

## TEST REPORT FROM RFI GLOBAL SERVICES LTD



Test of: NTT docomo P-07C

FCC ID: UCE211040A

To: FCC Part 15.247: 2010 Subpart C

**Test Report Serial No:**  
RFI-RPT-RP81533JD01A V2.0

**Version 2.0 supersedes all previous versions**

This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:		
Checked By:	Ian Watch	
Signature:		
Date of Issue:	03 June 2011	

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 licence. Other trademarks and trade names are those of their respective owners.

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

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

**RFI Global Services Ltd**

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

<b>1. Customer Information .....</b>	<b>4</b>
<b>2. Summary of Testing .....</b>	<b>5</b>
2.1. General Information .....	5
2.2. Summary of Test Results .....	5
2.3. Methods and Procedures .....	6
2.4. Deviations from the Test Specification .....	6
<b>3. Equipment Under Test (EUT) .....</b>	<b>7</b>
3.1. Identification of Equipment Under Test (EUT) .....	7
3.2. Description of EUT .....	9
3.3. Modifications Incorporated in the EUT .....	9
3.4. Additional Information Related to Testing .....	9
3.5. Support Equipment .....	10
<b>4. Operation and Monitoring of the EUT during Testing .....</b>	<b>11</b>
4.1. Operating Modes .....	11
4.2. Configuration and Peripherals .....	11
<b>5. Measurements, Examinations and Derived Results .....</b>	<b>12</b>
5.1. General Comments .....	12
5.2. Test Results .....	13
5.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions .....	13
5.2.2. Receiver/Idle Mode Radiated Spurious Emissions .....	16
5.2.3. Transmitter AC Conducted Spurious Emissions .....	20
5.2.4. Transmitter 20 dB Bandwidth .....	23
5.2.5. Transmitter Carrier Frequency Separation .....	27
5.2.6. Transmitter Number of Hopping Frequencies and Average Time of Occupancy .....	30
5.2.7. Transmitter Maximum Peak Output Power .....	32
5.2.8. Transmitter Radiated Emissions .....	37
5.2.9. Transmitter Band Edge Radiated Emissions .....	43
<b>6. Measurement Uncertainty .....</b>	<b>51</b>
<b>Appendix 1. Test Equipment Used .....</b>	<b>52</b>

**1. Customer Information**












<b>Company Name:</b>	Panasonic Mobile Communications Development of Europe Ltd.
<b>Address:</b>	Panasonic House Willoughby Road Bracknell Berkshire RG12 8FP United Kingdom

## **2. Summary of Testing**

### **2.1. General Information**

<b>Specification Reference:</b>	47CFR15.247
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart C (Intentional Radiators) - Section 15.247
<b>Specification Reference:</b>	47CFR15.107 and 47CFR15.109
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart B (Unintentional Radiators) - Sections 15.107 and 15.109
<b>Specification Reference:</b>	47CFR15.207 and 47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
<b>Site Registration:</b>	FCC: 209735
<b>Location of Testing:</b>	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
<b>Test Dates:</b>	11 May 2011 to 25 May 2011

### **2.2. Summary of Test Results**

<b>FCC Reference (47CFR)</b>	<b>Measurement</b>	<b>Result</b>
Part 15.107(a)	Receiver/Idle Mode AC Conducted Emissions	
Part 15.109	Receiver/Idle Mode Radiated Spurious Emissions	
Part 15.207	Transmitter AC Conducted Emissions	
Part 15.247(a)(1)	Transmitter 20 dB Bandwidth	
Part 15.247(a)(1)	Transmitter Carrier Frequency Separation	
Part 15.247(a)(1)(iii)	Transmitter Number of Hopping Frequencies and Average Time of Occupancy	
Part 15.247(b)(1)	Transmitter Maximum Peak Output Power	
Part 15.247(d) & 15.209(a)	Transmitter Radiated Emissions	
Part 15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	
<b>Key to Results</b>  = Complied  = Did not comply		

**2.3. Methods and Procedures**

<b>Reference:</b>	ANSI C63.4 (2009)
<b>Title:</b>	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>Reference:</b>	ANSI C63.10 (2009)
<b>Title:</b>	American National Standard for Testing Unlicensed Wireless Devices

**2.4. Deviations from the Test Specification**

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

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

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

<b>Brand Name:</b>	NTT docomo
<b>Model Name or Number:</b>	P-07C ( <i>Radiated sample #1</i> )
<b>IMEI:</b>	356333040014081
<b>Hardware Version Number:</b>	Rev C
<b>Software Version Number:</b>	laputa-ginger-inc4x-dcm-07-0249 R1E_EC06_005
<b>FCC ID:</b>	UCE211040A

*\*The customer stated this S/W version is identical to laputa-ginger-inc4x-dcm-07-0312 R1E\_EC07 except for the audio speech parameters which do not impact FCC testing.*

<b>Brand Name:</b>	NTT docomo
<b>Model Name or Number:</b>	P-07C ( <i>Radiated sample #2</i> )
<b>IMEI:</b>	356333040014073
<b>Hardware Version Number:</b>	Rev C
<b>Software Version Number:</b>	laputa-ginger-inc4x-dcm-07-0312 R1E_EC07
<b>FCC ID:</b>	UCE211040A

<b>Brand Name:</b>	NTT docomo
<b>Model Name or Number:</b>	P-07C ( <i>Conducted sample</i> )
<b>IMEI:</b>	356333040014099
<b>Hardware Version Number:</b>	Rev C
<b>Software Version Number:</b>	laputa-ginger-inc4x-dcm-07-0483 R1E_EC08
<b>FCC ID:</b>	UCE211040A

*\* The customer stated this S/W version contains a bug fix to prevent the S/W from crashing under certain circumstances. The RF performance is identical to laputa-ginger-inc4x-dcm-07-0312 R1E\_EC07 and the change does not impact FCC testing.*

**Identification of Equipment Under Test (continued)**

<b>Brand Name:</b>	NTT docomo
<b>Description:</b>	Battery
<b>Model Name or Number:</b>	P24

<b>Brand Name:</b>	NTT docomo
<b>Description:</b>	AC Charger and USB cable
<b>Model Name or Number:</b>	P01

<b>Brand Name:</b>	NTT docomo
<b>Description:</b>	Personal Hands-Free
<b>Model Name or Number:</b>	L0ZZ00000027



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

The equipment under test was a dual mode UMTS/GSM cellular handset with Bluetooth and WLAN.

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

No modifications were applied to the EUT during testing.

### **3.4. Additional Information Related to Testing**

Tested Technology:	Bluetooth		
Power Supply Requirement:	Nominal	3.7 V	
Type of Unit:	Transceiver		
Channel Spacing:	1 MHz		
Mode:	Basic Rate	Enhanced Data Rate	
Modulation:	GFSK	π/4-DQPSK	8DQPSK
Packet Type: (Maximum Payload)	DH5	2DH5	3DH5
Data Rate (Mbit/s):	1	2	3
Maximum Conducted Output Power:	1.3 dBm		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480
Receive Frequency Range:	2402 MHz to 2480 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480

### **3.5. Support Equipment**

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

<b>Brand Name:</b>	Panasonic
<b>Description:</b>	Laptop PC
<b>Model Name or Number:</b>	Toughbook CF-74

<b>Brand Name:</b>	Generic
<b>Description:</b>	Micro SD Memory Card
<b>Model Name or Number:</b>	None stated

<b>Brand Name:</b>	Buffalo
<b>Description:</b>	USB Hub
<b>Model Name or Number:</b>	BSH3U01

## **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
- Transmit mode with Basic Rate (DH5 packets) or EDR (2DH5 or 3DH5 packets) as required.

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

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

- For Transmit tests: Connected via a radio link to a Bluetooth tester in order to place the EUT into Bluetooth test mode. The laptop PC with the Client's bespoke application was used to place the EUT into Bluetooth mode.
- Receive/Idle tests: The Bluetooth mode was active but not transmitting.
- Both EDR/Basic rate modes were compared and tests were performed with the mode that presented the worst case result. For output power, bandwidth, band edge and channel separation, all modes were tested.
- Idle and transmitter radiated spurious emissions tests were performed with the AC charger connected to the EUT as this was found to be the worst case during pre-scans. All the accessories were individually connected and measurements made during the pre-scans to determine the worst case combination.
- The conducted sample with IMEI 356333040014099 was used for maximum output power tests.
- The radiated sample with IMEI 356333040014081 was used for AC conducted emissions, EIRP and idle mode radiated spurious emissions > 1 GHz tests.
- The radiated sample with IMEI 356333040014073 was used for all other tests.

## **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****5.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions****Test Summary:**

<b>Test Engineer:</b>	Ian Watch	<b>Test Date:</b>	16 May 2011
<b>Test Sample Serial No:</b>	356333040014081		

<b>FCC Part:</b>	15.107
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

**Environmental Conditions:**

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

**Results: Live - Quasi Peak**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.433500	Live	38.0	57.2	19.2	Complied
0.469500	Live	38.6	56.5	17.9	Complied
0.595500	Live	36.0	56.0	20.0	Complied
0.757500	Live	36.1	56.0	19.9	Complied
1.135500	Live	36.4	56.0	19.6	Complied
1.446000	Live	37.9	56.0	18.1	Complied
1.504500	Live	40.5	56.0	15.6	Complied
1.527000	Live	39.0	56.0	17.0	Complied
1.540500	Live	39.2	56.0	16.8	Complied
1.648500	Live	43.8	56.0	12.2	Complied
1.689000	Live	49.6	56.0	6.4	Complied

**Results: Live - Average**

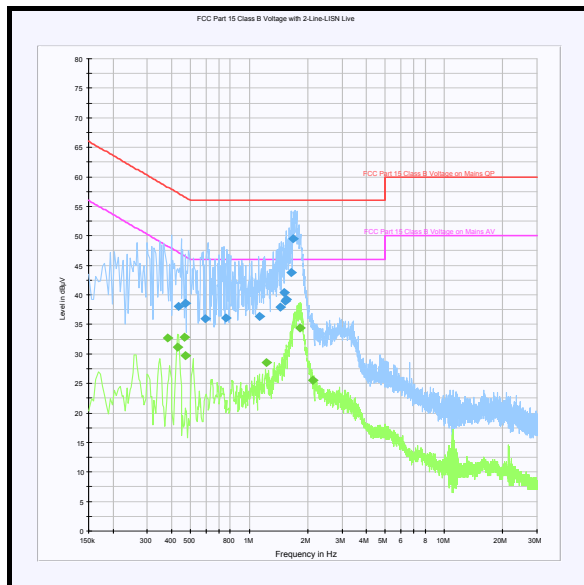
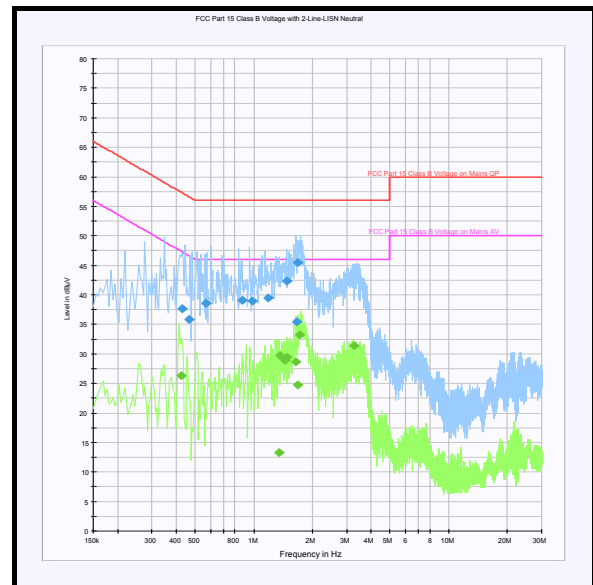
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.379500	Live	32.7	48.3	15.6	Complied
0.429000	Live	31.1	47.3	16.2	Complied
0.465000	Live	32.9	46.6	13.7	Complied
0.469500	Live	29.7	46.5	16.8	Complied
1.221000	Live	28.6	46.0	17.4	Complied
1.819500	Live	34.4	46.0	11.6	Complied
2.112000	Live	25.6	46.0	20.4	Complied

**Receiver/Idle Mode AC Conducted Spurious Emissions (continued)****Results: Neutral - Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.429000	Neutral	37.7	57.3	19.6	Complied
0.465000	Neutral	35.9	56.6	20.7	Complied
0.568500	Neutral	38.5	56.0	17.5	Complied
0.874500	Neutral	39.1	56.0	16.9	Complied
0.987000	Neutral	39.0	56.0	17.0	Complied
1.180500	Neutral	39.5	56.0	16.5	Complied
1.482000	Neutral	42.3	56.0	13.7	Complied
1.666500	Neutral	35.4	56.0	20.6	Complied
1.689000	Neutral	45.4	56.0	10.6	Complied

**Results: Neutral - Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.424500	Neutral	26.3	47.4	21.1	Complied
1.347000	Neutral	13.3	46.0	32.7	Complied
1.365000	Neutral	29.7	46.0	16.3	Complied
1.441500	Neutral	28.9	46.0	17.1	Complied
1.482000	Neutral	29.4	46.0	16.6	Complied
1.635000	Neutral	28.6	46.0	17.4	Complied
1.689000	Neutral	24.7	46.0	21.3	Complied
1.725000	Neutral	33.2	46.0	12.8	Complied
3.255000	Neutral	31.4	46.0	14.6	Complied

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

*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>Test Engineer:</b>	Patrick Jones	<b>Test Date:</b>	18 May 2011
<b>Test Sample IMEI:</b>	356333040014073		

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

**Environmental Conditions:**

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

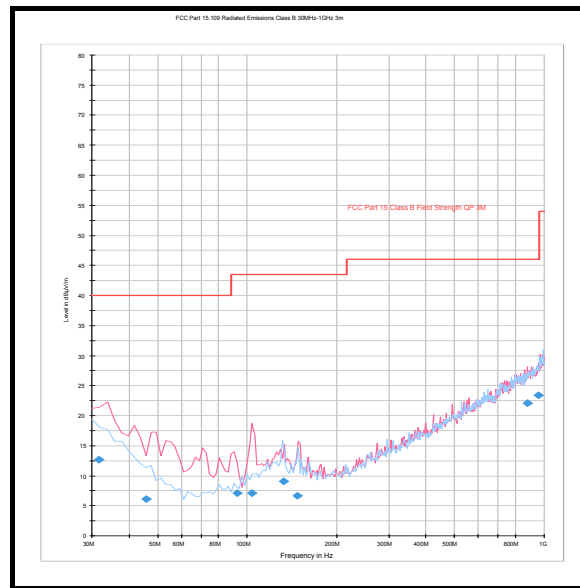
**Results: Quasi Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
31.603	Vertical	12.7	40.0	27.3	Complied
45.701	Vertical	6.1	40.0	33.9	Complied
92.391	Vertical	7.1	43.5	36.4	Complied
103.786	Vertical	7.1	43.5	36.4	Complied
132.425	Vertical	9.1	43.5	34.4	Complied
147.485	Vertical	6.7	43.5	36.8	Complied
879.454	Vertical	22.1	46.0	23.9	Complied
958.298	Vertical	23.4	46.0	22.6	Complied

**Note(s):**

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. All emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.



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

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

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

<b>Test Engineer:</b>	Tim Stanley	<b>Test Date:</b>	11 May 2011
<b>Test Sample IMEI:</b>	356333040014081		

<b>FCC Part:</b>	15.109
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8
<b>Frequency Range:</b>	1 GHz to 12.75 GHz

**Environmental Conditions:**

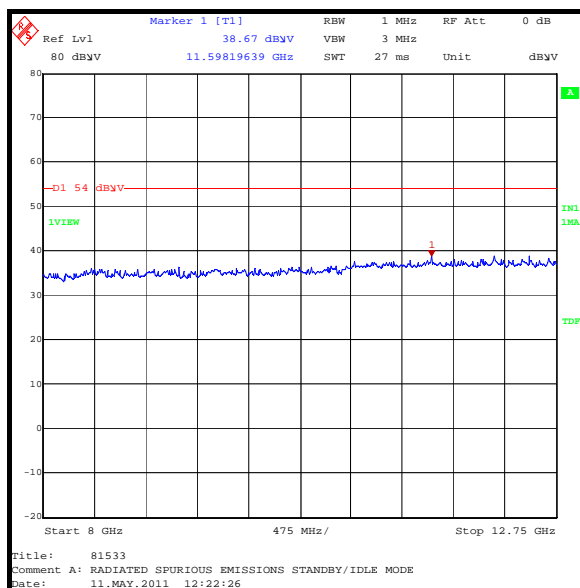
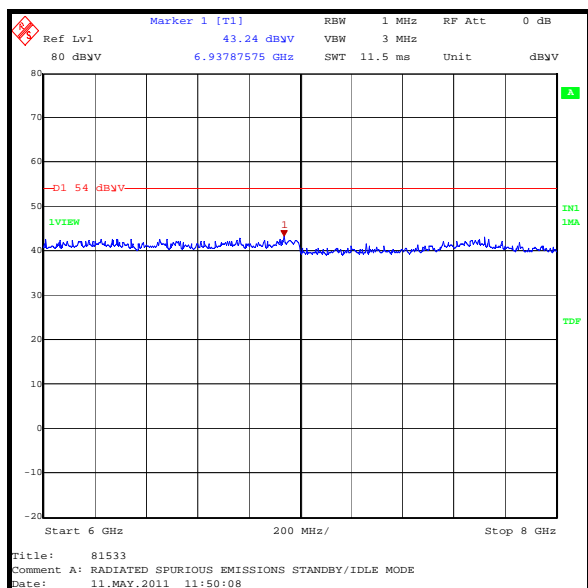
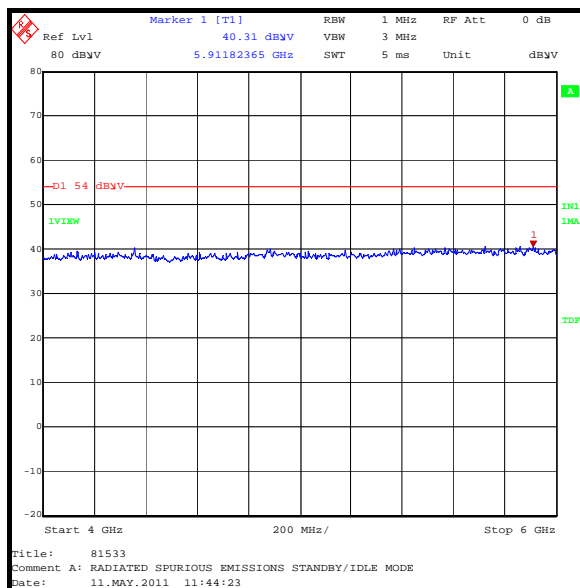
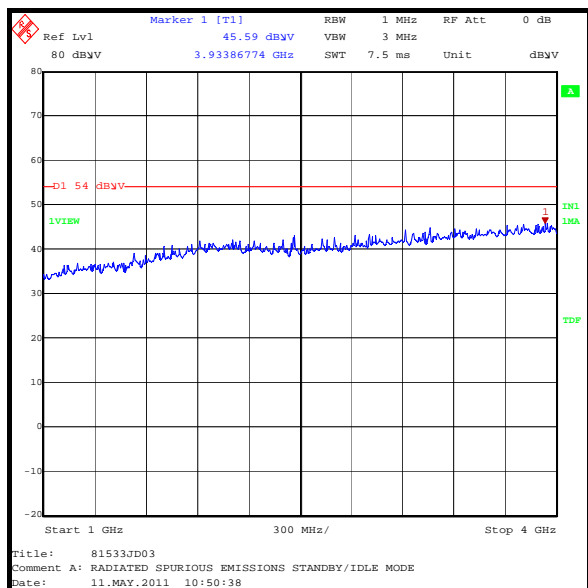
<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	22

**Results:**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
3933.868	Vertical	45.6	54.0	8.4	Complied

**Note(s):**

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
3. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

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

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

<b>Test Engineer:</b>	Patrick Jones	<b>Test Date:</b>	17 May 2011
<b>Test Sample Serial No:</b>	356333040014073		

<b>FCC Part:</b>	15.207
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

**Environmental Conditions:**

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

**Results: Quasi Peak**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.843000	Live	30.3	56.0	25.7	Complied
1.117500	Live	30.9	56.0	25.1	Complied
1.239000	Live	31.7	56.0	24.3	Complied
1.311000	Live	32.9	56.0	23.1	Complied
1.324500	Live	32.3	56.0	23.7	Complied
1.360500	Live	31.8	56.0	24.2	Complied
1.450500	Live	32.5	56.0	23.5	Complied
1.482000	Live	32.2	56.0	23.8	Complied
1.545000	Live	32.8	56.0	23.2	Complied
1.554000	Live	33.5	56.0	22.5	Complied
1.720500	Live	38.8	56.0	17.2	Complied
1.864500	Live	34.3	56.0	21.7	Complied

**Results: Average**

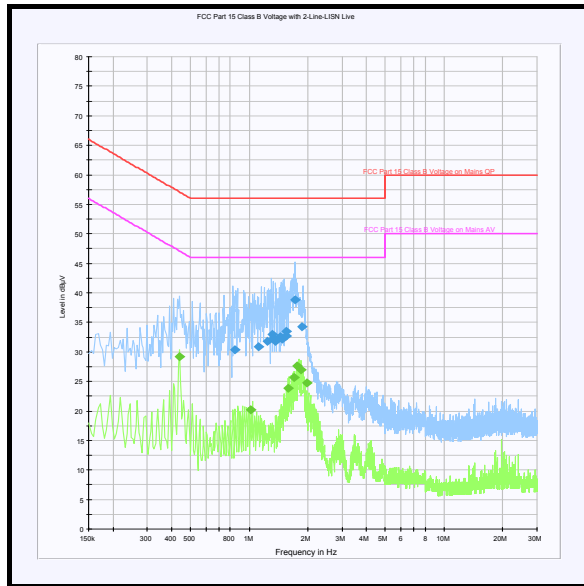
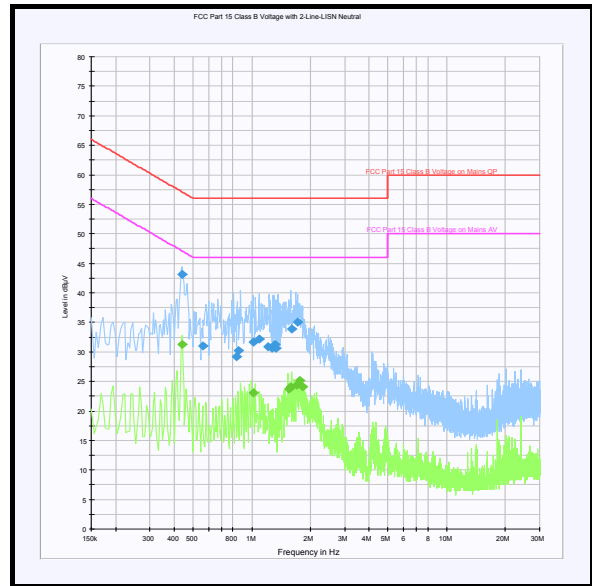
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.438000	Live	29.2	47.1	17.9	Complied
1.018500	Live	20.2	46.0	25.8	Complied
1.576500	Live	23.9	46.0	22.2	Complied
1.698000	Live	25.7	46.0	20.3	Complied
1.770000	Live	27.6	46.0	18.4	Complied
1.842000	Live	27.0	46.0	19.0	Complied
1.968000	Live	24.7	46.0	21.3	Complied

**Results: Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.438000	Neutral	43.2	57.1	13.9	Complied
0.559500	Neutral	31.0	56.0	25.0	Complied
0.834000	Neutral	29.2	56.0	26.8	Complied
0.856500	Neutral	30.2	56.0	25.8	Complied
1.014000	Neutral	31.7	56.0	24.3	Complied
1.090500	Neutral	32.2	56.0	23.8	Complied
1.216500	Neutral	30.9	56.0	25.1	Complied
1.266000	Neutral	30.6	56.0	25.4	Complied
1.311000	Neutral	31.2	56.0	24.8	Complied
1.333500	Neutral	30.6	56.0	25.4	Complied
1.603500	Neutral	33.9	56.0	22.1	Complied
1.725000	Neutral	35.0	56.0	21.0	Complied

**Results: Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.438000	Neutral	31.2	47.1	15.9	Complied
1.018500	Neutral	23.1	46.0	22.9	Complied
1.554000	Neutral	23.8	46.0	22.2	Complied
1.576500	Neutral	24.1	46.0	21.9	Complied
1.698000	Neutral	24.4	46.0	21.6	Complied
1.770000	Neutral	25.1	46.0	20.9	Complied
1.824000	Neutral	24.1	46.0	21.9	Complied

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

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

**5.2.4. Transmitter 20 dB Bandwidth****Test Summary:**

<b>Test Engineer:</b>	Tim Stanley	<b>Test Date:</b>	19 May 2011
<b>Test Sample Serial No:</b>	356333040014073		

<b>FCC Part:</b>	15.247(a)(1)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.9.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	23

**Results DH5:**

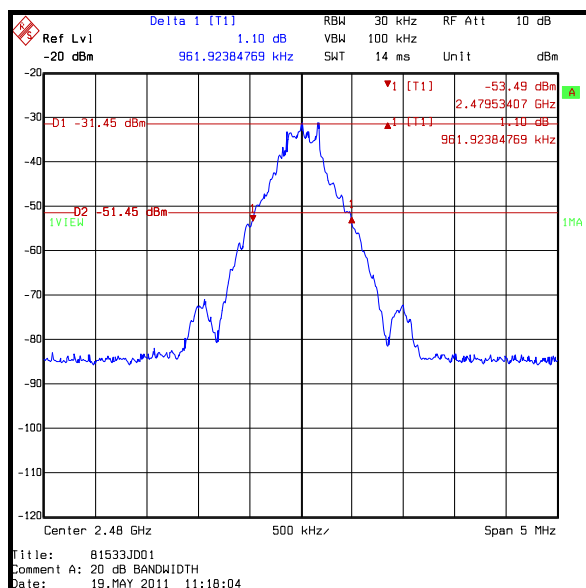
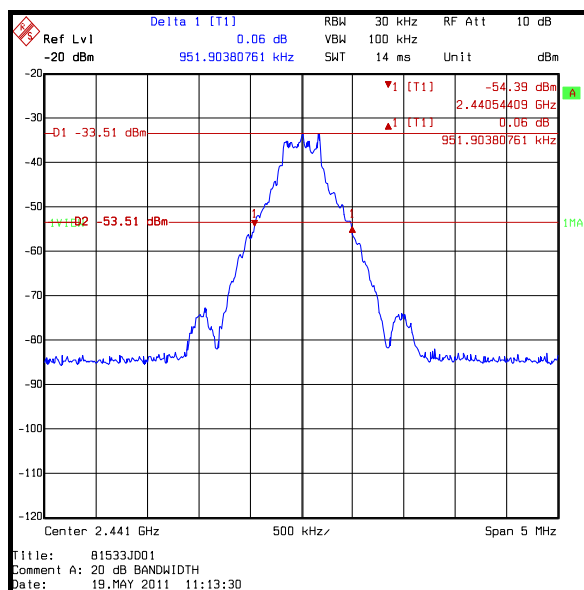
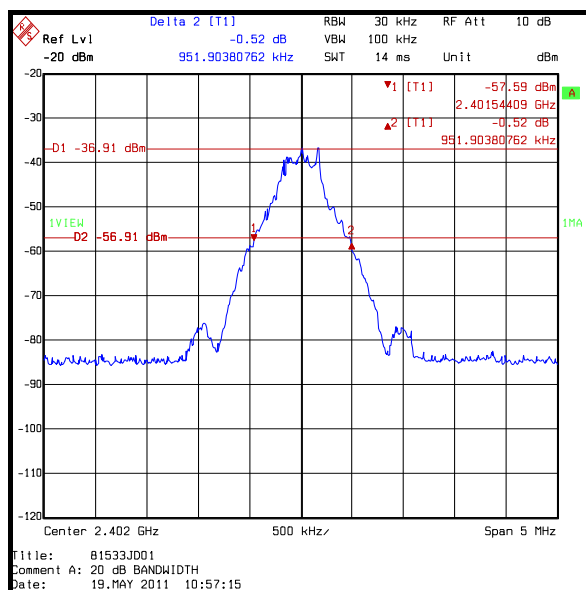
Channel	20 dB Bandwidth (kHz)
Bottom	951.904
Middle	951.904
Top	961.924

**Results 2DH5:**

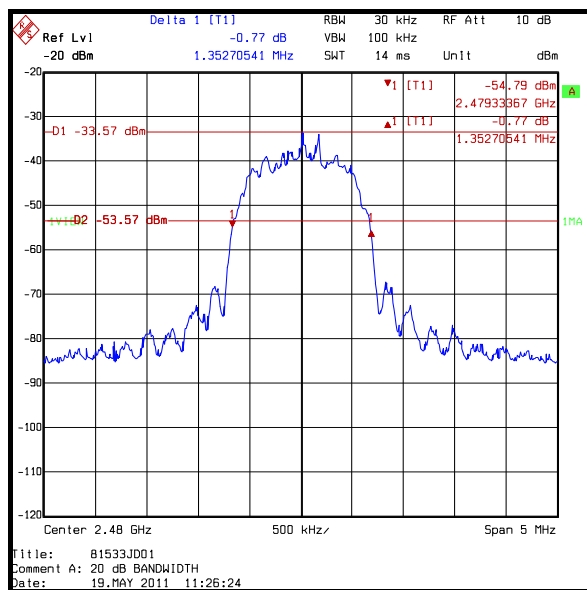
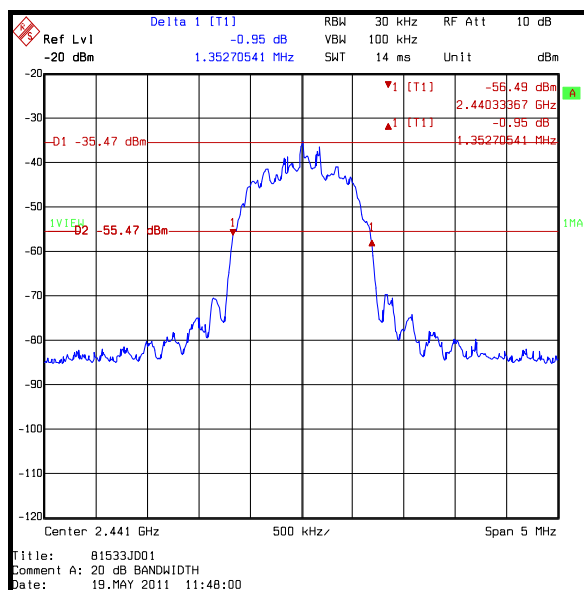
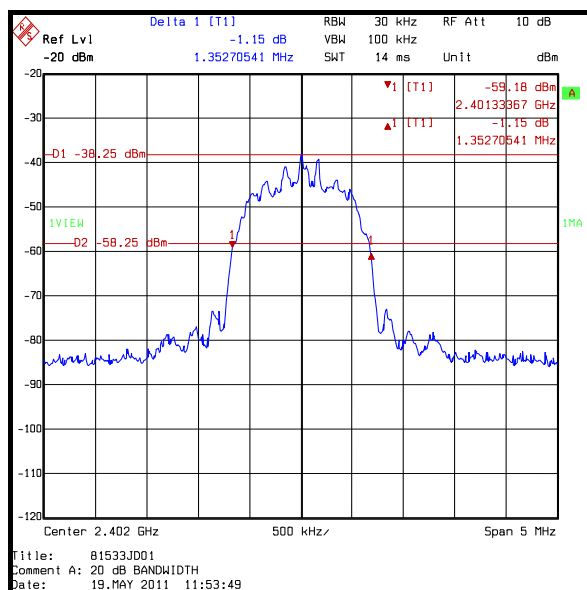
Channel	20 dB Bandwidth (kHz)
Bottom	1352.705
Middle	1352.705
Top	1352.705

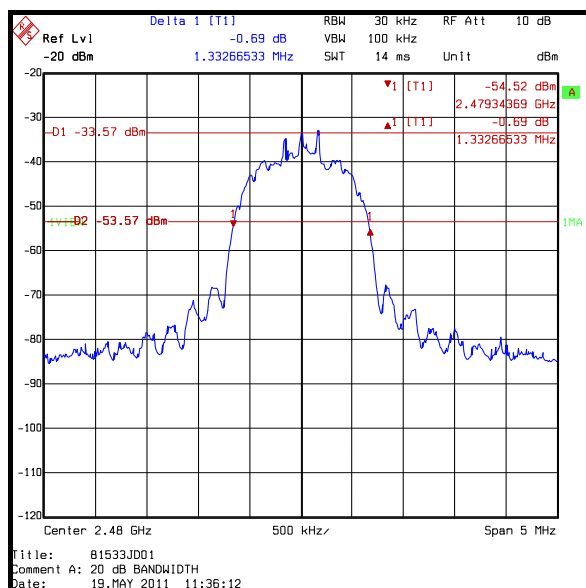
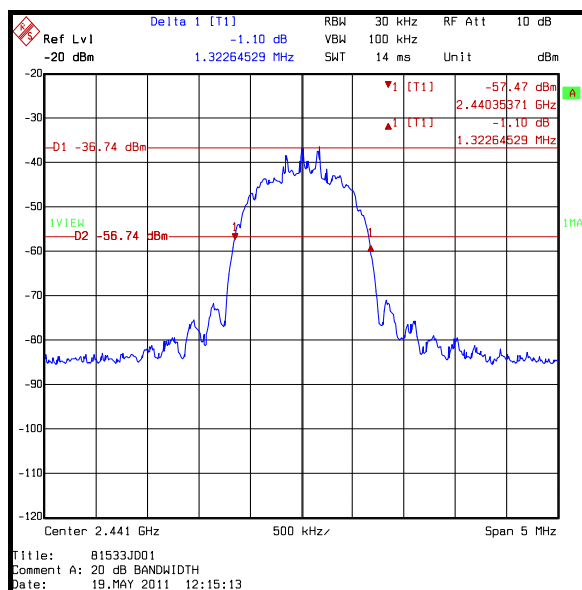
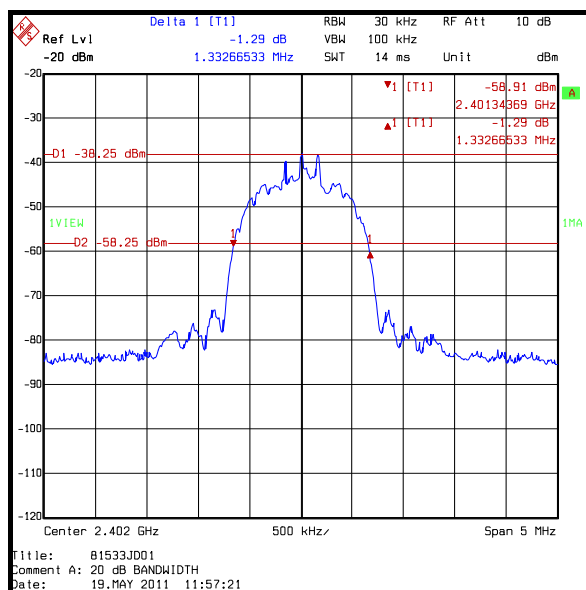
**Results 3DH5:**

Channel	20 dB Bandwidth (kHz)
Bottom	1332.665
Middle	1322.645
Top	1332.666

**Transmitter 20 dB Bandwidth (continued)****Results DH5:**



**Transmitter 20 dB Bandwidth (continued)****Results 2DH5:**

**Transmitter 20 dB Bandwidth (continued)****Results 3DH5:**

**5.2.5. Transmitter Carrier Frequency Separation****Test Summary:**

Test Engineer:	Tim Stanley	Test Date:	19 May 2011
Test Sample Serial No:	356333040014073		

FCC Part:	15.247(a)(1)
Test Method Used:	As detailed in ANSI C63.10 Section 7.7.2

**Environmental Conditions:**

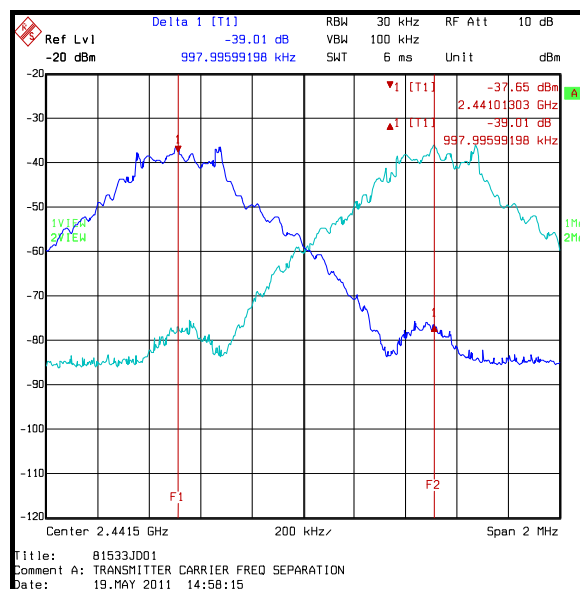
Temperature (°C):	28
Relative Humidity (%):	22

**Results: DH5**

Carrier Frequency Separation (kHz)	Limit ( $2/3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
997.995	634.603	354.392	Complied

**Note(s):**

- The 20 dB bandwidth measured for the middle channel operating at 2441 MHz was used to calculate the limit.

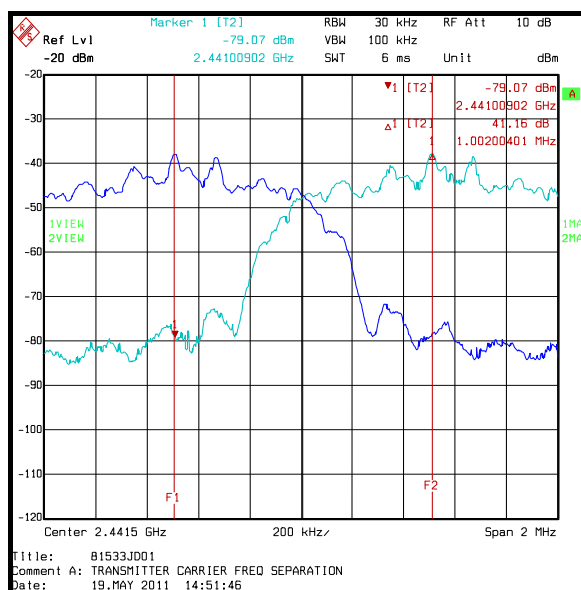


**Transmitter Carrier Frequency Separation (continued)****Results: 2DH5**

Carrier Frequency Separation (kHz)	Limit ( $2/3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.004	901.803	100.201	Complied

**Note(s):**

- The 20 dB bandwidth measured for the middle channel operating at 2441 MHz was used to calculate the limit.

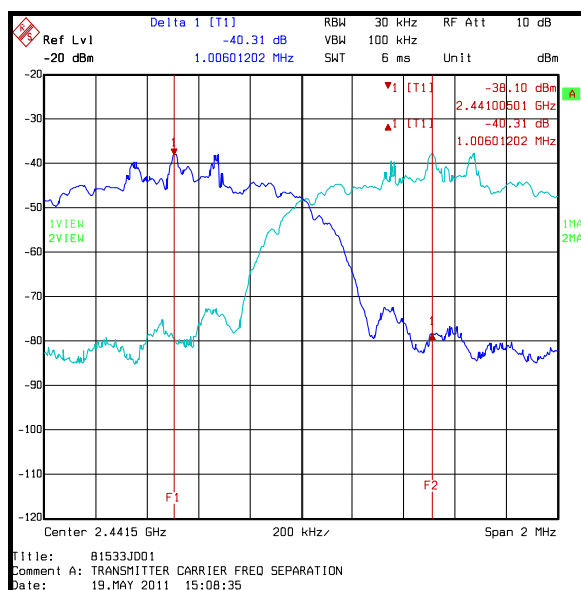


**Transmitter Carrier Frequency Separation (continued)****Results: 3DH5**

Carrier Frequency Separation (kHz)	Limit ( $2/3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1006.012	881.763	124.249	Complied

**Note(s):**

- The 20 dB bandwidth measured for the middle channel operating at 2441 MHz was used to calculate the limit.



**5.2.6. Transmitter Number of Hopping Frequencies and Average Time of Occupancy****Test Summary:**

Test Engineer:	Tim Stanley	Test Date:	19 May 2011
Test Sample Serial No:	356333040014073		

FCC Part:	15.247(a)(1)(iii)
Test Method Used:	As detailed in ANSI C63.10 Section 7.7.3 & 7.7.4

**Environmental Conditions:**

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

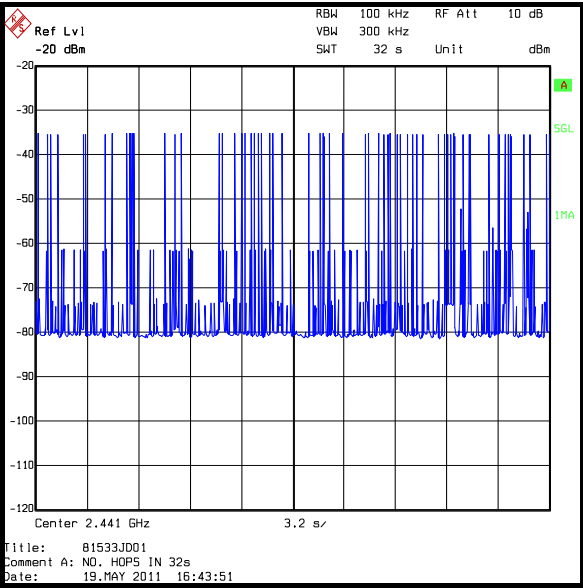
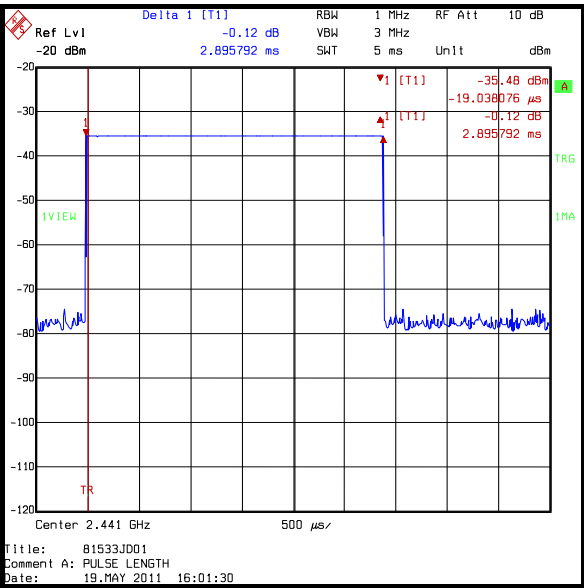
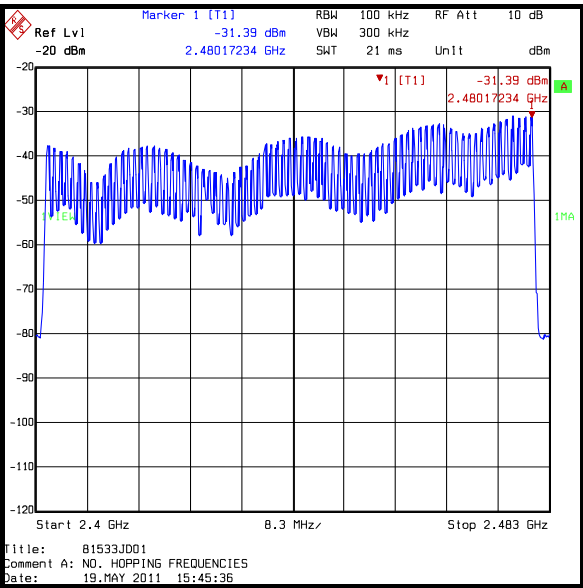
**Results:**

Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2895.792	64	0.185	0.4	0.215	Complied

**Note(s):**

1. Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.

Transmitter Number of Hopping Frequencies and Average Time of Occupancy (continued)



**5.2.7. Transmitter Maximum Peak Output Power****Test Summary:**

<b>Test Engineer:</b>	Ian Watch	<b>Test Date:</b>	25 May 2011
<b>Test Sample Serial No:</b>	356333040014099		

<b>FCC Part:</b>	15.247(b)(3)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.10.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	20

**Results: DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	0.2	30.0	29.8	Complied
Middle	0.2	30.0	29.8	Complied
Top	0.7	30.0	29.3	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	0.2	-2.3	-2.1	36.0	38.1	Complied
Middle	0.2	-2.3	-2.1	36.0	38.1	Complied
Top	0.7	-2.3	-1.6	36.0	37.6	Complied

**Results: 2DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	0.6	21.0	20.4	Complied
Middle	0.6	21.0	20.4	Complied
Top	0.3	21.0	20.7	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	0.6	-2.3	-1.7	27.0	28.7	Complied
Middle	0.6	-2.3	-1.7	27.0	28.7	Complied
Top	0.3	-2.3	-2.0	27.0	29.0	Complied



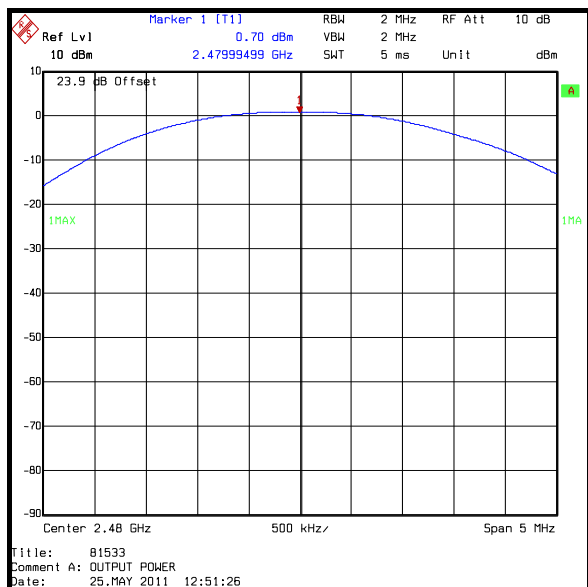
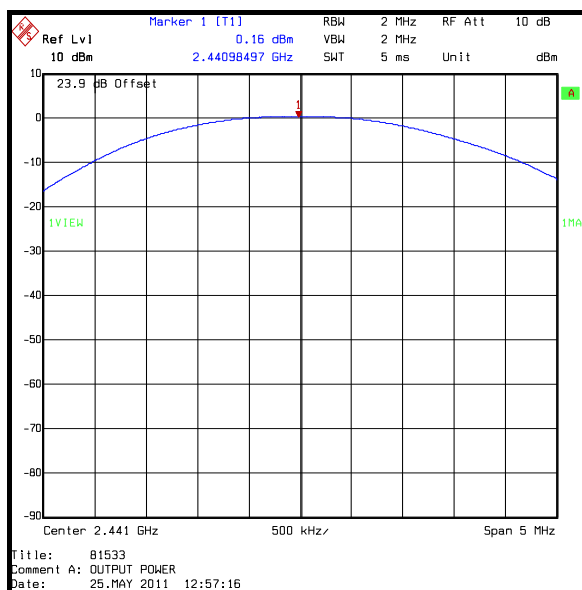
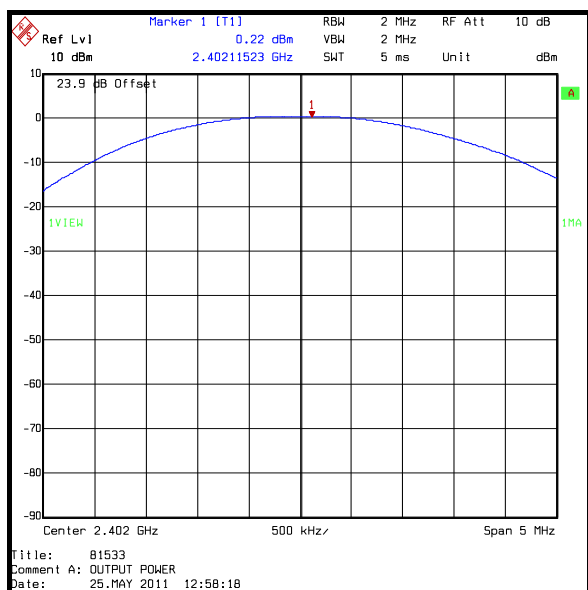
**Transmitter Maximum Peak Output Power (continued)****Results: 3DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	1.0	21.0	20.0	Complied
Middle	1.3	21.0	19.7	Complied
Top	1.0	21.0	20.0	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	1.0	-2.3	-1.3	27.0	28.3	Complied
Middle	1.3	-2.3	-1.0	27.0	28.0	Complied
Top	1.0	-2.3	-1.3	27.0	28.3	Complied

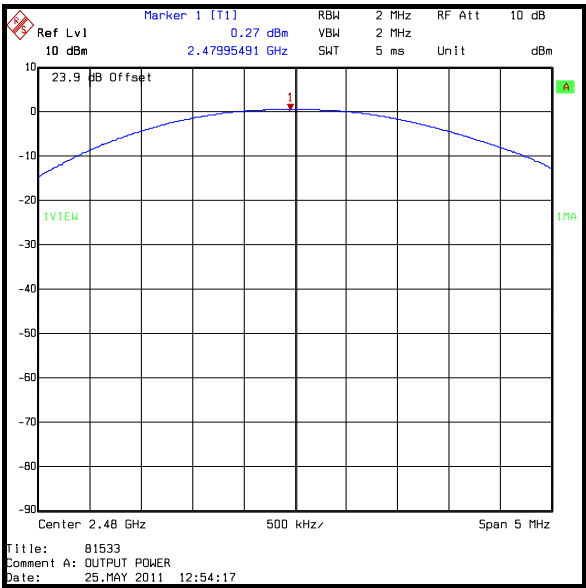
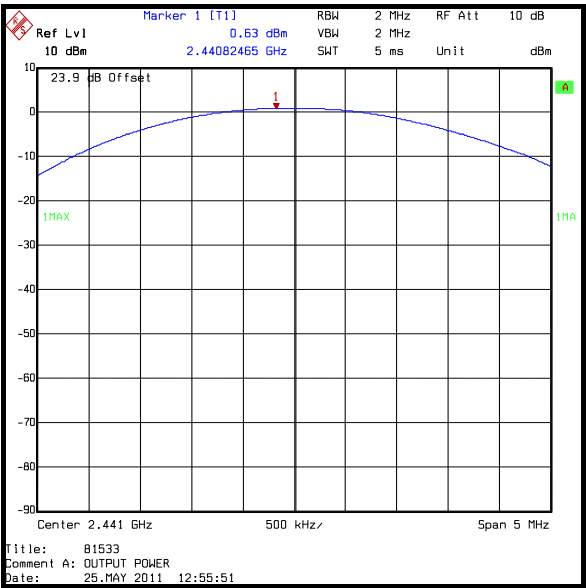
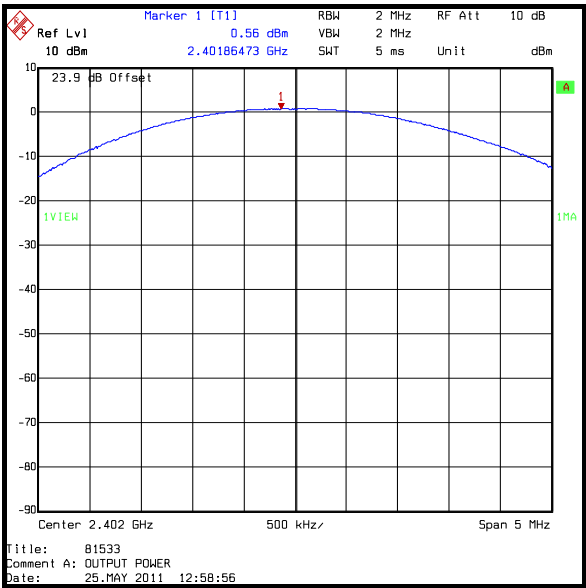
**Note(s):**

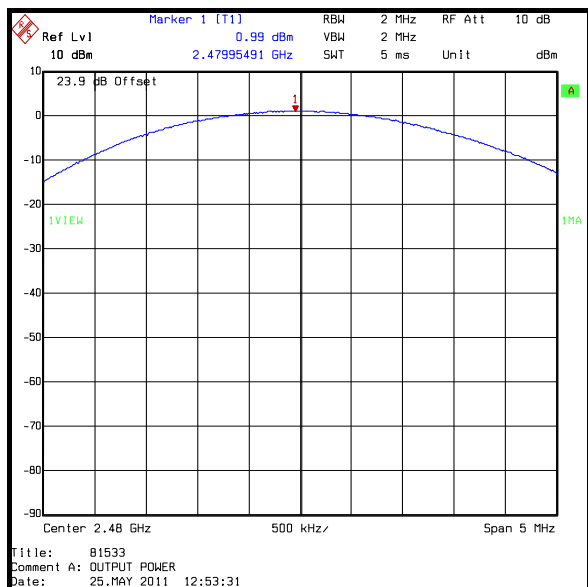
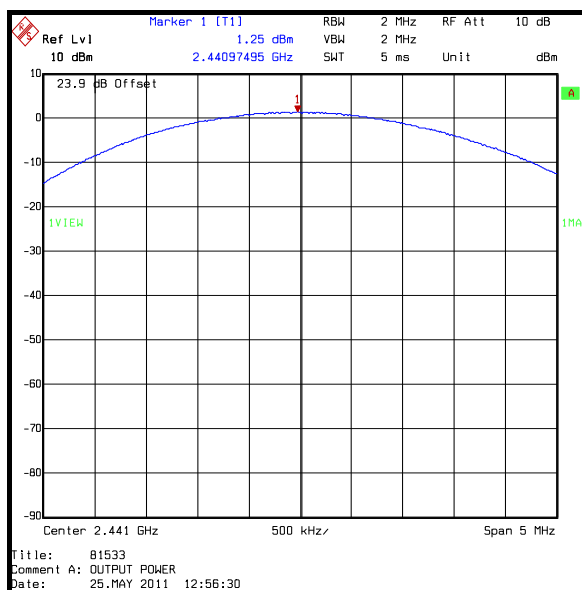
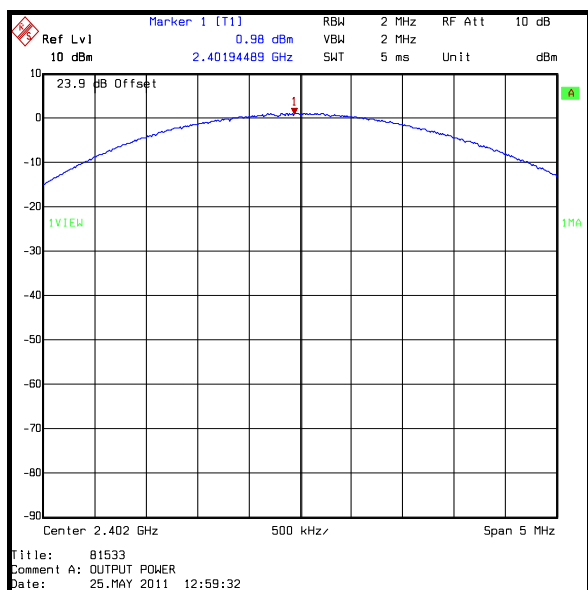
1. Measurements were made on a conducted sample using a directional coupler fitted between the EUT and the Bluetooth tester. The spectrum analyser was connected to the coupled port and the insertion loss of the coupler and associated cables entered as an RF level offset on the spectrum analyser.
2. In order to obtain the EIRP the declared antenna gain was added to the measured conducted peak power.

**Transmitter Maximum Peak Output Power (continued)****Results: DH5**

Transmitter Maximum Peak Output Power (continued)

Results: 2DH5



**Transmitter Maximum Peak Output Power (continued)****Results: 3DH5**

**5.2.8. Transmitter Radiated Emissions****Test Summary:**

<b>Test Engineer:</b>	Patrick Jones	<b>Test Date:</b>	18 May 2011
<b>Test Sample Serial No:</b>	356333040014073		

<b>FCC Part:</b>	15.247(d) & 15.209(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
<b>Frequency Range</b>	30 MHz to 1000 MHz

**Environmental Conditions:**

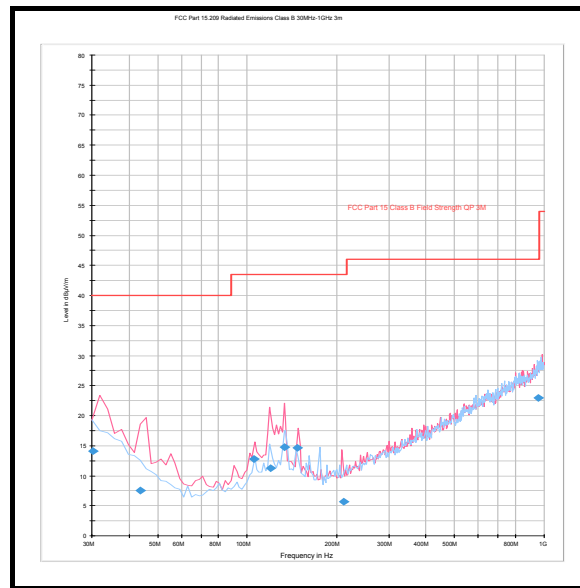
<b>Temperature (°C):</b>	31
<b>Relative Humidity (%):</b>	27

**Results: Quasi-Peak 3-DH5**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
30.322	Vertical	14.1	40.0	25.9	Complied
43.632	Vertical	7.6	40.0	32.4	Complied
105.162	Vertical	12.8	43.5	30.7	Complied
120.347	Vertical	11.2	43.5	32.3	Complied
133.194	Vertical	14.7	43.5	28.8	Complied
147.245	Vertical	14.7	43.5	28.8	Complied
211.045	Vertical	5.7	43.5	37.8	Complied
952.571	Horizontal	23.0	46.0	23.0	Complied

**Note(s):**

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
3. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

**Transmitter Radiated Emissions (continued)**

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

**Transmitter Radiated Emissions (continued)****Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	11 May 2011
<b>Test Sample Serial No:</b>	356333040014073		

<b>FCC Part:</b>	15.247(d) & 15.209(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
<b>Frequency Range</b>	1 GHz to 25.0 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	20

**Results: Peak Bottom Channel 3DH5**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4804.591	Horizontal	42.5	74.0	31.5	Complied

**Results: Average Bottom Channel 3DH5**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4804.591	Horizontal	30.8	54.0	23.2	Complied

**Results: Peak Middle Channel 3DH5**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4882.070	Horizontal	43.7	74.0	30.3	Complied

**Results: Average Middle Channel 3DH5**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4882.070	Horizontal	32.3	54.0	21.7	Complied

**Transmitter Radiated Emissions (continued)****Results: Peak Top Channel 3DH5**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4960.050	Horizontal	44.8	74.0	29.2	Complied

**Results: Average Top Channel 3DH5**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4960.050	Horizontal	32.9	54.0	21.1	Complied

**Results: Peak Hopping Mode 3DH5**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4916.513	Horizontal	43.1	74.0	30.9	Complied

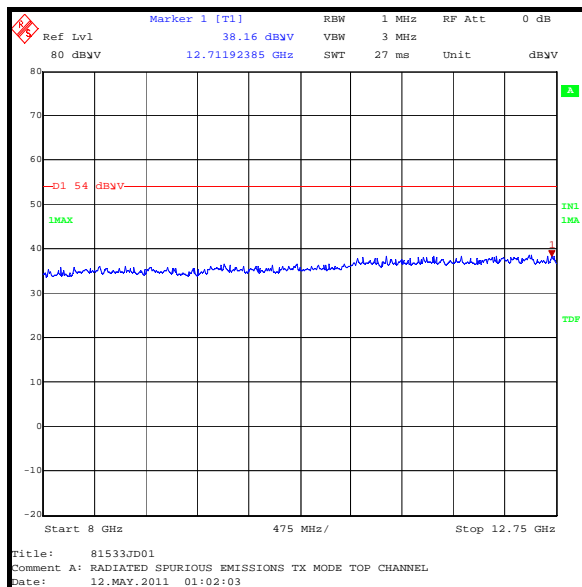
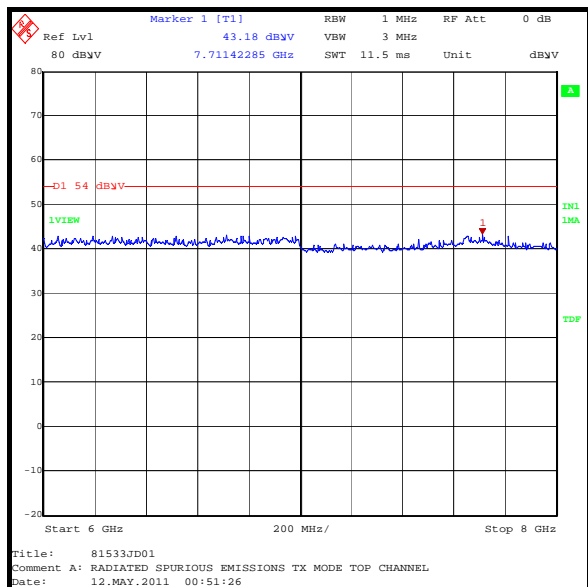
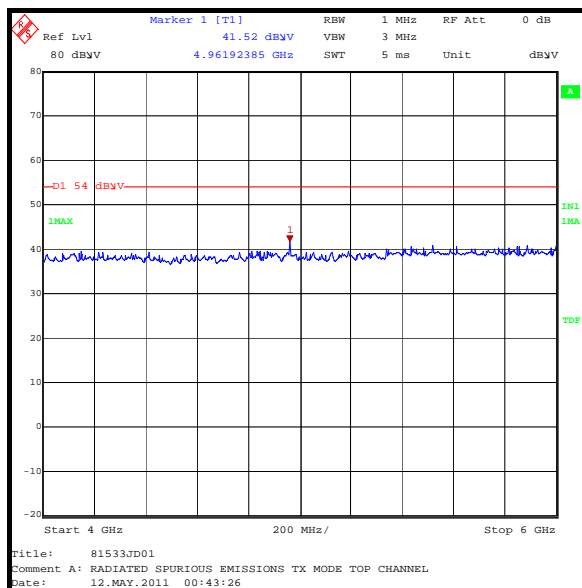
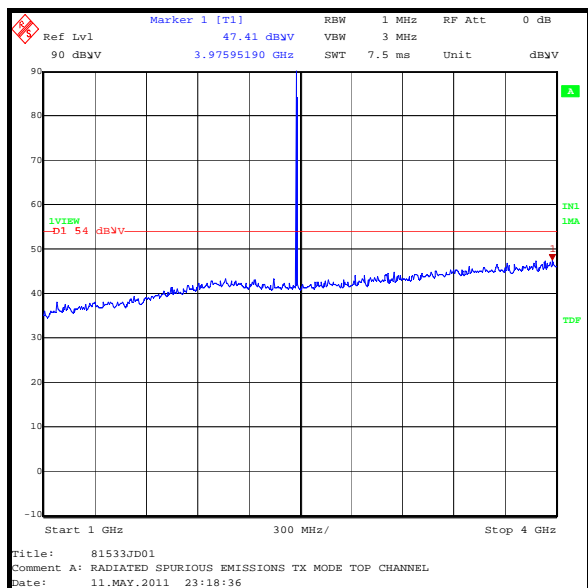
**Results: Average Hopping Mode 3DH5**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4881.764	Horizontal	27.2	54.0	26.8	Complied

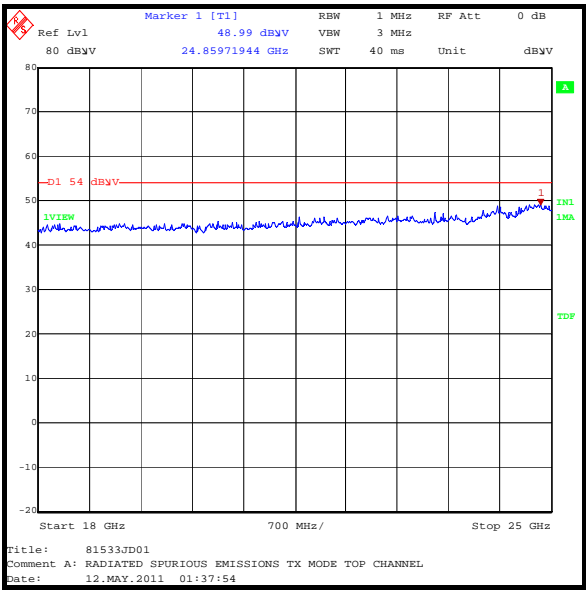
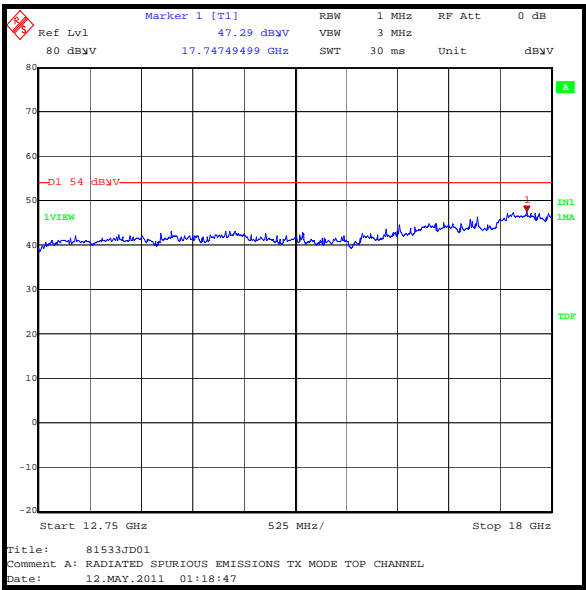
**Note(s):**

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. The emission shown on the 1 GHz to 4 GHz plot is the EUT fundamental at 2480 MHz.
3. All other emissions shown on the pre-scan plots were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. The EUT was found to radiate the highest emission levels in 3DH5 mode. Final measurements were performed in DH5 mode.



**Transmitter Radiated Emissions (continued)**

Transmitter Radiated Emissions (continued)



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

**5.2.9. Transmitter Band Edge Radiated Emissions****Test Summary:**

<b>Test Engineer:</b>	Tim Stanley	<b>Test Date:</b>	12 May 2011
<b>Test Sample Serial No:</b>	356333040014073		

<b>FCC Part:</b>	15.247(d) & 15.209(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.9.2

**Environmental Conditions:**

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

**Results: Static Mode DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	43.5	74.1*	30.6	Complied
2483.5	Horizontal	52.7	74.0	21.3	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	43.1	54.0	10.9	Complied

**Results: Hopping Mode DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	43.5	74.1*	30.6	Complied
2483.5	Horizontal	52.3	74.0	21.7	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	39.3	54.0	14.7	Complied

**Results: Static Mode 2DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	45.6	70.7*	25.1	Complied
2483.5	Horizontal	53.7	74.0	20.3	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	42.8	54.0	11.2	Complied

**Transmitter Band Edge Radiated Emissions (continued)****Results: Hopping Mode 2DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	45.0	70.7*	25.7	Complied
2483.5	Horizontal	52.7	74.0	21.3	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	39.3	54.0	14.7	Complied

**Results: Static Mode 3DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	45.8	70.7*	24.9	Complied
2483.5	Horizontal	54.4	74.0	19.6	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	43.0	54.0	11.0	Complied

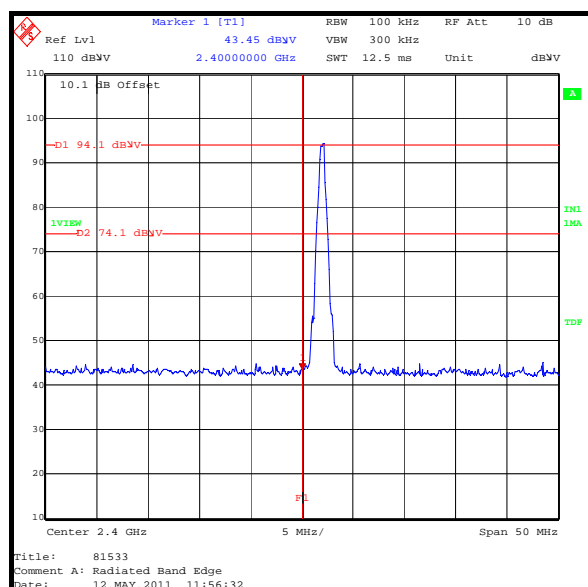
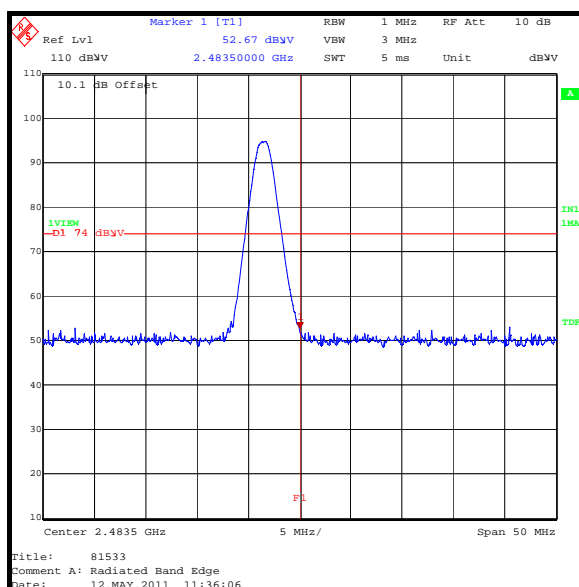
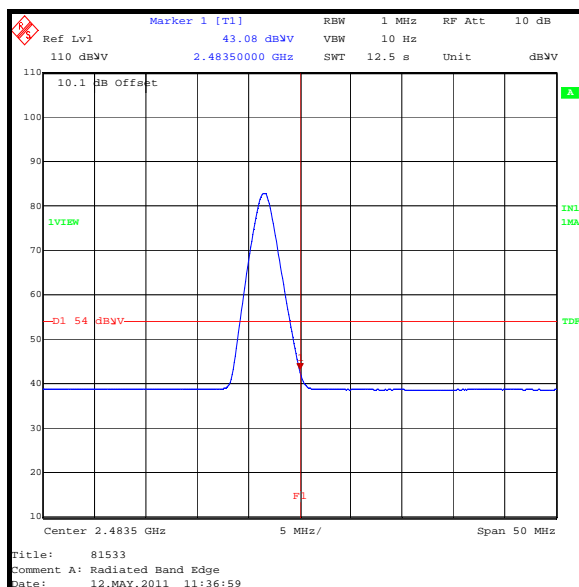
**Results: Hopping Mode 3DH5**

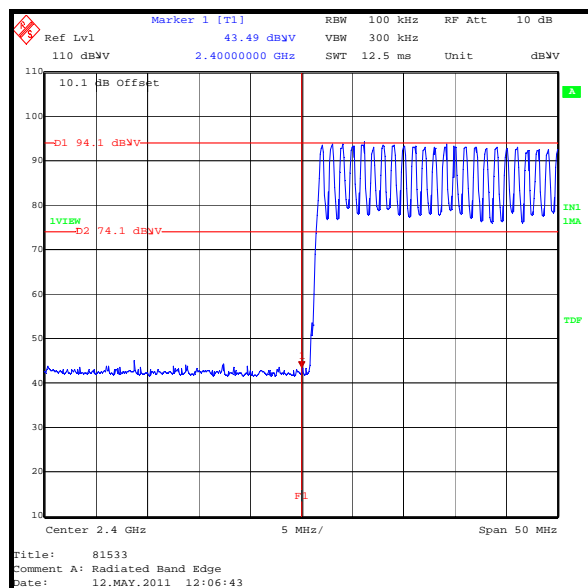
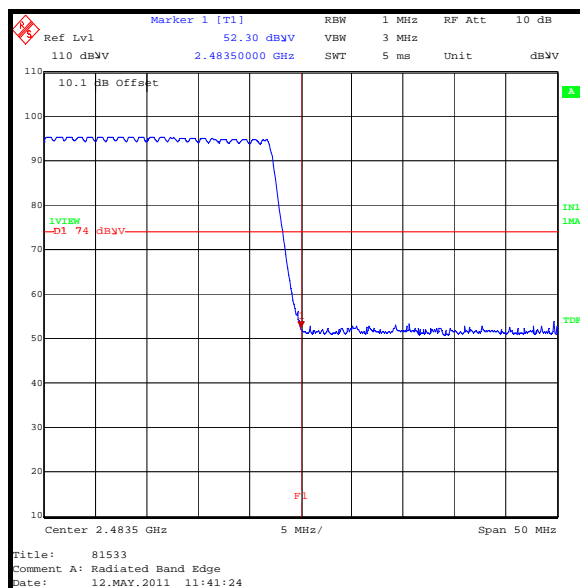
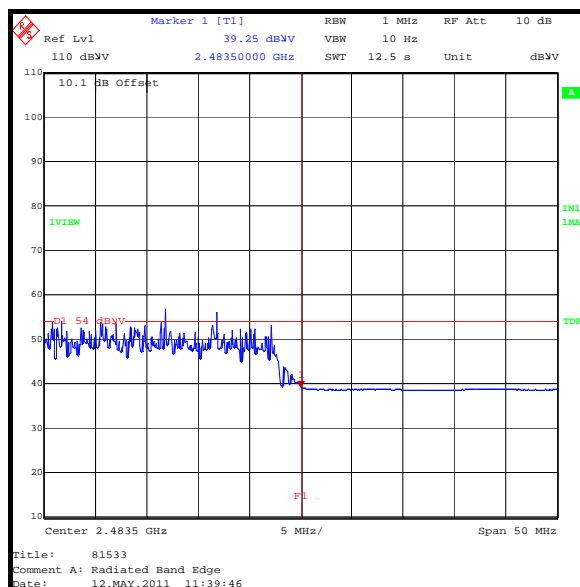
Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	43.4	70.0*	26.6	Complied
2483.5	Horizontal	53.1	74.0	20.9	Complied

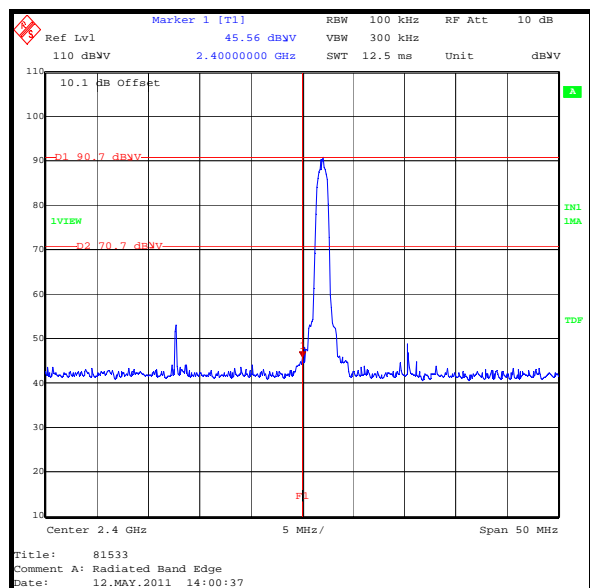
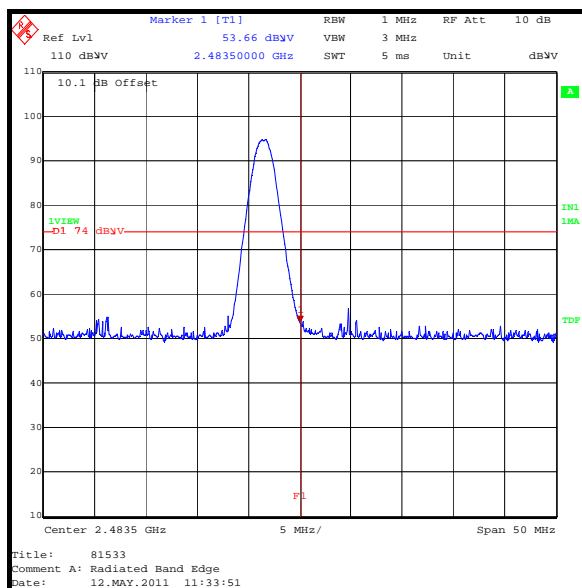
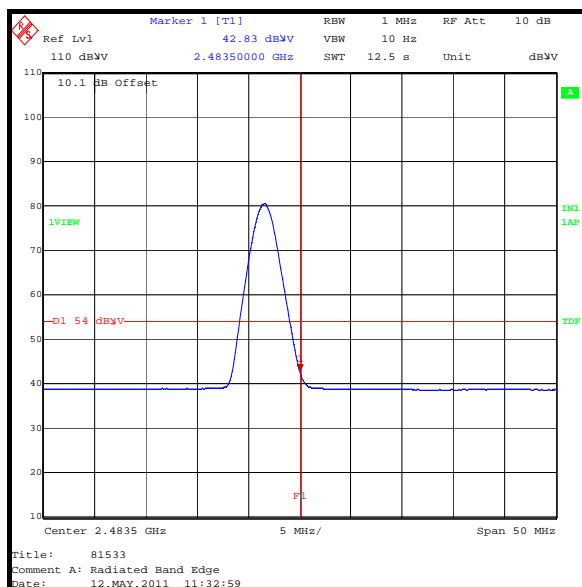
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	39.3	54.0	14.7	Complied

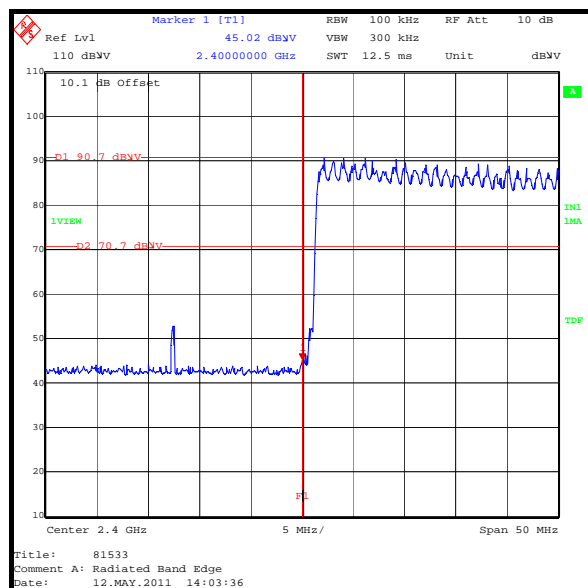
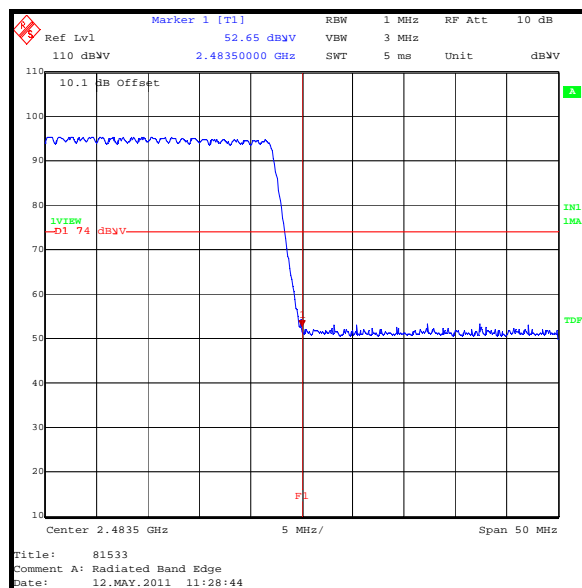
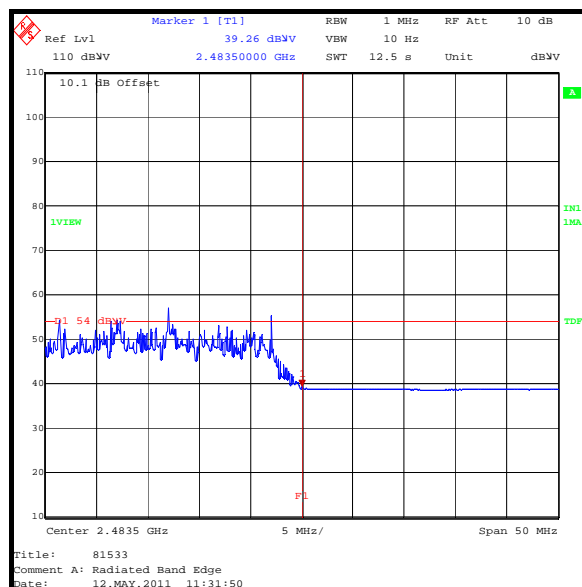
**Note(s):**

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. \* -20 dBc limit

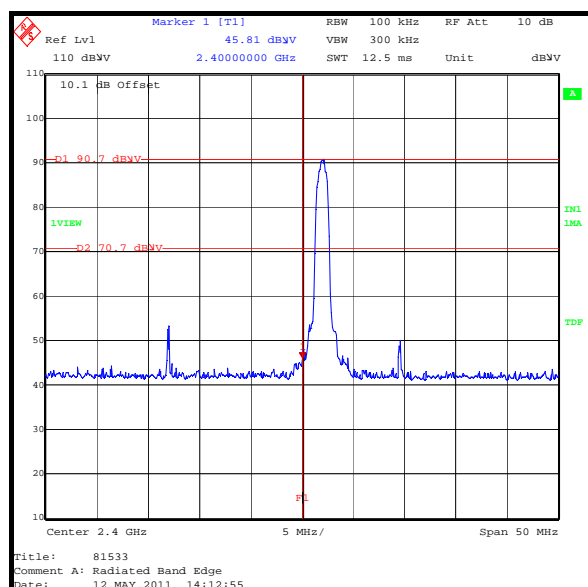
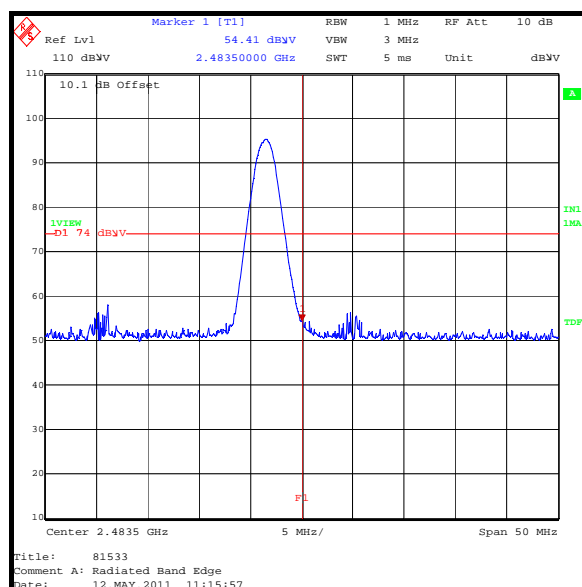
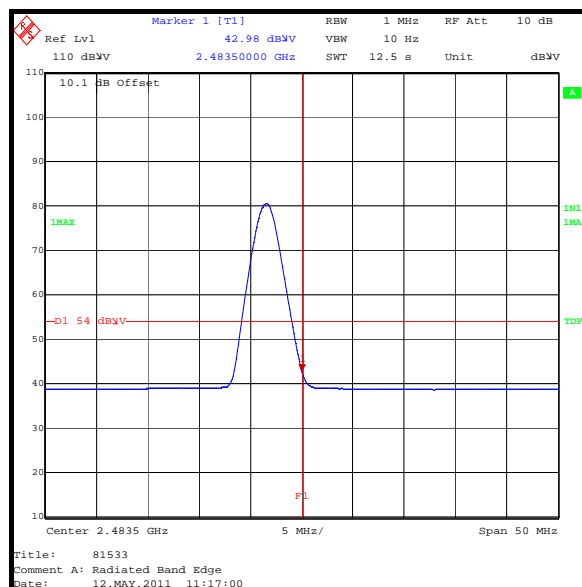
**Transmitter Band Edge Radiated Emissions (continued)****DH5 Static Mode****Lower Band Edge Peak Static****Upper Band Edge Peak Static****Upper Band Edge Average Static**

**Transmitter Band Edge Radiated Emissions (continued)****DH5 Hopping Mode****Lower Band Edge Peak Hopping****Upper Band Edge Peak Hopping****Upper Band Edge Average Hopping**

**Transmitter Band Edge Radiated Emissions (continued)****2DH5 Static Mode****Lower Band Edge Peak Static****Upper Band Edge Peak Static****Upper Band Edge Average Static**

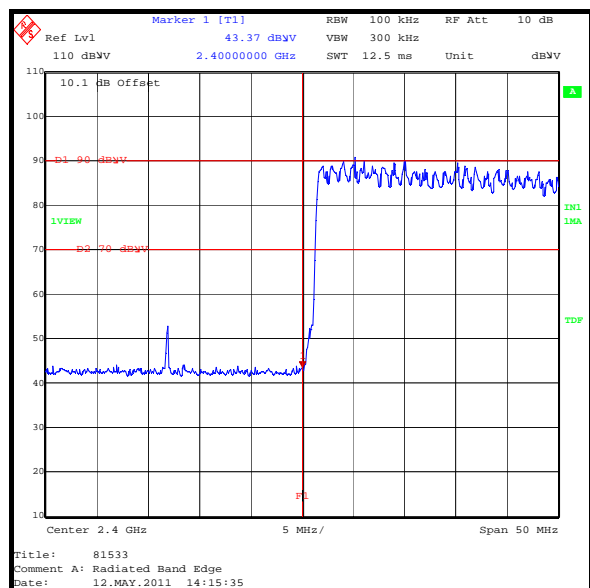
**Transmitter Band Edge Radiated Emissions (continued)****2DH5 Hopping Mode****Lower Band Edge Peak Hopping****Upper Band Edge Peak Hopping****Upper Band Edge Average Hopping**



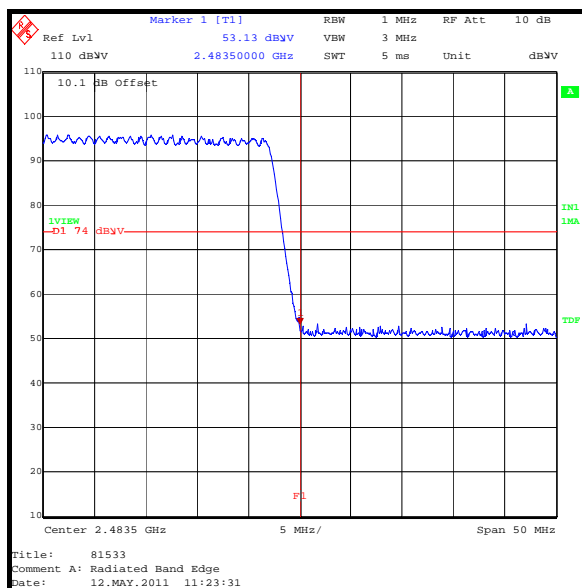
**Transmitter Band Edge Radiated Emissions (continued)****3DH5 Static Mode****Lower Band Edge Peak Static****Upper Band Edge Peak Static****Upper Band Edge Average Static**

### Transmitter Band Edge Radiated Emissions (continued)

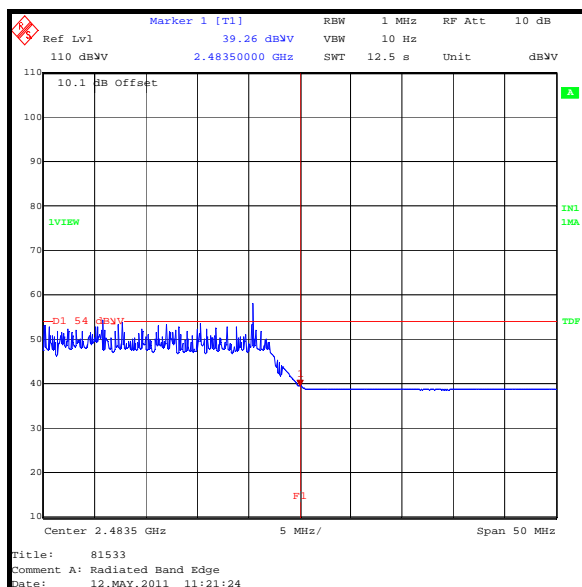
### 3DH5 Hopping Mode



### Lower Band Edge Peak Hopping



### Upper Band Edge Peak Hopping



### Upper Band Edge Average Hopping

## **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%	±3.25 dB
Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±2.94 dB
Carrier Frequency Separation	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
Average Time of Occupancy	2.4 GHz to 2.4835 GHz	95%	±0.3 ns
20 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 26.5 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**

<b>RFI No.</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Type No.</b>	<b>Serial No.</b>	<b>Date Calibration Due</b>	<b>Cal. Interval (months)</b>
A1141	Directional Coupler	Hewlett Packard	11691D	1212A02494	Calibrated before use	-
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	06 Jun 2011	12
A1818	Antenna	EMCO	3115	00075692	05 Sep 2011	12
A1830	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100668	05 Mar 2012	12
A1834	Attenuator	Hewlett Packard	8491B	10444	30 Jun 2011	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	29 Dec 2011	12
A1996	Attenuator	Huber + Suhner	6810.17.B	301749	09 Feb 2012	12
A253	Antenna	Flann Microwave	12240-20	128	05 Sep 2011	12
A254	Antenna	Flann Microwave	14240-20	139	05 Sep 2011	12
A255	Antenna	Flann Microwave	16240-20	519	05 Sep 2011	12
A256	Antenna	Flann Microwave	18240-20	400	05 Sep 2011	12
A436	Antenna	Flann Microwave	20240-20	330	05 Sep 2011	12
A553	Antenna	Chase	CBL6111A	1593	26 Mar 2012	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	05 Apr 2012	12
E013	Environmental Chamber	Sanyo	ATMOS chamber	None	Calibrated before use	-
G0543	Amplifier	Sonoma Instrument	310N	230801	30 Jun 2011	12
K0001	5m Semi-Anechoic Chamber	Rainford EMC	N/A	N/A	25 Jun 2011	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	05 Sep 2011	12
L1023	Bluetooth tester	Tescom	TC-3000A	3000A31004 2	Calibration not required	-
M1124	Test Receiver	Rohde & Schwarz	ESI26	100046K	22 Jun 2011	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	28 Jun 2011	12
M1269	Multimeter	Fluke	179	90250210	15 Jul 2011	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	15 Sep 2011	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	04 Feb 2012	12
S0537	DC Power Supply	TTI	EL302D	249928	Calibrated before use	-

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