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DATE: 24 June 2012

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

FCC Radio Test Report

for

Precyse Technologies Inc

Equipment under test:

PBC Beacon

BC91/403000

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
I. Siboni, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

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Measurement/Technical Report for

Precyse Technologies Inc

PBC Beacon

BC91/403000

FCC ID: WONBC91403000

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 according to KDB 558074 D01 18 January 2012 and ANSI 6.34: 2003.

Application for Certification
prepared by:
Ishaishou Raz
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail Sraz@itl.co.il

Applicant for this device:
(different from "prepared by")
Lior Bilia
Precyse Technologies Ltd.
94 Em Hamoshavot St.
Petach Tikva 41930
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Fax: +972-3-922-7515
e-mail: lbilia@precysetech.com

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1. General Information

1.1 Administrative Information

Manufacturer:	Precyse Technologies Inc
Manufacturer's Address:	94 Em Hamoshavot St. Petach Tikva 41930 Israel Tel: +972-3-922-7093 Fax: +972-3-922-7515
Manufacturer's Representative:	Lior Bilia
Equipment Under Test (E.U.T):	PBC Beacon
Equipment Model No.:	BC91/403000
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	22.11.2011
Start of Test:	22.11.2011
End of Test:	28.11.2011 17.06.2012*
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	47CFR15 Section 15.247

* Intermodulation test performed on 17.06.2012. All other tests completed on 28.11.2011.

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 PBC is used to define a location zone. It is based on a microcontroller and 4 RF transceivers.
It uses the iLocate proprietary protocol which provides a 2 way, half duplex communication with the base station and to transmit its ID to the SATs.
The unit is DC powered, 12 VDC, up to 100mA.

1.4 Test Methodology

Radiated testing was performed according to the procedures in KDB 558074 D01 18 January 2012 and ANSI 63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing September 3, 2009).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

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

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

2.2 EUT Exercise Software

The unit was operated in continuous transmission mode.

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

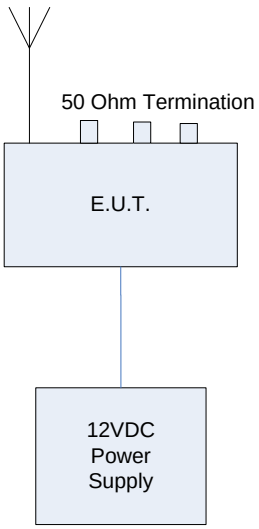

Figure 1. Configuration of Tested System

Note: For intermodulation test, only two antennas were connected. See additional details in Section 13 of this report.

3. Test Setup Photos

Figure 2. Conducted Emission From Antenna Ports Tests

Figure 3. Radiated Emission Test

Figure 4. Intermodulation Test

4. 6 dB Minimum Bandwidth

4.1 Test Specification

FCC Part 15, Subpart C Section 15.247-a2

4.2 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 (30 dB) and an appropriate coaxial cable (cable loss = 1 dB). 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, 916.4, and 917.3 MHz.

4.3 Test Results

Operation Frequency (MHz)	Reading (MHz)	Specification (MHz)
904.9	0.519	0.5
911.46	0.519	0.5
917.16	0.511	0.5

Figure 5 — 6 dB Minimum Bandwidth Test Results Table

See additional information in Figure 6 to Figure 8.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 20.06.12

Typed/Printed Name: I. Siboni

6 dB Minimum Bandwidth

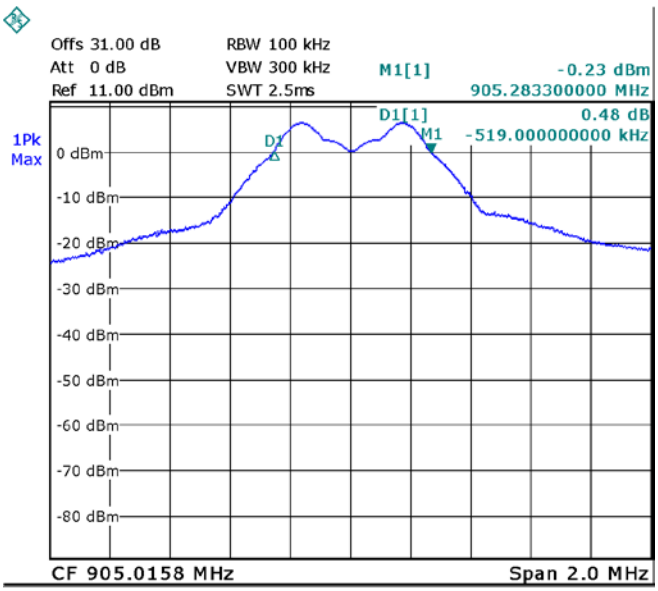

Figure 6 — 904.9 MHz

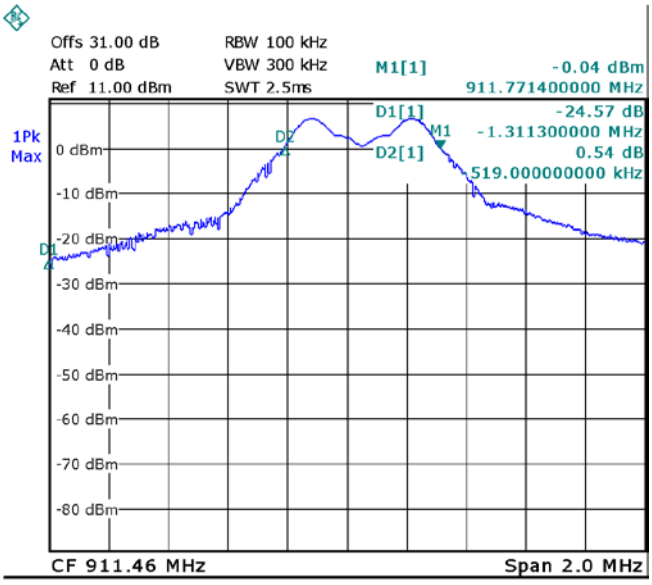

Figure 7 — 911.4 MHz

6 dB Minimum Bandwidth

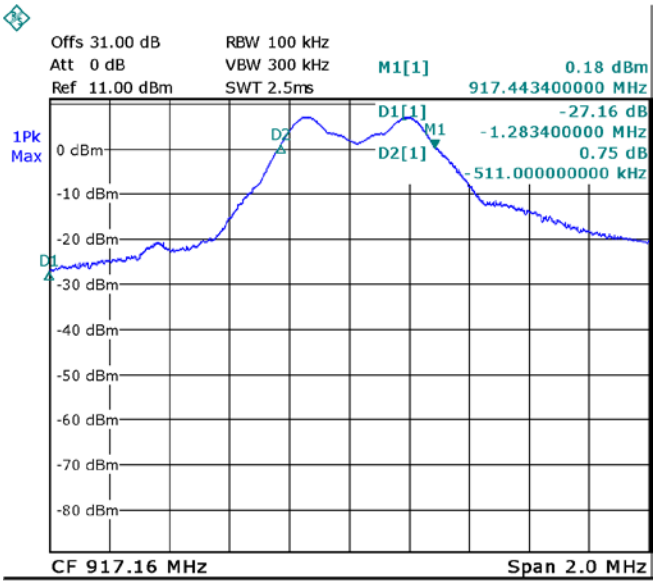

Figure 8 — 917.3 MHz

4.4 6 dB Minimum Bandwidth Test Equipment Used.

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	ROHDE & SCHWARZ	FSL	10-300191865	October 31, 2011	1 year
Attenuator	MCL	Bw-s30w5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	February 10, 2011	1 year

Figure 9 Test Equipment Used

5. Maximum Peak Power Output

5.1 Test Specification

FCC Part 15, Subpart C Section 15.247(b)

5.2 Test Procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (30 dB) and an appropriate coaxial cable (cable loss = 1 dB). 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.

5.3 Test Results

Operation Frequency (MHz)	Power (dBm)	Specification (dBm)	Margin (dB)
904.9	8.08	30.0	-21.20
911.4	8.41	30.0	-21.59
917.3	8.78	30.0	-21.22

Figure 10 Maximum Peak Power Output Test Results Table

See additional information in Figure 11 to Figure 13.

JUDGEMENT: Passed by 21.2 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 20.06.12

Typed/Printed Name: I. Siboni

Maximum Peak Power Output

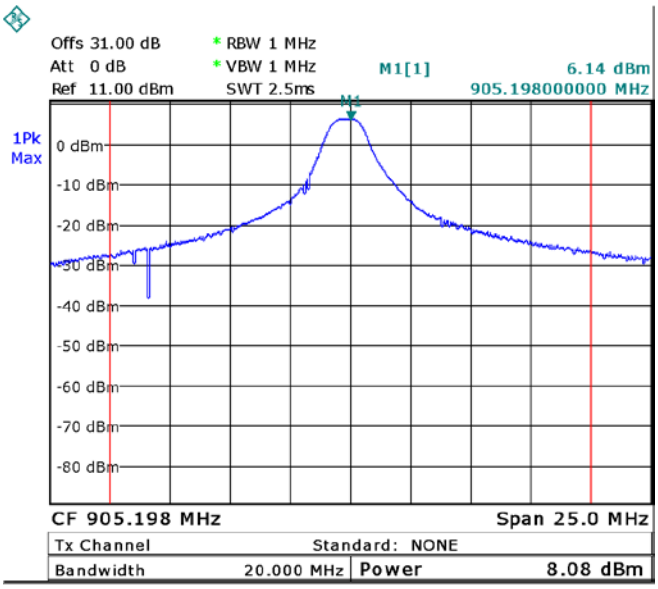

Figure 11 — 904.9 MHz

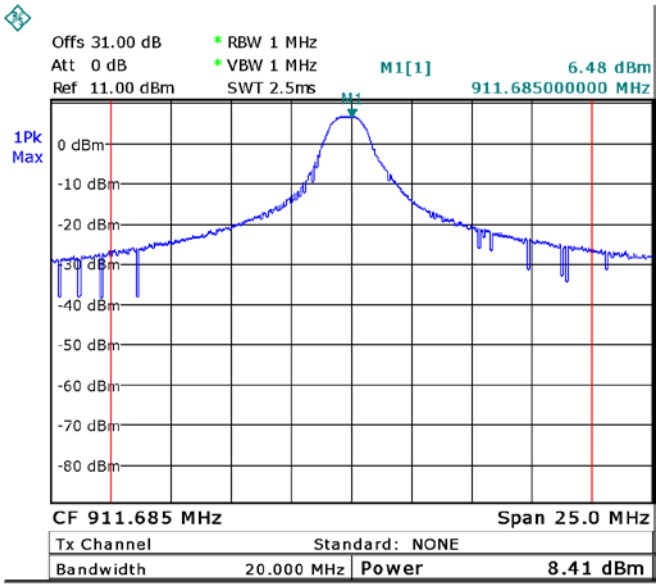

Figure 12 — 911.4 MHz

Maximum Peak Power Output

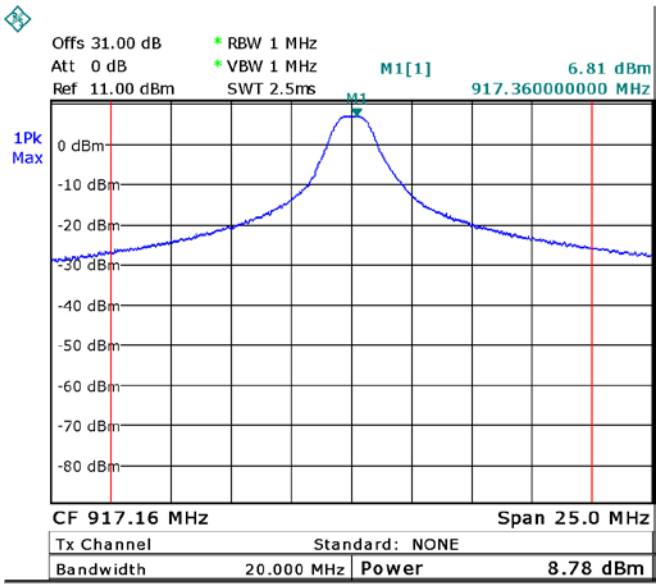

Figure 13 — 917.3 MHz

5.1 Maximum Peak Output Power Test Equipment

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	ROHDE & SCHWARZ	FSL	10-300191865	October 31, 2011	1 year
Attenuator	MCL	Bw-s30w5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	February 10, 2011	1 year

Figure 14 Test Equipment Used

6. Peak Power Output Out of 902-928 MHz Band

6.1 Test Specification

FCC Part 15, Subpart C, Section 15.247

6.2 Test Procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (30 dB) and an appropriate coaxial cable (cable loss = 1 dB). 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-1 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 902-928 MHz was measured at the 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)	Reading (dBm)	Specification (dBm)	Margin (dB)
904.9	-29.33	-13.5	-15.83
911.4	-28.17	-13.0	-15.17
917.3	-28.67	-12.5	-16.17

Figure 15 Peak Power Output of 902 - 928 MHz Band Test Results Table

See additional information in Figure 16 to Figure 35.

JUDGEMENT: Passed by 15.2 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 20.06.12

Typed/Printed Name: I. Siboni

Peak Power Output Out of 902-928 MHz Band

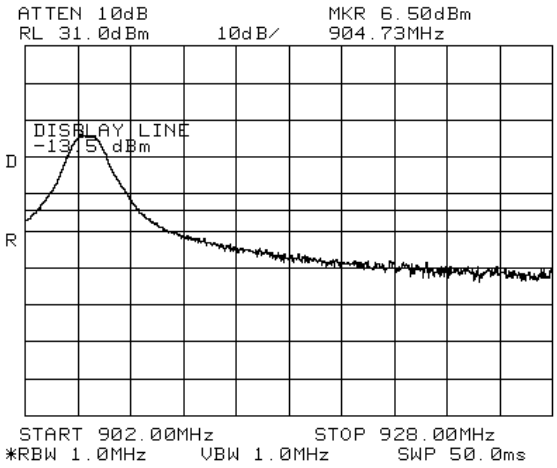

Figure 16 — 904.9 MHz

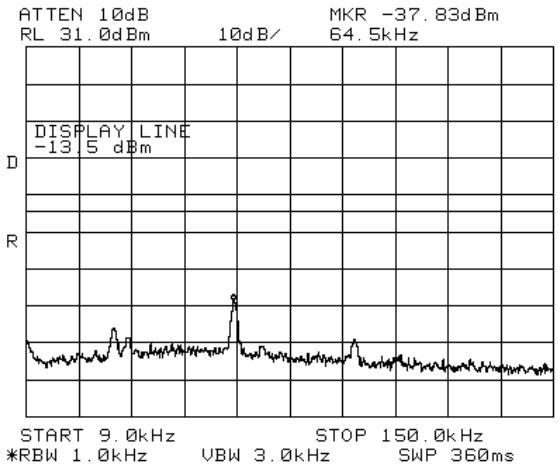

Figure 17 — 904.9 MHz

Peak Power Output Out of 902-928 MHz Band

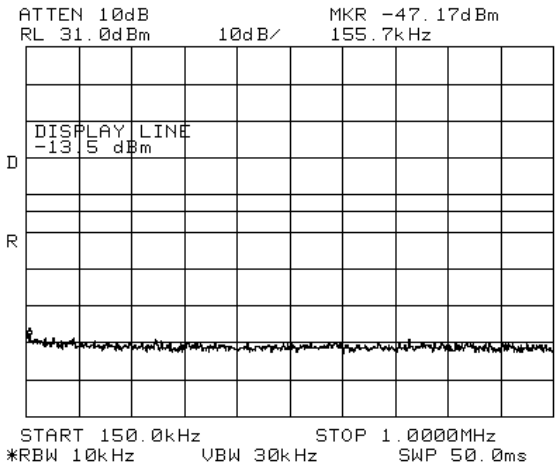

Figure 18 — 904.9 MHz

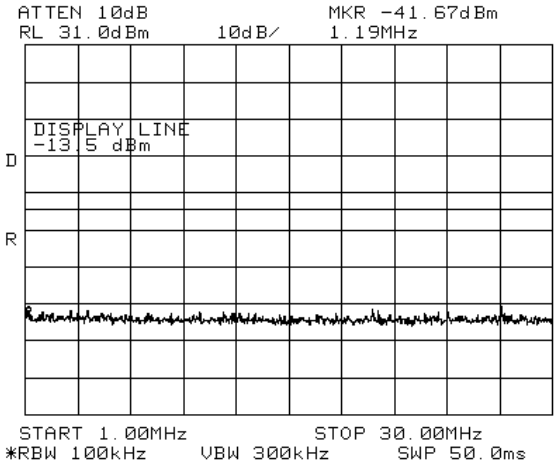

Figure 19 — 904.9 MHz

Peak Power Output Out of 902-928 MHz Band

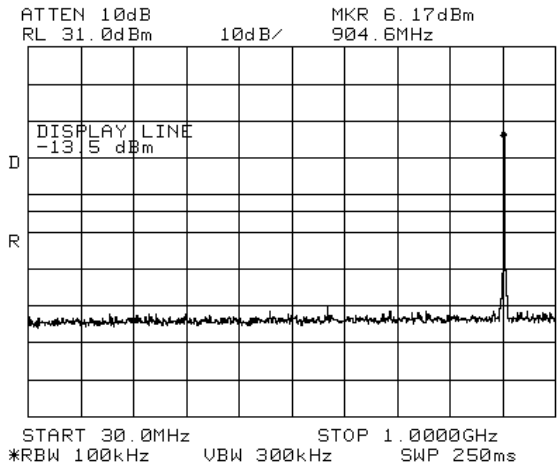

Figure 20 — 904.9 MHz

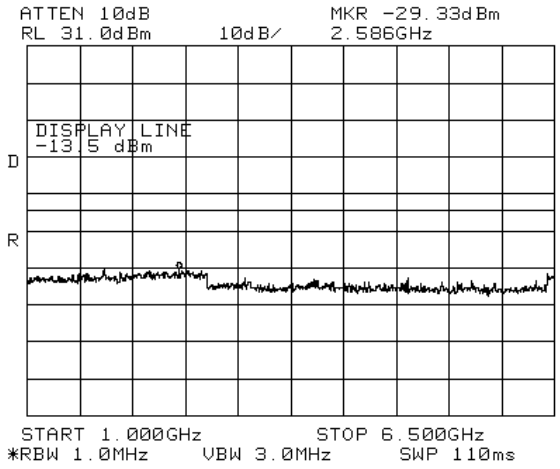

Figure 21 — 904.9 MHz

Peak Power Output Out of 902-928 MHz Band

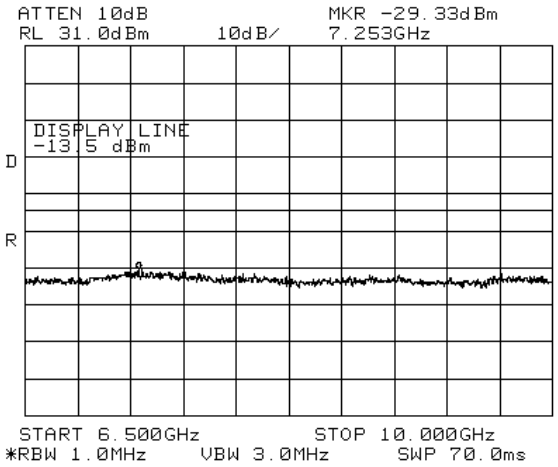

Figure 22 — 904.9 MHz

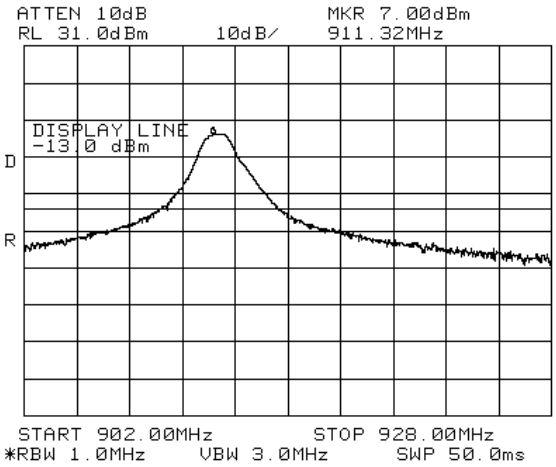

Figure 23 — 911.4 MHz

Peak Power Output Out of 902-928 MHz Band

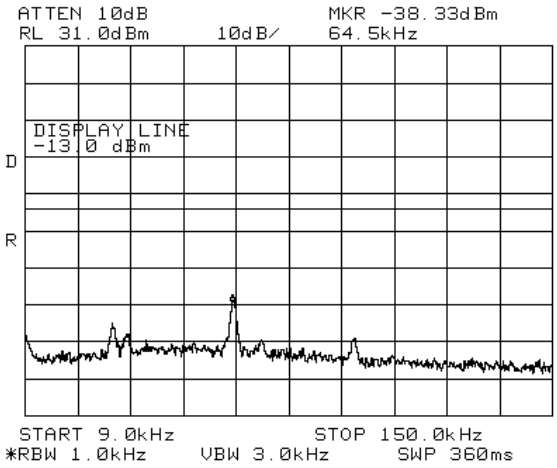

Figure 24 — 911.4 MHz

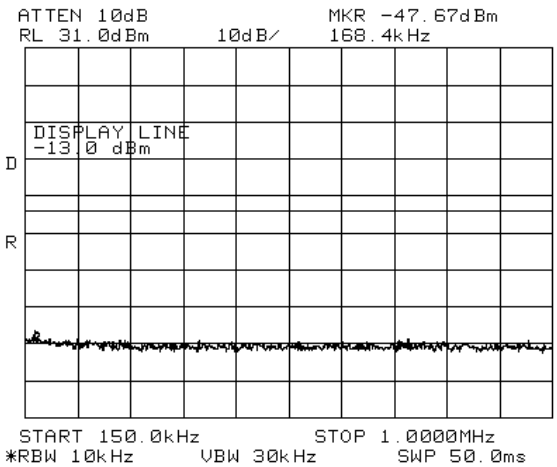

Figure 25 — 911.4 MHz

Peak Power Output Out of 902-928 MHz Band

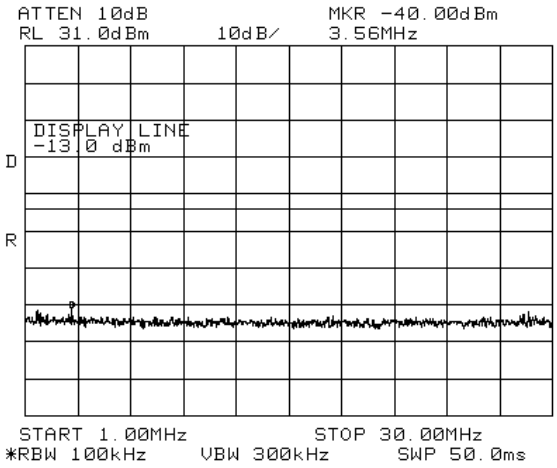

Figure 26 — 911.4 MHz

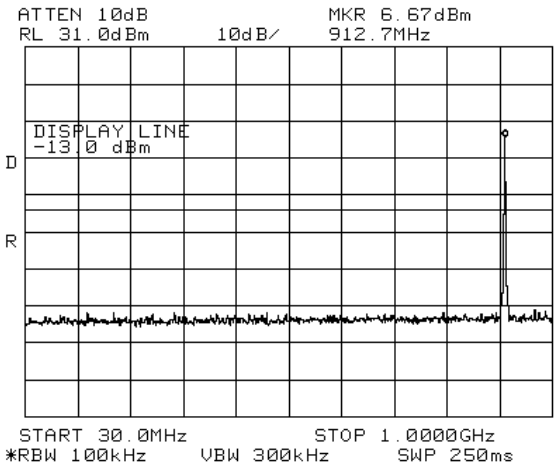

Figure 27 — 911.4 MHz

Peak Power Output Out of 902-928 MHz Band

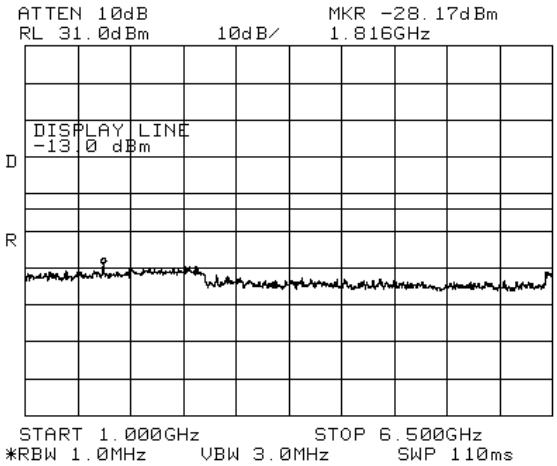

Figure 28 — 911.4 MHz

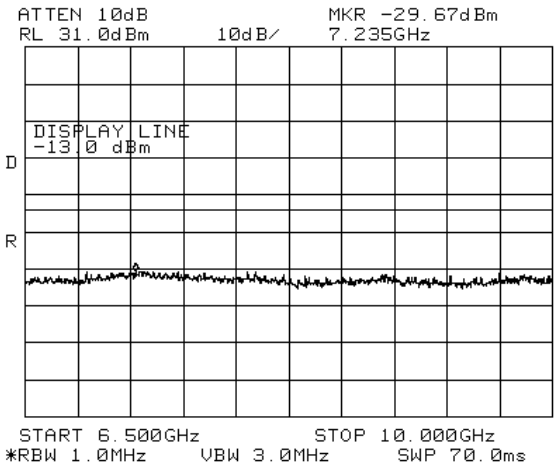

Figure 29 — 911.4 MHz

Peak Power Output Out of 902-928 MHz Band

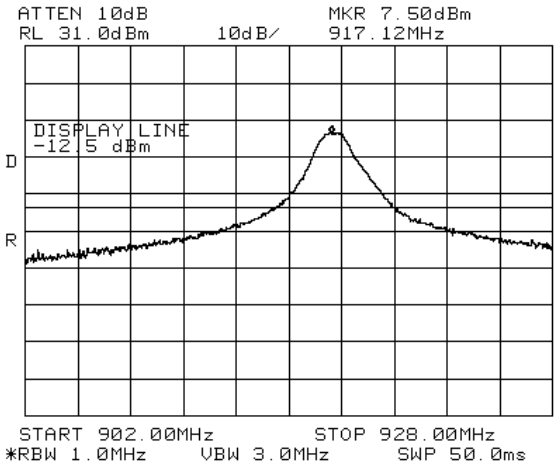

Figure 30 — 917.3 MHz

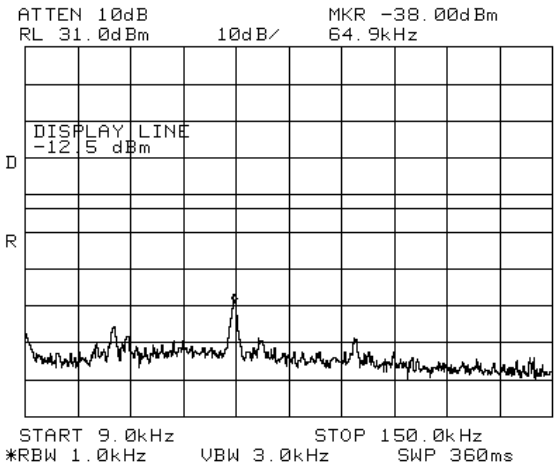

Figure 31 — 917.3 MHz

Peak Power Output Out of 902-928 MHz Band

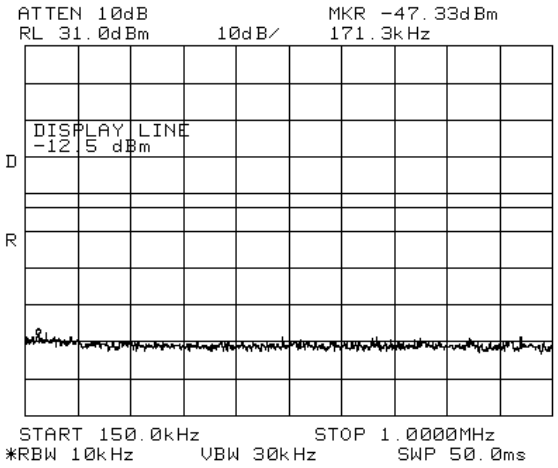

Figure 32 — 917.3 MHz

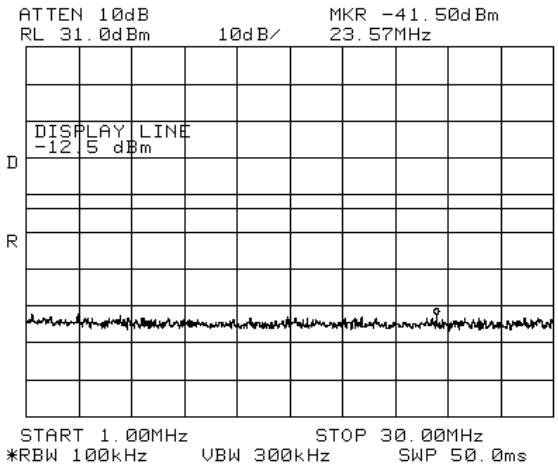

Figure 33 — 917.3 MHz

Peak Power Output Out of 902-928 MHz Band

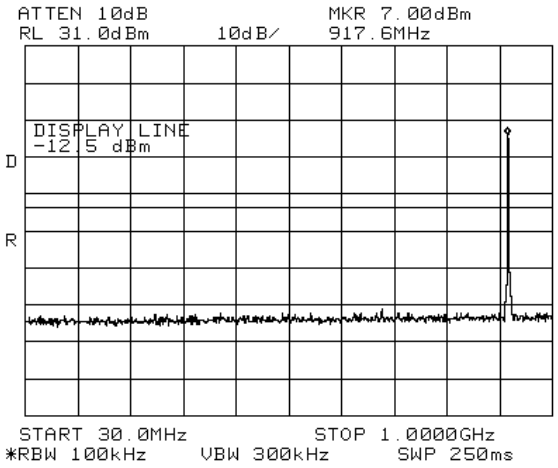

Figure 34 — 917.3 MHz

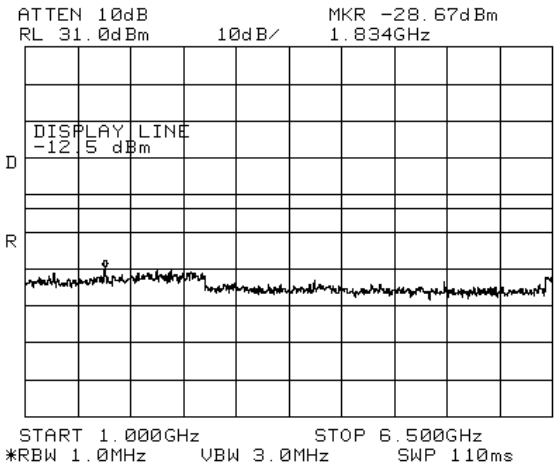

Figure 35 — 917.3 MHz

Peak Power Output Out of 902-928 MHz Band

6.4 Peak Power Output of 902-928 MHz Band Test Equipment Used.

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8546E	3442A00275	January 11, 2011	1 year
Attenuator	MCL	Bw-s30w5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	February 10, 2011	1 year

Figure 36 Test Equipment Used

7. Band Edge Spectrum

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 (30 dB) and an appropriate coaxial cable
(cable loss = 1 dB). 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 917.16 MHz correspondingly.

The E.U.T. was tested at the operation frequencies of 904.9 and 917.3 MHz.

7.3 Test Results

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBm)	Specification (dBm)	Margin (dB)
904.9	902	-34.8	-14.0	-20.8
917.3	928	-43.8	-13.2	-30.6

Figure 37 Band Edge Spectrum Test Results Table

See additional information in Figure 38 to Figure 39.

JUDGEMENT: Passed by 20.8 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 20.06.12

Typed/Printed Name: I. Siboni

Band Edge Spectrum

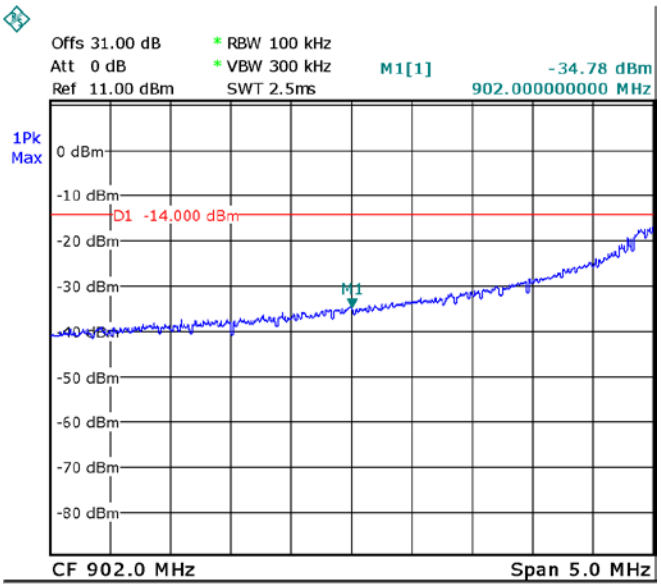

Figure 38 — 904.9 MHz

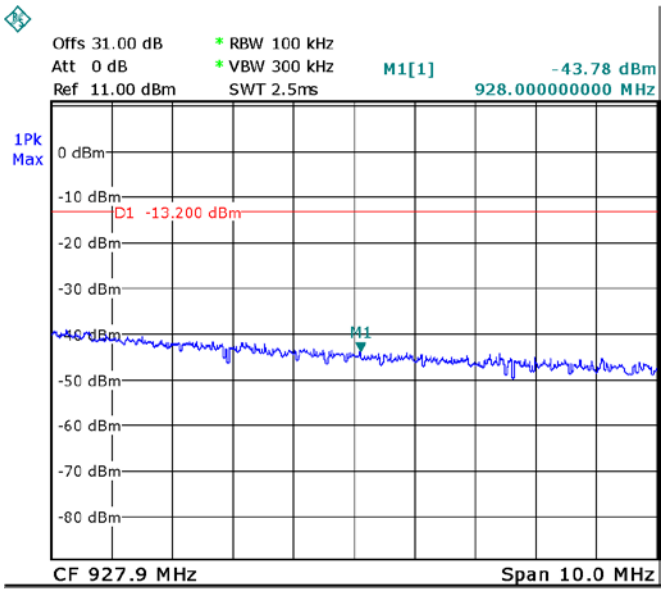

Figure 39 — 917.3 MHz

Band Edge Spectrum

7.4 Band Edge Spectrum Test Equipment

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	ROHDE & SCHWARZ	FSL	10-300191865	October 31, 2011	1 year
Attenuator	MCL	Bw-s30w5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	February 10, 2011	1 year

Figure 40 Test Equipment Used

8. Spurious 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 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 tested at the operating frequencies of 904.9, 911.4, and 917.3 MHz.

8.3 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: 20.06.12

Typed/Printed Name: I. Siboni

Spurious Radiated Emission, 9 kHz – 30 MHz

8.4 Spurious Radiated Emission, 9 kHz – 30 MHz Test Equipment

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010*	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010*	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2011	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 41 Test Equipment Used

* Calibration valid until November 30 2011.

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 [dBμv/m]
RA: Receiver Amplitude [dBμv]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

9. Spurious Radiated Emission 30 MHz – 10 GHz

9.1 Test Specification

30 MHz - 10 GHz, F.C.C., Part 15, Subpart C

9.2 Test Procedure

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

See Section 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 - 10 GHz 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 GHz, 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 GHz, a spectrum analyzer including a low noise amplifier was used. 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 E.U.T. was tested at the operating frequencies of 904.9, 911.4, and 917.3 MHz.

9.3 Test Results

JUDGEMENT: Passed by 6.4 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 20.06.12

Typed/Printed Name: I. Siboni

For the operation frequencies of 904.90 and 917.30 MHz, no signals were detected in the frequency range of 30 – 1000 MHz.

For the operation frequency 904.90 MHz, the margin between the emission level and the specification limit is 6.7 in the worst case at the frequency of 1809.80 MHz, horizontal polarization.

For the operation frequency 911.40 MHz, the margin between the emission level and the specification limit is 6.4 in the worst case at the frequency of 742.30 MHz, vertical polarization.

For the operation frequency 917.30 MHz, the margin between the emission level and the specification limit is 9.6 in the worst case at the frequency of 1834.60 MHz, vertical polarization.

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 42 to Figure 44.

Spurious Radiated Emission, 30 MHz – 10 GHz

E.U.T Description	PBC Beacon
Type	BC91/403000
Serial Number:	Not Designated

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Antenna: 3 meters distance
Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dBµV/m)	QP (dBµV/m)	Specification (dB µV/m)	Margin (dB)
911.40	742.30	H	39.3	36.0	46.0	-10.0
911.40	742.30	V	42.7	39.6	46.0	-6.4

Figure 42. Radiated Emission. Antenna Polarization: HORIZONTAL/VERTICAL Detectors: Peak, Quasi-peak

Spurious Radiated Emission, 30 MHz - 10 GHz

E.U.T Description	PBC Beacon
Part Number	BC91/403000
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 Freq. (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dBµV/m)	Peak Specification (dB µV/m)	Margin (dB)
904.90	1809.80	H	59.0	74.0	-15.0
904.90	1809.80	V	63.5	74.0	-10.5
911.40	1828.80	H	58.2	74.0	-15.8
911.40	1828.80	V	57.9	74.0	-16.1
917.30	1834.60	H	58.7	74.0	-15.3
917.30	1834.60	V	63.2	74.0	-10.8

Figure 43. 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 MHz - 10 GHz

E.U.T Description	PBC Beacon
Part Number	BC91/403000
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: Average

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Average Reading (dBµV/m)	Average Specification (dB µV/m)	Margin (dB)
904.90	1809.80	H	47.3	54.0	-6.7
904.90	1809.80	V	44.8	54.0	-9.2
911.40	1828.80	H	40.3	54.0	-13.7
911.40	1828.80	V	45.8	54.0	-8.2
917.30	1834.60	H	42.7	54.0	-11.3
917.30	1834.60	V	44.4	54.0	-9.6

Figure 44. 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

9.4 Spurious Radiated Emission 30 – 10000 MHz Test Equipment

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010*	1Year
RF Filter Section	HP	85420E	3705A00248	November 24, 2010*	1Year
Antenna Biconical	ARA	BCD 235/B	1041	November 12, 2011	1Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 29, 2011	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2011	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 11, 2011	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 45 Test Equipment Used

* Calibration valid until November 30 2011.

9.5 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:

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

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

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

No external pre-amplifiers are used.

10. Transmitted Power Density

10.1 Test Specification

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

10.2 Test Procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (30dB) and an appropriate coaxial cable (cable loss = 1 dB). 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.

10.3 Test Results

Operation Frequency (MHz)	Reading Spectrum Analyzer (dBm)	Specification (dBm)	Margin (dB)
904.9	0.42	8.0	7.58
911.4	0.75	8.0	7.25
917.3	1.02	8.0	6.98

Figure 46 Transmitted Power Density Test Results Table

See additional information in Figure 47 to Figure 49.

JUDGEMENT: Passed by 6.98dB

TEST PERSONNEL:

Tester Signature: _____ Date: 20.06.12

Typed/Printed Name: I. Siboni

Transmitted Power Density

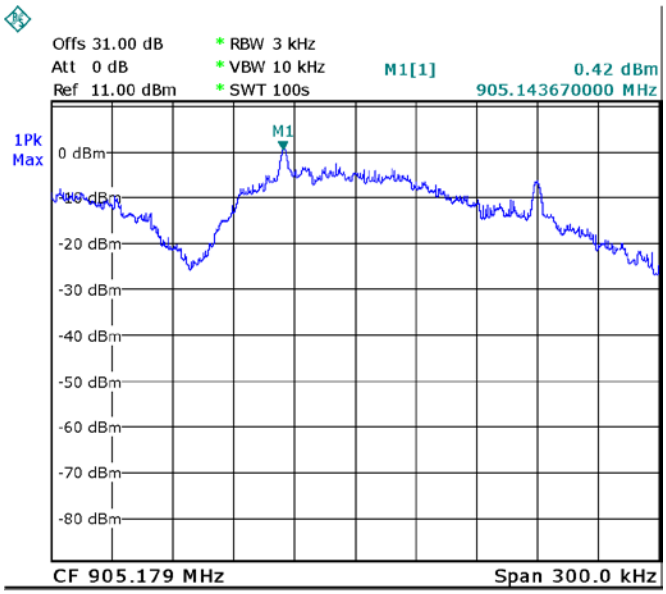

Figure 47 — 904.9 MHz

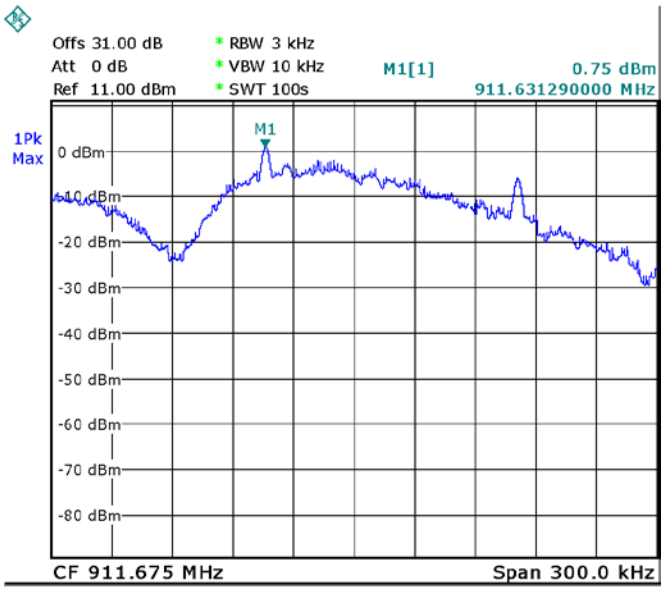

Figure 48 — 911.4 MHz

Transmitted Power Density

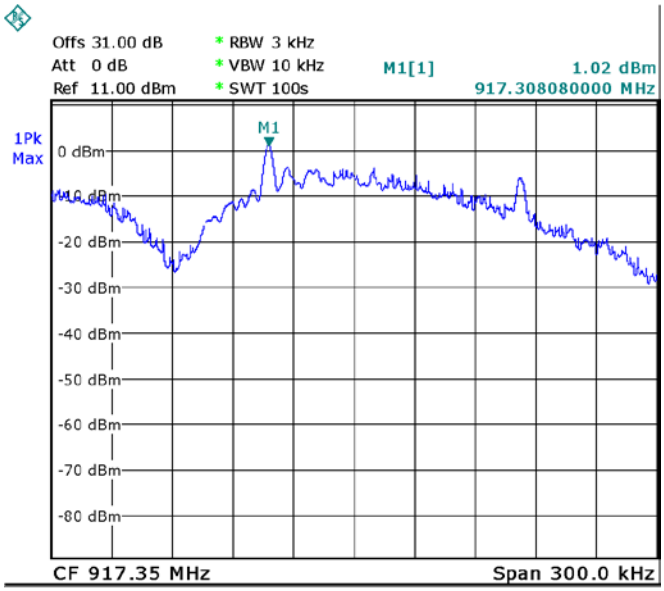

Figure 49 — 917.3 MHz

10.1 Test Equipment Used.

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	ROHDE & SCHWARZ	FSL	10-300191865	October 31, 2011	1 year
Attenuator	MCL	Bw-s30w5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	CBL-4FT-SMNM+	30084	February 10, 2011	1 year

Figure 50 Test Equipment Used

11. Antenna Gain/Information

The antenna gain is 0 dBi.

12. 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 1 m.

Calculation of Maximum Permissible Exposure (MPE)
Based on Section 1.1307(b)(1) Requirements

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

FCC limits at 911.4 MHz is: $\frac{f}{1500} = 0.608 \frac{mW}{cm^2}$

FCC limits at 917.3 MHz is: $\frac{f}{1500} = 0.611 \frac{mW}{cm^2}$

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_t- Transmitted Power

G_T- Antenna Gain

R- Distance from Transmitter

(c) Transmitter peak power using source based time averaging of 20 % maximum, 20 msec “ON” time, “OFF” + “ON” time 1sec:

Frequency MHz	Pt dBm	Pt mW	Pt Source Based Time Averaging mW
904.9	8.08	6.42	1.284
911.4	8.41	6.93	1.386
917.3	8.78	7.55	1.510

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

Frequency (MHz)	Pt (mW)	Antenna type	G_T (dBi)	R (cm)	S_{AV} (mW/cm^2)	Spec (mW/cm^2)
904.9	1.284	External	0	100	1.022×10^{-5}	0.603
911.4	1.386	External	0	100	1.103×10^{-5}	0.608
917.3	1.510	External	0	100	1.202×10^{-5}	0.611

(e) In the worst case, 4 transceivers transmitting at the same time, the peak power density (time averaging) is :

For 904.9 MHz:

$$S_p = 1.022 \times 10^{-5} \times 4 = 4.088 \times 10^{-5} \frac{mW}{cm^2}$$

For 911.4 MHz:

$$S_p = 1.103 \times 10^{-5} \times 4 = 4.412 \times 10^{-5} \frac{mW}{cm^2}$$

For 917.3 MHz:

$$S_p = 1.202 \times 10^{-5} \times 4 = 4.808 \times 10^{-5} \frac{mW}{cm^2}$$

(f) The above are below the FCC limits.

13. Intermodulation

13.1 Test Procedure

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

The E.U.T was placed in the open site on a non-conductive table, 0.8 meters above the ground. The table azimuth was controlled by a remote positioner.

The emissions below 2.9 GHz 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 above 2.9 GHz, a spectrum analyzer including a low noise amplifier was used. 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 receiver and/or spectrum analyzer center frequency was set to 3rd order intermodulation products, resulting from the transmitters' operation frequencies below.

The emissions were measured at a distance of 3 meters.

The configurations tested included 2 transmitters operating at the following frequencies representing the worst case scenario both as the closest channels that can be configured and using adjacent antennas:

905.80 MHz

906.60 MHz

The gain of each antenna is: 0 dBi

13.2 Test Data

JUDGEMENT: Passed by 11.5 dB

The margin between the emission level and the specification limit is 11.5 in the worst case at the frequency of 1810.60MHz, vertical polarization.

TEST PERSONNEL:

Tester Signature: _____ Date: 20.06.12

Typed/Printed Name: I. Siboni

Intermodulation

E.U.T Description	PBC Beacon
Type	BC91/403000
Serial Number:	Not Designated

Antenna Polarization: Horizontal/Vertical
Frequency range: 30 MHz to 10.0 GHz
Test Distance: 3 meters
Detector: Peak

Frequency (MHz)	Polarity (H/V)	Peak Reading (dBµV/m)	Peak Specification (dBµV/m)	Margin (dB)
1810.60	V	55.6	74.0	-18.4
1810.60	H	55.3	74.0	-18.7
1812.40	V	59.1	74.0	-14.9
1812.40	H	54.4	74.0	-19.6
1814.00	V	55.7	74.0	-18.3
1814.00	H	55.2	74.0	-18.8

Figure 51. intermodulation. 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

Intermodulation

E.U.T Description	PBC Beacon
Type	BC91/403000
Serial Number:	Not Designated

Antenna Polarization: Horizontal/Vertical
Frequency range: 30 MHz to 10.0 GHz
Test Distance: 3 meters
Detector: Average

Frequency (MHz)	Polarity (H/V)	Average Reading (dB µV/m)	Average Specification (dBµV/m)	Margin (dB)
1810.60	V	42.5	54.0	-11.5
1810.60	H	42.3	54.0	-11.7
1812.40	V	42.5	54.0	-11.5
1812.40	H	42.3	54.0	-11.7
1814.00	V	42.5	54.0	-11.5
1814.00	H	42.2	54.0	-11.8

Figure 52. intermodulation. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Average

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

13.3 Test Instrumentation Used, Intermodulation Measurements

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	December 12, 2011	1Year
RF Filter Section	HP	85420E	3705A00248	December 12, 2011	1Year
Antenna Biconical	ARA	BCD 235/B	1041	November 12, 2011	1Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 29, 2011	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2011	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 11, 2011	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 53 Test Equipment Used

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)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
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

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

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 38M3O.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