

# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Partial Test of: Tempus IC 00-1001

To: FCC Parts 15.107 & 15.109: 2008 Subpart B, Parts 15.207 & 15.209: 2008 Subpart C  
FCC Part 22: 2008 Subpart H, FCC Part 24: 2008 Subpart E,  
RSS 132 Issue 2 September 2005 and RSS-133 Issue 5 February 2009

**Test Report Serial No:**  
RFI/RPT3/RP75697JD01A

**Supersedes Test Report Serial No:**  
RFI/RPT2/RP75697JD01A

**This Test Report Is Issued Under The Authority  
Of Brian Watson, Operations Director:**



<b>Checked By:</b>	Nigel Davison
<b>Signature:</b>	
<b>Date of Issue:</b>	26 February 2010

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

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

The *Bluetooth*® word mark and logos are owned by the Bluetooth SIG, Inc. and any use of such marks by RFI Global Services Ltd. is under license. Other trademarks and trade names are those of their respective owners.

**RFI Global Services Ltd**  
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG  
Telephone: +44 (0)1256 312000 Facsimile: +44 (0)1256 312001  
Email: [info@rfi-global.com](mailto:info@rfi-global.com) Website: [www.rfi-global.com](http://www.rfi-global.com)

Registered in England and Wales. Company number: 2117901

This page has been left intentionally blank.

**Table of Contents**

1. Customer Information .....	4
2. Summary of Testing .....	5
3. Equipment Under Test (EUT) .....	8
4. Operation and Monitoring of the EUT during Testing .....	11
5. Measurements, Examinations and Derived Results .....	12
6. Measurement Uncertainty .....	54
Appendix 1. Test Equipment Used.....	55

## **1. Customer Information**

<b>Company Name:</b>	Remote Diagnostic Technologies Ltd
<b>Address:</b>	The Old Coach House The Avenue Farleigh Wallop Basingstoke Hampshire RG25 2HT United Kingdom

## **2. Summary of Testing**

### **2.1. General Information**

<b>Specification Reference:</b>	47CFR22
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2008: Part 22 Subpart H (Public Mobile Services)
<b>Specification Reference:</b>	47CFR24
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2008: 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) 2008: Part 15 Subpart B (Radio Frequency Devices) - Sections 15.107 and 15.109
<b>Specification Reference:</b>	47CFR15.207 and 47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2008: Part 15 Subpart C (Radio Frequency Devices) - Sections 15.207 and 15.209
<b>Specification Reference:</b>	RSS-GEN Issue 2 June 2007
<b>Specification Title:</b>	General Requirements and Information for the Certification of Radiocommunication Equipment
<b>Specification Reference:</b>	RSS-132 Issue 2 Sep 2005
<b>Specification Title:</b>	Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz
<b>Specification Reference:</b>	RSS-133 Issue 5 Feb 2009
<b>Specification Title:</b>	2 GHz Personal Communications Services
<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>	06 October 2009 to 15 October 2009

## 2.2. Summary of Test Results

### Idle Mode; Bluetooth and WiFi / GSM850 / PCS1900 enabled

FCC Reference (47CFR )	IC Reference	Measurement	Port Type	Result
Part 15.107	RSS-Gen 7.2.2	Receiver/Idle Mode AC Conducted Spurious Emissions	AC Mains	✓
Part 15.109	RSS-Gen 4.10/6 RSS-132 4.6 RSS-133 6.6	Receiver/Idle Mode Radiated Spurious Emissions	Enclosure	✓
<b>Key to Results</b>				
✓ = Complied    ✗ = Did not comply				

### Transmit Mode; Bluetooth and WiFi / GSM850 simultaneous operation

FCC Reference (47CFR )	IC Reference	Measurement	Port Type	Result
Part 15.207	RSS-Gen 7.2.2	Transmitter AC Conducted Spurious Emissions	AC Mains	✓
Part 15.209/ 2.1053/22.917	RSS-Gen 4.9/ RSS-132 4.5	Transmitter Radiated Spurious Emissions	Antenna	✓
<b>Key to Results</b>				
✓ = Complied    ✗ = Did not comply				

### Transmit Mode; Bluetooth and WiFi / PCS1900 simultaneous operation

FCC Reference (47CFR)	IC Reference	Measurement	Port Type	Result
Part 15.207	RSS-Gen 7.2.2	Transmitter AC Conducted Spurious Emissions	AC Mains	✓
Part 15.209/ 2.1053/24.238	RSS-Gen 4.9/ RSS-133 6.5	Transmitter Radiated Spurious Emissions	Antenna	✓
<b>Key to Results</b>				
✓ = Complied    ✗ = Did not comply				

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

<b>Reference:</b>	ANSI/TIA-603-C-2004
<b>Title:</b>	Land Mobile Communications Equipment, Measurements and performance Standards
<b>Reference:</b>	ANSI C63.4 (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.

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

Only the measurements of AC mains conducted emissions and radiated emissions were performed.

Transmitter emissions was performed with the device's Bluetooth and WiFi transmitters operating simultaneously with its GSM850 transmitter and then with its PCS1900 transmitter in order to determine the intermodulation product emissions level of these transmitters which are co-located within the EUT.

Idle mode emissions were performed with all technologies within the device enabled but not transmitting i.e. Bluetooth, WiFi, GSM850 and PCS1900.

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

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

<b>Description:</b>	Patient Monitor
<b>Brand Name:</b>	Tempus IC™
<b>Model Name or Number:</b>	00-1001
<b>Serial Number:</b>	000233
<b>IMEI Number:</b>	35202402170957505
<b>Industry Canada Certification Number:</b>	7845A-TEMPUSIC
<b>FCC ID:</b>	ROSTEMPUSIC-1

<b>Description:</b>	AC Charger
<b>Brand Name:</b>	Cincon Electronics
<b>Model Name or Number:</b>	TR60M12
<b>Serial Number:</b>	60120-0001218

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

The equipment under test was a patient monitor which comprises off-the-shelf modules for wireless communications; these include a WiFi SD card (Socket Communications GoWiFi P320), Bluetooth module (Bluegiga WT11) and a MC55i Wireless Quad-Band GSM/GPRS module.

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

No modifications were applied to the EUT during testing.

### 3.4. Additional Information Related to Testing

<b>Technology Tested:</b>	GSM850		
<b>Mode:</b>	GSM (GMSK)		
<b>Maximum Output Power (ERP):</b>	GSM	20.5 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>
	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>
	Top	251	893.8

<b>Technology Tested:</b>	PCS1900		
<b>Mode:</b>	GSM (GMSK)		
<b>Maximum Output Power (EIRP):</b>	GSM	26.6 dBm	
<b>Transmit Frequency Range:</b>	1850 to 1910 MHz		
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	512	1850.2
<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

<b>Technology Tested:</b>	Bluetooth®		
<b>Mode:</b>	Basic Rate		
<b>Maximum Output Power (EIRP):</b>	4.9 dBm		
<b>Transmit &amp; Receive Frequency Range:</b>	2400 to 2483.5 MHz		
<b>Transmit &amp; Receive Channel Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Top	78	2480

<b>Technology Tested:</b>	WiFi		
<b>Mode:</b>	802.11g		
<b>Maximum Output Power (EIRP):</b>	4.9 dBm		
<b>Transmit &amp; Receive Frequency Range:</b>	2400 to 2483.5 MHz		
<b>Transmit &amp; Receive Channel Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	1	2412

### **3.5. Support Equipment**

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

<b>Description:</b>	Laptop
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	Latitude D610
<b>Serial Number:</b>	None Stated

<b>Description:</b>	USB Keyboard
<b>Brand Name:</b>	None Stated
<b>Model Name or Number:</b>	None Stated
<b>Serial Number:</b>	None Stated

<b>Description:</b>	USB Mouse
<b>Brand Name:</b>	None Stated
<b>Model Name or Number:</b>	None Stated
<b>Serial Number:</b>	None Stated

<b>Description:</b>	Ethernet Router
<b>Brand Name:</b>	Belkin
<b>Model Name or Number:</b>	None Stated
<b>Serial Number:</b>	None Stated

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

### **4.1. Operating Modes**

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

- Receive / Idle mode radiated spurious emissions tests were performed with the following modes enables but not transmitting:  
Bluetooth, GSM850, PCS1900 (both GSM bands not connected to network but scanning both bands) and WiFi.
- GSM850 transmitting simultaneously with Bluetooth and WiFi at maximum power.
- PCS1900 transmitting simultaneously with Bluetooth and WiFi at maximum power.

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

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

- EUT was tested standalone with all the ports terminated with accessories.

## **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 – Idle Mode; Bluetooth and WiFi / GSM850 / PCS1900 enabled****5.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions****Test Summary:**

FCC Part:	15.107(a)
Test Method Used:	As detailed in ANSI C63.4 Section 7 and relevant annexes

**Environmental Conditions:**

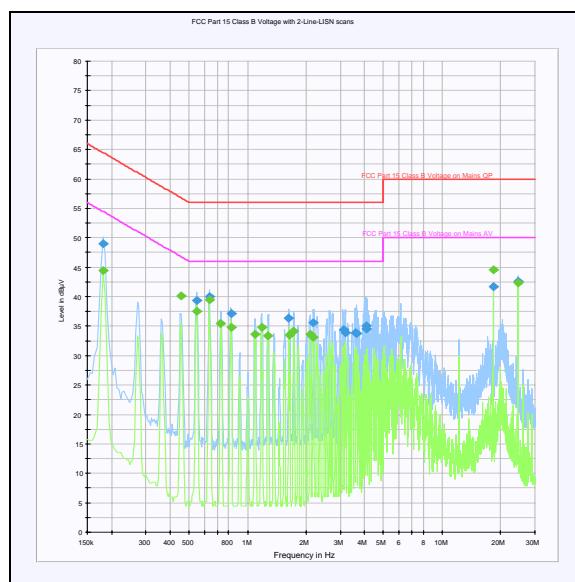
Temperature (°C):	26
Relative Humidity (%):	33

**Results: Quasi Peak Detector Measurements**

Frequency (MHz)	Line	Quasi Peak Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.181500	Live	49.0	64.4	15.4	Complied
0.546000	Neutral	39.3	56.0	16.7	Complied
0.636000	Neutral	40.0	56.0	16.0	Complied
0.820500	Neutral	37.1	56.0	18.9	Complied
1.630500	Neutral	36.3	56.0	19.7	Complied
2.184000	Neutral	35.6	56.0	20.4	Complied
3.111000	Neutral	34.4	56.0	21.6	Complied
3.187500	Neutral	33.9	56.0	22.1	Complied
3.570000	Live	33.9	56.0	22.1	Complied
3.642000	Neutral	33.7	56.0	22.3	Complied
4.074000	Live	34.5	56.0	21.5	Complied
4.092000	Live	35.1	56.0	20.9	Complied
18.357000	Live	41.6	60.0	18.4	Complied
24.477000	Live	42.6	60.0	17.4	Complied

**Receiver/Idle Mode AC Conducted Spurious Emissions (continued)****Results: Average Detector Measurements**

Frequency (MHz)	Line	Average Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.181500	Live	44.4	54.4	10.0	Complied
0.456000	Neutral	40.2	46.8	6.6	Complied
0.546000	Neutral	37.5	46.0	8.5	Complied
0.636000	Neutral	39.5	46.0	6.5	Complied
0.726000	Neutral	35.5	46.0	10.5	Complied
0.820500	Neutral	34.8	46.0	11.2	Complied
1.090500	Neutral	33.6	46.0	12.4	Complied
1.180500	Neutral	34.7	46.0	11.3	Complied
1.270500	Neutral	33.4	46.0	12.6	Complied
1.635000	Neutral	33.5	46.0	12.5	Complied
1.725000	Neutral	34.2	46.0	11.8	Complied
2.089500	Neutral	33.6	46.0	12.4	Complied
2.179500	Neutral	33.1	46.0	12.9	Complied
18.357000	Live	44.6	50.0	5.4	Complied
24.477000	Live	42.3	50.0	7.7	Complied

**Receiver/Idle Mode AC Conducted Spurious Emissions (continued)**

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

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

#### **Test Summary:**

<b>FCC Part:</b>	15.109
<b>Frequency Range:</b>	30 MHz to 12.75 GHz
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	29

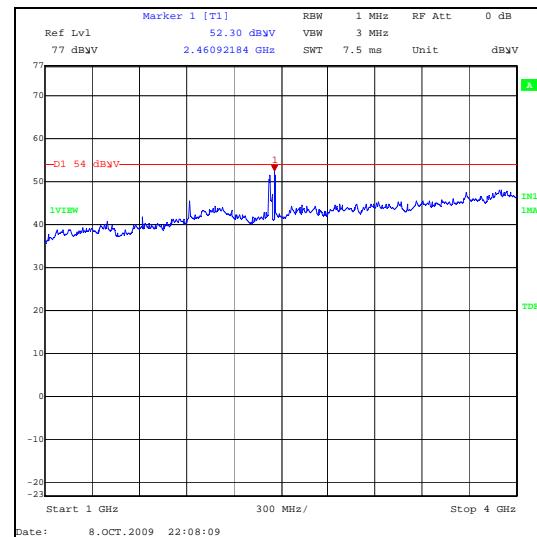
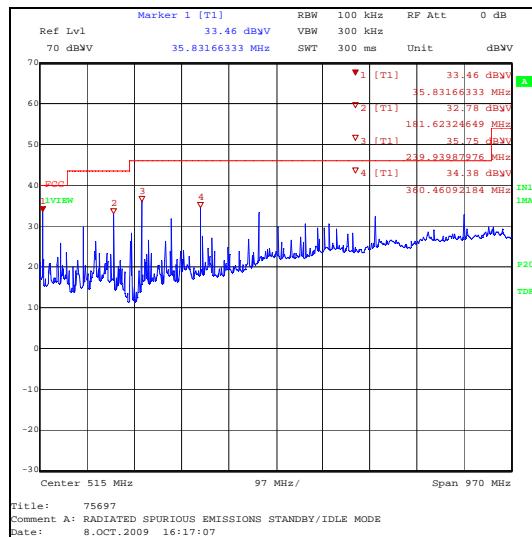
#### **Results:**

Frequency (MHz)	Detector	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
36.327	Quasi-peak	Horizontal	36.4	40.0	3.6	Complied
181.623	Quasi-peak	Horizontal	33.7	43.5	9.8	Complied
240.031	Quasi-peak	Horizontal	36.0	46.0	10.0	Complied
300.052	Quasi-peak	Horizontal	33.3	46.0	12.7	Complied
360.047	Quasi-peak	Horizontal	35.2	46.0	10.8	Complied
480.053	Quasi-peak	Horizontal	33.8	46.0	12.2	Complied
519.982	Quasi-peak	Horizontal	30.1	46.0	15.9	Complied
576.063	Quasi-peak	Vertical	30.8	46.0	15.2	Complied
600.049	Quasi-peak	Horizontal	33.2	46.0	12.8	Complied
623.974	Quasi-peak	Horizontal	32.0	46.0	14.0	Complied
720.083	Quasi-peak	Horizontal	33.8	46.0	12.2	Complied
2562.049	Peak	Horizontal	64.9	74.0	9.1	Complied
2562.049	Average	Horizontal	52.5	54.0	1.5	Complied

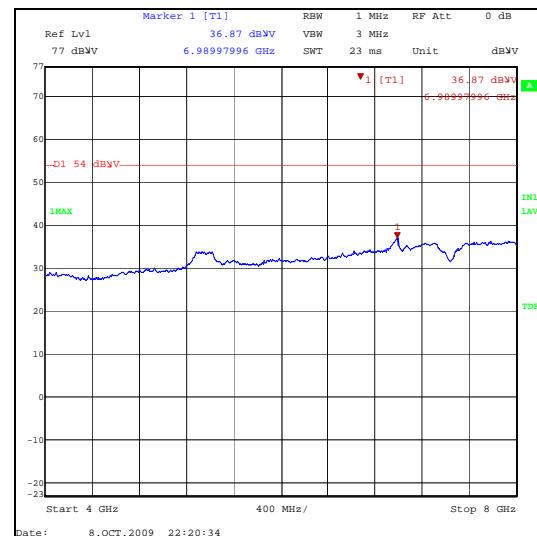
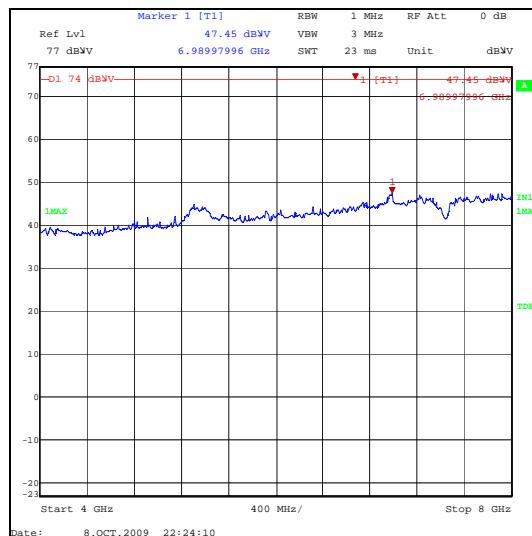
#### **Note(s):**

1. All pre-scans were performed with a peak detector against average limits apart from measurements made in the range of 4 to 12.75 GHz where pre-scans were performed with peak and average detectors and the applicable limit applied. This was due to the noise floor exceeding the average limit when using a peak detector.

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



### 30 MHz to 1 GHz

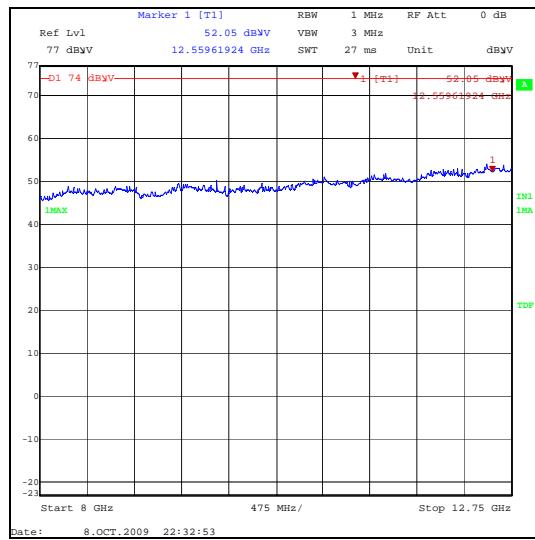


### Peak Detector

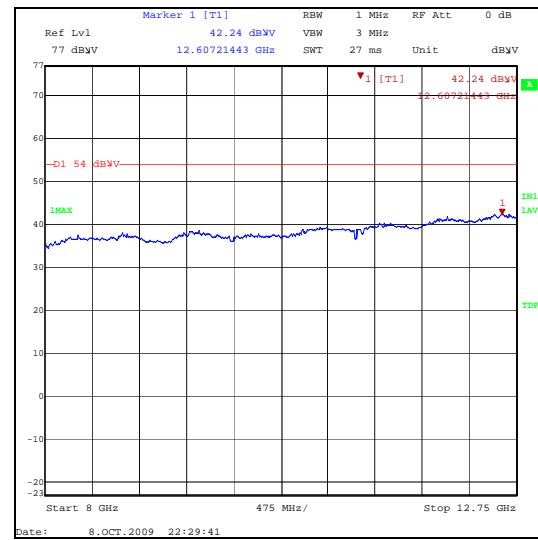
### Average Detector

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

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



Peak Detector



Average Detector

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

### **5.3. Test Results – Transmit Mode; Bluetooth and WiFi / GSM850 simultaneous operation**

#### **5.3.1. Transmitter AC Conducted Spurious Emissions**

##### **Test Summary:**

FCC Part:	15.207
Test Method Used:	As detailed in ANSI C63.4 Section 7 and relevant annexes

##### **Environmental Conditions:**

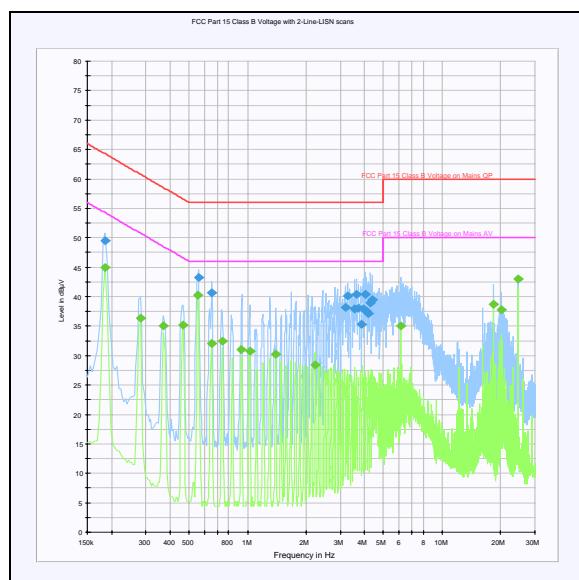
Temperature (°C):	26
Relative Humidity (%):	32

##### **Results: Quasi Peak Detector Measurements**

Frequency (MHz)	Line	Quasi Peak Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.186000	Live	49.5	64.2	14.7	Complied
0.559500	Live	43.2	56.0	12.8	Complied
0.654000	Live	40.7	56.0	15.3	Complied
3.174000	Neutral	38.2	56.0	17.8	Complied
3.264000	Neutral	40.1	56.0	15.9	Complied
3.547500	Live	37.9	56.0	18.1	Complied
3.637500	Neutral	40.4	56.0	15.6	Complied
3.723000	Neutral	38.0	56.0	18.0	Complied
3.826500	Live	35.3	56.0	20.7	Complied
3.921000	Neutral	37.9	56.0	18.1	Complied
4.011000	Live	40.4	56.0	15.6	Complied
4.096500	Neutral	37.6	56.0	18.4	Complied
4.186500	Neutral	37.1	56.0	18.9	Complied
4.290000	Neutral	39.0	56.0	17.0	Complied
4.384500	Neutral	39.5	56.0	16.5	Complied

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Average Detector Measurements**

Frequency (MHz)	Line	Average Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.186000	Live	44.9	54.2	9.3	Complied
0.280500	Live	36.4	50.8	14.4	Complied
0.370500	Live	35.1	48.5	13.4	Complied
0.465000	Live	35.2	46.6	11.4	Complied
0.555000	Live	40.3	46.0	5.7	Complied
0.649500	Live	32.0	46.0	14.0	Complied
0.739500	Neutral	32.5	46.0	13.5	Complied
0.928500	Neutral	31.1	46.0	14.9	Complied
1.023000	Neutral	30.7	46.0	15.3	Complied
1.392000	Neutral	30.2	46.0	15.8	Complied
2.229000	Neutral	28.5	46.0	17.5	Complied
6.121500	Neutral	35.1	50.0	14.9	Complied
18.357000	Live	38.7	50.0	11.3	Complied
20.256000	Live	37.7	50.0	12.3	Complied
24.477000	Live	43.1	50.0	6.9	Complied

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

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

### **5.3.2. Transmitter Radiated Emissions (GSM850 / Bluetooth / 802.11g)**

#### **Test Summary:**

<b>FCC Part:</b>	15.209 / 2.1053 / 22.917
<b>Frequency Range:</b>	30 MHz to 26.5 GHz
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes and ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Part 2.1053

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	26

#### **Configuration 1:**

The EUT was transmitting in the following configuration:

GSM850 circuit switched / top channel 848.8 MHz / maximum power

Bluetooth DH5 / top channel 2480 MHz / maximum power

802.11g 54 Mbps / bottom channel 2412 MHz / maximum power

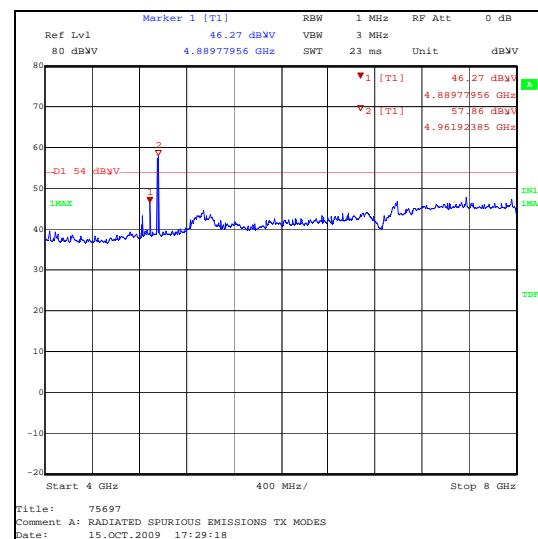
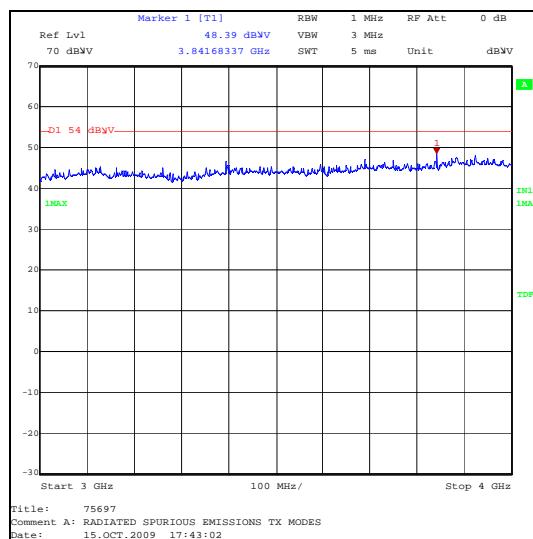
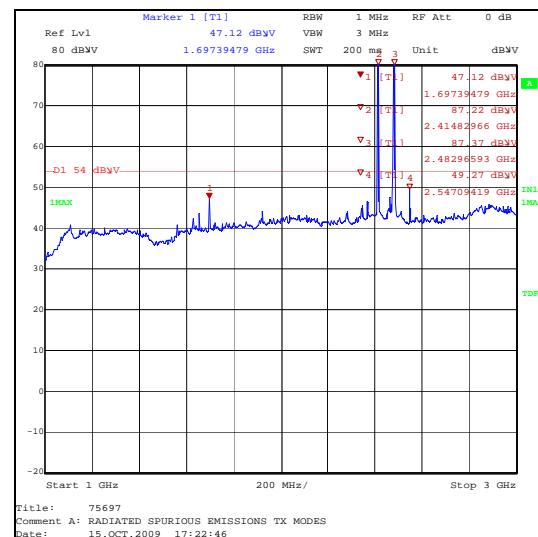
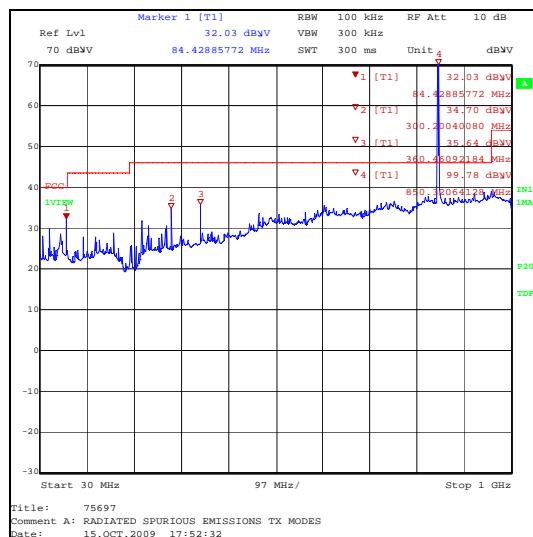
#### **Results:**

Frequency (MHz)	Detector	Antenna Polarity	Level	Applicable FCC Limit	Margin (dB)	Result
49.939	Quasi-peak	Horizontal	28.5 dB $\mu$ V/m	40.0 dB $\mu$ V/m	11.5	Complied
85.668	Quasi-peak	Horizontal	31.3 dB $\mu$ V/m	40.0 dB $\mu$ V/m	8.7	Complied
181.560	Quasi-peak	Horizontal	28.6 dB $\mu$ V/m	43.5 dB $\mu$ V/m	14.9	Complied
300.029	Quasi-peak	Vertical	33.7 dB $\mu$ V/m	46.0 dB $\mu$ V/m	12.3	Complied
360.034	Quasi-peak	Vertical	35.3 dB $\mu$ V/m	46.0 dB $\mu$ V/m	10.7	Complied
1697.763	Peak	Vertical	-45.3 dBm	-13.0 dBm	32.3	Complied
2546.493	Peak	Vertical	-43.9 dBm	-13.0 dBm	30.9	Complied
3840.637	Peak	Vertical	49.2 dB $\mu$ V/m	74.0 dB $\mu$ V/m	24.8	Complied
3840.637	Average	Vertical	40.3 dB $\mu$ V/m	54.0 dB $\mu$ V/m	13.7	Complied
4823.980	Peak	Vertical	44.6 dB $\mu$ V/m	74.0 dB $\mu$ V/m	29.4	Complied
4823.980	Average	Vertical	37.0 dB $\mu$ V/m	54.0 dB $\mu$ V/m	17.0	Complied
4891.632	Peak	Vertical	44.0 dB $\mu$ V/m	74.0 dB $\mu$ V/m	30.0	Complied
4891.632	Average	Vertical	36.7 dB $\mu$ V/m	54.0 dB $\mu$ V/m	17.3	Complied
4959.942	Peak	Vertical	61.9 dB $\mu$ V/m	74.0 dB $\mu$ V/m	12.1	Complied
4959.942	Average	Vertical	53.1 dB $\mu$ V/m	54.0 dB $\mu$ V/m	0.9	Complied

**Transmitter Radiated Emissions (continued)****Note(s):**

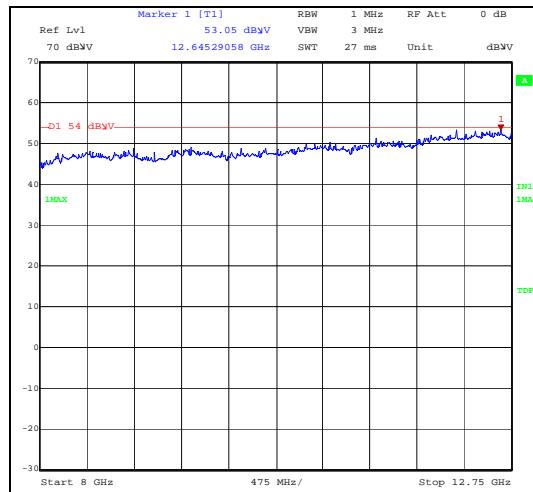
1. The emission shown at approximately 850 MHz on the 30 MHz to 1 GHz plot is the GSM850 carrier.
2. The emission shown at approximately 2414 MHz on the 1 GHz to 3 GHz plot is the WiFi carrier.
3. The emission shown at approximately 2482 MHz on the 1 GHz to 3 GHz plot is the Bluetooth carrier.
4. If the spurious emission was a product of the GSM device the FCC Part 22 limit of -13 dBm (43 + 10 log P) applies, otherwise the 75 / 54 dB $\mu$ V/m (peak / average) limits specified in FCC Part 15.209 apply.
5. All pre-scans were performed with a peak detector against average limits apart from measurements made in the range 12.75 to 18 GHz where pre-scans were performed with peak and average detectors and the applicable limit applied. This was due to the noise floor exceeding the average limit when using a peak detector.

## Transmitter Radiated Emissions (continued)

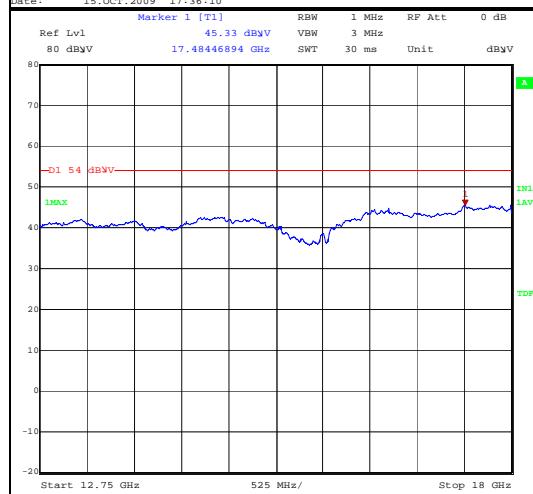


*Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

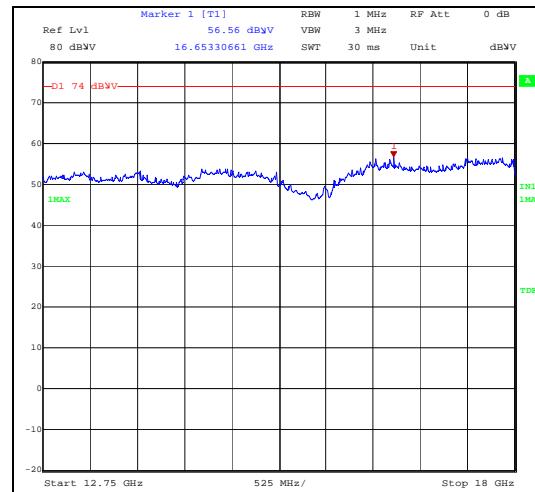
## Transmitter Radiated Emissions (continued)



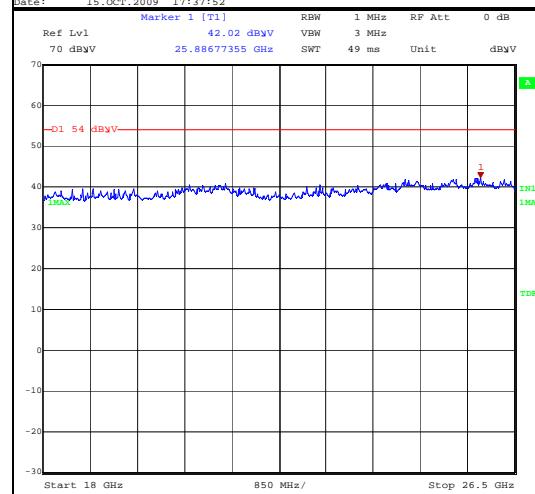
Title: 75697  
Comment A: RADIATED SPURIOUS EMISSIONS TX MODES  
Date: 15.OCT.2009 17:36:10



Title: 75697  
Comment A: RADIATED SPURIOUS EMISSIONS TX MODES  
Date: 15.OCT.2009 17:38:34



Title: 75697  
Comment A: RADIATED SPURIOUS EMISSIONS TX MODES  
Date: 15.OCT.2009 17:37:52



Title: 75697  
Comment A: RADIATED SPURIOUS EMISSIONS TX MODES  
Date: 15.OCT.2009 17:39:21

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

### 5.3.3 Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g)

#### Test Summary:

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.4 Section 8 and Public Notice DA 00-75

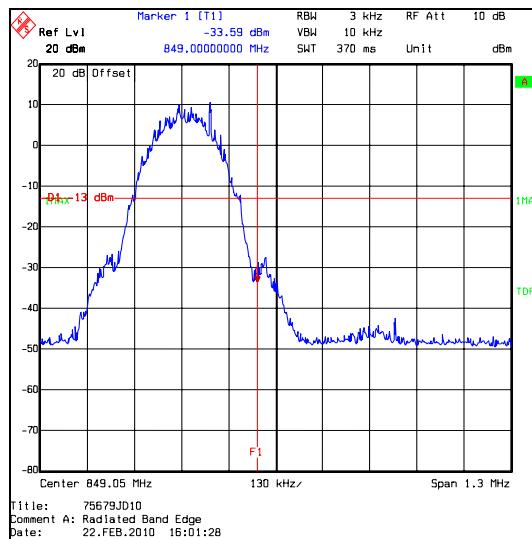
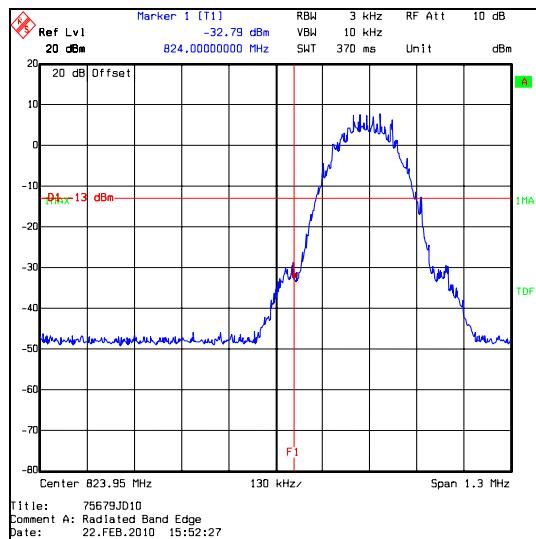
#### Environmental Conditions:

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

#### Results: GSM 850

Mode: Bluetooth – Static / 802.11b/g all transmitting

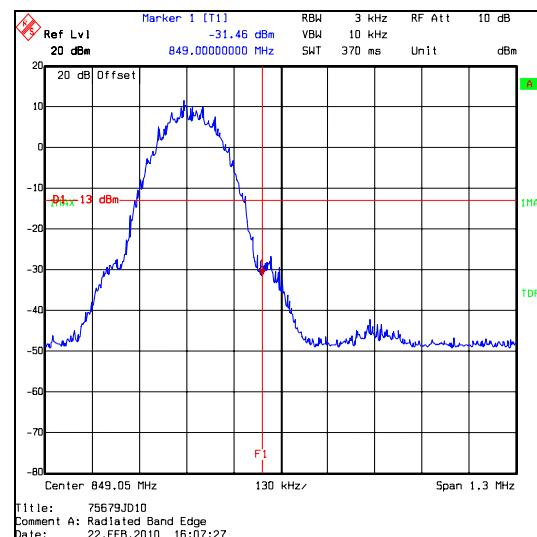
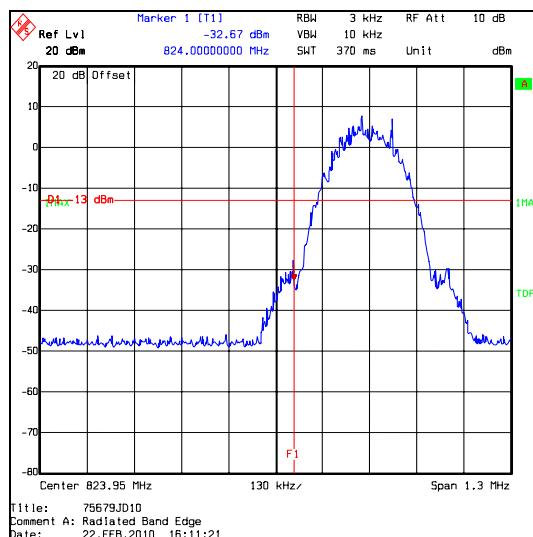
Frequency (MHz)	Antenna Polarity	Detector Level (dBm)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	Horizontal	-65.1	32.3	-32.8	-13	19.8	Complied
849	Horizontal	-65.3	31.7	-33.6	-13	20.6	Complied



**Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g)****Results: GSM 850**

Mode: Bluetooth – Hopping / 802.11b/g all transmitting.

Frequency (MHz)	Antenna Polarity	Detector Level (dBm)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	Horizontal	-65.1	32.4	-32.7	-13	19.7	Complied
849	Horizontal	-63.2	31.7	-31.5	-13	18.5	Complied



**Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g)****Results: WIFI 802.11b/g**

Mode: Bluetooth – Static / GSM 850 all transmitting

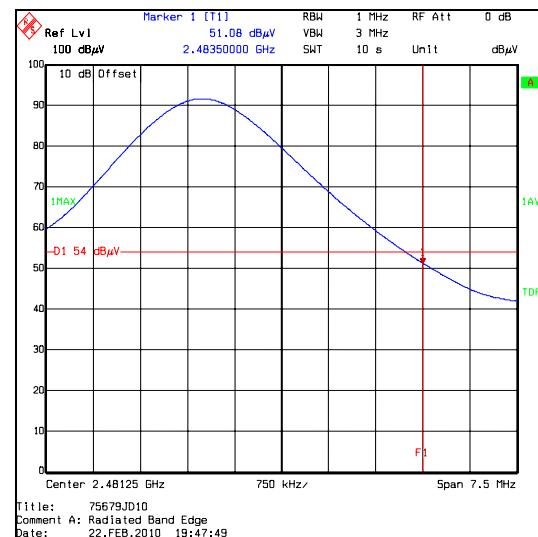
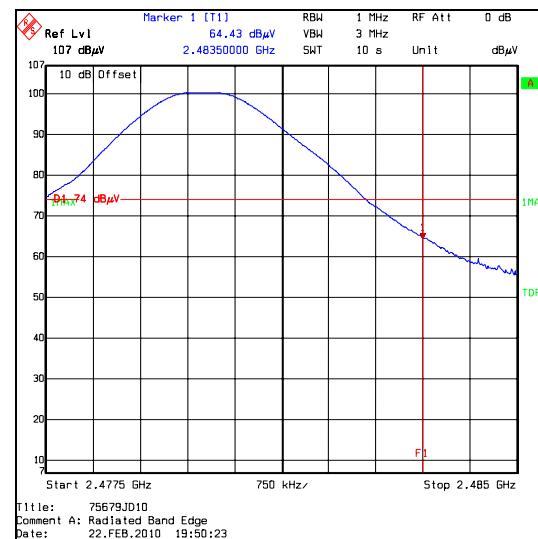
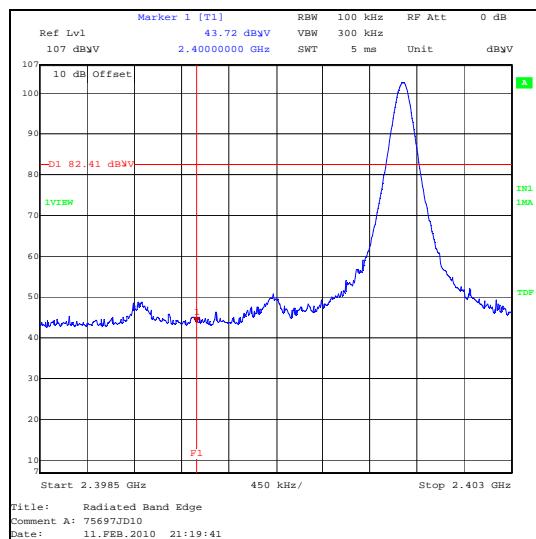
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400	Horizontal	43.9	-0.2	43.7	82.4*	38.7	Complied
2483.5	Horizontal	64.7	-0.3	64.4	74.0	9.6	Complied

**Results: Average- 802.11b/g plots - with respect GSM 850, BT-static**

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	52.1	-0.3	51.8	54.0	2.2	Complied

**Note(s):**

\* -20dBc

**Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g) (continued)****Results: WIFI 802.11b/g**

**Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g)****Results: WIFI 802.11b/g**

Mode: Bluetooth – Hopping / GSM 850 all transmitting

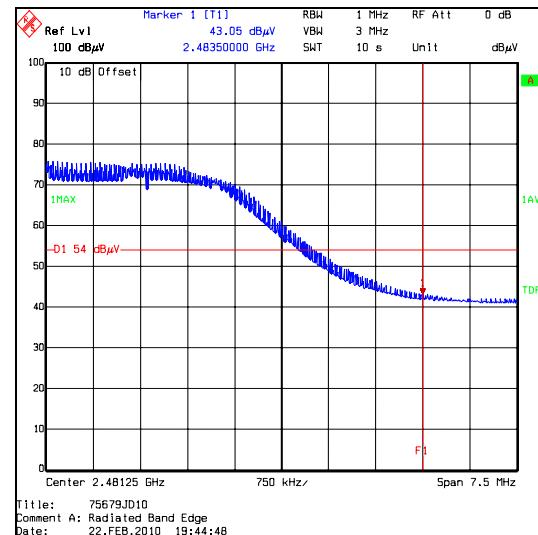
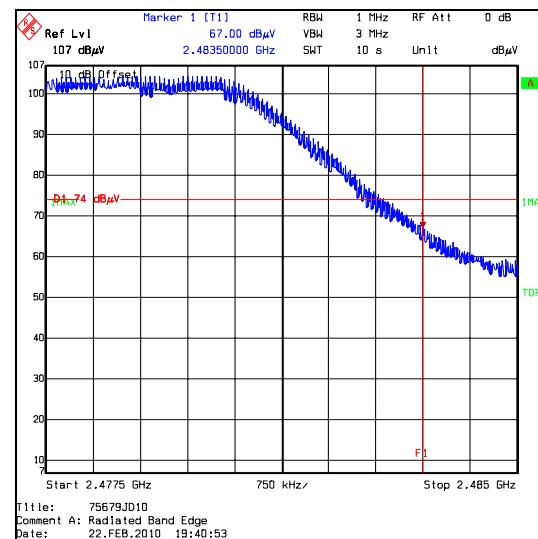
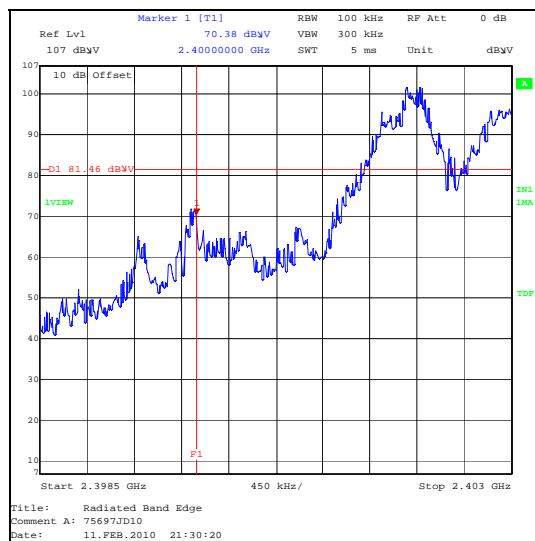
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400	Horizontal	70.6	-0.2	70.4	81.5*	11.1	Complied
2483.5	Horizontal	67.3	-0.3	67.0	74.0	7	Complied

**Results: Average- 802.11b/q plots - with respect GSM 850, BT-Hopping**

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	43.4	-0.3	43.1	54.0	10.9	Complied

**Note(s):**

\* -20dBc

**Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g) (continued)****Results: WIFI 802.11b/q (continued)**

**Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g)****Results: Bluetooth - Static**

Mode: WIFI 802.11b/g / GSM 850 all transmitting

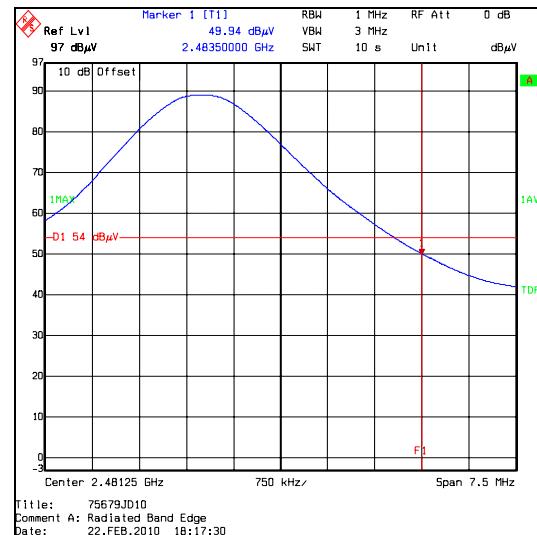
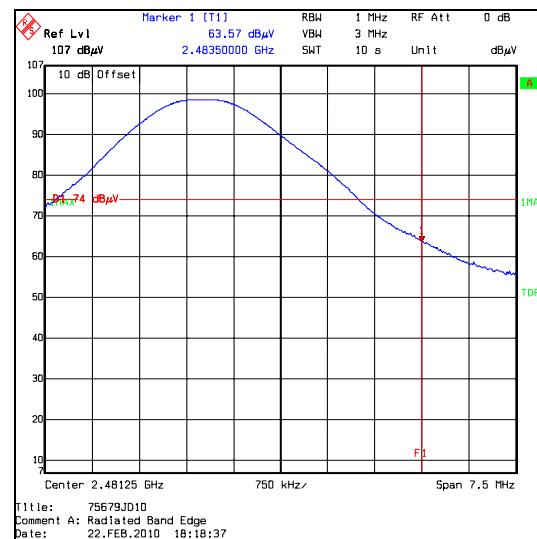
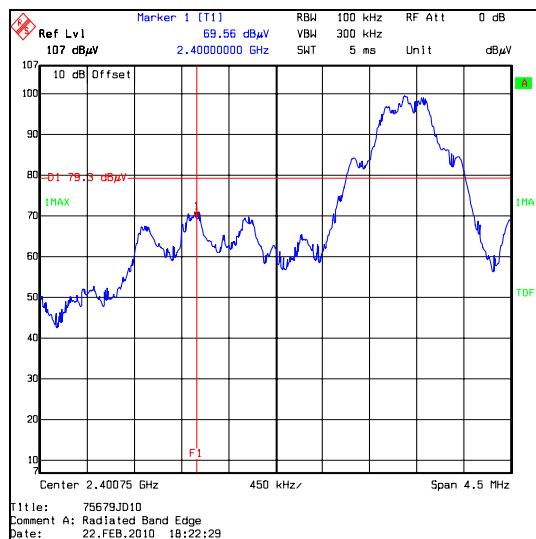
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400	Horizontal	69.9	-0.2	69.6	79.3*	9.7	Complied
2483.5	Horizontal	63.9	-0.3	63.6	74	10.4	Complied

**Results: Average 802.11a plots - with respect GSM 850, BT-static**

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	50.2	-0.3	49.9	54	4.1	Complied

**Note(s):**

\* -20dBc

**Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g) (continued)****Results: Bluetooth – Static (continued)**

**Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g)****Results: Bluetooth - Hopping**

Mode: WIFI 802.11a / GSM 850 Bottom all transmitting

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400	Horizontal	67.2	-0.2	67.0	79.1*	12.1	Complied
2483.5	Horizontal	64.5	-0.3	64.2	74.0	9.8	Complied

**Results: Average Bluetooth -with respect to GSM 850/hopping**

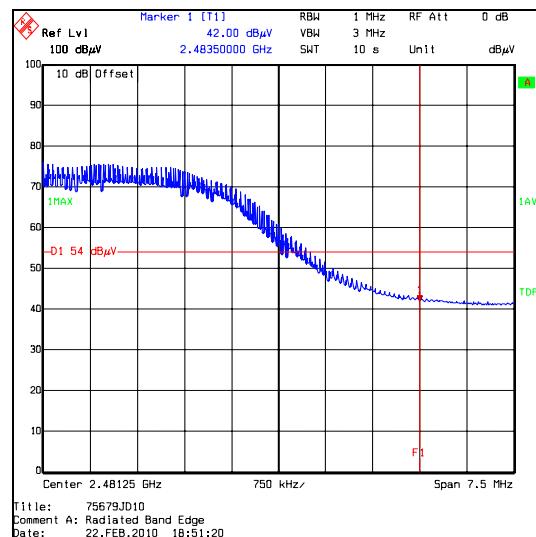
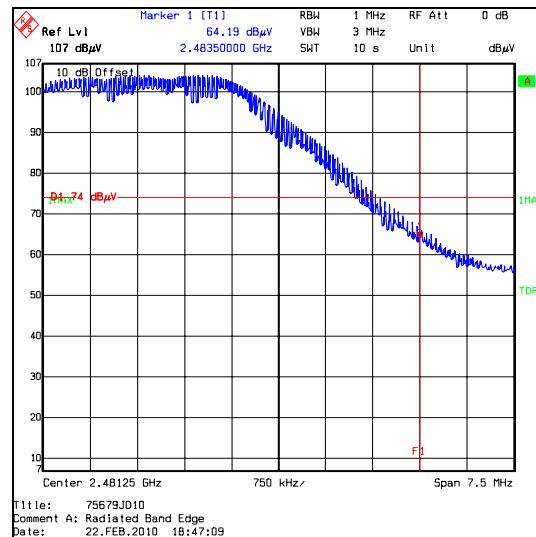
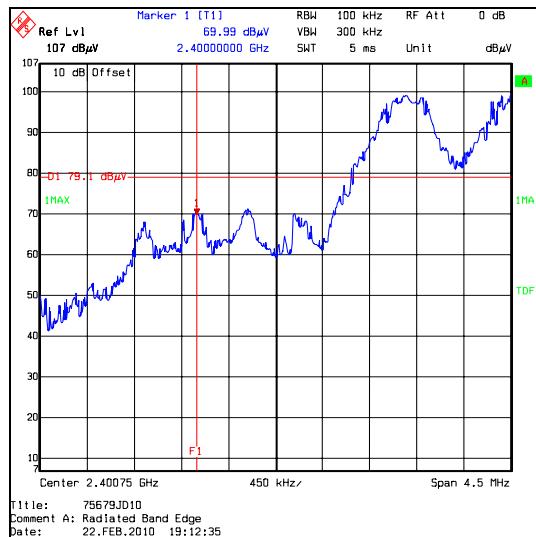
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	42.3	-0.3	42.0	54.0	12.0	Complied

**Note(s):**

\* -20dBc

**Transmitter Band Edge Radiated Emission - (GSM850 / Bluetooth / 802.11g) (continued)**

## **Results: Bluetooth – Hopping (continued)**



## **5.4. Test Results – Bluetooth and WiFi / PCS1900 simultaneous operation**

### **5.4.1. Transmitter AC Conducted Spurious Emissions**

#### **Test Summary:**

FCC Part:	15.207
Test Method Used:	As detailed in ANSI C63.4 Section 7 and relevant annexes

#### **Environmental Conditions:**

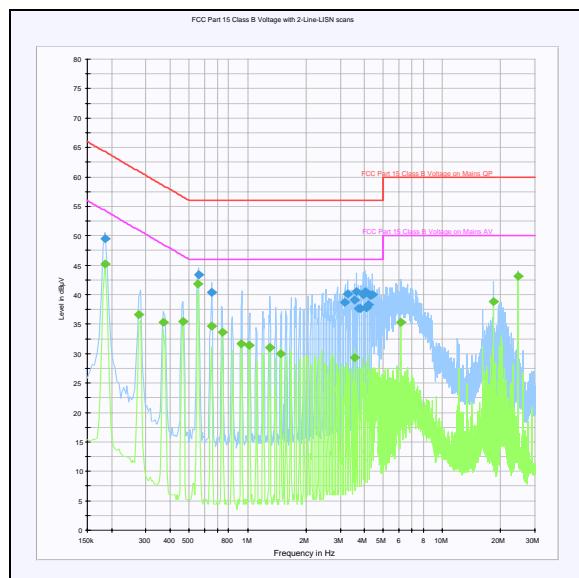
Temperature (°C):	26
Relative Humidity (%):	32

#### **Results: Quasi Peak Detector Measurements**

Frequency (MHz)	Line	Quasi Peak Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.186000	Live	49.5	64.2	14.7	Complied
0.559500	Live	43.3	56.0	12.7	Complied
0.654000	Live	40.4	56.0	15.6	Complied
3.169500	Neutral	38.6	56.0	17.4	Complied
3.264000	Neutral	40.1	56.0	15.9	Complied
3.543000	Neutral	39.1	56.0	16.9	Complied
3.637500	Neutral	40.5	56.0	15.5	Complied
3.723000	Neutral	37.7	56.0	18.3	Complied
3.813000	Neutral	37.7	56.0	18.3	Complied
3.916500	Live	40.0	56.0	16.0	Complied
4.011000	Neutral	40.5	56.0	15.5	Complied
4.096500	Neutral	37.7	56.0	18.3	Complied
4.182000	Live	38.3	56.0	17.7	Complied
4.290000	Live	39.8	56.0	16.2	Complied
4.384500	Live	39.9	56.0	16.1	Complied

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Average Detector Measurements**

Frequency (MHz)	Line	Average Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.186000	Live	45.2	54.2	9.0	Complied
0.276000	Live	36.6	50.9	14.3	Complied
0.370500	Live	35.4	48.5	13.1	Complied
0.465000	Live	35.4	46.6	11.2	Complied
0.555000	Neutral	41.8	46.0	4.2	Complied
0.649500	Live	34.7	46.0	11.3	Complied
0.739500	Neutral	33.6	46.0	12.4	Complied
0.928500	Neutral	31.7	46.0	14.3	Complied
1.018500	Neutral	31.4	46.0	14.6	Complied
1.297500	Neutral	31.0	46.0	15.0	Complied
1.482000	Neutral	29.9	46.0	16.1	Complied
3.525000	Neutral	29.4	46.0	16.6	Complied
6.121500	Neutral	35.3	50.0	14.7	Complied
18.357000	Live	38.8	50.0	11.2	Complied
24.477000	Live	43.1	50.0	6.9	Complied

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

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

### **5.4.2. Transmitter Radiated Emissions (PCS 1900 / Bluetooth / WiFi)**

#### **Test Summary:**

<b>FCC Part:</b>	15.209 / 2.1053 / 24.238
<b>Frequency Range:</b>	30 MHz to 26.5 GHz
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes and ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Part 2.1053

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	26

#### **Configuration 2:**

The EUT was transmitting in the following configuration:

GSM1900 circuit switched / bottom channel 1850.2 MHz / maximum power

Bluetooth DH5 / top channel 2480 MHz / maximum power

802.11g 54 Mbps / bottom channel 2412 MHz / maximum power

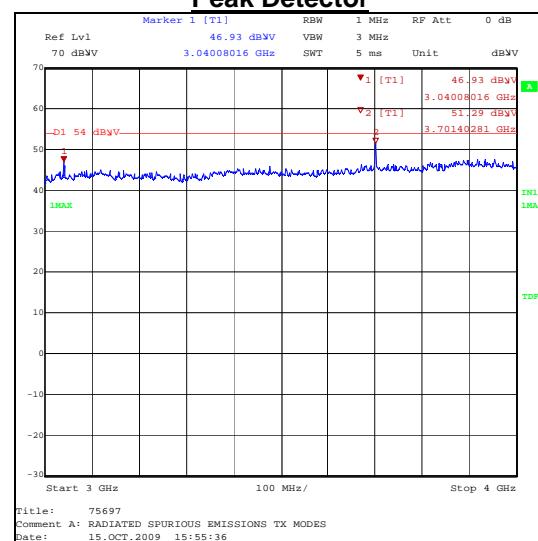
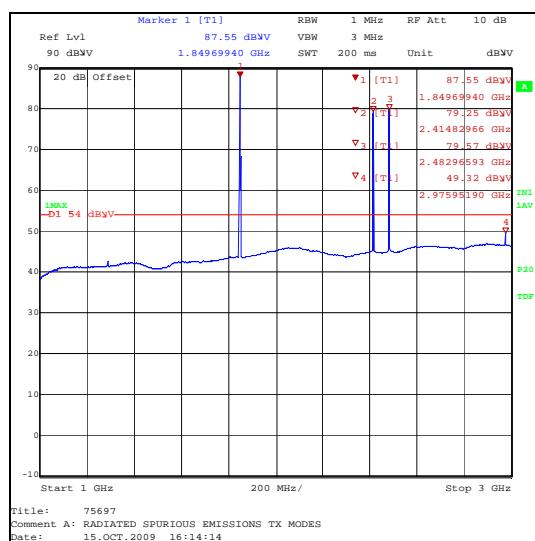
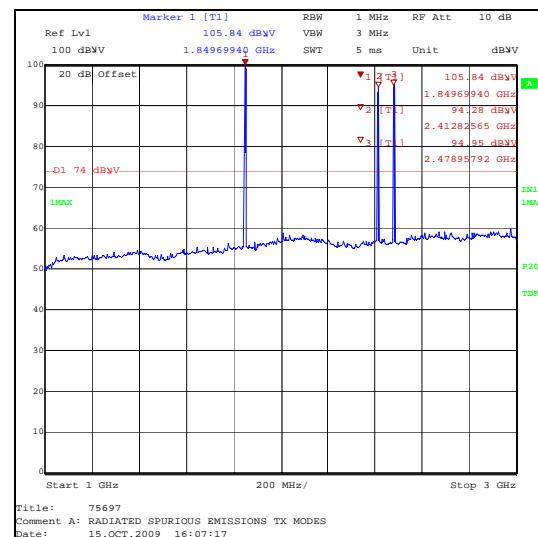
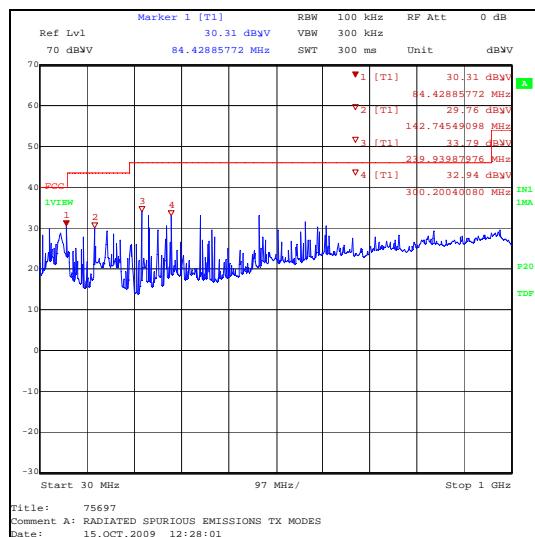
#### **Results:**

Frequency (MHz)	Detector	Antenna Polarity	Level	Applicable FCC Limit	Margin (dB)	Result
85.666	Quasi-peak	Horizontal	32.6 dB $\mu$ V/m	40.0 dB $\mu$ V/m	7.4	Complied
142.985	Quasi-peak	Horizontal	28.4 dB $\mu$ V/m	43.5 dB $\mu$ V/m	15.1	Complied
240.012	Quasi-peak	Horizontal	25.6 dB $\mu$ V/m	46.0 dB $\mu$ V/m	20.4	Complied
300.012	Quasi-peak	Vertical	35.8 dB $\mu$ V/m	46.0 dB $\mu$ V/m	10.2	Complied
360.018	Quasi-peak	Horizontal	36.0 dB $\mu$ V/m	46.0 dB $\mu$ V/m	10.0	Complied
480.040	Quasi-peak	Vertical	37.8 dB $\mu$ V/m	46.0 dB $\mu$ V/m	8.2	Complied
2973.842	Peak	Vertical	67.7 dB $\mu$ V/m	74.0 dB $\mu$ V/m	6.3	Complied
2973.842	Average	Vertical	53.9 dB $\mu$ V/m	54.0 dB $\mu$ V/m	0.1	Complied
3039.657	Peak	Vertical	45.0 dB $\mu$ V/m	74.0 dB $\mu$ V/m	29.0	Complied
3039.657	Average	Vertical	33.4 dB $\mu$ V/m	54.0 dB $\mu$ V/m	20.6	Complied
3700.358	Peak	Vertical	-42.7 dBm	-13.0 dBm	29.7	Complied
4262.067	Peak	Vertical	49.6 dB $\mu$ V/m	74.0 dB $\mu$ V/m	24.4	Complied
4262.217	Average	Vertical	38.6 dB $\mu$ V/m	54.0 dB $\mu$ V/m	15.4	Complied
4823.898	Peak	Vertical	46.7 dB $\mu$ V/m	74.0 dB $\mu$ V/m	30.6	Complied
4823.898	Average	Vertical	43.4 dB $\mu$ V/m	54.0 dB $\mu$ V/m	10.6	Complied
4959.945	Peak	Vertical	62.4 dB $\mu$ V/m	74.0 dB $\mu$ V/m	11.6	Complied
4959.945	Average	Vertical	53.5 dB $\mu$ V/m	54.0 dB $\mu$ V/m	0.5	Complied

**Transmitter Out of Band Radiated Emissions (continued)****Note(s):**

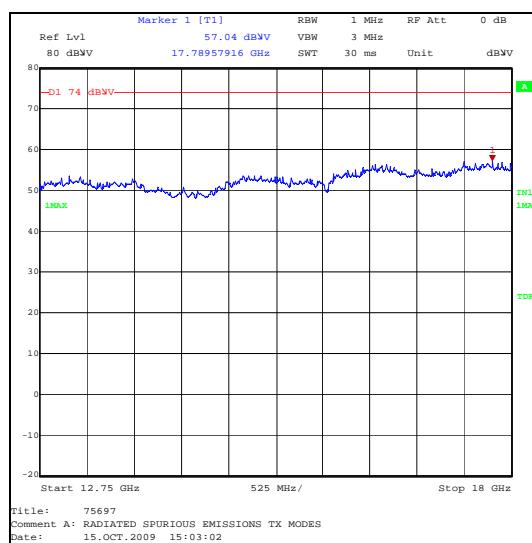
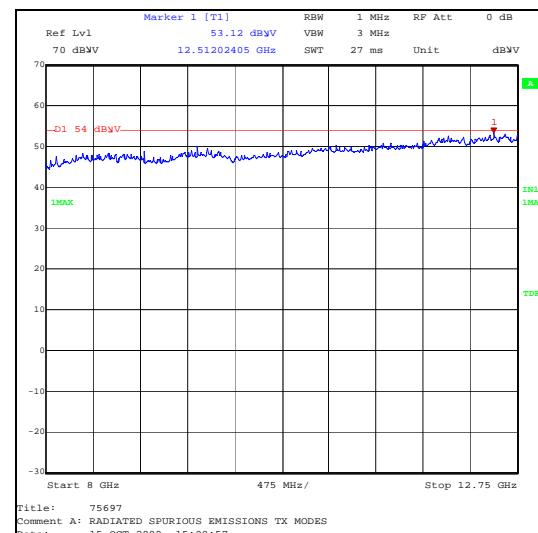
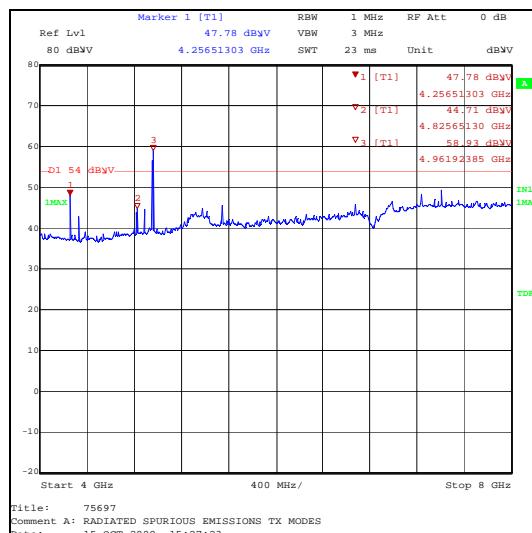
1. The emission shown at approximately 1.849 GHz on the 1 GHz to 3 GHz plot is the PCS1900 carrier.
2. The emission shown at approximately 2412 MHz on the 1 GHz to 3 GHz plot is the WiFi carrier.
3. The emission shown at approximately 2478 MHz on the 1 GHz to 3 GHz plot is the Bluetooth carrier.
4. If the spurious emission was a product of the GSM device the FCC Part 22 limit of -13 dBm (43 + 10 log P) applies, otherwise the 75 / 54 dB<sub>u</sub>V/m (peak / average) limits specified in FCC Part 15.209 apply.
5. All pre-scans were performed with a peak detector against average limits apart from measurements made in the ranges 1 to 3 GHz and 12.75 to 18 GHz where pre-scans were performed with peak and average detectors and the applicable limit applied. This was due to the noise floor exceeding the average limit when using a peak detector.

## Transmitter Out of Band Radiated Emissions (continued)

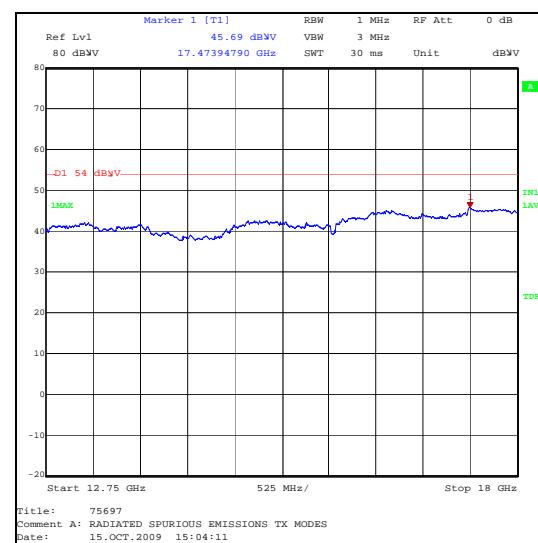


## Average Detector

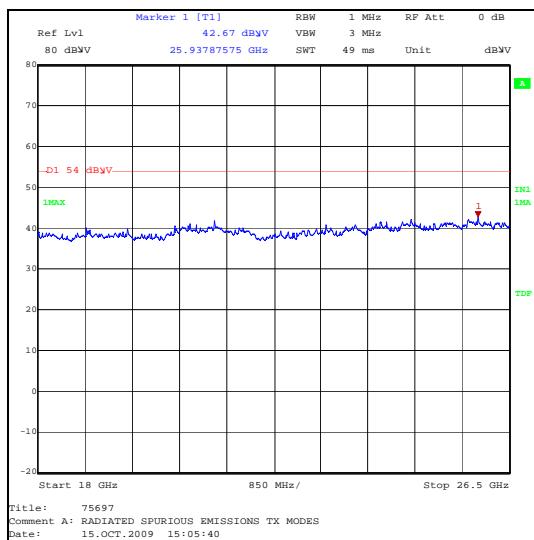
## Transmitter Out of Band Radiated Emissions (continued)



**Peak Detector**



**Average Detector**

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

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

### **5.4.3. Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth)**

#### **Test Summary:**

<b>FCC Part:</b>	15.247(d) & 15.209(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and Public Notice DA 00-75

#### **Environmental Conditions:**

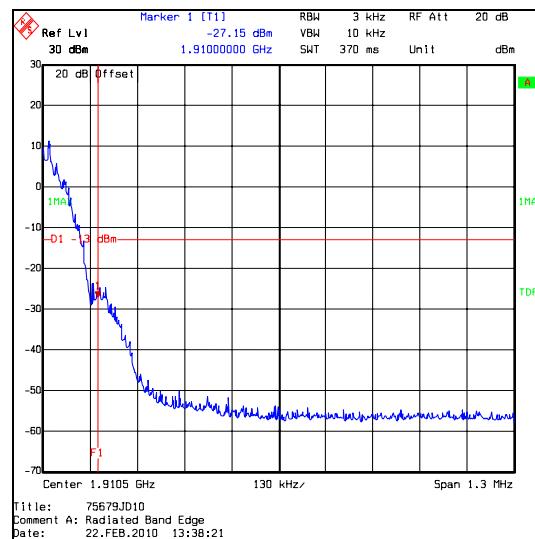
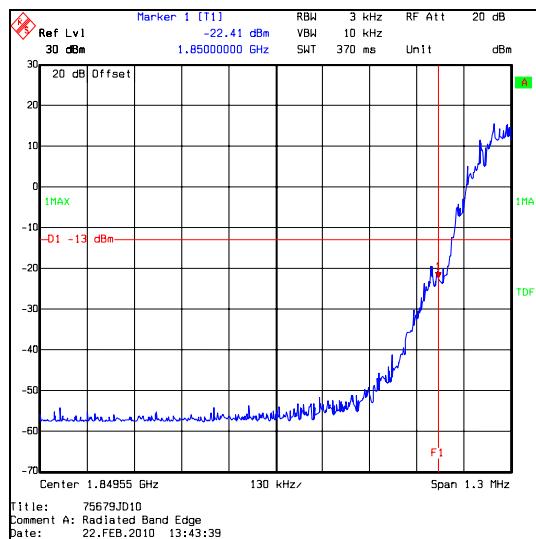
<b>Temperature(°C)</b>	23
<b>Relative Humidity (%)</b>	25

#### **Results: Peak- BT/802.11b/g /PCS 1900- Static**

#### **Results: PCS 1900**

Mode: Bluetooth – Static / 802.11b/g all transmitting

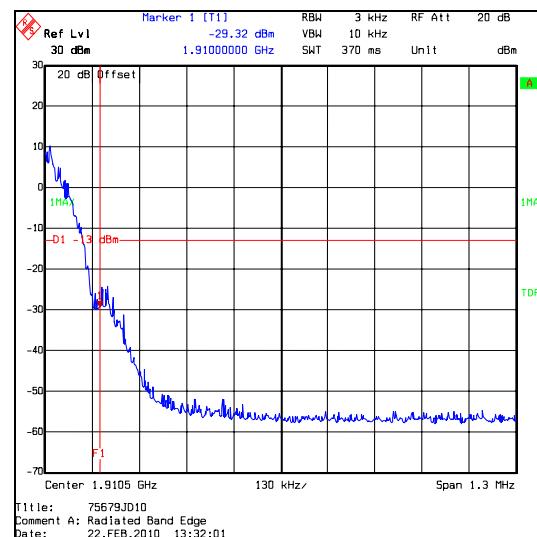
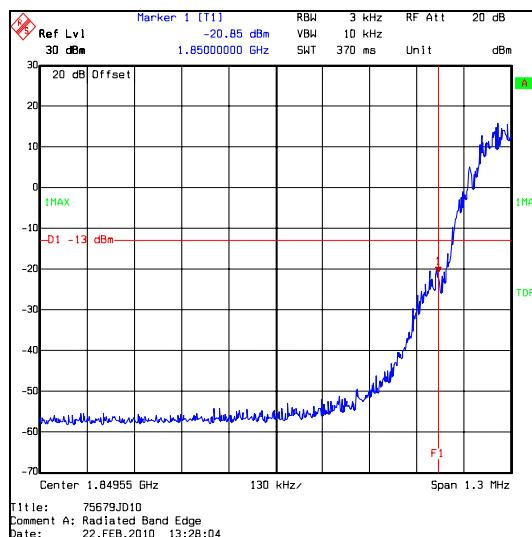
Frequency (MHz)	Antenna Polarity	Detector Level (dBm)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	Horizontal	-32.4	10.0	-22.4	-13	9.4	Complied
1910	Horizontal	-37.5	10.4	-27.2	-13	14.2	Complied



**Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth)****Results: PCS 1900**

Mode: Bluetooth – Hopping / 802.11b/g all transmitting

Frequency (MHz)	Antenna Polarity	Detector Level (dBm)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	Horizontal	-30.9	10.0	-20.9	-13	7.9	Complied
1910	Horizontal	-39.7	10.4	-29.3	-13	16.3	Complied



**Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth)****Results: WIFI 802.11b/g**

Mode: Bluetooth – Static / PCS 1900 all transmitting

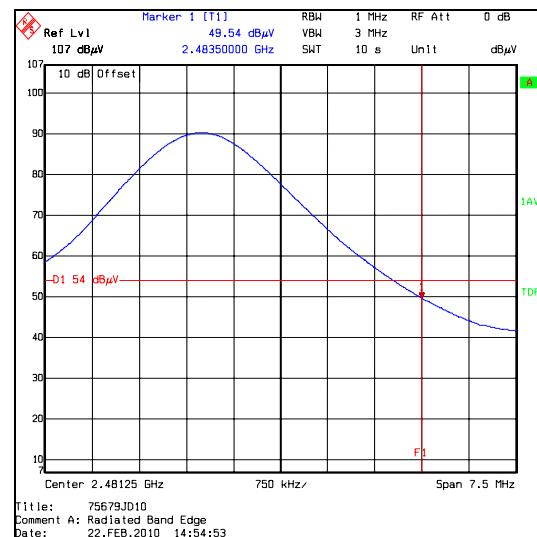
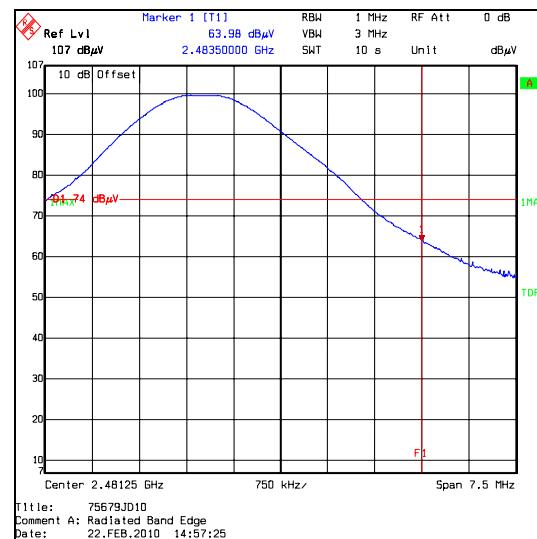
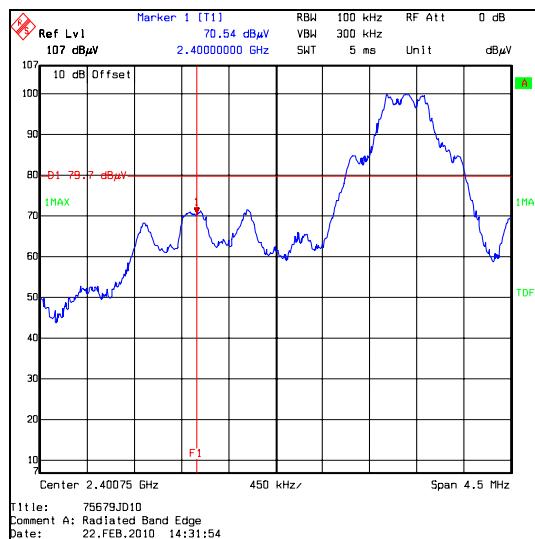
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400	Horizontal	70.2	-0.2	70.5	79.7*	9.2	Complied
2483.5	Horizontal	64.3	-0.3	64.0	74.0	10.0	Complied

**Results: Average- 802.11b/q plots - with respect PCS 1900, BT-static**

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	49.8	-0.3	49.5	54.0	4.5	Complied

**Note(s):**

\* -20dBc

**Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth) (continued)****Results: WIFI 802.11b/g (continued)**

**Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth)****Results: WIFI 802.11b/g**

Mode: Bluetooth – Hopping / PCS 1900 all transmitting

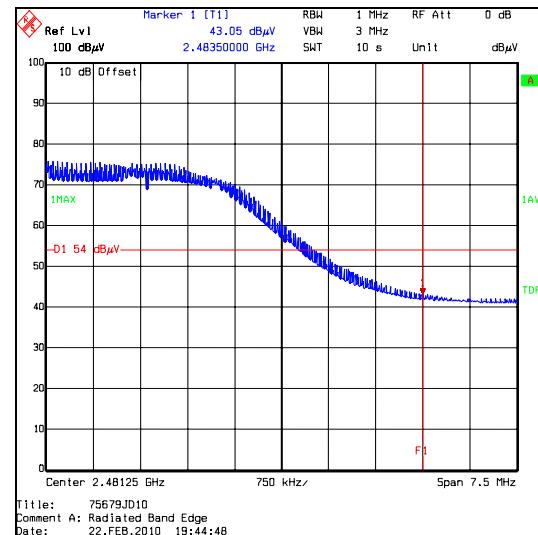
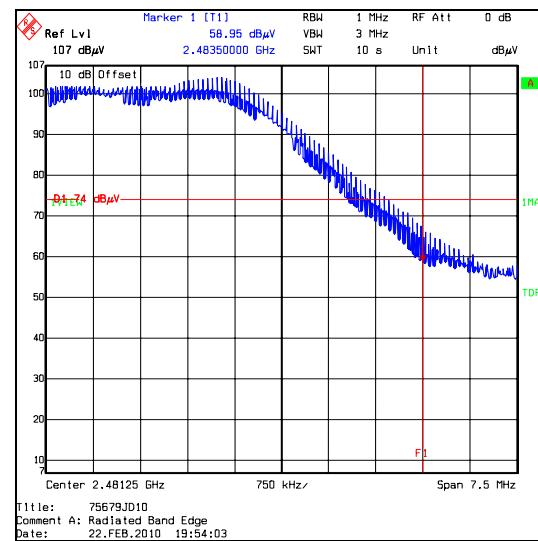
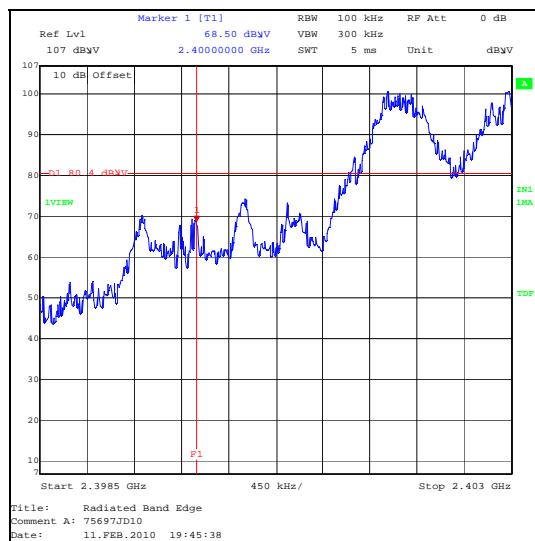
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400	Horizontal	68.7	-0.2	68.5	80.4*	11.9	Complied
2483.5	Horizontal	59.3	-0.3	59.0	74.0	15.0	Complied

**Results: Average- 802.11b/q plots - with respect PCS 1900, BT-Hopping**

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	49.4	-0.3	49.1	54.0	4.9	Complied

**Note(s):**

\* -20dBc

**Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth) (continued)****Results: WIFI 802.11b/g (continued)**

**Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth)****Results: Bluetooth - Static**

Mode: WIFI 802.11b/g / PCS 1900 all transmitting

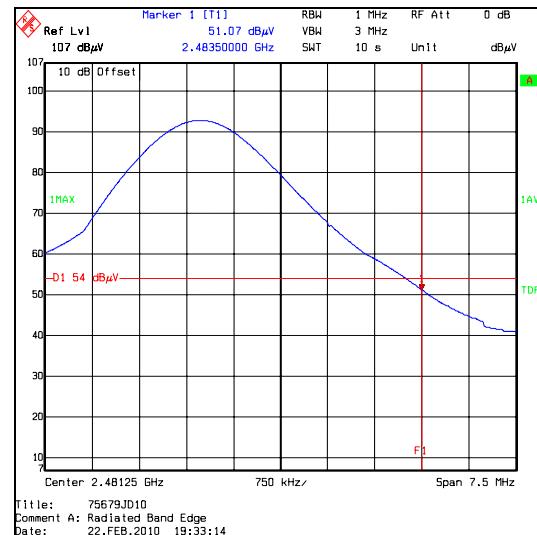
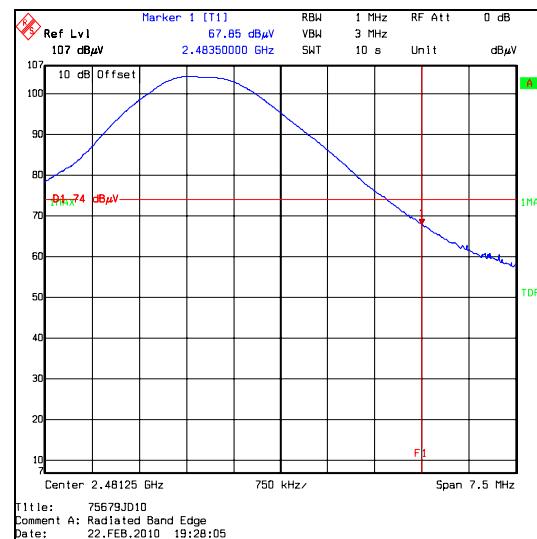
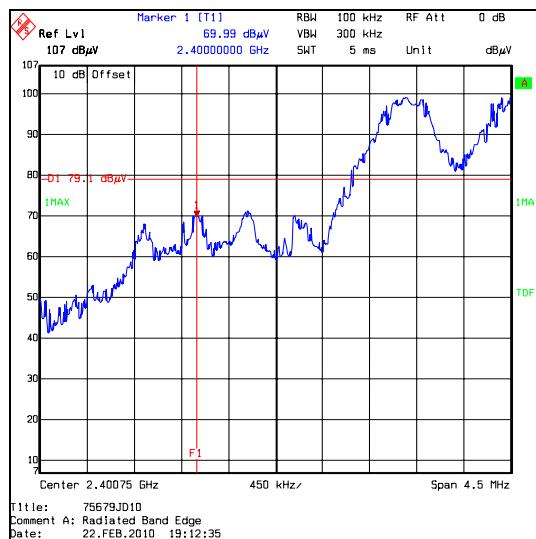
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400	Horizontal	70.2	-0.2	70.0	79.1*	9.1	Complied
2483.5	Horizontal	68.2	-0.3	67.9	74.0	6.1	Complied

**Results: Average 802.11a plots - with respect PCS 1900, BT-static**

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	51.4	-0.3	51.1	54.0	2.9	Complied

**Note(s):**

\* -20dBc

**Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth) (continued)****Results: Bluetooth – Static (continued)**

**Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth)****Results: Bluetooth – Hopping**

Mode: WIFI 802.11b/g / PCS 1900 all transmitting

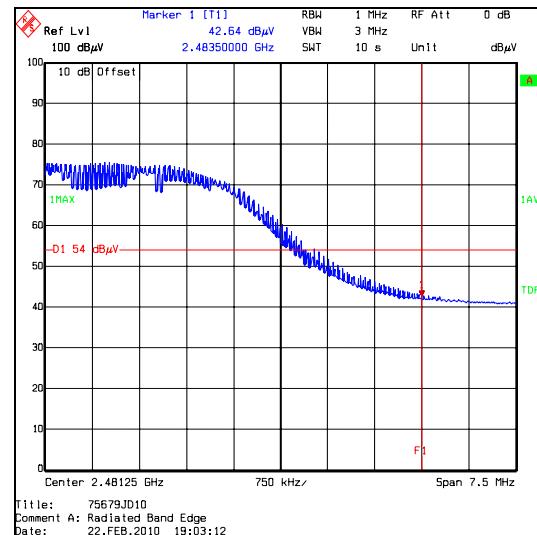
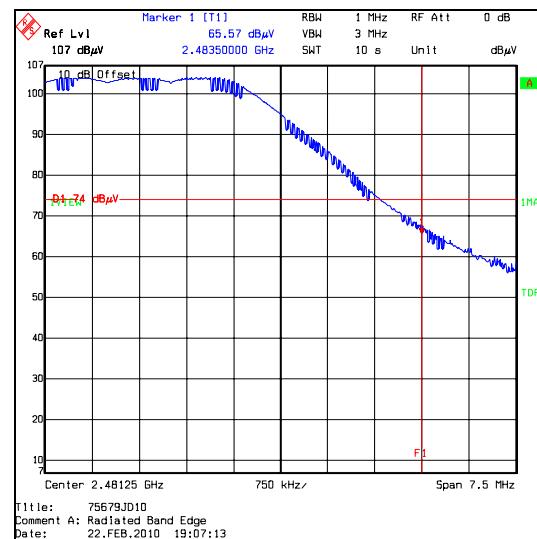
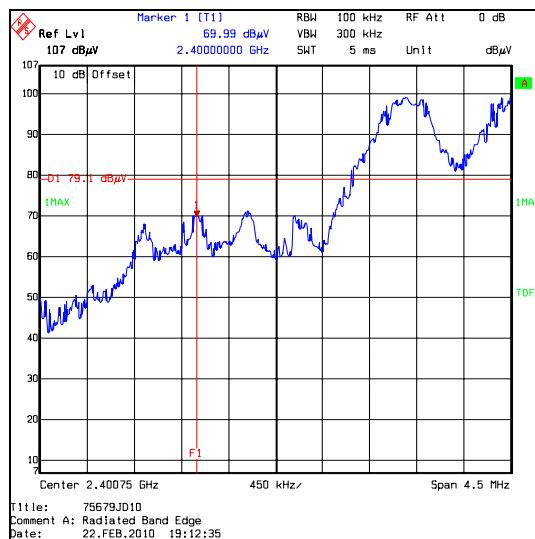
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400	Horizontal	70.2	-0.2	70	79.1*	9.1	Complied
2483.5	Horizontal	65.9	-0.3	65.6	74.0	8.4	Complied

**Results: Average Bluetooth -with respect to PCS 1900-hopping**

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dBm)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	42.9	-0.3	42.6	54.0	11.4	Complied

**Note(s):**

\* -20dBc

**Transmitter Band Edge Radiated Emission (PCS 1900,802.11b/g,Bluetooth) (continued)****Results: Bluetooth – Hopping (continued)**

## **6. Measurement Uncertainty**

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

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

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

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

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.72 dB
Radiated Spurious Emissions	30 MHz to 26 GHz	95%	±2.94 dB

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

## Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	25 Oct 2008	12
A1830	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100668	05 Jan 2009	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	Calibrated before use	-
A288	Antenna	Chase	CBL6111A	1589	13 Mar 2009	12
A649	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	825562/008	19 Mar 2009	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	01 Sep 2009	12
M1013	GSM Test Set	Hewlett Packard	8922H	3503U00372	Calibration not required	-
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	09 Mar 2009	12
M1244	GSM Test Set	HP	8922M	4012U04465	Calibration not required	-

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