



TEST REPORT

Test Report No. : UL-RPT-RP10036246JD04A V2.0

Manufacturer : Panasonic Mobile Communications Development of Europe Ltd
Model No. : NTT docomo D32CS1
FCC ID : UCE113059A
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: 20 August 2013

Checked by:

Sarah Williams
WiSE Engineer

Issued by :

pp

John Newell
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Table of Contents

1. Customer Information.....	4
2. Summary of Testing.....	5
2.1. General Information	5
2.2. Summary of Test Results	5
2.3. Methods and Procedures	6
2.4. Deviations from the Test Specification	6
3. Equipment Under Test (EUT)	7
3.1. Identification of Equipment Under Test (EUT)	7
3.2. Description of EUT	7
3.3. Modifications Incorporated in the EUT	8
3.4. Additional Information Related to Testing	8
3.5. Support Equipment	8
4. Operation and Monitoring of the EUT during Testing	9
4.1. Operating Modes	9
4.2. Configuration and Peripherals	9
5. Measurements, Examinations and Derived Results	10
5.1. General Comments	10
5.2. Test Results	11
5.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions	11
5.2.2. Receiver/Idle Mode Radiated Spurious Emissions	14
5.2.3. Transmitter AC Conducted Spurious Emissions	18
5.2.4. Transmitter 20 dB Bandwidth	21
5.2.5. Transmitter Carrier Frequency Separation	26
5.2.6. Transmitter Number of Hopping Frequencies and Average Time of Occupancy	29
5.2.7. Transmitter Maximum Peak Output Power	31
5.2.8. Transmitter Radiated Emissions	39
5.2.9. Transmitter Band Edge Radiated Emissions	44
6. Measurement Uncertainty	52
7. Report Revision History	53

1. Customer Information












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

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.107 and 47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.107 and 15.109
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Site Registration:	FCC: 209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	09 August 2013 to 15 August 2013

2.2. Summary of Test Results

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

2.3. Methods and Procedures

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

2.4. Deviations from the Test Specification

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

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	NTT docomo
Model Name or Number:	D32CS1
IMEI:	357544050009519 (<i>Radiated sample</i>)
Hardware Version Number:	Revision C
Software Version Number:	ACPU: B-D32CS1-01.04.001 CCPU: D32CS1_Cv18112102
FCC ID:	UCE113059A

Brand Name:	NTT docomo
Model Name or Number:	D32CS1
IMEI:	357544050009493 (<i>Conducted RF port sample</i>)
Hardware Version Number:	Revision C
Software Version Number:	ACPU: B-D32CS1-01.04.001 CCPU: D32CS1_Cv18112102
FCC ID:	UCE113059A

Brand Name:	NTT docomo
Description:	Battery
Model Name or Number:	P23

Brand Name:	NTT docomo
Description:	AC Charger
Model Name or Number:	01 (MAS-0008-A 002)

Brand Name:	NTT docomo
Description:	USB Cable
Model Name or Number:	USB Cable with Charge Function 02

Brand Name:	NTT docomo
Description:	Personal Hands-Free
Model Name or Number:	P001

3.2. Description of EUT

The equipment under test was a Single Mode UMTS Mobile Phone with *Bluetooth*.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Tested Technology:	Bluetooth		
Power Supply Requirement:	Nominal	3.7 V	
Type of Unit:	Transceiver		
Channel Spacing:	1 MHz		
Mode:	Basic Rate	Enhanced Data Rate	
Modulation:	GFSK	π/4-DQPSK	8DQPSK
Packet Type: (Maximum Payload)	DH5	2DH5	3DH5
Data Rate (Mbit/s):	1	2	3
Maximum Peak Output Power:	0.4 dBm		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480

3.5. Support Equipment

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

Brand Name:	Panasonic Tough book
Description:	Laptop PC
Model Name or Number:	CF-74

Brand Name:	Not marked or stated
Description:	Dummy battery
Model Name or Number:	Not marked or stated

Brand Name:	Not marked or stated
Description:	2 GB Micro SD Card
Model Name or Number:	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):

- The EUT was placed into *Bluetooth* test mode using a laptop PC and application supplied by the customer. Once in *Bluetooth* mode test mode, a link was established to a *Bluetooth* tester which was then used to control the EUT.
- 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 mode radiated spurious emissions were performed with the AC Charger connected to the EUT and transmitter radiated spurious emissions tests were performed with the PHF connected to the EUT as these were found to be the worst case modes 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 the EUT transmitting in DH5 mode as this mode was found to transmit the highest power.
- The conducted sample with IMEI 357544050009493 was used for 20 dB bandwidth, carrier frequency separation, average time of occupancy tests and conducted output power tests.
- The radiated sample with IMEI 357544050009519 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:**

Test Engineer:	Mark Percival	Test Date:	14 August 2013
Test Sample IMEI:	357544050009519		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	49

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.190	Live	47.7	64.0	16.3	Complied
0.393	Live	30.8	58.0	27.2	Complied
1.333	Live	31.5	56.0	24.5	Complied
3.736	Live	19.4	56.0	36.6	Complied

Results: Live / Average

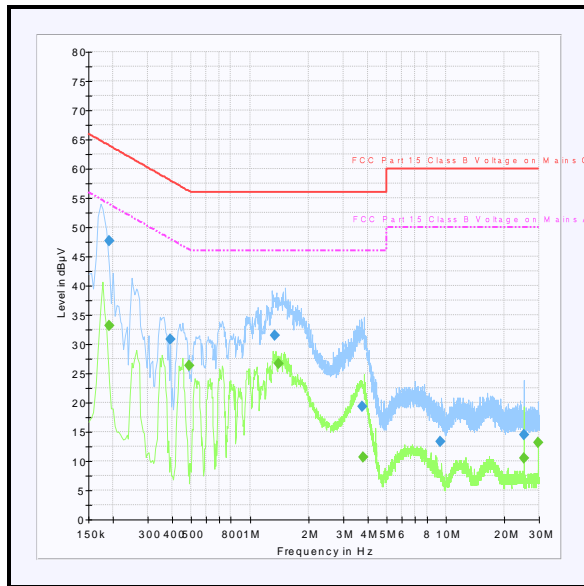
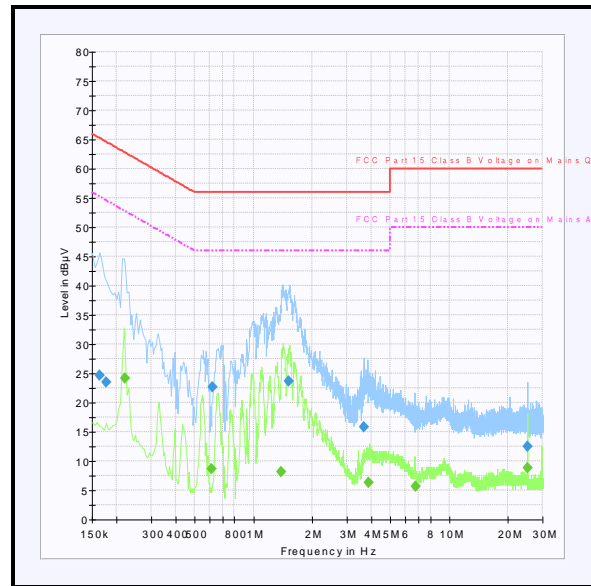
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.190	Live	33.2	54.0	20.8	Complied
0.492	Live	26.3	46.1	19.8	Complied
1.401	Live	26.6	46.0	19.4	Complied
3.777	Live	10.7	46.0	35.3	Complied

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

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.618	Neutral	22.7	56.0	33.3	Complied
1.518	Neutral	23.6	56.0	32.4	Complied
3.673	Neutral	15.8	56.0	40.2	Complied
25.057	Neutral	12.5	60.0	47.5	Complied

Results: Neutral / Average

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.222	Neutral	24.2	52.7	28.5	Complied
0.609	Neutral	8.7	46.0	37.3	Complied
1.387	Neutral	8.1	46.0	37.9	Complied
3.862	Neutral	6.3	46.0	39.7	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:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1625	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	09 Jan 2014	12
A004	LISN	Rohde & Schwarz	ESH3-Z5	890604/027	30 Oct 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	19 Feb 2014	12
M1379	Test Receiver	Rohde & Schwarz	ESIB7	100330	15 Oct 2013	12

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

Test Engineer:	Andrew Edwards	Test Date:	13 August 2013
Test Sample IMEI:	357544050009519		

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

Environmental Conditions:

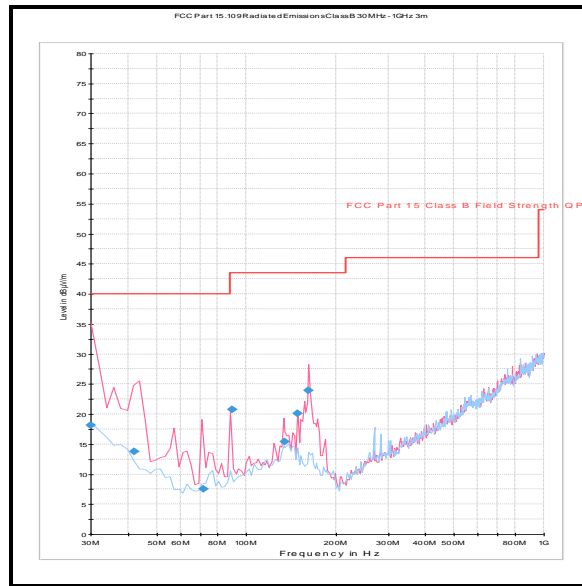
Temperature (°C):	24
Relative Humidity (%):	39

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 (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 μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
30.048	Vertical	18.2	40.00	21.8	Complied
161.987	Vertical	23.9	43.5	19.6	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:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A490	Antenna	Chase	CBL6111A	1590	09 Aug 2014	12
G0543	Pre Amplifier	Sonoma	310N	230801	05 Oct 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	07 Feb 2014	12
M1622	Thermometer Hygrometer Station	JM handelspunkt	30.5015.06	Not Stated	24 May 2014	12

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

Test Engineer:	Andrew Edwards	Test Date:	14 August 2012
Test Sample IMEI:	357544050009519		

FCC Reference:	Part 15.109
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range:	1 GHz to 12.5 GHz

Environmental Conditions:

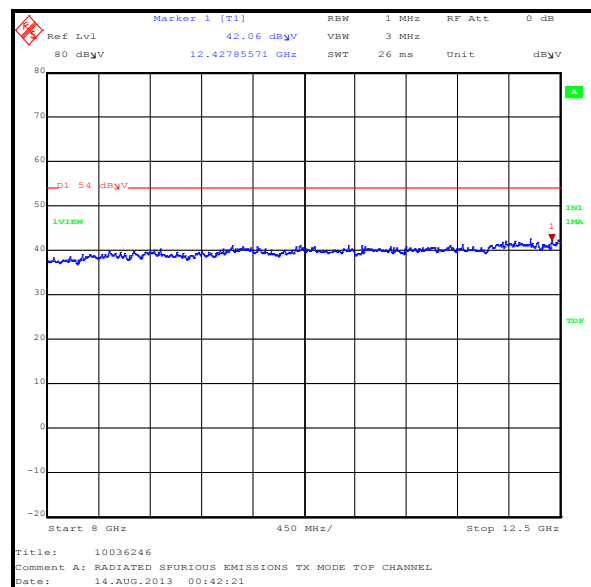
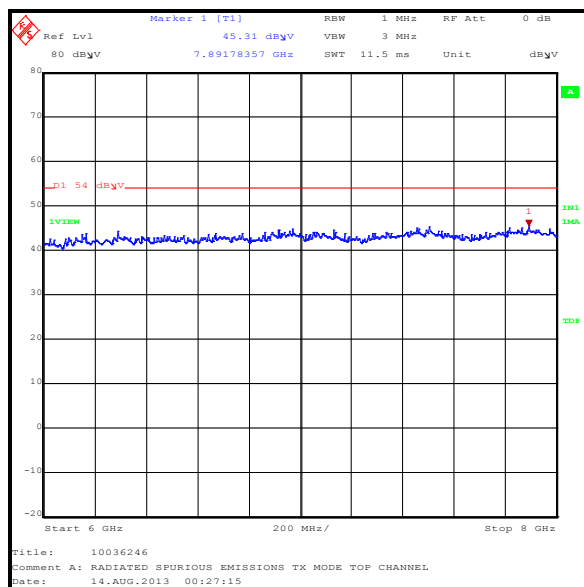
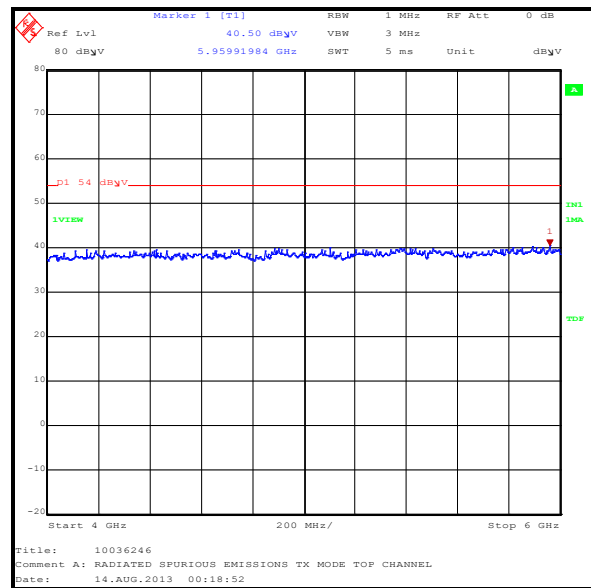
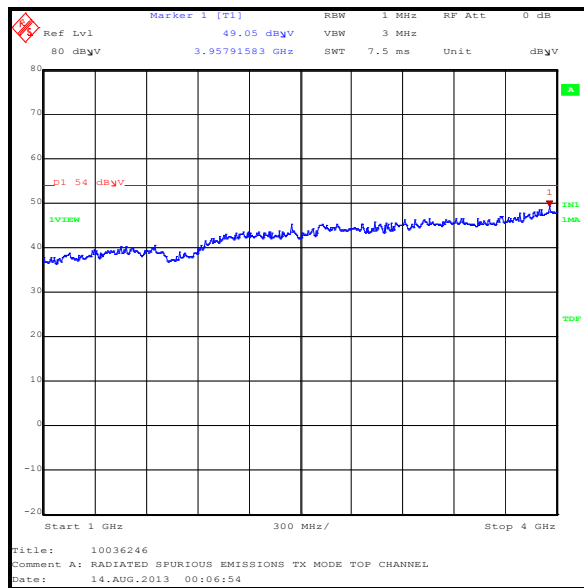
Temperature (°C):	22
Relative Humidity (%):	41

Note(s):

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
3. Pre-scans above 1 GHz were performed in a fully anechoic chamber (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 (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 (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
3957.916	Vertical	49.1	54.0	4.9	Complied

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

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
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
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	20 Sep 2013	12
M1656	Thermometer Hygrometer Station	JM handelspunkt	30.5015.06	Not Stated	24 May 2014	12

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

Test Engineer:	Mark Percival	Test Date:	14 August 2013
Test Sample IMEI:	357544050009519		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	49

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.200	Live	43.8	63.6	19.8	Complied
0.263	Live	37.1	61.4	24.3	Complied
1.784	Live	36.9	56.0	19.1	Complied
3.629	Live	33.6	56.0	22.4	Complied

Results: Live / Average

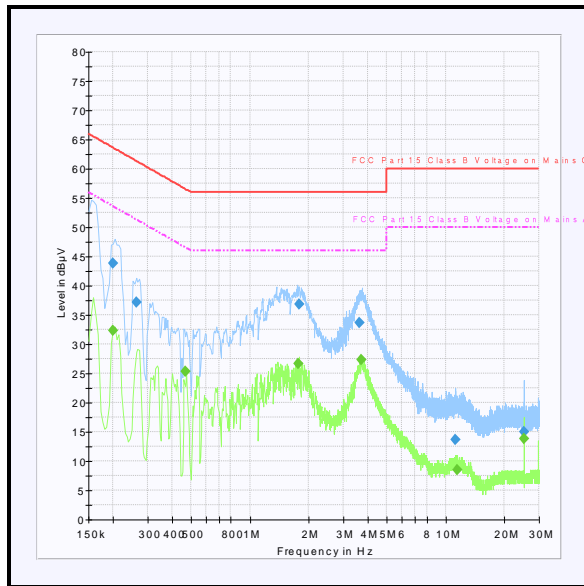
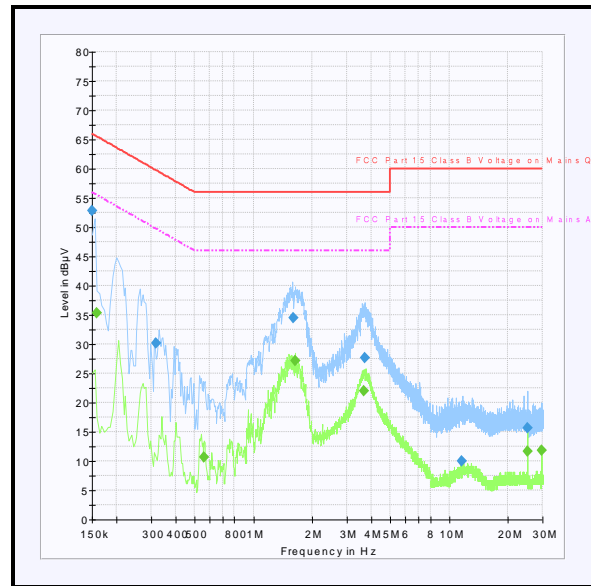
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.199	Live	32.4	53.6	21.2	Complied
0.469	Live	25.4	46.5	21.1	Complied
1.775	Live	26.6	46.0	19.4	Complied
3.723	Live	27.4	46.0	18.6	Complied

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

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Neutral	52.8	66.0	13.2	Complied
0.317	Neutral	30.2	59.8	29.6	Complied
1.595	Neutral	34.4	56.0	21.6	Complied
3.705	Neutral	27.7	56.0	28.3	Complied

Results: Neutral / Average

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.159	Neutral	35.3	55.5	20.2	Complied
0.560	Neutral	10.6	46.0	35.4	Complied
1.631	Neutral	27.2	46.0	18.8	Complied
3.669	Neutral	22.0	46.0	24.0	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:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1625	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	09 Jan 2014	12
A004	LISN	Rohde & Schwarz	ESH3-Z5	890604/027	30 Oct 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	19 Feb 2014	12
M1379	Test Receiver	Rohde & Schwarz	ESIB7	100330	15 Oct 2013	12

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

Test Engineer:	Nick Steele	Test Date:	13 August 2013
Test Sample IMEI:	357544050009493		

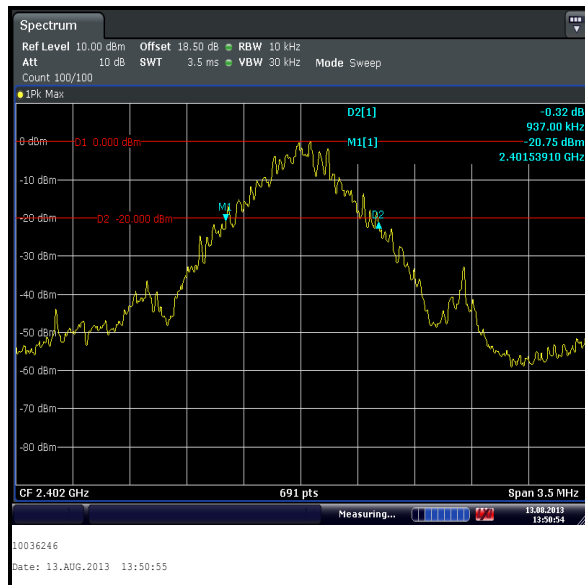
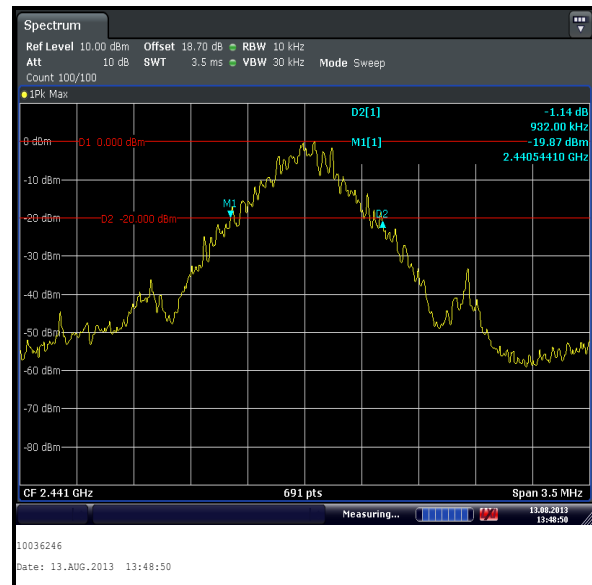
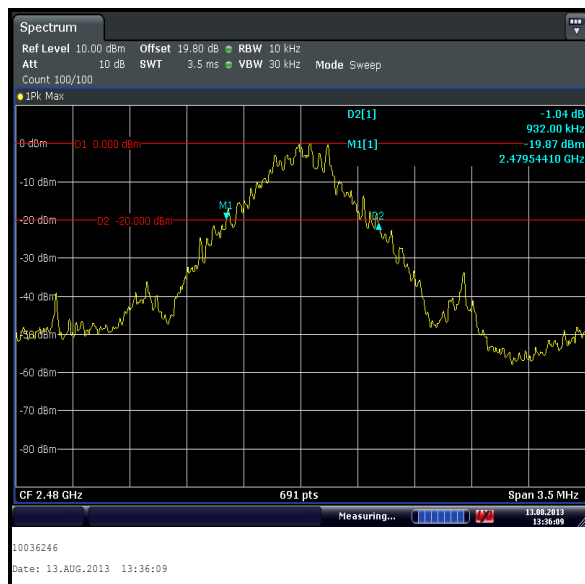
FCC Reference:	Part 15.247(a)(1)
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.1

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	44

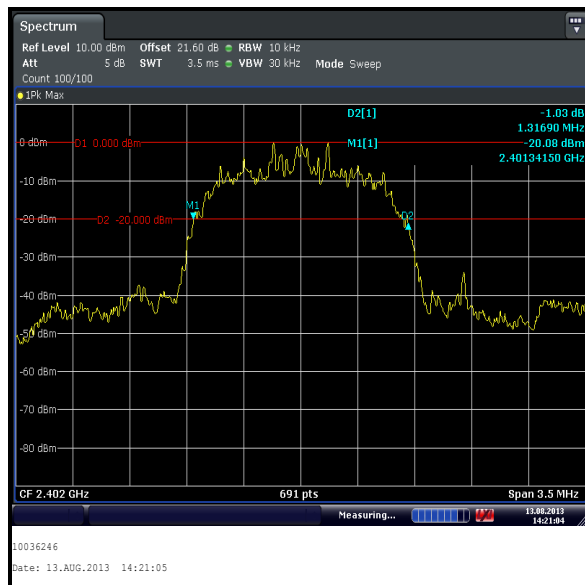
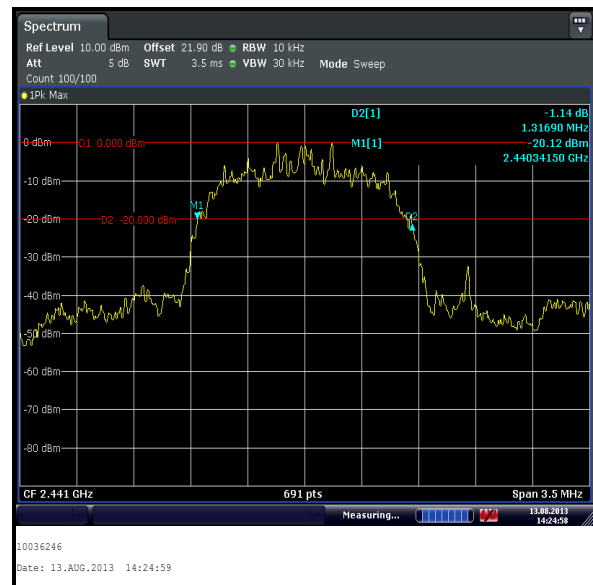
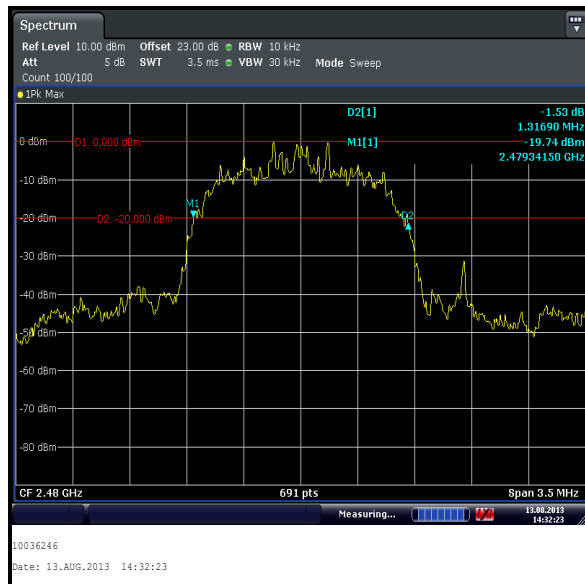
Transmitter 20 dB Bandwidth (continued)**Results DH5:**

Channel	20 dB Bandwidth (kHz)
Bottom	937.0
Middle	932.0
Top	932.0

**Bottom Channel****Middle Channel****Top Channel**

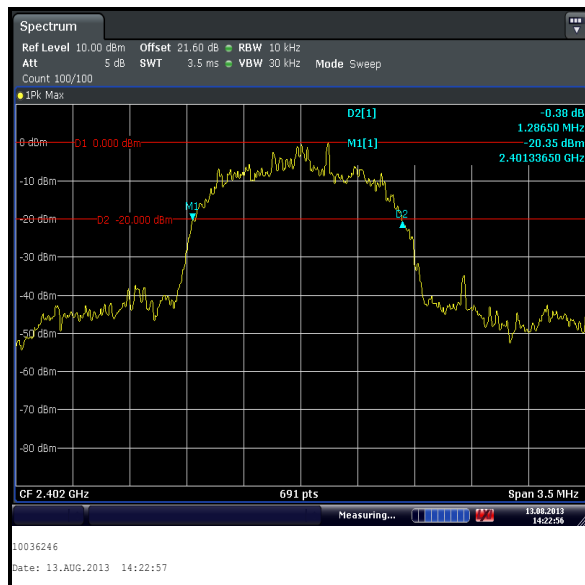
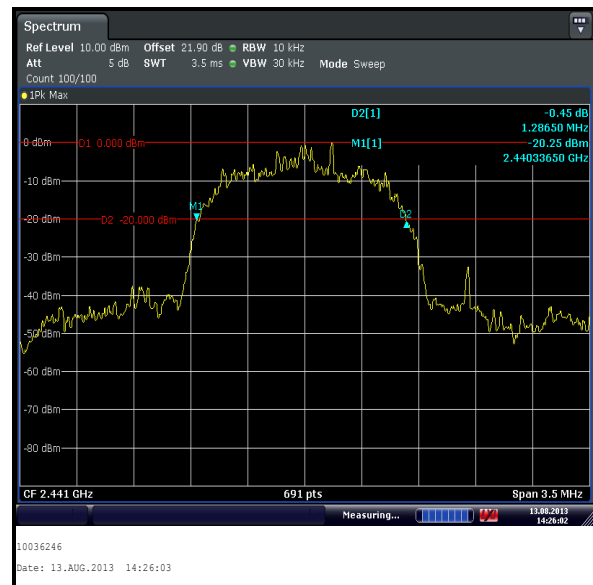
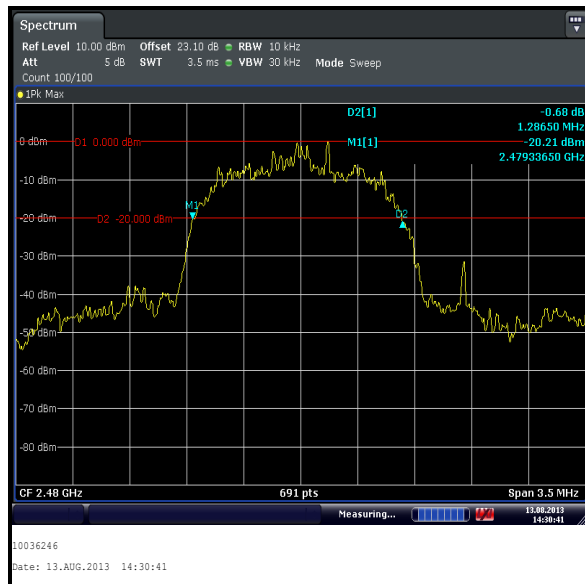
Transmitter 20 dB Bandwidth (continued)**Results 2DH5:**

Channel	20 dB Bandwidth (kHz)
Bottom	1316.9
Middle	1316.9
Top	1316.9

**Bottom Channel****Middle Channel****Top Channel**

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

Channel	20 dB Bandwidth (kHz)
Bottom	1286.5
Middle	1286.5
Top	1286.5

**Bottom Channel****Middle Channel****Top Channel**

Transmitter 20 dB Bandwidth (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
L1028	Signal Analyser	Rohde & Schwarz	FSV 30	100854	23 May 2014	12
A2136	Directional Coupler	Atlan TecRF	BDC-020080-10	SDC1010-069	Calibrated before use	-
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-
M1229	Digital Multimeter	Fluke	179	87640015	26 Jun 2014	12

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

Test Engineer:	Nick Steele	Test Date:	13 August 2013
Test Sample IMEI:	357544050009493		

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

Environmental Conditions:

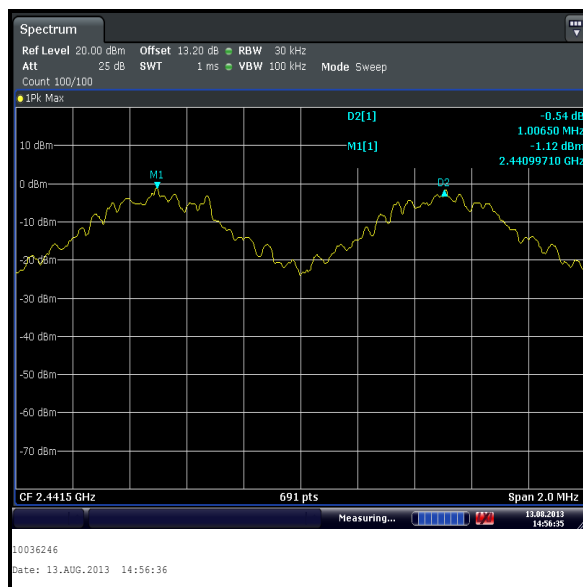
Temperature (°C):	24
Relative Humidity (%):	44

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
1006.500	621.333	385.167	Complied

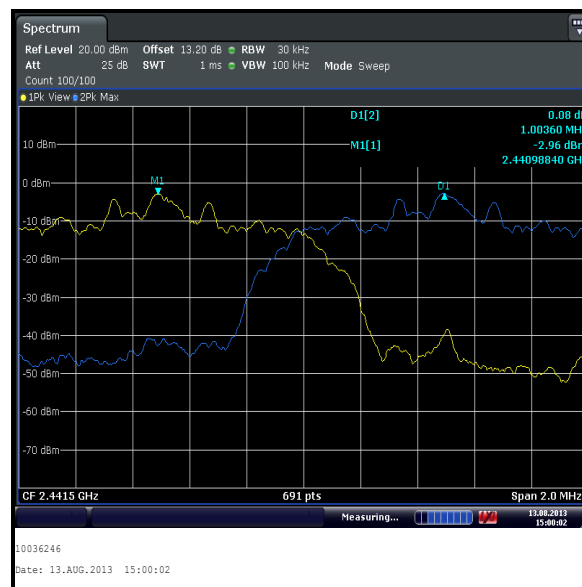


Transmitter Carrier Frequency Separation (continued)**Note(s):**

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
1003.600	877.933	125.667	Complied

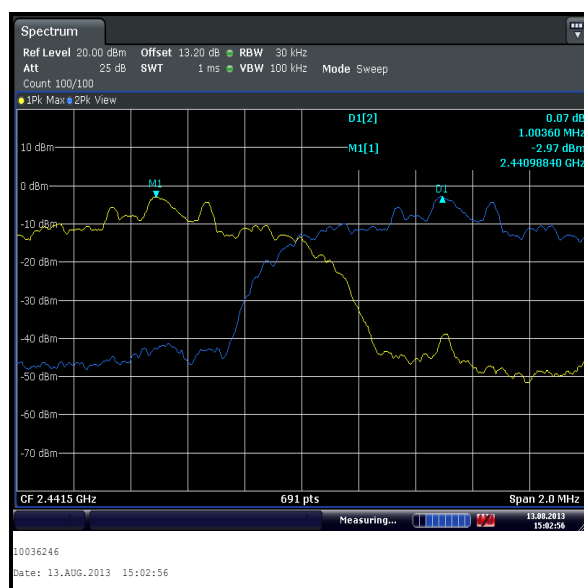


Transmitter Carrier Frequency Separation (continued)**Note(s):**

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
1003.600	857.667	145.933	Complied

**Test Equipment Used:****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
L1028	Signal Analyser	Rohde & Schwarz	FSV 30	100854	23 May 2014	12
A2136	Directional Coupler	Atlan TecRF	BDC-020080-10	SDC1010-069	Calibrated before use	-
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-
M1229	Digital Multimeter	Fluke	179	87640015	26 Jun 2014	12

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

Test Engineer:	Nick Steele	Test Date:	13 August 2013
Test Sample IMEI:	357544050009493		

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

Environmental Conditions:

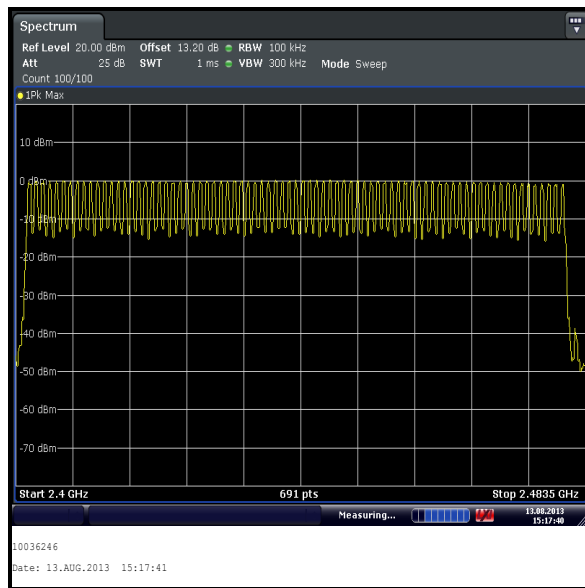
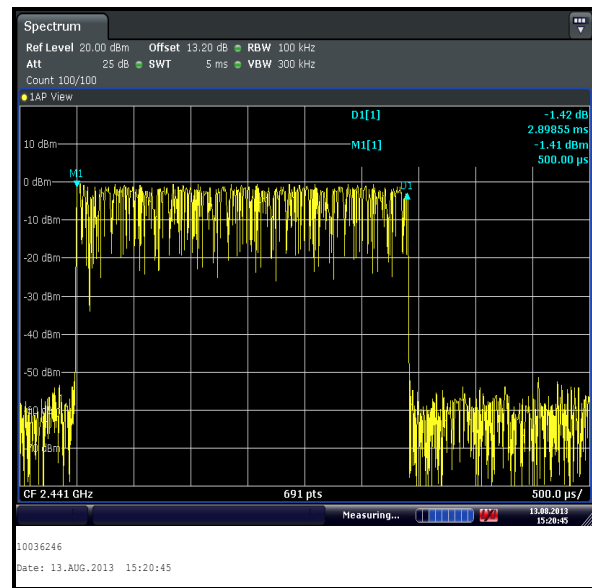
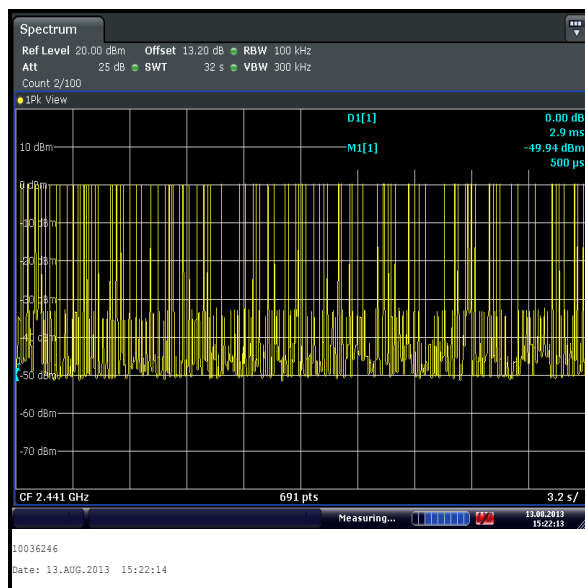
Temperature (°C):	24
Relative Humidity (%):	44

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:

Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2898.550	99	0.287	0.4	0.113	Complied

Transmitter Number of Hopping Frequencies and Average Time of Occupancy (continued)**Number of Hopping Frequencies****Emission Width****Number of Hopping Frequencies in 32 s****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
L1028	Signal Analyser	Rohde & Schwarz	FSV 30	100854	23 May 2014	12
A2136	Directional Coupler	Atlan TecRF	BDC-020080-10	SDC1010-069	Calibrated before use	-
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-
M1229	Digital Multimeter	Fluke	179	87640015	26 Jun 2014	12

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

Test Engineer:	Nick Steele	Test Date:	13 August 2013
Test Sample IMEI:	357544050009493		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	44

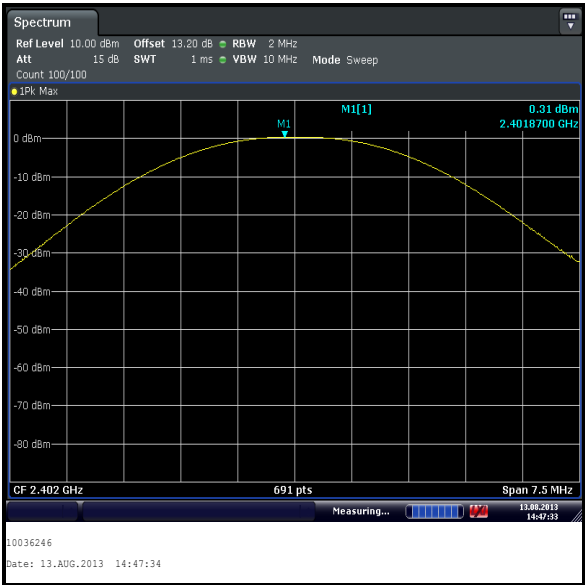
Transmitter Maximum Peak Output Power (continued)**Results: DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	0.3	30.0	29.7	Complied
Middle	0.3	30.0	29.7	Complied
Top	0.4	30.0	29.6	Complied

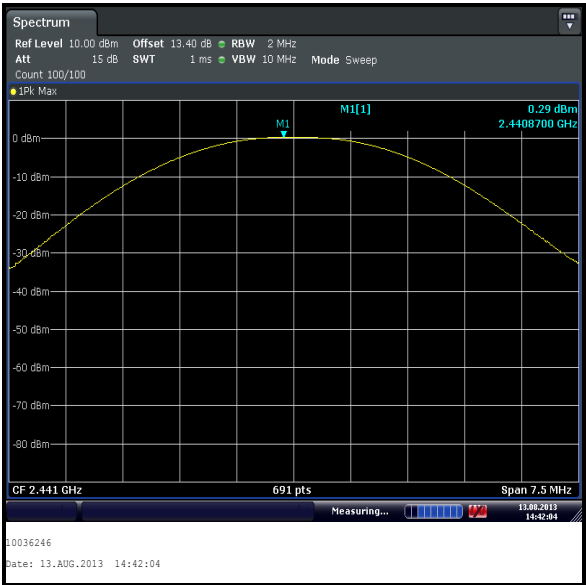
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	0.3	0.0	0.3	36.0	35.7	Complied
Middle	0.3	0.0	0.3	36.0	35.7	Complied
Top	0.4	0.0	0.4	36.0	35.6	Complied

Transmitter Maximum Peak Output Power (continued)

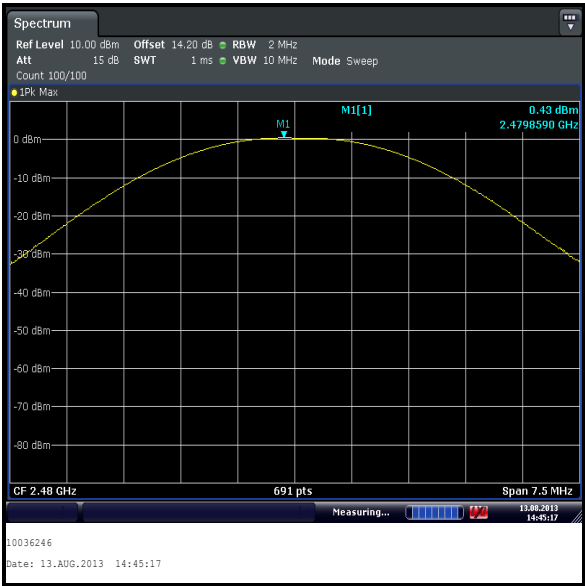
Results: DH5



Bottom Channel



Middle Channel

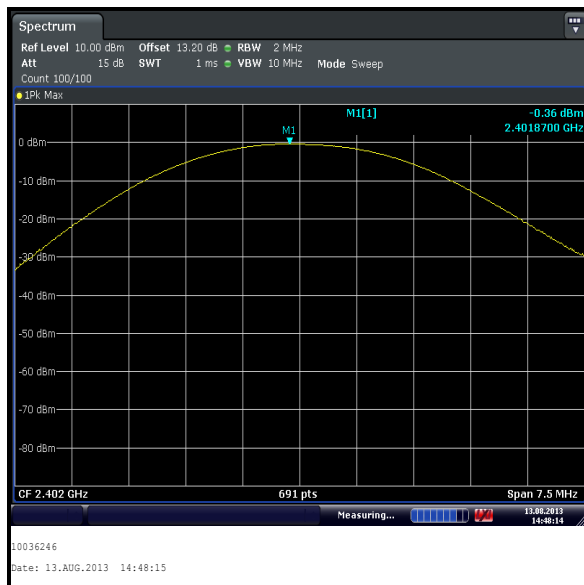
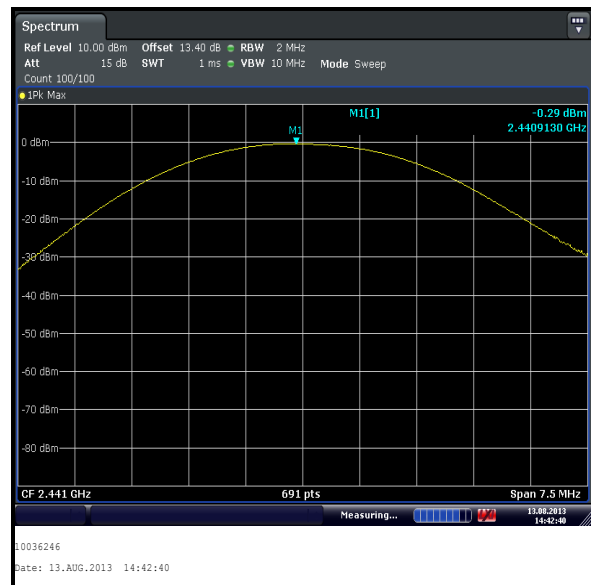
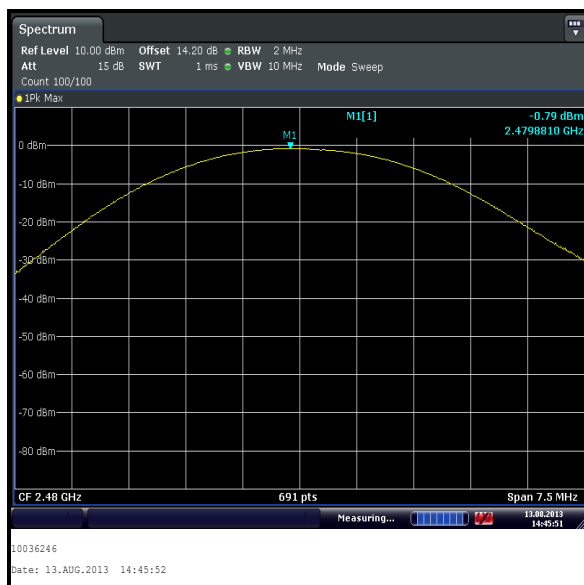


Top Channel

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

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-0.4	21.0	21.4	Complied
Middle	-0.3	21.0	21.3	Complied
Top	-0.8	21.0	21.8	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-0.4	0.0	-0.4	27.0	27.4	Complied
Middle	-0.3	0.0	-0.3	27.0	27.3	Complied
Top	-0.8	0.0	-0.8	27.0	27.8	Complied

Transmitter Maximum Peak Output Power (continued)**Results: 2DH5****Bottom Channel****Middle Channel****Top Channel**

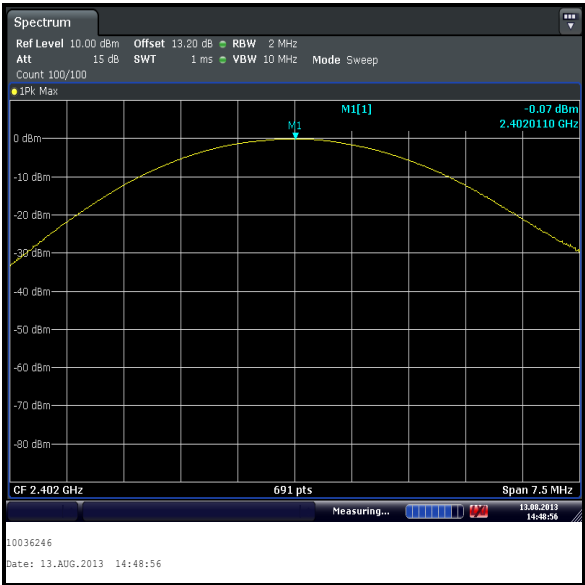
Transmitter Maximum Peak Output Power (continued)**Results: 3DH5**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-0.1	21.0	21.1	Complied
Middle	0.0	21.0	21.0	Complied
Top	-0.5	21.0	21.5	Complied

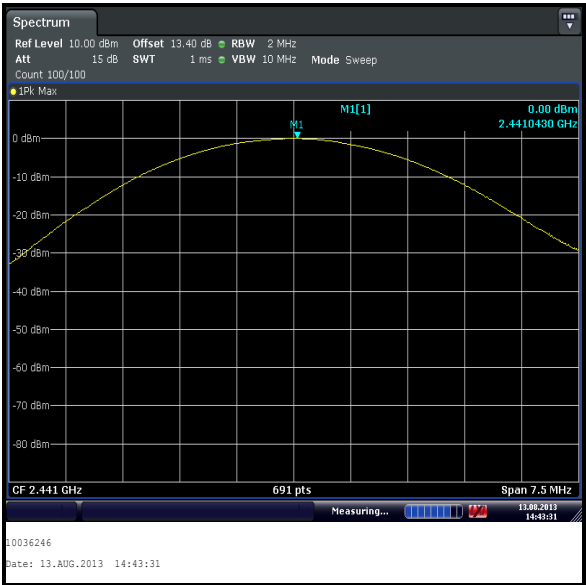
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-0.1	0.0	-0.1	27.0	27.1	Complied
Middle	0.0	0.0	0.0	27.0	27.0	Complied
Top	-0.5	0.0	-0.5	27.0	27.5	Complied

Transmitter Maximum Peak Output Power (continued)

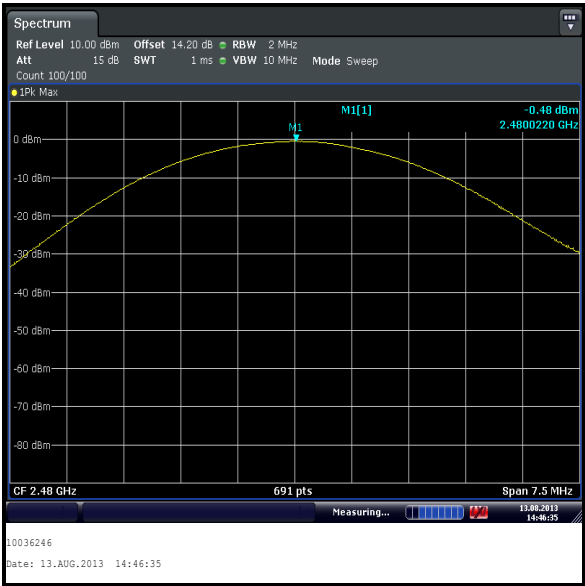
Results: 3DH5



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Peak Output Power (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
L1028	Signal Analyser	Rohde & Schwarz	FSV 30	100854	23 May 2014	12
A2136	Directional Coupler	Atlan TecRF	BDC-020080-10	SDC1010-069	Calibrated Before Use	-
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	15 May 2014	12
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	14 May 2014	12
M1449	Signal Generator	Rohde & Schwarz	SMIQ03B	100176	13 Mar 2014	12
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-
M1229	Digital Multimeter	Fluke	179	87640015	26 Jun 2014	12

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

Test Engineer:	Mark Percival	Test Date:	15 August 2013
Test Sample IMEI:	357544050009519		

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

Environmental Conditions:

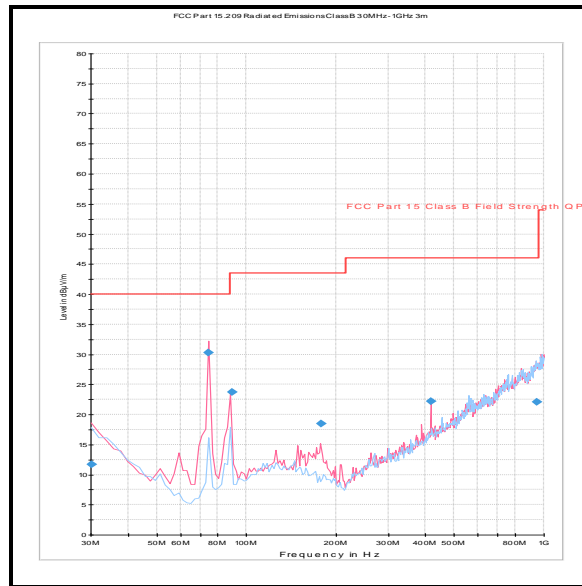
Temperature (°C):	23
Relative Humidity (%):	52

Note(s):

1. Transmitter radiated spurious emissions tests were performed with the EUT transmitting in DH5 mode as this was found to transmit the highest power and therefore deemed worst case.
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 (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 / DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
74.801	Vertical	30.2	40.0	9.8	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:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A490	Antenna	Chase	CBL6111A	1590	09 Apr 2014	12
A1834	Attenuator	Hewlett Packard	8491B	10444	27 Jan 2014	12
G0543	Pre Amplifier	Sonoma	310N	230801	05 Oct 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	07 Feb 2014	12
M1622	Thermometer Hygrometer Station	JM handelspunkt	30.5015.06	Not Stated	24 May 2014	12

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

Test Engineer:	Mark Percival	Test Date:	12 August 2013
Test Sample IMEI:	357544050009519		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	41

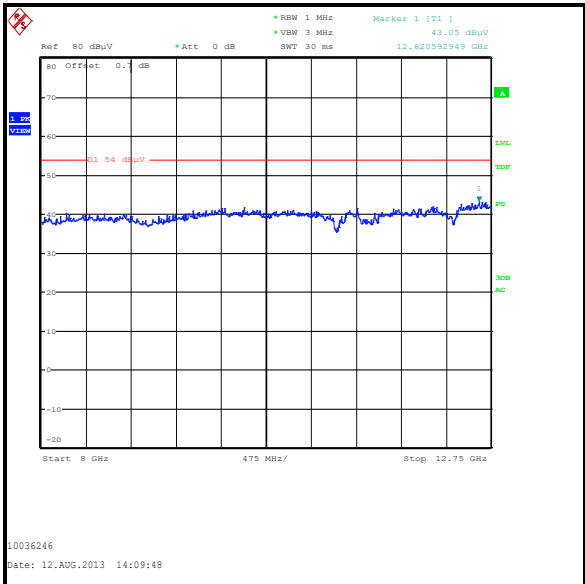
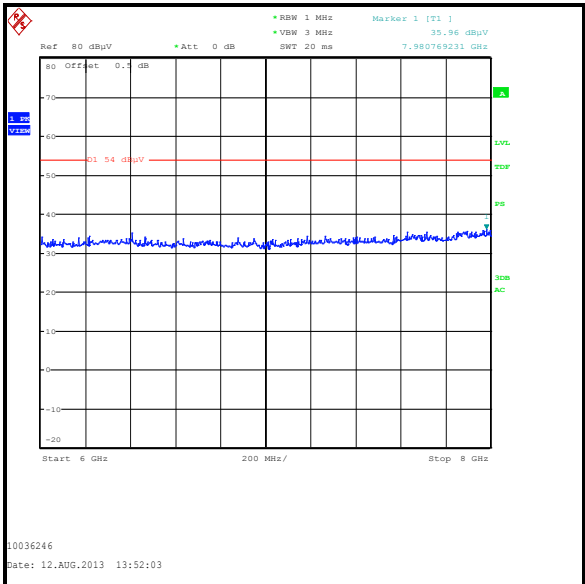
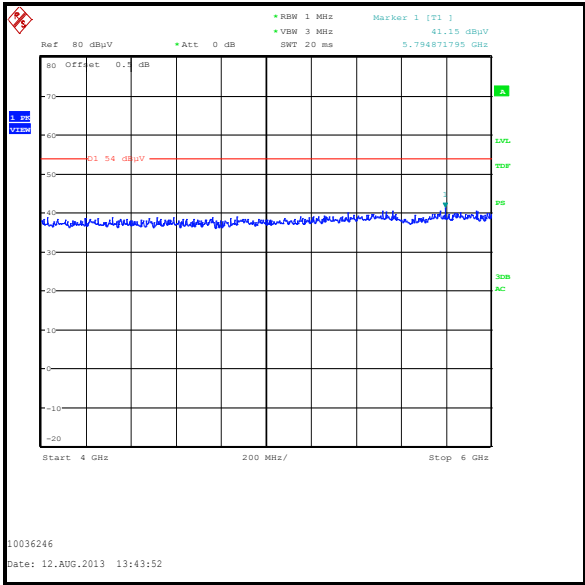
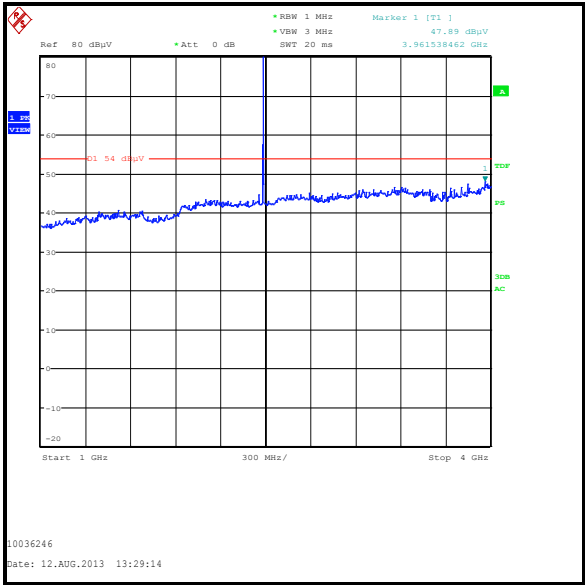
Note(s):

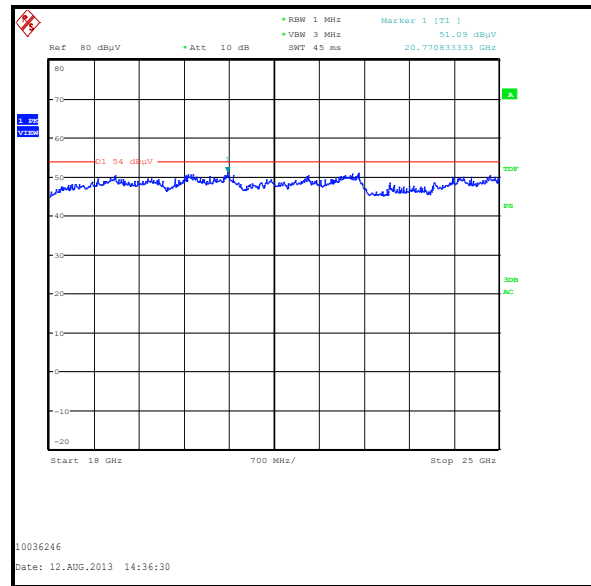
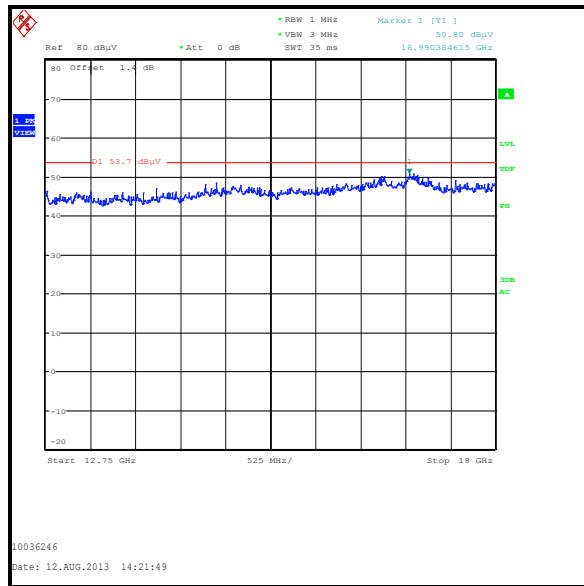
1. Transmitter radiated spurious emissions tests were performed with the EUT transmitting in DH5 mode as this was found to transmit the highest power.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. The emission shown 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 (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 (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	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
20770.833	Horizontal	51.1	54.0	2.9	Complied

Transmitter Radiated Emissions (continued)



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

Asset 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
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	07 Feb 2014	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
A256	Antenna	Flann Microwave	18240-20	400	04 Nov 2013	12
A436	Antenna	Flann Microwave	20240-20	330	04 Nov 2013	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	19 Apr 2014	12
M1656	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	Not stated	24 May 2014	12

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

Test Engineer:	Mark Percival	Test Date:	09 August 2013
Test Sample IMEI:	357544050009519		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	54

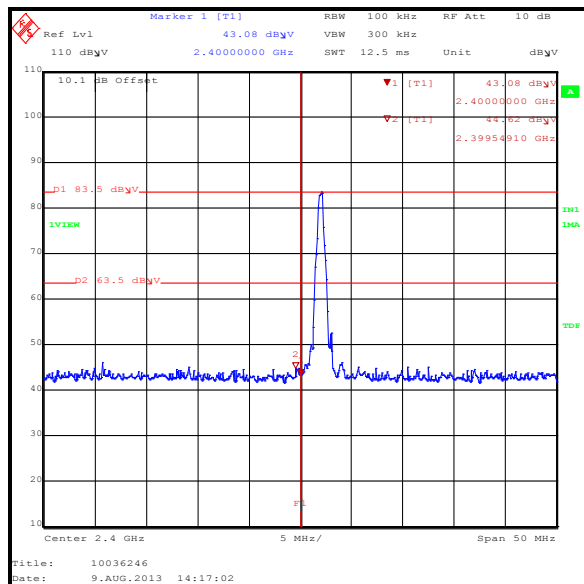
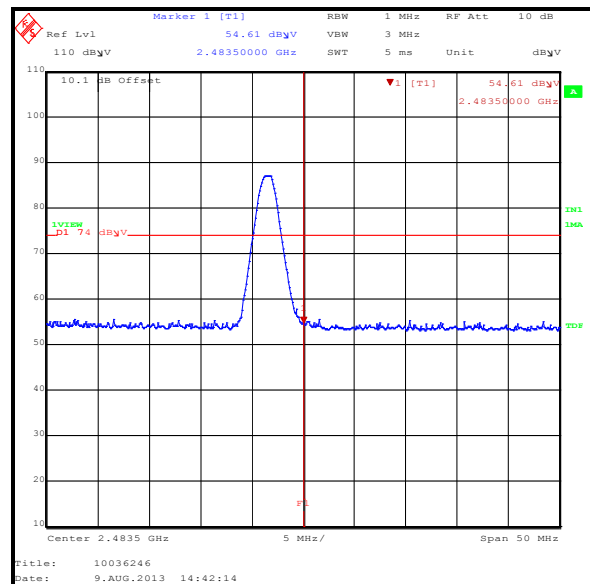
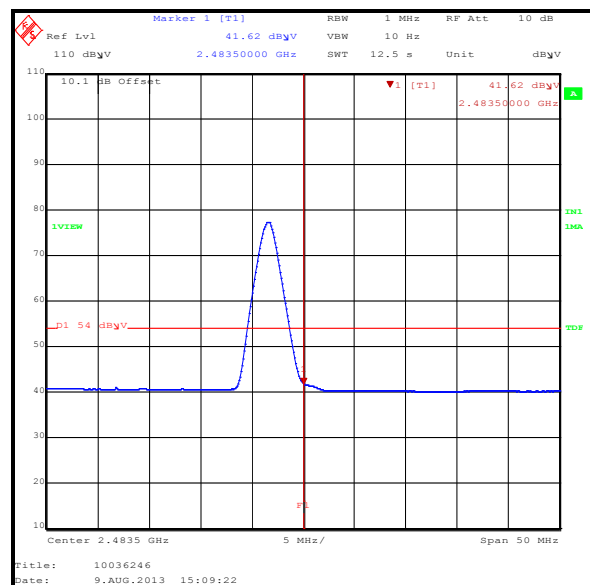
Note(s):

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 μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2399.549	Horizontal	44.6	63.5*	18.9	Complied
2400.0	Horizontal	43.1	63.5*	20.4	Complied
2483.5	Horizontal	54.6	74.0	19.4	Complied

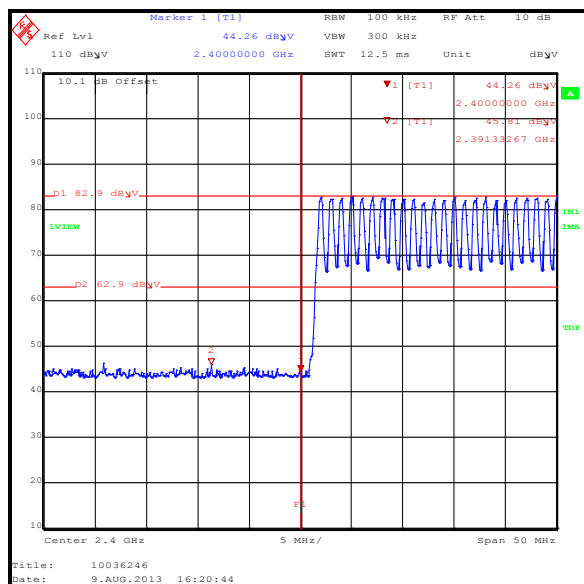
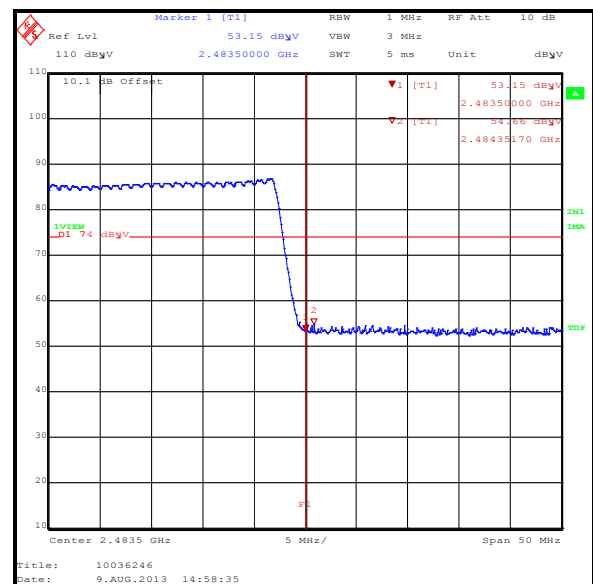
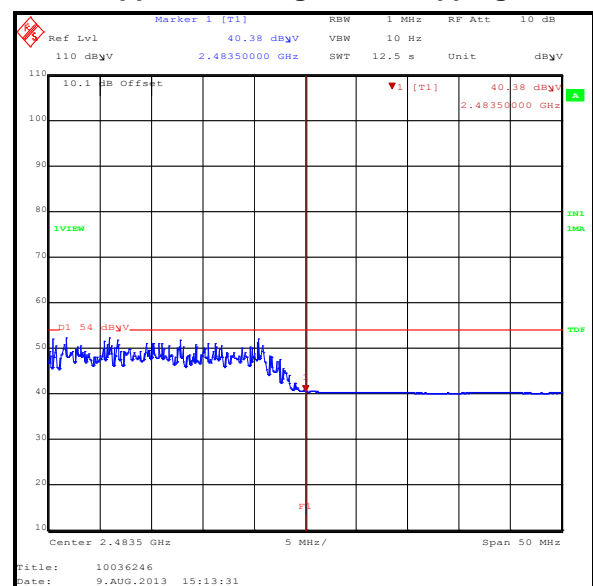
Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2483.5	Horizontal	41.6	54.0	12.4	Complied

**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 μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2391.333	Horizontal	45.8	62.9*	17.1	Complied
2400.0	Horizontal	44.3	62.9*	18.6	Complied
2483.5	Horizontal	53.2	74.0	20.8	Complied
2484.351	Horizontal	54.7	74.0	19.3	Complied

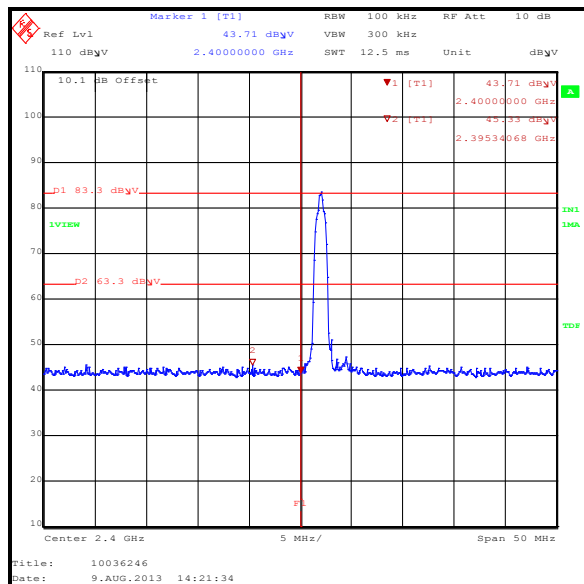
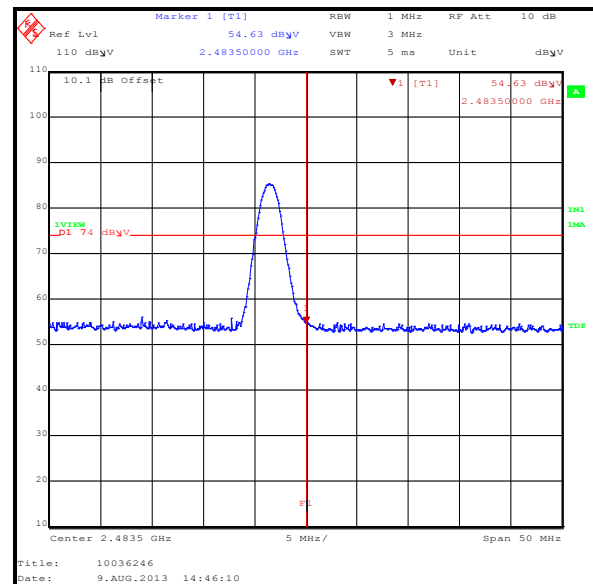
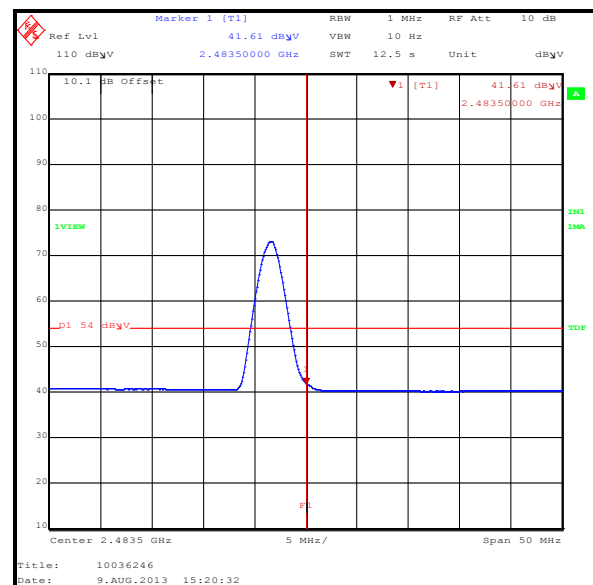
Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2483.5	Horizontal	40.4	54.0	13.6	Complied

**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 μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2395.341	Horizontal	45.3	63.3*	18.0	Complied
2400.0	Horizontal	43.7	63.3*	19.6	Complied
2483.5	Horizontal	54.6	74.0	19.4	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2483.5	Horizontal	41.6	54.0	12.4	Complied

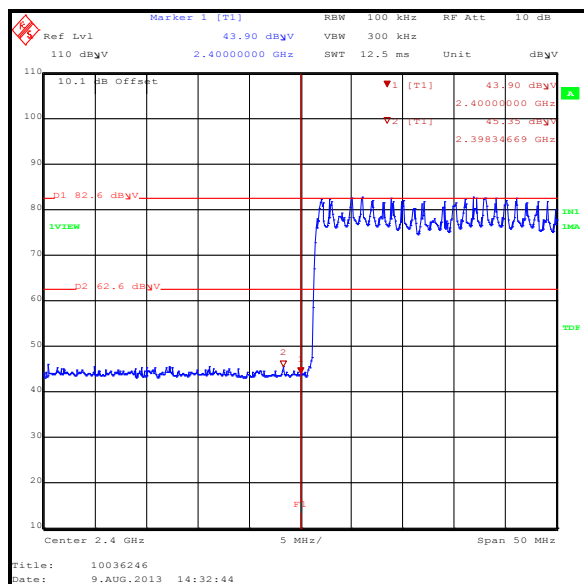
**Lower Band Edge Peak Static****Upper Band Edge Peak Static****Upper Band Edge Average Static**

Transmitter Band Edge Radiated Emissions (continued)

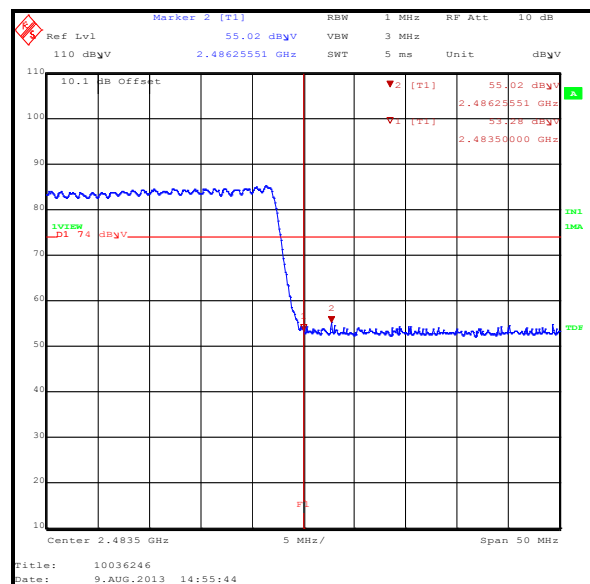
Results: Hopping Mode / 2DH5

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2398.347	Horizontal	45.4	62.6*	17.2	Complied
2400.0	Horizontal	43.9	62.6*	18.7	Complied
2483.5	Horizontal	53.3	74.0	20.7	Complied
2486.256	Horizontal	55.0	74.0	19.0	Complied

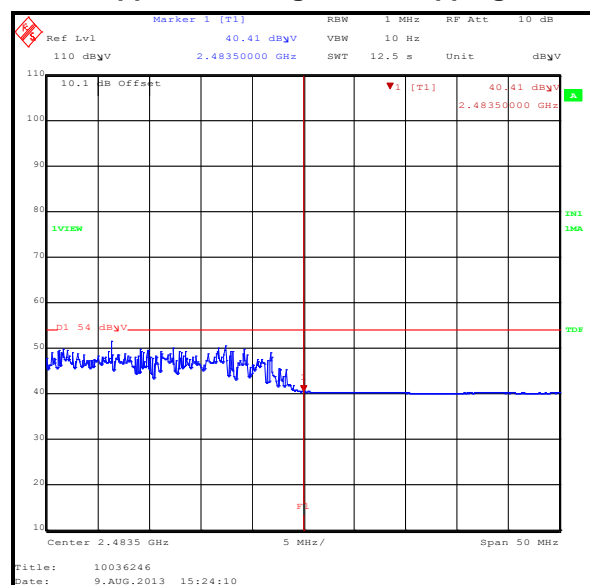
Frequency (MHz)	Antenna Polarity	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	Horizontal	40.4	54.0	13.6	Complied



Lower Band Edge Peak Hopping



Upper Band Edge Peak Hopping

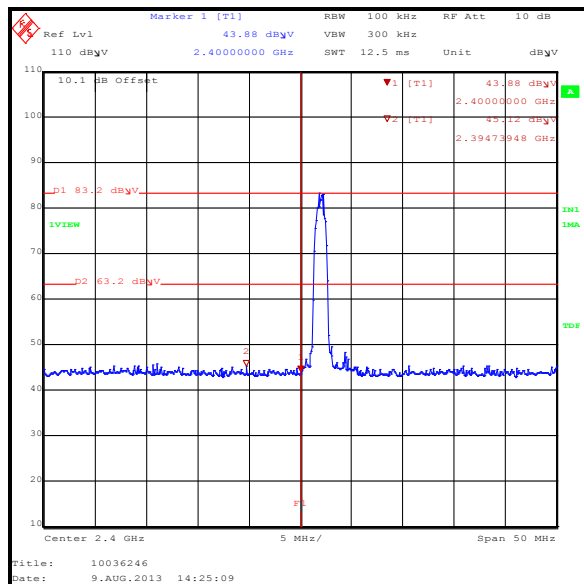
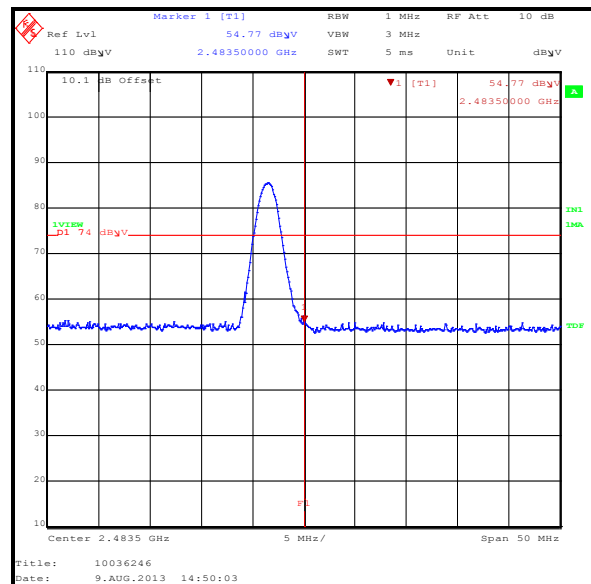
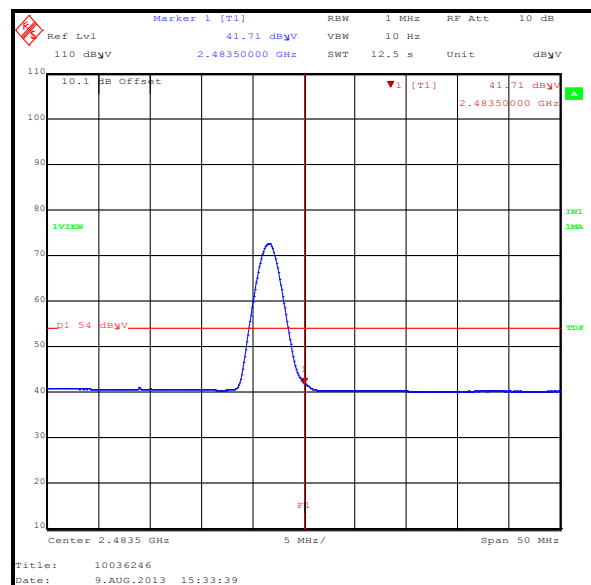


Upper Band Edge Average Hopping

Transmitter Band Edge Radiated Emissions (continued)**Results: Static Mode / 3DH5**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2394.739	Horizontal	45.1	63.2*	18.1	Complied
2400.0	Horizontal	43.9	63.2*	19.3	Complied
2483.5	Horizontal	54.8	74.0	19.2	Complied

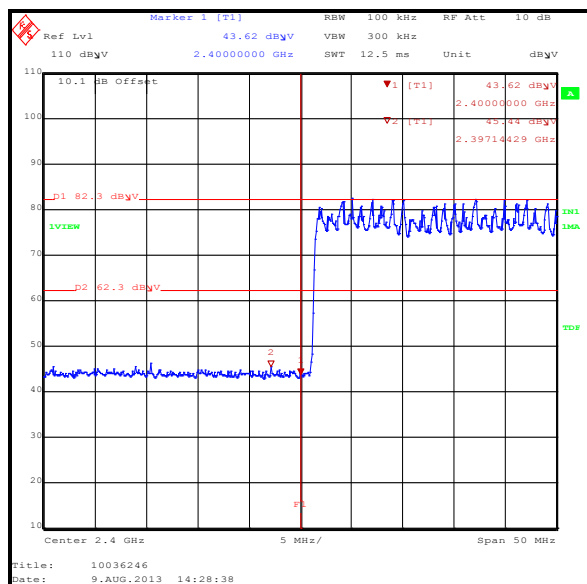
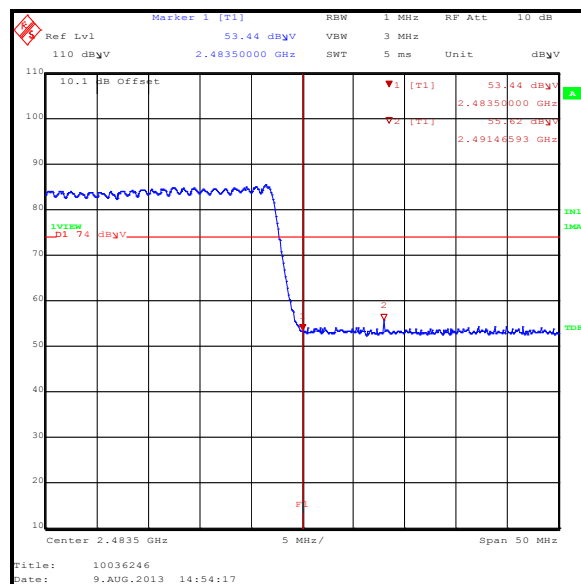
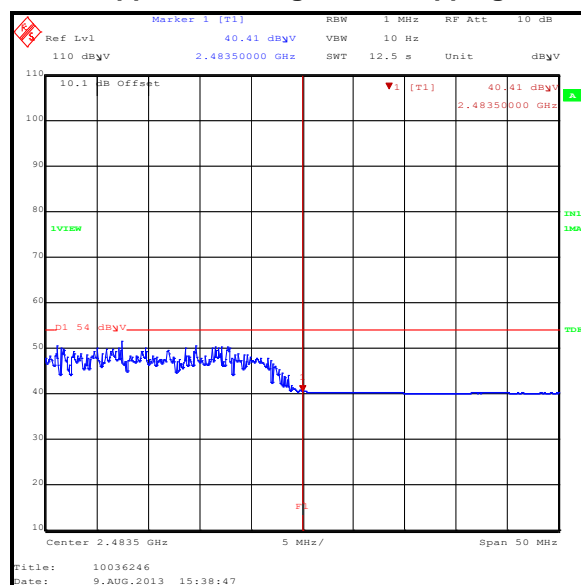
Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2483.5	Horizontal	41.7	54.0	12.3	Complied

**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 μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2397.144	Horizontal	45.4	62.3*	16.9	Complied
2400.0	Horizontal	43.6	62.3*	18.7	Complied
2483.5	Horizontal	53.4	74.0	20.6	Complied
2491.466	Horizontal	55.6	74.0	18.4	Complied

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2483.5	Horizontal	40.4	54.0	13.6	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:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
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	20 Sep 2013	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	10 May 2014	12
A1818	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”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 dB
Maximum Peak 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 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz 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	-	-	Updates to front page and section 4.2