



# TEST REPORT

**Test Report No. : UL-RPT-RP92315JD11A V2.0**

**Manufacturer** : Panasonic Mobile Communications Development of Europe Ltd  
**Model No.** : NTT docomo P-03E  
**FCC ID** : UCE313058A  
**Technology** : Bluetooth – Basic Rate & EDR  
**Test Standard(s)** : FCC Parts 15.107(a), 15.109, 15.207, 15.209(a) & 15.247

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

**Date of Issue:** 10 April 2013

**Checked by:**

Sarah Williams  
WiSE Laboratory Engineer

**Issued by :**

pp

John Newell  
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This laboratory is accredited by UKAS. The tests reported herein have been performed in accordance with its' terms of accreditation.

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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) 2012: 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) 2012: 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) 2012: 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 trading as UL, Wade Road, Basingstoke, Hampshire, RG24 8AH.
<b>Test Dates:</b>	26 March 2013 to 05 April 2013

### 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 (2003)
<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-03E
<b>IMEI:</b>	355335050017244 ( <i>Radiated sample #1</i> )
<b>Hardware Version Number:</b>	Rev B
<b>Software Version Number:</b>	ACPU: zoro-jb-10-0371 CCPU: 161022_DCM_00.15
<b>FCC ID:</b>	UCE313058A

<b>Brand Name:</b>	NTT docomo
<b>Model Name or Number:</b>	P-03E
<b>IMEI:</b>	355335050017228 ( <i>Radiated sample #2</i> )
<b>Hardware Version Number:</b>	Rev B
<b>Software Version Number:</b>	ACPU: zoro-jb-10-0371 CCPU: 161022_DCM_00.15
<b>FCC ID:</b>	UCE313058A

<b>Brand Name:</b>	NTT docomo
<b>Model Name or Number:</b>	P-03E
<b>IMEI:</b>	355335050017236 ( <i>Radiated sample #3</i> )
<b>Hardware Version Number:</b>	Rev B
<b>Software Version Number:</b>	ACPU: zoro-jb-10-0371 CCPU: 161022_DCM_00.15
<b>FCC ID:</b>	UCE313058A

<b>Brand Name:</b>	NTT docomo
<b>Model Name or Number:</b>	P-03E
<b>IMEI:</b>	355335050017087 ( <i>Conducted RF port sample</i> )
<b>Hardware Version Number:</b>	Rev B
<b>Software Version Number:</b>	ACPU: zoro-jb-10-0371 CCPU: 161022_DCM_00.15
<b>FCC ID:</b>	UCE313058A

<b>Brand Name:</b>	NTT docomo
<b>Description:</b>	Battery
<b>Model Name or Number:</b>	P30

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

<b>Brand Name:</b>	NTT docomo
<b>Description:</b>	AC Charger
<b>Model Name or Number:</b>	AC04

<b>Brand Name:</b>	NTT docomo
<b>Description:</b>	Charge/USB Data cable
<b>Model Name or Number:</b>	Type 01

<b>Brand Name:</b>	NTT docomo
<b>Description:</b>	Personal Hands-Free
<b>Model Name or Number:</b>	Type 02

**3.2. Description of EUT**

The equipment under test was a Multi-Mode LTE/UMTS/GSM Mobile Phone with WLAN, *Bluetooth* and RFID.

**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	3.8 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>Maximum Conducted Output Power:</b>	1.7 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>	Hewlett Packard
<b>Description:</b>	Laptop PC
<b>Model Name or Number:</b>	HP Mini 200-4200

<b>Description:</b>	Dummy Battery
<b>Brand Name:</b>	Not marked or stated
<b>Model Name or Number:</b>	Not marked or stated

<b>Brand Name:</b>	Not marked or stated
<b>Description:</b>	2 GB Micro SD Card
<b>Model Name or Number:</b>	Not marked or stated

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

### **4.1. Operating Modes**

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

- Receive/Idle Mode.
- 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):

- 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 Customer'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 and PHF 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.
- Transmitter radiated spurious emissions tests were performed with EUT transmitting in 3DH5 mode as this mode was found to transmit the highest power.
- The EUT conducted sample with IMEI 355335050017087 was used for 20 dB bandwidth, carrier frequency separation, average time of occupancy tests and conducted output power tests.
- The radiated samples with IMEI 355335050017228, IMEI 355335050017244 and IMEI 355335050017236 were 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.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

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

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	29 March 2013
<b>Test Sample IMEI:</b>	355335050017228		

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

**Environmental Conditions:**

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

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

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.155	Live	51.0	65.8	14.8	Complied
0.231	Live	46.2	62.4	16.2	Complied
0.398	Live	39.5	57.9	18.4	Complied
1.622	Live	39.5	56.0	16.5	Complied
1.856	Live	38.8	56.0	17.2	Complied
1.964	Live	39.7	56.0	16.3	Complied
2.252	Live	37.4	56.0	18.6	Complied

**Results: Live / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
2.022	Live	28.2	46.0	17.8	Complied
2.594	Live	29.2	46.0	16.8	Complied
15.351	Live	30.0	50.0	20.0	Complied
15.414	Live	30.9	50.0	19.1	Complied
15.747	Live	32.6	50.0	17.4	Complied
15.842	Live	34.8	50.0	15.2	Complied
15.945	Live	30.0	50.0	20.0	Complied

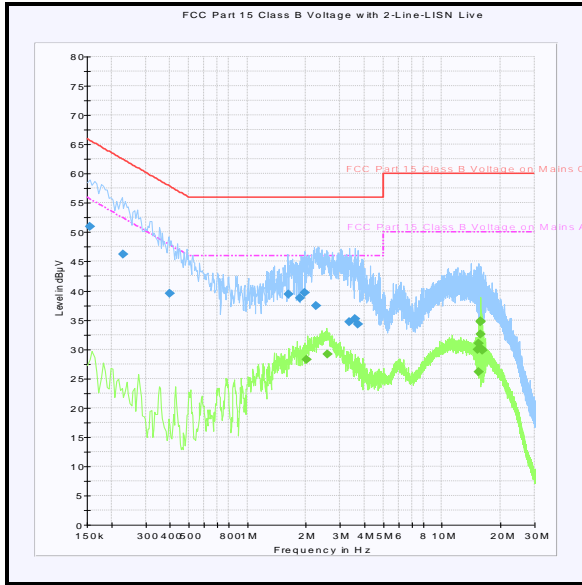
**Results: Neutral / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.155	Neutral	57.3	65.8	8.5	Complied
0.245	Neutral	52.7	61.9	9.2	Complied
0.267	Neutral	51.8	61.2	9.4	Complied
0.285	Neutral	50.8	60.7	9.9	Complied
0.303	Neutral	50.5	60.2	9.7	Complied
0.335	Neutral	48.8	59.3	10.5	Complied
0.344	Neutral	49.1	59.1	10.0	Complied
0.384	Neutral	46.5	58.2	11.7	Complied
0.411	Neutral	44.9	57.6	12.7	Complied
0.443	Neutral	45.5	57.0	11.5	Complied

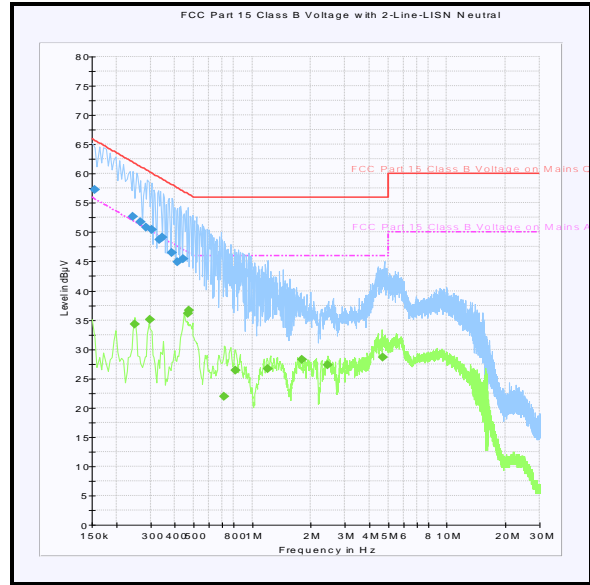
**Results: Neutral / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.249	Neutral	34.3	51.8	17.5	Complied
0.299	Neutral	35.1	50.3	15.2	Complied
0.465	Neutral	36.1	46.6	10.5	Complied
0.474	Neutral	36.6	46.4	9.8	Complied
0.816	Neutral	26.4	46.0	19.6	Complied
1.199	Neutral	26.7	46.0	19.3	Complied
1.806	Neutral	28.3	46.0	17.7	Complied
2.432	Neutral	27.3	46.0	18.7	Complied
4.668	Neutral	28.7	46.0	17.3	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.*

**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	19 Apr 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	19 Feb 2014	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	09 Aug 2013	12

**5.2.2. Receiver/Idle Mode Radiated Spurious Emissions****Test Summary:**

<b>Test Engineer:</b>	Sarah Williams	<b>Test Date:</b>	29 March 2013
<b>Test Sample IMEI:</b>	355335050017236		

<b>FCC Reference:</b>	Part 15.109
<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>	22
<b>Relative Humidity (%):</b>	26

**Note(s):**

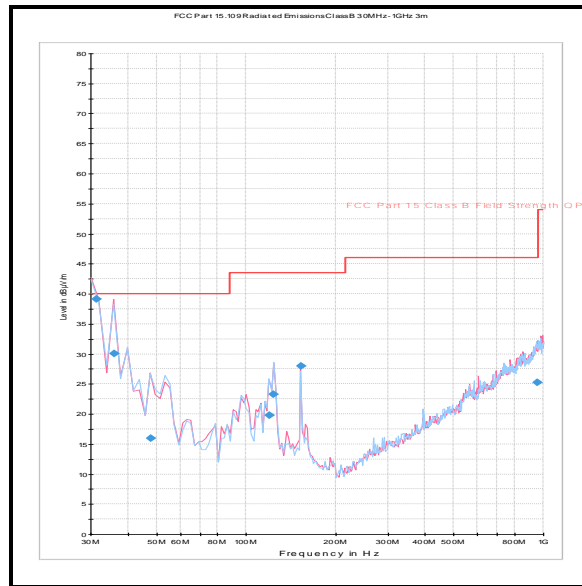
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
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.

**Results: Quasi Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
31.337	Vertical	39.1	40.0	0.9	Complied
36.096	Vertical	30.0	40.0	10.0	Complied
123.571	Horizontal	23.3	43.5	20.2	Complied
153.307	Vertical	28.0	43.5	15.5	Complied
956.200	Vertical	25.3	46.0	20.7	Complied



**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.*

**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1834	Attenuator	Hewlett Packard	8491B	10444	27 Jan 2014	12
A490	Antenna	Chase	CBL6111A	1590	14 May 2013	12
G0543	Amplifier	Sonoma	310N	230801	03 Apr 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2014	12

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

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	26 March 2013
<b>Test Sample IMEI:</b>	355335050017244		

<b>FCC Reference:</b>	Part 15.109
<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 12.75 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	29

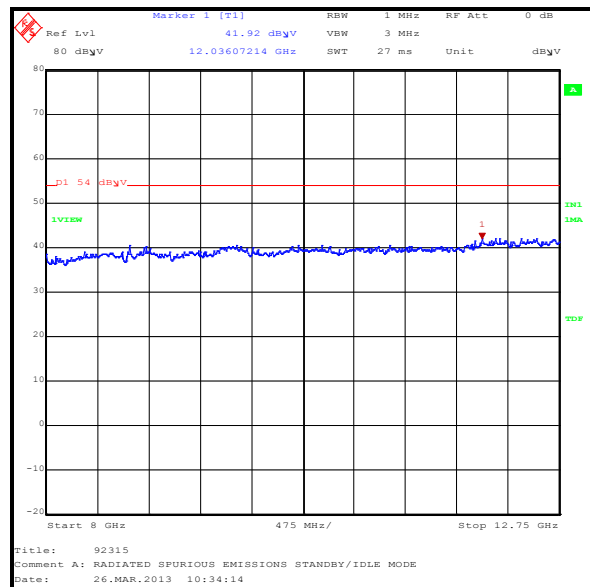
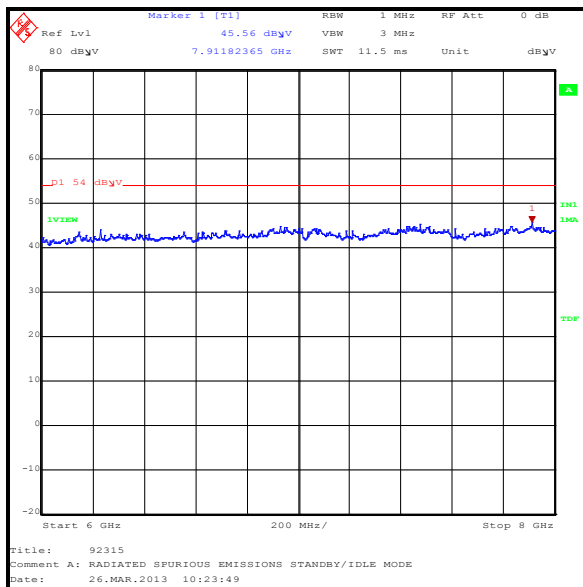
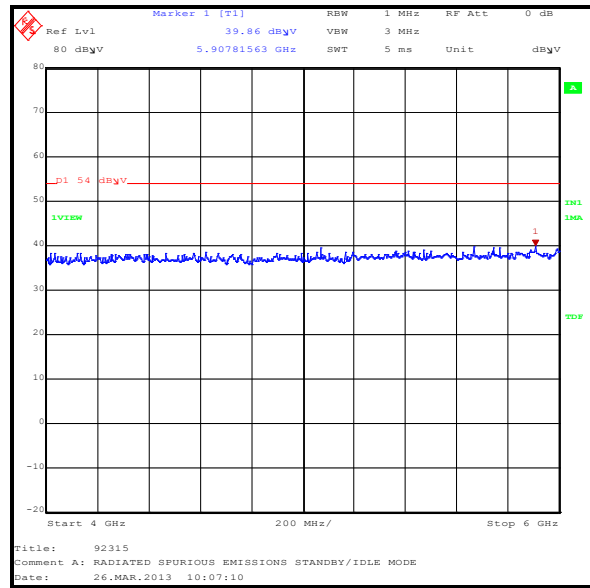
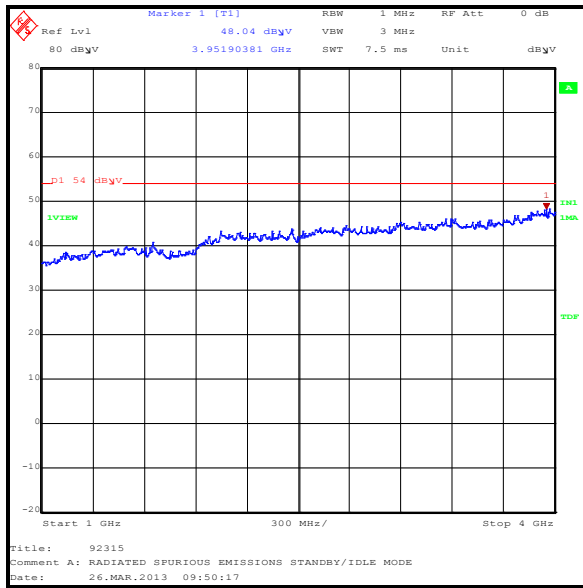
**Note(s):**

1. The final measured value, for the given emission, in the table below 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 below. 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.

**Results:**

<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Peak Level (dB<math>\mu</math>V/m)</b>	<b>Average Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
3951.904	Vertical	48.0	54.0	6.0	Complied

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



**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0002	3m RSE Chamber	Rainford	N/A	N/A	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
A253	Antenna	Flann Microwave	12240-20	128	04 Nov 2013	12
A254	Antenna	Flann Microwave	14240-20	139	04 Nov 2013	12
A255	Antenna	Flann Microwave	16240-20	519	04 Nov 2013	12

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

<b>Test Engineer:</b>	Patrick Jones	<b>Test Date:</b>	05 April 2013
<b>Test Sample IMEI:</b>	355335050017228		

<b>FCC Reference:</b>	Part 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>	24
<b>Relative Humidity (%):</b>	28

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Live / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.222	Live	36.7	62.7	26.0	Complied
0.263	Live	36.9	61.4	24.5	Complied
0.267	Live	37.9	61.2	23.3	Complied
0.308	Live	37.0	60.0	23.0	Complied
0.353	Live	35.5	58.9	23.4	Complied

**Results: Live / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.177	Live	32.7	54.6	21.9	Complied
0.267	Live	32.5	51.2	18.7	Complied
0.312	Live	32.6	49.9	17.3	Complied
0.353	Live	32.2	48.9	16.7	Complied
0.488	Live	42.5	46.2	3.7	Complied
0.830	Live	29.4	46.0	16.6	Complied
1.338	Live	25.4	46.0	20.6	Complied
4.002	Live	31.7	46.0	14.3	Complied

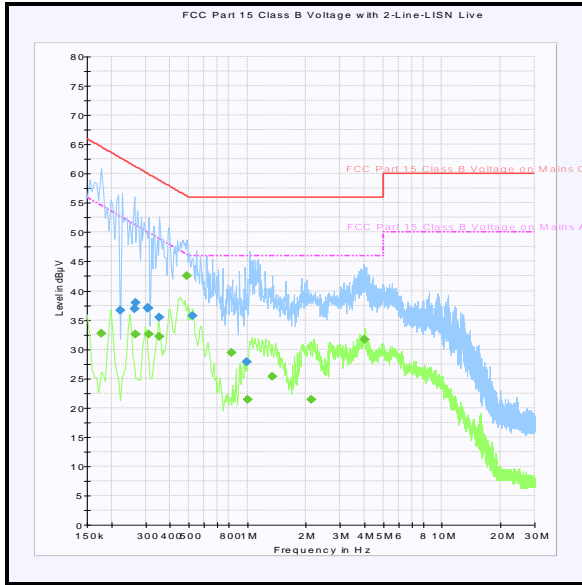
**Transmitter AC Conducted Spurious Emissions (continued)****Results: Neutral / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.150	Neutral	55.8	66.0	10.2	Complied
0.155	Neutral	56.1	65.8	9.7	Complied
0.177	Neutral	55.7	64.6	8.9	Complied
0.186	Neutral	55.4	64.2	8.8	Complied
0.222	Neutral	54.2	62.7	8.5	Complied
0.231	Neutral	54.1	62.4	8.3	Complied
0.258	Neutral	53.3	61.5	8.2	Complied
5.573	Neutral	34.2	60.0	25.8	Complied

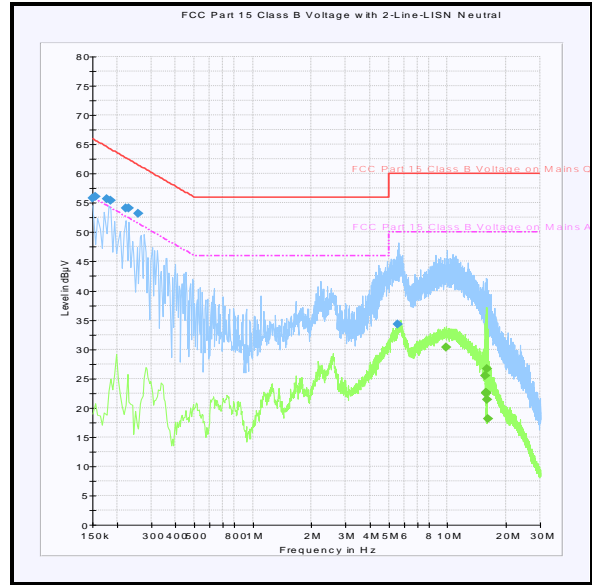
**Results: Neutral / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
9.870	Neutral	30.3	50.0	19.7	Complied
15.684	Neutral	25.4	50.0	24.6	Complied
15.734	Neutral	22.6	50.0	27.4	Complied
15.783	Neutral	22.6	50.0	27.4	Complied
15.882	Neutral	22.5	50.0	27.5	Complied
15.981	Neutral	21.4	50.0	28.6	Complied
16.080	Neutral	18.2	50.0	31.8	Complied

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



**Live**



**Neutral**

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

**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	09 Aug 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	19 Feb 2014	12
A649	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	825562/008	19 Apr 2013	12

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

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	27 March 2013
<b>Test Sample IMEI:</b>	355335050017087		

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

**Environmental Conditions:**

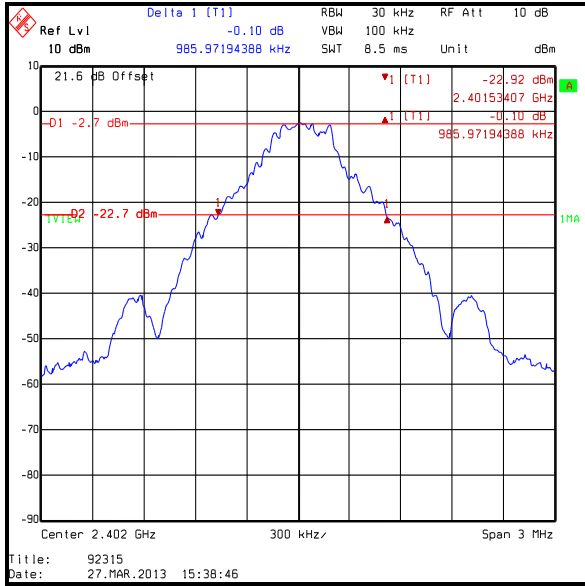
<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	29



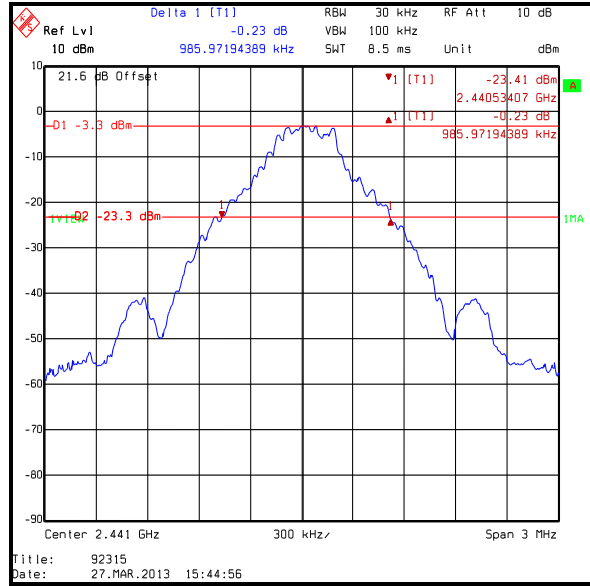
**Transmitter 20 dB Bandwidth (continued)**

**Results DH5:**

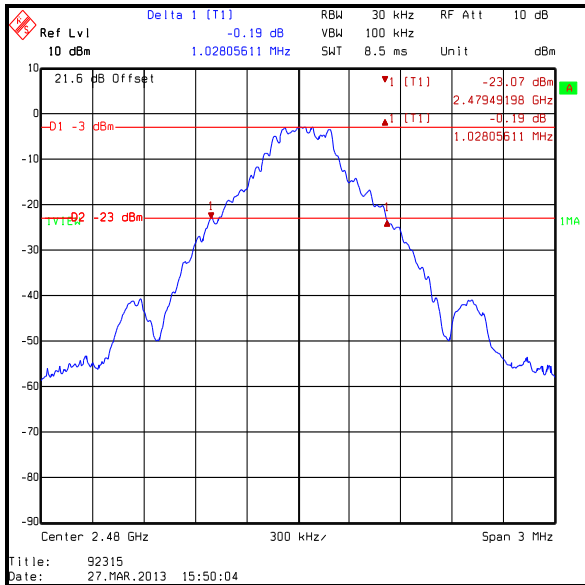
Channel	20 dB Bandwidth (kHz)
Bottom	985.972
Middle	985.972
Top	1028.056



**Bottom Channel**



**Middle Channel**

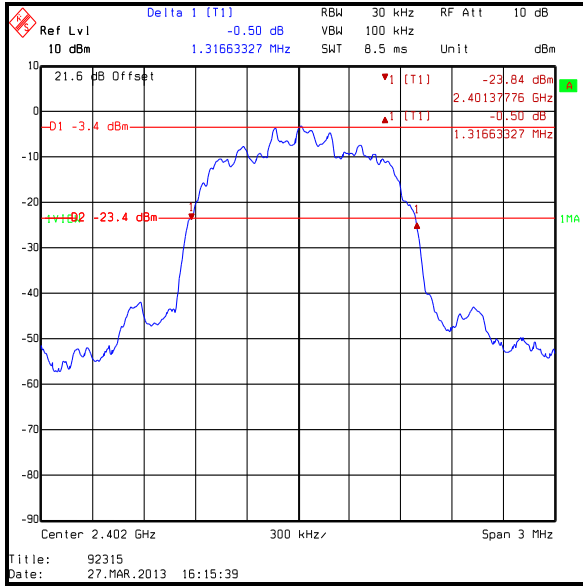


**Top Channel**

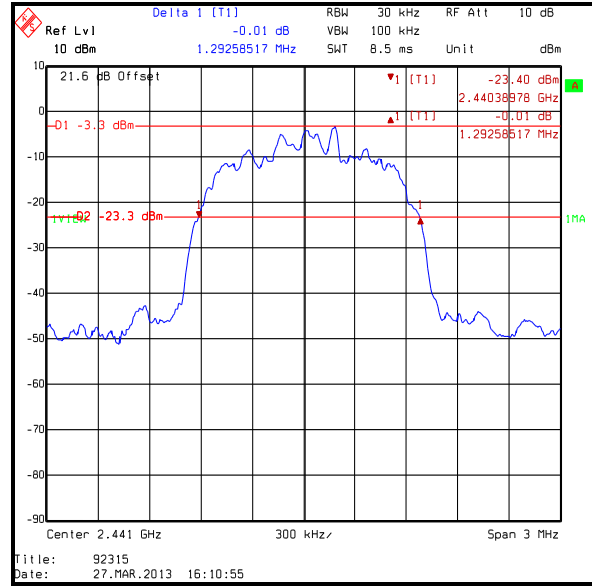
**Transmitter 20 dB Bandwidth (continued)**

**Results 2DH5:**

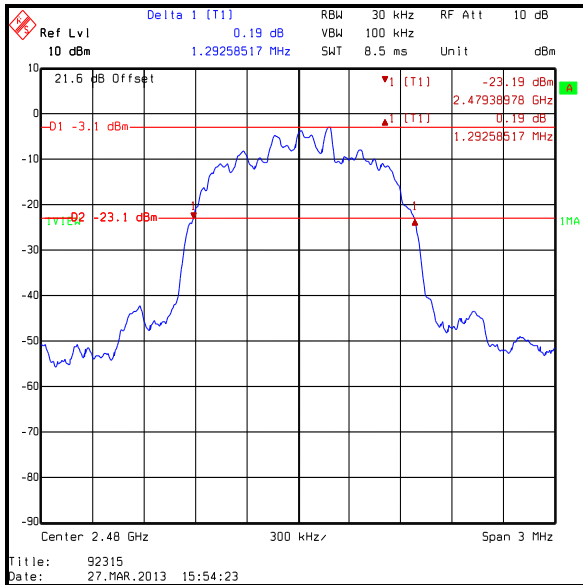
Channel	20 dB Bandwidth (kHz)
Bottom	1316.633
Middle	1292.585
Top	1292.585



**Bottom Channel**



**Middle Channel**

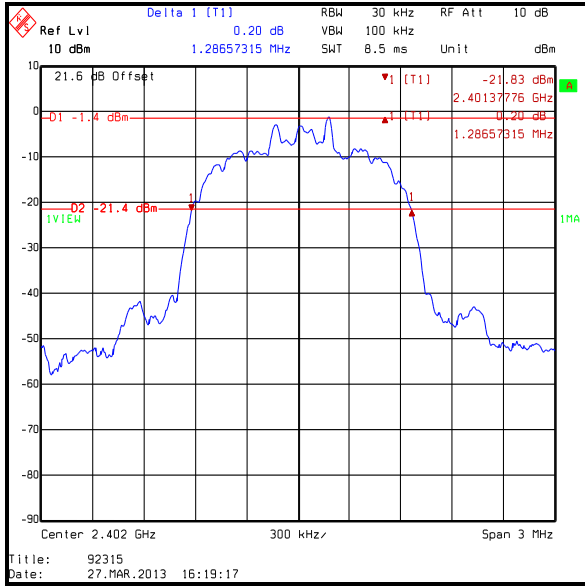


**Top Channel**

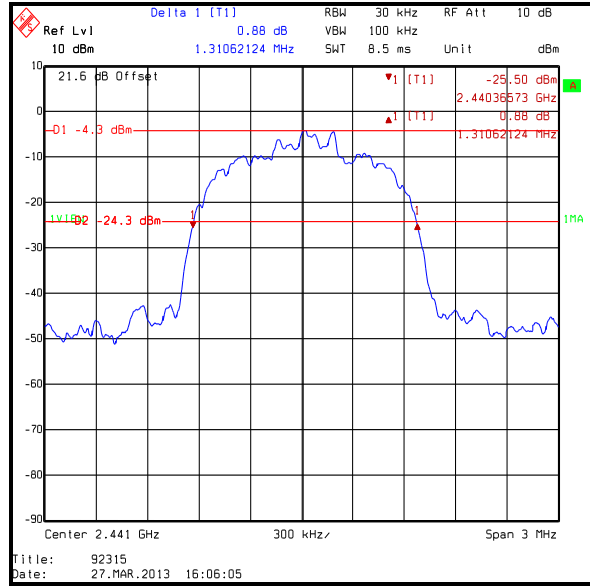
**Transmitter 20 dB Bandwidth (continued)**

**Results 3DH5:**

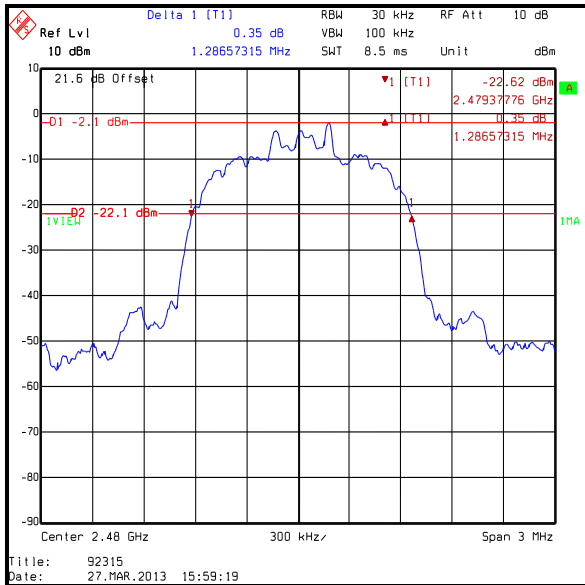
Channel	20 dB Bandwidth (kHz)
Bottom	1286.573
Middle	1310.621
Top	1286.573



**Bottom Channel**



**Middle Channel**



**Top Channel**

**Transmitter 20 dB Bandwidth (continued)****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>
A1996	Attenuator	Huber & Suhner	6810.17.B	301749	03 Apr 2013	12
A2072	Coupler	Narda	4242B	03549	Calibrated before use	-
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	19 Dec 2013	12

**5.2.5. Transmitter Carrier Frequency Separation**

**Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Dates:</b>	27 March 2013 & 02 April 2013
<b>Test Sample IMEI:</b>	355335050017087		

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

**Environmental Conditions:**

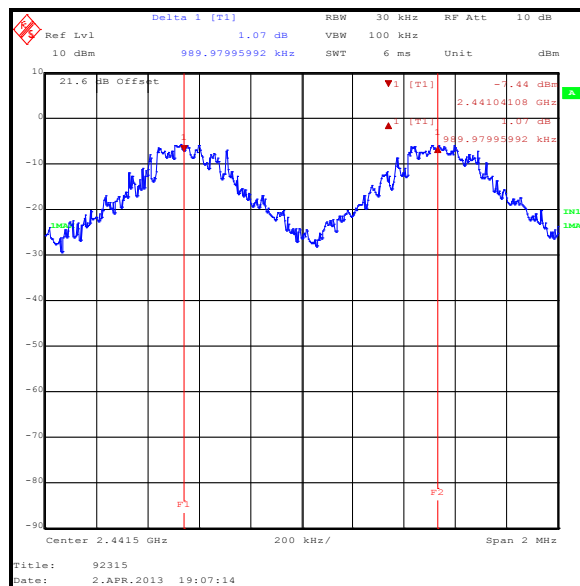
<b>Temperature (°C):</b>	22 to 24
<b>Relative Humidity (%):</b>	26 to 30

**Note(s):**

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

**Results: DH5**

Carrier Frequency Separation (kHz)	Limit ( $2/3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
989.980	657.315	332.665	Complied



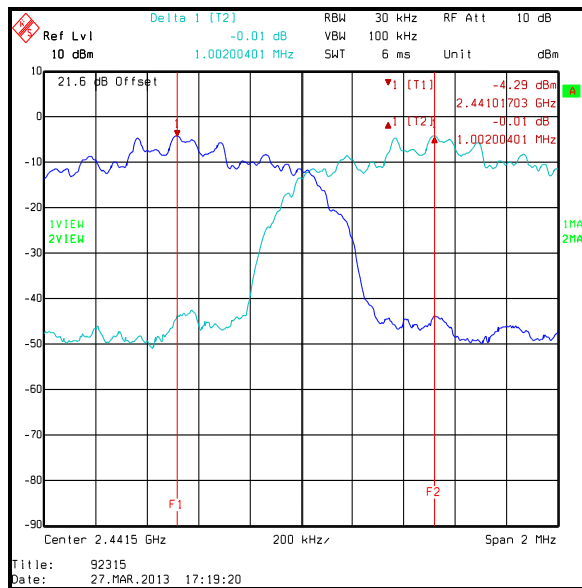
**Transmitter Carrier Frequency Separation (continued)**

**Note(s):**

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

**Results: 2DH5**

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



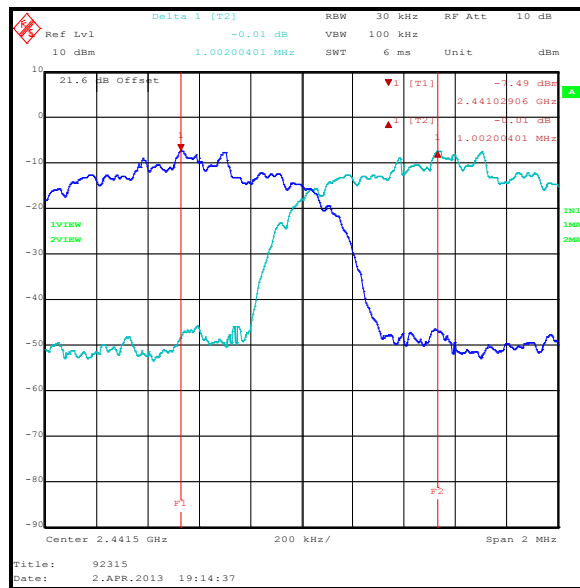
**Transmitter Carrier Frequency Separation (continued)**

**Note(s):**

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

**Results: 3DH5**

Carrier Frequency Separation (kHz)	Limit ( $2/3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.004	873.747	128.257	Complied



**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1996	Attenuator	Huber & Suhner	6810.17.B	301749	03 Apr 2013	12
A2072	Coupler	Narda	4242B	03549	Calibrated before use	-
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	19 Dec 2013	12

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

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	27 March 2013
<b>Test Sample IMEI:</b>	355335050017087		

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

**Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	30

**Note(s):**

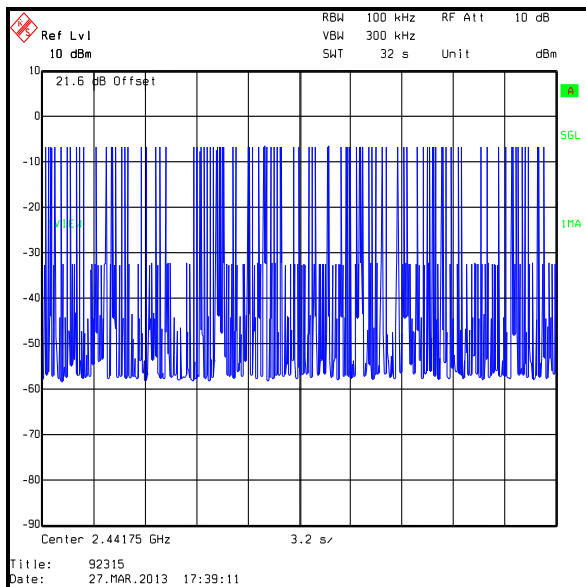
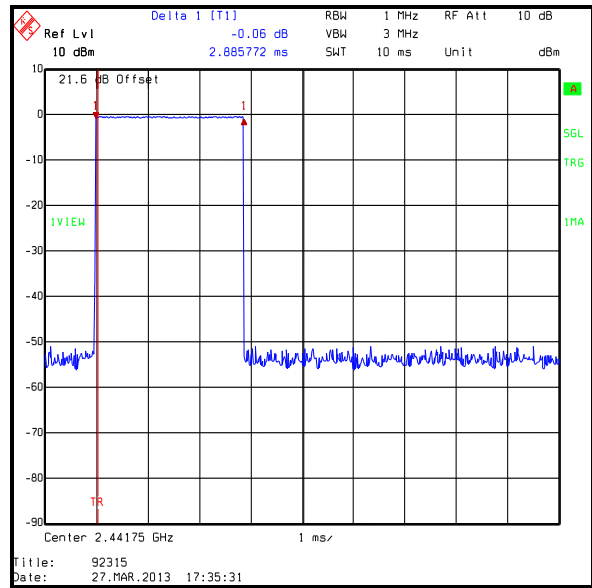
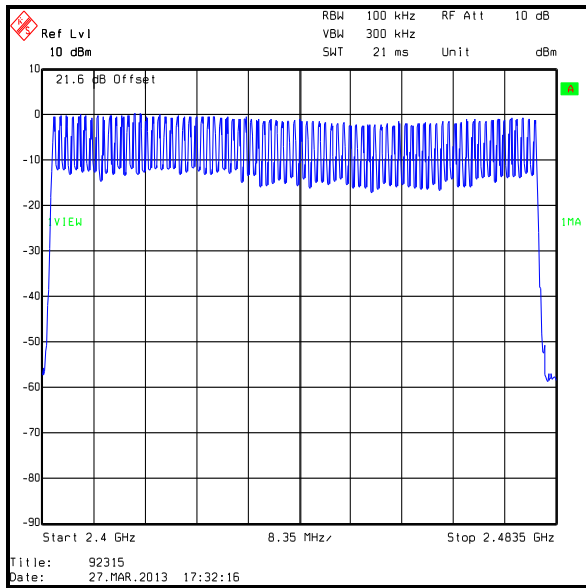
1. Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.

**Results:**

<b>Emission Width (μs)</b>	<b>Number of Hops in 31.6 Seconds</b>	<b>Average Time of Occupancy (s)</b>	<b>Limit (s)</b>	<b>Margin (s)</b>	<b>Result</b>
2885.772	86	0.248	0.4	0.152	Complied



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



**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1996	Attenuator	Huber & Suhner	6810.17.B	301749	03 Apr 2013	12
A2072	Coupler	Narda	4242B	03549	Calibrated before use	-
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	19 Dec 2013	12

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

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	27 March 2013
<b>Test Sample IMEI:</b>	355335050017087		

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

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	30

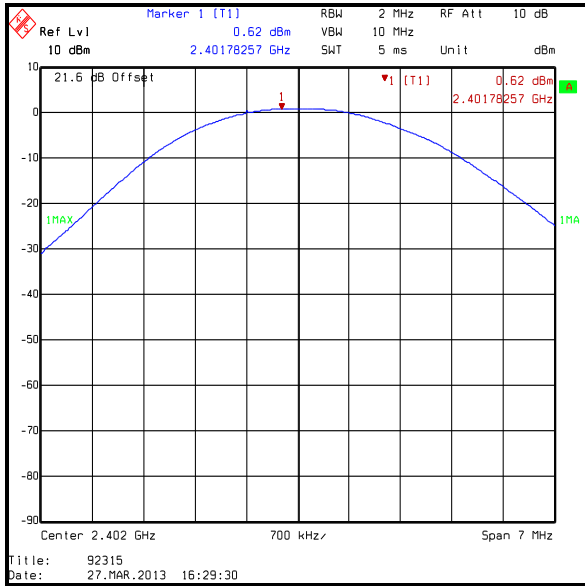
**Transmitter Maximum Peak Output Power (continued)****Results: DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	0.6	30.0	29.4	Complied
Middle	-0.3	30.0	30.3	Complied
Top	0.3	30.0	29.7	Complied

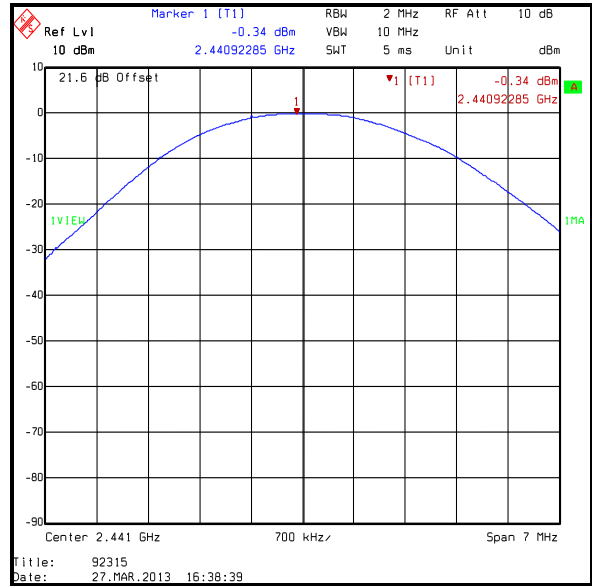
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	0.6	-2.0	-1.4	36.0	37.4	Complied
Middle	-0.3	-2.0	-2.3	36.0	38.3	Complied
Top	0.3	-2.0	-1.7	36.0	37.7	Complied

### Transmitter Maximum Peak Output Power (continued)

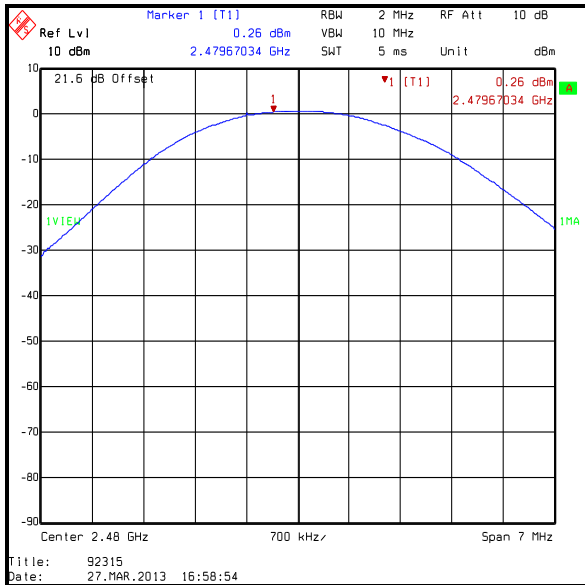
#### Results: DH5



Bottom Channel



Middle Channel



Top Channel

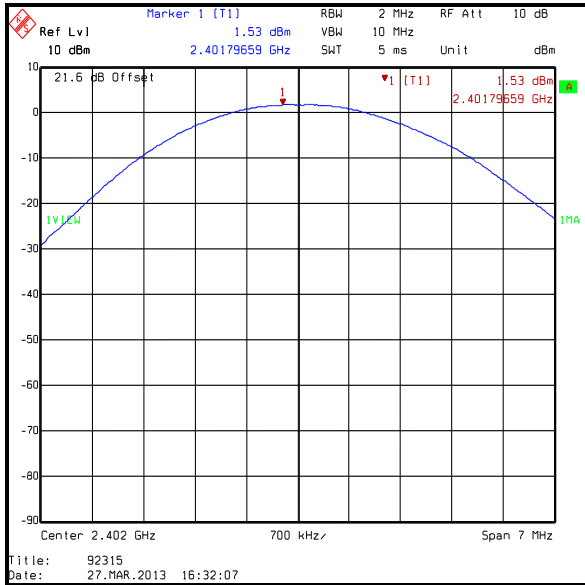
**Transmitter Maximum Peak Output Power (continued)****Results: 2DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	1.5	21.0	19.5	Complied
Middle	0.4	21.0	20.6	Complied
Top	1.1	21.0	19.9	Complied

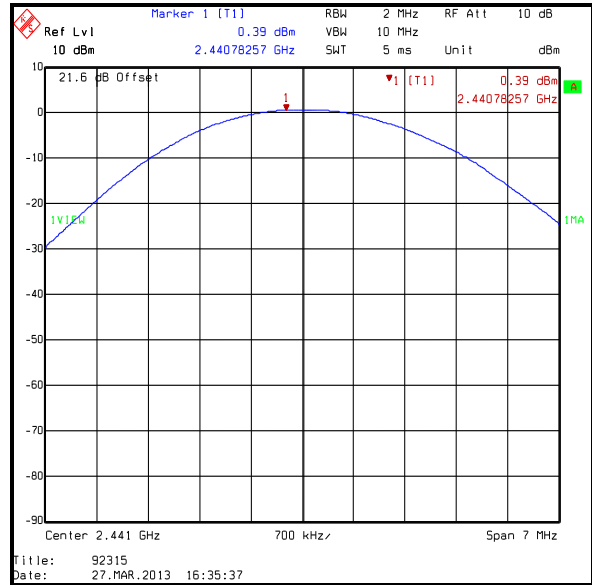
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	1.5	-2.0	-0.5	27.0	27.5	Complied
Middle	0.4	-2.0	-1.6	27.0	28.6	Complied
Top	1.1	-2.0	-0.9	27.0	27.9	Complied

**Transmitter Maximum Peak Output Power (continued)**

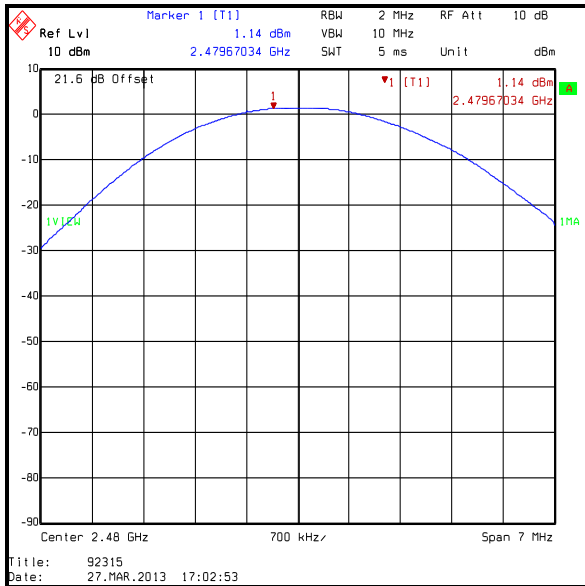
**Results: 2DH5**



**Bottom Channel**



**Middle Channel**



**Top Channel**

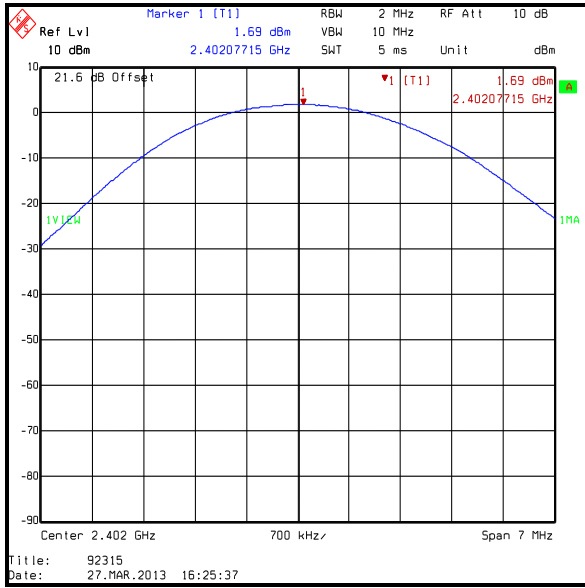
**Transmitter Maximum Peak Output Power (continued)****Results: 3DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	1.7	21.0	19.3	Complied
Middle	0.6	21.0	20.4	Complied
Top	1.4	21.0	19.6	Complied

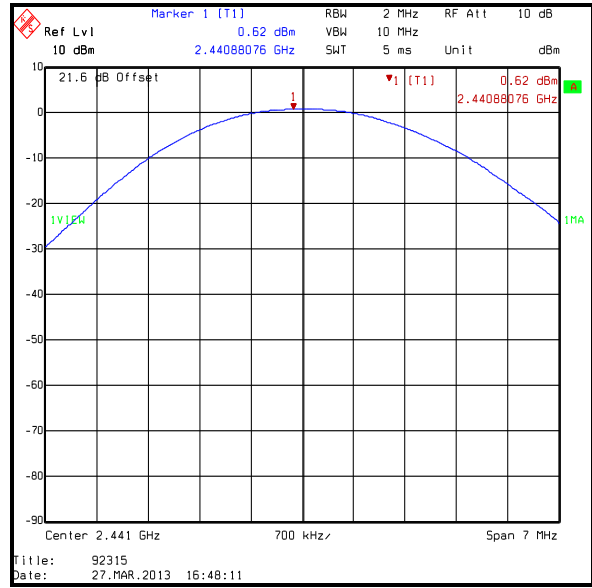
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	1.7	-2.0	-0.3	27.0	27.3	Complied
Middle	0.6	-2.0	-1.4	27.0	28.4	Complied
Top	1.4	-2.0	-0.6	27.0	27.6	Complied

**Transmitter Maximum Peak Output Power (continued)**

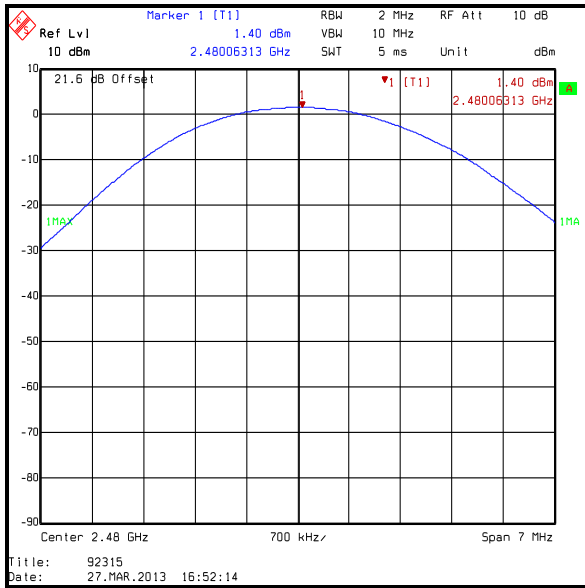
**Results: 3DH5**



**Bottom Channel**



**Middle Channel**



**Top Channel**



**Transmitter Maximum Peak Output Power (continued)****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>
A1996	Attenuator	Huber & Suhner	6810.17.B	301749	03 Apr 2013	12
A2072	Directional Coupler	Narda	4242B	03549	Calibrated before use	-
G085	CW Generator	Hewlett Packard	83650L	3614A00104	28 Nov 2014	24
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	19 Dec 2013	12
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	07 Jun 2013	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	07 Jun 2013	12

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

<b>Test Engineer:</b>	Mark Percival	<b>Test Date:</b>	04 April 2013
<b>Test Sample IMEI:</b>	355335050017236		

<b>FCC Reference:</b>	Parts 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>	21
<b>Relative Humidity (%):</b>	25

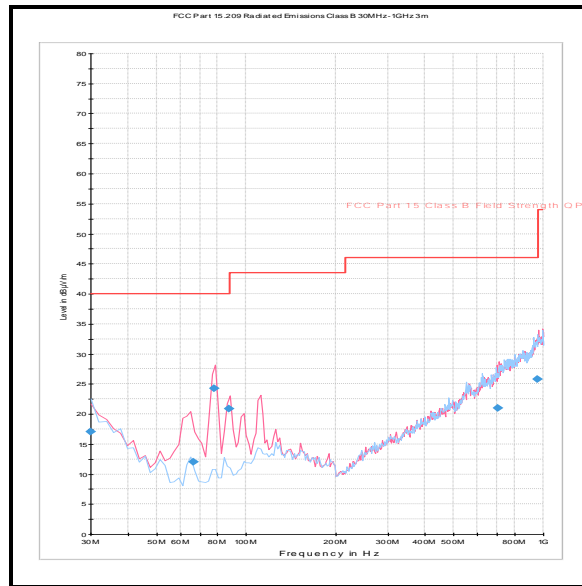
**Note(s):**

1. Transmitter radiated spurious emissions tests were performed with EUT transmitting in 3DH5 mode as this mode was found to transmit the highest power.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss
3. 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.
4. 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.
5. 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.

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

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
78.160	Vertical	24.3	40.0	15.7	Complied
87.907	Vertical	20.8	40.0	19.2	Complied

**Transmitter Radiated Emissions (continued)**



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

**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1834	Attenuator	Hewlett Packard	8491B	10444	27 Jan 2014	12
A490	Antenna	Chase	CBL6111A	1590	14 May 2013	12
G0543	Amplifier	Sonoma	310N	230801	04 Jul 2013	3
K0001	5m RSE Chamber	Rainford	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2014	12

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

<b>Test Engineer:</b>	Sandeep Bharat	<b>Test Date:</b>	03 April 2013
<b>Test Sample IMEI:</b>	355335050017236		

<b>FCC Reference:</b>	Parts 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 GHz

**Environmental Conditions:**

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

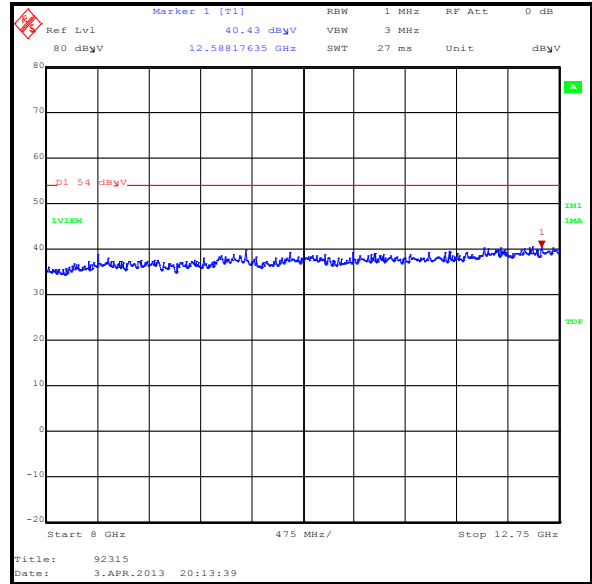
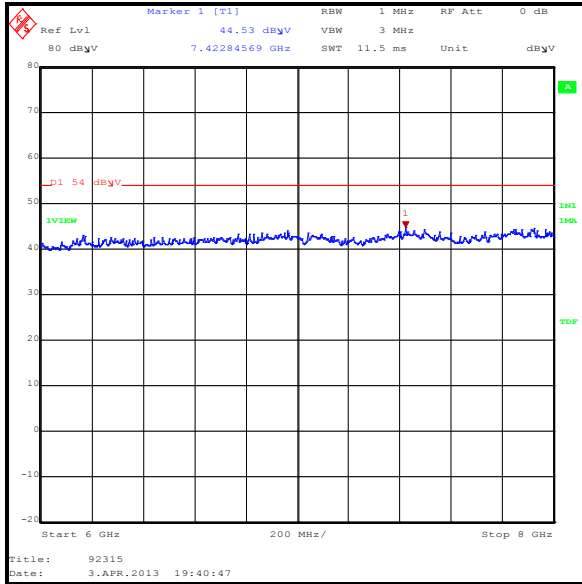
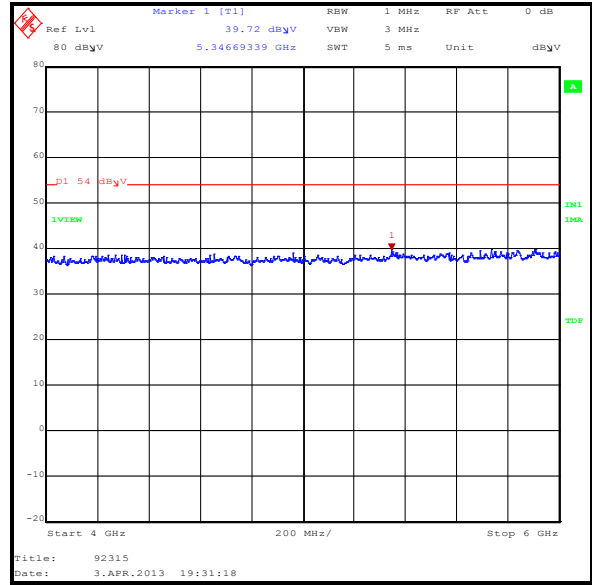
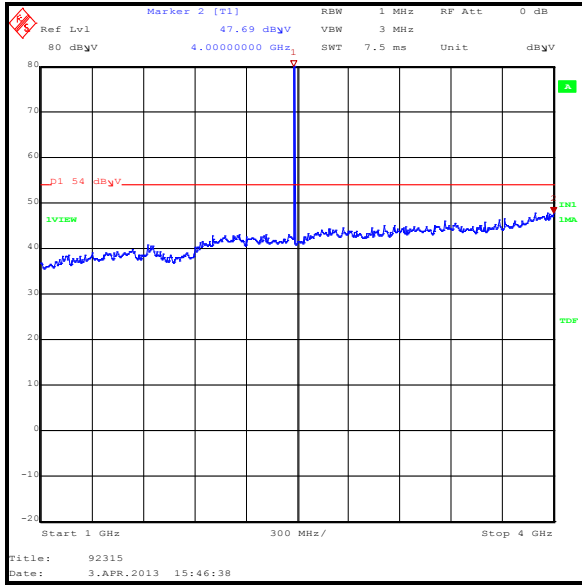
**Note(s):**

1. Transmitter radiated spurious emissions tests were performed with EUT transmitting in 3DH5 mode as this mode was found to transmit the highest power.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. The emission shown on the 1 GHz to 4 GHz plot is the EUT fundamental at 2480 MHz.
4. 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 below. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
5. 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.

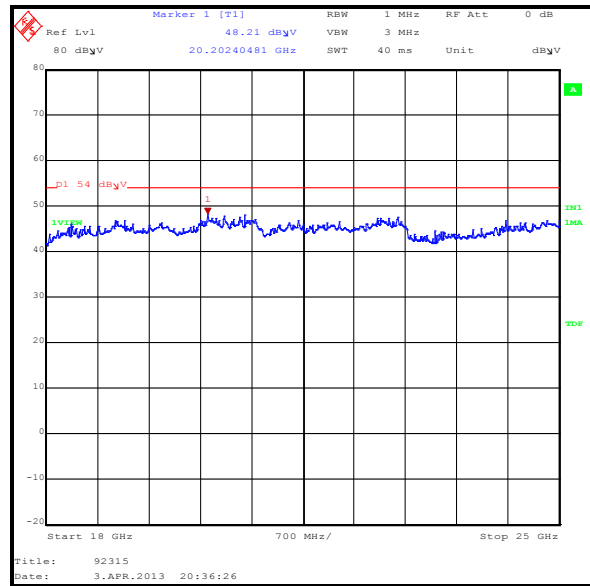
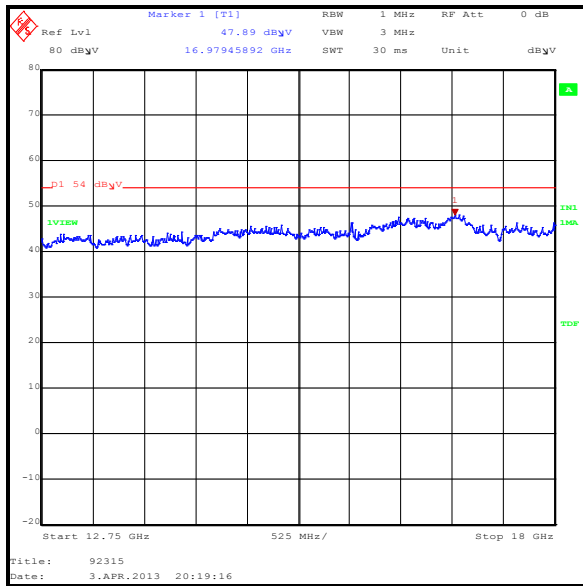
**Results:**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
20202.405	Horizontal	48.2	54.0	5.8	Complied

**Transmitter Radiated Emissions (continued)**



**Transmitter Radiated Emissions (continued)**



**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
A1818	Horn Antenna	EMCO	3115	00075692	04 Nov 2013	12
A253	Horn Antenna	Flann Microwave	12240-20	128	04 Nov 2013	12
A254	Horn Antenna	Flann Microwave	14240-20	139	04 Nov 2013	12
A255	Horn Antenna	Flann Microwave	16240-20	519	04 Nov 2013	12
A256	Horn Antenna	Flann Microwave	18240-20	400	04 Nov 2013	12
A436	Horn Antenna	Flann Microwave	20249-20	330	04 Nov 2013	12

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

<b>Test Engineer:</b>	Sandeep Bharat	<b>Test Date:</b>	03 April 2013
<b>Test Sample IMEI:</b>	355335050017236		

<b>FCC Reference:</b>	Parts 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>	22
<b>Relative Humidity (%):</b>	28

**Note(s):**

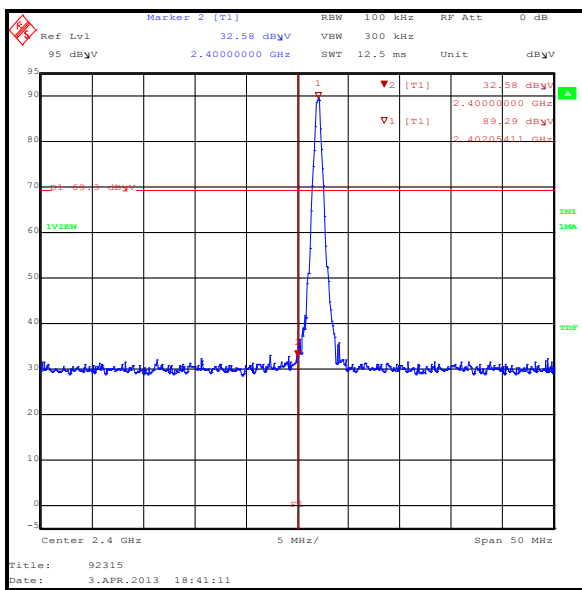
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. \* -20 dBc limit

**Transmitter Band Edge Radiated Emissions (continued)**

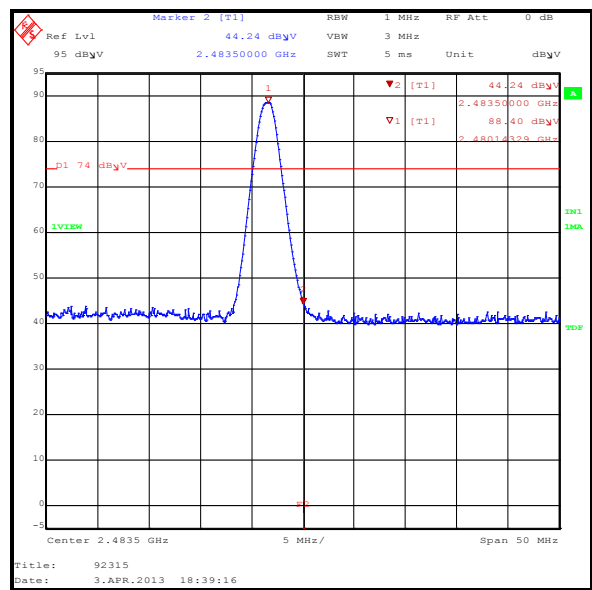
**Results: Static Mode / DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	32.6	69.3*	36.7	Complied
2483.5	Horizontal	44.2	74.0	29.8	Complied

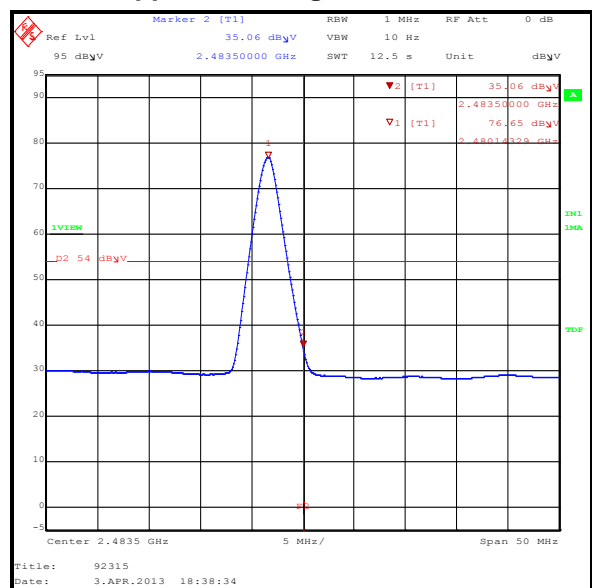
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	35.1	54.0	18.9	Complied



**Lower Band Edge Peak Static**



**Upper Band Edge Peak Static**



**Upper Band Edge Average Static**

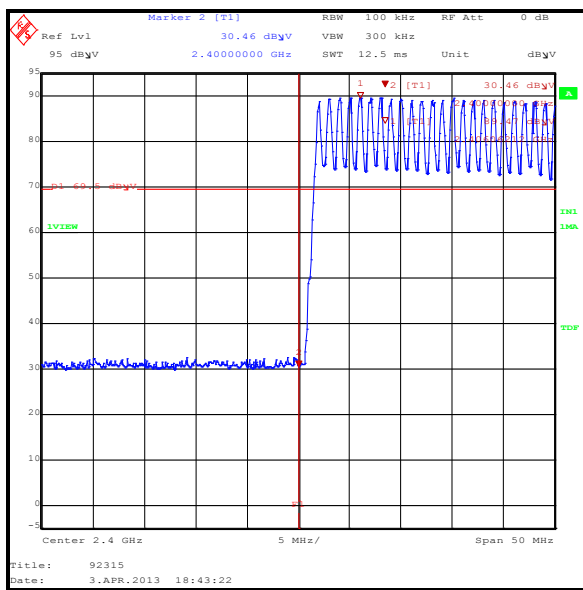


**Transmitter Band Edge Radiated Emissions (continued)**

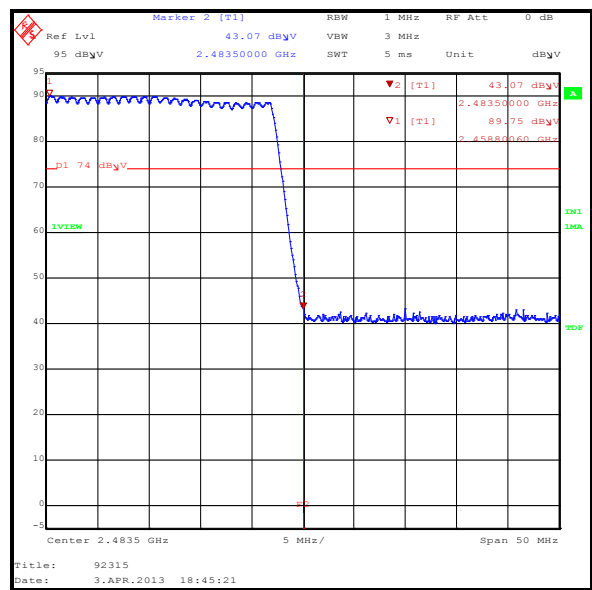
**Results: Hopping Mode / DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	30.5	69.5*	39.0	Complied
2483.5	Horizontal	43.1	74.0	30.9	Complied

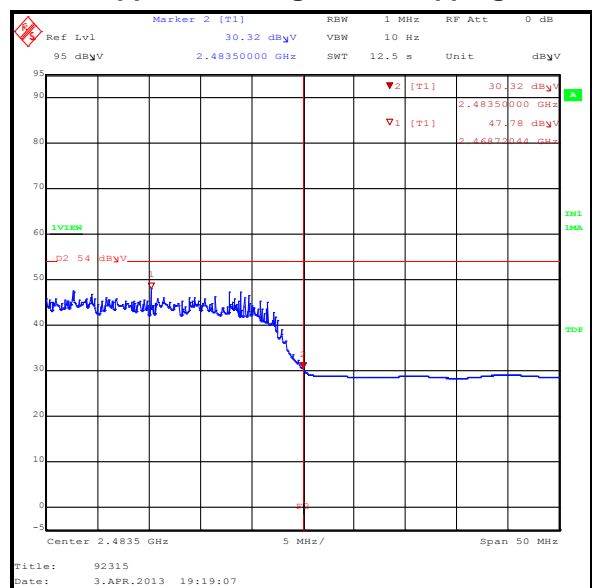
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	30.3	54.0	23.7	Complied



**Lower Band Edge Peak Hopping**



**Upper Band Edge Peak Hopping**



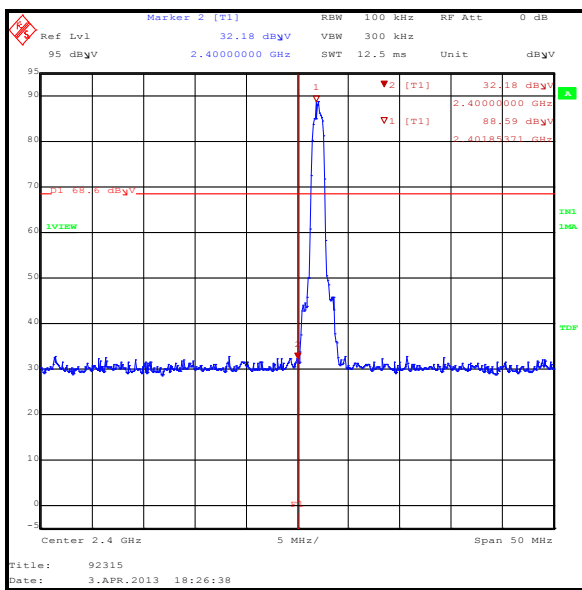
**Upper Band Edge Average Hopping**

**Transmitter Band Edge Radiated Emissions (continued)**

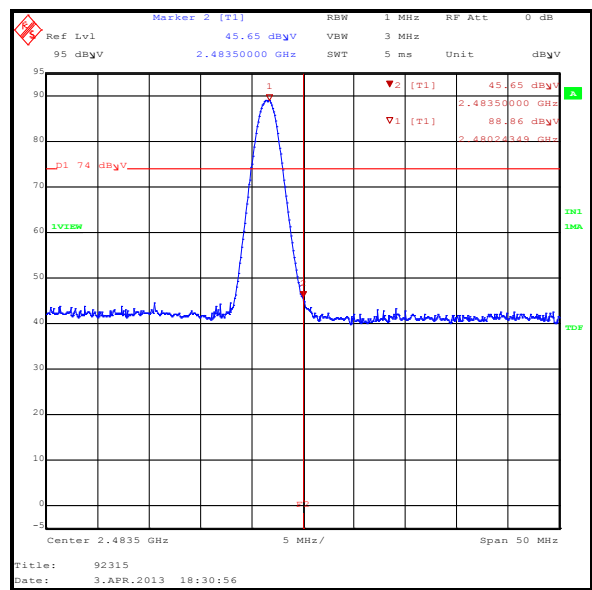
**Results: Static Mode / 2DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400.0	Horizontal	32.2	68.6*	36.4	Complied
2483.5	Horizontal	45.7	74.0	28.3	Complied

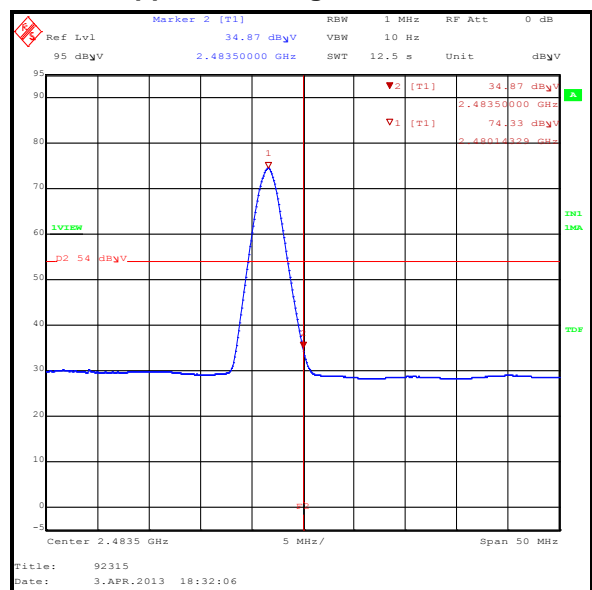
Frequency (MHz)	Antenna Polarity	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	Horizontal	34.9	54.0	19.1	Complied



**Lower Band Edge Peak Static**



**Upper Band Edge Peak Static**



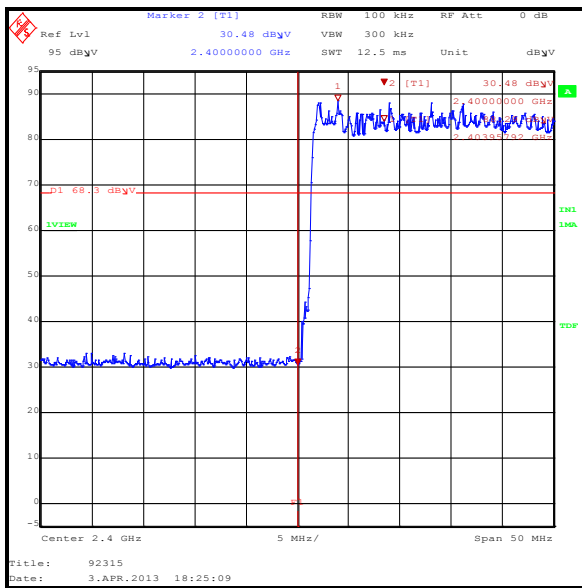
**Upper Band Edge Average Static**

**Transmitter Band Edge Radiated Emissions (continued)**

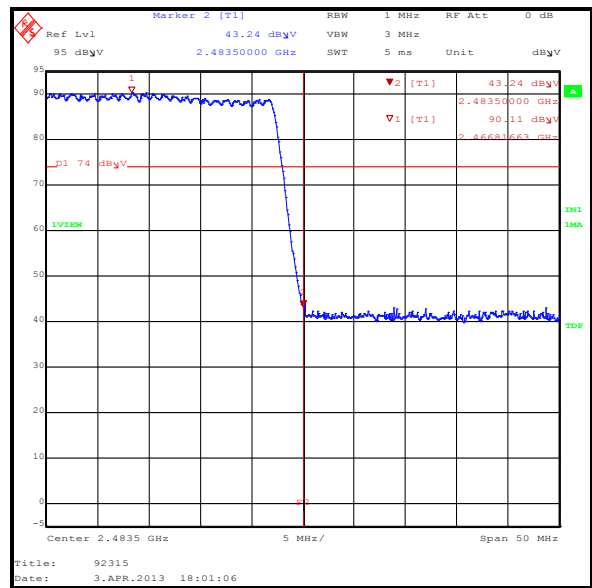
**Results: Hopping Mode / 2DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	30.5	68.3*	37.8	Complied
2483.5	Horizontal	43.2	74.0	30.8	Complied

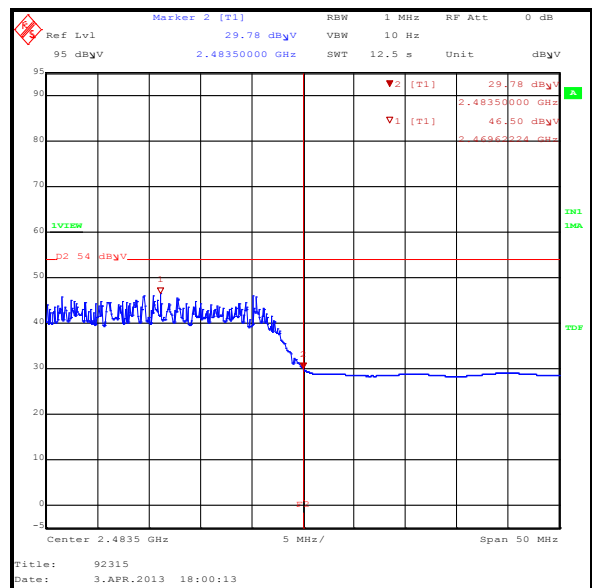
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	29.8	54.0	24.2	Complied



**Lower Band Edge Peak Hopping**



**Upper Band Edge Peak Hopping**



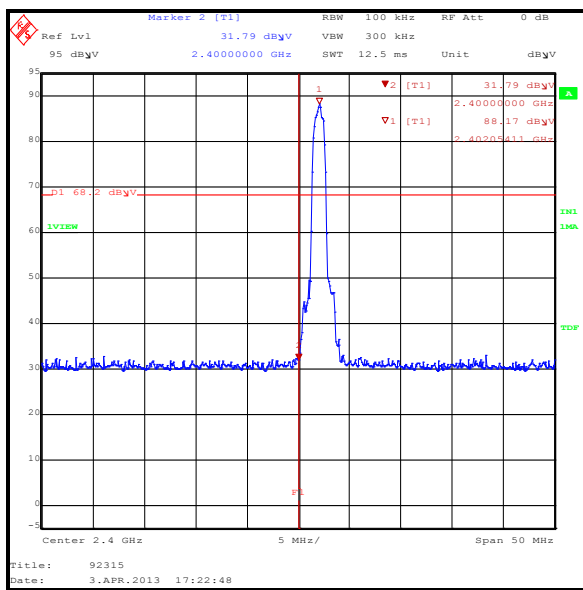
**Upper Band Edge Average Hopping**

**Transmitter Band Edge Radiated Emissions (continued)**

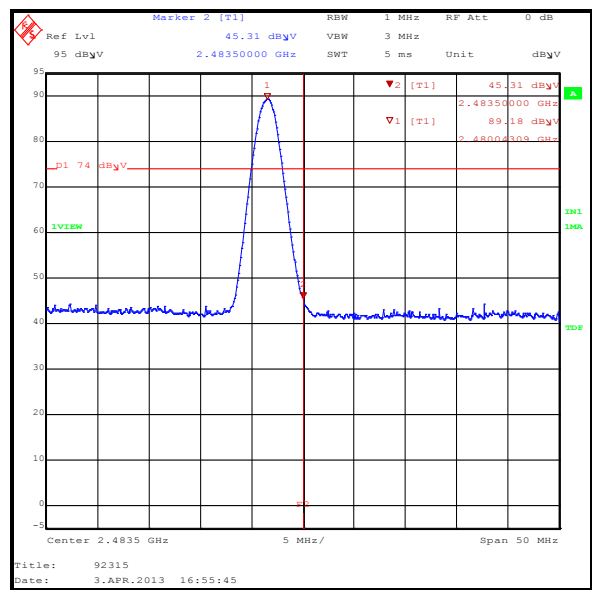
**Results: Static Mode / 3DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	31.8	68.2*	36.4	Complied
2483.5	Horizontal	45.3	74.0	28.7	Complied

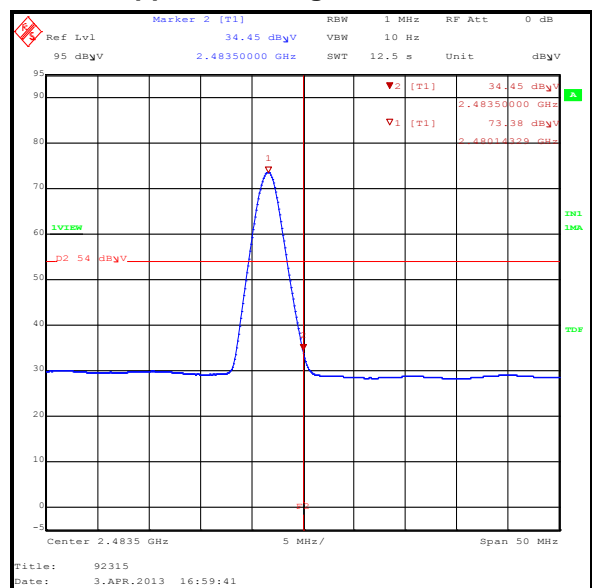
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	34.5	54.0	19.5	Complied



**Lower Band Edge Peak Static**



**Upper Band Edge Peak Static**



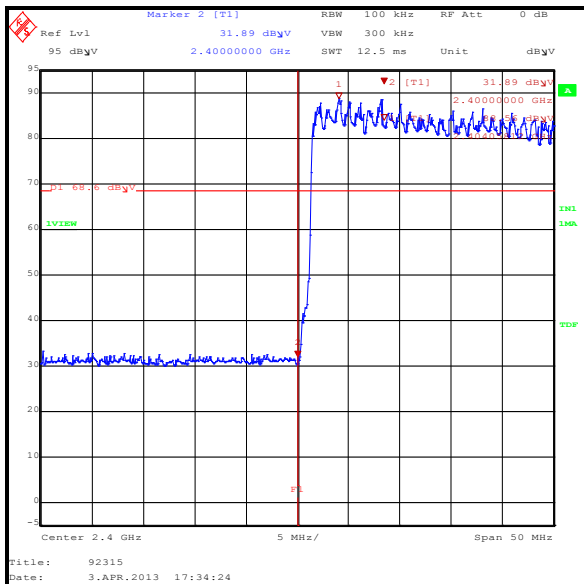
**Upper Band Edge Average Static**

**Transmitter Band Edge Radiated Emissions (continued)**

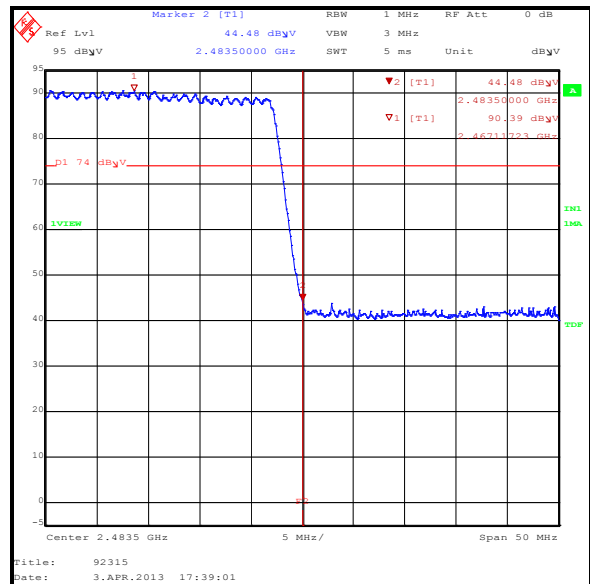
**Results: Hopping Mode / 3DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400.0	Horizontal	31.9	68.6*	36.7	Complied
2483.5	Horizontal	44.5	74.0	29.5	Complied

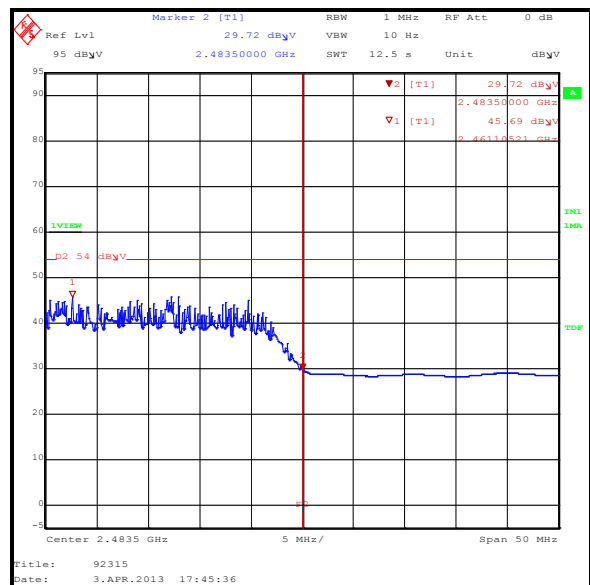
Frequency (MHz)	Antenna Polarity	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	Horizontal	29.7	54.0	24.3	Complied



**Lower Band Edge Peak Hopping**



**Upper Band Edge Peak Hopping**



**Upper Band Edge Average Hopping**

**Transmitter Band Edge Radiated Emissions (continued)****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>
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
A1818	Horn Antenna	EMCO	3115	00075692	04 Nov 2013	12

## **6. Measurement Uncertainty**

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

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

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

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

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 dB
Maximum Conducted Output Power	2.4 GHz to 2.4835 GHz	95%	±1.13 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.

## **7. Report Revision History**

<b>Version Number</b>	<b>Revision Details</b>		
	<b>Page No(s)</b>	<b>Clause</b>	<b>Details</b>
1.0	-	-	Initial Version
2.0	17, 42	-	Update to test equipment