TEST REPORT

Test Report No. : UL-RPT-RP10648417JD02A V2.0

Manufacturer	:	Pasce Ltd
Model No.	:	MRBT
FCC ID	:	2AD65MRBT
Technology	:	*Bluetooth* – Basic Rate & EDR
Test Standard(s)	:	FCC Parts 15.109, 15.209(a) & 15.247

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
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: 19 February 2015

Checked by:

Sarah Williams
Engineer, Radio Laboratory

Issued by :

pp
John Newell
Quality Manager,
UL VS LTD

UKAS TESTING 0644

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

UL VS LTD

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1. Customer Information

Company Name:	Pasce Ltd
Address:	10 Backfields Lane Bristol BS2 8QW 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:	47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart B (Unintentional Radiators) – Section 15.109
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.209
Site Registration:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	30 January 2015 to 06 February 2015

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.109	Receiver/Idle Mode Radiated Spurious 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:	Minirig
Model Name or Number:	MRBT
Test Sample MAC Address:	00126f7349bd *(Conducted sample)*
Hardware Version Number:	V5E-2B
Software Version Number:	1.8 5.6 RC6 - TBC
FCC ID:	2AD65MRBT

Brand Name:	Minirig
Model Name or Number:	MRBT
Test Sample MAC Address:	00126f734979 *(Radiated sample)*
Hardware Version Number:	V5E-2B
Software Version Number:	1.8 5.6 RC6 - TBC
FCC ID:	2AD65MRBT

3.2. Description of EUT

The equipment under test was a portable *Bluetooth* speaker.

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	5 VDC	
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 (Mbps):	1	2	3
Maximum Conducted Output Power:	6.2 dBm		
Antenna Gain:	1.9 dBi		
Operating Frequency Range:	2400 MHz to 2483.5 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	0	2402
	Top	78	2480

3.5. Support Equipment

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

Description:	Test Laptop
Brand Name:	Dell
Model Name or Number:	Latitude D610
Serial Number:	B7Y0T1J

Description:	Level Shifter
Brand Name:	CSR
Model Name or Number:	DEV-PC-1309C
Serial Number:	Not marked or stated

Description:	USB/Serial Diagnostic Cable
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Audio Cable
Brand Name:	Minirig
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	MP3 Player
Brand Name:	Creative
Model Name or Number:	Zen Stone Plus 2 GB
Serial Number:	MAPF 2191 745M 1946 8N

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.
- Continuously transmitting at maximum power on bottom, middle and top channels in Basic Rate (DH5 packets) or EDR (2DH5 or 3DH5 packets) as required.
- Continuously transmitting at maximum power in hopping mode on all channels in 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 powered from its internal battery whilst charging via a USB diagnostic cable during all tests.
- The EUT was controlled with a test laptop and a third party test software application using commands supplied by the customer. Channels, packet types and other settings were then set using this software application as required.
- For all transmitter tests, the CONFIG TX POWER setting was set to 4 dBm & the EXT & INT pre-amp gains were set to 255 & 47 respectively on the test application.
- Transmitter radiated spurious emissions were performed with the EUT transmitting DH5 packets as this was seen to transmit the highest power.
- Radiated spurious emissions were performed with an MP3 player connected to the AUX port of the EUT whilst streaming pink noise at 80% volume as this was considered to be representative of normal operation. This also exercised the only other port on the EUT.

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 Radiated Spurious Emissions

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	06 February 2015
Test Sample MAC Address:	00126f734979		

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):	23
Relative Humidity (%):	35

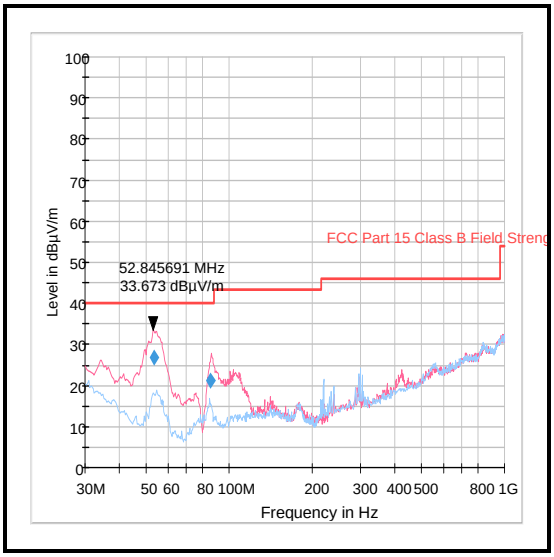
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (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 Polarisation	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
53.376	Vertical	26.9	40.0	13.1	Complied
85.582	Vertical	21.2	40.0	18.8	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)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Mar 2015	12
A490	Antenna	Chase	CBL6111A	1590	29 Apr 2015	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
G0543	Amplifier	Sonoma	310N	230801	04 Mar 2015	3
A1834	Attenuator	Hewlett Packard	8491B	10444	Calibrated before use	-

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Dates:**	03 February 2015 to 05 February 2015
Test Sample Serial Number:	00126f734979		

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

Environmental Conditions:

Temperature (°C):	22 to 23
Relative Humidity (%):	32 to 36

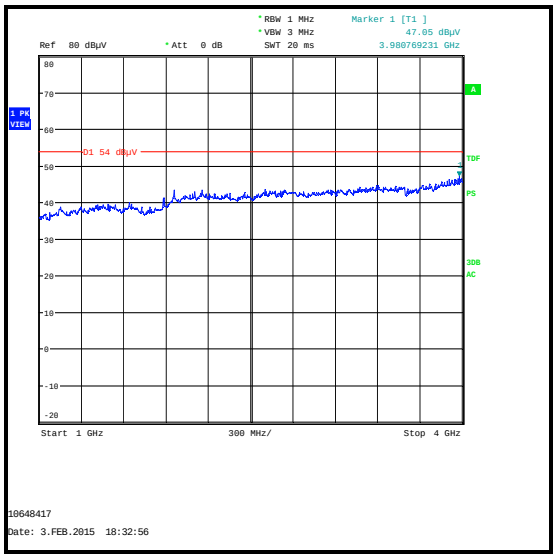
Note(s):

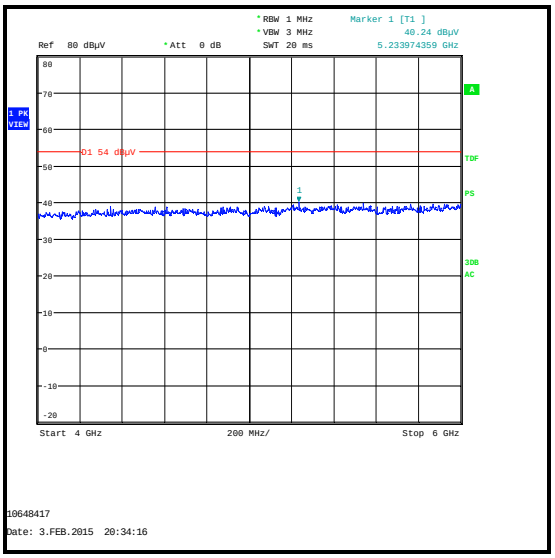
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded 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 (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.

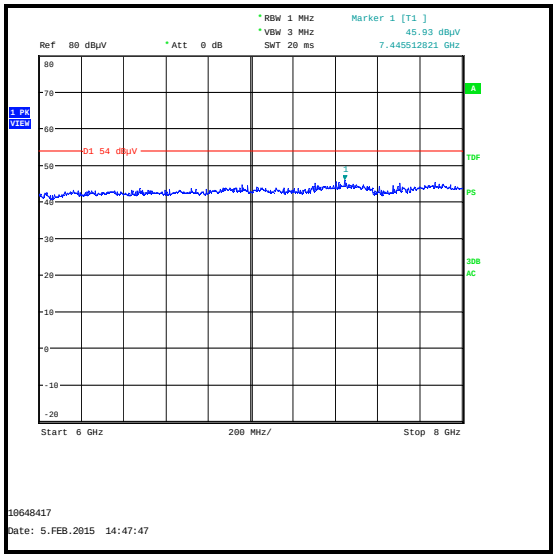
Results:

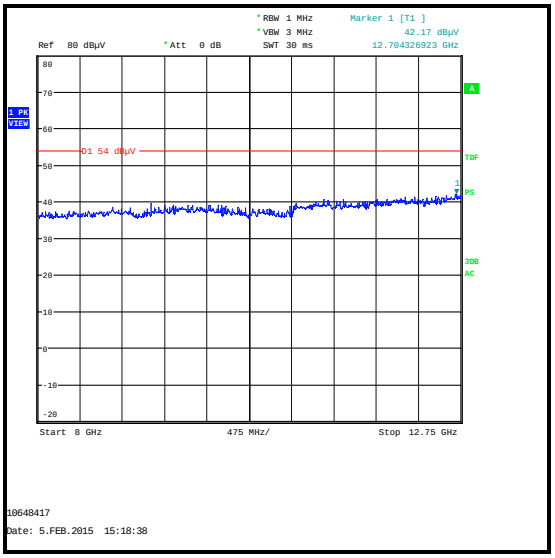
Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
3980.769	Vertical	47.1	54.0	6.9	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)









Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	13 Feb 2015	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	21 Dec 2015	12
A1818	Antenna	EMCO	3115	00075692	20 Dec 2015	12
A253	Antenna	Flann Microwave	12240-20	128	20 Dec 2015	12
A254	Antenna	Flann Microwave	14240-20	139	20 Dec 2015	12
A255	Antenna	Flann Microwave	16240-20	519	20 Dec 2015	12

5.2.2. Transmitter 20 dB Bandwidth

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	30 January 2015
Test Sample MAC Address:	00126f7349bd		

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 (%):	29

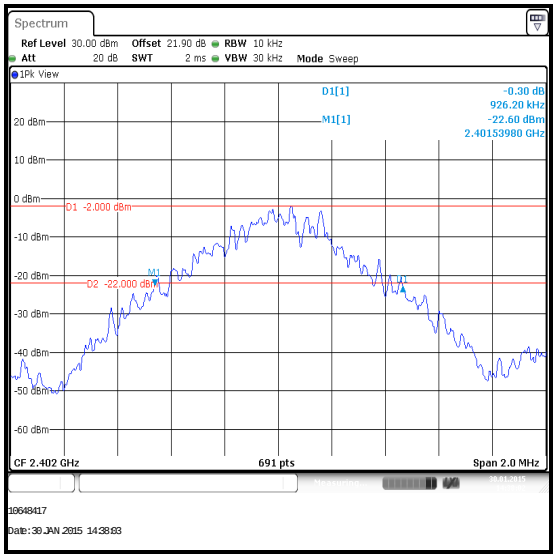
Note(s):

1. A spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

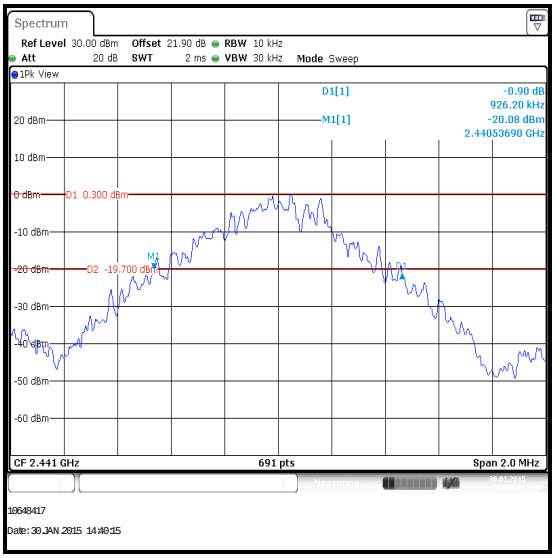
Transmitter 20 dB Bandwidth (continued)

Results DH5:

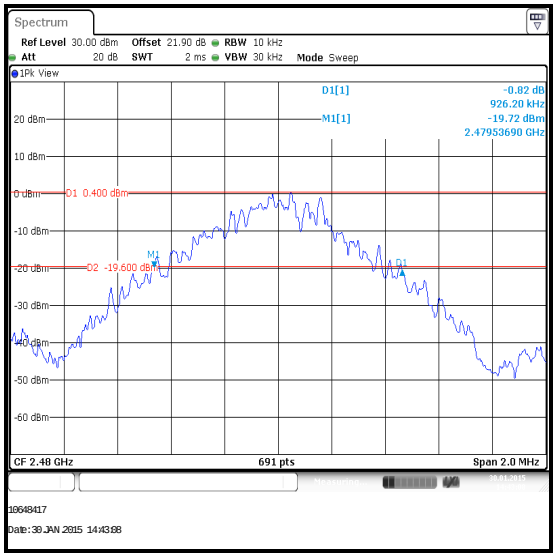
Channel	20 dB Bandwidth (kHz)
Bottom	926.200
Middle	926.200
Top	926.200



Bottom Channel



Middle Channel

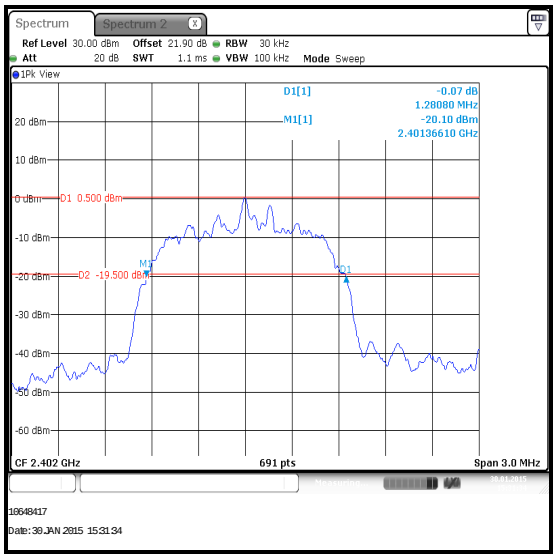


Top Channel

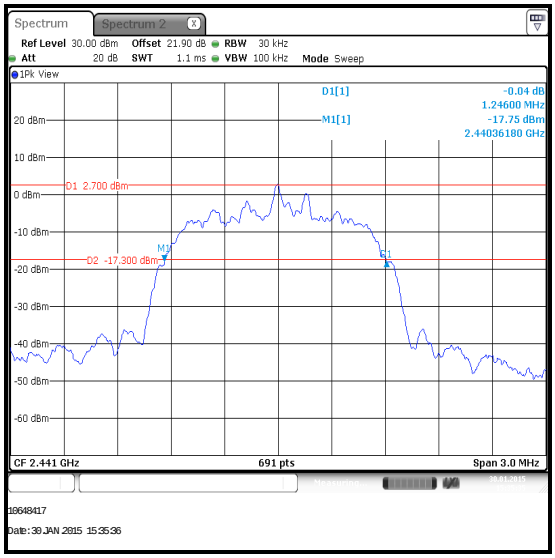
Transmitter 20 dB Bandwidth (continued)

Results 2DH5:

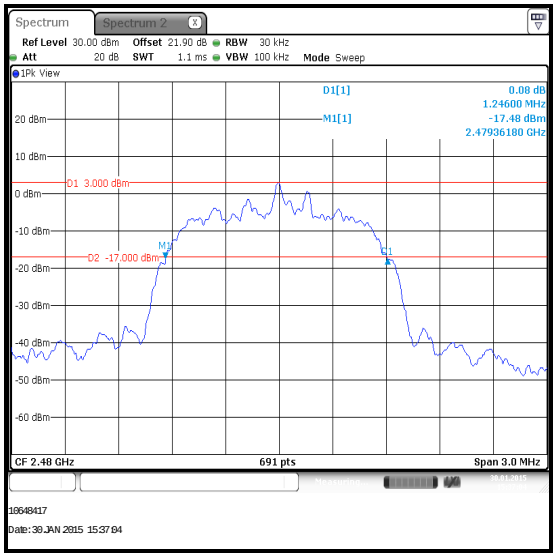
Channel	20 dB Bandwidth (kHz)
Bottom	1280.800
Middle	1246.000
Top	1246.000



Bottom Channel



Middle Channel

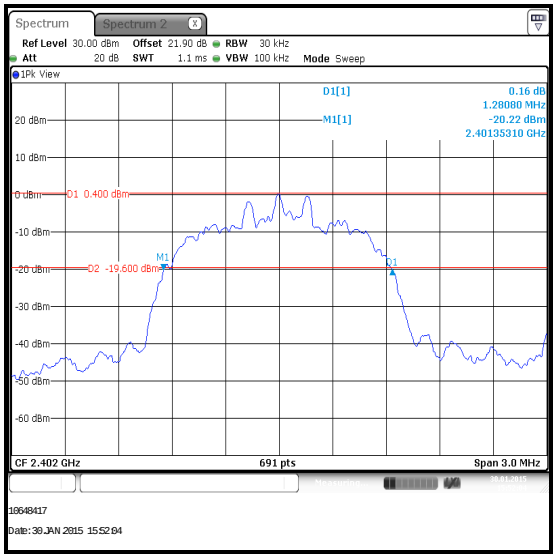


Top Channel

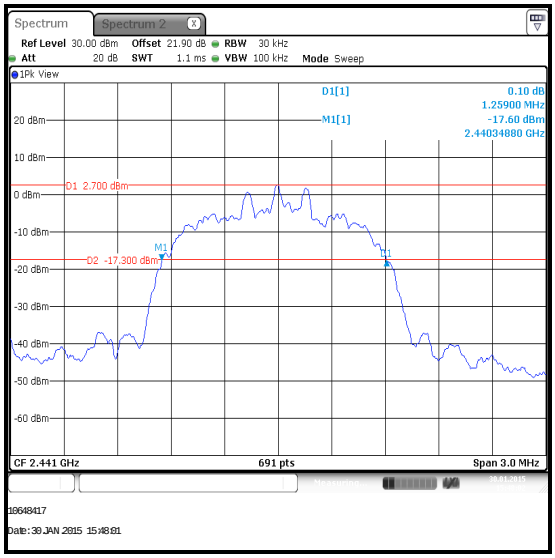
Transmitter 20 dB Bandwidth (continued)

Results 3DH5:

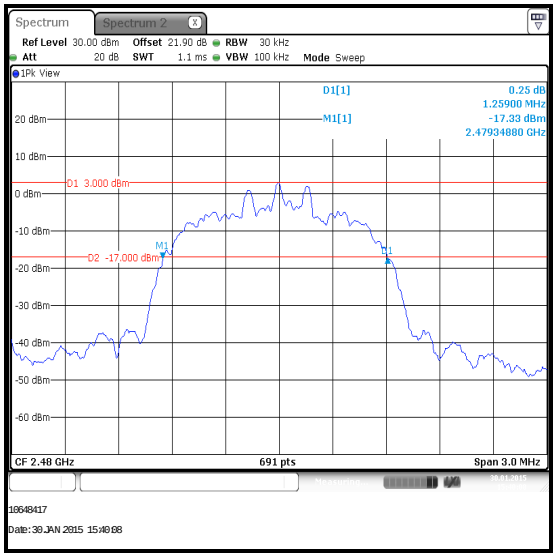
Channel	20 dB Bandwidth (kHz)
Bottom	1280.800
Middle	1259.000
Top	1259.000



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)
M1658	Thermohygrometer	JM Handelspunkt	30.5015.13	None Stated	14 Mar 2015	12
A2534	Directional Coupler	AtlanTecRF	CDC-003060-20	14041701718	Calibrated before use	-
M1873	Signal Analyser	Rohde & Schwarz	FSV 30	103074	15 May 2015	12

5.2.3. Transmitter Carrier Frequency Separation

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	02 February 2015
Test Sample MAC Address:	00126f7349bd		

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

Environmental Conditions:

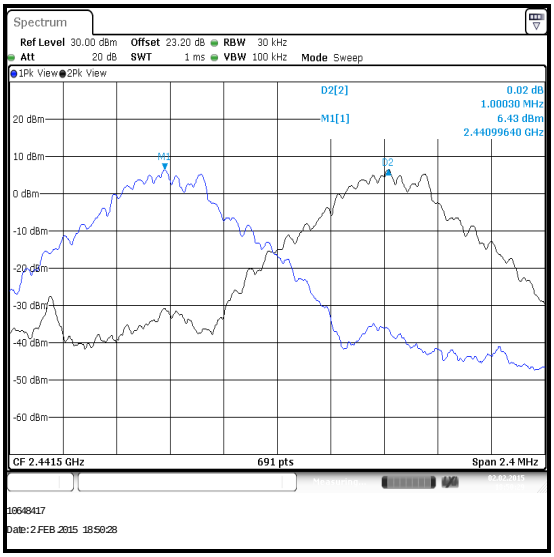
Temperature (℃):	23
Relative Humidity (%):	31

Note(s):

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

Results: DH5

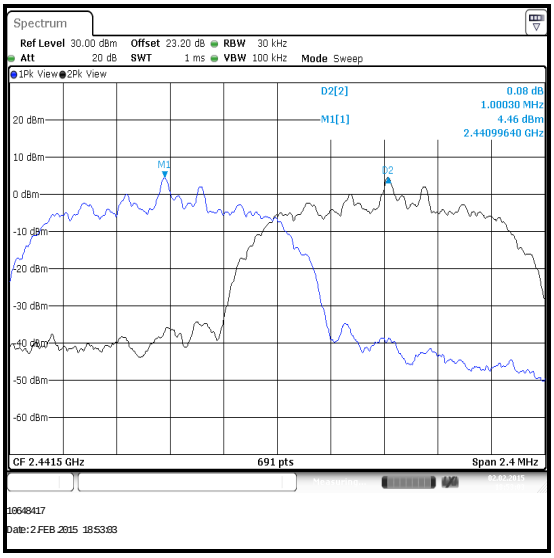
Carrier Frequency Separation (kHz)	Limit ($^2/_3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1000.300	617.467	382.833	Complied



Transmitter Carrier Frequency Separation (continued)

Results: 2DH5

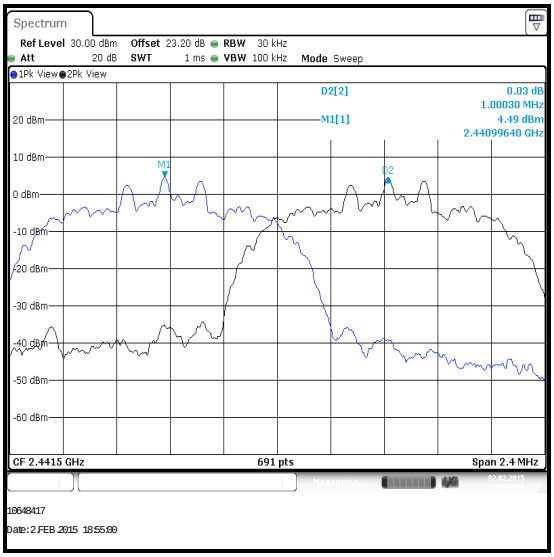
Carrier Frequency Separation (kHz)	Limit ($^2/_3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1000.300	830.667	169.633	Complied



Transmitter Carrier Frequency Separation (continued)

Results: 3DH5

Carrier Frequency Separation (kHz)	Limit ($^2/_3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1000.300	839.333	160.967	Complied



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1658	Thermohygrometer	JM Handelspunkt	30.5015.13	None Stated	14 Mar 2015	12
A2534	Directional Coupler	AtlanTecRF	CDC-003060-20	14041701718	Calibrated before use	-
M1873	Signal Analyser	Rohde & Schwarz	FSV 30	103074	15 May 2015	12

5.2.4. Transmitter Number of Hopping Frequencies and Average Time of Occupancy

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	02 February 2015
Test Sample MAC Address:	00126f7349bd		

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):	23
Relative Humidity (%):	31

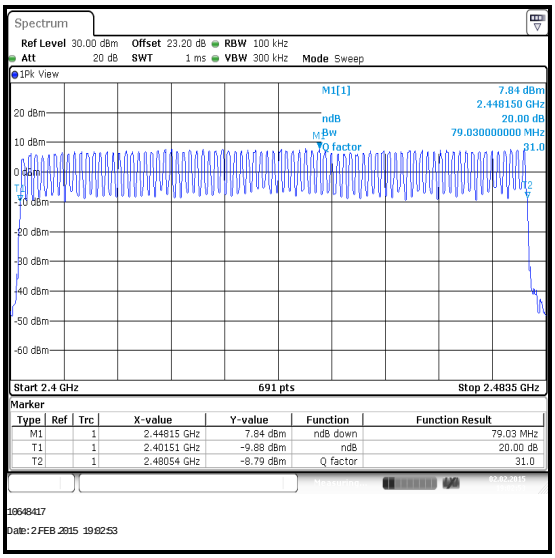
Note(s):

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.

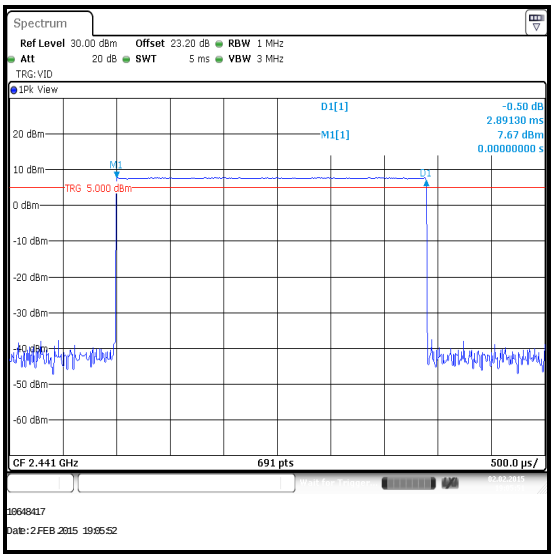
Results:

Emission Width (ms)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2.891	110	0.318	0.4	0.082	Complied

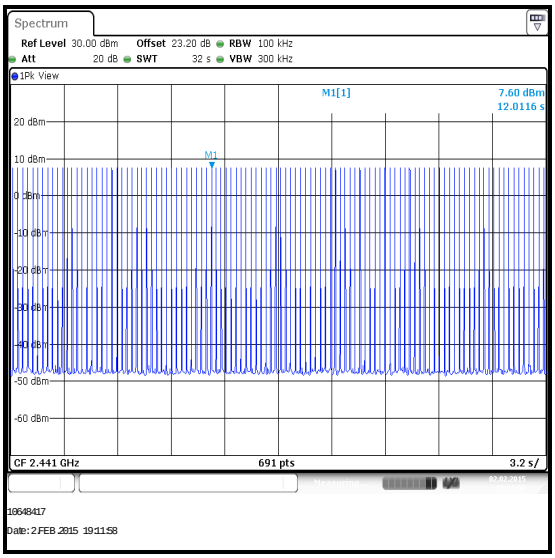
Transmitter Number of Hopping Frequencies and Average Time of Occupancy (continued)



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)
M1658	Thermohygrometer	JM Handelspunkt	30.5015.13	None Stated	14 Mar 2015	12
A2534	Directional Coupler	AtlanTecRF	CDC-003060-20	14041701718	Calibrated before use	-
M1873	Signal Analyser	Rohde & Schwarz	FSV 30	103074	15 May 2015	12

5.2.5. Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	30 January 2015
Test Sample MAC Address:	00126f7349bd		

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 (%):	29

Note(s):

1. A spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.
2. The declared antenna gain was added to the conducted peak power to obtain the EIRP.

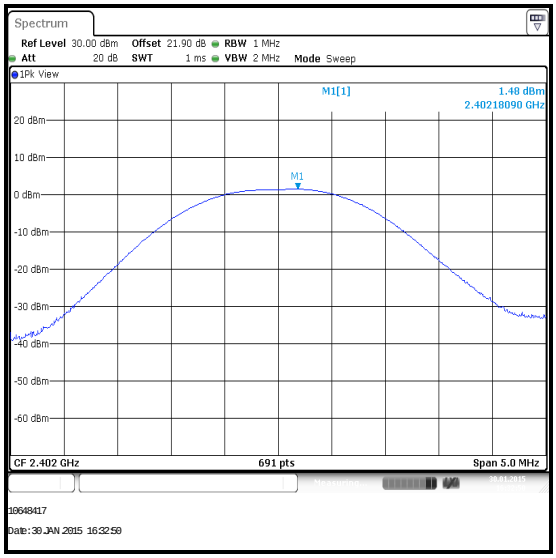
Results: DH5

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	1.5	30.0	28.5	Complied
Middle	6.0	30.0	24.0	Complied
Top	6.2	30.0	23.8	Complied

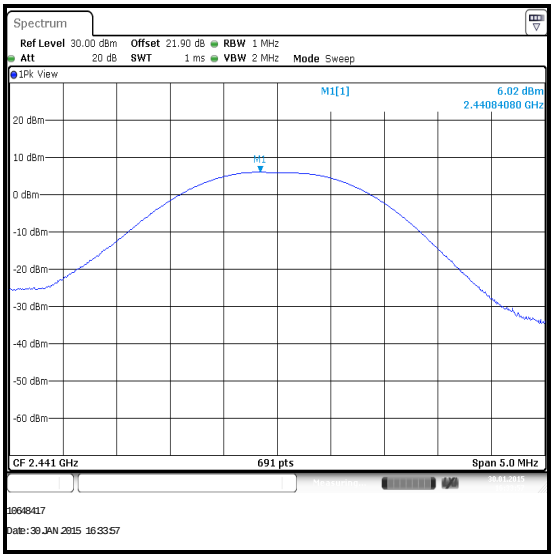
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	1.5	1.9	3.4	36.0	32.6	Complied
Middle	6.0	1.9	7.9	36.0	28.1	Complied
Top	6.2	1.9	8.1	36.0	27.9	Complied

Transmitter Maximum Peak Output Power (continued)

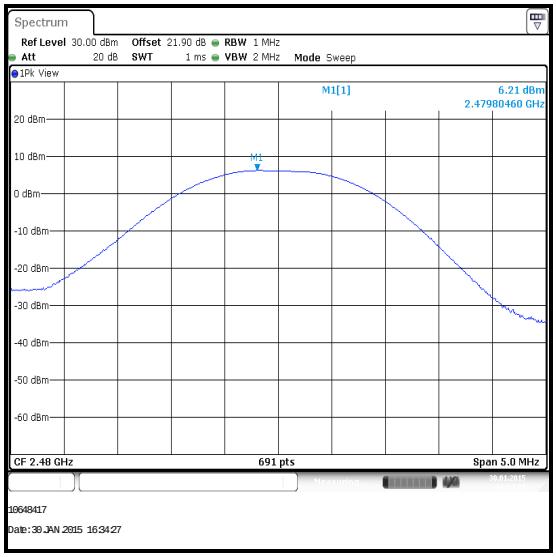
Results: DH5



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Peak Output Power (continued)

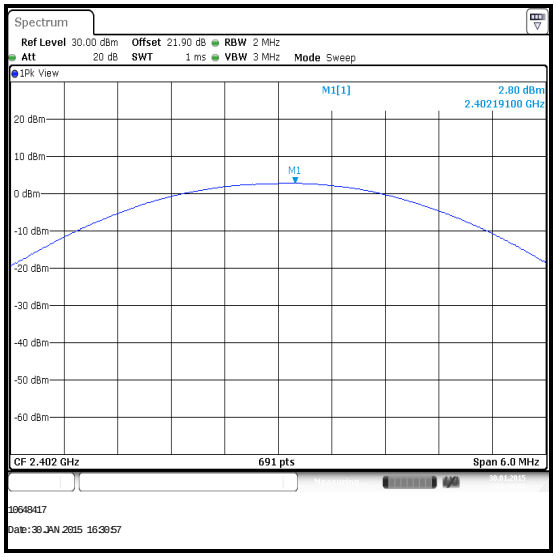
Results: 2DH5

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	2.8	21.0	18.2	Complied
Middle	5.0	21.0	16.0	Complied
Top	5.4	21.0	15.6	Complied

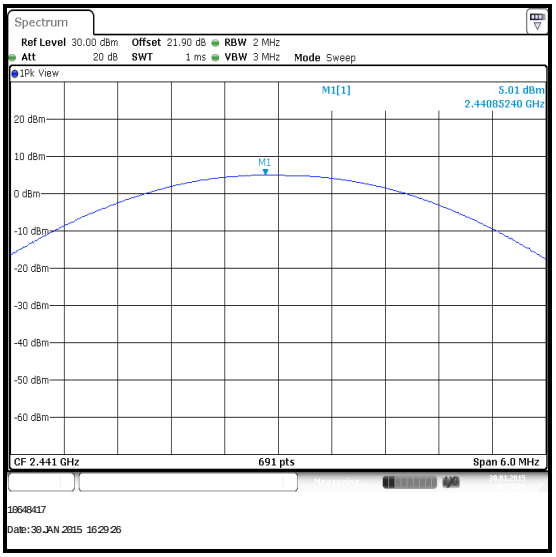
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	2.8	1.9	4.7	27.0	22.3	Complied
Middle	5.0	1.9	6.9	27.0	20.1	Complied
Top	5.4	1.9	7.3	27.0	19.7	Complied

Transmitter Maximum Peak Output Power (continued)

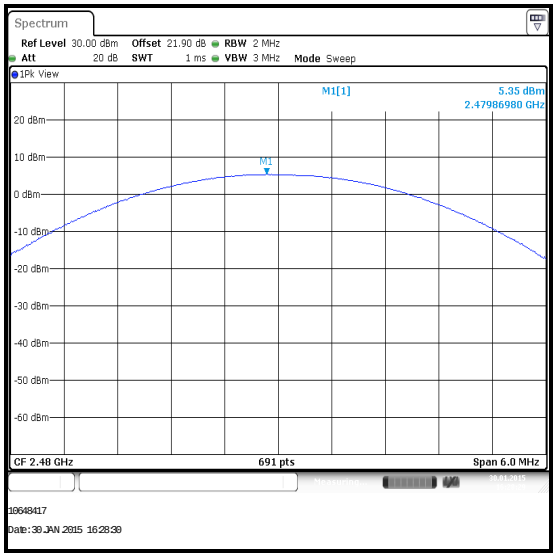
Results: 2DH5



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Peak Output Power (continued)

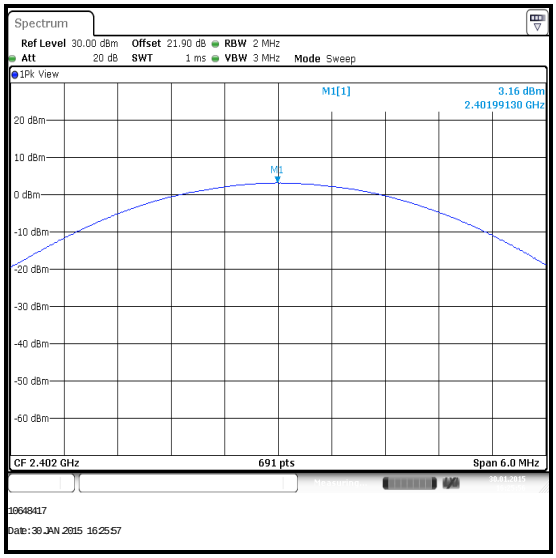
Results: 3DH5

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	3.2	21.0	17.8	Complied
Middle	5.4	21.0	15.6	Complied
Top	5.7	21.0	15.3	Complied

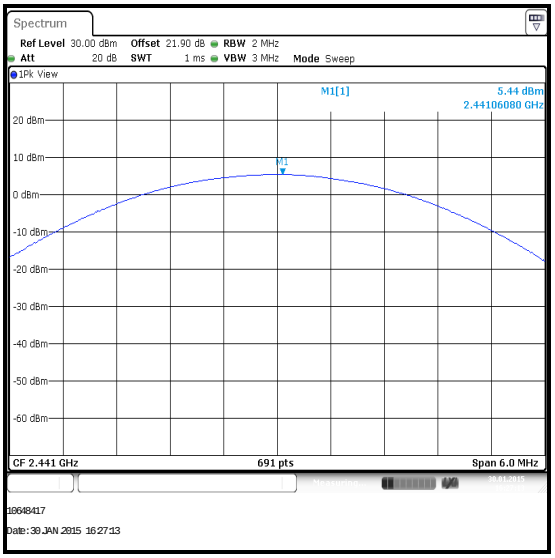
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	3.2	1.9	5.1	27.0	21.9	Complied
Middle	5.4	1.9	7.3	27.0	19.7	Complied
Top	5.7	1.9	7.6	27.0	19.4	Complied

Transmitter Maximum Peak Output Power (continued)

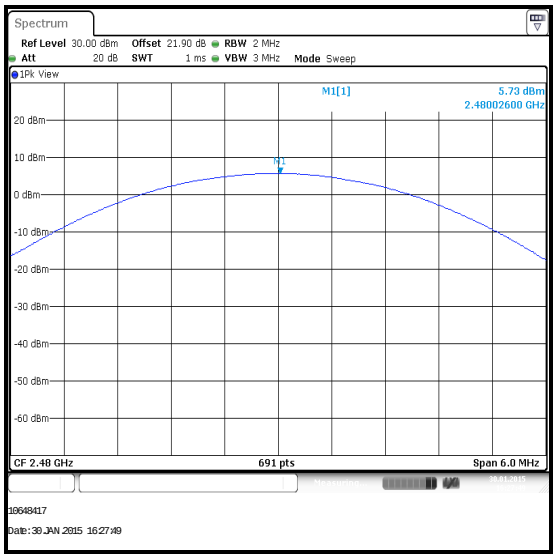
Results: 3DH5



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1658	Thermohygrometer	JM Handelspunkt	30.5015.13	None Stated	14 Mar 2015	12
A2534	Directional Coupler	AtlanTecRF	CDC-003060-20	14041701718	Calibrated before use	-
M1873	Signal Analyser	Rohde & Schwarz	FSV 30	103074	15 May 2015	12

5.2.6. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	Keith Tucker	**Test Date:**	04 February 2015
Test Sample MAC Address:	00126f734979		

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):	22
Relative Humidity (%):	31

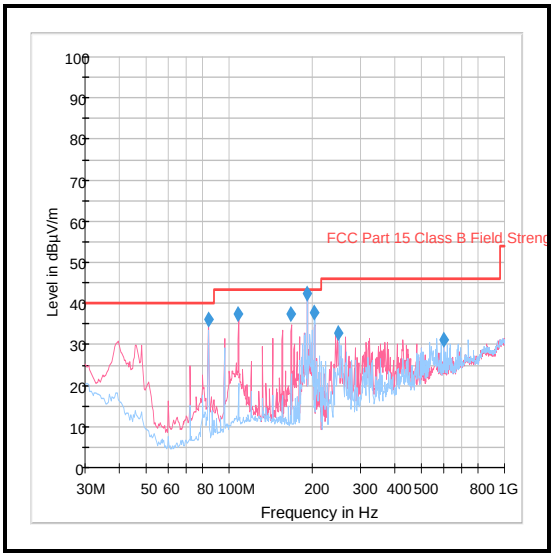
Note(s):

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 middle channel only.
4. All other emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system.
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 Polarisation	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
167.992	Vertical	37.3	43.5	6.2	Complied
248.031	Vertical	32.8	46.0	13.2	Complied

Transmitter Radiated Emissions (continued)



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

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Mar 2015	12
A490	Antenna	Chase	CBL6111A	1590	29 Apr 2015	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
G0543	Amplifier	Sonoma	310N	230801	04 Mar 2015	3
A1834	Attenuator	Hewlett Packard	8491B	10444	Calibrated before use	-

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Dates:**	03 February 2015 to 05 February 2015
Test Sample MAC Address:	00126f734979		

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):	22 to 23
Relative Humidity (%):	32 to 36

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 emission shown on the 1 GHz to 4 GHz plot is the EUT fundamental.
4. *In accordance with ANSI C63.10 Section 6.6.4.2 (Note 1), if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
5. All other emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system.
6. 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.
7. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.

Transmitter Radiated Emissions (continued)

Results: Peak / Bottom Channel / DH5

Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
4804.128	Vertical	53.2	54.0*	0.8	Complied

Results: Peak / Middle Channel / DH5

Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
4882.208	Vertical	53.9	54.0*	0.1	Complied

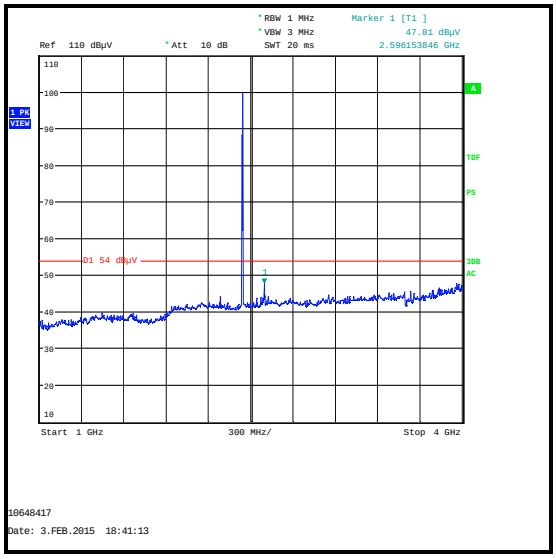
Results: Peak / Top Channel / DH5

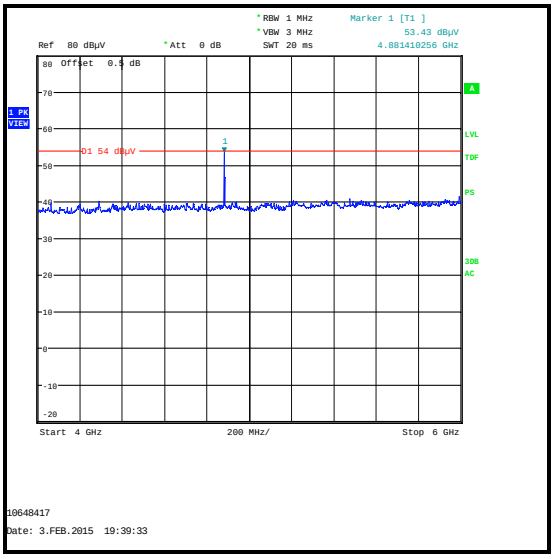
Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
4960.160	Vertical	52.4	54.0*	1.6	Complied

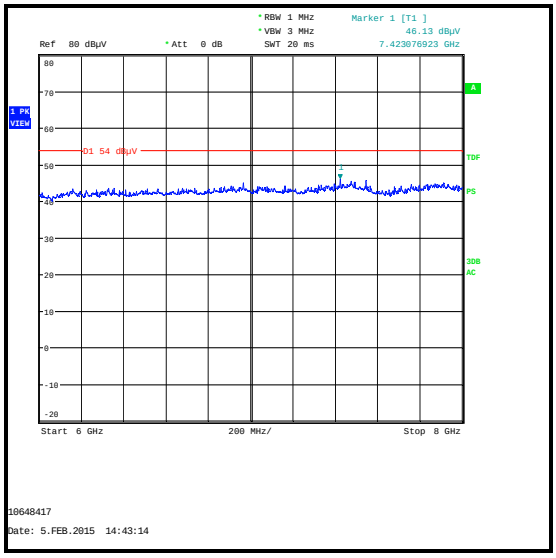
Results: Peak / Hopping Mode / DH5

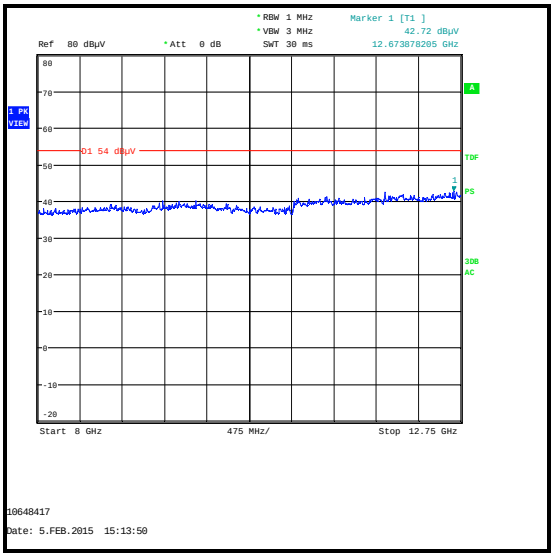
Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
4837.929	Vertical	53.6	54.0*	0.4	Complied

Transmitter Radiated Emissions (continued)

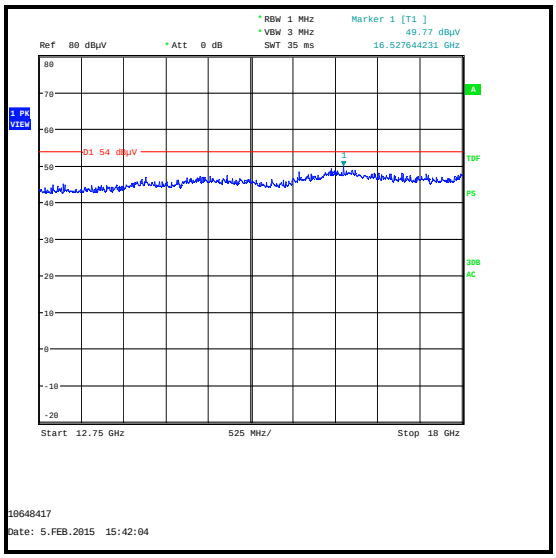


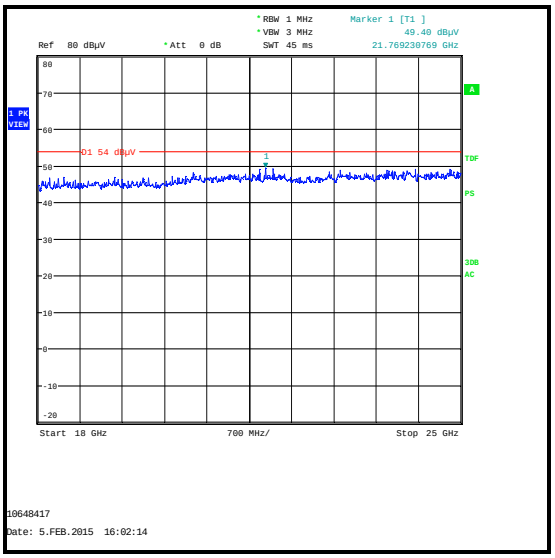






Transmitter Radiated Emissions (continued)





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

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	13 Feb 2015	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	21 Dec 2015	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	12 Apr 2015	12
A1818	Antenna	EMCO	3115	00075692	20 Dec 2015	12
A253	Antenna	Flann Microwave	12240-20	128	20 Dec 2015	12
A254	Antenna	Flann Microwave	14240-20	139	20 Dec 2015	12
A255	Antenna	Flann Microwave	16240-20	519	20 Dec 2015	12
A256	Antenna	Flann Microwave	18240-20	400	20 Dec 2015	12
A436	Antenna	Flann Microwave	20240-20	330	21 Dec 2015	12

5.2.7. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	03 February 2015
Test Sample MAC Address:	00126f734979		

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):	22
Relative Humidity (%):	32

Note(s):

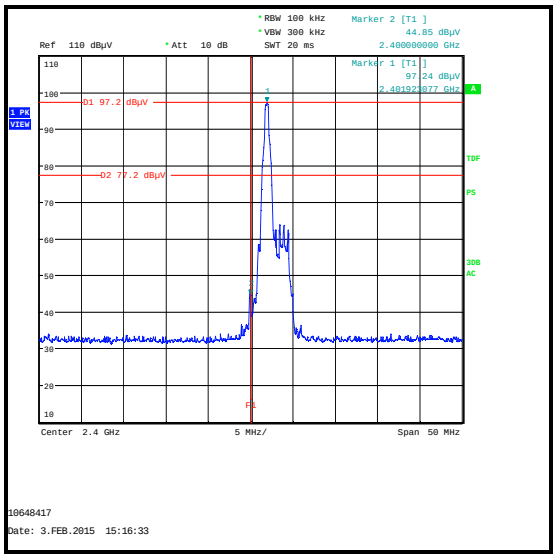
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with their respective detectors. Markers were placed on the highest point on each trace.
3. The restricted band plot for 2310 MHz to 2390 MHz can be found under the results for DH5 static as this mode had the highest output power and was therefore deemed worst case.
4. * -20 dBc limit.

Transmitter Band Edge Radiated Emissions (continued)

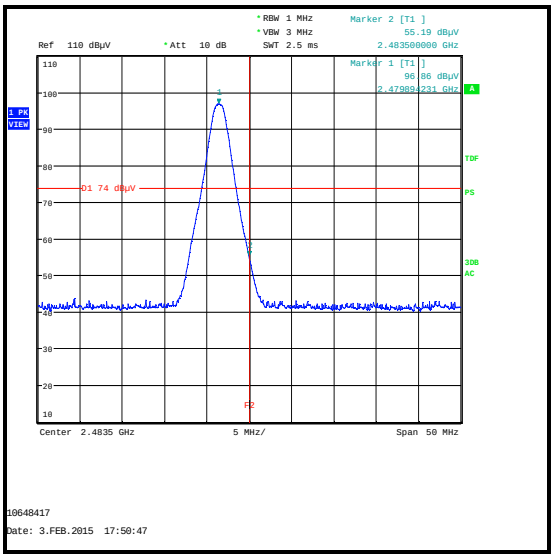
Results: Static Mode / DH5

Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2310.769	Vertical	44.4	74.0	29.6	Complied
2400.0	Vertical	44.9	77.2*	32.3	Complied
2483.5	Vertical	55.2	74.0	18.8	Complied

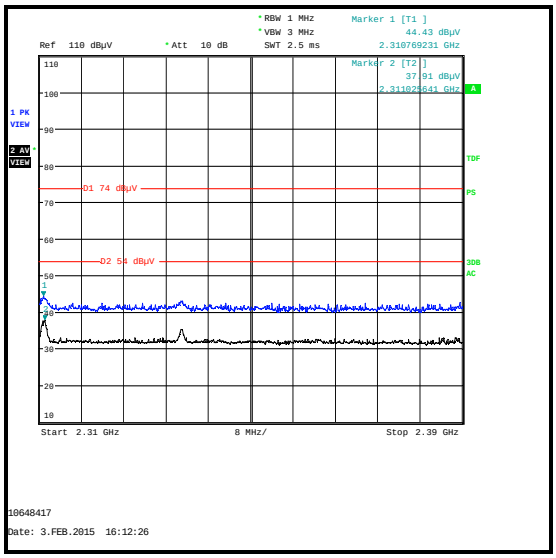
Frequency (MHz)	Antenna Polarisation	Average Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2311.026	Vertical	37.9	54.0	16.1	Complied
2483.5	Vertical	45.6	54.0	8.4	Complied



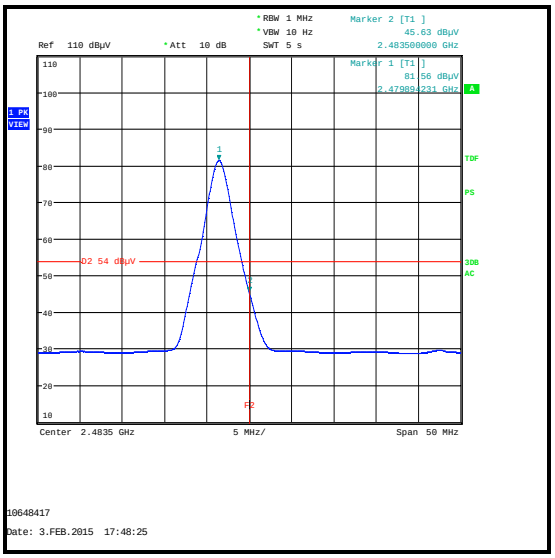
Lower Band Edge Peak Static



Upper Band Edge Peak Static



2310 MHz to 2390 MHz Restricted Band Plot



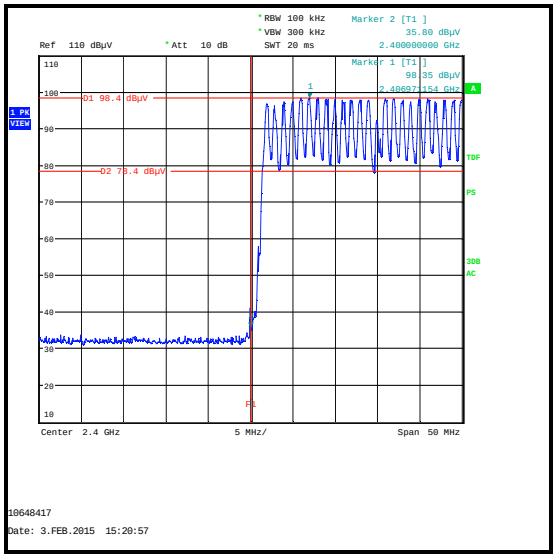
Upper Band Edge Average Static

Transmitter Band Edge Radiated Emissions (continued)

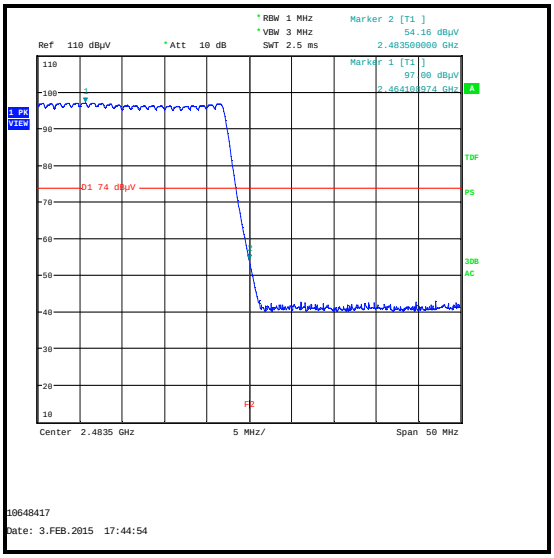
Results: Hopping Mode / DH5

Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400.0	Vertical	35.8	78.4*	42.6	Complied
2483.5	Vertical	54.2	74.0	19.8	Complied

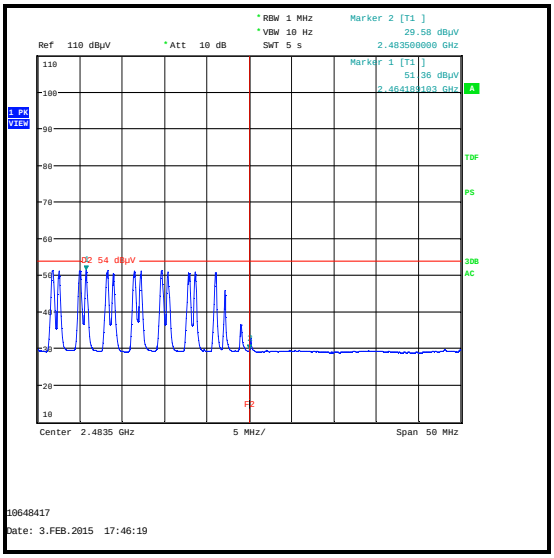
Frequency (MHz)	Antenna Polarisation	Average Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	29.6	54.0	24.4	Complied



Lower Band Edge Peak Hopping



Upper Band Edge Peak Hopping



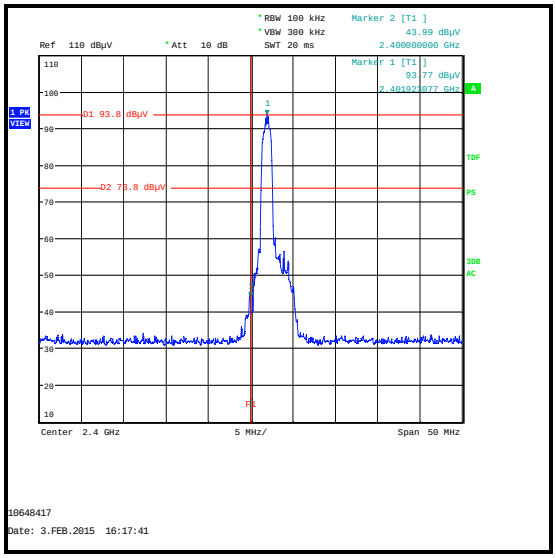
Upper Band Edge Average Hopping

Transmitter Band Edge Radiated Emissions (continued)

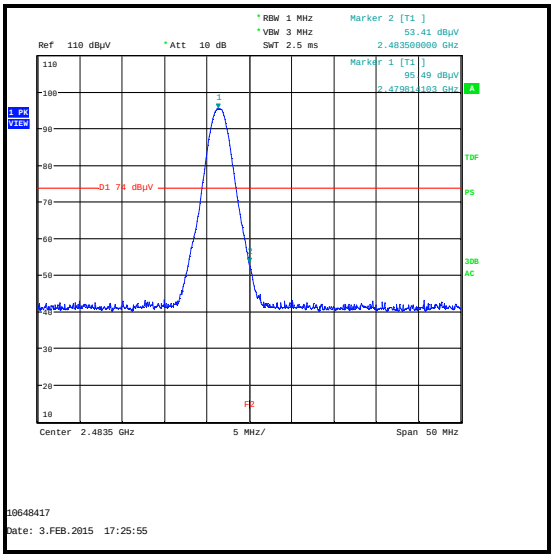
Results: Static Mode / 2DH5

Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400.0	Vertical	44.0	73.8*	29.8	Complied
2483.5	Vertical	53.4	74.0	20.6	Complied

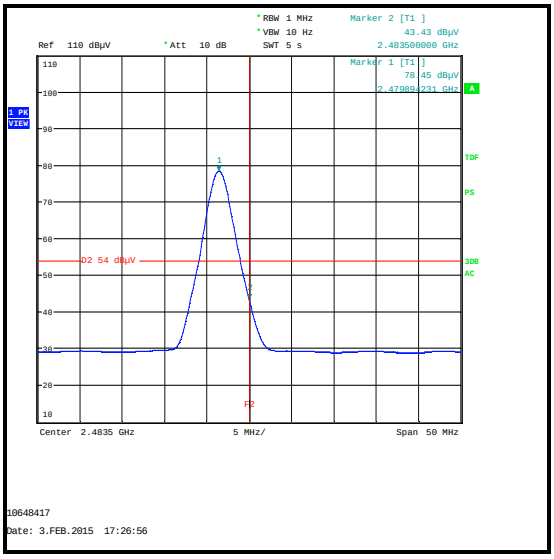
Frequency (MHz)	Antenna Polarisation	Average Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	43.4	54.0	10.6	Complied



Lower Band Edge Peak Static



Upper Band Edge Peak Static



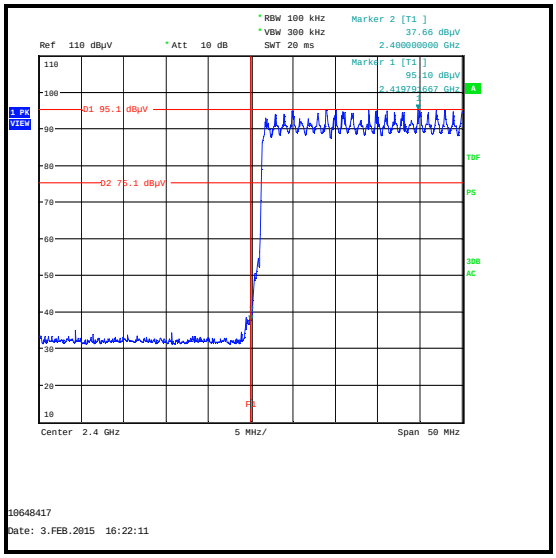
Upper Band Edge Average Static

Transmitter Band Edge Radiated Emissions (continued)

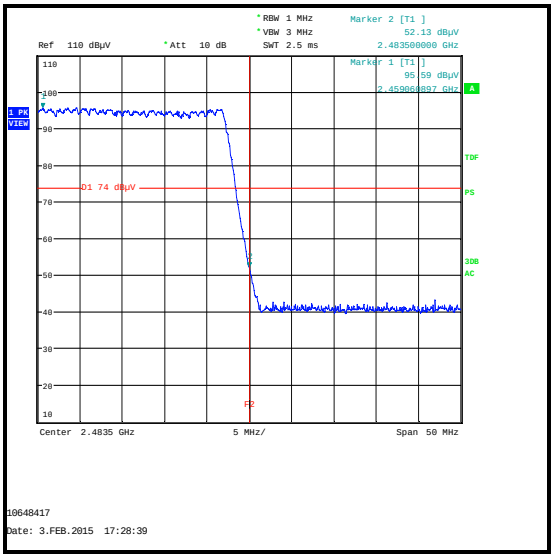
Results: Hopping Mode / 2DH5

Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400.0	Vertical	37.7	75.1*	37.4	Complied
2483.5	Vertical	52.1	74.0	21.9	Complied

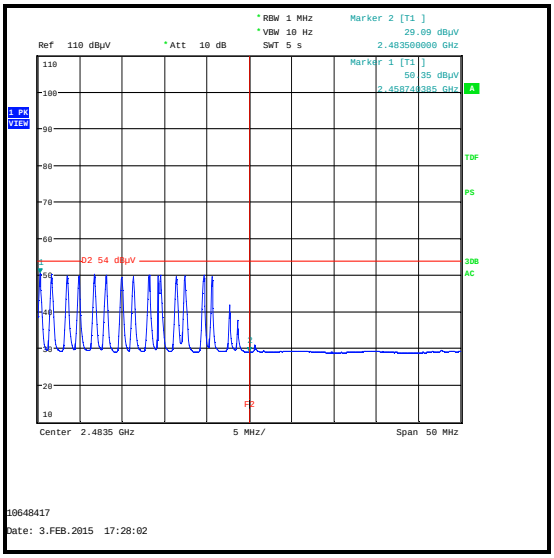
Frequency (MHz)	Antenna Polarisation	Average Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	29.1	54.0	24.9	Complied



Lower Band Edge Peak Hopping



Upper Band Edge Peak Hopping



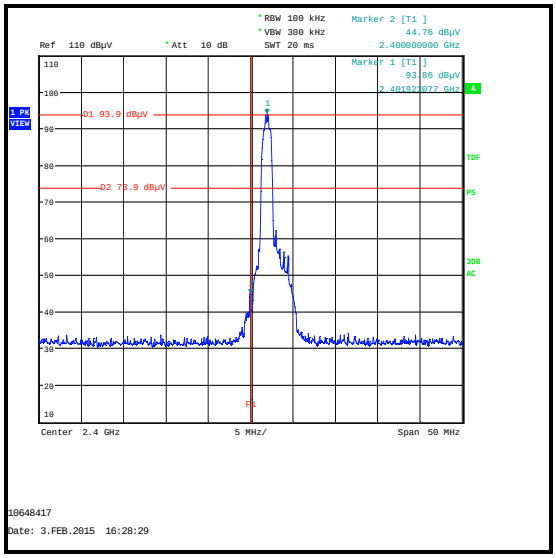
Upper Band Edge Average Hopping

Transmitter Band Edge Radiated Emissions (continued)

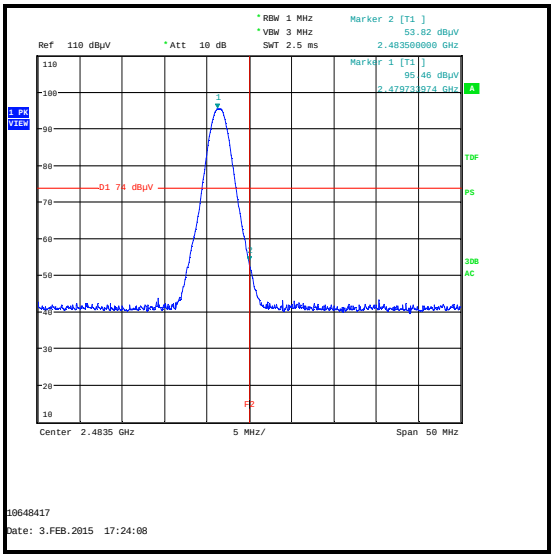
Results: Static Mode / 3DH5

Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400.0	Vertical	44.8	73.9*	29.1	Complied
2483.5	Vertical	53.8	74.0	20.2	Complied

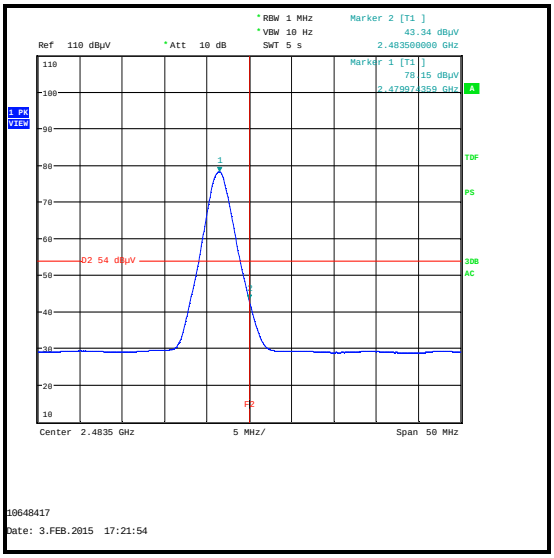
Frequency (MHz)	Antenna Polarisation	Average Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	43.3	54.0	10.7	Complied



Lower Band Edge Peak Static



Upper Band Edge Peak Static



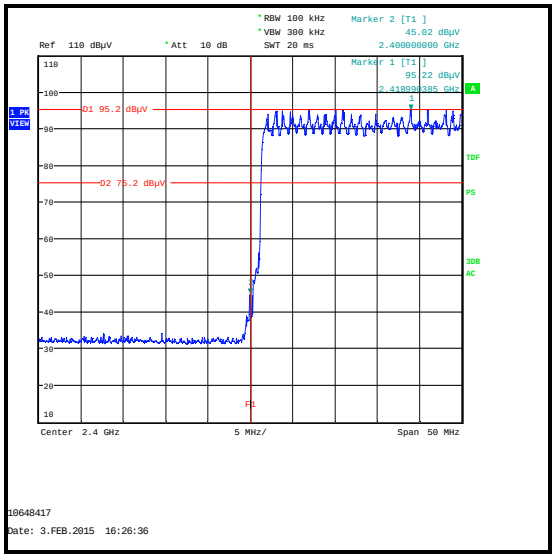
Upper Band Edge Average Static

Transmitter Band Edge Radiated Emissions (continued)

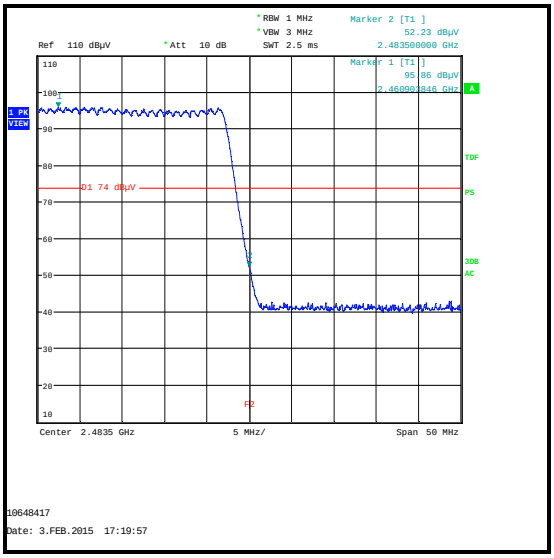
Results: Hopping Mode / 3DH5

Frequency (MHz)	Antenna Polarisation	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400.0	Vertical	45.0	75.2	30.2	Complied
2483.5	Vertical	52.2	74.0	21.8	Complied

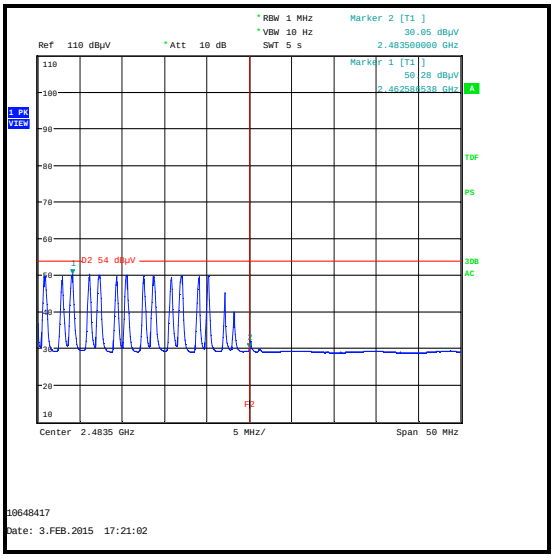
Frequency (MHz)	Antenna Polarisation	Average Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	30.1	54.0	23.9	Complied



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	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	13 Feb 2015	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	21 Dec 2015	12
A1818	Antenna	EMCO	3115	00075692	20 Dec 2015	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
Conducted 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%	±3.92 %
Average Time of Occupancy	2.4 GHz to 2.4835 GHz	95%	±3.53 ns
20 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±3.92 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 26.5 GHz	95%	±2.94 dB

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

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	Update to EDR De Facto EIRP Limit in section 5.2.5

--- END OF REPORT ---