



# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Enfora LPP0208-40 – Enabler IIIG LPP

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

**Test Report Serial No:**  
RFI-RPT-RP77171JD05A

<b>This Test Report Is Issued Under The Authority Of Brian Watson, COO Payments and Consultancy:</b>	pp 
<b>Checked By:</b>	R. Graham
<b>Signature:</b>	
<b>Date of Issue:</b>	07 June 2010

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## **1. Customer Information**











<b>Company Name:</b>	Enfora Inc.
<b>Address:</b>	251 Renner Parkway Richardson TEXAS 75080 USA

## 2. Summary of Testing

### 2.1. General Information – FCC Part 22

<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, September 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, September 2008
<b>Specification Title:</b>	Technical Requirements for Cellular Radiotelephone Systems Operating in the Bands 824 – 849 MHz and 869 – 894 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>	12 April 2010 to 06 May 2010











### 2.2. Summary of Test Results – GSM 850

FCC Reference (47CFR )	Industry Canada Reference	Measurement	Result
Part 15.107	RSS-Gen Section 7.2.2	Receiver/Idle Mode AC Conducted Spurious Emissions	
Part 15.109	RSS-Gen Section 4.10	Receiver/Idle Mode Radiated Spurious Emissions	
Part 22.913(a)	RSS-132 Section 4.4	Transmitter Output Power and ERP	
Part 22.355	RSS-132 Section 4.3	Transmitter Frequency Stability (Temperature Variation)	
Part 22.355	RSS-132 Section 4.3	Transmitter Frequency Stability (Voltage Variation)	
Part 2.1049	RSS-Gen 4.6.1	Transmitter Occupied Bandwidth	
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>Key to Results</b>			
 = Complied  = Did not comply			

### **2.3. General Information – FCC Part 24**

<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-Gen Issue 2, June 2007
<b>Specification Title:</b>	General Requirements and Information for the Certification of Radiocommunication Equipment
<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, February 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>	12 April 2010 to 06 May 2010

### **2.4. Summary of Test Results – PCS 1900**

<b>FCC Reference (47CFR)</b>	<b>Industry Canada Reference</b>	<b>Measurement</b>	<b>Result</b>
15.107	RSS-Gen Section 7.2.2	Receiver/Idle Mode AC Conducted Spurious Emissions	
15.109	RSS-Gen Section 4.10	Receiver/Idle Mode Radiated Spurious Emissions	
15.207	RSS-Gen Section 7.2.2	Transmitter AC Conducted Spurious Emissions	
24.232(c)	SRSP-510 Section 5.1.2	Transmitter Output Power and EIRP	
24.235	RSS-133 Section 6.3	Transmitter Frequency Stability (Temperature & Voltage Variation)	
2.1049/24.238	RSS-Gen Section 4.6.1	Transmitter Occupied Bandwidth	
2.1053/24.238	RSS-133 Section 6.5	Transmitter Out of Band Radiated Emissions	
2.1053/24.238	RSS-133 Section 6.5	Transmitter Band Edge Radiated Emissions	
<b>Key to Results</b>			
 = Complied  = Did not comply			

## **2.5. 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 (2003)
<b>Title:</b>	American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

## **2.6. 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>Description:</b>	GSM/GPRS/GPS Module
<b>Brand Name:</b>	Enfora
<b>Model Name or Number:</b>	LPP0208-40 – Enabler IIIG LPP
<b>Serial Number:</b>	P050A00990008
<b>IMEI Number:</b>	012271000000045
<b>Hardware Version Number:</b>	A
<b>Software Version Number:</b>	1.1.4
<b>Industry Canada Certification Number:</b>	4160A-LPP0208
<b>FCC ID Number:</b>	MIVLPP0208

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

The equipment under test was a GSM/GPRS/GPS Module mounted on a development board.

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

No modifications were applied to the EUT during testing.



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

<b>Technology Tested:</b>	GSM 850		
<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	3.80 V	
	Minimum	3.23 V	
	Maximum	4.37 V	
<b>Maximum Conducted Output Power:</b>	GSM	32.2 dBm	
	GPRS	32.2 dBm	
<b>Transmit Frequency Range:</b>	824.2 to 848.8 MHz		
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	128	824.2
	Middle	190	836.6
	Top	251	848.8
<b>Receive Frequency Range:</b>	869.2 to 893.8 MHz		
<b>Receive Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	128	869.2
	Middle	190	881.6
	Top	251	893.8

**FCC Part 24**

<b>Technology Tested:</b>	PCS 1900		
<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	3.80 V	
	Minimum	3.23 V	
	Maximum	4.37 V	
<b>Maximum Conducted Output Power:</b>	GSM	29.2 dBm	
	GPRS	29.2 dBm	
<b>Transmit Frequency Range:</b>	1850.2 to 1909.8 MHz		
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	512	1850.2
	Middle	660	1879.8
	Top	810	1909.8
<b>Receive Frequency Range:</b>	1930.2 to 1989.8 MHz		
<b>Receive Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	512	1930.2
	Middle	660	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>	RFI Asset Number PC 343NT

<b>Description:</b>	DC Bench power supply
<b>Brand Name:</b>	TTL
<b>Model Name or Number:</b>	EL320D Dual power supply
<b>Serial Number:</b>	249944

<b>Description:</b>	Development board
<b>Brand Name:</b>	Enfora
<b>Model Name or Number:</b>	LPM0108 SDK
<b>Serial Number:</b>	Not Stated

<b>Description:</b>	Voltage regulator
<b>Brand Name:</b>	Enfora
<b>Model Name or Number:</b>	Not Stated
<b>Serial Number:</b>	Not Stated

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

### **4.1. Operating Modes**

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

- Idle Mode.
- Transmitter mode: constantly transmitting on bottom, middle and top channels.

### **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
- The EUT was connected to a supporting laptop PC. AT commands were sent to the EUT from the laptop PC via the serial port on the development board.
- Radiated and conducted emissions tests were performed with the antenna port connected to a Rohde & Schwarz CMU 200 used as support equipment via an RF cable. The support equipment was placed outside the anechoic chamber during radiated tests.
- Occupied Bandwidth, EIRP and Band edge measurements were performed with the EUT in GSM, single timeslot, circuit switched mode and GPRS transmitting packet data on two timeslots in the uplink, with one timeslot in the downlink.
- Transmitter/Idle radiated spurious emissions were performed with the EUT in GSM, single timeslot, circuit switched 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 – FCC Part 22**

**5.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions**

**Test Summary:**

<b>FCC Part:</b>	15.107(a)
<b>Industry Canada Part:</b>	RSS-Gen Section 7.2.2
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 7 and relevant annexes

**Environmental Conditions:**

<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	25

**Results: Quasi Peak Detector Measurements**

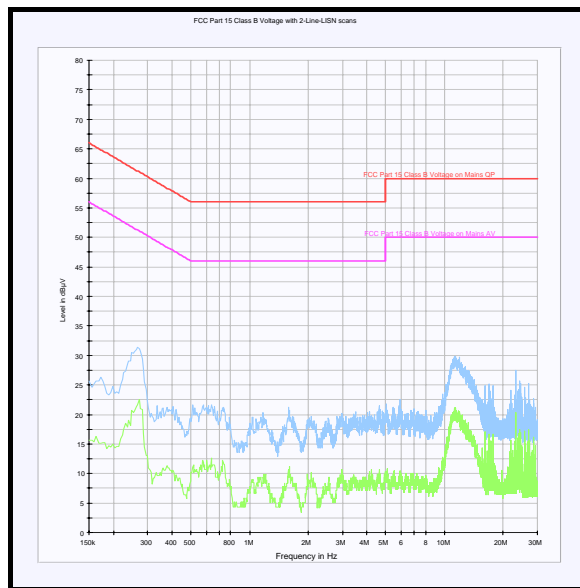
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
Refer to note 1					

**Results: Average Detector Measurements**

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
Refer to note 1					

**Note(s):**

1. All emissions were > 20 dB below the applicable limits.



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

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

**Test Summary:**

<b>FCC Part:</b>	15.109(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes
<b>Industry Canada Part:</b>	RSS-Gen Section 6
<b>Test Method Used:</b>	RSS-Gen Section 4.10
<b>Frequency Range:</b>	30 MHz to 1 GHz

**Environmental Conditions:**

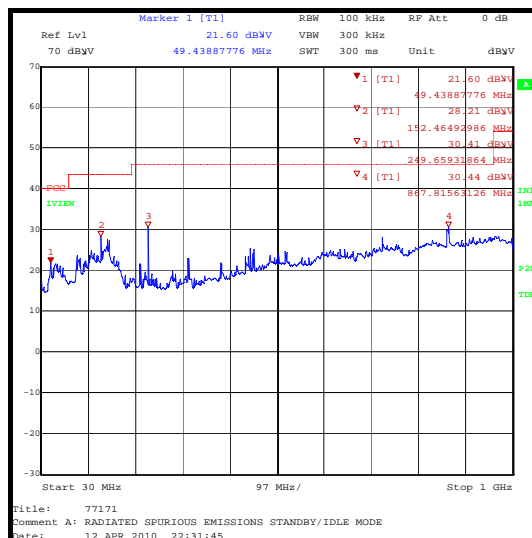
<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	21

**Results: Quasi Peak Detector Measurements**

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
49.663	Vertical	20.1	40.0	19.9	Complied
153.288	Vertical	29.5	43.5	14.0	Complied
249.969	Vertical	31.3	46.0	14.7	Complied
868.051	Vertical	30.8	46.0	15.2	Complied

**Note(s):**

1. Measurements were performed with the test antenna in the vertical and horizontal planes and the EUT in the X, Y and Z planes. The highest level was recorded in the above table.



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

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

**Test Summary:**

<b>FCC Part:</b>	15.109(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes
<b>Industry Canada Part:</b>	RSS-Gen Section 6
<b>Test Method Used:</b>	RSS-Gen Section 4.10
<b>Frequency Range:</b>	1 GHz to 5 GHz

**Environmental Conditions:**

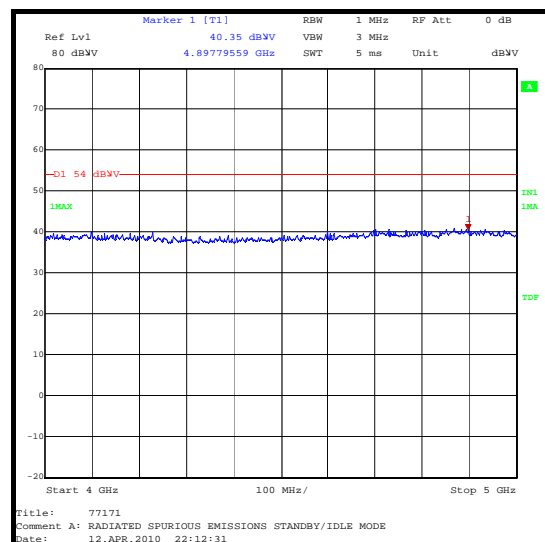
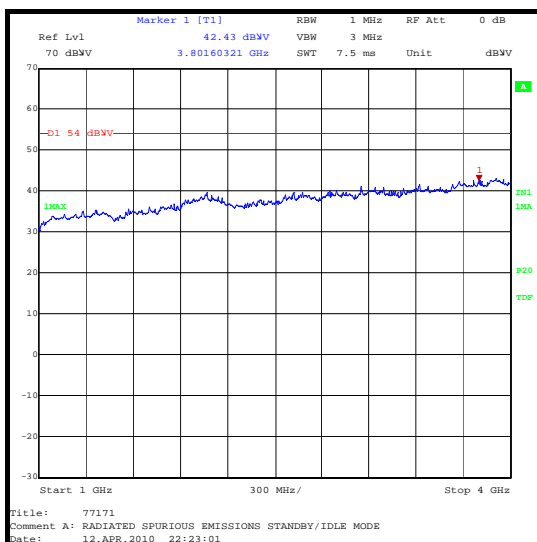
<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	21

**Results: Highest Peak Level**

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV/m)	Transducer Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
3.801603	Vertical	41.3	1.1	42.4	54.0	11.6	Complied

**Note(s):**

1. Measurements were performed with the test antenna in the vertical and horizontal planes and the EUT in the X, Y and Z planes. The highest level was recorded in the above table.
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.





**5.2.3. Transmitter AC Conducted Spurious Emissions****Test Summary:**

<b>FCC Part:</b>	15.207(a)
<b>Industry Canada Part:</b>	RSS-Gen Section 7.2.2
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 7 and relevant annexes

**Environmental Conditions:**

<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	25

**Results: Quasi Peak Detector Measurements**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.159000	Neutral	32.1	65.5	33.4	Complied
0.172500	Live 1	29.7	64.8	35.1	Complied
0.406500	Neutral	22.5	57.7	35.2	Complied
10.329000	Neutral	31.8	60.0	28.2	Complied
10.752000	Neutral	36.6	60.0	23.4	Complied
11.017500	Neutral	38.1	60.0	21.9	Complied
11.436000	Neutral	38.0	60.0	22.0	Complied
11.701500	Neutral	37.4	60.0	22.6	Complied
12.016500	Neutral	36.3	60.0	23.7	Complied
12.232500	Neutral	35.0	60.0	25.0	Complied
12.691500	Neutral	33.3	60.0	26.7	Complied

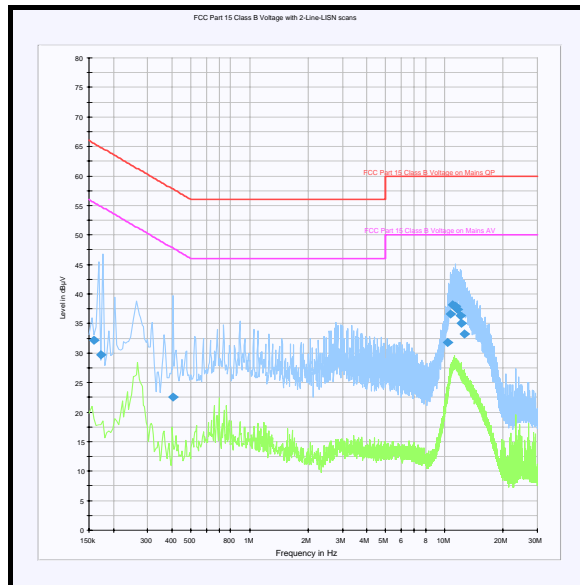
**Results: Average Detector Measurements**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
Refer to note 1					

**Note(s):**

1. All emissions were > 20 dB below the applicable limits.

**Transmitter AC Conducted Spurious Emissions (continued)**



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

**5.2.4. Transmitter Effective Radiated Power (ERP)****Test Summary:**

<b>FCC Part:</b>	22.913(a)(2)
<b>Industry Canada Part:</b>	SRSP-503 Section 5.1.3
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.17.2
<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	24

**Results: GSM Circuit Switched**

Channel	Measured Frequency (MHz)	Maximum Transmitter Conducted Power (dBm)	FCC / IC Limit (dBm)	Margin (dB)	Result
Bottom	824.2	32.0	38.5	6.5	Complied
Middle	836.6	32.2	38.5	6.3	Complied
Top	848.8	32.2	38.5	6.3	Complied

**Results: GPRS Packet Data**

Channel	Measured Frequency (MHz)	Maximum Transmitter Conducted Power (dBm)	FCC / IC Limit (dBm)	Margin (dB)	Result
Bottom	824.2	32.1	38.5	6.4	Complied
Middle	836.6	32.2	38.5	6.3	Complied
Top	848.8	32.2	38.5	6.3	Complied

**Note(s):**

1. Power was measured as a conducted measurement on a calibrated Rohde & Schwarz CMU 200 as no antenna was specified or supplied.

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

<b>FCC Part:</b>	22.355
<b>Test Method Used:</b>	ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055
<b>Industry Canada Part:</b>	RSS-132 Section 4.3
<b>Test Method Used:</b>	RSS-Gen Section 4.7

**Environmental Conditions:**

<b>Ambient Temperature (°C):</b>	29
<b>Ambient Relative Humidity (%):</b>	20

**Results: Middle Channel (836.4 MHz)**

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	836.399986	14	0.02	2.5	2.48	Complied
-20	836.399988	12	0.01	2.5	2.49	Complied
-10	836.399980	20	0.02	2.5	2.48	Complied
0	836.399981	19	0.02	2.5	2.48	Complied
10	836.399980	20	0.02	2.5	2.48	Complied
20	836.399972	28	0.03	2.5	2.47	Complied
30	836.399973	27	0.03	2.5	2.47	Complied
40	836.399978	22	0.03	2.5	2.47	Complied
50	836.399979	21	0.03	2.5	2.47	Complied

**Note(s):**

1. Absolute frequency error was measured using the GSM 850 modulation test on a calibrated Rohde & Schwarz CMU 200 Universal Radio Communications Tester in Circuit Switched mode in accordance with current Rohde & Schwarz application notes. The EUT was placed in a temperature chamber and connected by suitable RF cables to the CMU 200 outside the chamber. A bidirectional communications link was established on the centre channel between the EUT and the CMU 200. The frequency meter value was recorded.
2. Temperature was monitored throughout the test with a calibrated digital thermometer

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

<b>FCC Part:</b>	22.355
<b>Test Method Used:</b>	ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055
<b>Industry Canada Part:</b>	RSS-132 Section 4.3
<b>Test Method Used:</b>	RSS-Gen Section 4.7

**Environmental Conditions:**

<b>Temperature (°C):</b>	20
<b>Relative Humidity (%):</b>	27

**Results: Middle (836.4 MHz)**

Supply Voltage (V)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
3.23 V	836.399959	44	0.05	2.5	2.55	Complied
3.80 V	836.399972	28	0.03	2.5	2.47	Complied
4.37 V	836.399988	12	0.01	2.5	2.51	Complied

**Note(s):**

1. Absolute frequency error was measured using the GSM 850 modulation test on a calibrated Rohde & Schwarz CMU 200 Universal Radio Communications Tester in Circuit Switched mode in accordance with current Rohde & Schwarz application notes. The EUT was placed in a temperature chamber and connected by suitable RF cables to the CMU 200 outside the chamber. A bidirectional communications link was established on the centre channel between the EUT and the CMU 200. The frequency meter value was recorded.
2. Voltage was monitored throughout the test with a calibrated digital voltmeter

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

<b>FCC Part:</b>	2.1049
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.1.7 and relevant annexes referencing FCC CFR Part 2.1049 (see note below)
<b>Industry Canada Part:</b>	RSS-Gen Section 4.6
<b>Test Method Used:</b>	RSS-Gen Section 4.6.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	30
<b>Relative Humidity (%):</b>	27

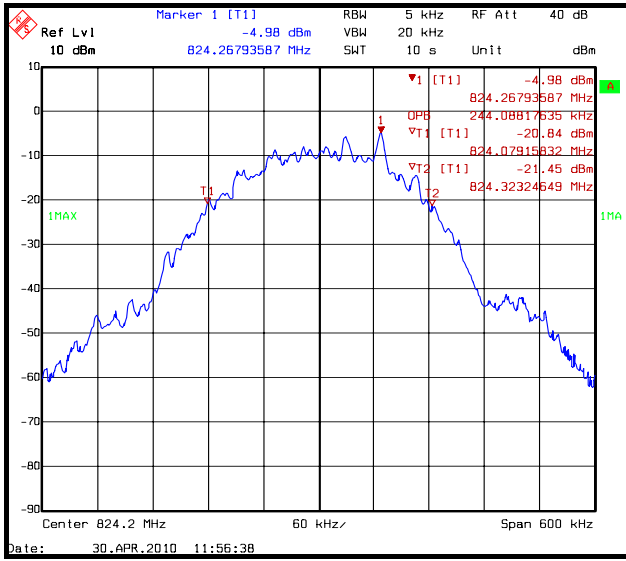
**Results: GSM Circuit Switched**

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

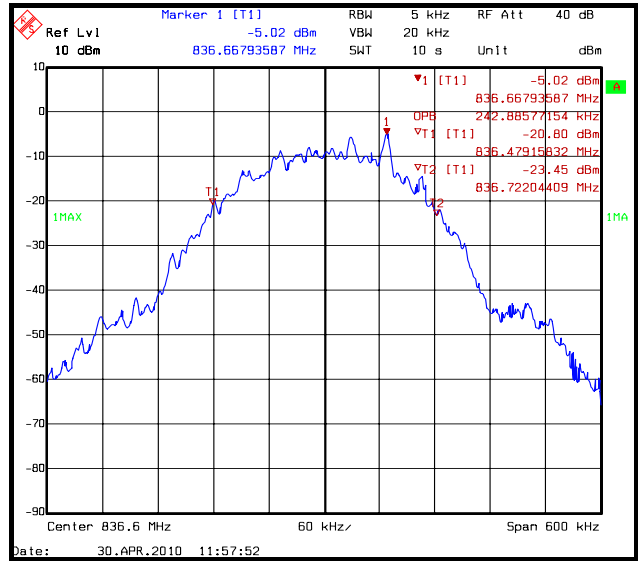
**Note(s):**

1. In lieu of the test method detailed in ANSI C63.4 Section 13.1.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser

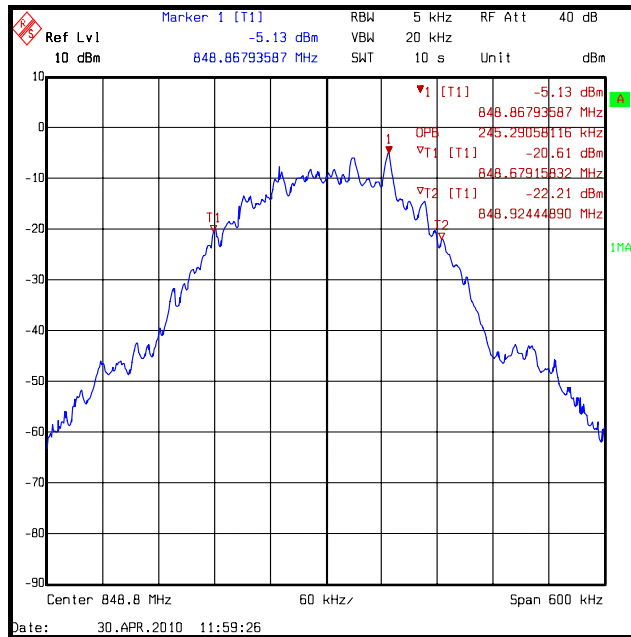
**Transmitter Occupied Bandwidth (continued)**



Bottom Channel



Middle Channel

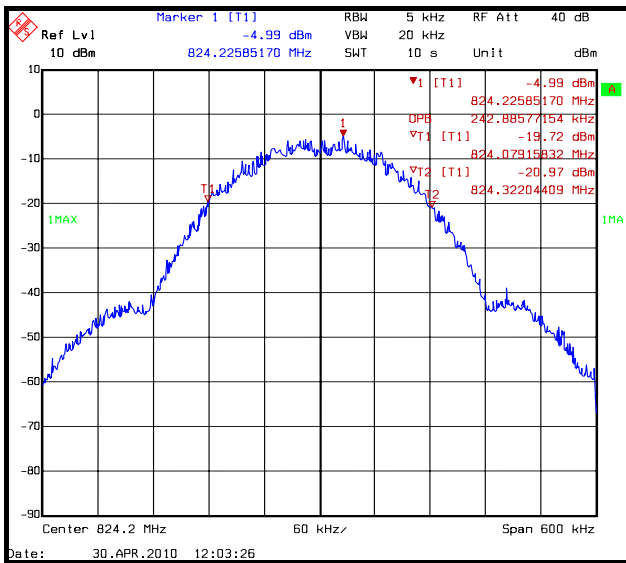


Top Channel

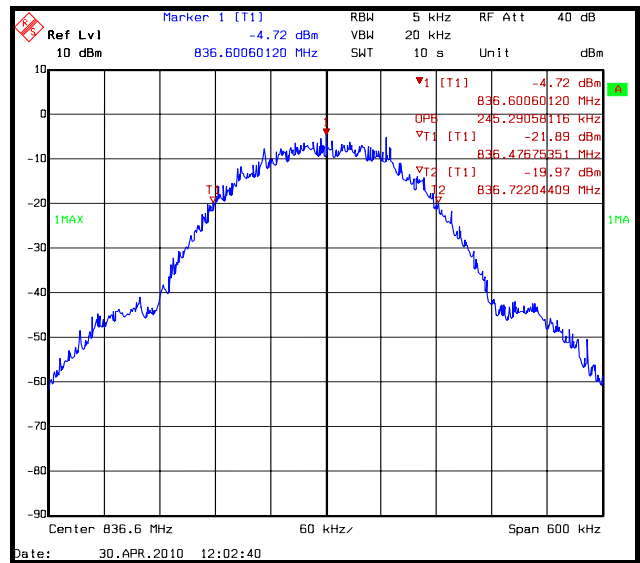
**Transmitter Occupied Bandwidth (continued)**

**Results: GPRS Packet Data**

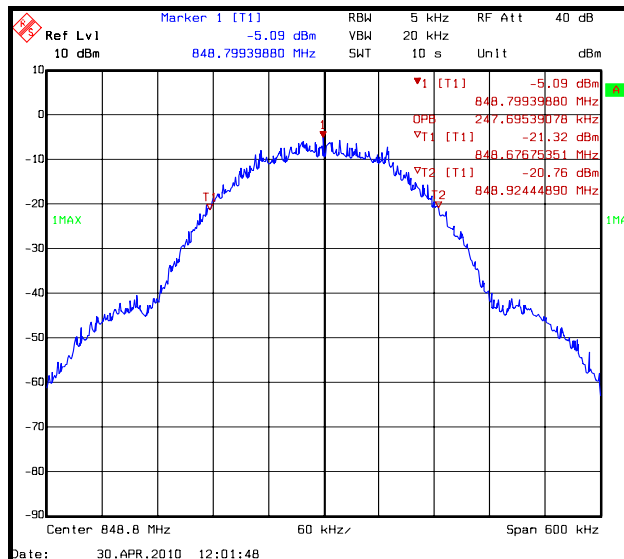
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Bottom	824.2	242.886
Middle	836.6	245.291
Top	848.8	247.695



Bottom Channel



Middle Channel



Top Channel



**5.2.8. Transmitter Out of Band Radiated Emissions****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 Part 2.1053
<b>Industry Canada Part:</b>	RSS-132 Section 4.5
<b>Test Method Used:</b>	RSS-132 Section 4.5.1.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	21

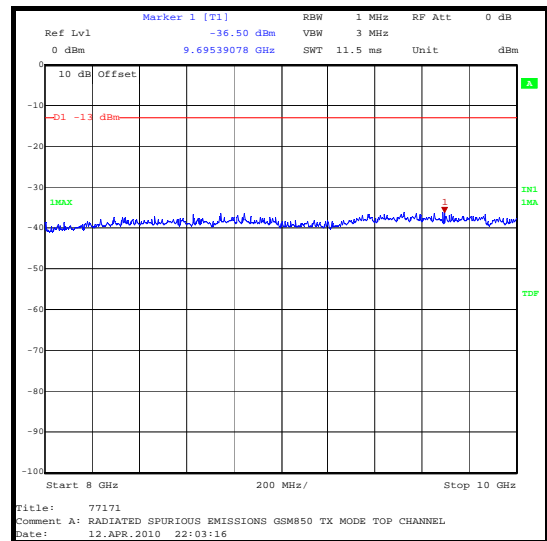
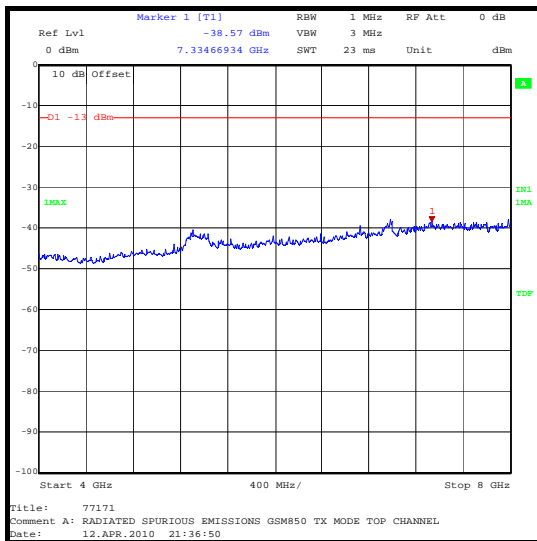
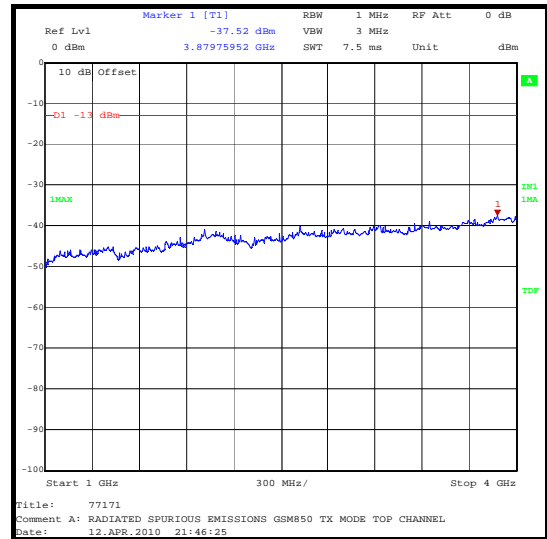
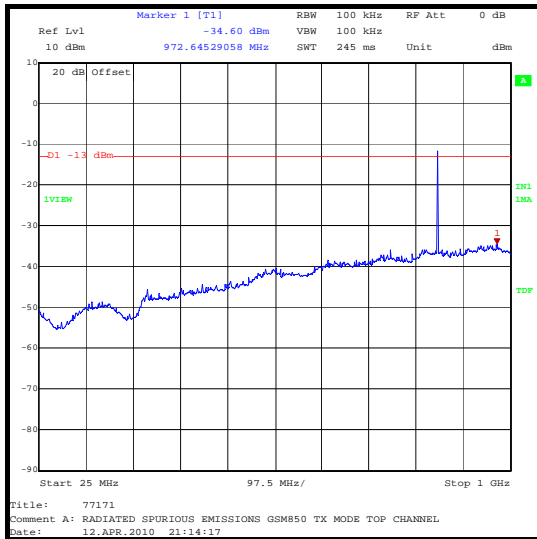
**Results: Highest Peak Level**

<b>Frequency (MHz)</b>	<b>Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
972.645	-34.6	-13.0	21.6	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.
2. The carrier is shown on the 30 MHz to 1 GHz plot at approximately 848 MHz.

**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
<b>Industry Canada Part:</b>	RSS-132 Section 4.5
<b>Test Method Used:</b>	RSS-132 Section 4.5.1.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	28

**Results: Highest Peak Level GSM Circuit Switched - Bottom Band Edge**

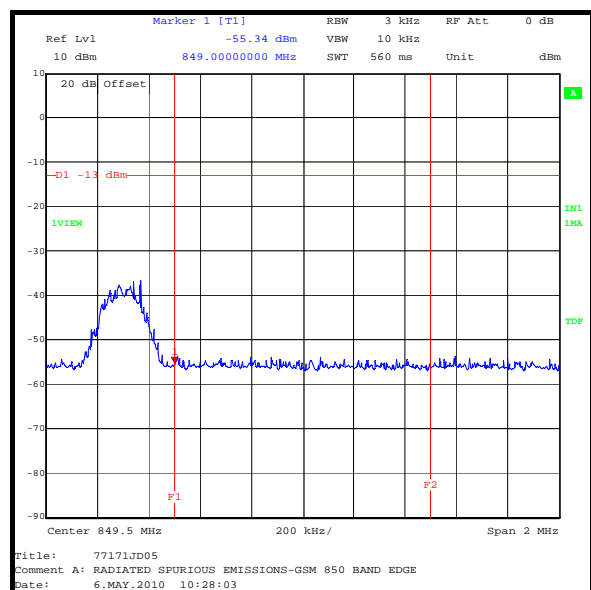
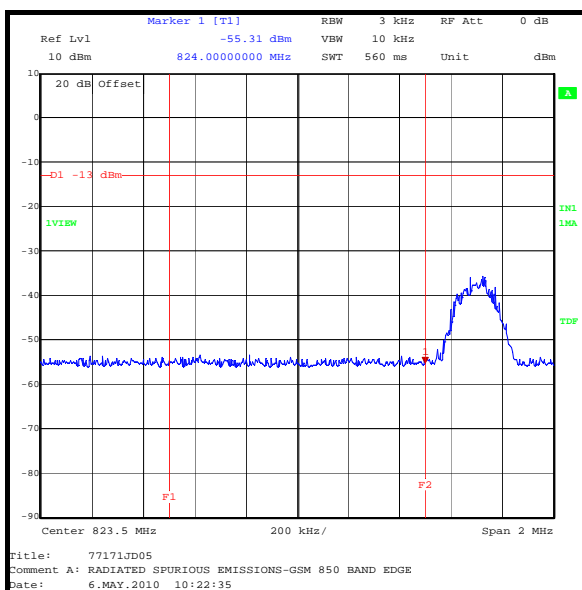
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
824.0	-55.3	-13.0	42.3	Complied

**Results: Highest Peak Level GSM Circuit Switched - Top Band Edge**

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dBm)	Result
849.0	-55.3	-13.0	42.3	Complied

**Note(s):**

1. The EUT was transmitting at maximum power.
2. Measurements were performed with the test antenna in the vertical and horizontal planes and the EUT in the X, Y and Z planes. The highest level was recorded in the above tables.



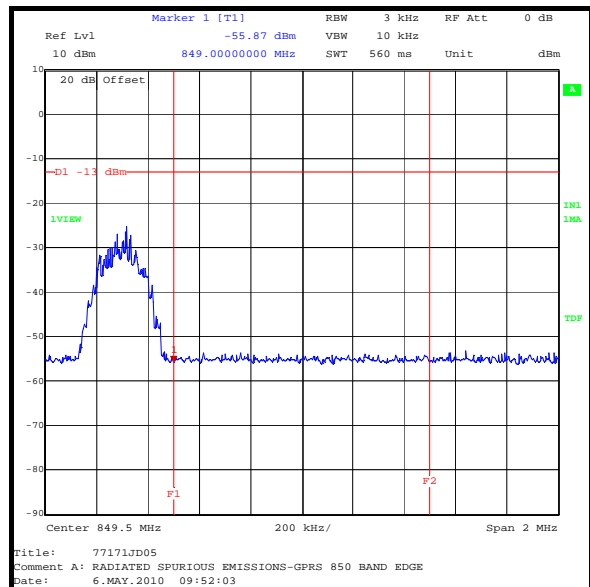
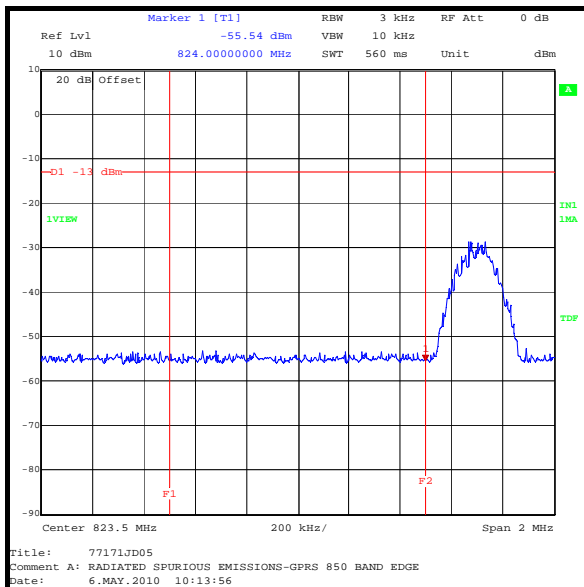
**Transmitter Radiated Emissions at Band Edges (continued)**

**Results: Highest Peak Level GPRS Packet Data - Bottom Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
824.0	-55.5	-13.0	42.5	Complied

**Results: Highest Peak Level GPRS Packet Data - Top Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
849.0	-55.9	-13.0	42.9	Complied



**5.3. Test Results – FCC Part 24**

**5.3.1. Receiver/Idle Mode AC Conducted Spurious Emissions**

**Test Summary:**

<b>FCC Part:</b>	15.107(a)
<b>Industry Canada Part:</b>	RSS-Gen Section 7.2.2
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 7 and relevant annexes

**Environmental Conditions:**

<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	25

**Results: Quasi Peak Detector Measurements**

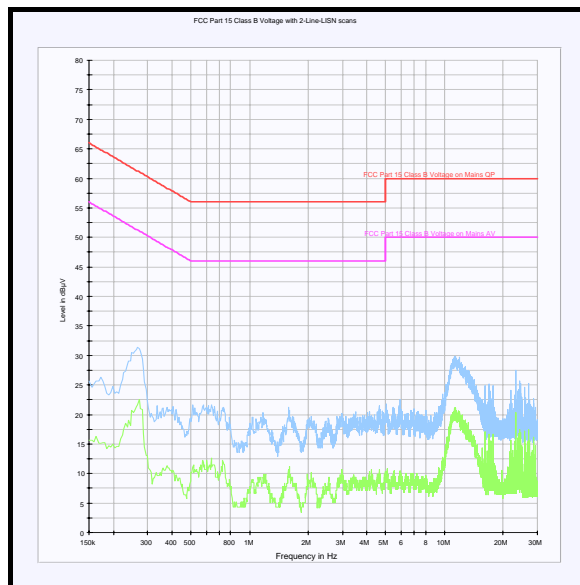
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
Refer to note 1					

**Results: Average Detector Measurements**

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
Refer to note 1					

**Note(s):**

1. All other emissions were investigated and found to be at least 20 dB below the specified limit.



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

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

**Test Summary:**

<b>FCC Part:</b>	15.109(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes
<b>Industry Canada Part:</b>	RSS-Gen Section 6
<b>Test Method Used:</b>	RSS-Gen Section 4.10
<b>Frequency Range:</b>	30 MHz to 1 GHz

**Environmental Conditions:**

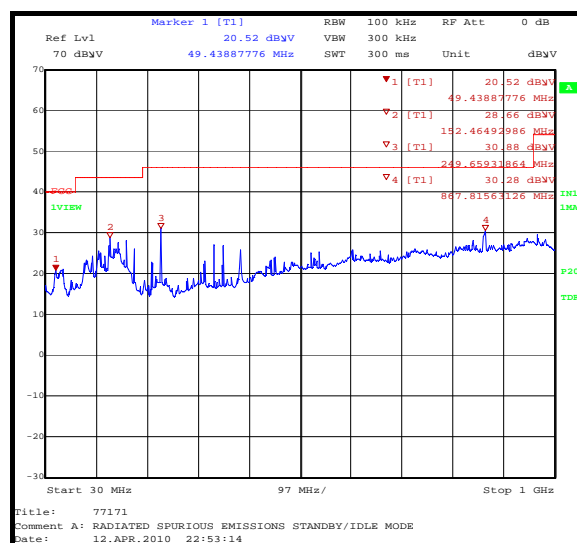
<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	21

**Results: Quasi Peak Detector Measurements (Circuit Switched Mode)**

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
50.099	Vertical	20.4	40.0	19.6	Complied
153.313	Vertical	30.2	43.5	13.3	Complied
249.975	Vertical	31.4	46.0	14.6	Complied
367.250	Vertical	33.0	46.0	13.0	Complied
400.601	Horizontal	27.5	46.0	18.5	Complied
867.967	Vertical	30.5	46.0	14.5	Complied

**Note(s):**

1. Measurements were performed with the test antenna in the vertical and horizontal planes and the EUT in the X, Y and Z planes. The highest level was recorded.



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

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

<b>FCC Part:</b>	15.109(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes
<b>Industry Canada Part:</b>	RSS-Gen Section 6
<b>Test Method Used:</b>	RSS-Gen Section 4.10
<b>Frequency Range:</b>	1 GHz to 12.75 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	21

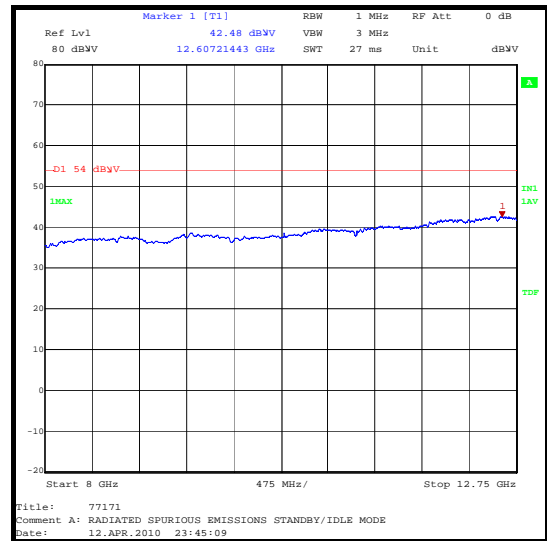
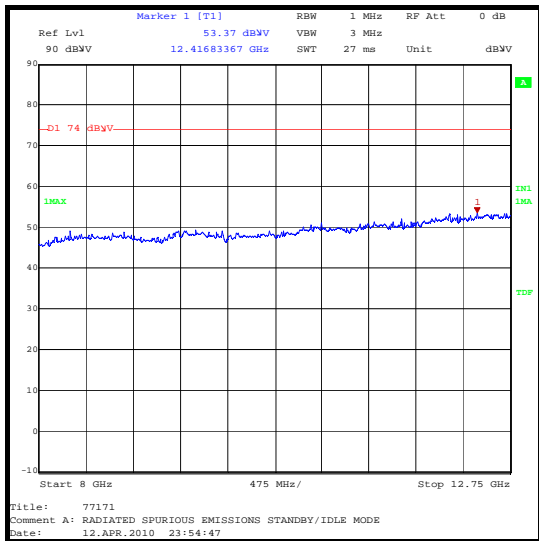
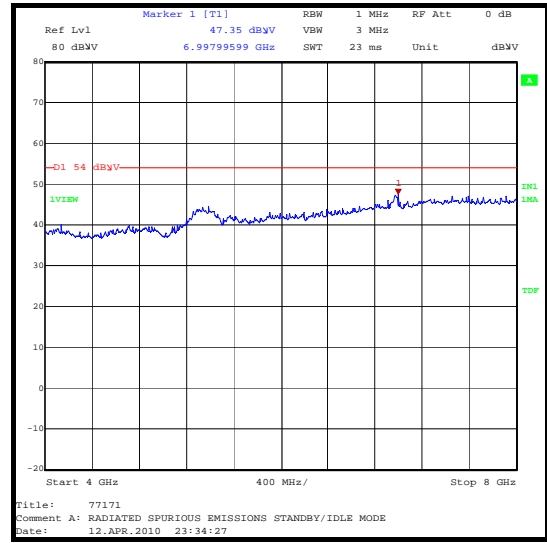
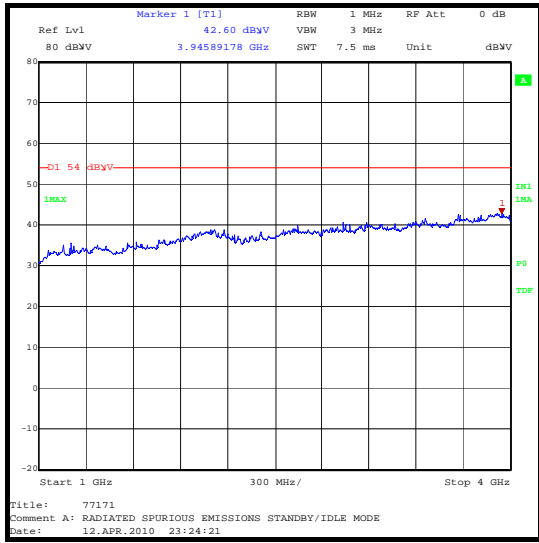
**Results: Peak Detector Measurement (Circuit Switched Mode)**

<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>
6997.996	Vertical	47.4	54.0	6.6	Complied

**Note(s):**

1. Measurements were performed with the test antenna in the vertical and horizontal planes and the EUT in the X, Y and Z planes. The highest level was recorded
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.

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



*Peak Detector*

*Average Detector*



**5.3.3. Transmitter AC Conducted Spurious Emissions****Test Summary:**

<b>FCC Part:</b>	15.207(a)
<b>Industry Canada Part:</b>	RSS-Gen Section 7.2.2
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 7 and relevant annexes

**Environmental Conditions:**

<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	25

**Results: Quasi Peak Detector Measurements**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.159000	Neutral	56.0	65.5	9.5	Complied
0.195000	Live 1	53.0	63.8	10.8	Complied
0.213000	Live 1	52.0	63.1	11.1	Complied
0.244500	Live 1	50.0	61.9	11.9	Complied
0.262500	Live 1	49.1	61.4	12.3	Complied
0.294000	Live 1	15.2	60.4	45.2	Complied
0.325500	Live 1	12.7	59.6	46.9	Complied
0.343500	Neutral	44.8	59.1	14.3	Complied
0.370500	Live 1	13.1	58.5	45.4	Complied
0.397500	Neutral	42.3	57.9	15.6	Complied
0.465000	Live 1	39.3	56.6	17.3	Complied
0.519000	Live 1	37.0	56.0	19.0	Complied

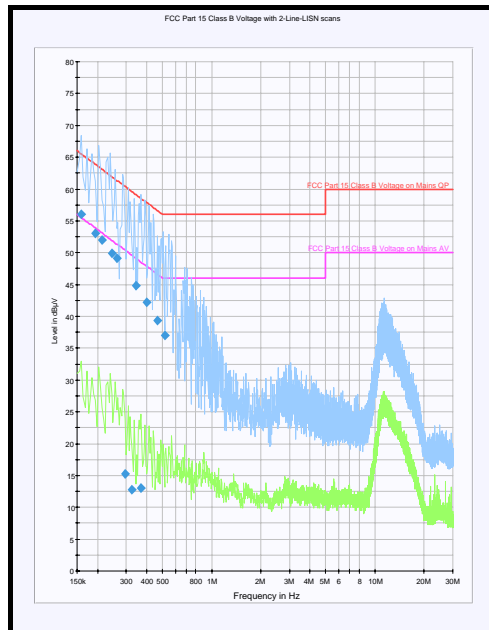
**Results: Average Detector Measurements**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
Refer to note 1					

**Note(s):**

1. All other emissions were investigated and found to be at least 20 dB below the specified limit.

**Transmitter AC Conducted Spurious Emissions (continued)**



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

**5.3.4. Transmitter Equivalent Isotropic Radiated Power (EIRP)****Test Summary:**

<b>FCC Part:</b>	24.232
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.17.2
<b>Industry Canada Part:</b>	SRSP-510 Section 5.1.2

**Environmental Conditions:**

<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	24

**Results: GSM Circuit Switch**

Channel	Measured Frequency (MHz)	Maximum Transmitter Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	27.5	33.0	5.5	Complied
Middle	1879.8	27.8	33.0	5.2	Complied
Top	1909.8	29.2	33.0	3.8	Complied

**Results: GPRS Packet Data**

Channel	Measured Frequency (MHz)	Maximum Transmitter Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	28.5	33.0	4.5	Complied
Middle	1879.8	28.8	33.0	4.2	Complied
Top	1909.8	29.2	33.0	3.8	Complied

**Note(s):**

- Power was measured as a conducted measurement on a calibrated Rohde & Schwarz CMU 200 as no antenna was specified or supplied.

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

<b>FCC Part:</b>	24.235
<b>Test Method Used:</b>	ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055
<b>Industry Canada Part:</b>	RSS-133 Section 6.3
<b>Test Method Used:</b>	RSS-Gen Section 4.7

**Environmental Conditions:**

<b>Ambient Temperature (°C):</b>	30
<b>Ambient Relative Humidity (%):</b>	20

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

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	18	1850.199982	1850.0	0.199982	Complied
-20	20	1850.199980	1850.0	0.199980	Complied
-10	23	1850.199977	1850.0	0.199977	Complied
0	33	1850.199967	1850.0	0.199967	Complied
10	39	1850.199961	1850.0	0.199961	Complied
20	50	1850.199950	1850.0	0.199950	Complied
30	40	1850.199960	1850.0	0.199960	Complied
40	36	1850.199974	1850.0	0.199974	Complied
50	50	1850.199950	1850.0	0.199950	Complied

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

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	20	1909.799980	1910.0	0.200020	Complied
-20	30	1909.799970	1910.0	0.200030	Complied
-10	27	1909.799973	1910.0	0.200027	Complied
0	45	1909.799955	1910.0	0.200045	Complied
10	32	1909.799967	1910.0	0.200033	Complied
20	54	1909.799946	1910.0	0.200054	Complied
30	45	1909.799955	1910.0	0.200045	Complied
40	46	1909.799954	1910.0	0.200046	Complied
50	55	1909.799945	1910.0	0.200055	Complied

**Transmitter Frequency Stability (Temperature Variation)****Note(s):**

1. Frequency error was measured using the PCS 1900 modulation test on a calibrated Rohde & Schwarz CMU 200 Universal Radio Communications Tester in Circuit Switched mode in accordance with current Rohde & Schwarz application notes. The EUT was placed in a temperature chamber and connected by suitable RF cables to the CMU 200 outside the chamber. A bidirectional communications link was established on the centre channel between the EUT and the CMU 200. The frequency meter value was recorded.
2. Temperature was monitored throughout the test with a calibrated digital thermometer.

**5.3.6. 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>	25
<b>Relative Humidity (%):</b>	27

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

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.23	44	1850.199956	1850.0	0.199956	Complied
4.37	32	1850.199968	1850.0	0.199968	Complied

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

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
3.23	50	1909.799950	1910.0	0.200050	Complied
4.37	47	1909.799953	1910.0	0.200047	Complied

**Note(s):**

1. Frequency error was measured using the GSM 850 modulation test on a calibrated Rohde & Schwarz CMU 200 Universal Radio Communications Tester in Circuit Switch mode in accordance with current Rohde & Schwarz application notes. The EUT was placed in a temperature chamber and connected by suitable RF cables to the CMU 200 outside the chamber. A bidirectional communications link was established on the centre channel between the EUT and the CMU 200. The frequency meter value was recorded.
2. Voltage was monitored throughout the test with a calibrated digital voltmeter.

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

<b>FCC Part:</b>	24.238
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.1.7 and relevant annexes referencing FCC CFR Part 2.1049 (see note below)
<b>Industry Canada Part:</b>	RSS-Gen Section 4.6
<b>Test Method Used:</b>	RSS-Gen Section 4.6.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	30
<b>Relative Humidity (%):</b>	27

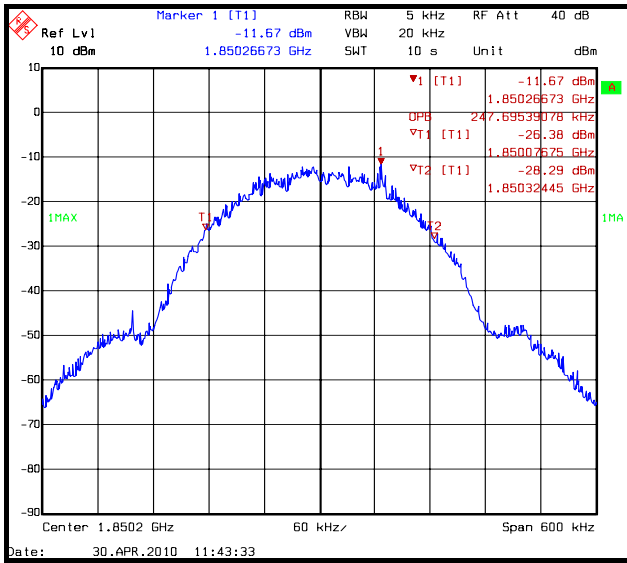
**Results: GSM**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	1850.2	247.695
Middle	1879.8	245.291
Top	1909.8	245.291

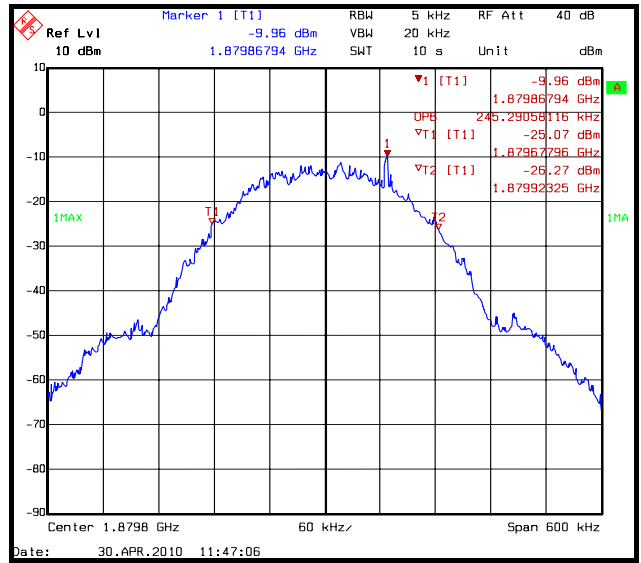
**Note(s):**

1. In lieu of the test method detailed in ANSI C63.4 Section 13.1.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.

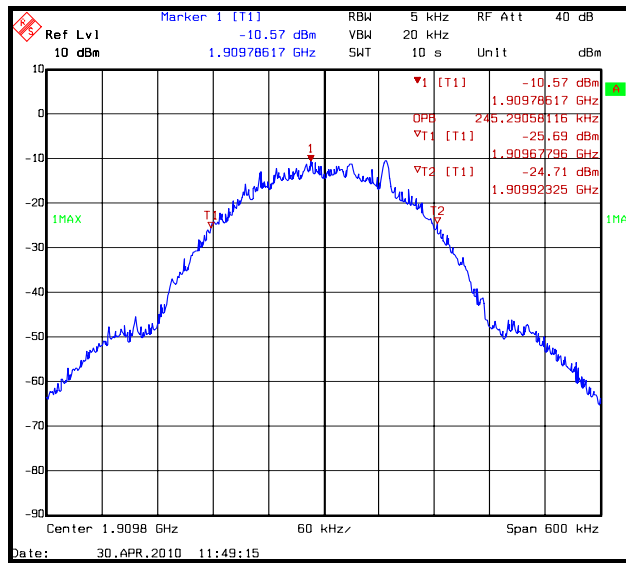
**Transmitter Occupied Bandwidth (continued)**



Bottom Channel



Middle Channel



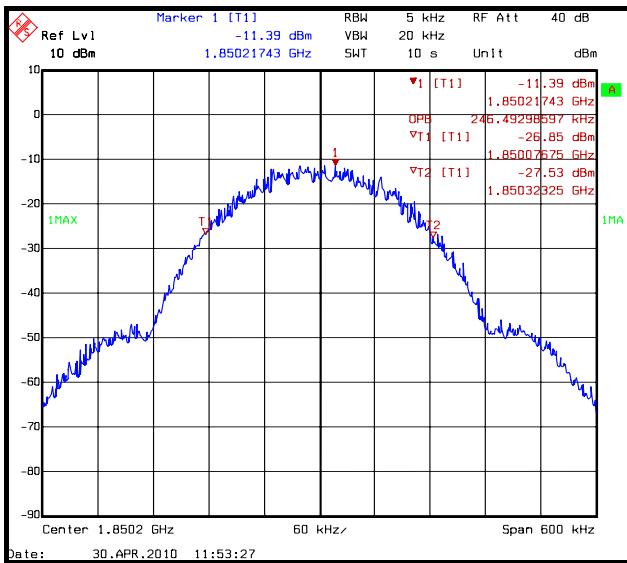
Top Channel



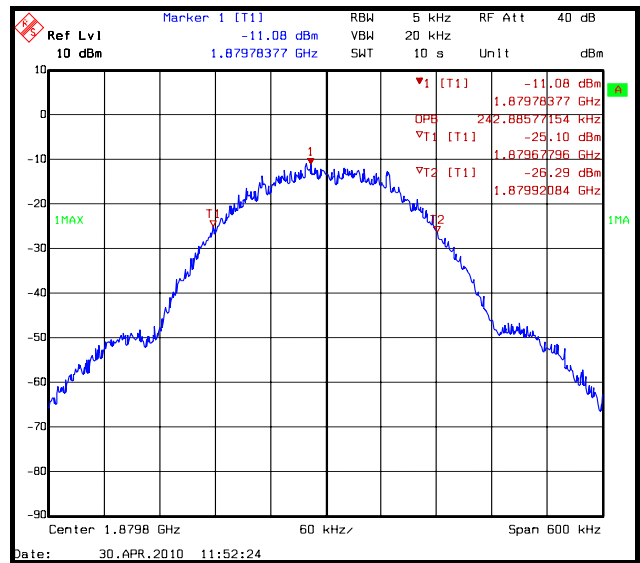
**Transmitter Occupied Bandwidth (continued)**

**Results: GPRS Packet Data**

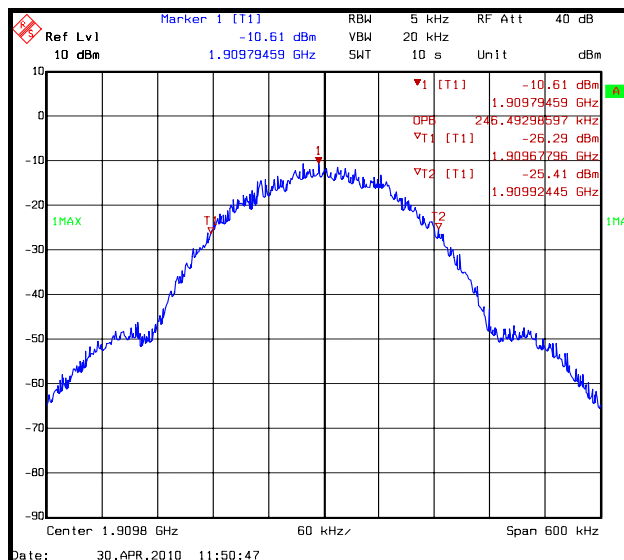
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Bottom	1850.2	246.493
Middle	1879.8	242.886
Top	1909.8	246.493



Bottom Channel



Middle Channel



Top Channel

**5.3.8. Transmitter Out of Band Radiated Emissions****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
<b>Industry Canada Part:</b>	RSS-133 Section 6.5.1(b)
<b>Test Method Used:</b>	RSS-133 Section 4.2
<b>Frequency Range:</b>	30 MHz to 20 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	21

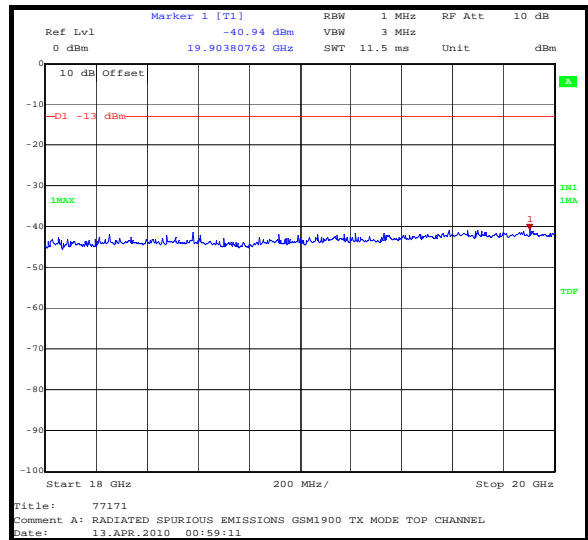
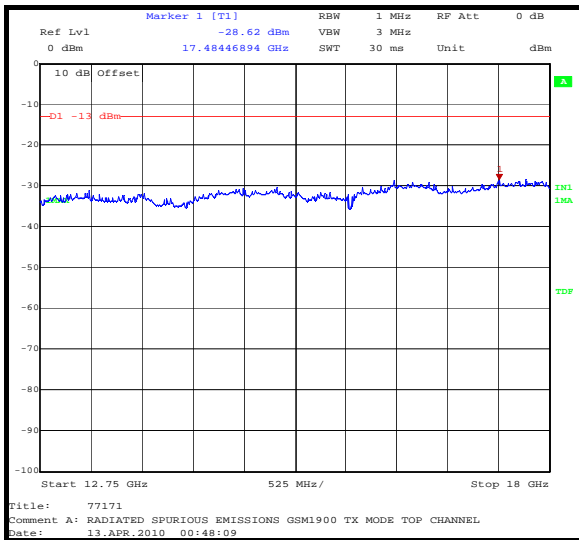
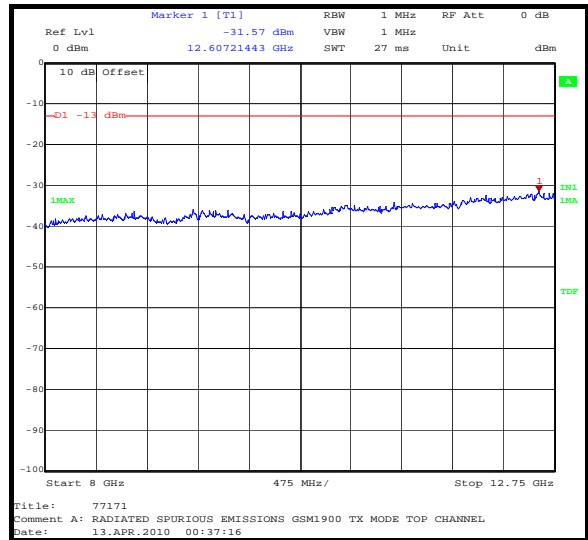
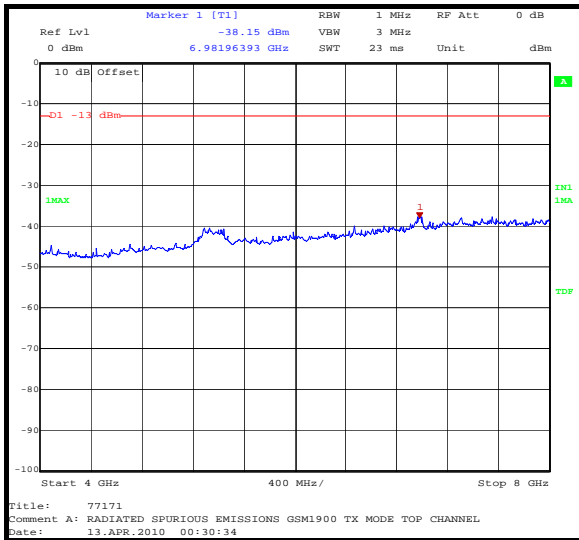
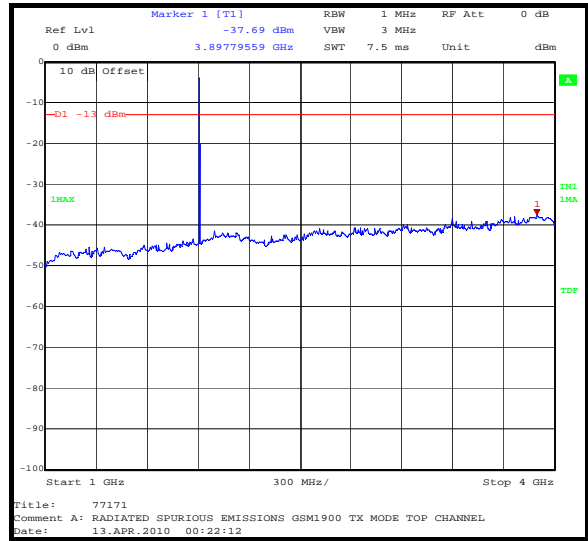
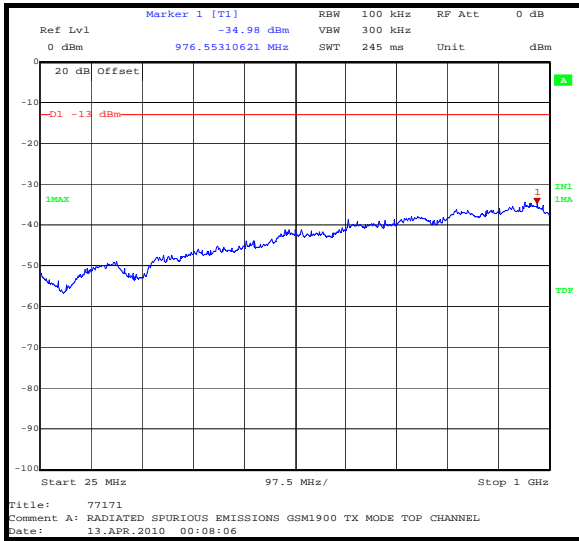
**Results: Peak Detector Measurements**

<b>Frequency (MHz)</b>	<b>Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
12607.214	-31.6	-13.0	28.6	Complied

**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. Pre-scans were performed on the top channel. Comparable results were observed with the EUT transmitting on the top and bottom channels.
2. The transmitter fundamental is shown on the 1 GHz to 4 GHz plot at approximately 1909 MHz
3. Measurements were performed with the test antenna in the vertical and horizontal planes and the EUT in the X, Y and Z planes. The highest level was recorded.

### 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
<b>Industry Canada Part:</b>	RSS-133 Section 6.5(a)(i)
<b>Test Method Used:</b>	RSS-133 Section 4.2

**Environmental Conditions:**

<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	22

**Results: Peak Detector Measurements GSM - Bottom Band Edge**

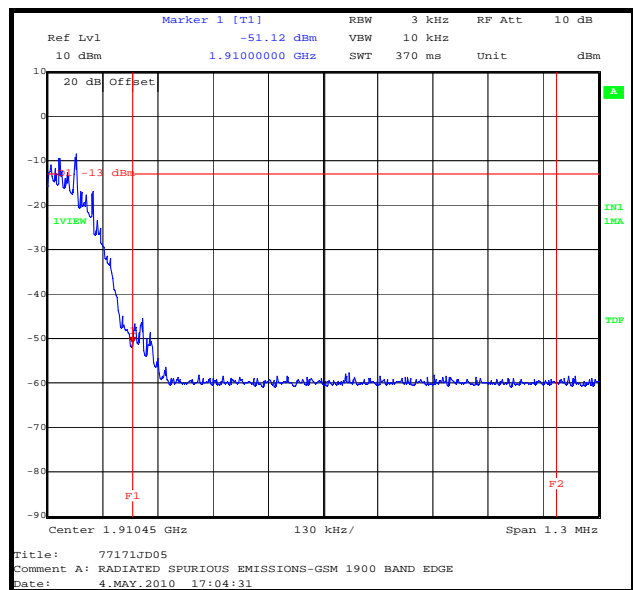
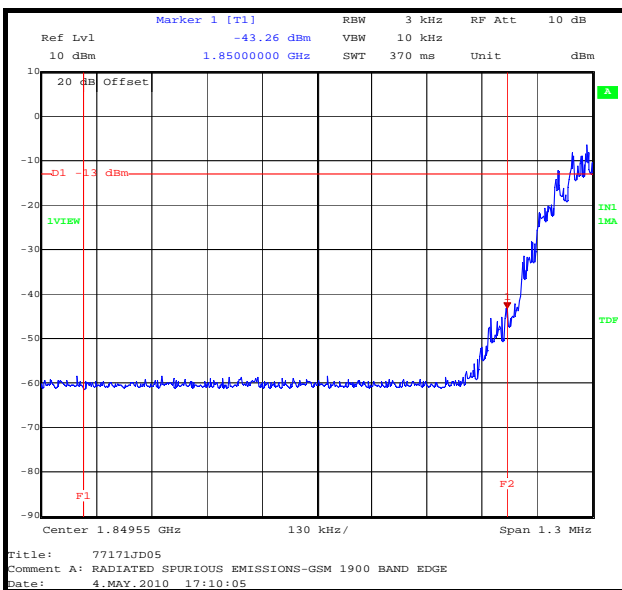
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850.0	-43.3	-13.0	30.3	Complied

**Results: Peak Detector Measurements GSM - Top Band Edge**

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910.0	-51.1	-13.0	38.1	Complied

**Note(s):**

1. The EUT was transmitting at maximum power.
2. Measurements were performed with the test antenna in the vertical and horizontal planes and the EUT in the X, Y and Z planes. The highest level was recorded in the above tables.



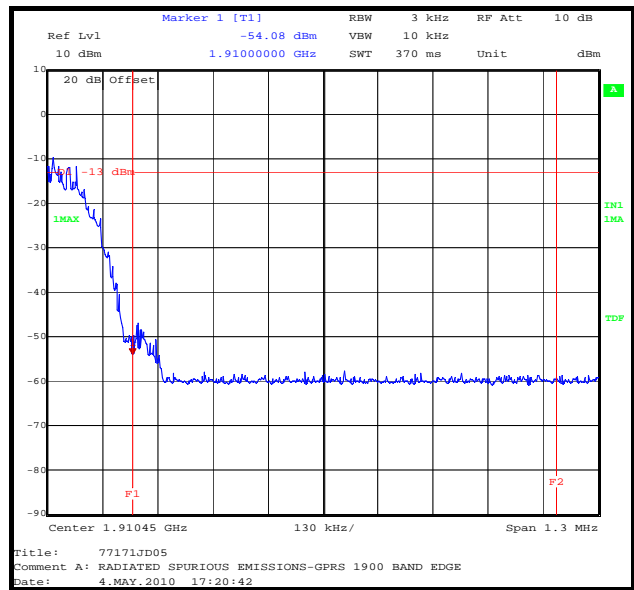
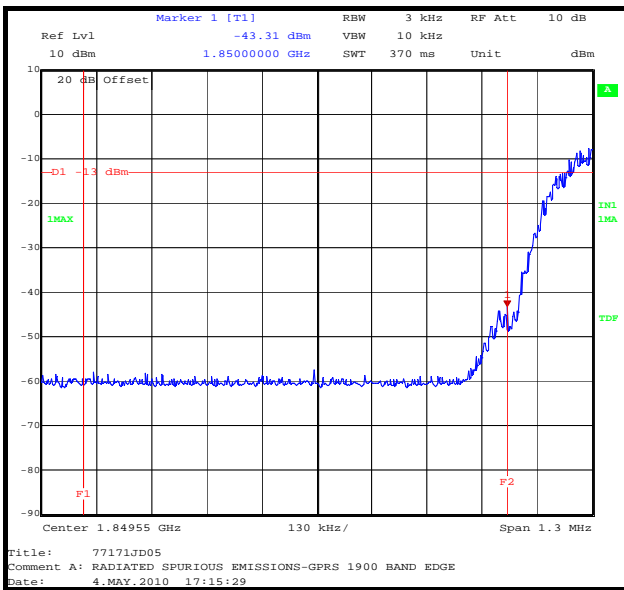
**Transmitter Radiated Emissions at Band Edges (continued)**

**Results: Peak Detector Measurements GPRS - Bottom Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850.0	-43.1	-13.0	30.1	Complied

**Results: Peak Detector Measurements GPRS - Top Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910.0	-54.1	-13.0	41.1	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>
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.25 dB
Effective Radiated Power (ERP)	824 to 849 MHz	95%	±2.94 dB
Equivalent Isotropic Radiated Power (EIRP)	1850 to 1910 MHz	95%	±2.94 dB
Frequency Stability	824 to 1910 MHz	95%	±0.92 ppm
Occupied Bandwidth	824 to 1910 MHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±3.53 dB
Radiated Spurious Emissions	1 GHz 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 Last Calibrated	Cal. Interval (Months)
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002	03 Jun 2009	12
A1391	Attenuator	Huber + Suhner AG	757987	6810.17.B	Calibrated before use	-
A1392	Attenuator	Huber + Suhner AG	757456	6820.17.B	Calibrated before use	-
A1396	Attenuator	Huber + Suhner AG	757987	6810.17.B	Calibrated before use	-
A1516	Universal Radio Comms Tester	Rohde & Schwarz	CMU200	835687/011	19 Mar 2010	-
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1537	Dual Directional Coupler	Hewlett Packard	778D	1144A05122	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	27 Nov 2009	12
A1830	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100668	01 Mar 2010	12
A288	Antenna	Chase	CBL6111A	1589	16 Mar 2010	12
A436	Antenna	Flann	20240-20	330	11 May 2010	36
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	01 Sep 2009	12
L1005	Universal Radio Comms Tester	Rohde & Schwarz	CMU200	116284	Calibration not required	-
M1068	Thermometer	Iso-Tech	RS55	93102884	01 Oct 2009	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	09 Mar 2009	15
M1138	Universal Radio Comms Tester	Rohde & Schwarz	CMU200	836202/093	Calibration not required	-
M1223	Votsch VT4002	Votsch	VT4002	58566072720010	Calibrated before use	-
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	22 Apr 2009	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	10 Jul 2009	12
M1273	Test Receiver	Rhode & Schwarz	ESIB 26	100275	08 Apr 2010	12
M1346	Digital Multi-meter	Fluke	73III	90770264	17 July 2009	-
M208	Thermo/Hygrometer	RS Components	212-124	None	30 Apr 2009	12
S0537	EL302D Dual Power Supply	TTI	EL302D	249928	Calibrated before use	-

Note that assets M1263 and M208 indicate they were out of calibration during testing. It shall be noted however that the assets were in calibration for the tests for which they were used.

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