



# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Softbank S21CS1

FCC ID: UCE211049A

To: FCC Part 15.247: 2011 Subpart C

**Test Report Serial No:**  
RFI-RPT-RP87154JD01B V2.0

**Version 2.0 Supersedes All Previous Versions**

This Test Report Is Issued Under The Authority  
Of John Newell, Group Quality Manager:

Checked By:	Steven White
Signature:	
Date of Issue:	31 May 2012

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## **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) 2011: 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) 2011: 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) 2011: 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>	23 April 2012 to 18 May 2012

### 2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
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>	Panasonic
<b>Model Name or Number:</b>	S21CS1
<b>IMEI:</b>	004401221227289 (Radiated Sample) 004401221227263 (Radiated Sample) 004401221227123 (Conducted Sample)
<b>Hardware Version Number:</b>	Rev C
<b>Software Version Number:</b>	ACPU: B-S21CS1-007.01.001 CCPU: Cv4A000303
<b>FCC ID:</b>	UCE211049A

<b>Brand Name:</b>	Softbank
<b>Description:</b>	Battery
<b>Model Name or Number:</b>	PMBAS1

<b>Brand Name:</b>	Softbank
<b>Description:</b>	AC Charger
<b>Model Name or Number:</b>	ZTDAA1

<b>Brand Name:</b>	Softbank
<b>Description:</b>	Charge/USB Data cable
<b>Model Name or Number:</b>	ZTFE01

<b>Brand Name:</b>	Softbank
<b>Description:</b>	Personal Hands-Free
<b>Model Name or Number:</b>	ZTCK01/ZTBBA1

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

The equipment under test was a Dual Mode UMTS/GSM Mobile Phone with *Bluetooth*

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

No modifications were applied to the EUT during testing.

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

<b>Tested Technology:</b>	<i>Bluetooth</i>		
<b>Power Supply Requirement:</b>	Nominal	3.7 V	
<b>Type of Unit:</b>	Transceiver		
<b>Channel Spacing:</b>	1 MHz		
<b>Mode:</b>	Basic Rate	Enhanced Data Rate	
<b>Modulation:</b>	GFSK	$\pi/4$ -DQPSK	8DQPSK
<b>Packet Type: (Maximum Payload)</b>	DH5	2DH5	3DH5
<b>Data Rate (Mbit/s):</b>	1	2	3
<b>Declared Antenna Gain:</b>	1.5 dBi		
<b>Maximum Conducted Output Power:</b>	1.0 dBm		
<b>Transmit Frequency Range:</b>	2402 MHz to 2480 MHz		
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480
<b>Receive Frequency Range:</b>	2402 MHz to 2480 MHz		
<b>Receive Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	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>	Not stated
<b>Description:</b>	Micro SD Memory Card
<b>Model Name or Number:</b>	Not 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: Standalone, 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: Standalone, with the Bluetooth mode 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 USB cable connected to the EUT as this was found to be the worst case during pre-scans. The USB cable was terminated into a USB hub supplied by the client. All the accessories were individually connected and measurements made during the pre-scans to determine the worst case combination.
- The EUT conducted sample was used for 20 dB bandwidth, carrier frequency separation, average time of occupancy and conducted peak output power tests
- The EUT radiated sample was used for AC conducted emissions and radiated spurious emissions 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 Engineer:	Nick Steele	Test Date:	24 April 2012
Test Sample IMEI:	004401221227289		

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

#### **Environmental Conditions:**

Temperature (°C):	19
Relative Humidity (%):	42

#### **Results: Live / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.168	Live	42.2	65.1	22.9	Complied
0.168	Live	39.5	65.1	25.6	Complied
0.195	Live	47.2	63.8	16.6	Complied
0.361	Live	30.5	58.7	28.2	Complied
0.397	Live	32.7	57.9	25.2	Complied
1.617	Live	22.8	56.0	33.2	Complied

#### **Results: Live / Average**

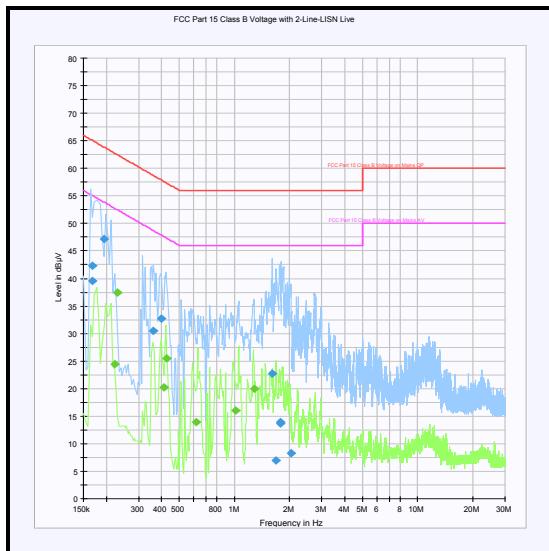
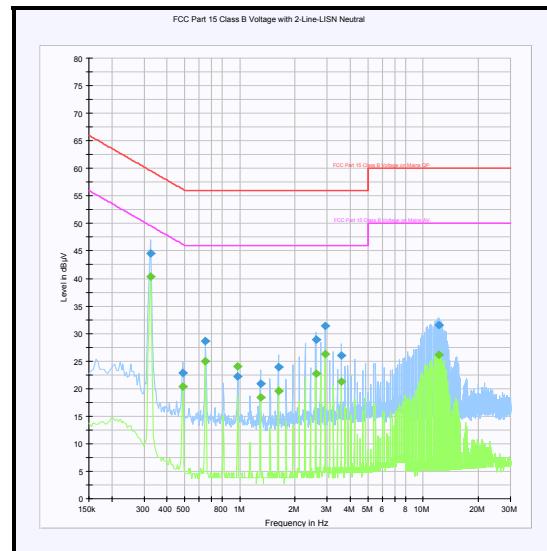
Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.222	Live	24.5	52.7	28.2	Complied
0.231	Live	37.5	52.4	14.9	Complied
0.411	Live	20.2	47.6	27.4	Complied
0.429	Live	25.5	47.3	21.8	Complied
1.018	Live	16.1	46.0	29.9	Complied
1.293	Live	20.0	46.0	26.0	Complied

**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
0.325	Neutral	44.5	59.6	15.1	Complied
0.649	Neutral	28.6	56.0	27.4	Complied
1.621	Neutral	23.9	56.0	32.1	Complied
2.598	Neutral	28.9	56.0	27.1	Complied
2.922	Neutral	31.4	56.0	24.6	Complied
12.174	Neutral	31.5	60.0	28.5	Complied

**Results: Neutral / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.325	Neutral	40.4	49.6	9.2	Complied
0.649	Neutral	25.0	46.0	21.0	Complied
0.973	Neutral	24.0	46.0	22.0	Complied
2.598	Neutral	22.7	46.0	23.3	Complied
2.922	Neutral	26.3	46.0	19.7	Complied
12.174	Neutral	26.1	50.0	23.9	Complied

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

*Note: These plots are pre-scans 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>	Nick Steele	<b>Test Date:</b>	23 April 2012 & 24 April 2012
<b>Test Sample Serial No:</b>	004401221227289		

<b>FCC Part:</b>	15.109
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.3 and 6.5 referencing ANSI C63.4
<b>Frequency Range:</b>	30 MHz to 1000 MHz

**Environmental Conditions:**

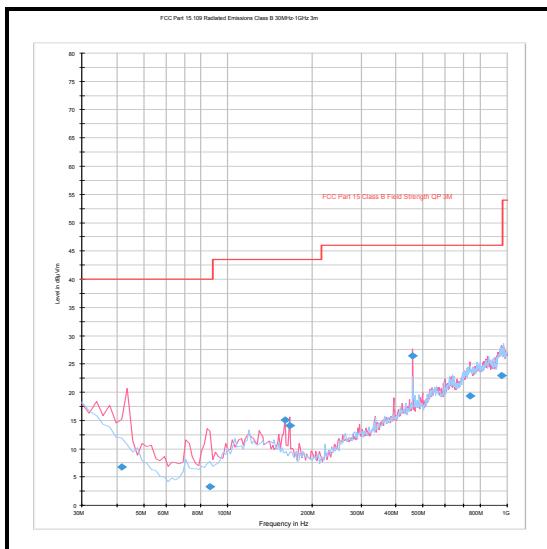
<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	31

**Results: Quasi Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
41.592	Vertical	6.7	40.0	33.3	Complied
160.014	Vertical	15.1	43.5	28.4	Complied
166.067	Vertical	14.1	43.5	29.4	Complied
458.767	Vertical	26.5	46.0	19.5	Complied
735.010	Vertical	19.3	46.0	26.7	Complied
955.276	Vertical	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. 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.
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>	Nick Steele	<b>Test Date:</b>	24 April 2012
<b>Test Sample Serial No:</b>	004401221227289		

<b>FCC Part:</b>	15.109
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.3 and 6.5 referencing ANSI C63.4
<b>Frequency Range:</b>	1 GHz to 12.75 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	20
<b>Relative Humidity (%):</b>	24

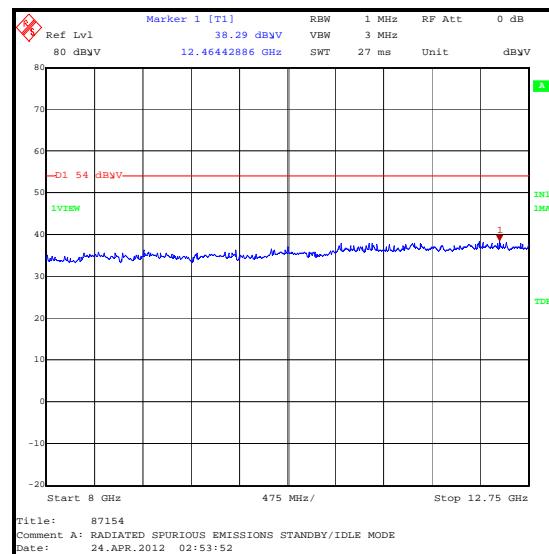
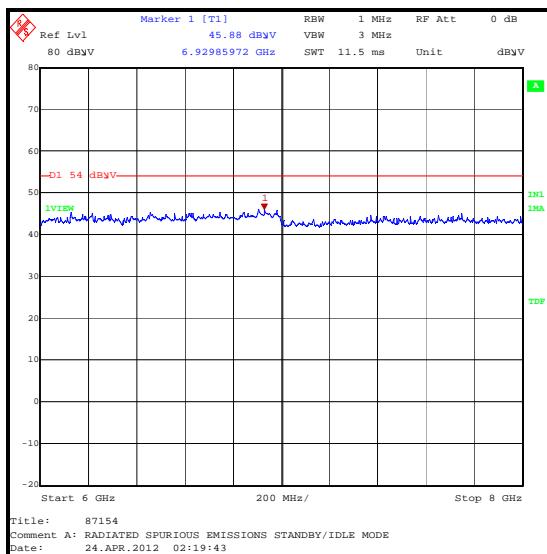
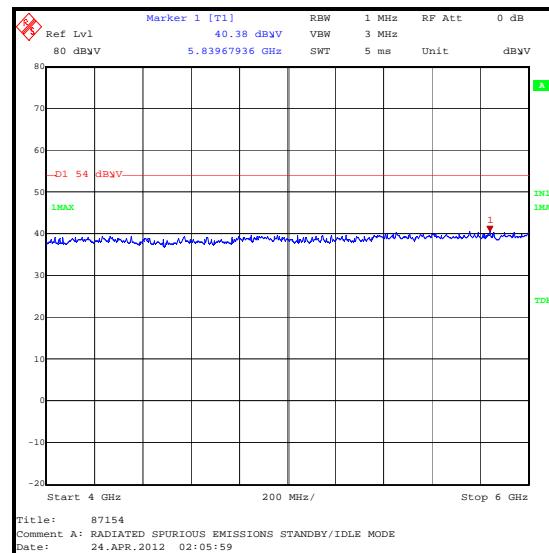
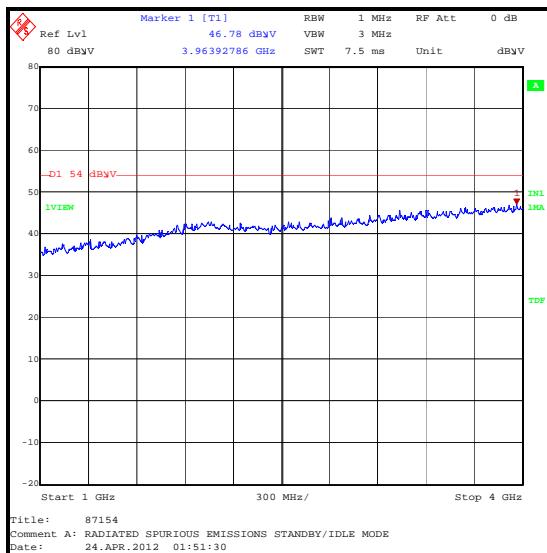
**Results:**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
3963.928	Vertical	46.8	54.0	7.2	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. 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.
3. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.

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



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

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

Test Engineer:	Andrew Edwards	Test Date:	18 May 2012
Test Sample Serial No:	00440122122729		

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

**Environmental Conditions:**

Temperature (°C):	27
Relative Humidity (%):	31

**Results: Live / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.240	Live	41.8	62.1	20.3	Complied
0.505	Live	38.0	56.0	18.0	Complied
1.495	Live	32.0	56.0	24.0	Complied
1.612	Live	39.9	56.0	16.1	Complied
1.675	Live	42.1	56.0	13.9	Complied
2.179	Live	32.3	56.0	23.7	Complied
2.391	Live	33.2	56.0	22.8	Complied
2.503	Live	30.1	56.0	25.9	Complied
2.877	Live	30.4	56.0	25.6	Complied
3.250	Live	23.4	56.0	32.6	Complied

**Results: Live / Average**

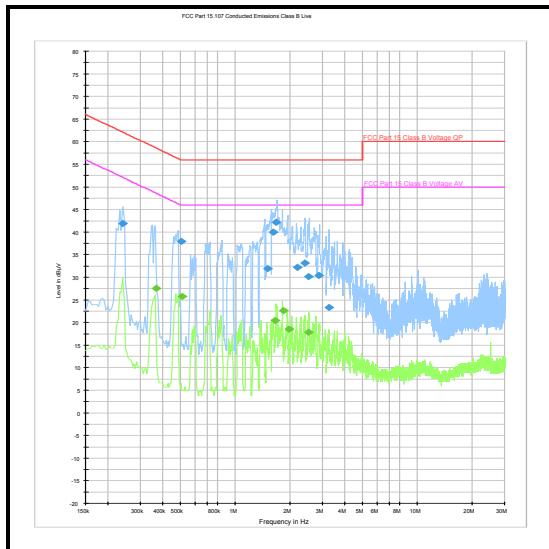
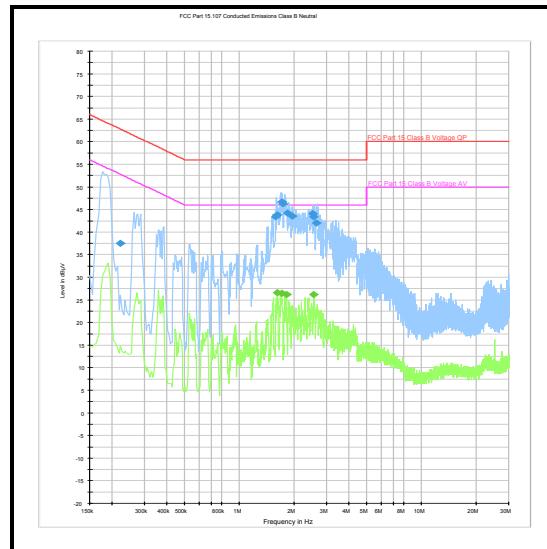
Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.366	Live	27.5	48.6	21.1	Complied
0.510	Live	25.8	46.0	20.2	Complied
1.639	Live	20.4	46.0	25.6	Complied
1.833	Live	22.6	46.0	23.4	Complied
1.968	Live	18.5	46.0	27.5	Complied
2.521	Live	17.9	46.0	28.1	Complied

**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
0.222000	Neutral	37.6	62.7	25.1	Complied
1.567500	Neutral	43.4	56.0	12.6	Complied
1.612500	Neutral	43.8	56.0	12.2	Complied
1.711500	Neutral	46.6	56.0	9.4	Complied
1.725000	Neutral	46.3	56.0	9.7	Complied
1.824000	Neutral	44.2	56.0	11.8	Complied
1.941000	Neutral	43.5	56.0	12.5	Complied
2.512500	Neutral	44.0	56.0	12.0	Complied
2.535000	Neutral	43.4	56.0	12.6	Complied
2.647500	Neutral	42.0	56.0	14.0	Complied

**Results: Neutral / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
1.603500	Neutral	26.6	46.0	19.4	Complied
1.716000	Neutral	26.4	46.0	19.6	Complied
1.810500	Neutral	26.2	46.0	19.8	Complied
2.530500	Neutral	26.2	46.0	19.8	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:**

Test Engineer:	Mark Percival	Test Date:	18 May 2012
Test Sample Serial No:	004401221227123		

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

**Environmental Conditions:**

Temperature (°C):	24
Relative Humidity (%):	33

**Results DH5:**

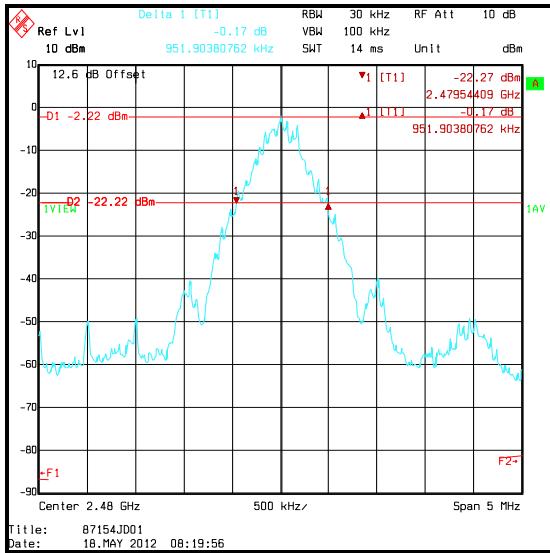
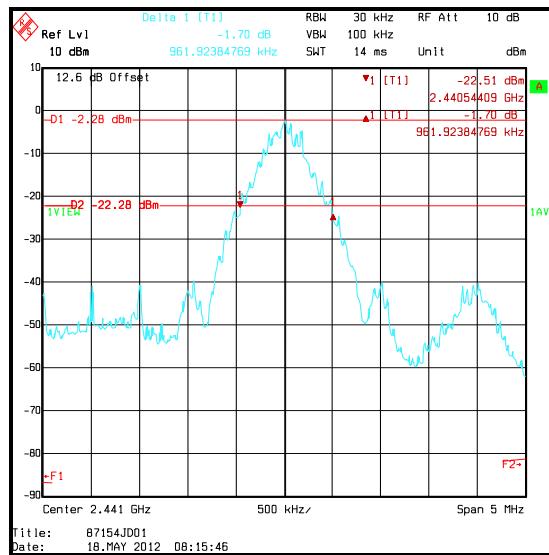
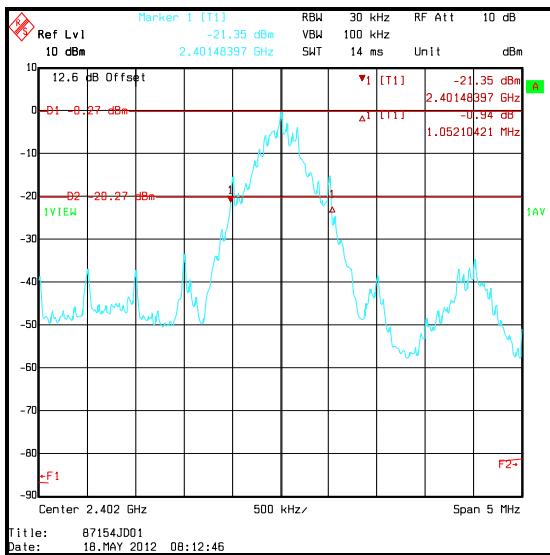
Channel	20 dB Bandwidth (kHz)
Bottom	1052.104
Middle	961.924
Top	951.904

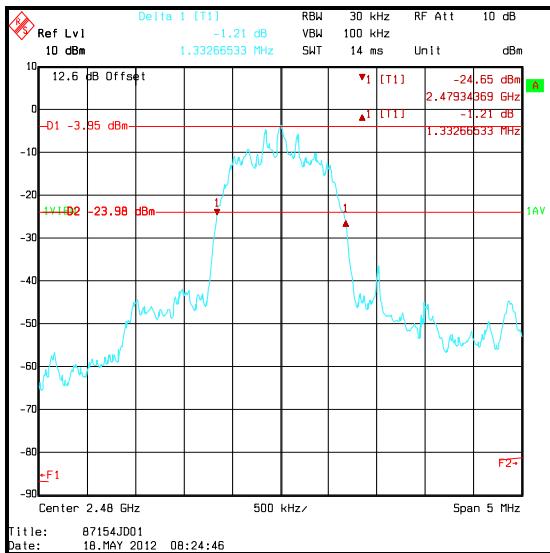
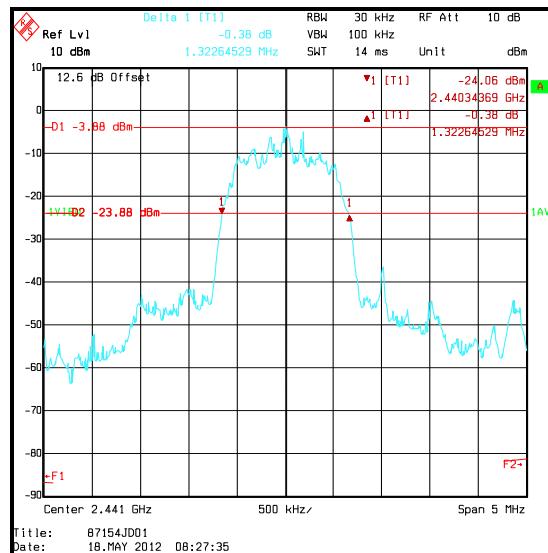
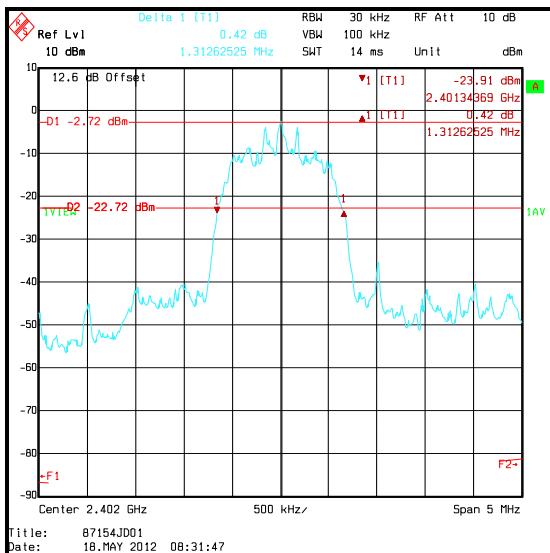
**Results 2DH5:**

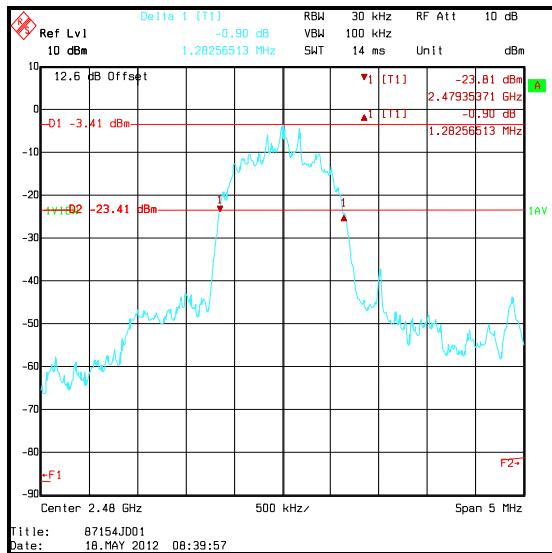
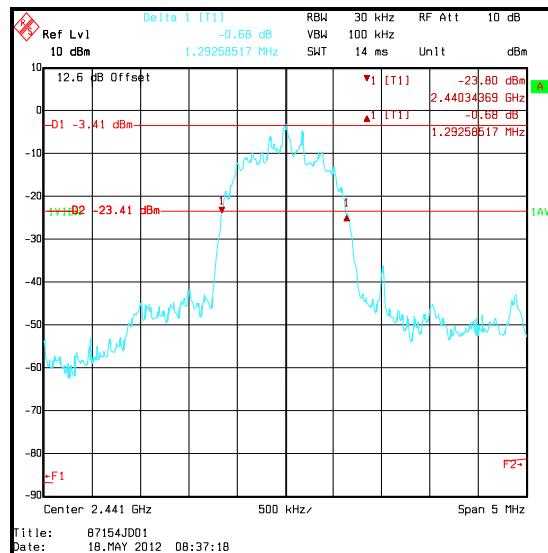
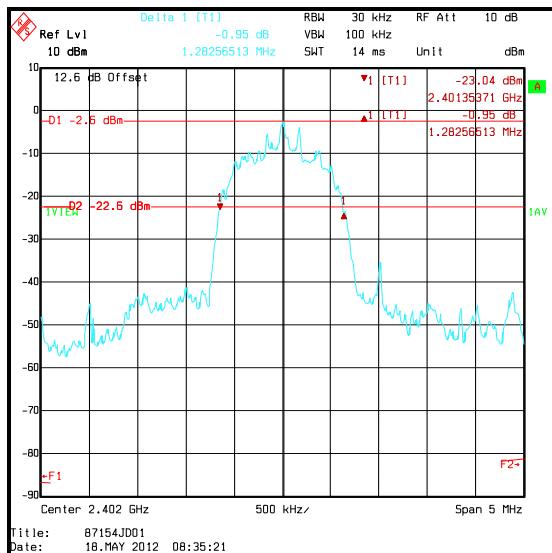
Channel	20 dB Bandwidth (kHz)
Bottom	1312.625
Middle	1322.645
Top	1332.665

**Results 3DH5:**

Channel	20 dB Bandwidth (kHz)
Bottom	1282.565
Middle	1292.585
Top	1282.565

**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:	Mark Percival	Test Date:	18 May 2012
Test Sample Serial No:	004401221227123		

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

#### Environmental Conditions:

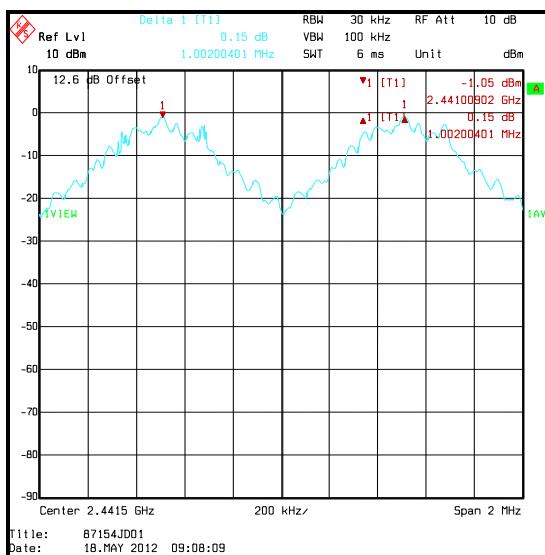
Temperature (°C):	24
Relative Humidity (%):	33

#### Results: DH5

Carrier Frequency Separation (kHz)	Limit (2/3 of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.004	641.283	360.721	Complied

#### Note(s):

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

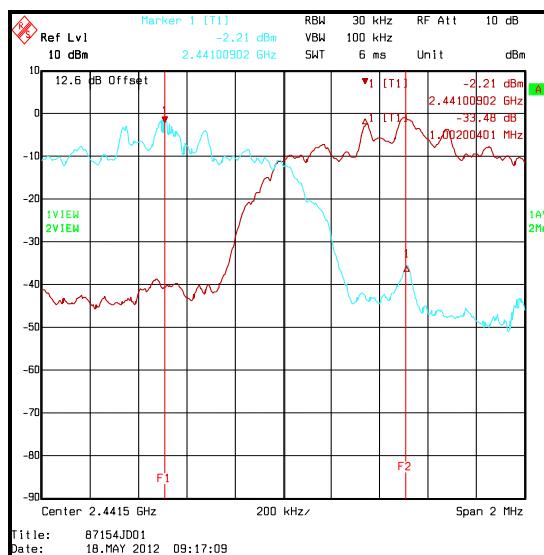


**Transmitter Carrier Frequency Separation (continued)****Results: 2DH5**

Carrier Frequency Separation (kHz)	Limit ( $\frac{2}{3}$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.004	881.763	120.241	Complied

**Note(s):**

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

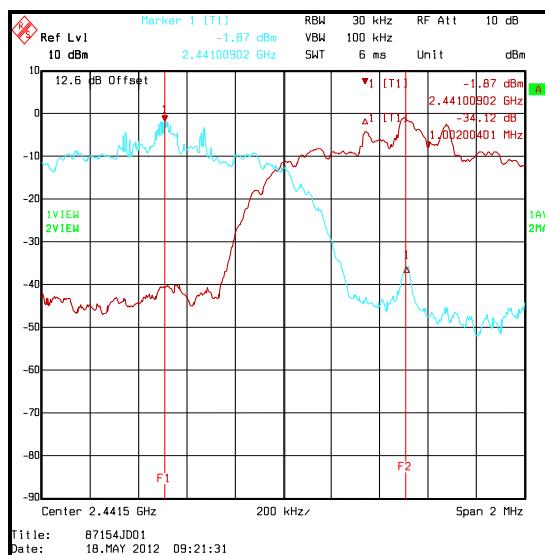


**Transmitter Carrier Frequency Separation (continued)****Results: 3DH5**

Carrier Frequency Separation (kHz)	Limit ( $\frac{2}{3}$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.004	861.723	140.281	Complied

**Note(s):**

1. 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:	Mark Percival	Test Date:	18 May 2012
Test Sample Serial No:	004401221227123		

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:**

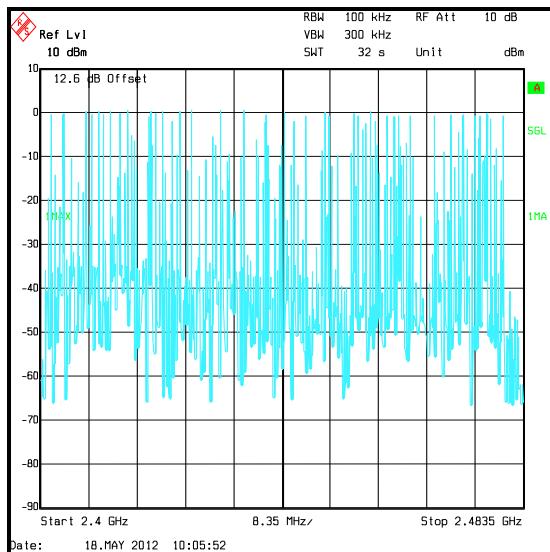
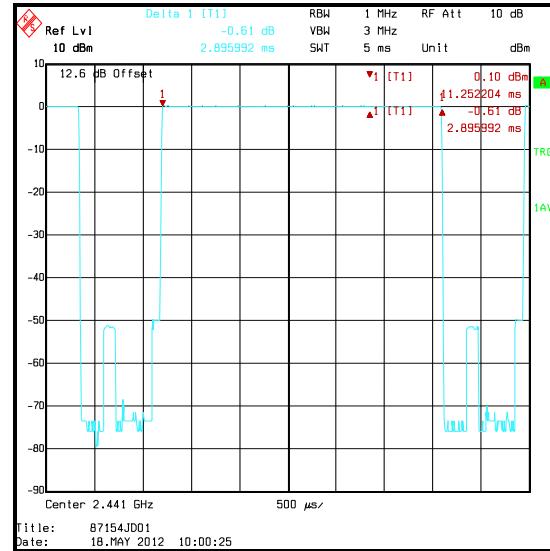
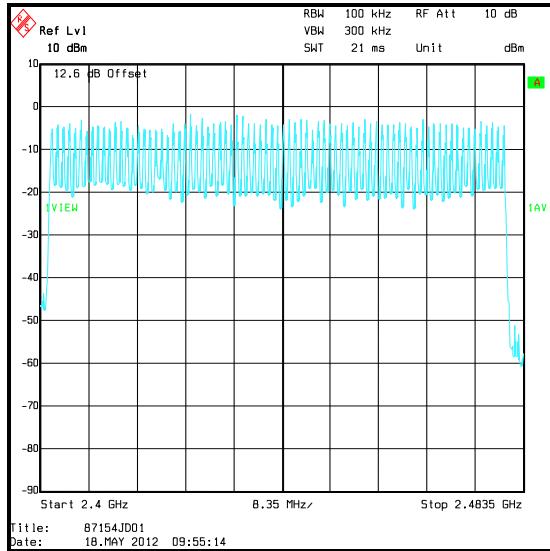
Temperature (°C):	24
Relative Humidity (%):	33

**Results:**

Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2895.992	86	0.336	0.4	0.064	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:**

Test Engineer:	Mark Percival	Test Date:	18 May 2012
Test Sample Serial No:	00440122122712		

FCC Part:	15.247(b)(1)
Test Method Used:	As detailed in ANSI C63.10 Section 6.10.1

**Environmental Conditions:**

Temperature (°C):	24
Relative Humidity (%):	33

**Results: DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-0.2	30.0	30.2	Complied
Middle	0.2	30.0	28.8	Complied
Top	0.0	30.0	30.0	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-0.2	1.5	1.3	36.0	34.7	Complied
Middle	0.2	1.5	1.7	36.0	34.3	Complied
Top	0.0	1.5	1.5	36.0	34.5	Complied

**Results: 2DH5**

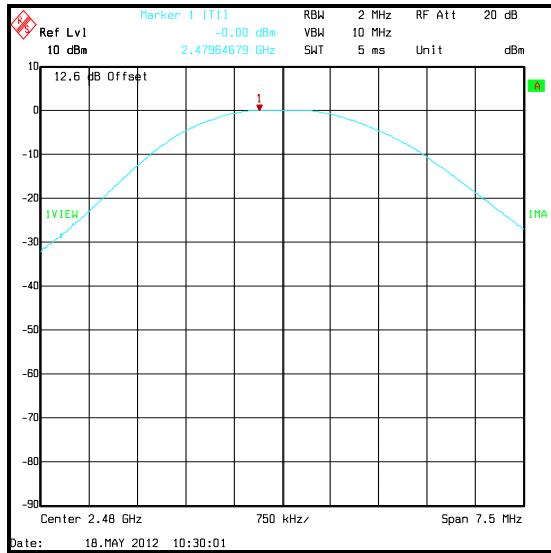
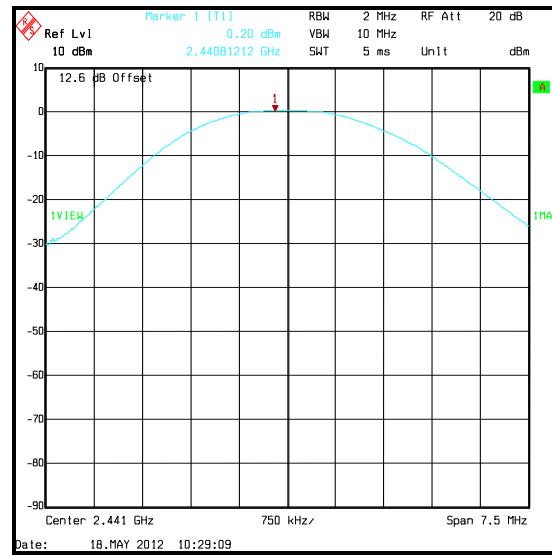
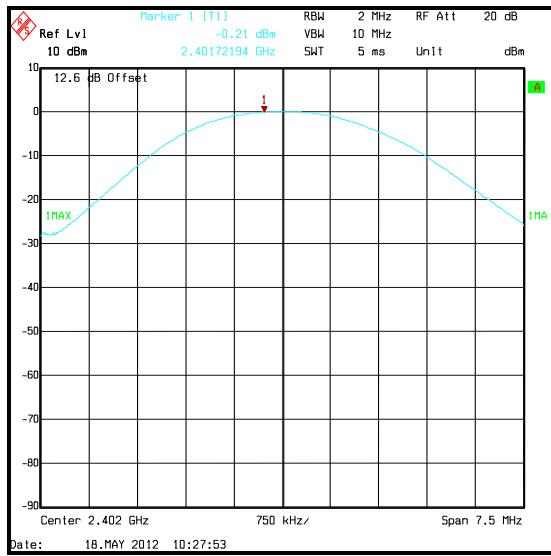
Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	0.6	21.0	20.4	Complied
Middle	0.7	21.0	20.3	Complied
Top	0.3	21.0	20.7	Complied

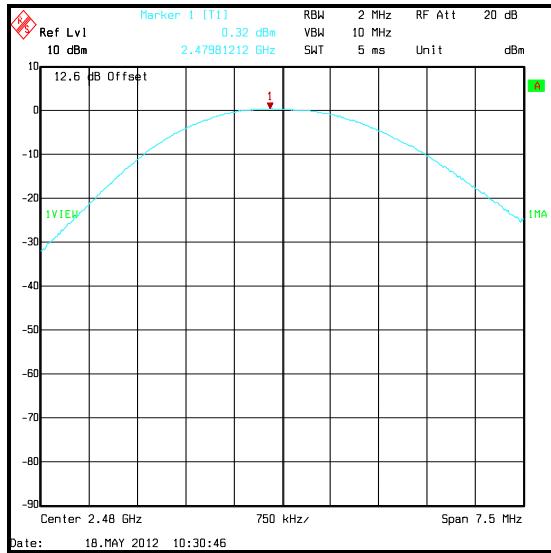
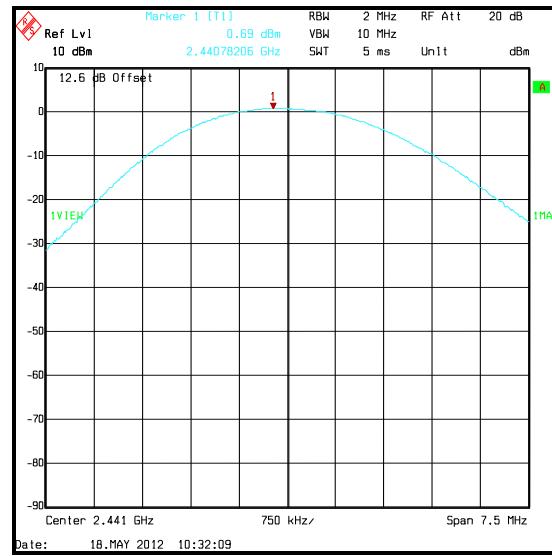
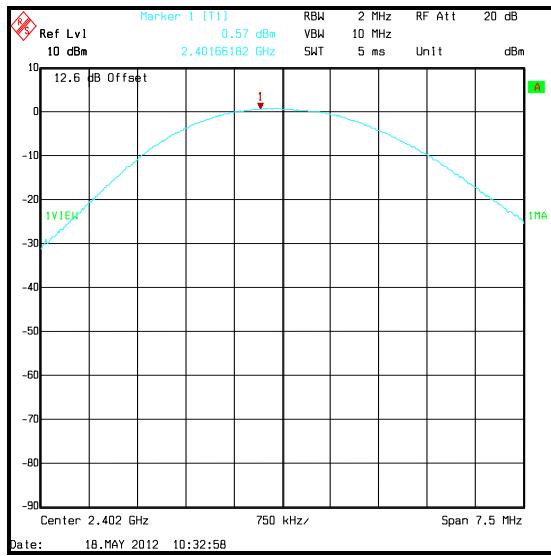
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	0.6	1.5	2.1	27.0	24.9	Complied
Middle	0.7	1.5	2.2	27.0	24.8	Complied
Top	0.3	1.5	1.8	27.0	25.2	Complied

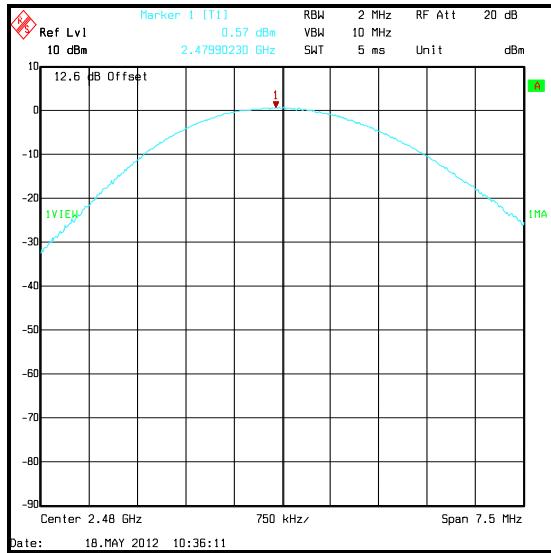
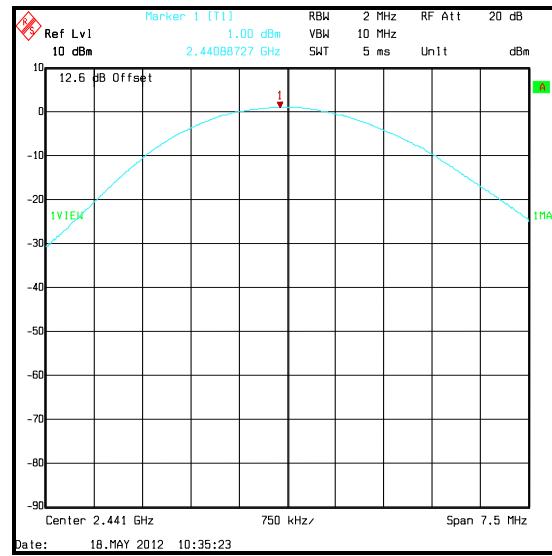
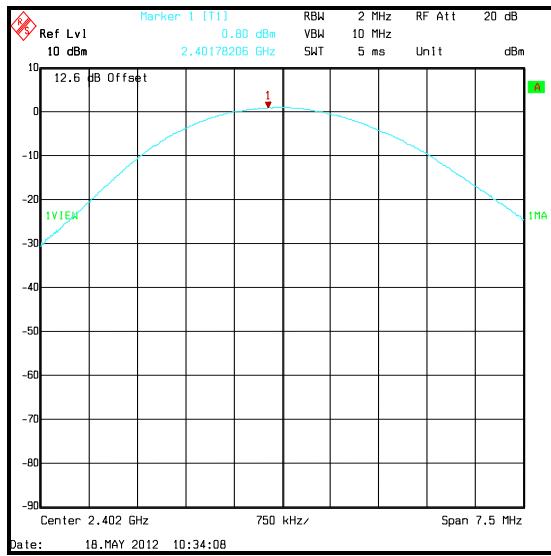
**Transmitter Maximum Peak Output Power (continued)****Results: 3DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	0.8	21.0	20.2	Complied
Middle	1.0	21.0	20.0	Complied
Top	0.6	21.0	20.4	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	0.8	1.5	2.3	27.0	24.7	Complied
Middle	1.0	1.5	2.5	27.0	24.5	Complied
Top	0.6	1.5	2.1	27.0	24.9	Complied

**Transmitter Maximum Peak Output Power (continued)****Results: Basic Rate 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>	Andrew Edwards	<b>Test Date:</b>	17 May 2012
<b>Test Sample Serial No:</b>	004401221227289		

<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:**

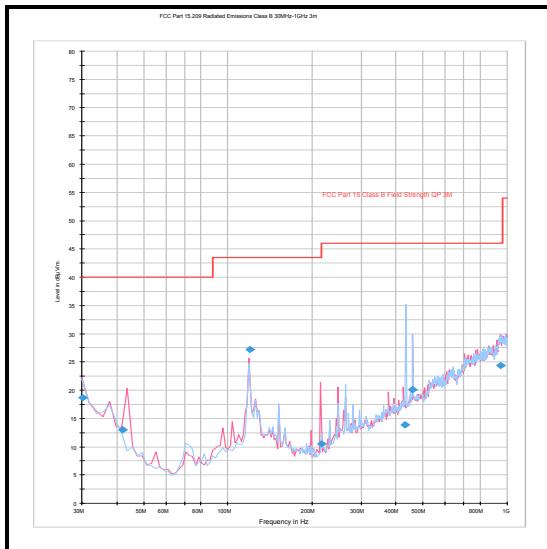
<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	29

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

<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Level (dB<math>\mu</math>V/m)</b>	<b>Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
30.149	Vertical	18.7	40.0	21.3	Complied
42.160	Vertical	13.0	40.0	27.0	Complied
120.001	Vertical	27.2	43.5	16.3	Complied
458.777	Horizontal	20.1	46.0	25.9	Complied
945.259	Vertical	24.4	46.0	21.6	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. 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>	Andrew Edwards	<b>Test Date:</b>	17 May 2012
<b>Test Sample Serial No:</b>	004401221227289		

<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 26 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	32

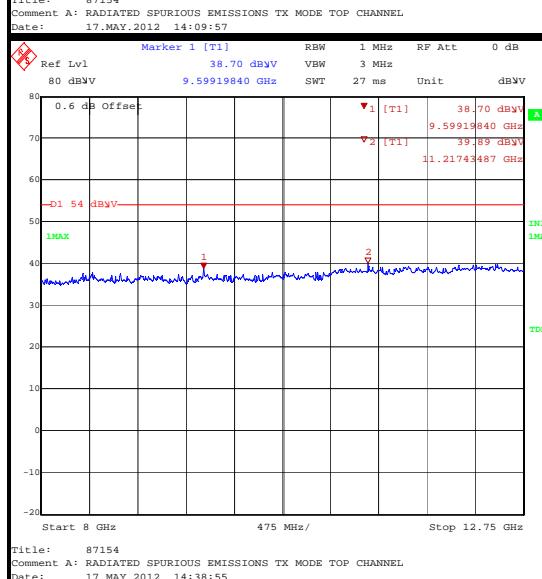
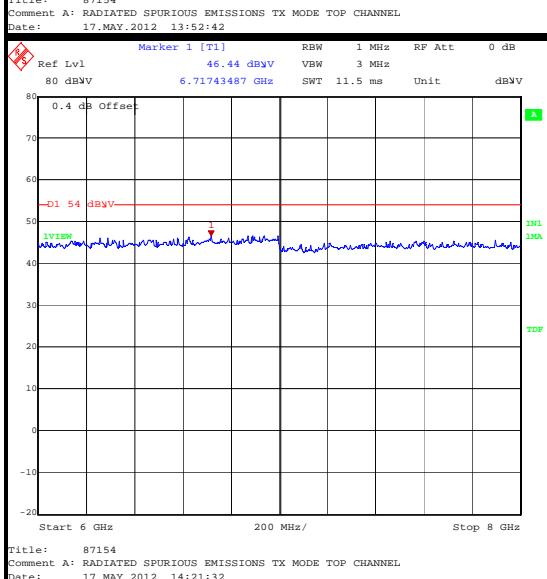
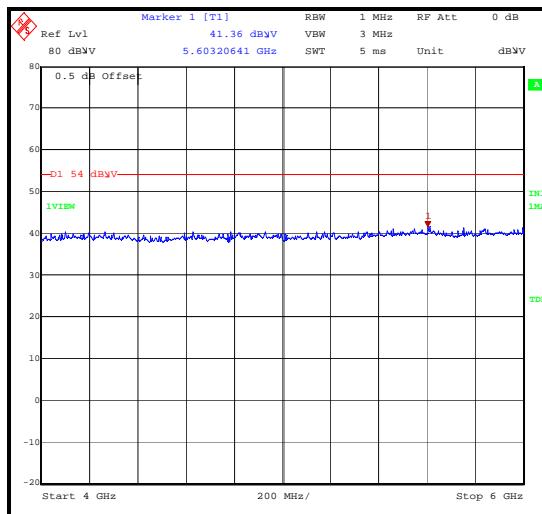
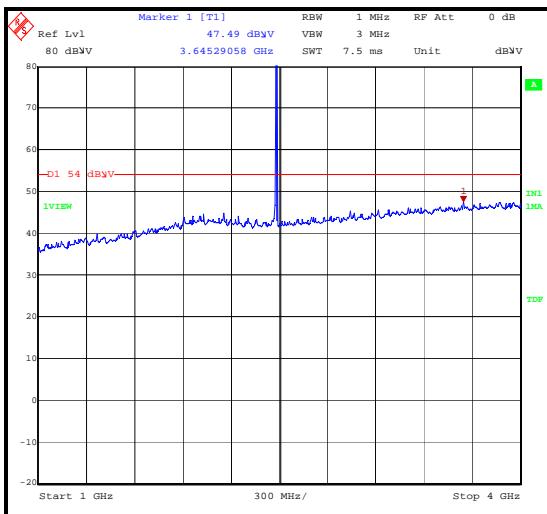
**Results:**

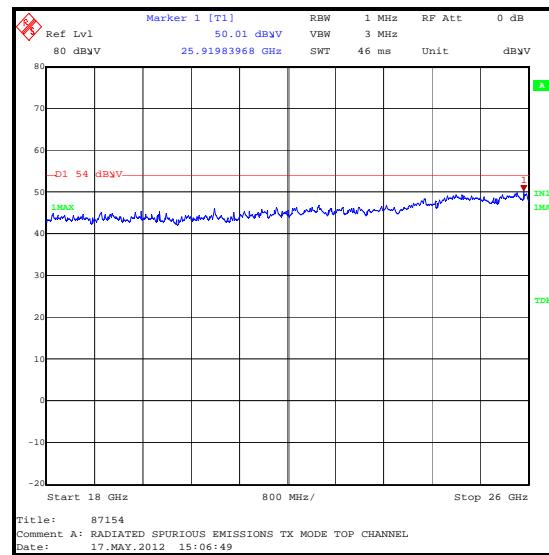
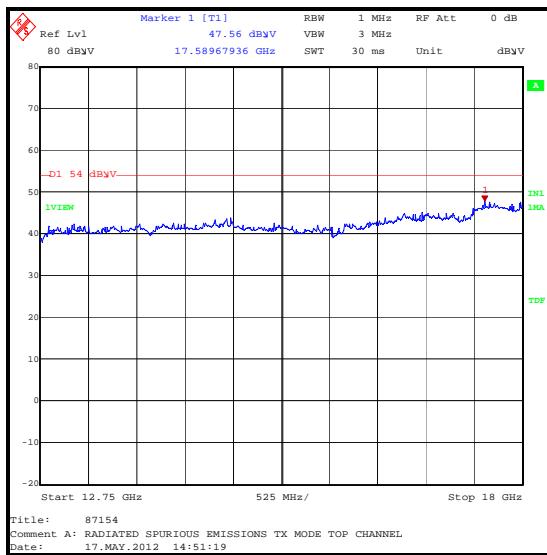
Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
25919.840	Vertical	50.0	54.0	4.0	Complied

**Note(s):**

1. The final measured value, for the given emission is for the noise floor and 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. The emission at 9.920 GHz was investigated and found to be in the Non-restricted band and therefore it was greater than 20dB below its applicable limit.
4. All other emissions shown on the pre-scan plot were investigated and found to be ambient, >20 dB below the applicable limit or below the measurement system noise floor.
5. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

## Transmitter 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:**

Test Engineer:	Andrew Edwards	Test Date:	17 May 2012
Test Sample Serial No:	004401221227289		

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

**Environmental Conditions:**

Temperature (°C):	24
Relative Humidity (%):	31

**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	62.4	76.9*	14.5	Complied
2483.5	Horizontal	58.2	74.0	15.8	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	45.3	54.0	8.7	Complied

**Results: Hopping Mode DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2399.599	Horizontal	59.3	76.7*	17.4	Complied
2400.0	Horizontal	58.7	76.7*	18.0	Complied
2483.5	Horizontal	56.3	74.0	17.7	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	40.2	54.0	13.8	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	56.1	76.9*	20.8	Complied
2483.5	Horizontal	61.9	74.0	12.1	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	47.3	54.0	6.7	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	54.7	76.9*	22.2	Complied
2483.5	Horizontal	59.9	74.0	14.1	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	41.0	54.0	13.0	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	55.5	76.8*	21.3	Complied
2483.5	Horizontal	62.0	74.0	12.0	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	47.0	54.0	7.0	Complied

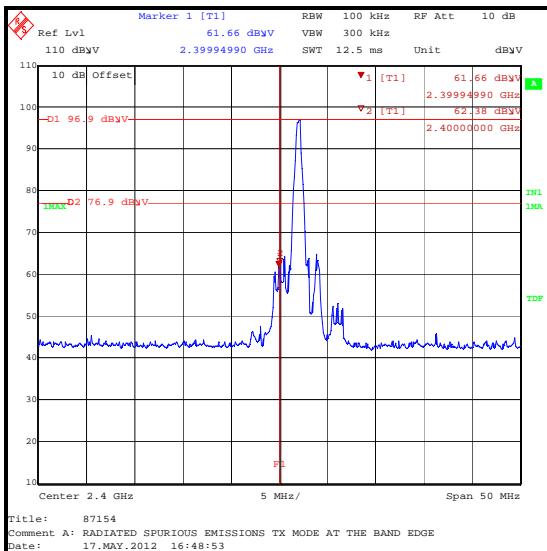
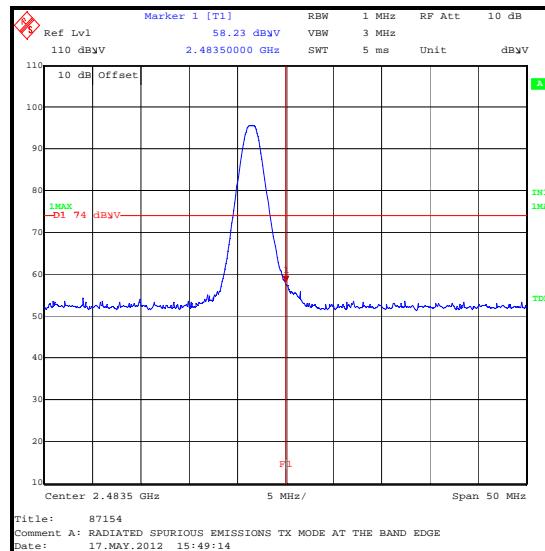
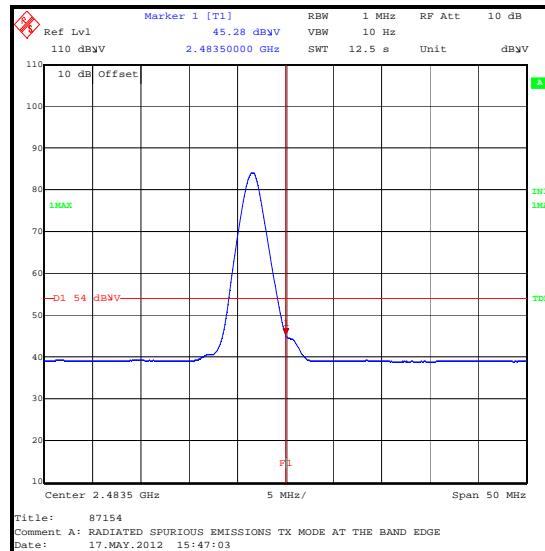
**Results: Hopping Mode 3DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	55.6	76.4*	20.8	Complied
2483.5	Horizontal	59.7	74.0	14.3	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	40.4	54.0	13.6	Complied

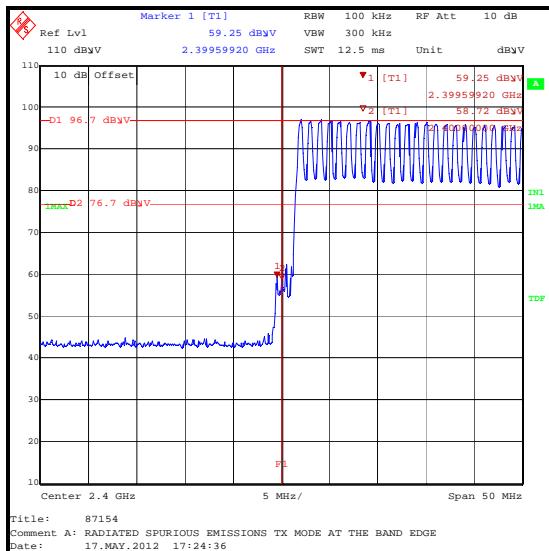
**Note(s):**

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

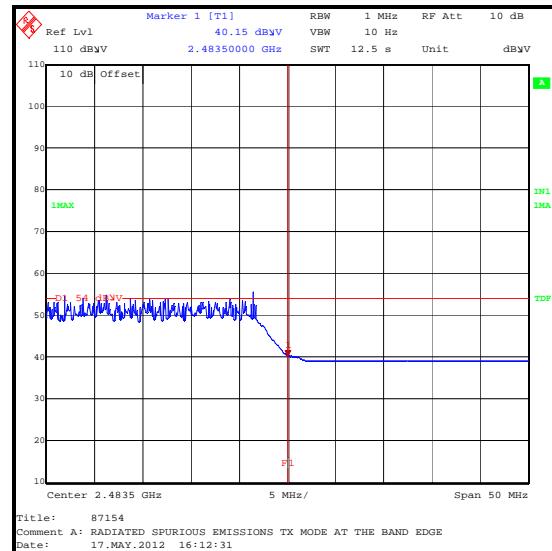
## DH5 Hopping Mode



## Lower Band Edge Peak Hopping



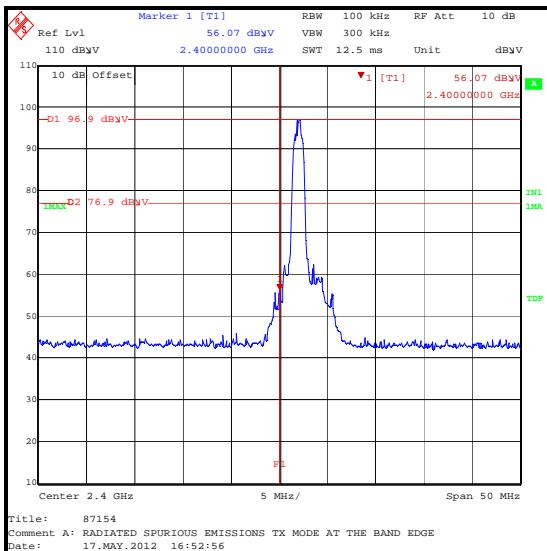
## Upper Band Edge Peak Hopping



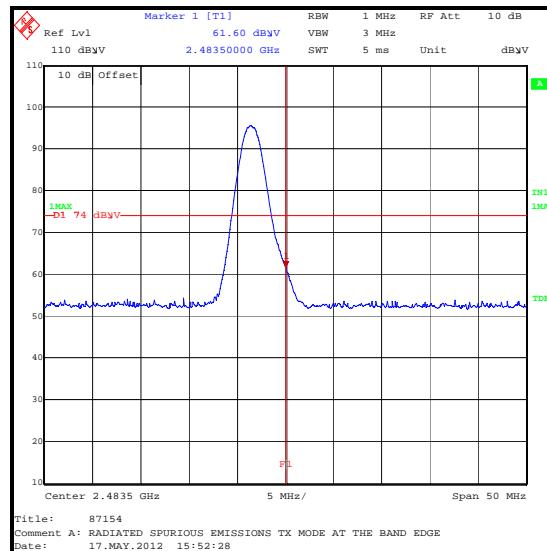
## Upper Band Edge Average Hopping

## Transmitter Band Edge Radiated Emissions (continued)

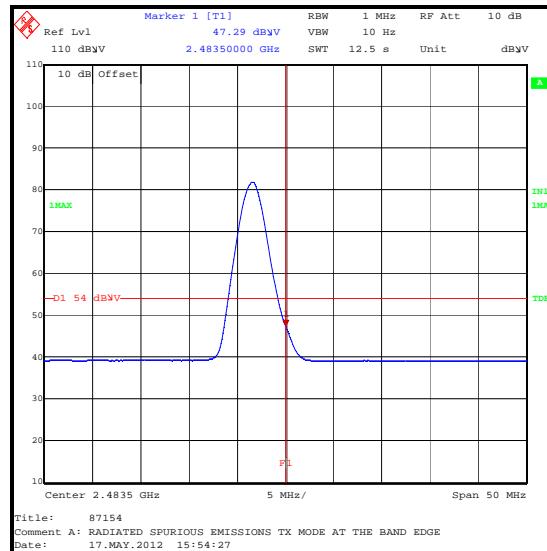
## 2DH5 Static Mode



## Lower Band Edge Peak Static



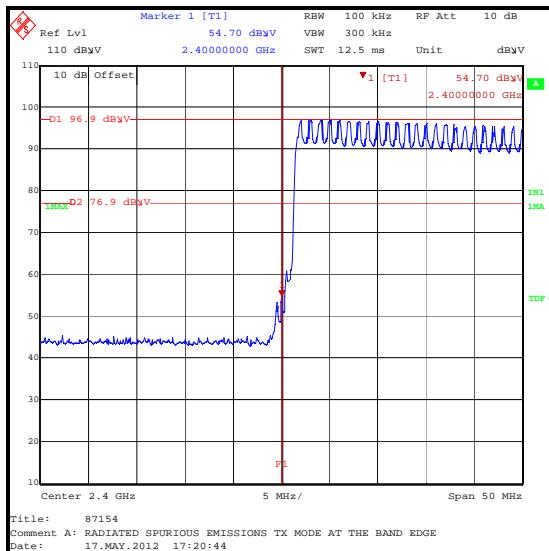
## Upper Band Edge Peak Static



### Upper Band Edge Average Static

### Transmitter Band Edge Radiated Emissions (continued)

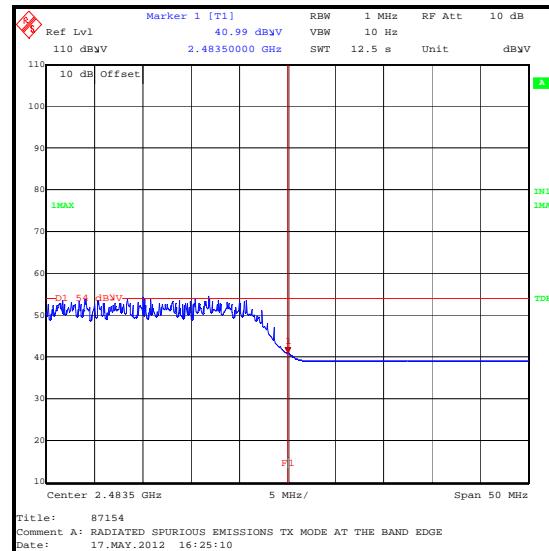
## 2DH5 Hopping Mode



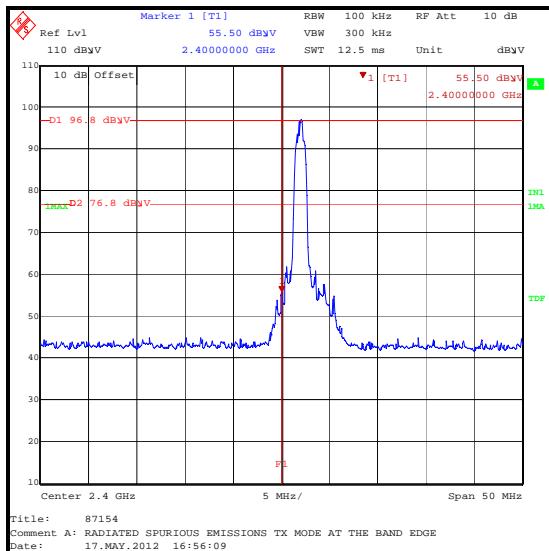
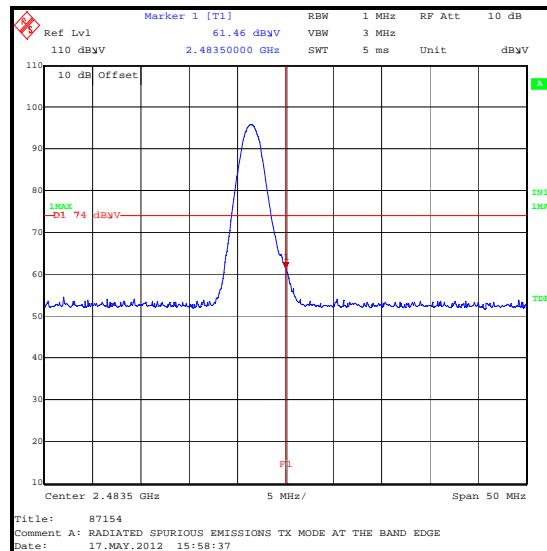
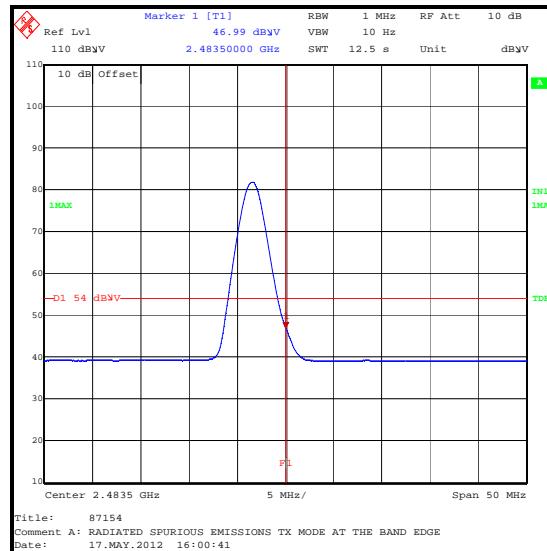
## Lower Band Edge Peak Hopping

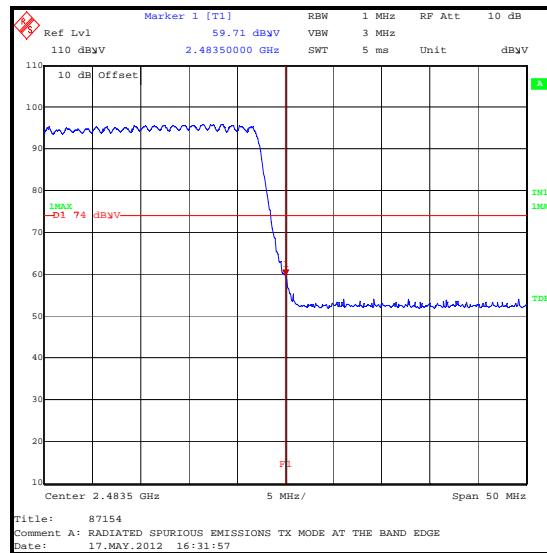
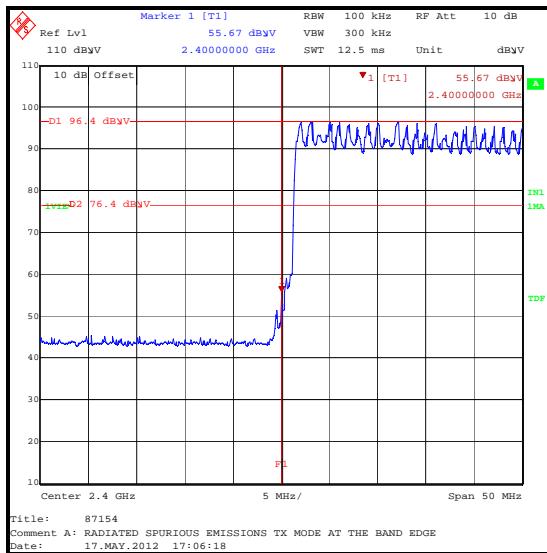
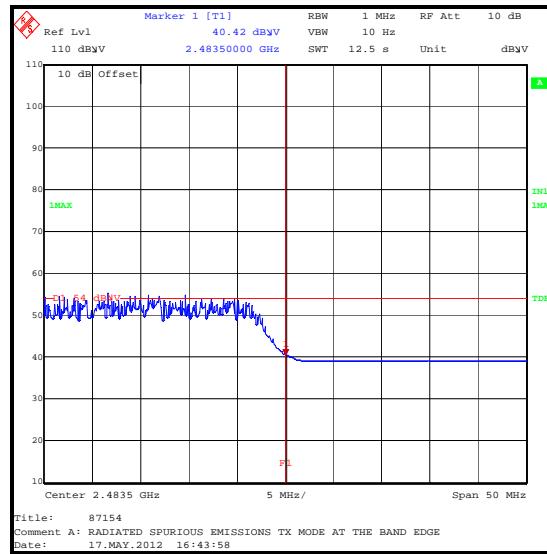


## Upper Band Edge Peak Hopping



## 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 GHz	95%	±2.94 dB

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

## Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (months)
A004	Line Impedance Stabilization Network	Rohde & Schwarz	ESH3-Z5	890604/027	14 Sep 2012	12
A067	Line Impedance Stabilization Network	Rohde & Schwarz	ESH3-Z5	890603/002	02 Jun 2012	12
A1391	Attenuator	HUBER + SUHNER AG	757987	6810.17.B	03 Apr 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	09 Oct 2012	12
A1818	Antenna	EMCO	3115	00075692	09 Oct 2012	12
A1829	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100671	31 Jan 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	25 Feb 2013	12
A1834	Attenuator	Hewlett Packard	8491B	10444	29 Jan 2013	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	15 Mar 2013	12
A2072	1-3.5GHz Directional Coupler	Narda	4242B	03549	Calibrated before use	-
A253	Antenna	Flann Microwave	12240-20	128	09 Oct 2012	12
A254	Antenna	Flann Microwave	14240-20	139	09 Oct 2012	12
A255	Antenna	Flann Microwave	16240-20	519	09 Oct 2012	12
A256	Antenna	Flann Microwave	18240-20	400	09 Oct 2012	12
A436	Antenna	Flann	20240-20	330	09 Oct 2012	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
G0543	Amplifier	Sonoma Instrument Co.	310N	230801	13 Jul 2012	3
K0001	5m Semi-Anechoic Chamber	Rainford EMC	N/A	N/A	29 May 2012	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	09 Oct 2012	12
K0008	Site Reference 4422	RFI Global Services Ltd	N/A	N/A	Calibration not required	-
M1124	Spectrum Analyser	Rohde & Schwarz	ESI26	100046K	29 Jun 2012	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	08 Nov 2012	12

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (months)
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12
M1379	Test Receiver	Rohde and Schwarz	ESIB7	100330	20 Sep 2012	12
M1632	Tescom TC-3000A	Tescom	TC-3000A Bluetooth tester	3000A310042	Calibration not required	-

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