



**TEST REPORT  
FROM  
RFI GLOBAL SERVICES LTD**

Test of: GE864-QUAD V2

To: FCC Part 22: 2008 Subpart H, FCC Part 24: 2008 Subpart E,  
RSS 132 Issue 2 September 2005 and RSS-133 Issue 5 February 2009

**Test Report Serial No:**  
RFI/RPT/RP76922JD03A V2.0

**Version 2.0 Supersedes All Previous Versions**

<b>This Test Report Is Issued Under The Authority Of Brian Watson, COO Payments and Consultancy:</b>	
<b>Checked By:</b>	A. Henriques
<b>Signature:</b>	
<b>Date of Issue:</b>	10 June 2010

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**1. Customer Information**



















<b>Company Name:</b>	Telit Communications S.p.A.
<b>Address:</b>	Via Stazione di Prosecco, 5/B Sgonico TS 34010 Italy

## **2. Summary of Testing**

### **2.1. General Information**

<b>Specification Reference:</b>	47CFR22
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2009: Part 22 Subpart H (Public Mobile Services)
<b>Specification Reference:</b>	RSS-GEN Issue 2 June 2007
<b>Specification Title:</b>	General Requirements and Information for the Certification of Radiocommunication Equipment
<b>Specification Reference:</b>	RSS-132 Issue 2 Sep 2005
<b>Specification Title:</b>	Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz
<b>Specification Reference:</b>	SRSP-503 Issue 7 Sep 2008
<b>Specification Title:</b>	Technical Requirements for Cellular Radiotelephone Systems Operating in the Bands 824 – 849 MHz and 869 – 894 MHz
<b>Specification Reference:</b>	47CFR24
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2009: Part 24 Subpart E (Personal Communication Services)
<b>Specification Reference:</b>	RSS-133 Issue 5 Feb 2009
<b>Specification Title:</b>	2 GHz Personal Communications Services
<b>Specification Reference:</b>	SRSP-510 Issue 5 Feb 2009
<b>Specification Title:</b>	Technical Requirements for Personal Communications Services (PCS) in the Bands 1850-1915 MHz and 1930-1995 MHz
<b>Site Registration:</b>	FCC: 209735, Industry Canada: 3245B-2
<b>Location of Testing:</b>	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
<b>Test Dates:</b>	29 April 2010 to 27 May 2010

**2.2. Summary of Test Results**

FCC Reference (47CFR )	IC Reference	Measurement	Result
<b>GSM850</b>			
Part 15.109	RSS-Gen 4.10/6 RSS-132 4.6	Receiver/Idle Mode Radiated Spurious Emissions	
Part 22.913/ 2.1046(a)	RSS-132 4.4 SRSP-503 5.1.3	Transmitter Carrier Output Power (Conducted)	
Part 22.355	RSS-132 4.3 RSS Gen 4.7	Transmitter Frequency Stability (Temperature & Voltage Variation)	
Part 2.1049	RSS-Gen 4.6.1	Transmitter Occupied Bandwidth	
Part 2.1051/22.917	RSS-132 4.5	Transmitter Out of Band Conducted Emissions	
Part 2.1051/22.917	RSS-132 4.5	Transmitter Band Edge Conducted Emissions	
Part 2.1053/22.917	RSS-132 4.5	Transmitter Out of Band Radiated Emissions	
Part 2.1053/22.917	RSS-132 4.5	Transmitter Band Edge Radiated Emissions	 Note 1
<b>PCS1900</b>			
Part 15.109	RSS-Gen 4.10/6 RSS-133 6.6	Idle Mode Radiated Spurious Emissions	
Part 24.232/ 2.1046(a)	RSS-133 6.4 SRSP-510 5.1.2	Transmitter Carrier Output Power (Conducted)	
Part 24.235	RSS-133 6.3 RSS Gen 4.7	Transmitter Frequency Stability (Temperature & Voltage Variation)	
Part 2.1049/24.238	RSS-Gen 4.6.1	Transmitter Occupied Bandwidth	
Part 2.1051/24.238	RSS-133 6.5	Transmitter Out of Band Conducted Emissions	
Part 2.1051/24.238	RSS-133 6.5	Transmitter Band Edge Conducted Emissions	
Part 2.1053/24.238	RSS-133 6.5	Transmitter Out of Band Radiated Emissions	
Part 2.1053/24.238	RSS-133 6.5	Transmitter Band Edge Radiated Emissions	
<b>Key to Results</b>			
 = Complied  = Did not comply			

**Note(s):**

1. Transmitter band edge radiated emissions were not performed for GSM850 as the residual carrier power seen on the emissions plot is lower than the specified -13.0 dBm limit and therefore complies with the band edge requirements by default.

### **2.3. Methods and Procedures**

<b>Reference:</b>	ANSI/TIA-603-C-2004
<b>Title:</b>	Land Mobile Communications Equipment, Measurements and performance Standards
<b>Reference:</b>	ANSI C63.4 (2009)
<b>Title:</b>	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 kHz

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

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

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

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

<b>Brand Name:</b>	Telit
<b>Model Name or Number:</b>	GE864-QUAD V2
<b>IMEI Number:</b>	351934048900356
<b>Hardware Version Number:</b>	2H00
<b>Software Version Number:</b>	10.00.023
<b>IC Certification Number::</b>	5131A-GE864Q2
<b>FCC ID::</b>	RI7GE864Q2

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

The equipment under test was a quad band GSM/GPRS modem mounted on a Telit development board. The EUT was mounted to the development board on four support posts and connected by two 40 pin connectors.

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

No modifications were applied to the EUT during testing.



**3.4. Additional Information Related to Testing**

<b>Type of Radio Device:</b>	Transceiver					
<b>Power Supply Requirement(s):</b>	Nominal	3.8 V	Minimum	3.4 V	Maximum	4.4 V
<b>Mode:</b>	GSM/GPRS					
<b>Modulation Type:</b>	GMSK					
<b>Channel Spacing:</b>	200 kHz					
<b>Technology Tested:</b>	GSM850					
<b>Maximum Conducted Output Power:</b>	GSM	32.4 dBm	GPRS	32.4 dBm		
<b>Transmit Frequency Range:</b>	824 to 849 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 to 894 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>Technology Tested:</b>	PCS1900					
<b>Maximum Conducted Output Power:</b>	GSM	29.7 dBm	GPRS	29.6 dBm		
<b>Transmit Frequency Range:</b>	1850 to 1910 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 to 1990 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	1959.8			
	Top	810	1989.8			

### **3.5. Support Equipment**

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

<b>Description:</b>	Laptop PC
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	Latitude D600
<b>Serial Number:</b>	PC353NT

<b>Description:</b>	Development Board
<b>Brand Name:</b>	Telit
<b>Model Name or Number:</b>	Not stated
<b>Serial Number:</b>	113990001010

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

### **4.1. Operating Modes**

The EUT was tested in the following operating mode(s):

- Receiver/Idle mode.
- Constantly transmitting at full power on bottom, centre and top channels as required.
- Occupied bandwidth, output power and band edge tests were performed with the EUT in GSM single timeslot circuit switched and GPRS Multislot Class 10 with the unit transmitting on two timeslots in the uplink.
- Transmitter radiated spurious emissions were checked in all modes during prescans. Circuit switched voice was found to be the worst case and all final measurements were performed with the EUT in this mode.

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

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

- The EUT RF port was connected to a GSM/GPRS system simulator via conducted link, operating in transceiver mode.
- Powered from a bench power supply connected to the 3.8V IN port on the development board.

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

### **5.1. General Comments**

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

**5.2. Test Results – FCC Part 22**

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

**Test Summary:**

<b>FCC Part:</b>	15.109
<b>Frequency Range:</b>	30 MHz to 1000 MHz
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes

**Environmental Conditions:**

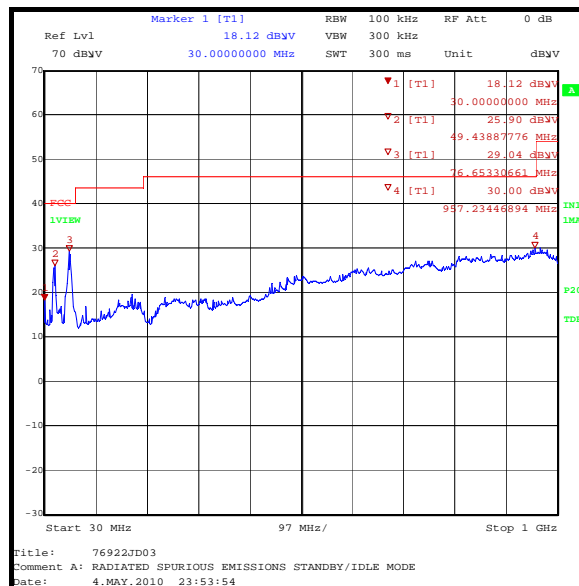
<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	21

**Results:**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
30.002	Horizontal	30.2	40.0	8.8	Complied
49.977	Vertical	36.4	40.0	3.6	Complied
77.789	Horizontal	30.2	40.0	8.8	Complied

**Note(s):**

- The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.



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

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

**Test Summary:**

<b>FCC Part:</b>	15.109
<b>Frequency Range:</b>	1 GHz to 5 GHz
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes

**Environmental Conditions:**

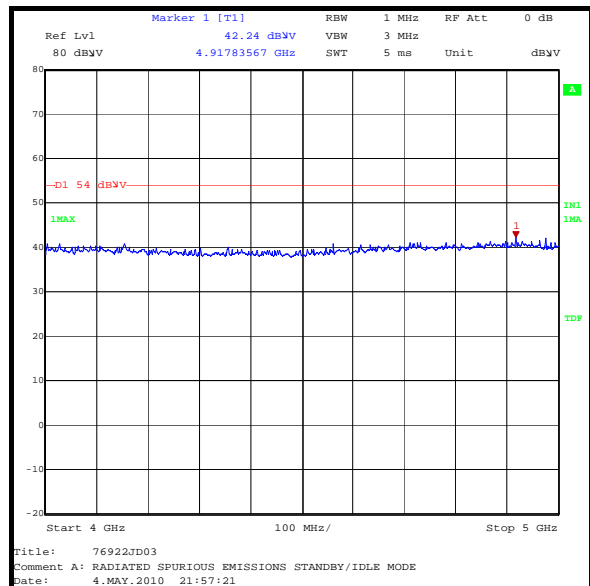
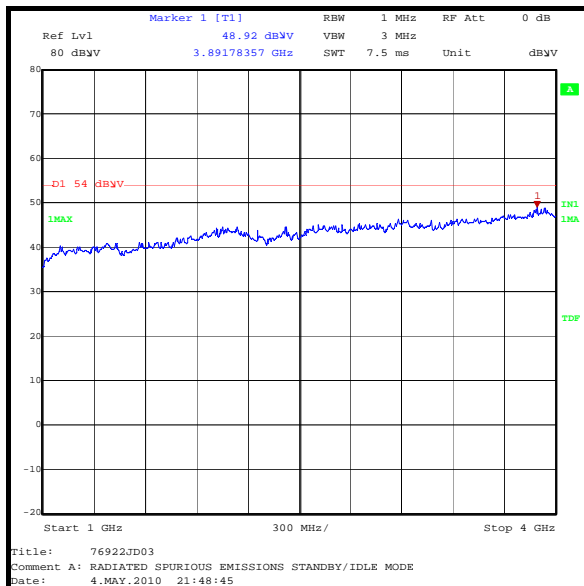
<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	21

**Results:**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
3891.784	Horizontal	48.9	54.0	5.1	Complied

**Note(s):**

1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
2. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.



**5.2.2. Transmitter Carrier Output Power (Conducted)****Test Summary:**

<b>FCC Part:</b>	22.913(a) & 2.1046(a)
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.1 referencing FCC CFR Part 2.1046(a)

**Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

**Results: GSM**

Channel	Frequency (MHz)	Conducted RF Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	824.2	32.4	38.5	6.1	Complied
Middle	836.6	32.2	38.5	6.3	Complied
Top	848.8	31.9	38.5	6.6	Complied

**Results: GPRS**

Channel	Frequency (MHz)	Conducted RF Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	824.2	32.4	38.5	6.1	Complied
Middle	836.6	32.2	38.5	6.3	Complied
Top	848.8	31.9	38.5	6.6	Complied

**5.2.3. Transmitter Frequency Stability (Temperature Variation)****Test Summary:**

<b>FCC Part:</b>	22.355
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

**Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

**Results: Middle Channel (836.6 MHz)**

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	836.600061	61	0.07	2.5	2.43	Complied
-20	836.600048	48	0.06	2.5	2.44	Complied
-10	836.600012	12	0.01	2.5	2.49	Complied
0	836.600016	16	0.01	2.5	2.49	Complied
10	836.600007	7	0.02	2.5	2.48	Complied
20	836.600037	37	0.01	2.5	2.49	Complied
30	836.599990	-10	0.01	2.5	2.49	Complied
40	836.599988	-12	0.01	2.5	2.49	Complied
50	836.599989	-11	0.01	2.5	2.49	Complied



**5.2.4. Transmitter Frequency Stability (Voltage Variation)****Test Summary:**

<b>FCC Part:</b>	22.355
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

**Environmental Conditions:**

<b>Temperature (°C):</b>	20
<b>Relative Humidity (%):</b>	24

**Results: Middle Channel (836.6 MHz)**

<b>Supply Voltage (V)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (Hz)</b>	<b>Frequency Error (ppm)</b>	<b>Limit (ppm)</b>	<b>Margin (ppm)</b>	<b>Result</b>
3.2	836.600012	12	0.01	2.5	2.49	Complied
4.4	836.599989	-11	0.01	2.5	2.49	Complied

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

<b>FCC Part:</b>	2.1049
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.7 and relevant annexes referencing FCC CFR Part 2.1049 (see note below)

**Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

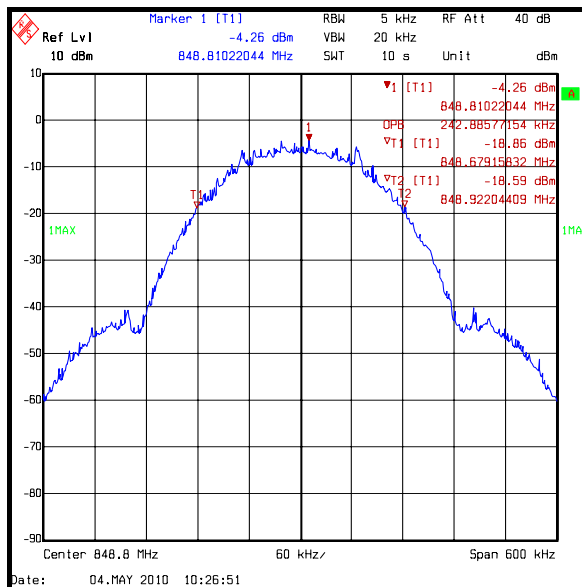
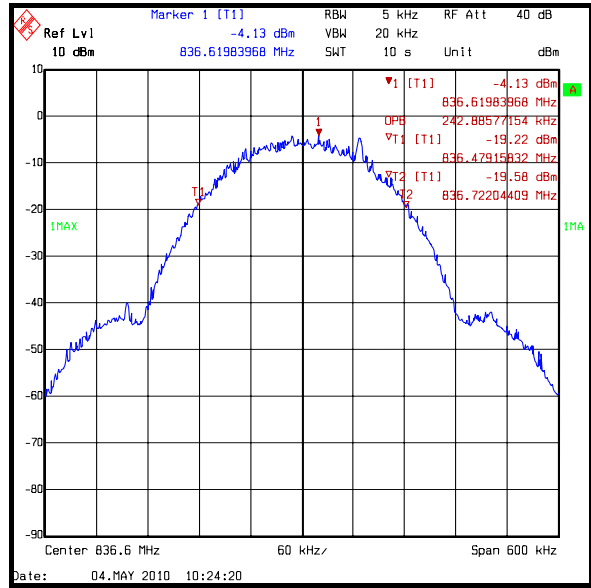
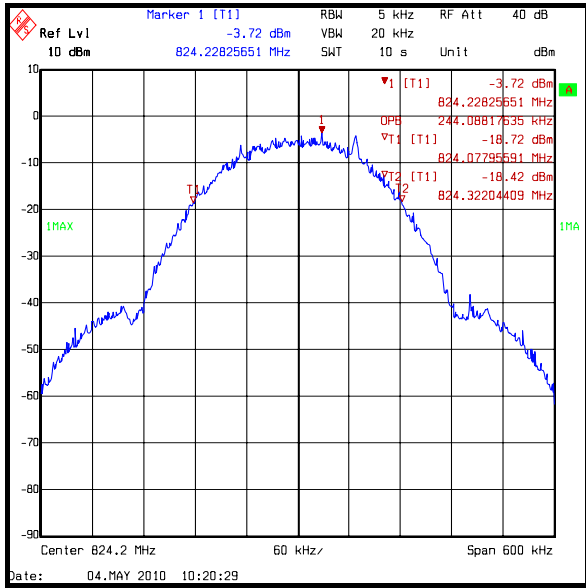
**Results: GSM**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	824.2	244.088
Middle	836.6	242.886
Top	848.8	242.886

**Note(s):**

1. In lieu of the test method detailed in ANSI C63.4 Section 13.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.

**Transmitter Occupied Bandwidth (continued)**



**Transmitter Occupied Bandwidth (continued)****Test Summary:**

<b>FCC Part:</b>	2.1049
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.7 and relevant annexes referencing FCC CFR Part 2.1049 (see note below)

**Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

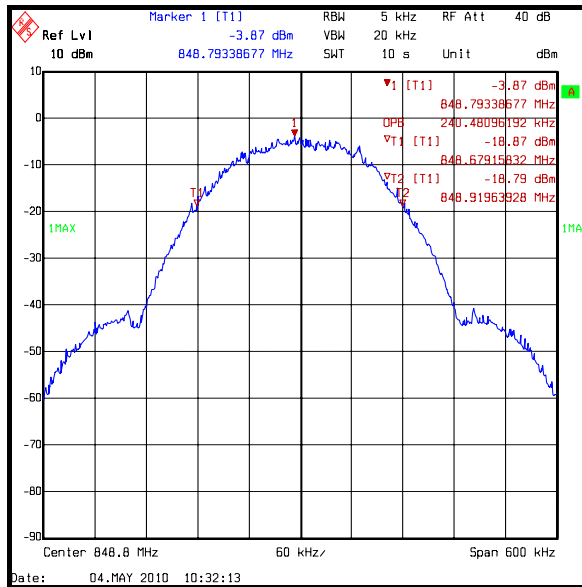
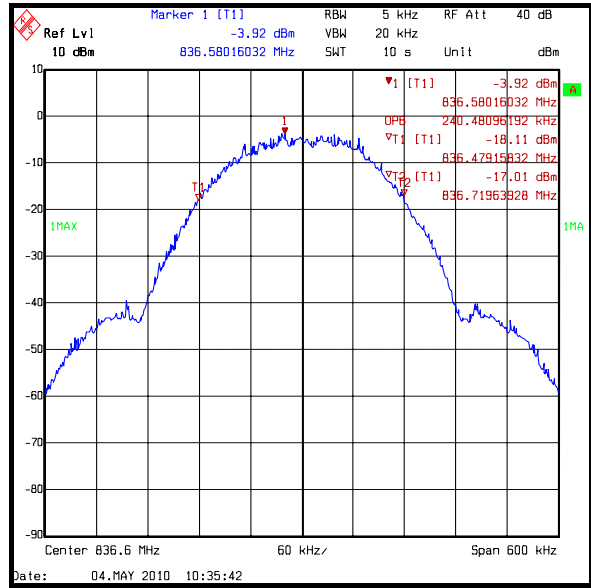
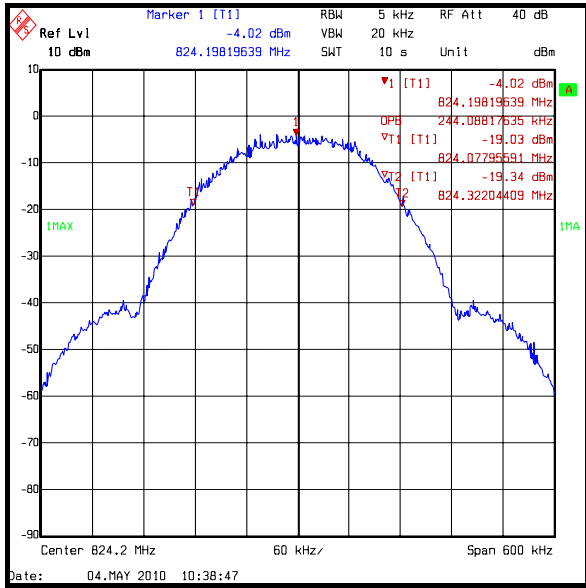
**Results: GPRS**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	824.2	244.088
Middle	836.6	240.481
Top	848.8	240.481

**Note(s):**

1. In lieu of the test method detailed in ANSI C63.4 Section 13.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.

**Transmitter Occupied Bandwidth (continued)**



**5.2.6. Transmitter Out of Band Conducted Emissions****Test Summary:**

<b>FCC Part:</b>	2.1051 & 22.917
<b>Frequency Range:</b>	9 kHz to 10 GHz
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC CFR Part 2.1051

**Environmental Conditions:**

<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	31

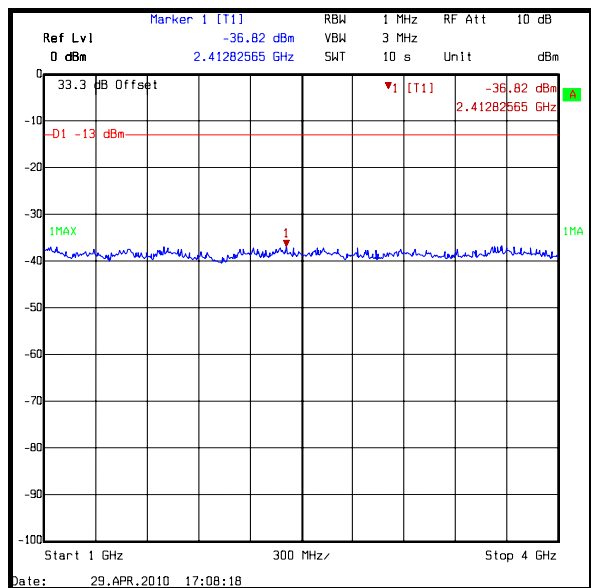
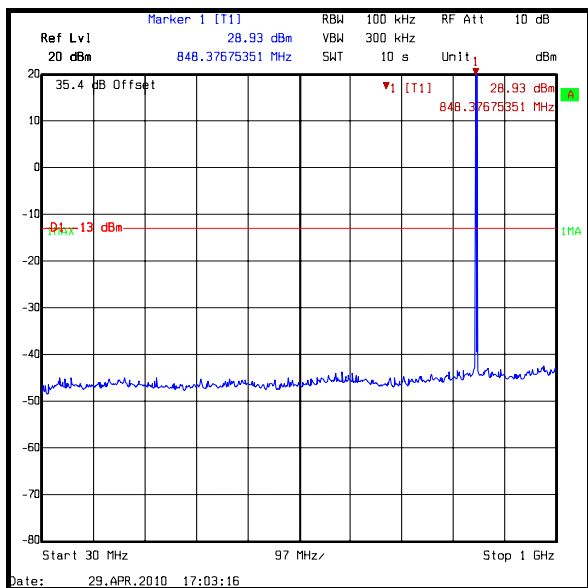
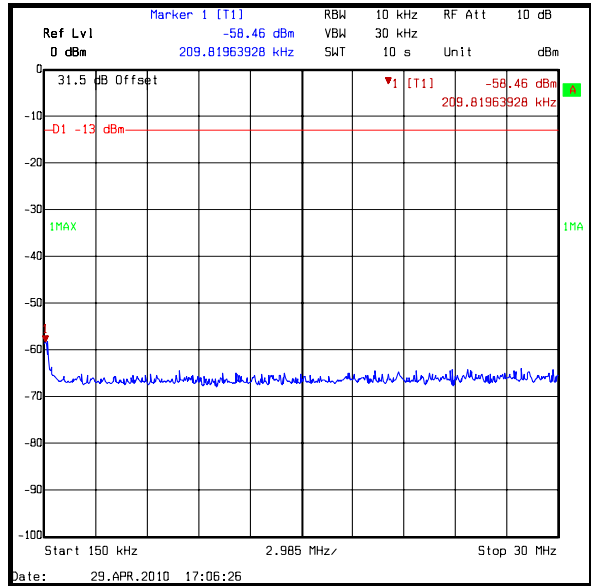
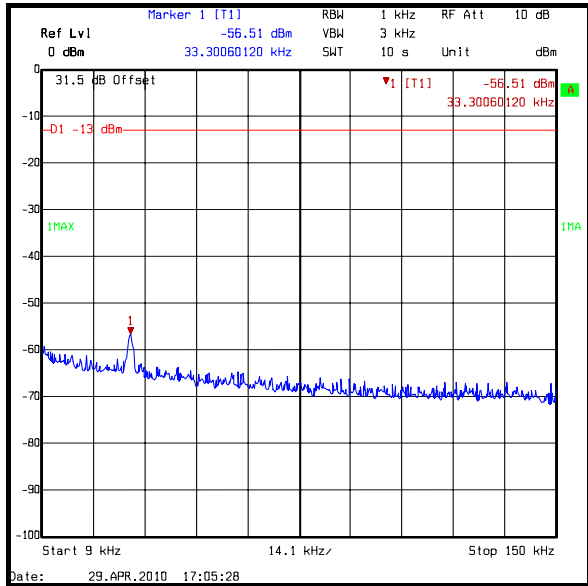
**Results: Top Channel**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
2412.826	-36.8	-13.0	23.8	Complied

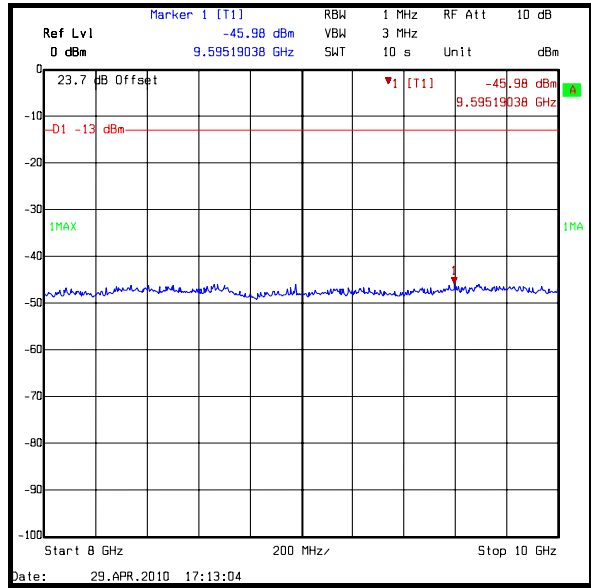
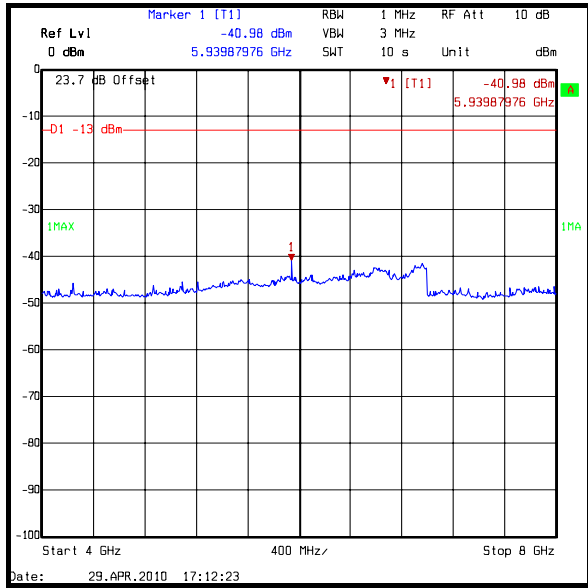
**Note(s):**

1. All emissions were investigated and found to be at least 20 dB below the specified limit; therefore the highest emission level was recorded as shown in the table above.
2. The emissions shown at approximately 848.376 MHz on the 30 MHz to 1 GHz plot is the carrier.

### Transmitter Out of Band Conducted Emissions (continued)



**Transmitter Out of Band Conducted Emissions (continued)**





**5.2.7. Transmitter Conducted Emissions at Band Edges**

**Test Summary:**

<b>FCC Part:</b>	2.1051 & 22.917
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC CFR Part 2.1051 and 22.917

**Environmental Conditions:**

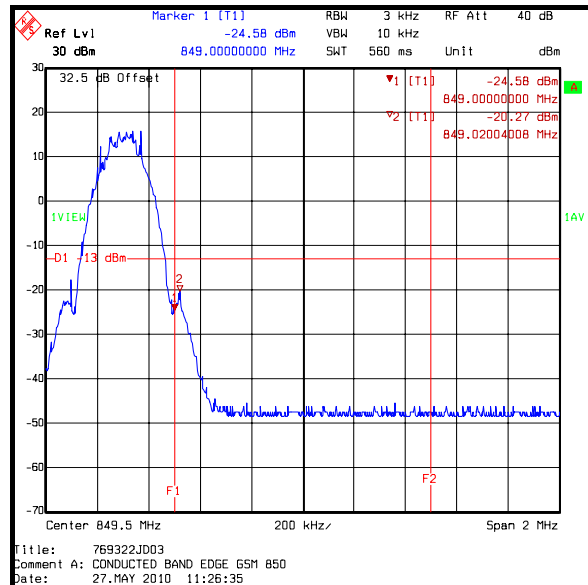
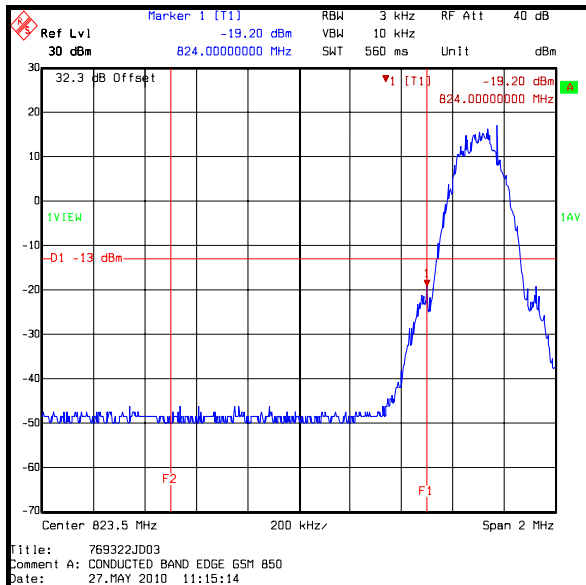
<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

**Results: GSM Lower Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
824	-19.2	-13.0	6.2	Complied

**Results: GSM Upper Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
849	-24.6	-13.0	11.6	Complied
849.020	-20.3	-13.0	7.3	Complied



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

**Test Summary:**

<b>FCC Part:</b>	2.1051 & 22.917
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC CFR Part 2.1051 and 22.917

**Environmental Conditions:**

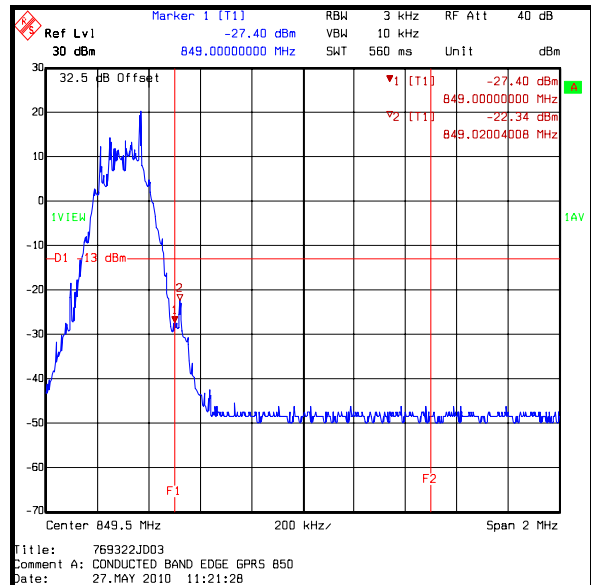
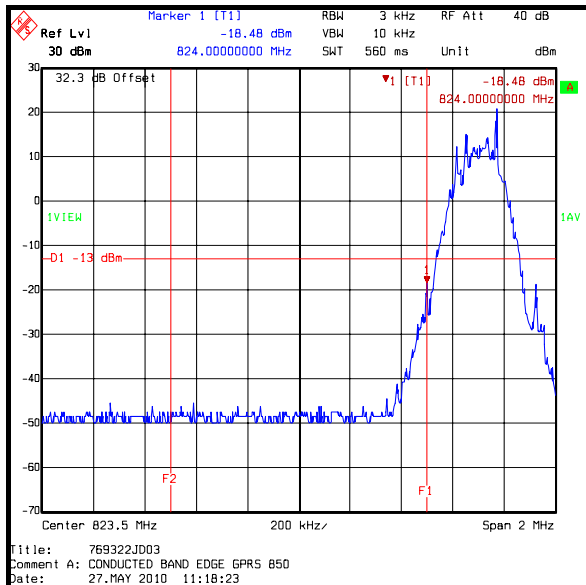
<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

**Results: GPRS Lower Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
824	-18.5	-13.0	5.5	Complied

**Results: GPRS Upper Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
849	-27.4	-13.0	14.4	Complied
849.020	-22.3	-13.0	9.3	Complied



**5.2.8. Transmitter Out of Band Radiated Emissions****Test Summary:**

<b>FCC Part:</b>	2.1053 & 22.917
<b>Frequency Range:</b>	30 MHz to 10 GHz
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Part 2.1053

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	24

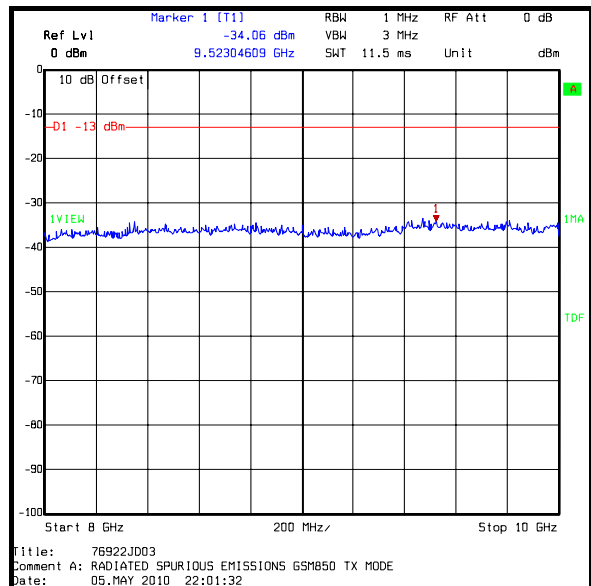
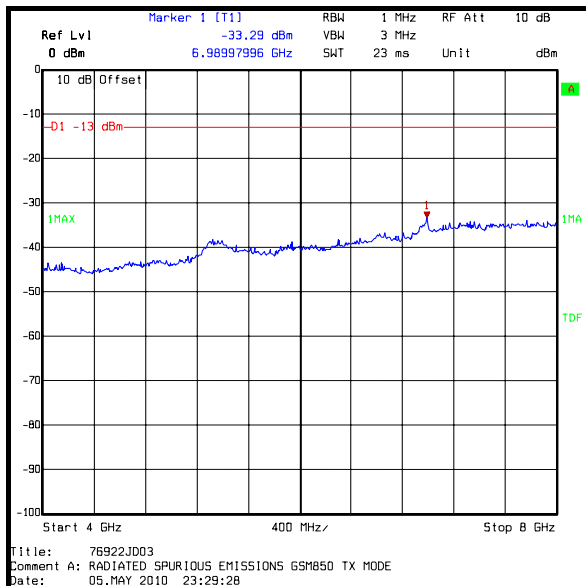
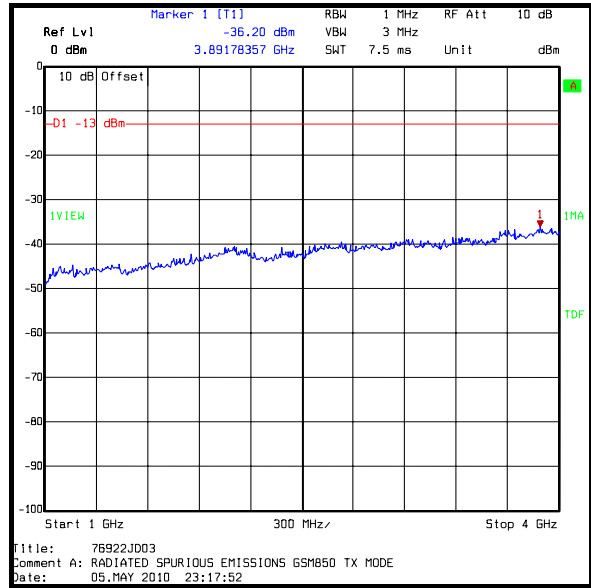
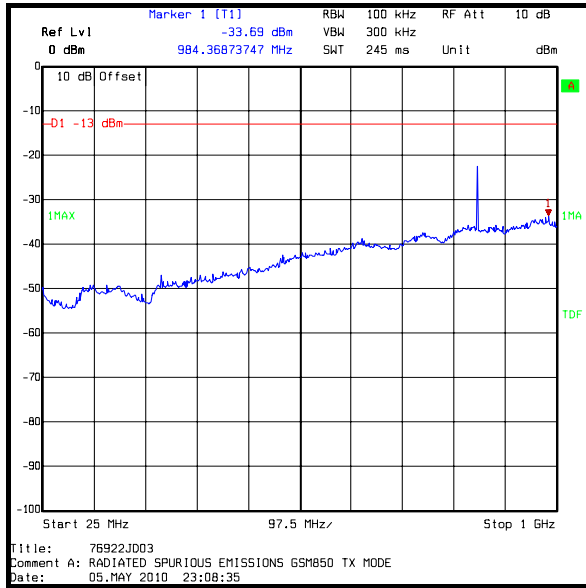
**Results:**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
6981.964	-32.8	-13.0	19.8	Complied

**Note(s):**

1. The emissions shown at approximately 849.5 MHz on the 30 MHz to 1 GHz plot is the carrier.
2. All emissions were investigated and found to be at least 20 dB below the specified limit; therefore the highest noise floor level was recorded as shown in the table above.

**Transmitter Out of Band Radiated Emissions (continued)**



### 5.3. Test Results – FCC Part 24

#### 5.3.1. Idle Mode Radiated Spurious Emissions

##### Test Summary:

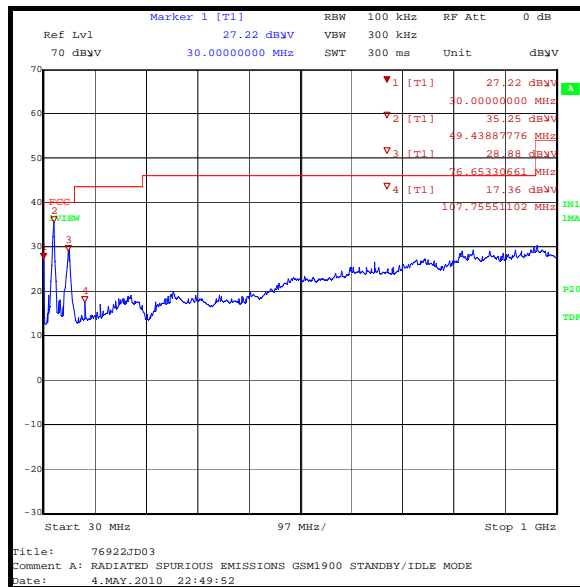
FCC Part:	15.109
Frequency Range:	30 MHz to 1000 MHz
Test Method Used:	As detailed in ANSI C63.4 Section 8 and relevant annexes

##### Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	21

##### Results:

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
30.000	Horizontal	30.9	40.0	8.1	Complied
49.978	Vertical	37.2	40.0	12.8	Complied
76.796	Horizontal	29.4	40.0	10.6	Complied



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

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

<b>FCC Part:</b>	15.109
<b>Frequency Range:</b>	1 GHz to 10 GHz
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	22

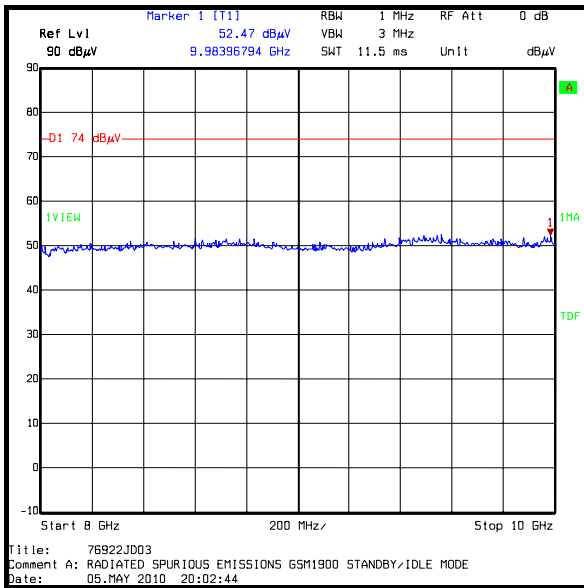
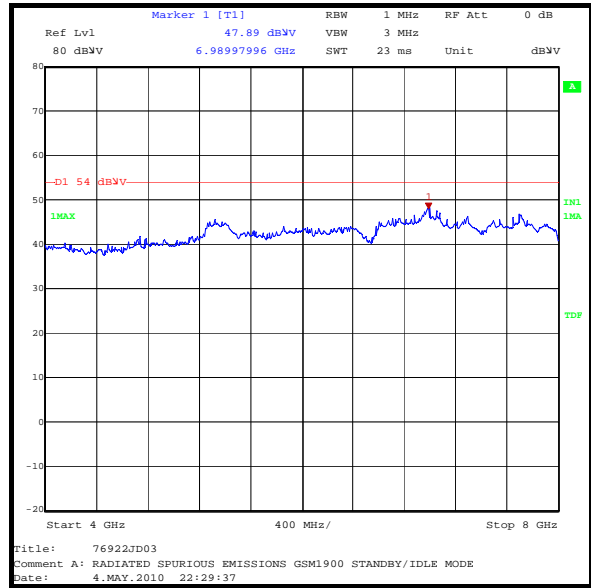
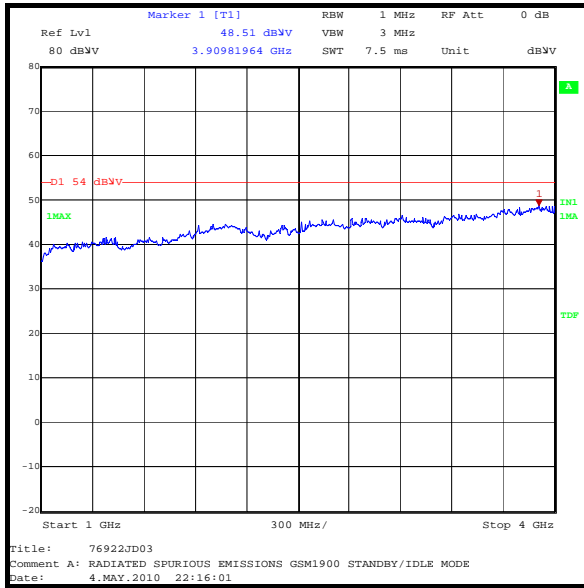
**Results:**

<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Peak Level (dB<math>\mu</math>V/m)</b>	<b>Average Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
3909.820	Horizontal	48.5	54.0	5.5	Complied

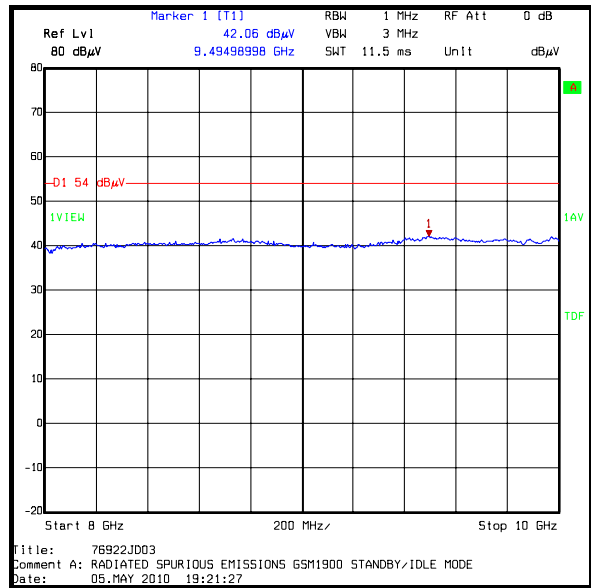
**Note(s):**

1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
2. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
3. All pre-scans were performed with the peak detector against average limits apart from measurements made in the range 8 GHz to 10 GHz where pre-scans were performed with peak and average detector and the applicable limit applied. This was due to the noise floor being close to the average limit when using the peak detector.

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



**Peak Detector**



**Average Detector**

**5.3.2. Transmitter Carrier Output Power (Conducted)****Test Summary:**

<b>FCC Part:</b>	24.232 & 2.1046(a)
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.1 referencing FCC CFR Part 2.1046(a)

**Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

**Results: GSM**

Channel	Frequency (MHz)	Conducted RF Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	29.3	33.0	3.7	Complied
Middle	1879.8	29.7	33.0	3.3	Complied
Top	1909.8	29.5	33.0	3.5	Complied

**Results: GPRS**

Channel	Frequency (MHz)	Conducted RF Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	29.2	33.0	3.8	Complied
Middle	1879.8	29.6	33.0	3.4	Complied
Top	1909.8	29.5	33.0	3.5	Complied



**5.3.3. Transmitter Frequency Stability (Temperature Variation)****Test Summary:**

<b>FCC Part:</b>	24.235
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

**Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

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

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	104	1850.200104	1850.0	0.200104	Complied
-20	55	1850.200055	1850.0	0.200055	Complied
-10	62	1850.200062	1850.0	0.200062	Complied
0	50	1850.200050	1850.0	0.200050	Complied
10	44	1850.200044	1850.0	0.200044	Complied
20	47	1850.200047	1850.0	0.200047	Complied
30	40	1850.200040	1850.0	0.200040	Complied
40	36	1850.200036	1850.0	0.200036	Complied
50	42	1850.200042	1850.0	0.200042	Complied

**Results: Top Channel (1909.8 MHz)**

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	80	1909.800080	1910.0	0.199920	Complied
-20	57	1909.800057	1910.0	0.199943	Complied
-10	57	1909.800057	1910.0	0.199943	Complied
0	51	1909.800051	1910.0	0.199949	Complied
10	44	1909.800044	1910.0	0.199956	Complied
20	43	1909.800043	1910.0	0.199957	Complied
30	46	1909.800046	1910.0	0.199954	Complied
40	46	1909.800046	1910.0	0.199954	Complied
50	41	1909.800041	1910.0	0.199959	Complied

**5.3.4. Transmitter Frequency Stability (Voltage Variation)****Test Summary:**

<b>FCC Part:</b>	24.235
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

**Environmental Conditions:**

<b>Temperature (°C):</b>	20
<b>Relative Humidity (%):</b>	24

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

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.2	48	1850.200048	1850.0	0.200048	Complied
4.4	40	1850.200040	1850.0	0.200040	Complied

**Results: Top Channel (1909.8 MHz)**

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
3.2	46	1909.800046	1910.0	0.199954	Complied
4.4	45	1909.800045	1910.0	0.199955	Complied

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

<b>FCC Part:</b>	24.238
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.7 and relevant annexes referencing FCC CFR Part 2.1049 (see note below)

**Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

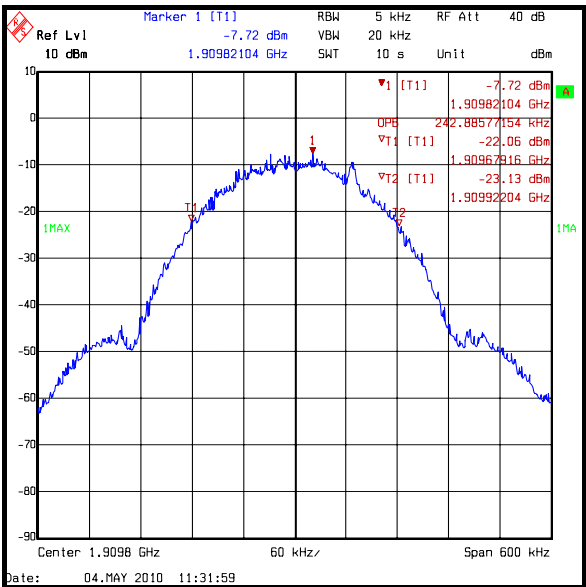
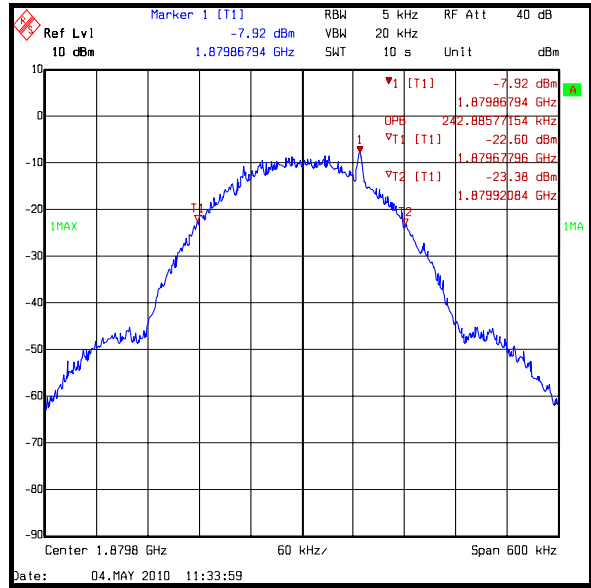
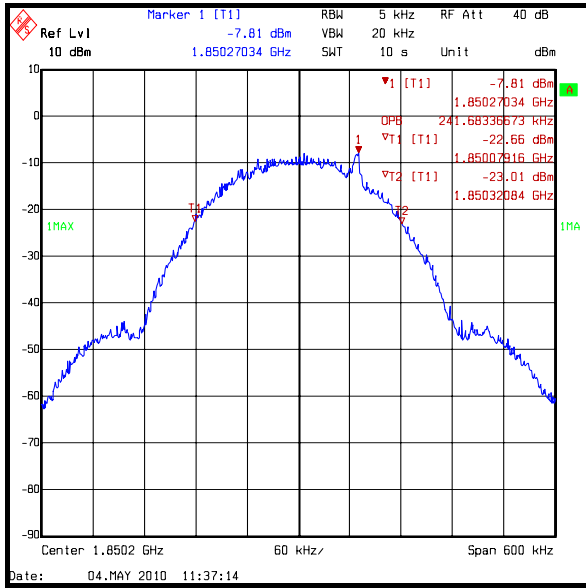
**Results: GSM**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	1850.2	241.683
Middle	1879.8	242.886
Top	1909.8	242.886

**Note(s):**

1. In lieu of the test method detailed in ANSI C63.4 Section 13.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.

**Transmitter Occupied Bandwidth (continued)**



**Transmitter Occupied Bandwidth (continued)****Test Summary:**

<b>FCC Part:</b>	24.238
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.7 and relevant annexes referencing FCC CFR Part 2.1049 (see note below)

**Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	27

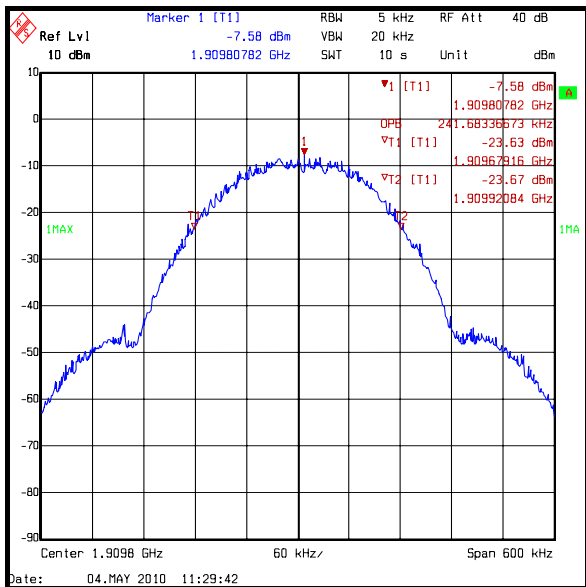
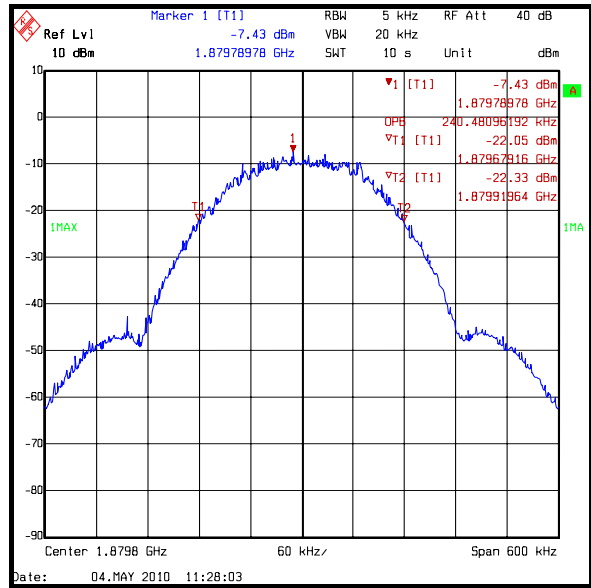
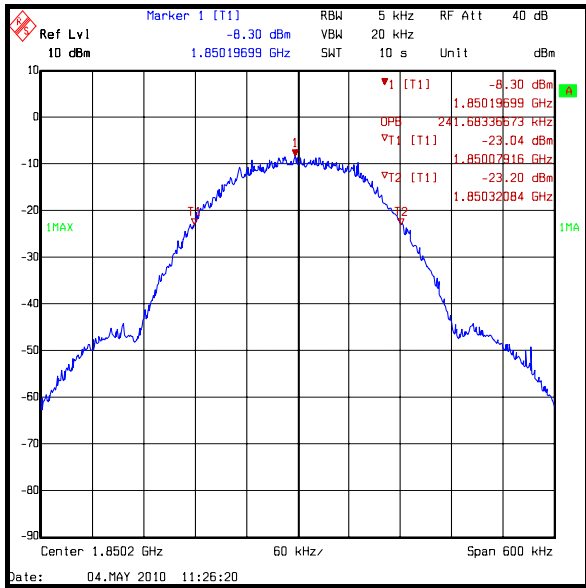
**Results: GPRS**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	1850.2	241.683
Middle	1879.8	240.481
Top	1909.8	241.683

**Note(s):**

1. In lieu of the test method detailed in ANSI C63.4 Section 13.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.

**Transmitter Occupied Bandwidth (continued)**



**5.3.6. Transmitter Out of Band Conducted Emissions****Test Summary:**

<b>FCC Part:</b>	2.1051 & 24.238
<b>Frequency Range:</b>	9 kHz to 20 GHz
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC CFR Part 2.1051

**Environmental Conditions:**

<b>Temperature (°C):</b>	22
<b>Relative Humidity (%):</b>	24

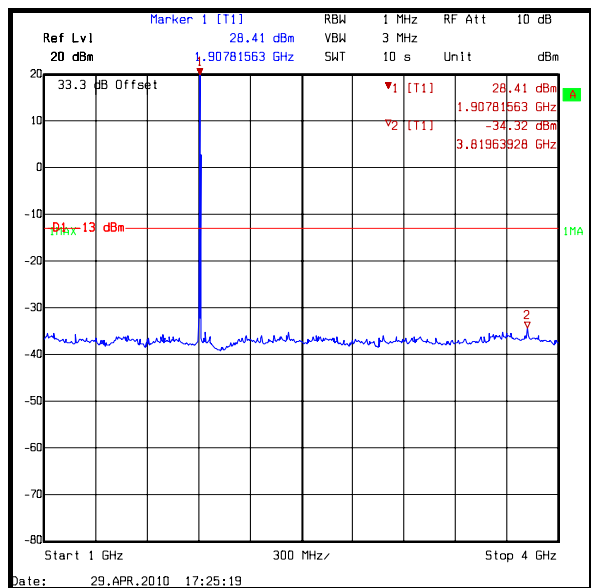
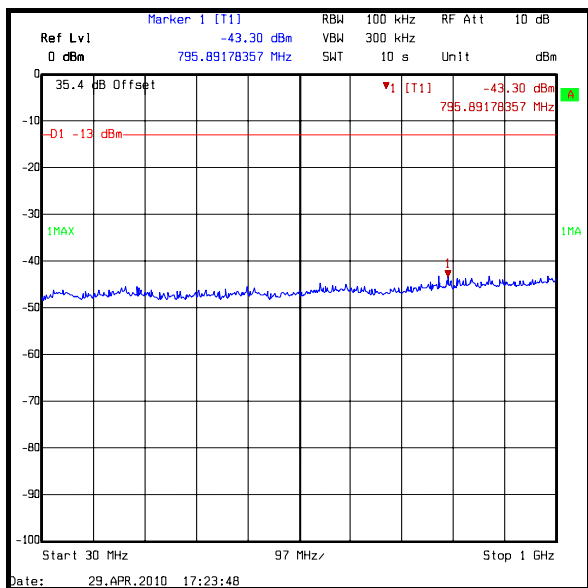
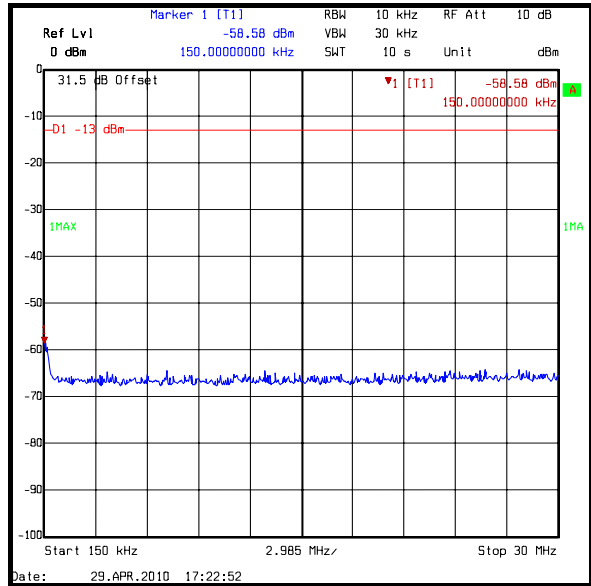
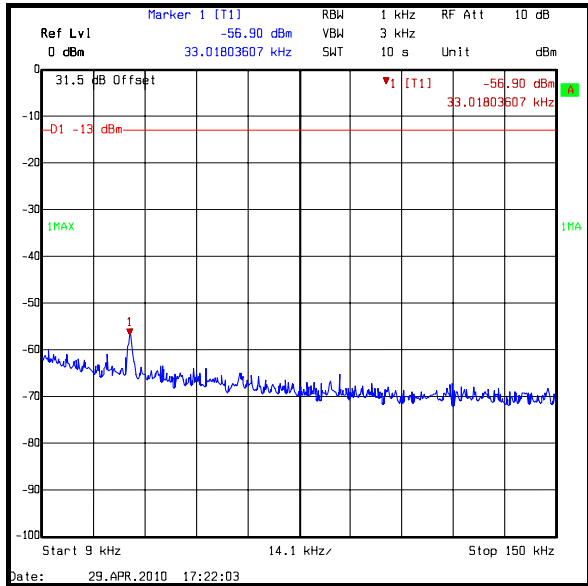
**Results: Top Channel**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
3819.639	-34.3	-13.0	21.3	Complied

**Note(s):**

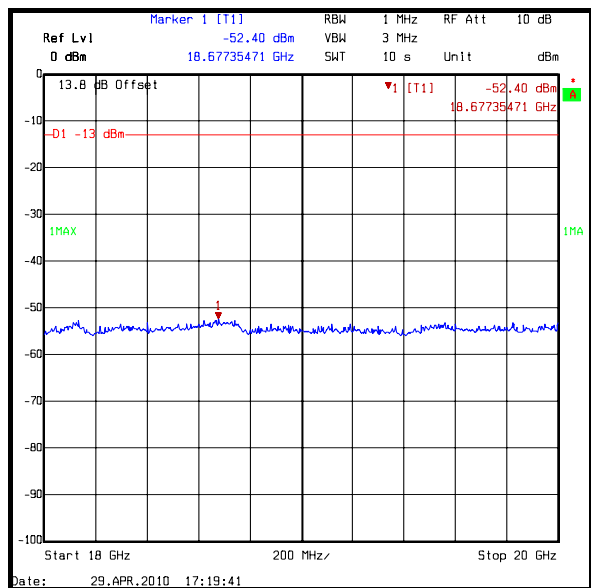
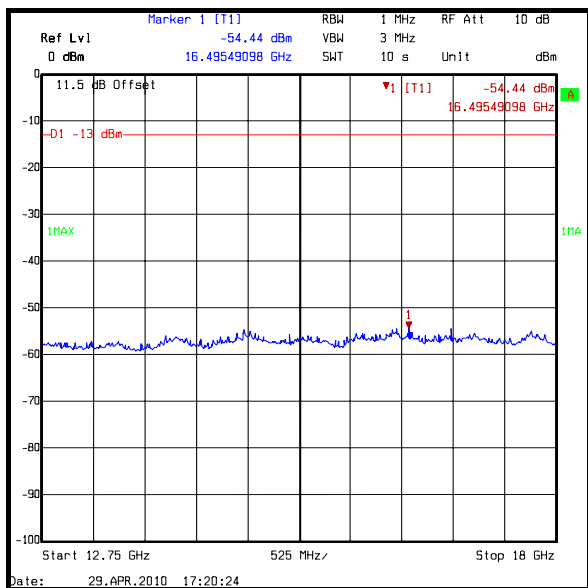
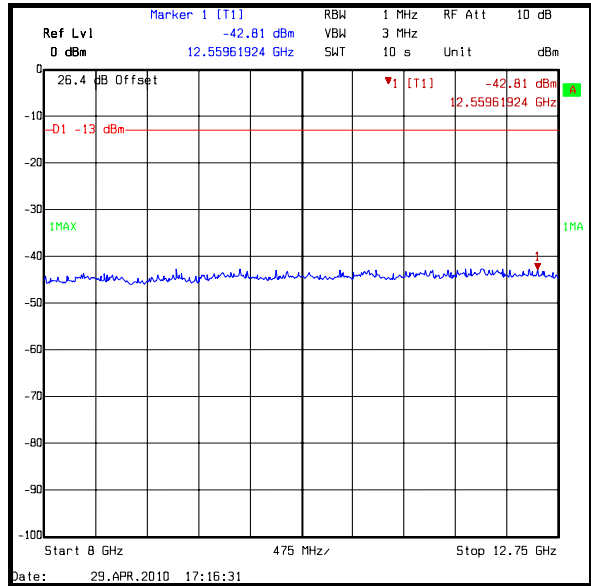
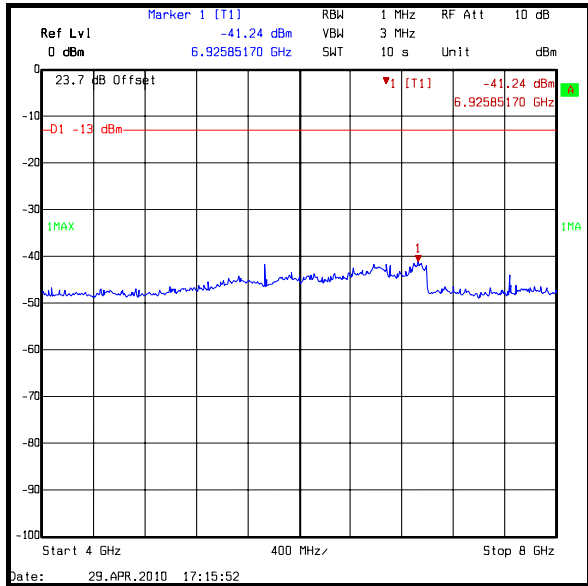
1. All emissions were investigated and found to be at least 20 dB below the specified limit; therefore the highest emission level was recorded as shown in the table above.
2. The emissions shown at approximately 1907.816 MHz on the 1 MHz to 4 GHz plot is the carrier.

**Transmitter Out of Band Conducted Emissions (continued)**





**Transmitter Out of Band Conducted Emissions (continued)**



**5.3.7. Transmitter Conducted Emissions at Band Edges**

**Test Summary:**

<b>FCC Part:</b>	2.1051 & 24.238
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC CFR Part 2.1051 and 24.238

**Environmental Conditions:**

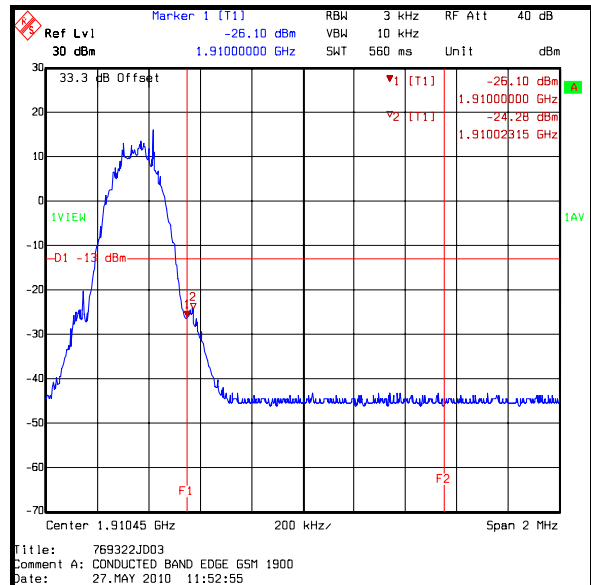
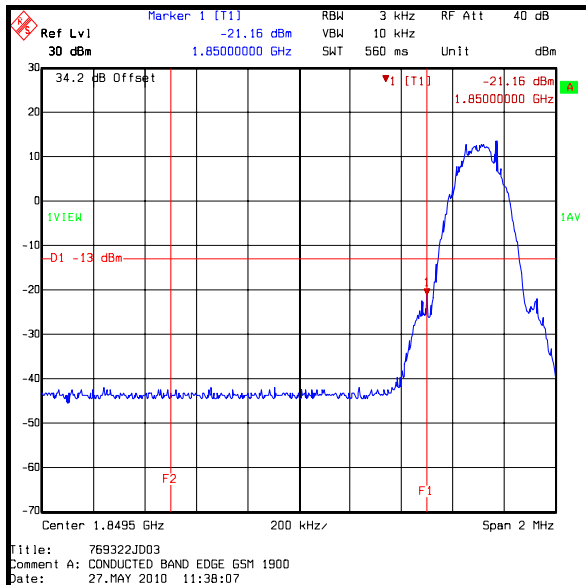
<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	27

**Results: GSM Lower Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
1850	-21.2	-13.0	8.2	Complied

**Results: GSM Upper Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
1910	-26.1	-13.0	13.1	Complied
1910.023	-24.3	-13.0	11.3	Complied



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

**Test Summary:**

<b>FCC Part:</b>	2.1051 & 24.238
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC CFR Part 2.1051 and 24.238

**Environmental Conditions:**

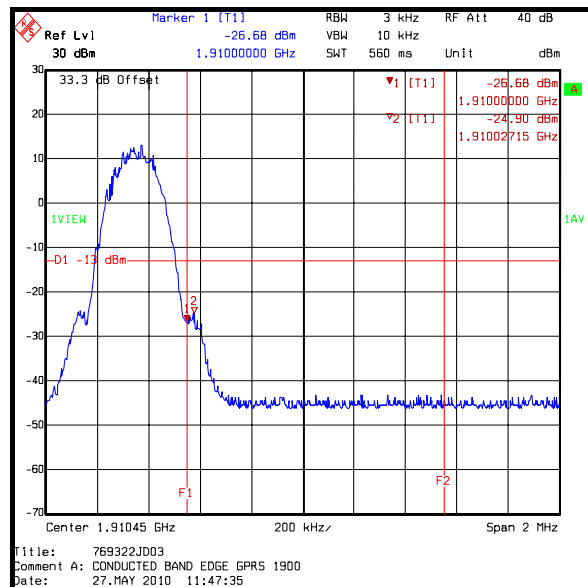
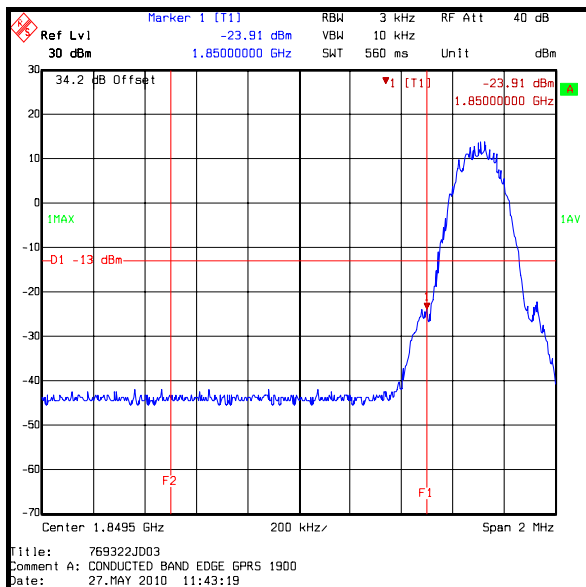
<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	27

**Results: GPRS Lower Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
1850	-21.9	-13.0	8.9	Complied

**Results: GPRS Upper Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
1910	-26.7	-13.0	13.7	Complied
1910.027	-24.9	-13.0	11.9	Complied



### **5.3.8. Transmitter Out of Band Radiated Emissions**

#### **Test Summary:**

<b>FCC Part:</b>	2.1053 & 24.238
<b>Frequency Range:</b>	30 MHz to 20 GHz
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Parts 2.1053 and 24.238

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	29

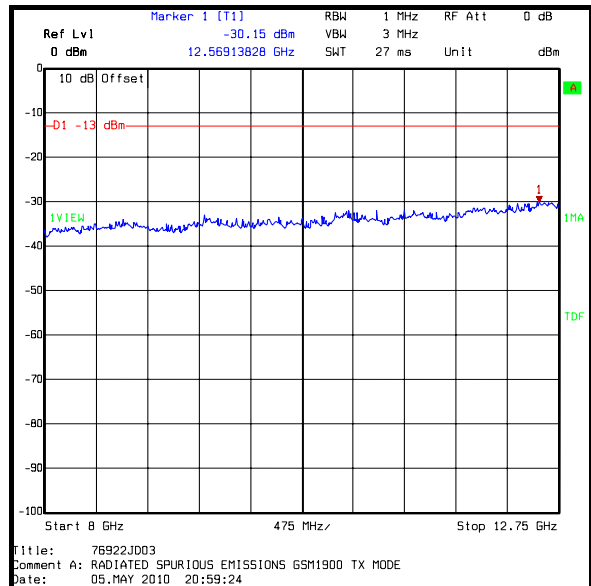
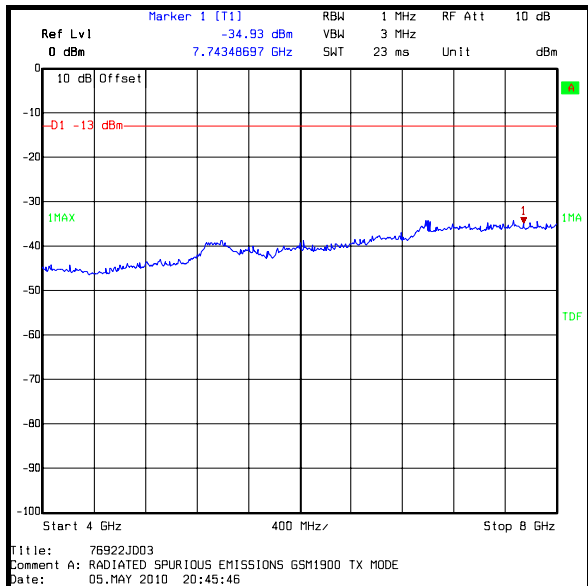
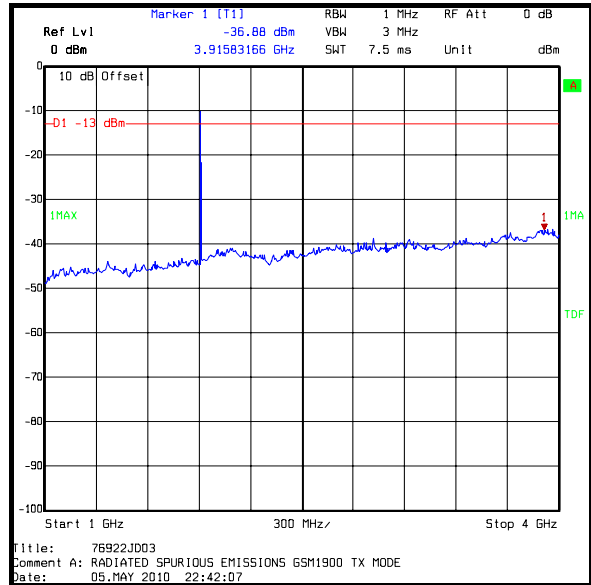
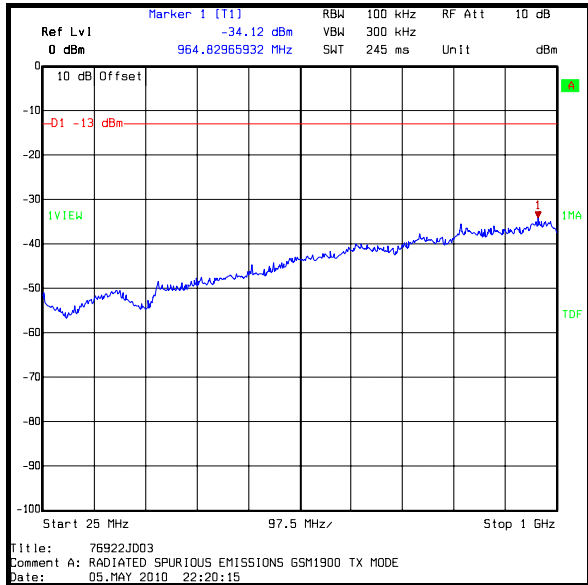
#### **Results: Top Channel**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
17400.301	-25.1	-13.0	12.1	Complied

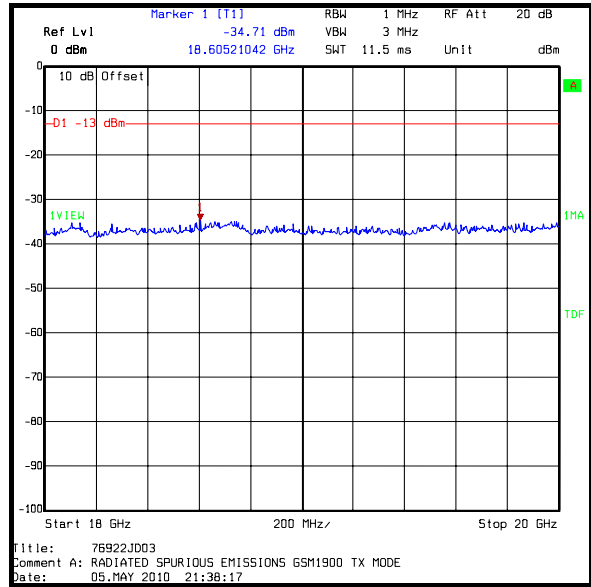
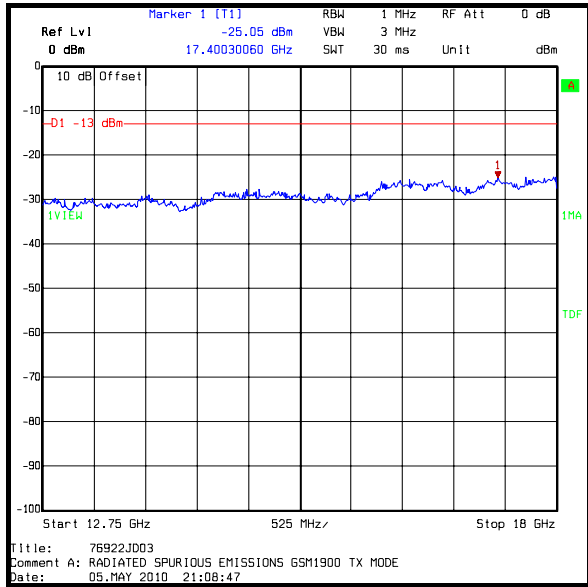
#### **Note(s):**

1. All emissions were investigated and found to be at least 20 dB below the specified limit; therefore the highest noise floor level was recorded as shown in the table above.
2. The transmitter fundamental is shown on the 1 GHz to 4 GHz plot at 1907.815 MHz

**Transmitter Out of Band Radiated Emissions (continued)**



**Transmitter Out of Band Radiated Emissions (continued)**



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

<b>FCC Part:</b>	2.1053 & 24.238
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Parts 2.1053 and 24.238

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	24

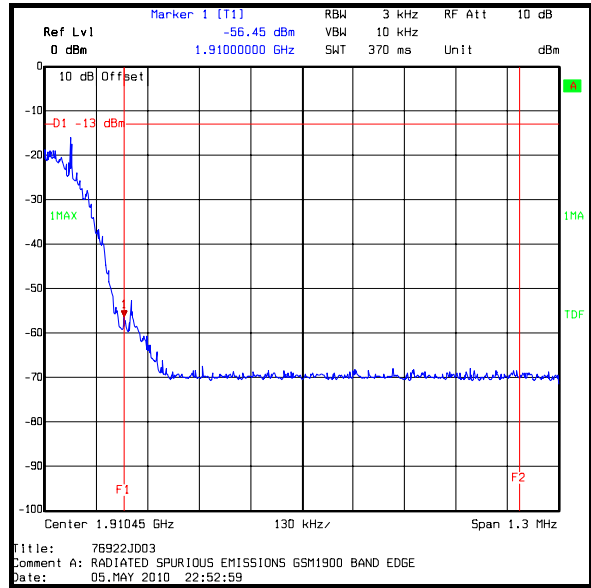
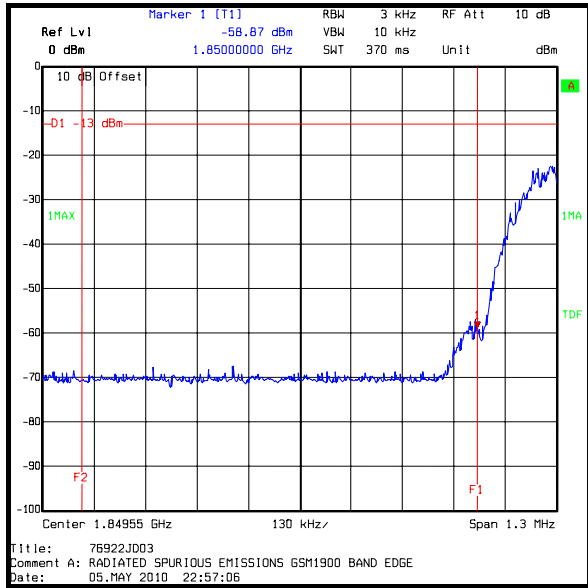
**Results: GSM - Bottom Band Edge**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dBm)</b>	<b>Result</b>
1850	-58.9	-13.0	45.9	Complied

**Results: GSM - Top Band Edge**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dBm)</b>	<b>Result</b>
1910	-56.5	-13.0	43.5	Complied

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





**Transmitter Radiated Emissions at Band Edges (continued)****Test Summary:**

<b>FCC Part:</b>	2.1053 & 24.238
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Parts 2.1053 and 24.238

**Environmental Conditions:**

<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	21

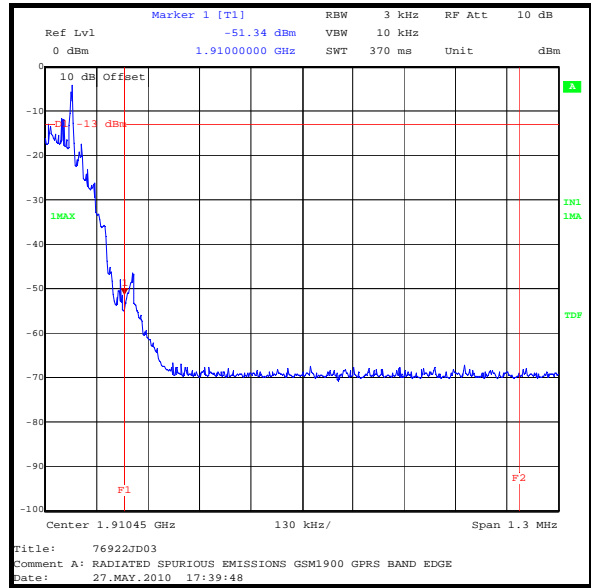
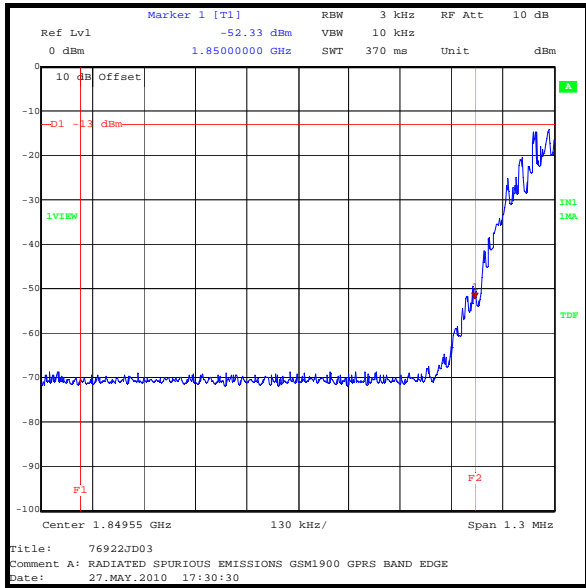
**Results: GPRS - Bottom Band Edge**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dBm)</b>	<b>Result</b>
1850	-52.3	-13.0	39.3	Complied

**Results: GPRS - Top Band Edge**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dBm)</b>	<b>Result</b>
1910	-51.3	-13.0	38.3	Complied

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



## **6. Measurement Uncertainty**

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
Conducted Output Power	Not applicable	95%	±0.28 dB
Frequency Stability	Not applicable	95%	±0.92 ppm
Occupied Bandwidth	Not applicable	95%	±0.92 ppm
Conducted Spurious Emissions	9 kHz to 20 GHz	95%	±2.64 dB
Radiated Spurious Emissions	30 MHz to 20 GHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

**Appendix 1. Test Equipment Used**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1391	Attenuator	Huber + Suhner	757987	6810.17.B	Calibrated before use	-
A1392	Attenuator	Huber + Suhner	757456	6820.17.B	Calibrated before use	-
A1396	Attenuator	Huber + Suhner	757987	6810.17.B	Calibrated before use	-
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1537	Directional Coupler	Hewlett Packard	778D	1144A05122	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	27 Nov 2010	12
A1974	High Pass Filter	AtlanTecRF	AFH-01000	090000283	19 Aug 2010	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	Calibrated before use	-
A1980	High Pass Filter	AtlanTecRF	N/A	09110900303	Calibrated before use	-
A288	Antenna	Chase	CBL6111A	1589	16 Mar 2011	12
A436	Antenna	Flann	20240-20	330	11 May 2013	36
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	01 Sep 2010	12
L1005	Comms Test Set	Rohde & Schwarz	CMU200	116284	23 Mar 2010	12
M1068	Thermometer	Iso-Tech	RS55	93102884	01 Oct 2010	12
M1124	Test Receiver	Rohde & Schwarz	ESI26	100046K	22 Apr 2011	12
M122	Multimeter	Fluke	77	64910017	23 Jun 2010	12
M1223	Environmental Chamber	Votsch	VT4002	58566072720010	Calibrated before use	12
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	18 Mar 2011	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	10 Jul 2010	12
M1273	Test Receiver	Rhode & Schwarz	ESIB 26	100275	08 Apr 2011	12
S0537	Power Supply	TTI	EL302D	249928	Calibrated before use	-

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