

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: IWL222

FCC ID: XKB-IWL2XXBPOS

IC Certification Number: 2586D-IWL2XXBPOS

To: FCC Part 15.247: 2010 Subpart C, RSS-210 Issue 8 December 2010
& RSS-Gen Issue 3 December 2010

Test Report Serial No:
RFI-RPT-RP81035JD03A 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:	23 June 2011	

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1. Customer Information

Company Name:	Ingenico France
Address:	1 Rue Claude Chappe - BP 346 Guilherand-Granges 7503 France

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.107 and 47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart B (Unintentional Radiators) - Sections 15.107 and 15.109
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Specification Reference:	RSS-Gen Issue 3 December 2010
Specification Title:	General Requirements and Information for the Certification of Radio Apparatus
Specification Reference:	RSS-210 Issue 8 December 2010
Specification Title:	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
Site Registration:	FCC: 209735; Industry Canada: 3245B-2
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	15 March to 26 May 2011

2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.107(a)	-	Receiver/Idle Mode AC Conducted Emissions	
Part 15.109	-	Receiver/Idle Mode Radiated Spurious Emissions	
Part 15.207	RSS-Gen 7.2.4	Transmitter AC Conducted Emissions	
Part 15.247(a)(1)	RSS-Gen 4.6.1/4.6.3 RSS-210 A8.1(a)	Transmitter 20 dB Bandwidth	
Part 15.247(a)(1)	RSS-210 A8.1(b)	Transmitter Carrier Frequency Separation	
Part 15.247(a)(1)(iii)	RSS-210 A8.1(d)	Transmitter Number of Hopping Frequencies and Average Time of Occupancy	
Part 15.247(b)(1)	RSS-Gen 4.8 RSS-210 A8.4(2)	Transmitter Maximum Peak Output Power	
Part 15.247(d)/15.209(a)	RSS-Gen 4.9 RSS-210 A8.5	Transmitter Radiated Emissions	
Part 15.247(d)/15.209(a)	RSS-Gen 4.9 RSS-210 A8.5	Transmitter Band Edge Radiated Emissions	
Key to Results  = Complied  = Did not comply			

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2009)
Title:	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
Reference:	ANSI C63.10 (2009)
Title:	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)

Brand Name:	Ingenico
Model Name or Number:	IWL222
Serial Number:	11040WL40001076
Hardware Version Number:	IWL222
Software Version Number:	Y001
FCC ID:	XKB-IWL2XXBPOS
IC Certification Number:	2586D-IWL2XXBPOS

3.2. Description of EUT

The equipment under test was a wireless payment terminal supporting *Bluetooth* and PSTN.

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	100 Vac	
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:	-0.9 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:

Description:	Bluetooth Point of Sales cradle
Brand Name:	IWL2xx
Model Name or Number:	IWL222
Serial Number:	11042WL40001119

Description:	Power adaptor
Brand Name:	Ingenico
Model Name or Number:	FW7601/151964
Serial Number:	4509B

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. 3DH5 was shown to have the highest power.
- The EUT was put into test mode by using a Bluetooth test simulator during testing.

4.2. Configuration and Peripherals

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

- Resting in its cradle, powered by an AC power adaptor.
- Configured into Bluetooth test mode using customer supplied test mode.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

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

Test Engineer:	Tim Stanley	Test Date:	26 May 2011
Test Sample Serial No:	11040WL40001076		

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

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	22

Results: Live - Quasi Peak

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.159000	Live	44.4	65.5	21.1	Complied
0.172500	Live	43.5	64.8	21.3	Complied
0.190500	Live	41.6	64.0	22.4	Complied
0.213000	Live	39.4	63.1	23.7	Complied
0.253500	Live	37.0	61.6	24.6	Complied
0.258000	Live	36.5	61.5	25.0	Complied
0.312000	Live	32.9	59.9	27.0	Complied
0.352500	Live	32.4	58.9	26.5	Complied
0.429000	Live	33.0	57.3	24.3	Complied
0.460500	Live	28.6	56.7	28.1	Complied
3.003000	Live	35.9	56.0	20.1	Complied
3.106500	Live	34.9	56.0	21.1	Complied
3.637500	Live	33.6	56.0	22.4	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)**Results: Live - Average**

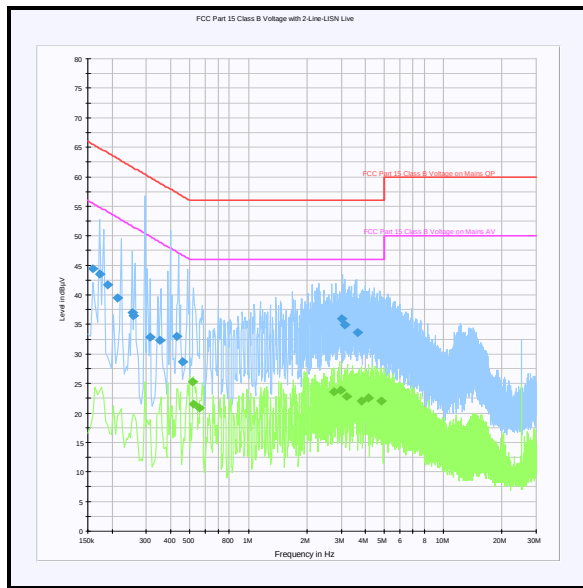
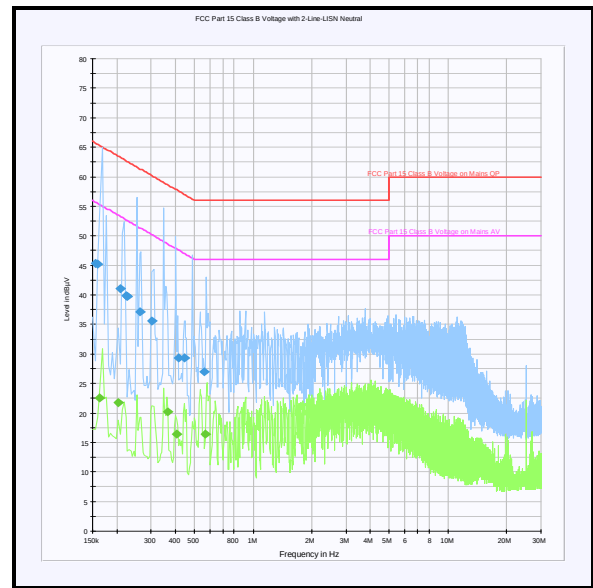
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.519000	Live	25.3	46.0	20.7	Complied
0.523500	Live	21.5	46.0	24.5	Complied
0.564000	Live	20.9	46.0	25.1	Complied
2.737500	Live	23.6	46.0	22.4	Complied
2.980500	Live	23.9	46.0	22.1	Complied
3.192000	Live	22.8	46.0	23.2	Complied
3.799500	Live	22.0	46.0	24.0	Complied
4.119000	Live	22.6	46.0	23.4	Complied
4.780500	Live	22.1	46.0	23.9	Complied

Results: Neutral - Quasi Peak

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.154500	Neutral	45.4	65.8	20.4	Complied
0.159000	Neutral	45.3	65.5	20.2	Complied
0.208500	Neutral	41.0	63.3	22.3	Complied
0.222000	Neutral	39.9	62.7	22.8	Complied
0.226500	Neutral	39.7	62.6	22.9	Complied
0.262500	Neutral	37.1	61.4	24.3	Complied
0.303000	Neutral	35.6	60.2	24.6	Complied
0.415500	Neutral	29.3	57.5	28.2	Complied
0.442500	Neutral	29.3	57.0	27.7	Complied
0.564000	Neutral	27.0	56.0	29.0	Complied

Results: Neutral - Average

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.163500	Neutral	22.5	55.3	32.8	Complied
0.204000	Neutral	21.7	53.4	31.7	Complied
0.366000	Neutral	20.2	48.6	28.4	Complied
0.406500	Neutral	16.4	47.7	31.3	Complied
0.568500	Neutral	16.4	46.0	29.6	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:**

Test Engineer:	Crawford Lindsay	Test Date:	03 April 2011
Test Sample Serial No:	11040WL40001076		

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

Environmental Conditions:

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

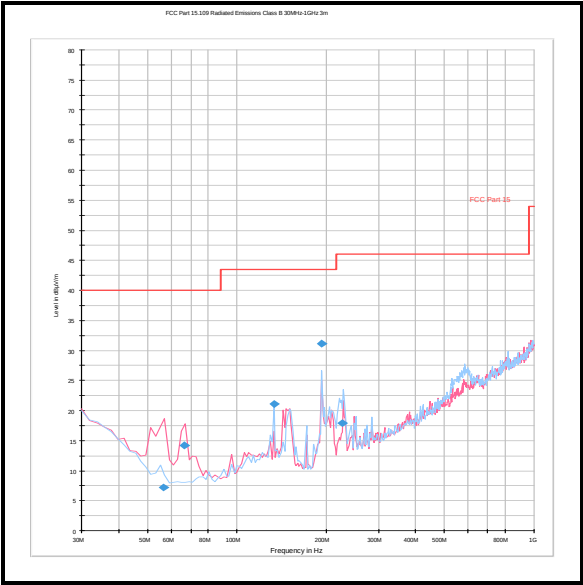
Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
56.777	Vertical	7.2	40.0	32.8	Complied
66.592	Vertical	14.2	40.0	25.8	Complied
133.319	Horizontal	21.1	43.5	22.4	Complied
193.522	Horizontal	31.1	43.5	12.4	Complied
226.348	Horizontal	17.9	46.0	28.1	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:**

Test Engineer:	Crawford Lindsay	Test Date:	03 April 2011
Test Sample Serial No:	11040WL40001076		

FCC Part:	15.109
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range:	1 GHz to 12.75 GHz

Environmental Conditions:

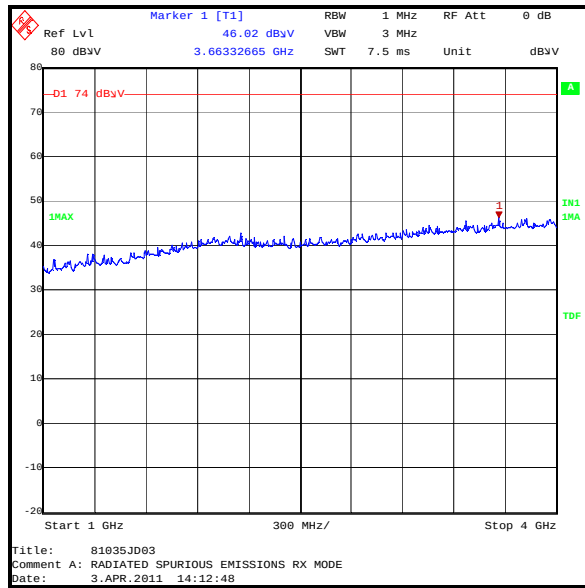
Temperature (°C):	25
Relative Humidity (%):	23

Results:

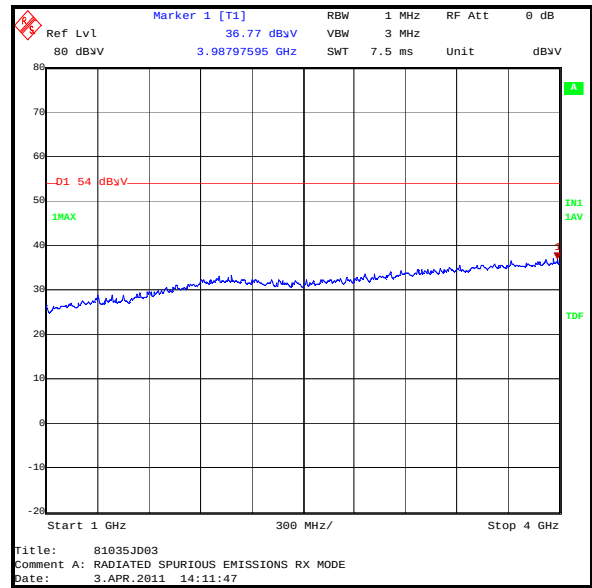
Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
12483.467	Vertical	36.9	54.0	17.1	Complied

Note(s):

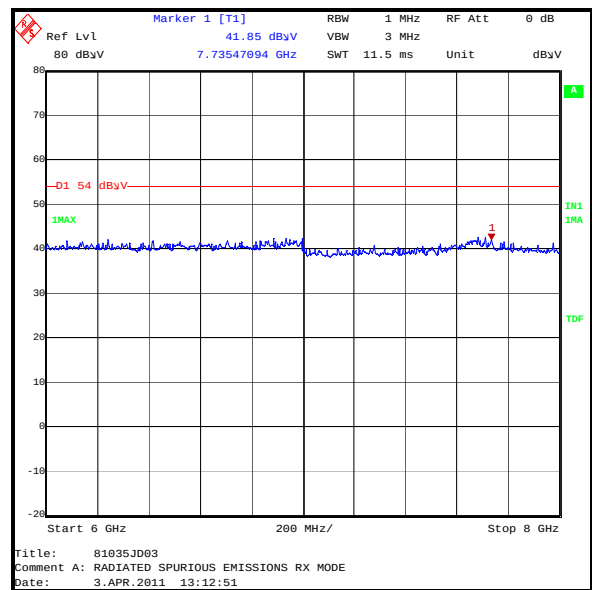
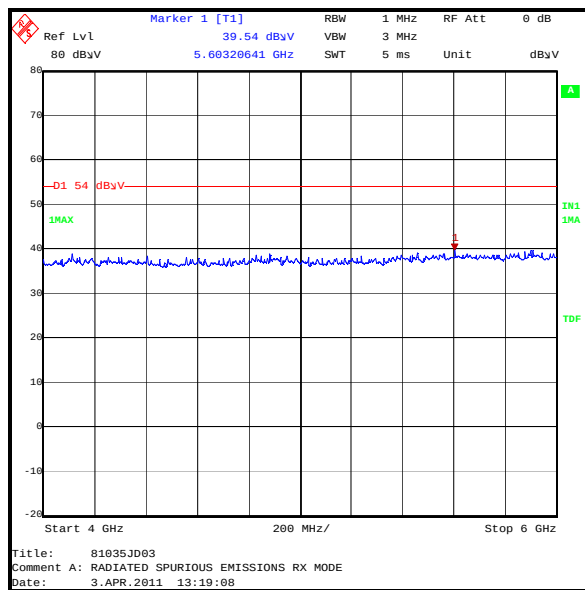
1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above 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)

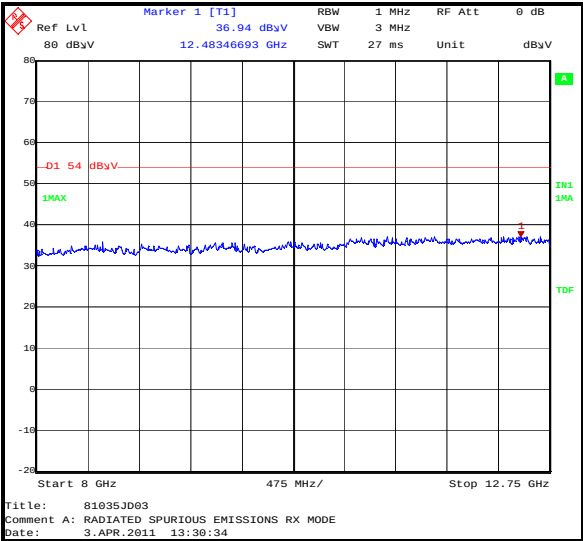
Peak



Average



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:	Tim Stanley	Test Date:	24 May 2011
Test Sample Serial No:	11040WL40001076		

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 (%):	20

Results: Live - Quasi Peak

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150000	Live	53.0	66.0	13.0	Complied
0.208500	Live	48.2	63.3	15.1	Complied
0.226500	Live	46.8	62.6	15.8	Complied
0.262500	Live	44.5	61.4	16.9	Complied
0.312000	Live	41.3	59.9	18.6	Complied
2.755500	Live	38.7	56.0	17.3	Complied
3.358500	Live	38.3	56.0	17.7	Complied

Results: Live - Average

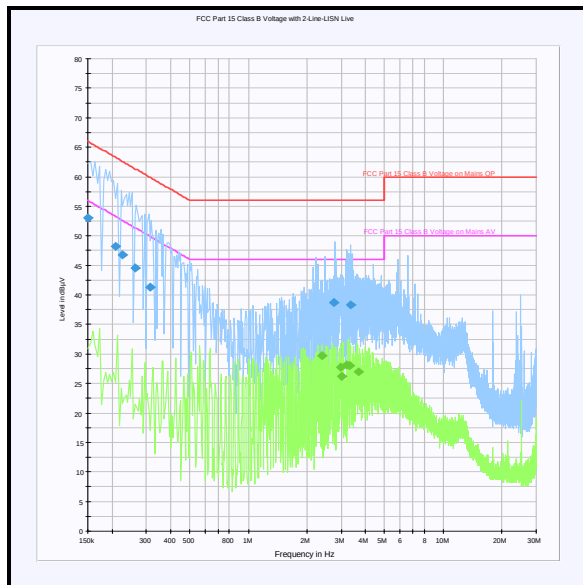
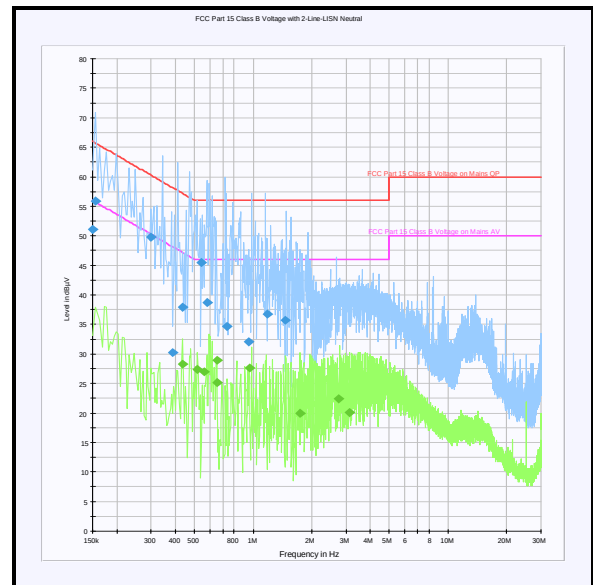
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
2.382000	Live	29.8	46.0	16.2	Complied
2.976000	Live	27.7	46.0	18.3	Complied
3.016500	Live	26.1	46.0	19.9	Complied
3.192000	Live	28.1	46.0	17.9	Complied
3.318000	Live	28.0	46.0	18.0	Complied
3.660000	Live	27.0	46.0	19.0	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: Neutral - Quasi Peak**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150000	Neutral	51.1	66.0	14.9	Complied
0.154500	Neutral	55.9	65.8	9.9	Complied
0.298500	Neutral	49.8	60.3	10.5	Complied
0.384000	Neutral	30.3	58.2	27.9	Complied
0.433500	Neutral	37.9	57.2	19.3	Complied
0.541500	Neutral	45.5	56.0	10.5	Complied
0.582000	Neutral	38.6	56.0	17.4	Complied
0.735000	Neutral	34.6	56.0	21.4	Complied
0.951000	Neutral	32.0	56.0	24.0	Complied
1.180500	Neutral	36.8	56.0	19.2	Complied
1.468500	Neutral	35.7	56.0	20.3	Complied

Results: Neutral - Average

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.433500	Neutral	28.3	47.2	18.9	Complied
0.519000	Neutral	27.4	46.0	18.6	Complied
0.564000	Neutral	27.0	46.0	19.0	Complied
0.649500	Neutral	25.1	46.0	20.9	Complied
0.654000	Neutral	29.0	46.0	17.0	Complied
0.955500	Neutral	27.7	46.0	18.3	Complied
1.738500	Neutral	20.0	46.0	26.0	Complied
2.737500	Neutral	22.4	46.0	23.6	Complied
3.129000	Neutral	20.1	46.0	25.9	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:**

Test Engineer:	Tim Stanley	Test Date:	14 April 2011
Test Sample Serial No:	11040WL40001076		

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

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	22

Results DH5:

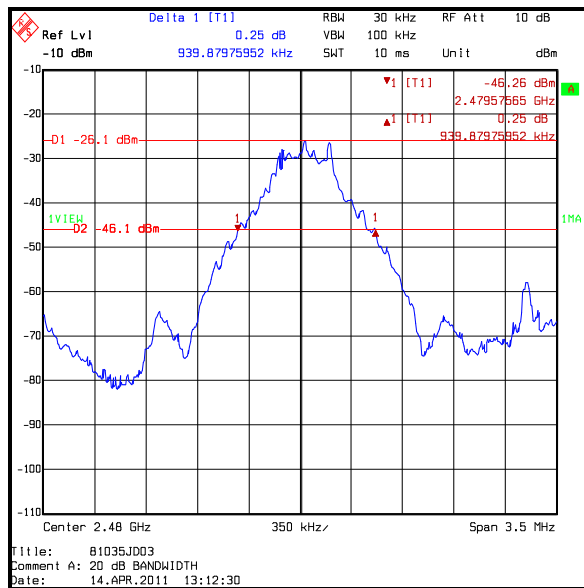
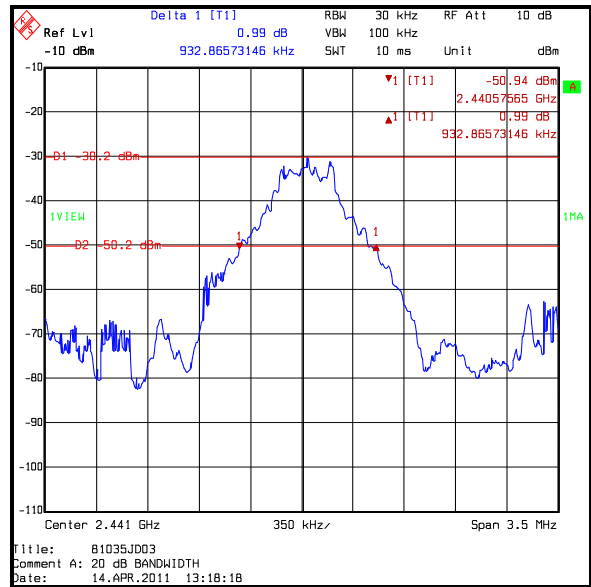
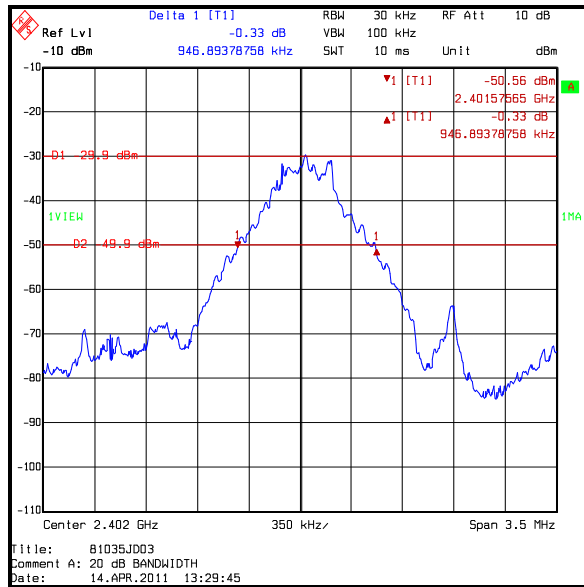
Channel	20 dB Bandwidth (kHz)
Bottom	946.894
Middle	932.866
Top	939.880

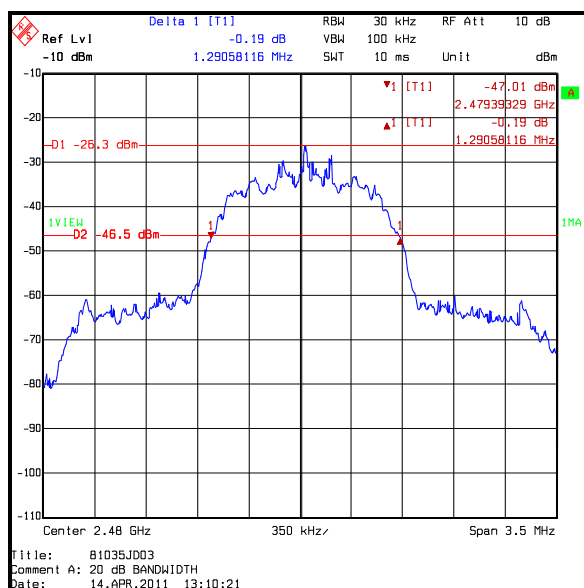
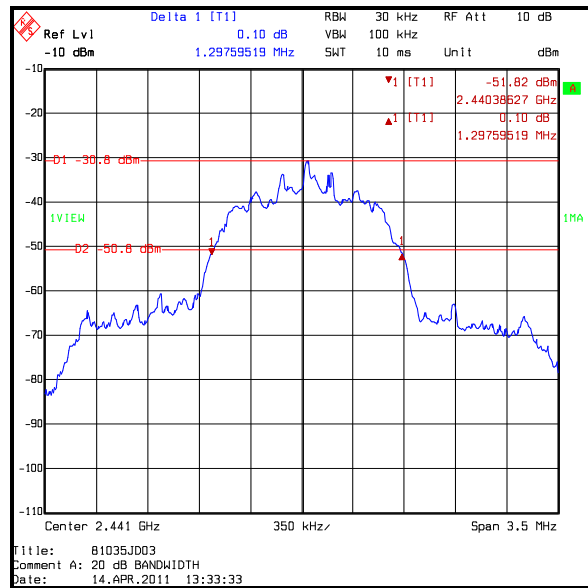
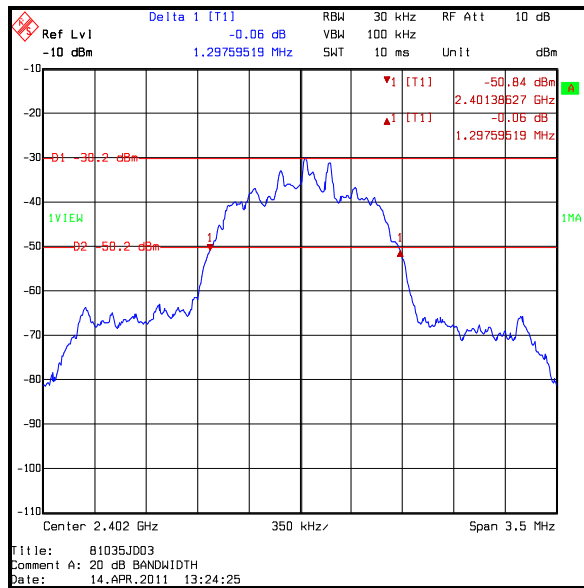
Results 2DH5:

Channel	20 dB Bandwidth (kHz)
Bottom	1297.595
Middle	1297.595
Top	1290.581

Results 3DH5:

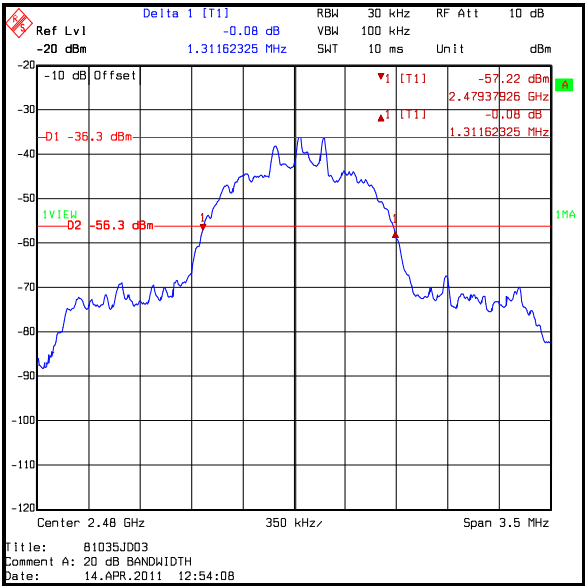
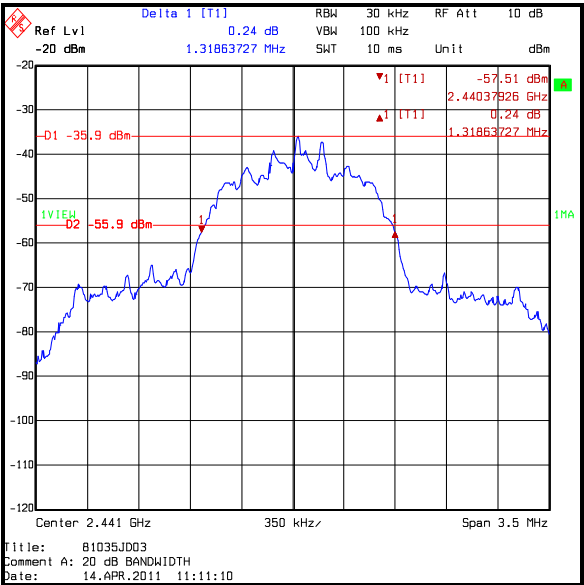
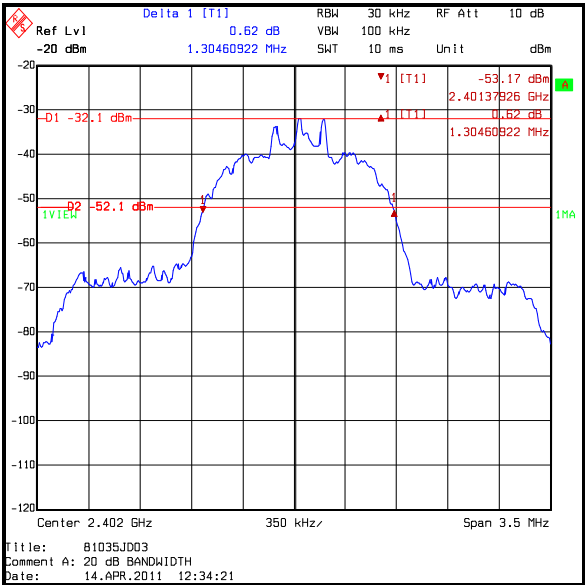
Channel	20 dB Bandwidth (kHz)
Bottom	1304.609
Middle	1318.637
Top	1311.623

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:	14 April 2011
Test Sample Serial No:	11040WL40001076		

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

Environmental Conditions:

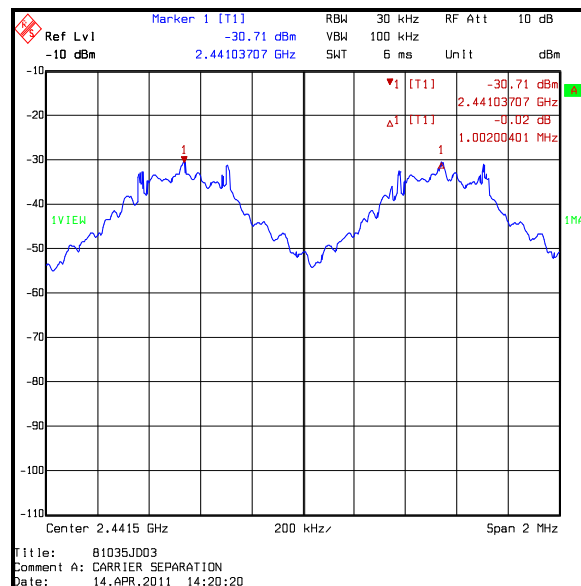
Temperature (°C):	26
Relative Humidity (%):	22

Results: DH5

Carrier Frequency Separation (kHz)	Limit (2I_3 of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.004	621.911	380.093	Complied

Note(s):

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

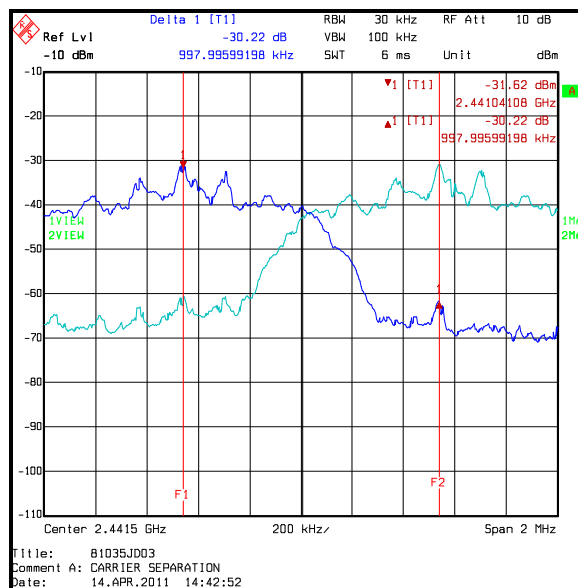


Transmitter Carrier Frequency Separation (continued)**Results: 2DH5**

Carrier Frequency Separation (kHz)	Limit ($^{2}/_{3}$ of 20 dB BW) (kHz)	Margin (kHz)	Result
997.996	865.063	132.993	Complied

Note(s):

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

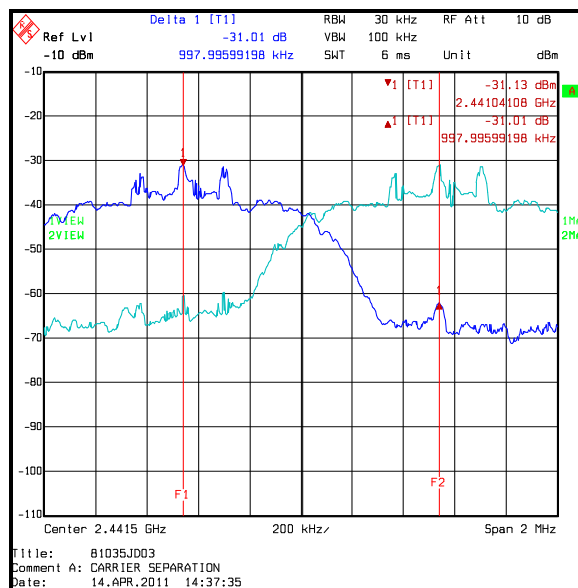


Transmitter Carrier Frequency Separation (continued)**Results: 3DH5**

Carrier Frequency Separation (kHz)	Limit ($^{2}/_{3}$ of 20 dB BW) (kHz)	Margin (kHz)	Result
997.996	879.091	118.905	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:	14 April 2011
Test Sample Serial No:	11040WL40001076		

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:

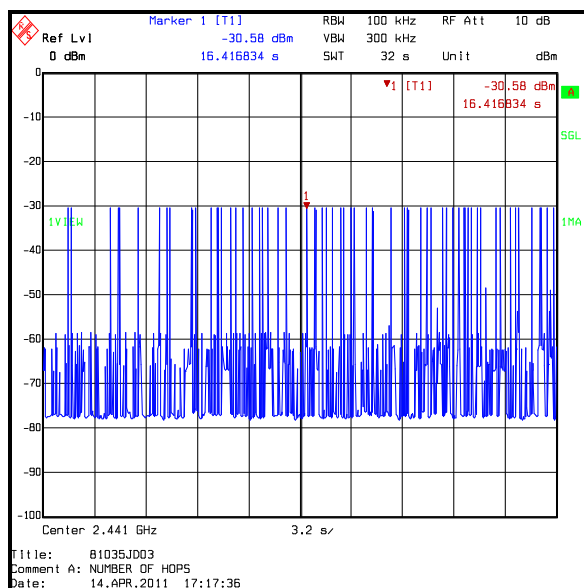
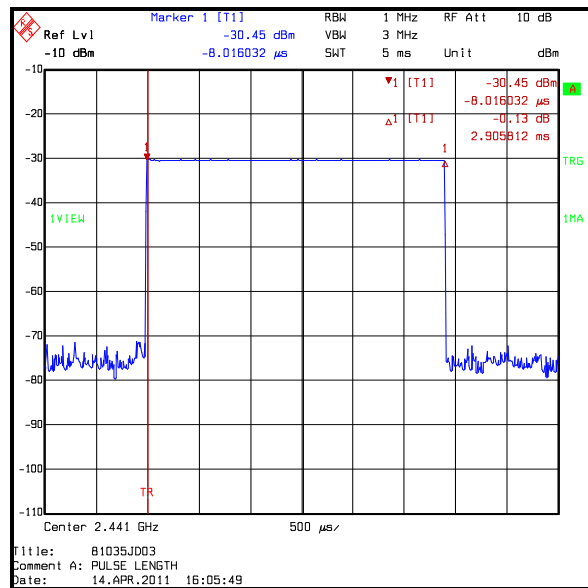
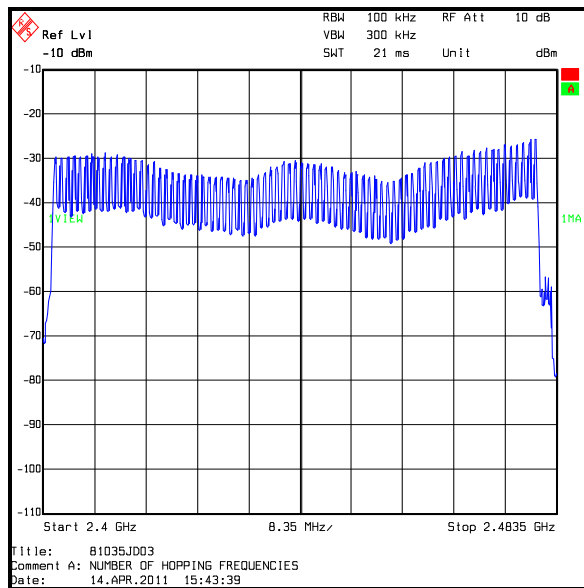
Temperature (°C):	26
Relative Humidity (%):	21

Results:

Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2905.812	57	0.163	0.4	0.237	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:	Crawford Lindsay	Test Date:	03 April 2011
Test Sample Serial No:	11040WL40001076		

FCC Part:	15.247(b)(1)
Test Method Used:	As detailed in ANSI C63.10 Section 6.10.1 and Sections 6.3 and 6.6 referencing ANSI C63.4 (see note below)

Environmental Conditions:

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

Results: DH5

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-5.0	30.0	35.0	Complied
Middle	-5.2	30.0	35.2	Complied
Top	-4.9	30.0	34.9	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-5.0	1.1	-3.9	36.0	39.9	Complied
Middle	-5.2	1.1	-4.1	36.0	40.1	Complied
Top	-4.9	1.1	-3.8	36.0	39.8	Complied

Results: 2DH5

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-3.4	21.0	24.4	Complied
Middle	-3.5	21.0	24.5	Complied
Top	-3.3	21.0	24.3	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-3.4	1.1	-2.3	27.0	29.3	Complied
Middle	-3.5	1.1	-2.4	27.0	29.4	Complied
Top	-3.3	1.1	-2.2	27.0	29.2	Complied

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

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-0.9	21.0	21.9	Complied
Middle	-0.9	21.0	21.9	Complied
Top	-1.0	21.0	22.0	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-0.9	1.1	0.2	27.0	26.8	Complied
Middle	-0.9	1.1	0.2	27.0	26.8	Complied
Top	-1.0	1.1	0.1	27.0	26.9	Complied

Note(s):

1. These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable.
2. As the EUT has an integral antenna, in order to obtain the conducted peak power (into the antenna) the declared antenna gain was subtracted from the measured ERP.
3. Tests were performed using a combination of the conducted test method described in ANSI C63.10 Section 6.10.1 and the test methods for radiated emissions measurements described in Sections 6.3 and 6.6. The reason for this being that the measurements were performed radiated as the EUT has an integral antenna and does not have an external antenna port

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

Test Engineer:	Crawford Lindsay	Test Date:	03 April 2011
Test Sample Serial No:	11040WL40001076		

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

Environmental Conditions:

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

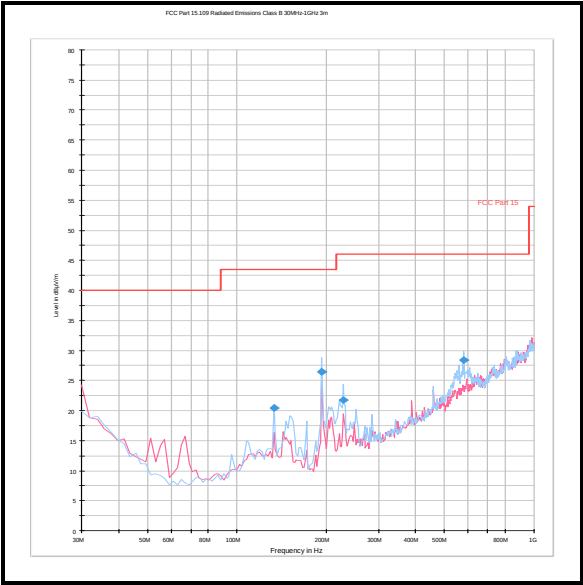
Results: Quasi-Peak 3-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
133.339	Horizontal	20.4	43.5	23.1	Complied
193.532	Horizontal	26.5	43.5	17.0	Complied
228.551	Horizontal	21.8	46.0	24.2	Complied
580.568	Horizontal	28.4	46.0	17.6	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:**

Test Engineer:	Crawford Lindsay, Nick Steele & Andrew Edwards	Test Date:	03 April 2011, 03 May 2011 & 21 May 2011
Test Sample Serial No:	11040WL40001076		

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range	1 GHz to 26.5 GHz

Environmental Conditions:

Temperature (°C):	25 to 28
Relative Humidity (%):	19 to 24

Results: Peak Bottom Channel DH5

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4804.394	Vertical	62.9	74.0	11.1	Complied
7206.179	Vertical	47.9	74.0	26.1	Complied

Results: Average Bottom Channel DH5

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4804.117	Vertical	50.4	54.0	3.6	Complied
7206.179	Vertical	32.1	54.0	21.9	Complied

Results: Peak Middle Channel DH5

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4879.694	Vertical	63.0	74.0	11.0	Complied
7323.057	Vertical	53.6	74.0	20.4	Complied

Results: Average Middle Channel DH5

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4882.108	Vertical	52.4	54.0	1.6	Complied
7323.057	Vertical	35.4	54.0	18.6	Complied

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

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4959.709	Vertical	63.1	74.0	10.9	Complied
7439.444	Vertical	55.4	74.0	18.6	Complied

Results: Average Top Channel DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4960.101	Vertical	53.1	54.0	0.9	Complied
7440.082	Vertical	37.6	54.0	16.4	Complied

Results: Peak Hopping Mode DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4840.541	Vertical	59.0	74.0	15.0	Complied
7407.219	Vertical	50.8	74.0	23.2	Complied

Results: Average Hopping Mode DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4960.174	Vertical	34.6	54.0	19.4	Complied
7407.219	Vertical	28.5	54.0	25.5	Complied

Results: Peak Bottom Channel 2-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4803.813	Vertical	59.0	74.0	15.0	Complied
7205.349	Vertical	46.6	74.0	27.4	Complied

Results: Average Bottom Channel 2-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4804.055	Vertical	42.2	54.0	11.8	Complied
7205.349	Vertical	32.1	54.0	21.9	Complied

Transmitter Radiated Emissions (continued)**Results: Peak Middle Channel 2-DH5**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4879.885	Vertical	59.0	74.0	15.0	Complied
7322.540	Vertical	48.3	74.0	25.7	Complied

Results: Average Middle Channel 2-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4882.133	Vertical	44.4	54.0	9.6	Complied
7322.540	Vertical	37.6	54.0	16.4	Complied

Results: Peak Top Channel 2-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4959.880	Vertical	59.2	74.0	14.8	Complied
7439.444	Vertical	49.5	74.0	24.5	Complied

Results: Average Top Channel 2-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4960.101	Vertical	45.1	54.0	8.9	Complied
7439.444	Vertical	38.4	54.0	15.6	Complied

Results: Peak Hopping Mode 2-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4887.896	Vertical	54.3	74.0	19.7	Complied
7292.345	Vertical	48.5	74.0	25.5	Complied

Results: Average Hopping Mode 2-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4959.958	Vertical	29.7	54.0	24.3	Complied
7292.345	Vertical	28.9	54.0	25.1	Complied

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

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4803.993	Vertical	59.7	74.0	14.3	Complied
7205.398	Vertical	46.7	74.0	27.3	Complied

Results: Average Bottom Channel 3-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4804.086	Vertical	42.4	54.0	11.6	Complied
7205.398	Vertical	32.5	54.0	21.5	Complied

Results: Peak Middle Channel 3-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4879.965	Vertical	59.5	74.0	14.5	Complied
7323.126	Vertical	48.6	74.0	25.4	Complied

Results: Average Middle Channel 3-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4882.039	Vertical	44.9	54.0	9.1	Complied
7323.126	Vertical	37.4	54.0	16.6	Complied

Results: Peak Top Channel 3-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4959.920	Vertical	58.9	74.0	15.1	Complied
7440.068	Vertical	50.1	74.0	23.9	Complied

Results: Average Top Channel 3-DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4960.101	Vertical	45.0	54.0	9.0	Complied
7439.344	Vertical	37.6	54.0	16.4	Complied

Transmitter Radiated Emissions (continued)**Results: Peak Hopping Mode 3-DH5**

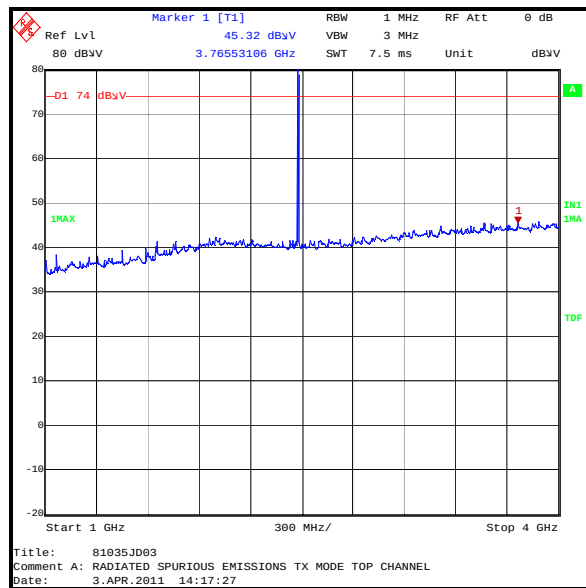
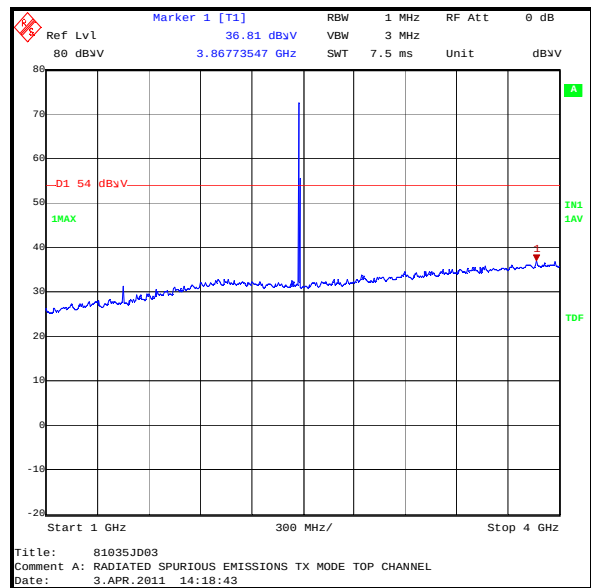
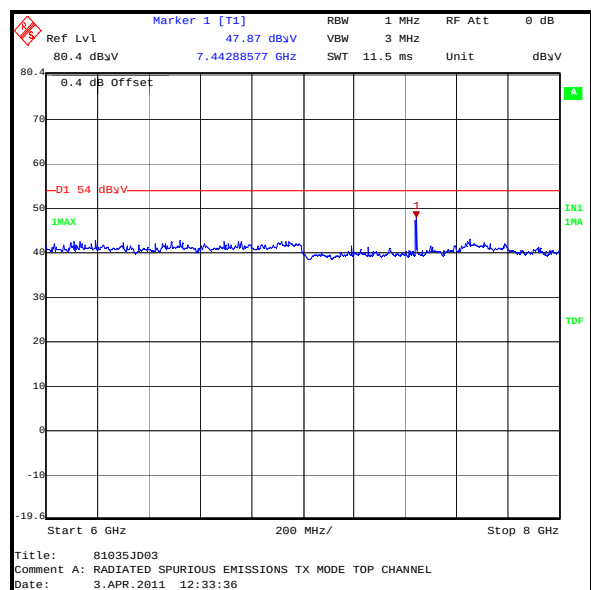
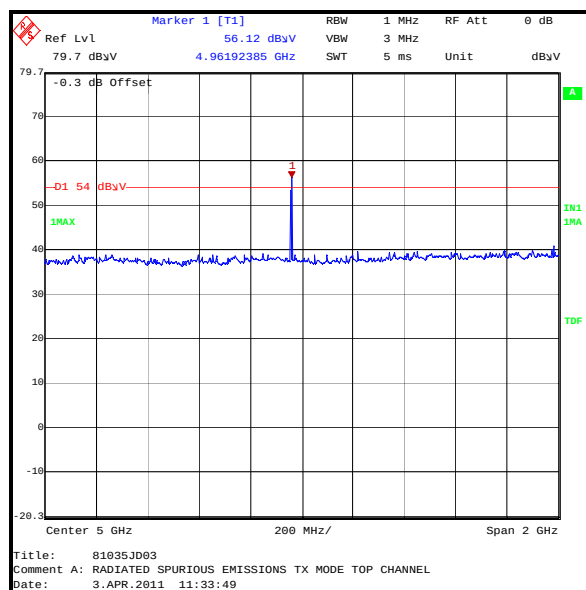
Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4888.236	Vertical	55.2	74.0	18.8	Complied
7434.228	Vertical	48.6	74.0	25.4	Complied

Results: Average Hopping Mode 3-DH5

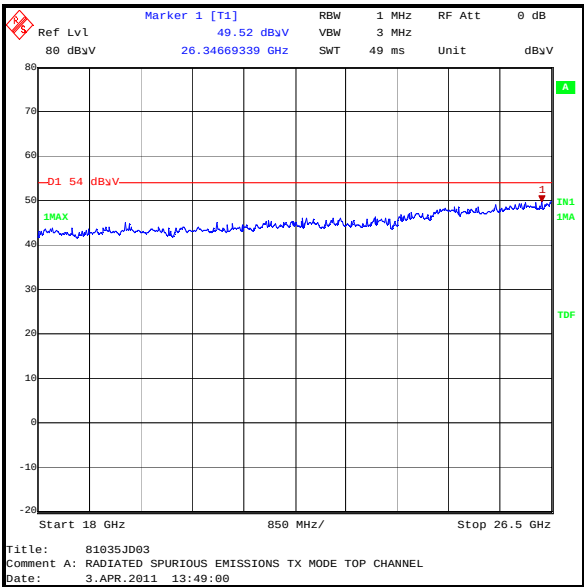
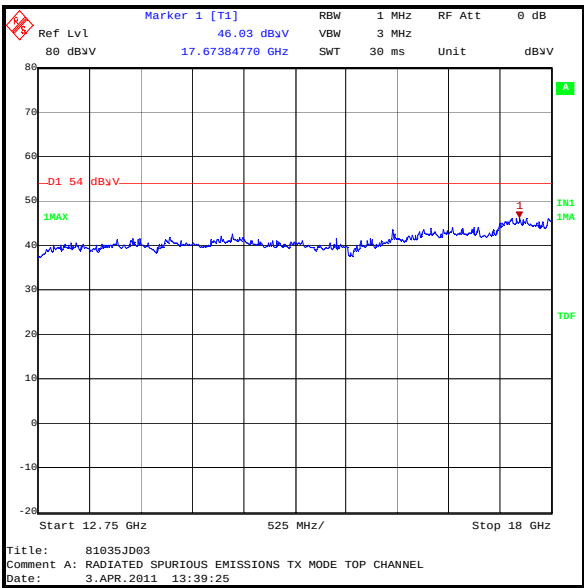
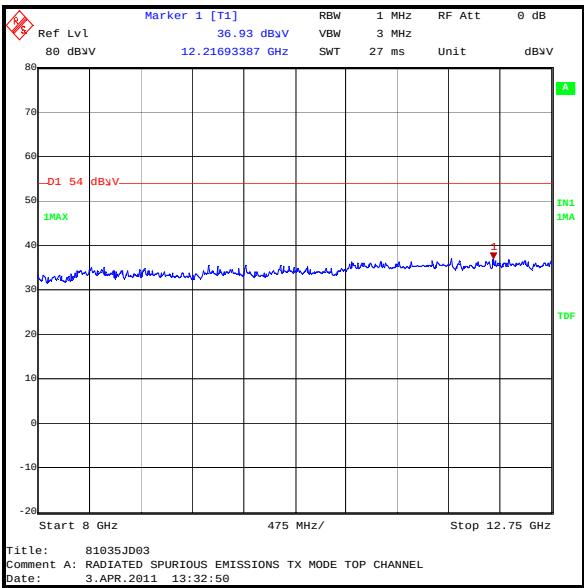
Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4959.991	Vertical	29.8	54.0	24.2	Complied
7434.228	Vertical	28.9	54.0	25.1	Complied

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 plot 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.

Transmitter Radiated Emissions (continued)**Peak Detector****Average Detector**

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:	Crawford Lindsay	Test Date:	26 April 2011
Test Sample Serial No:	11040WL40001076		

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):	29
Relative Humidity (%):	25

Results: Static Mode DH5

Frequency (MHz)	Peak Level	Limit	Margin (dB)	Result
2400.0	-41.6 dBm	*-24.2 dBm	17.4	Complied
2483.5	65.3 dB μ V/m	74.0 dB μ V/m	8.7	Complied

Frequency (MHz)	Average Level	Limit	Margin (dB)	Result
2483.5	51.8 dB μ V/m	54.0 dB μ V/m	2.2	Complied

Results: Hopping Mode DH5

Frequency (MHz)	Peak Level	Limit	Margin (dB)	Result
2400.0	-46.5 dBm	*-23.2 dBm	23.3	Complied
2483.5	64.2 dB μ V/m	74.0 dB μ V/m	9.8	Complied

Frequency (MHz)	Average Level	Limit	Margin (dB)	Result
2483.5	40.1 dB μ V/m	54.0 dB μ V/m	13.9	Complied

Results: Static Mode 2DH5

Frequency (MHz)	Peak Level	Limit	Margin (dB)	Result
2400.0	-47.6 dBm	*-24.6 dBm	23.0	Complied
2483.5	62.8 dB μ V/m	74.0 dB μ V/m	11.2	Complied

Frequency (MHz)	Average Level	Limit	Margin (dB)	Result
2483.5	48.0 dB μ V/m	54.0 dB μ V/m	6.0	Complied

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

Frequency (MHz)	Peak Level	Limit	Margin (dB)	Result
2400.0	-51.4 dBm	*-23.5 dBm	27.9	Complied
2483.5	62.0 dB μ V/m	74.0 dB μ V/m	12.0	Complied

Frequency (MHz)	Average Level	Limit	Margin (dB)	Result
2483.5	38.3 dB μ V/m	54.0 dB μ V/m	15.7	Complied

Results: Static Mode 3DH5

Frequency (MHz)	Peak Level	Limit	Margin (dB)	Result
2400.0	-48.8 dBm	*-24.4 dBm	24.4	Complied
2483.5	62.1 dB μ V/m	74.0 dB μ V/m	11.9	Complied

Frequency (MHz)	Average Level	Limit	Margin (dB)	Result
2483.5	48.0 dB μ V/m	54.0 dB μ V/m	6.0	Complied

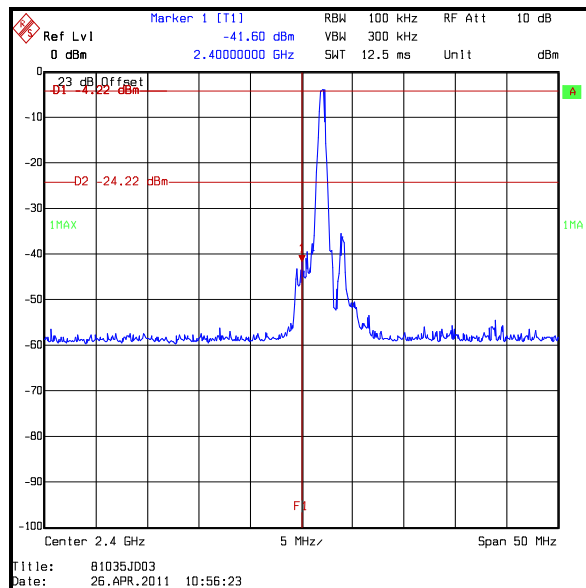
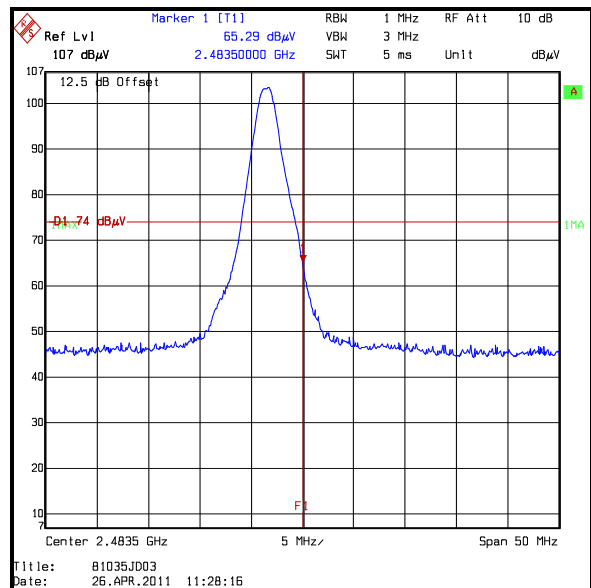
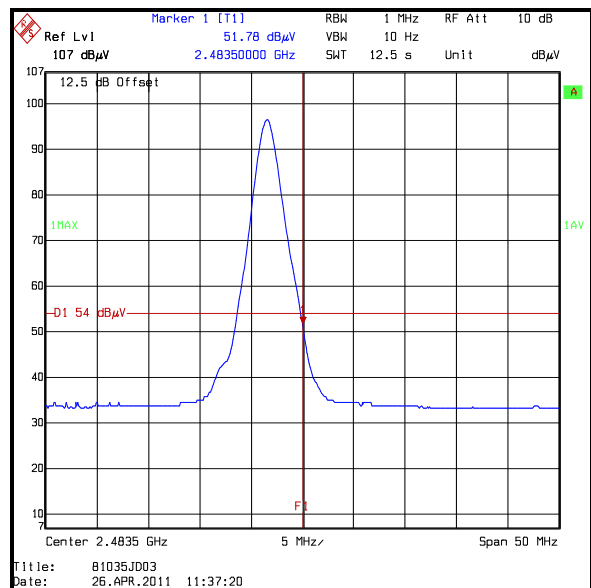
Results: Hopping Mode 3DH5

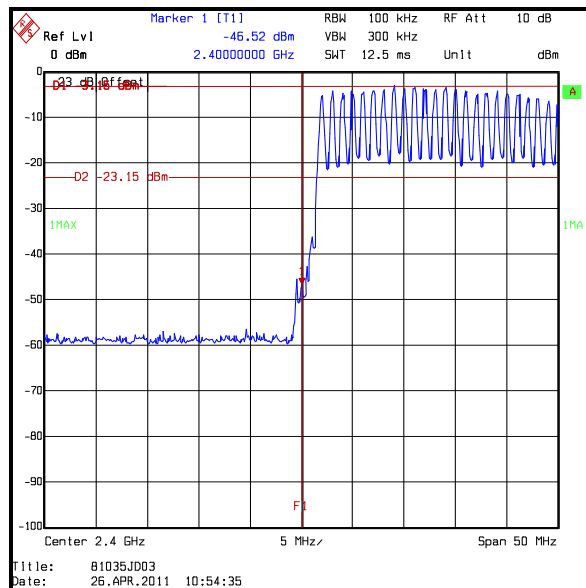
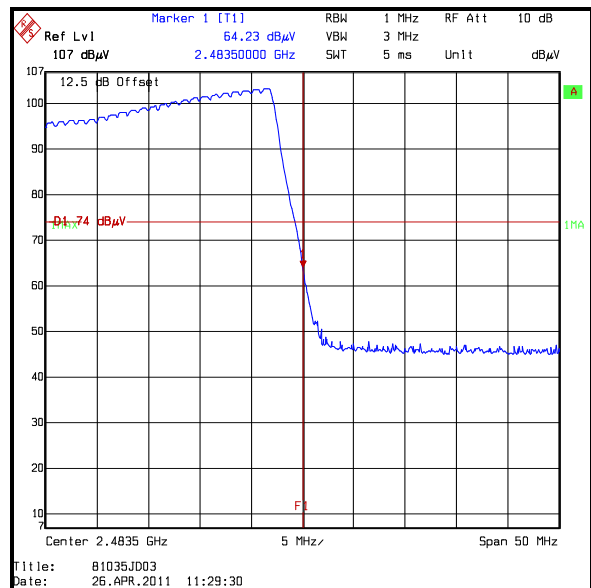
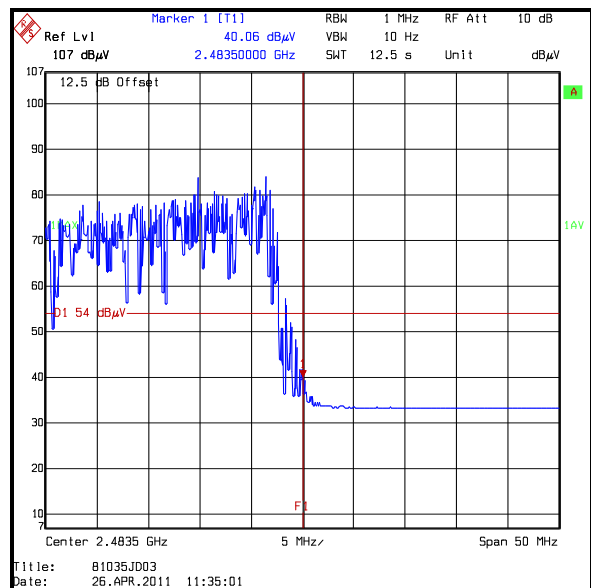
Frequency (MHz)	Peak Level	Limit	Margin (dB)	Result
2400.0	-61.7 dBm	*-23.4 dBm	38.3	Complied
2483.5	61.0 dB μ V/m	74.0 dB μ V/m	13.0	Complied

Frequency (MHz)	Average Level	Limit	Margin (dB)	Result
2483.5	36.5 dB μ V/m	54.0 dB μ V/m	17.5	Complied

Note(s):

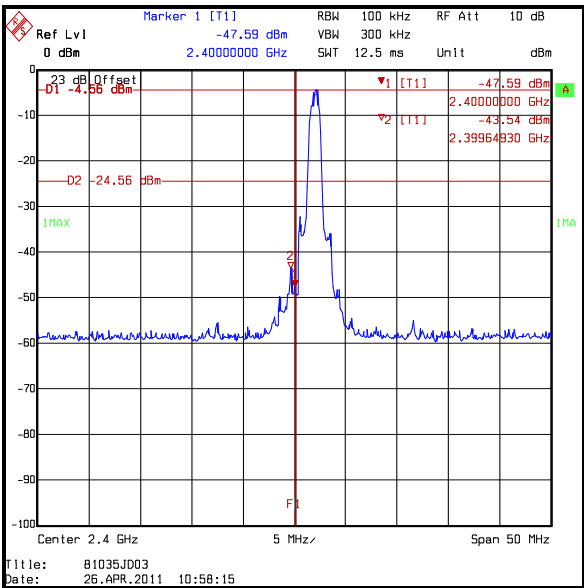
1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. * -20 dBc limit

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

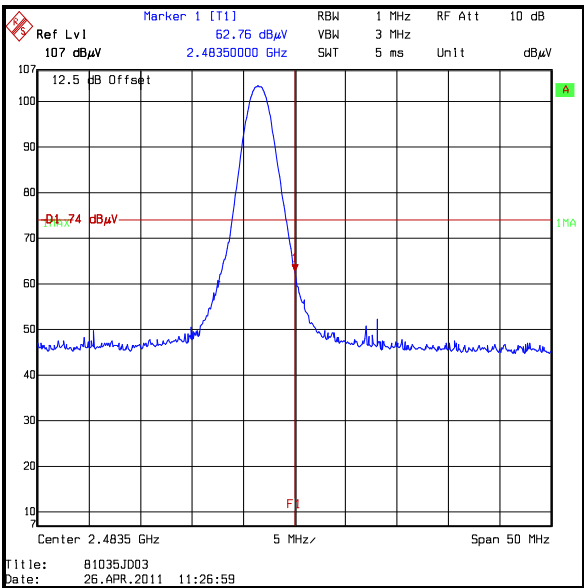
Transmitter Band Edge Radiated Emissions (continued)**DH5 Hopping Mode****Lower Band Edge Peak Hopping****Upper Band Edge Peak Hopping****Upper Band Edge Average Hopping**

Transmitter Band Edge Radiated Emissions (continued)

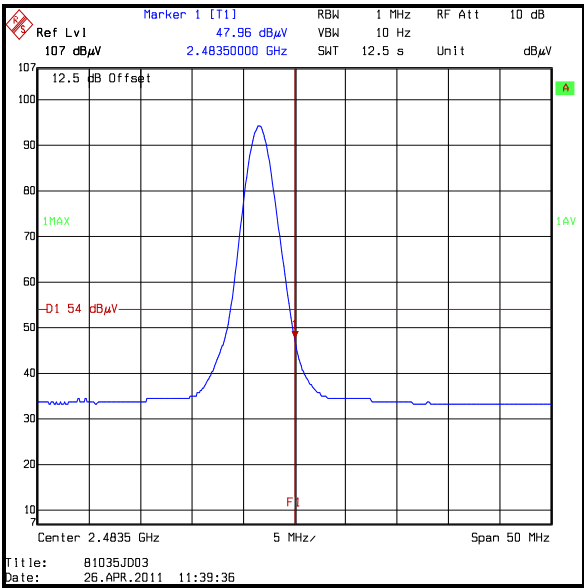
2DH5 Static Mode



Lower Band Edge Peak Static



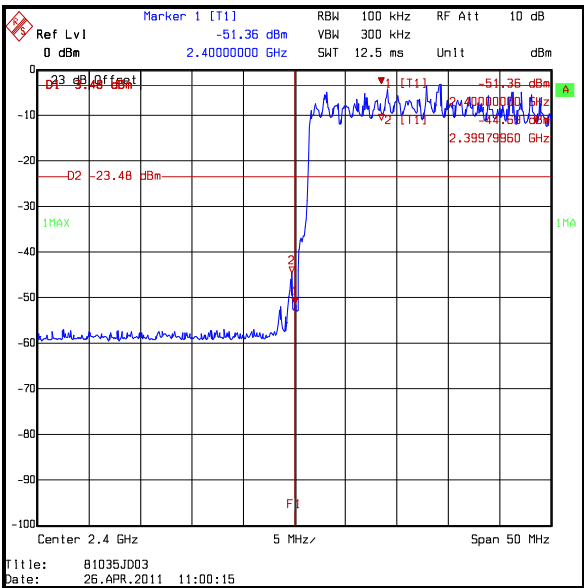
Upper Band Edge Peak Static



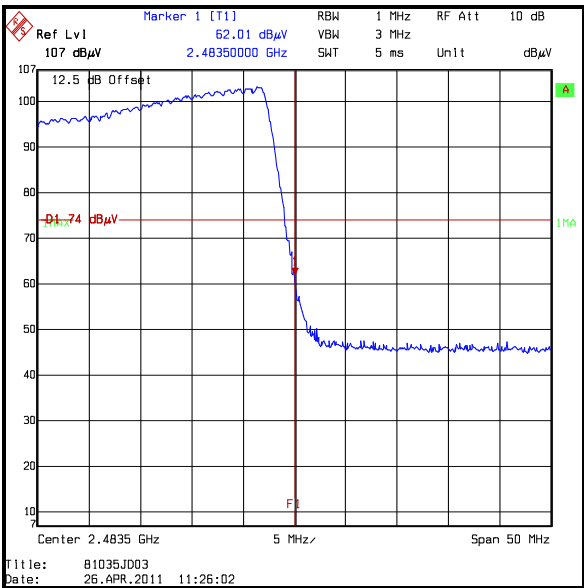
Upper Band Edge Average Static

Transmitter Band Edge Radiated Emissions (continued)

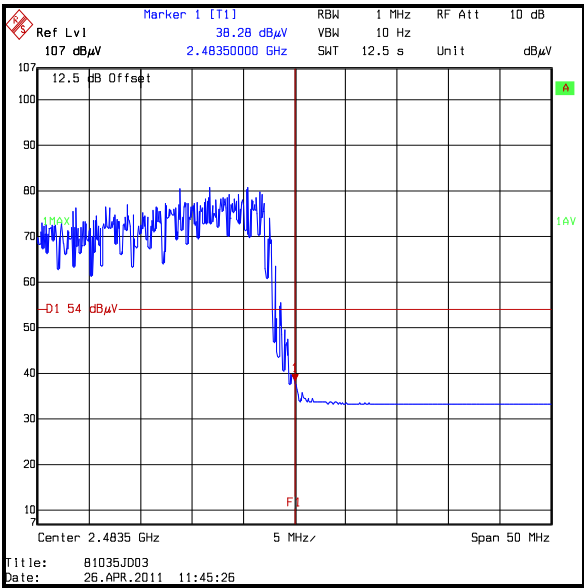
2DH5 Hopping Mode



Lower Band Edge Peak Hopping



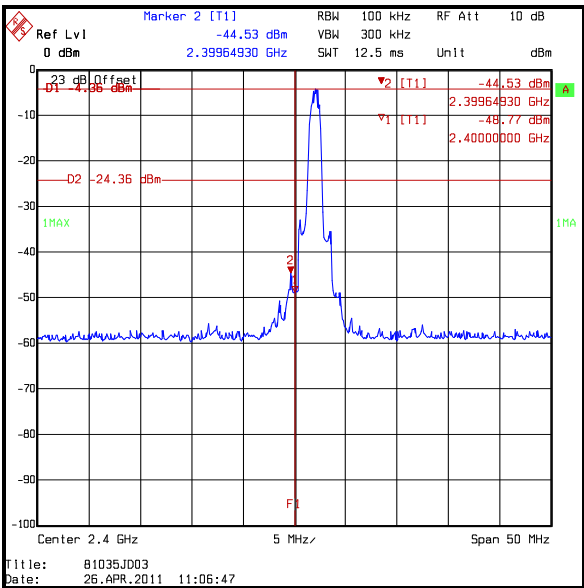
Upper Band Edge Peak Hopping



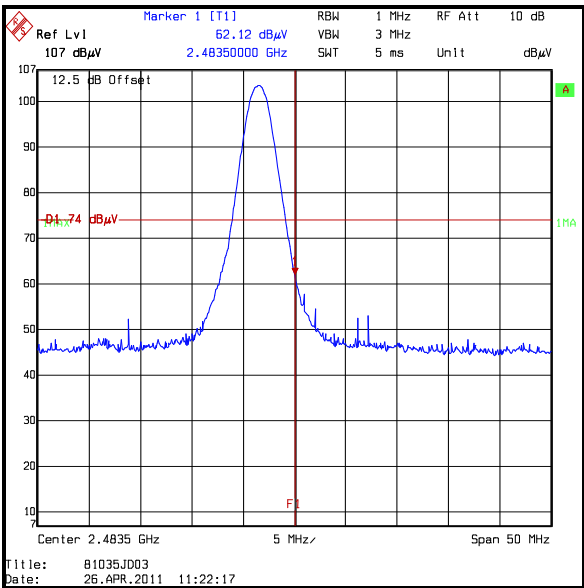
Upper Band Edge Average Hopping

Transmitter Band Edge Radiated Emissions (continued)

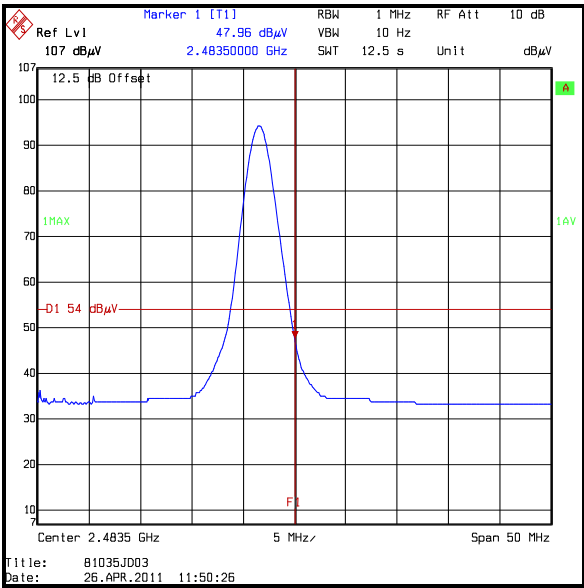
3DH5 Static Mode



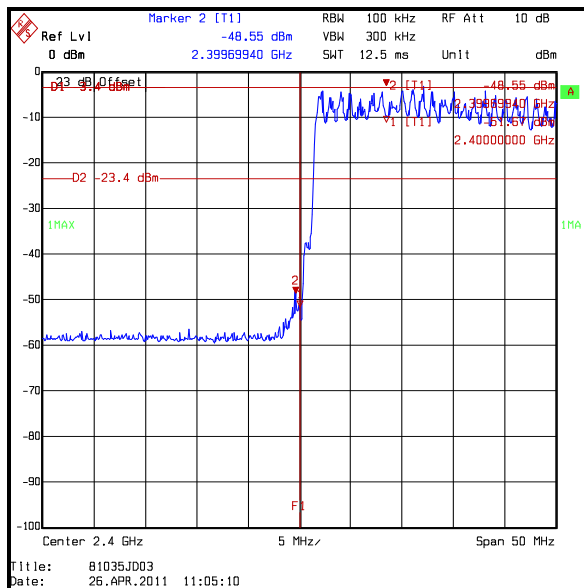
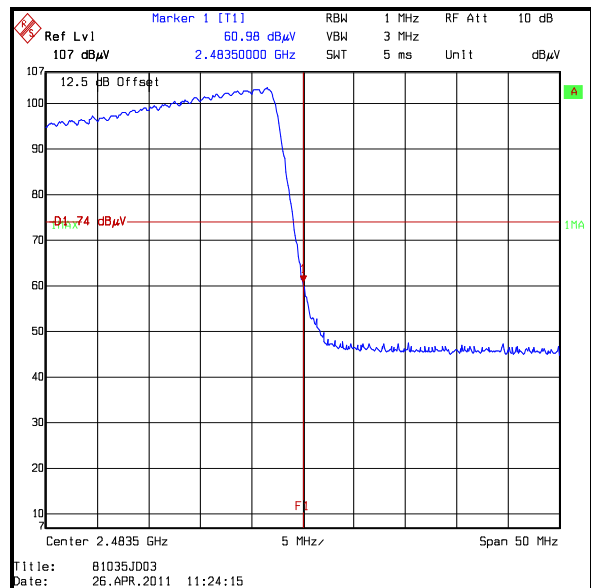
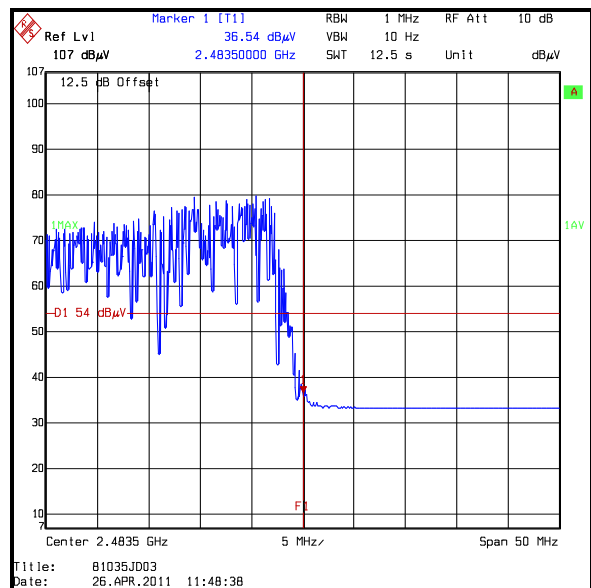
Lower Band Edge Peak Static



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
Radiated 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

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (months)
A1368	Directional Coupler	Pasternack Enterprises.	PE2214-10	None	Calibrated before use	-
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	06 Jun 2011	12
A1535	Attenuator	Agilent & Hewlett Packard	8495B/8494B	00007	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	05 Sep 2011	12
A1830	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100668	05 Mar 2012	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	29 Dec 2011	12
A253	Antenna	Flann Microwave	12240-20	128	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
A427	Antenna	Flann Microwave	14240-20	150	21 Nov 2013	36
A436	Antenna	Flann Microwave	20240-20	330	05 Sep 2011	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	05 Apr 2012	12
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
M1124	Test Receiver	Rohde & Schwarz	ESI26	100046K	22 Jun 2011	12
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	03 Dec 2011	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	28 Jun 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
M1447	Bluetooth Tester	Rohde & Schwarz	CBT	100329	18 Feb 2012	12

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