

# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: HSC-TP-RF-TAES

To: FCC Part 15.231: 2011

**Test Report Serial No.:**  
RFI-RPT-RP87057JD02A

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

pp



<b>Checked By:</b>	Steven White
<b>Signature:</b>	
<b>Date of Issue:</b>	29 June 2012

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## **1. Customer Information**

<b>Company Name:</b>	LOGICDATA
<b>Address:</b>	Electronic & Software Entwicklungs GmbH Wirtschaftspark 18 A-8530 Deutschlandsberg Austria

## 2. Summary of Testing

### 2.1. General Information

<b>Specification Reference:</b>	47CFR15.231
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart C (Radio Frequency Devices) - Section 15.231
<b>Specification Reference:</b>	47CFR15.109
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart B (Unintentional Radiators) - Sections 15.109
<b>Specification Reference:</b>	47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart C (Intentional Radiators) - Sections 15.209
<b>Site Registration:</b>	FCC: 209735
<b>Location of Testing:</b>	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
<b>Test Dates:</b>	19 June 2012 to 20 June 2012

### 2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.109	Receiver/Idle Mode Radiated Spurious Emissions	✓
Part 15.231(e)	Transmitter Fundamental Field Strength	✓
Part 15.231(c)	Transmitter 20 dB Bandwidth	✓
Part 15.231(a)	Transmitter Timeout	✓
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Part 15.231(e) & 15.209	Transmitter Radiated Emissions	✓

**Key to Results**

✓ = Complied    ✘ = Did not comply

*Note 1: The measurement was performed to assist in the calculation of the level of average and emissions as the EUT employs pulsed operation.*

### 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>	Tempur-Pedic
<b>Model Name or Number:</b>	HSC-TP-RF-TAES
<b>Serial Number:</b>	369476789012345
<b>Hardware Version Number:</b>	Rev:1
<b>Software Version Number:</b>	Rev:1
<b>FCC ID:</b>	UNQTPAES

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

The equipment under test was a Wireless remote control.

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

No modifications were applied to the EUT during testing.

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

<b>Power Supply Requirement:</b>	Nominal	3.0 V Alkaline battery	
<b>Type of Unit:</b>	Transceiver		
<b>Transmit Frequency Range:</b>	433.050 MHz to 434.790 MHz		
<b>Transmit Channel Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	2010	433.36356
	Middle	6010	433.98756
	Top	8010	434.30048
<b>Receive Frequency Range:</b>	433.050 MHz to 434.790 MHz		
<b>Receive Channel Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	2010	433.36356
	Middle	6010	433.98756
	Top	8010	434.30048

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

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

<b>Description:</b>	Battery
<b>Brand Name:</b>	Duracell
<b>Model Name or Number:</b>	AA

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

### **4.1. Operating Modes**

The EUT was tested in the following operating test modes, unless otherwise stated:

- Continuous transmit or transmitting 6 mS (approx) transmission bursts every 20 s repetitively on bottom, middle and top channels (as required) at maximum output power.
- Receive/Idle Mode.

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

The EUT was tested in the following configuration:

- To configure the EUT to transmit (pulsed operation), the flat and stop buttons had to be held down for approximately 60 seconds in accordance with the instructions provided by the Customer.
- To select different channels, the flat and stop buttons had to be held down as above, when the screen was flashing the required channel could be set. To confirm the channel selected, the stop button was pressed.
- For continuous transmission, one of the buttons on the remote control had to be held down continually.

## **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. Receiver/Idle Mode Radiated Spurious Emissions**

#### **Test Summary:**

Test Engineer:	Nick Steele	Test Date:	19 June 2012
Test Sample Serial No.:	369476789012345		

FCC Reference:	Part 15.109
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range:	30 MHz to 1000 MHz

#### **Environmental Conditions:**

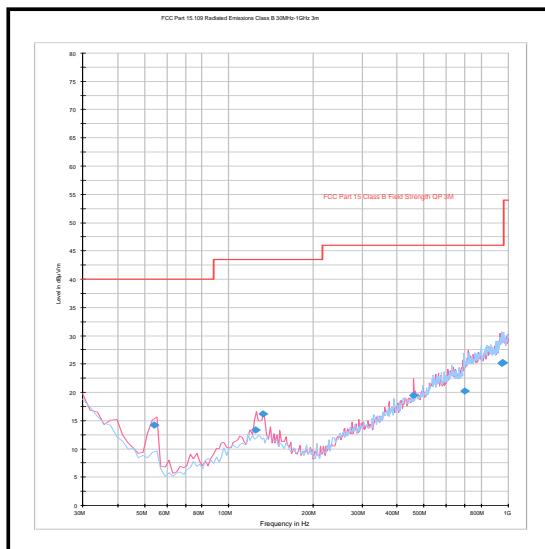
Temperature (°C):	25
Relative Humidity (%):	40

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

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
54.131	Vertical	14.2	40.0	25.8	Complied
132.877	Vertical	16.2	43.5	27.3	Complied
458.767	Vertical	19.4	46.0	26.6	Complied
696.661	Horizontal	20.2	46.0	25.8	Complied
950.580	Horizontal	25.1	46.0	20.9	Complied
951.937	Horizontal	25.3	46.0	20.7	Complied

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

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. Measurements below 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.

**Receiver/Idle Mode Radiated Spurious Emissions (continued)**

*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

**Receiver/Idle Mode Radiated Spurious Emissions (continued)****Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	19 June 2012
<b>Test Sample Serial No.:</b>	369476789012345		

<b>FCC Reference:</b>	Part 15.109
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
<b>Frequency Range:</b>	1 GHz to 2.2 GHz

**Environmental Conditions:**

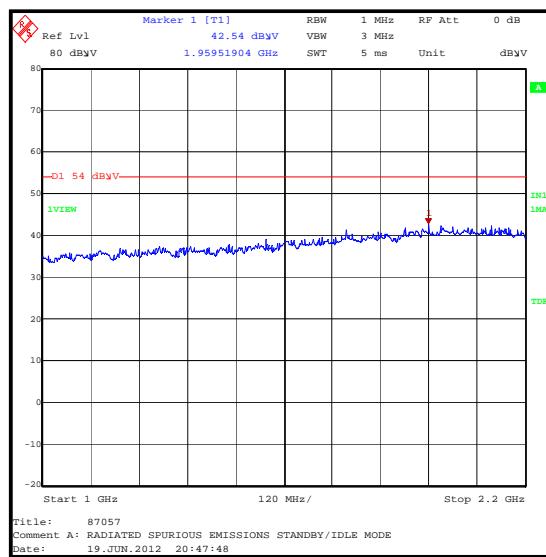
<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	38

**Results:**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
1959.519	Vertical	42.5	54.0	11.5	Complied

**Note(s):**

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
3. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 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.

**Receiver/Idle Mode Radiated Spurious Emissions (continued)**

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

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	19 June 2012
<b>Test Sample Serial No.:</b>	369476789012345		

<b>FCC Reference:</b>	Part 15.231(e)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.10.1 and Sections 6.3 and 6.6 referencing ANSI C63.4 (see note below)

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	40

**Results: Average Level**

Channel	Frequency (MHz)	Average Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
Bottom	433.329	58.0	80.8	22.8	Complied
Middle	434.085	57.8	80.8	23.0	Complied
Top	434.266	57.6	80.8	23.2	Complied

**Results: Peak Level**

Channel	Frequency (MHz)	Peak Level (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Margin (dB)	Result
Bottom	433.329	77.3	100.8	23.5	Complied
Middle	434.085	77.1	100.8	23.7	Complied
Top	434.266	76.9	100.8	23.9	Complied

**Note(s):**

1. The average level was determined as per the method detailed in ANSI C63.10 Section 7.6 by subtracting the duty cycle correction factor (based on the measured transmission interval of 10.859 ms) from the measured peak level. The duty cycle correction factor of -19.3 dB was calculated using formula  $20 \log_{10}(\text{On Time}/100\text{ms})$  as stated in FCC Part 15.35(c).
2. Measurements were made with the test antenna in the horizontal and vertical planes and the EUT in the X, Y and Z planes. The highest level was recorded in the above table.
3. This test was maximised first and then measured in zero span.

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

Test Engineer:	Mark Percival	Test Date:	20 June 2012
Test Sample Serial No.:	369476789012345		

FCC Reference:	Part 15.231(c)
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.1

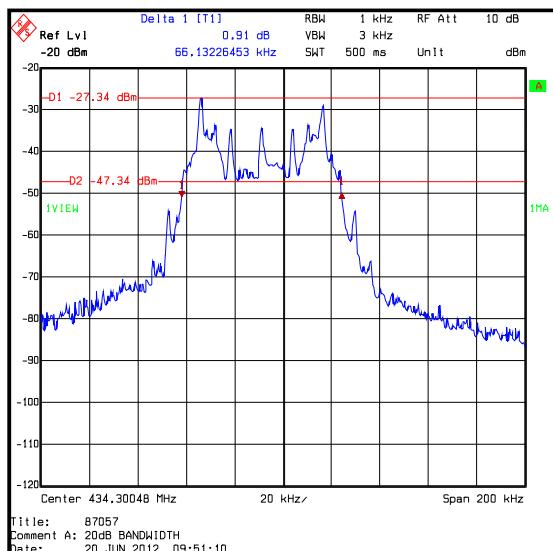
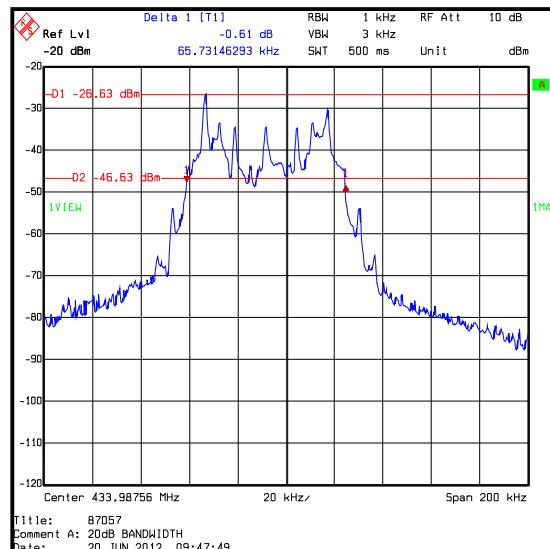
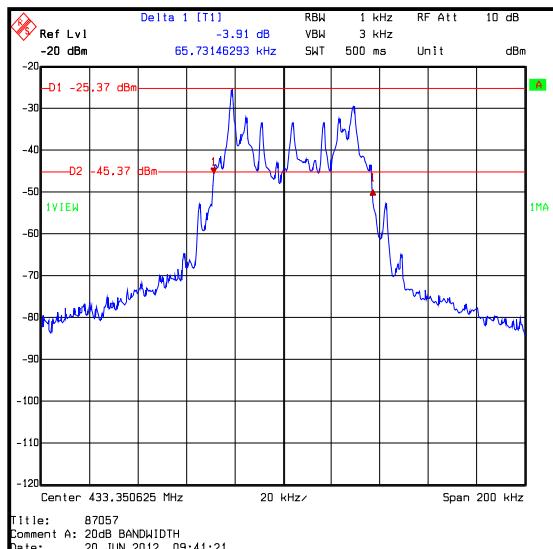
**Environmental Conditions:**

Temperature (°C):	25
Relative Humidity (%):	40

**Results:**

Transmitter 20 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
0.065731	1.08332	1.017589	Complied
0.065731	1.08521	1.019479	Complied
0.066132	1.08566	1.019528	Complied

## Transmitter 20 dB Bandwidth (continued)



### **5.2.4. Transmitter Timeout**

#### **Test Summary:**

<b>Test Engineer:</b>	Mark Percival	<b>Test Date:</b>	20 June 2012
<b>Test Sample Serial No.:</b>	369476789012345		

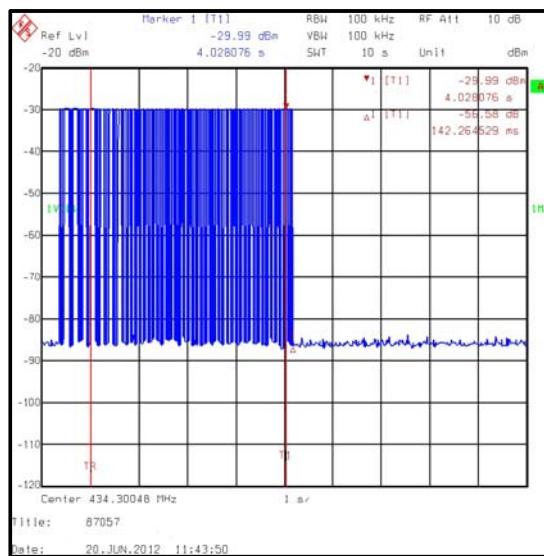
<b>FCC Reference:</b>	Part 15.231(a)
<b>Test Method Used:</b>	The EUT transmitter was activated and monitored using a spectrum analyser for a period not exceeding 6 seconds.

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	40

#### **Results:**

<b>Deactivation Time (seconds)</b>	<b>Limit (seconds)</b>
<0.142	5



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

1. The transmitter was manually released at the T1 line on the plot and the transmitter stopped within 142.264mS.

**5.2.5. Transmitter Duty Cycle****Test Summary:**

<b>Test Engineer:</b>	Mark Percival	<b>Test Date:</b>	20 June 2012
<b>Test Sample Serial No.:</b>	369476789012345		

<b>FCC Reference:</b>	Part 15.35(c)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 7.5

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	40

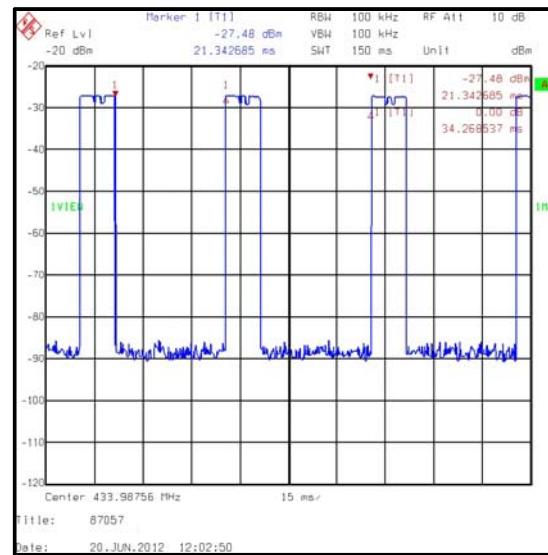
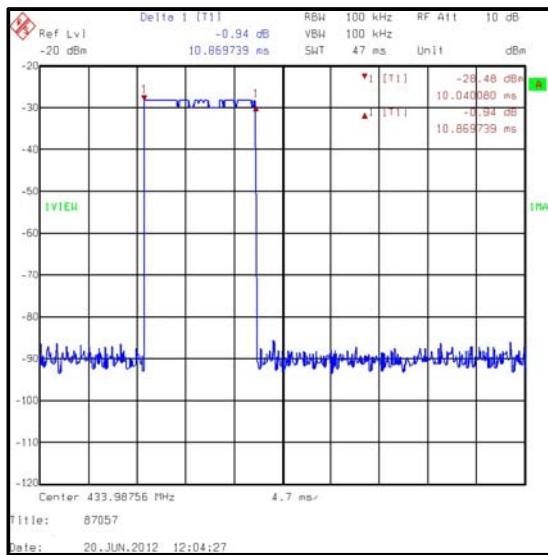
**Results:**

<b>Pulse Duration (mS)</b>	<b>Duty Cycle (dB)</b>
10.859	-19.28

<b>Silent Period (seconds)</b>
0.021343

**Note(s):**

1. In order to assist with the determination of the average level of fundamental and spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by  $20 \log(\text{On Time} / [\text{Period or } 100\text{mS} \text{ whichever is the lesser}])$ .

**Transmitter Duty Cycle (continued)**

**5.2.5.1. Transmitter Radiated Emissions****Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	19 June 2012
<b>Test Sample Serial No.:</b>	369476789012345		

<b>FCC Reference:</b>	Part 15.231(e) & 15.209
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
<b>Frequency Range</b>	30 MHz to 1 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	40

**Results: Peak**

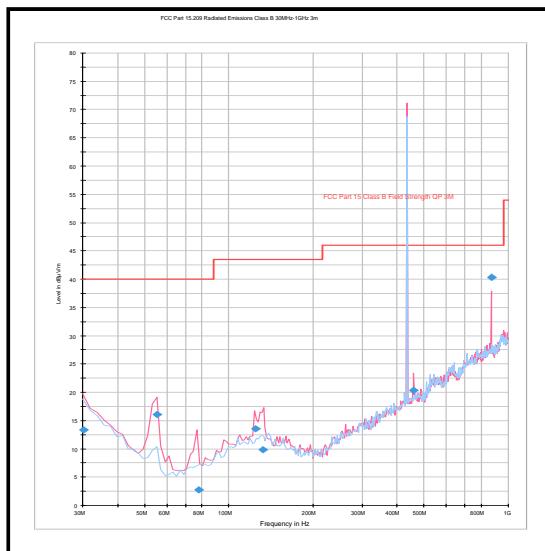
Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
868.562	Vertical	40.3	46.0	5.7	Complied

**Results: Average**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
868.562	Vertical	21.0	60.6	39.6	Complied

**Note(s):**

1. The final measured value, for the given emission, in the table above incorporated the calibrated antenna factor and cable loss.
2. Measurements below 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.
3. The fundamental is shown on the plot at approximately 433 MHz.
4. FCC Part 15.209 general limits are shown on the pre-scan plot.
5. The average level was obtained by subtracting the duty cycle correction (-19.3 dB) from the peak level measured with the EUT constantly transmitting.
6. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.

**Transmitter Radiated Emission (continued)**

*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

**5.2.5.2. Transmitter Radiated Emissions****Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	19 June 2012
<b>Test Sample Serial No.:</b>	369476789012345		

<b>FCC Reference:</b>	Part 15.231(e) & 15.209
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
<b>Frequency Range</b>	1 GHz to 4.4 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	38

**Results: Peak / Bottom channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1733.296	Horizontal	40.9	80.6*	39.7	Complied
2599.966	Horizontal	55.7	80.6*	24.9	Complied
3467.012	Horizontal	47.8	80.6*	32.8	Complied
3900.165	Vertical	49.4	74.0	24.6	Complied

**Results: Average / Bottom channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1733.296	Horizontal	21.6	60.6*	39.0	Complied
2599.966	Horizontal	36.4	60.6*	24.2	Complied
3467.012	Horizontal	28.5	60.6*	32.1	Complied
3900.165	Vertical	30.1	54.0	23.9	Complied

**Results: Peak / Middle channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1735.972	Horizontal	41.2	80.6*	39.2	Complied
2603.370	Horizontal	55.2	80.6*	25.4	Complied
3471.603	Horizontal	48.1	80.6*	32.5	Complied
3905.775	Vertical	50.8	74.0	23.2	Complied

**Transmitter Radiated Emissions (continued)****Results: Average / Middle channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1735.972	Horizontal	21.9	60.6*	38.7	Complied
2603.370	Horizontal	35.9	60.6*	24.7	Complied
3471.603	Horizontal	28.8	60.6*	31.8	Complied
3905.775	Vertical	31.5	54.0	22.5	Complied

**Results: Peak / Top channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1737.091	Horizontal	41.5	80.6*	39.1	Complied
2605.900	Horizontal	55.3	80.6*	25.3	Complied
3474.102	Horizontal	48.9	80.6*	31.7	Complied
3908.422	Vertical	50.2	74.0	23.8	Complied

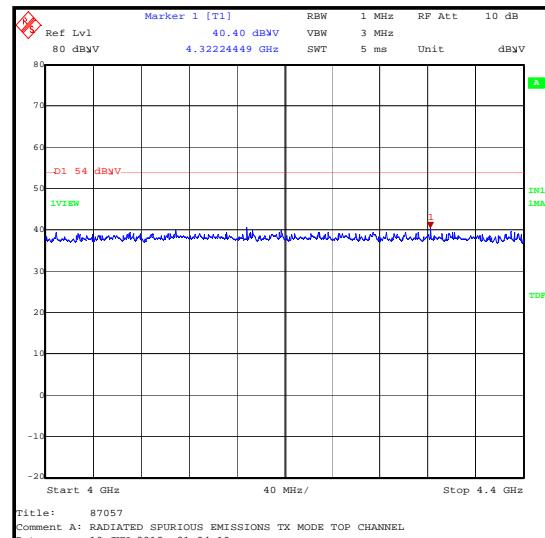
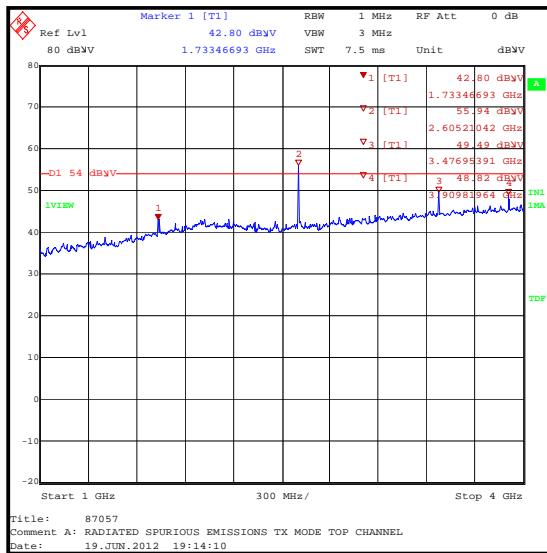
**Results: Average / Top channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1737.091	Horizontal	22.2	60.6*	38.4	Complied
2605.900	Horizontal	36.0	60.6*	24.6	Complied
3474.102	Horizontal	29.6	60.6*	31.0	Complied
3908.422	Vertical	30.9	54.0	23.1	Complied

**Note(s):**

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. In accordance with Part 15.35(c), the average level was calculated by subtracting the duty cycle correction (-19.3 dB) from the peak level measured with the EUT constantly transmitting.
3. FCC Part 15.209 general limits are shown on the pre-scan plots.
4. Part 15.209 general limits were applied to any emissions that were found to be in the restricted bands as defined in part 15.209. Part 15.231 (b) limits for a device operating in 433 MHz were applied to all other emissions.
5. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 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.
6. \*15.231(b).

## Transmitter Radiated Emissions (continued)



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

## **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%	±3.72 dB
Fundamental Field Strength	433.05 MHz to 434.79 MHz	95%	±2.94 dB
20 dB Bandwidth	433.05 MHz to 434.79 MHz	95%	±0.92 ppm
Transmitter Timeout / Duty Cycle	433.05 MHz to 434.79 MHz	95%	± 0.29 ms
Radiated Spurious Emissions	30 MHz to 9.5 GHz	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)
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	09 Oct 2012	12
A1818	Antenna	EMCO	3115	00075692	09 Oct 2012	12
A1834	Attenuator	Hewlett Packard	8491B	10444	29 Jan 2013	12
A1974	High Pass Filter	AtlanTecRF	AFH-01000	090000283	15 Mar 2013	12
A253	Antenna	Flann Microwave	12240-20	128	09 Oct 2012	12
A288	Antenna	Chase	CBL6111A	1589	19 Aug 2012	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
G0543	Amplifier	Sonoma	310N	230801	13 Jul 2012	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	31 Aug 2012	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	09 Oct 2012	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESI26	100046K	29 Jun 2012	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	08 Nov 2012	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12

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