

## TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**Test Report Serial No:**  
RFI\MPTE1\RP47892JD02A

|                                                                                                                             |                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>This Test Report Is Issued Under The Authority<br/>Of Andrew Brown, Operations Manager:</b>                              |                                                                                                                          |
| <br>pp                                   |                                                                                                                          |
| <b>Tested By: Fara Razally</b><br><br>pp | <b>Checked By: Nigel Davison</b><br> |
| <b>Report Copy No: PDF01</b>                                                                                                |                                                                                                                          |
| <b>Issue Date: 31 January 2006</b>                                                                                          | <b>Test Dates: 15 December 2005 to 19 January 2006</b>                                                                   |

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This report may be copied in full. The results in this report apply only to the sample(s) tested.

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Registered in England and Wales. Company number: 2117901

**Test of:** Psion Teklogix UK Ltd.  
7535 + RA3020

**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020  
To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**Table of Contents**

1. Client Information .....4

2. Equipment Under Test (EUT) .....5

3. Test Specification, Methods and Procedures ..... 12

4. Deviations from the Test Specification ..... 13

5. Operation of the EUT During Testing..... 14

6. Summary of Test Results ..... 15

7. Measurements, Examinations and Derived Results ..... 17

8. Measurement Uncertainty ..... 54

9. Measurement Methods ..... 55

Appendix 1. Test Equipment Used ..... 68

Appendix 2. Test Configuration Drawings..... 70

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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## **1. Client Information**

|                      |                                                                                     |
|----------------------|-------------------------------------------------------------------------------------|
| <b>Company Name:</b> | Psion Teklogix UK Ltd.                                                              |
| <b>Address:</b>      | Unit Q Bourne End Business Park<br>Cores End Road<br>Bourne End<br>Bucks<br>SL8 5AS |
| <b>Contact Name:</b> | Mr S Lucas                                                                          |

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**Test of:** Psion Teklogix UK Ltd.  
7535 + RA3020

**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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## **2. Equipment Under Test (EUT)**

The following information (with the exception of the Date of Receipt) has been supplied by the client:

### **2.1. Identification of Equipment Under Test (EUT)**

|                                    |                  |
|------------------------------------|------------------|
| <b>Brand Name:</b>                 | Psion Teklogix   |
| <b>Model Name or Number:</b>       | 7535 + RA3020    |
| <b>Serial Number:</b>              | None Stated      |
| <b>Hardware Version:</b>           | 7535RA3020A      |
| <b>Software Version:</b>           | None Stated      |
| <b>Software Version Number:</b>    | 01               |
| <b>Hardware Rev. of GSM Module</b> | B                |
| <b>Software Rev. of GSM Module</b> | 0.6.1 (SVN11)    |
| <b>FCC ID Number:</b>              | GM37535GSMA      |
| <b>Country of Manufacture:</b>     | Canada           |
| <b>Date of Receipt:</b>            | 15 December 2005 |

|                                    |                  |
|------------------------------------|------------------|
| <b>Brand Name:</b>                 | Psion Teklogix   |
| <b>Model Name or Number:</b>       | HU1005           |
| <b>Unique Type Identification:</b> | None Stated      |
| <b>Serial Number:</b>              | 0000524420       |
| <b>Country of Manufacture:</b>     | Canada           |
| <b>Date of Receipt:</b>            | 15 December 2005 |

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**Test of:** Psion Teklogix UK Ltd.  
7535 + RA3020

**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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## **2.2. Accessories**

The following accessories were supplied with the EUT:

|                               |                |
|-------------------------------|----------------|
| <b>Description:</b>           | AC/DC Adaptor  |
| <b>Brand Name:</b>            | Sino-American  |
| <b>Model Name or Number:</b>  | SA150A-1533U-3 |
| <b>Serial Number:</b>         | None Stated    |
| <b>Cable Length and Type:</b> | None Stated    |
| <b>Connected to Port:</b>     | None Stated    |

|                               |               |
|-------------------------------|---------------|
| <b>Description:</b>           | 128M MMC Card |
| <b>Brand Name:</b>            | Fulifilm      |
| <b>Model Name or Number:</b>  | None Stated   |
| <b>Serial Number:</b>         | None Stated   |
| <b>Cable Length and Type:</b> | None Stated   |
| <b>Connected to Port:</b>     | None Stated   |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **2.3. Description of EUT**

The equipment under test is a 7535 rugged handheld terminal (i.e. a PC) running Windows CE.net 4.2 Pro. The RA3020 is dual band (850 MHz/1900 MHz) PCS radio option that is integrated inside the 7535 to offer the user the ability to access/send data in real time. The 7535 + RA3020 is used for logistic support, inventory, warehousing, etc.

### **2.4. Modifications Incorporated in EUT**

During the course of testing the EUT was not modified.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**2.5. Additional Information Related to Testing FCC Part 22**

|                                        |                                                                                              |                       |                                |
|----------------------------------------|----------------------------------------------------------------------------------------------|-----------------------|--------------------------------|
| <b>Power Supply Requirement:</b>       | Nominal 115 V 60 Hz AC Mains supply and Internal battery supply of 7.4 V nominal.            |                       |                                |
| <b>Intended Operating Environment:</b> | Residential, Commercial, Light Industry and within PCS coverage.                             |                       |                                |
| <b>Equipment Category:</b>             | GSM 850/GSM 1900                                                                             |                       |                                |
| <b>Type of Unit:</b>                   | Base Station (Fixed Use), Portable (Standalone battery powered device) and Ancillary (Radio) |                       |                                |
| <b>Transmit Frequency Range:</b>       | 824.2 MHz to 848.8 MHz                                                                       |                       |                                |
| <b>Transmit Channels Tested:</b>       | <b>Channel ID</b>                                                                            | <b>Channel Number</b> | <b>Channel Frequency (MHz)</b> |
|                                        | Bottom                                                                                       | 128                   | 824.2                          |
|                                        | Middle                                                                                       | 190                   | 836.6                          |
|                                        | Top                                                                                          | 251                   | 848.8                          |
| <b>Receive Frequency Range:</b>        | 869.2 MHz to 893.8 MHz                                                                       |                       |                                |
| <b>Receive Channels Tested:</b>        | <b>Channel ID</b>                                                                            | <b>Channel Number</b> | <b>Channel Frequency (MHz)</b> |
|                                        | Bottom                                                                                       | 128                   | 869.2                          |
|                                        | Middle                                                                                       | 190                   | 881.6                          |
|                                        | Top                                                                                          | 251                   | 893.8                          |
| <b>Maximum Peak Power Output (ERP)</b> | 31.2 dBm                                                                                     |                       |                                |

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**Test of:** Psion Teklogix UK Ltd.  
7535 + RA3020

**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**Additional Information Related to Testing FCC Part 24 (Continued)**

|                                         |                                                                                              |                       |                                |
|-----------------------------------------|----------------------------------------------------------------------------------------------|-----------------------|--------------------------------|
| <b>Power Supply Requirement:</b>        | Nominal 115 V 60 Hz AC Mains supply and Internal battery supply of 7.4 V nominal.            |                       |                                |
| <b>Intended Operating Environment:</b>  | Residential, Commercial, Light Industry and within PCS coverage.                             |                       |                                |
| <b>Equipment Category:</b>              | GSM 850/GSM 1900                                                                             |                       |                                |
| <b>Type of Unit:</b>                    | Base Station (Fixed Use), Portable (Standalone battery powered device) and Ancillary (Radio) |                       |                                |
| <b>Transmit Frequency Range:</b>        | 1850.2 MHz to 1909.8 MHz                                                                     |                       |                                |
| <b>Transmit Channels Tested:</b>        | <b>Channel ID</b>                                                                            | <b>Channel Number</b> | <b>Channel Frequency (MHz)</b> |
|                                         | Bottom                                                                                       | 512                   | 1850.2                         |
|                                         | Middle                                                                                       | 660                   | 1879.8                         |
|                                         | Top                                                                                          | 810                   | 1909.8                         |
| <b>Receive Frequency Range:</b>         | 1930.2 MHz to 1989.8 MHz                                                                     |                       |                                |
| <b>Receive Channels Tested:</b>         | <b>Channel ID</b>                                                                            | <b>Channel Number</b> | <b>Channel Frequency (MHz)</b> |
|                                         | Bottom                                                                                       | 512                   | 1930.2                         |
|                                         | Middle                                                                                       | 660                   | 1960.0                         |
|                                         | Top                                                                                          | 810                   | 1989.8                         |
| <b>Maximum Peak Power Output (EIRP)</b> | 30.9                                                                                         |                       |                                |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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## **2.6. Port Identification**

| Port | Description             | Type/Length                                   | Applicable |
|------|-------------------------|-----------------------------------------------|------------|
| 1    | Portable Docking Module | 0 Metres (clip onto the base of the terminal) | Y          |
| 2    | Tether Port             | 1.8m Screened                                 | Y          |

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**Test of:** Psion Teklogix UK Ltd.  
7535 + RA3020

**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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## **2.7. Support Equipment**

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

|                               |                |
|-------------------------------|----------------|
| <b>Description:</b>           | Laptop         |
| <b>Brand Name:</b>            | Dell           |
| <b>Model Name or Number:</b>  | Latitude C PPX |
| <b>Serial Number:</b>         | INDS 00372     |
| <b>Cable Length and Type:</b> | None Stated    |
| <b>Connected to Port:</b>     | None Stated    |

|                               |                                  |
|-------------------------------|----------------------------------|
| <b>Description:</b>           | Optical USB Mouse                |
| <b>Brand Name:</b>            | Microsoft                        |
| <b>Model Name or Number:</b>  | X08-71118-PID56180-576-2143156-1 |
| <b>Serial Number:</b>         | None Stated                      |
| <b>Cable Length and Type:</b> | None Stated                      |
| <b>Connected to Port:</b>     | None Stated                      |

|                               |                                    |
|-------------------------------|------------------------------------|
| <b>Description:</b>           | AC/DC Adaptor for the Laptop       |
| <b>Brand Name:</b>            | Dell                               |
| <b>Model Name or Number:</b>  | ADP-70EB PA-6 Family 09364U-C/O TH |
| <b>Serial Number:</b>         | None Stated                        |
| <b>Cable Length and Type:</b> | None Stated                        |
| <b>Connected to Port:</b>     | None Stated                        |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **3. Test Specification, Methods and Procedures**

#### **3.1. Test Specifications**

|                   |                                                                                    |
|-------------------|------------------------------------------------------------------------------------|
| <b>Reference:</b> | FCC Part 22: 2004 Subpart H (Cellular Radiotelephone Service)                      |
| <b>Title:</b>     | Code of Federal Regulations, Part 22 (47CFR22)<br>Personal Communication Services. |

|                   |                                                                                    |
|-------------------|------------------------------------------------------------------------------------|
| <b>Reference:</b> | FCC Part 24 Subpart E: 2004 (Broadband PCS)                                        |
| <b>Title:</b>     | Code of Federal Regulations, Part 24 (47CFR24)<br>Personal Communication Services. |

#### **3.2. Methods and Procedures**

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

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.

ANSI C63.5 (1988)

Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)

Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)

Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

#### **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.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **4. Deviations from the Test Specification**

None.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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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.

Preliminary radiated scans were performed on the EUT with the accessories stated in section 2.5 of this report connected and then disconnected. The combination that exhibited the worst-case mode of operation was then used to perform final measurements.

In transmit mode with GSM Active

In idle mode

Transmitter Modes:

For carrier output power, occupied bandwidth and final transmitter radiated measurements, testing was performed at full power on top, middle and bottom channels of the assigned frequency block. For frequency stability testing, measurements were performed at full power on the top and bottom channel of the assigned frequency block at -30°C through to +50°C in 10° increments.

All transmitter radiated spurious pre-scan tests were performed at full power on the top channel of the assigned frequency block. Final measurements were then performed on the top, middle and bottom channels if an emission was identified.

Receiver/Idle Modes:

Testing was performed with the call terminated from the GSM Test Simulator and the phone left in its Idle mode.

### **5.2. Configuration and Peripherals**

The EUT was tested in the following configuration:

Configured with its portable docking module (PDM) connected, which contains USB, RS232 and AC mains charger port. The PDM port was connected a USB mouse, USB cable, RS232 cable and AC Mains supply

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**Test of:** Psion Teklogix UK Ltd.  
7535 + RA3020**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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## **6. Summary of Test Results**

### **FCC Part 22 (Subpart H)**

| <b>Range of Measurements</b>                                      | <b>Specification Reference</b>                    | <b>Port Type</b>  | <b>Compliance Status</b> |
|-------------------------------------------------------------------|---------------------------------------------------|-------------------|--------------------------|
| Receiver/Idle AC Conducted Spurious Emissions (150 kHz to 30 MHz) | C.F.R. 47 FCC Part 15: 2004 Section 15.107        | AC Mains Input    | Complied                 |
| Receiver/Idle Radiated Emissions                                  | C.F.R. 47 FCC Part 15: 2004 Section 15.109        | Enclosure         | Complied                 |
| Transmitter Effective Radiated Power (ERP)                        | C.F.R. 47 FCC Part 22: 2004 Section 22.913(a)     | Antenna           | Complied                 |
| Transmitter Frequency Stability (Temperature Variation)           | C.F.R. 47 FCC Part 22: 2004 Section 22.355        | Antenna Terminals | Complied                 |
| Transmitter Frequency Stability (Voltage Variation)               | C.F.R. 47 FCC Part 22: 2004 Section 22.355        | Antenna Terminals | Complied                 |
| Transmitter Occupied Bandwidth                                    | C.F.R. 47 FCC Part 22: 2004 Section 2.1049        | Antenna Terminals | Complied                 |
| Transmitter Out of Band Radiated Emissions                        | C.F.R. 47 FCC Part 22: 2004 Section 2.1053/22.917 | Antenna           | Complied                 |
| Transmitter Band Edge Radiated Emissions                          | C.F.R. 47 FCC Part 22: 2004 Section 2.1053/22.917 | Antenna           | Complied                 |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **Summary of Test Results (Continued)**

#### **FCC Part 24 (Subpart E)**

| Range of Measurements                                         | Specification Reference                           | Port Type         | Compliance Status |
|---------------------------------------------------------------|---------------------------------------------------|-------------------|-------------------|
| Idle Mode AC Conducted Spurious Emissions (150 kHz to 30 MHz) | C.F.R. 47 FCC Part 15: 2004 Section 15.107        | AC Mains Input    | Complied          |
| Idle Mode Radiated Spurious Emissions                         | C.F.R. 47 FCC Part 15: 2004 Section 15.109        | Enclosure         | Complied          |
| Transmitter Effective Isotropic Radiated Power (EIRP)         | C.F.R. 47 FCC Part 24: 2004 Section 24.232        | Antenna           | Complied          |
| Transmitter Frequency Stability (Temperature Variation)       | C.F.R. 47 FCC Part 24: 2004 Section 24.235        | Antenna Terminals | Complied          |
| Transmitter Frequency Stability (Voltage Variation)           | C.F.R. 47 FCC Part 24: 2004 Section 24.235        | Antenna Terminals | Complied          |
| Transmitter Occupied Bandwidth                                | C.F.R. 47 FCC Part 24: 2004 Section 24.238        | Antenna Terminals | Complied          |
| Transmitter Out of Band Radiated Emissions                    | C.F.R. 47 FCC Part 24: 2004 Section 2.1053/24.238 | Antenna           | Complied          |
| Transmitter Band Edge Radiated Emissions                      | C.F.R. 47 FCC Part 2: 2004 Section 2.1053/24.238  | Antenna           | Complied          |

#### **6.1. Location of Tests**

All the measurements described in this report were performed at the premises of RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England and RFI Global Services Ltd, Pavilion, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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

### **7.1. General Comments**

This section contains test results only.

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.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

## **7.2. Test Results FCC Part 22 (Subpart H)**

### **7.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions: Section 15.107**

The EUT was configured as for ac conducted emission measurements as described in section 9 of this report.

Tests were performed to identify the maximum emission levels present on the ac mains line of the EUT.

#### **Results:**

#### **Quasi-Peak Detector Measurements on Live and Neutral Lines**

| Frequency (MHz) | Line    | Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|---------|--------------------|--------------------|-------------|----------|
| 0.18544         | Neutral | 47.03              | 64.24              | 17.21       | Complied |
| 0.24844         | Neutral | 40.61              | 62.81              | 21.20       | Complied |
| 0.31018         | Neutral | 35.66              | 59.97              | 24.31       | Complied |
| 0.37234         | Neutral | 38.91              | 58.45              | 19.54       | Complied |
| 4.05928         | Live    | 31.67              | 56.00              | 24.33       | Complied |
| 4.68739         | Live    | 30.02              | 56.00              | 25.93       | Complied |
| 7.75216         | Live    | 23.60              | 60.00              | 36.40       | Complied |
| 15.19546        | Live    | 30.55              | 60.00              | 29.45       | Complied |

#### **Average Detector Measurements on Live and Neutral Lines**

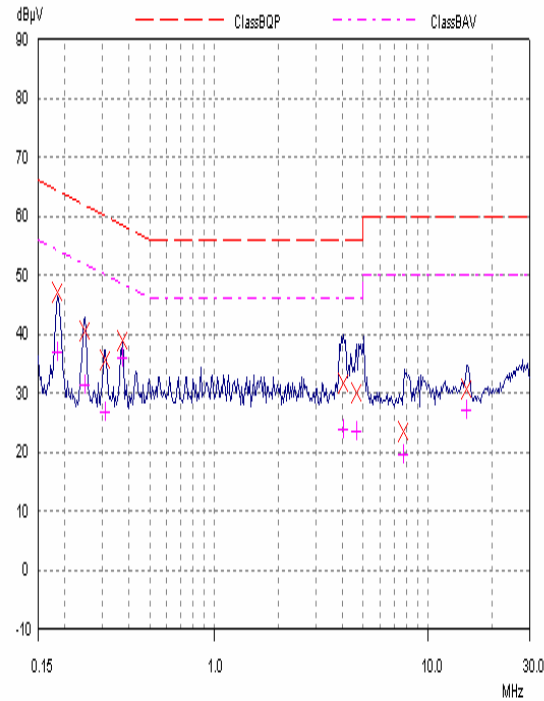
| Frequency (MHz) | Line    | Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|---------|--------------------|--------------------|-------------|----------|
| 0.18544         | Neutral | 36.80              | 54.24              | 17.44       | Complied |
| 0.24844         | Neutral | 31.21              | 51.81              | 20.60       | Complied |
| 0.31018         | Neutral | 26.64              | 49.97              | 23.33       | Complied |
| 0.37234         | Neutral | 36.06              | 48.45              | 12.39       | Complied |
| 4.05928         | Live    | 23.72              | 46.00              | 22.28       | Complied |
| 4.68739         | Live    | 23.42              | 46.00              | 22.58       | Complied |
| 7.75216         | Neutral | 19.38              | 50.00              | 30.62       | Complied |
| 15.19546        | Neutral | 26.97              | 50.00              | 23.03       | Complied |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**Receiver/Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)**



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

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**7.2.2. Receiver/Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)**

The EUT was configured as for radiated emission – Part 22 testing as described in section 9 of this report.

Tests were performed to identify the maximum receiver or standby radiated emission levels.

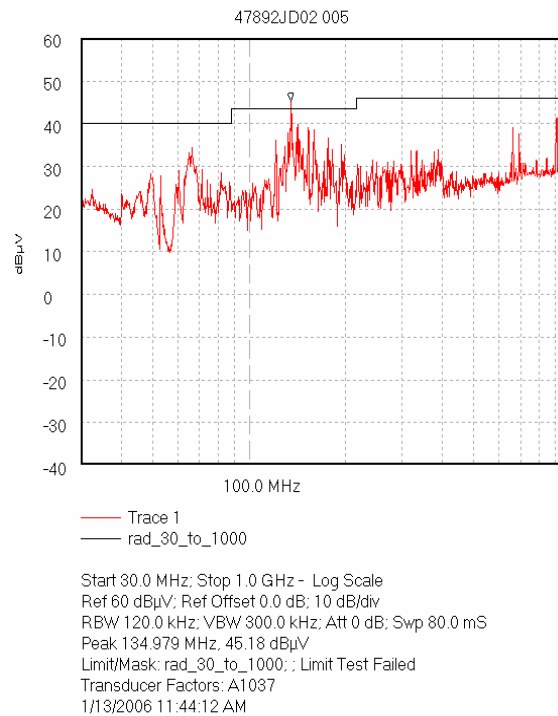
**Results:**

| Frequency (MHz) | Antenna Polarity | Quasi Peak Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|---------------------------------|----------------------|-------------|----------|
| 40.126          | Vertical         | 21.4                            | 40.0                 | 18.6        | Complied |
| 49.327          | Vertical         | 18.6                            | 40.0                 | 21.4        | Complied |
| 52.830          | Vertical         | 21.8                            | 40.0                 | 18.2        | Complied |
| 65.266          | Vertical         | 17.1                            | 40.0                 | 22.9        | Complied |
| 66.283          | Vertical         | 20.8                            | 40.0                 | 19.2        | Complied |
| 120.841         | Vertical         | 28.8                            | 43.5                 | 14.7        | Complied |
| 134.779         | Vertical         | 28.1                            | 43.5                 | 15.4        | Complied |
| 135.786         | Vertical         | 18.4                            | 43.5                 | 25.1        | Complied |
| 152.742         | Vertical         | 27.9                            | 43.5                 | 15.6        | Complied |
| 159.751         | Vertical         | 21.4                            | 43.5                 | 22.1        | Complied |
| 176.695         | Vertical         | 24.8                            | 43.5                 | 18.7        | Complied |
| 194.692         | Vertical         | 29.5                            | 43.5                 | 14.0        | Complied |
| 388.151         | Vertical         | 19.4                            | 46.0                 | 26.6        | Complied |
| 697.011         | Vertical         | 26.2                            | 46.0                 | 19.8        | Complied |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**Receiver/Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz) (Continued)**



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

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**7.2.3. Receiver/Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz)****Results:****Highest Peak Level**

| Frequency (MHz) | Antenna Polarity | Detector Level (dB $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|------------------------|-----------------------------|----------------------|-------------|----------|
| 4245.017        | Vertical         | 53.0                        | -17.2                  | 35.8                        | 74.0                 | 38.2        | Complied |
| 9358.470        | Horizontal       | 59.7                        | -13.4                  | 46.3                        | 74.0                 | 27.7        | Complied |

**Highest Average Level**

| Frequency (MHz) | Antenna Polarity | Detector Level (dB $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|------------------------|-----------------------------|----------------------|-------------|----------|
| 4245.017        | Vertical         | 35.5                        | -17.2                  | 18.3                        | 54.0                 | 35.7        | Complied |
| 9358.470        | Horizontal       | 31.2                        | -13.4                  | 17.8                        | 54.0                 | 36.2        | Complied |

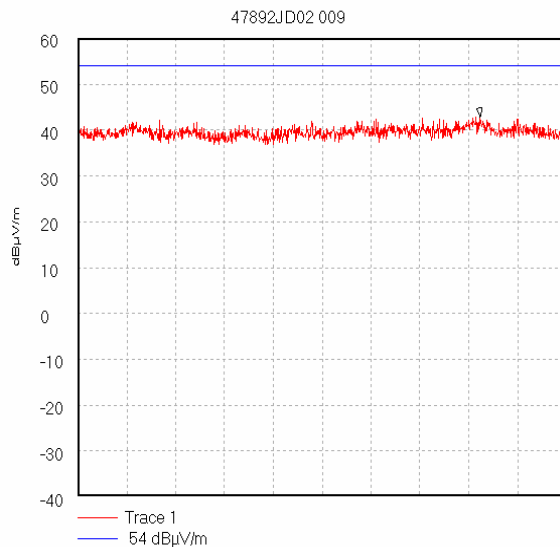
**Note(s):**

1. The transducer factor incorporates the antenna factor, cable losses, pre-amplifier gain and attenuations.

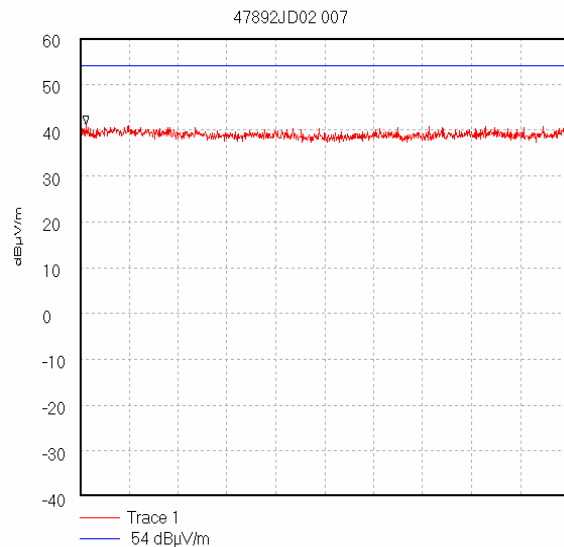
Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

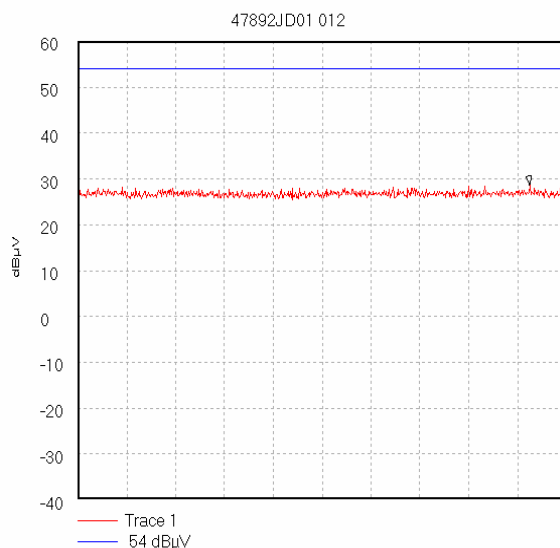
**Receiver/Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (Continued)**



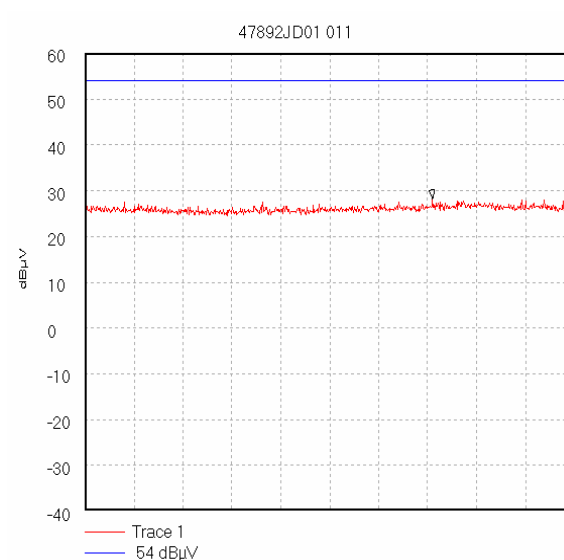
Start 1.0 GHz; Stop 2.0 GHz  
Ref 60 dBμV/m; Ref Offset 1.2 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 1.824 GHz, 42.79 dBμV/m  
Display Line: 54 dBμV/m; Limit Test Passed  
Transducer Factors: 1 to 2  
1/13/2006 1:30:33 PM



Start 2.0 GHz; Stop 4.0 GHz  
Ref 60 dBμV/m; Ref Offset 0.0 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 2.024 GHz, 41.09 dBμV/m  
Limit/Mask: Limit Test Passed  
Transducer Factors: 2 to 4  
1/13/2006 12:49:44 PM



Start 4.0 GHz; Stop 6.0 GHz  
Ref 60 dBμV; Ref Offset 0.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS  
Peak 5.85 GHz, 28.67 dBμV  
Display Line: 54 dBμV; Limit Test Passed  
Transducer Factors: 4G-6G\_Horn(@1m,3m\_cable,A1534)  
15/12/2005 16:56:07



Start 6.0 GHz; Stop 8.0 GHz  
Ref 60 dBμV; Ref Offset 0.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS  
Peak 7.42 GHz, 28.17 dBμV  
Display Line: 54 dBμV; Limit Test Passed  
Transducer Factors: 6G-8G\_Horn(@0.7m,3m\_cable,A1534)  
15/12/2005 16:54:24

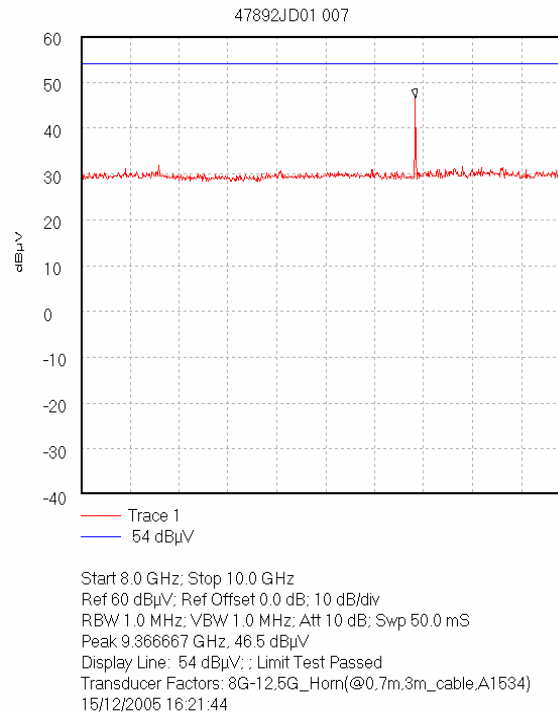
*Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**Receiver/Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (Continued)**



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

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **7.2.4. Transmitter Effective Radiated Power (ERP): Section 22.913(a)**

The EUT was configured as for effective radiated power as described in section 9 of this report.

Tests were performed to identify the maximum effective radiated power (ERP).

#### **Results:**

| Channel | Frequency (MHz) | Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|---------|-----------------|-------------|-------------|-------------|----------|
| Bottom  | 824.2           | 31.2        | 38.4        | 7.2         | Complied |
| Middle  | 836.6           | 31.1        | 38.4        | 7.3         | Complied |
| Top     | 848.8           | 29.8        | 38.4        | 8.6         | Complied |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **7.2.5. Transmitter Frequency Stability (Temperature Variation): Section 22.355**

The EUT was configured as for Part 2.1055 - frequency stability measurements as described in section 9 of this report.

Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

#### **Results:**

##### **Bottom Channel (824.2 MHz)**

| Temperature (°C) | Measured Frequency (MHz) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) | Margin (ppm) | Result   |
|------------------|--------------------------|----------------------|-----------------------|-------------|--------------|----------|
| -30              | 824.200020               | 20                   | 0.02                  | 2.5         | 2.48         | Complied |
| -20              | 824.200020               | 20                   | 0.02                  | 2.5         | 2.48         | Complied |
| -10              | 824.200014               | 14                   | 0.02                  | 2.5         | 2.48         | Complied |
| 0                | 824.200015               | 15                   | 0.02                  | 2.5         | 2.48         | Complied |
| 10               | 824.200019               | 19                   | 0.02                  | 2.5         | 2.48         | Complied |
| 20               | 824.200013               | 13                   | 0.02                  | 2.5         | 2.48         | Complied |
| 30               | 824.200020               | 20                   | 0.02                  | 2.5         | 2.48         | Complied |
| 40               | 824.199994               | 6                    | 0.01                  | 2.5         | 2.49         | Complied |
| 50               | 824.200017               | 17                   | 0.02                  | 2.5         | 2.48         | Complied |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**Transmitter Frequency Stability (Temperature Variation): Section 22.355 (Continued)**

**Results:**

**Top Channel (848.8 MHz)**

| Temperature (°C) | Measured Frequency (MHz) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) | Margin (ppm) | Result   |
|------------------|--------------------------|----------------------|-----------------------|-------------|--------------|----------|
| -30              | 848.799990               | 10                   | 0.01                  | 2.5         | 2.49         | Complied |
| -20              | 848.800011               | 11                   | 0.01                  | 2.5         | 2.49         | Complied |
| -10              | 848.800017               | 17                   | 0.02                  | 2.5         | 2.48         | Complied |
| 0                | 848.800012               | 12                   | 0.01                  | 2.5         | 2.49         | Complied |
| 10               | 848.800010               | 10                   | 0.01                  | 2.5         | 2.49         | Complied |
| 20               | 848.800013               | 13                   | 0.02                  | 2.5         | 2.48         | Complied |
| 30               | 848.800011               | 11                   | 0.01                  | 2.5         | 2.49         | Complied |
| 40               | 848.800015               | 15                   | 0.02                  | 2.5         | 2.48         | Complied |
| 50               | 848.800010               | 10                   | 0.01                  | 2.5         | 2.49         | Complied |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **7.2.6. Transmitter Frequency Stability (Voltage Variation): Section 22.355**

The EUT was configured as for Part 2.1055 frequency stability measurements as described in section 9 of this report.

Tests were performed to identify the maximum frequency error of the EUT with variations in nominal operating voltage.

#### **Results:**

##### **Bottom Channel (824.2 MHz)**

| Supply Voltage (V) | Measured Frequency (MHz) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) | Margin (ppm) | Result   |
|--------------------|--------------------------|----------------------|-----------------------|-------------|--------------|----------|
| 7.1                | 824.200029               | 29                   | 0.04                  | 2.5         | 2.46         | Complied |
| 8.4                | 824.200022               | 22                   | 0.03                  | 2.5         | 2.47         | Complied |

##### **Top Channel (848.8 MHz)**

| Supply Voltage (V) | Measured Frequency (MHz) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) | Margin (ppm) | Result   |
|--------------------|--------------------------|----------------------|-----------------------|-------------|--------------|----------|
| 7.1                | 848.800014               | 14                   | 0.02                  | 2.5         | 2.48         | Complied |
| 8.4                | 848.800016               | 16                   | 0.02                  | 2.5         | 2.48         | Complied |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **7.2.7. Transmitter Occupied Bandwidth: Section 2.1049**

The EUT was configured as for occupied bandwidth measurements as described in section 9 of this report.

Tests were performed to identify the maximum bandwidth occupied by the fundamental frequency of the EUT.

#### **Results:**

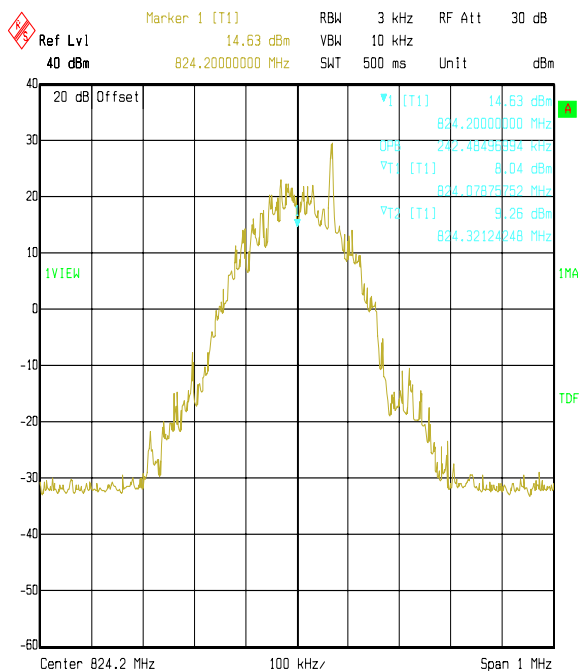
| Channel | Frequency<br>(MHz) | Resolution<br>Bandwidth<br>(kHz) | Video Bandwidth<br>(kHz) | Occupied<br>Bandwidth<br>(kHz) |
|---------|--------------------|----------------------------------|--------------------------|--------------------------------|
| Bottom  | 824.2              | 3.0                              | 10.0                     | 242.485                        |
| Middle  | 836.6              | 3.0                              | 10.0                     | 244.489                        |
| Top     | 848.8              | 3.0                              | 10.0                     | 236.473                        |

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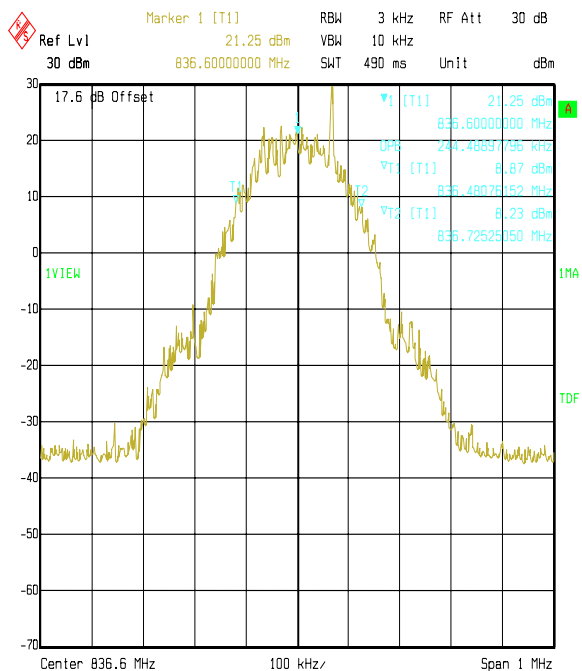
Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

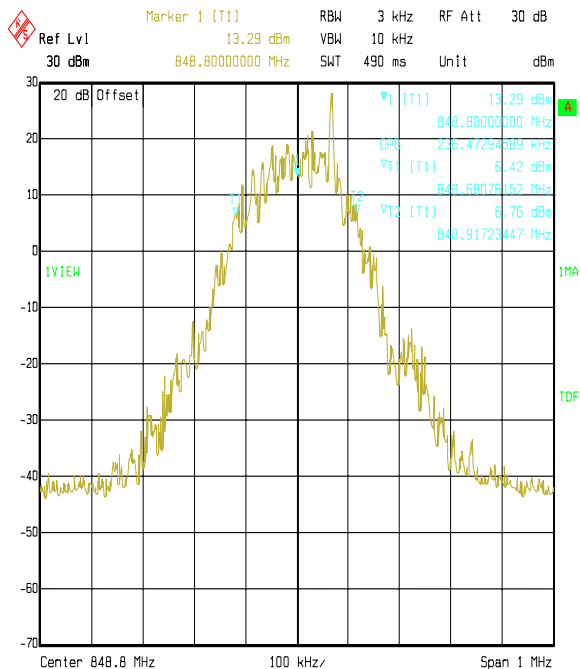
### Transmitter Occupied Bandwidth: Section 2.1049 (Continued)



Title: 47892JD02 Psion Teklogix EUT: 7535 FCC Part 22&24  
Comment A: Transmitter Occupied Bandwidth Bottom Channel  
Date: 18.JAN.2006 12:29:20



Title: 47892JD02 Psion Teklogix EUT: 7535 FCC Part 22&24  
Comment A: Transmitter Occupied Bandwidth Middle Channel  
Date: 18.JAN.2006 12:33:00



Title: 47892JD02 Psion Teklogix EUT: 7535 FCC Part 22&24  
Comment A: Transmitter Occupied Bandwidth Top Channel  
Date: 18.JAN.2006 12:38:18

*Note: The occupied bandwidth is measured using the internal OBW function of the measurement analyser. The analyser automatically configures the measurement bandwidths to make an accurate measurement. The results can be observed in the right hand corner of the graphs.*

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **7.2.8. Transmitter Out of Band Radiated Emissions: Section 2.1053 & 22.917**

The EUT was configured as for transmitter radiated emission – Part 22 testing as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

#### **Results:**

##### **Bottom Channel**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 1648.199        | -31.2                     | -13.0       | 18.2        | Complied |

##### **Middle Channel**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 1673.280        | -27.6                     | -13.0       | 14.6        | Complied |

##### **Top Channel**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 1697.505        | -25.5                     | -13.0       | 12.5        | Complied |

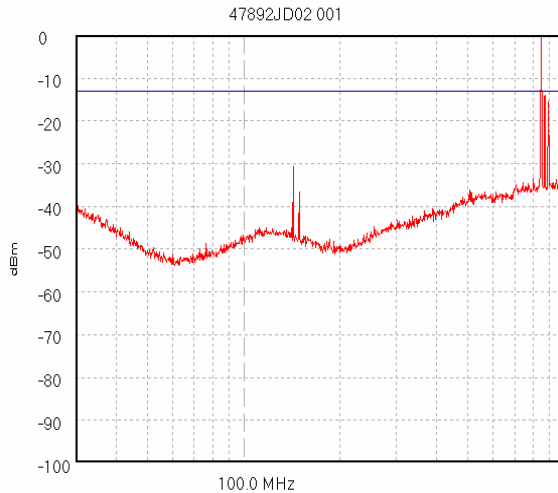
#### **Note(s):**

1. The emission shown in plot 47892JD02 001 at 881.600 MHz and 893.800 MHz emanates from the GSM test Set and not the EUT, because the emission is not from the EUT, no level has been rewarded in the preceding results table.
-

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

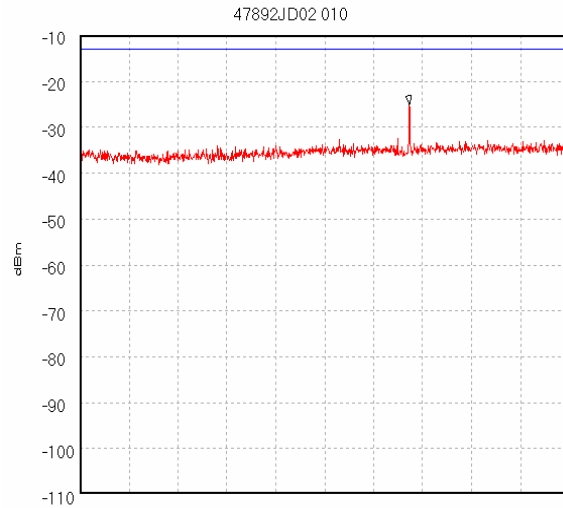
To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

### Transmitter Out of Band Radiated Emissions: Section 2.1053 & 22.917 (Continued)



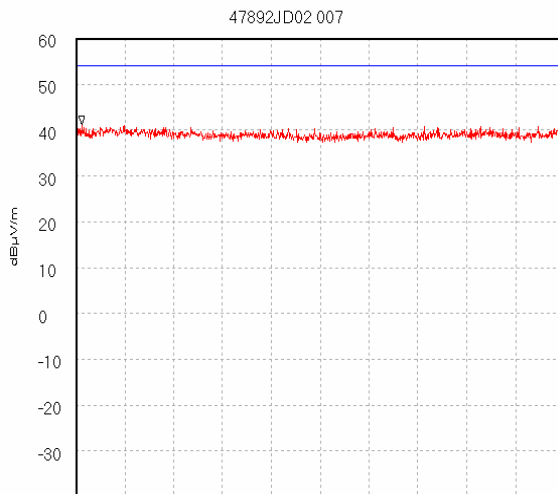
Trace 1  
-13 dBm

Start 30.0 MHz; Stop 1.0 GHz - Log Scale  
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div  
RBW 120.0 kHz; VBW 100.0 kHz; Att 30 dB; Swp 480.0 mS  
Marker 849.048 MHz; 3.98 dBm  
Display Line: -13 dBm; Limit Test Failed  
Transducer Factors: A1037  
1/13/2006 10:19:57 AM



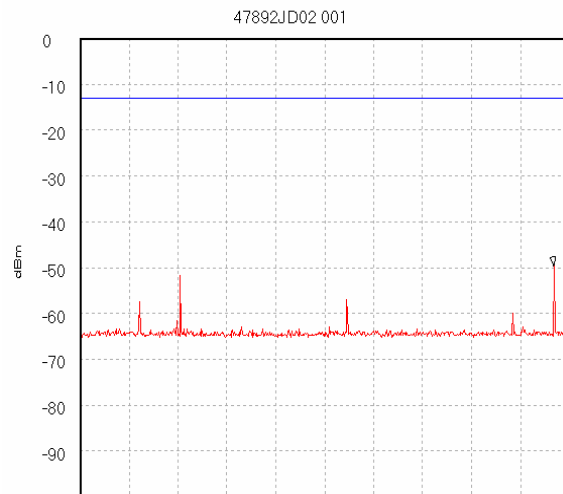
Trace 1  
-13 dBm

Start 1.0 GHz; Stop 2.0 GHz  
Ref -10 dBm; Ref Offset 13.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 60.0 mS  
Peak 1.673 GHz; -25.15 dBm  
Display Line: -13 dBm; Limit Test Passed  
Transducer Factors: 1 to 2  
1/13/2006 1:41:40 PM



Trace 1  
54 dBμV/m

Start 2.0 GHz; Stop 4.0 GHz  
Ref 60 dBμV/m; Ref Offset 0.0 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 2.024 GHz; 41.09 dBμV/m  
Limit/Mask: ; Limit Test Passed  
Transducer Factors: 2 to 4  
1/13/2006 12:49:44 PM



Trace 1  
-13 dBm

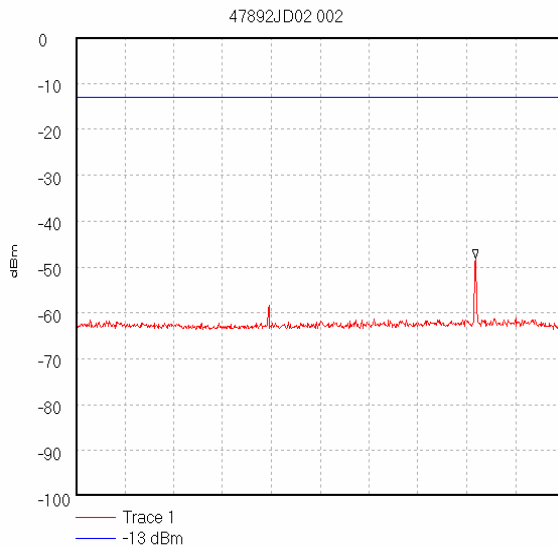
Centre 5.0 GHz; Span 2.0 GHz  
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div  
RBW 2.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS  
Peak 5.936667 GHz; -49.67 dBm  
Display Line: -13 dBm; Limit Test Passed  
Transducer Factors: 4G-6G\_Horn(@1m,3m\_cable,A1534)  
15/12/2005 14:39:34

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

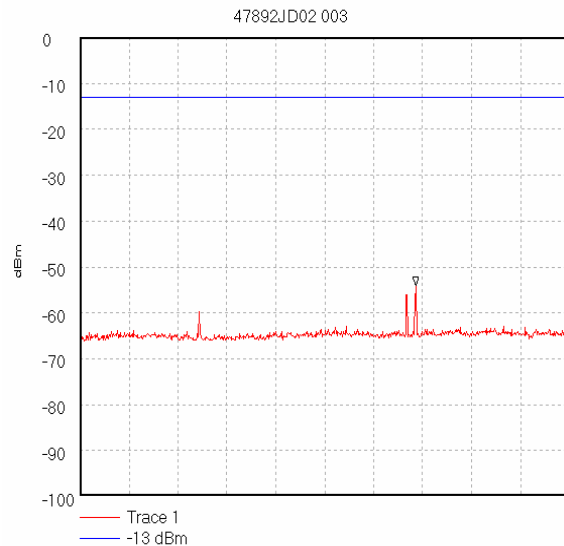
Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**Transmitter Out of Band Radiated Emissions: Section 2.1053 & 22.917 (Continued)**



Start 6.0 GHz; Stop 8.0 GHz  
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div  
RBW 2.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS  
Peak 7.636667 GHz; -48.17 dBm  
Display Line: -13 dBm; ; Limit Test Passed  
Transducer Factors: 6G-8G\_Horn(@1m,3m\_cable,A1534)  
15/12/2005 15:14:10



Start 8.0 GHz; Stop 10.0 GHz  
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div  
RBW 2.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS  
Peak 9.373333 GHz; -54.17 dBm  
Display Line: -13 dBm; ; Limit Test Passed  
Transducer Factors: 8G-12.5G\_Horn(@0.7m,3m\_cable,A1534)  
15/12/2005 16:14:54

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

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

### 7.2.9. Transmitter Radiated Emissions at Band Edges: Section 2.1053/22.917

The EUT was configured as for transmitter radiated emission – Part 22 testing described in section 9 of this report.

Tests were performed to identify the maximum emission level at the band edges of the frequency block that the EUT will operate over.

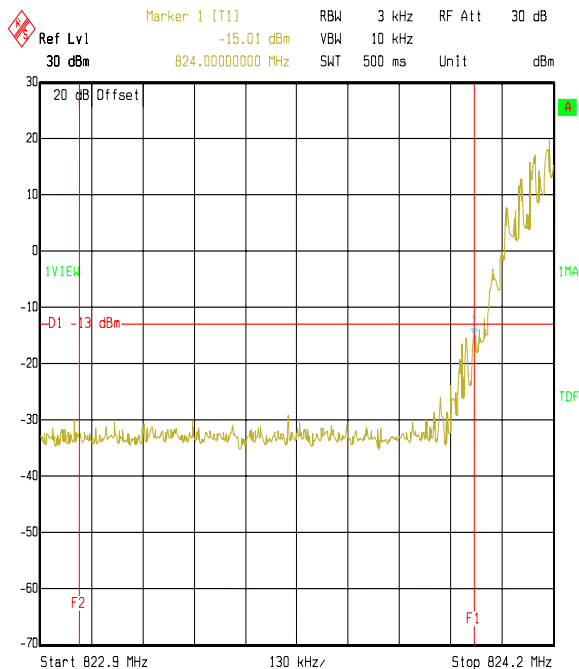
#### Results:

##### Bottom Band Edge

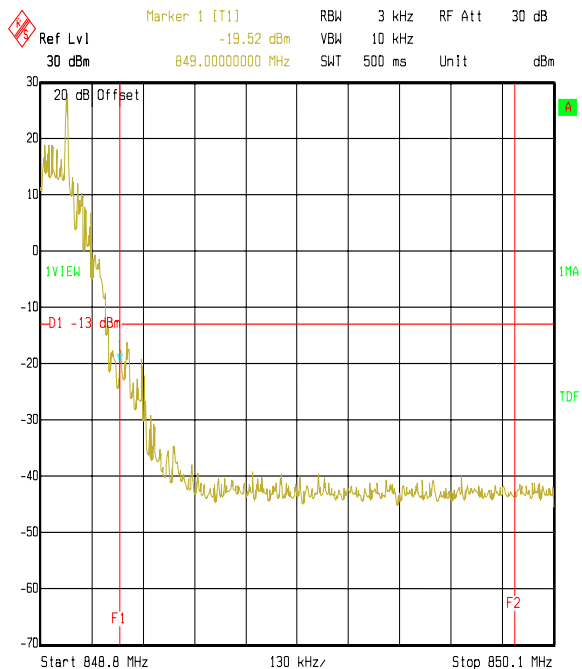
| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 824             | -15.0                     | -13.0       | 2.0         | Complied |

##### Top Band Edge

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 849             | -19.5                     | -13.0       | 6.5         | Complied |



Title: 47892JD02 Psion Teklogix EUT: 7535 FCC Part 22&24  
Comment A: Transmitter Radiated Emissions at Bottom Band Edge  
Date: 18.JAN.2006 12:22:45



Title: 47892JD02 Psion Teklogix EUT: 7535 FCC Part 22&24  
Comment A: Transmitter Radiated Emissions at Top Band Edge  
Date: 18.JAN.2006 12:16:23

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**7.3. Test Results FCC Part 24 (Subpart E)****7.3.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107**

The EUT was configured as for ac conducted emission measurements as described in section 9 of this report.

Tests were performed to identify the maximum emissions levels present on the ac mains line of the EUT.

**Results:****Quasi-Peak Detector Measurements on Live and Neutral Lines**

| Frequency (MHz) | Line    | Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|---------|--------------------|--------------------|-------------|----------|
| 0.18782         | Neutral | 42.67              | 64.13              | 21.46       | Complied |
| 0.25141         | Neutral | 39.57              | 61.71              | 22.14       | Complied |
| 0.31454         | Neutral | 32.31              | 59.85              | 27.54       | Complied |
| 0.37685         | Neutral | 37.99              | 58.35              | 20.36       | Complied |
| 4.19565         | Live    | 35.71              | 56.00              | 20.26       | Complied |
| 8.39425         | Neutral | 35.83              | 60.00              | 34.17       | Complied |
| 15.35108        | Neutral | 30.81              | 60.00              | 29.19       | Complied |

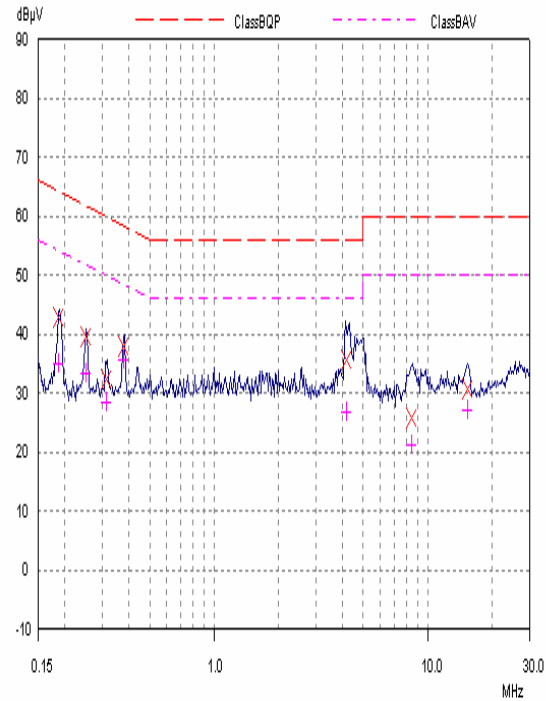
**Average Detector Measurements on Live and Neutral Lines**

| Frequency (MHz) | Line    | Level (dB $\mu$ V) | Limit (dB $\mu$ V) | Margin (dB) | Result   |
|-----------------|---------|--------------------|--------------------|-------------|----------|
| 0.18782         | Neutral | 34.82              | 54.13              | 19.31       | Complied |
| 0.25141         | Neutral | 33.19              | 51.71              | 18.52       | Complied |
| 0.31454         | Live    | 28.52              | 49.85              | 21.33       | Complied |
| 0.37685         | Neutral | 35.48              | 48.35              | 12.87       | Complied |
| 4.19565         | Live    | 26.74              | 46.00              | 19.26       | Complied |
| 8.39425         | Neutral | 31.13              | 50.00              | 28.87       | Complied |
| 15.35108        | Neutral | 27.10              | 50.00              | 22.90       | Complied |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)**



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

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**7.3.2. Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)**

The EUT was configured as for receiver radiated emission – Part 24 testing as described in section 9 of this report.

Tests were performed to identify the maximum receiver or standby radiated emission levels.

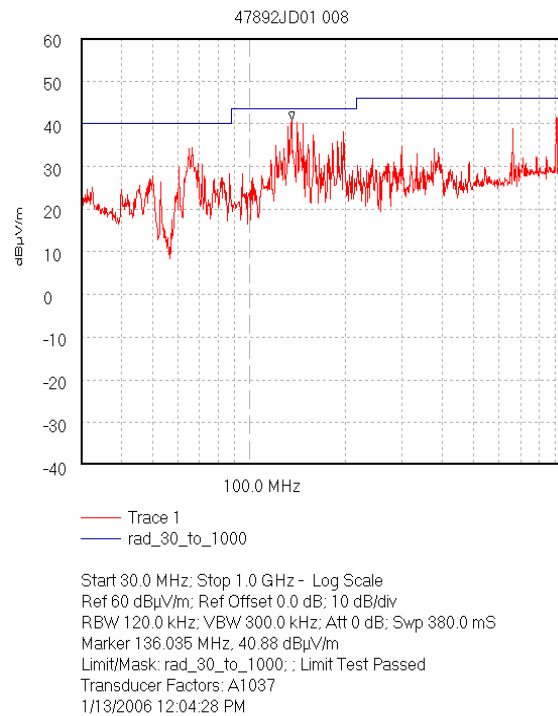
**Results:**

| Frequency (MHz) | Antenna Polarity | Quasi Peak Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Result   |
|-----------------|------------------|---------------------------|----------------|-------------|----------|
| 40.155          | Vertical         | 18.3                      | 40.0           | 21.7        | Complied |
| 49.344          | Vertical         | 16.3                      | 40.0           | 23.7        | Complied |
| 52.842          | Vertical         | 14.6                      | 40.0           | 25.4        | Complied |
| 66.302          | Vertical         | 13.1                      | 40.0           | 26.9        | Complied |
| 71.176          | Vertical         | 12.7                      | 40.0           | 27.3        | Complied |
| 120.841         | Vertical         | 26.8                      | 43.5           | 16.7        | Complied |
| 134.777         | Vertical         | 24.1                      | 43.5           | 19.4        | Complied |
| 136.396         | Vertical         | 14.8                      | 43.5           | 28.7        | Complied |
| 152.738         | Vertical         | 27.5                      | 43.5           | 16.0        | Complied |
| 158.745         | Vertical         | 26.6                      | 43.5           | 16.9        | Complied |
| 182.712         | Vertical         | 24.4                      | 43.5           | 19.1        | Complied |
| 190.204         | Vertical         | 14.0                      | 43.5           | 29.5        | Complied |
| 320.508         | Vertical         | 17.7                      | 46.0           | 28.3        | Complied |
| 378.390         | Vertical         | 22.0                      | 46.0           | 24.0        | Complied |
| 483.362         | Horizontal       | 27.8                      | 46.0           | 18.2        | Complied |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz) (Continued)**



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

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**7.3.3. Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz)****Results:****Peak Level:**

| Frequency (MHz) | Antenna Polarity | Detector Level (dB $\mu$ V) | Transducer (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|-----------------|-----------------------------|----------------------|-------------|----------|
| 4245.017        | Vertical         | 53.0                        | -17.2           | 35.8                        | 74.00                | 38.2        | Complied |
| 9358.470        | Horizontal       | 59.7                        | -13.4           | 46.3                        | 74.00                | 27.7        | Complied |

**Average Level:**

| Frequency (MHz) | Antenna Polarity | Detector Level (dB $\mu$ V) | Transducer (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|-----------------|-----------------------------|----------------------|-------------|----------|
| 4245.017        | Vertical         | 35.5                        | -17.2           | 18.3                        | 54.00                | 35.7        | Complied |
| 9358.470        | Horizontal       | 31.2                        | -13.4           | 17.8                        | 54.00                | 36.2        | Complied |

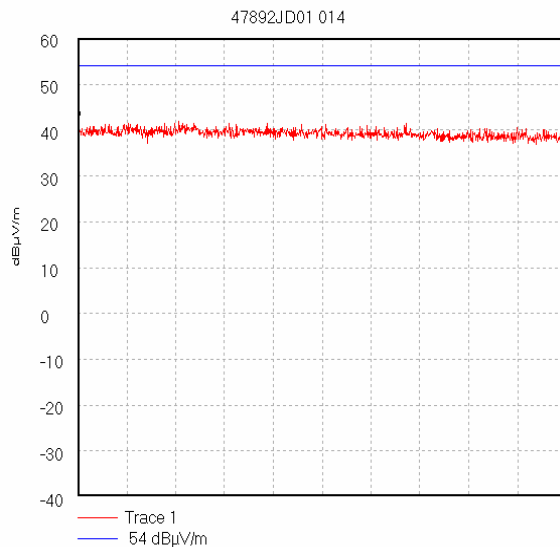
**Note(s):**

1. The transducer factor incorporates the antenna factor, cables losses, pre-amplifier gain and attenuations.

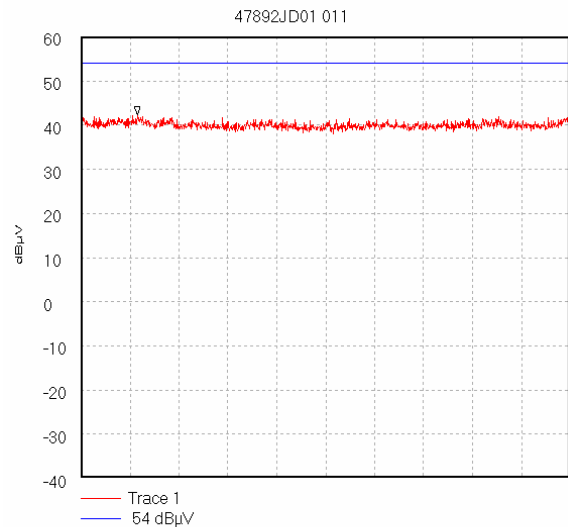
Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

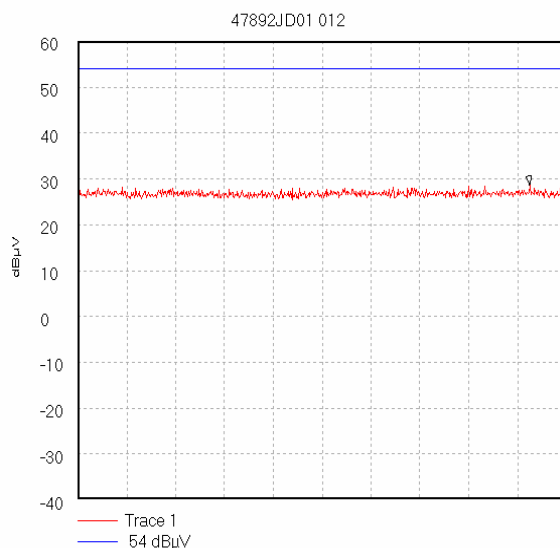
**Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (Continued)**



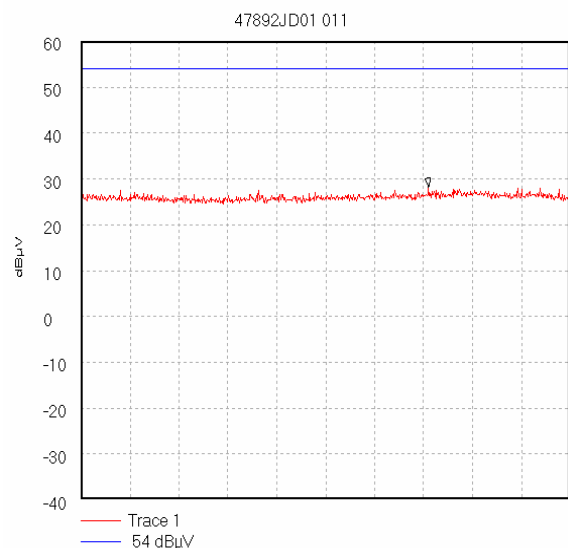
Start 1.0 GHz; Stop 2.0 GHz  
Ref 60 dBµV/m; Ref Offset 1.2 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 1.0 GHz, 41.92 dBµV/m  
Display Line: 54 dBµV/m; : Limit Test Passed  
Transducer Factors: 1 to 2  
1/13/2006 1:09:48 PM



Start 2.0 GHz; Stop 4.0 GHz  
Ref 60 dBµV; Ref Offset 1.6 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 2.231 GHz, 42.23 dBµV  
Display Line: 54 dBµV; : Limit Test Passed  
Transducer Factors: 2 to 4  
1/13/2006 12:38:46 PM



Start 4.0 GHz; Stop 6.0 GHz  
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS  
Peak 5.85 GHz, 28.67 dBµV  
Display Line: 54 dBµV; : Limit Test Passed  
Transducer Factors: 4G-6G\_Horn(@1m,3m\_cable,A1534)  
15/12/2005 16:56:07



Start 6.0 GHz; Stop 8.0 GHz  
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS  
Peak 7.42 GHz, 28.17 dBµV  
Display Line: 54 dBµV; : Limit Test Passed  
Transducer Factors: 6G-8G\_Horn(@0.7m,3m\_cable,A1534)  
15/12/2005 16:54:24

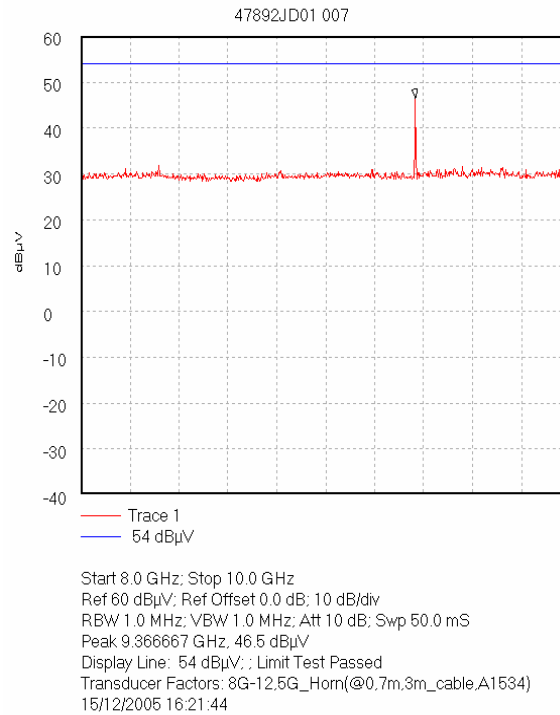
*Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (Continued)**



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

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **7.3.4. Transmitter Effective Isotropic Radiated Power (EIRP): Section 24.232**

The EUT was configured as for effective isotropic radiated power as described in section 9 of this report.

Tests were performed to identify the maximum effective isotropic radiated power (EIRP).

#### **Results:**

| Channel | Measured Frequency (MHz) | Antenna Polarity | Maximum Transmitter EIRP (dBm) | Limit EIRP (dBm) | Margin (dB) | Result   |
|---------|--------------------------|------------------|--------------------------------|------------------|-------------|----------|
| Bottom  | 1850.20                  | Vertical         | 30.7                           | 33.0             | 2.3         | Complied |
| Middle  | 1879.80                  | Vertical         | 30.5                           | 33.0             | 2.5         | Complied |
| Top     | 1909.80                  | Vertical         | 30.9                           | 33.0             | 2.1         | Complied |

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

1. Testing was performed with the EUT operating on GPRS and PCS 1900 mode. The EIRP measured for GPRS mode (Top Channel) was 30.4 dBm and EIRP measured for PCS 1900 mode (Top Channel) was 30.9 dBm. As the EIRP for PCS 1900 mode is higher than GPRS mode, all the results recorded in the preceding table present the EIRP measurement for PCS 1900 mode.
-

**Test of:** Psion Teklogix UK Ltd.  
7535 + RA3020**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**7.3.5. Transmitter Frequency Stability (Temperature Variation): Section 24.235**

The EUT was configured as for frequency stability – Part 24 measurements as described in section 9 of this report.

Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

**Results:****Bottom Channel (1850.2 MHz)**

| Temperature (°C) | Frequency Error (Hz) | Measured Frequency (MHz) | Lower Band Edge Limit (MHz) | Margin (MHz) | Result   |
|------------------|----------------------|--------------------------|-----------------------------|--------------|----------|
| -30              | 11                   | 1850.200011              | 1850.00                     | 0.200011     | Complied |
| -20              | 17                   | 1850.199983              | 1850.00                     | 0.199983     | Complied |
| -10              | 20                   | 1850.200020              | 1850.00                     | 0.200020     | Complied |
| 0                | 30                   | 1850.199970              | 1850.00                     | 0.199970     | Complied |
| 10               | 7                    | 1850.199993              | 1850.00                     | 0.1999993    | Complied |
| 20               | 7                    | 1850.200007              | 1850.00                     | 0.200007     | Complied |
| 30               | 27                   | 1850.199973              | 1850.00                     | 0.199973     | Complied |
| 40               | 42                   | 1850.199958              | 1850.00                     | 0.199958     | Complied |
| 50               | 53                   | 1850.199947              | 1850.00                     | 0.199947     | Complied |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**Transmitter Frequency Stability (Temperature Variation): Section 24.235 (Continued)****Results:****Top Channel (1909.8 MHz)**

| Temperature (°C) | Frequency Error (Hz) | Measured Frequency (MHz) | Upper Band Edge Limit (MHz) | Margin (MHz) | Result   |
|------------------|----------------------|--------------------------|-----------------------------|--------------|----------|
| -30              | 20                   | 1909.800020              | 1910.00                     | 0.199980     | Complied |
| -20              | 11                   | 1909.799989              | 1910.00                     | 0.200011     | Complied |
| -10              | 13                   | 1909.799987              | 1910.00                     | 0.200013     | Complied |
| 0                | 20                   | 1909.799980              | 1910.00                     | 0.200020     | Complied |
| 10               | 27                   | 1909.799973              | 1910.00                     | 0.200027     | Complied |
| 20               | 2                    | 1909.800002              | 1910.00                     | 0.199998     | Complied |
| 30               | 25                   | 1909.799975              | 1910.00                     | 0.200025     | Complied |
| 40               | 23                   | 1909.799977              | 1910.00                     | 0.200023     | Complied |
| 50               | 31                   | 1909.799969              | 1910.00                     | 0.200031     | Complied |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **7.3.6. Transmitter Frequency Stability (Voltage Variation): Section 24.235**

The EUT was configured as for frequency stability – Part 24 measurements as described in section 9 of this report.

Tests were performed to identify the maximum frequency error of the EUT with variations in nominal operating voltage.

#### **Results:**

##### **Bottom Channel (1850.2 MHz)**

| Supply Voltage (V) | Frequency Error (Hz) | Measured Frequency (MHz) | Lower Band Edge Limit (MHz) | Margin (MHz) | Result   |
|--------------------|----------------------|--------------------------|-----------------------------|--------------|----------|
| 7.1                | 25                   | 1850.199975              | 1850                        | 0.199975     | Complied |
| 8.4                | 22                   | 1850.199978              | 1850                        | 0.199978     | Complied |

##### **Top Channel (1909.8 MHz)**

| Supply Voltage (V) | Frequency Error (Hz) | Measured Frequency (MHz) | Lower Band Edge Limit (MHz) | Margin (MHz) | Result   |
|--------------------|----------------------|--------------------------|-----------------------------|--------------|----------|
| 7.1                | 27                   | 1909.799973              | 1910.0                      | 0.200027     | Complied |
| 8.4                | 2                    | 1909.799998              | 1910.0                      | 0.200002     | Complied |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **7.3.7. Transmitter Occupied Bandwidth: Section 24.238**

The EUT was configured as for occupied bandwidth measurements as described in section 9 of this report.

Tests were performed to identify the maximum bandwidth occupied by the fundamental frequency of the EUT.

#### **Results:**

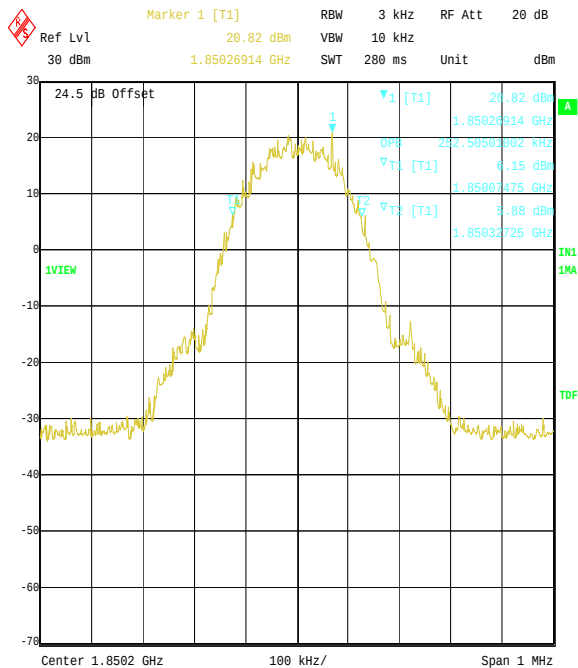
| Channel | Frequency (MHz) | Resolution Bandwidth (kHz) | Video Bandwidth (kHz) | Occupied Bandwidth (kHz) |
|---------|-----------------|----------------------------|-----------------------|--------------------------|
| Bottom  | 1850.2          | 3.0                        | 10.0                  | 252.505                  |
| Middle  | 1879.8          | 3.0                        | 10.0                  | 246.493                  |
| Top     | 1909.8          | 3.0                        | 10.0                  | 250.501                  |

---

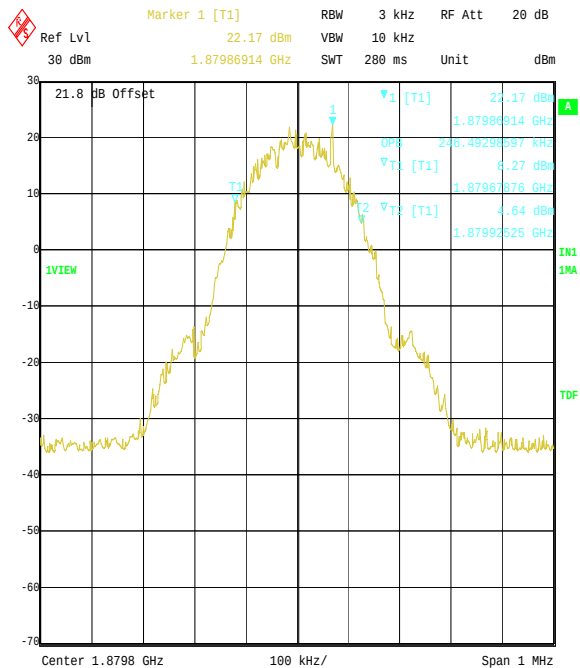
Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

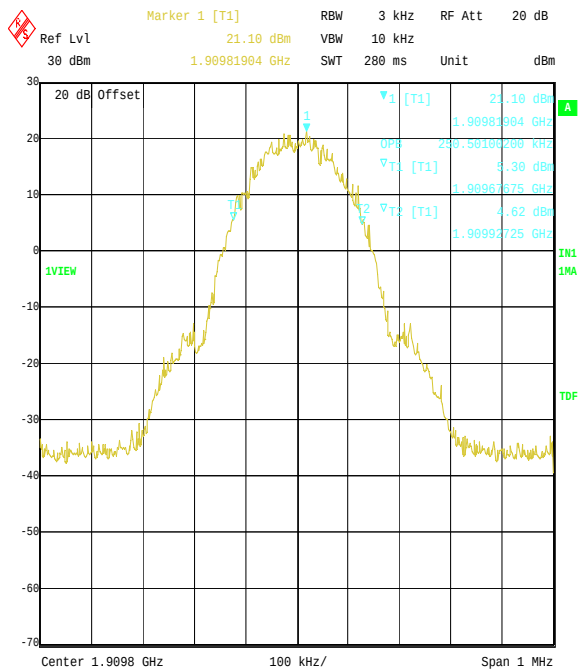
### Transmitter Occupied Bandwidth: Section 24.238 (Continued)



Title: 47892JD01 Psion Teklogik EUT:7535  
Comment A: Transmitter Occupied Bandwidth Bottom Channel  
Date: 16.JAN.2006 16:17:26



Title: 47892JD01 Psion Teklogik EUT:7535  
Comment A: Transmitter Occupied Bandwidth Middle Channel  
Date: 16.JAN.2006 16:13:56



Title: 47892JD01 Psion Teklogik EUT:7535  
Comment A: Transmitter Occupied Bandwidth Top Channel  
Date: 16.JAN.2006 16:08:01

*Note: The occupied bandwidth is measured using the internal OBW function of the measurement analyser. The analyser automatically configures the measurement bandwidths to make an accurate measurement. The results can be observed in the right hand corner of the graphs.*

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **7.3.8. Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238**

The EUT was configured as for transmitter radiated emission – Part 24 testing as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

#### **Results:**

##### **Bottom Channel**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 3700.530        | -31.4                     | -13.0       | 18.4        | Complied |

##### **Middle Channel**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 3759.463        | -29.2                     | -13.0       | 16.2        | Complied |

##### **Top Channel**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 3819.609        | -28.4                     | -13.0       | 15.4        | Complied |

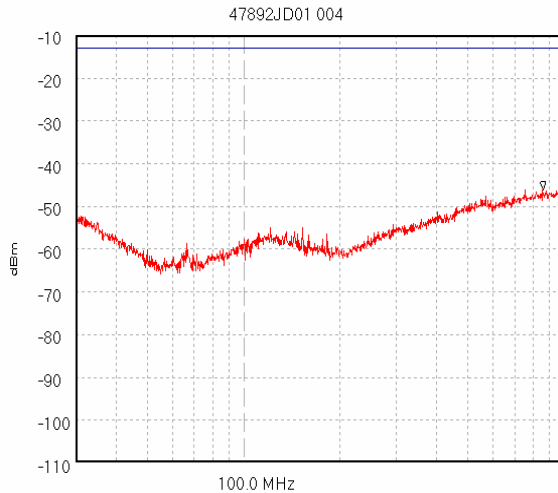
#### **Note(s):**

1. The emission shown in plot 47892JD01 013 at 1948.8 MHz and 1991.1 MHz emanates from the GSM test set and not the EUT. Because the emission is not from the EUT, no level has been recorded in the preceding results table/.
-

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

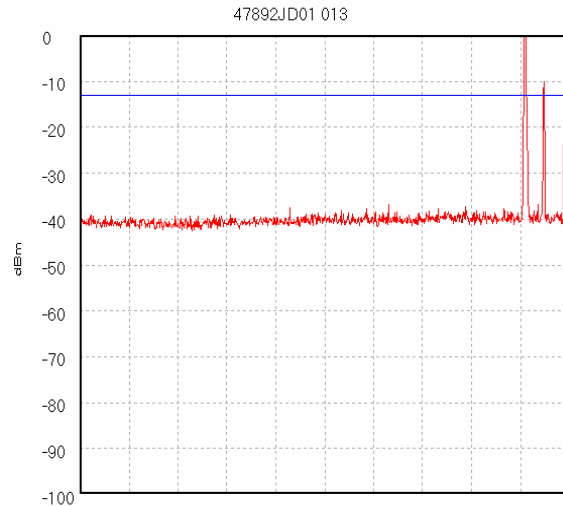
To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

### Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)



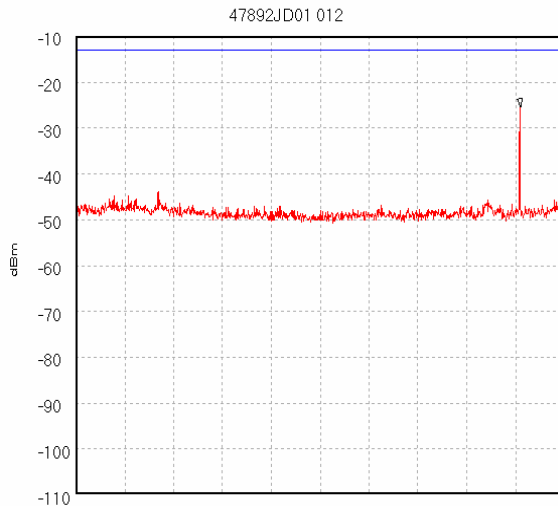
Trace 1  
-13 dBm

Start 30.0 MHz; Stop 1.0 GHz - Log Scale  
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div  
RBW 120.0 kHz; VBW 300.0 kHz; Att 10 dB; Swp 380.0 mS  
Peak 859.03 MHz; -46.18 dBm  
Display Line: -13 dBm; Limit Test Passed  
Transducer Factors: A1037  
1/13/2006 11:00:03 AM



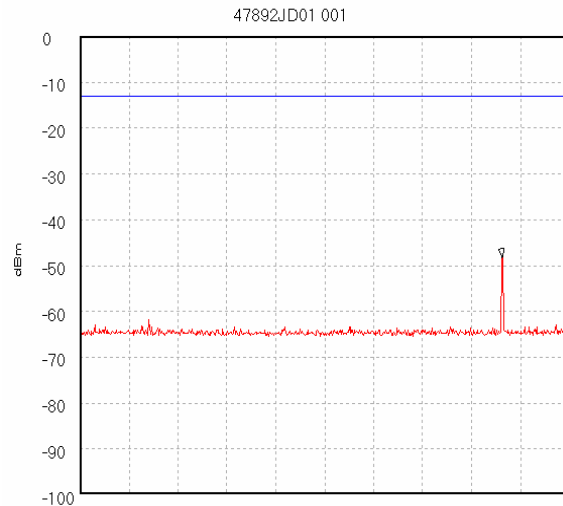
Trace 1  
-13 dBm

Start 1.0 GHz; Stop 2.0 GHz  
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 1.911 GHz; 3.98 dBm  
Display Line: -13 dBm; Limit Test Passed  
Transducer Factors: 1 to 2  
1/13/2006 1:02:06 PM



Trace 1  
-13 dBm

Start 2.0 GHz; Stop 4.0 GHz  
Ref -10 dBm; Ref Offset 13.4 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 3.82 GHz; -25.41 dBm  
Display Line: -13 dBm; Limit Test Passed  
Transducer Factors: 2 to 4  
1/13/2006 12:55:27 PM



Trace 1  
-13 dBm

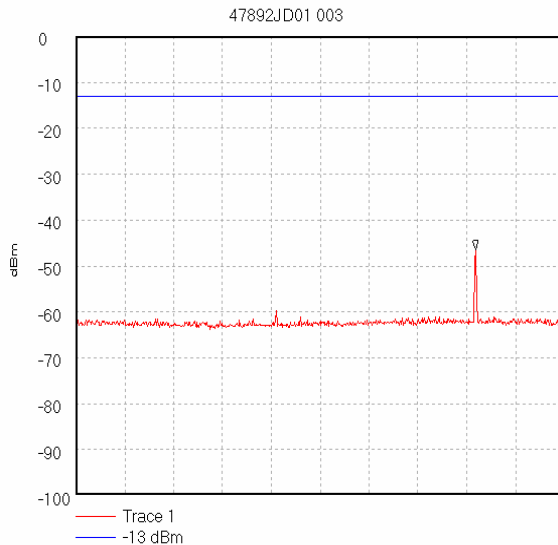
Start 4.0 GHz; Stop 6.0 GHz  
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div  
RBW 2.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS  
Peak 5.726667 GHz; -48.33 dBm  
Display Line: -13 dBm; Limit Test Passed  
Transducer Factors: 4G-6G\_Horn(@1m,3m\_cable,A1534)  
15/12/2005 14:46:06

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

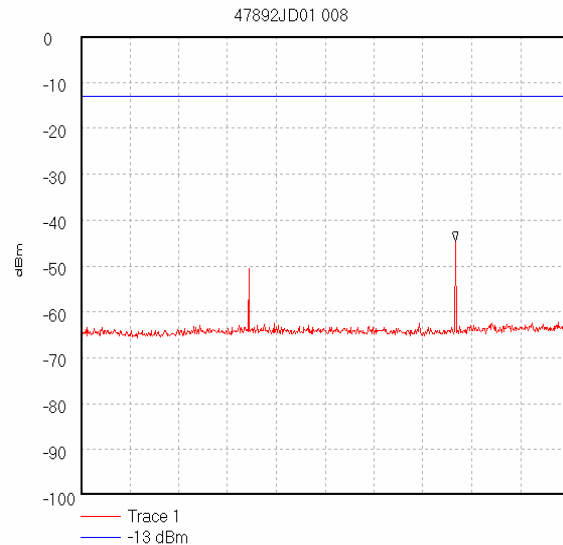
**Test of:** Psion Teklogix UK Ltd.  
**7535 + RA3020**

**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

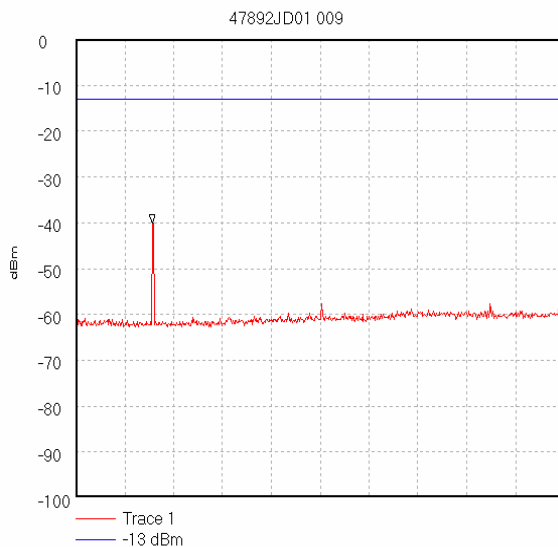
**Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)**



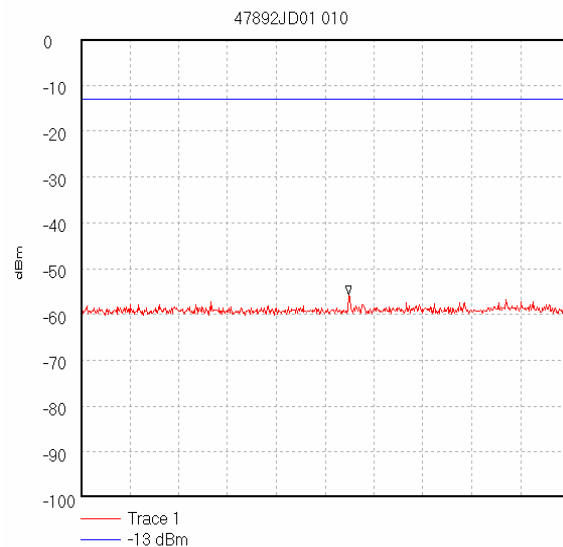
Start 6.0 GHz; Stop 8.0 GHz  
 Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div  
 RBW 2.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS  
 Peak 7.636667 GHz, -46.5 dBm  
 Display Line: -13 dBm; ; Limit Test Passed  
 Transducer Factors: 6G-8G\_Horn(@1m,3m\_cable,A1534)  
 15/12/2005 15:09:41



Start 8.0 GHz; Stop 12.5 GHz  
 Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div  
 RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 90.0 mS  
 Peak 11.45 GHz, -44.67 dBm  
 Display Line: -13 dBm; ; Limit Test Passed  
 Transducer Factors: 8G-12.5G\_Horn(@0.7m,3m\_cable,A1534)  
 15/12/2005 16:40:26



Start 12.5 GHz; Stop 18.0 GHz  
 Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div  
 RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 110.0 mS  
 Peak 13.361667 GHz, -40.17 dBm  
 Display Line: -13 dBm; ; Limit Test Passed  
 Transducer Factors: 12.5-18G\_Horn(@0.5m,3m\_cable,A1534)  
 15/12/2005 16:45:57



Start 18.0 GHz; Stop 20.0 GHz  
 Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div  
 RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS  
 Peak 19.096667 GHz, -55.67 dBm  
 Display Line: -13 dBm; ; Limit Test Passed  
 Transducer Factors: 18-26.5\_Horn(@0.5m,3m\_cable,A1534)  
 15/12/2005 16:49:35

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

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

**Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)**

**Integrated Power Over 1 MHz Strip Band: 1911 to 1912 MHz**

1<sup>st</sup> 1 MHz block immediately outside adjacent frequency block

| 100 kHz Strip Number     | Peak Power<br>(nW/100 kHz) | 100 kHz Strip Number | Peak Power<br>(nW/100 kHz) |
|--------------------------|----------------------------|----------------------|----------------------------|
| 1                        | 1049                       | 6                    | 925                        |
| 2                        | 874                        | 7                    | 840                        |
| 3                        | 816                        | 8                    | 949                        |
| 4                        | 1040                       | 9                    | 893                        |
| 5                        | 1018                       | 10                   | 746                        |
| <b>Total Peak Power:</b> |                            | 9150 nW/MHz          |                            |

**Integrated Power Over 1 MHz Strip Band: 1912 to 1913 MHz**

2<sup>nd</sup> 1 MHz block immediately outside adjacent frequency block

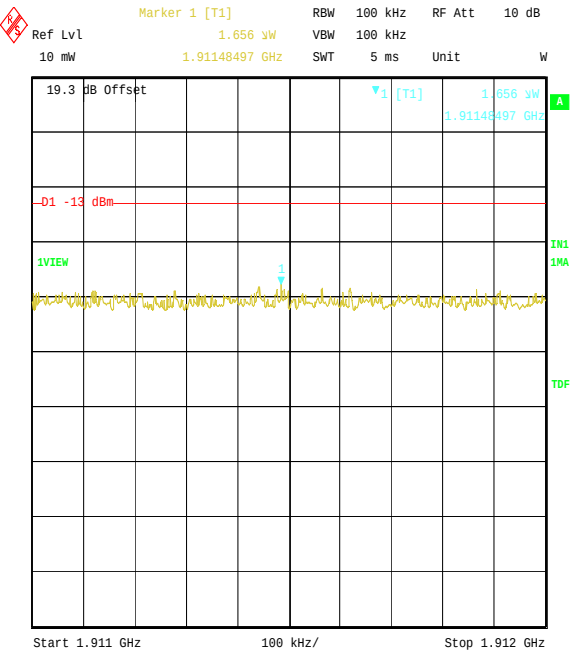
| 100 kHz Strip Number     | Peak Power<br>(nW/100 kHz) | 100 kHz Strip Number | Peak Power<br>(nW/100 kHz) |
|--------------------------|----------------------------|----------------------|----------------------------|
| 1                        | 1431                       | 6                    | 830                        |
| 2                        | 1154                       | 7                    | 1156                       |
| 3                        | 886                        | 8                    | 1030                       |
| 4                        | 917                        | 9                    | 1011                       |
| 5                        | 1186                       | 10                   | 1487                       |
| <b>Total Peak Power:</b> |                            | 11070 nW/MHz         |                            |

**Results:**

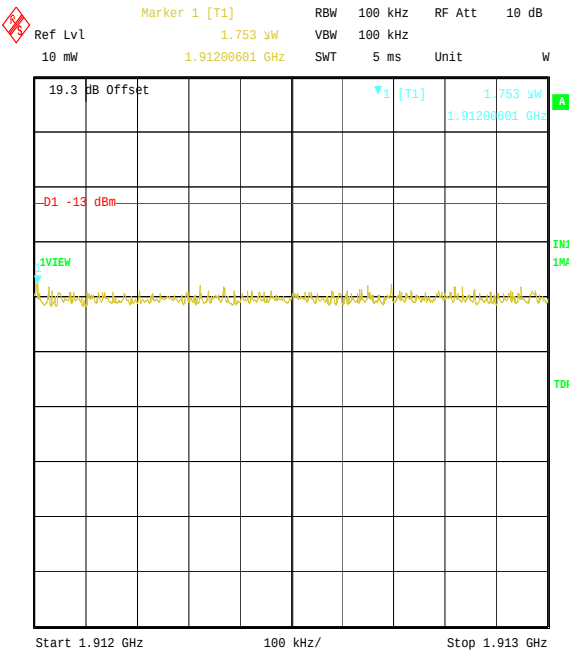
| Band<br>(MHz) | Peak Power<br>(nW/MHz) | Peak Power<br>(dBm/MHz) | Limit<br>(dBm/MHz) | Margin<br>(dB) | Status   |
|---------------|------------------------|-------------------------|--------------------|----------------|----------|
| 1911 to 1912  | 9150                   | -20.4                   | -13.0              | 7.4            | Complied |
| 1912 to 1913  | 11070                  | -19.6                   | -13.0              | 6.6            | Complied |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020  
To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)



Title: 47892JD01 Psion Teklogix EUT:7535  
Comment A: Transmitter Out of Band Radiated Emissions Integrated Power  
Over 1MHz Strip Band  
Date: 16.JAN.2006 15:52:55



Title: 47892JD01 Psion Teklogix EUT:7535  
Comment A: Transmitter Out of Band Radiated Emissions Integrated Power  
Over 1MHz Strip Band  
Date: 16.JAN.2006 15:56:18

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

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

### 7.3.9. Transmitter Radiated Emissions at Band Edges: Section 2.1053 & 24.238

The EUT was configured as for transmitter radiated emissions testing described in section 9 of this report.

Tests were performed to identify the maximum emissions level at the band edges of the frequency block that the EUT will operate over.

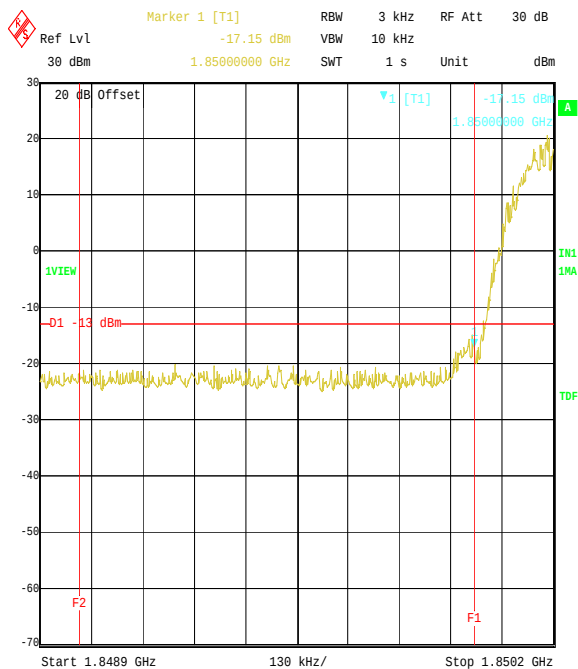
#### Results:

##### Bottom Band Edge

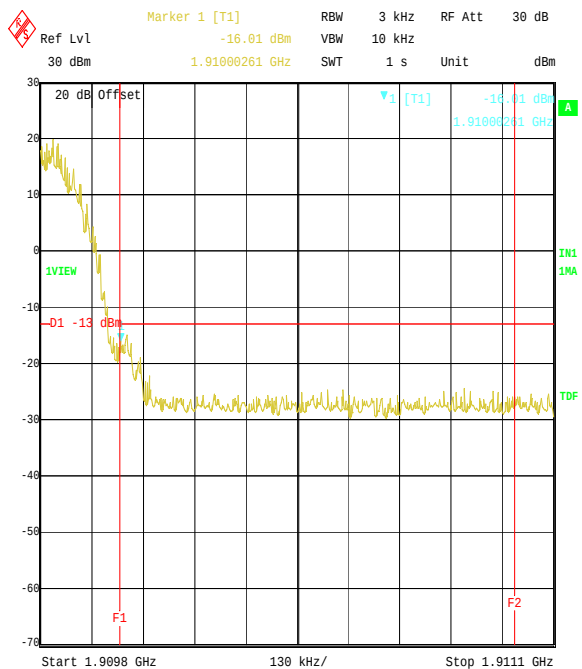
| Frequency (MHz) | Spurious Emission (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|-------------------------|-------------|-------------|----------|
| 1850            | -17.2                   | -13.0       | 4.2         | Complied |

##### Top Band Edge

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result   |
|-----------------|---------------------------|-------------|-------------|----------|
| 1910            | -16.0                     | -13.0       | 3.0         | Complied |



Title: 47892JD01 Psion Teklogix EUT:7535  
Comment A: Radiated Emissions at Bottom Band Edge  
Date: 16.JAN.2006 15:32:40



Title: 47892JD01 Psion Teklogix EUT:7535  
Comment A: Radiated Emissions at Top Band Edge  
Date: 16.JAN.2006 15:24:23

**Test of:** Psion Teklogix UK Ltd.  
7535 + RA3020**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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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”.

| <b>Measurement Type</b>                   | <b>Range</b>       | <b>Confidence Level (%)</b> | <b>Calculated Uncertainty</b> |
|-------------------------------------------|--------------------|-----------------------------|-------------------------------|
| AC Conducted Spurious Emissions           | 0.15 MHz to 30 MHz | 95%                         | ±3.25 dB                      |
| Effective Isotropic Radiated Power (EIRP) | Not applicable     | 95%                         | ±2.94 dB                      |
| Frequency Stability                       | Not applicable     | 95%                         | ±11.37 Hz                     |
| Minimum Bandwidth                         | Not applicable     | 95%                         | ±0.12%                        |
| Occupied Bandwidth                        | 1850 to 1910 MHz   | 95%                         | ±0.12%                        |
| Radiated Spurious Emissions               | 30 MHz to 1000 MHz | 95%                         | ±5.26 dB                      |
| Radiated Spurious Emissions               | 1 GHz to 26 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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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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## **9. Measurement Methods**

### **9.1. Effective Radiated Power (ERP)**

ERP measurements were performed in accordance with the standard, against appropriate limits.

The ERP was measured with the EUT arranged on a non-conducting turntable on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4. The transmitter was fitted with an integral antenna; as such all radiated tests were performed with the unit operating into the integral antenna.

The level of the ERP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane. The EUT was oriented in the X plane. The test antenna was then raised and lowered until a maximum peak was observed. The turntable was then rotated through 360 degrees and the maximum peak reading obtained. The height search was then repeated to take into consideration the new angular position of the turntable. The maximum reading observed was then recorded. This procedure was then repeated with the EUT oriented in the Y and Z planes. The highest reading taken in all 3 planes was recorded. The entire procedure was then repeated with the test antenna set in the vertical polarity.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For ERP measurements a dipole antenna was used. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The ERP was calculated as:-

$$\text{ERP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **Effective Radiated Power (ERP) (Continued)**

Circumstances where the signal generator could not produce the desired power substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The ERP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated ERP to obtain the substituted EUT ERP.

$$\text{Delta (dB)} = \text{EUT} - \text{SG}$$

Where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual ERP is calculated as:

$$\text{ERP SG} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

The EUT ERP is calculated as:

$$\text{ERP EUT} = \text{ERP SG} + \text{Delta.}$$

The test equipment settings for ERP measurements were as follows:

| Receiver Function | Setting              |
|-------------------|----------------------|
| Detector Type:    | Peak                 |
| Mode:             | Not applicable       |
| Bandwidth:        | ≥ Emission Bandwidth |
| Amplitude Range:  | 100 dB               |
| Sweep Time:       | Coupled              |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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## **9.2. Effective Isotropic Radiated Power (EIRP)**

EIRP measurements were performed in accordance with the standard, against appropriate limits.

The EIRP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4. The transmitter was fitted with an integral antenna; therefore all radiated tests were performed with the unit operating into the integral antenna.

The level of the EIRP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane. The EUT was oriented in the X plane. The test antenna was then raised and lowered until a maximum peak was observed. The turntable was then rotated through 360 degrees and the maximum peak reading obtained. The height search was then repeated to take into consideration the new angular position of the turntable. The maximum reading observed was then recorded. This procedure was then repeated with the EUT oriented in the Y and Z planes. The highest reading taken in all 3 planes was recorded. The entire procedure was then repeated with the test antenna set in the vertical polarity.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

All measurements were performed using broadband Horn antennas.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **Effective Isotropic Radiated Power (EIRP) (Continued)**

Circumstances where the signal generator could not produce the desired power substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The EIRP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated EIRP to obtain the substituted EUT EIRP.

$$\text{Delta (dB)} = \text{EUT} - \text{SG}$$

where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

$$\text{EIRP SG} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

The EUT EIRP is calculated as:

$$\text{EIRP EUT} = \text{EIRP SG} + \text{Delta.}$$

The test equipment settings for EIRP measurements were as follows:

| Receiver Function | Setting        |
|-------------------|----------------|
| Detector Type:    | Peak           |
| Mode:             | Not applicable |
| Bandwidth:        | 1 MHz          |
| Amplitude Range:  | 100 dB         |
| Sweep Time:       | Coupled        |

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **9.3. FCC Part 2.1055: Frequency Stability**

The EUT was situated within an environmental test chamber and connected directly to the GSM test set via an access port.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range -30 to 50 °C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for hand carried battery operated equipment) or by varying the primary supply voltage from 85% to 115% of the nominal value for all other equipment types.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions.

Measurements were made on the top and bottom channels.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

The frequency error measured was converted to an error in ppm using the following formula as defined by TIA\_EIA\_603A :-

$$\text{ppm error} = \left( \frac{MCF_{\text{MHz}}}{ACF_{\text{MHz}}} - 1 \right) * 10^6$$

where  $MCF_{\text{MHz}}$  is the measured carrier frequency in MHz  
 $ACF_{\text{MHz}}$  is the assigned carrier frequency in MHz

The measured ppm had to be less than the relevant limits in order to comply.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **9.4. Frequency Stability – Part 24**

The EUT was situated within an environmental test chamber and connected directly to the GSM test set via an access port.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range -30 to 50 °C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for hand carried battery operated equipment) or by varying the primary supply voltage from 85% to 115% of the nominal value for all other equipment types.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions and ensure they remained within specified operating parameters.

Measurements were made on the top and bottom channels.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

Once the environmental chamber had reached thermal equilibrium, the nominal frequency of the EUT was measured and recorded. The recorded frequency was compared to the applicants declared operating frequency band edges.

In order to show compliance, the measured frequency must remain within the declared frequency band.

The reported data shows the nominal frequency drift and its margin from the band edge. If this margin is positive, the result is compliant. If it goes negative, the result is a non-compliance. There is also a frequency graph presented offering the frequency variation around nominal frequency.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **9.5. Occupied Bandwidth**

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set via a bi-directional coupler to its antenna port.

Measurements were performed to determine the occupied bandwidth in accordance with FCC Part 2.1049. The occupied bandwidth was measured from the fundamental emission at the bottom, middle and top channels.

As the EUT is a PCS phone, no modulation input port was available. A call was thus set up using the PCS/GSM simulator and using normal modulation. The Occupied Bandwidth was measured in this configuration.

The occupied bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB or ESIB spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser settings were set as per those outlined in the spectrum analyser user manual for this measurement, i.e., RBW  $\geq$  1% of occupied bandwidth. A value of 3 kHz was used.

**Test of:** Psion Teklogix UK Ltd.  
7535 + RA3020**To:** FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**9.6. AC Mains Conducted Emissions**

AC mains conducted emission measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with 115V 60 Hz AC mains supplied via a line impedance stabilisation network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

| Receiver Function | Initial Scan     | Final Measurements         |
|-------------------|------------------|----------------------------|
| Detector Type:    | Peak             | Quasi-Peak (CISPR)/Average |
| Mode:             | Max Hold         | Not applicable             |
| Bandwidth:        | 10 kHz           | 9 kHz                      |
| Amplitude Range:  | 60 dB            | 20 dB                      |
| Measurement Time: | Not applicable   | > 1 s                      |
| Observation Time: | Not applicable   | > 15 s                     |
| Step Size:        | Continuous sweep | Not applicable             |
| Sweep Time:       | Coupled          | Not applicable             |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **9.7. Transmitter Radiated Emissions – Part 22**

Radiated emission measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT, which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the horizontal polarisation.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The radiated power was calculated as:-

$$\text{EIRP/ERP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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#### **Transmitter Radiated Emissions – Part 22 (Continued)**

The limit in the standard states that emissions shall be attenuated by at least  $43 + 10 \log (P)$  dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to -13dBm therefore, the limit line presented on the accompanying plots is set to -13dBm.

Any spurious measured were then compared to the -13dBm limit. The requirement is for the emission to be less than -13dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

It should be noted that FCC Part 22.917 states that the 1<sup>st</sup> MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found by calculating 1% of the bandwidth measured in the transmitter occupied bandwidth section of this report. The next largest available bandwidth above this calculated figure was, therefore, used i.e. 3 kHz.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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### **9.8. Transmitter Radiated Emissions – Part 24**

Radiated emission measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT, which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the horizontal polarisation.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

The limit in the standard states that emissions shall be attenuated by at least  $43 + 10 \log(P)$  dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to -13 dBm therefore, the limit line presented on the accompanying plots is set to -13 dBm.

Any spurious measured were then compared to the -13 dBm limit. The requirement is for the emission to be less than -13 dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

All measurements were performed using broadband horn antennas.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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**Transmitter Radiated Emissions – Part 24 (Continued)**

It should be noted that FCC Part 24.238 states that the 1<sup>st</sup> MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found by calculating 1% of the bandwidth measured in the transmitter occupied bandwidth section of this report. The next largest available bandwidth above this calculated figure was, therefore, used i.e. 3 kHz.

The measurements in the 2<sup>nd</sup> and 3<sup>rd</sup> 1 MHz blocks away from the adjacent 1 MHz block from 1911 MHz to 1912 MHz and 1912 MHz to 1913 MHz were carried out using an analyser span of 1 MHz and a 100 kHz receiver resolution bandwidth (RBW). 10 linear readings were taken for each 100 kHz strip across the 1 MHz band. These readings were integrated to give the emission level in an equivalent 1 MHz bandwidth.

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Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

### 9.9. Receiver Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to the upper frequency detailed in Section 15.33(b) were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT, which required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit. Levels within 20dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a quasi peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the horizontal polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the vertical polarisation.

The final field strength was determined as the indicated level in dB $\mu$ V plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

| Receiver Function | Initial Scan                    | Final Measurements<br><1GHz | Final Measurements<br>≥1 GHz |
|-------------------|---------------------------------|-----------------------------|------------------------------|
| Detector Type:    | Peak                            | Quasi-Peak (CISPR)          | Peak/Average                 |
| Mode:             | Max Hold                        | Not applicable              | Not applicable               |
| Bandwidth:        | (120 kHz <1GHz)<br>(1MHz ≥1GHz) | 120 kHz                     | 1 MHz<br>(If applicable)     |
| Amplitude Range:  | 60 dB                           | 20 dB                       | 20 dB (typical)              |
| Step Size:        | Continuous sweep                | Not applicable              | Not applicable               |
| Sweep Time:       | Coupled                         | Not applicable              | Not applicable               |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

## Appendix 1. Test Equipment Used

| RFI No. | Instrument                    | Manufacturer                      | Type No.         | Serial No.     |
|---------|-------------------------------|-----------------------------------|------------------|----------------|
| A027    | Horn Antenna                  | Eaton                             | 9188-2           | 301            |
| A028    | Horn Antenna                  | Eaton                             | 91888-2          | 304            |
| A031    | 2 to 4 GHz Eaton Horn Antenna | Eaton                             | 91889-2          | 557            |
| A059    | 3146 Log Periodic Antenna     | EMCO                              | 3146             | 8902-2378      |
| A1037   | Chase Bilog Antenna           | Chase EMC Ltd                     | CBL6112B         | 2413           |
| A1069   | ESH3-Z5                       | Rohde & Schwarz                   | ESH3-Z5          | 837469/012     |
| A1360   | ESH3-Z2 Pulse Limiter         | Rohde & Schwarz                   | ESH3-Z2          | A1360-20112003 |
| A1362   | Horn Antenna                  | Stoddart Aircraft Radio Co., Inc. | 91889-1          | N/A            |
| A1393   | Attenuator                    | HUBER + SUHNER AG                 | 757456           | 6820.17.B      |
| A253    | WG 12 Microwave Horn          | Flann Microwave                   | 12240-20         | 128            |
| A254    | WG 14 Microwave Horn          | Flann Microwave                   | 14240-20         | 139            |
| A259    | Bilog Antenna                 | Chase                             | CBL6111          | 1513           |
| A276    | OATS Positioning Controller   | Rohde & Schwarz                   | HCC              | -              |
| A392    | 3 dB attenuator (9)           | Suhner                            | 6803.17.B        | None           |
| A430    | WG 18 horn                    | Flann                             | 18240-20         | 425            |
| A436    | WG 20 horn                    | Flann                             | 20240-20         | 330            |
| C1155   | 8m cable                      | Huber & Suhner                    | Sucoflex 104PA   | 1522/4PA       |
| C1164   | 1.5m N-type Cable             | Rosenberger Micro-Coax            | FA210A1015007070 | 43188-1        |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

### **Test Equipment Used (Continued)**

| RFI No. | Instrument                             | Manufacturer               | Type No.         | Serial No.                                    |
|---------|----------------------------------------|----------------------------|------------------|-----------------------------------------------|
| C1166   | 2m N-Type Cable                        | Rosenberger<br>Micro-Coax  | FA210A1020007070 | 43189-02                                      |
| L0799   | AC Power Supply                        | Kikusui                    | PCR 1000LA       | JA002944                                      |
| L0802   | Environmental Chamber                  | Gallenkamp<br>Industrial   | FE300.T.R75      | 6974                                          |
| M003    | Spectrum Monitor                       | Rohde &<br>Schwarz         | EZM              | 883 580/008                                   |
| M023    | ESVP Receiver                          | Rohde &<br>Schwarz         | ESVP             | 872 991/027                                   |
| M028    | FSB Spectrum Analyser                  | Rohde &<br>Schwarz         | FSB              | 860 001/009 (RF),<br>860 161/007<br>(Display) |
| M090    | Receiver / Spectrum Analyser<br>System | Rohde &<br>Schwarz         | ESBI             | DU:838494/005<br>RU:836833/001                |
| M1008   | HP 8563E                               | Hewlett Packard            | 8563E            | 3551A04412                                    |
| M1070   | IDM63 DVM                              | ISO-Tech                   | IDM63            | 70602324                                      |
| M1124   | Spectrum Analyser                      | Rohde &<br>Schwarz         | ESIB26           | 100046K                                       |
| M1140   | Analyser                               | Anritsu                    | MT8820A          | 6K0000647                                     |
| M1242   | FSEM30 Spectrum Analyser               | Rohde &<br>Schwarz, Inc.   | FSEM30           | 845986_022                                    |
| M165    | Thermocouple Meter                     | RS Components              | 206-3738         | 63101536                                      |
| M173    | Turntable Controller                   | R.H.Electrical<br>Services | RH351            | 3510020                                       |
| S201    | Site 1                                 | RFI                        | 1                | -                                             |
| S202    | Site 2                                 | RFI                        | 2                | S202-15011990                                 |
| S212    | Site 12                                | RFI                        | 12               | -                                             |
| S240    | Site 40                                | RFI                        | 40               | -                                             |
| S505    | PSU                                    | Weir                       | 4000             | 964214/164                                    |

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

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

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## **Appendix 2. Test Configuration Drawings**

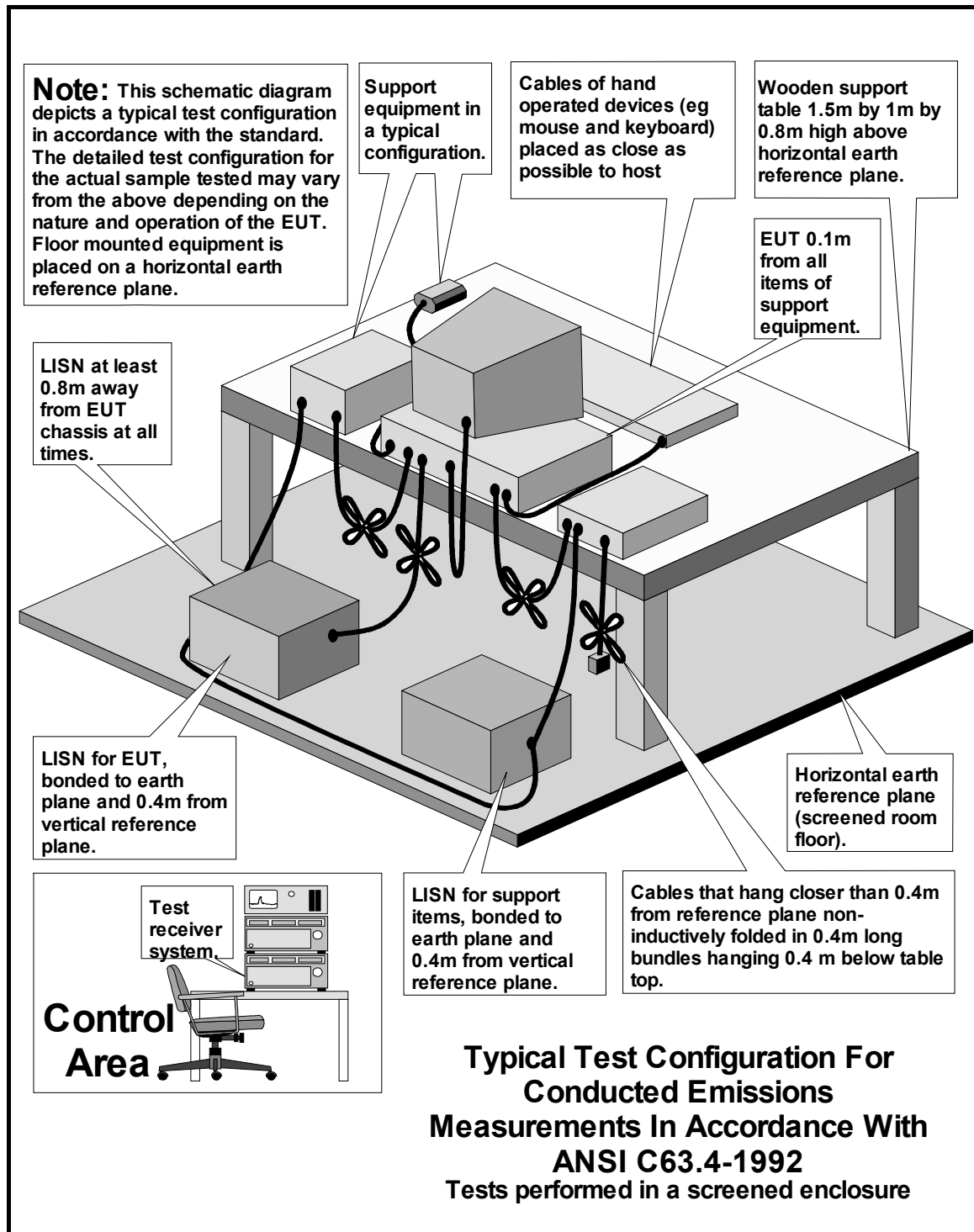
This appendix contains the following drawings:

| Drawing Reference Number | Title                                                      |
|--------------------------|------------------------------------------------------------|
| DRG\47892\EMICON         | Test configuration for measurement of conducted emissions. |
| DRG\47892\EMIRAD         | Test configuration for measurement of radiated emissions.  |

Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

DRG\47892\EMICON



Test of: Psion Teklogix UK Ltd.  
7535 + RA3020

To: FCC Part 22: 2004 (Subpart H) and FCC Part 24: 2004 (Subpart E)

DRG\47892\EMIRAD

