

TEST REPORT FROM RFI GLOBAL SERVICES LTD



Test of: F@st 3965CV Managed Home Router

FCC ID: VW3FAST3965CV

To: FCC Part 15.247: 2011 Subpart C

Test Report Serial No.:
RFI-RPT-RP89496JD01A V3.0

Version 3.0 supersedes all previous versions

This Test Report Is Issued Under The Authority Of John Newell, Group Quality Manager:	
Checked By:	Steven White
Signature:	
Date of Issue:	03 October 2012

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1. Customer Information











Company Name:	Sagemcom SAS
Address:	250 RTE De L`Empereur 92500 Rueil Malmaison France

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.107 and 47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart B (Unintentional Radiators) - Sections 15.107 and 15.109
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Site Registration:	FCC: 209735
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	17 August 2012 to 26 September 2012

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.107(a)	Receiver/Idle Mode AC Conducted Emissions	
Part 15.109	Receiver/Idle Mode Radiated Spurious Emissions	
Part 15.207	Transmitter AC Conducted Emissions	
Part 15.247(a)(2)	Transmitter 6 dB Bandwidth	
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		

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 v01 1/18/2012
Title:	Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) devices operating Under §15.247
Reference:	FCC KDB 662911 D01 v01r01 10/25/2011
Title:	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
Reference:	FCC 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:	Sagemcom
Model Name or Number:	F@st 3965CV
Serial Number:	LK2202002181
Hardware Version Number:	253509713
Software Version Number:	2.7
FCC ID:	VW3FAST3965CV

Brand Name:	Sagemcom
Model Name or Number:	F@st 3965CV
Serial Number:	LK220202177
Hardware Version Number:	253509713
Software Version Number:	2.7
FCC ID:	VW3FAST3965CV

3.2. Description of EUT

The equipment under test was an IEEE 802.11a,b,g,n WLAN router operating in the 2.4 GHz and 5 GHz bands. The EUT has five internal antennas, two transmit/receive for 2.4 GHz band and three transmit/receive for 5 GHz band. The antennas are integral to the PCB and connected to the module via PCB tracks which incorporate a port on each track. When an RF cable is connected to the port the antenna is disconnected. For 802.11n operation the device uses MIMO – 2x2 for the 2.4 GHz band and 3x3 for the 5 GHz band. Depending on the 802.11 MCS, the device transmits 1, 2 or 3 spatial stream. The device uses spatial multiplexing and from an RF point of view the streams are correlated with unequal gain antennas.

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:	IEEE 802.11		
Type of Unit:	Transceiver		
Modulation:	CCK, 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	6.5, 13, 19.5, 26, 39, 52, 58.5, 65, 78, 104, 117 & 130 Mbps	
	802.11n HT40	13.5, 27, 40.5, 54, 81, 108, 121.5, 135, 162, 216, 243 & 270 Mbps	
Power Supply Requirement(s):	Nominal	120 VAC 60 Hz via 12 V adaptor	
Maximum Combined Conducted Output Power:	25.7 dBm		
Antenna Gain:	P2104 4.2 dBi, P2105 4.1 dBi		
Channel Spacing:	20 MHz		
Transmit & Receive Frequency Range:	2412 MHz to 2462 MHz		
Transmit & Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2412
	Middle	6	2437
	Top	11	2462
Channel Spacing:	40 MHz		
Transmit & Receive Frequency Range:	2422 MHz to 2452 MHz		
Transmit & Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	3	2422
	Middle	6	2437
	Top	9	2452

3.5. Support Equipment

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

Description:	Network Adaptor
Brand Name:	Belkin
Model Name or Number:	Gigabit USB 3.0
Serial Number:	2210120201074

Description:	4 Port Hub
Brand Name:	Belkin
Model Name or Number:	F5U404-BLK
Serial Number:	D12-00047182

Description:	Ethernet router
Brand Name:	Netgear
Model Name or Number:	DG834 V4
Serial Number:	1PL596BD001A4

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Latitude D610
Serial Number:	RFI Asset No. PC471NT

Description:	AC Adaptor
Brand Name:	Sagemcom
Model Name or Number:	NBS24120200VU
Serial Number:	Not marked or stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Constantly transmitting with a modulated carrier at maximum power/widest bandwidth on the bottom, middle and top channels as required using the supported data rates/modulation types.
- Receive/Idle mode The 802.11 mode was active but not transmitting.

4.2. Configuration and Peripherals

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

- Transmitting in test mode with >99% duty cycle and controlled using a bespoke application on a laptop PC using Telnet PC application. The application was used to enable continuous transmit mode or receive mode and to select the test channels, data rates and modulation schemes as required. The Customer supplied instructions on how to configure the EUT for test purposes.
- All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power were:
 - 802.11b – 5.5 Mbps
 - 802.11g – 24 Mbps
 - 802.11n HT20 – 26 Mbps / MCS3
 - 802.11n HT40 – 54 Mbps / MCS3

Measurements were performed on the required channels and ports dependant on each test case.

- All supported modes and channel widths were initially investigated on one channel. The modes that produced the widest bandwidth for all bands were:
 - 802.11b – 5.5 Mbps
 - 802.11g – 24 Mbps
 - 802.11n HT20 – 26 Mbps / MCS3
 - 802.11n HT40 – 54 Mbps / MCS3

Measurements were performed on the required channels and ports dependant on each test case.

- The EUT has two transmit/receive RF ports (labelled as P2104 and P2105). Conducted measurements were performed on both transmit ports. RF cables and attenuators connecting the test equipment to the EUT ports were calibrated before use and the calibration data incorporated into the conducted measurement results.
- Transmitter radiated spurious emissions final measurements were performed using the 802.11n HT20 – 26 Mbps/MCS3, as it was previously measured and found to produce the highest EIRP.
- Radiated emissions tests were performed with all unused ports terminated.
- AC conducted emissions tests were performed with the unused ports terminated into an Ethernet router, 4 port hub, and network adaptor. A laptop PC was connected via an Ethernet cable, this was used to control the EUT during testing.

5. Measurements, Examinations and Derived Results

5.1. General Comments

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

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

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

Test Engineer:	Philip Harrison	Test Date:	17 August 2012
Test Sample Serial Number:	LK2202002181		

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

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	44

Note(s):

1. All other emissions were >30 dB below the applicable limits and therefore were not recorded.

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Live	54.6	66.0	11.4	Complied
0.159	Live	50.9	65.5	14.6	Complied
0.191	Live	46.3	64.0	17.7	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Live	38.6	56.0	17.4	Complied
0.425	Live	25.7	47.4	21.7	Complied

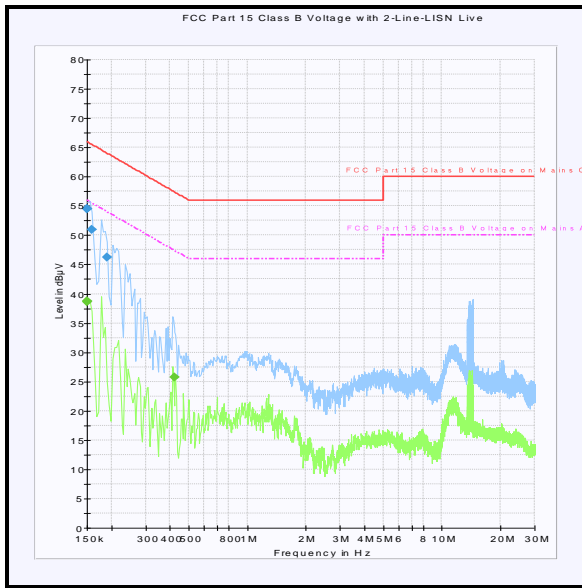
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Neutral	53.6	66.0	12.4	Complied
0.177	Neutral	49.2	64.6	12.4	Complied
0.209	Neutral	45.2	63.3	15.4	Complied
14.325	Neutral	20.3	60.0	18.1	Complied

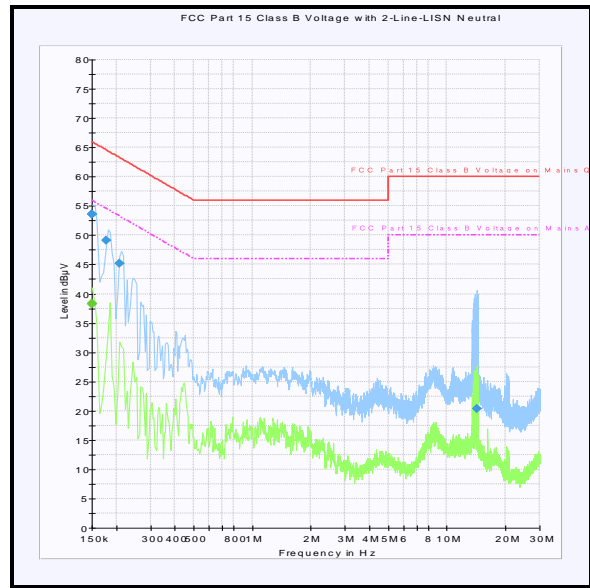
Results: Neutral / Average

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Neutral	38.3	56.0	17.7	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)



Live



Neutral

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

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M1379	Test Receiver	ESIB7	20 Oct 2012	12
A1830	Pulse Limiter	ESH3-Z2	25 Feb 2013	12
A649	LISN	ESH3-Z5	19 Feb 2013	12

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

Test Engineer:	Steven White	Test Date:	24 August 2012
Test Sample Serial Number:	LK220202169		

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:

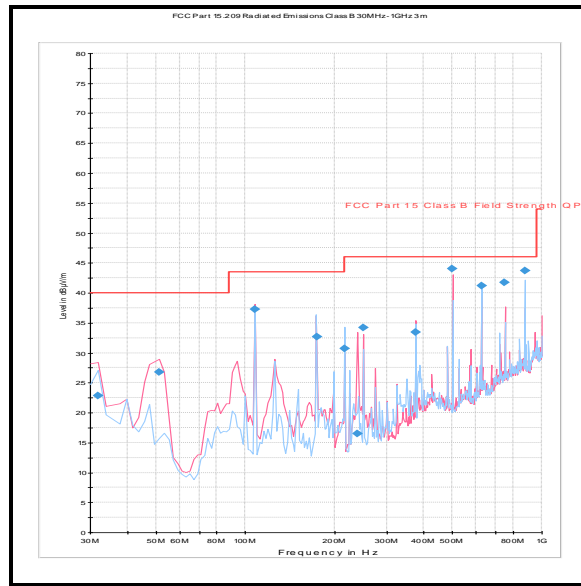
Temperature (°C):	26.9
Relative Humidity (%):	39.0

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
31.967	Vertical	22.9	40.0	17.1	Complied
51.243	Vertical	26.8	40.0	13.2	Complied
108.020	Vertical	37.3	43.5	6.2	Complied
175.006	Horizontal	32.7	43.5	10.8	Complied
216.050	Horizontal	30.7	46.0	15.3	Complied
239.001	Vertical	16.5	46.0	29.5	Complied
250.039	Vertical	34.2	46.0	11.8	Complied
374.997	Vertical	33.4	46.0	12.6	Complied
500.002	Vertical	44.0	46.0	2.0	Complied
625.026	Vertical	41.2	46.0	4.8	Complied
750.023	Vertical	41.7	46.0	4.3	Complied
875.028	Horizontal	43.8	46.0	2.2	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)



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

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M1273	Test Receiver	ESIB 26	03 Feb 2013	12
A553	Antenna	CB6111A	15 Feb 2013	12
G0543	Amplifier	310N	15 Oct 2013	12
A1834	Attenuator	8491B	29 Jan 2013	12

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

Test Engineer:	Andrew Edwards	Test Dates:	31 August 2012 & 21 September 2012
Test Sample Serial Number:	LK220202169		

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 12.5 GHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	35

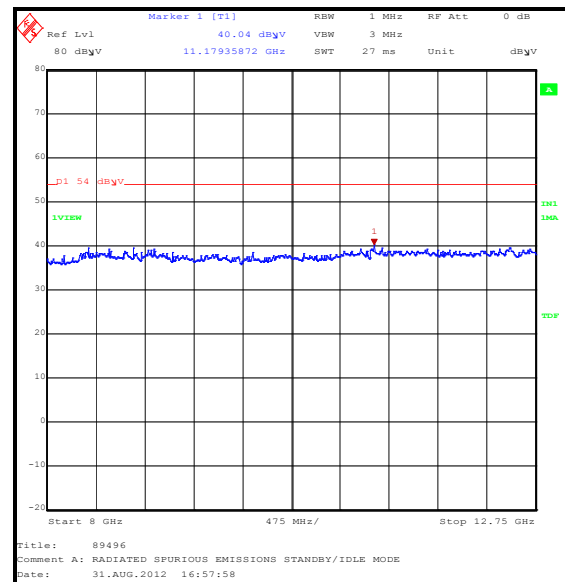
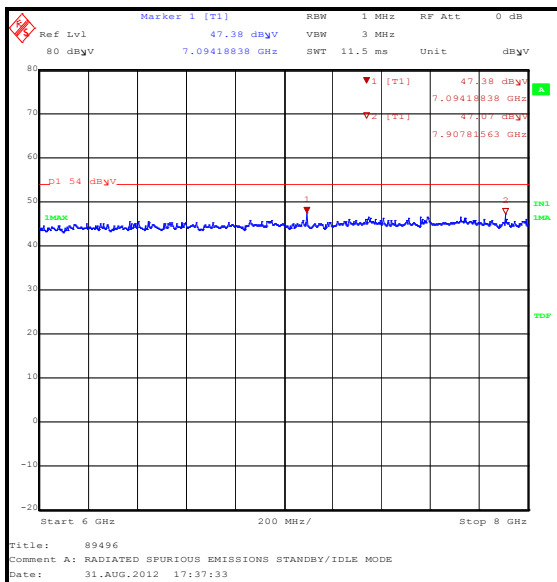
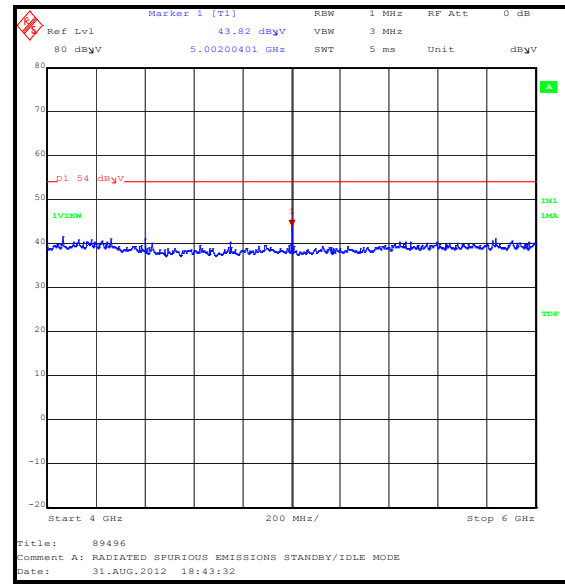
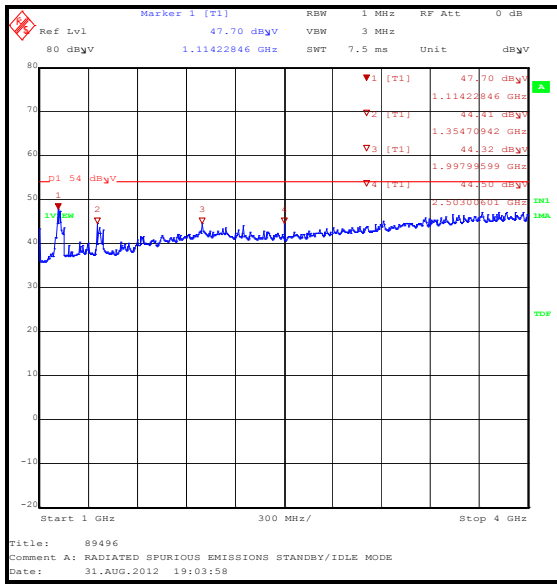
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
3. 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.

Results:

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
1114.228	Horizontal	47.4	54.0	6.6	Complied
1354.709	Horizontal	47.4	54.0	6.6	Complied
1997.996	Horizontal	44.3	54.0	9.7	Complied
2503.006	Horizontal	44.5	54.0	9.5	Complied
4999.836	Horizontal	44.6	54.0	9.4	Complied
7093.297	Horizontal	49.8	54.0	4.2	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)



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

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

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0002	3m RSE Chamber	N/A	09 Oct 2012	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12
A1534	Pre Amplifier	8449B	09 Oct 2012	12
A1818	Antenna	3115	09 Oct 2012	12
A253	Antenna	12240-20	09 Oct 2012	12
A254	Antenna	14240-20	09 Oct 2012	12
A255	Antenna	16240-20	09 Oct 2012	12
A256	Antenna	18240-20	09 Oct 2012	12
A436	Antenna	20240-20	09 Oct 2012	12
A203	Antenna	22240-20	11 May 2013	36
M1390	Harmonic Mixer	WHMP 28	Cal before use	-
A1785	Pre-amplifier	FLNA-28-30	Cal before use	-
A366	Isolator	FRR-400	Cal before use	-
S0537	DC Power Supply Unit	EL302D	Cal before use	-
M1251	Digital Multimeter	175	30 Jul 2013	12

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

Test Engineer:	Philip Harrison	Test Date:	17 August 2012
Test Sample Serial Number:	LK2202002181		

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):	28
Relative Humidity (%):	44

Note(s):

1. All other emissions were >30 dB below the applicable limits and therefore were not recorded.

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Live	52.4	65.3	12.9	Complied
0.195	Live	47.6	63.8	16.2	Complied
0.407	Live	34.6	57.7	23.1	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Live	36.7	55.3	18.6	Complied
0.407	Live	27.5	47.7	20.2	Complied
0.407	Live	25.2	47.7	22.5	Complied
0.645	Live	24.1	46.0	21.9	Complied
1.640	Live	22.2	46.0	23.8	Complied

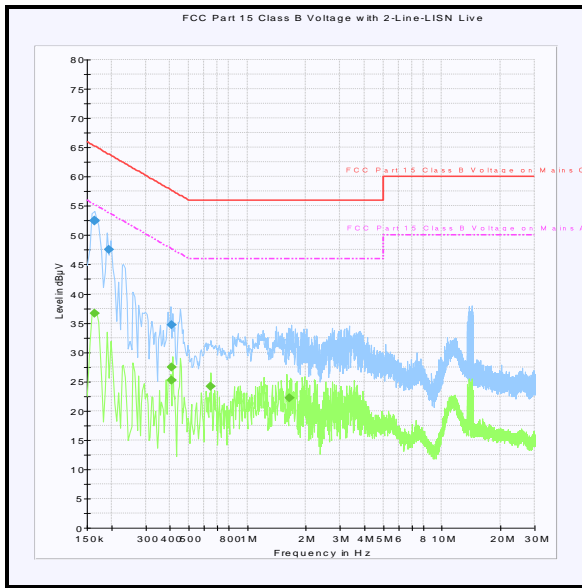
Transmitter AC Conducted Spurious Emissions (continued)**Results: Neutral / Quasi Peak**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.159	Neutral	51.7	65.5	13.8	Complied
0.195	Neutral	47.4	63.8	16.4	Complied
0.443	Neutral	35.3	57.0	21.7	Complied

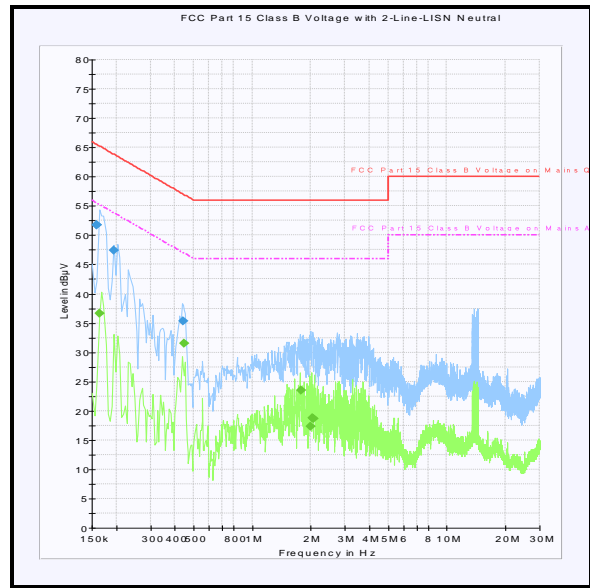
Results: Neutral / Average

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Neutral	36.6	55.3	18.7	Complied
0.447	Neutral	31.6	46.9	15.3	Complied
1.784	Neutral	23.5	46.0	22.5	Complied
1.986	Neutral	17.3	46.0	28.7	Complied
2.040	Neutral	18.8	46.0	27.2	Complied
2.054	Neutral	18.7	46.0	27.3	Complied

Transmitter AC Conducted Spurious Emissions (continued)



Live



Neutral

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

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M1379	Test Receiver	ESIB7	20 Oct 2012	12
A1830	Pulse Limiter	ESH3-Z2	25 Feb 2013	12
A649	LISN	ESH3-Z5	19 Feb 2013	12

5.2.4. Transmitter 6 dB Bandwidth**Test Summary:**

Test Engineer:	Sarah Williams	Test Dates:	18 August 2012, 21 September 2012 & 26 September 2012
Test Sample Serial Number:	LK220202177		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	FCC KDB 558074 Section 5.1.1

Environmental Conditions:

Temperature (°C):	19 to 21
Relative Humidity (%):	47 to 54

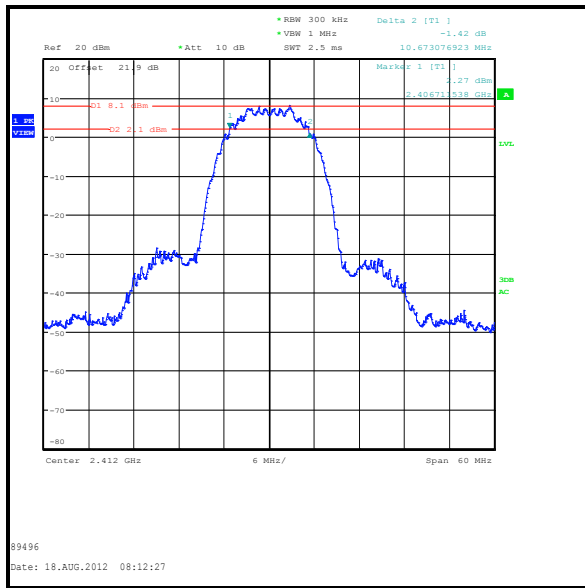
Note(s):

1. All configurations supported by the EUT were investigated on the bottom channel in accordance with KDB 558074 Section 5.1.1 emission bandwidth test procedure.
2. The data rates that produced the widest bandwidth (worst case) have been reported as detailed below:
 - 802.11b 20 MHz channel – DQPSK / 5.5 Mbps
 - 802.11g 20 MHz channel – 16QAM / 24 Mbps
 - 802.11n 20 MHz channel – 16QAM / 26 Mbps / MCS3
 - 802.11n 40 MHz channel – 16QAM / 54 Mbps / MCS3
3. Final measurements were performed on both ports using the above configurations on the bottom, middle and top channels.
4. The EUT was configured with a power setting of 14.0 dBm on all bottom and middle channels and both channel bandwidths.
5. The top channel was configured with the following power settings:
 - 802.11b – 14.0 dBm
 - 802.11g – 11.5 dBm
 - 802.11n HT20 – 11.5 dBm
 - 802.11n HT40 – 9.5 dBm.

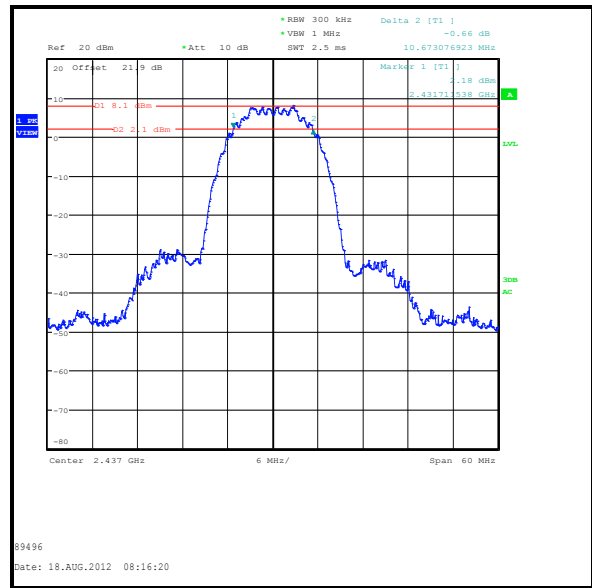
Transmitter 6 dB Bandwidth (continued)

Results: 802.11b / 20 MHz / 5.5 Mbps / DQPSK / Port 2104

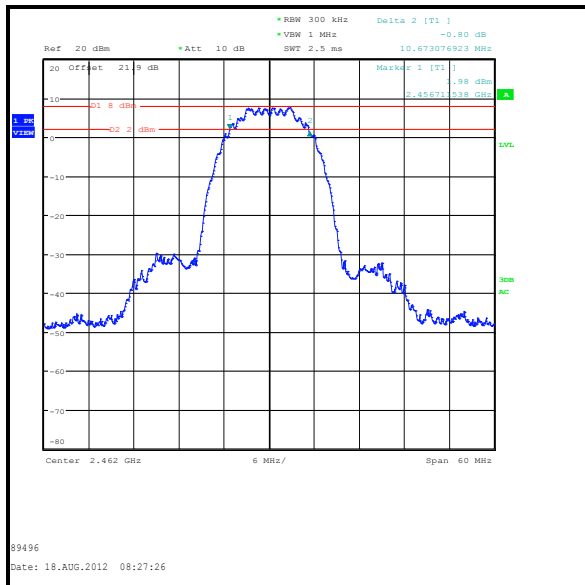
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	10.673	≥0.5	10.173	Complied
Middle	10.673	≥0.5	10.173	Complied
Top	10.673	≥0.5	10.173	Complied



Bottom Channel



Middle Channel

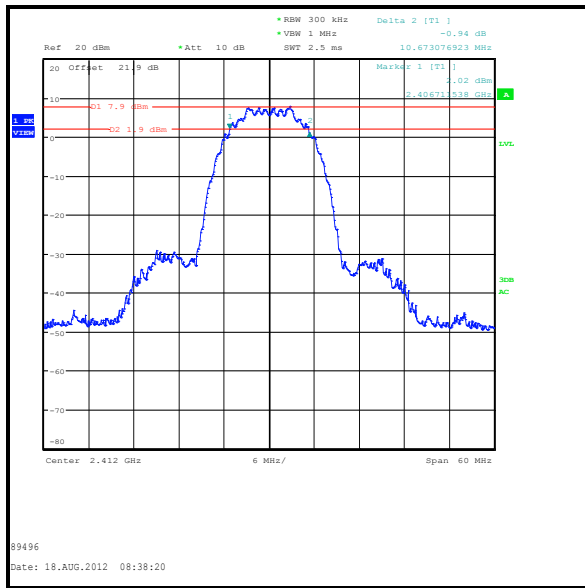


Top Channel

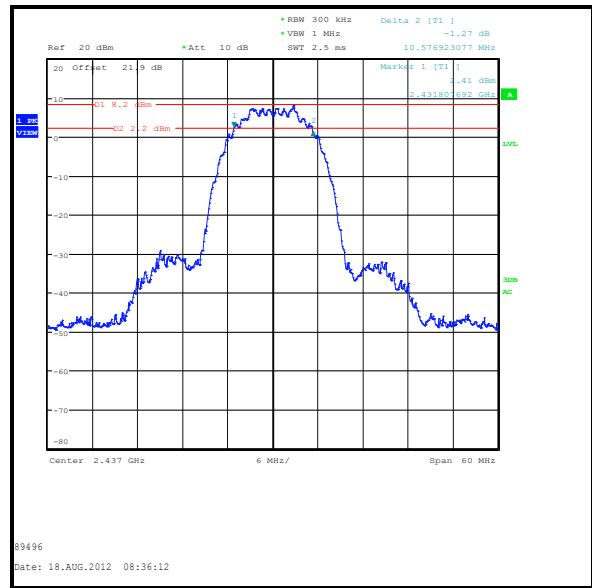
Transmitter 6 dB Bandwidth (continued)

Results: 802.11b / 20 MHz / 5.5 Mbps / DQPSK / Port 2105

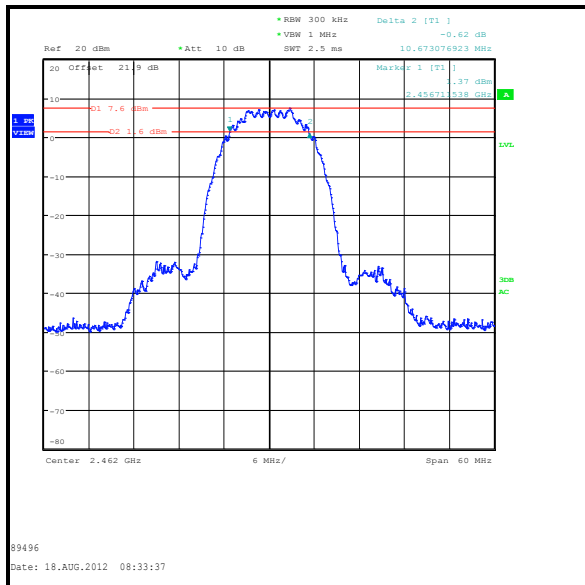
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	10.673	≥0.5	10.173	Complied
Middle	10.577	≥0.5	10.077	Complied
Top	10.673	≥0.5	10.173	Complied



Bottom Channel



Middle Channel

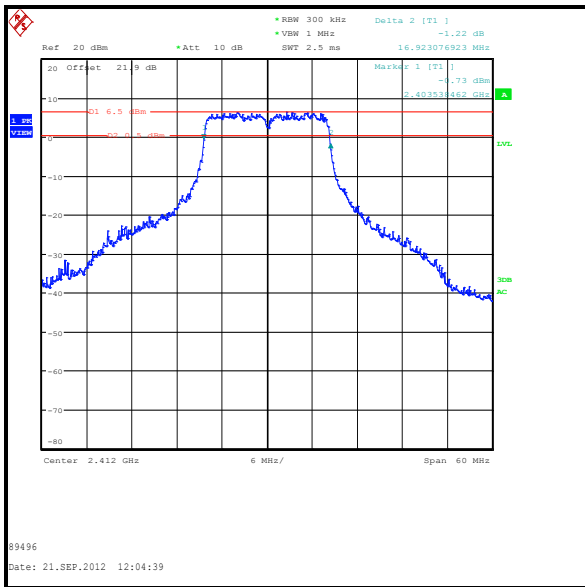


Top Channel

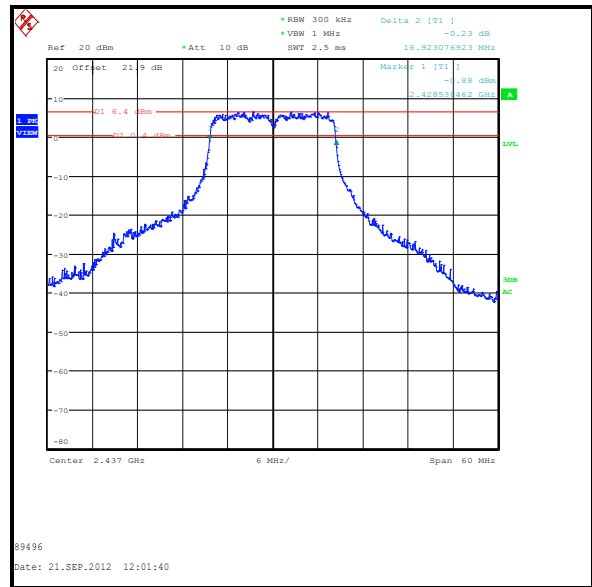
Transmitter 6 dB Bandwidth (continued)

Results: 802.11g / 20 MHz / 24 Mbps / 16QAM / Port 2104

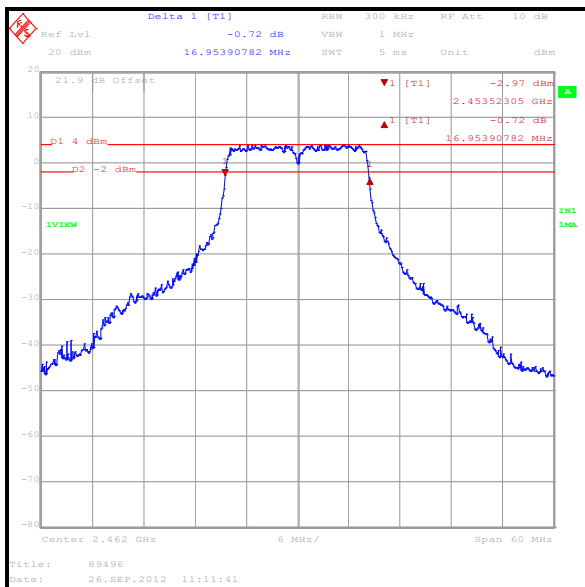
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	16.923	≥0.5	16.423	Complied
Middle	16.923	≥0.5	16.423	Complied
Top	16.954	≥0.5	16.454	Complied



Bottom Channel



Middle Channel

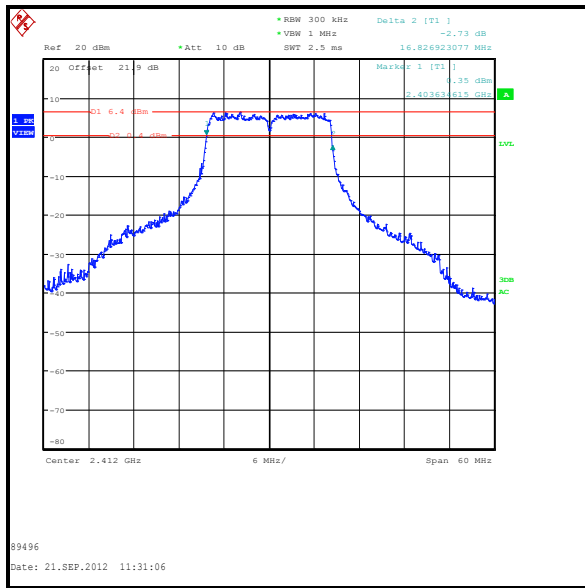


Top Channel

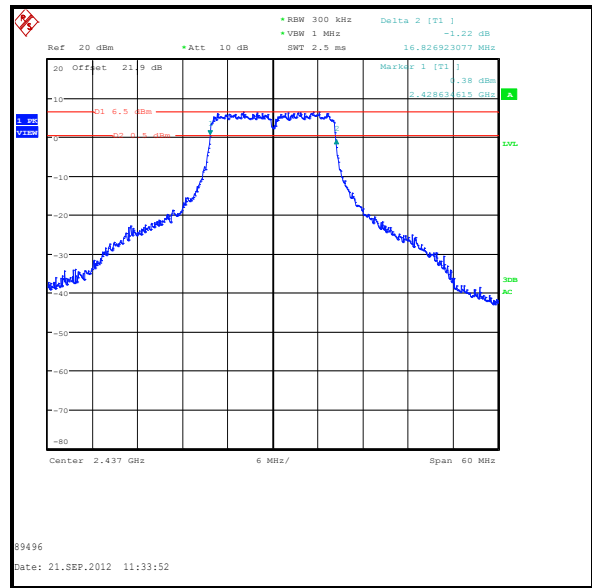
Transmitter 6 dB Bandwidth (continued)

Results: 802.11g / 20 MHz / 24 Mbps / 16QAM / Port 2105

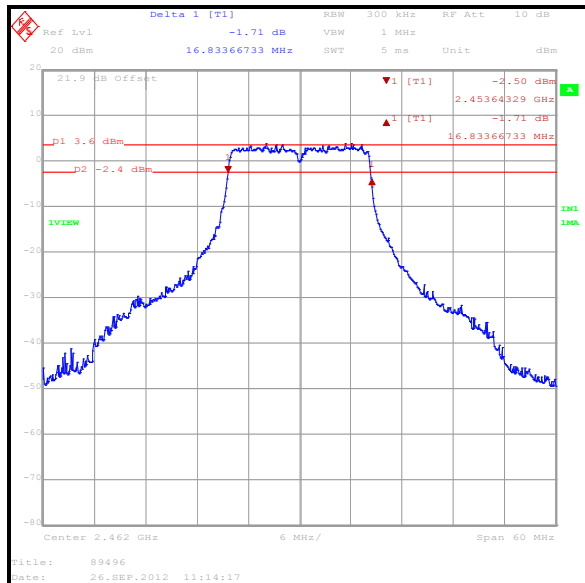
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	16.827	≥0.5	16.327	Complied
Middle	16.827	≥0.5	16.327	Complied
Top	16.834	≥0.5	16.334	Complied



Bottom Channel



Middle Channel

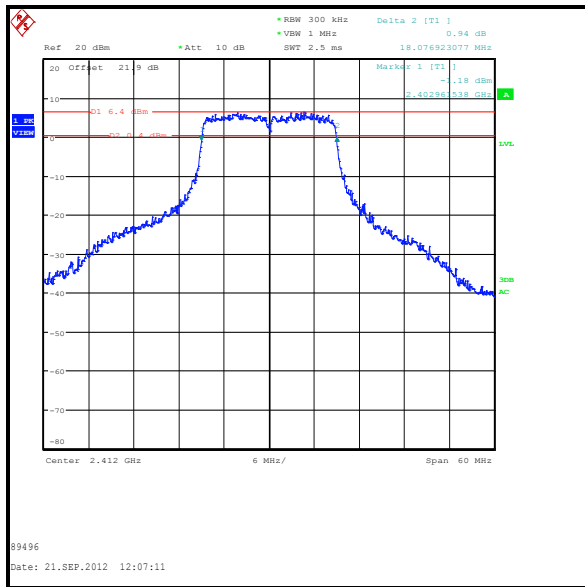


Top Channel

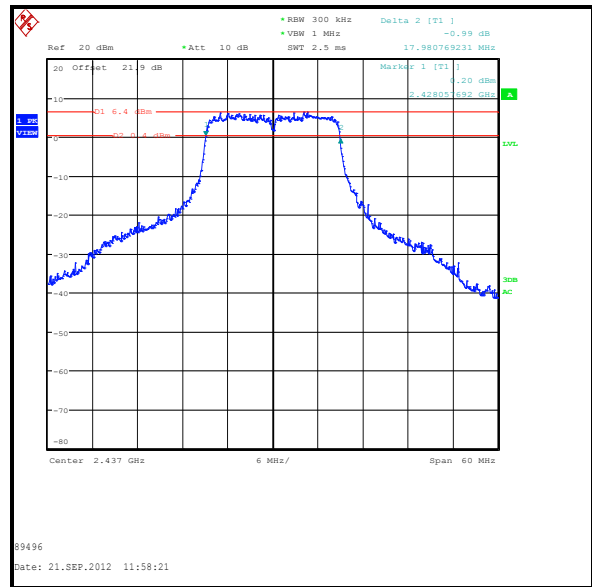
Transmitter 6 dB Bandwidth (continued)

Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM / Port 2104

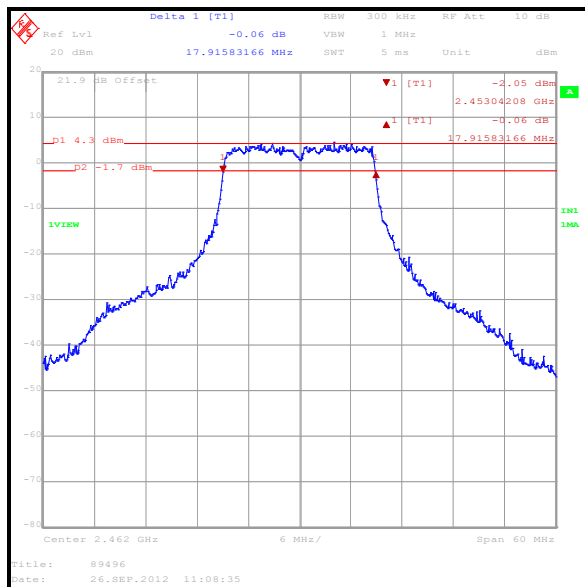
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	18.077	≥0.5	17.577	Complied
Middle	17.981	≥0.5	17.481	Complied
Top	17.916	≥0.5	17.416	Complied



Bottom Channel



Middle Channel

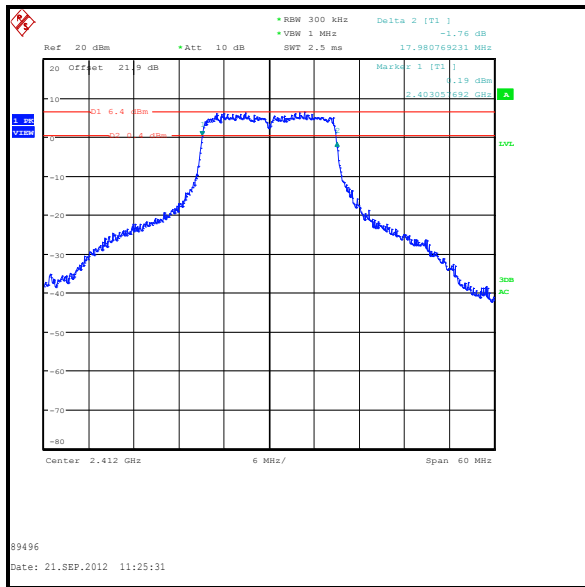


Top Channel

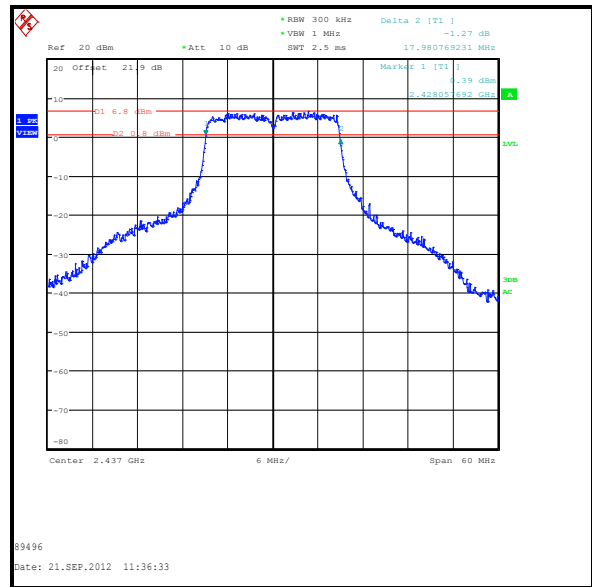
Transmitter 6 dB Bandwidth (continued)

Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM / Port 2105

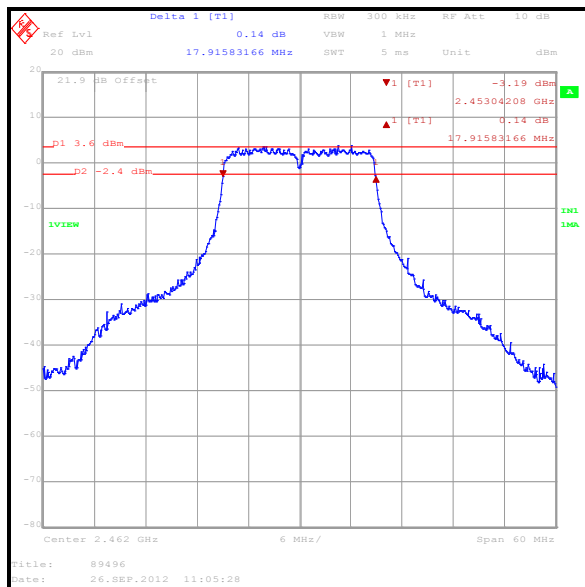
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	17.981	≥0.5	17.481	Complied
Middle	17.981	≥0.5	17.481	Complied
Top	17.916	≥0.5	17.416	Complied



Bottom Channel



Middle Channel

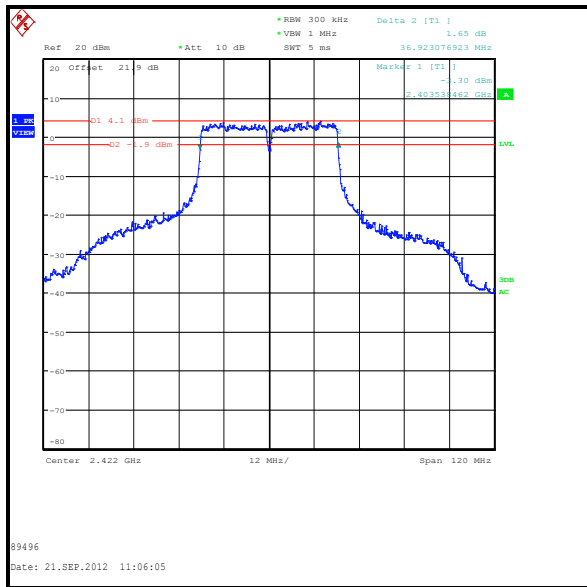


Top Channel

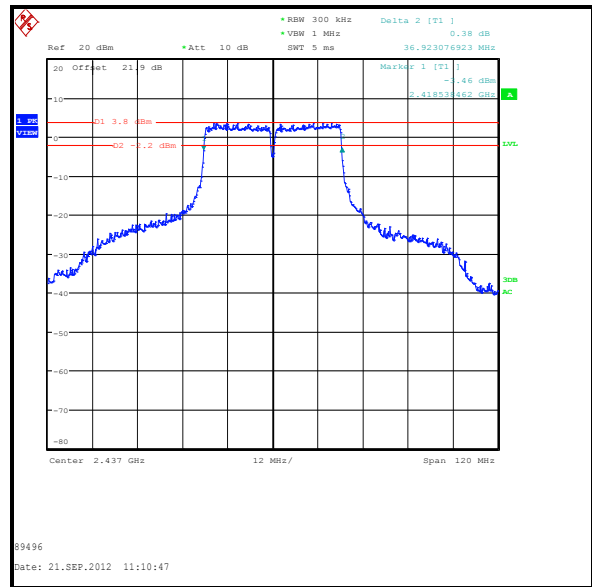
Transmitter 6 dB Bandwidth (continued)

Results: 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM / Port 2104

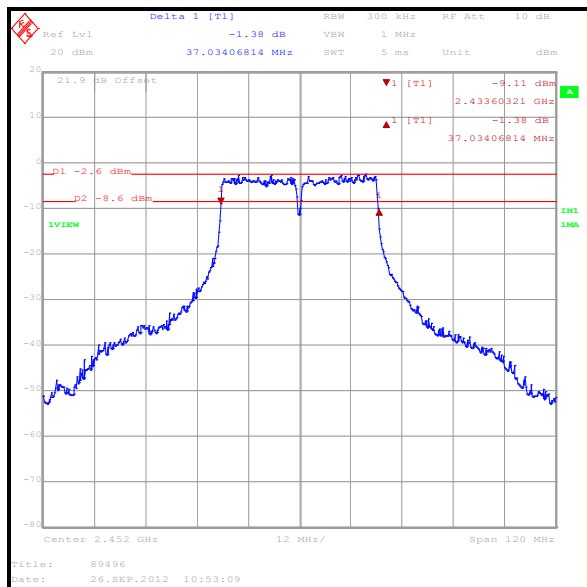
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	36.923	≥0.5	36.423	Complied
Middle	36.923	≥0.5	36.423	Complied
Top	37.034	≥0.5	36.534	Complied



Bottom Channel



Middle Channel

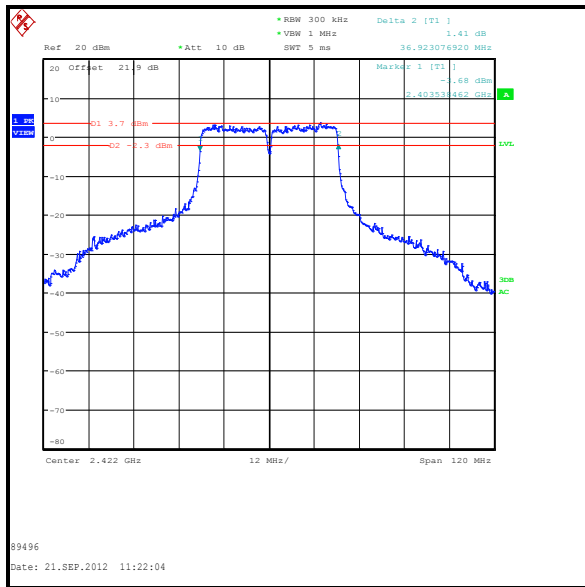


Top Channel

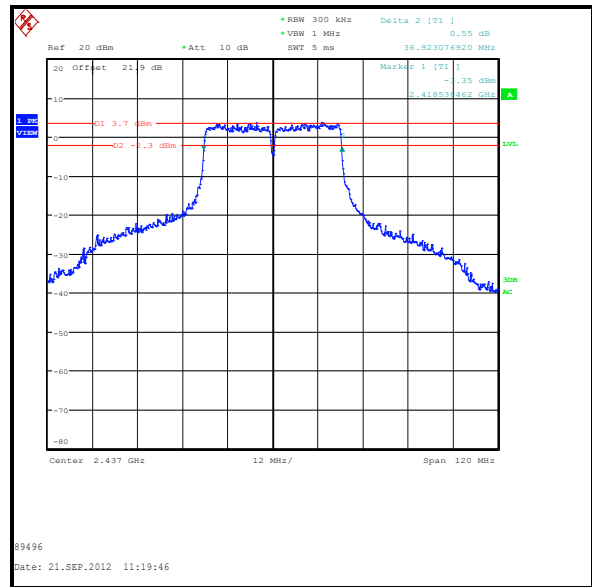
Transmitter 6 dB Bandwidth (continued)

Results: 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM / Port 2105

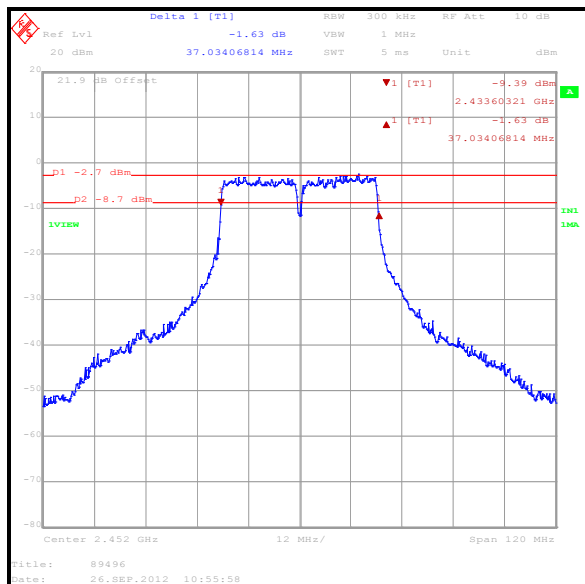
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	36.923	≥0.5	36.423	Complied
Middle	36.923	≥0.5	36.423	Complied
Top	37.034	≥0.5	36.534	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter 6 dB Bandwidth (continued)**Test Equipment Used:**

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1393	Attenuator	6820.17.B	06 Jul 2013	12
A1999	Attenuator	6820.17.B	04 Apr 2013	12
M1630	Test Receiver	ESU40	13 Jan 2013	12

5.2.5. Transmitter Power Spectral Density**Test Summary:**

Test Engineer:	Sarah Williams	Test Dates:	22 August 2012, 21 September 2012 & 26 September 2012
Test Sample Serial Number:	LK220202177		

FCC Reference:	Part 15.247(e)
Test Method Used:	KDB 558074 Section 5.3.1

Environmental Conditions:

Temperature (°C):	19 to 22
Relative Humidity (%):	47 to 61

Transmitter Power Spectral Density (continued)**Note(s):**

1. Transmitter Power Spectral Density tests in all bands were performed using a test receiver in accordance with FCC KDB 558074 Section 5.3.1 Measurement Procedure PKSPD.
2. The EUT has two RF ports, P2104 and P2105. PSD from both ports was measured and combined using the measure-and-sum method stated in FCC KDB 662911 D01.
3. The EUT was configured with a power setting of 14.0 dBm on all bottom and middle channels and both channel bandwidths.
4. The top channel was configured with the following power settings:
 - 802.11b – 14.0 dBm
 - 802.11g – 11.5 dBm
 - 802.11n HT20 – 11.5 dBm
 - 802.11n HT40 – 9.5 dBm.
5. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and widest bandwidth were:
 - 802.11b – DQPSK / 5.5 Mbps
 - 802.11g – 16QAM / 24 Mbps
 - 802.11n HT20 – 16QAM / 26 Mbps / MCS3
 - 802.11n HT40 – 16QAM / 54 Mbps / MCS3

Measurements were performed on the required channels and ports.

6. A 20 dB attenuator and RF cable were used to connect the measurement equipment to the EUT. The combined cable and attenuator loss was measured prior to performing the measurements and the loss compensation incorporated into the measurement results.
7. In accordance with FCC KDB 558074 Section 5.3.1, the measurements were performed using a 100 kHz resolution bandwidth. A Band Width Correction Factor of 15.2 dB was then subtracted from the combined results to convert from a level measured in 100 kHz bandwidth as the limit is specified in a 3 kHz bandwidth. The correction factor (BWCF) was calculated as shown below:

$$10 \log_{10} (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

8. The Customer declared that the transmit signals from both ports are correlated. The Customer stated that the 2 antennas used have unequal antenna gains: G1 = 4.2 dBi and G2 = 4.1 dBi. The directional gain was calculated in accordance with FCC KDB 662911 D01 Directional Gain Calculations:

$$10 \log[(10^{G1/20} + 10^{G2/20})^2/2]$$

The total array gain was calculated as:

$$10 \log[(10^{4.2/20} + 10^{4.1/20})^2/2] = 7.2 \text{ dBi}$$

In accordance with 15.247(b)(4), 7.2 dBi is 1.2 dBi over the directional gain of 6 dBi therefore the PSD limit of 8 dBm is reduced to 6.8 dBm.

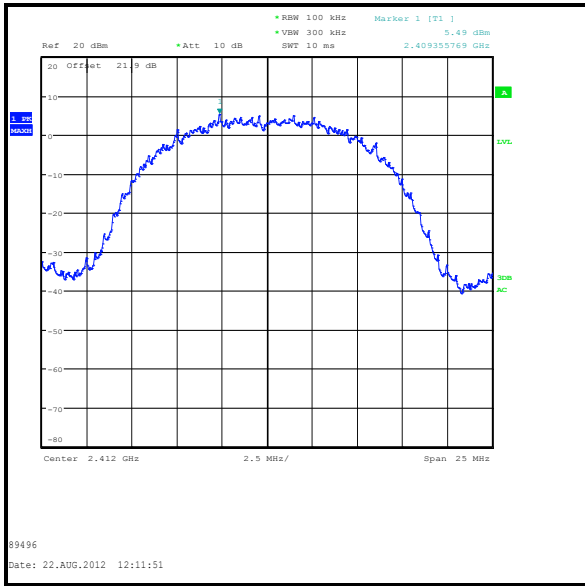
Transmitter Power Spectral Density (continued)**Results: 802.11b / 20 MHz / 5.5 Mbps / DQPSK**

Channel	PSD P2104 (dBm / 100 kHz)	PSD P2104 (dBm / 3 kHz)	PSD P2105 (dBm / 100 kHz)	PSD P2105 (dBm / 3 kHz)
Bottom	5.5	-9.7	5.3	-9.9
Middle	5.6	-9.6	5.3	-9.9
Top	5.1	-10.1	4.9	-10.3

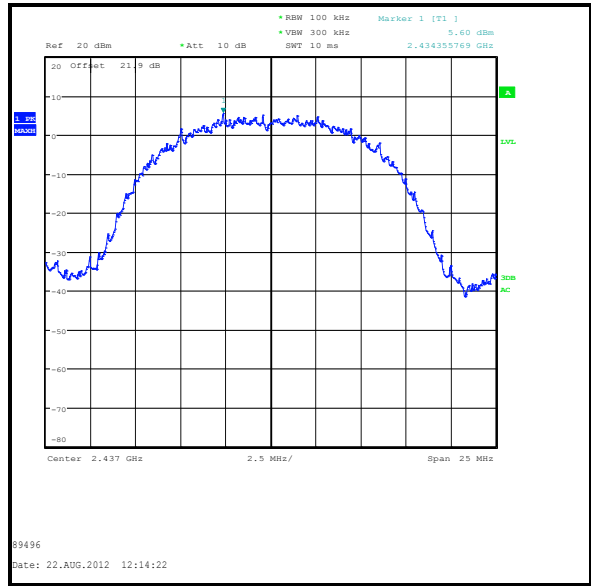
Channel	Combined PSD P2104 & P2105 (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	-6.8	6.8	13.6	Complied
Middle	-6.7	6.8	13.5	Complied
Top	-7.2	6.8	14.0	Complied

Transmitter Power Spectral Density (continued)

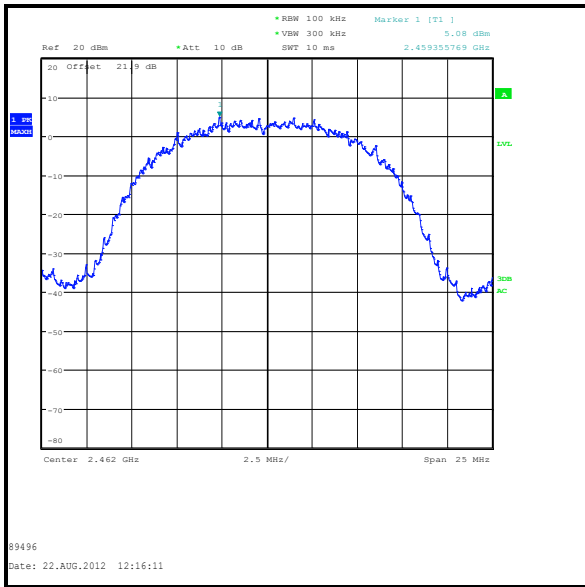
Results: 802.11b / 20 MHz / 5.5 Mbps / DQPSK / Port 2104



Bottom Channel



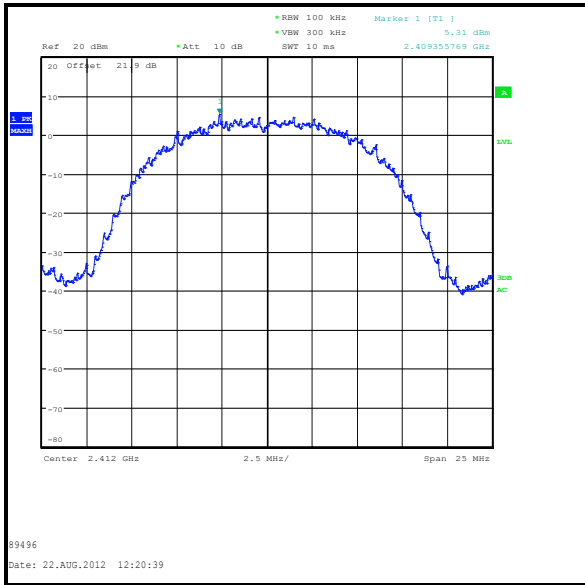
Middle Channel



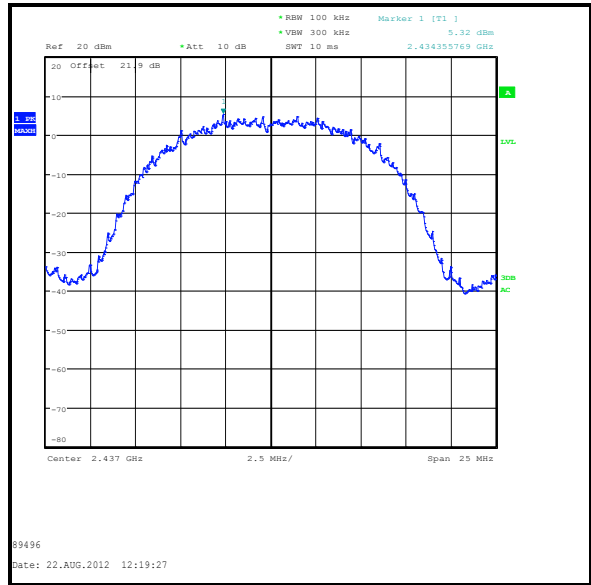
Top Channel

Transmitter Power Spectral Density (continued)

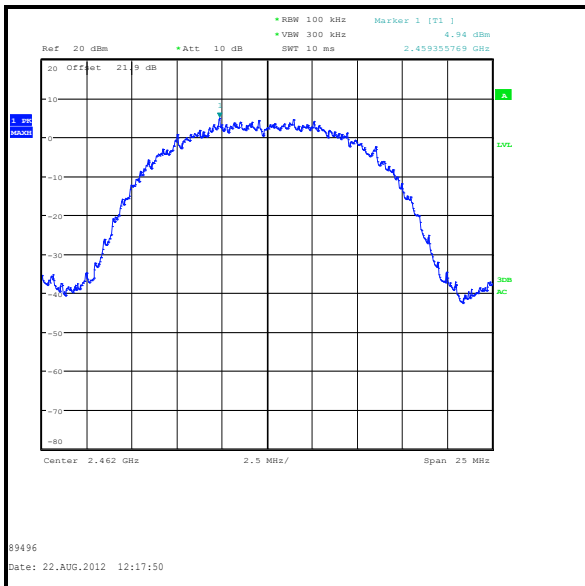
Results: 802.11b / 20 MHz / 5.5 Mbps / DQPSK / Port 2105



Bottom Channel



Middle Channel



Top Channel

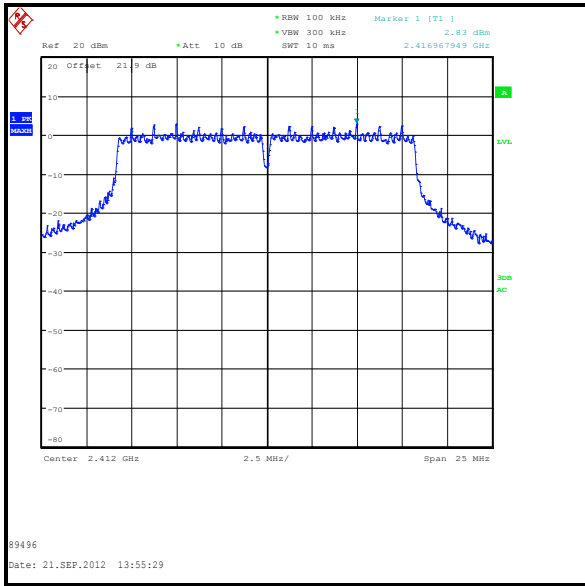
Transmitter Power Spectral Density (continued)**Results: 802.11g / 20 MHz / 24 Mbps / 16QAM**

Channel	PSD P2104 (dBm / 100 kHz)	PSD P2104 (dBm / 3 kHz)	PSD P2105 (dBm / 100 kHz)	PSD P2105 (dBm / 3 kHz)
Bottom	2.8	-12.4	2.8	-12.4
Middle	2.8	-12.4	2.9	-12.3
Top	0	-15.2	-0.1	-15.3

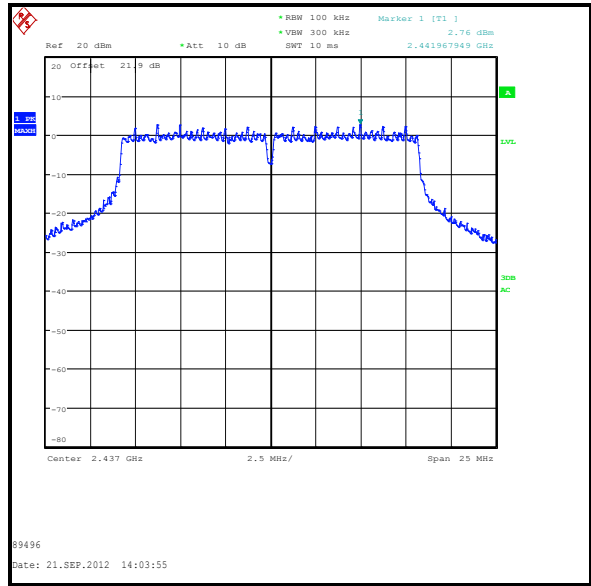
Channel	Combined PSD P2104 & P2105 (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	-9.4	6.8	16.2	Complied
Middle	-9.3	6.8	16.1	Complied
Top	-12.2	6.8	19.0	Complied

Transmitter Power Spectral Density (continued)

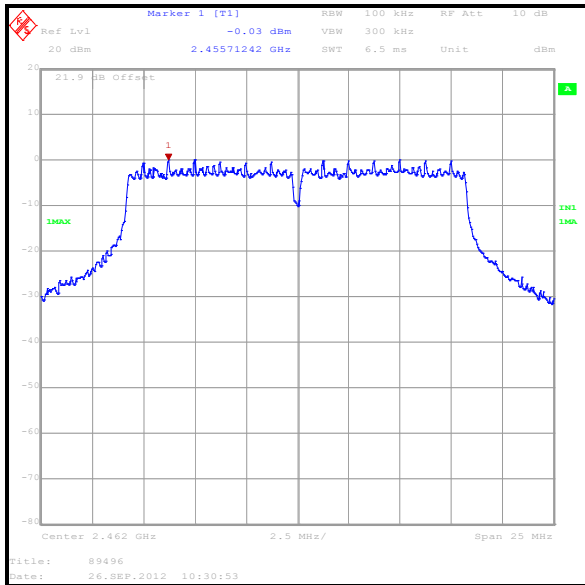
Results: 802.11g / 20 MHz / 24 Mbps / 16QAM / Port 2104



Bottom Channel



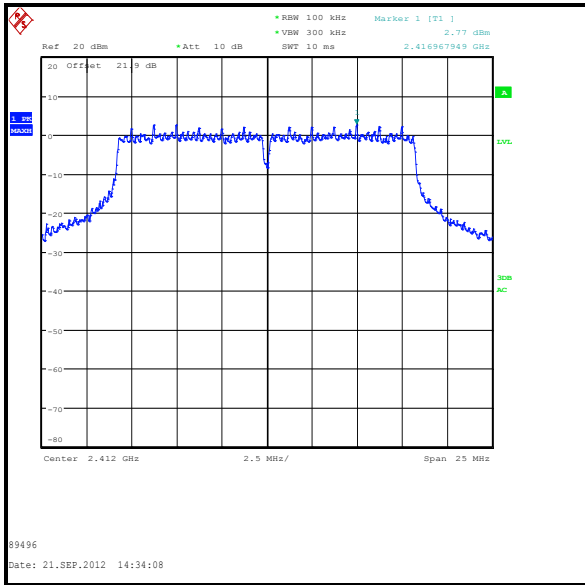
Middle Channel



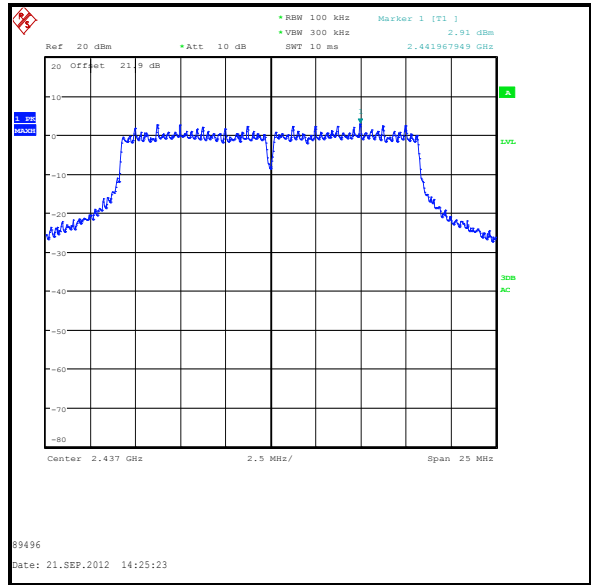
Top Channel

Transmitter Power Spectral Density (continued)

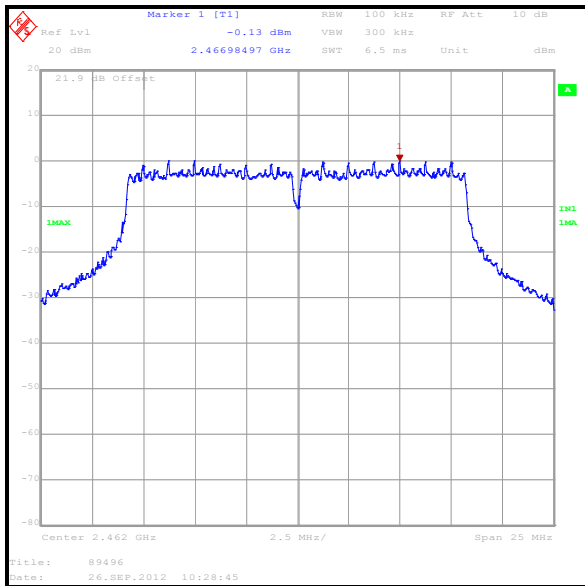
Results: 802.11g / 20 MHz / 24 Mbps / 16QAM / Port 2105



Bottom Channel



Middle Channel



Top Channel

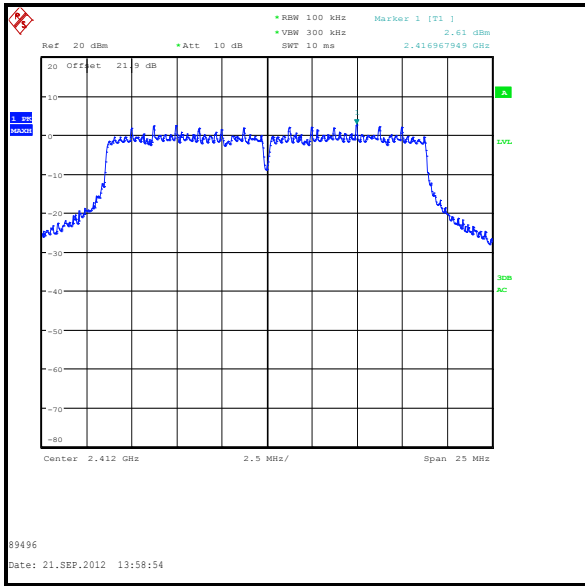
Transmitter Power Spectral Density (continued)**Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM**

Channel	PSD P2104 (dBm / 100 kHz)	PSD P2104 (dBm / 3 kHz)	PSD P2105 (dBm / 100 kHz)	PSD P2105 (dBm / 3 kHz)
Bottom	2.6	-12.6	2.7	-12.5
Middle	2.7	-12.5	2.9	-12.3
Top	0.2	-15.0	-0.1	-15.3

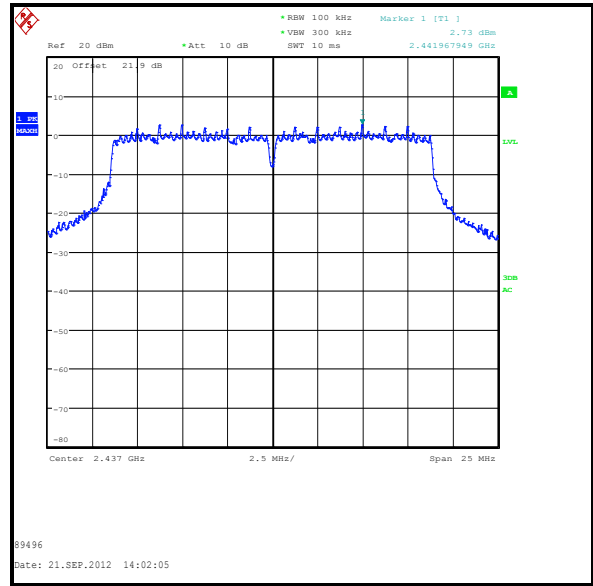
Channel	Combined PSD P2104 & P2105 (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	-9.5	6.8	16.3	Complied
Middle	-9.4	6.8	16.2	Complied
Top	-12.1	6.8	18.9	Complied

Transmitter Power Spectral Density (continued)

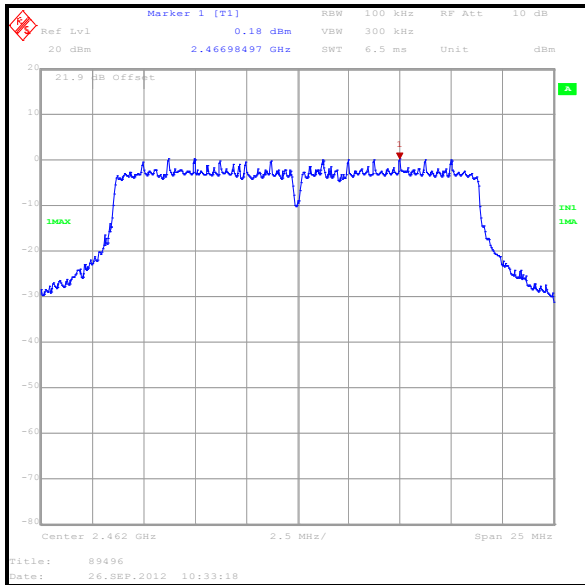
Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM / Port 2104



Bottom Channel



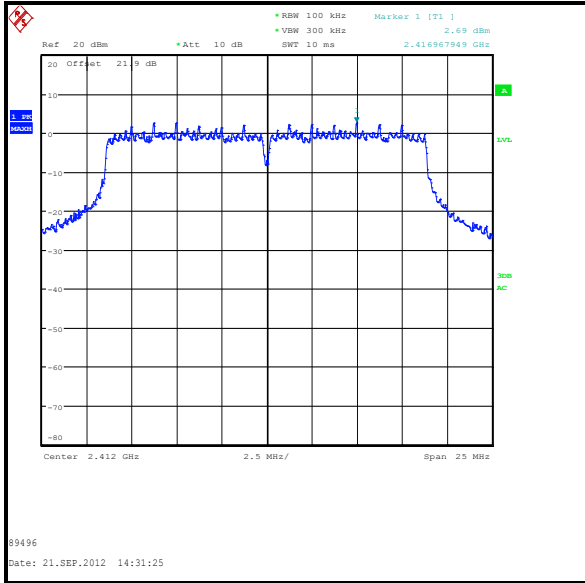
Middle Channel



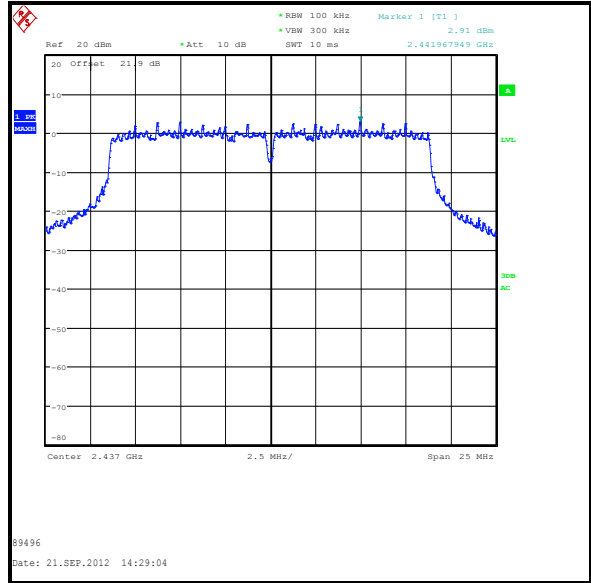
Top Channel

Transmitter Power Spectral Density (continued)

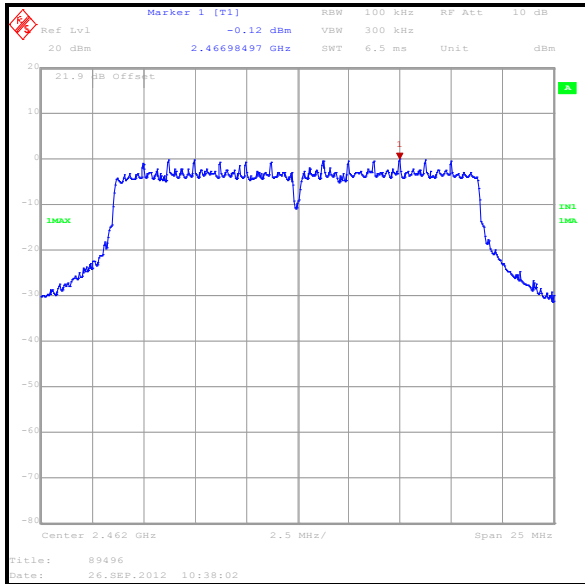
Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM / Port 2105



Bottom Channel



Middle Channel



Top Channel

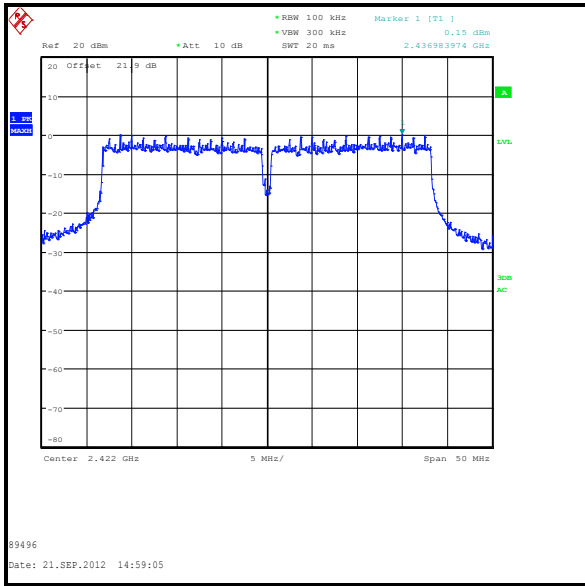
Transmitter Power Spectral Density (continued)**Results: 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM**

Channel	PSD P2104 (dBm / 100 kHz)	PSD P2104 (dBm / 3 kHz)	PSD P2105 (dBm / 100 kHz)	PSD P2105 (dBm / 3 kHz)
Bottom	0.2	-15.0	0	-15.2
Middle	0.3	-14.9	0.3	-14.9
Top	-6.4	-21.6	-6.3	-21.5

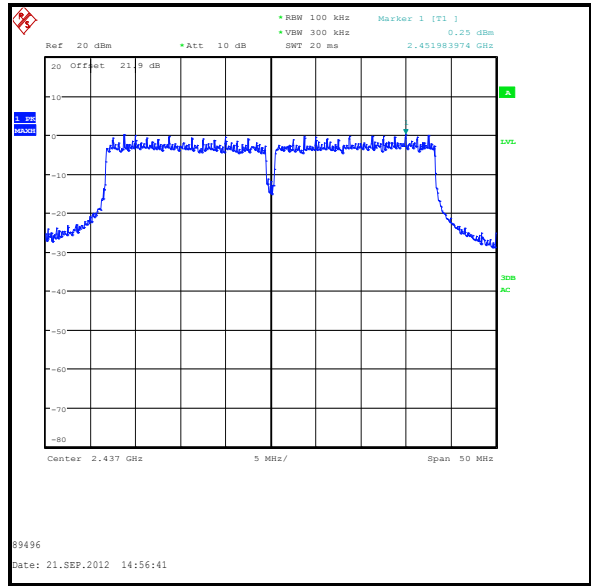
Channel	Combined PSD P2104 & P2105 (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	-12.1	6.8	18.9	Complied
Middle	-11.9	6.8	18.7	Complied
Top	-18.5	6.8	25.3	Complied

Transmitter Power Spectral Density (continued)

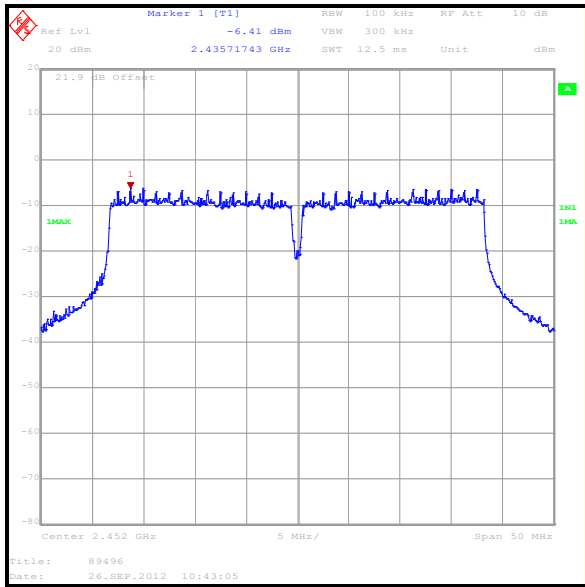
Results: 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM / Port 2104



Bottom Channel



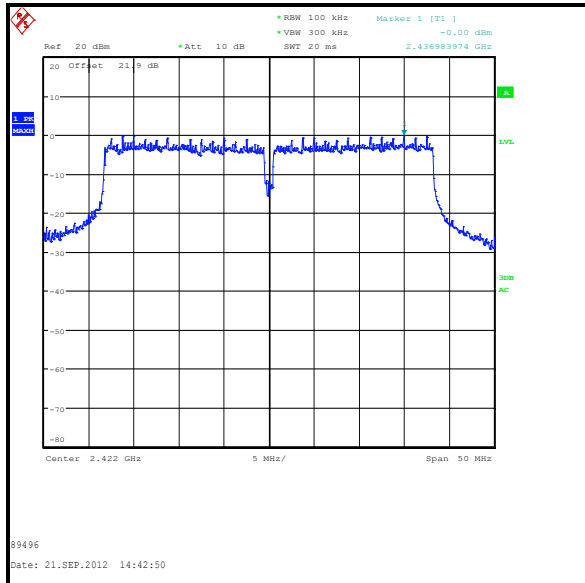
Middle Channel



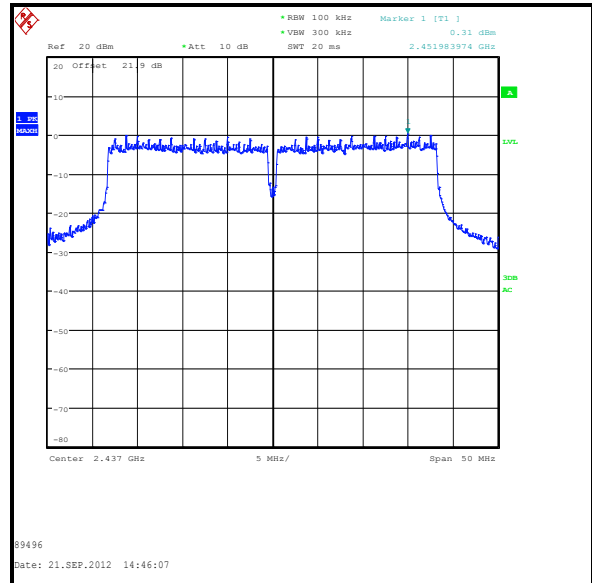
Top Channel

Transmitter Power Spectral Density (continued)

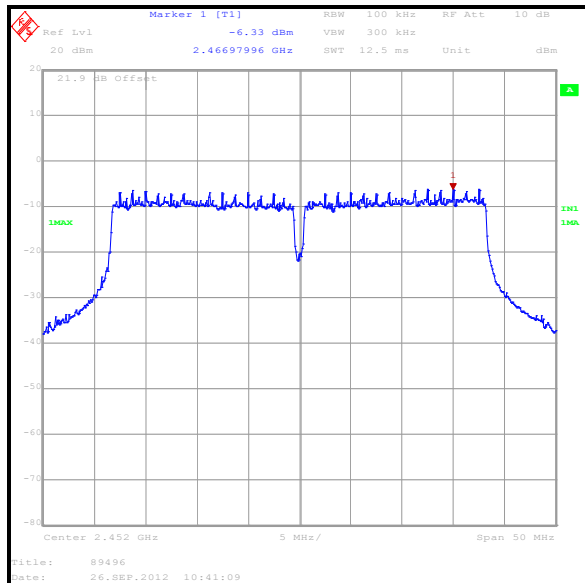
Results: 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM / Port 2105



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1393	Attenuator	6820.17.B	06 Jul 2013	12
A1999	Attenuator	6820.17.B	04 Apr 2013	12
M1630	Test Receiver	ESU40	13 Jan 2013	12

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

Test Engineer:	Sarah Williams	Test Dates:	23 August 2012, 21 September 2012 & 26 September 2012
Test Sample Serial Number:	LK220202177		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	KDB 558074 Section 5.2.1.2

Environmental Conditions:

Temperature (°C):	21 to 22
Relative Humidity (%):	47 to 58

Transmitter Maximum Peak Output Power (continued)**Note(s):**

1. All conducted power tests were performed using a test receiver in accordance with FCC KDB 558074 Section 5.2.1.2. Measurement Procedure PK2.
2. The EUT has two RF ports, P2104 and P2105. Power from both ports was measured and combined using the measure-and-sum method stated in FCC KDB 662911 D01.
3. The EUT was configured with a power setting of 14.0 dBm on all bottom and middle channels and both channel bandwidths.
4. The top channel was configured with the following power settings:
 - 802.11b – 14.0 dBm
 - 802.11g – 11.5 dBm
 - 802.11n HT20 – 11.5 dBm
 - 802.11n HT40 – 7.5 dBm.
5. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power (i.e. worst case) were:
 - 802.11b – DQPSK / 5.5 Mbps
 - 802.11g – 16QAM / 24 Mbps
 - 802.11n HT20 – 16QAM / 26 Mbps / MCS3
 - 802.11n HT40 – 16QAM / 54 Mbps / MCS3

Measurements were performed on the required channels and ports.

6. The combined cable and attenuator loss was measured prior to performing the measurements and the loss compensation incorporated into the measurement results.
7. The Customer declared that the transmit signals from both ports are correlated. The Customer stated that the 2 antennas used have unequal antenna gains: G1 = 4.2 dBi and G2 = 4.1 dBi. The directional gain was calculated in accordance with FCC KDB 662911 D01 Directional Gain Calculations:

$$10 \log[(10^{G1/20} + 10^{G2/20})^2/2]$$

The total array gain was calculated as:

$$10 \log[(10^{4.2/20} + 10^{4.1/20})^2/2] = 7.2 \text{ dBi}$$

In accordance with 15.247(b)(4), 7.2 dBi is 1.2 dBi over the directional gain of 6 dBi therefore the maximum conducted output power limit of 30 dBm is reduced to 28.8 dBm.

8. The conducted peak power from both ports have been combined and added to the total array gain to calculate the EIRP. The De Facto EIRP limit of 36 dBm has been reduced to 34.8 dBm.

Transmitter Maximum Peak Output Power (continued)**Results: 802.11b / 20 MHz / 5.5 Mbps / DQPSK****Peak Power**

Channel	P2104 Conducted Peak Power (dBm)	P2105 Conducted Peak Power (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	21.4	21.4	24.4	28.8	4.4	Complied
Middle	21.5	21.5	24.5	28.8	4.3	Complied
Top	21.4	21.2	24.3	28.8	4.5	Complied

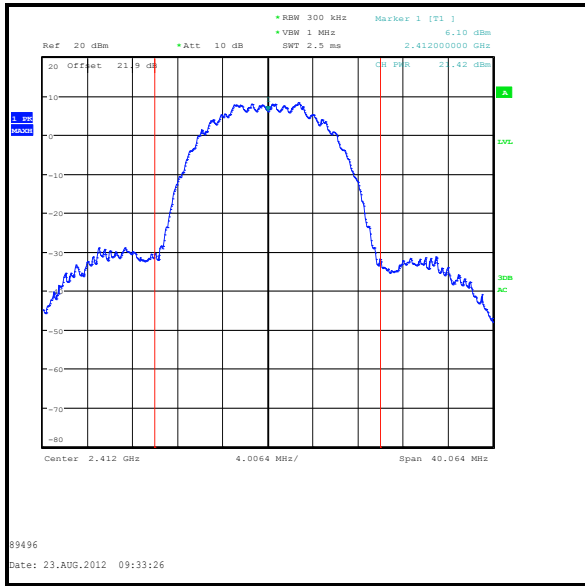
EIRP

Channel	Combined Peak Power (dBm)	Calculated Array Gain (dBi)	EIRP / Combined Peak Power + Array Gain (dBm)
Bottom	24.4	7.2	31.6
Middle	24.5	7.2	31.7
Top	24.3	7.2	31.5

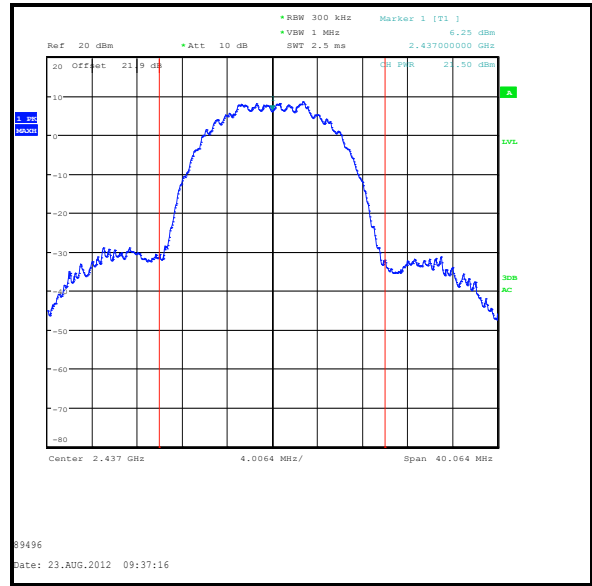
Channel	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	31.6	34.8	3.2	Complied
Middle	31.7	34.8	3.1	Complied
Top	31.5	34.8	3.3	Complied

Transmitter Maximum Peak Output Power (continued)

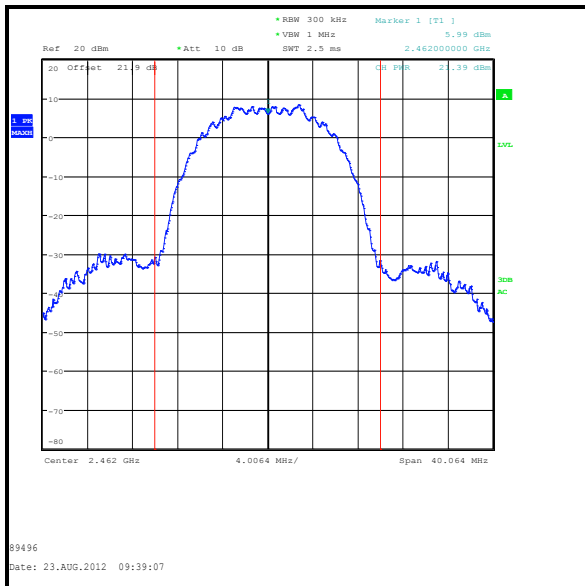
Results: 802.11b / 20 MHz / 5.5 Mbps / DQPSK / Port 2104



Bottom Channel



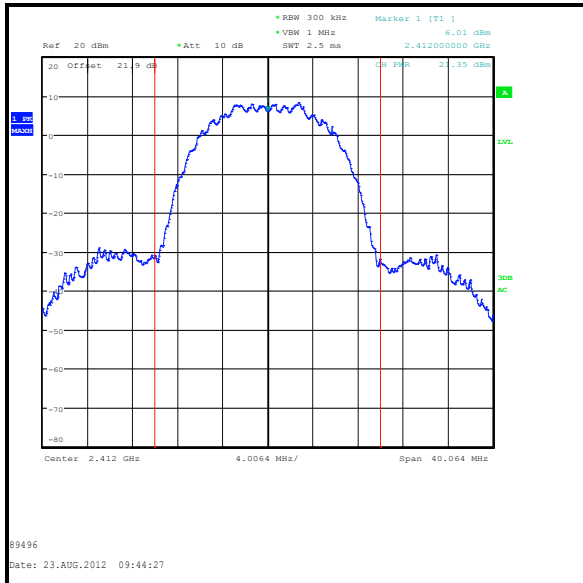
Middle Channel



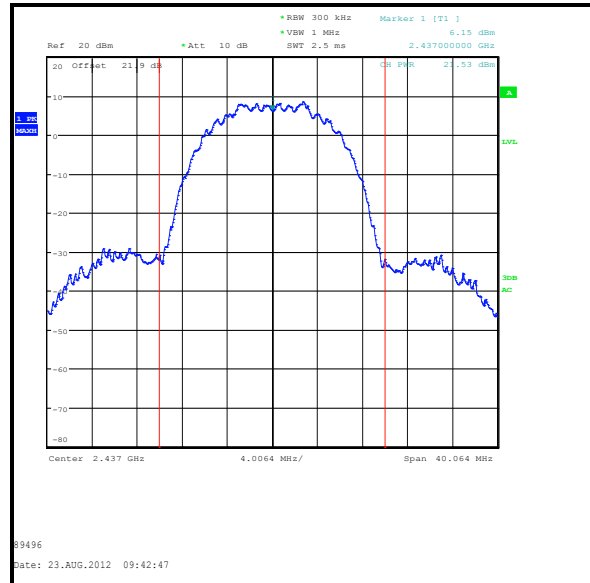
Top Channel

Transmitter Maximum Peak Output Power (continued)

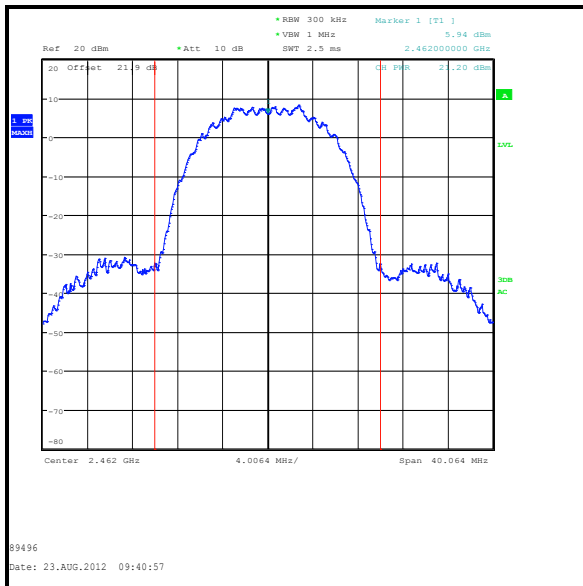
Results: 802.11b / 20 MHz / 5.5 Mbps / DQPSK / Port 2105



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Peak Output Power (continued)**Results: 802.11g / 20 MHz / 24 Mbps / 16QAM****Peak Power**

Channel	P2104 Conducted Peak Power (dBm)	P2105 Conducted Peak Power (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	22.3	22.1	25.2	28.8	3.6	Complied
Middle	22.6	22.4	25.5	28.8	3.3	Complied
Top	19.6	19.3	22.5	28.8	6.3	Complied

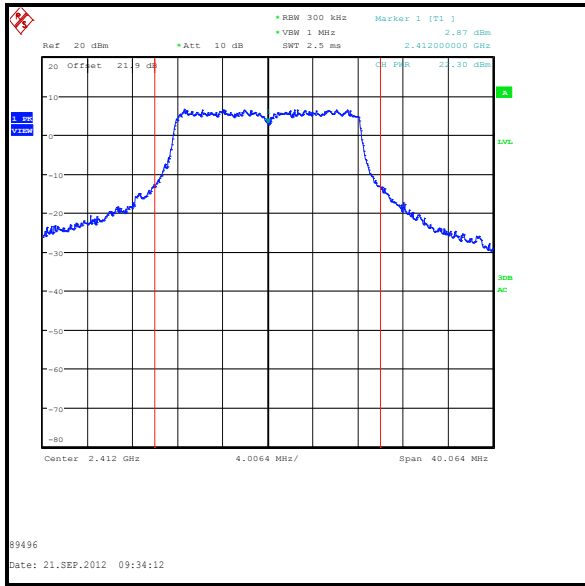
EIRP

Channel	Combined Peak Power (dBm)	Calculated Array Gain (dBi)	EIRP / Combined Peak Power + Array Gain (dBm)
Bottom	25.2	7.2	32.4
Middle	25.5	7.2	32.7
Top	22.5	7.2	29.7

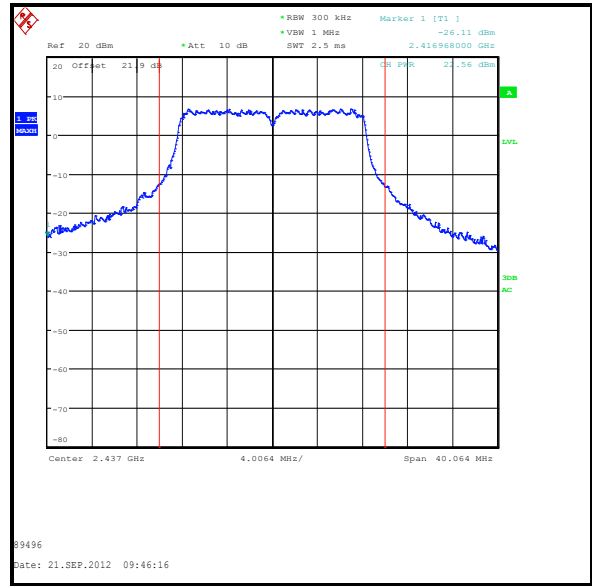
Channel	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	32.4	34.8	2.4	Complied
Middle	32.7	34.8	2.1	Complied
Top	29.7	34.8	5.1	Complied

Transmitter Maximum Peak Output Power (continued)

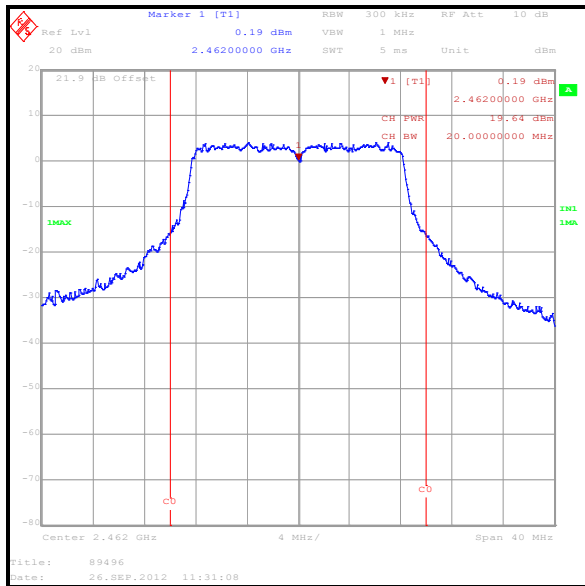
Results: 802.11g / 20 MHz / 24 Mbps / 16QAM / Port 2104



Bottom Channel



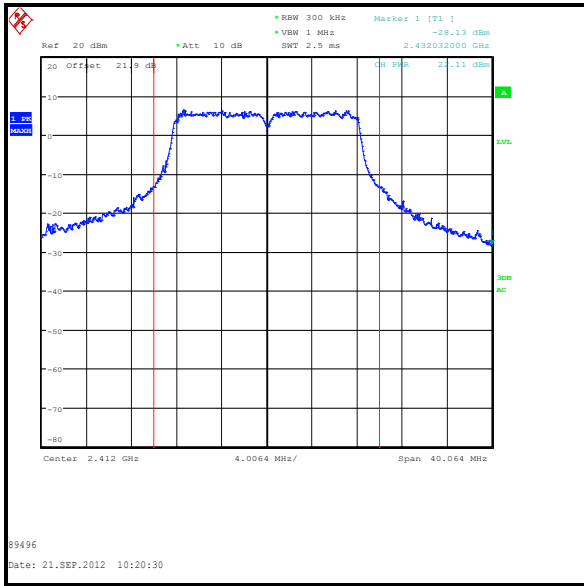
Middle Channel



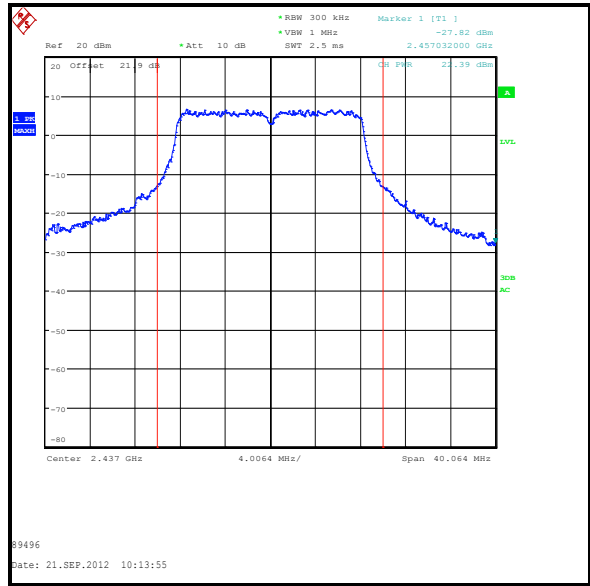
Top Channel

Transmitter Maximum Peak Output Power (continued)

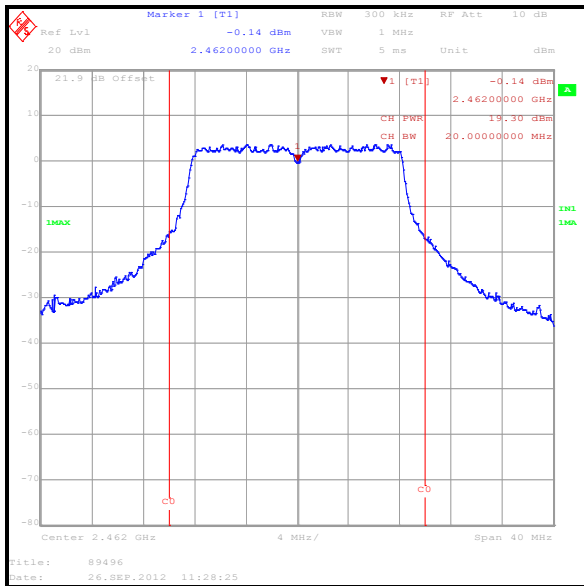
Results: 802.11g / 20 MHz / 24 Mbps / 16QAM / Port 2105



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Peak Output Power (continued)**Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM****Peak Power**

Channel	P2104 Conducted Peak Power (dBm)	P2105 Conducted Peak Power (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	22.4	22.2	25.3	28.8	3.5	Complied
Middle	22.6	22.5	25.6	28.8	3.2	Complied
Top	19.8	19.3	22.3	28.8	6.5	Complied

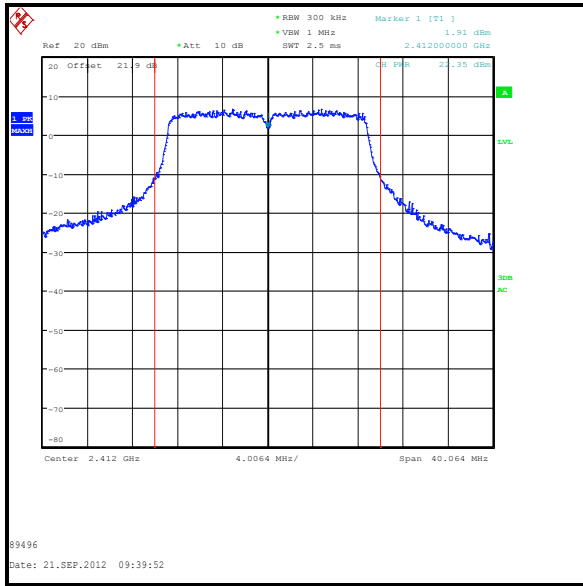
EIRP

Channel	Combined Peak Power (dBm)	Calculated Array Gain (dBi)	EIRP / Combined Peak Power + Array Gain (dBm)
Bottom	25.3	7.2	32.5
Middle	25.6	7.2	32.8
Top	22.3	7.2	29.5

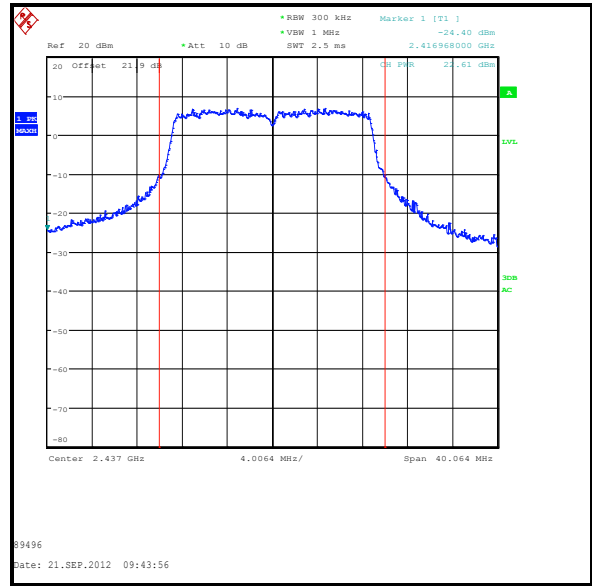
Channel	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	32.5	34.8	2.3	Complied
Middle	32.8	34.8	2.0	Complied
Top	29.5	34.8	5.3	Complied

Transmitter Maximum Peak Output Power (continued)

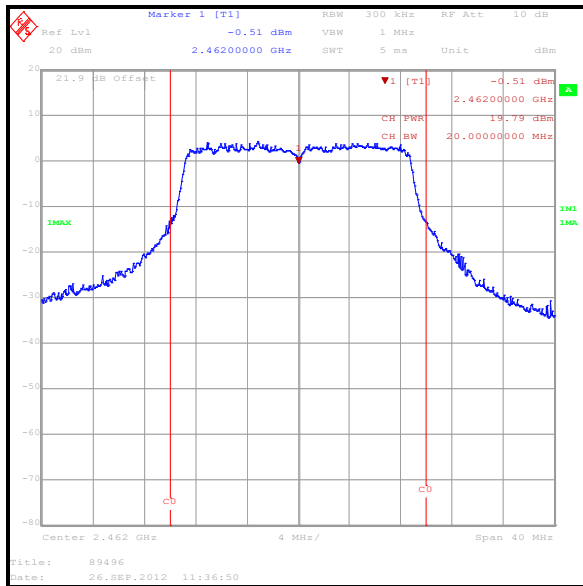
Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM / Port 2104



Bottom Channel



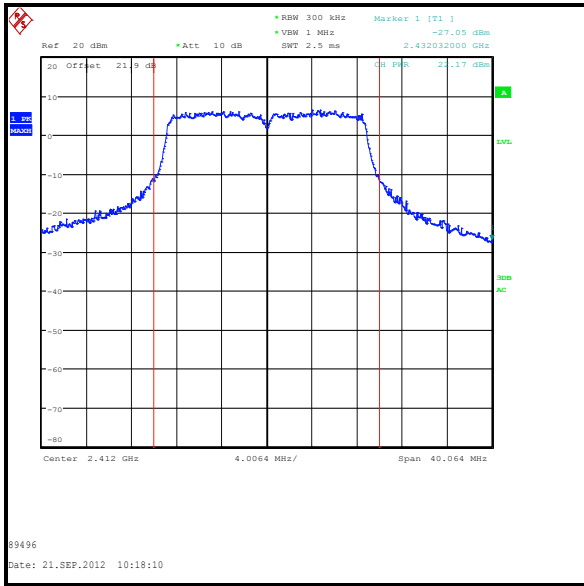
Middle Channel



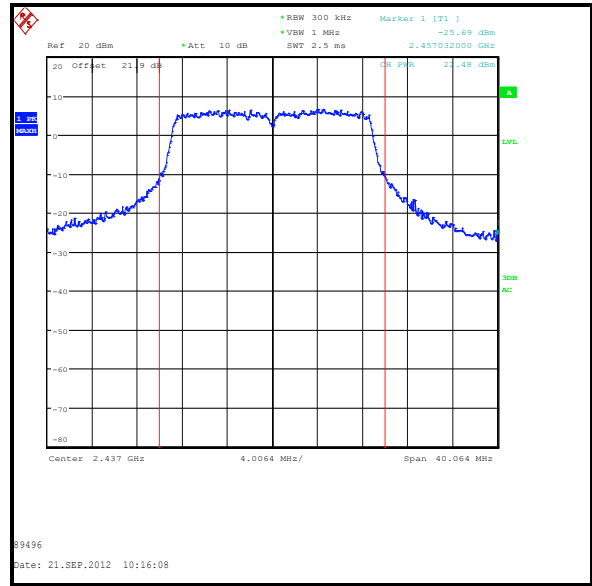
Top Channel

Transmitter Maximum Peak Output Power (continued)

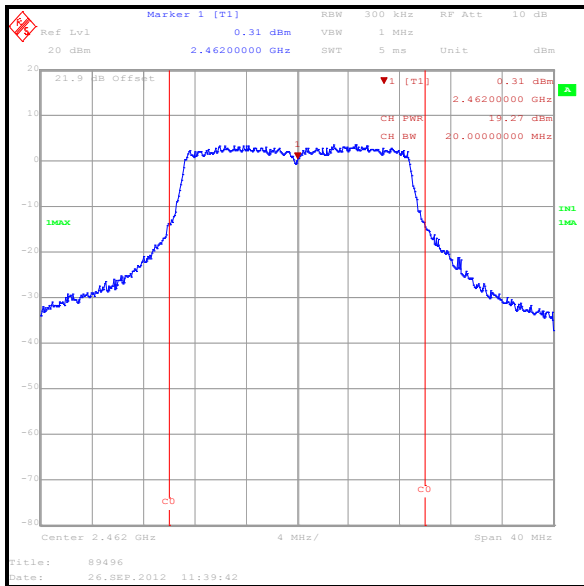
Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM / Port 2105



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Peak Output Power (continued)**Results: 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM****Peak Power**

Channel	P2104 Conducted Peak Power (dBm)	P2105 Conducted Peak Power (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	22.5	22.5	25.5	28.8	3.3	Complied
Middle	22.6	22.7	25.7	28.8	3.1	Complied
Top	16.3	16.0	19.2	28.8	9.6	Complied

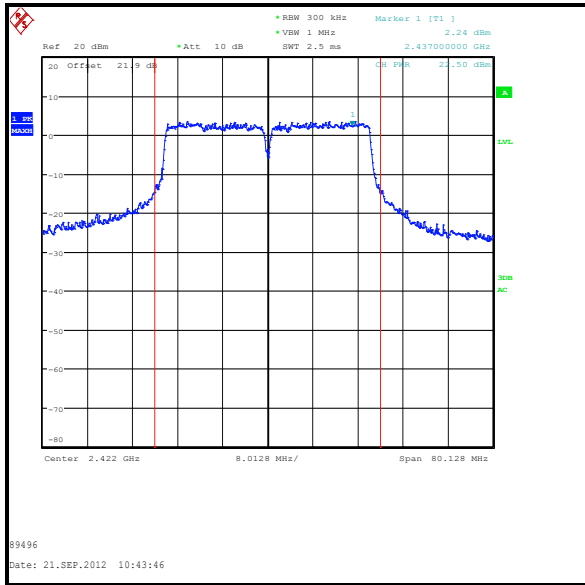
EIRP

Channel	Combined Peak Power (dBm)	Calculated Array Gain (dBi)	EIRP / Combined Peak Power + Array Gain (dBm)
Bottom	25.5	7.2	32.7
Middle	25.7	7.2	32.9
Top	19.2	7.2	26.4

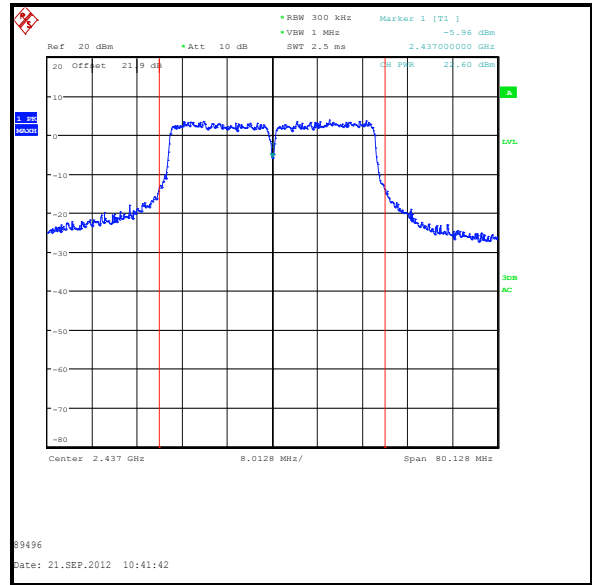
Channel	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	32.7	34.8	2.1	Complied
Middle	32.9	34.8	1.9	Complied
Top	26.4	34.8	8.4	Complied

Transmitter Maximum Peak Output Power (continued)

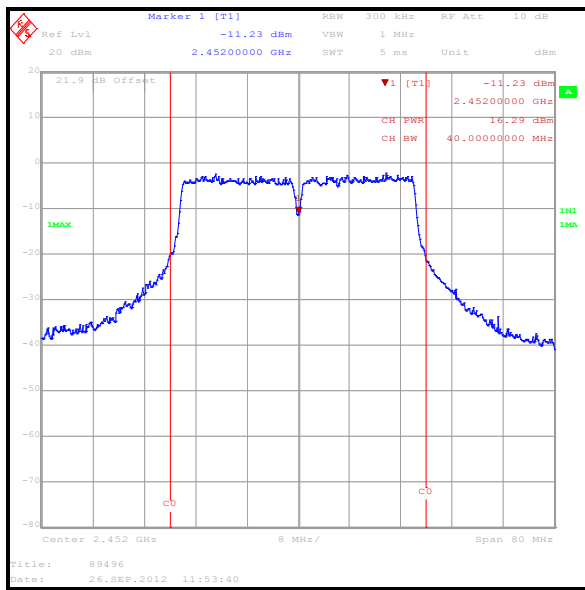
Results: 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM / Port 2104



Bottom Channel



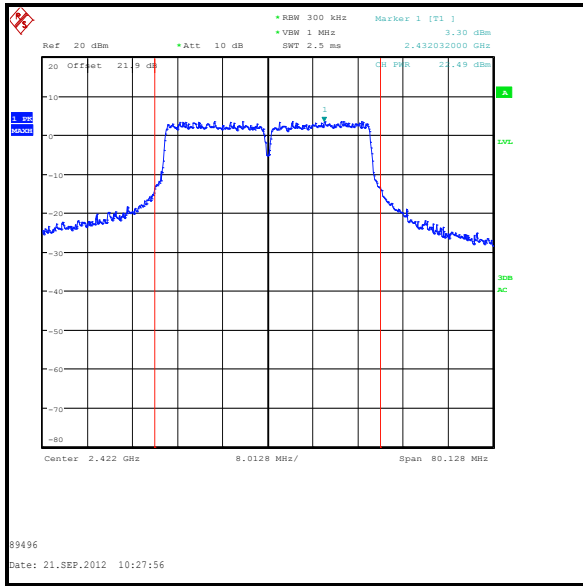
Middle Channel



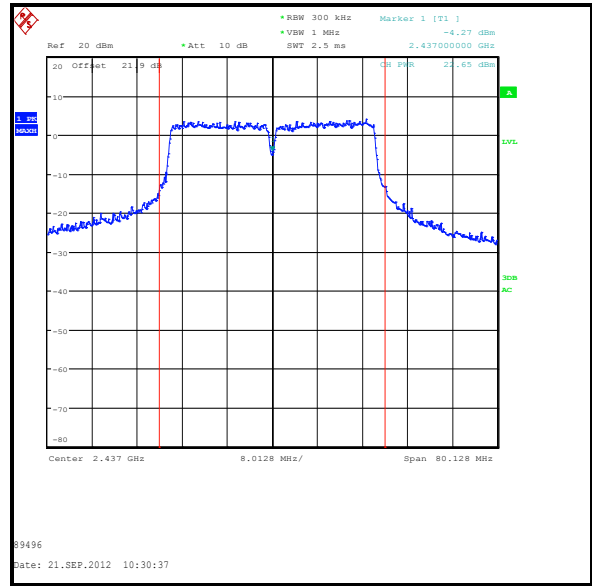
Top Channel

Transmitter Maximum Peak Output Power (continued)

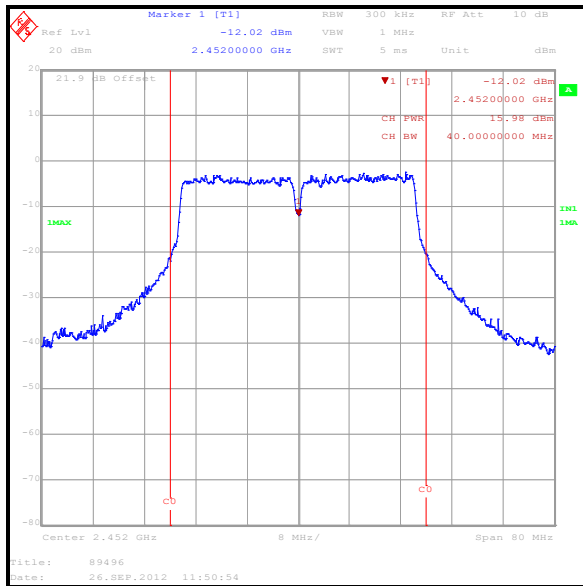
Results: 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM / Port 2105



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1393	Attenuator	6820.17.B	06 Jul 2013	12
A1999	Attenuator	6820.17.B	04 Apr 2013	12
M1630	Test Receiver	ESU40	13 Jan 2013	12

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

Test Engineer:	Steven White	Test Date:	24 August 2012
Test Sample Serial Number:	LK220202169		

FCC Reference:	Part 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):	25.9
Relative Humidity (%):	42.0

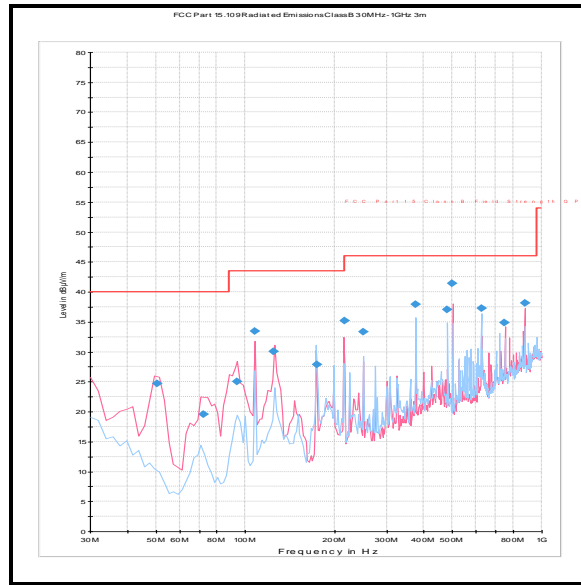
Note(s):

1. Measurements below 1GHz were performed on the top channel, which also exhibited the highest output power.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
4. The final measurements shown are within restricted bands, all other emissions were determined to be either unrestricted or greater than 20 dB below the appropriate limit.

Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / SW Power Level 11.5

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
124.966	Vertical	30.1	43.5	13.4	Complied
250.000	Vertical	33.3	46.0	12.7	Complied

Transmitter Radiated Emissions (continued)



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

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M1273	EMI Test Receiver	ESIB 26	03 Feb 2013	12
K0001	5m RSE Chamber	N/A	30 Sep 2012	12
A553	Antenna	CB6111A	15 Feb 2013	12
G0543	Amplifier	310N	15 Oct 2013	12
A1834	Attenuator	8491B	29 Jan 2013	12

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

Test Engineer:	Nick Steele	Test Date:	24 September 2012
Test Sample Serial Number:	LK220202169		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	40

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss
2. Pre scans were performed on the top channel, before final measurements were made on top, middle and bottom channels
3. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
4. The EUT was configured in 802.11n / MCS3 mode, with a software power setting of 14 dBm for bottom channel and middle channel and 11.5 dBm for top channel, this is as shown in the below headings
5. The emission shown at 2462 MHz on the 1 GHz to 4 GHz plot is the EUT fundamental.
6. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Radiated Emissions (continued)**Results: 802.11n / MCS3 / Peak / Bottom Channel / SW Power Level 14.0 dBm**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4823.130	Vertical	55.8	74.0	18.2	Complied
7237.538	Vertical	63.1	74.0	10.9	Complied

Results: 802.11n / MCS3 / Average / Bottom Channel / SW Power Level 14.0 dBm

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4823.130	Vertical	40.9	54.0	13.1	Complied
7237.538	Vertical	44.9	54.0	9.1	Complied

Results: 802.11n / MCS3 / Peak / Middle Channel / SW Power Level 14.0 dBm

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4870.291	Vertical	57.5	74.0	16.5	Complied
7309.056	Vertical	64.0	74.0	10.0	Complied

Results: 802.11n / MCS3 / Average / Middle Channel / SW Power Level 14.0 dBm

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4870.291	Vertical	41.8	54.0	12.2	Complied
7309.056	Vertical	45.4	54.0	8.6	Complied

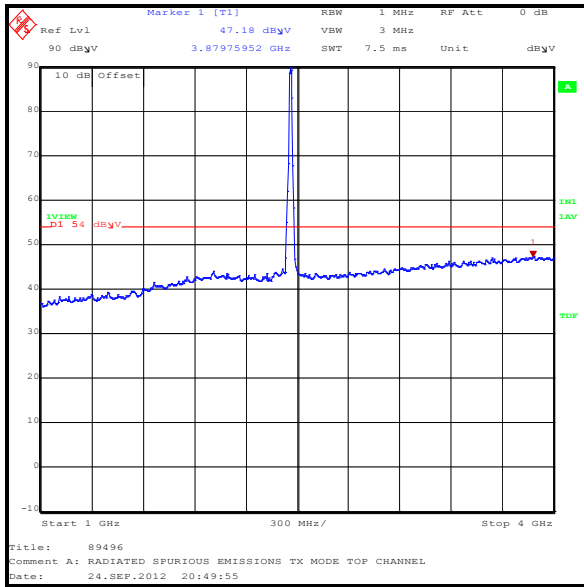
Results: 802.11n / MCS3 / Peak / Top Channel / SW Power Level 11.5 dBm

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4925.679	Vertical	56.0	74.0	18.0	Complied
7392.097	Vertical	59.4	74.0	14.6	Complied

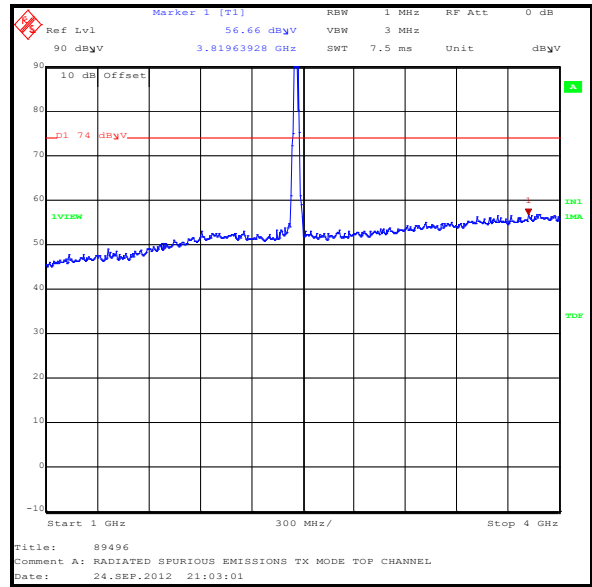
Results: 802.11n / MCS3 / Average / Top Channel / SW Power Level 11.5 dBm

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4925.679	Vertical	41.0	54.0	13.0	Complied
7392.097	Vertical	40.2	54.0	13.8	Complied

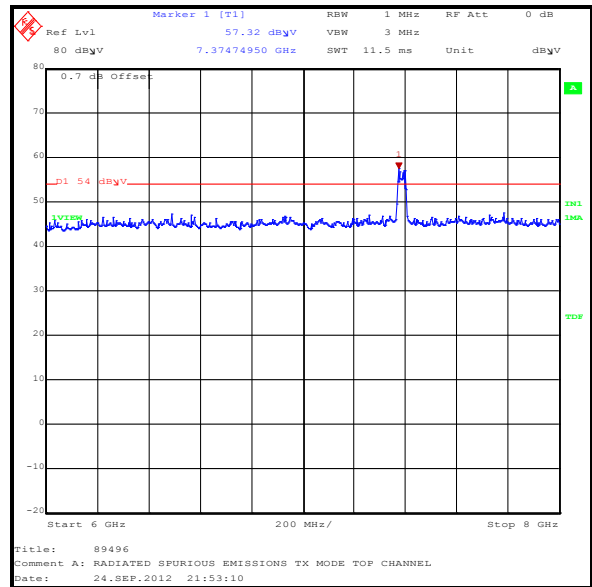
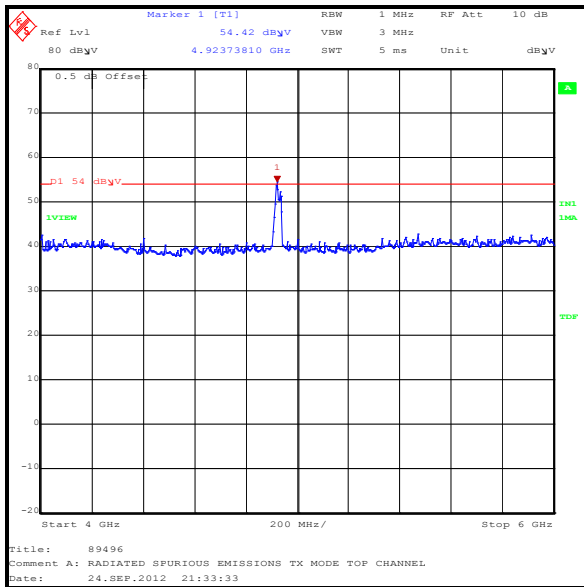
Transmitter Radiated Emissions (continued)



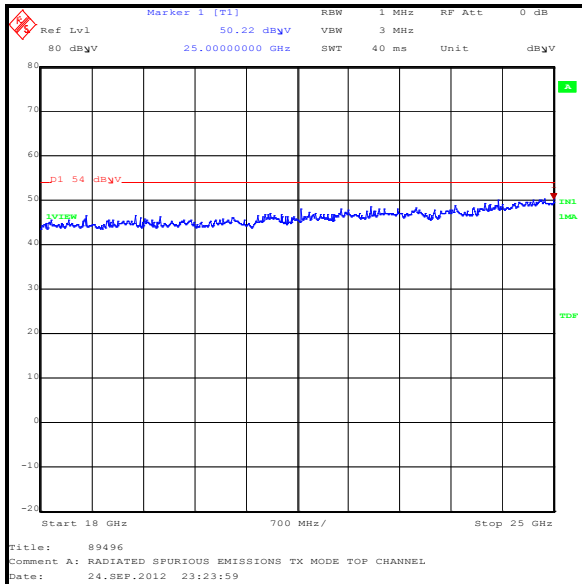
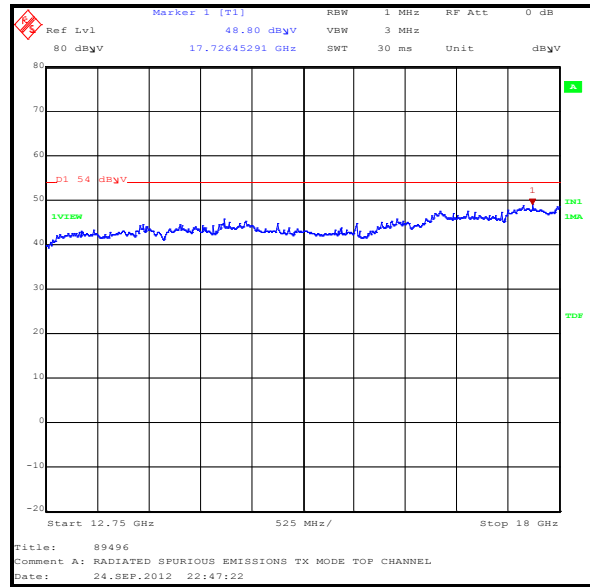
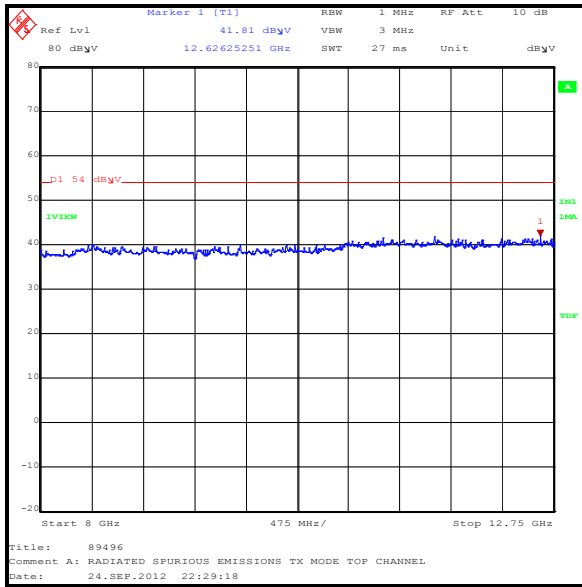
Average Detector



Peak Detector



Transmitter Radiated Emissions (continued)



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

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

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A253	Antenna	12240-20	09 Oct 2012	12
A254	Antenna	14240-20	09 Oct 2012	12
A255	Antenna	16240-20	09 Oct 2012	12
A256	Antenna	18240-20	09 Oct 2012	12
A436	Antenna	20240-20	09 Oct 2012	12
A1396	Attenuator	6810.17.B	06 Jul 2013	12
A1534	Pre Amplifier	8449B	09 Oct 2012	12
A1818	Antenna	3115	09 Oct 2012	12
A1975	High Pass Filter	AFH-03000	15 Mar 2013	12
A1818	Antenna	3115	09 Oct 2012	12
K0002	RSE Chamber	N/A	09 Oct 2012	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12

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

Test Engineers:	Ian Watch & Nick Steele	Test Dates:	25 August 2012 & 24 September 2012
Test Sample Serial Number:	LK220202169		

FCC Reference:	Part 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 D01 Section 5.4 ANSI C63.10 Sections 6.3 and 6.6

Environmental Conditions:

Temperature (°C):	22 to 24
Relative Humidity (%):	40 to 60

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 supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and widest bandwidth were:
 - 802.11b – DQPSK / 5.5 Mbps
 - 802.11g – 16QAM / 24 Mbps
 - 802.11n HT20 – 16QAM / 26 Mbps / MCS3
 - 802.11n HT40 – 16QAM / 54 Mbps / MCS3

Measurements were performed on the required channels and ports.
3. * -20 dBc limit.
4. In accordance with FCC KDB 558074 D01 Section 5.4.2.2.4, peak EIRP measurements within the first 1 MHz beyond the upper band edge were performed with the band power function of a spectrum analyser. Measurement bandwidths shown on the plots were set automatically by the spectrum analyser. The measured EIRP at a distance of 3 metres was converted to field strength by adding 95.2 dB. Average measurements at the upper band edges were performed following ANSI C63.10 Section 6.9.2 procedures.

Transmitter Band Edge Radiated Emissions (continued)**Results: Peak / 802.11b / 20 MHz / 5.5 Mbps / DQPSK**

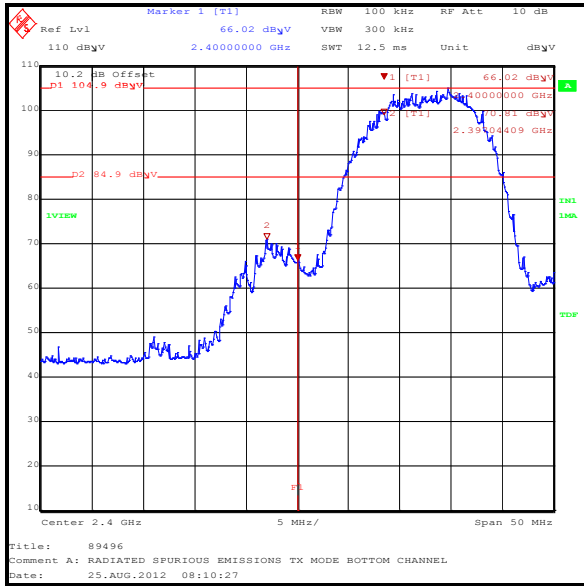
Band Edge Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2397.044	70.8	84.9	14.1	Complied
2400	66.0	84.9	18.9	Complied
2483.5	51.9	74.0	22.1	Complied

Results: Average / 802.11b / 20 MHz / 5.5 Mbps / DQPSK

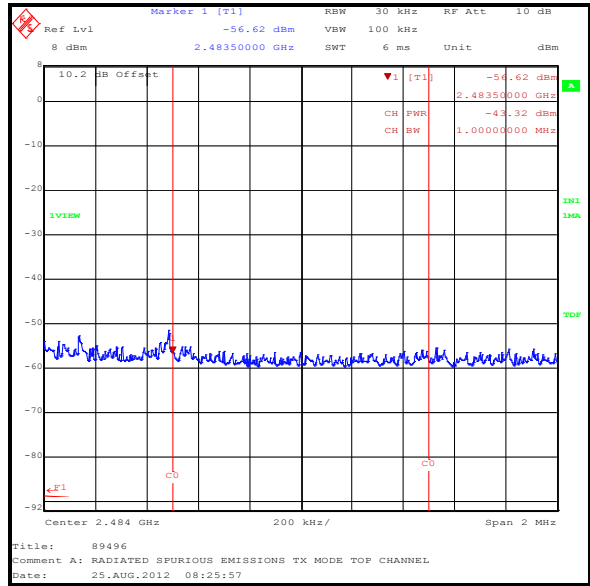
Band Edge Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	41.2	54.0	12.8	Complied

Transmitter Band Edge Radiated Emissions (continued)

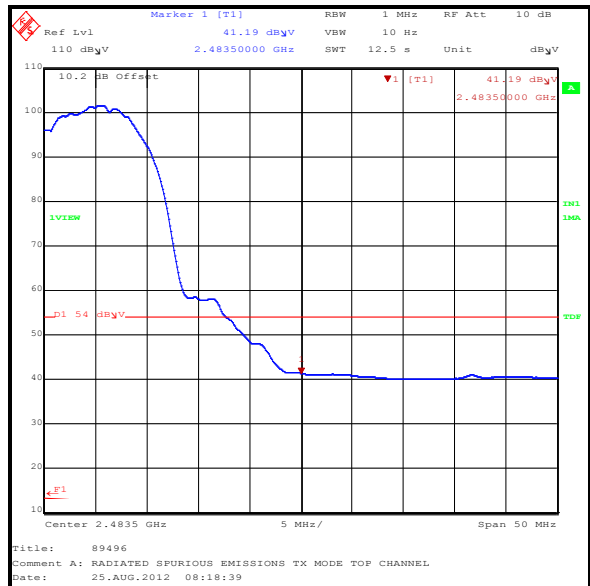
Results: 802.11b / 20 MHz / 5.5 Mbps / DQPSK



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement



Upper Band Edge Average Measurement

Transmitter Band Edge Radiated Emissions (continued)**Results: Peak / 802.11g / 20 MHz / 24 Mbps / 16QAM**

Band Edge Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2398.347	75.0	82.8	7.8	Complied
2400.0	71.2	82.8	11.6	Complied
2483.5	66.3	74.0	7.7	Complied

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

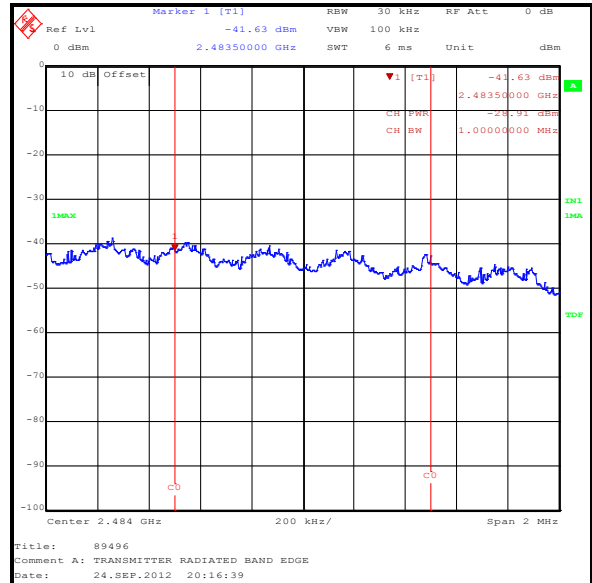
Band Edge Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	53.0	54.0	1.0	Complied

Transmitter Band Edge Radiated Emissions (continued)

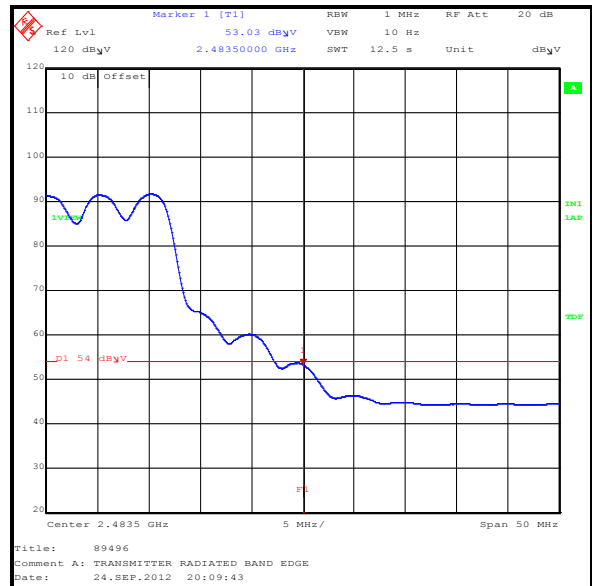
Results: 802.11g / 20 MHz / 24 Mbps / 16QAM



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 / 26 Mbps / MCS3 / 16QAM**

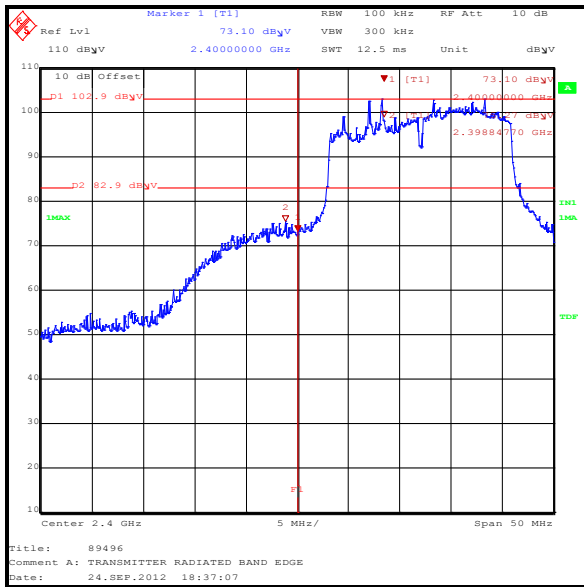
Band Edge Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2398.848	76.3	82.9	6.6	Complied
2400.0	73.1	82.9	9.8	Complied
2483.5	65.2	74.0	8.8	Complied

Results: Average / 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM

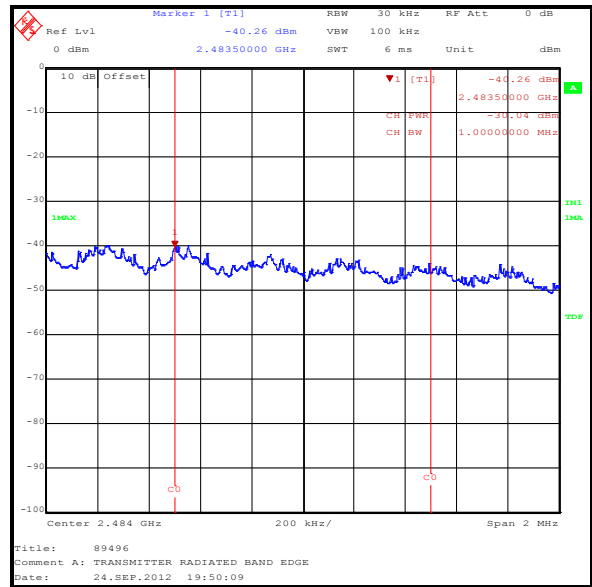
Band Edge Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	53.0	54.0	1.0	Complied

Transmitter Band Edge Radiated Emissions (continued)

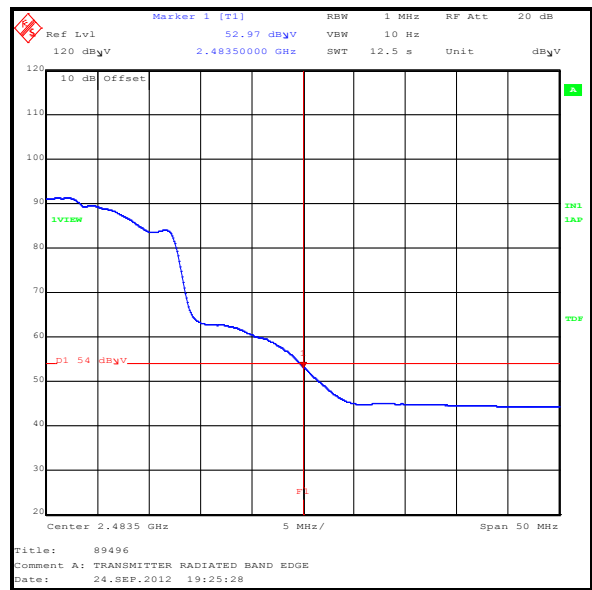
Results: 802.11n / 20 MHz / 26 Mbps / MCS3 / 16QAM



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 / 40 MHz / 54 Mbps / MCS3 / 16QAM**

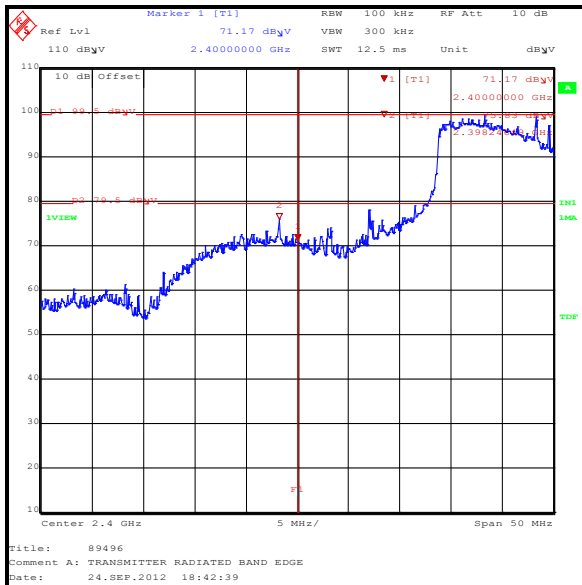
Band Edge Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2398.246	75.8	79.5	3.7	Complied
2400.0	71.2	79.5	8.3	Complied
2483.5	66.0	74.0	8.0	Complied

Results: Average / 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM

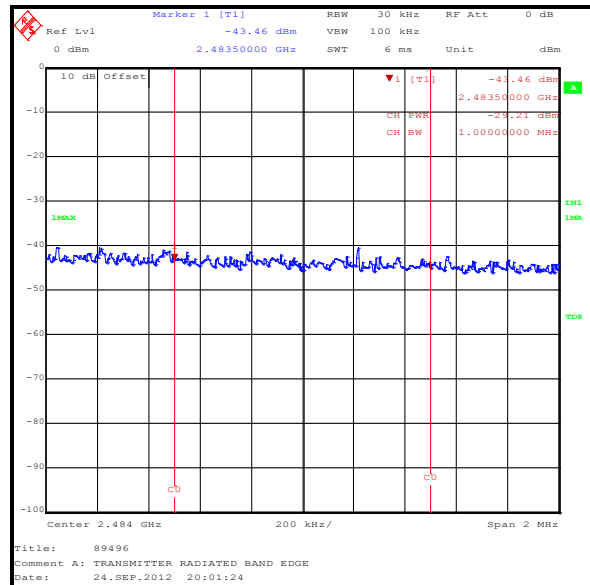
Band Edge Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	52.7	54.0	1.3	Complied

Transmitter Band Edge Radiated Emissions (continued)

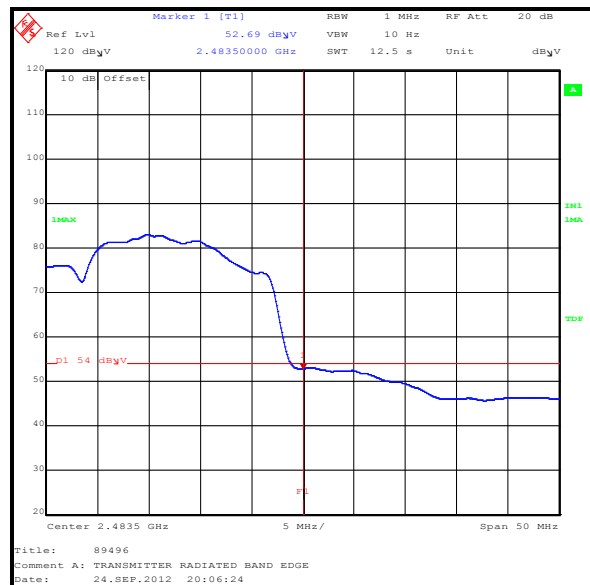
Results: 802.11n / 40 MHz / 54 Mbps / MCS3 / 16QAM



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement



Upper Band Edge Average Measurement

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

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0002	RSE Chamber	N/A	09 Oct 2012	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12
A1534	Pre Amplifier	8449B	09 Oct 2012	12
A1396	Attenuator	6810.17.B	06 Jul 2013	12

6. Measurement Uncertainty

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

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

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

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

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.25 dB
Conducted Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±0.28 dB
Conducted Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	±0.28 dB
6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 26.5 GHz	95%	±2.94 dB

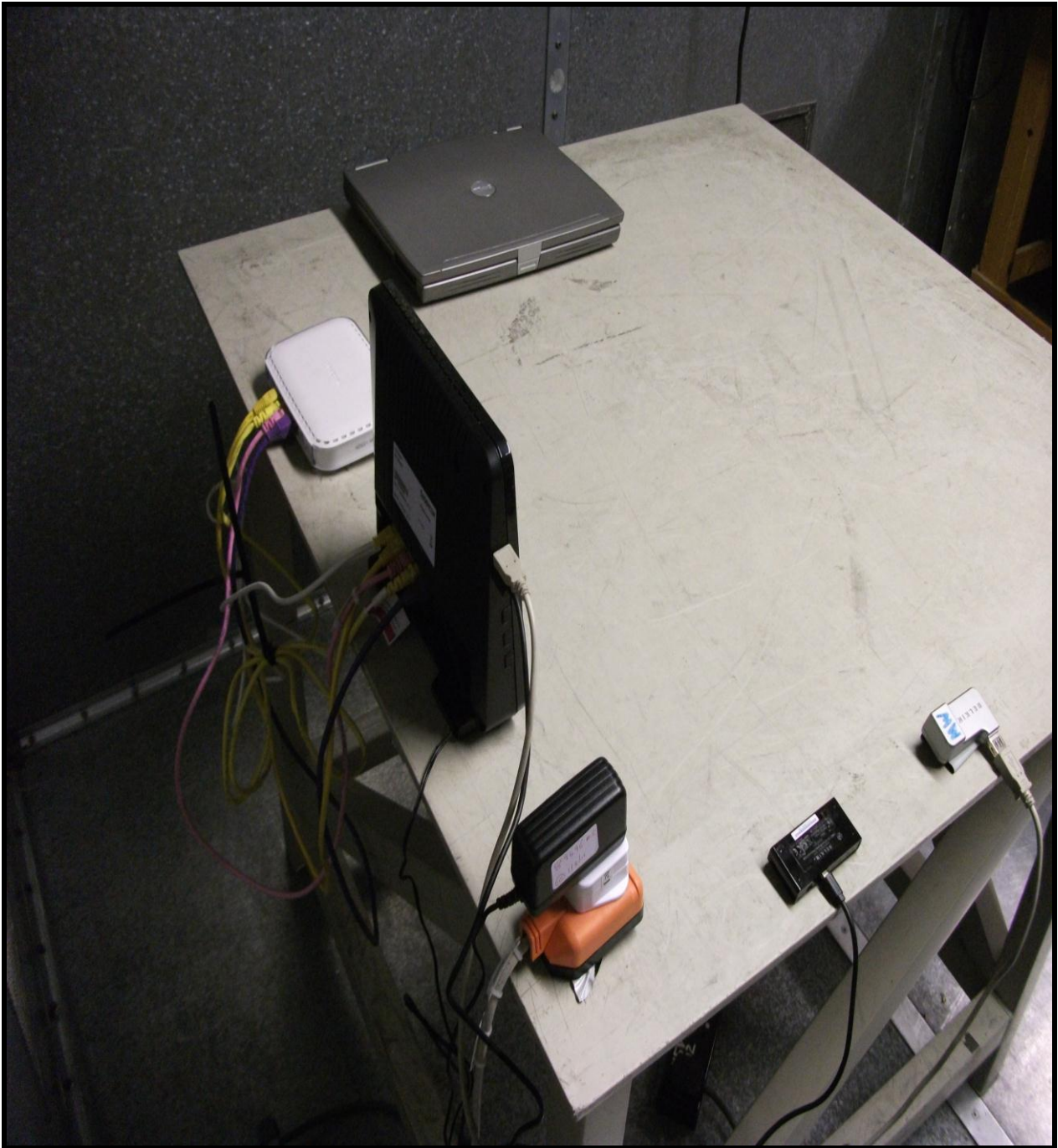
The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body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

7. Set up Photographs

Radiated Emissions



AC Conducted Emissions



8. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	Addition of setup photographs & correction of typographic errors
3.0	-	-	Clarification provided on EUT software configuration