



**TEST REPORT
FROM
RFI GLOBAL SERVICES LTD**

Test of: Wireless ACU Module z99-wa01 / 325-070-US

To: FCC Part 15 Subpart C: 2008 Part 15.249

Test Report Serial No:
RFI/RPT5/RP73223JD12A

Supersedes Test Report Serial No:
RFI/RPT4/RP73223JD12A

| | |
|---|---|
| This Test Report Is Issued Under The Authority Of Brian Watson, Operations Director: | pp  |
| Checked By: Robert Graham  | Report Copy No: PDF01 |
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1. Customer Information

| | |
|----------------------|--|
| Company Name: | Paxton Access Ltd |
| Address: | Paxton House Home Farm Brighton Sussex BN1 9HU |

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2. Equipment Under Test (EUT)

2.1. Identification of Equipment Under Test (EUT)

| | |
|--------------------------|-------------------------------|
| Brand Name: | Paxton Access |
| Model Name or Number: | z99-wa01 / 325-070-US |
| Serial Number: | 0001 |
| Hardware Version Number: | z-wa01 Rev. 4, ppc-wam Rev. C |
| Software Version Number: | Not stated |
| FCC ID Number: | USEWA01 |

2.2. Description of EUT

The equipment under test was a wireless ACU module.

2.3. Modifications Incorporated in the EUT

The EUT has had a modified firmware installed to allow it to permanently transmit for the purpose of the test. This did not affect the RF characteristics of the device.

2.4. Support Equipment

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

| | |
|-----------------------|----------------------|
| Description: | 12 V DC Power Supply |
| Brand Name: | Stontronics Limited |
| Model Name or Number: | EPA-121DA-12 |
| Serial Number: | T2323ST |

2.5. Additional Information Related to Testing

| | | | |
|---------------------------|----------------------|----------------|-------------------------|
| Channel Spacing: | 5 MHz | | |
| Modulation Type: | O-QPSK | | |
| Data Rate: | 250 kbit/s | | |
| Transmit Frequency Range: | 2405 MHz to 2475 MHz | | |
| Transmit Channels Tested: | Channel ID | Channel Number | Channel Frequency (MHz) |
| | Bottom | 11 | 2405 |
| | Middle | 18 | 2440 |
| | Top | 25 | 2475 |
| Receiver Frequency Range: | 2405 MHz to 2475 MHz | | |

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3. Test Specification, Methods and Procedures

3.1. Test Specifications

| | |
|------------|---|
| Reference: | FCC Part 15 Subpart C: 2008 (Part 15.249). |
| Title: | Code of Federal Regulations, Part 15 (47CFR249) |

3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI C63.4 (2003)

Title: 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.

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations from the Test Specification

There were no deviations from the test specification.

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5. Operation of the EUT During Testing

5.1. Operating Modes

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

- Transmitting full power and configured to use either bottom, middle or top channel.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

- Standalone powered by a 12 V DC power supply.

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6. Summary of Test Results

| Range of Measurements | Specification Reference | Port Type | Result |
|---|-----------------------------------|------------------|---------------|
| Transmitter AC Conducted Spurious Emissions | Part 15.207 | AC Mains | Complied |
| Transmitter Fundamental Field Strength | Part 15.249 (a) | Antenna | Complied |
| Transmitter 20 dB Bandwidth | Part 2.1049 | Antenna | Complied |
| Transmitter Radiated Emissions | Part 15.249(a)(d) (e) & 15.209(a) | Antenna | Complied |
| Transmitter Band Edge Radiated Emissions | Part 15.249(d) & 15.209(a) | Antenna | Complied |

6.1. Location of Tests

All the measurements described in this report were performed at the premises of RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.

6.2. Site Registration Numbers

FCC: 209735

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7. Measurements, Examinations and Derived Results

7.1. General Comments

7.1.1. This section contains test results only.

7.1.2. 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 8 for details of measurement uncertainties.

7.1.3. As the device is a transceiver that operates periodically i.e. it transmits and receives simultaneously when in operation there is no 'receive only' condition. Consequently no testing of separate receive only emissions testing was performed as the performance was verified at the same time as the transmitter.

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7.2. Test Results

7.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

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

Environmental Conditions:

| | |
|------------------------|----|
| Temperature (°C): | 19 |
| Relative Humidity (%): | 35 |

Quasi-Peak Detector Measurements on Live and Neutral Lines

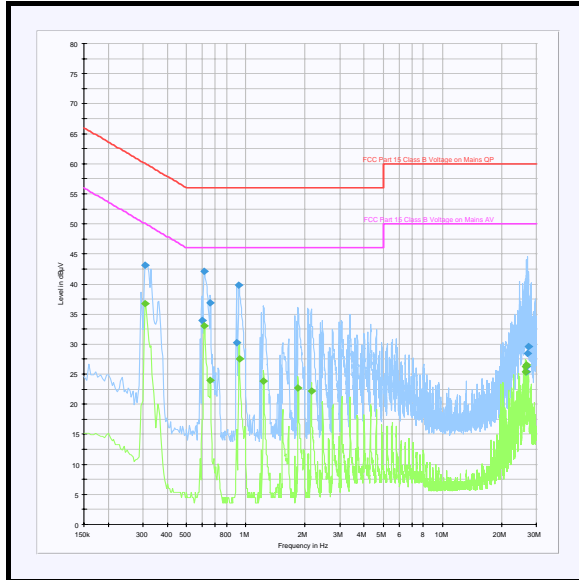
| Frequency (MHz) | Line | Level (dB μ V) | Limit (dB μ V) | Margin (dB) | Result |
|-----------------|---------|--------------------|--------------------|-------------|----------|
| 0.307500 | Live | 43.1 | 60.0 | 16.9 | Complied |
| 0.600000 | Neutral | 34.0 | 56.0 | 22.0 | Complied |
| 0.613500 | Live | 42.1 | 56.0 | 13.9 | Complied |
| 0.658500 | Neutral | 36.9 | 56.0 | 19.1 | Complied |
| 0.897000 | Live | 30.3 | 56.0 | 25.7 | Complied |
| 0.919500 | Neutral | 39.8 | 56.0 | 16.2 | Complied |
| 26.682000 | Live | 25.4 | 60.0 | 34.6 | Complied |
| 26.718000 | Neutral | 26.3 | 60.0 | 33.7 | Complied |
| 26.965500 | Neutral | 28.4 | 60.0 | 31.6 | Complied |
| 27.276000 | Neutral | 29.6 | 60.0 | 30.4 | Complied |

Average Detector Measurements on Live and Neutral Lines

| Frequency (MHz) | Line | Level (dB μ V) | Limit (dB μ V) | Margin (dB) | Result |
|-----------------|---------|--------------------|--------------------|-------------|----------|
| 0.307500 | Live | 36.8 | 50.0 | 13.2 | Complied |
| 0.613500 | Live | 33.0 | 46.0 | 13.0 | Complied |
| 0.658500 | Neutral | 23.9 | 46.0 | 22.1 | Complied |
| 0.924000 | Neutral | 27.5 | 46.0 | 18.5 | Complied |
| 1.230000 | Live | 23.9 | 46.0 | 22.1 | Complied |
| 1.842000 | Live | 22.7 | 46.0 | 23.3 | Complied |
| 2.148000 | Live | 22.3 | 46.0 | 23.7 | Complied |
| 26.488500 | Neutral | 26.3 | 50.0 | 23.7 | Complied |
| 26.547000 | Live | 25.4 | 50.0 | 24.6 | Complied |
| 26.610000 | Neutral | 26.5 | 50.0 | 23.5 | Complied |

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Transmitter AC Conducted Spurious Emissions (Continued)



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

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7.2.2. Transmitter Fundamental Field Strength

Test Summary:

| | |
|-------------------|--|
| FCC Part: | 15.249(a) |
| Test Method Used: | As detailed in ANSI C63.4 Section 8 and relevant annexes |

Environmental Conditions:

| | |
|------------------------|----|
| Temperature (°C): | 19 |
| Relative Humidity (%): | 35 |

Peak Level Results:

| Frequency (MHz) | Antenna Polarity | Detector Level (dB μ V) | Transducer Factor (dB) | Peak Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|-----------------------------|------------------------|---------------------------|----------------------|-------------|----------|
| 2405 | Horizontal | 102.3 | -7.7 | 94.6 | 114.0 | 19.4 | Complied |
| 2440 | Horizontal | 106.9 | -8.0 | 98.9 | 114.0 | 15.1 | Complied |
| 2475 | Horizontal | 105.1 | -8.2 | 96.9 | 114.0 | 17.1 | Complied |

Average Level Results:

| Frequency (MHz) | Antenna Polarity | Detector Level (dB μ V) | Transducer Factor (dB) | Peak Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|-----------------------------|------------------------|---------------------------|----------------------|-------------|----------|
| 2405 | Horizontal | 80.1 | -7.7 | 72.4 | 94.0 | 21.6 | Complied |
| 2440 | Horizontal | 84.7 | -8.0 | 76.7 | 94.0 | 17.3 | Complied |
| 2475 | Horizontal | 82.9 | -8.2 | 74.7 | 94.0 | 19.3 | Complied |

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7.2.3. Transmitter 20 dB Bandwidth

Test Summary:

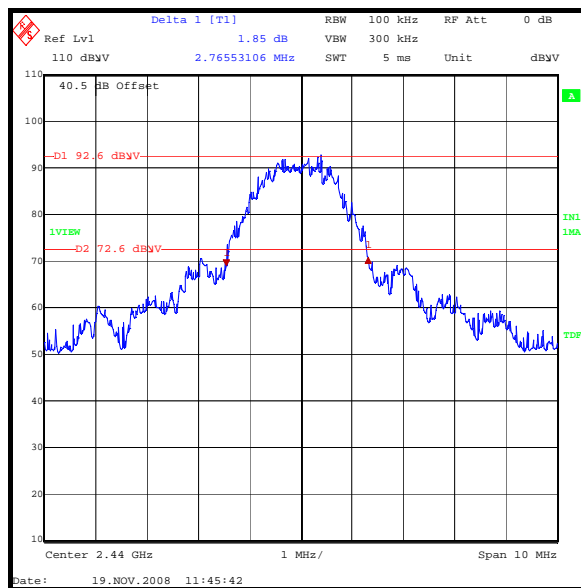
| | |
|-------------------|---|
| FCC Part: | 2.1049 |
| Test Method Used: | As detailed in ANSI C63.4 Section 13.1.7 and relevant annexes |

Environmental Conditions:

| | |
|------------------------|----|
| Temperature (°C): | 19 |
| Relative Humidity (%): | 35 |

Results:

| |
|--|
| Transmitter 20 dB Bandwidth (MHz) |
| 2.765 |



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7.2.4. Transmitter Radiated Emissions

Test Summary:

| | |
|-------------------|--|
| FCC Part: | 15.249(a)(d)(e) & 15.209 |
| Test Method Used: | As detailed in ANSI C63.4 Section 8 and relevant annexes |
| Frequency Range: | 30 MHz to 1 GHz |

Environmental Conditions:

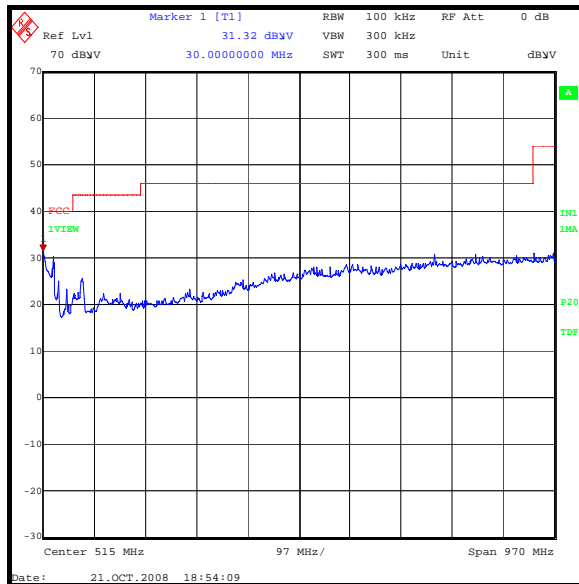
| | |
|------------------------|----|
| Temperature (°C): | 22 |
| Relative Humidity (%): | 37 |

Results:

| Frequency (MHz) | Antenna Polarity | Q-P Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|-----------------|------------------|--------------------|----------------|-------------|----------|
| 30.000 | Vertical | 31.3 | 40.0 | 8.7 | Complied |

Note(s):

- 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.



30 MHz to 1 GHz

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7.2.5. Transmitter Radiated Emissions (Continued)

Test Summary:

| | |
|-------------------|--|
| FCC Part: | 15.249(a)(d)(e) & 15.209 |
| Test Method Used: | As detailed in ANSI C63.4 Section 8 and relevant annexes |
| Frequency Range: | 1 GHz to 26 GHz |

Environmental Conditions:

| | |
|------------------------|----|
| Temperature (°C): | 28 |
| Relative Humidity (%): | 30 |

Results: Highest Peak Level:

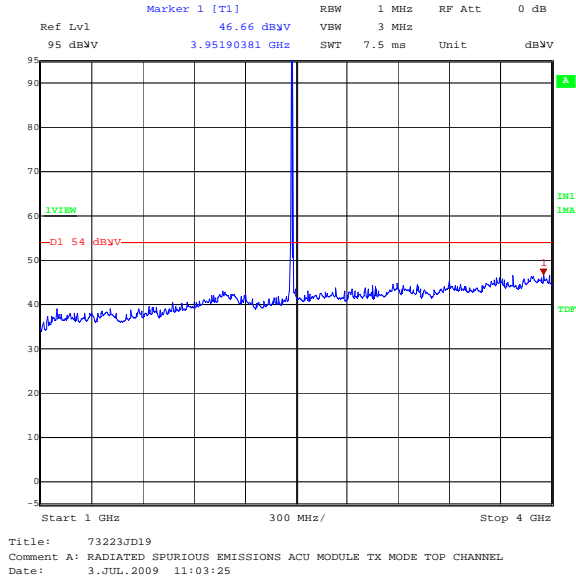
| Frequency (MHz) | Antenna Polarity | Detector Level (dB μ V) | Transducer Factor (dB) | Peak Level (dB μ V/m) | Average Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|-----------------------------|------------------------|---------------------------|------------------------------|-------------|----------|
| 16590.180 | Vertical | 44.4 | 2.0 | 46.4 | 54.0 | 7.6 | Complied |

Note(s):

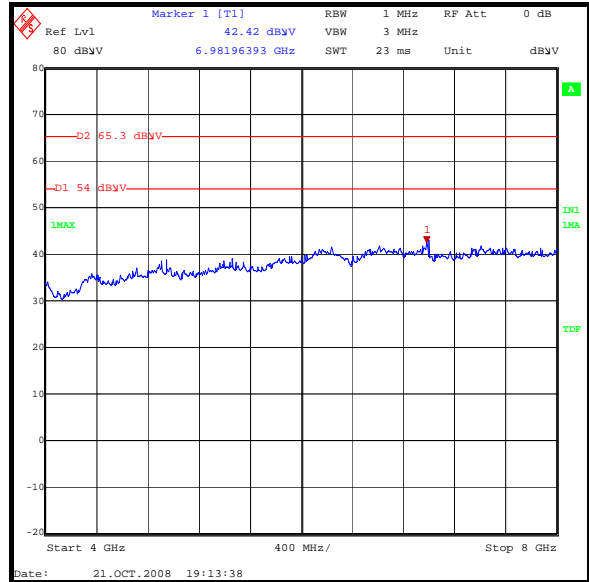
- No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
- All other emissions were at least 20 dB below the specification limit.

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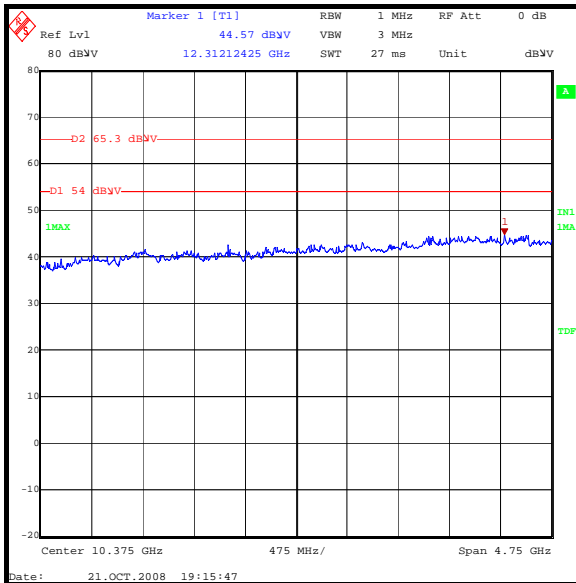
Transmitter Radiated Emissions (Continued)



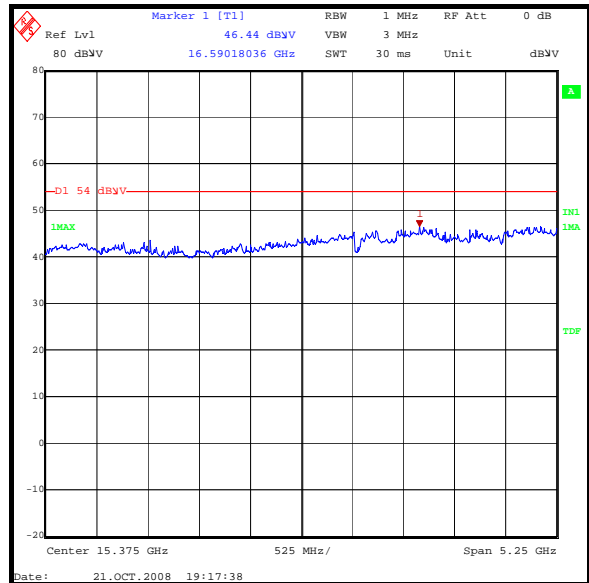
1 GHz to 4 GHz



4 GHz to 8 GHz



8 GHz to 12.75 GHz

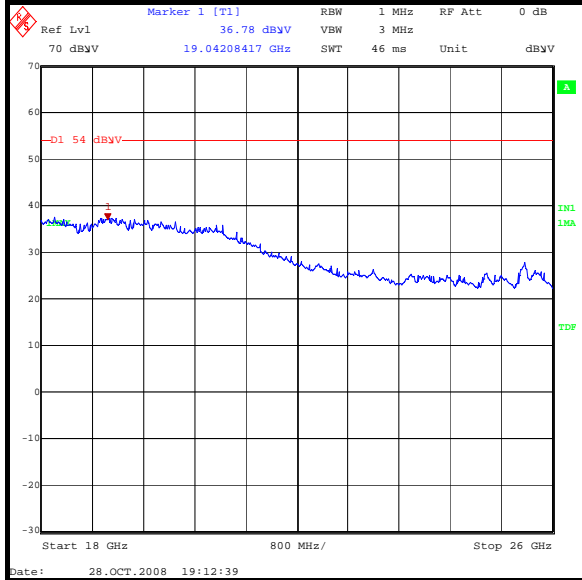


12.75 GHz to 18 GHz

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

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Transmitter Radiated Emissions: Section 15.249(a)(d)(e) & Section 15.209 (Continued)



18 GHz to 26 GHz

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

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7.2.6. Transmitter Radiated Emissions at Band Edges

Test Summary:

| | |
|-------------------|--|
| FCC Part: | 15.249(d) & 15.209 |
| Test Method Used: | As detailed in ANSI C63.4 Section 8 and relevant annexes |

Environmental Conditions:

| | |
|------------------------|----|
| Temperature (°C): | 30 |
| Relative Humidity (%): | 28 |

Peak Power Level:

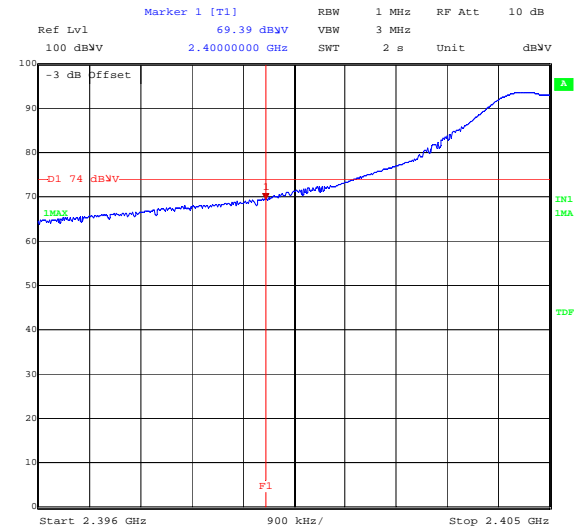
| Frequency (GHz) | Antenna Polarity | Detector Level (dB μ V) | Transducer Factor (dB) | Actual Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|-----------------------------|------------------------|-----------------------------|----------------------|-------------|----------|
| 2.4000 | Horizontal | 77.1 | -7.7 | 69.4 | 74.0 | 4.6 | Complied |
| 2.4835 | Horizontal | 73.5 | -8.2 | 65.3 | 74.0 | 8.7 | Complied |

Average Power Level:

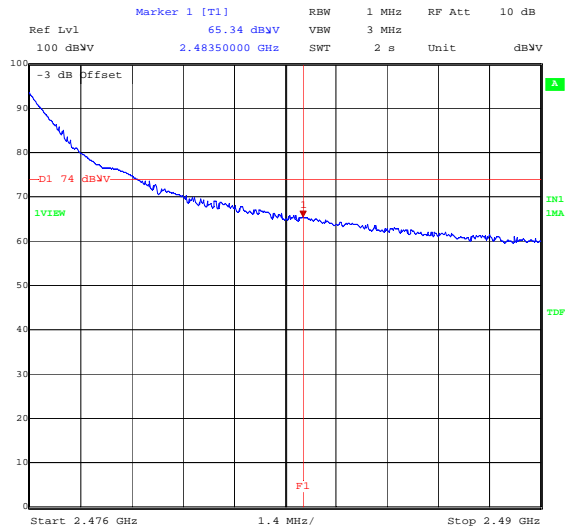
| Frequency (GHz) | Antenna Polarity | Detector Level (dB μ V) | Transducer Factor (dB) | Actual Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Result |
|-----------------|------------------|-----------------------------|------------------------|-----------------------------|----------------------|-------------|----------|
| 2.4000 | Horizontal | 43.0 | -7.7 | 35.3 | 54.0 | 18.7 | Complied |
| 2.4835 | Horizontal | 37.0 | -8.2 | 28.8 | 54.0 | 22.5 | Complied |

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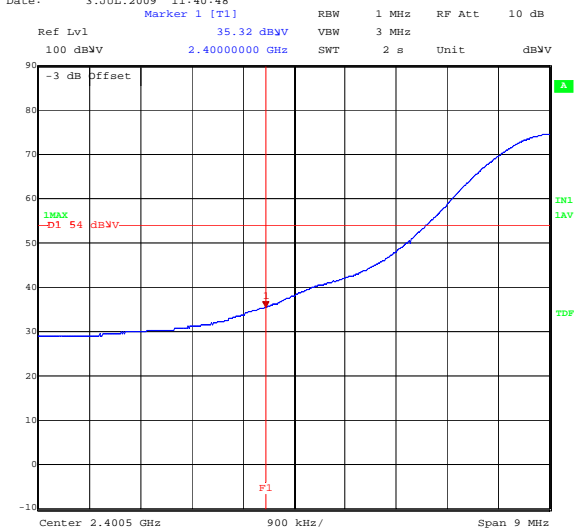
Transmitter Radiated Emissions at Band Edges (Continued)



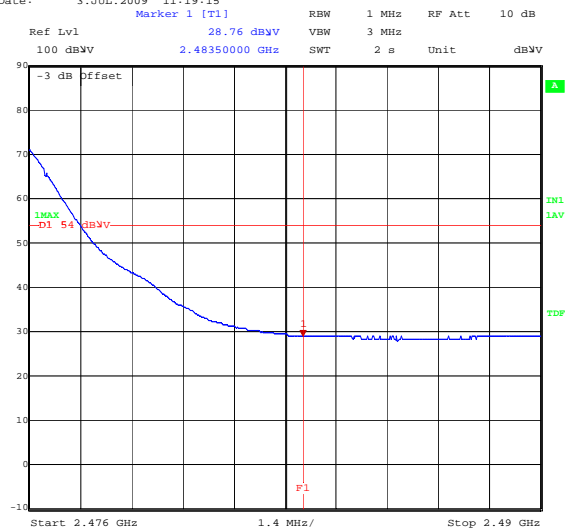
Title: 73223JD19
 Comment A: TRANSMITTER BAND EDGE - ACU MODULE - TX MODE BOTTOM CHANNEL
 Date: 3.JUL.2009 11:40:48



Title: 73223JD19
 Comment A: TRANSMITTER BAND EDGE - ACU MODULE - TX MODE TOP CHANNEL
 Date: 3.JUL.2009 11:19:15



Title: 73223JD19
 Comment A: TRANSMITTER BAND EDGE - ACU MODULE - TX MODE BOTTOM CHANNEL
 Date: 3.JUL.2009 11:44:45



Title: 73223JD19
 Comment A: TRANSMITTER BAND EDGE - ACU MODULE - TX MODE TOP CHANNEL
 Date: 3.JUL.2009 11:26:25

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8. 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% | ±3.25 dB |
| Fundamental Field Strength | Not Applicable | 95% | ±2.94 dB |
| 20 dB Bandwidth | Not Applicable | 95% | ±0.92 ppm |
| Radiated Spurious Emissions | 30 MHz to 40 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.

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Appendix 1. Test Equipment Used

| RFI No. | Instrument | Manufacturer | Type No. | Serial No. | Date Last Calibrated | Cal. Interval (Months) |
|---------|----------------|-----------------|----------|------------|----------------------|------------------------|
| A004 | LISN | Rohde & Schwarz | ESH3-Z5 | 890604/027 | 30 Apr 2009 | 12 |
| A1818 | Antenna | EMCO | 3115 | 00075692 | 25 Oct 2008 | 12 |
| A1830 | Pulse Limiter | Rhode & Schwarz | ESH3-Z2 | 100668 | 05 Jan 2009 | 12 |
| K0001 | 5m SA Chamber | Rainford EMC | N/A | N/A | 13 Aug 2008 | 12 |
| K0002 | 3m RSE Chamber | Rainford EMC | N/A | N/A | 28 Aug 2008 | 12 |
| M1124 | Test Receiver | Rohde & Schwarz | ESIB26 | 100046K | 09 Mar 2009 | 12 |
| M1263 | Test Receiver | Rohde & Schwarz | ESIB7 | 100265 | 22 Apr 2009 | 12 |

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