JPKG19982	N/A	N/A

Figure 33 Test Equipment Used

## 10.5 **Field Strength Calculation 30 – 1000 MHz**

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

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

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

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

No external pre-amplifiers are used.

## 11. Transmitted Power Density

### 11.1 Test Specification

FCC Part 15, Subpart C, section 15.247(d)

### 11.2 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20dB) and an appropriate coaxial cable. The spectrum analyzer was set to 3 kHz resolution BW and sweep time of 1 second for each 3 kHz “window”. The spectrum peaks were located at each of the 3 operating frequencies.

### 11.3 Test Results


Operation Frequency (MHz)	Reading Spectrum Analyzer (dBm)	Specification (dBm)	Margin (dB)
904.9	7.37	8.0	-0.63
911.4	7.53	8.0	-0.47
917.3	7.87	8.0	-0.13

**Figure 34 Test Results Table**

See additional information in Figure 35 to Figure 37.

JUDGEMENT: Passed by 0.13dB

TEST PERSONNEL:

Tester Signature: 

Date: 05.11.13

Typed/Printed Name: A.Sharabi

## Transmitted Power Density

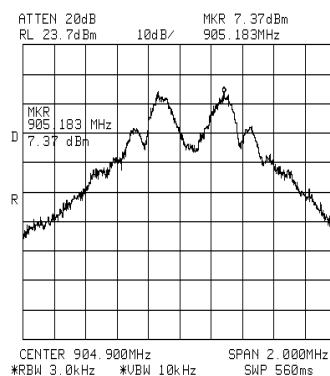


Figure 35 — 904.9 MHz

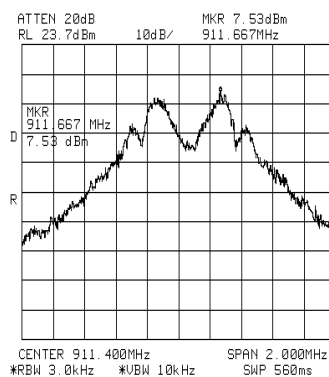


Figure 36 — 911.4 MHz

## Transmitted Power Density

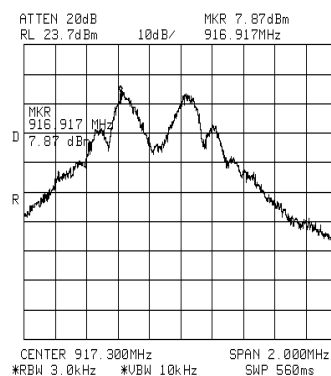


Figure 37 — 917.3 MHz

### 11.4 Test Equipment Used.

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8564E	3442A00275	February 28, 2013	1 year
Attenuator	Mini-Circuits	20dB		October 27, 2013	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	October 27, 2013	1 year

Figure 38 Test Equipment Used





## 12. Antenna Gain/Information

Antenna for the PBS is Pasternack 51028

Specifications:

Type: Half wave dipole

Gain: 5dBi

Impedance: 50Ohm

VSWR: < 2.0:1

Polarization: Vertical

Radiation pattern: Omni

### 13. R.F Exposure/Safety

Typical use of the E.U.T. is defining a location zone. The typical placement of the E.U.T. is wall mounted. The typical distance between the E.U.T. and the user is 20cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1310 Requirements

(a) FCC limits at 904.9 MHz is:  $\frac{f}{1500} = 0.603 \frac{mW}{cm^2}$

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: 17.20 dBm Peak = 52.5 mw

G<sub>T</sub>- Antenna Gain: 5dBi= 3.16 numeric

R- Distance from Transmitter = 20 cm

(c) The peak power density is:

$$S_p = \frac{52.5 \times 3.16}{4\pi(20)^2} = 0.03 \frac{mW}{cm^2}$$

(e) This is below the FCC limit.

## 14. APPENDIX A - 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 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.*

**14.3 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".

#### 14.4 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".

**14.5 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".





#### 14.6 Correction factors for ACTIVE LOOP ANTENNA

**Model 6502**

**S/N 9506-2950**

FREQUENCY	Magnetic Antenna Factor	Electric Antenna 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