



# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: IPWireless AFD 2.5 GHz Outdoor Unit

To: FCC Part 27: 2008 Subpart C

**Test Report Serial No:**  
RFI/RPT2/RP75600JD01A

**Supersedes Test Report Serial No:**  
RFI/RPT1/RP75600JD01A

|   |  |   |
|---|--|---|
| <b>This Test Report Is Issued Under The Authority Of Brian Watson, Operations Director:</b> |  | pp  |
| <b>Checked By:</b>  | Robert Graham  |   |
| <b>Signature:</b>   |  |   |
| <b>Date of Issue:</b>   | 24 September 2009  |   |

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**1. Customer Information**











|                      |   |
|----------------------|---|
| <b>Company Name:</b> | IPWireless (UK) Ltd   |
| <b>Address:</b>      | Unit 7<br>Greenways Business Park<br>Bellinger Close<br>Chippenham<br>Wiltshire<br>SN15 1BN |

## **2. Summary of Testing**

### **2.1. General Information**

|                                 |   |
|---------------------------------|---|
| <b>Specification Reference:</b> | 47CFR27   |
| <b>Specification Title:</b>     | Code of Federal Regulations Volume 47 (Telecommunications) 2008:<br>Part 27 Subpart C (Miscellaneous Wireless Communication Services) |
| <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>              | 12 August 2009 to 09 September 2009   |

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

| <b>FCC Reference<br/>(47CFR)</b>   | <b>Measurement</b>   | <b>Port Type</b>     | <b>Result</b>   |
|--|--|----------------------|---|
| Part 15.107  | Idle Mode AC Conducted Spurious Emissions                  | AC Mains             |    |
| Part 15.109  | Idle Mode Radiated Spurious Emissions                      | Enclosure            |    |
| Part 15.207  | Transmitter AC Conducted Spurious Emissions                | AC Mains             |    |
| Part 27.50   | Transmitter Equivalent Isotropic Radiated Power (EIRP)     | Antenna<br>Terminals |   |
| Part 2.1049  | Transmitter Occupied Bandwidth                             | Enclosure            |  |
| Part 2.1051, Part 27.53  | Transmitter Radiated Spurious Emissions –<br>Channel Edges | Enclosure            |  |
| Part 2.1051, Part 27.53  | Transmitter Radiated Spurious Emissions                    | Enclosure            |  |
| Part 2.1051, Part 27.53  | Transmitter Radiated Spurious Emissions<br>at Band Edge    | Enclosure            |  |
| <b>Key to Results</b><br> = Complied  = Did not comply |  |                      |   |

**2.3. Methods and Procedures**

|                   |  |
|-------------------|--|
| <b>Reference:</b> | ANSI/TIA-603-C-2004  |
| <b>Title:</b>     | Land Mobile Communications Equipment, Measurements and performance Standards   |
| <b>Reference:</b> | ANSI C63.4 (2003)  |
| <b>Title:</b>     | American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |

**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>Description:</b>             | 2.5 GHz Outdoor Unit |
| <b>Brand Name:</b>              | IPWireless           |
| <b>Model Name or Number:</b>    | AFD                  |
| <b>Serial Number:</b>           | None Stated          |
| <b>Hardware Version Number:</b> | Version 1            |
| <b>FCC ID Number:</b>           | PKTODUAFD            |

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

The equipment under test was a 2.5 GHz Outdoor Unit.

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

No modifications were applied to the EUT during testing.

**3.4. Additional Information Related to Testing**

|  |                      |                       |                                |
|--|----------------------|-----------------------|--------------------------------|
| <b>Category of Equipment:</b>          | Fixed                |                       |                                |
| <b>Type of Equipment</b>               | Outdoor Unit         |                       |                                |
| <b>Intended Operating Environment:</b> | None Stated          |                       |                                |
| <b>Highest Generated Frequency:</b>    | 5.4 GHz              |                       |                                |
| <b>Modulation Type:</b>                | QPSK                 |                       |                                |
| <b>Duty Cycle</b>                      | 80%                  |                       |                                |
| <b>Chip Rate:</b>                      | 7.68 Mcps            |                       |                                |
| <b>Declared Channel Bandwidth:</b>     | 11 MHz               |                       |                                |
| <b>Antenna Type:</b>                   | Integral             |                       |                                |
| <b>Power Supply Requirement:</b>       | 120 V AC 60 Hz       |                       |                                |
| <b>Transmit Frequency Range:</b>       | 2496 MHz to 2690 MHz |                       |                                |
| <b>Transmit Channels Tested:</b>       | <b>Channel ID</b>    | <b>Channel Number</b> | <b>Channel Frequency (MHz)</b> |
|  | Bottom               | 12507                 | 2501.4                         |
|  | Middle               | 12965                 | 2593.0                         |
|  | Top                  | 13420                 | 2684.6                         |
| <b>Receive Frequency Range:</b>        | 2496 MHz to 2690 MHz |                       |                                |
| <b>Receive Channels Tested:</b>        | <b>Channel ID</b>    | <b>Channel Number</b> | <b>Channel Frequency (MHz)</b> |
|  | Bottom               | 12507                 | 2501.4                         |
|  | Middle               | 12965                 | 2593.0                         |
|  | Top                  | 13420                 | 2684.6                         |



### **3.5. Support Equipment**

The following support equipment was supplied by the applicant and used to exercise the EUT during testing:

|                                |                 |
|--------------------------------|-----------------|
| <b>Description:</b>            | AC Power Supply |
| <b>Brand Name:</b>             | Phihong         |
| <b>Model Name or Number:</b>   | PSA15R-240P     |
| <b>Serial Number:</b>          | P90400230A1     |
| <b>Country of Manufacture:</b> | China           |
| <b>Date of Receipt:</b>        | 12 August 2009  |

|                               |                        |
|-------------------------------|------------------------|
| <b>Description:</b>           | Ethernet cable         |
| <b>Cable Length and Type:</b> | 3.0 metre / multi core |
| <b>Connected to Port:</b>     | Ethernet               |

|                               |                          |
|-------------------------------|--------------------------|
| <b>Description:</b>           | Ethernet / Power adaptor |
| <b>Cable Length and Type:</b> | 0.2 metre / multi core   |
| <b>Connected to Port:</b>     | Ethernet / Power         |

|                               |                  |
|-------------------------------|------------------|
| <b>Description:</b>           | Laptop PC        |
| <b>Brand Name:</b>            | Toshiba          |
| <b>Model Name or Number:</b>  | PSAAPE-00H00KEN  |
| <b>Serial Number:</b>         | 670709710        |
| <b>Cable Length and Type:</b> | 1.5 metres / USB |
| <b>Connected to Port:</b>     | USB              |

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

### **4.1. Operating Modes**

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

- The EUT operates across the FCC Part 27 band from 2496 MHz to 2690 MHz.
- The EUT was tested in the following operating modes, unless otherwise stated:
- TD-CDMA idle mode on all 15 timeslots.
- TD-CDMA traffic mode on all 15 timeslots at full power (+24dBm).

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

The EUT was tested in the following configuration:

- For radiated emissions testing, the EUT was mounted on a plastic stand and connected to a laptop and AC/DC power supply via an Ethernet cable.
- Connected to a laptop PC via the Ethernet port. A bespoke application on the laptop PC was used to configure the EUT during the testing.

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

### **5.1. General Comments**

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

## **5.2. Test Results**

### **5.2.1. Idle Mode AC Conducted Spurious Emissions**

#### **Test Summary:**

|                          |  |
|--------------------------|--|
| <b>FCC Part:</b>         | FCC 15.107   |
| <b>Test Method Used:</b> | As detailed in ANSI C63.4 Section 7 and relevant annexes |

#### **Environmental Conditions:**

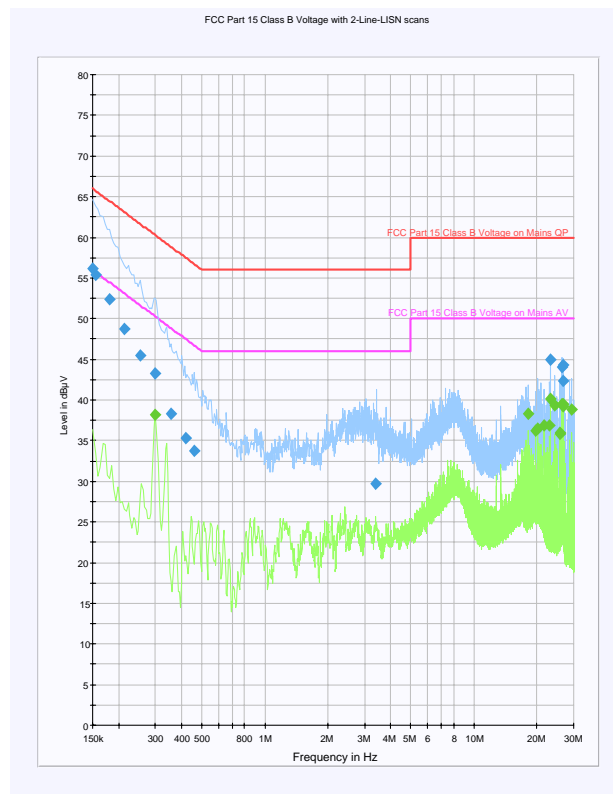
|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 27 |
| <b>Relative Humidity (%):</b> | 42 |

#### **Results: Quasi Peak Detector Measurements**

| <b>Frequency (MHz)</b> | <b>Line</b> | <b>Quasi Peak Level (dB<math>\mu</math>V)</b> | <b>Limit (dB<math>\mu</math>V)</b> | <b>Margin (dB)</b> | <b>Result</b> |
|------------------------|-------------|---|------------------------------------|--------------------|---------------|
| 0.150000               | Live 1      | 56.2  | 66.0                               | 9.8                | Complied      |
| 0.154500               | Neutral     | 55.4  | 65.8                               | 10.4               | Complied      |
| 0.181500               | Live 1      | 52.4  | 64.4                               | 12.0               | Complied      |
| 0.213000               | Neutral     | 48.7  | 63.1                               | 14.4               | Complied      |
| 0.253500               | Live 1      | 45.4  | 61.6                               | 16.2               | Complied      |
| 0.298500               | Neutral     | 43.2  | 60.3                               | 17.1               | Complied      |
| 0.357000               | Live 1      | 38.4  | 58.8                               | 20.4               | Complied      |
| 0.420000               | Neutral     | 35.3  | 57.4                               | 22.1               | Complied      |
| 0.460500               | Neutral     | 33.7  | 56.7                               | 23.0               | Complied      |
| 3.381000               | Live 1      | 29.7  | 56.0                               | 26.3               | Complied      |
| 23.131500              | Neutral     | 45.0  | 60.0                               | 15.0               | Complied      |
| 26.488500              | Neutral     | 44.0  | 60.0                               | 16.0               | Complied      |
| 26.551500              | Neutral     | 42.3  | 60.0                               | 17.7               | Complied      |
| 26.610000              | Neutral     | 44.3  | 60.0                               | 15.7               | Complied      |

**Idle Mode AC Conducted Spurious Emissions (continued)****Results: Average Detector Measurements**

| Frequency (MHz) | Line    | Average Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|---------|----------------------------|--------------------|-------------|----------|
| 0.298500        | Live 1  | 38.2                       | 50.3               | 12.1        | Complied |
| 18.244500       | Neutral | 38.4                       | 50.0               | 11.6        | Complied |
| 19.711500       | Neutral | 36.2                       | 50.0               | 13.8        | Complied |
| 20.260500       | Neutral | 36.5                       | 50.0               | 13.5        | Complied |
| 21.664500       | Neutral | 36.9                       | 50.0               | 13.1        | Complied |
| 23.068500       | Neutral | 36.9                       | 50.0               | 13.1        | Complied |
| 23.131500       | Neutral | 40.1                       | 50.0               | 9.9         | Complied |
| 24.351000       | Neutral | 39.3                       | 50.0               | 10.7        | Complied |
| 25.696500       | Neutral | 35.9                       | 50.0               | 14.1        | Complied |
| 25.876500       | Neutral | 35.9                       | 50.0               | 14.1        | Complied |
| 26.488500       | Neutral | 39.5                       | 50.0               | 10.5        | Complied |
| 26.551500       | Neutral | 39.2                       | 50.0               | 10.8        | Complied |
| 26.610000       | Neutral | 39.5                       | 50.0               | 10.5        | Complied |
| 29.238000       | Neutral | 38.8                       | 50.0               | 11.2        | Complied |



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

**5.2.2. Idle Mode Radiated Spurious Emissions****Test Summary:**

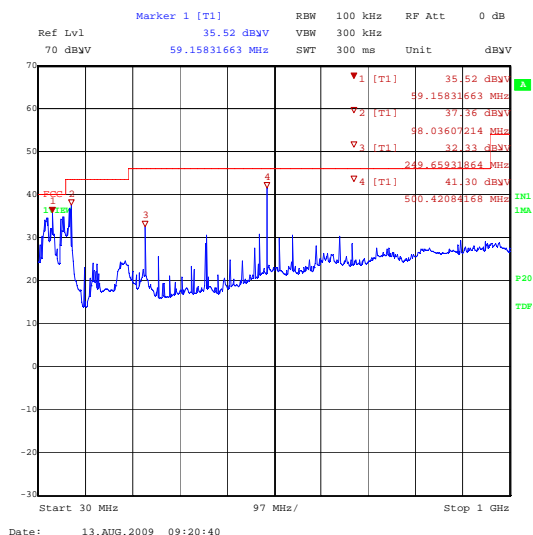
|                          |  |
|--------------------------|--|
| <b>FCC Part:</b>         | FCC 15.109   |
| <b>Test Method Used:</b> | As detailed in ANSI C63.4 Section 8 and relevant annexes |
| <b>Frequency Range:</b>  | 30 MHz to 1 GHz  |

**Environmental Conditions:**

|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 26 |
| <b>Relative Humidity (%):</b> | 42 |

**Results:**

| Frequency (MHz) | Antenna Polarity | Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|----------------------|----------------------|-------------|----------|
| 43.780560       | Vertical         | 36.0                 | 40.0                 | 4.0         | Complied |
| 58.683614       | Vertical         | 34.8                 | 40.0                 | 5.2         | Complied |
| 98.438993       | Vertical         | 37.2                 | 43.5                 | 36.3        | Complied |
| 250.002027      | Vertical         | 32.2                 | 46.0                 | 13.8        | Complied |
| 374.994183      | Horizontal       | 34.4                 | 46.0                 | 11.6        | Complied |
| 483.969962      | Horizontal       | 36.5                 | 46.0                 | 9.5         | Complied |
| 500.006732      | Vertical         | 41.2                 | 46.0                 | 4.8         | Complied |



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

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

|                          |  |
|--------------------------|--|
| <b>FCC Part:</b>         | FCC 15.109   |
| <b>Test Method Used:</b> | As detailed in ANSI C63.4 Section 8 and relevant annexes |
| <b>Frequency Range:</b>  | 1 GHz to 27 GHz  |

**Environmental Conditions:**

|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 27 |
| <b>Relative Humidity (%):</b> | 34 |

**Results: TD-CDMA - Highest Peak Level**

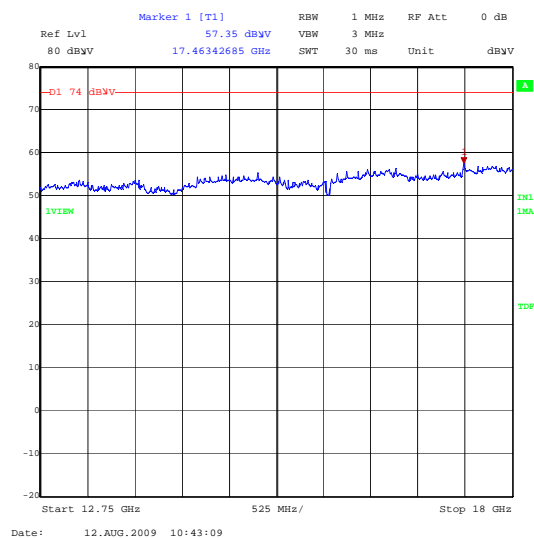
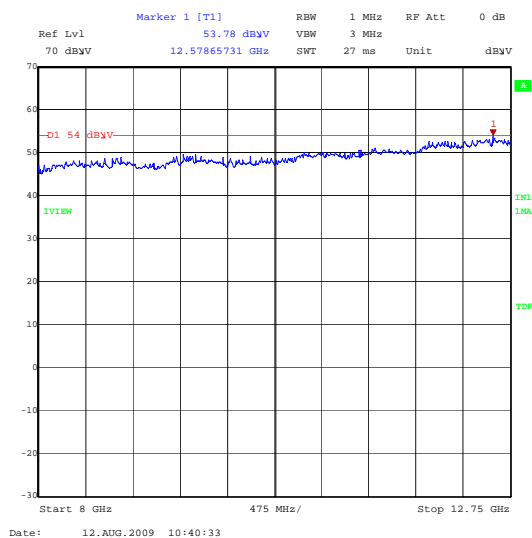
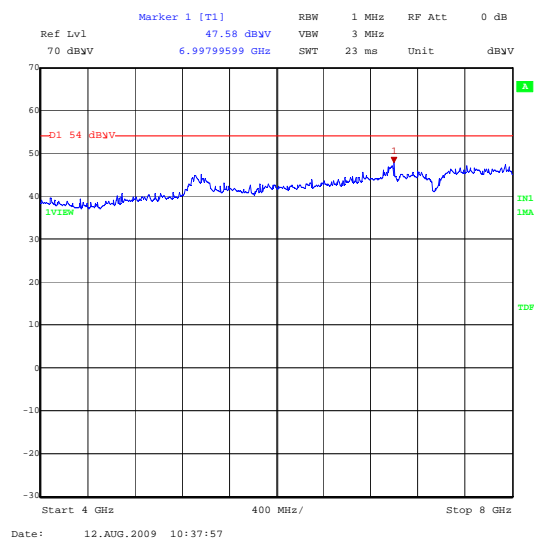
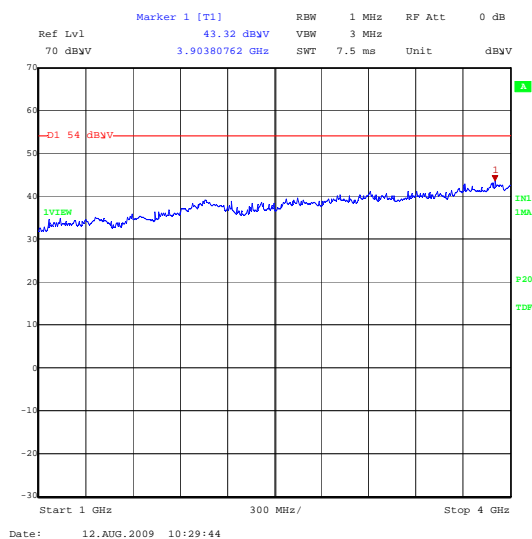
| Frequency (GHz) | Antenna Polarity | Detector level (dB $\mu$ V) | Antenna factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|---------------------|-----------------------------|----------------------|-------------|----------|
| 17.463          | Vertical         | 40.6                        | 16.8                | 57.4                        | 74.0                 | 16.6        | Complied |

**Results: TD-CDMA - Highest Average Level**

| Frequency (GHz) | Antenna Polarity | Detector level (dB $\mu$ V) | Antenna factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|---------------------|-----------------------------|----------------------|-------------|----------|
| 17.800          | Vertical         | 28.5                        | 17.2                | 45.7                        | 54.0                 | 8.3         | Complied |

**Note(s):**

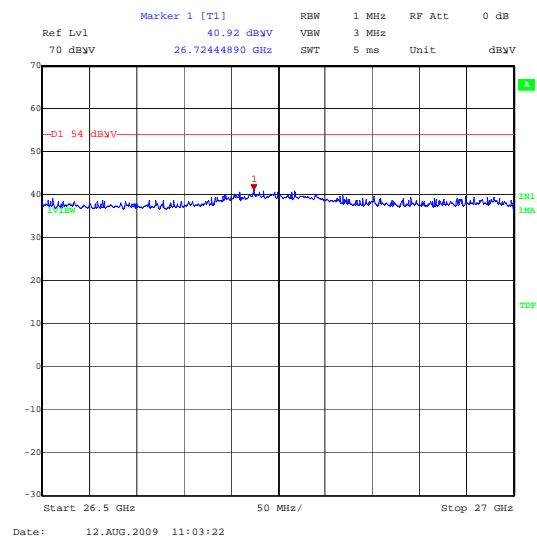
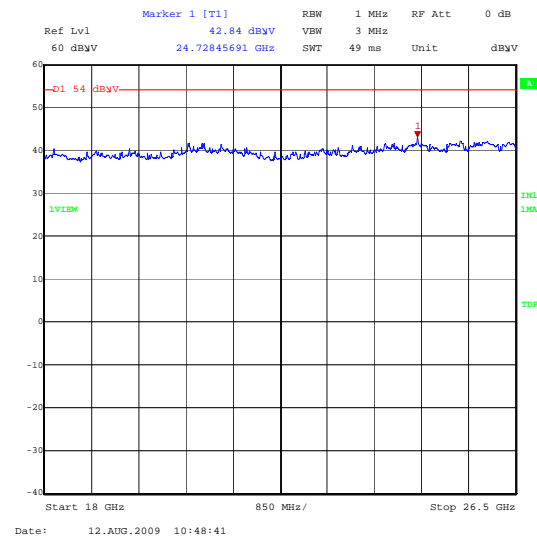
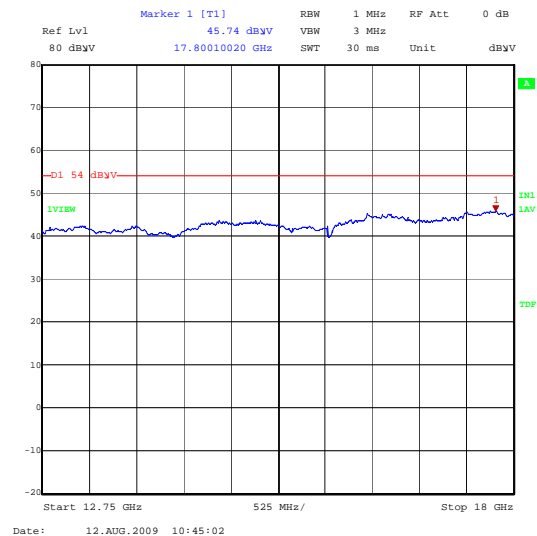
1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak and average noise floor reading of the measuring receiver was recorded as shown in the table above.
2. All pre-scans were performed with a peak detector against average limits apart from measurements made in the range of 12.75 to 18 GHz where pre-scans were performed with peak and average detectors and the applicable limit applied. This was due to the noise floor exceeding the average limit when using a peak detector.

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

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



Idle Mode Radiated Spurious Emissions (continued)



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

**5.2.3. Transmitter AC Conducted Spurious Emissions****Test Summary:**

|                          |  |
|--------------------------|--|
| <b>FCC Part:</b>         | 15.207   |
| <b>Test Method Used:</b> | As detailed in ANSI C63.4 Section 7 and relevant annexes |

**Environmental Conditions:**

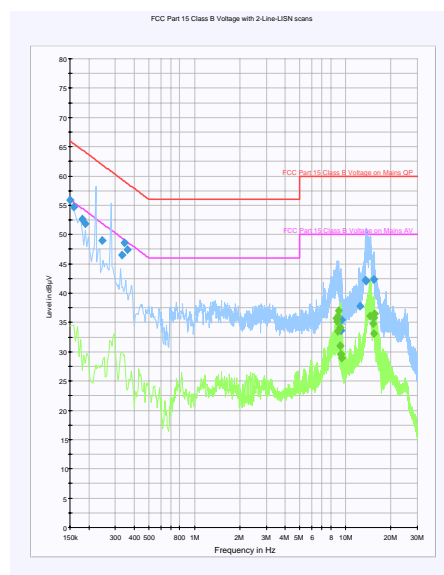
|                                     |    |
|-------------------------------------|----|
| <b>Temperature Range (°C):</b>      | 27 |
| <b>Relative Humidity Range (%):</b> | 33 |

**Results: Quasi Peak Detector Measurements**

| <b>Frequency (MHz)</b> | <b>Line</b> | <b>Quasi Peak Level (dB<math>\mu</math>V)</b> | <b>Limit (dB<math>\mu</math>V)</b> | <b>Margin (dB)</b> | <b>Result</b> |
|------------------------|-------------|---|------------------------------------|--------------------|---------------|
| 0.150000               | Neutral     | 55.8  | 66.0                               | 10.2               | Complied      |
| 0.159000               | Live 1      | 54.7  | 65.5                               | 10.8               | Complied      |
| 0.181500               | Live 1      | 52.7  | 64.4                               | 11.7               | Complied      |
| 0.190500               | Live 1      | 51.8  | 64.0                               | 12.2               | Complied      |
| 0.244500               | Live 1      | 49.0  | 61.9                               | 12.9               | Complied      |
| 0.330000               | Live 1      | 46.6  | 59.5                               | 12.9               | Complied      |
| 0.343500               | Live 1      | 48.6  | 59.1                               | 10.5               | Complied      |
| 0.361500               | Live 1      | 47.4  | 58.7                               | 11.3               | Complied      |
| 8.992500               | Live 1      | 35.8  | 60.0                               | 24.2               | Complied      |
| 9.330000               | Neutral     | 33.6  | 60.0                               | 26.4               | Complied      |
| 9.397500               | Neutral     | 35.5  | 60.0                               | 24.5               | Complied      |
| 12.444000              | Neutral     | 37.7  | 60.0                               | 22.3               | Complied      |
| 13.569000              | Neutral     | 42.3  | 60.0                               | 17.7               | Complied      |
| 13.762500              | Neutral     | 42.1  | 60.0                               | 17.9               | Complied      |
| 15.490500              | Neutral     | 42.4  | 60.0                               | 17.6               | Complied      |

**Transmitter AC Conducted Spurious Emissions****Results: Average Detector Measurements**

| Frequency (MHz) | Line    | Average Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|---------|----------------------------|--------------------|-------------|----------|
| 8.736000        | Neutral | 35.7                       | 50.0               | 14.3        | Complied |
| 8.803500        | Neutral | 35.2                       | 50.0               | 14.8        | Complied |
| 8.866500        | Live 1  | 33.5                       | 50.0               | 16.5        | Complied |
| 8.934000        | Live 1  | 36.0                       | 50.0               | 14.0        | Complied |
| 9.001500        | Live 1  | 37.0                       | 50.0               | 13.0        | Complied |
| 9.199500        | Neutral | 34.1                       | 50.0               | 15.9        | Complied |
| 9.267000        | Neutral | 31.1                       | 50.0               | 18.9        | Complied |
| 9.330000        | Neutral | 29.6                       | 50.0               | 20.4        | Complied |
| 9.397500        | Neutral | 28.9                       | 50.0               | 21.1        | Complied |
| 14.626500       | Neutral | 36.0                       | 50.0               | 14.0        | Complied |
| 15.288000       | Neutral | 34.8                       | 50.0               | 15.2        | Complied |
| 15.355500       | Neutral | 33.1                       | 50.0               | 16.9        | Complied |
| 15.490500       | Neutral | 35.9                       | 50.0               | 14.2        | Complied |
| 15.558000       | Neutral | 36.5                       | 50.0               | 13.5        | Complied |



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

**5.2.4. Transmitter Equivalent Isotropically Radiated Power (EIRP)****Test Summary:**

|                          |   |
|--------------------------|---|
| <b>FCC Part:</b>         | FCC 27.50(h)(1)   |
| <b>Test Method Used:</b> | Tests were performed using the test methods detailed in ANSI TIA-603-C-2004 |

**Environmental Conditions:**

|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 27 |
| <b>Relative Humidity (%):</b> | 34 |

**Results:**

| Channel | Frequency (MHz) | EIRP (dBm) | EIRP (dBW) | EIRP Limit (dBW) | Margin (dB) | Result   |
|---------|-----------------|------------|------------|------------------|-------------|----------|
| 12507   | 2501.4          | 31.5       | 1.5        | 33.0             | 31.5        | Complied |
| 12965   | 2593.0          | 35.8       | 5.8        | 33.0             | 27.2        | Complied |
| 13420   | 2684.6          | 34.4       | 4.4        | 33.0             | 28.6        | Complied |

**5.2.5. Transmitter Occupied Bandwidth****Test Summary:**

|                          |  |
|--------------------------|--|
| <b>FCC Part:</b>         | FCC 2.1049   |
| <b>Test Method Used:</b> | As detailed in ANSI C63.4 Section 13.1.7 and relevant annexes referencing FCC CFR Part 2.1049 (see note below) |

**Environmental Conditions:**

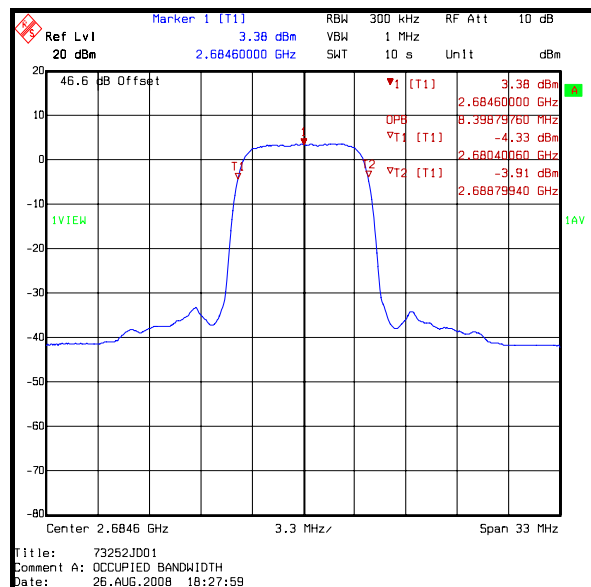
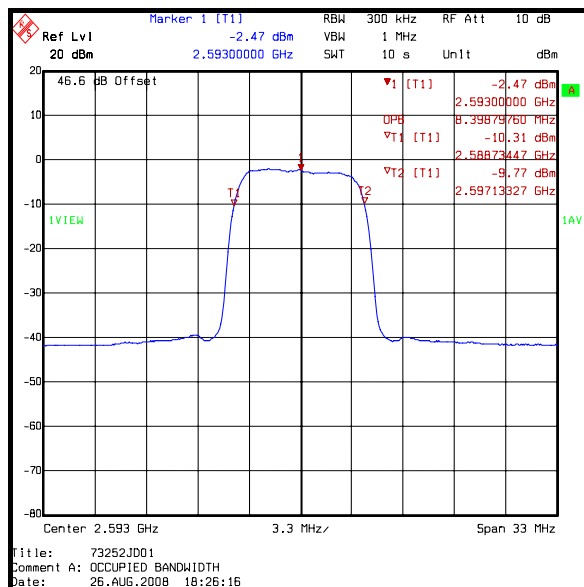
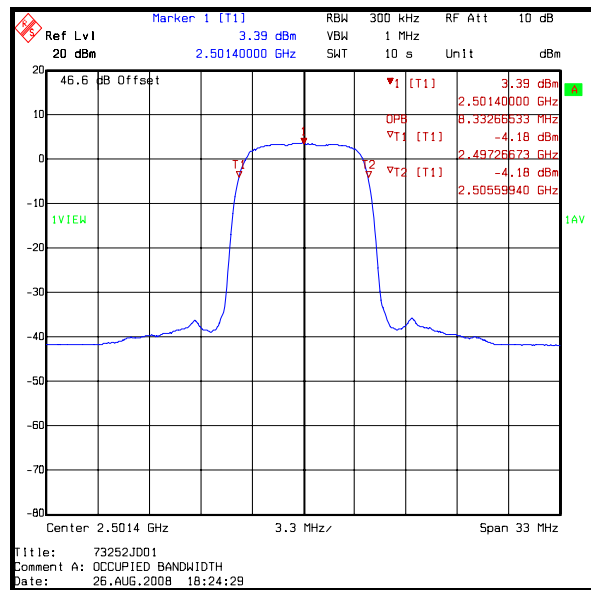
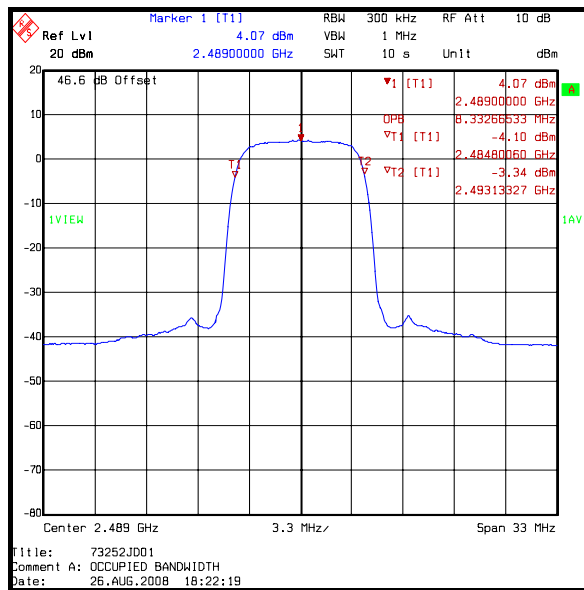
|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 19 |
| <b>Relative Humidity (%):</b> | 49 |

**Results:**

| <b>Channel</b> | <b>Frequency (MHz)</b> | <b>Resolution Bandwidth (kHz)</b> | <b>Video Bandwidth (kHz)</b> | <b>Occupied Bandwidth (MHz)</b> |
|----------------|------------------------|-----------------------------------|------------------------------|---------------------------------|
| 12445          | 2489.0                 | 300                               | 1000                         | 8.332                           |
| 12507          | 2501.4                 | 300                               | 1000                         | 8.332                           |
| 12965          | 2593.0                 | 300                               | 1000                         | 8.398                           |
| 13423          | 2684.6                 | 300                               | 1000                         | 8.398                           |

**Note(s):**

1. In lieu of the test method detailed in ANSI C63.4 Section 13.1.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.

**Transmitter Occupied Bandwidth (continued)**

**5.2.6. Transmitter Radiated Emissions - Channel Edges****Test Summary:**

|                          |   |
|--------------------------|---|
| <b>FCC Part:</b>         | FCC 2.1051 and FCC Part 27.53                             |
| <b>Test Method Used:</b> | As detailed in ANSI TIA-603-C-2004 referencing FCC Part 2 |

**Environmental Conditions:**

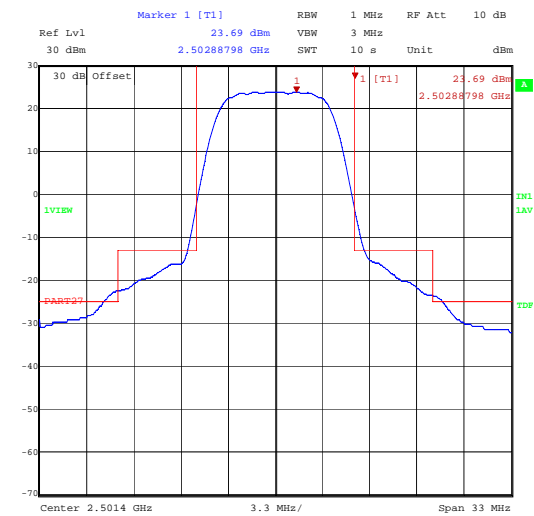
|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 26 |
| <b>Relative Humidity (%):</b> | 32 |

**Results: Bottom channel**

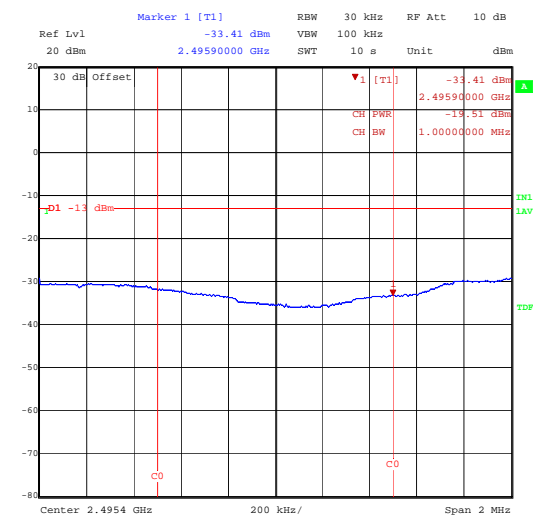
| <b>Frequency of<br/>1 MHz strip<br/>adjacent to<br/>channel edge</b> | <b>Level in 1 MHz<br/>strip adjacent to<br/>block edge<br/>(dBm)</b> | <b>Band edge limit<br/>(dBm)</b> | <b>Margin (dB)</b> | <b>Result</b> |
|--|--|----------------------------------|--------------------|---------------|
| 2495.9   | -19.5  | -13.0                            | 6.5                | Complied      |
| 2506.9   | -19.5  | -13.0                            | 6.5                | Complied      |

**Note(s):**

1. The limit (-25 dBm) shown at  $\pm 11$  MHz from the channel centre frequency shown in the plot below is incorrect as this requirement does not apply to fixed digital stations.
2. It can be seen on the main mask plot that the emission goes through the limit line. This is on account of the analyser bandwidth being too great to make an accurate measurement. The analyser Integration function was thus used to demonstrate compliance and this can be seen on the two plots accompanying the mask plot.

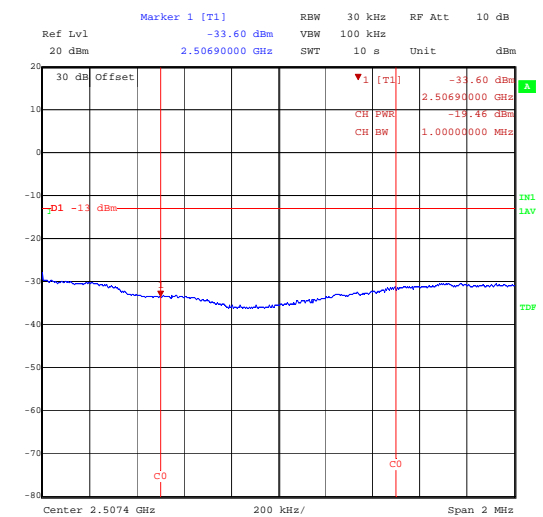
**Transmitter Radiated Emissions - Channel Edges (continued)**

Date: 12.AUG.2009 13:41:42



Date: 12.AUG.2009 13:46:53

1 MHz strip below channel centre freq -5.5 MHz  
 measured using the spectrum analyser  
 Channel Power function.



Date: 12.AUG.2009 13:48:14

1 MHz strip above channel centre freq +5.5 MHz  
 measured using the spectrum analyser  
 Channel Power function.



**Transmitter Radiated Emissions - Channel Edges (continued)****Test Summary:**

|                          |   |
|--------------------------|---|
| <b>FCC Part:</b>         | FCC 2.1051 and FCC Part 27.53                             |
| <b>Test Method Used:</b> | As detailed in ANSI TIA-603-C-2004 referencing FCC Part 2 |

**Environmental Conditions:**

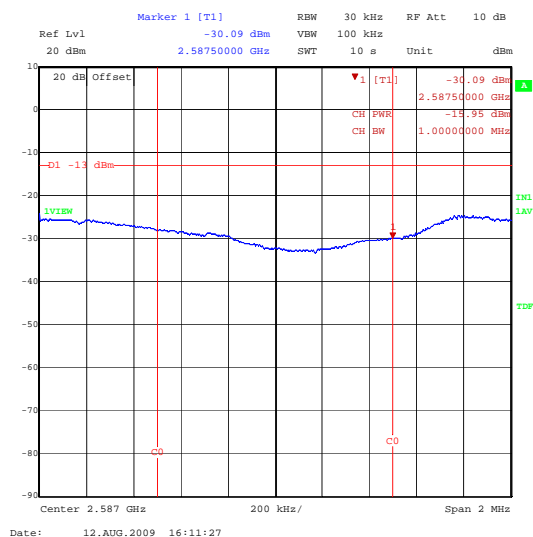
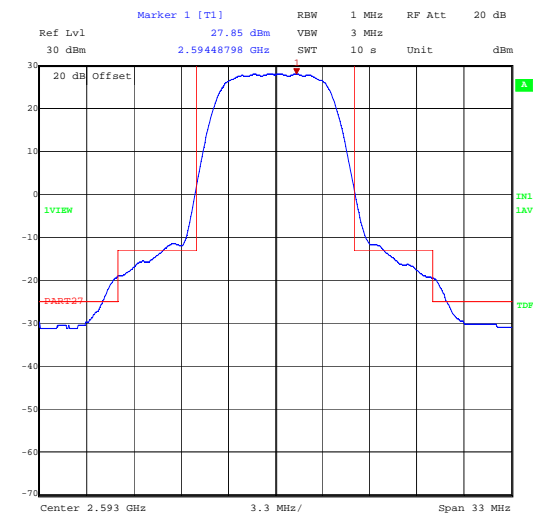
|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 26 |
| <b>Relative Humidity (%):</b> | 32 |

**Results: Middle channel**

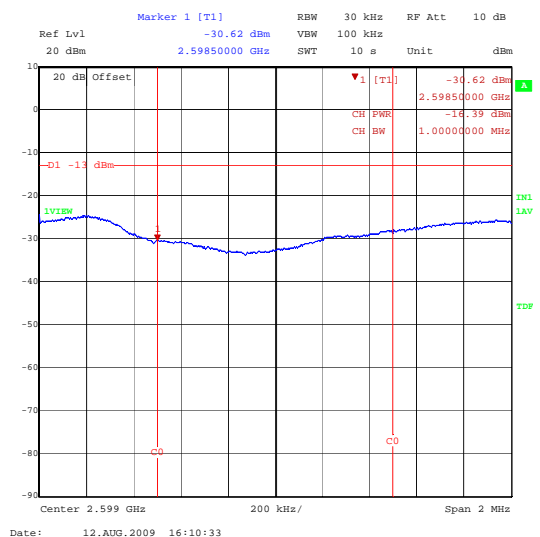
| <b>Frequency of<br/>1 MHz strip<br/>adjacent to<br/>channel edge</b> | <b>Level in 1 MHz<br/>strip adjacent to<br/>block edge<br/>(dBm)</b> | <b>Band edge limit<br/>(dBm)</b> | <b>Margin (dB)</b> | <b>Result</b> |
|--|--|----------------------------------|--------------------|---------------|
| 2587.5   | -16.0  | -13.0                            | 3.0                | Complied      |
| 2598.5   | -16.4  | -13.0                            | 3.4                | Complied      |

**Note(s):**

1. The limit (-25 dBm) shown at  $\pm 11$  MHz from the channel centre frequency shown in the plot below is incorrect as this requirement does not apply to fixed digital stations.
2. It can be seen on the main mask plot that the emission goes through the limit line. This is on account of the analyser bandwidth being too great to make an accurate measurement. The analyser Integration function was thus used to demonstrate compliance and this can be seen on the two plots accompanying the mask plot.

**Transmitter Radiated Emissions - Channel Edges (continued)**

1 MHz strip below channel centre freq -5.5 MHz  
measured using the spectrum analyser  
Channel Power function.



1 MHz strip above channel centre freq +5.5 MHz  
measured using the spectrum analyser  
Channel Power function.

**Transmitter Radiated Emissions - Channel Edges (continued)****Test Summary:**

|                          |   |
|--------------------------|---|
| <b>FCC Part:</b>         | FCC 2.1051 and FCC Part 27.53                             |
| <b>Test Method Used:</b> | As detailed in ANSI TIA-603-C-2004 referencing FCC Part 2 |

**Environmental Conditions:**

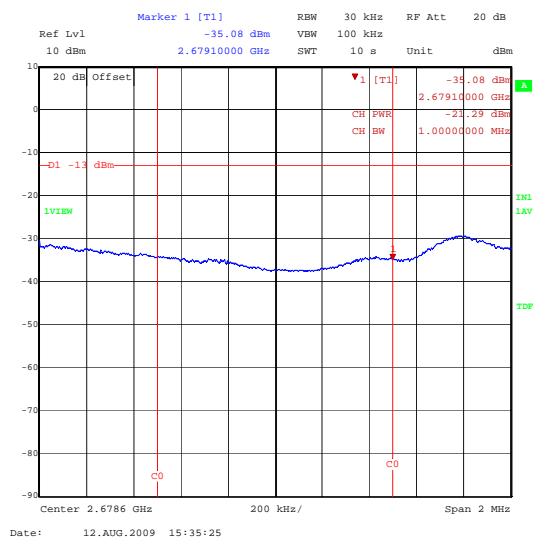
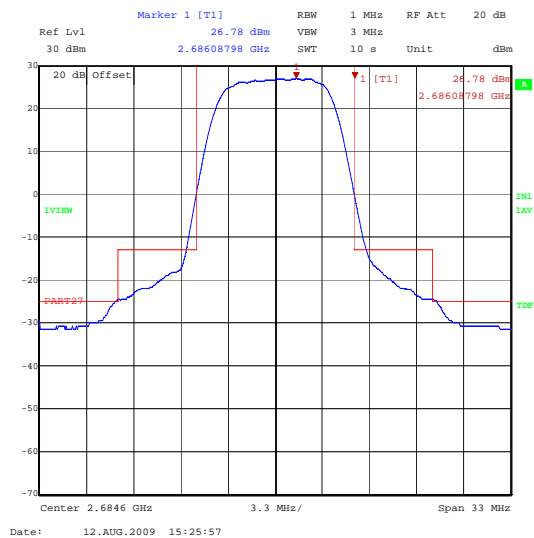
|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 26 |
| <b>Relative Humidity (%):</b> | 32 |

**Results: Top channel**

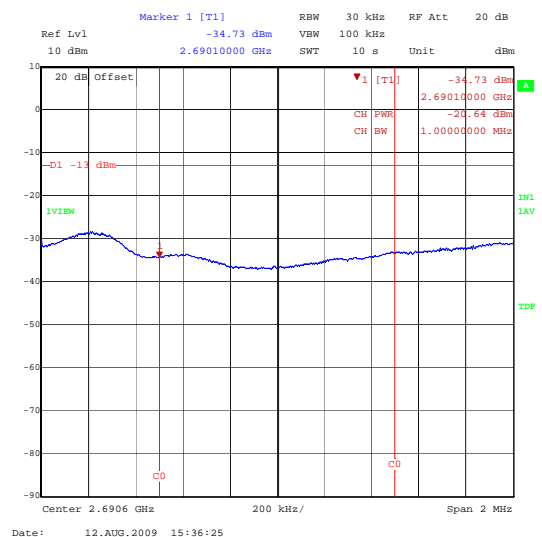
| <b>Frequency of<br/>1 MHz strip<br/>adjacent to<br/>channel edge</b> | <b>Level in 1 MHz<br/>strip adjacent to<br/>block edge<br/>(dBm)</b> | <b>Band edge limit<br/>(dBm)</b> | <b>Margin (dB)</b> | <b>Result</b> |
|--|--|----------------------------------|--------------------|---------------|
| 2679.1   | -21.3  | -13.0                            | 8.3                | Complied      |
| 2690.1   | -20.6  | -13.0                            | 7.6                | Complied      |

**Note(s):**

1. It can be seen on the main mask plot that the emission goes through the limit line. This is on account of the analyser bandwidth being too great to make an accurate measurement. The analyser Integration function was thus used to demonstrate compliance and this can be seen on the two plots accompanying the mask plot.

**Transmitter Radiated Emissions - Channel Edges (continued)**

1 MHz strip below channel centre freq -5.5 MHz  
measured using the spectrum analyser  
Channel Power function.



1 MHz strip above channel centre freq +5.5 MHz  
measured using the spectrum analyser  
Channel Power function.

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

|                          |   |
|--------------------------|---|
| <b>FCC Part:</b>         | FCC 2.1051 and FCC Part 27.53                             |
| <b>Test Method Used:</b> | As detailed in ANSI TIA-603-C-2004 referencing FCC Part 2 |

**Environmental Conditions:**

|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 26 |
| <b>Relative Humidity (%):</b> | 32 |

**Results: Bottom Channel**

| Frequency (MHz) | Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|----------------------|-------------|-------------|----------|
| 2467.391790     | -30.6                | -13.0       | 17.6        | Complied |
| 2473.930860     | -23.4                | -13.0       | 10.4        | Complied |
| 4999.022440     | -44.7                | -13.0       | 31.7        | Complied |
| 7497.666930     | -45.8                | -13.0       | 32.8        | Complied |

**Results: Middle Channel:**

| Frequency (MHz) | Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|----------------------|-------------|-------------|----------|
| 2022.264530     | -31.8                | -13.0       | 18.8        | Complied |
| 3163.386120     | -36.5                | -13.0       | 23.5        | Complied |
| 5189.816230     | -41.6                | -13.0       | 28.6        | Complied |
| 77772.784440    | -40.4                | -13.0       | 28.4        | Complied |

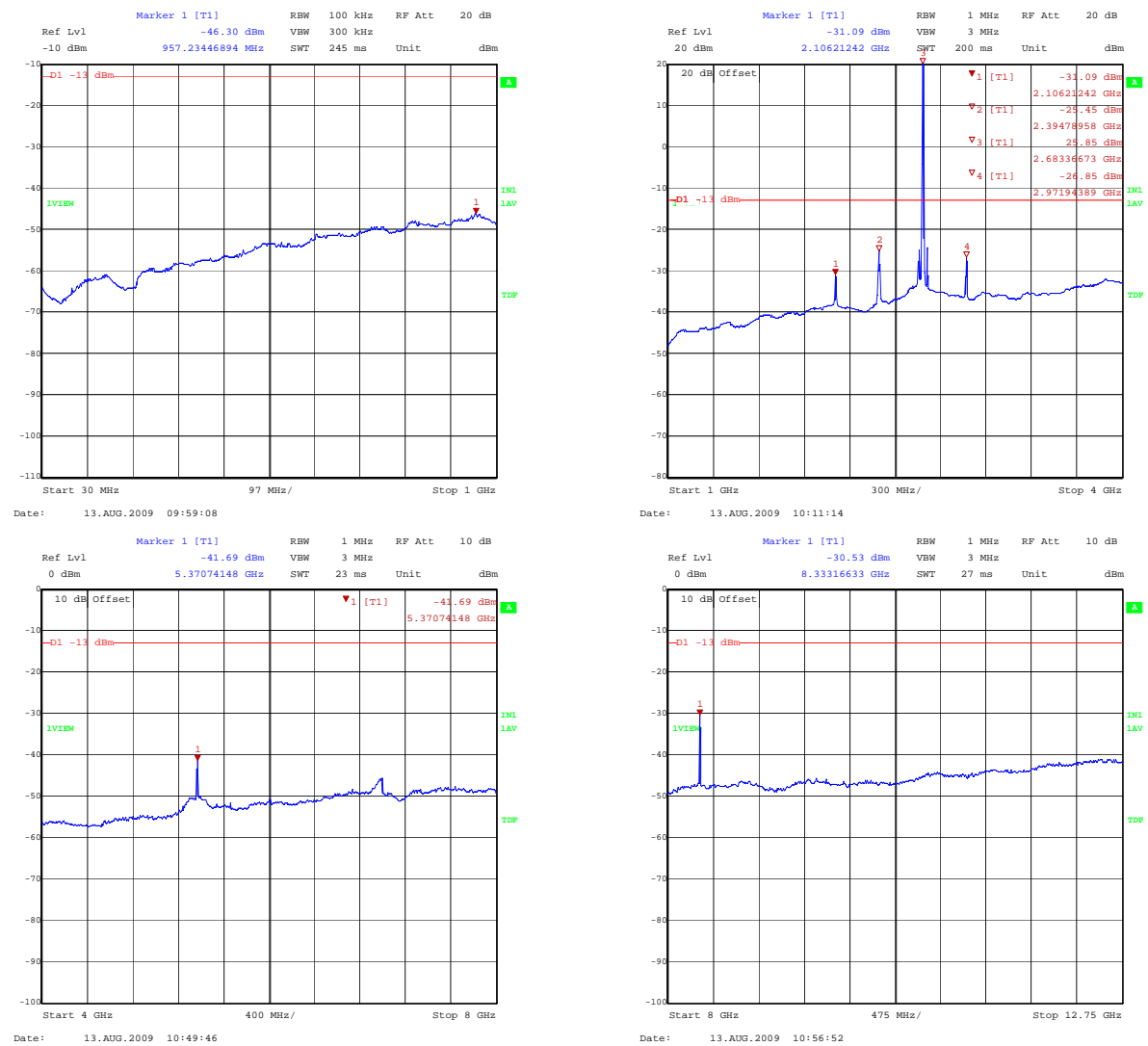
**Results: Top Channel:**

| Frequency (MHz) | Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|----------------------|-------------|-------------|----------|
| 2111.037320     | -30.5                | -13.0       | 17.5        | Complied |
| 2397.072470     | -21.0                | -13.0       | 8.0         | Complied |
| 2711.876660     | -20.8                | -13.0       | 7.8         | Complied |
| 2968.650800     | -25.7                | -13.0       | 12.7        | Complied |
| 5372.980340     | -37.3                | -13.0       | 24.3        | Complied |
| 8341.867330     | -20.9                | -13.0       | 7.9         | Complied |

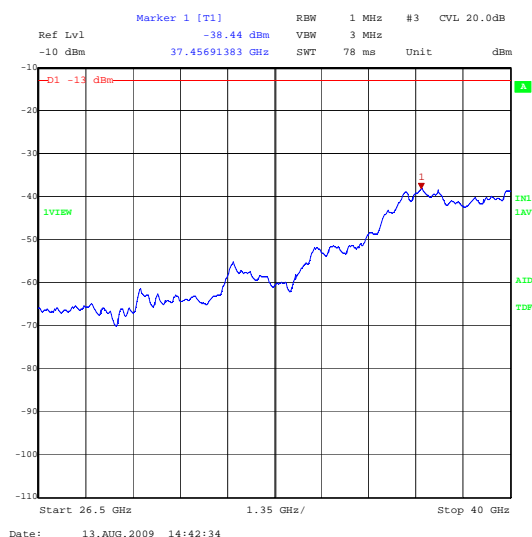
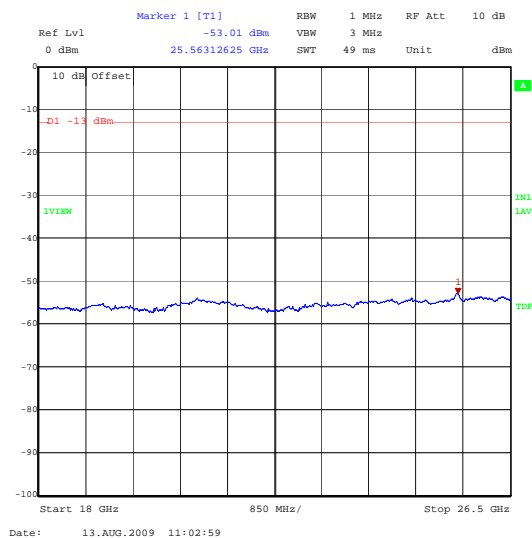
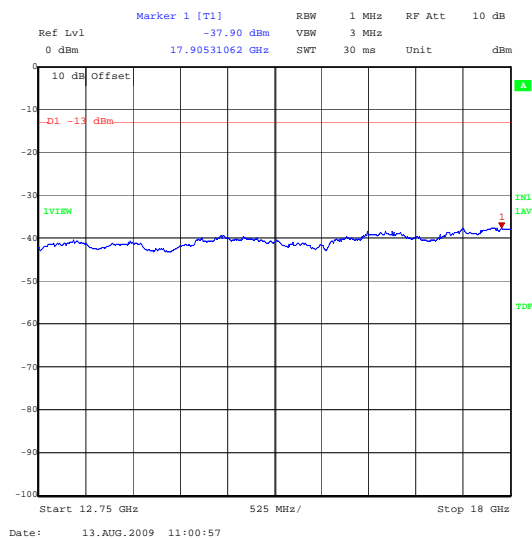
**Note(s):**

1. The emission shown at approximately 2683.367 MHz on the 1 GHz to 4 GHz plot is the carrier

Transmitter Radiated Emissions (continued)



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

**Transmitter Radiated Emissions (continued)**

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

**5.2.8. Transmitter Radiated Emissions at Band Edges****Test Summary:**

|                          |   |
|--------------------------|---|
| <b>FCC Part:</b>         | FCC 2.1051 and FCC Part 27.53                             |
| <b>Test Method Used:</b> | As detailed in ANSI TIA-603-C-2004 referencing FCC Part 2 |

**Environmental Conditions:**

|                               |    |
|-------------------------------|----|
| <b>Temperature (°C):</b>      | 26 |
| <b>Relative Humidity (%):</b> | 42 |

**Results: 1 MHz strip below the lower band edge**

| Frequency (MHz) | Spurious Emission (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|-------------------------|-------------|-------------|----------|
| 2495 to 2496    | -19.8                   | -13.0       | 6.8         | Complied |

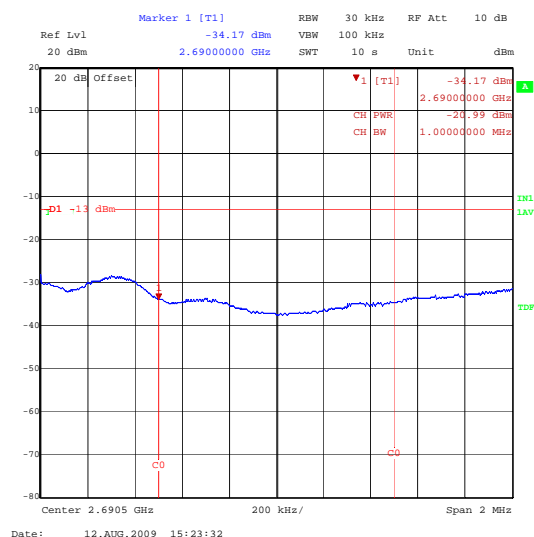
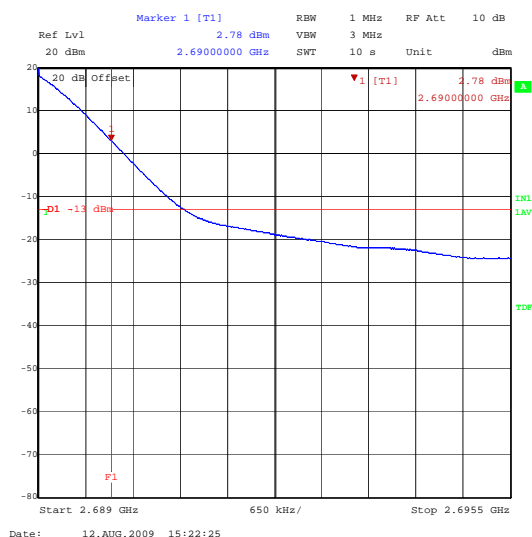
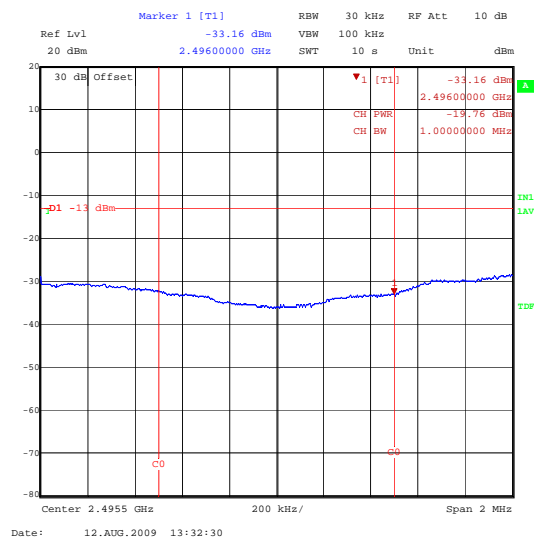
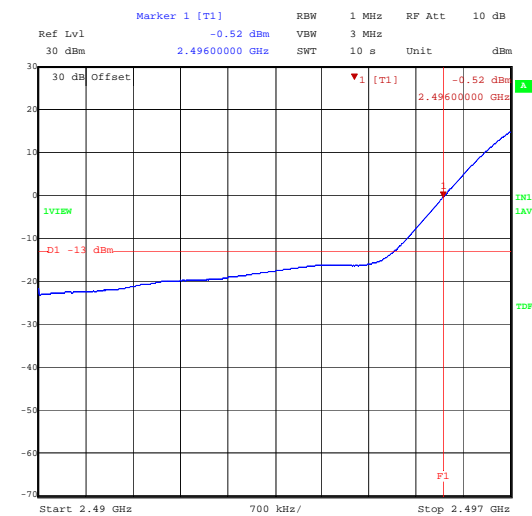
**1 MHz strip above the upper band edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 2690 to 2691    | -21.0                     | -13.0       | 8.0         | Complied |

**Note(s):**

1. Measured with a 1 MHz resolution bandwidth and also using the channel power function of the spectrum analyser.
2. It can be seen on the main mask plots that the emission goes through the limit line. This is on account of the analyser bandwidth being too great to make an accurate measurement. The analyser Integration function was thus used to demonstrate compliance and this can be seen on the two plots accompanying the mask plot



**Transmitter Radiated Emissions at Band Edges (continued)**

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

## **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 30.0 MHz | 95%                  | ±3.25 dB               |
| Radiated Spurious Emissions     | 30 MHz to 1000 MHz   | 95%                  | ±5.26 dB               |
| Radiated Spurious Emissions     | 1 GHz to 26.5 GHz    | 95%                  | ±2.94 dB               |
| Occupied Bandwidth              | 9 kHz to 26.5 GHz    | 95%                  | ±0.92 ppm              |

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**

| <b>RFI No.</b> | <b>Instrument</b>    | <b>Manufacturer</b>     | <b>Type No.</b> | <b>Serial No.</b> | <b>Date Last Calibrated</b> | <b>Cal. Interval (Months)</b> |
|----------------|----------------------|-------------------------|-----------------|-------------------|-----------------------------|-------------------------------|
| A1391          | Attenuator           | HUBER + SUHNER AG       | 757987          | 6810.17.B         | Calibrated before use       | -                             |
| A1392          | Attenuator           | HUBER + SUHNER AG       | 757456          | 6820.17.B         | Calibrated before use       | -                             |
| A1534          | Pre Amplifier        | Hewlett Packard         | 8449B OPT H02   | 3008A00405        | Calibrated before use       | -                             |
| A174           | Waveguide Transition | Flann Microwave Ltd     | 22094-KF20      | 211               | Calibration not required    | -                             |
| A1818          | Antenna              | EMCO                    | 3115            | 00075692          | 25 Oct 2008                 | 12                            |
| A1830          | Pulse Limiter        | Rhode & Schwarz         | ESH3-Z2         | 100668            | 05 Jan 2009                 | 12                            |
| A288           | Antenna              | Chase                   | CBL6111A        | 1589              | 13 Mar 2009                 | 12                            |
| A366           | Isolator             | MRI                     | FRR-400         | 169               | Calibration not required    | -                             |
| A649           | Single Phase LISN    | Rohde & Schwarz         | ESH3-Z5         | 825562/008        | 19 Mar 2009                 | 12                            |
| K0002          | Site Reference 4421  | Rainford EMC            | N/A             | N/A               | 19 Sept 2008 (Note 1)       | 12                            |
| K0008          | Site Reference 4422  | RFI Global Services Ltd | N/A             | N/A               | Calibrated before use       | -                             |
| M1124          | Spectrum Analyser    | Rohde & Schwarz         | ESIB26          | 100046K           | 09 Mar 2009                 | 12                            |
| M1263          | Test Receiver        | Rohde & Schwarz         | ESIB7           | 100265            | 22 Apr 2009                 | 12                            |

Note 1: Site 4422 was used for testing on the 12<sup>th</sup> and 13<sup>th</sup> August 2009.

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