



# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: GL865-QUAD



FCC ID: RI7GL865Q

IC Certification Number: 5131A-GL865Q

To: FCC Part 22: 2010 Subpart H, Part 24: 2010 Subpart E,  
RSS 132 Issue 2 September 2005 and RSS-133 Issue 5 February 2009

**Test Report Serial No:**  
RFI-RPT-RP80190JD08A V2.0

**Version 2.0 Supersedes All Previous Versions**

<b>This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:</b>	
<b>Checked By:</b>	Ian Watch
<b>Signature:</b>	
<b>Date of Issue:</b>	05 August 2011

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## **Table of Contents**

<b>1. Customer Information .....</b>	<b>4</b>
<b>2. Summary of Testing .....</b>	<b>5</b>
2.1. General Information	5
Summary of Test Results	6
2.2. Methods and Procedures	7
2.3. Deviations from the Test Specification	7
<b>3. Equipment Under Test (EUT) .....</b>	<b>8</b>
3.1. Identification of Equipment Under Test (EUT)	8
3.2. Description of EUT	8
3.3. Modifications Incorporated in the EUT	8
3.4. Additional Information Related to Testing	9
3.5. Support Equipment	10
<b>4. Operation and Monitoring of the EUT during Testing .....</b>	<b>11</b>
4.1. Operating Modes	11
4.2. Configuration and Peripherals	11
<b>5. Measurements, Examinations and Derived Results .....</b>	<b>12</b>
5.1. General Comments	12
5.2. Test Results - Part 22 & RSS-132	13
5.2.1. Receiver/Idle Mode Radiated Spurious Emissions	13
5.2.2. Transmitter Output Power (Conducted)	17
5.2.3. Transmitter Frequency Stability (Temperature Variation)	18
5.2.4. Transmitter Frequency Stability (Voltage Variation)	19
5.2.5. Transmitter Occupied Bandwidth	20
5.2.6. Transmitter Conducted Emissions	23
5.2.7. Transmitter Out of Band Radiated Emissions	25
5.2.8. Transmitter Band Edge Conducted Emissions	28
5.2.9. Transmitter Radiated Emissions at Band Edges	30
5.3. Test Results - Part 24 & RSS-133	32
5.3.1. Receiver/Idle Mode Radiated Spurious Emissions	32
5.3.2. Transmitter Output Power (Conducted)	36
5.3.3. Transmitter Frequency Stability (Temperature Variation)	37
5.3.4. Transmitter Frequency Stability (Voltage Variation)	39
5.3.5. Transmitter Occupied Bandwidth	40
5.3.6. Transmitter Conducted Emissions	43
5.3.7. Transmitter Out of Band Radiated Emissions	46
5.3.8. Transmitter Band Edge Conducted Emissions	49
5.3.9. Transmitter Band Edge Radiated Emissions	51
<b>6. Measurement Uncertainty .....</b>	<b>53</b>
<b>Appendix 1. Test Equipment Used .....</b>	<b>54</b>

## **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) 2010: Part 22 Subpart H (Public Mobile Services)
<b>Specification Reference:</b>	47CFR24
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 24 Subpart E (Personal Communication Services)
<b>Specification Reference:</b>	47CFR15.107 and 47CFR15.109
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart B (Unintentional Radiators) - Sections 15.107 and 15.109
<b>Specification Reference:</b>	RSS-Gen Issue 3 December 2010
<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>	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>	21 February 2011 to 02 August 2011

**Summary of Test Results**

FCC Reference (47CFR)	IC Reference	Measurement	Result
<b>Part 22 &amp; RSS-132</b>			
Part 15.109	RSS-Gen 4.10/6.1 RSS-132 4.6	Receiver/Idle Mode Radiated Spurious Emissions	
Part 22.913(a)	RSS-132 4.4 SRSP-503 5.1.3	Transmitter Output Power (Conducted)	
Part 2.1055/22.355	RSS-132 4.3 RSS Gen 4.7	Transmitter Frequency Stability (Temperature and 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 2.1053/22.917	RSS-132 4.5	Transmitter Out of Band Radiated 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 Band Edge Radiated Emissions	
<b>Part 24 &amp; RSS-133</b>			
Part 15.109	RSS-Gen 4.10/6.1 RSS-133 4.6	Receiver/Idle Mode Radiated Spurious Emissions	
Part 24.232	RSS-133 6.4 SRSP-510 5.1.2	Transmitter Output Power (Conducted)	
Part 2.1055/24.235	RSS-133 6.3 RSS Gen 4.7	Transmitter Frequency Stability (Temperature and Voltage Variation)	
Part 2.1049	RSS-Gen 4.6.1	Transmitter Occupied Bandwidth	
Part 2.1051/24.238	RSS-133 6.5	Transmitter Out of Band Conducted Emissions	
Part 2.1053/24.238	RSS-133 6.5	Transmitter Out of Band Radiated 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 Band Edge Radiated Emissions	
<b>Key to Results</b>			
 = Complied  = Did not comply			

## **2.2. 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 GHz.

## **2.3. 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>	GL865-QUAD
<b>IMEI:</b>	356308049000075
<b>Hardware Version Number:</b>	0H00
<b>Software Version Number:</b>	10.00.144-B001
<b>FCC ID:</b>	RI7GL865Q
<b>IC Certification Number:</b>	5131A-GL865Q

#### **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>Mode:</b>	GSM/GPRS		
<b>Modulation Type:</b>	GMSK		
<b>Channel Spacing:</b>	200 kHz		
<b>Power Supply Requirement(s):</b>	Nominal	3.8 V	
	Minimum	3.4 V	
	Maximum	4.2 V	
<b>Technology Tested:</b>	GSM850		
<b>Maximum Output Power (ERP):</b>	GSM	32.3 dBm	
	GPRS	32.2 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 Output Power (EIRP):</b>	GSM	28.8 dBm	
	GPRS	28.8 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>	Protoboard
<b>Brand Name:</b>	Telit Communications S.p.A
<b>Model Name or Number:</b>	None stated
<b>Serial Number:</b>	CS1139BLS 230107

<b>Description:</b>	Bench power supply
<b>Brand Name:</b>	Thurlby Thandar
<b>Model Name or Number:</b>	Powerflex
<b>Serial Number:</b>	BD0611

## **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, middle and top channels as required.
- Occupied bandwidth, ERP/EIRP 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 and conducted spurious emissions were checked in all modes during pre-scans. 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):

- Connected to a GSM/GPRS system simulator, operating in transceiver mode.

## **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 - Part 22 & RSS-132****5.2.1. Receiver/Idle Mode Radiated Spurious Emissions****Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	25 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

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

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	33

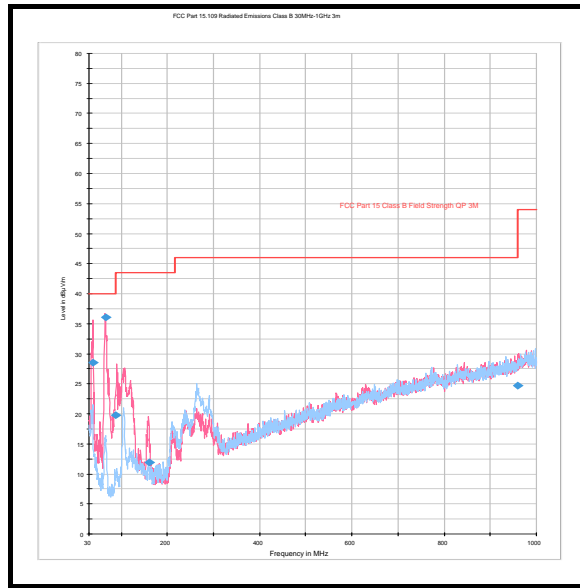
**Results:**

<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Level (dB<math>\mu</math>V/m)</b>	<b>Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
38.459	Vertical	28.5	40.0	11.5	Complied
65.646	Vertical	36.1	40.0	3.9	Complied
88.792	Vertical	19.7	43.5	23.8	Complied
161.539	Vertical	11.9	43.5	31.6	Complied
958.695	Vertical	24.7	46.0	21.3	Complied

**Note(s):**

1. All emissions shown on the pre-scan plot were found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
2. 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.

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



*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>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	21 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

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

**Environmental Conditions:**

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

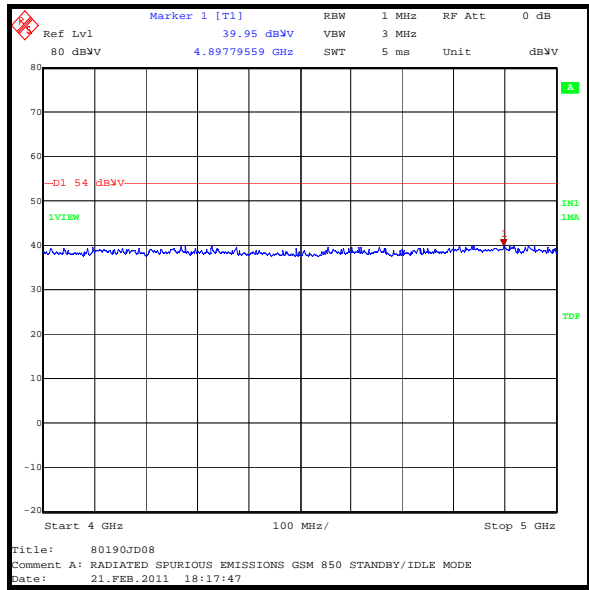
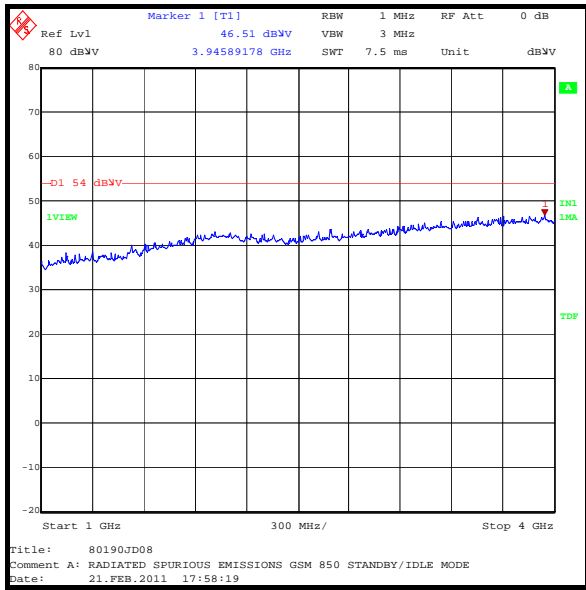
**Results:**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
3945.892	Vertical	46.5	54.0	7.5	Complied

**Note(s):**

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. 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.
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.

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





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

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	22 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<b>FCC Part:</b>	2.1046(a) & 22.913(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>	30

**Results: GSM Circuit Switched**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	824.2	31.7	38.45	6.75	Complied
Middle	836.6	32.0	38.45	6.45	Complied
Top	848.8	32.3	38.45	6.15	Complied

**Results: GPRS**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	824.2	31.6	38.45	6.85	Complied
Middle	836.6	31.9	38.45	6.55	Complied
Top	848.8	32.2	38.45	6.25	Complied

**Note(s):**

1. SRSP-503 states the limit as an EIRP value of 11.5 Watts (40.6 dBm) which equates to an ERP limit of 7 Watts (38.45 dBm)

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

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	25 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<b>FCC Part:</b>	2.1055 & 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>	23
<b>Relative Humidity (%):</b>	33

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

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	836.600	52	0.06	2.5	2.44	Complied
-20	836.600	20	0.02	2.5	2.48	Complied
-10	836.600	22	0.02	2.5	2.48	Complied
0	836.600	22	0.02	2.5	2.48	Complied
10	836.600	14	0.02	2.5	2.48	Complied
20	836.600	16	0.02	2.5	2.48	Complied
30	836.600	19	0.02	2.5	2.48	Complied
40	836.600	18	0.02	2.5	2.48	Complied
50	836.600	20	0.02	2.5	2.48	Complied

**Note(s):**

1. Temperature was monitored throughout the test with a calibrated digital thermometer.

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

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	25 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<b>FCC Part:</b>	2.1055 & 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>	23
<b>Relative Humidity (%):</b>	33

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

Supply Voltage (V)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
3.4	836.600	16	0.02	2.5	2.48	Complied
4.8	836.600	17	0.02	2.5	2.48	Complied

**Note(s):**

1. Voltage was monitored throughout the test with a calibrated digital voltmeter.

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

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	21 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<b>FCC Part:</b>	2.1049
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.7 referencing FCC CFR Part 2.1049

**Environmental Conditions:**

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

**Results: GSM Circuit Switched**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Bottom	824.2	246.493
Middle	836.6	246.493
Top	848.8	244.088

**Results: GPRS**

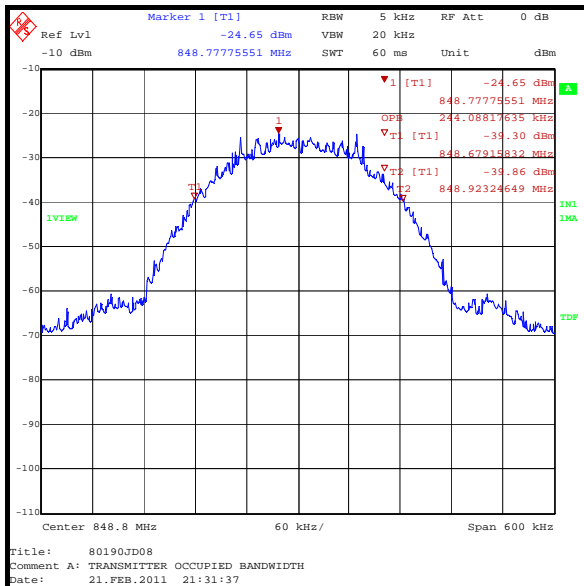
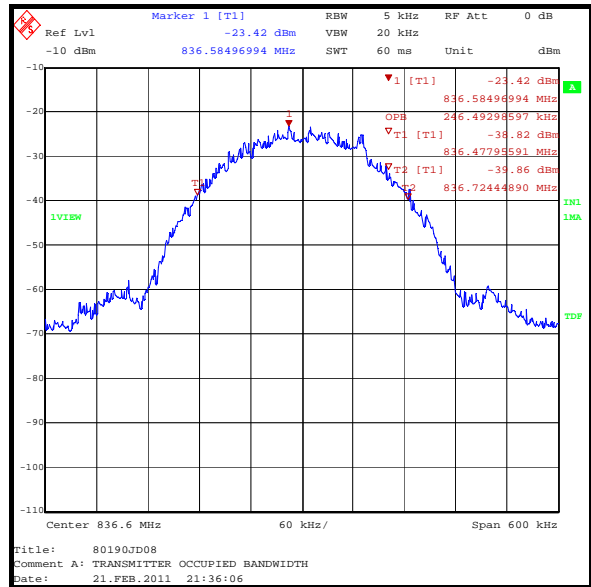
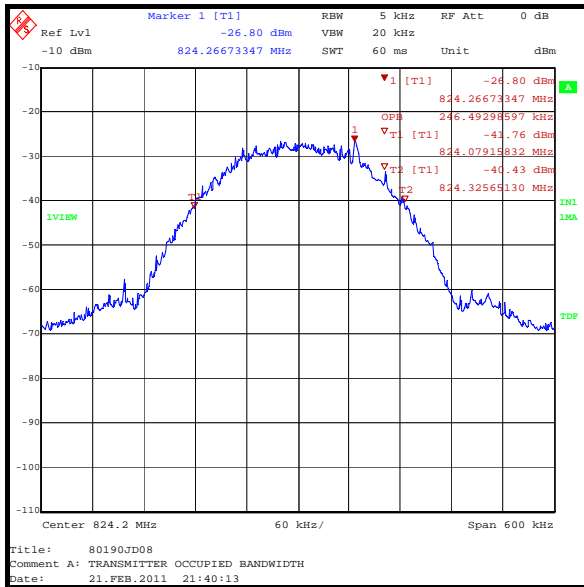
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Bottom	824.2	245.291
Middle	836.6	244.088
Top	848.8	242.886

**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.

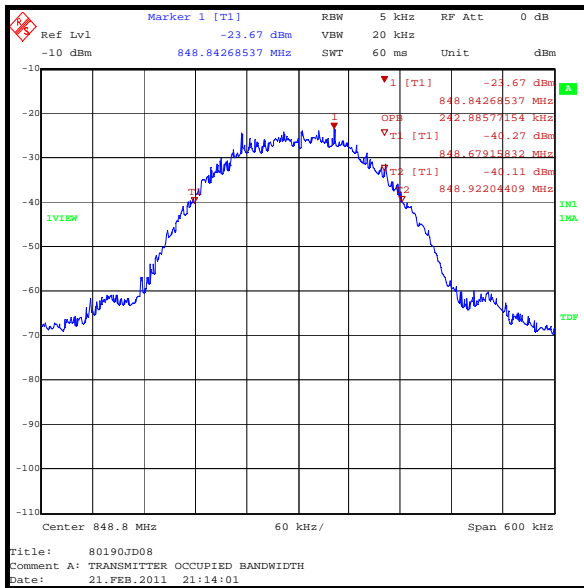
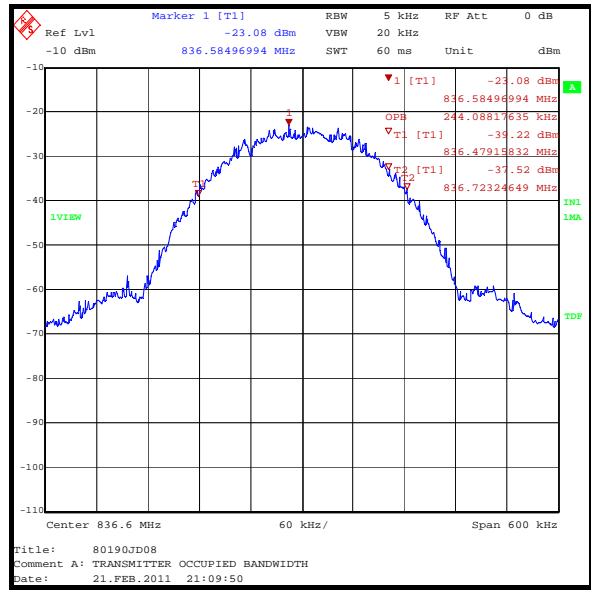
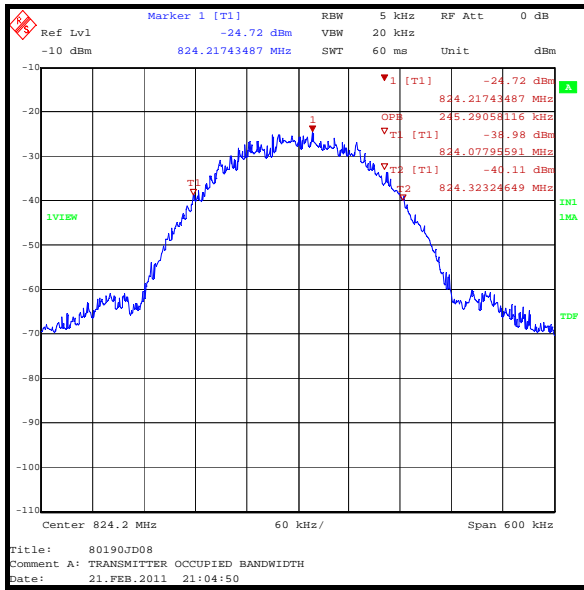
### Transmitter Occupied Bandwidth (continued)

#### GSM Circuit Switched



### Transmitter Occupied Bandwidth (continued)

#### GPRS



**5.2.6. Transmitter Conducted Emissions****Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	22 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<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 Parts 2.1051 and 22.917
<b>Frequency Range:</b>	1 MHz to 9 GHz
<b>Configuration:</b>	GSM Circuit Switched

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	30

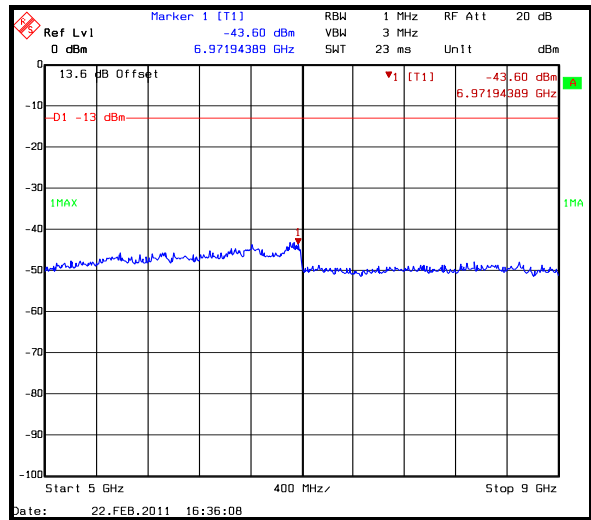
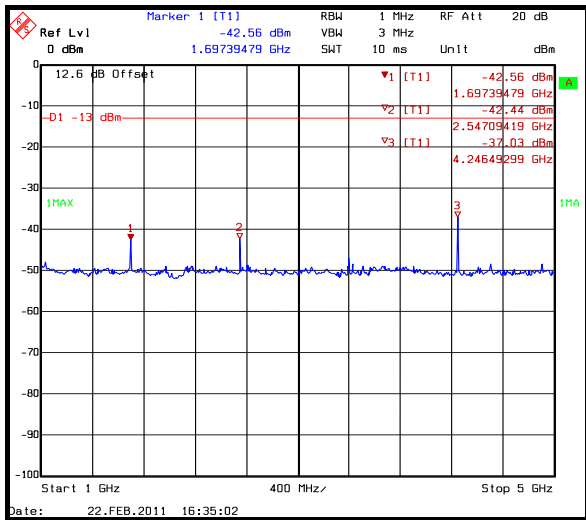
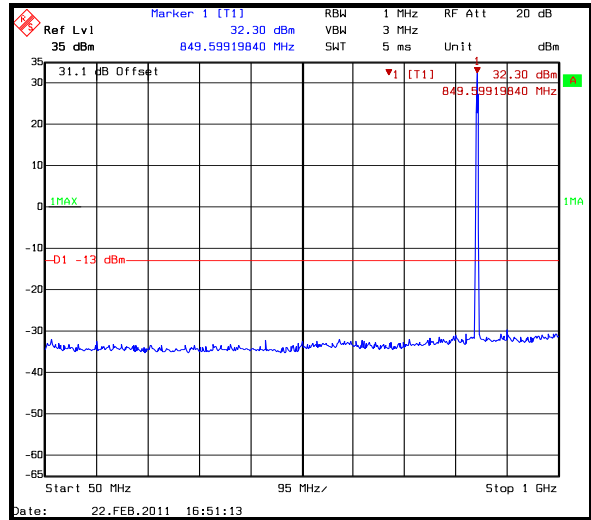
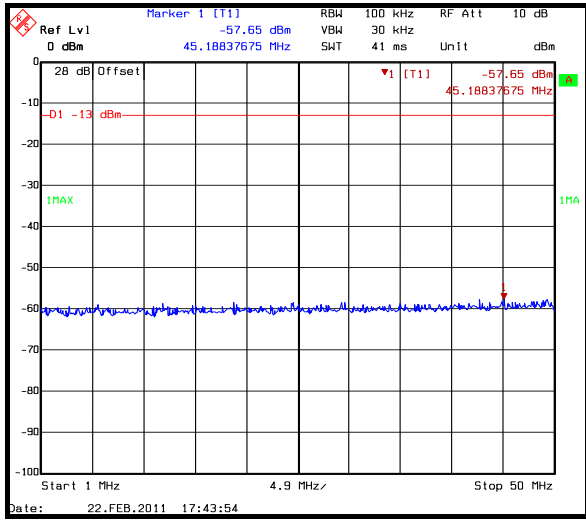
**Results:**

<b>Frequency (MHz)</b>	<b>Peak Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
Note 2				

**Note(s):**

1. The transmitter fundamental is shown on the 50 MHz to 1 GHz plot.
2. No emissions were recorded within 20 dB of the limit and therefore no final measurements were taken.

**Transmitter Conducted Emissions (Continued)**





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

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	21 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<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 Part 2.1053
<b>Frequency Range:</b>	30 MHz to 9 GHz
<b>Configuration:</b>	GSM Circuit Switched

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	33

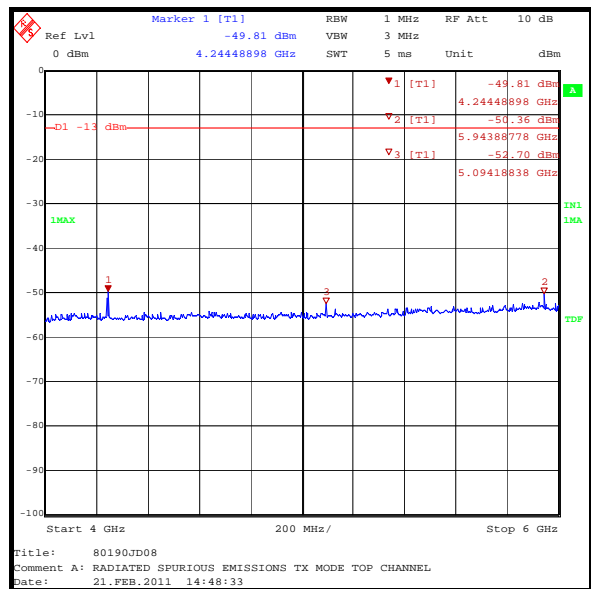
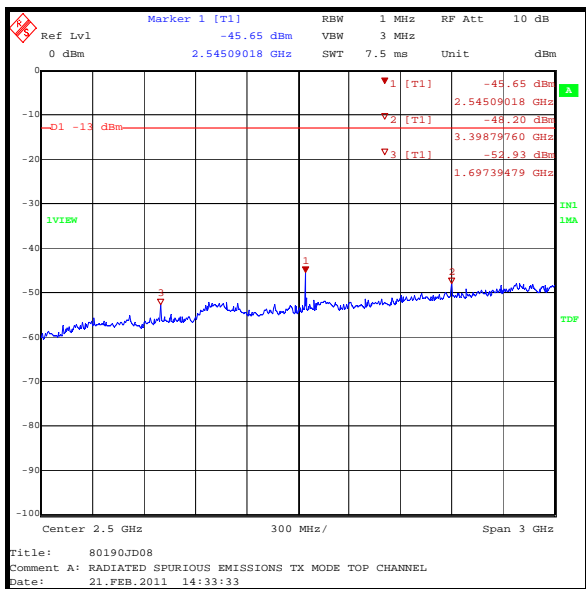
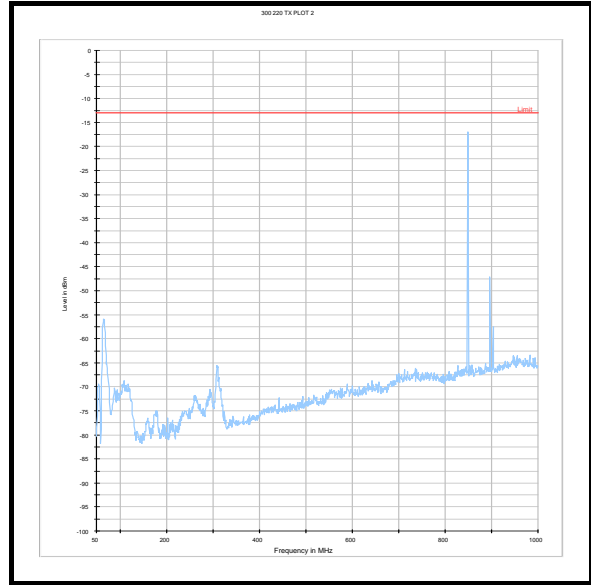
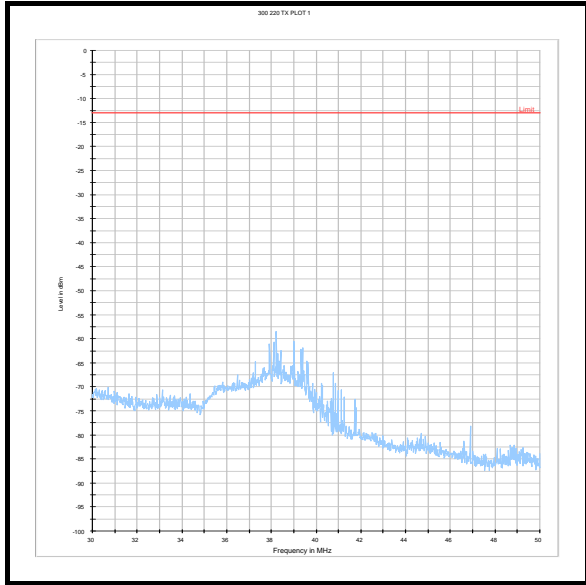
**Results: Bottom Channel**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
Note 1				

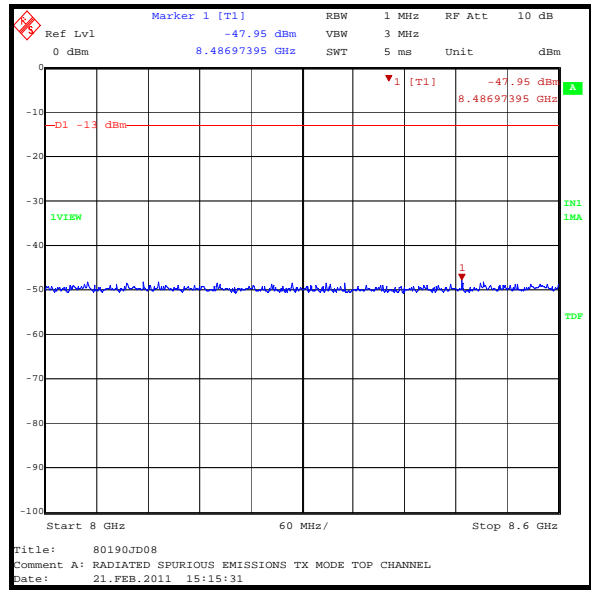
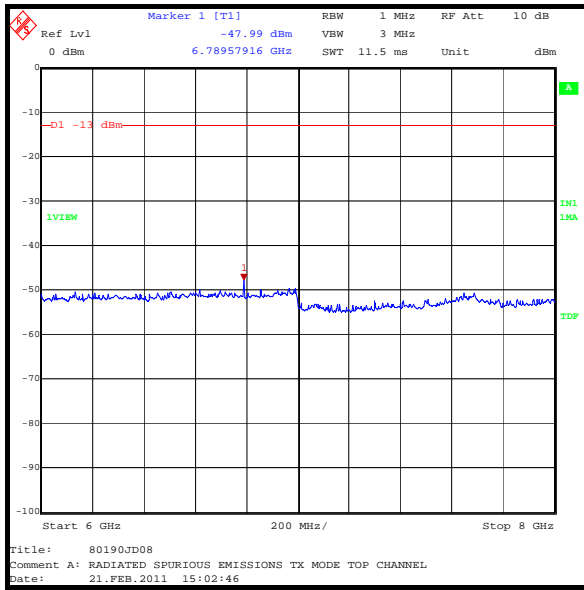
**Note(s):**

- No emissions were recorded within 20 dB of the limit and therefore no final measurements were taken.
- The uplink and downlink traffic channels are shown on the 30 MHz to 1 GHz plot.
- All emissions shown on the pre-scan plots were investigated and found to be below the measurement system noise floor or ambient.
- 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.
- 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)**



**5.2.8. Transmitter Band Edge Conducted Emissions**

**Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	02 August 2011
<b>Test Sample IMEI:</b>	356308049000075		

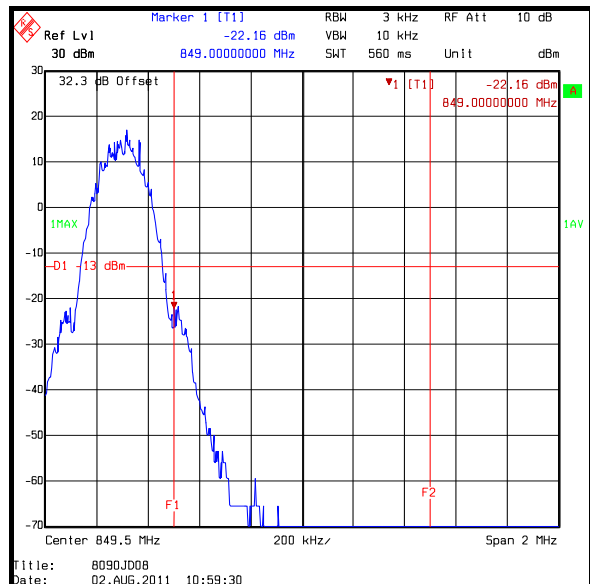
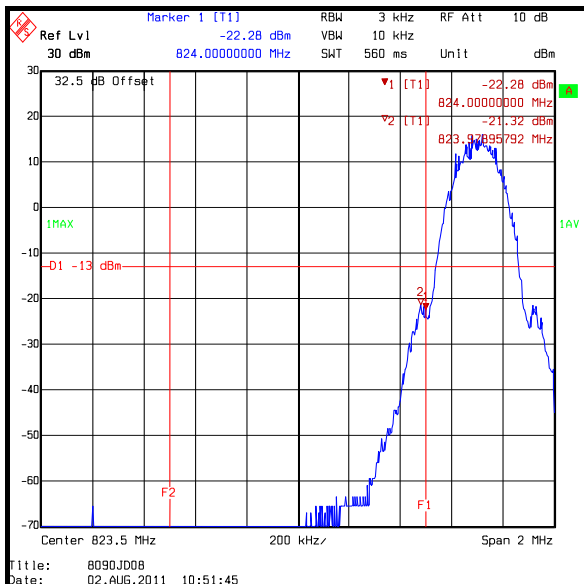
<b>FCC Part:</b>	2.1051 & 22.917
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC CFR Parts 2.1051 and 22.917

**Environmental Conditions:**

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

**Results: GSM Circuit Switched**

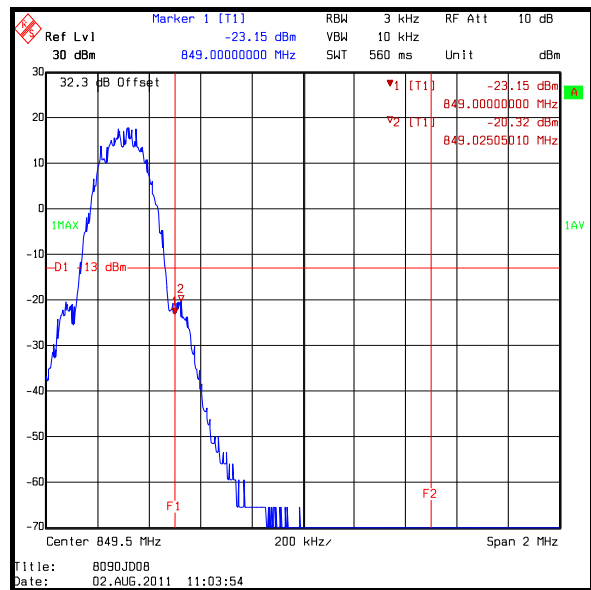
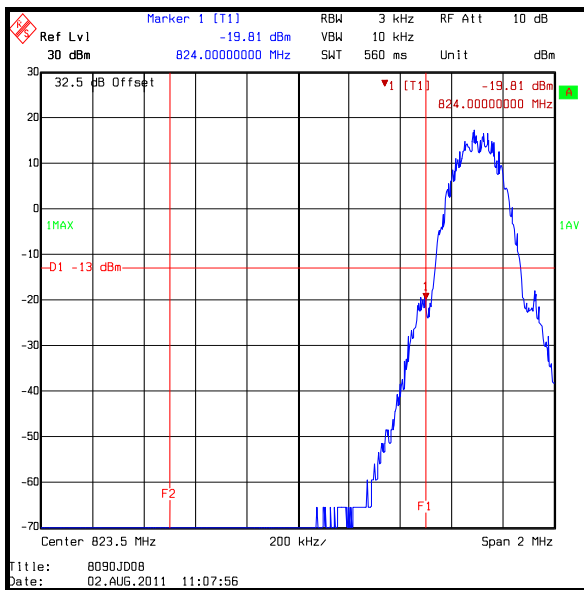
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.979	-21.3	-13.0	8.3	Complied
824.000	-22.3	-13.0	9.3	Complied
849.000	-23.2	-13.0	10.2	Complied



**Transmitter Band Edge Conducted Emissions (continued)**

**Results: GPRS**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824.000	-19.8	-13.0	6.8	Complied
849.000	-23.2	-13.0	10.2	Complied
849.025	-20.3	-13.0	7.3	Complied



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

**Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	21 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

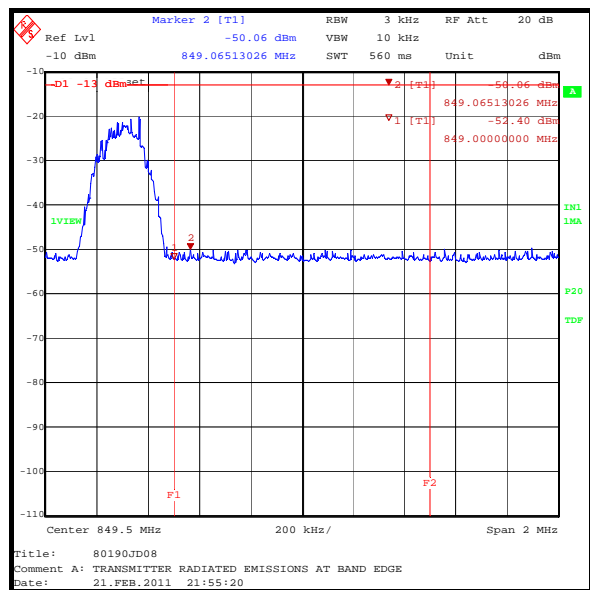
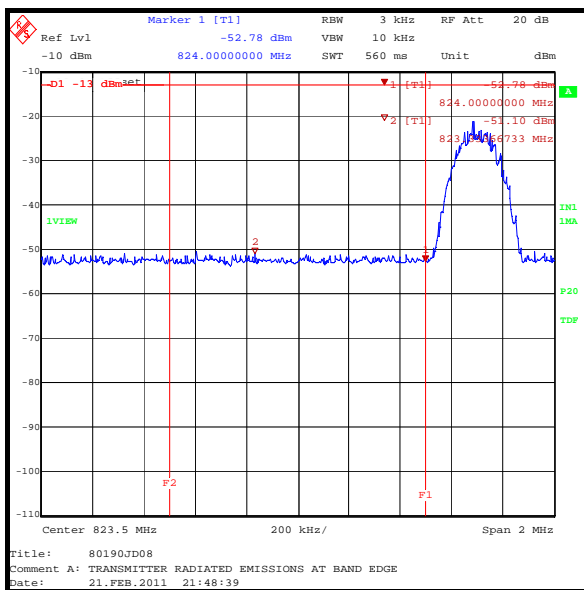
<b>FCC Part:</b>	2.1053 & 22.917
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Part 22.917

**Environmental Conditions:**

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

**Results: GSM Circuit Switched**

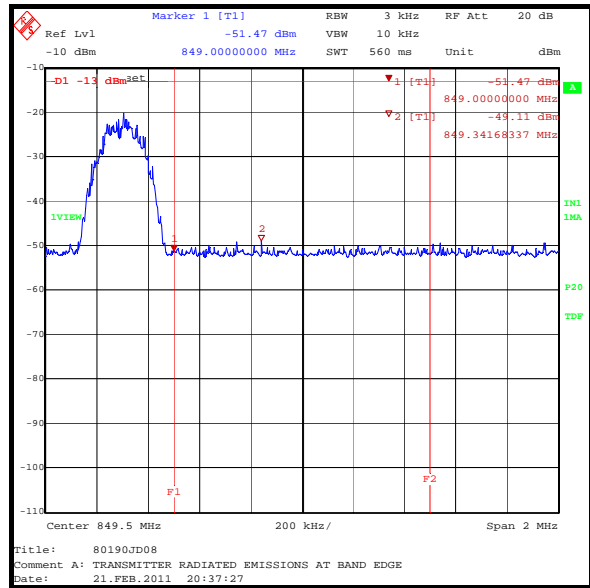
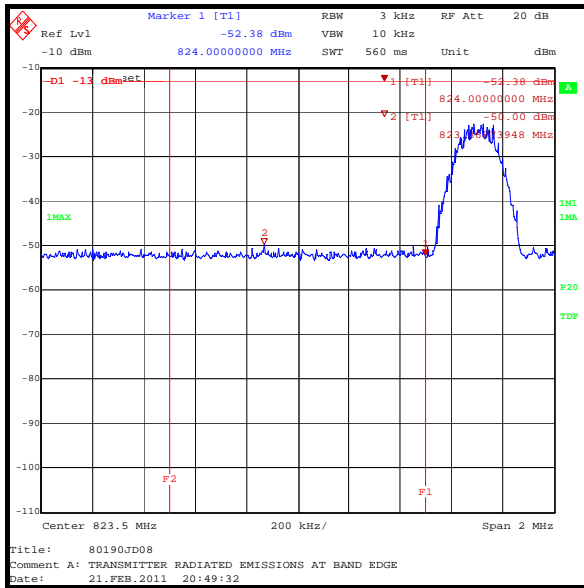
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-52.7	-13.0	39.7	Complied
849	-52.4	-13.0	39.4	Complied



**Transmitter Band Edge Radiated Emissions (continued)**

**Results: GPRS**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-52.4	-13.0	39.4	Complied
849	-51.5	-13.0	38.5	Complied



**5.3. Test Results - Part 24 & RSS-133****5.3.1. Receiver/Idle Mode Radiated Spurious Emissions****Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	25 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

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

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	33

**Results:**

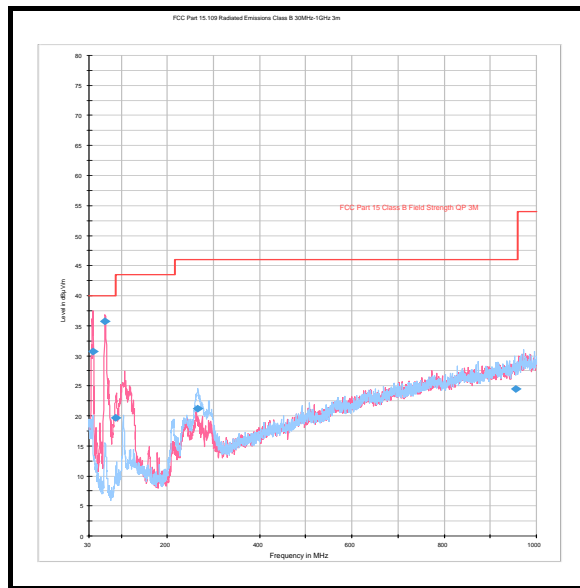
Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
38.006	Vertical	30.7	40.0	9.3	Complied
64.905	Vertical	35.7	40.0	4.3	Complied
88.054	Vertical	19.7	43.5	23.8	Complied
264.902	Horizontal	21.2	46.0	24.8	Complied
955.652	Horizontal	24.5	46.0	21.5	Complied

**Note(s):**

1. All emissions shown on the pre-scan plot were found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
2. 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.



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



*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>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	21 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

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

**Environmental Conditions:**

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

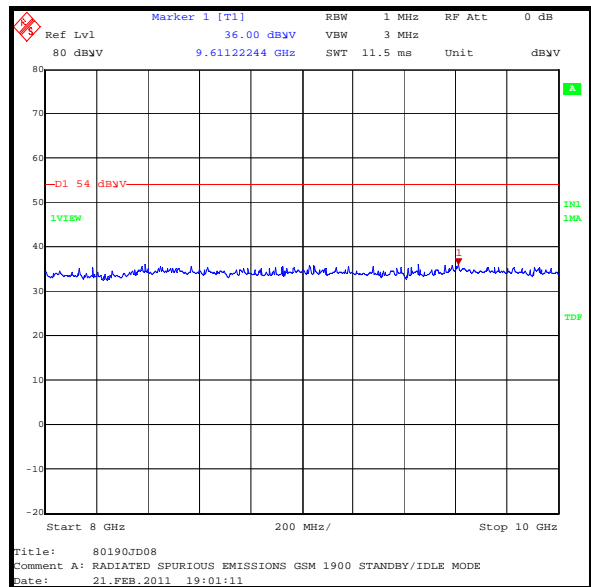
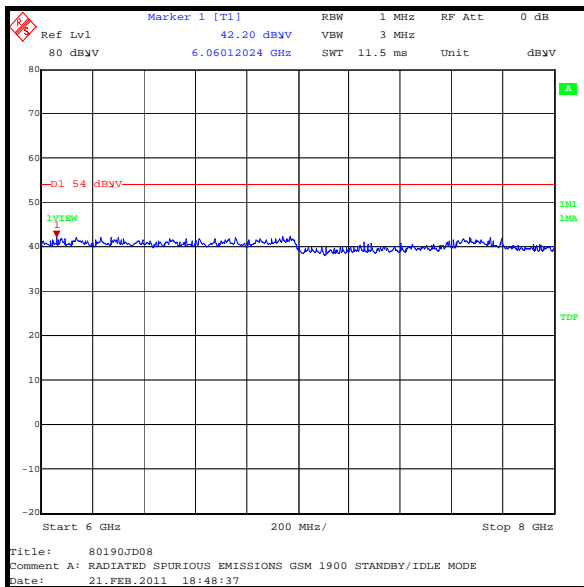
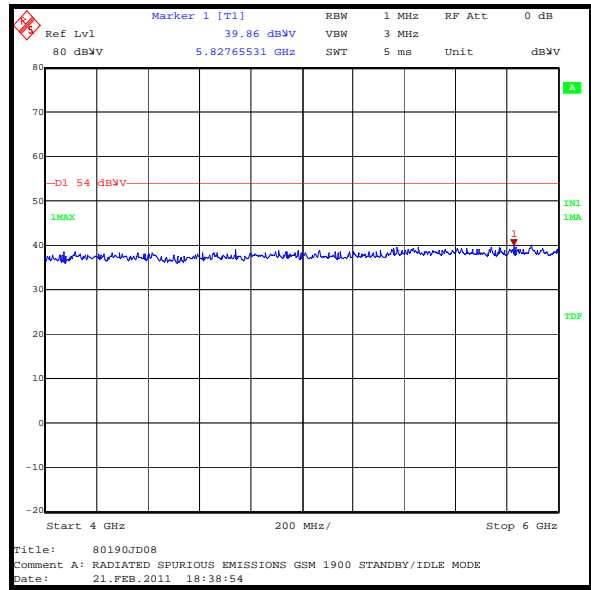
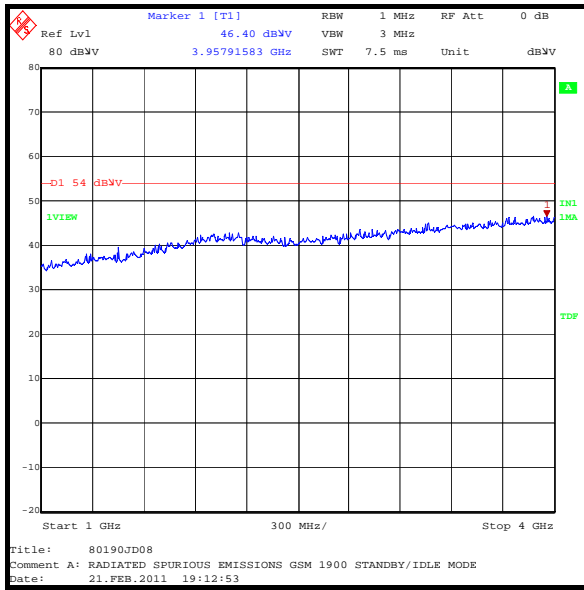
**Results:**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
3957.916	Vertical	46.4	54.0	7.6	Complied

**Note(s):**

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. 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.
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.

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



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

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	22 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<b>FCC Part:</b>	2.1046(a) & 24.232
<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>	30

**Results: GSM Circuit Switched**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	28.6	33.0	4.4	Complied
Middle	1879.8	28.5	33.0	4.5	Complied
Top	1909.8	28.8	33.0	4.2	Complied

**Results: GPRS**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	28.6	33.0	4.4	Complied
Middle	1879.8	28.5	33.0	4.5	Complied
Top	1909.8	28.8	33.0	4.2	Complied

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

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	25 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<b>FCC Part:</b>	2.1055 & 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>	23
<b>Relative Humidity (%):</b>	33

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

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	66	1850.200066	1850.0	0.200066	Complied
-20	71	1850.200071	1850.0	0.200071	Complied
-10	62	1850.200062	1850.0	0.200062	Complied
0	63	1850.200063	1850.0	0.200063	Complied
10	61	1850.200061	1850.0	0.200061	Complied
20	52	1850.200052	1850.0	0.200052	Complied
30	59	1850.200059	1850.0	0.200059	Complied
40	54	1850.200054	1850.0	0.200054	Complied
50	58	1850.200058	1850.0	0.200058	Complied

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

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	67	1909.800067	1910.0	0.199933	Complied
-20	66	1909.800066	1910.0	0.199934	Complied
-10	61	1909.800061	1910.0	0.199939	Complied
0	61	1909.800061	1910.0	0.199939	Complied
10	60	1909.800060	1910.0	0.199940	Complied
20	53	1909.800053	1910.0	0.199947	Complied
30	63	1909.800063	1910.0	0.199937	Complied
40	60	1909.800060	1910.0	0.199940	Complied
50	60	1909.800060	1910.0	0.199940	Complied

**Note(s):**

1. Temperature was monitored throughout the test with a calibrated digital thermometer.

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

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	25 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<b>FCC Part:</b>	2.1055 & 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>	23
<b>Relative Humidity (%):</b>	33

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

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.4	45	1850.200045	1850.0	0.200045	Complied
4.2	46	1850.200046	1850.0	0.200046	Complied

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

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
3.4	52	1909.800052	1910.0	0.199948	Complied
4.2	49	1909.800049	1910.0	0.199951	Complied

**Note(s):**

1. Voltage was monitored throughout the test with a calibrated digital voltmeter.

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

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	21 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<b>FCC Part:</b>	2.1049
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.7 referencing FCC CFR Part 2.1049

**Environmental Conditions:**

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

**Results: GSM Circuit Switched**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Bottom	1850.2	244.088
Middle	1879.8	242.886
Top	1909.8	242.886

**Results: GPRS**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Bottom	1850.2	246.493
Middle	1879.8	245.291
Top	1909.8	244.088

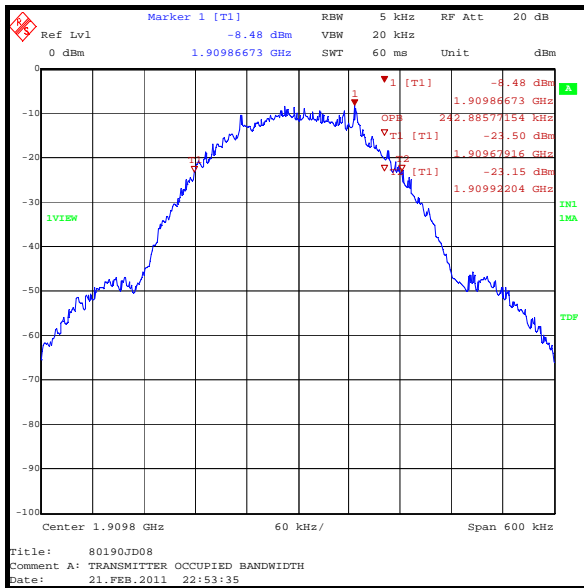
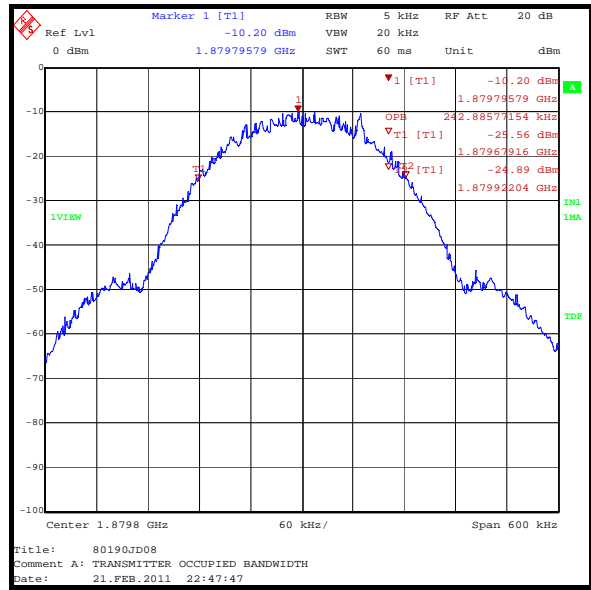
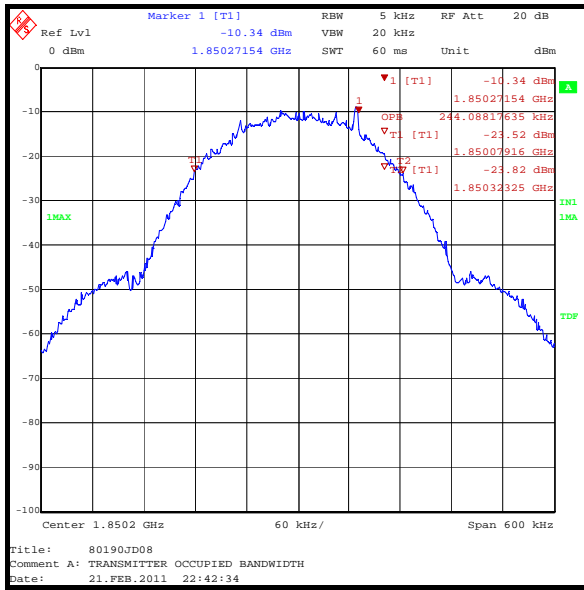
**Note(s):**

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.



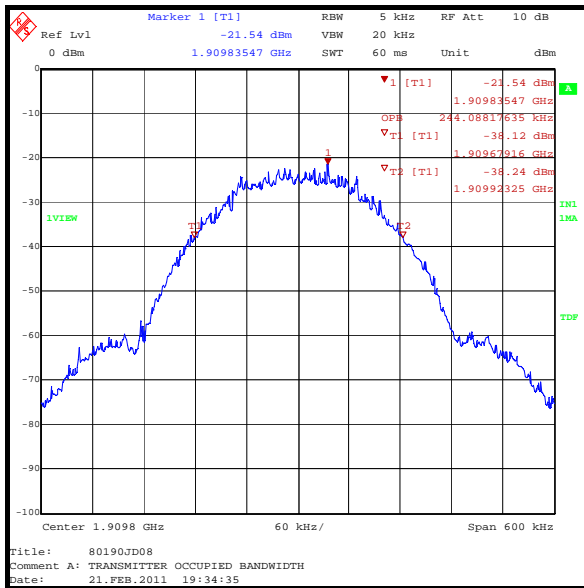
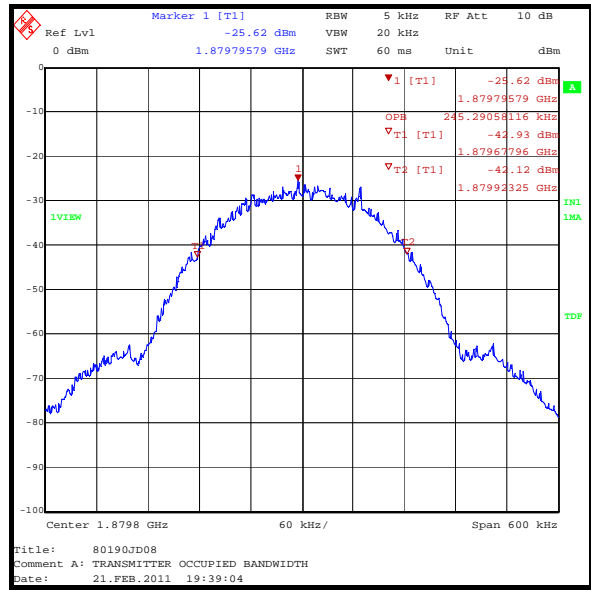
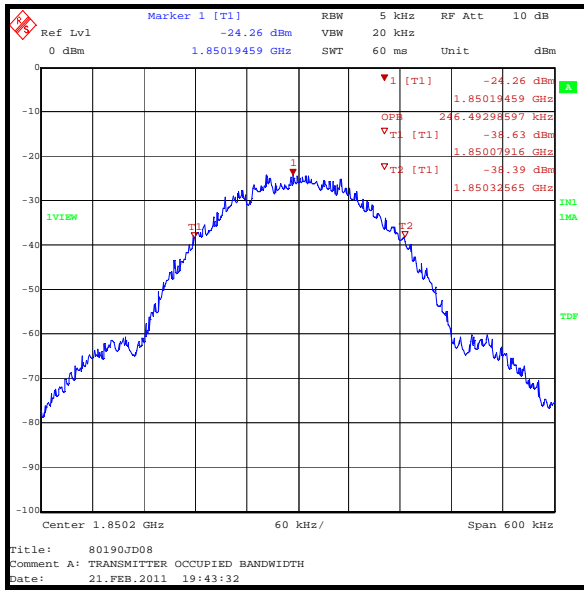
### Transmitter Occupied Bandwidth (continued)

#### GSM Circuit Switched



### Transmitter Occupied Bandwidth (continued)

#### GPRS



**5.3.6. Transmitter Conducted Emissions****Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	22 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<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 Parts 2.1051 and 24.238
<b>Frequency Range:</b>	1 MHz to 20 GHz
<b>Configuration:</b>	GSM Circuit Switched

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	30

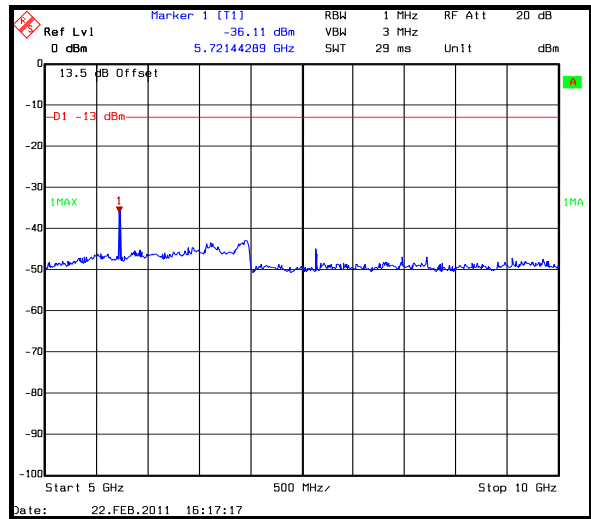
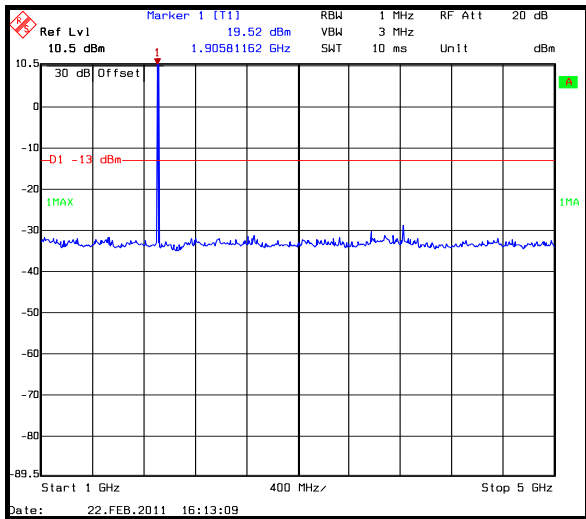
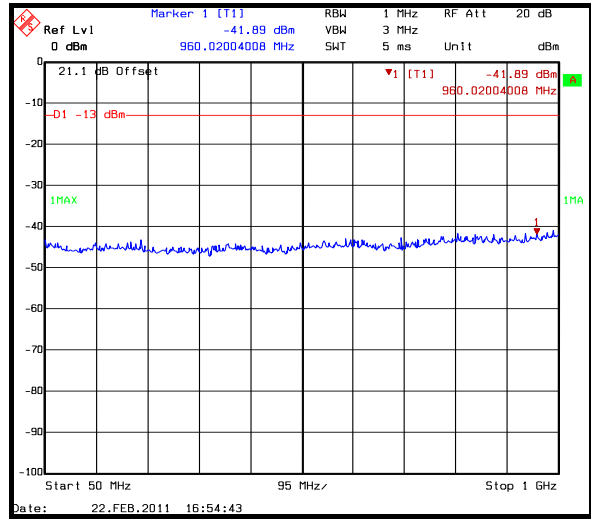
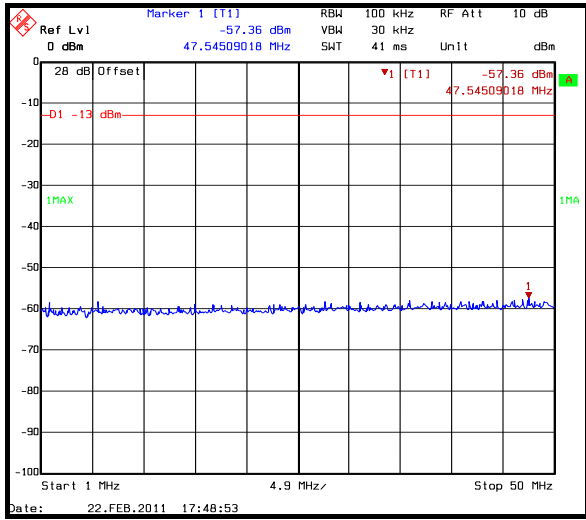
**Results:**

<b>Frequency (MHz)</b>	<b>Peak Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
Note 2				

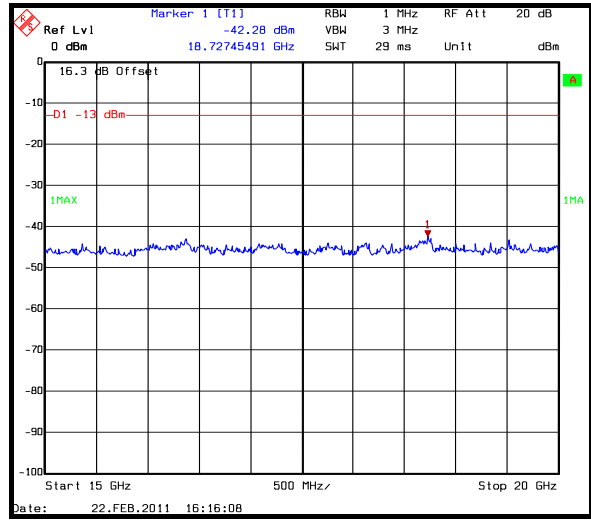
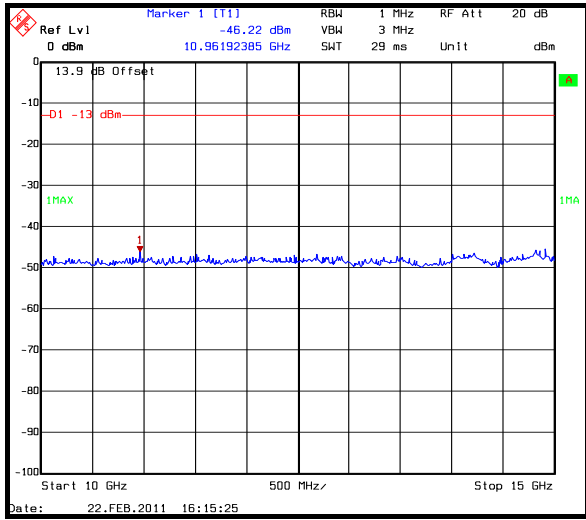
**Note(s):**

1. The emission at 1905.811 shown on the 1 GHz to 5 GHz plot is the EUT fundamental.
2. No emissions were recorded within 20 dB of the limit and therefore no final measurements were taken.

### Transmitter Conducted Emissions (Continued)



**Transmitter Conducted Emissions (Continued)**



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

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	21 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

<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
<b>Frequency Range:</b>	30 MHz to 20 GHz
<b>Configuration:</b>	GSM Circuit Switched

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	33

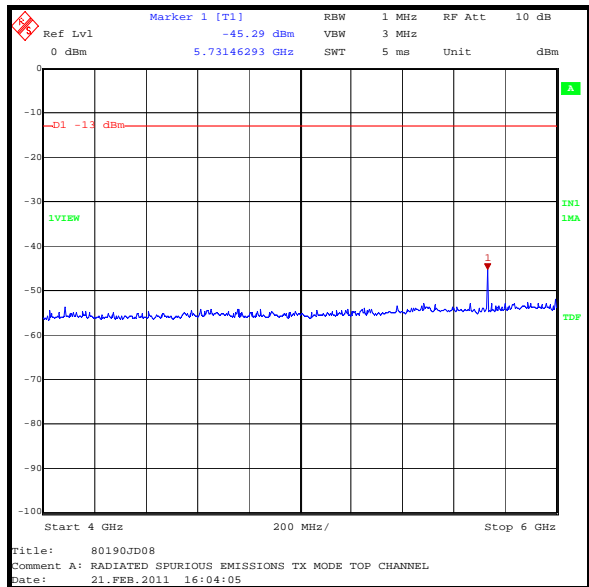
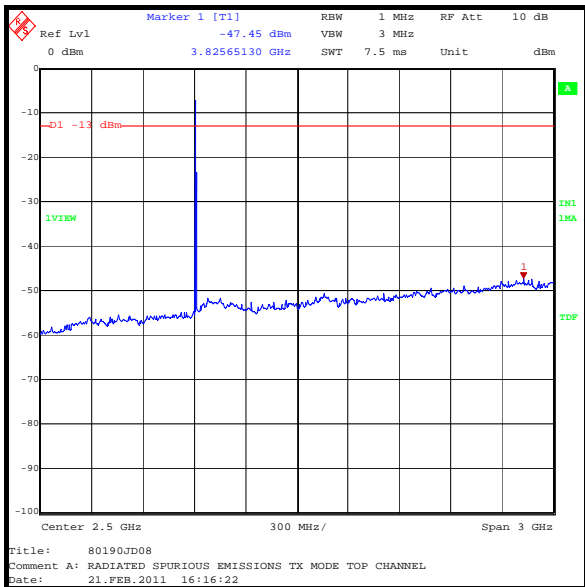
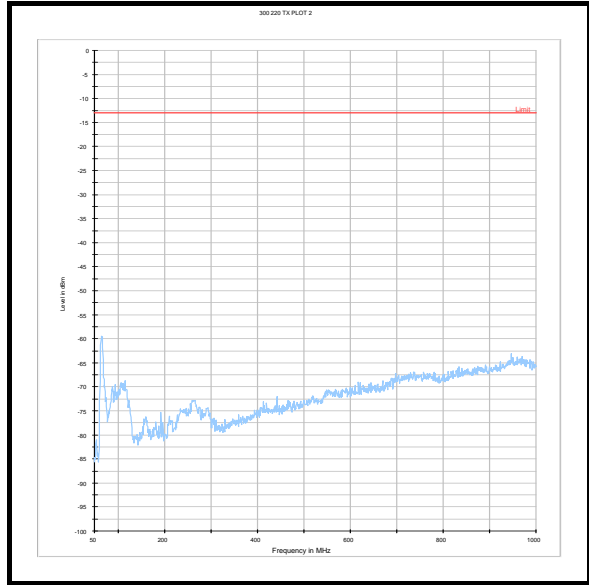
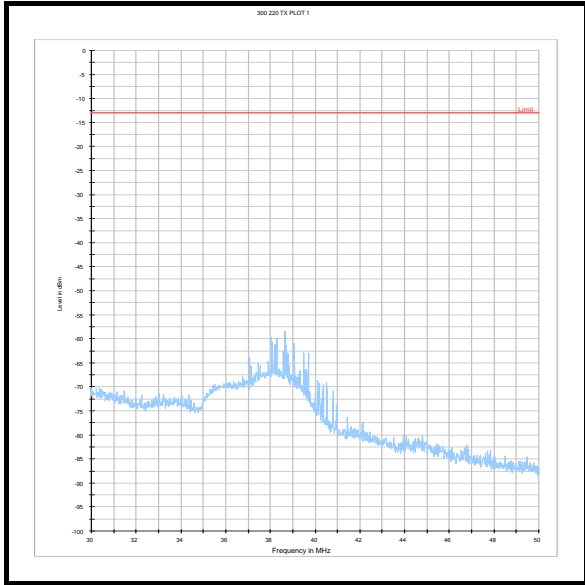
**Results:**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
Note 1				

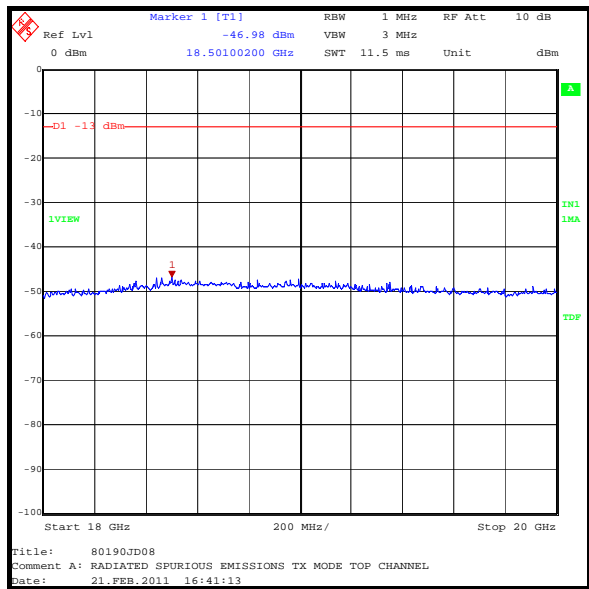
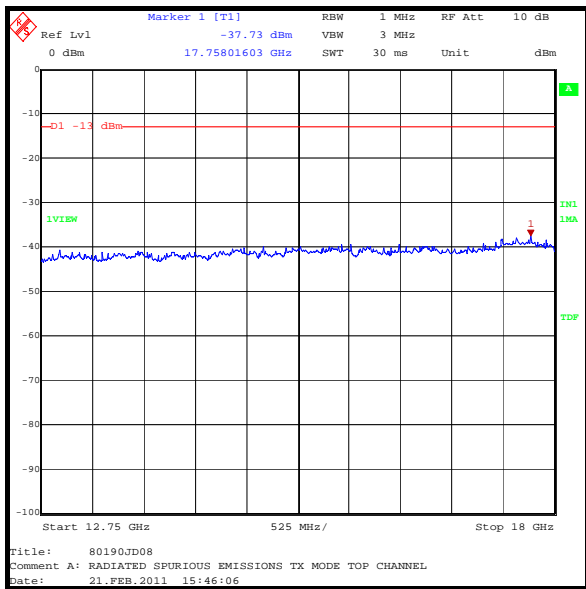
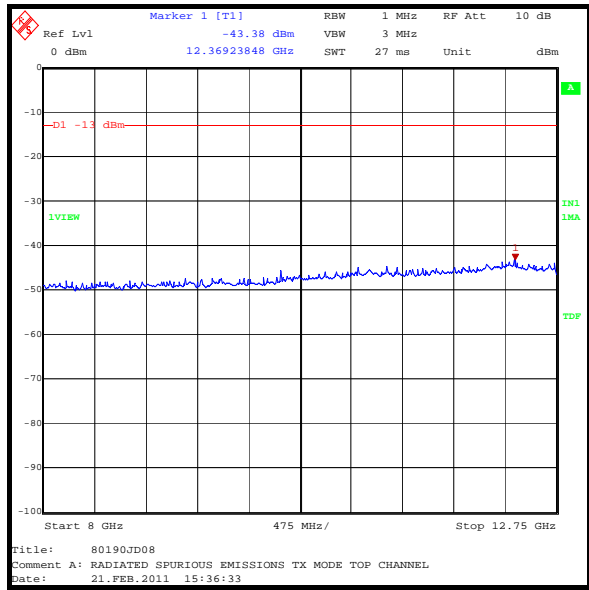
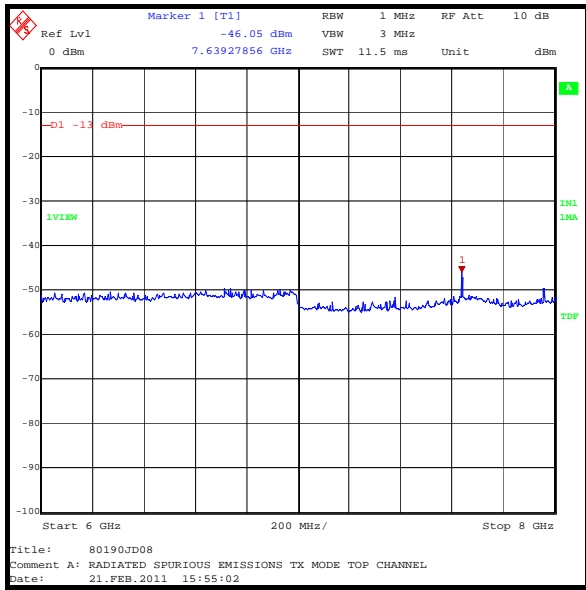
**Note(s):**

1. No spurious emissions were detected above the noise floor of the measuring receiver; the highest peak noise floor reading of the measuring receiver was recorded.
2. The transmitter fundamental is shown on the 1 GHz to 4 GHz plot.
3. No emissions were recorded within 20 dB of the limit and therefore no final measurements were taken.
4. 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.
5. 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)





**5.3.8. Transmitter Band Edge Conducted Emissions**

**Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	02 August 2011
<b>Test Sample IMEI:</b>	356308049000075		

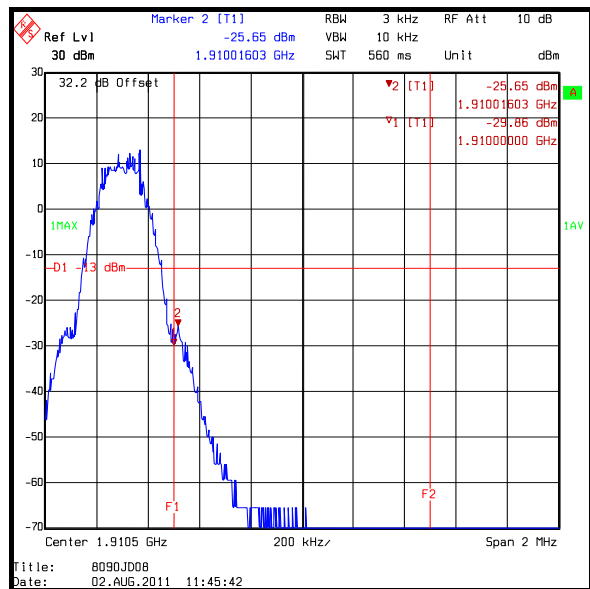
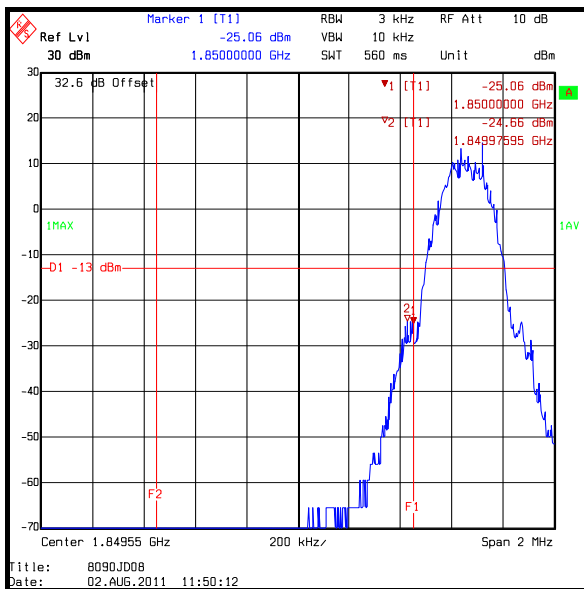
<b>FCC Part:</b>	2.1051 & 24.238
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC CFR Parts 2.1051 and 24.238

**Environmental Conditions:**

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

**Results: GSM Circuit Switched**

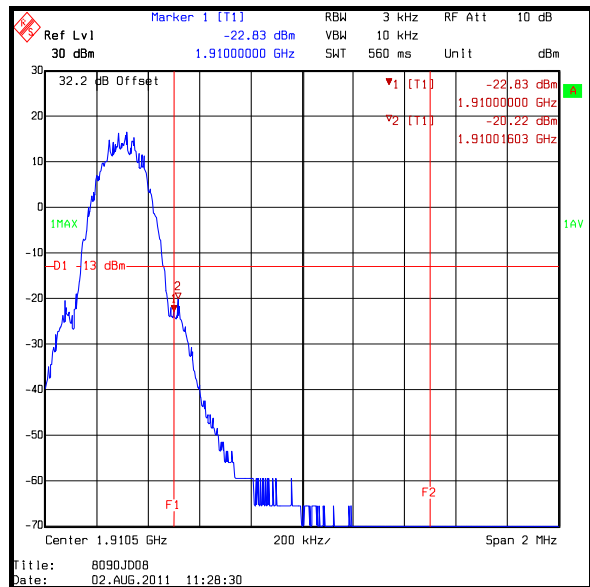
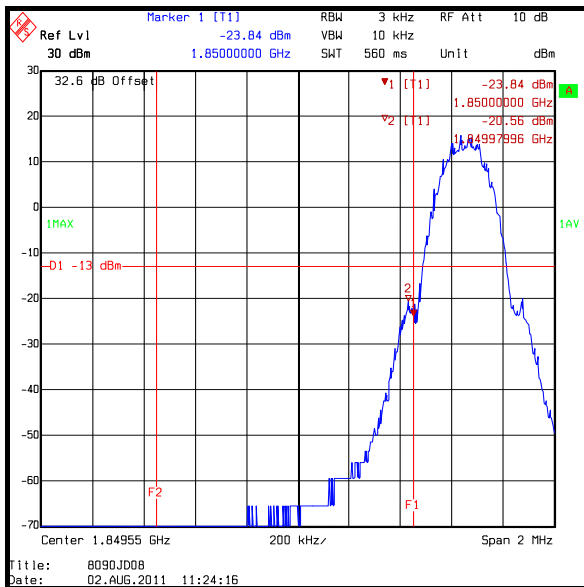
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1849.976	-24.7	-13.0	11.7	Complied
1850.000	-25.1	-13.0	12.1	Complied
1910.000	-29.8	-13.0	16.8	Complied
1910.016	-25.7	-13.0	12.7	Complied



**Transmitter Band Edge Conducted Emissions (continued)**

**Results: GPRS**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1849.998	-20.6	-13.0	7.6	Complied
1850.000	-23.8	-13.0	10.8	Complied
1910.000	-22.8	-13.0	9.8	Complied
1910.016	-20.2	-13.0	7.2	Complied



**5.3.9. Transmitter Band Edge Radiated Emissions**

**Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	21 February 2011
<b>Test Sample IMEI:</b>	356308049000075		

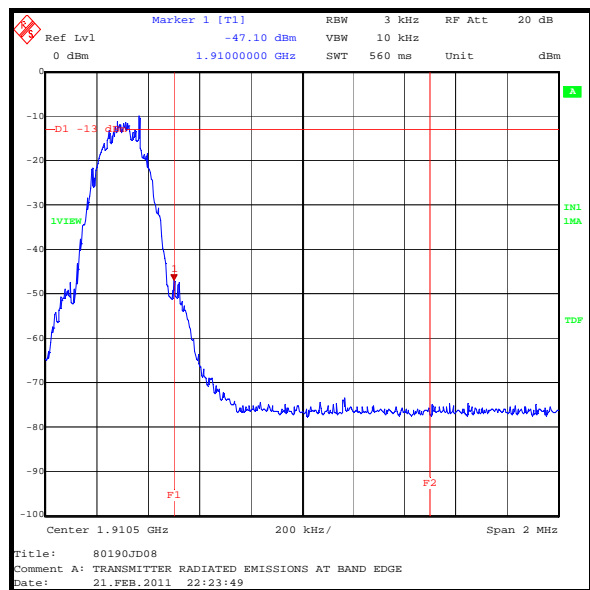
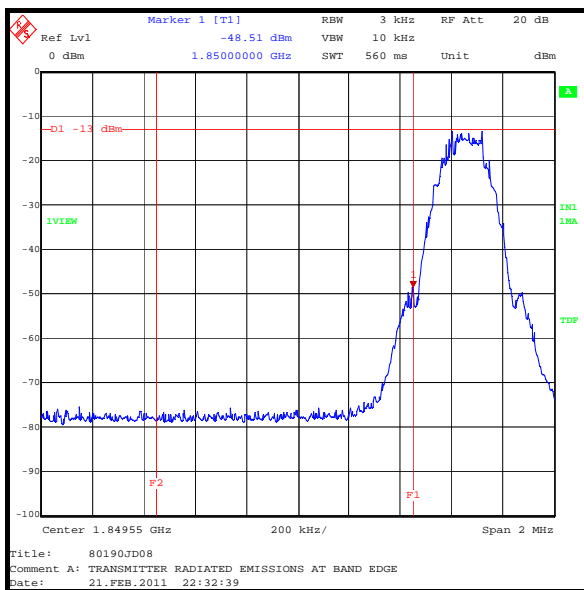
<b>FCC Part:</b>	2.1053 & 24.238
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Parts 2.1053 and 24.238

**Environmental Conditions:**

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

**Results: GSM Circuit Switched**

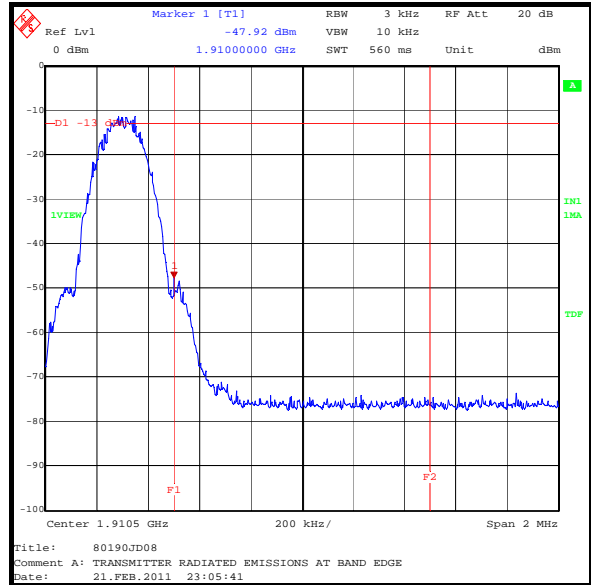
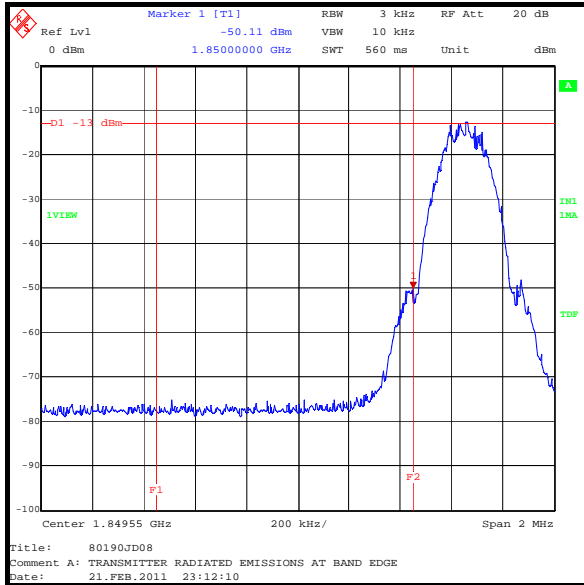
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-48.5	-13.0	35.5	Complied
1910	-47.1	-13.0	34.1	Complied



**Transmitter Band Edge Radiated Emissions (continued)**

**Results: GPRS**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-50.1	-13.0	37.1	Complied
1910	-47.9	-13.0	34.9	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	824 to 849 MHz / 1850 to 1910 MHz	95%	±0.27 dB
Frequency Stability	824 to 849 MHz / 1850 to 1910 MHz	95%	±0.92 ppm
Occupied Bandwidth	824 to 849 MHz / 1850 to 1910 MHz	95%	±0.92 ppm
Conducted Spurious Emissions	1 MHz 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)
A1100	Directional Coupler	Hewlett Packard	HP87300C	3239A01058	Calibrated before use	-
A1396	Attenuator	Huber + Suhner	757987	6810.17.B	06 Jul 2011	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	06 Jun 2011	12
A1818	Antenna	EMCO	3115	00075692	05 Sep 2011	12
A1974	High Pass Filter	AtlanTecRF	AFH-01000	090000283	29 Dec 2011	12
A253	Antenna	Flann Microwave	12240-20	128	05 Sep 2011	12
A254	Antenna	Flann Microwave	14240-20	139	05 Sep 2011	12
A255	Antenna	Flann Microwave	16240-20	519	05 Sep 2011	12
A256	Antenna	Flann Microwave	18240-20	400	05 Sep 2011	12
A288	Antenna	Chase	CBL6111A	1589	05 Sep 2011	12
A436	Antenna	Flann	20240-20	330	05 Sep 2011	12
A526	Directional Coupler	Narda	3020A	37106	Calibrated before use	-
A553	Antenna	Chase	CBL6111A	1593	16 Mar 2011	12
K0001	5m Semi-Anechoic Chamber	Rainford EMC	N/A	N/A	25 Apr 2011	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	05 Sep 2011	12
L1001	Test Receiver	Rohde & Schwarz	ESU26	100239	16 Mar 2011	12
L1021	Comms Test Set	Rohde & Schwarz	CMU 200	111379	11 Jan 2012	12
M1068	Thermometer	Iso-Tech	RS55	93102884	10 Nov 2011	12
M1124	Test Receiver	Rohde & Schwarz	ESI26	100046K	22 Apr 2011	12
M1223	Environmental Chamber	Votsch	VT4002	58566072720010	Calibrated before use	-
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	06 Dec 2011	12
M1269	Multimeter	Fluke	179	90250210	15 Jul 2011	12
S021	DC Power Supply	Thurlby Thandar	CPX200	061034	Calibrated before use	-

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