



# **TEST REPORT**

**Test Report No. : UL-RPT-RP10014935JD03A V2.0**

**Manufacturer** : Sony Mobile Communications AB  
**Type No.** : PM-0440-BV  
**FCC ID** : PY7PM-0440  
**Technology** : RFID – 13.56 MHz  
**Test Standard(s)** : FCC Parts 15.207, 15.209(a) & 15.225

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

**Date of Issue:** 23 June 2015

**Checked by:**

Ian Watch  
Senior Engineer, Radio Laboratory

**Issued by :**

pp

John Newell  
Quality Manager,  
UL VS LTD



This laboratory is accredited by UKAS.  
The tests reported herein have been  
performed in accordance with its terms  
of accreditation.

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**1. Customer Information**

|                      |                                                 |
|----------------------|-------------------------------------------------|
| <b>Company Name:</b> | Sony Mobile Communications AB                   |
| <b>Address:</b>      | Nya Vattentornet<br>Lund<br>SE-221 88<br>Sweden |

## **2. Summary of Testing**

### **2.1. General Information**

|                                 |                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Specification Reference:</b> | 47CFR15.225                                                                                                                           |
| <b>Specification Title:</b>     | Code of Federal Regulations Volume 47 (Telecommunications):<br>Part 15 Subpart C (Radio Frequency Devices) - Section 15.225           |
| <b>Specification Reference:</b> | 47CFR15.207 and 47CFR15.209                                                                                                           |
| <b>Specification Title:</b>     | Code of Federal Regulations Volume 47 (Telecommunications):<br>Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209 |
| <b>Site Registration:</b>       | 209735                                                                                                                                |
| <b>Location of Testing:</b>     | UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park,<br>Basingstoke, Hampshire, RG24 8AH, United Kingdom                    |
| <b>Test Dates:</b>              | 26 July 2013 to 30 July 2013                                                                                                          |

### **2.2. Summary of Test Results**

| <b>FCC Reference (47CFR)</b>                                                                                                                                                                                                 | <b>Measurement</b>                                                | <b>Result</b>                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Part 15.207                                                                                                                                                                                                                  | Transmitter AC Conducted Emissions                                |    |
| Part 15.225(a)(b)(c)(d)                                                                                                                                                                                                      | Transmitter Fundamental Field Strength                            |    |
| Part 15.209(a), 15.225(d)                                                                                                                                                                                                    | Transmitter Radiated Spurious Emissions                           |  |
| Part 15.209(a), 15.225(c)(d)                                                                                                                                                                                                 | Transmitter Band Edge Radiated Emissions                          |  |
| Part 2.1049                                                                                                                                                                                                                  | Transmitter 20 dB Bandwidth                                       |  |
| Part 15.225(e)                                                                                                                                                                                                               | Transmitter Frequency Stability (Temperature & Voltage Variation) |  |
| <b>Key to Results</b><br> = 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>              | Sony                                          |
| <b>IMEI:</b>                    | 004402540812108 ( <i>Radiated sample #1</i> ) |
| <b>Serial Number:</b>           | CB5124UN3A                                    |
| <b>Hardware Version Number:</b> | AP2                                           |
| <b>Software Version Number:</b> | 14.1.H.0.246                                  |
| <b>FCC ID:</b>                  | PY7PM-0440                                    |

|                                 |                                                                              |
|---------------------------------|------------------------------------------------------------------------------|
| <b>Brand Name:</b>              | Sony                                                                         |
| <b>IMEI:</b>                    | 004402540811944 ( <i>Radiated sample #2, modified with a Dummy battery</i> ) |
| <b>Serial Number:</b>           | CB5124UN43                                                                   |
| <b>Hardware Version Number:</b> | AP2                                                                          |
| <b>Software Version Number:</b> | 14.1.H.0.246                                                                 |
| <b>FCC ID:</b>                  | PY7PM-0440                                                                   |

|                              |            |
|------------------------------|------------|
| <b>Brand Name:</b>           | Sony       |
| <b>Description:</b>          | AC Charger |
| <b>Model Name or Number:</b> | EP880      |

|                              |                      |
|------------------------------|----------------------|
| <b>Brand Name:</b>           | Sony                 |
| <b>Description:</b>          | MHL Cable            |
| <b>Model Name or Number:</b> | Not marked or stated |

|                              |             |
|------------------------------|-------------|
| <b>Brand Name:</b>           | Sony        |
| <b>Description:</b>          | MHL Adaptor |
| <b>Model Name or Number:</b> | IM750       |

|                              |               |
|------------------------------|---------------|
| <b>Brand Name:</b>           | Sony          |
| <b>Description:</b>          | Magnetic Plug |
| <b>Model Name or Number:</b> | EC801         |

|                              |           |
|------------------------------|-----------|
| <b>Brand Name:</b>           | Sony      |
| <b>Description:</b>          | USB cable |
| <b>Model Name or Number:</b> | EC21      |

**Identification of Equipment Under Test (EUT) (continued)**

|                              |       |
|------------------------------|-------|
| <b>Brand Name:</b>           | Sony  |
| <b>Description:</b>          | PHF   |
| <b>Model Name or Number:</b> | MH750 |

**3.2. Description of EUT**

The equipment under test (EUT) is a model of GSM/UMTS/LTE mobile phone with integrated antenna and inbuilt Li-Polymer battery.

The EUT supports GSM 850/900/1800/1900MHz bands, WCDMA FDD bands 1/5 and LTE FDD bands 1/3. It also supports GPRS service with multi-slots class 33 and EGPRS service with multi-slots class 33 too. The HSDPA and HSUPA features are also supported. It has MP3, camera, FM radio, USB memory, GPS receiver, NFC, Mobile High-Definition Link (MHL), Bluetooth (EDR and Bluetooth 4.0), WLAN (802.11 a/b/g/n/ac) and Wi-Fi hotspot functions.

**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>Category of Equipment:</b>    | Transceiver           |        |
| <b>Channel Spacing:</b>          | Single channel device |        |
| <b>Transmit Frequency Range:</b> | 13.56 MHz             |        |
| <b>Receive Frequency Range:</b>  | 13.56 MHz             |        |
| <b>Power Supply Requirement:</b> | Nominal               | 3.8 V  |
|                                  | Minimum               | 3.23 V |
|                                  | Maximum               | 4.37 V |
| <b>Tested Temperature Range:</b> | Minimum               | -20°C  |
|                                  | Maximum               | 50°C   |

### **3.5. Support Equipment**

The following support equipment was used to exercise the EUT during testing:

|                       |                                            |
|-----------------------|--------------------------------------------|
| <b>Brand Name:</b>    | Sony                                       |
| <b>IMEI:</b>          | 004402540814724 ( <i>Radiated sample</i> ) |
| <b>Serial Number:</b> | CB5124UMV0                                 |

|                                 |                  |
|---------------------------------|------------------|
| <b>Description:</b>             | RFID tag         |
| <b>Brand Name:</b>              | Sony             |
| <b>Model Name or Number:</b>    | AI-1400 (salvor) |
| <b>Hardware Version Number:</b> | DP               |

|                              |                      |
|------------------------------|----------------------|
| <b>Brand Name:</b>           | Not marked or stated |
| <b>Description:</b>          | 2 GB Micro SD Card   |
| <b>Model Name or Number:</b> | Not marked or stated |

|                              |                                |
|------------------------------|--------------------------------|
| <b>Brand Name:</b>           | Logik                          |
| <b>Description:</b>          | 22" High Definition Television |
| <b>Model Name or Number:</b> | L22FE12A                       |
| <b>Serial Number</b>         | 1309020661                     |

## **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 RFID test mode.

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

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

- The RFID transmitter test mode was enabled by running a customer specific application on the handset. The application scans until the receiver phone is placed within 30 mm of the handset under test. When the handset is in place, this enables a continuously modulated RFID mode.
- For transmitter radiated emissions above 30 MHz, an RFID tag was used to perform measurements. The application scans until an RFID tag is placed near the RFID antenna of the handset which enables a continuously modulated RFID mode.
- Transmitter radiated spurious emission tests were performed with the following configurations, employing all available accessories:
  - o Configuration 1 – Handset with the AC charger, USB Cable, MHL cable (terminated in to a television), MHL adaptor and PHF
  - o Configuration 2 – Handset with the AC charger, Magnetic plug and PHF

Pre-scans below 1 GHz were performed in both configurations 1 and 2, with final measurements limited to the configuration which provided worst case results.

- Testing at voltage extremes was performed with a dummy battery fitted to the EUT, which was supplied by the customer.
- AC conducted emissions tests were performed with the EUT connected to the AC charger. The AC charger was connected to a 120 VAC 60 Hz single phase supply via a LISN.
- Radiated sample with IMEI 004402540812108 was used for AC conducted emission, fundamental field strength, radiated spurious emissions, band edge emissions and 20dB bandwidth tests.
- Radiated sample with IMEI 004402540811944 was used for Transmitter Frequency Stability test.

## **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 Uncertainties* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

**5.2. Test Results****5.2.1. Transmitter AC Conducted Spurious Emissions****Test Summary:**

|                   |                 |            |              |
|-------------------|-----------------|------------|--------------|
| Test Engineer:    | Andrew Edwards  | Test Date: | 30 July 2013 |
| Test Sample IMEI: | 004402540812108 |            |              |

|                   |                                                               |
|-------------------|---------------------------------------------------------------|
| FCC Reference:    | Part 15.207                                                   |
| Test Method Used: | As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4 |

**Environmental Conditions:**

|                        |    |
|------------------------|----|
| Temperature (°C):      | 25 |
| Relative Humidity (%): | 50 |

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Live / Quasi Peak**

| Frequency (MHz) | Line | Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|------|--------------------|--------------------|-------------|----------|
| 0.488           | Live | 38.6               | 56.2               | 17.6        | Complied |
| 0.974           | Live | 40.4               | 56.0               | 15.6        | Complied |
| 1.239           | Live | 42.5               | 56.0               | 13.5        | Complied |
| 1.311           | Live | 41.4               | 56.0               | 14.6        | Complied |
| 13.560          | Live | 52.2               | 60.0               | 7.8         | Complied |
| 17.466          | Live | 42.5               | 60.0               | 17.5        | Complied |
| 17.804          | Live | 42.7               | 60.0               | 17.3        | Complied |
| 17.808          | Live | 42.4               | 60.0               | 17.6        | Complied |

**Results: Live / Average**

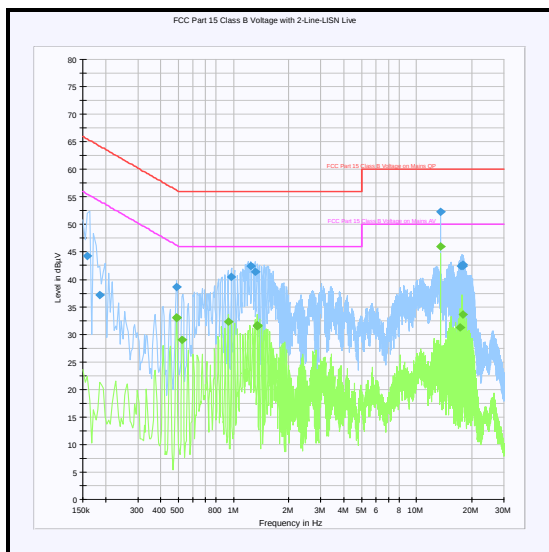
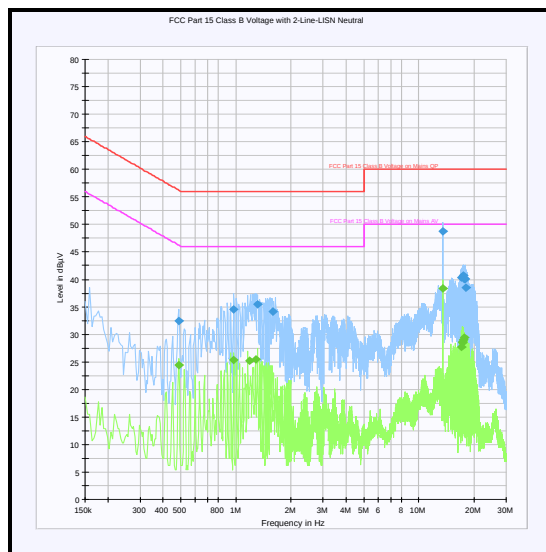
| Frequency (MHz) | Line | Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|------|--------------------|--------------------|-------------|----------|
| 0.488           | Live | 33.0               | 46.2               | 13.2        | Complied |
| 0.488           | Live | 33.0               | 46.2               | 13.2        | Complied |
| 0.524           | Live | 29.1               | 46.0               | 16.9        | Complied |
| 0.938           | Live | 32.3               | 46.0               | 13.7        | Complied |
| 1.356           | Live | 31.6               | 46.0               | 14.4        | Complied |
| 1.356           | Live | 31.6               | 46.0               | 14.4        | Complied |
| 1.356           | Live | 31.6               | 46.0               | 14.4        | Complied |
| 13.560          | Live | 46.0               | 50.0               | 4.0         | Complied |
| 17.345          | Live | 31.2               | 50.0               | 18.8        | Complied |
| 17.799          | Live | 33.6               | 50.0               | 16.4        | Complied |

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Neutral / Quasi Peak**

| Frequency (MHz) | Line    | Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|---------|--------------------|--------------------|-------------|----------|
| 1.320           | Neutral | 35.5               | 56.0               | 20.5        | Complied |
| 13.560          | Neutral | 48.8               | 60.0               | 11.2        | Complied |
| 17.111          | Neutral | 40.3               | 60.0               | 19.7        | Complied |
| 17.462          | Neutral | 40.7               | 60.0               | 19.3        | Complied |
| 17.772          | Neutral | 40.1               | 60.0               | 19.9        | Complied |
| 17.840          | Neutral | 40.1               | 60.0               | 19.9        | Complied |

**Results: Neutral / Average**

| Frequency (MHz) | Line    | Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|---------|--------------------|--------------------|-------------|----------|
| 0.974           | Neutral | 25.4               | 46.0               | 20.6        | Complied |
| 1.185           | Neutral | 25.2               | 46.0               | 20.8        | Complied |
| 1.289           | Neutral | 25.5               | 46.0               | 20.5        | Complied |
| 13.560          | Neutral | 38.4               | 50.0               | 11.6        | Complied |
| 17.421          | Neutral | 29.0               | 50.0               | 21.0        | Complied |
| 17.768          | Neutral | 29.4               | 50.0               | 20.6        | Complied |

**Transmitter AC Conducted Spurious Emissions (continued)****Live****Neutral**

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

**Test Equipment Used:**

| Asset No. | Instrument                       | Manufacturer    | Type No.   | Serial No.  | Date Calibration Due | Cal. Interval (Months) |
|-----------|----------------------------------|-----------------|------------|-------------|----------------------|------------------------|
| A004      | LISN                             | Rohde & Schwarz | ESH3-Z5    | 890604/027  | 30 Oct 2013          | 12                     |
| A1830     | Pulse Limiter                    | Rohde & Schwarz | ESH3-Z2    | 100668      | 19 Feb 2014          | 12                     |
| M1263     | Test Receiver                    | Rohde & Schwarz | ESIB 7     | 100265      | 09 Aug 2013          | 12                     |
| M1625     | Thermometer / Hygrometer station | JM Handelspunkt | 30.5015.13 | None stated | 29 Jan 2014          | 12                     |

**5.2.2. Transmitter Fundamental Field Strength****Test Summary:**

|                          |                 |                   |              |
|--------------------------|-----------------|-------------------|--------------|
| <b>Test Engineer:</b>    | Andrew Edwards  | <b>Test Date:</b> | 26 July 2013 |
| <b>Test Sample IMEI:</b> | 004402540812108 |                   |              |

|                          |                         |
|--------------------------|-------------------------|
| <b>FCC Reference:</b>    | Part 15.225(a)(b)(c)(d) |
| <b>Test Method Used:</b> | ANSI C63.10 Section 6.4 |

**Environmental Conditions:**

|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 22 |
| <b>Relative Humidity (%):</b> | 44 |

**Note(s):**

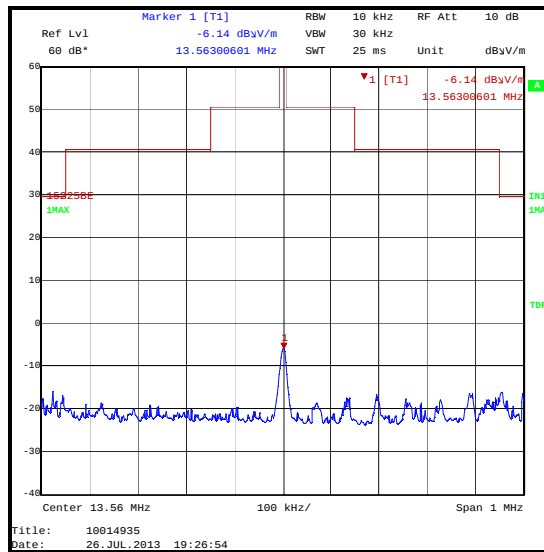
1. The limit is specified at a test distance of 30 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).
2. A transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 30 metres. A distance extrapolation factor of 40 dB was used.
3. Pre-scans were performed with a peak detector. Final measurements were performed with a quasi-peak detector.

Note: An additional 20 dB has been added to attain the final value shown in the table; this is to account for a transducer factor that was not included during the original measurement.

$$i.e.: -6.9 \text{ dB}\mu\text{V/m} + 20 \text{ dB} = 13.1 \text{ dB}\mu\text{V/m}$$

**Results: Quasi Peak**

| Frequency (MHz) | Antenna Polarity | Level (dB $\mu$ V/m) | Limit at 30 m (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|----------------------|------------------------------|-------------|----------|
| 13.56           | 45° to EUT       | 13.1                 | 84.0                         | 70.9        | Complied |

**Transmitter Fundamental Field Strength (continued)****Test Equipment Used:**

| Asset No. | Instrument                       | Manufacturer    | Type No.   | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|-----------|----------------------------------|-----------------|------------|------------|----------------------|------------------------|
| K0001     | 5m RSE Chamber                   | Rainford EMC    | N/A        | N/A        | 24 Oct 2013          | 12                     |
| M1273     | Test Receiver                    | Rohde & Schwarz | ESIB 26    | 100275     | 07 Feb 2014          | 12                     |
| M1568     | Magnetic Loop Antenna            | Rohde & Schwarz | HFH2-Z2    | 879284/2   | 12 Feb 2014          | 12                     |
| M1622     | Thermometer / Hygrometer station | JM Handelspunkt | 30.5015.13 | Not stated | 24 May 2014          | 12                     |

**5.2.3. Transmitter Radiated Spurious Emissions****Test Summary:**

|                          |                 |                    |                                |
|--------------------------|-----------------|--------------------|--------------------------------|
| <b>Test Engineers:</b>   | Andrew Edwards  | <b>Test Dates:</b> | 26 July 2013 &<br>30 July 2013 |
| <b>Test Sample IMEI:</b> | 004402540812108 |                    |                                |

|                          |                                                                             |
|--------------------------|-----------------------------------------------------------------------------|
| <b>FCC Reference:</b>    | Parts 15.225(d) & 15.209(a)                                                 |
| <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:**

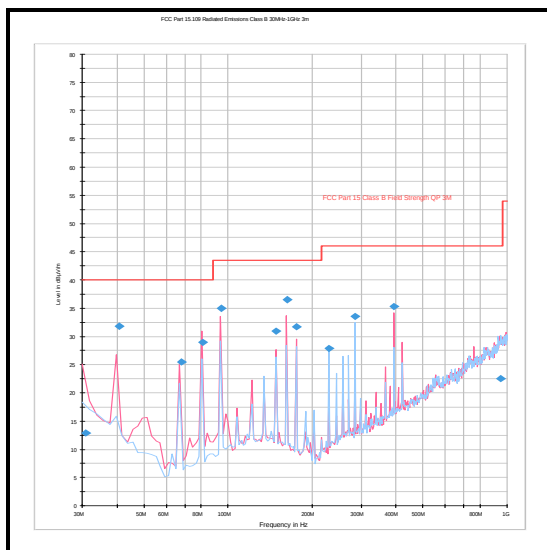
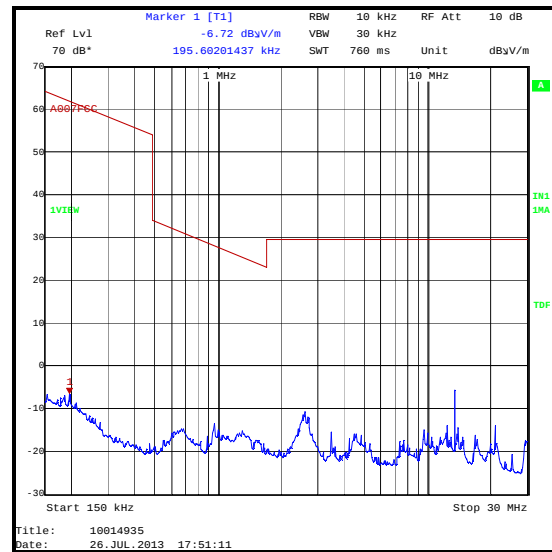
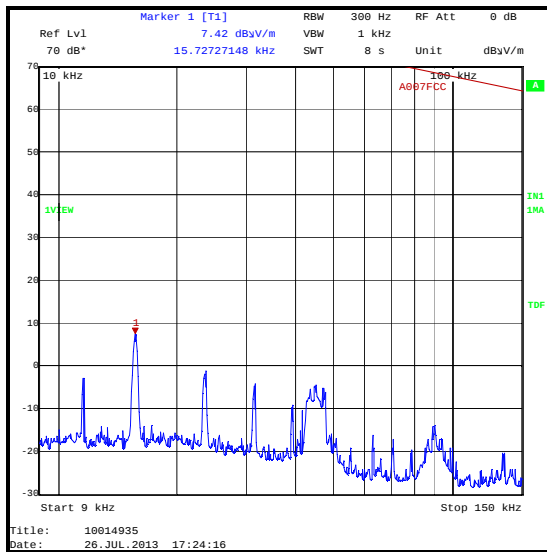
|                               |          |
|-------------------------------|----------|
| <b>Temperature (°C):</b>      | 21 to 24 |
| <b>Relative Humidity (%):</b> | 45 to 48 |

**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 metres where required. A distance extrapolation factor of 40 dB was used.
3. Final measurement values include corrections for antenna factor and cable losses.
4. The emission shown at approximately 13.56 MHz 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 (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)****Results: Quasi Peak**

| Frequency (MHz) | Antenna Polarity | Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|----------------------|----------------------|-------------|----------|
| 40.686          | Vertical         | 31.8                 | 40.0                 | 8.2         | Complied |
| 67.804          | Vertical         | 25.4                 | 40.0                 | 14.6        | Complied |
| 81.354          | Vertical         | 28.9                 | 40.0                 | 11.1        | Complied |
| 94.913          | Vertical         | 34.9                 | 43.5                 | 8.6         | Complied |
| 149.159         | Vertical         | 30.9                 | 43.5                 | 12.6        | Complied |
| 162.718         | Vertical         | 36.5                 | 43.5                 | 7.0         | Complied |
| 176.277         | Horizontal       | 31.7                 | 43.5                 | 11.8        | Complied |
| 230.514         | Horizontal       | 27.9                 | 46.0                 | 18.1        | Complied |
| 284.760         | Horizontal       | 33.6                 | 46.0                 | 12.4        | Complied |
| 393.233         | Vertical         | 35.3                 | 46.0                 | 10.7        | Complied |

**Transmitter Radiated Spurious Emissions (continued)**

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

**Transmitter Radiated Spurious Emissions (continued)****Test Equipment Used:**

| <b>Asset No.</b> | <b>Instrument</b>                | <b>Manufacturer</b> | <b>Type No.</b> | <b>Serial No.</b> | <b>Date Calibration Due</b> | <b>Cal. Interval (Months)</b> |
|------------------|----------------------------------|---------------------|-----------------|-------------------|-----------------------------|-------------------------------|
| A490             | Antenna                          | Chase               | CBL6111A        | 1590              | 18 Apr 2014                 | 12                            |
| A1834            | Attenuator                       | Hewlett Packard     | 8491B           | 10444             | 27 Jan 2014                 | 12                            |
| G0543            | Pre-Amplifier                    | Sonoma              | 310N            | 230801            | 04 Jul 2013                 | 3                             |
| K0001            | 5m RSE Chamber                   | Rainford EMC        | N/A             | N/A               | 24 Oct 2013                 | 12                            |
| M1273            | Test Receiver                    | Rohde & Schwarz     | ESIB 26         | 100275            | 07 Feb 2014                 | 12                            |
| M1568            | Magnetic Loop Antenna            | Rohde & Schwarz     | HFH2-Z2         | 879284/2          | 12 Feb 2014                 | 12                            |
| M1622            | Thermometer / Hygrometer station | JM Handelspunkt     | 30.5015.13      | Not stated        | 24 May 2014                 | 12                            |

**5.2.4. Transmitter Band Edge Radiated Emissions****Test Summary:**

|                   |                 |            |              |
|-------------------|-----------------|------------|--------------|
| Test Engineer:    | Andrew Edwards  | Test Date: | 26 July 2013 |
| Test Sample IMEI: | 004402540812108 |            |              |

|                   |                                          |
|-------------------|------------------------------------------|
| FCC Reference:    | Parts 15.225(c)(d) & 15.209(a)           |
| Test Method Used: | As detailed in ANSI C63.10 Section 6.9.2 |

**Environmental Conditions:**

|                        |    |
|------------------------|----|
| Temperature (°C):      | 21 |
| Relative Humidity (%): | 44 |

**Note(s):**

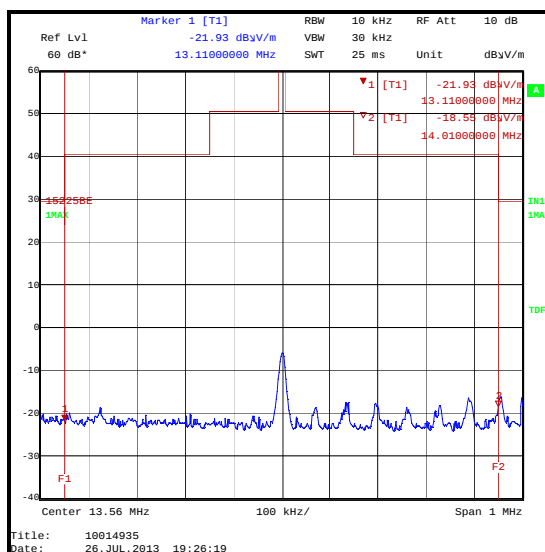
1. A transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 30 metres where required. A distance extrapolation factor of 40 dB was used.
2. The band edge emission plot shown below is low by a factor of 20 dB, due to the absence of a transducer factor at the time of measurement. An additional 20 dB was subsequently added to any band edge measurements, for comparisons with the limit, when determining compliance.

**Results: Quasi Peak Lower Band Edge**

| Frequency (MHz) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Result   |
|-----------------|----------------|----------------|-------------|----------|
| 13.11           | -8.8           | 29.5           | 38.3        | Complied |

**Results: Quasi Peak Upper Band Edge**

| Frequency (MHz) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Result   |
|-----------------|----------------|----------------|-------------|----------|
| 14.01           | -6.2           | 29.5           | 35.7        | Complied |



**Transmitter Band Edge Radiated Emissions (continued)****Test Equipment Used:**

| Asset No. | Instrument                       | Manufacturer    | Type No.   | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|-----------|----------------------------------|-----------------|------------|------------|----------------------|------------------------|
| K0001     | 5m RSE Chamber                   | Rainford EMC    | N/A        | N/A        | 24 Oct 2013          | 12                     |
| M1273     | Test Receiver                    | Rohde & Schwarz | ESIB 26    | 100275     | 07 Feb 2014          | 12                     |
| M1568     | Magnetic Loop Antenna            | Rohde & Schwarz | HFH2-Z2    | 879284/2   | 12 Feb 2014          | 12                     |
| M1622     | Thermometer / Hygrometer station | JM Handelspunkt | 30.5015.13 | Not stated | 24 May 2014          | 12                     |

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

|                   |                 |            |              |
|-------------------|-----------------|------------|--------------|
| Test Engineer:    | Andrew Edwards  | Test Date: | 26 July 2013 |
| Test Sample IMEI: | 004402540812108 |            |              |

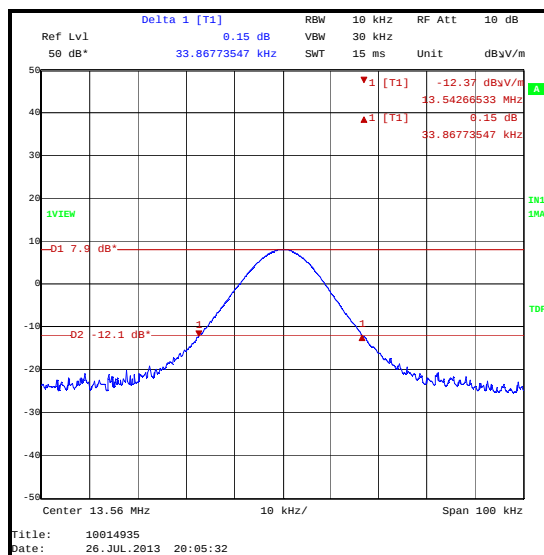
|                   |                                          |
|-------------------|------------------------------------------|
| FCC Reference:    | Part 2.1049                              |
| Test Method Used: | As detailed in ANSI C63.10 Section 6.9.1 |

**Environmental Conditions:**

|                        |    |
|------------------------|----|
| Temperature (°C):      | 20 |
| Relative Humidity (%): | 46 |

**Results:**

|                                  |
|----------------------------------|
| <b>20 dB Bandwidth<br/>(kHz)</b> |
| 33.868                           |

**Test Equipment Used:**

| Asset No. | Instrument                       | Manufacturer    | Type No.   | Serial No. | Date Calibration Due | Cal. Interval (Months) |
|-----------|----------------------------------|-----------------|------------|------------|----------------------|------------------------|
| K0001     | 5m RSE Chamber                   | Rainford EMC    | N/A        | N/A        | 24 Oct 2013          | 12                     |
| M1273     | Test Receiver                    | Rohde & Schwarz | ESIB 26    | 100275     | 07 Feb 2014          | 12                     |
| M1568     | Magnetic Loop Antenna            | Rohde & Schwarz | HFH2-Z2    | 879284/2   | 12 Feb 2014          | 12                     |
| M1622     | Thermometer / Hygrometer station | JM Handelspunkt | 30.5015.13 | Not stated | 24 May 2014          | 12                     |

**5.2.6. Transmitter Frequency Stability (Temperature & Voltage Variation)****Test Summary:**

|                   |                 |            |              |
|-------------------|-----------------|------------|--------------|
| Test Engineer:    | Nick Steele     | Test Date: | 27 July 2013 |
| Test Sample IMEI: | 004402540811944 |            |              |

|                   |                                                    |
|-------------------|----------------------------------------------------|
| FCC Reference:    | Part 15.225(e)                                     |
| Test Method Used: | As detailed in ANSI C63.10 Section 6.8.1 and 6.8.2 |

**Environmental Conditions:**

|                        |    |
|------------------------|----|
| Temperature (°C):      | 23 |
| Relative Humidity (%): | 45 |

**Results: Maximum frequency error of the EUT with variations in ambient temperature**

| Temperature (°C) | Time after Start-up |               |               |               |
|------------------|---------------------|---------------|---------------|---------------|
|                  | 0 minutes           | 2 minutes     | 5 minutes     | 10 minutes    |
| -20              | 13.560085 MHz       | 13.560095 MHz | 13.560092 MHz | 13.560092 MHz |
| 20               | 13.560065 MHz       | 13.560064 MHz | 13.560064 MHz | 13.560065 MHz |
| 50               | 13.560008 MHz       | 13.560007 MHz | 13.560008 MHz | 13.560007 MHz |

| Frequency with Worst Case Deviation (MHz) | Frequency Error (Hz) | Frequency Error (%) | Limit (%) | Margin (%) | Result   |
|-------------------------------------------|----------------------|---------------------|-----------|------------|----------|
| 13.560095 MHz                             | 95                   | 0.000701            | 0.01      | 0.009299   | Complied |

**Results: Maximum frequency error of the EUT with variations in nominal operating voltage at an ambient temperature of 20°C**

| Supply Voltage (V) | Nominal Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (Hz) | Frequency Error (%) | Limit (%) | Margin (%) | Result   |
|--------------------|-------------------------|--------------------------|----------------------|---------------------|-----------|------------|----------|
| 3.23               | 13.56                   | 13.560050                | 50                   | 0.000369            | 0.01      | 0.009631   | Complied |
| 3.7                | 13.56                   | 13.560065                | 65                   | 0.000479            | 0.01      | 0.009521   | Complied |
| 4.37               | 13.56                   | 13.560054                | 54                   | 0.000398            | 0.01      | 0.009602   | Complied |

**Transmitter Frequency Stability (Temperature & Voltage Variation) (continued)****Test Equipment Used:**

| Asset No. | Instrument                       | Manufacturer    | Type No.       | Serial No.  | Date Calibration Due  | Cal. Interval (Months) |
|-----------|----------------------------------|-----------------|----------------|-------------|-----------------------|------------------------|
| E0513     | Environmental Chamber            | TAS             | LT600 Series 3 | 23900506    | Calibrated before use | -                      |
| M1269     | Multimeter                       | Fluke           | 179            | 90250210    | 30 Jul 2013           | 12                     |
| M1643     | Thermometer                      | Fluke           | 52II           | 18890136    | 19 Mar 2014           | 12                     |
| M1659     | Thermometer / Hygrometer station | JM Handelspunkt | 30.5015.13     | None stated | 24 May 2014           | 12                     |
| S0557     | DC Power Supply                  | TTI             | EL303R         | 395819      | Calibrated before use | -                      |
| E0513     | Environmental Chamber            | TAS             | LT600 Series 3 | 23900506    | Calibrated before use | -                      |

## **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 |
|----------------------------------------|--------------------|----------------------|------------------------|
| AC Conducted Spurious Emissions        | 0.15 MHz to 30 MHz | 95%                  | ±4.69 dB               |
| 20 dB Bandwidth                        | 13 MHz to 14 MHz   | 95%                  | ±0.92 ppm              |
| Frequency Stability                    | 13 MHz to 14 MHz   | 95%                  | ±0.92 ppm              |
| Radiated Spurious Emissions            | 9 kHz to 30 MHz    | 95%                  | ±3.73 dB               |
| Radiated Spurious Emissions            | 30 MHz to 1000 MHz | 95%                  | ±5.65 dB               |
| Transmitter Fundamental Field Strength | 13 MHz to 14 MHz   | 95%                  | ±3.73 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.

**7. Report Revision History**

| Version Number | Revision Details |        |                                                          |
|----------------|------------------|--------|----------------------------------------------------------|
|                | Page No(s)       | Clause | Details                                                  |
| 1.0            | -                | -      | Initial Version                                          |
| 2.0            | 15 & 21          | -      | Corrected previously reported emissions levels by +20 dB |

--- END OF REPORT ---