



Engineering Solutions & Electromagnetic Compatibility Services

**Intentional Radiated Emissions Test Report - FCC Part 15.247 & RSS-210**

|                                                                                                                                                                      |                                                                                                                                                                        |                                                                                                                                             |                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|----------------|
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|                                                                                                                                                                      |                                                                                                                                                                        |                                                                                                                                             |                |
| <b>FCC ID:</b>                                                                                                                                                       | CFS8DLRF6FOB                                                                                                                                                           | <b>Test Report Date</b>                                                                                                                     | March 31, 2015 |
| <b>IC:</b>                                                                                                                                                           | 573F-RF6FOB                                                                                                                                                            | <b>RTL Work Order Number</b>                                                                                                                | 2014228        |
| <b>Model #</b>                                                                                                                                                       | RF6FOB                                                                                                                                                                 | <b>RTL Quote Number</b>                                                                                                                     | QRTL14-069A    |
|                                                                                                                                                                      |                                                                                                                                                                        |                                                                                                                                             |                |
| <b>American National Standard Institute</b>                                                                                                                          | ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices                                                                                   |                                                                                                                                             |                |
| <b>FCC Rule Part(s)</b>                                                                                                                                              | FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System (10-01-14)                                     |                                                                                                                                             |                |
| <b>IC Rule Part(s)</b>                                                                                                                                               | RSS-210 Issue 8: Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment<br>RSS-Gen Issue 4: General Requirements for Compliance of Radio Apparatus |                                                                                                                                             |                |

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, IC RSS-210, IC RSS-Gen, ANSI C63.4 and ANSI C63.10.

Signature: 

Date: March 31, 2015

Typed/Printed Name: Desmond A. Fraser

Position: President

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*These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANAB.  
Refer to certificate and scope of accreditation AT-1445.*

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## 1 General Information

### 1.1 Scope

Applicable Standards:

- FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.
- RSS-210 Issue 8: Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
- RSS-Gen Issue 3: General Requirements and Information for the Certification of Radio Apparatus

This test report addresses the intentional radiated emissions requirements per FCC 15.247, which are the harmonic/spurious radiated emissions occurring in the restricted bands per FCC 15.205 (against the FCC 15.209 limits).

### 1.2 Description of EUT

|                               |                 |
|-------------------------------|-----------------|
| <b>Equipment Under Test</b>   | RF6FOB          |
| <b>Power Supply</b>           | 3V battery      |
| <b>Frequency Range</b>        | 2405 – 2475 MHz |
| <b>Antenna Connector Type</b> | N/A             |
| <b>Antenna Types</b>          | Internal        |

### 1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

### 1.4 Modifications

None.

## 2 Test Information

### 2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

**Table 2-1: Frequencies Tested**

| Channel | Frequency |
|---------|-----------|
| Low     | 2405      |
| Mid     | 2445      |
| High    | 2475      |

### 2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

### 2.3 Test Result Summary

**Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.247), IC RSS-210/RSS-Gen**

| FCC Reference | IC Reference  | C63.10 Procedure | Test               | Pass/Fail or N/A |
|---------------|---------------|------------------|--------------------|------------------|
| FCC 15.209    | RSS-Gen 7.2.5 | 6.5, 6.6         | Radiated Emissions | Pass             |

### 2.4 Related Submittal(s)/Grant(s)

This report is to support an application for certification under FCC ID: CFS8DLRF6FOB, IC: 573F-RF6FOB.

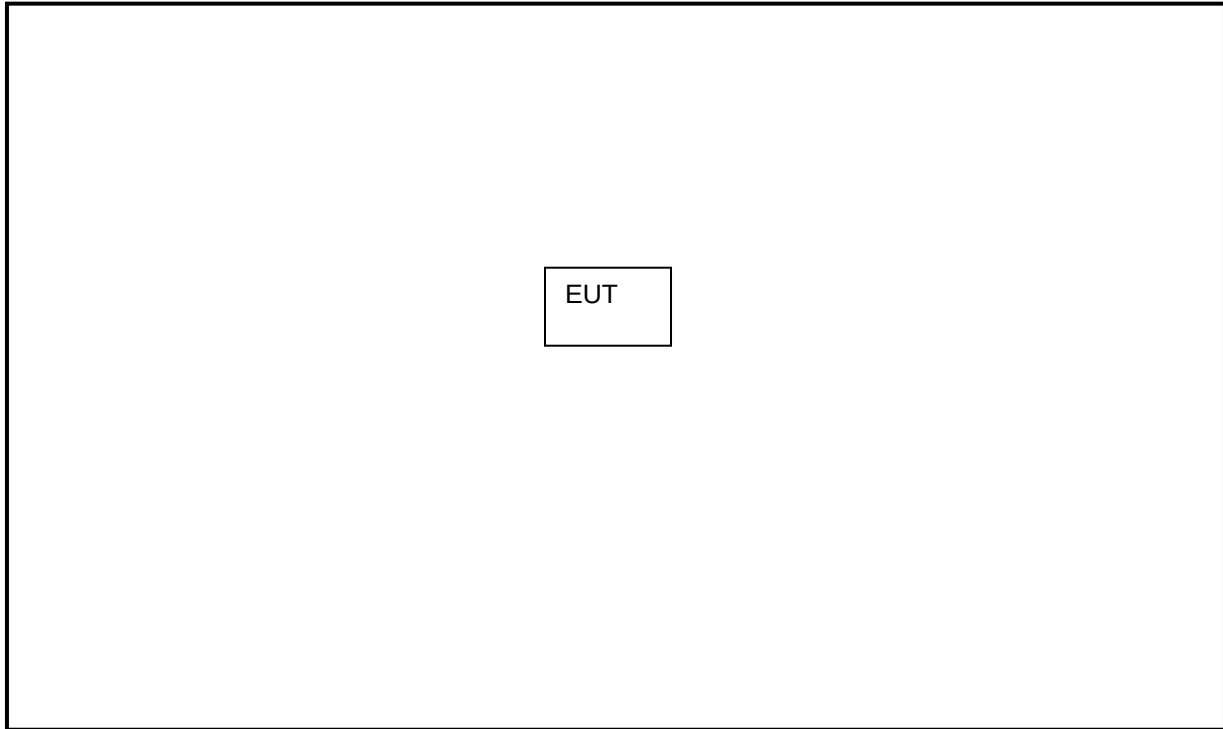
### 2.5 Test System Details

The test samples were received on March 12, 2015. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

**Table 2-3: Equipment Under Test**

| Part | Manufacturer            | Model # | Serial Number | FCC ID       | RTL Bar Code |
|------|-------------------------|---------|---------------|--------------|--------------|
| FOB  | Honeywell International | RF6FOB  | SARF6F0BV1    | CFS8DLRF6FOB | 21602        |

**Figure 2-1: Configuration of Tested System**



### 3 Radiated Emissions – FCC 15.209; IC RSS-210

#### 3.1 Limits of Radiated Emissions Measurement

| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
|-----------------|-----------------------|--------------------------|
| 0.009-0.490     | 2400/f (kHz)          | 300                      |
| 0.490-1.705     | 2400/f (kHz)          | 30                       |
| 1.705-30.0      | 30                    | 30                       |
| 30-88           | 100                   | 3                        |
| 88-216          | 150                   | 3                        |
| 216-960         | 200                   | 3                        |
| Above 960       | 500                   | 3                        |

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

#### 3.2 Radiated Emissions Measurement Test Procedure

Procedure: C63.10-2009 6.5, 6.6

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10<sup>th</sup> harmonic of the highest fundamental transmitter frequency (24.75 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1,000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

**Table 3-1: Radiated Emissions Test Equipment**

| RTL Asset # | Manufacturer            | Model         | Part Type                            | Serial Number | Calibration Due Date |
|-------------|-------------------------|---------------|--------------------------------------|---------------|----------------------|
| 901583      | Agilent Technologies    | EXA N9010     | Spectrum Analyzer (10 Hz – 26.5 GHz) | MY51250846    | 4/16/15              |
| 900932      | Rhein Tech Laboratories | 8449B OPT H02 | Amplifier (1 – 26.5 GHz)             | 3008A00505    | 9/5/15               |
| 900878      | Rhein Tech Laboratories | AM3-1197-0005 | 3 meter antenna mast, polarizing     | OATS1         | N/A                  |
| 900791      | Chase                   | CBL6112       | Antenna (30 MHz – 2 GHz)             | 2099          | 6/11/17              |
| 901218      | EMCO                    | 3160-09       | Horn Antenna (18 - 26.5 GHz)         | 960281-003    | 4/20/15              |
| 900772      | EMCO                    | 3161-02       | Horn Antenna (2 - 4 GHz)             | 9804-1044     | 4/20/15              |
| 900321      | EMCO                    | 3161-03       | Horn Antenna (4 – 8.2 GHz)           | 9508-1020     | 4/20/15              |
| 900323      | EMCO                    | 3160-07       | Horn Antenna (8.2 – 12.4 GHz)        | 9605-1054     | 4/20/15              |
| 900356      | EMCO                    | 3160-08       | Horn Antenna (12.4 – 18 GHz)         | 9607-1044     | 4/20/15              |
| 901218      | EMCO                    | 3160-09       | Horn Antenna (18 – 26.5 GHz)         | 960281-003    | 4/19/15              |



### 3.3 Radiated Emissions Test Results

#### 3.3.1 Radiated Emissions Harmonics/Spurious

**Table 3-2: 2405 MHz; Average Mode**

| Emission Frequency (MHz) | Analyzer Reading (dBuV)<br>(1 MHz RBW, 10 Hz VBW) | Site Correction Factor (dB/m) | Corrected Average Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|--------------------------|---------------------------------------------------|-------------------------------|----------------------------------|----------------|-------------|
| 2405.000                 | 62.7                                              | 26.0                          | 88.7                             | Fundamental    |             |

**Table 3-3: 2445 MHz; Average Mode**

| Emission Frequency (MHz) | Analyzer Reading (dBuV)<br>(1 MHz RBW, 10 Hz VBW) | Site Correction Factor (dB/m) | Corrected Average Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|--------------------------|---------------------------------------------------|-------------------------------|----------------------------------|----------------|-------------|
| 2445.000                 | 62.9                                              | 26.1                          | 89.0                             | Fundamental    |             |

**Table 3-4: 2475 MHz; Average Mode**

| Emission Frequency (MHz) | Analyzer Reading (dBuV)<br>(1 MHz RBW, 10 Hz VBW) | Site Correction Factor (dB/m) | Corrected Average Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|--------------------------|---------------------------------------------------|-------------------------------|----------------------------------|----------------|-------------|
| 2475.00                  | 64.9                                              | 26.2                          | 91.1                             | Fundamental    |             |

**Table 3-5: 2405 MHz; Peak Mode**

| Emission Frequency (MHz) | Spectrum Analyzer Peak Level (1 MHz RBW/3 MHz VBW) (dBuV) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|--------------------------|-----------------------------------------------------------|-------------------------------|-------------------------|----------------|-------------|
| 2405.000                 | 64.8                                                      | 26.0                          | 90.8                    | Fundamental    |             |
| 4810.000                 | 66.3                                                      | -0.1                          | 66.2                    | 74.0           | -7.8        |
| 7215.000                 | 52.0                                                      | 2.7                           | 54.7                    | 74.0           | -19.3       |
| 9620.000                 | 27.3                                                      | 10.3                          | 37.6                    | 74.0           | -36.4       |
| 12025.000                | 23.5                                                      | 10.0                          | 33.5                    | 74.0           | -40.5       |
| 14430.000                | 22.8                                                      | 15.7                          | 38.5                    | 74.0           | -35.5       |
| 16835.000                | 31.9                                                      | 18.0                          | 49.9                    | 74.0           | -24.1       |

**Table 3-6: 2445 MHz; Peak Mode**

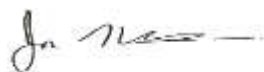
| Emission Frequency (MHz) | Spectrum Analyzer Peak Level (1 MHz RBW/3 MHz VBW) (dBuV) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|--------------------------|-----------------------------------------------------------|-------------------------------|-------------------------|----------------|-------------|
| 2445.000                 | 64.5                                                      | 26.1                          | 90.6                    | Fundamental    |             |
| 4890.000                 | 71.2                                                      | 0.1                           | 71.3                    | 74.0           | -2.7        |
| 7335.000                 | 46.7                                                      | 3.1                           | 49.8                    | 74.0           | -24.2       |
| 9780.000                 | 31.0                                                      | 10.0                          | 41.0                    | 74.0           | -33.0       |
| 12225.000                | 31.4                                                      | 9.8                           | 41.2                    | 74.0           | -32.8       |
| 14670.000                | 31.4                                                      | 15.7                          | 47.1                    | 74.0           | -26.9       |
| 17115.000                | 34.2                                                      | 18.3                          | 52.5                    | 74.0           | -21.5       |

**Table 3-7: 2475 MHz; Peak Mode**

| Emission Frequency (MHz) | Spectrum Analyzer Peak Level (1 MHz RBW/3 MHz VBW) (dBuV) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|--------------------------|-----------------------------------------------------------|-------------------------------|-------------------------|----------------|-------------|
| 2475.00                  | 66.1                                                      | 26.2                          | 92.3                    | Fundamental    |             |
| 4950.00                  | 70.3                                                      | 0.1                           | 70.4                    | 74.0           | -3.6        |
| 7425.00                  | 48.3                                                      | 2.6                           | 50.9                    | 74.0           | -23.1       |
| 9900.00                  | 30.3                                                      | 9.0                           | 39.3                    | 74.0           | -34.7       |
| 12375.00                 | 29.4                                                      | 10.3                          | 39.7                    | 74.0           | -34.3       |
| 14850.00                 | 29.9                                                      | 15.8                          | 45.7                    | 74.0           | -28.3       |
| 17325.00                 | 33.6                                                      | 18.4                          | 52.0                    | 74.0           | -22.0       |

**Test Personnel:**

Jon Wilson  
EMC Test Engineer



Signature

March 13, 2015  
Date of Test

#### **4 Compliance with the Band Edge – FCC 15.247(d); RSS-210 2.2**

##### **4.1 Band Edge Test Procedure**

Peak (1 MHz RBW/3 MHz VBW) and average (1 MHz RBW/10 Hz VBW) corrected radiated measurements were taken within the restricted band to show compliance.

**Table 4-1: Band Edge Test Equipment**

| <b>RTL<br/>Asset #</b> | <b>Manufacturer</b>     | <b>Model</b> | <b>Part Type</b>                        | <b>Serial<br/>Number</b> | <b>Calibration<br/>Due Date</b> |
|------------------------|-------------------------|--------------|-----------------------------------------|--------------------------|---------------------------------|
| 901583                 | Agilent<br>Technologies | EXA N9010    | Spectrum Analyzer<br>(10 Hz – 26.5 GHz) | MY51250846               | 4/16/15                         |

## 4.2 Restricted Band Edge Test Results

### 4.2.1 Lower Band Edge

88.7 dBuV/m is the average field strength measurement, from which the delta measurement of 42.9 dB is subtracted (reference Peak plot 4-1, note DET=P), resulting in a level 45.8 dB. This level has a margin of 8.2 dB below the limit of 54 dBuV/m.

Calculation:  $88.7 \text{ dBuV/m} - 42.9 \text{ dB} - 54 \text{ dBuV/m} = -8.2$   
 $88.7 - 42.9 - 54 = -8.2$

Peak Field Strength of Lower Band Edge (1 MHz RBW/3 MHz VBW) = 90.8 dBuV/m  
 Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 88.7 dBuV/m  
 Delta measurement = 42.9 dB

Plot 4-1: In Band Emissions - 2405 MHz



#### 4.2.2 Upper Band Edge

91.1 dBuV/m is the average field strength measurement, from which the delta measurement of 49.0 dB is subtracted (reference Peak plot 4-2, note DET=P), resulting in a level 42.1 dB. This level has a margin of 11.9 dB below the limit of 54 dBuV/m.

Calculation:  $91.1 \text{ dBuV/m} - 49.0 \text{ dB} - 54 \text{ dBuV/m} = -11.9 \text{ dB}$

Peak Field Strength of Upper Band Edge (1 MHz RBW/1 MHz VBW) = 92.3 dBuV/m

Average Field Strength of Upper Band Edge (1 MHz RBW/10 Hz VBW) = 91.1 dBuV/m

Delta measurement = 49.0 dB

#### Plot 4-2: In Band Emissions – 2475 MHz



#### Test Personnel:

Jon Wilson  
EMC Test Engineer

*Jon Wilson*  
Signature

February 13, 2015  
Date of Test

## **5 Conclusion**

The data in this measurement report shows that the Honeywell International Model # RF6FOB, FCC ID: CFS8DLRF6FOB, IC: 573F-RF6FOB, complies with the applicable intentional radiated emissions requirements of Parts 2 and 15 of the FCC rules and regulations and Industry Canada RSS-Gen and RSS-210.

## Appendix A: Test Photographs



Photograph 1: Radiated Testing – Front View



**Photograph 2: Radiated Testing**