



**TEST REPORT  
FROM  
RFI GLOBAL SERVICES LTD**

Test of: GE865-QUAD

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

**Test Report Serial No:**  
RFI-RPT-RP76937JD03B

<b>This Test Report Is Issued Under The Authority Of Scott D'Adamo, Operations Manager Global Approvals:</b>	
	
<b>Checked By:</b>	Ian Watch
<b>Signature:</b>	
<b>Date of Issue:</b>	20 September 2010

This report is issued in Adobe Acrobat portable document format (PDF). It is only a valid copy of the report if it is being viewed in PDF format with the following security options not allowed: Changing the document, Selecting text and graphics, Adding or changing notes and form fields.

This report may not be reproduced other than in full, except with the prior written approval of RFI Global Services Ltd. The results in this report apply only to the sample(s) tested.

**RFI Global Services Ltd**

Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG  
Telephone: +44 (0)1256 312000 Facsimile: +44 (0)1256 312001  
Email: info@rfi-global.com Website: www.rfi-global.com

Registered in England and Wales. Company number:2117901

This page has been left intentionally blank.

**Table of Contents**

**1. Customer Information ..... 4**

**2. Summary of Testing ..... 5**

**3. Equipment Under Test (EUT) ..... 8**

**4. Operation and Monitoring of the EUT during Testing ..... 11**

**5. Measurements, Examinations and Derived Results ..... 12**

**6. Measurement Uncertainty ..... 53**

**Appendix 1. Test Equipment Used ..... 54**

**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	
<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			

### **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>	GE865-QUAD
<b>IMEI:</b>	35777048950347
<b>Hardware Version Number:</b>	3H00
<b>Software Version Number:</b>	10.00.003
<b>IC Certification Number:</b>	5131A-GE865
<b>FCC ID:</b>	RI7GE865

This is a duplicate report of RFI report reference RFI-RPT-RP76937JD03A Version 4.0. All contents including test cases and test results are identical and it therefore reflects the build status of the product originally tested under RFI report reference RFI-RPT-RP76937JD03A Version 4.0.

#### **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	3.2 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	32.3 dBm		
<b>Transmit Frequency Range:</b>	824 MHz 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 MHz 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	30.0 dBm	GPRS	29.9 dBm		
<b>Transmit Frequency Range:</b>	1850 MHz 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 MHz 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>	113920002441

## **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:

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:

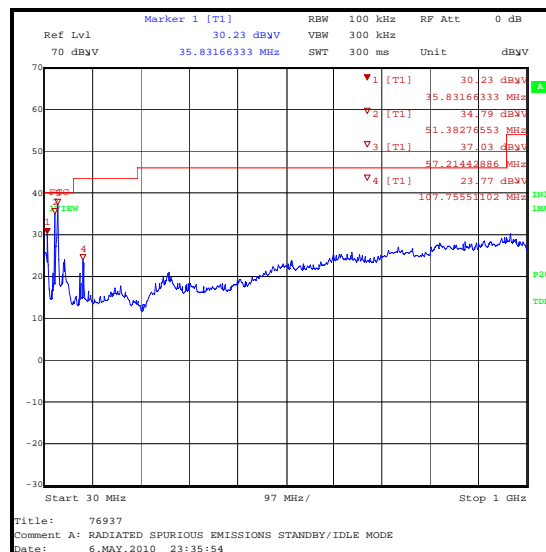
Temperature (°C):	25
Relative Humidity (%):	23

#### Results:

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
36.583	Vertical	29.4	40.0	10.6	Complied
50.068	Vertical	36.3	40.0	3.7	Complied
57.423	Horizontal	34.6	40.0	3.4	Complied
107.583	Vertical	28.3	43.5	15.2	Complied

#### Note(s):

- The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
- Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.



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:**

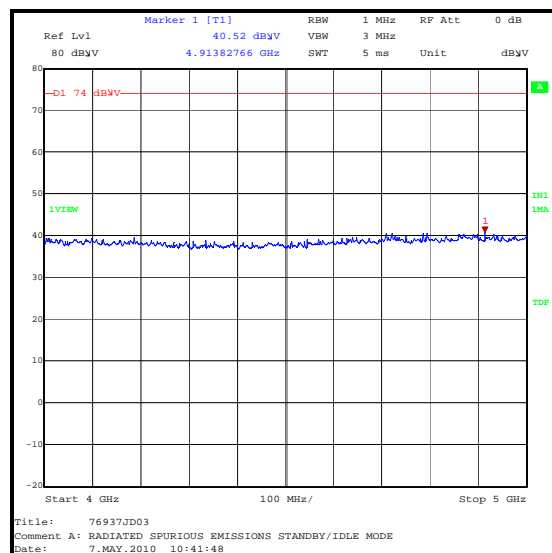
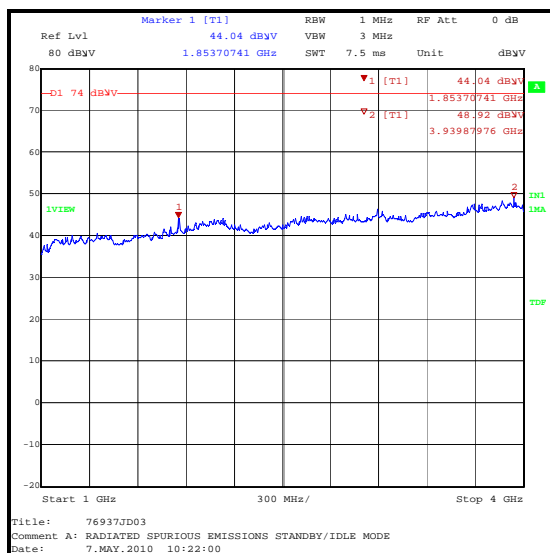
<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	22

**Results:**

Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
3939.880	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.
3. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.



**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>	25
<b>Relative Humidity (%):</b>	32

**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	32.3	38.5	6.2	Complied
Top	848.8	32.0	38.5	6.5	Complied

**Results: GPRS**

Channel	Frequency (MHz)	Conducted RF Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	824.2	32.3	38.5	6.2	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>	27
<b>Relative Humidity (%):</b>	30

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

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	836.600015	15	0.02	2.5	2.48	Complied
-20	836.600012	12	0.01	2.5	2.49	Complied
-10	836.600011	11	0.01	2.5	2.49	Complied
0	836.600010	10	0.01	2.5	2.49	Complied
10	836.600012	12	0.01	2.5	2.49	Complied
20	836.600009	9	0.01	2.5	2.49	Complied
30	836.600015	15	0.02	2.5	2.48	Complied
40	836.600010	10	0.01	2.5	2.49	Complied
50	836.600013	13	0.02	2.5	2.48	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>	31

**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	836.599987	13	0.02	2.5	2.48	Complied
4.4	836.600015	15	0.02	2.5	2.48	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)

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	32

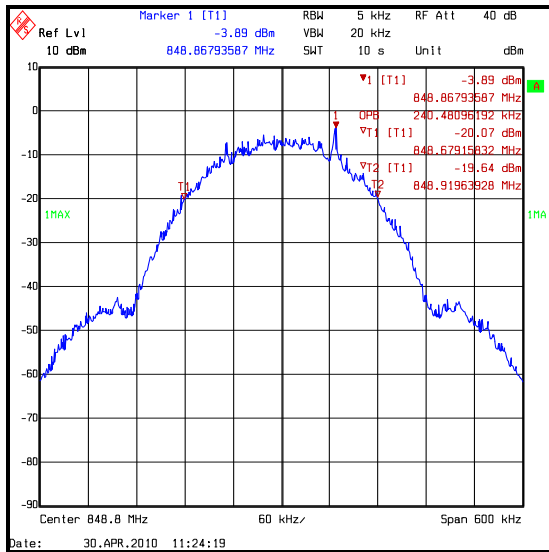
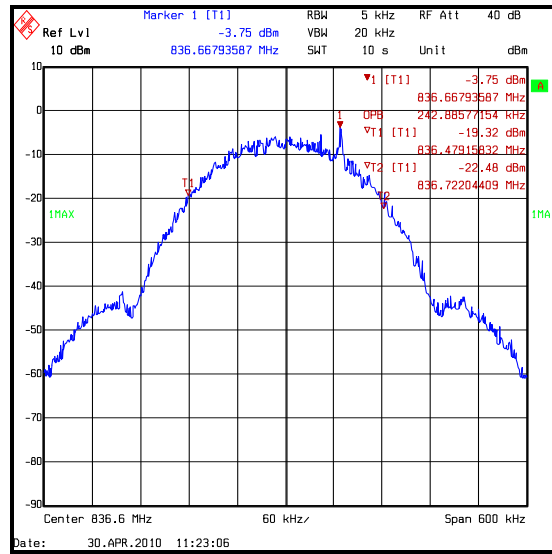
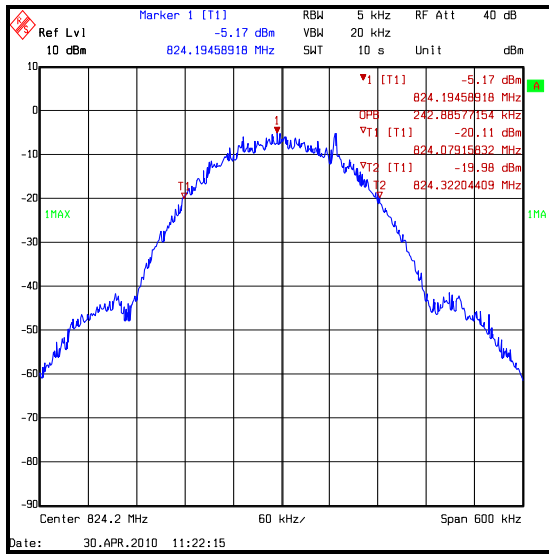
**Results: GSM**

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



**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>	25
<b>Relative Humidity (%):</b>	32

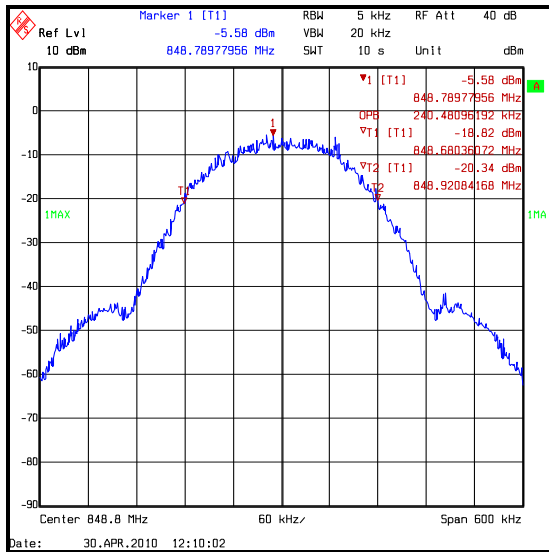
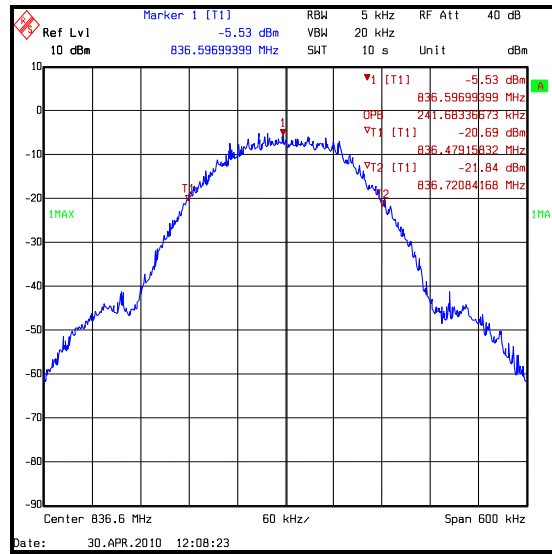
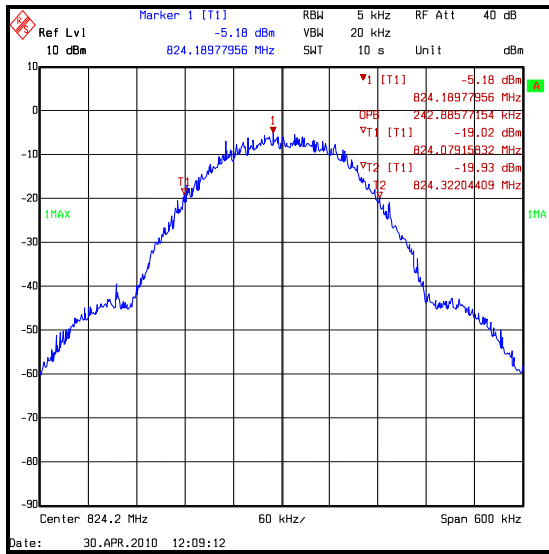
**Results: GPRS**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	824.2	242.886
Middle	836.6	241.683
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>	25
<b>Relative Humidity (%):</b>	32

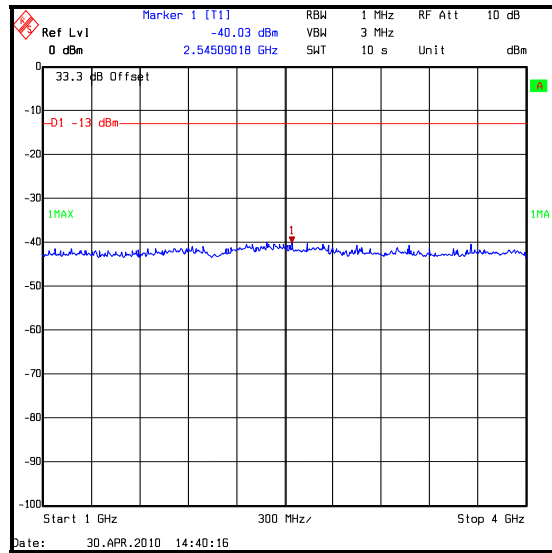
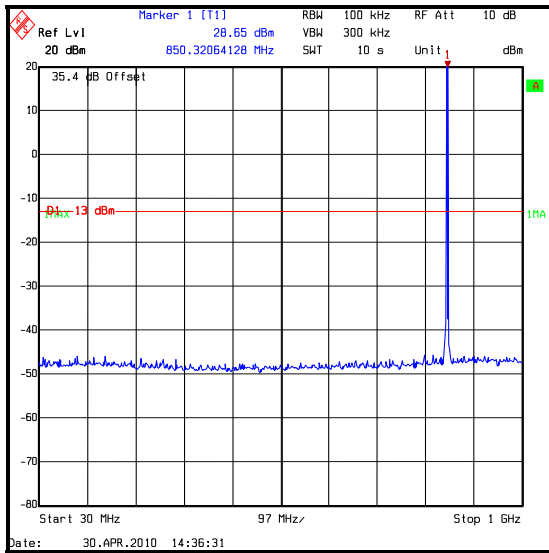
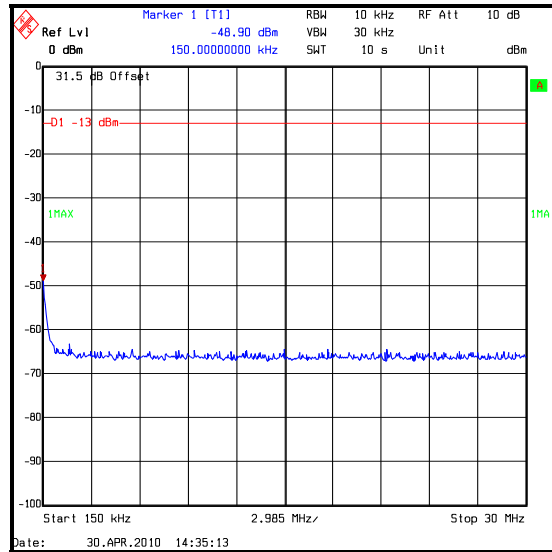
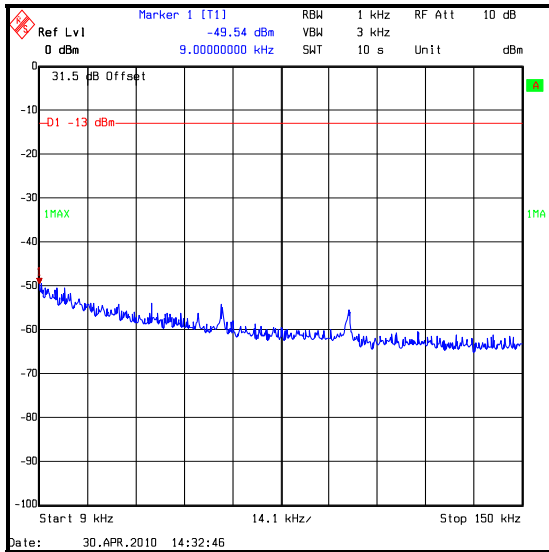
**Results: Top Channel**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
2545.090	-40.3	-13.0	27.3	Complied

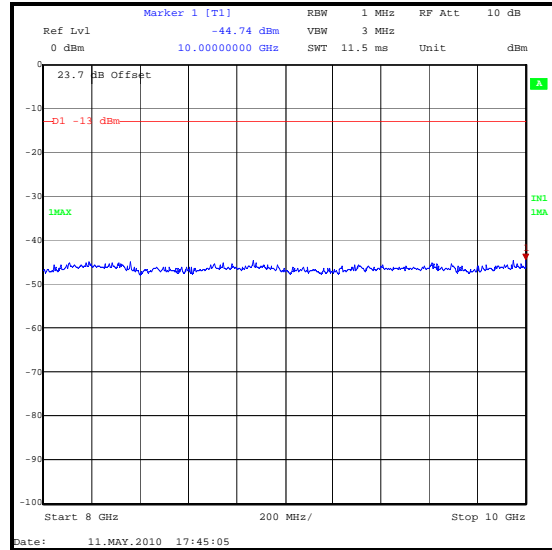
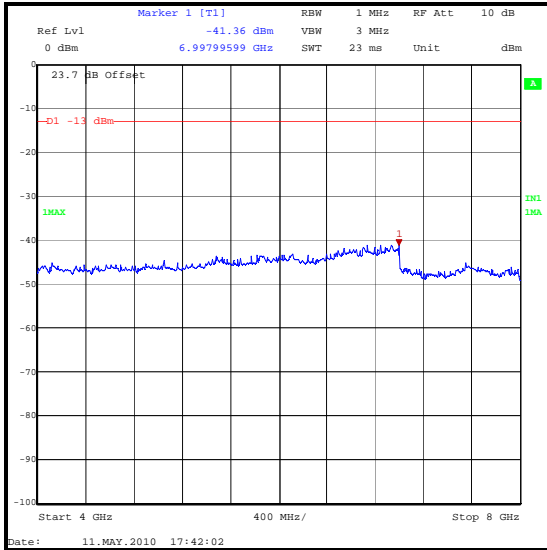
**Note(s):**

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 850.321 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:**

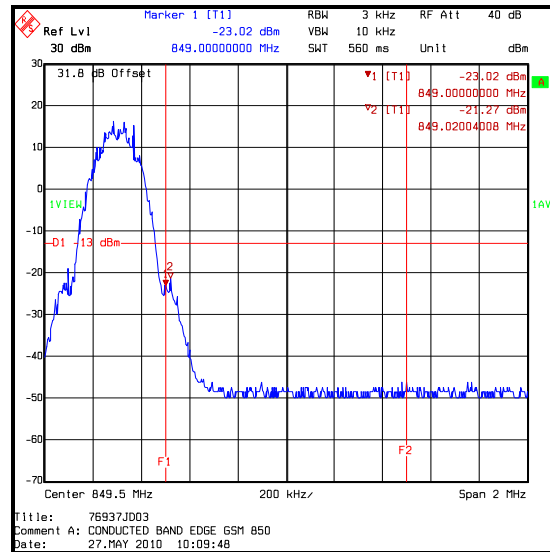
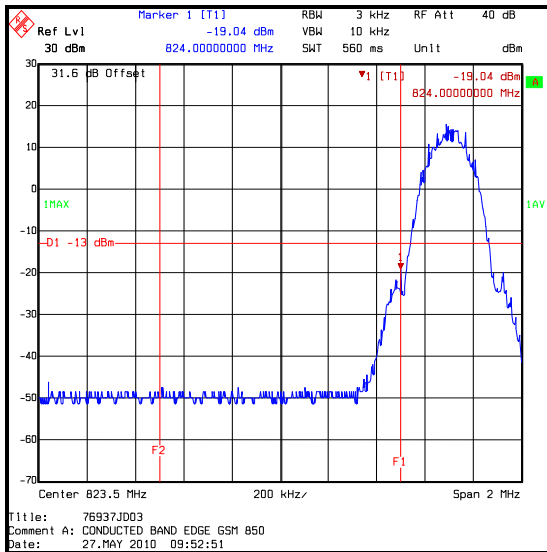
<b>Temperature (°C):</b>	29
<b>Relative Humidity (%):</b>	31

**Results: GSM Lower Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
824	-19.0	-13.0	6.0	Complied

**Results: GSM Upper Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
849	-23.0	-13.0	10.0	Complied
849.020	-21.3	13.0	9.3	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:**

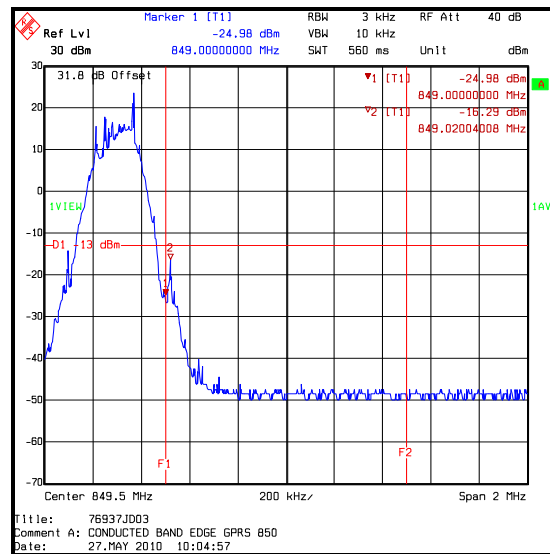
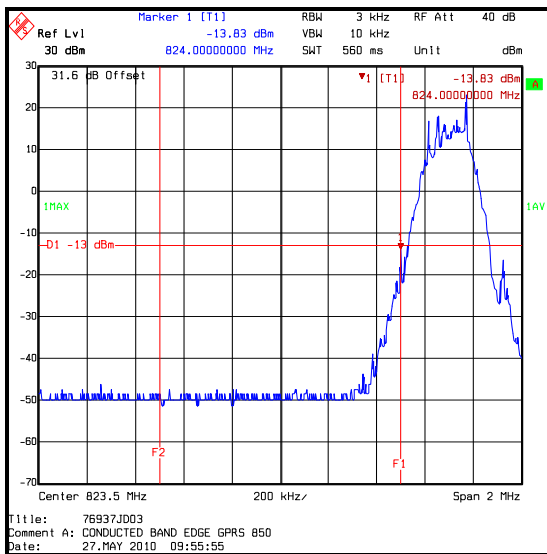
<b>Temperature (°C):</b>	29
<b>Relative Humidity (%):</b>	31

**Results: GPRS Lower Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
824	-13.8	-13.0	0.8	Complied

**Results: GPRS Upper Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
849	-25.0	-13.0	12.0	Complied
849.020	-16.3	-13.0	3.3	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 8.6 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>	21

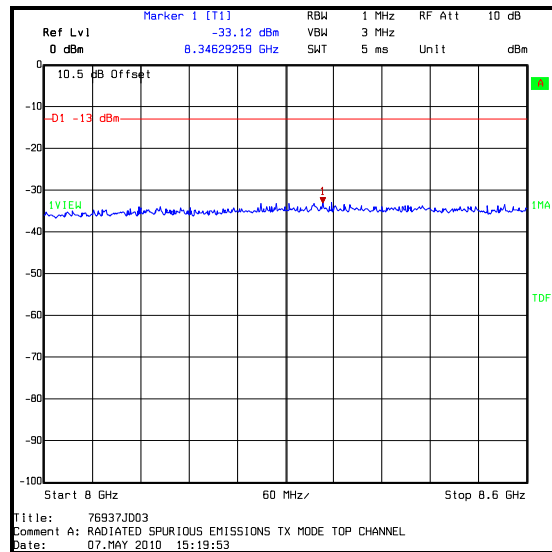
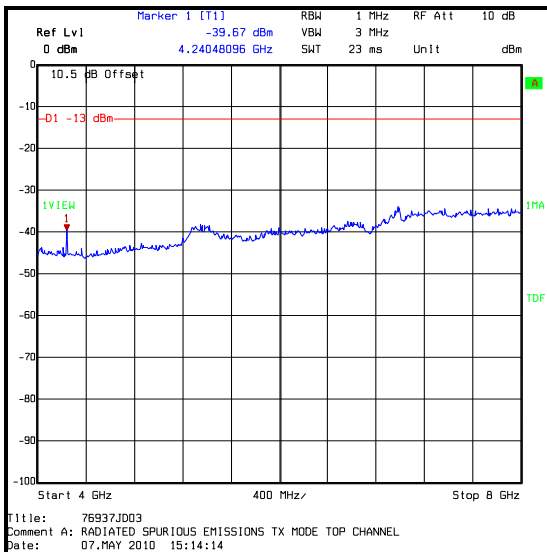
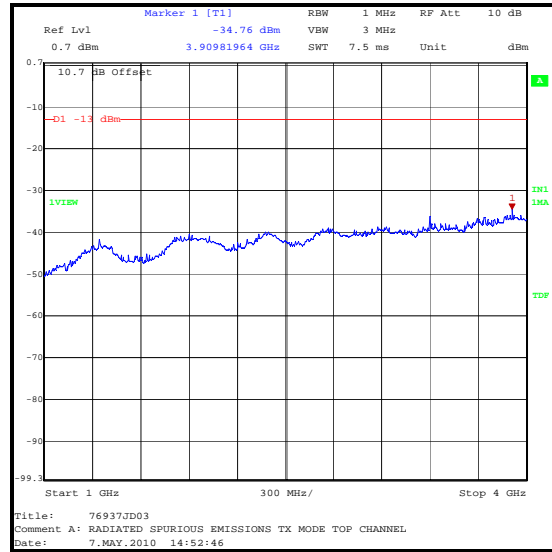
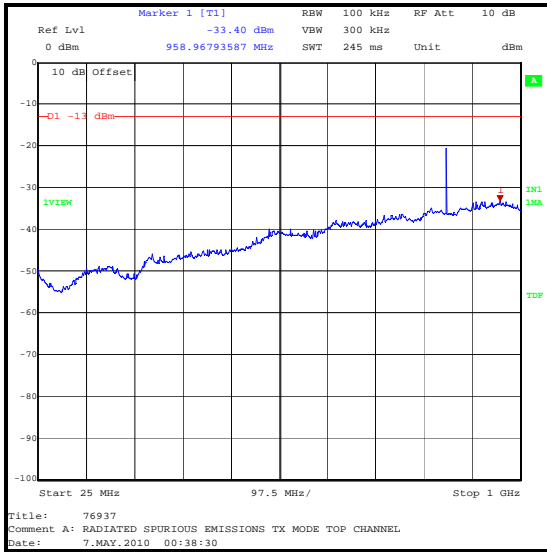
**Results: Top Channel**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
8346.293	-33.1	-13.0	20.1	Complied

**Note(s):**

1. All emissions (including the second harmonic on the bottom, middle and top channels) 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 emission shown at approximately 850.320 MHz on the 30 MHz to 1 GHz plot is the carrier.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

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



**5.2.9. Transmitter Radiated Emissions at Band Edges**

**Test Summary:**

<b>FCC Part:</b>	2.1053 & 22.917
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Parts 2.1053 and 22.917

**Environmental Conditions:**

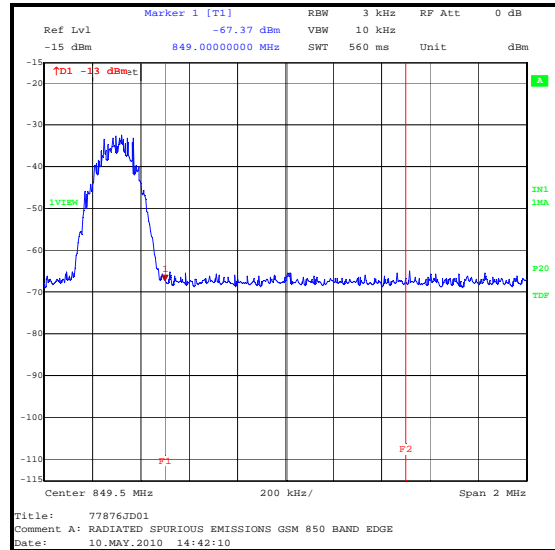
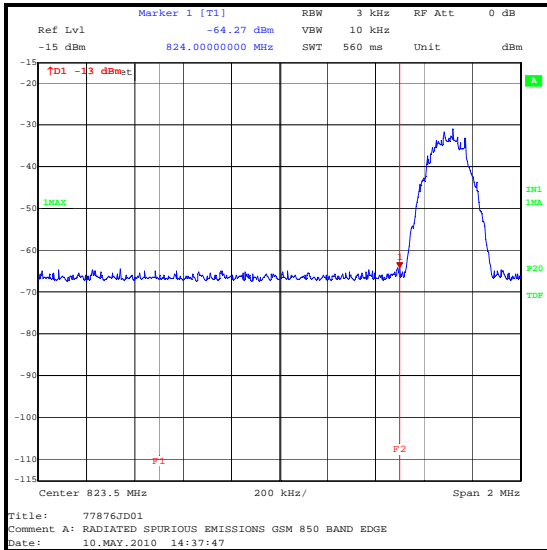
<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	23

**Results: GSM - Bottom Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
824	-64.3	-13.0	51.3	Complied

**Results: GSM - Top Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
849	-67.4	-13.0	54.4	Complied



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

**Test Summary:**

<b>FCC Part:</b>	2.1053 & 22.917
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Parts 2.1053 and 22.917

**Environmental Conditions:**

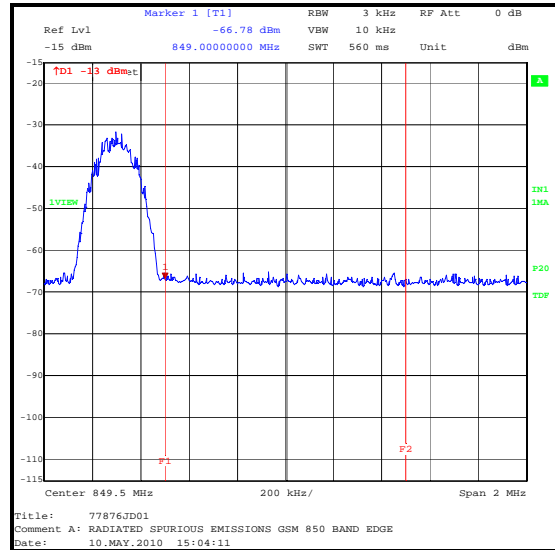
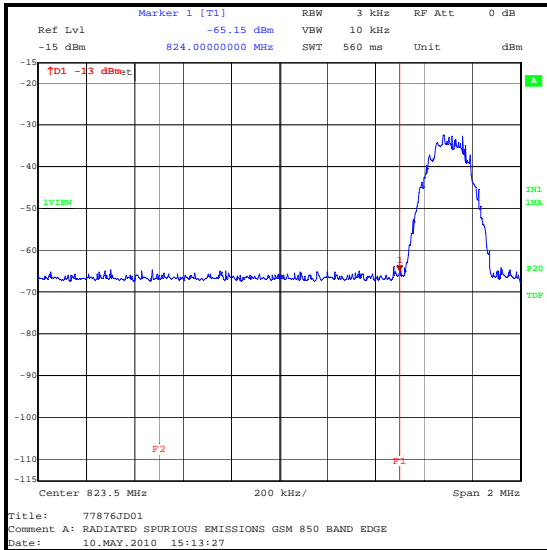
<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	23

**Results: GPRS - Bottom Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
824	-65.2	-13.0	52.2	Complied

**Results: GPRS - Top Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
849	-66.8	-13.0	53.8	Complied



**5.3. Test Results – FCC Part 24**

**5.3.1. 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:**

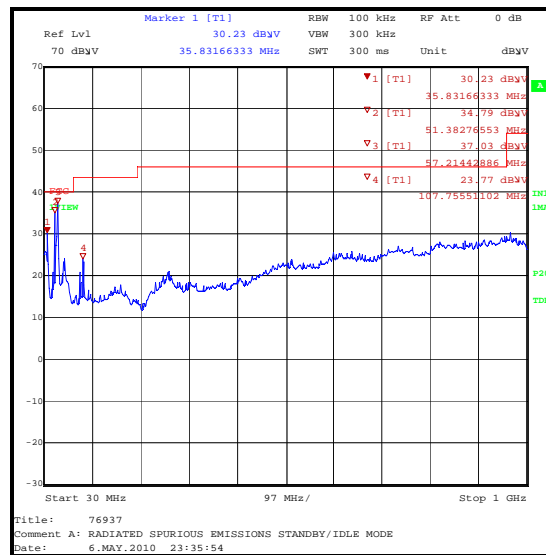
<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	23

**Results:**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
36.583	Vertical	29.4	40.0	10.6	Complied
50.068	Vertical	36.3	40.0	3.7	Complied
57.423	Horizontal	34.6	40.0	3.4	Complied
107.583	Vertical	28.3	43.5	15.2	Complied

**Note(s):**

- Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.



*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>	22
<b>Relative Humidity (%):</b>	23

**Results:**

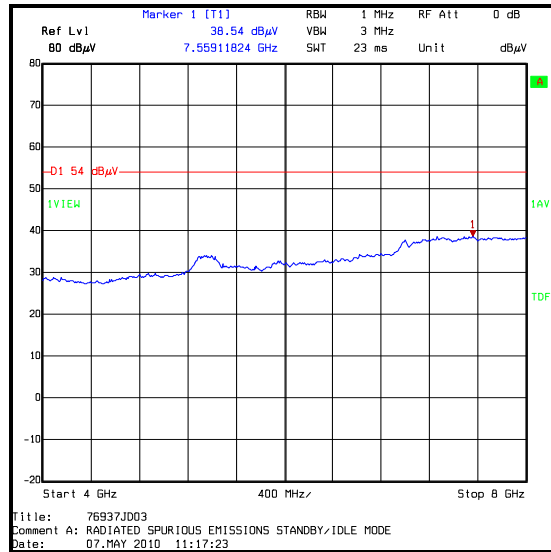
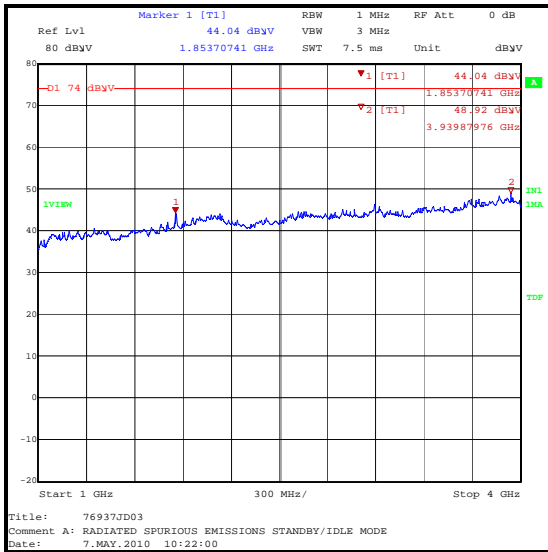
<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Peak Level (dB<math>\mu</math>V/m)</b>	<b>Average Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
3939.880	Horizontal	48.9	54.0	5.1	Complied

**Note(s):**

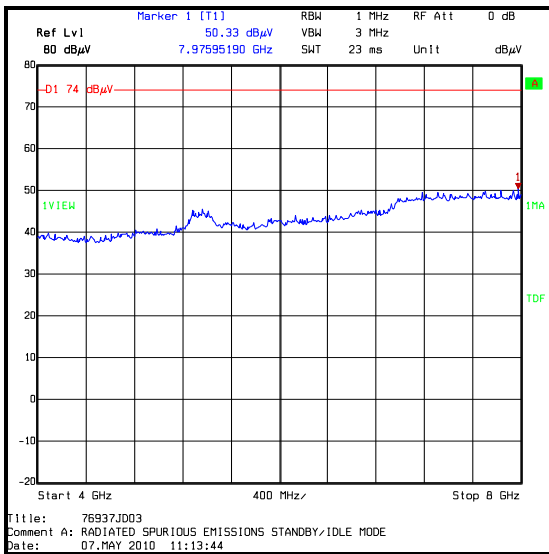
1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because 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.
3. All pre-scans were performed with a peak detector against average limits apart from measurements made in the range of 8 to 10 GHz where pre-scans were performed with peak and average detectors and the applicable limit applied. This was due to the noise floor exceeding the average limit when using a peak detector.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.



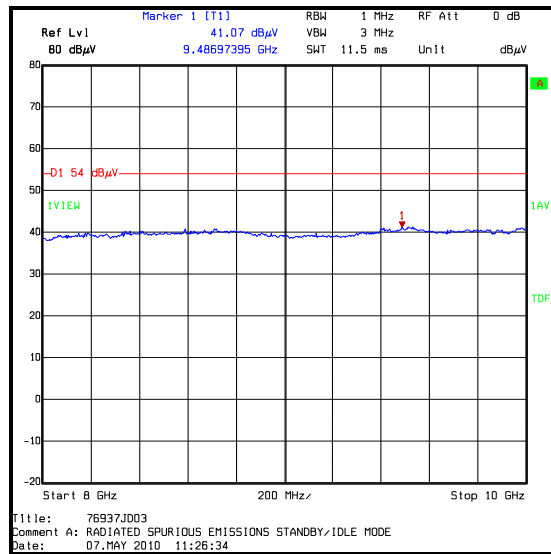
**Idle Mode Radiated Spurious Emissions (continued)**



**Average Detector**

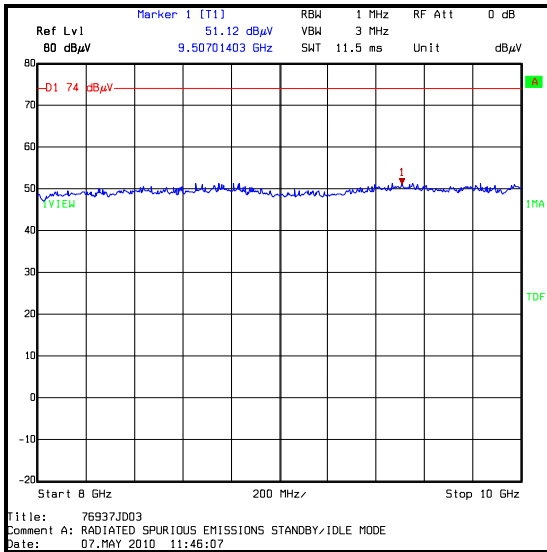


**Peak Detector**



**Average Detector**

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



**Peak 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>	24
<b>Relative Humidity (%):</b>	33

**Results: GSM**

Channel	Frequency (MHz)	Conducted RF Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	30.0	33.0	3.0	Complied
Middle	1879.8	29.9	33.0	3.1	Complied
Top	1909.8	29.9	33.0	3.1	Complied

**Results: GPRS**

Channel	Frequency (MHz)	Conducted RF Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	29.9	33.0	3.1	Complied
Middle	1879.8	29.8	33.0	3.2	Complied
Top	1909.8	29.8	33.0	3.2	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>	27
<b>Relative Humidity (%):</b>	30

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

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	56	1850.200056	1850.0	0.200056	Complied
-20	53	1850.200053	1850.0	0.200053	Complied
-10	51	1850.200051	1850.0	0.200051	Complied
0	48	1850.200048	1850.0	0.200048	Complied
10	52	1850.200052	1850.0	0.200052	Complied
20	47	1850.200047	1850.0	0.200047	Complied
30	47	1850.200047	1850.0	0.200047	Complied
40	44	1850.200044	1850.0	0.200044	Complied
50	46	1850.200046	1850.0	0.200046	Complied

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

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	52	1909.800052	1910.0	0.199948	Complied
-20	56	1909.800056	1910.0	0.199944	Complied
-10	53	1909.800053	1910.0	0.199947	Complied
0	49	1909.800049	1910.0	0.199951	Complied
10	54	1909.800054	1910.0	0.199945	Complied
20	48	1909.800048	1910.0	0.199952	Complied
30	50	1909.800050	1910.0	0.199950	Complied
40	47	1909.800047	1910.0	0.199953	Complied
50	51	1909.800051	1910.0	0.199949	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>	31

**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	45	1850.200045	1850.0	0.200045	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	56	1909.800056	1910.0	0.199944	Complied
4.4	47	1909.800047	1910.0	0.199953	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>	25
<b>Relative Humidity (%):</b>	32

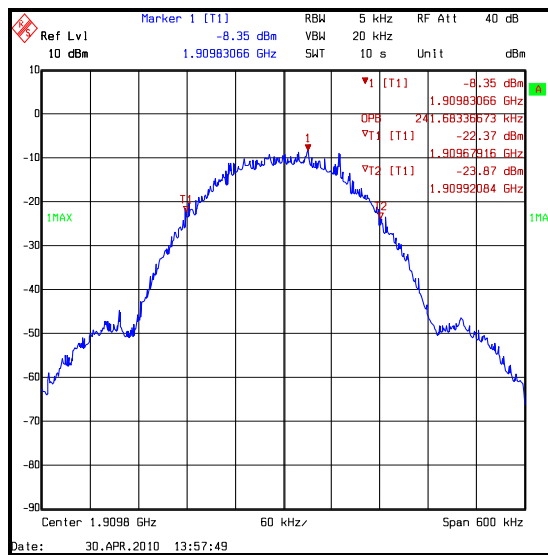
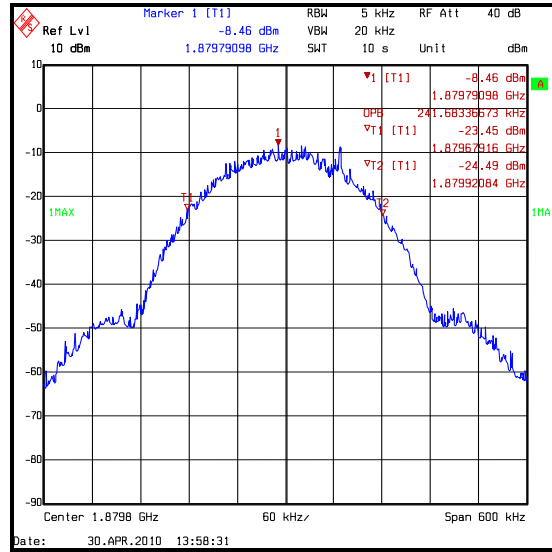
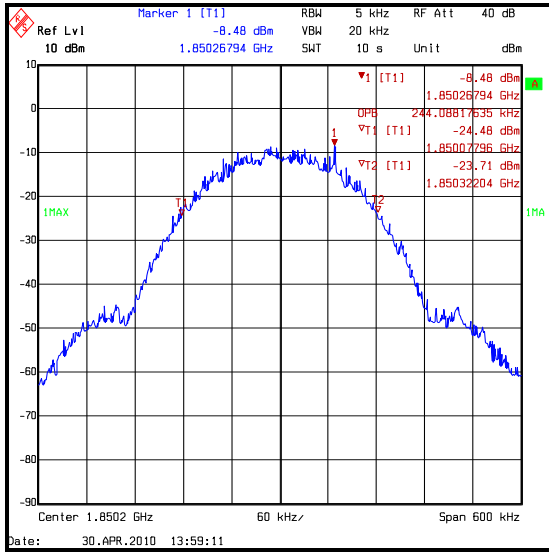
**Results: GSM**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	1850.2	244.088
Middle	1879.8	241.683
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)**



**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>	25
<b>Relative Humidity (%):</b>	32

**Results: GPRS**

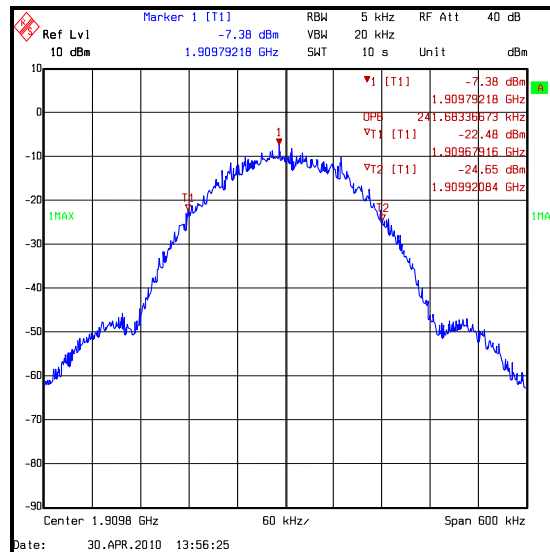
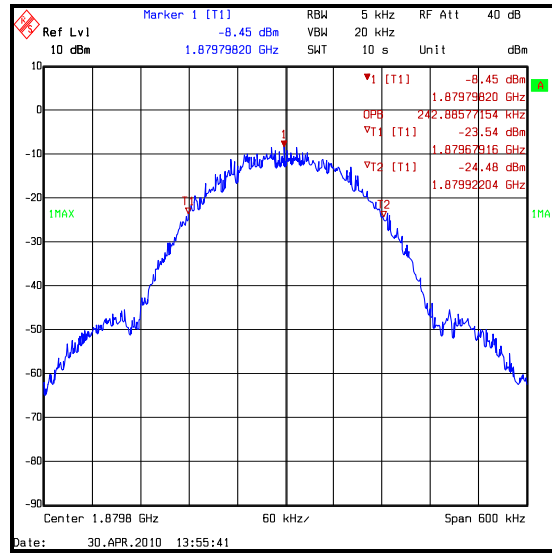
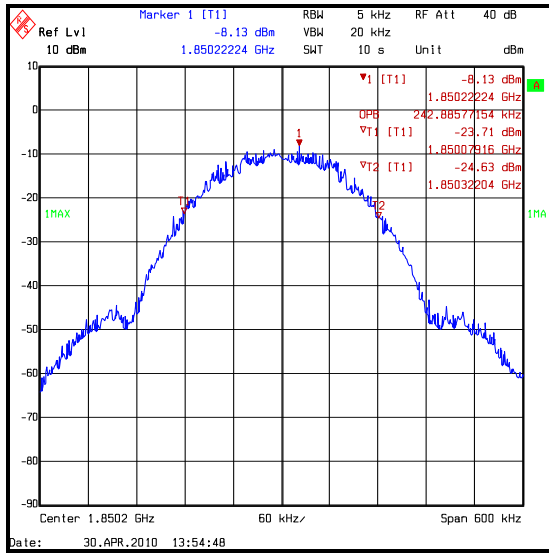
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	1850.2	242.886
Middle	1879.8	242.885
Top	1909.8	241.683

**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>	25
<b>Relative Humidity (%):</b>	32

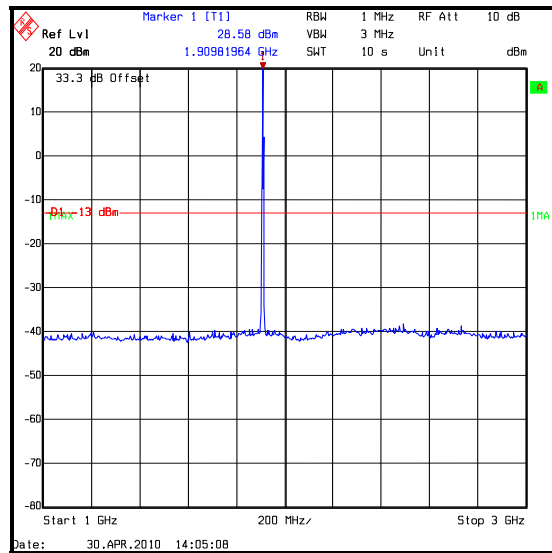
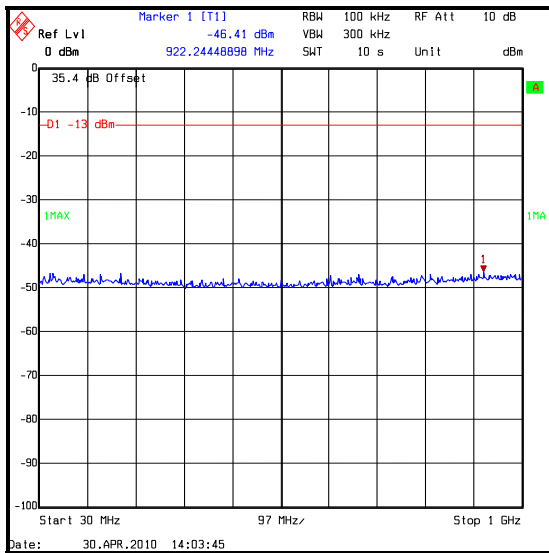
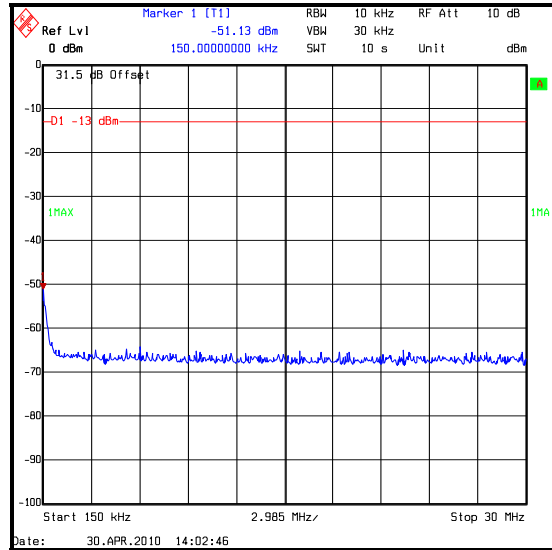
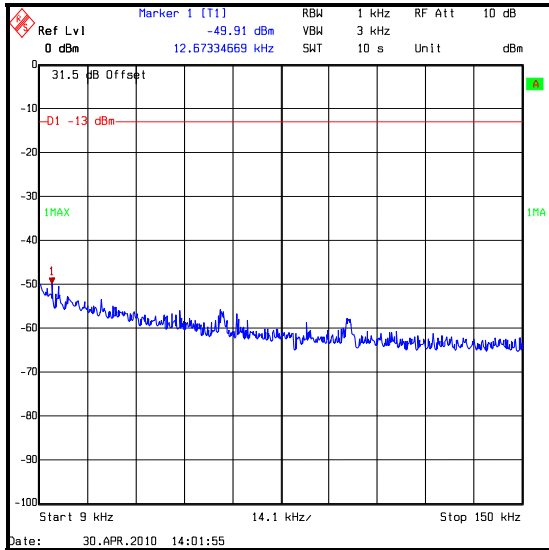
**Results: Top Channel**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
3819.639	-38.0	-13.0	26.0	Complied

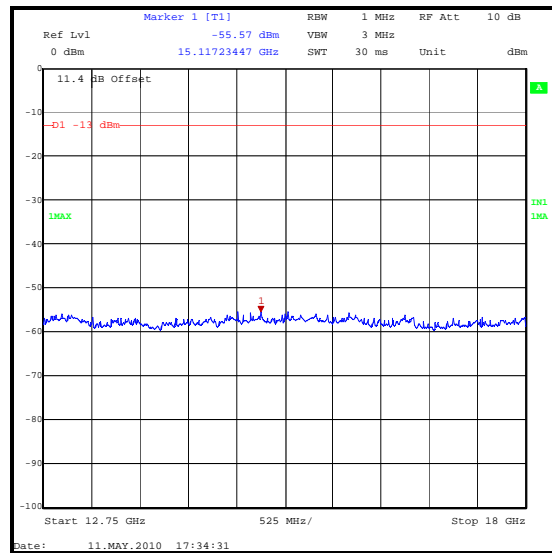
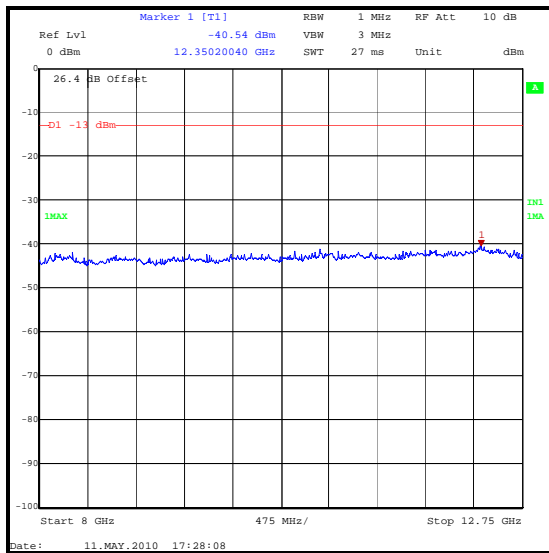
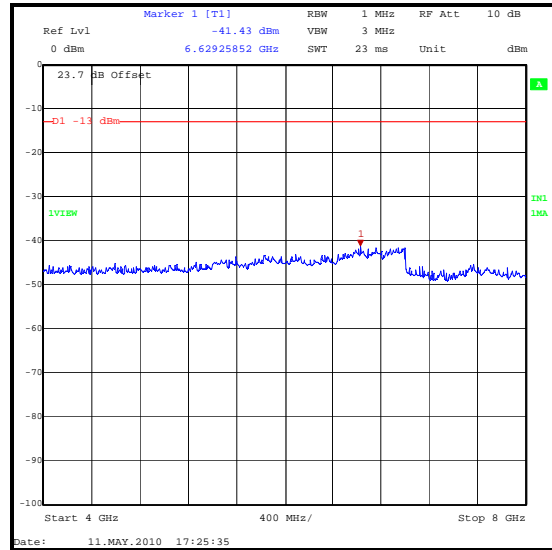
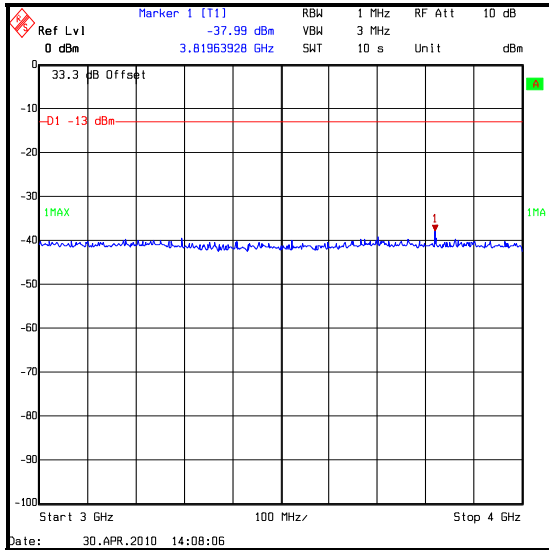
**Note(s):**

1. All emissions (including the second harmonic on the bottom and middle channels) were investigated and found to be at least 20 dB below the specified limit; therefore the highest emission level (i.e. the top channel second harmonic) was recorded as shown in the table above.
2. The emissions shown at approximately 1909.820 MHz on the 1 MHz to 4 GHz plot is the carrier.

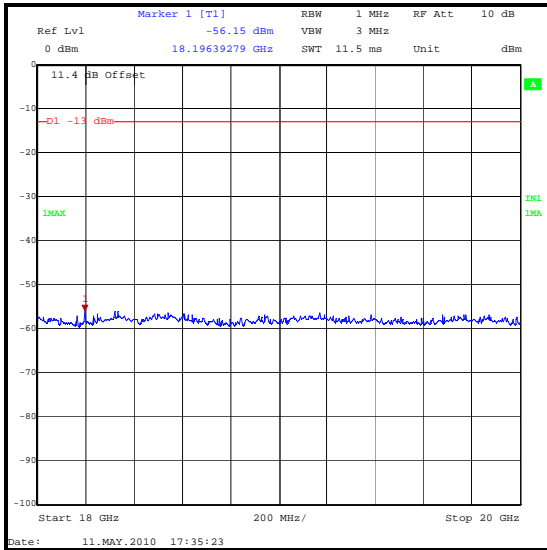
**Transmitter Out of Band Conducted Emissions (continued)**



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



**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:**

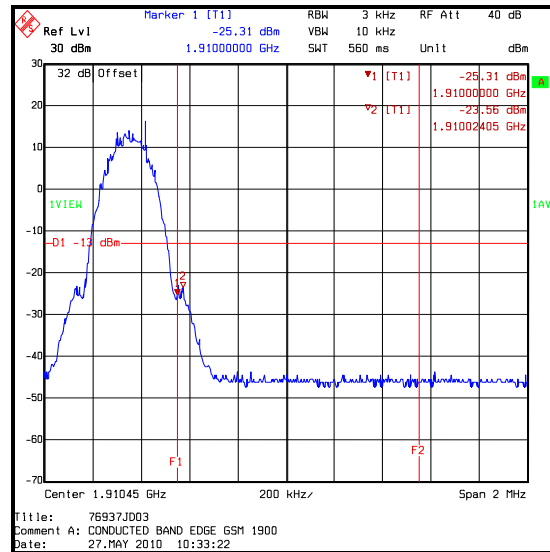
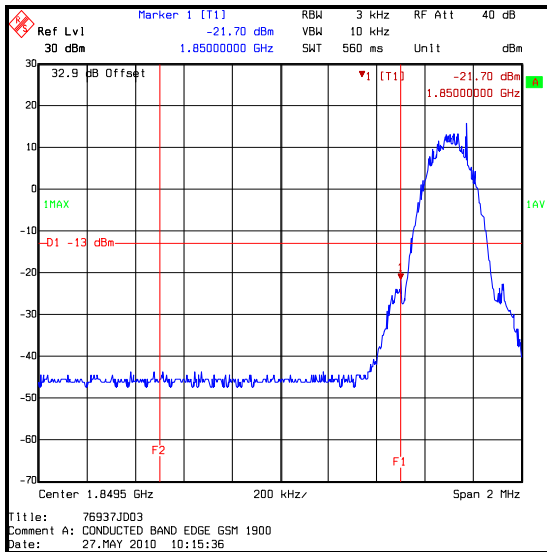
<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	27

**Results: GSM Lower Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
1850	-21.7	-13.0	8.7	Complied

**Results: GSM Upper Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
1910	-25.3	-13.0	12.3	Complied
1910.024	-23.6	-13.0	10.6	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:**

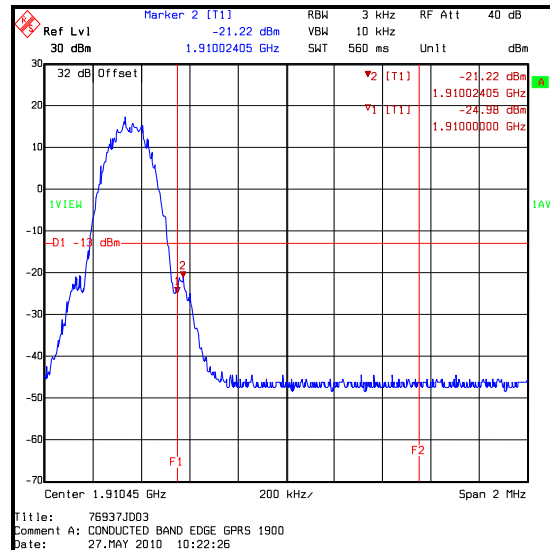
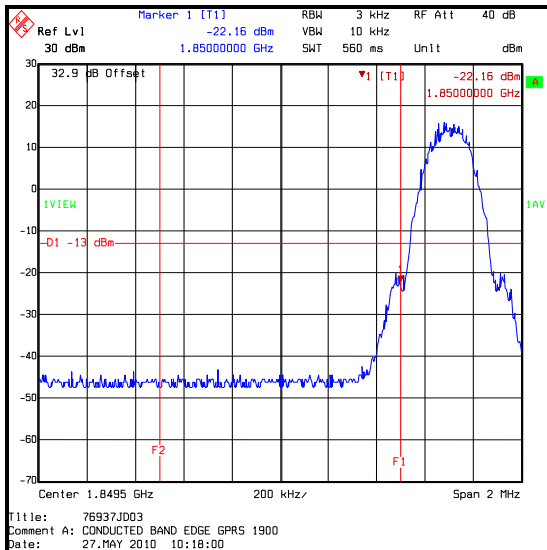
<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	27

**Results: GPRS Lower Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
1850	-22.2	-13.0	9.2	Complied

**Results: GPRS Upper Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Band edge limit (dBm)	Margin (dB)	Result
1910	-25.0	-13.0	12.0	Complied
1910.024	-21.2	-13.0	8.2	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>	26
<b>Relative Humidity (%):</b>	21

**Results: Bottom Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
7400.670	-31.8	-13.0	18.8	Complied

**Results: Middle Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
7518.770	-31.6	-13.0	18.6	Complied

**Results: Top Channel**

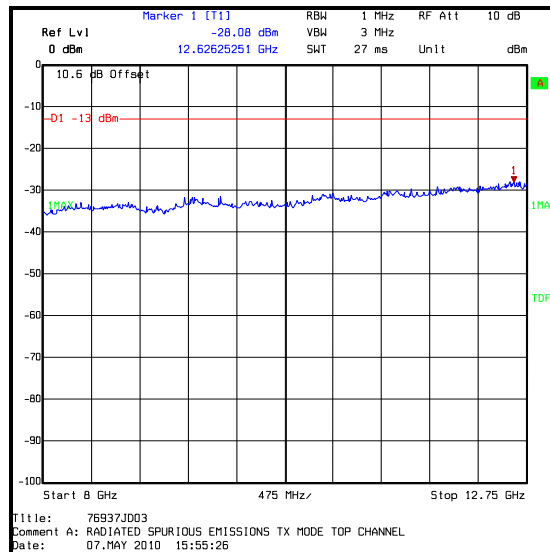
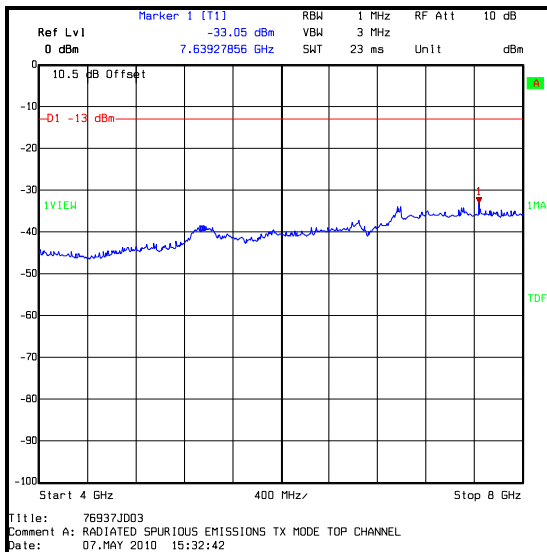
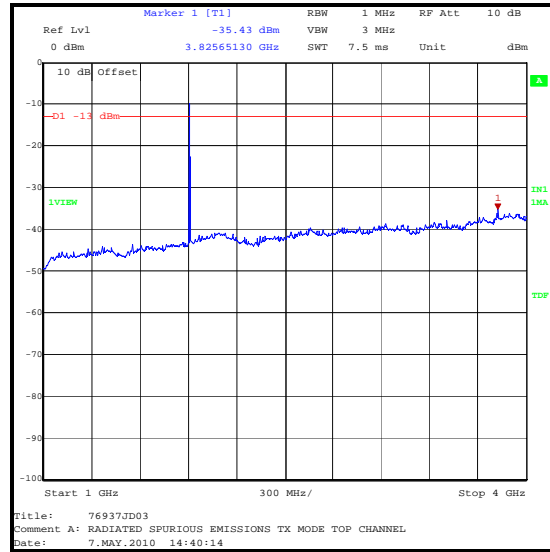
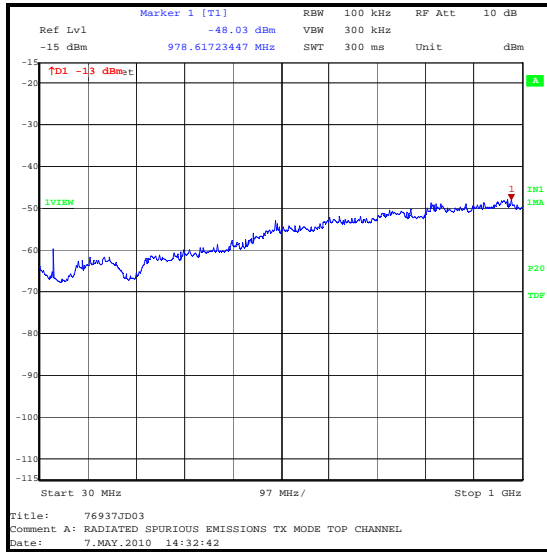
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
7639.314	-30.9	-13.0	17.9	Complied

**Note(s):**

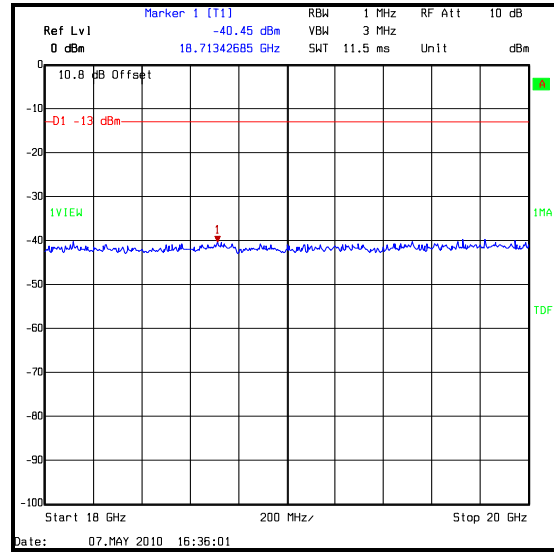
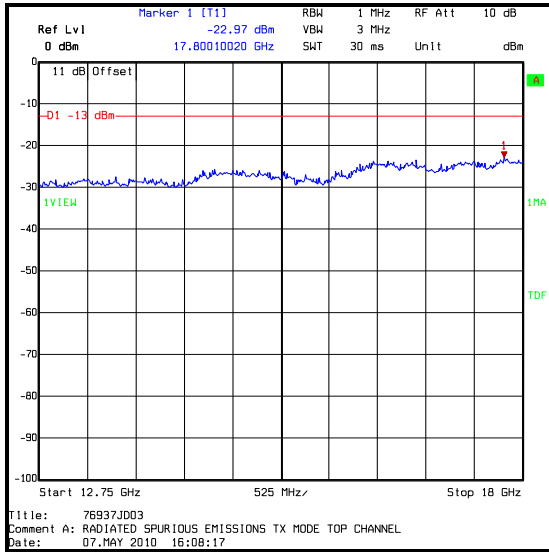
1. Final measurements were made using appropriate attenuation and filters where required.
2. The transmitter fundamental is shown on the 1 GHz to 4 GHz plot at 1907.815 MHz.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.



### 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:**

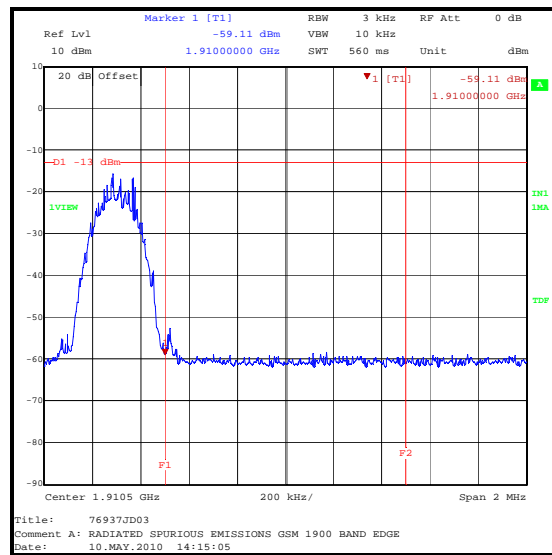
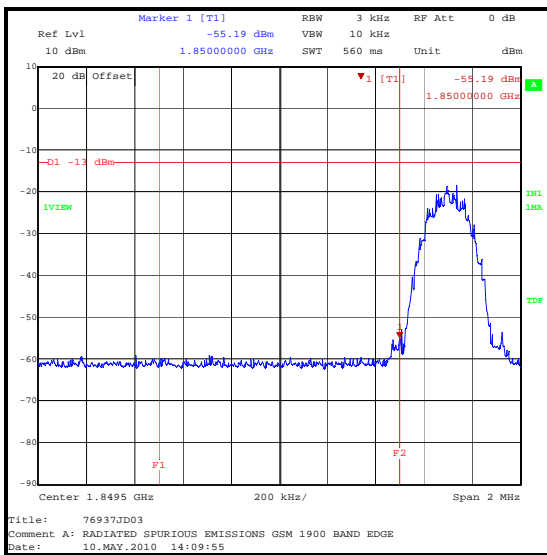
<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	24

**Results: GSM - Bottom Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
1850	-55.2	-13.0	42.2	Complied

**Results: GSM - Top Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
1910	-59.1	-13.0	46.1	Complied



**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:**

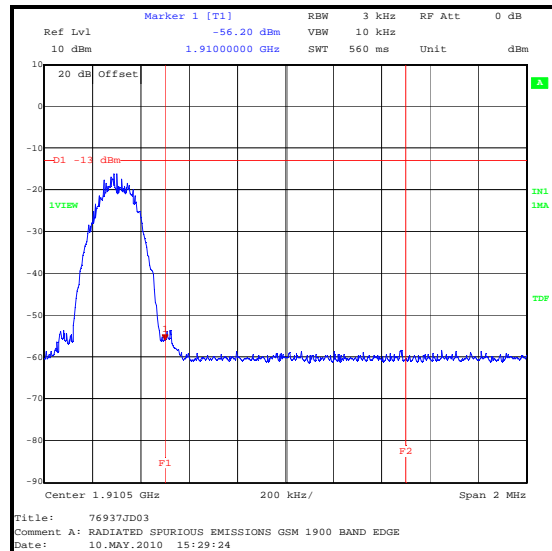
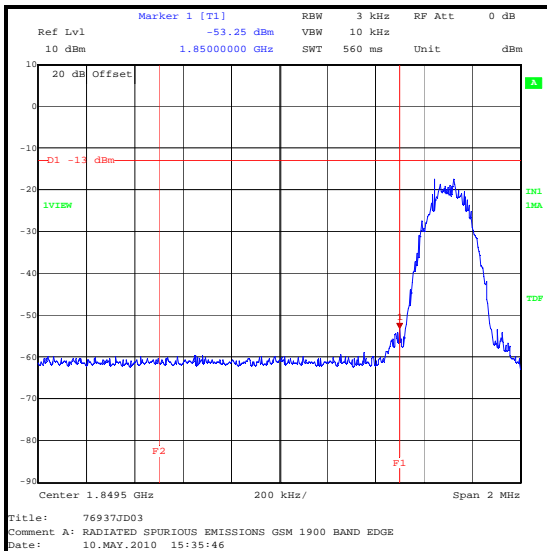
<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	23

**Results: GPRS - Bottom Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
1850	-53.3	-13.0	40.3	Complied

**Results: GPRS - Top Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
1910	-56.2	-13.0	43.2	Complied



## **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	-
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	Calibrated before use	-
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
E013	Environmental Chamber	Sanyo	ATMOS chamber	None	Calibrated before use	-
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
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.