



# TEST REPORT

**Test Report No. : UL-RPT-RP90385JD13A V2.0**

**Manufacturer** : Panasonic Mobile Communications Development of Europe Ltd  
**Model No.** : NTT docomo EB-4063  
**FCC ID** : UCE312057A  
**Technology** : Bluetooth – Basic Rate & EDR  
**Test Standard(s)** : FCC Parts 15.107(a), 15.109, 15.207, 15.209(a) & 15.247

1. This test report shall not be reproduced in full or partial, without the written approval of RFI Global Services Ltd trading as UL.
2. The results in this report apply only to the sample(s) tested.
3. This 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:** 27 November 2012

**Checked by:**

Sarah Williams  
WiSE Laboratory Engineer

**Issued by :**

pp  
John Newell  
Group Quality Manager, WiSE  
Basingstoke,  
UL Verification Services



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>	11 November 2012 to 20 November 2012

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

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

**2.3. Methods and Procedures**

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

**2.4. Deviations from the Test Specification**

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

### 3. Equipment Under Test (EUT)

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

<b>Brand Name:</b>	NTT docomo
<b>Model Name or Number:</b>	EB-4063
<b>IMEI:</b>	353740050011927 ( <i>Radiated sample</i> )
<b>Hardware Version Number:</b>	Rev B-2
<b>Software Version Number:</b>	ACPU: rupy-jb-10-0336 CCPU: 101033_DCM_00.12
<b>FCC ID:</b>	UCE312057A

<b>Brand Name:</b>	NTT docomo
<b>Model Name or Number:</b>	EB-4063
<b>IMEI:</b>	353740050010663 ( <i>Conducted RF port sample</i> )
<b>Hardware Version Number:</b>	Rev B-2
<b>Software Version Number:</b>	ACPU: rupy-jb-10-0336 CCPU: 101033_DCM_00.12
<b>FCC ID:</b>	UCE312057A

<b>Brand Name:</b>	NTT docomo
<b>Description:</b>	Battery
<b>Model Name or Number:</b>	P29

<b>Brand Name:</b>	NTT docomo
<b>Description:</b>	AC Charger
<b>Model Name or Number:</b>	AC 04

<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 Peak Output Power:</b>	1.4 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>	HP
<b>Description:</b>	Laptop PC
<b>Model Name or Number:</b>	Test laptop 1

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

- For Transmit tests: Standalone, connected via a radio link to a Bluetooth tester in order to place the EUT into Bluetooth test mode. The laptop PC with the Customer's bespoke application was used to place the EUT into Bluetooth mode.
- Receive/Idle tests: Standalone, with the Bluetooth mode active but not transmitting.
- Both EDR/Basic rate modes were compared and tests were performed with the mode that presented the worst case result. For output power, bandwidth, band edge and channel separation, all modes were tested.
- Idle and transmitter radiated spurious emissions tests were performed with the AC Charger and PHF connected to the EUT as this was found to be the worst case during pre-scans. The USB cable was terminated into a USB hub supplied by the customer. All the accessories were individually connected and measurements made during the pre-scans to determine the worst case combination.
- The EUT conducted sample with IMEI 353740050010663 was used for 20 dB bandwidth, carrier frequency separation, average time of occupancy tests and conducted output power tests.
- The radiated sample with IMEI 353740050011927 was used for AC conducted emissions and radiated spurious emissions tests.

## **5. Measurements, Examinations and Derived Results**

### **5.1. General Comments**

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

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>	David Doyle	<b>Test Date:</b>	15 November 2012
<b>Test Sample IMEI:</b>	353740050011927		

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

**Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	41

**Results: Live / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.479	Live	42.3	56.4	14.1	Complied
2.558	Live	34.6	56.0	21.4	Complied
4.259	Live	36.0	56.0	20.0	Complied
4.493	Live	37.9	56.0	18.1	Complied
5.325	Live	36.5	60.0	23.5	Complied
5.694	Live	36.2	60.0	23.8	Complied

**Results: Live / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.474	Live	35.9	46.4	10.5	Complied
2.832	Live	33.4	46.0	12.6	Complied
4.335	Live	28.8	46.0	17.2	Complied
4.515	Live	30.6	46.0	15.4	Complied
5.357	Live	29.4	50.0	20.6	Complied
5.681	Live	29.9	50.0	20.1	Complied

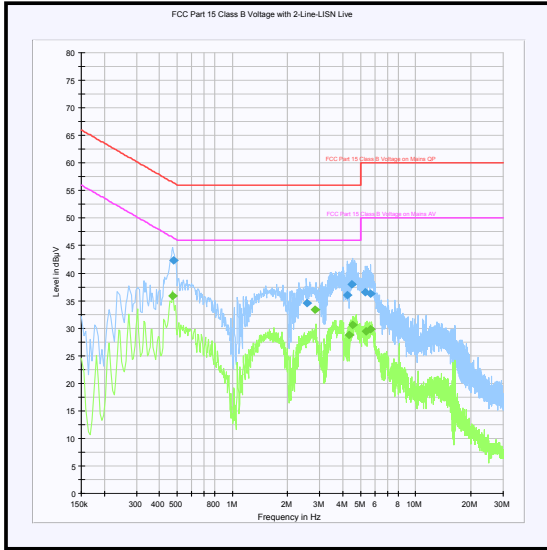
**Receiver/Idle Mode AC Conducted Spurious Emissions (continued)****Results: Neutral / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.209	Neutral	34.6	63.3	28.7	Complied
2.004	Neutral	22.1	56.0	33.9	Complied
2.526	Neutral	23.7	56.0	32.3	Complied
3.539	Neutral	28.8	56.0	27.2	Complied
4.812	Neutral	36.7	56.0	19.3	Complied
5.240	Neutral	36.4	60.0	23.6	Complied
5.645	Neutral	36.2	60.0	23.8	Complied

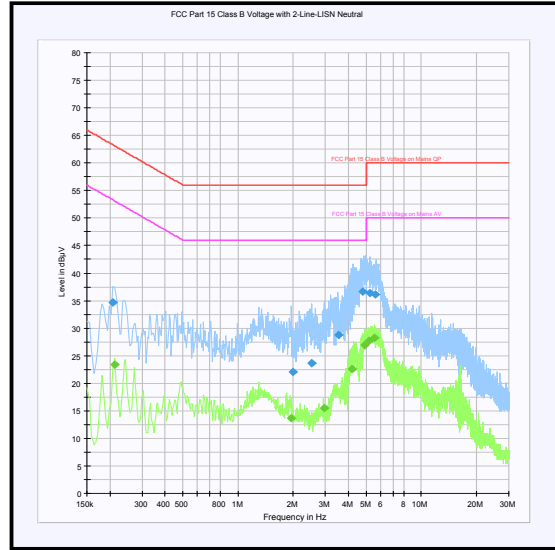
**Results: Neutral / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.213	Neutral	23.4	53.1	29.7	Complied
1.950	Neutral	13.6	46.0	32.4	Complied
2.949	Neutral	15.6	46.0	30.4	Complied
4.205	Neutral	22.6	46.0	23.4	Complied
4.920	Neutral	26.9	46.0	19.1	Complied
5.177	Neutral	27.7	50.0	22.3	Complied
5.573	Neutral	28.3	50.0	21.7	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 Feb 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	25 Feb 2013	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>	Nick Steele	<b>Test Date:</b>	11 November 2012
<b>Test Sample IMEI:</b>	353740050011927		

<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:**

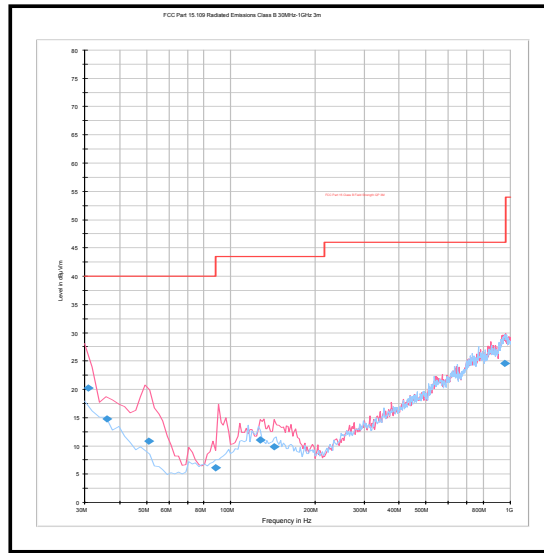
<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	33

**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.

**Results: Quasi Peak**

<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Level (dB<math>\mu</math>V/m)</b>	<b>Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
30.986	Vertical	20.2	40.0	19.8	Complied
36.115	Vertical	14.8	40.0	25.2	Complied
50.848	Vertical	10.9	40.0	29.1	Complied
127.430	Vertical	11.1	43.5	32.4	Complied
142.693	Vertical	9.9	43.5	33.6	Complied
956.932	Vertical	24.6	46.0	21.4	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	29 Jan 2013	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
G0543	Amplifier	Sonoma	310N	230801	02 Jan 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12



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

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	13 November 2012
<b>Test Sample IMEI:</b>	353740050011927		

<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>	41

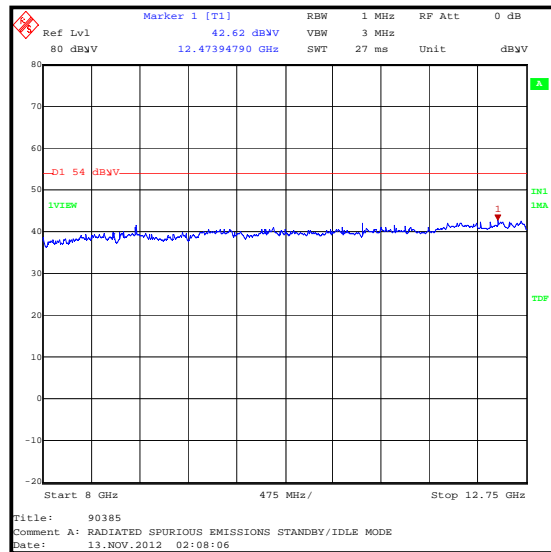
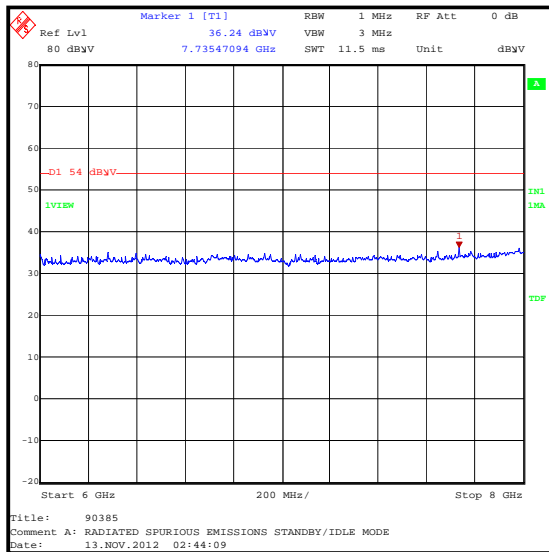
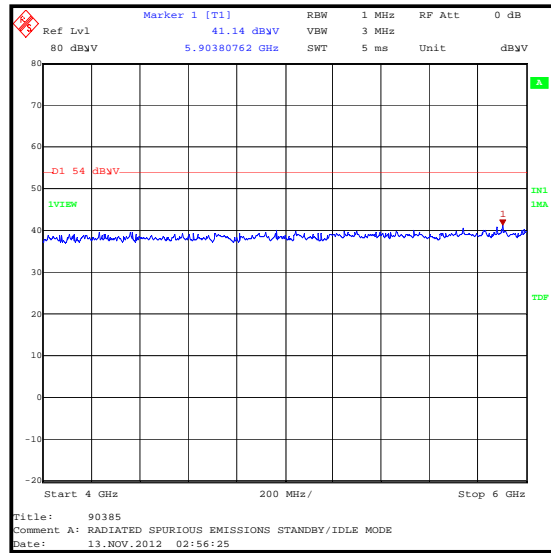
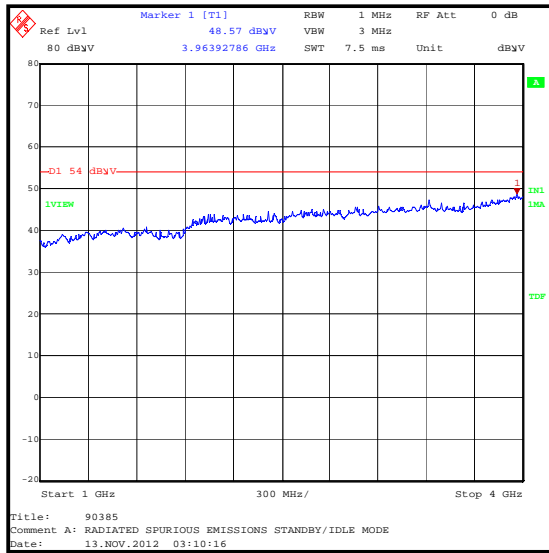
**Note(s):**

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:**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
3963.928	Vertical	48.6	54.0	5.4	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 EMC	N/A	N/A	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	N/A	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>	David Doyle	<b>Test Date:</b>	20 November 2012
<b>Test Sample IMEI:</b>	353740050011927		

<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>	21
<b>Relative Humidity (%):</b>	40

**Results: Live / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
1.154	Live	42.8	56.0	13.2	Complied
2.085	Live	41.9	56.0	14.1	Complied
2.558	Live	43.4	56.0	12.6	Complied
3.386	Live	45.0	56.0	11.0	Complied
4.133	Live	46.4	56.0	9.6	Complied
4.803	Live	44.3	56.0	11.7	Complied
5.645	Live	43.5	60.0	16.5	Complied
6.531	Live	43.0	60.0	17.0	Complied
9.407	Live	43.0	60.0	17.0	Complied
10.568	Live	43.0	60.0	17.0	Complied

**Results: Live / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.335	Live	40.6	49.3	8.7	Complied
0.425	Live	40.0	47.4	7.4	Complied
0.510	Live	38.2	46.0	7.8	Complied
1.167	Live	37.4	46.0	8.6	Complied
2.540	Live	37.4	46.0	8.6	Complied
3.489	Live	38.6	46.0	7.4	Complied
4.151	Live	39.2	46.0	6.8	Complied
4.947	Live	39.8	46.0	6.2	Complied
15.792	Live	41.7	50.0	8.3	Complied
15.878	Live	37.1	50.0	12.9	Complied

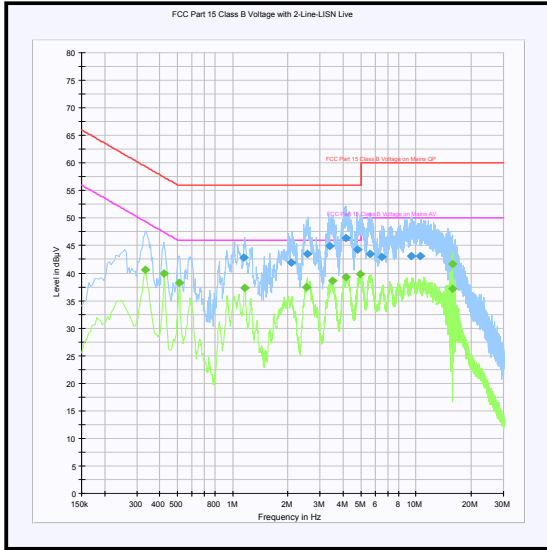
**Transmitter AC Conducted Spurious Emissions (continued)****Results: Neutral / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
2.148	Neutral	33.4	56.0	22.6	Complied
2.904	Neutral	34.6	56.0	21.4	Complied
3.467	Neutral	35.7	56.0	20.3	Complied
3.485	Neutral	36.2	56.0	19.8	Complied
3.575	Neutral	35.5	56.0	20.5	Complied
4.034	Neutral	38.8	56.0	17.2	Complied
4.313	Neutral	41.8	56.0	14.2	Complied
4.848	Neutral	46.1	56.0	9.9	Complied
5.397	Neutral	41.9	60.0	18.1	Complied
8.777	Neutral	41.3	60.0	18.7	Complied

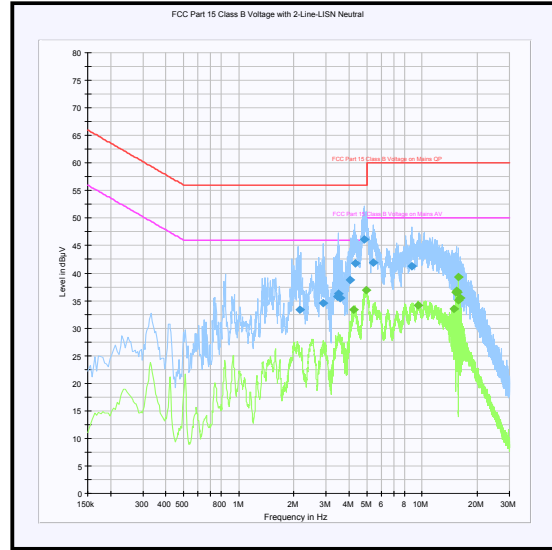
**Results: Neutral / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
4.259	Neutral	33.3	46.0	12.7	Complied
4.943	Neutral	36.9	46.0	9.1	Complied
9.483	Neutral	34.2	50.0	15.8	Complied
14.856	Neutral	33.6	50.0	16.4	Complied
15.275	Neutral	36.5	50.0	13.5	Complied
15.365	Neutral	36.8	50.0	13.2	Complied
15.698	Neutral	36.5	50.0	13.5	Complied
15.783	Neutral	39.2	50.0	10.8	Complied
15.873	Neutral	35.1	50.0	14.9	Complied
16.206	Neutral	35.5	50.0	14.5	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)
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	19 Feb 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	25 Feb 2013	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	09 Aug 2013	12

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

<b>Test Engineer:</b>	Mark Percival	<b>Test Date:</b>	15 November 2012
<b>Test Sample IMEI:</b>	353740050010663		

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

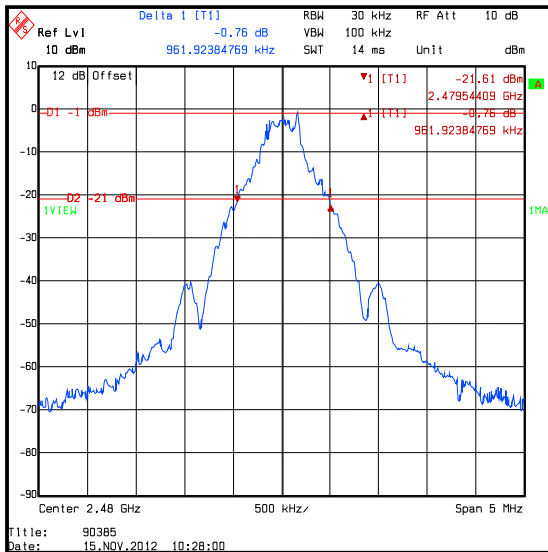
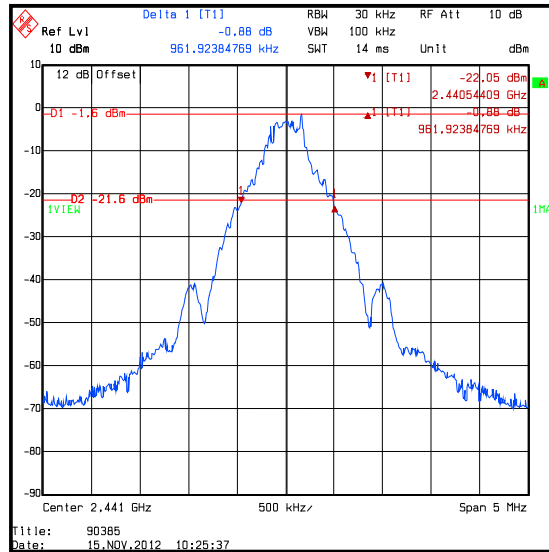
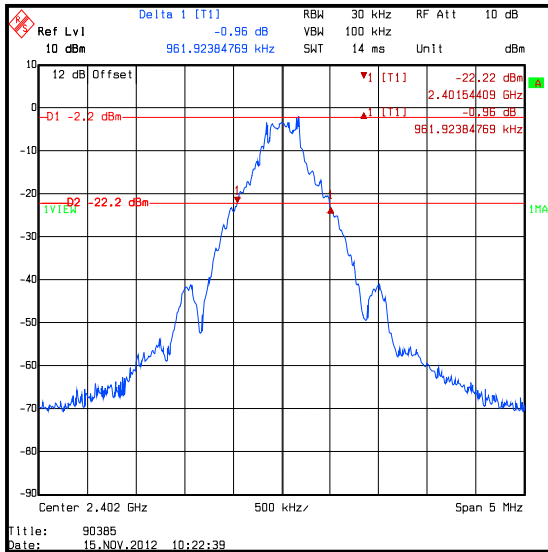
**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	33

**Transmitter 20 dB Bandwidth (continued)**

**Results DH5:**

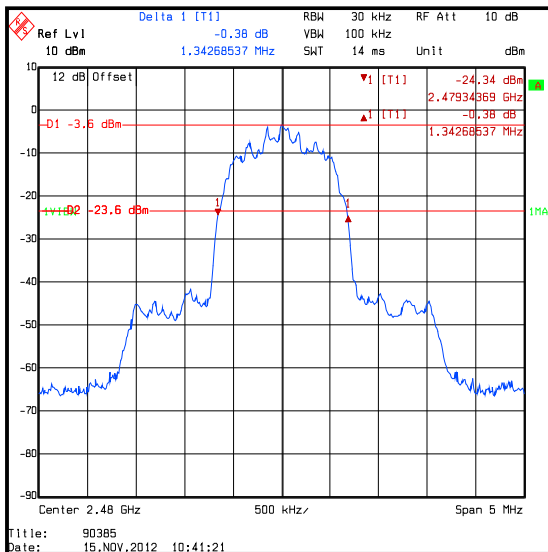
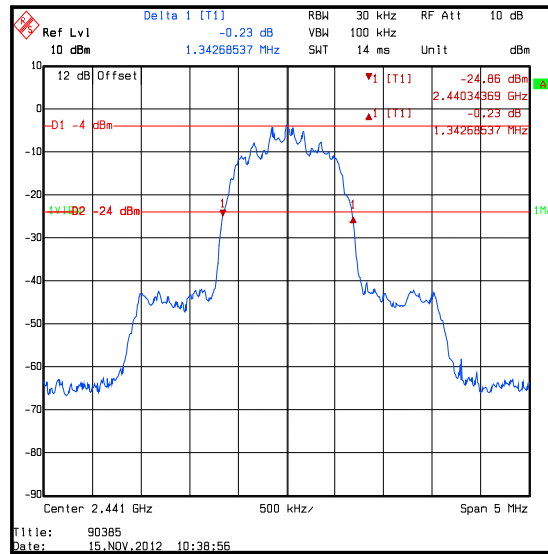
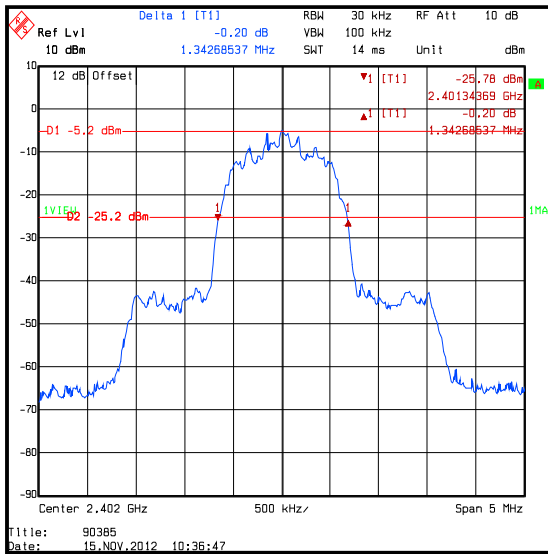
Channel	20 dB Bandwidth (kHz)
Bottom	961.924
Middle	961.924
Top	961.924



**Transmitter 20 dB Bandwidth (continued)**

**Results 2DH5:**

Channel	20 dB Bandwidth (kHz)
Bottom	1342.685
Middle	1342.685
Top	1342.685

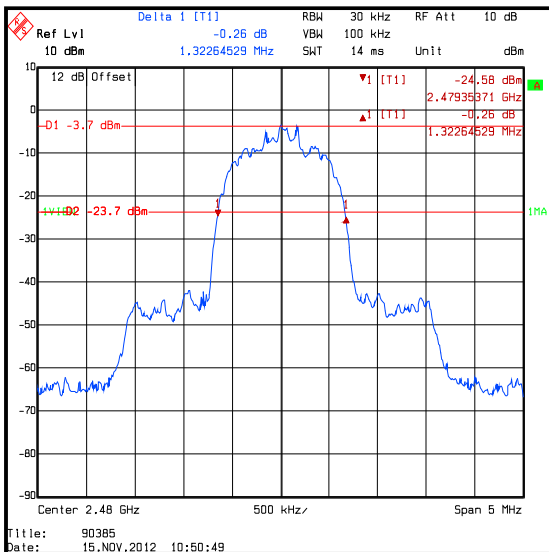
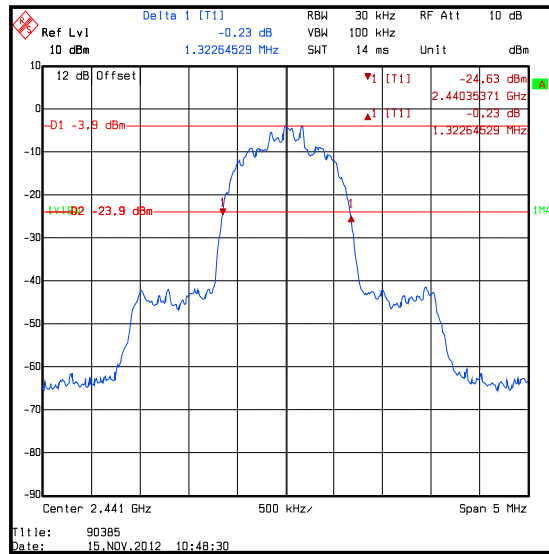
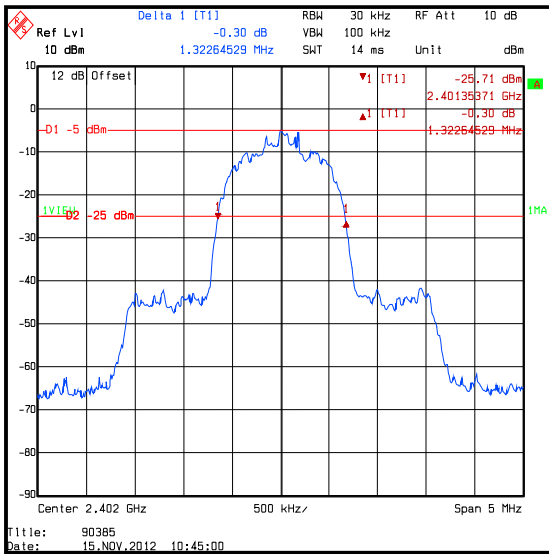




**Transmitter 20 dB Bandwidth (continued)**

**Results 3DH5:**

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



**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>
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
A2072	Directional Coupler	Narda	4242B	03549	Calibrated Before Use	N/A

**5.2.5. Transmitter Carrier Frequency Separation**

**Test Summary:**

<b>Test Engineer:</b>	Mark Percival	<b>Test Date:</b>	15 November 2012
<b>Test Sample IMEI:</b>	353740050010663		

<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:**

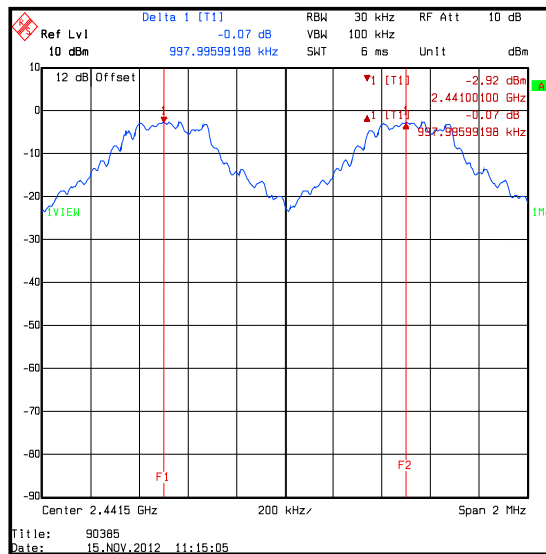
<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	33

**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
997.996	641.283	356.713	Complied



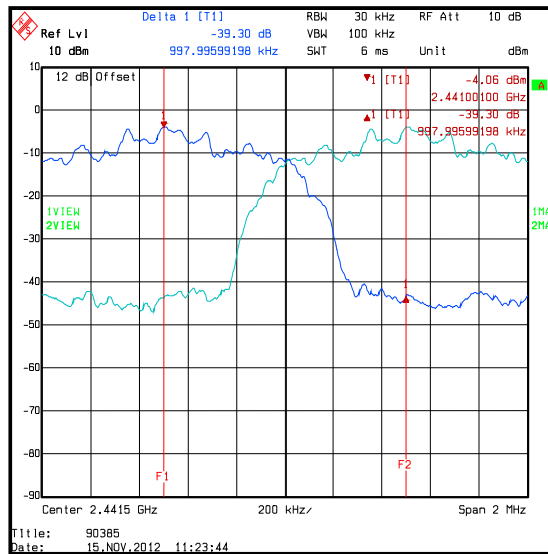
**Transmitter Carrier Frequency Separation (continued)**

**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
997.996	895.123	102.873	Complied



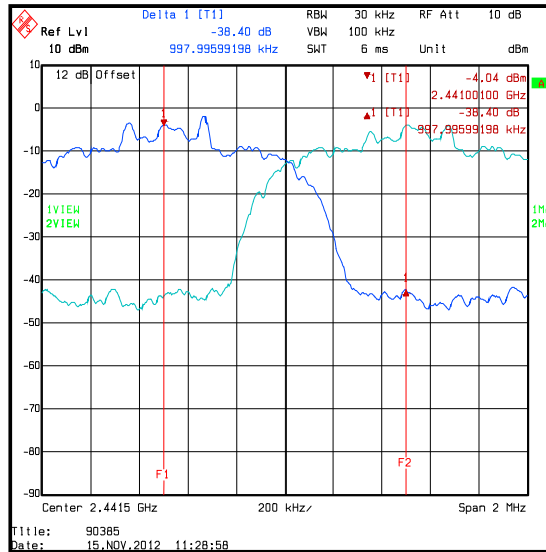
**Transmitter Carrier Frequency Separation (continued)**

**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
997.996	881.763	116.233	Complied



**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
A2072	Directional Coupler	Narda	4242B	03549	Calibrated Before Use	N/A

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

<b>Test Engineer:</b>	Mark Percival	<b>Test Date:</b>	15 November 2012
<b>Test Sample IMEI:</b>	353740050010663		

<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>	25
<b>Relative Humidity (%):</b>	33

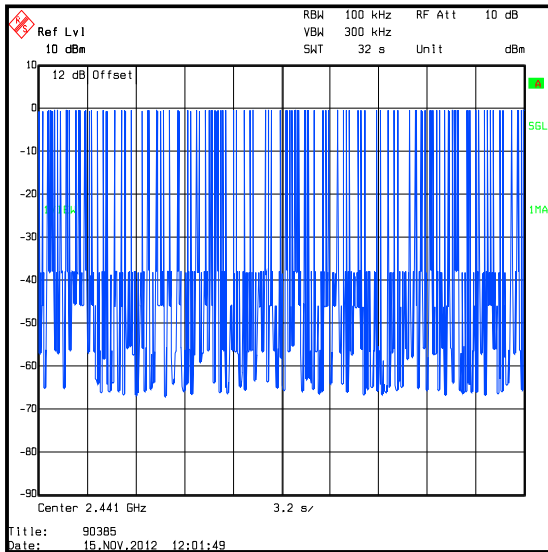
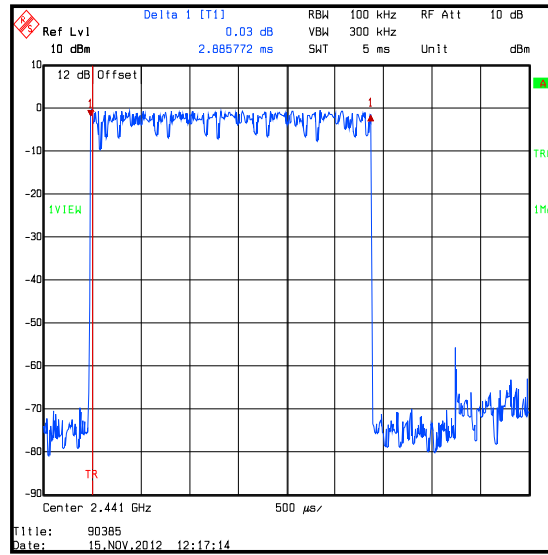
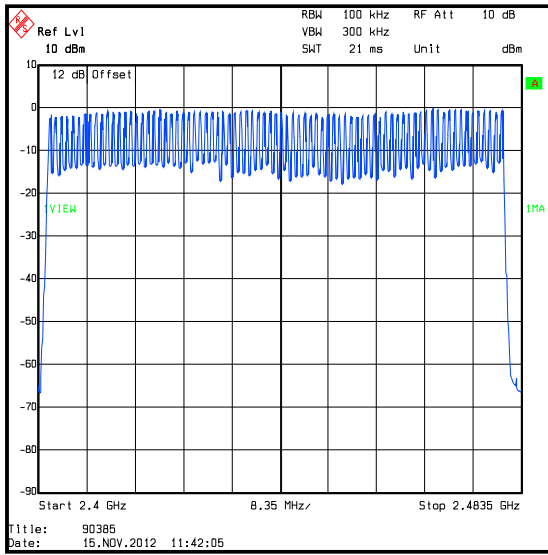
**Note(s):**

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	118	0.341	0.4	0.059	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)
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
A2072	Directional Coupler	Narda	4242B	03549	Calibrated Before Use	N/A

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

<b>Test Engineer:</b>	Mark Percival	<b>Test Date:</b>	15 November 2012
<b>Test Sample IMEI:</b>	353740050010663		

<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>	25
<b>Relative Humidity (%):</b>	33



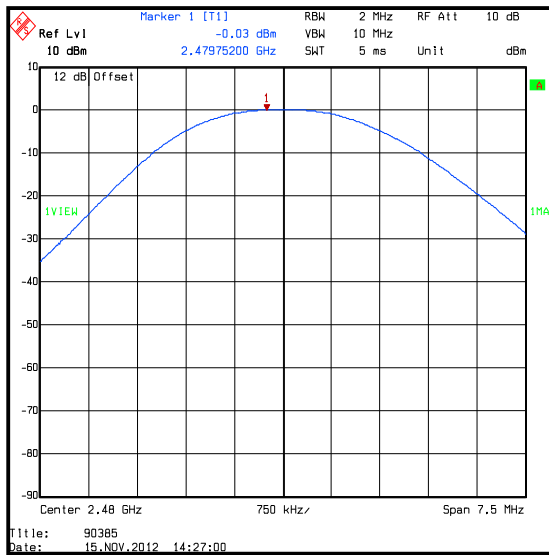
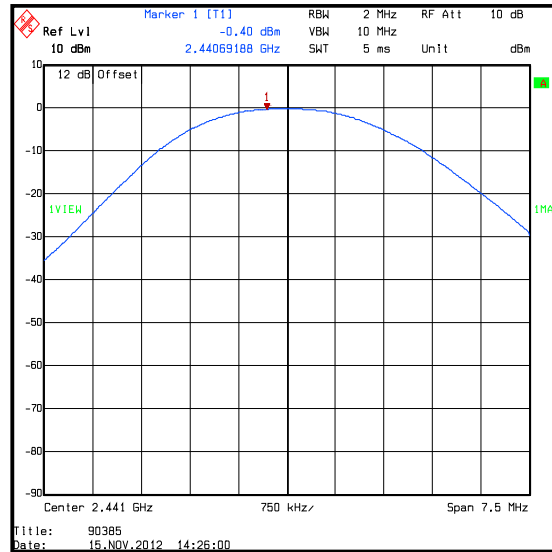
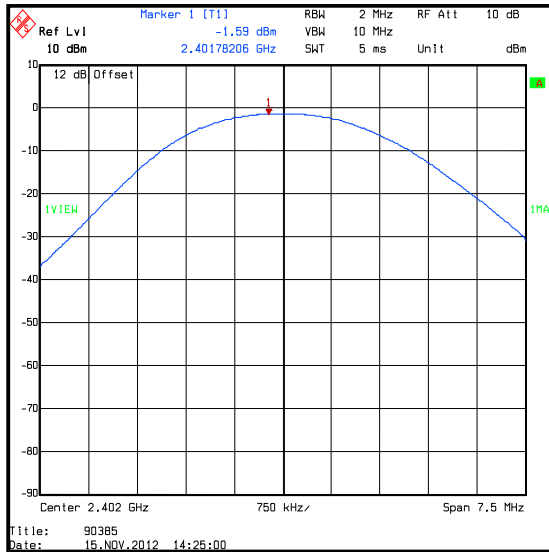
**Transmitter Maximum Peak Output Power (continued)****Results: DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-1.6	30.0	31.6	Complied
Middle	-0.4	30.0	30.4	Complied
Top	0.0	30.0	30.0	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-1.6	-2.3	-3.9	36.0	39.9	Complied
Middle	-0.4	-2.3	-2.7	36.0	38.7	Complied
Top	0.0	-2.3	-2.3	36.0	38.3	Complied

### Transmitter Maximum Peak Output Power (continued)

#### Results: DH5



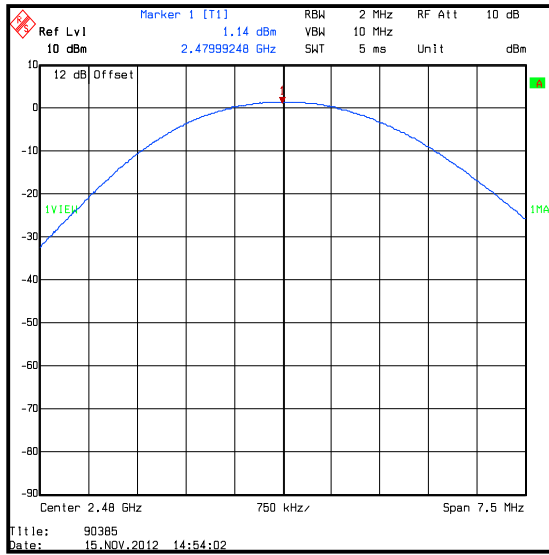
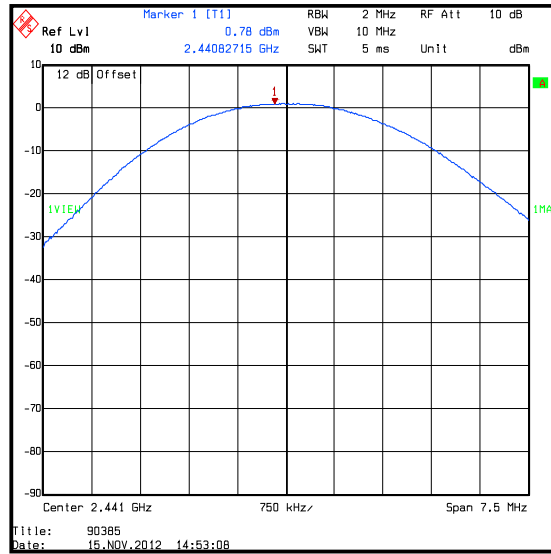
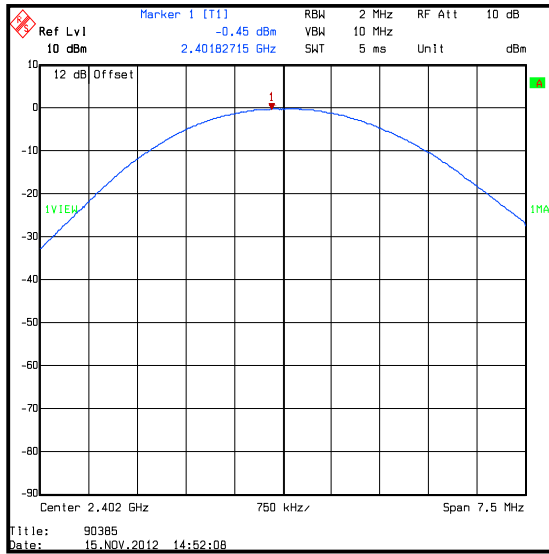
**Transmitter Maximum Peak Output Power (continued)****Results: 2DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-0.5	21.0	21.5	Complied
Middle	0.8	21.0	20.2	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	-0.5	-2.3	-2.8	27.0	29.8	Complied
Middle	0.8	-2.3	-1.5	27.0	28.5	Complied
Top	1.1	-2.3	-1.2	27.0	28.2	Complied

### Transmitter Maximum Peak Output Power (continued)

#### Results: 2DH5



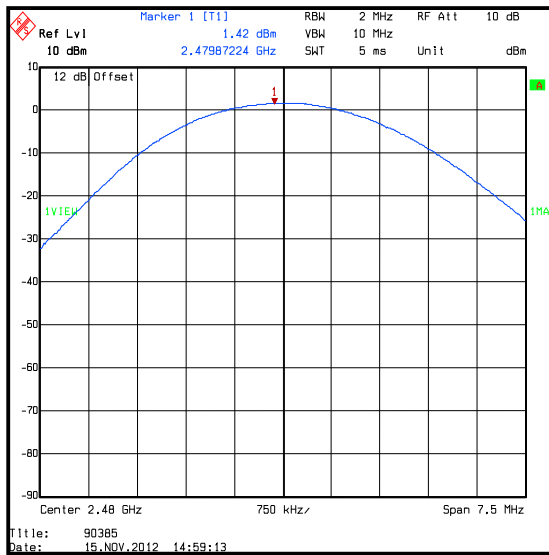
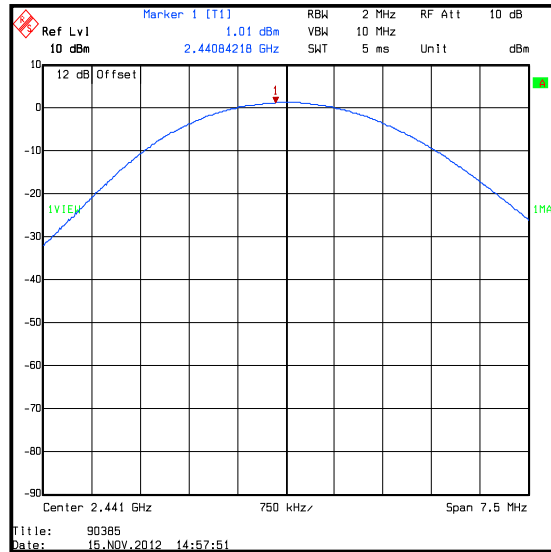
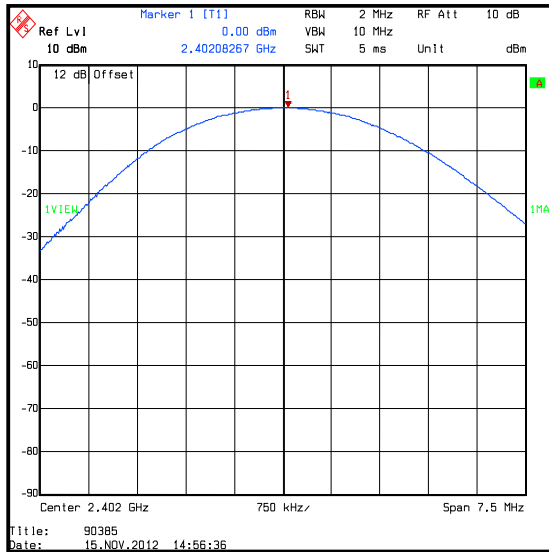
**Transmitter Maximum Peak Output Power (continued)****Results: 3DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	0.0	21.0	21.0	Complied
Middle	1.0	21.0	20.0	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	0.0	-2.3	-2.3	27.0	29.3	Complied
Middle	1.0	-2.3	-1.3	27.0	28.3	Complied
Top	1.4	-2.3	-0.9	27.0	27.9	Complied

### Transmitter Maximum Peak Output Power (continued)

#### Results: 3DH5



**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>
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
A2072	Directional Coupler	Narda	4242B	03549	Calibrated Before Use	N/A
M260	Signal Generator	Rohde & Schwarz	1035.5005.02	829076/008	14 Jun 2013	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	07 Jun 2013	12
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	07 Jun 2013	12

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

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	11 November 2012
<b>Test Sample IMEI:</b>	353740050011927		

<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>	23
<b>Relative Humidity (%):</b>	32

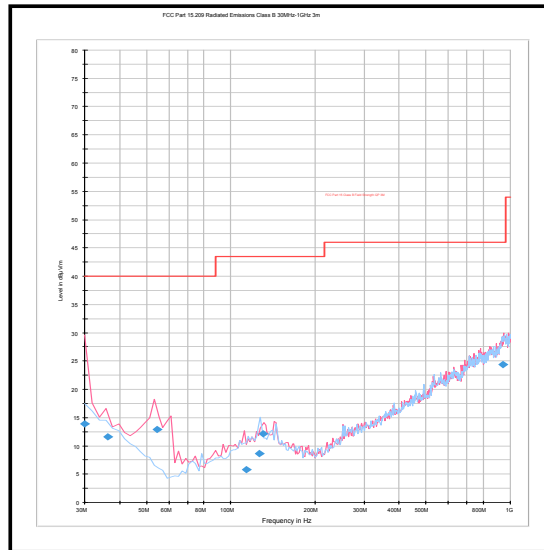
**Note(s):**

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

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

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
113.784	Vertical	5.8	43.5	37.7	Complied
126.834	Horizontal	8.6	43.5	34.9	Complied
130.414	Vertical	12.1	43.5	31.4	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	29 Jan 2013	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
G0543	Amplifier	Sonoma	310N	230801	02 Jan 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12

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

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	19 November 2012
<b>Test Sample IMEI:</b>	353740050011927		

<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>	24
<b>Relative Humidity (%):</b>	37

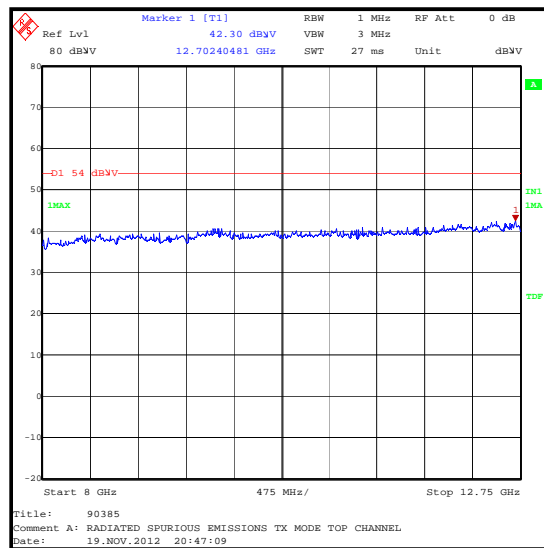
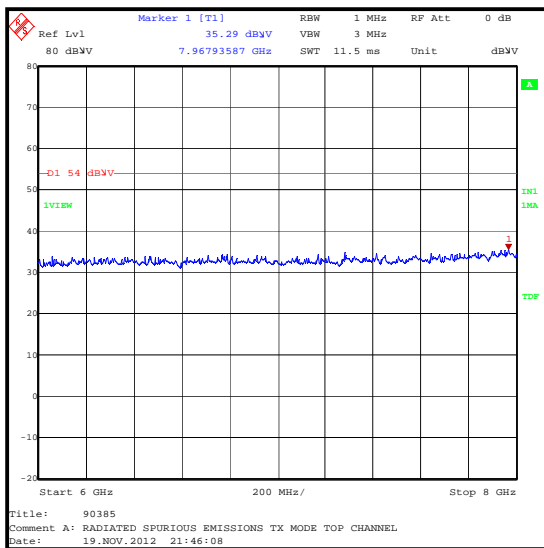
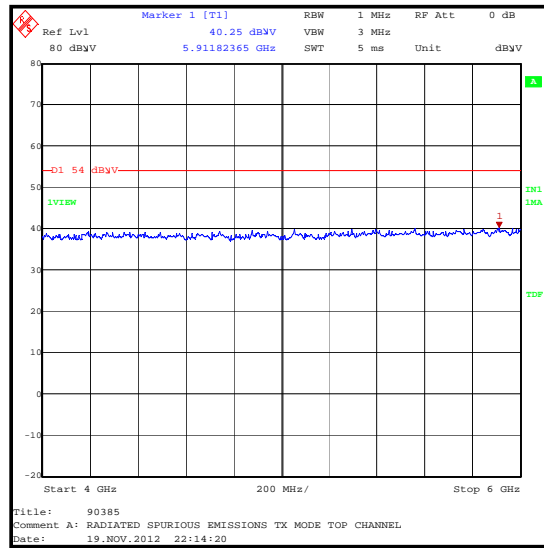
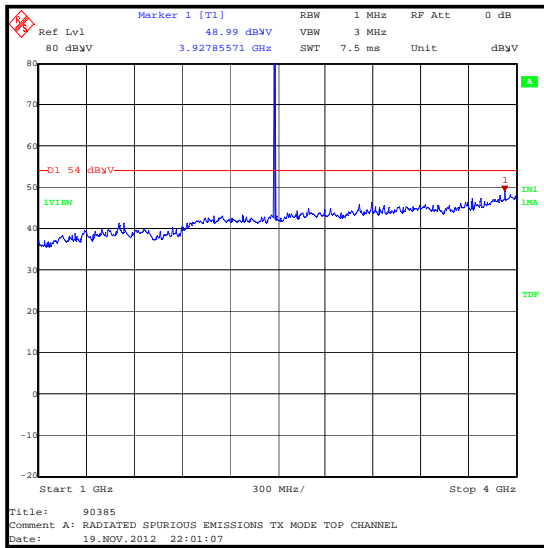
**Note(s):**

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

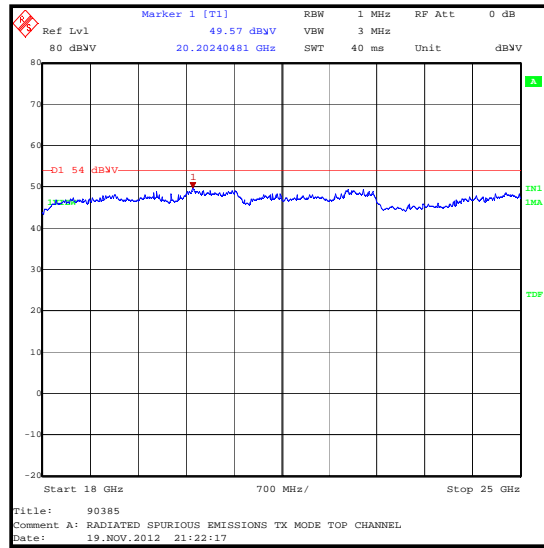
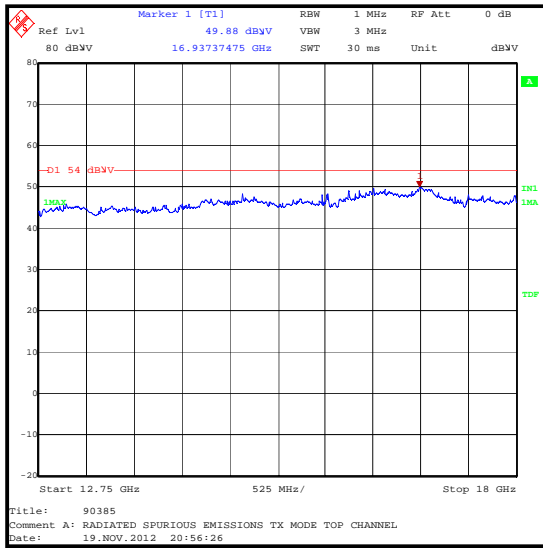
**Results:**

<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Level (dB<math>\mu</math>V/m)</b>	<b>Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
16937.375	Vertical	49.9	54.0	4.1	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	N/A	N/A	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	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
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
A256	Antenna	Flann Microwave	18240-20	400	04 Nov 2013	12
A436	Antenna	Flann Microwave	20240-20	330	04 Nov 2013	12

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

<b>Test Engineer:</b>	Mark Percival	<b>Test Date:</b>	16 November 2012
<b>Test Sample IMEI:</b>	353740050011927		

<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>	23
<b>Relative Humidity (%):</b>	35

**Note(s):**

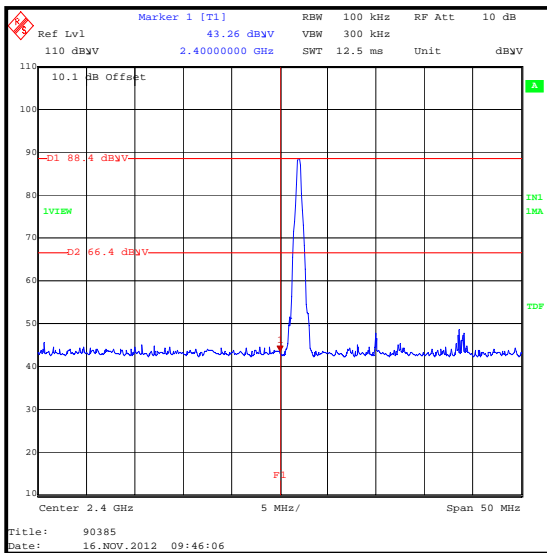
1. The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor and cable loss.
2. \* -20 dBc limit

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

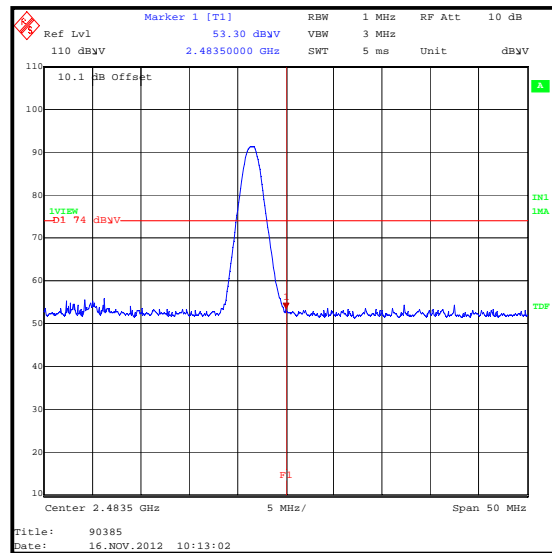
**Results: Static Mode / DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	43.3	68.4*	25.1	Complied
2483.5	Horizontal	53.3	74.0	20.7	Complied

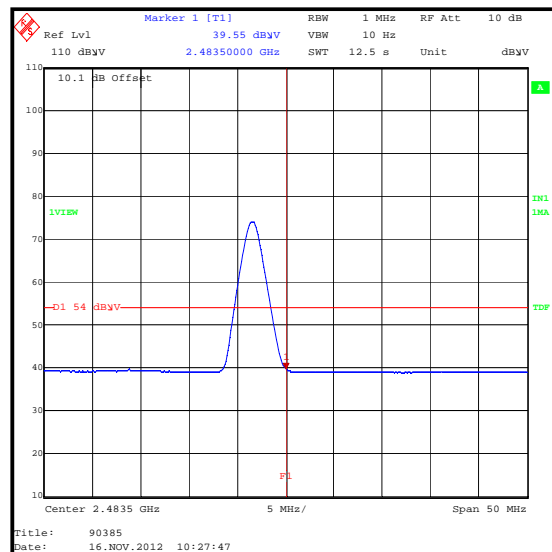
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	39.6	54.0	14.4	Complied



**Lower Band Edge Peak Static**



**Upper Band Edge Peak Static**



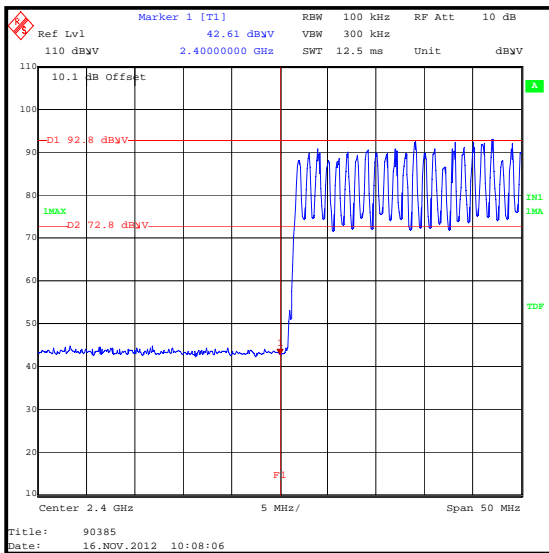
**Upper Band Edge Average Static**

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

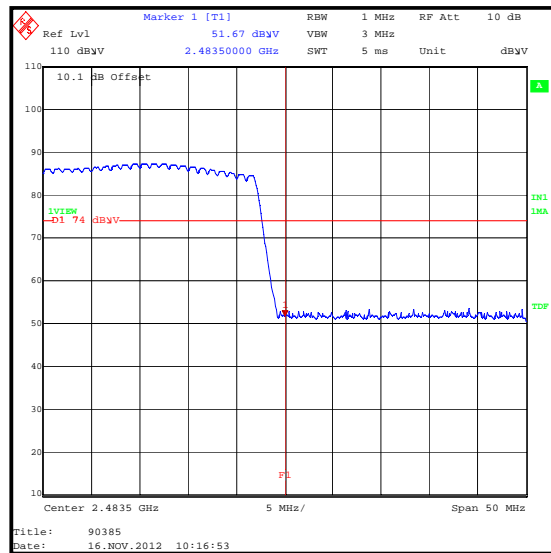
**Results: Hopping Mode / DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	42.6	72.8*	30.2	Complied
2483.5	Horizontal	51.7	74.0	22.3	Complied

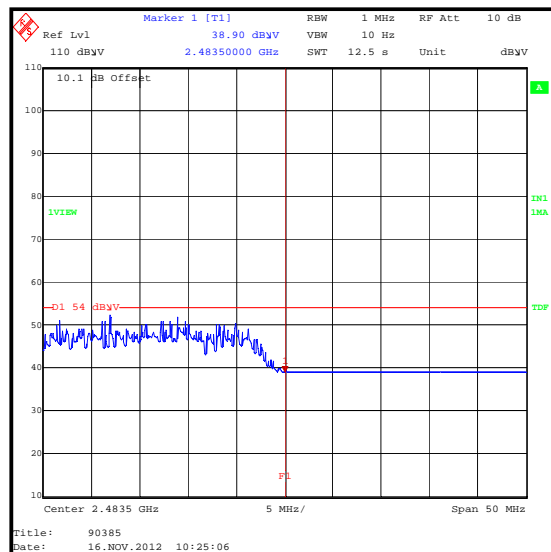
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	38.9	54.0	15.1	Complied



**Lower Band Edge Peak Hopping**



**Upper Band Edge Peak Hopping**



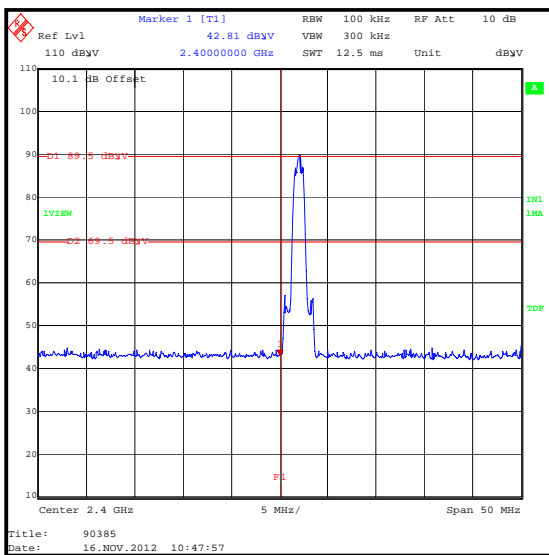
**Upper Band Edge Average Hopping**

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

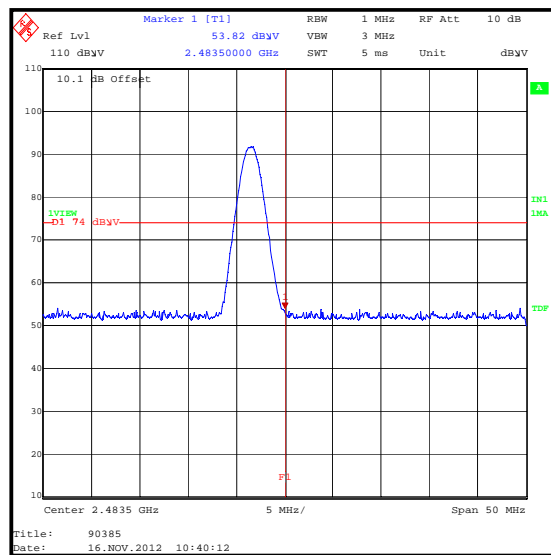
**Results: Static Mode / 2DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	42.8	69.5*	26.7	Complied
2483.5	Horizontal	53.8	74.0	20.2	Complied

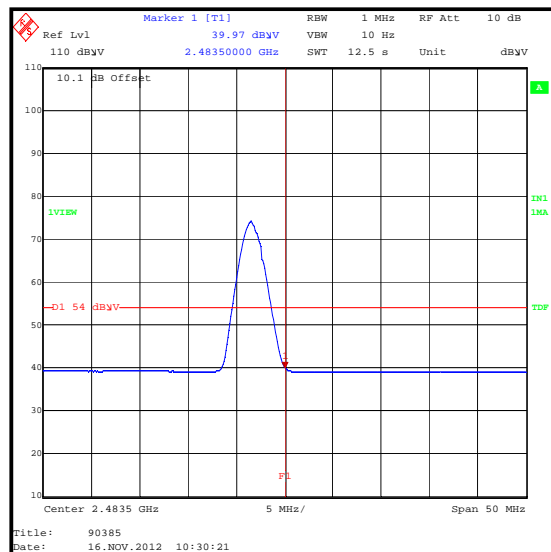
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	40.0	54.0	14.0	Complied



**Lower Band Edge Peak Static**



**Upper Band Edge Peak Static**



**Upper Band Edge Average Static**

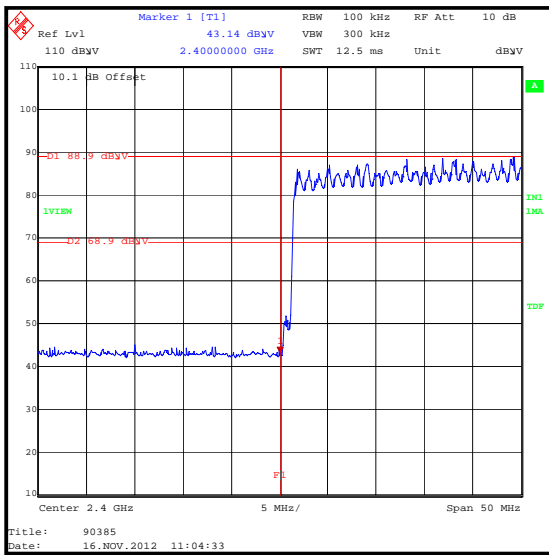


**Transmitter Band Edge Radiated Emissions (continued)**

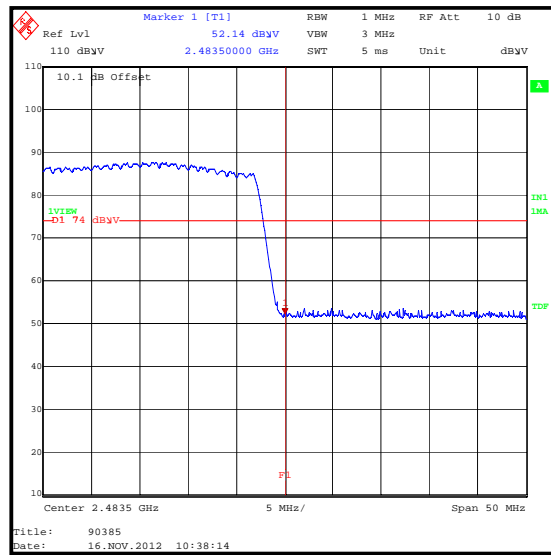
**Results: Hopping Mode / 2DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	43.1	68.9*	25.8	Complied
2483.5	Horizontal	52.1	74.0	21.9	Complied

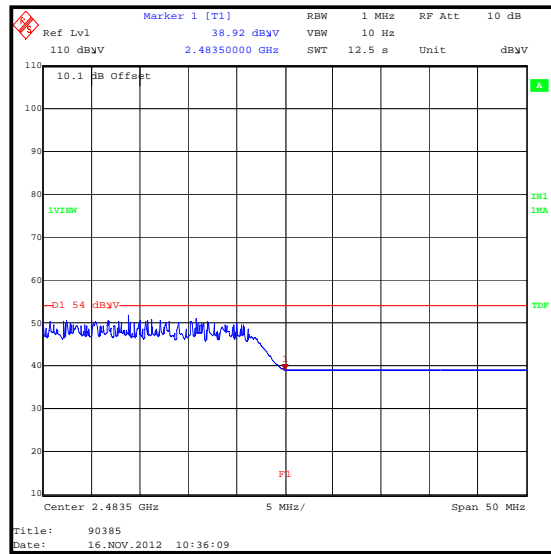
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	38.9	54.0	15.1	Complied



**Lower Band Edge Peak Hopping**



**Upper Band Edge Peak Hopping**



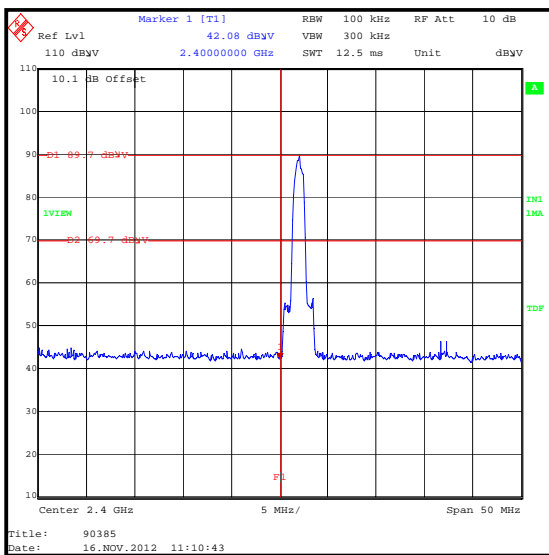
**Upper Band Edge Average Hopping**

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

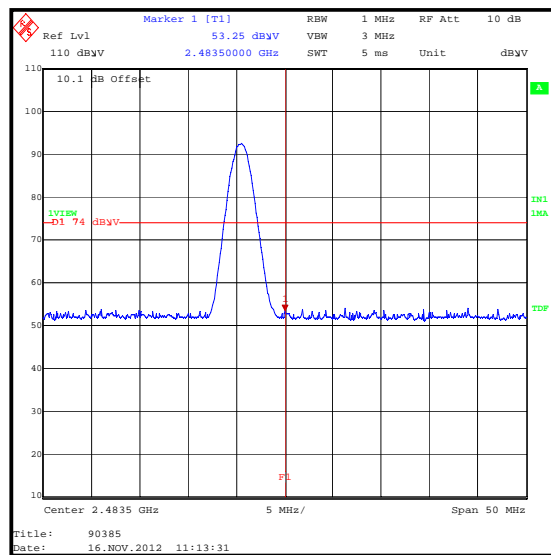
**Results: Static Mode / 3DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	42.1	69.7*	27.6	Complied
2483.5	Horizontal	53.3	74.0	20.7	Complied

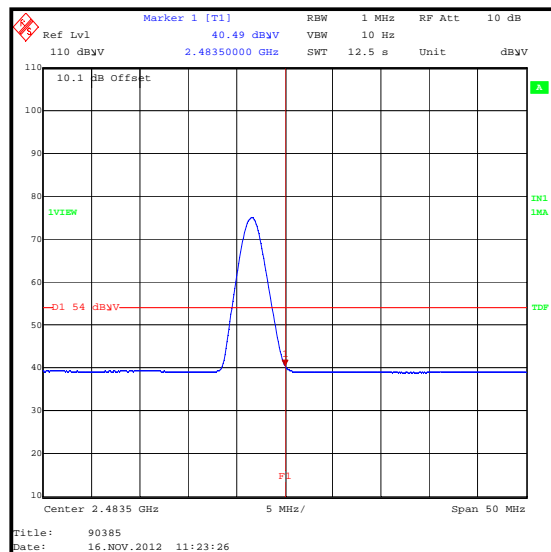
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	40.5	54.0	13.5	Complied



**Lower Band Edge Peak Static**



**Upper Band Edge Peak Static**



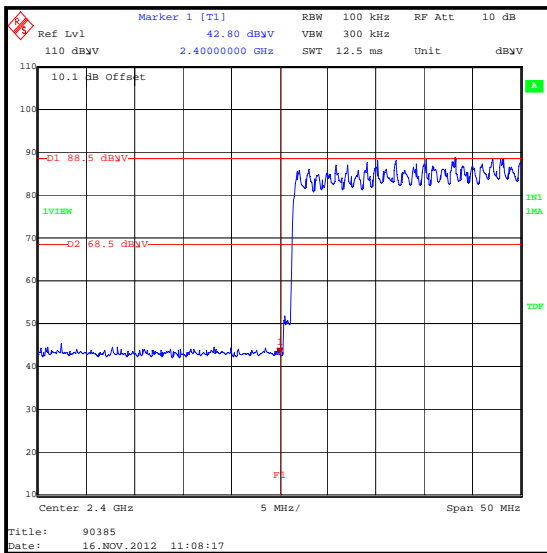
**Upper Band Edge Average Static**

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

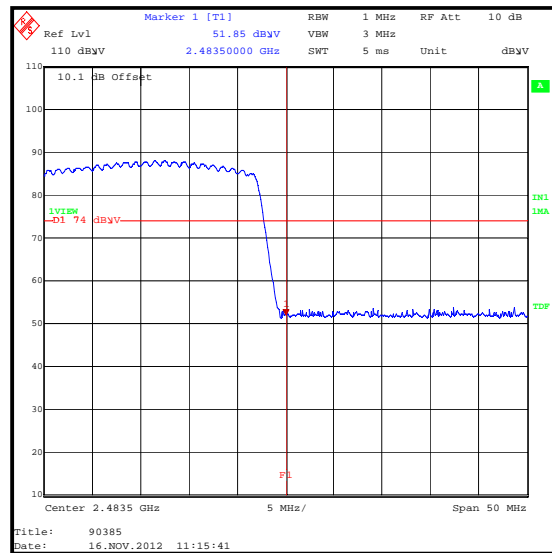
**Results: Hopping Mode / 3DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	Horizontal	42.8	68.5*	25.7	Complied
2483.5	Horizontal	51.9	74.0	22.1	Complied

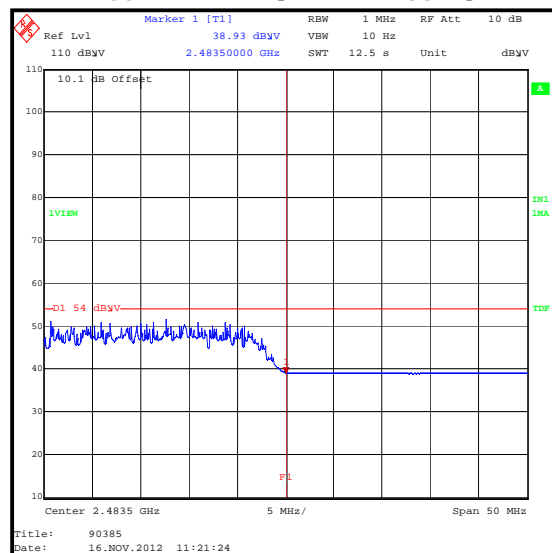
Frequency (MHz)	Antenna Polarity	Average Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	Horizontal	38.9	54.0	15.1	Complied



**Lower Band Edge Peak Hopping**



**Upper Band Edge Peak Hopping**



**Upper Band Edge Average Hopping**

**Transmitter Band Edge Radiated Emissions (continued)****Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0002	RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	06 Jul 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 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%	±3.25 dB
Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±2.94 dB
Carrier Frequency Separation	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
Average Time of Occupancy	2.4 GHz to 2.4835 GHz	95%	±0.3 ns
20 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 25 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**

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	Antenna Gain updated as requested by Customer