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Project Number: 14E4885-1f

Prepared for:

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By

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**FCC Site Registration: 92592**

**Industry Canada Assigned Site Code: 8517A-2**

**Date**

14 June 2014

FCC EQUIPMENT AUTHORISATION

Test Report

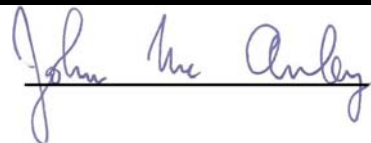
**EUT Description**

RFID Reader module in 610f plastics

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**Authorised :**

**John McAuley**

A handwritten signature in blue ink, reading 'John McAuley', is written over a horizontal line.

**TEST SUMMARY**

Emissions were assessed to the following standards:

FCC CFR 47 Part 15

Federal Communications Commission: Part 15 Radio Frequency Devices

The equipment complies with the requirements according to the following standards.

| FCC Part | TEST PARAMETERS    | Test Result |
|----------|--------------------|-------------|
| 15.209   | RADIATED EMISSIONS | PASS        |

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF COMPLIANCE ENGINEERING IRELAND LTD

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## 1.0 EUT Description

The EUT was a RFID reader unit which contained a transceiver module (as below) housed in plastic case. A finger print reader is also fitted on the EUT.

The module used a short range 13.56 MHz band transceiver for RFID.

### RFID unit

|                      |                                                |
|----------------------|------------------------------------------------|
| <b>Manufacturer:</b> | Control Electronic Measurement Systems Limited |
| <b>Make:</b>         | 610f                                           |
| <b>Model:</b>        | 610f                                           |

### Module

|                |                                     |
|----------------|-------------------------------------|
| <b>Model:</b>  | S610MSCRM                           |
| <b>Type:</b>   | 13.56MHz Radio Transceiver for RFID |
| <b>FCC ID:</b> | QABS610MSCRM                        |
| <b>IC ID:</b>  | 12009A-S610MSCRM                    |

## **1.1 EUT Operation**

### **Operating Conditions during Test:**

The equipment under test was operated during the measurement under the following conditions:

The EUT was powered from a 12v dc mains adapter.

The module was operated in normal modulated mode.

### **Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

Temperature: +15 to +35 ° C

Humidity: 20-75 %

## **1.2 Modifications**

No modifications were required in order to pass the test specifications.

## **1.3 Date of Test**

The tests were carried out on one sample of the EUT on the 3<sup>rd</sup> March 2014.

## **1.4 Electromagnetic Emissions Testing**

The guidelines of CISPR 16-4 were used for all uncertainty calculations, estimates and expressions thereof for EMC testing. A copy of Compliance Engineering Ireland Ltd.'s policy for EMC Measurement Uncertainty is available on request.

RF Requirements: Spurious emissions in accordance with FCC CFR 15.107, 15.109 and 15.209. Tests were carried out to the requirements of CISPR 16-4 and ANSI C63.4-2003.

#### **1.4.1 Measurement Uncertainty**

The measurement uncertainty (with a 95% confidence level) for the conducted emissions test was  $\pm 3.5$  dB.

The measurement uncertainty (with a 95% confidence level) for the radiated emissions test was  $\pm 5.3$  dB (from 30 to 100 MHz),  $\pm 4.7$  dB (from 100 to 300 MHz),  $\pm 3.9$  dB (from 300 to 1000 MHz) and  $\pm 3.8$  dB (from 1 GHz to 40 GHz).

## **2.0 Emissions Measurements**

### **2.1 Conducted Emissions Measurements**

The EUT was connected to the mains through a LISN and measurements were carried out using a Receiver over the frequency range 150KHz to 30MHz.

### **2.2 Radiated Emissions Measurements**

Radiated Power measurements were made at the Compliance Engineering Ireland Ltd anechoic chamber located in Dunshaughlin, Co. Meath, Ireland to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

The EUT was connected to an AC2000 system comprising of a laptop running AC2000 firmware and a network switch / serial to Ethernet converter for communication to EUT. A Magnetic lock and Door simulator to mimic signals were also connected to the EUT to prove full functionality and simulate a complete system setup.

The EUT was centred on a motorized turntable, which allows 360 degree rotation. A measurement antenna was positioned at a distance of 3 metres as measured from the closest point of the EUT. The radiated emissions were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 meters.

Emissions below 30MHz were measured using a loop antenna. In this case the resolution bandwidth was 200Hz for frequencies below 150KHz and RBW was 9KHz for frequencies above 150KHz.

Emissions between 30MHz and 1GHz were measured using a bi-log antenna. In this case the resolution bandwidth was 100KHz.

### 3.0 Results for Conducted emissions

#### Mains conducted Emissions results

| Detector   | Frequency<br>MHz | Reading<br>dBuV | Margin<br>dB | Phase |
|------------|------------------|-----------------|--------------|-------|
| Quasi-Peak | 0.197            | 55.13           | -9.52        | Live  |
| Average    | 0.197            | 40.06           | -14.59       | Live  |
| Quasi-Peak | 0.258            | 48.46           | -14.45       | Live  |
| Quasi-Peak | 0.463            | 43.24           | -13.82       | Live  |
| Quasi-Peak | 13.560           | 50.55           | -9.45        | Live  |
| Average    | 17.124           | 38.20           | -11.8        | Live  |
| Quasi-Peak | 17.714           | 42.19           | -17.81       | Live  |
| Average    | 17.714           | 37.42           | -12.58       | Live  |

| Detector   | Frequency<br>MHz | Reading<br>dBuV | Margin<br>dB | Phase   |
|------------|------------------|-----------------|--------------|---------|
| Quasi-Peak | 0.197            | 56.09           | -8.56        | Neutral |
| Average    | 0.197            | 41.00           | -13.65       | Neutral |
| Quasi-Peak | 0.258            | 49.90           | -13.01       | Neutral |
| Quasi-Peak | 0.443            | 43.36           | -14.28       | Neutral |
| Average    | 0.476            | 33.43           | -13.25       | Neutral |
| Quasi-Peak | 13.560           | 50.56           | -9.44        | Neutral |
| Average    | 17.590           | 38.69           | -11.31       | Neutral |
| Average    | 17.727           | 38.26           | -11.74       | Neutral |
| Quasi-Peak | 17.729           | 43.04           | -16.96       | Neutral |

Ref Appendix 3 for scans

**Result: Pass**

## 4.0 Results for Radiated emissions

Appendix 3 shows the results of the scans in the anechoic chamber.

| Frequency | Level | Antenna Factor | Cable Loss | Final Field Strength | Detector   | Spurious Emission Limit | Margin | Pass / Fail |
|-----------|-------|----------------|------------|----------------------|------------|-------------------------|--------|-------------|
| MHz       | dBuV  | dB             | dB         | dBuV/m               |            | dBuV/m                  | dB     | P/F         |
| 0.252     | 59.91 | 9.49           | 0.1        | 69.5                 | Average    | 99.58                   | 30.08  | Pass        |
| 15.283    | 20.65 | 8.35           | 0.1        | 29                   | Quasi Peak | 69.54                   | 40.54  | Pass        |
| 18.47     | 6.15  | 8.35           | 0.1        | 14.5                 | Quasi Peak | 69.54                   | 55.04  | Pass        |
| 27.12     | 14.4  | 6.32           | 0.1        | 14.4                 | Quasi Peak | 69.54                   | 55.14  | Pass        |
| *13.56    | 66.5  | 8.25           | 0.1        | 74.8                 | Quasi Peak | *124                    | *49.2  | Pass        |

\* Intentional radiator fundamental

### 4.1 Measurements with Bilog Antenna (30MHz to 1GHz)

| Frequency MHz | Quasi Peak Level dBuV/m | Antenna Polarity | Antenna Factor dB | Cable loss dB | Final Field Strength Quasi Peak dBuV/m | Quasi Peak Limit dBuV/m | Margin dB |
|---------------|-------------------------|------------------|-------------------|---------------|----------------------------------------|-------------------------|-----------|
| 40.68         | 7.9                     | Vertical         | 14.2              | 0.2           | 22.3                                   | 40.0                    | 17.7      |
| 54.24         | 16.6                    | Vertical         | 7.2               | 0.2           | 24                                     | 40.0                    | 16.0      |
| 67.8          | 17.2                    | Vertical         | 6.1               | 0.2           | 23.5                                   | 40.0                    | 16.5      |
| 125           | 16.3                    | Vertical         | 12.1              | 0.2           | 28.6                                   | 43.5                    | 14.9      |
| 133.32        | 21.1                    | Vertical         | 12                | 0.2           | 33.3                                   | 43.5                    | 10.2      |
| 250.02        | 13.8                    | Vertical         | 12.4              | 0.2           | 26.4                                   | 46.0                    | 19.6      |
| 266.64        | 12.2                    | Vertical         | 13.7              | 0.2           | 26.1                                   | 46.0                    | 19.9      |
| 375.047       | 18.2                    | Vertical         | 14.3              | 1.2           | 33.7                                   | 46.0                    | 12.3      |
| 399.972       | 20.97                   | Vertical         | 15.6              | 1.2           | 37.77                                  | 46.0                    | 8.3       |
| 500.063       | 26.8                    | Vertical         | 17.5              | 1.2           | 45.5                                   | 46.0                    | 0.5       |
| 533.28        | 18.5                    | Vertical         | 17.9              | 1.2           | 37.6                                   | 46.0                    | 8.4       |
| 800           | 13.01                   | Vertical         | 21.5              | 1.4           | 35.91                                  | 46.0                    | 10.1      |
| 933.27        | 19.7                    | Vertical         | 23.3              | 1.4           | 44.4                                   | 46.0                    | 1.6       |
| 40.68         | 13.6                    | Horizontal       | 14.2              | 0.2           | 28                                     | 40.0                    | 12.0      |
| 54.24         | 2.6                     | Horizontal       | 7.2               | 0.2           | 10                                     | 40.0                    | 30.0      |
| 67.8          | 1.7                     | Horizontal       | 6.1               | 0.2           | 8                                      | 40.0                    | 32.0      |
| 250.02        | 16.3                    | Horizontal       | 12.4              | 0.2           | 28.9                                   | 46.0                    | 17.1      |
| 350.044       | 8                       | Horizontal       | 14.2              | 1.2           | 23.4                                   | 46.0                    | 22.6      |
| 375.06        | 19.2                    | Horizontal       | 14.3              | 1.2           | 34.7                                   | 46.0                    | 11.3      |
| 399.972       | 23.2                    | Horizontal       | 15.6              | 1.2           | 40                                     | 46.0                    | 6.0       |
| 500.07        | 22                      | Horizontal       | 17.5              | 1.2           | 40.7                                   | 46.0                    | 5.3       |
| 933.27        | 17.75                   | Horizontal       | 23.3              | 1.4           | 42.45                                  | 46.0                    | 3.6       |

Ref Appendix 3 for scans

**Result: Pass**

**Appendix 1****List of Test Equipment**

| <b>Instrument</b>          | <b>Mfr.</b>     | <b>Model</b> | <b>CEI Ref No.</b> | <b>Cal Due Date</b> |
|----------------------------|-----------------|--------------|--------------------|---------------------|
| Bilog Antenna              | Chase           | CBL 6140     | 690                | 03/10/2015          |
| Loop Antenna               | EMCO            | 6502         | 821                | 27/08/2016          |
| Spectrum Analyser/Receiver | Rohde & Schwarz | ESR          | 869                | 03/06/2015          |
| LISN                       | Rohde & Schwarz | ESH3-Z5      | 604                | 14/12/2015          |

## Appendix 2

### Test Configurations



**Fig 1 Radiated Emissions -**



**Fig 2 Radiated Emissions**



**Fig 3 Radiated Emissions -**



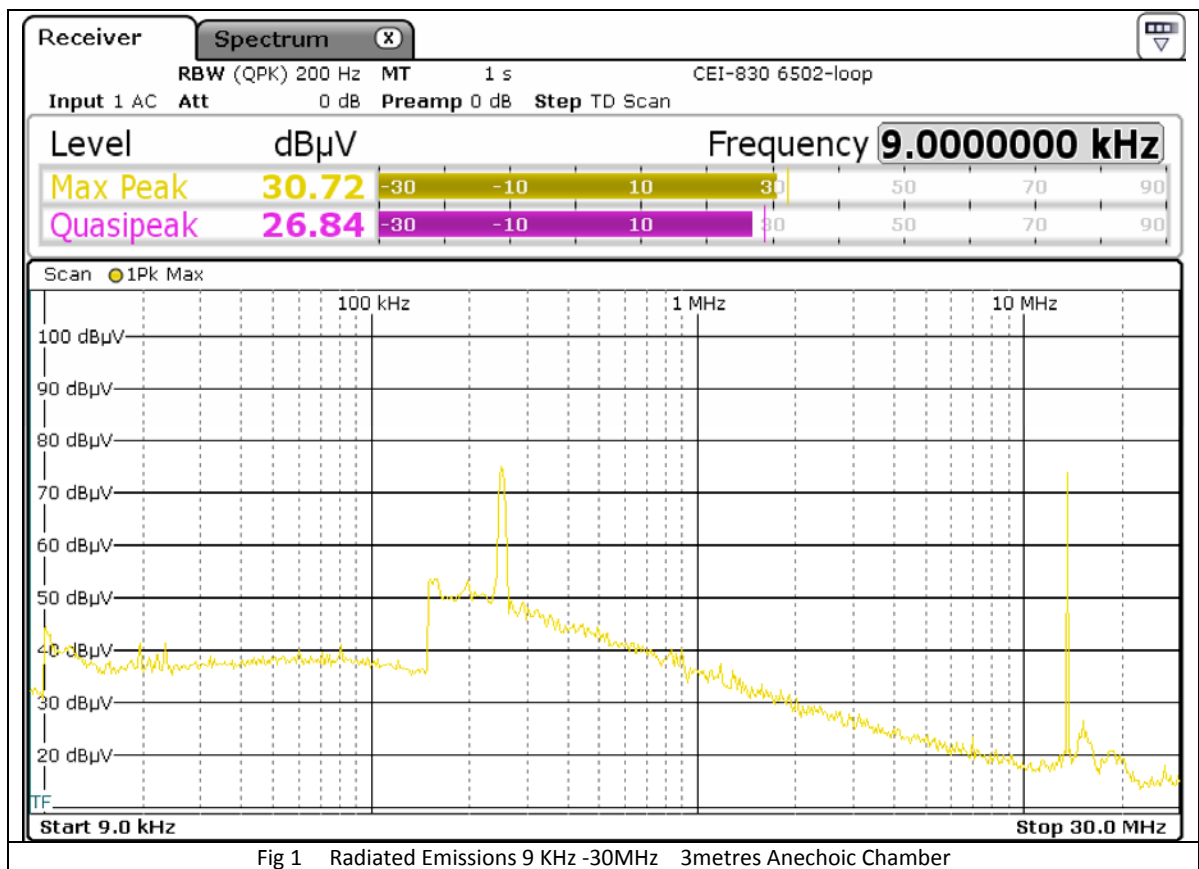
**Fig 4 Radiated Emissions**



**Fig 5 Conducted Emissions -**

**Appendix 3:**

**Test Results**



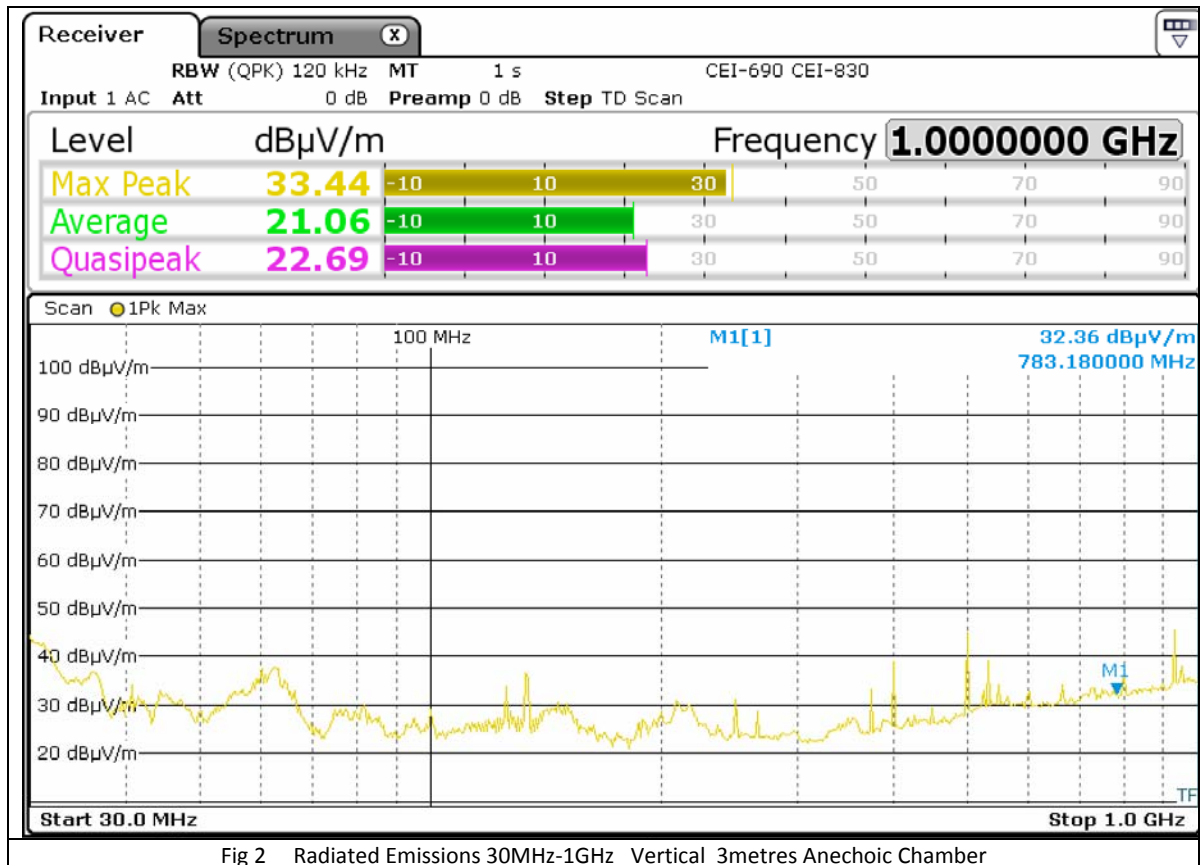


Fig 2 Radiated Emissions 30MHz-1GHz Vertical 3metres Anechoic Chamber

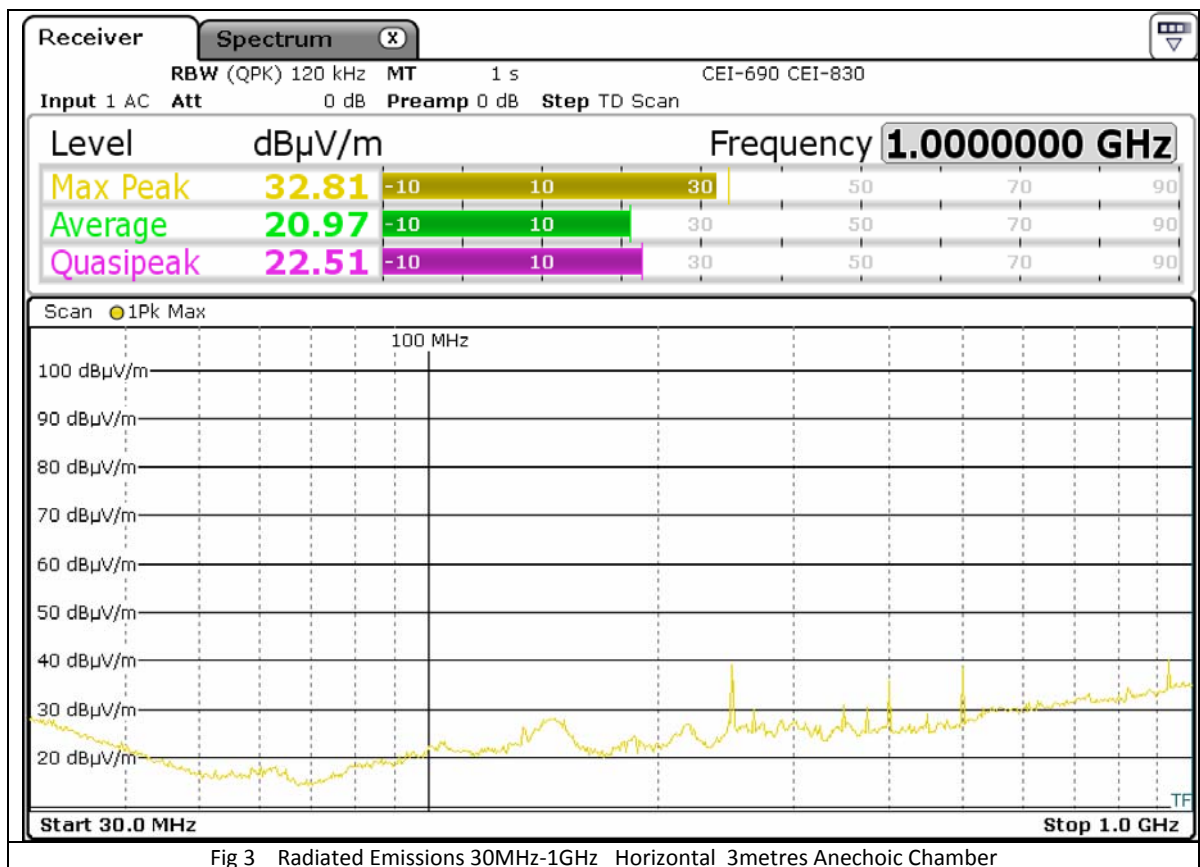


Fig 3 Radiated Emissions 30MHz-1GHz Horizontal 3metres Anechoic Chamber

