TEST REPORT

Test Report No. : UL-RPT-RP10014929JD20A

Manufacturer	:	Sony Mobile Communications AB
Type No.	:	PM-0470-BV
FCC ID	:	PY7PM-0470
Technology	:	WLAN
Test Standard(s)	:	FCC Parts 15.207, 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 1.0

Date of Issue: 31 July 2013

Checked by:

Sarah Williams
WiSE Laboratory Engineer

Issued by :

pp
John Newell
Group Quality Manager, WiSE
Basingstoke,
UL VS LTD

0644

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

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1. Customer Information

Company Name:	Sony Mobile Communications AB
Address:	Nya Vattentornet Lund SE-221 88 Sweden

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:	47CFR15.207 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:	24 July 2013 to 28 July 2013

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.207	Transmitter AC Conducted Emissions	✓
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	✓
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Part 15.247(e)	Transmitter Power Spectral Density	✓
Part 15.247(b)(3)	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

Note(s):

1. The measurement was performed to assist in the calculation of the level of maximum conducted output power, power spectral density and emissions. The EUT cannot transmit continuously and sweep triggering/signal gating cannot be implemented.

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
Reference:	KDB 558074 D01 v03 April 9, 2013
Title:	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247
Reference:	KDB 644545 D02 v01 6/7/2012
Title:	Alternative Guidance for IEEE 802.11ac and Pre-ac Device Emissions Testing

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:	Sony
IMEI:	004402451245652 *(Radiated sample)*
Serial Number:	CB5124VVNP
Hardware Version Number:	AP2
Software Version Number:	14.1.C.0.130
FCC ID:	PY7PM-0470

Brand Name:	Sony
IMEI:	004402451246239 *(Conducted sample)*
Serial Number:	CB5124VVM7
Hardware Version Number:	AP2
Software Version Number:	14.1.C.0.130
FCC ID:	PY7PM-0470

Brand Name:	Sony
Description:	AC Charger
Model Name or Number:	EP880

Brand Name:	Generic
Description:	MHL Cable
Model Name or Number:	Not marked or stated

Brand Name:	Sony
Description:	MHL Adaptor
Model Name or Number:	IM750

Brand Name:	Sony
Description:	Magnetic Plug
Model Name or Number:	EC21

Brand Name:	Sony
Description:	Charge/USB Data cable
Model Name or Number:	EC801

Identification of Equipment Under Test (EUT) (continue)

Brand Name:	Sony
Description:	PHF
Model Name or Number:	MH750

3.2. Description of EUT

The equipment under test (EUT) is a model of GSM/UMTS/LTE mobile phone with integrated antenna and inbuilt Li-Polymer battery.
The EUT supports GSM 850/900/1800/1900 MHz bands, WCDMA FDD bands 1/2/5 and LTE FDD bands 1/3. It also supports GPRS service with multi-slots class 33 and EGPRS service with multi-slots class 33 too. The HSDPA and HSUPA features are also supported. It has MP3, camera, FM radio, USB memory, GPS receiver, NFC, Mobile High-Definition Link (MHL), Bluetooth (EDR and Bluetooth 4.0), WLAN (802.11 a/b/g/n/ac) and Wi-Fi hotspot functions.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	WLAN (IEEE 802.11b,g,n) / Digital Transmission System		
Type of Unit:	Transceiver		
Modulation Type:	DBPSK, DQPSK, BPSK, QPSK, 16QAM & 64QAM		
Data Rates:	802.11b	1, 2, 5.5 & 11 Mbps	
	802.11g	6, 9, 12, 18, 24, 36, 48 & 54 Mbps	
	802.11n HT20	MCS0 to MCS7 (1 spatial stream) GI = 800 ns or 400 ns Greenfield & Mixed modes	
Power Supply Requirement(s):	Nominal	3.8 V	
Maximum Conducted Output Power:	24.3 dBm		
Declared Antenna Gain:	-4.7 dBi		
Channel Spacing:	20 MHz		
Transmit Frequency Range:	2412 MHz to 2462 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	2412
	Middle	6	2437
	Top	11	2462
Transmit Frequency Range:	5725 MHz to 5850 MHz		
Transmit Channels (see Note 1):	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	149	5745
	Middle	157	5785
	Top	165	5825

Note(s):

1. In accordance with FCC KDB 644545 D02, the testing of the 5 GHz frequency range has been covered in the 15.407 test report UL-RPT-RP10014929JD04A.

3.5. Support Equipment

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

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	Latitude E5400
Serial Number:	01150

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

Brand Name:	Logik
Description:	22” High Definition Television
Model Name or Number:	L22FE12A
Serial Number:	1309020661

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Continuously transmitting with a modulated carrier at maximum power on the bottom, middle and top channels as required using the supported data rates/modulation types.

4.2. Configuration and Peripherals

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

- Controlled using a bespoke application on the laptop PC supplied by the customer. The application was used to enable a continuous transmission mode and to select the test channels, data rates and modulation schemes as required.
- All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest output power, highest power spectral density, narrowest and widest bandwidths were:
    - Highest output power
        - 802.11b – DQPSK / 11 Mbps
        - 802.11g – BPSK / 6 Mbps
        - 802.11n HT20 – 64QAM / 65 Mbps / MCS7 (GI = 800 ns)
    - Highest power spectral density
        - 802.11b – DBPSK / 1 Mbps
        - 802.11g – 16QAM / 24 Mbps
        - 802.11n HT20 – 64QAM / 65 Mbps / MCS7 (GI = 800 ns)
    - Narrowest bandwidth (DTS bandwidth / 6 dB)
        - 802.11b – DBPSK / 1 Mbps
        - 802.11g – BPSK / 6 Mbps
        - 802.11n HT20 – BPSK / 6.5 Mbps / MCS0 (GI = 800 ns)
    - Widest bandwidth (Occupied bandwidth / 99%)
        - 802.11b – DQPSK / 11 Mbps
        - 802.11g – BPSK / 6 Mbps
        - 802.11n HT20 – 64QAM / 65 Mbps / MCS7 (GI = 800 ns)
- Transmitter spurious emissions were performed with the EUT transmitting with a data rate of 11 Mbps. This was found to be the worst case modulation scheme with regards to emissions after preliminary investigations and, as this mode emits the highest output power level, it was deemed to be the worst case.

Configuration and Peripherals (continued)

- Transmitter radiated spurious emission tests were performed with the following configurations, employing all available accessories:
    - Configuration 1 – Handset with the AC charger, USB Cable, MHL cable (terminated in to a television), MHL adaptor and PHF
    - Configuration 2 – Handset with the AC charger, Magnetic plug and PHF
- Pre-scans below 1 GHz were performed in both configurations 1 and 2, with final measurements limited to the configuration which provided worst case results. Pre-scans above 1 GHz were performed in the configuration that employed the most accessories (Configuration 1), with any final measurements being performed in both configurations.Radiated emissions tests were performed with all unused ports terminated.
- The conducted sample with IMEI 004402451246239 was used for minimum 6 dB bandwidth, duty cycle, maximum output power and power spectral density tests.
- The radiated sample with IMEI 004402451245652 was used for all other 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. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Mark Percival	**Test Date:**	24 July 2013
Test Sample IMEI:	004402451245652		

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):	22
Relative Humidity (%):	54

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Live	56.1	66.0	9.9	Complied
0.429	Live	42.4	57.3	14.9	Complied
1.473	Live	42.6	56.0	13.4	Complied
3.174	Live	31.2	56.0	24.8	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Live	27.7	56.0	28.3	Complied
0.429	Live	30.7	47.3	16.6	Complied
1.288	Live	31.3	46.0	14.7	Complied
3.097	Live	22.4	46.0	23.6	Complied

Transmitter AC Conducted Spurious Emissions (continued)

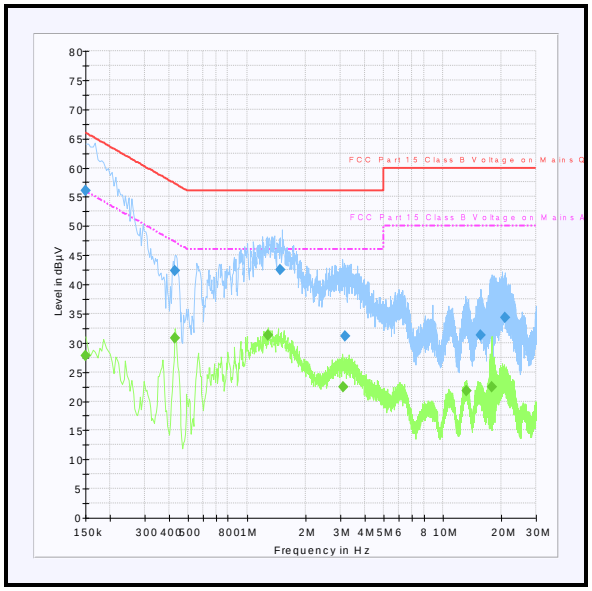
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Neutral	36.7	66.0	29.3	Complied
0.478	Neutral	38.1	56.4	18.3	Complied
1.239	Neutral	34.9	56.0	21.1	Complied
3.097	Neutral	30.4	56.0	25.6	Complied

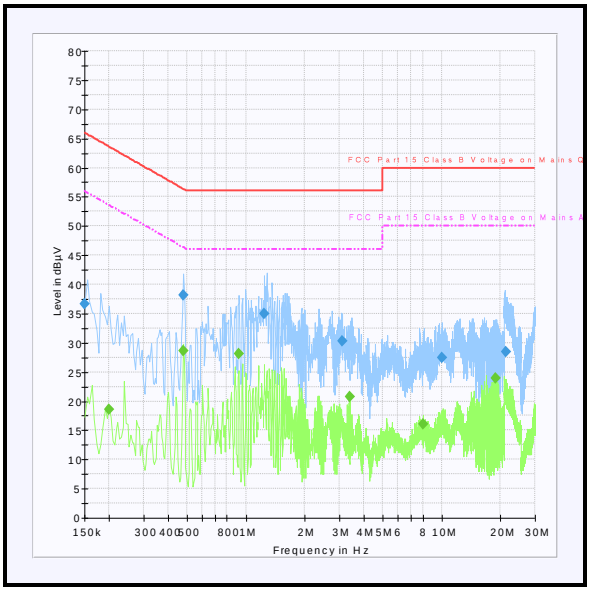
Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.478	Neutral	28.6	46.4	17.8	Complied
0.924	Neutral	28.1	46.0	17.9	Complied
3.403	Neutral	20.8	46.0	25.2	Complied
18.847	Neutral	23.9	50.0	26.1	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
M1020	Test Receiver	Rohde & Schwarz	SME-03	834617/030	14 Dec 2013	12

5.2.2. Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	28 July 2013
Test Sample IMEI:	004402451246239		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	As detailed in FCC KDB 558074 Section 8.1

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	46

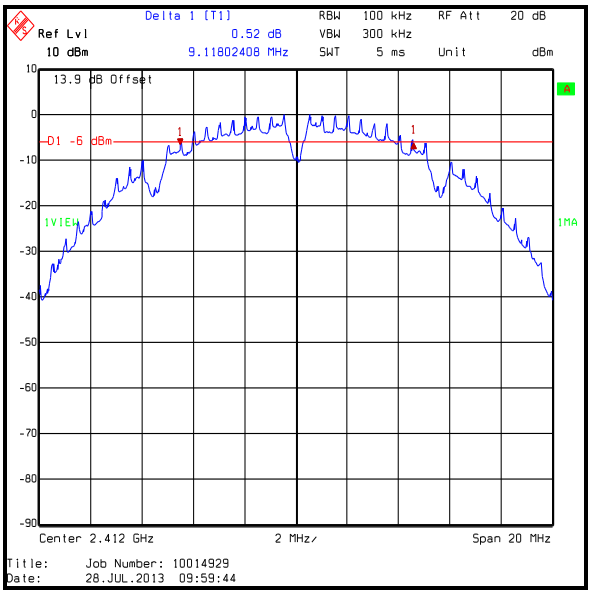
Note(s):

1. All configurations supported by the EUT were investigated on one channel in accordance with KDB 558074 Section 8.1 Option 1 measurement procedure. The data rates that produced the narrowest bandwidth and therefore deemed worst case were:
    - 802.11b – DBPSK / 1 Mbps
    - 802.11g – BPSK / 6 Mbps
    - 802.11n HT20 – BPSK / 6.5 Mbps / MCS0 (GI = 800 ns)
2. Final measurements were performed using the above configurations on the bottom, middle and top channels.
3. Plots for all data rates are archived on the Company server and available for inspection upon request.
4. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

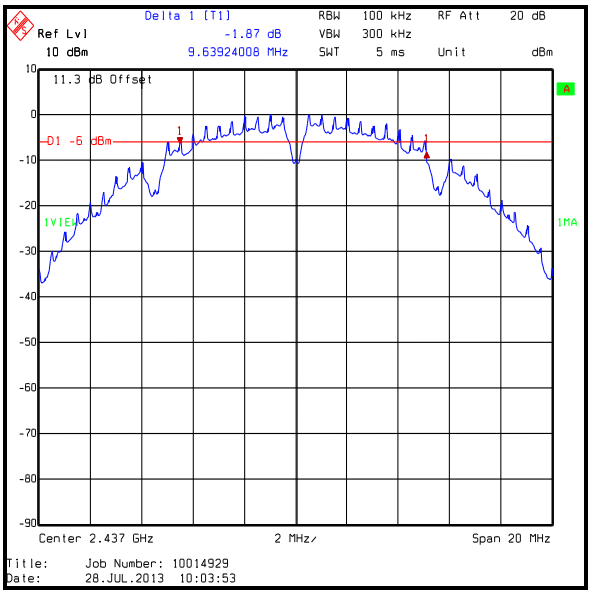
Transmitter Minimum 6 dB Bandwidth (continued)

Results: 802.11b / 20 MHz / DBPSK / 1 Mbps

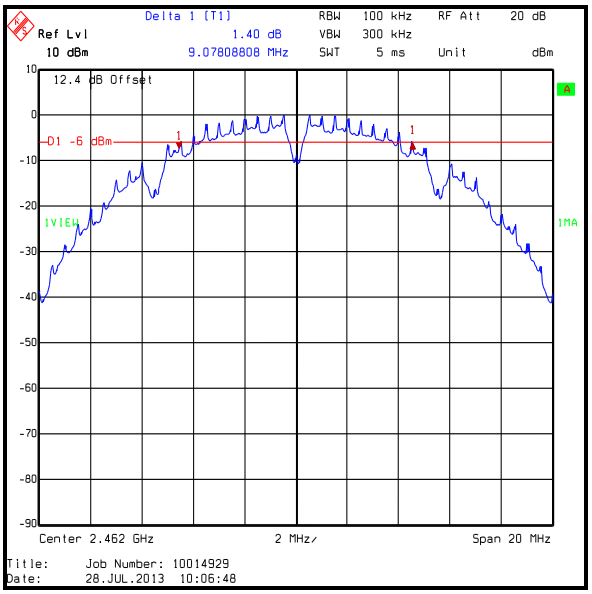
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	9118.024	≥500	8618.024	Complied
Middle	9639.240	≥500	9139.240	Complied
Top	9078.088	≥500	8578.088	Complied



Bottom Channel



Middle Channel

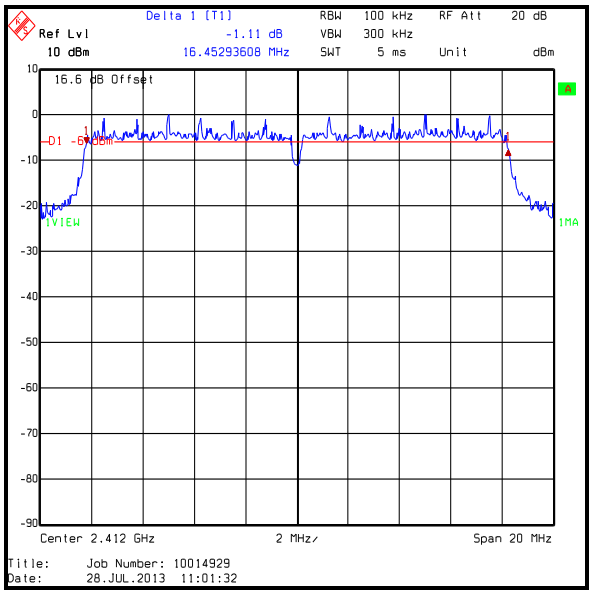


Top Channel

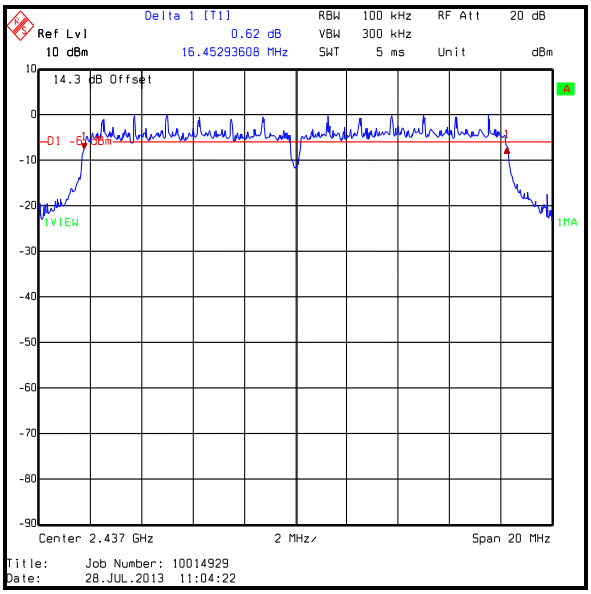
Transmitter Minimum 6 dB Bandwidth (continued)

Results: 802.11g / 20 MHz / BPSK / 6 Mbps

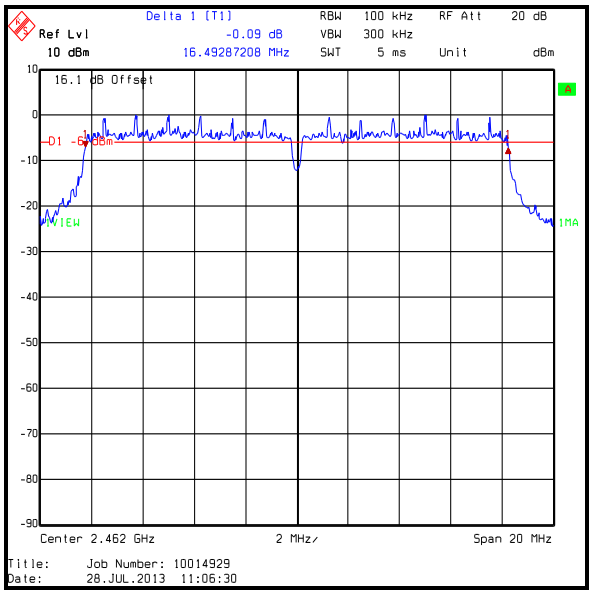
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	16452.936	≥500	15952.936	Complied
Middle	16452.936	≥500	15952.936	Complied
Top	16492.872	≥500	15992.872	Complied



Bottom Channel



Middle Channel

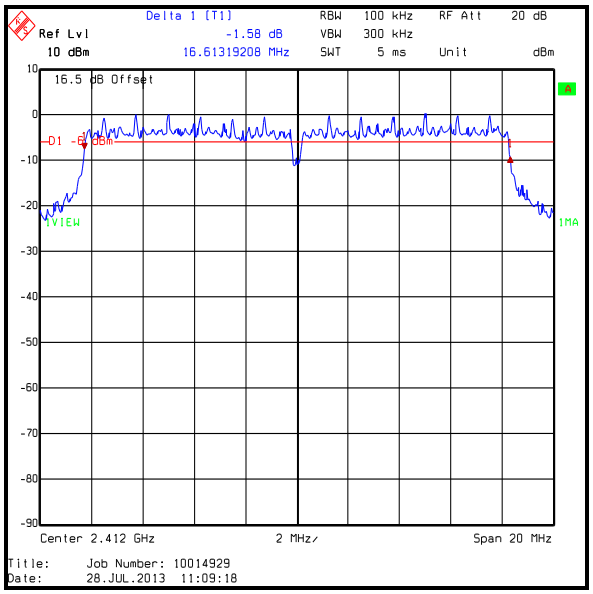


Top Channel

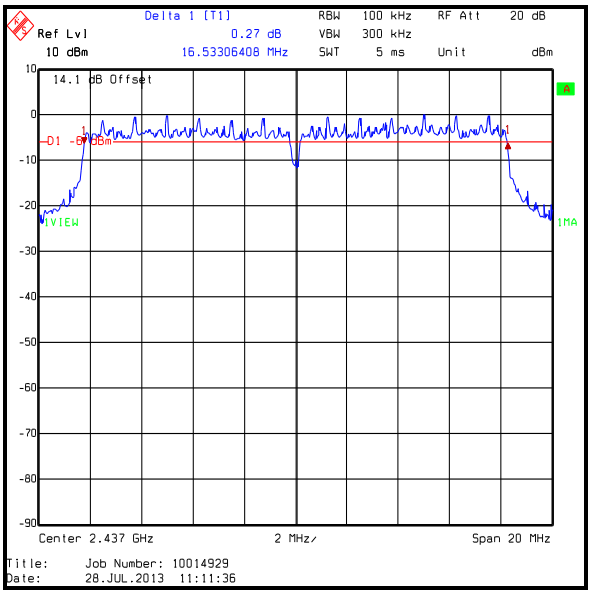
Transmitter Minimum 6 dB Bandwidth (continued)

Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0

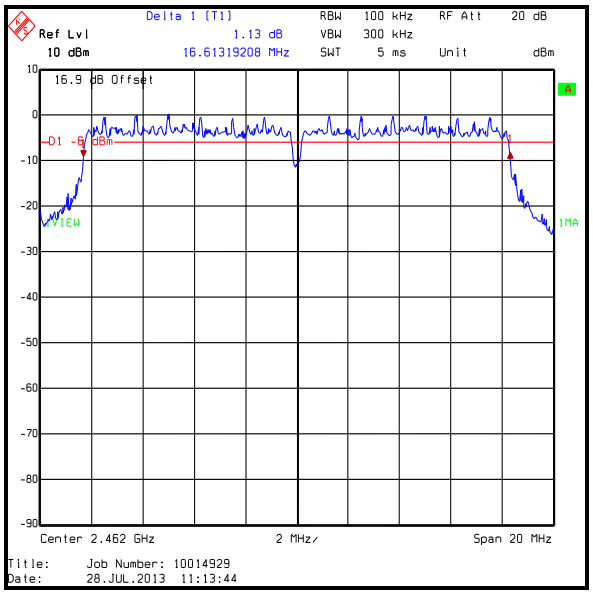
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	16613.192	≥500	16113.192	Complied
Middle	16533.064	≥500	16033.064	Complied
Top	16613.192	≥500	16113.192	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Minimum 6 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
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
A1999	Attenuator	Huber + Suhner	6820.17.B	07101	05 Apr 2014	12
M1269	Multimeter	Fluke	179	90250210	30 Jul 2013	12
S0520	DC Power Supply	GW Instek	GPC-3030	E835141	Calibrated before use	-

5.2.3.Transmitter Duty Cycle

Test Summary:

Test Engineers:	Ahmed Ali & Nick Steele	**Test Date:**	25 July 2013
Test Sample IMEI:	004402451246239		

FCC Reference:	Part 15.35(c)
Test Method Used:	As detailed in FCC KDB 558074 Section 6.0

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	45

Note(s):

1. In order to assist with the determination of the average level of fundamental and spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by using the following calculation:

10 log (1 / (On Time / [Period or 100 ms whichever is the lesser])).

802.11b / 1 Mbps duty cycle: ≥98%

802.11g / 11 Mbps duty cycle: ≥98%

802.11g / 6 Mbps duty cycle: ≥ 98%

802.11g / 24 Mbps duty cycle 10 log (1 / (0.349/0.365)) = 0.2 dB

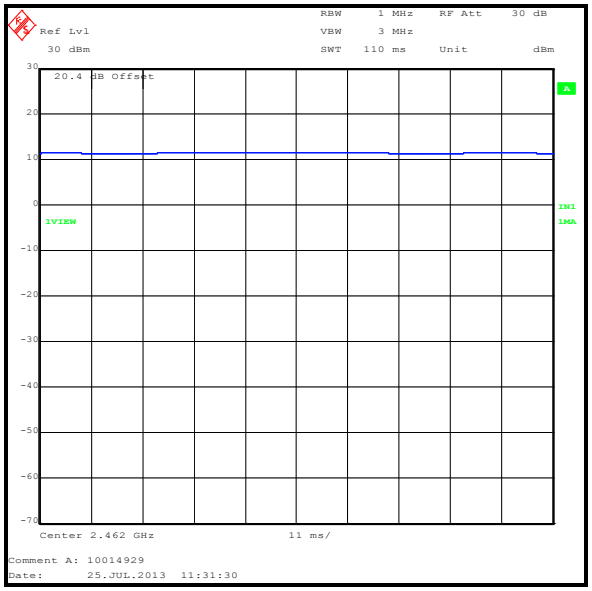
802.11n / 6.5 Mbps duty cycle: ≥ 98%

802.11n / 65 Mbps duty cycle 10 log (1 / (0.524/0.541)) = 0.1 dB

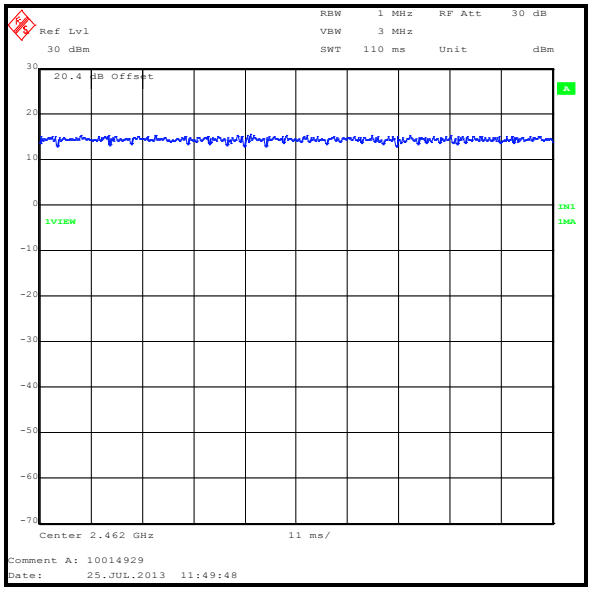
2. Where the duty cycle was measured to be greater than 98%, plots have been taken over 100 ms and can be seen below.

Transmitter Duty Cycle (continued)

Results: 802.11b / 20 MHz

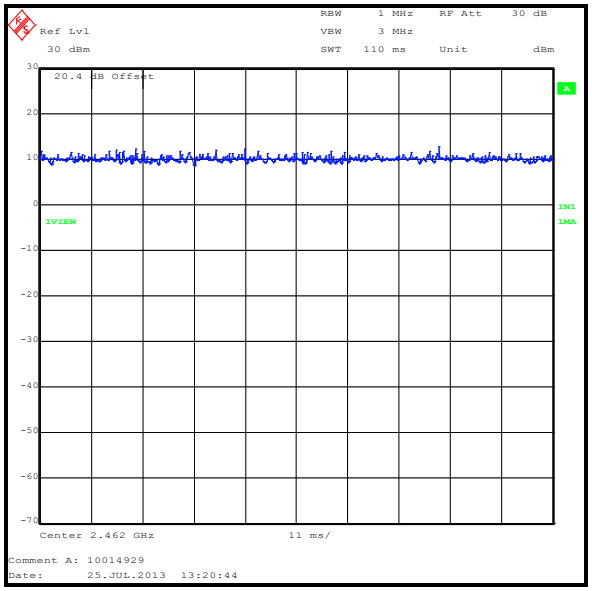


1 Mbps / 100 ms



11 Mbps / 100 ms

Results: 802.11g / 20 MHz



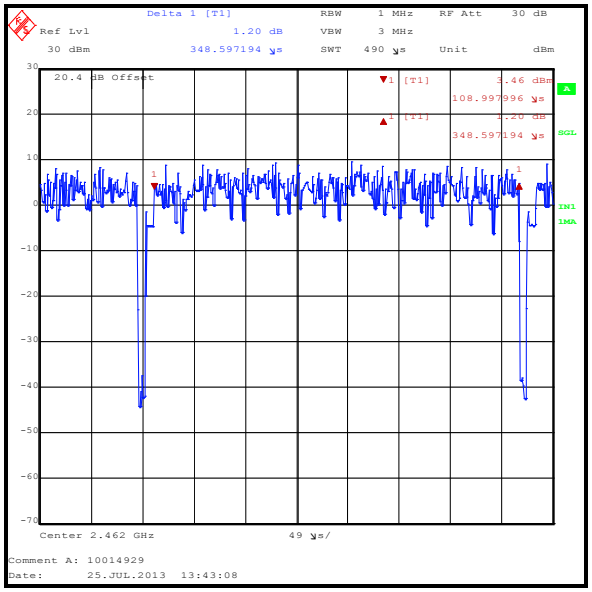
6 Mbps / 100 ms

Transmitter Duty Cycle (continued)

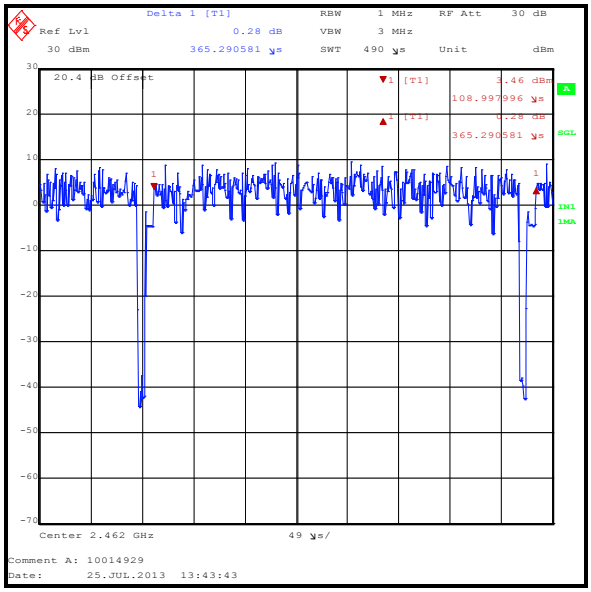
Results: 802.11g / 20 MHz / 24 Mbps

Pulse Duration (ms)	Duty Cycle (dB)
0.349	0.2

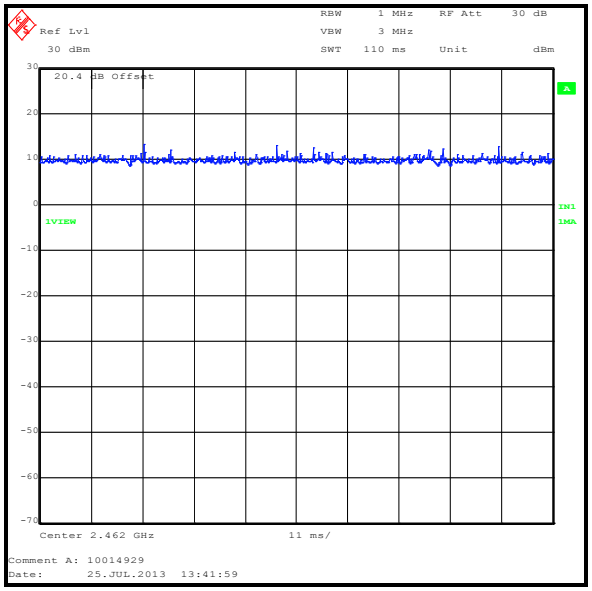
Period (ms)
0.365



TX on time



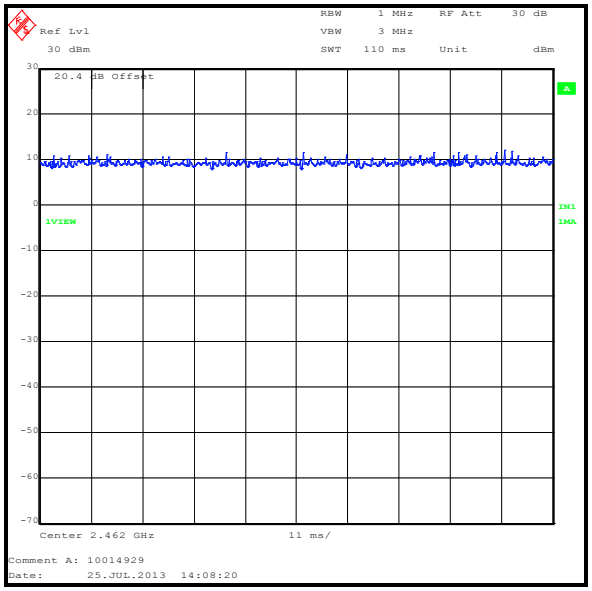
TX on + off time / period



100 ms

Transmitter Duty Cycle (continued)

Results: 802.11n / 20 MHz / 6.5 Mbps / MCS0



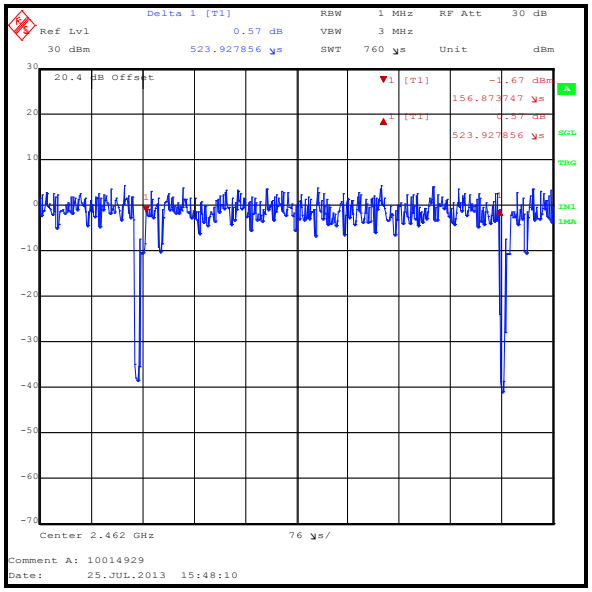
6.5 Mbps / 100 ms

Transmitter Duty Cycle (continued)

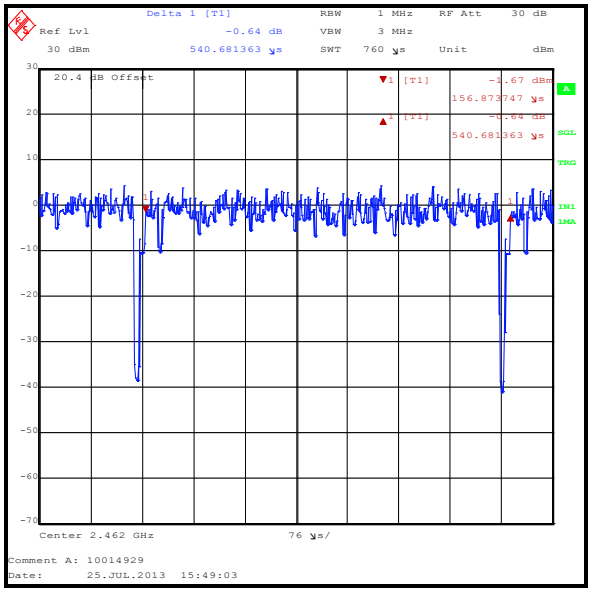
Results: 802.11n / 20 MHz / 65 Mbps / MCS7

Pulse Duration (ms)	Duty Cycle (dB)
0.524	0.1

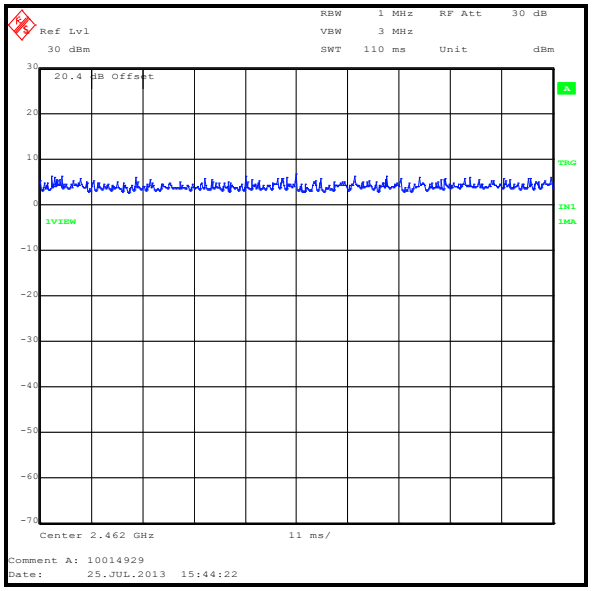
Period (ms)
0.541



TX on time



TX on + off time / period



100 ms

Transmitter Duty Cycle (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
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
A1999	Attenuator	Huber + Suhner	6820.17.B	07101	05 Apr 2014	12
M1269	Multimeter	Fluke	179	90250210	30 Jul 2013	12
S0520	DC Power Supply	GW Instek	GPC-3030	E835141	Calibrated before use	-

5.2.4. Transmitter Power Spectral Density

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	28 July 2013
Test Sample IMEI:	004402451246239		

FCC Reference:	Part 15.247(e)
Test Method Used:	As detailed in FCC KDB 558074 Sections 10.2 & 10.6

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	46

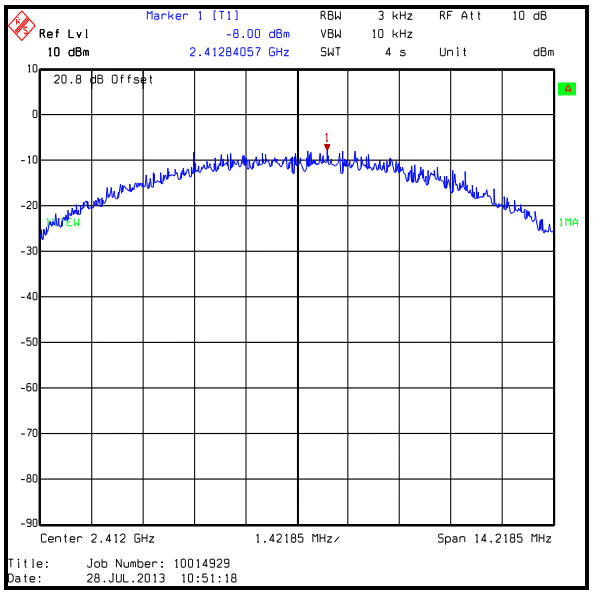
Note(s):

1. All configurations supported by the EUT were investigated on one channel in accordance with KDB 558074 Section 10.6 measurement procedure Method AVGPSD-2 Alternative. The data rates that produced the highest power and therefore deemed worst case were:
    - 802.11b – DBPSK / 1 Mbps
    - 802.11g – 16QAM / 24 Mbps
    - 802.11n HT20 – 64QAM / 65 Mbps / MCS7 (GI = 800 ns)
2. Final measurements were performed using the above configurations on the bottom, middle and top channels.
3. For 802.11b, the EUT was transmitting at 100% duty cycle and testing was performed in accordance with KDB 558074 Section 10.2.
4. For 802.11g and 802.11n, the EUT was transmitting at <98% duty cycle. The calculated duty cycle in section 5.2.3 was added to the measured average power spectral density in order to compute the average power spectral density during the actual transmission time.
5. The 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.

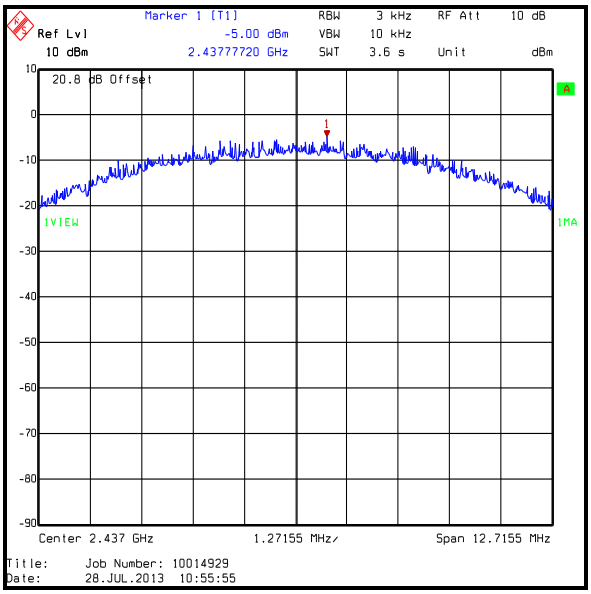
Transmitter Power Spectral Density (continued)

Results: 802.11b / 20 MHz / DBPSK / 1 Mbps

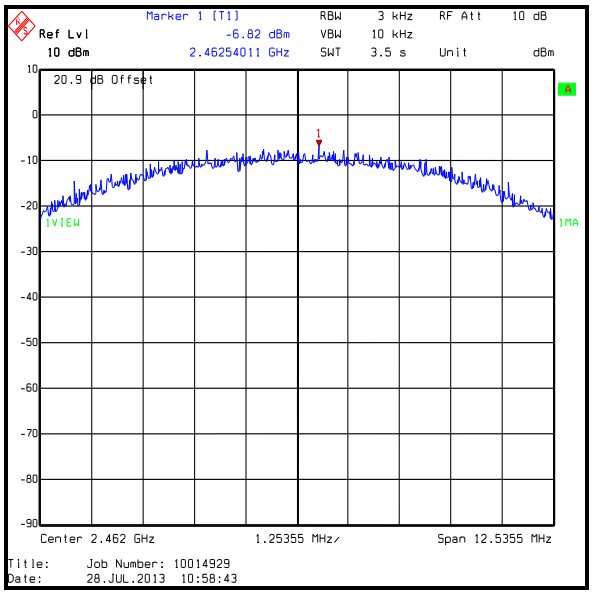
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-8.0	8.0	16.0	Complied
Middle	-5.0	8.0	13.0	Complied
Top	-6.8	8.0	14.8	Complied



Bottom Channel



Middle Channel

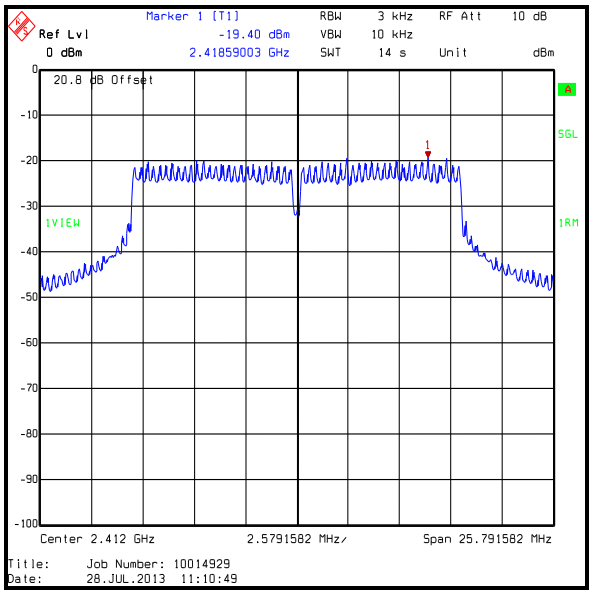


Top Channel

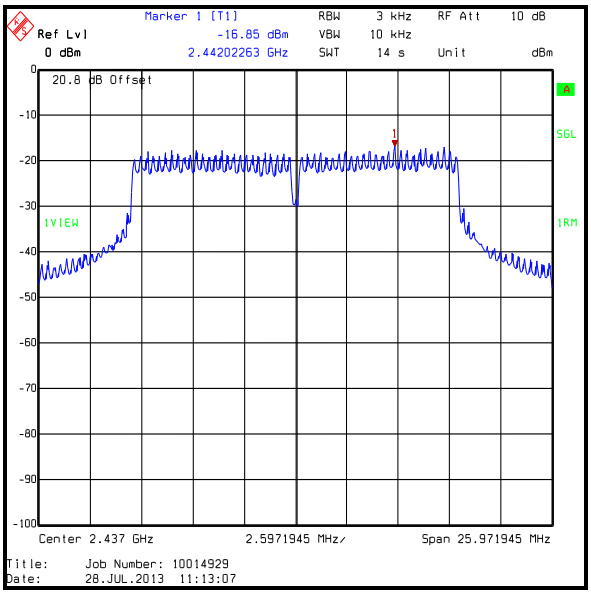
Transmitter Power Spectral Density (continued)

Results: 802.11g / 20 MHz / 16QAM / 24 Mbps

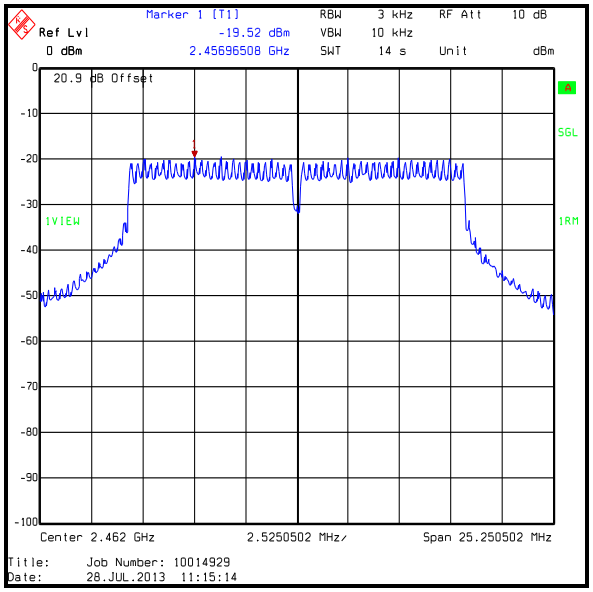
Channel	Output Power (dBm/3 kHz)	Duty cycle correction (dB)	Corrected Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-19.4	0.2	-19.2	8.0	27.2	Complied
Middle	-16.9	0.2	-16.7	8.0	24.7	Complied
Top	-19.5	0.2	-19.3	8.0	27.3	Complied



Bottom Channel



Middle Channel

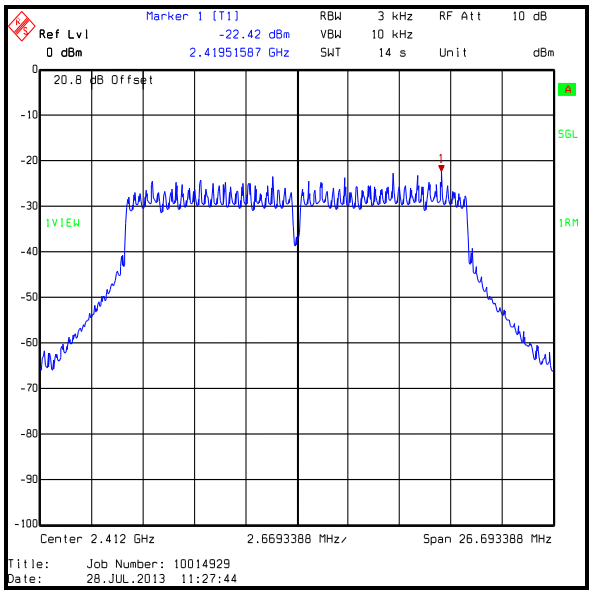


Top Channel

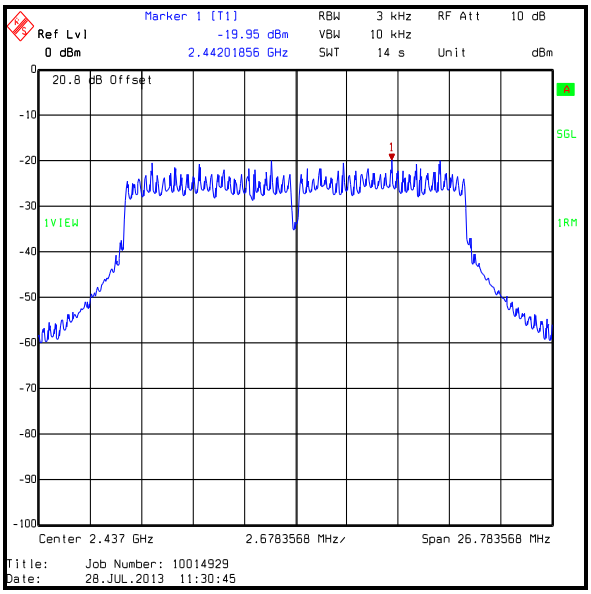
Transmitter Power Spectral Density (continued)

Results: 802.11n / 20 MHz / 64QAM / 65 Mbps / MCS7

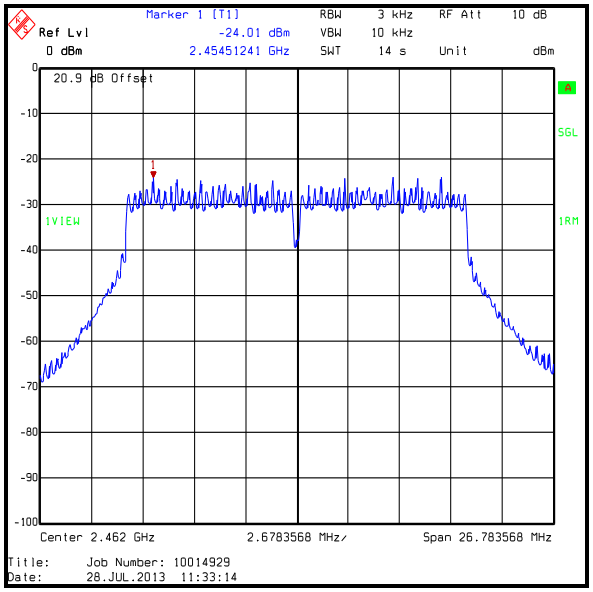
Channel	Output Power (dBm/3 kHz)	Duty cycle correction (dB)	Corrected Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-22.4	0.1	-22.3	8.0	30.3	Complied
Middle	-20.0	0.1	-19.9	8.0	27.9	Complied
Top	-24.0	0.1	-23.9	8.0	31.9	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Power Spectral Density (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
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
A1999	Attenuator	Huber + Suhner	6820.17.B	07101	05 Apr 2014	12
M1269	Multimeter	Fluke	179	90250210	30 Jul 2013	12
S0520	DC Power Supply	GW Instek	GPC-3030	E835141	Calibrated before use	-

5.2.5. Transmitter Maximum Output Power

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	28 July 2013
Test Sample IMEI:	004402451246239		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	As detailed in FCC KDB 558074 Sections 9.1.2 & 9.2.2.5

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	46

Note(s):

1. All configurations supported by the EUT were investigated on one channel in accordance with KDB 558074 Section 9.2.2.5 measurement procedure AVGSA-2 Alternative. The data rates that produced the highest power and therefore deemed worst case were:
    - 802.11b – DQPSK / 11 Mbps
    - 802.11g – BPSK / 6 Mbps
    - 802.11n HT20 – 64QAM / 65 Mbps / MCS7 (GI = 800 ns)
2. Final measurements were performed using the above configurations on the bottom, middle and top channels.
3. For 802.11b, the EUT was transmitting at 100% duty cycle and testing was performed in accordance with KDB 558074 Section 9.1.2.
4. For 802.11g and 802.11n, the EUT was transmitting at <98% duty cycle. The calculated duty cycle in section 5.2.3 was added to the measured power in order to compute the average power during the actual transmission time.
5. The 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.

Transmitter Maximum Output Power (continued)

Results: 802.11b / 20 MHz / DQPSK / 11 Mbps

Conducted Peak Limit Comparison

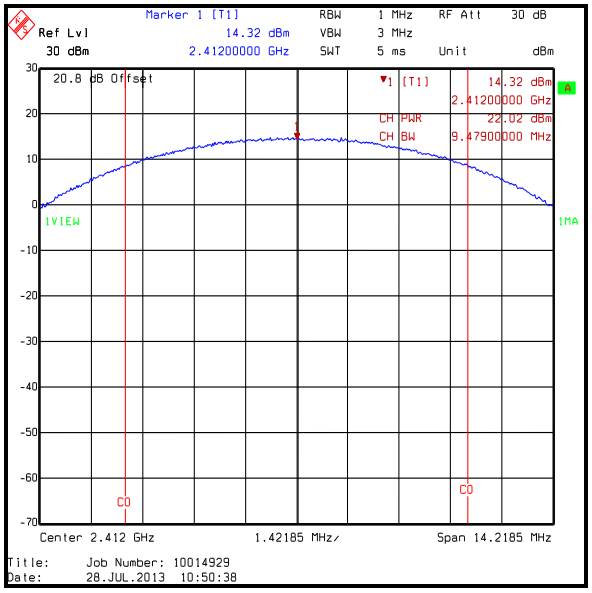
Channel	Conducted Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	22.0	30.0	8.0	Complied
Middle	24.3	30.0	5.7	Complied
Top	22.4	30.0	7.6	Complied

De Facto EIRP Limit Comparison

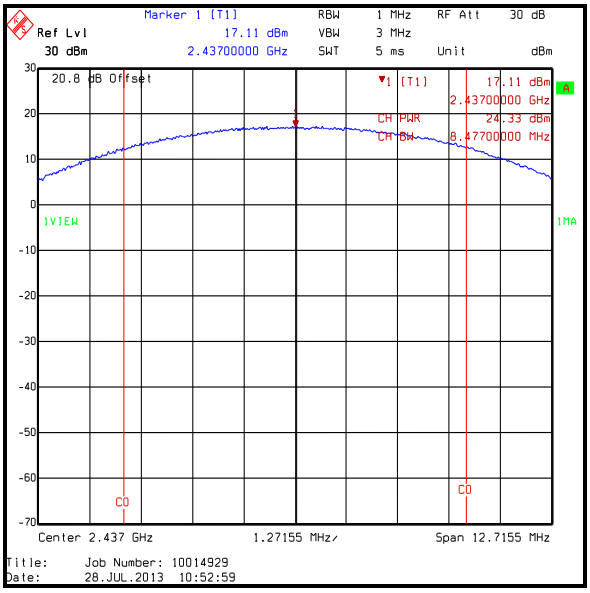
Channel	Conducted Power(dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	22.0	-4.7	17.3	36.0	18.7	Complied
Middle	24.3	-4.7	19.6	36.0	16.4	Complied
Top	22.4	-4.7	17.7	36.0	18.3	Complied

Transmitter Maximum Output Power (continued)

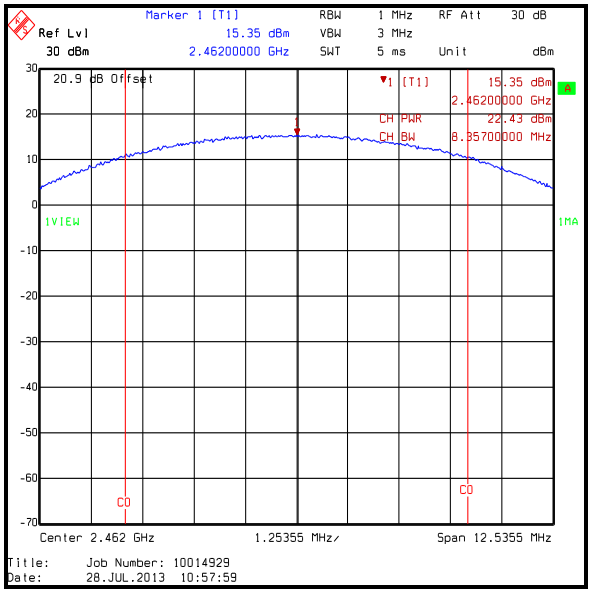
Results: 802.11b / 20 MHz / DQPSK / 11 Mbps



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Output Power (continued)

Results: 802.11g / 20 MHz / BPSK / 6 Mbps

Conducted Peak Limit Comparison

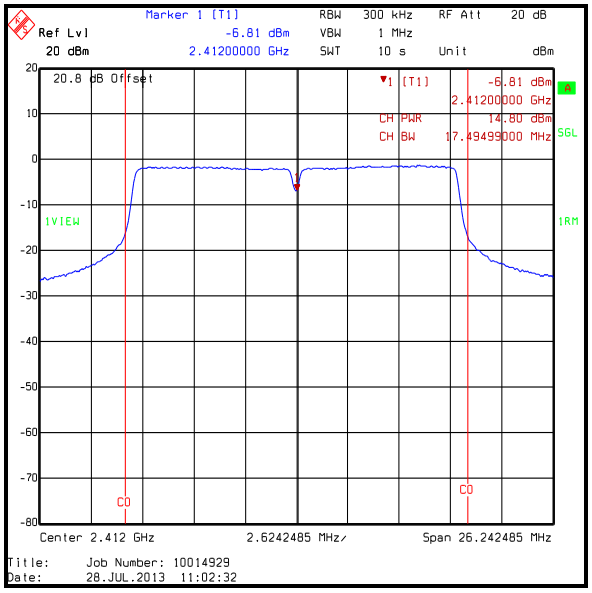
Channel	Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	14.8	30.0	15.2	Complied
Middle	17.5	30.0	12.5	Complied
Top	15.6	30.0	14.4	Complied

De Facto EIRP Limit Comparison

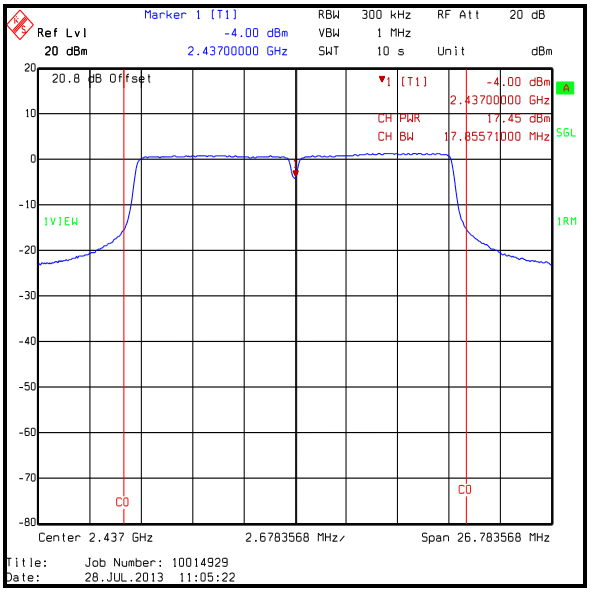
Channel	Corrected Conducted Power(dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	14.8	-4.7	10.1	36.0	25.9	Complied
Middle	17.5	-4.7	12.8	36.0	23.2	Complied
Top	15.6	-4.7	10.9	36.0	25.1	Complied

Transmitter Maximum Output Power (continued)

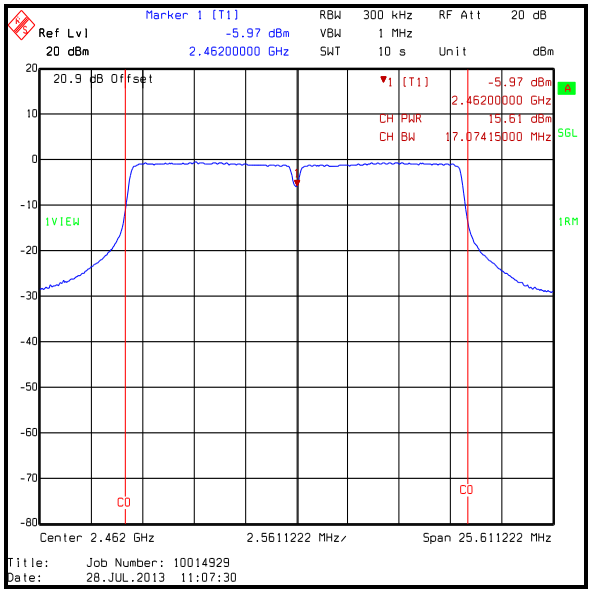
Results: 802.11g / 20 MHz / BPSK / 6 Mbps



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Output Power (continued)

Results: 802.11n / 20 MHz / 64QAM / 65 Mbps / MCS7

Conducted Peak Limit Comparison

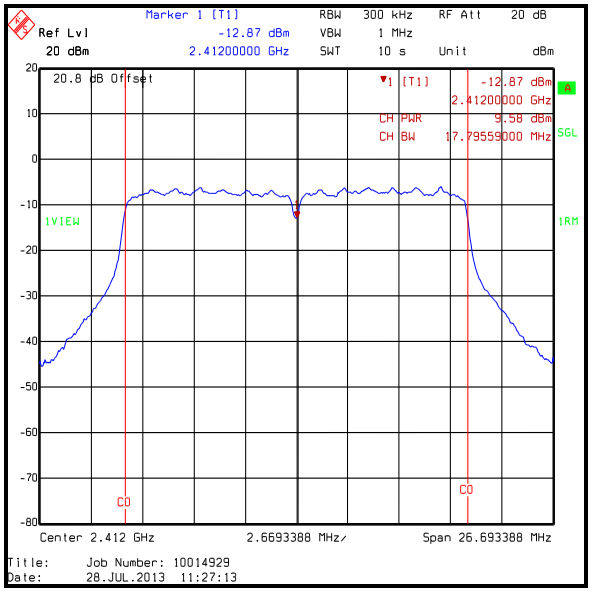
Channel	Conducted Power (dBm)	Duty cycle correction (dB)	Corrected Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	9.6	0.1	9.7	30.0	20.3	Complied
Middle	13.0	0.1	13.1	30.0	16.9	Complied
Top	9.9	0.1	10.0	30.0	20.0	Complied

De Facto EIRP Limit Comparison

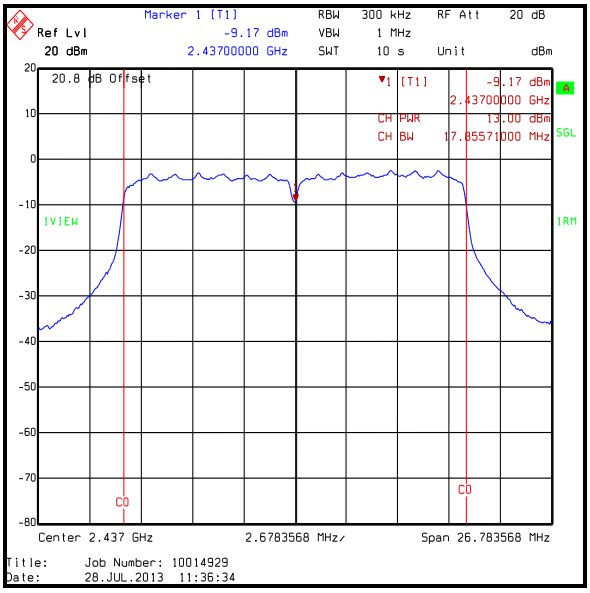
Channel	Corrected Conducted Power(dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	9.7	-4.7	5.0	36.0	31.0	Complied
Middle	13.1	-4.7	8.4	36.0	27.6	Complied
Top	10.0	-4.7	5.3	36.0	30.7	Complied

Transmitter Maximum Output Power (continued)

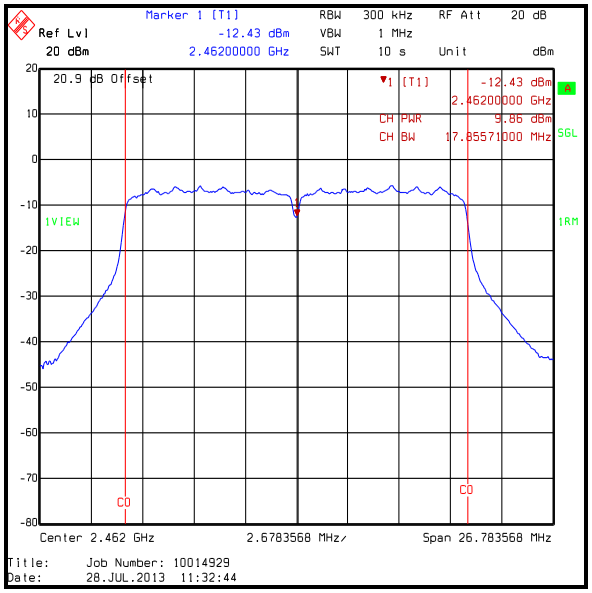
Results: 802.11n / 20 MHz / 64QAM / 65 Mbps / MCS4



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum 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
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
A1999	Attenuator	Huber + Suhner	6820.17.B	07101	05 Apr 2014	12
M1269	Multimeter	Fluke	179	90250210	30 Jul 2013	12
S0520	DC Power Supply	GW Instek	GPC-3030	E835141	Calibrated before use	-

5.2.6. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	Mark Percival	**Test Date:**	25 July 2013
Test Sample IMEI:	004402451245652		

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 (%):	52

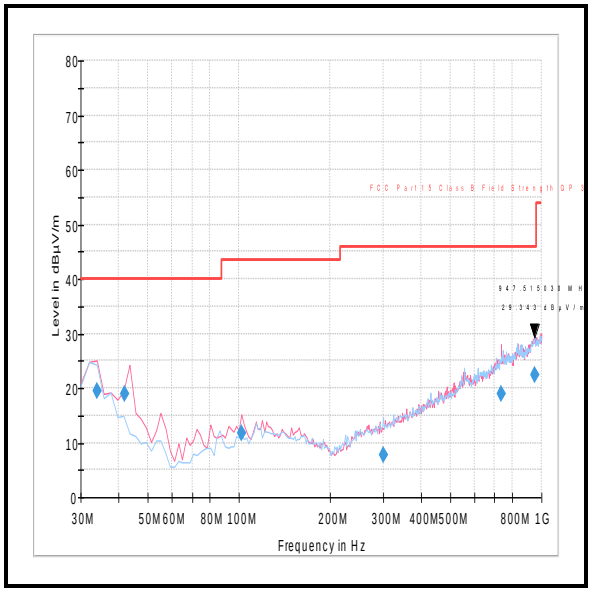
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
3. All emissions shown on the pre-scan plots were investigated and found to be ambient, or >20 dB below the applicable limit or below the measurement system noise floor. Therefore the highest peak noise floor reading of the measuring receiver was recorded in the table below.
4. 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: Top Channel / 802.11b / 20 MHz / 11 Mbps

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
947.515	Vertical	29.3	46.0	16.7	Complied

Transmitter Radiated Emissions (continued)



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
A1843	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	30.5015.13	None stated	24 May 2014	12

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineers:	Andrew Edwards & Nick Steele	**Test Dates:**	26 July 2013 & 27 July 2013
Test Sample IMEI:	004402451245652		

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 26.5 GHz

Environmental Conditions:

Temperature (°C):	23 to 25
Relative Humidity (%):	44

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 and average noise floor readings of the measuring receiver were recorded as shown in the tables below.
3. The emission shown approximately at 2462 MHz on the 1 GHz to 4 GHz plot is the EUT fundamental.
4. 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.

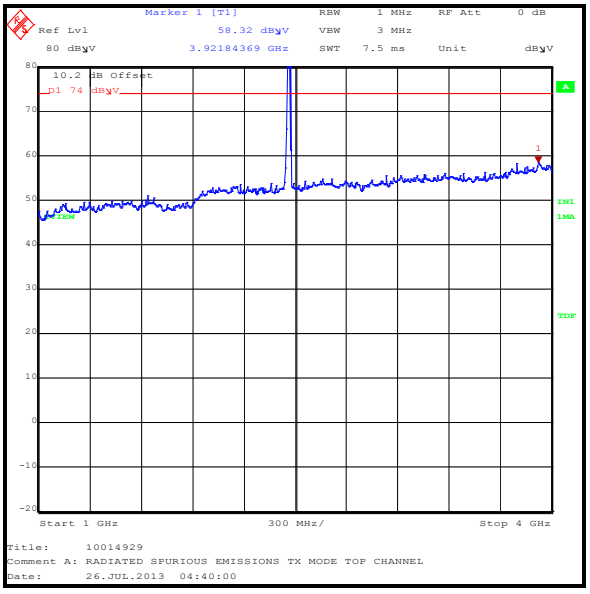
Results: Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
3921.844	Vertical	58.3	74.0	15.7	Complied

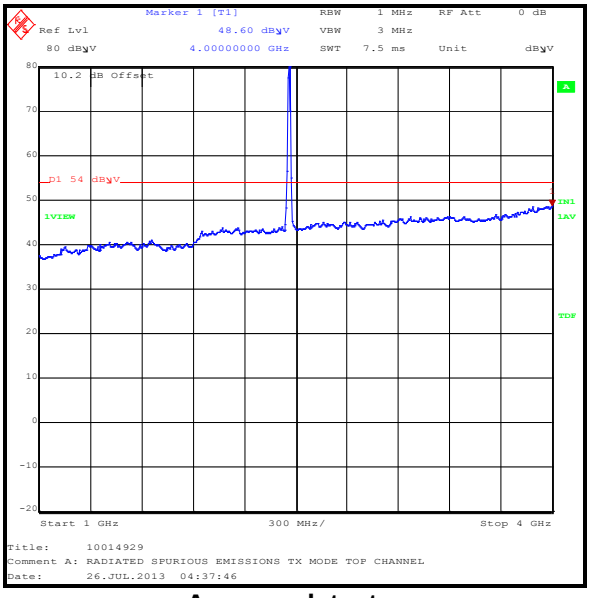
Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
4000.000	Vertical	48.6	54.0	5.4	Complied

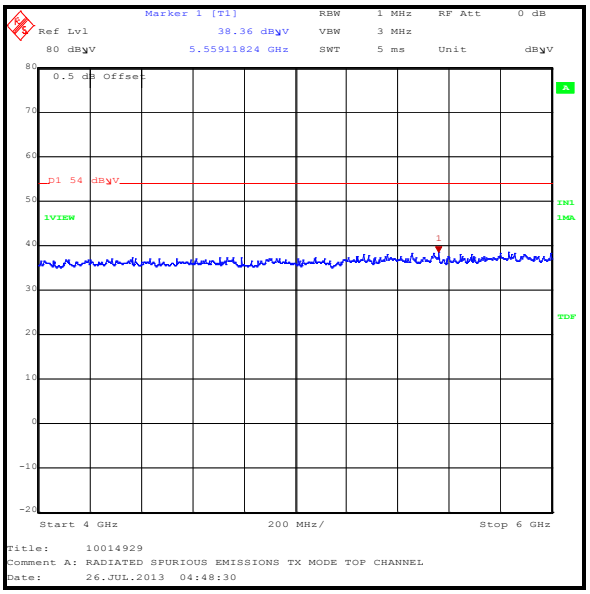
Transmitter Radiated Emissions (continued)

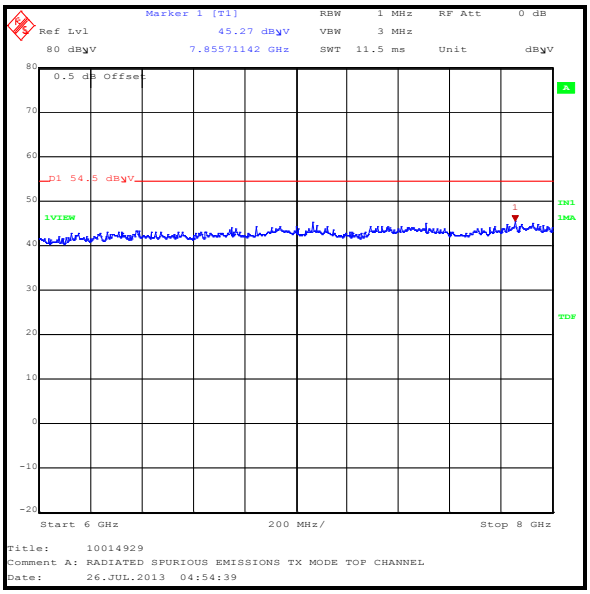


Peak detector

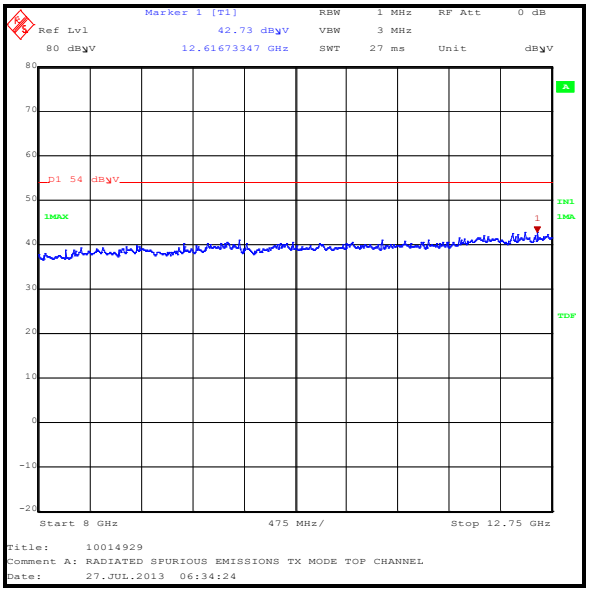


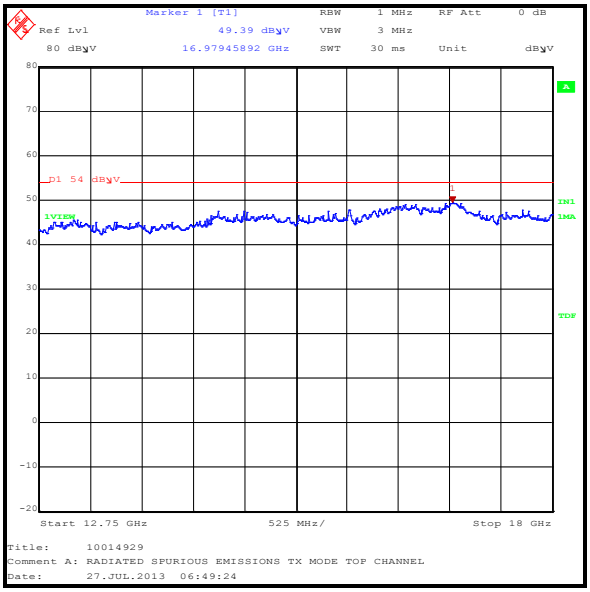
Average detector

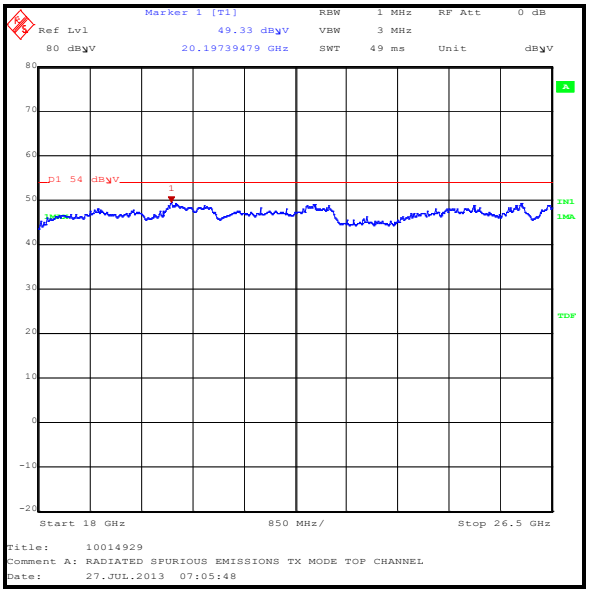




Transmitter Radiated Emissions (continued)







Transmitter Radiated Emissions (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
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
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
A1997	Attenuator	Huber & Suhner	6810.17.B	301749	06 Apr 2014	12
A1975	High Pass Filter	Atlan TecRF	AFH-03000	090424010	19 Apr 2014	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
M1656	Thermometer/ Hygrometer Station	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12

5.2.7. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineers:	Andrew Edwards & Nick Steele	**Test Dates:**	26 July 2013 & 27 July 2013
Test Sample IMEI:	004402451245652		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.2 referencing KDB 558074

Environmental Conditions:

Temperature (°C):	23 to 25
Relative Humidity (%):	44

Note(s):

1. All configurations supported by the EUT were investigated on one channel. The data rates that produced the highest power and widest bandwidth were therefore deemed worst case :
    - 802.11b – DQPSK / 11 Mbps
    - 802.11g – BPSK / 6 Mbps
    - 802.11n HT20 – 64QAM / 65 Mbps / MCS7 (GI = 800 ns)
2. Final measurements were performed with the above configurations.
3. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
4. For 802.11b the maximum peak conducted power was previously measured. In accordance with FCC KDB 558074 Section 11.1(a), the lower band edge measurement should be performed with a peak detector and the -20 dBc limit applied.
5. In accordance with KDB 558074 D01, if the upper band edge peak level is below the average limit, it is not necessary to perform a separate average measurement.
6. For 802.11g and 802.11n, the maximum conducted (average) output power was previously measured. In accordance with FCC KDB 558074 Section 11.1(b), the lower band edge measurement was performed with a peak detector and the -30 dBc limit applied.
7. * -20 dBc limit.
8. ** -30 dBc limit.

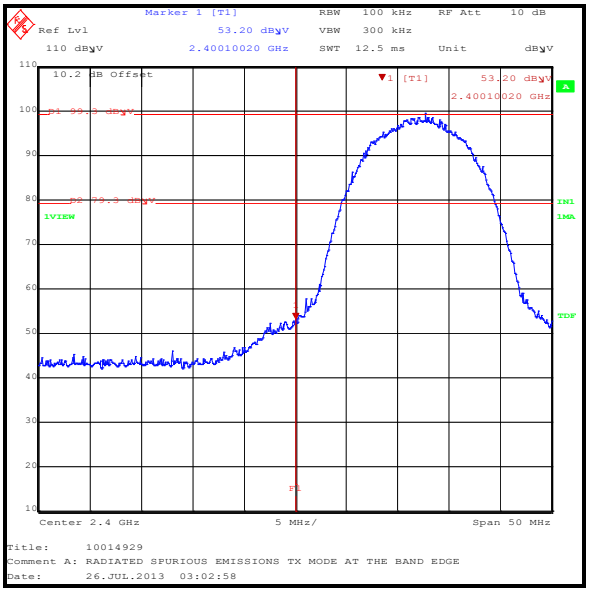
Transmitter Band Edge Radiated Emissions (continued)

Results: Peak / 802.11b / 20 MHz / DQPSK / 11 Mbps

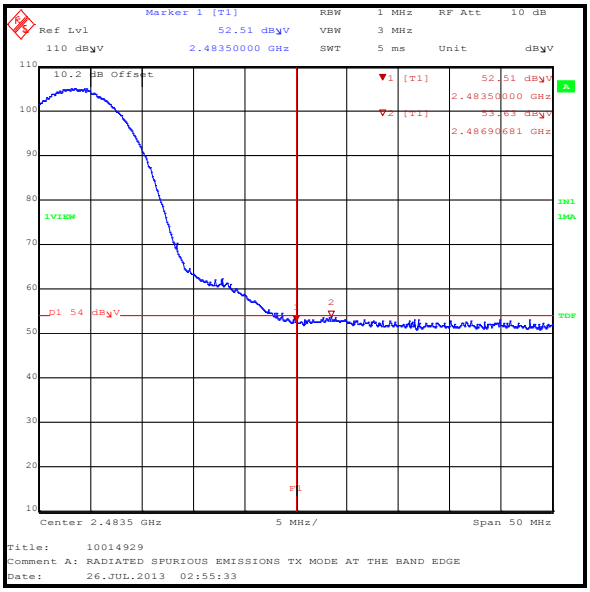
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400	53.2	79.3*	26.1	Complied

Results: 802.11b / 20 MHz / DQPSK / 11 Mbps

Frequency (MHz)	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2483.5	52.5	54.0	1.5	Complied
2486.907	53.6	54.0	0.4	Complied



Lower Band Edge Peak Measurement



Upper Band Edge Measurement

Transmitter Band Edge Radiated Emissions (continued)

Results: Peak / 802.11g / 20 MHz / BPSK / 6 Mbps

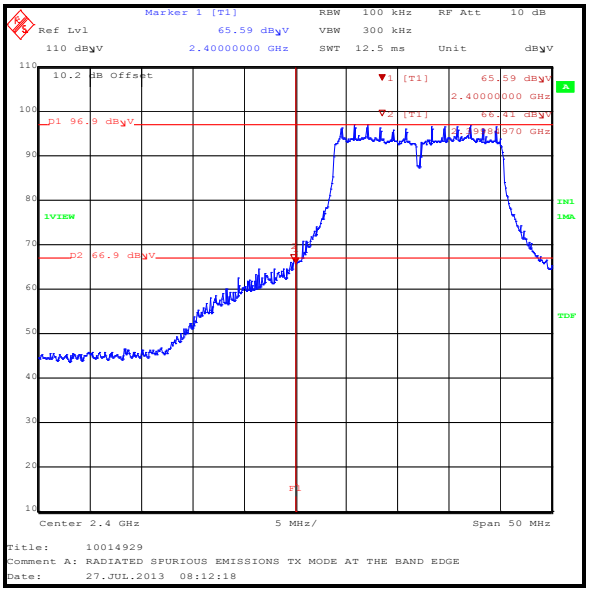
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2399.850	66.4	66.9**	0.5	Complied
2400	65.6	66.9**	1.3	Complied
2483.5	72.6	74.0	1.4	Complied

Results: Average / 802.11g / 20 MHz / BPSK / 6 Mbps

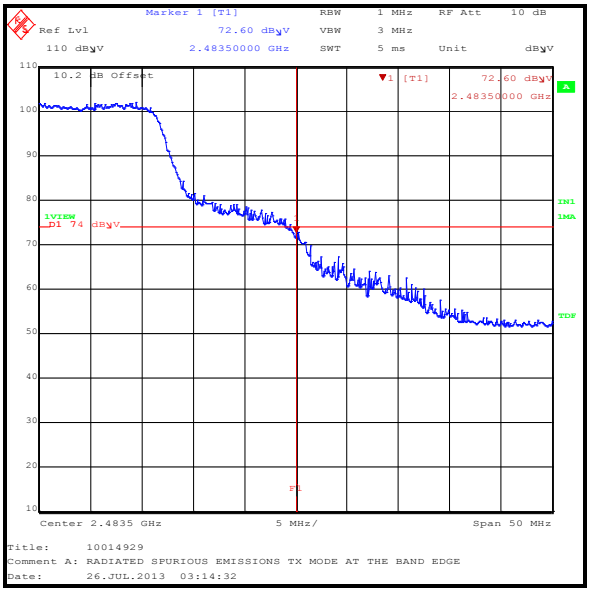
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	50.7	54.0	3.3	Complied

Transmitter Band Edge Radiated Emissions (continued)

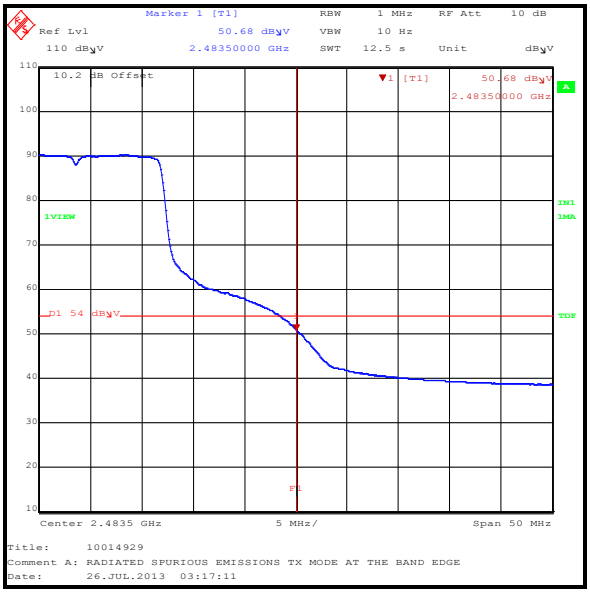
Results: 802.11g / 20 MHz / BPSK / 6 Mbps



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement



Upper Band Edge Average Measurement

Transmitter Band Edge Radiated Emissions (continued)

Results: Peak / 802.11n / 20 MHz / 64QAM / 65 Mbps / MCS7

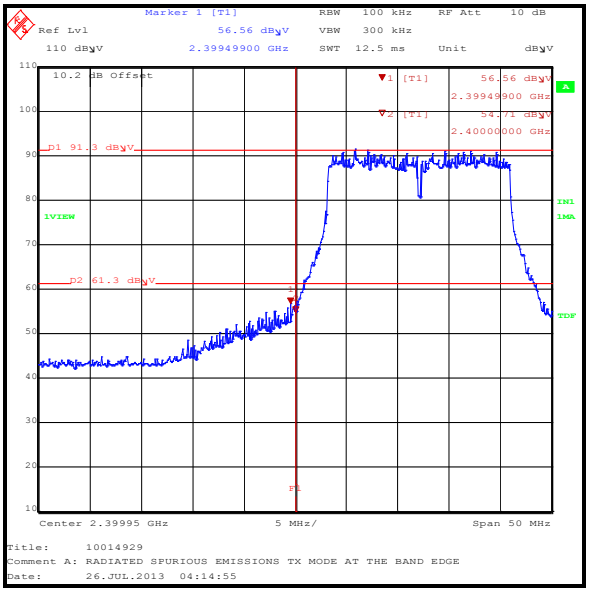
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2399.499	56.6	61.3**	4.7	Complied
2400	54.7	61.3**	6.6	Complied
2483.5	60.7	74.0	13.3	Complied
2484.151	62.3	74.0	11.7	Complied

Results: Average / 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0

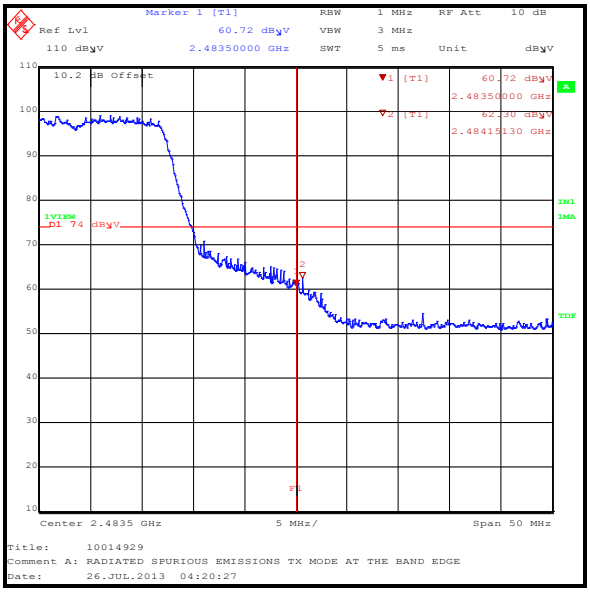
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	42.4	54.0	11.6	Complied

Transmitter Band Edge Radiated Emissions (continued)

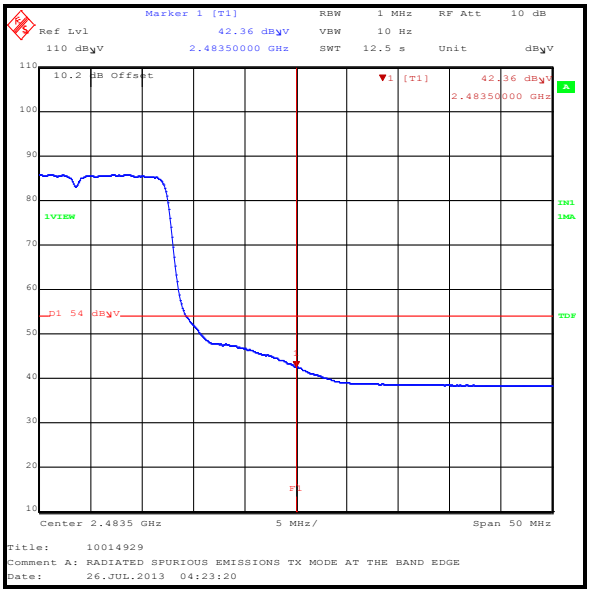
Results: Peak / 802.11n / 20 MHz / 64QAM / 65 Mbps / MCS7



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement



Upper Band Edge Average Measurement

Transmitter Band Edge Radiated Emissions (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
A1997	Attenuator	Huber & Suhner	6810.17.B	301749	6 Apr 2014	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
M1656	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	24 May 2014	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
Conducted Maximum Output Power	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Minimum 6 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 26.5 GHz	95%	±2.94 dB
Duty Cycle	2.4 GHz to 2.4835 GHz	95%	±0.3 ns

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