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ACCREDITED
TESTING Cert No.1152.01

DATE: 06 November 2014

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

FCC Radio Test Report

For

Visonic Ltd.

Equipment under test:

PG2 RF Module

RFD

Written by: _____
R. Pinchuck, Documentation

Approved by: _____
M. Zohar, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Measurement/Technical Report for

Visonic Ltd.

PG2 RF Module

RFD

FCC ID: WP3RFD

IC: 1467C-RFD

This report concerns:	Original Grant: X Class I Change: Class II Change:
Equipment type:	Frequency Hopping Spread Spectrum
Limits used:	47CFR15 Section 15.247

Measurement procedures used are FCC Public Notice DA-00-705 and ANSI C63.4: 2003.

Application for Certification
prepared by:
R. Pinchuck
ITL (Product Testing) Ltd.
1 Bat Sheva Street
Lod, 7116002
Israel
e-mail: rpinchuck@itl.co.il

Applicant for this device:
(different from "prepared by")
Arik Elshtein
Visonic Ltd.
24 Habarzel St.
Tel-Aviv 69710
Israel
Tel: +972-3-645-6789
Fax +972-3-645-6788
e-mail: aelshtein@tycoint.com

TABLE OF CONTENTS

1. General Information

1.1 Administrative Information

Manufacturer:	Visonic Ltd.
Manufacturer's Address:	Habarzel 24 Tel Aviv Israel 69710 Tel: +972-3-645-6789 Fax: +972-3-645-6788
Manufacturer's Representative:	Arick Elshtein
Equipment Under Test (E.U.T):	PG2 RF Module
Equipment Model No.:	RFD
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	13.07.14
Start of Test:	13.07.14
End of Test:	15.07.14
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.

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 RFD Transceiver is based on the CC1110Fx/CC1111Fx, which is a true low-power sub-1 GHz system-on-chip (SoC) designed for low power wireless applications. TheCC1110Fx/CC1111Fx combines the performance of the state-of-the-art RF transceiver CC1101 with an industry-standard enhanced 8051 MCU, up to 32 kB of in-system programmable flash memory and up to 4 kB of RAM.

1.4 Test Methodology

Radiated testing was performed according to the procedures in FCC Public Notice DA 00-705 and ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing November 21, 2012).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

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

All 3 host units contain the same RF card which is an independent PCB with integral antenna and is separate from the digital part.

Since all 3 host units are similarly constructed, a screening test was performed in order to determine the host with the highest emission at 902-928 MHz band.

Each host unit was placed inside a chamber transmitting at mid channel, and the first 3 harmonics was recorded.

Based on the below results, the Next PG2/ Next K9-85 PG2 host was chosen as the worst case.

Frequency	Next PG2/ Next K9-85 PG2	Next CAM PG2/ Next CAM K9-85 PG2	TOWER-30AM PG2/ TOWER-30AM K9-90 PG2
	(dBuV)	(dBuV)	(dBuV)
Fundamental, 915.0 MHz	107.7	107.2	104.8
2nd Harmonic	62.0	60.0	58.0
3rd Harmonic	61.0	60.0	62.0

Figure 1. Screening Results

Figure 2. Screening Next PG2

Figure 3. Screening Next CAM PG2

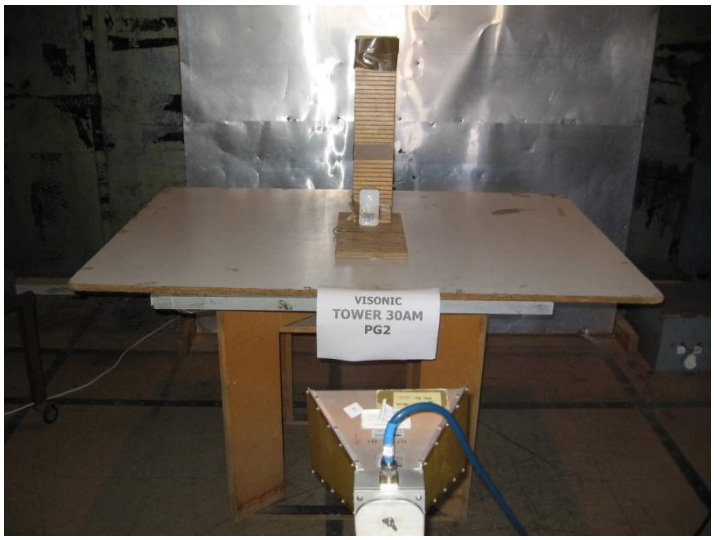

Figure 4. Screening TOWER 30 AM PG2

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Visonic
A Tyco International Company

Visonic Ltd.
24 Habarzel Street
P.O.Box 22020
Tel-Aviv 69710, Israel
Tele: +972 3 645 6789
Fax: +972 3 645 6788
www.visonic.com

22 September 2014

Product Similarity Declaration

To

ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

Ronit Pinchuck, Technical Writer

Please be advised that the Next Cam K9-85 PG2 is a variant of Next Cam PG2. The only difference is thet the K9-85 has a pet tolerant lens.

Thank you,

Arick Elshtein
International Compliance Manager
Visonic Ltd.

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22 September 2014

Product Similarity Declaration

To

ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

Ronit Pinchuck, Technical Writer

Please be advised that the Next K9-85 PG2 is a variant of Next PG2. The only difference is thet the K9-85 has a pet tolerant lens.

Thank you,

Arick Elshtein
International Compliance Manager
Visonic Ltd.

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www.visonic.com

22 September 2014

Product Similarity Declaration

To

ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

Ronit Pinchuck, Technical Writer

Please be advised that the Tower 30 AM K9-85 PG2 is a variant of Tower 30 AM PG2. The only difference is thet the K9-85 has a pet tolerant lens.

Thank you,

Arick Elshtein
International Compliance Manager
Visonic Ltd.

2.2 EUT Exercise Software

The EUT was tested when programmed with the formal, commercially released firmware, configured to transmit periodically at maximum transmission rate.

2.3 Special Accessories

No special accessories were needed in order to achieve compliance.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance

2.5 Configuration of Tested System

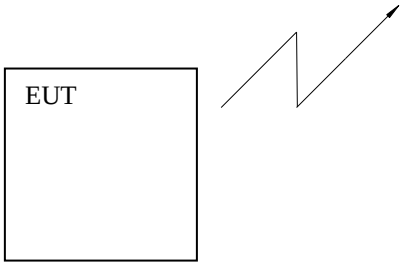

Figure 5. Configuration of Tested System

3. Radiated Measurement Test Set-Up Photos

Figure 6. Radiated Emission Test

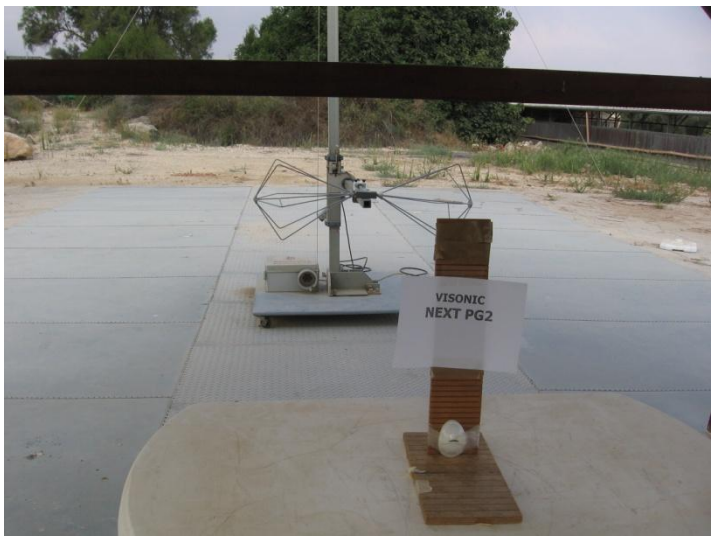

Figure 7. Radiated Emission Test

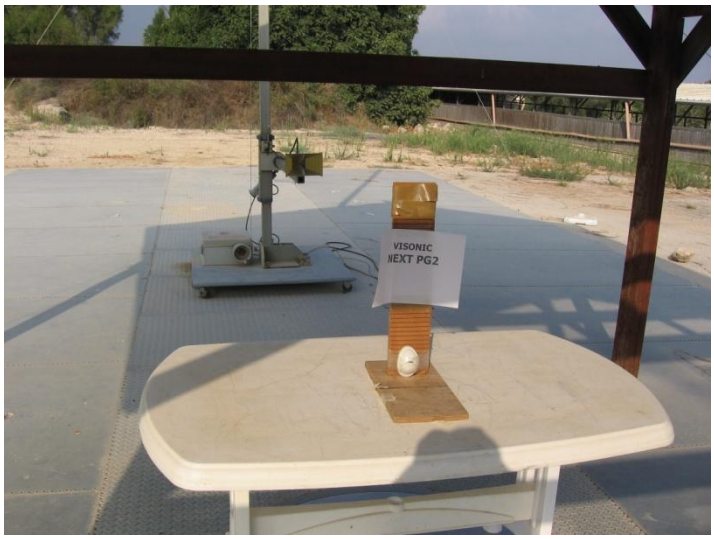

Figure 8. Radiated Emission Test

Figure 9. Radiated Emission Test

4. 20dB Minimum Bandwidth

4.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(1)(i)

4.2 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 spectrum analyzer was set to 10 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 5, 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 Low (912.750 MHz) and High (919.106 MHz) channels

4.3 Test Results

Operation Frequency (MHz)	Bandwidth Reading (kHz)	Specification (kHz)
912.750	106.5	<250
919.106	106.5	<250

Figure 10 — 20 dB Minimum Bandwidth Test Results Table

JUDGEMENT: Passed

For additional information see *Figure 11 to Figure 12*.

TEST PERSONNEL:

Tester Signature: _____ Date: 22.09.14

Typed/Printed Name: M. Zohar

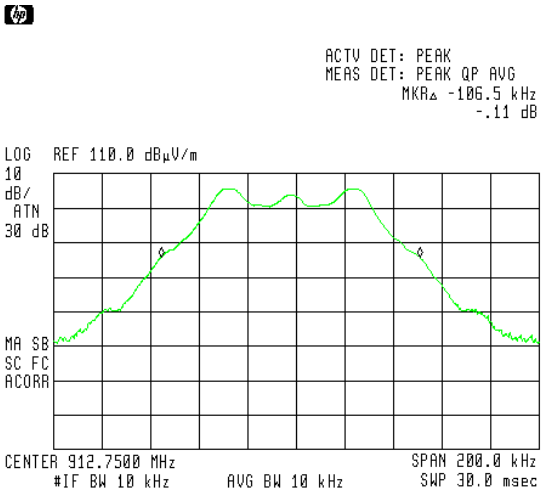

Figure 11. — 912.75 MHz

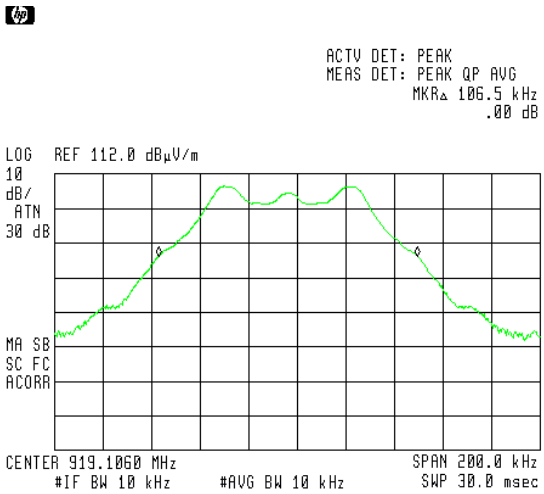

Figure 12. — 919.106 MHz

4.4 Test Equipment Used, 20 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A012014	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Log Periodic	ARA	LPD-2010-A	1038	April 2, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Turntable Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 13 Test Equipment Used

5. 26dB Minimum Bandwidth

5.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(1)(i)

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 spectrum analyzer was set to 10 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 5 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 Low (912.750 MHz) and High (919.106 MHz) channels

5.3 Test Results

Operation Frequency (MHz)	Bandwidth Reading (kHz)
912.750	119.0
919.106	119.5

Figure 14 — 26 dB Minimum Bandwidth Test Results Table

JUDGEMENT: Passed

For additional information see Figure 15 to Figure 16.

TEST PERSONNEL:

Tester Signature: _____ Date: 22.09.14

Typed/Printed Name: M. Zohar

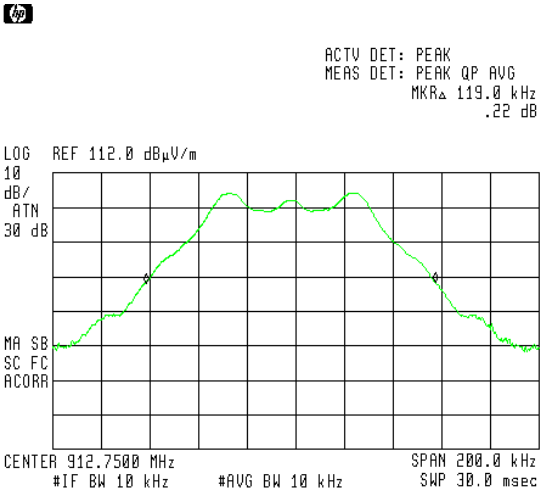

Figure 15. — 912.75 MHz

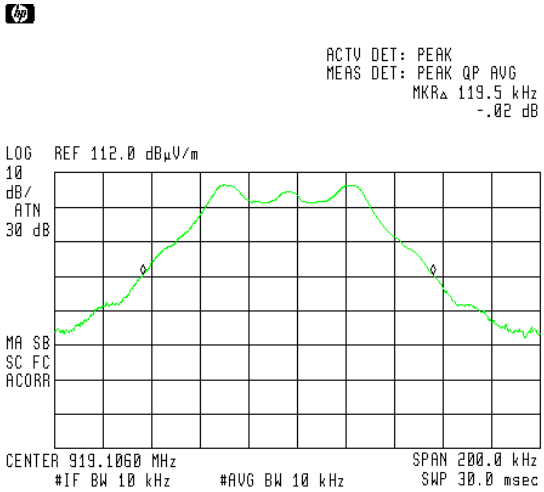

Figure 16. — 919.106 MHz

5.4 Test Equipment Used, 26 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A012014	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Log Periodic	ARA	LPD-2010-A	1038	April 2, 2013	2 Years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Turntable Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 17 Test Equipment Used

6. Number of Hopping Frequencies

6.1 Test Specification

F.C.C., Part 15, Subpart C Section 15.247(a)(1)(i)

6.2 Test Procedure

The E.U.T. was set to hopping mode.
The spectrum analyzer was set to the following parameters:

Band of Operation: 912-919.5 MHz
RBW: 10 kHz
VBW: 10 kHz
Detector Function: Peak
Trace: Maximum Hold

6.3 Test Results

Number of Hopping Frequencies	Specification
50	>=50

Figure 18 Number of Hopping Frequencies Test Results Table

JUDGEMENT: Passed

For additional information see *Figure 19* to *Figure 26.*

TEST PERSONNEL:

Tester Signature: _____ Date: 22.09.14

Typed/Printed Name: M. Zohar

Number of Hopping Frequencies

E.U.T Description	PG2 RF Module
Type	RFD
Serial Number:	Not designated

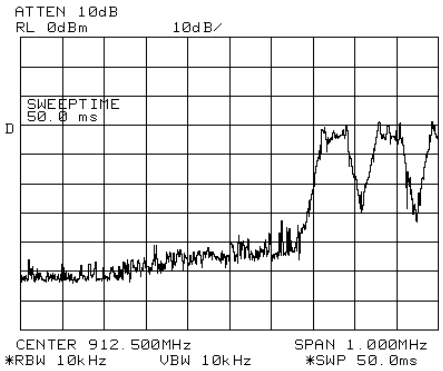

Figure 19. Number of Channels

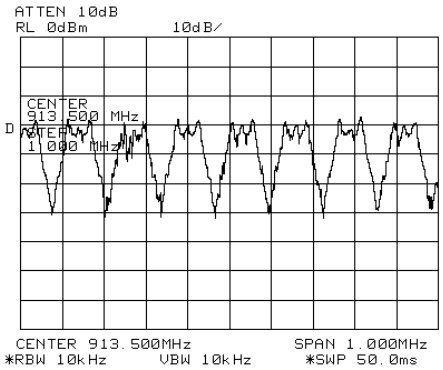

Figure 20. Number of Channels

Number of Hopping Frequencies

E.U.T Description	PG2 RF Module
Type	RFD
Serial Number:	Not designated

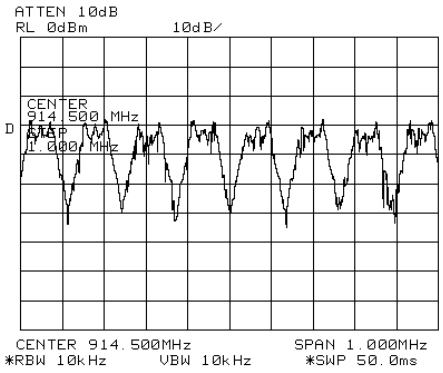

Figure 21. Number of Channels

Number of Hopping Frequencies

E.U.T Description	PG2 RF Module
Type	RFD
Serial Number:	Not designated

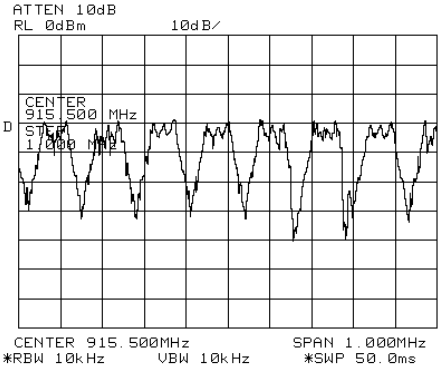

Figure 22. Number of Channels

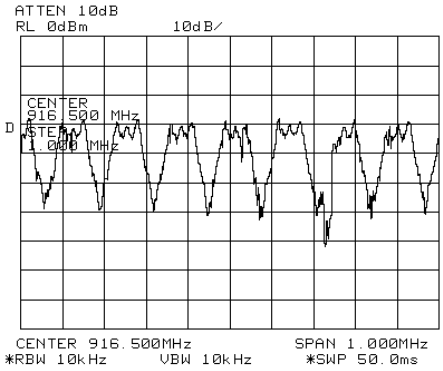

Figure 23. Number of Channels

Number of Hopping Frequencies

E.U.T Description	PG2 RF Module
Type	RFD
Serial Number:	Not designated

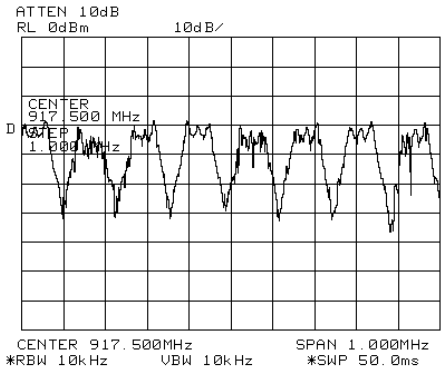

Figure 24. Number of Channels

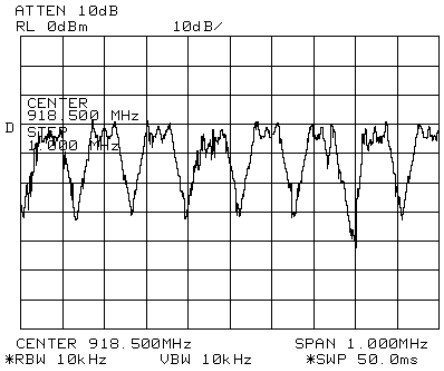

Figure 25. Number of Channels

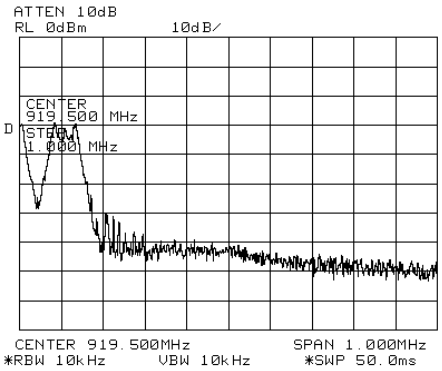

Figure 26. Number of Channels

6.4 Test Equipment Used; Number of Hopping Frequencies

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A012014	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Log Periodic	ARA	LPD-2010-A	1038	April 2, 2013	2 Years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Turntable Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 27 Test Equipment Used

7. Channel Frequency Separation

7.1 Test Specification

Specification: FCC Part 15, Subpart C, 15.247(a)(1)

7.2 Test procedure

The E.U.T. was set to hopping mode.
The spectrum analyzer was set to the following parameters:

RBW: 10 kHz
VBW: 10 kHz
Detector Function: Peak
Trace: Maximum Hold

The marker delta function to determine the separation between the peaks of the adjacent channels was used.

7.3 Test Results

Channel Frequency Separation (kHz)	Specification (kHz)	Margin (kHz)
131.3	>106.5	24.8

Figure 28 Channel Frequency Separation Test Results Table

JUDGEMENT: Passed by 24.8 kHz

For additional information see *Figure 29*.

TEST PERSONNEL:

Tester Signature: _____ Date: 22.09.14

Typed/Printed Name: M. Zohar

Channel Frequency Separation

E.U.T Description	PG2 RF Module
Type	RFD
Serial Number:	Not designated

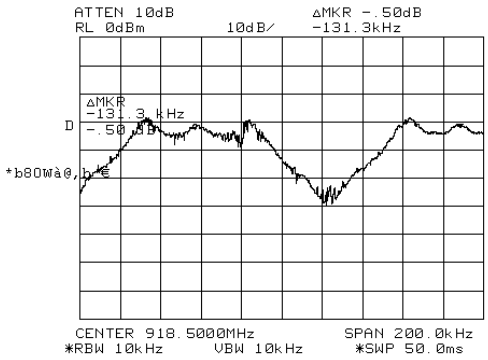

Figure 29. Channel Frequency Separation

7.4 Test Equipment Used, Channel Frequency Separation Test

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A012014	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Log Periodic	ARA	LPD-2010-A	1038	April 2, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Turntable Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 30 Test Equipment Used

8. Radiated Maximum Power Output

8.1 Test Specification

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

8.2 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 EUT was set up as shown in Figure 5 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 worst case emission were measured vertically

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 the Low (912.750 MHz) and High (919.106 MHz) channels with modulation.

8.3 Test Results

Frequency	Pol	E	Results	Limit	Margin
(MHz)		(dbµV/m)	(dBm)	(dBm)	(dB)
912.750	V	108.3	13.1	30	-16.9
912.750	H	93.0	-2.2	30	-32.2
919.106	V	109.6	14.4	30	-15.6
919.106	H	94.0	-1.2	30	-31.2

Figure 31 Radiated Power Output Test Results Table

JUDGEMENT: Passed by 15.6dB

For additional information see *Figure 32* to *Figure 35.*

TEST PERSONNEL:

Tester Signature: _____ Date: 22.09.14

Typed/Printed Name: M. Zohar

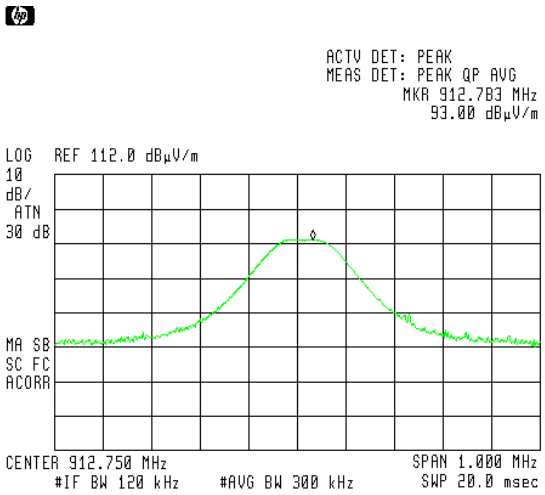

Figure 32 — 912.75 MHz Horizontal

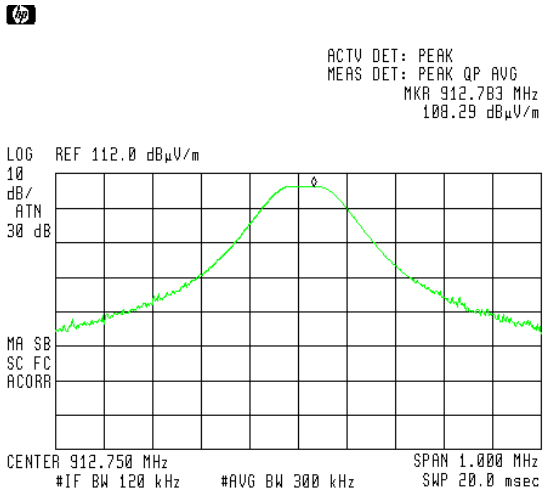

Figure 33 — 912.75 MHz Vertical

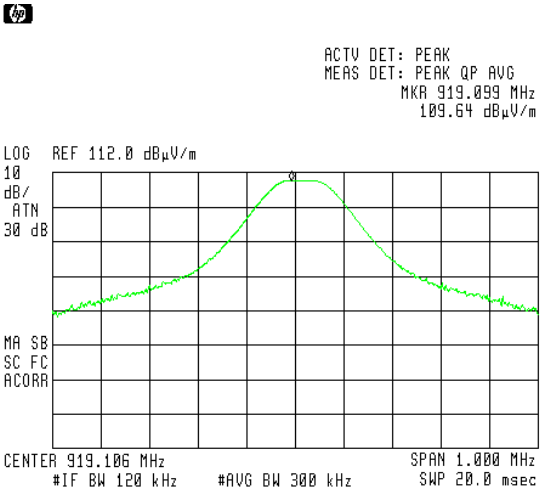

Figure 34 — 919.106 MHz VERTICAL

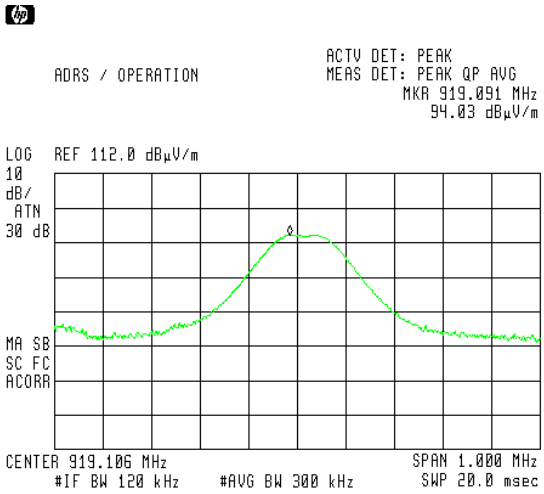

Figure 35 — 919.106 MHz HORIZONTAL

8.4 Test Equipment Used, Radiated Maximum Power Output

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A012014	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Log Periodic	ARA	LPD-2010-A	1038	April 2, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Turntable Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 36 Test Equipment Used

9. Dwell Time on Each Channel

9.1 Test Specification

FCC Part 15, Section 15.247(a)(1)(i)

9.2 Test Procedure

The E.U.T. was tested in radiated mode using the substitution antenna. The spectrum analyzer was set to 3 kHz VBW.

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 20 seconds.

9.3 Test Results

The E.U.T met the requirements of the FCC Part 15, Section 15.247(a)(1)(i).

Additional information of the results is given in *Figure 37 to Figure 38*.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 22.09.14

Typed/Printed Name: M. Zohar

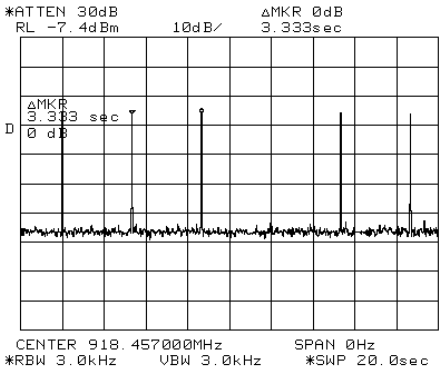

Figure 37 — Transmission Within 20 sec

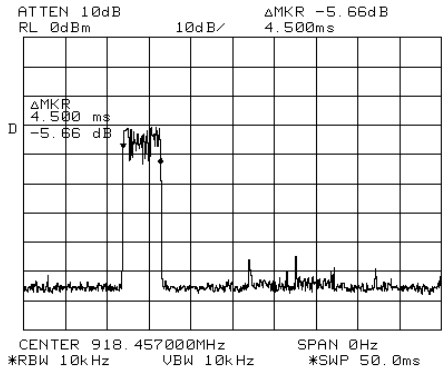

Figure 38 — Burst duration

(Dwell Time=4.5msec*5=22.5msec<400msec)

9.4 Test Equipment Used, Dwell Time on Each Channel

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A012014	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Log Periodic	ARA	LPD-2010-A	1038	April 2, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Turntable Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 39 Test Equipment Used

10. Band Edge

10.1 Test Specification

FCC Part 15, Section 15.247(d)

10.2 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 120 kHz resolution BW. The EUT was set up as shown in Figure 5, 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 EMC analyzer was set to the band edge frequencies.

The E.U.T. was tested at the lower and the upper channels.

10.3 Test Results

Operation Frequency (MHz)	**Band Edge Frequency** (MHz)	**Spectrum Level** (dBuV/m)	**Specification** (dBuV/m)
Low	902.0	41.3	88
High	928.0	42.2	89

Figure 40 Band Edge Test Results

JUDGEMENT: Passed

For additional information see *Figure 41* to *Figure 42*.

TEST PERSONNEL:

Tester Signature: _____ Date: 22.09.14

Typed/Printed Name: M. Zohar

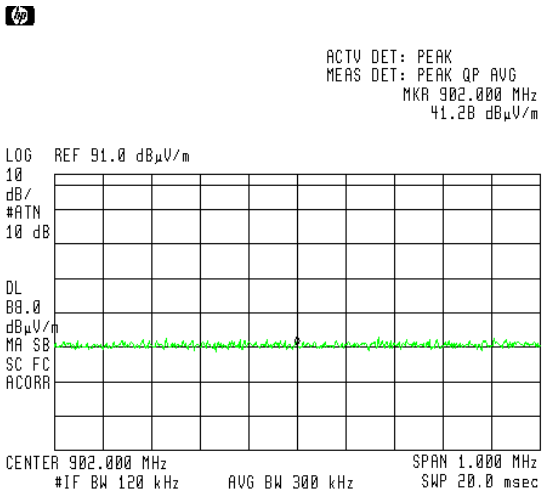

Figure 41 — 912.75 MHz vertical

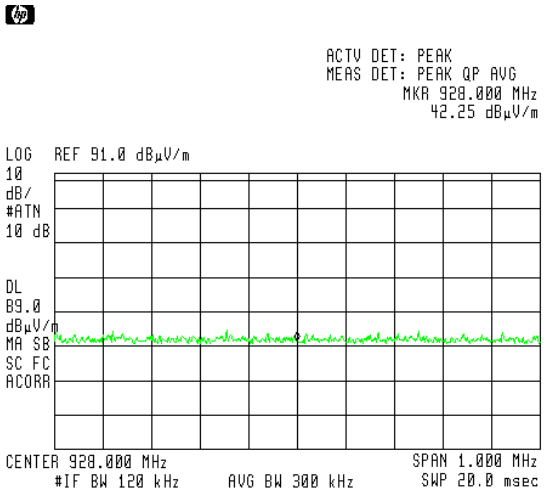

Figure 42 — 919.106 MHz vertical

10.4 Test Equipment Used, Band Edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A012014	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Log Periodic	ARA	LPD-2010-A	1038	April 2, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Turntable Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 43 Test Equipment Used

11. Spurious Radiated Emission, 9 kHz – 30 MHz

11.1 Test Specification

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

11.2 Test Procedure

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

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

The frequency range 9 kHz-30 MHz was scanned.

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

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

The E.U.T. was operated at the frequencies of 912.75 and 919.106 MHz. These frequencies were measured using a peak detector.

11.3 Test Results

JUDGEMENT: Passed

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

The results for operating frequencies were the same.

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

TEST PERSONNEL:

Tester Signature:  Date: 22.09.14

Typed/Printed Name: M. Zohar

11.4 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]

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

No external pre-amplifiers are used.

11.5 Test Equipment Used, Spurious Radiated Emission 9 kHz – 30 MHz

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A012014	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Active Loop Antenna	EMCO	6502	2950	November 4, 2013	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Turntable Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 44 Test Equipment Used

12. Spurious Radiated Emission 30 MHz – 10 GHz

12.1 Test Specification

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

12.2 Test Procedure

The E.U.T.'s 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-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 with CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 2.9-10.0 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 in 2 operating frequencies:
912.75 MHz; 919.106 MHz.

12.3 Test Data

JUDGEMENT: Passed

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

For the operation frequency 912.75 MHz, the margin between the emission level and the specification limit is 13.7dB in the worst case at the frequency of 912.750 MHz, horizontal polarization.

For the operation frequency 919.106 MHz, the margin between the emission level and the specification limit is 13.4dB in the worst case at the frequency of 2757.3 MHz, vertical polarization.

TEST PERSONNEL:

Tester Signature: _____ Date: 22.09.14

Typed/Printed Name: M. Zohar

Radiated Emission

E.U.T Description	PG2 RF Module
Type	RFD
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 30 MHz 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)	Peak Margin (dB)
912.750	1825.5	H	56.0	74.0	-18.0
912.750	1825.5	V	58.4	74.0	-15.6
912.750	2738.2	H	60.3	74.0	-13.7
912.750	2738.2	V	57.7	74.0	-16.3
919.106	1838.2	H	58.6	74.0	-15.4
919.106	1838.2	V	58.4	74.0	-15.6
919.106	2757.3	H	60.6	74.0	-13.4
919.106	2757.3	V	60.4	74.0	-13.6

Figure 45. 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

Radiated Emission

E.U.T Description PG2 RF Module
Type RFD
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C

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

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dBµV/m)	Average Factor (dB)	Average Result (dBµV/m)	Average Specification (dB µV/m)	Average Margin (dB)
912.750	1825.5	H	65.3	-26.9	38.4	54.0	-15.6
912.750	1825.5	V	69.3	-26.9	42.4	54.0	-11.6
912.750	2738.2	H	49.9	-26.9	23.0	54.0	-31.0
912.750	2738.2	V	57.7	-26.9	30.8	54.0	-23.2
919.106	1838.2	H	58.6	-26.9	31.7	54.0	-22.3
919.106	1838.2	V	58.4	-26.9	31.5	54.0	-22.5
919.106	2757.3	H	60.6	-26.9	33.7	54.0	-21.3
919.106	2757.3	V	60.4	-26.9	33.5	54.0	-21.5

Figure 46. 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.

"Peak Reading" includes correction factor.

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

Averg factor=20 LOG(4.5m/100m)=-26.9

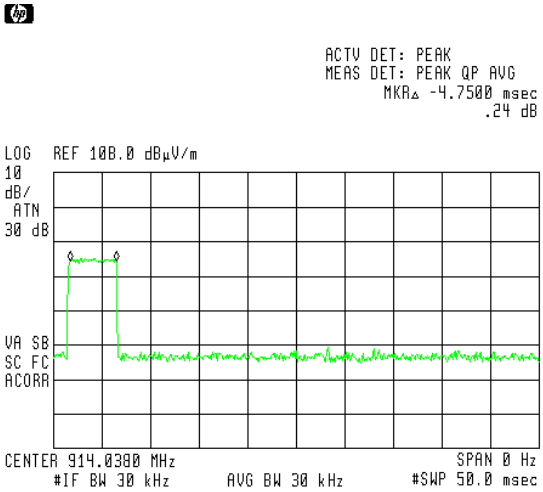

Figure 47 — Burst duration

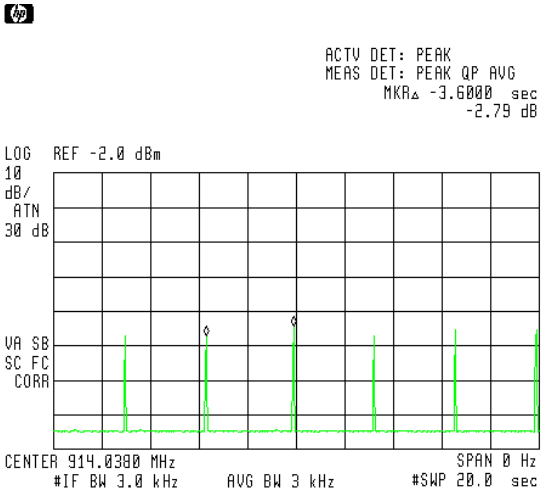

Figure 48 — Time Between Bursts

12.4 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.

12.5 Test Equipment Used, Spurious Radiated Emission 30 MHz – 10 GHz

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A012014	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2013	1 Year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Active Loop Antenna	EMCO	6502	2950	November 4, 2013	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	2 Years
Biconilog Antenna	EMCO	3104	2606	August 30, 2012	2 Years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 Years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 Years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Turntable Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 49 Test Equipment Used

13. Antenna Gain/Information

The antenna gain is 4 dBi.

14. R.F Exposure/Safety

The typical placement of the E.U.T. is wall or ceiling mounted. The typical distance between the E.U.T. and the user is 20 cm.

Calculation of Maximum Permissible Exposure (MPE)
Based on 47CFR1 Section1.1307 (b)(1) Requirements

(a) FCC Limit at 912.75 MHz is: $\frac{f}{1500} = 0.609 \frac{mW}{cm^2}$

FCC Limit at 919.11 MHz is: $\frac{f}{1500} = 0.613 \frac{mW}{cm^2}$

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

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

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

P_t = Calculated Transmitted Power (includes G_t)

G_t = Antenna Gain 4dBi

R = Distance From Transmitter

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

Frequency (MHz)	Pt (mW)	Antenna type	G_T (dBi)	R (cm)	S_{AV} (mW/cm^2)	Spec (mW/cm^2)
912.75	20.4	Internal	0	20	0.004	0.609
919.10	27.5	Internal	0	20	0.005	0.613

(d) The above are below the FCC limit.

15. APPENDIX A - CORRECTION FACTORS

15.1 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".

15.2 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.

15.3 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.

15.4 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".*

15.5 Correction factors for Antenna Biconical Type 3104 at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
30	14.8
40	13.4
50	11.8
60	11.0
70	9.1
80	8.1
90	12.4
100	13.9
120	13.7
140	12.5
160	15.1
180	16.5
200	16.4
250	18.6
300	20.6

NOTE:

Antenna serial number is 2606.

15.6 Correction factors for Double-Ridged Waveguide Horn

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

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

15.7 Correction factors for Horn Antenna

Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

15.8 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

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

16. Comparison Industry Canada Requirements With FCC

IC: 1467C-RFD **FCC ID:** WP3RFD

Test	FCC	IC
20 dB BW	15.247(a)2	RSS 210 Issue 8 A8.1(a)
Number of Hopping Frequencies	15.247(a)(1)(i)	RSS 210 Issue 8 A8.1(c)
Channel Frequency Separation	15.247(a)(1)	RSS 210 Issue 8 A8.1(b)
Max power / Peak power	15.247(b)(2)	RSS 210 Issue 8 A8.4(1)
Dwell Time on Each Channel	15.205(c)	RSS GEN Issue 3, 7.2.5 (Table 5)
Band Edge	15.247(d)	RSS 210 Issue 8 A8.5
Spurious radiated emission in the restricted band	15.205(c)	RSS GEN Issue 3, 7.2.5 (Table 5)
RF Exposure Limits	1.1307(b)(1)	RSS 102 4.4