



# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Mackay Guardian Solo MGSOLO

FCC ID: ZPZ0711MGSOLO

IC Certification Number: 9753A-MGSOLO

To: FCC Parts 15.209 and 15.215; Industry Canada RSS Gen 4.6 and 4.9

**Test Report Serial No:**  
RFI-RPT-RP81979JD05A

Version 3.0 supersedes all previous versions

**This Test Report Is Issued Under The Authority  
Of Chris Guy, Head of Global Approvals:**

Checked By:	Ian Watch
Signature:	pp A handwritten signature in black ink, appearing to read "Ian Watch".
Date of Issue:	09 September 2011

This report is issued in Adobe Acrobat portable document format (PDF). It is only a valid copy of the report if it is being viewed in PDF format with the following security options not allowed: Changing the document, Selecting text and graphics, Adding or changing notes and form fields.

This report may not be reproduced other than in full, except with the prior written approval of RFI Global Services Ltd. The results in this report apply only to the sample(s) tested.

This page has been left intentionally blank.

**Table of Contents**

<b>1. Customer Information .....</b>	<b>4</b>
<b>2. Summary of Testing .....</b>	<b>5</b>
2.1. General Information	5
2.2. Summary of Test Results	5
2.3. Methods and Procedures	5
2.4. Deviations from the Test Specification	5
<b>3. Equipment Under Test (EUT) .....</b>	<b>6</b>
3.1. Identification of Equipment Under Test (EUT)	6
3.2. Description of EUT	6
3.3. Modifications Incorporated in the EUT	6
3.4. Additional Information Related to Testing	6
3.5. Support Equipment	6
<b>4. Operation and Monitoring of the EUT during Testing .....</b>	<b>7</b>
4.1. Operating Modes	7
4.2. Configuration and Peripherals	7
<b>5. Measurements, Examinations and Derived Results .....</b>	<b>8</b>
5.1. General Comments	8
5.2. Test Results	9
5.2.1. Transmitter Radiated Emissions (Fundamental)	9
5.2.2. Transmitter Radiated Spurious Emissions	10
5.2.3. Transmitter 20 dB Bandwidth	12
<b>6. Measurement Uncertainty .....</b>	<b>13</b>
<b>Appendix 1. Test Equipment Used.....</b>	<b>14</b>

## **1. Customer Information**

<b>Company Name:</b>	Connected Development LLC
<b>Address:</b>	5020 Weston Parkway Suite 215 Cary NC 27513 United States

## 2. Summary of Testing

### 2.1. General Information

<b>Specification Reference:</b>	FCC 47CFR15.209 and 47CFR15.215
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart C (Intentional Radiators) - Sections 209 and 15.215
<b>Specification Reference:</b>	Industry Canada RSS-Gen Issue 3 December 2010
<b>Specification Title:</b>	General Requirements and Information for the Certification of Radio Apparatus
<b>Specification Reference:</b>	Industry Canada RSS-210 Issue 8 December 2010
<b>Specification Title:</b>	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
<b>Site Registration:</b>	FCC: 209735; Industry Canada: 3245B-2
<b>Location of Testing:</b>	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
<b>Test Dates:</b>	21 July 2011 to 28 July 2011

### 2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.209	RSS-Gen 4.9/7.2.5	Transmitter Radiated Emissions (Fundamental)	✓
Part 15.209	RSS-Gen 4.9/7.2.5	Transmitter Radiated Emissions	✓
Part 15.215(c)	RSS-Gen 4.6.1/4.6.3	Transmitter 20 dB Bandwidth	✓
<b>Key to Results</b>			
 = Complied	 = Did not comply		

### 2.3. Methods and Procedures

<b>Reference:</b>	ANSI C63.4 (2009)
<b>Title:</b>	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>Reference:</b>	ANSI C63.10 (2009)
<b>Title:</b>	American National Standard for Testing Unlicensed Wireless Devices

### 2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

### **3. Equipment Under Test (EUT)**

#### **3.1. Identification of Equipment Under Test (EUT)**

<b>Brand Name:</b>	Mackay Guardian Solo
<b>Model Number:</b>	MGSOLO
<b>Serial Number:</b>	9000001
<b>Hardware Version Number:</b>	001
<b>Software Version Number:</b>	001
<b>FCC ID:</b>	ZPZ0711MGSOLO
<b>IC Certification Number:</b>	9753A-MGSOLO

#### **3.2. Description of EUT**

The equipment under test was a parking meter fitted with an RFID module.

#### **3.3. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

#### **3.4. Additional Information Related to Testing**

<b>Tested Technology:</b>	RFID	
<b>Power Supply Requirement:</b>	Nominal	4.5 VDC
<b>Type of Unit:</b>	Transceiver	
<b>Channel Spacing:</b>	Single channel	
<b>Transmit Frequency</b>	114 kHz	

#### **3.5. Support Equipment**

No support equipment was used to exercise the EUT during testing.

## **4. Operation and Monitoring of the EUT during Testing**

### **4.1. Operating Modes**

The EUT was tested in the following operating mode(s):

- Constantly transmitting at full power with a modulated carrier in test mode.

### **4.2. Configuration and Peripherals**

The EUT was tested in the following configuration(s):

- Test mode was enabled by pressing the left hand green tick key on the front panel of the EUT. A test mode was implemented on the device for test purposes only.
- A fully charged battery was fitted before testing commenced and the battery level was frequently monitored during testing.

## **5. Measurements, Examinations and Derived Results**

### **5.1. General Comments**

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 6 Measurement Uncertainty for details.

## 5.2. Test Results

### 5.2.1. Transmitter Radiated Emissions (Fundamental)

#### Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	28 July 2011
Test Sample Serial No:	9000001		

FCC Part:	15.209
Test Method Used:	ANSI C63.10 Section 6.4

#### Environmental Conditions:

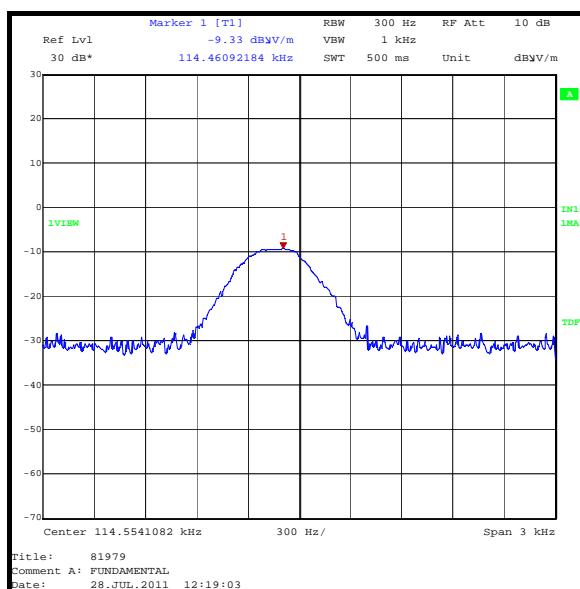
Temperature (°C):	29
Relative Humidity (%):	34

#### Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	QP Level (dB $\mu$ V/m)	Limit at 300 m (dB $\mu$ V/m)	Margin (dB)	Result
0.114	90° to EUT	-11.8	21	32.8	Complied

#### Note(s):

1. The limit is specified at a test distance of 300 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).
2. A transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 300 metres. A distance extrapolation factor of 80 dB was used.
3. Pre-scans were performed with a peak detector. Final measurements were performed with a quasi peak detector.



### **5.2.2. Transmitter Radiated Spurious Emissions**

#### **Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	21 July 2011
<b>Test Sample Serial No:</b>	9000001		

<b>FCC Part:</b>	15.209
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.3, 6.4 and 6.5 referencing ANSI C63.4
<b>Frequency Range:</b>	9 kHz to 1000 MHz

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	29
<b>Relative Humidity (%):</b>	34

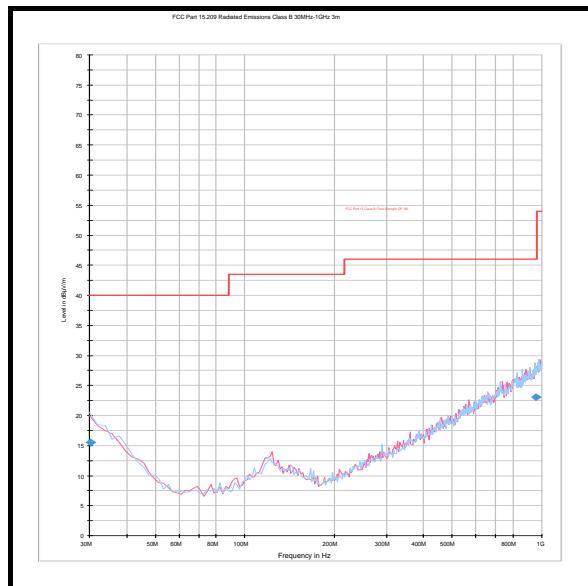
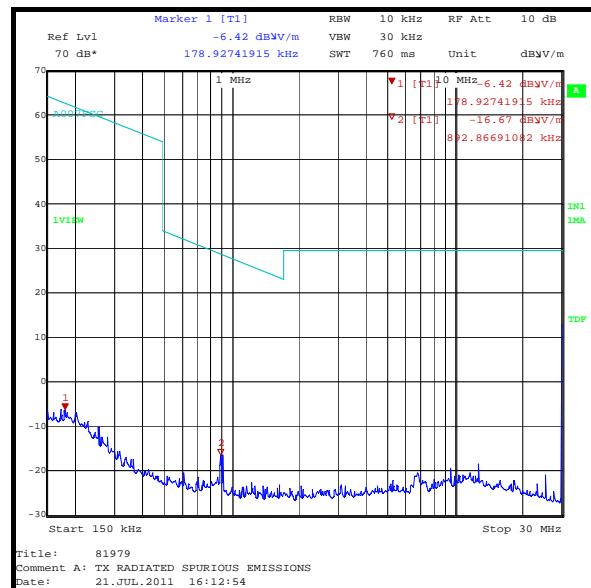
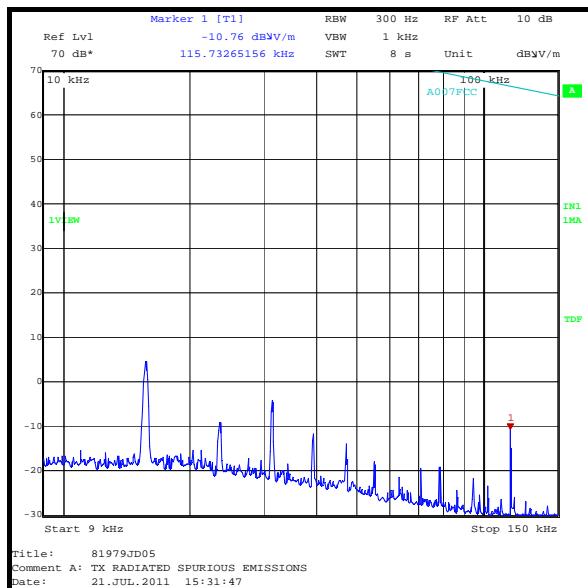
#### **Results: Quasi Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
30.197	Vertical	15.5	40.0	24.5	Complied
951.503	Vertical	23.1	46.0	22.9	Complied

#### **Note(s):**

1. Limits below 30 MHz are specified at a test distance of 30 metres, whilst below 0.49 MHz they are specified at a test distance of 300 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).
2. A transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 30 or 300 metres where required. A distance extrapolation factor of 40 dB or 80 dB was used.
3. Final measurement values include corrections for antenna factor and cable losses.
4. The emission shown at approximately 115 kHz is the fundamental.
5. All emissions on the 9 kHz to 150 kHz plot were investigated and found to be radiating from the test site turntable.
6. All other emissions shown on the pre-scan plots were investigated and found to be >20 dB below the applicable limit or below the measurement system noise floor.
7. Measurements in the range 30 MHz to 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

## Transmitter Radiated Spurious Emissions (continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying table.

**5.2.3. Transmitter 20 dB Bandwidth****Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	28 July 2011
<b>Test Sample Serial No:</b>	9000001		

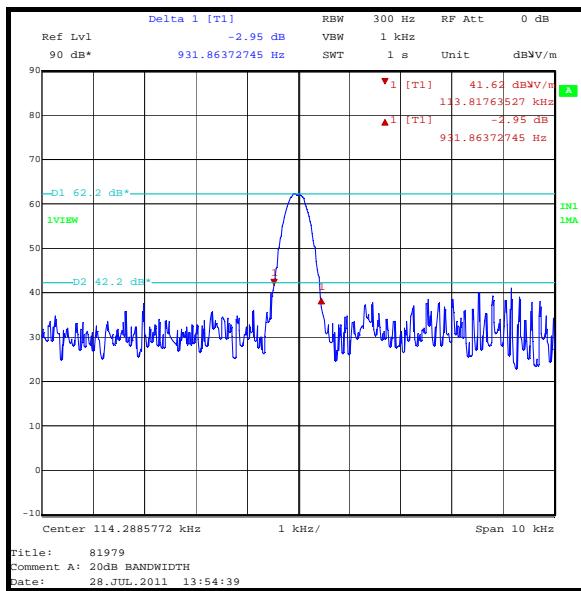
<b>FCC Part:</b>	15.215(c)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.9.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	30
<b>Relative Humidity (%):</b>	29

**Results:**

<b>20 dB Bandwidth (Hz)</b>	
	931.864



## **6. Measurement Uncertainty**

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
20 dB Bandwidth	9 kHz to 30 MHz	95%	±0.92 ppm
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	±3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

## Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A553	Antenna	Chase	CBL6111A	1593	26 Mar 2012	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	29 May 2012	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	04 Feb 2012	12
M1568	Magnetic Loop	Rohde & Schwarz	HFH2-Z2	879284/2	27 Jan 2012	12

**NB** In accordance with UKAS requirements all the measurement equipment is on a calibration schedule.