TEST REPORT

Test Report No. : UL-RPT-RP10407443JD04A V3.0

Manufacturer	:	Apple Inc.
Model No.	:	A1600
FCC ID	:	BCGA1600
Technology	:	WLAN
Test Standard(s)	:	FCC Parts 15.207, 15.209(a) & 15.407

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 3.0 supersedes all previous versions

Date of Issue: 14 September 2014

Checked by:

Sarah Williams
Engineer, Radio Laboratory

Issued by :

pp
John Newell
Quality Manager,
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:	Apple Inc.
Address:	1 Infinite Loop Cupertino, CA 95014 U.S.A.

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.407 and 47CFR15.403
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) – Sections 15.403 and 15.407
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:	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 2014 to 17 August 2014

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.207	Transmitter AC Conducted Emissions	✓
Part 15.403(i)	Transmitter 26 dB Emission Bandwidth	✓
Part 15.407(e)	Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band)	✓
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Part 15.407(a)(1)(iv)	Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band)	✓
Part 15.407(a)(2)	Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)	✓
Part 15.407(a)(3)	Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band)	✓
Part 15.407(a)(1)(iv)	Transmitter Maximum Power Spectral Density (5.15-5.25 GHz band)	✓
Part 15.407(a)(2)	Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)	✓
Part 15.407(a)(3)	Transmitter Maximum Power Spectral Density (5.725-5.85 GHz band)	✓
Part 15.407(b)/15.209(a)	Transmitter Out of Band Radiated Emissions	✓
Part 15.407(b)/15.209(a)	Transmitter Band Edge Radiated Emissions	✓
Part 15.407(g)	Transmitter Frequency Stability (Temperature & Voltage Variation)	Note 2
Part 15.407(h)(1)	Transmitter Power Control	Note 3
Key to Results ✓ = Complied ✗ = Did not comply		

Note(s):

1. The measurement was performed to assist in the calculation of the level of average output power, power spectral density, peak excursion and emissions as the EUT employs pulsed operation.
2. Frequency stability is better than 20 ppm which ensures that the signal remains in the allocated bands under all operational conditions stated in the user manual.
3. Transmit Power Control was not tested as the maximum EIRP is less than 500 mW (27 dBm).

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 789033 D02 General UNII Test Procedures New Rules v01 June 6, 2014
Title:	Guidelines for Compliance Testing of Unlicensed National Inforamtion Infrastructure (U-NII) Devices – Part 15, Subpart E
Reference:	KDB 662911 D01 Multiple Transmitter Output v02r01 October 31, 2013
Title:	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

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 specifications identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Apple
Model Name or Number:	A1600
Test Sample IMEI:	352025060307270 *(Radiated Sample)*
Hardware Version Number:	REV1.0
Software Version Number:	iOS 12A314 BB: 3.08.08
FCC ID:	BCGA1600

Brand Name:	Apple
Model Name or Number:	A1600
Test Sample IMEI:	352025060005387 *(Conducted Sample)*
Hardware Version Number:	REV1.0
Software Version Number:	iOS 12A314 BB: 3.08.08
FCC ID:	BCGA1600

3.2. Description of EUT

The Equipment Under Test was a tablet with GSM/GPRS/EGPRS/UMTS/LTE and CDMA technologies. It also supports IEEE 802.11a/b/g/n (MIMO 2x2) and *Bluetooth*®. The rechargeable battery is not user accessible.

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 802.11a,n) / U-NII			
Type of Unit:	Transceiver			
Modulation:	BPSK, QPSK, 16QAM, & 64QAM			
Data rates:	802.11a	6, 9, 12, 18, 24, 36 ,48 & 54 Mbps		
	802.11n HT20 (SISO)	MCS0 to MCS7		
	802.11n HT20 (MIMO)	MCS0 to MCS15 (CDD MCS0 to MCS7)		
	802.11n HT40 (SISO)	MCS0 to MCS7		
	802.11n HT40 (MIMO)	MCS0 to MCS15 (CDD MCS0 to MCS7)		
Power Supply Requirement(s):	Nominal	3.8 VDC via 120 VAC 60 Hz adaptor		
Antenna Gains:	**Frequency (GHz)**	**ANT1**	**ANT2**	**Directional Gain**
	5.15 to 5.25	0.0 dBi	3.1 dBi	4.7 dBi
	5.25 to 5.35	0.8 dBi	3.3 dBi	5.1 dBi
	5.47 to 5.725	2.4 dBi	4.3 dBi	6.4 dBi
	5.725 to 5.85	2.7 dBi	3.8 dBi	6.3 dBi
Maximum Conducted Output Power:	20 MHz	17.8 dBm		
	40 MHz	16.3 dBm		
Channel Spacing:	20 MHz			
Transmit Frequency Band:	5150 MHz to 5250 MHz			
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**	
	Bottom	36	5180	
	Middle	40	5200	
	Top	48	5240	
Transmit Frequency Band:	5250 MHz to 5350 MHz			
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**	
	Bottom	52	5260	
	Middle	60	5300	
	Top	64	5320	

Additional Information Related to Testing (continued)

Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	100	5500
	Middle	116	5580
	Top	140	5700
Transmit Frequency Band:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	149	5745
	Middle	157	5785
	Top	165	5825
Channel Spacing:	40 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	38	5190
	Top	46	5230
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	54	5270
	Top	62	5310
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	102	5510
	Middle	110	5550
	Top	134	5670
Transmit Frequency Band:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	151	5755
	Top	159	5795

3.5. Support Equipment

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

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Latitude E5400
Serial Number:	00788

Brand Name:	Not stated
Description:	USB Diagnostic cable
Model Name or Number:	Not stated
Serial Number:	Not stated

Brand Name:	Apple
Description:	USB Cable
Model Name or Number:	A1480
Serial Number:	Not stated

Brand Name:	Apple
Description:	USB Charger
Model Name or Number:	A1399
Serial Number:	Not stated

Brand Name:	Apple
Description:	PHF
Model Name or Number:	Apple Ear Plugs
Serial Number:	Not stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- 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 continuous transmission and to select the test channels, data rates and modulation schemes as required.
- The customer declared the following data rates to be used for all measurements as:
    - 802.11a – BPSK / 6 Mbps
    - 802.11n HT20 SISO – BPSK / 6.5 Mbps / MCS0
    - 802.11n HT40 SISO – BPSK / 13.5 Mbps / MCS0
    - 802.11n HT20 MIMO – BPSK / 6.5 Mbps / MCS0
    - 802.11n HT40 MIMO – BPSK / 13.5 Mbps / MCS0
- The EUT has two separate antennas which correspond to two separate antenna ports. Port 1 and Port 2 correspond to antenna 1 and antenna 2 respectively.
- For 802.11a the EUT transmits from only 1 antenna, both antennas were investigated and the conducted measurements for Port 1 were found to be worst-case. All conducted measurements were performed on Port 1 only.
- For 802.11n the EUT can transmit from both antennas, therefore conducted measurements were performed on both ports.
- For 802.11n SISO radiated measurements, the antenna gain was added to the conducted power measurements and antenna 2 was found to be worst-case. All SISO measurements were performed on antenna 2 only.
- For 802.11n MIMO radiated measurements, the EUT was transmitting from both ports.
- Transmitter spurious emissions and AC conducted tests were performed with the EUT transmitting with a data rate of 6.5 Mbps / MCS0 (802.11n HT20 / MIMO). This was found to be the worst case modulation scheme with regards to emissions after preliminary investigations and, as this mode emits the highest transmit output power level, it was deemed to be the worst case.
- Transmitter radiated spurious emissions and AC conducted tests were performed with the AC Charger and PHF connected to the EUT as this was found to be the worst case during pre-scans. All the accessories were individually connected and measurements made during the pre-scans to determine the worst case combination.
- The conducted sample with IMEI 352025060005387was used for 26 dB bandwidth, minimum 6 dB bandwidth, duty cycle, maximum output power and peak power spectral density tests.
- The radiated sample with IMEI 352025060307270 was used for all other tests

4.3. Worst case Justification

Table of test reduction and modes covering other modes:

Mode	Covered by
802.11a CDD (2TX)	80211n HT20 MIMO (CDD 2TX)
802.11n HT20 STBC (2TX)	80211n HT20 MIMO (CDD 2TX)
802.11n HT20 SDM (2TX)	80211n HT20 MIMO (CDD 2TX)
802.11n HT40 STBC (2TX)	80211n HT40 MIMO (CDD 2TX)
802.11n HT40 SDM (2TX)	80211n HT40 MIMO (CDD 2TX)

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:	Georgios Vrezas	**Test Date:**	25 July 2014
Test Sample IMEI:	352025060307270		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	41

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.420	Live	24.9	57.4	32.5	Complied
0.560	Live	23.8	56.0	32.2	Complied
0.753	Live	27.9	56.0	28.1	Complied
0.947	Live	26.4	56.0	29.6	Complied
1.752	Live	25.7	56.0	30.3	Complied
28.779	Live	31.8	60.0	28.2	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.749	Live	23.8	46.0	22.2	Complied
1.752	Live	24.5	46.0	21.5	Complied
3.255	Live	24.2	46.0	21.8	Complied
4.254	Live	23.1	46.0	22.9	Complied
26.282	Live	26.7	50.0	23.3	Complied
28.779	Live	28.5	50.0	21.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

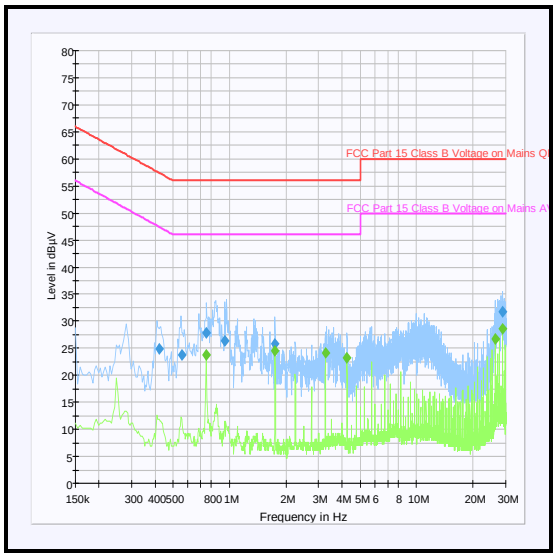
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.420	Neutral	24.1	57.4	33.4	Complied
0.870	Neutral	25.8	56.0	30.2	Complied
0.956	Neutral	25.7	56.0	30.3	Complied
1.518	Neutral	19.3	56.0	36.7	Complied
3.053	Neutral	15.3	56.0	40.7	Complied
5.496	Neutral	17.0	60.0	43.0	Complied

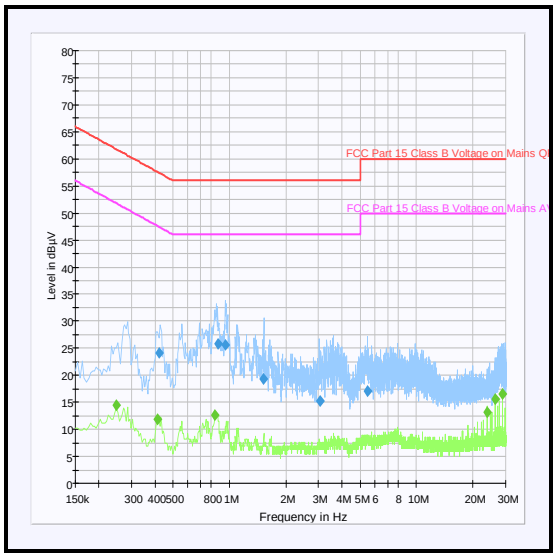
Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.249	Neutral	14.5	51.8	37.3	Complied
0.416	Neutral	11.8	47.5	35.7	Complied
0.839	Neutral	12.6	46.0	33.4	Complied
23.771	Neutral	13.3	50.0	36.7	Complied
26.277	Neutral	15.7	50.0	34.3	Complied
28.779	Neutral	16.5	50.0	33.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)



Live



Neutral

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

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1625	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
A004	LISN	Rohde & Schwarz	ESH3-Z5	890604/027	18 Nov 2014	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	27 Feb 2015	12
M1263	Test Receiver	Rohde & Schwarz	ESIB 7	100265	14 Oct 2014	12

5.2.2. Transmitter 26 dB Emission Bandwidth

Test Summary:

Test Engineers:	Nick Steele & Georgios Vrezas	**Test Dates:**	25 July 2014 to 12 August 2014
Test Sample IMEI:	352025060005387		

FCC Reference:	Part 15.403(i)
Test Method Used:	As detailed in KDB 789033 D02 Section II.C.1.

Environmental Conditions:

Temperatures (°C):	23 to 25
Relative Humidity (%):	39 to 44

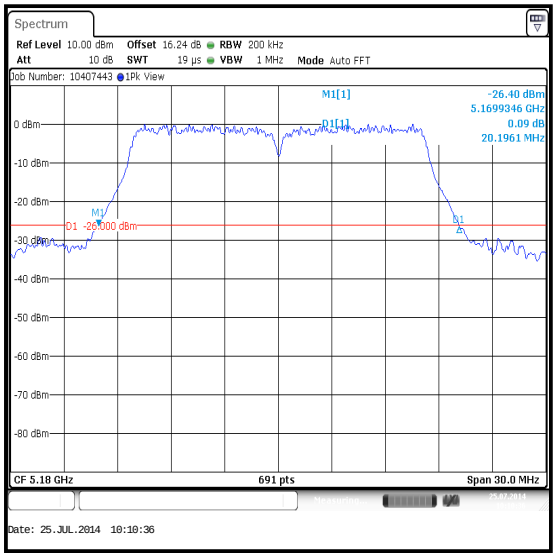
Note(s):

1. The customer declared the following data rates to be used for all measurements as:
    - 802.11a – BPSK / 6 Mbps
    - 802.11n HT20 SISO – BPSK / 6.5 Mbps / MCS0
    - 802.11n HT40 SISO – BPSK / 13.5 Mbps / MCS0
    - 802.11n HT20 MIMO – BPSK / 6.5 Mbps / MCS0
    - 802.11n HT40 MIMO – BPSK / 13.5 Mbps / MCS0
2. Final measurements were performed in each supported operating band using the above configurations on the bottom, middle and top channels in accordance with KDB 789033 Section II.C.1. Emission Bandwidth (EBW) test procedure.
3. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

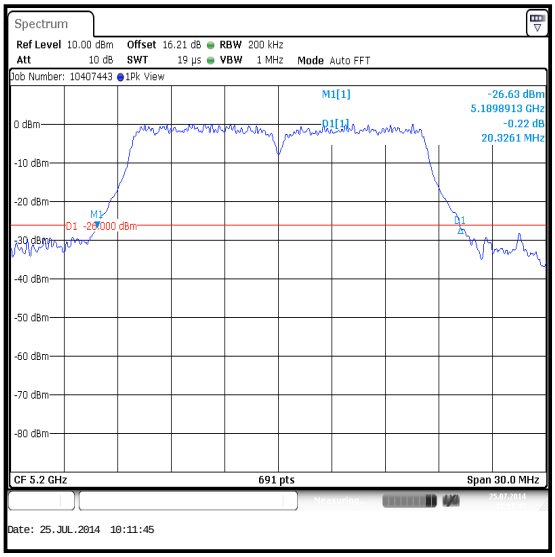
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.15-5.25 GHz band / Port 1

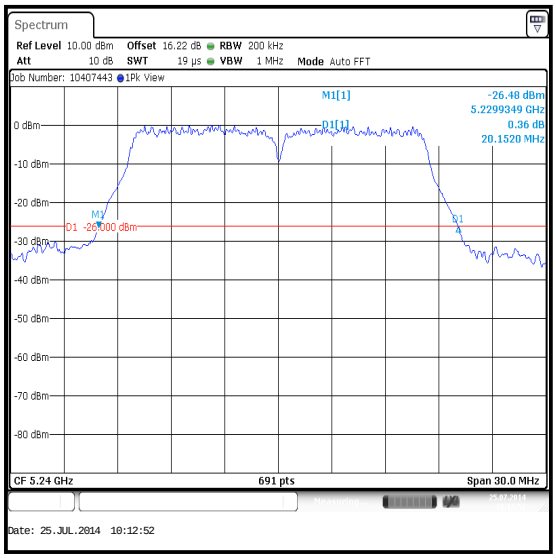
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6	20.196
Middle	5200	BPSK	6	20.326
Top	5240	BPSK	6	20.152



Bottom Channel



Middle Channel

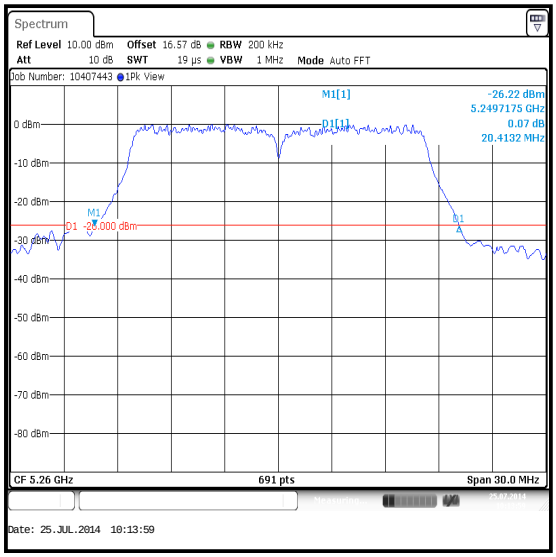


Top Channel

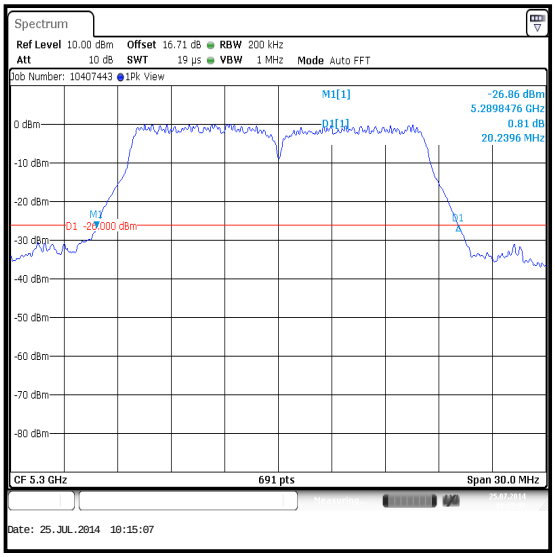
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.25-5.35 GHz band / Port 1

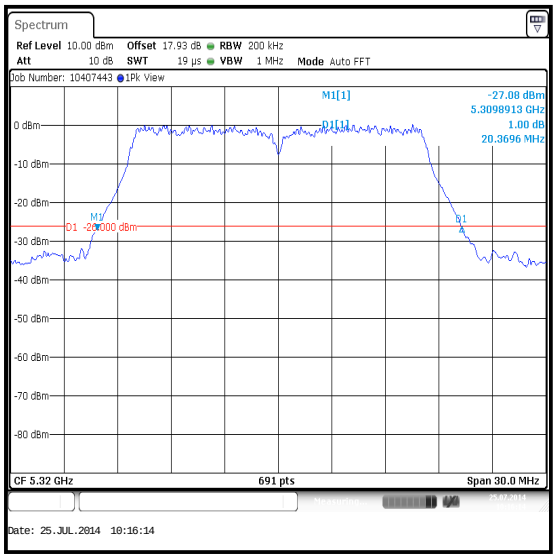
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6	20.413
Middle	5300	BPSK	6	20.240
Top	5320	BPSK	6	20.370



Bottom Channel



Middle Channel

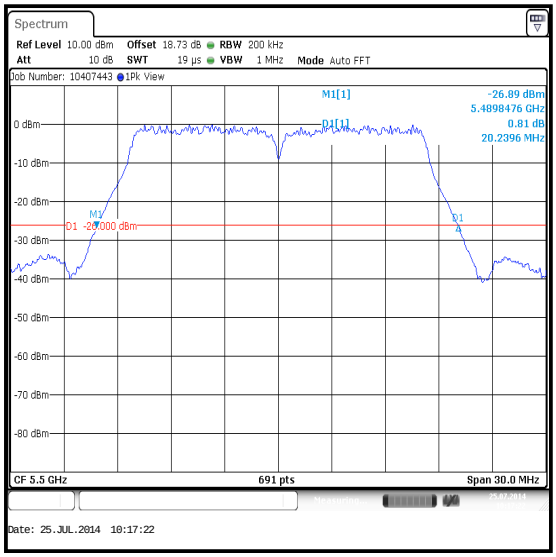


Top Channel

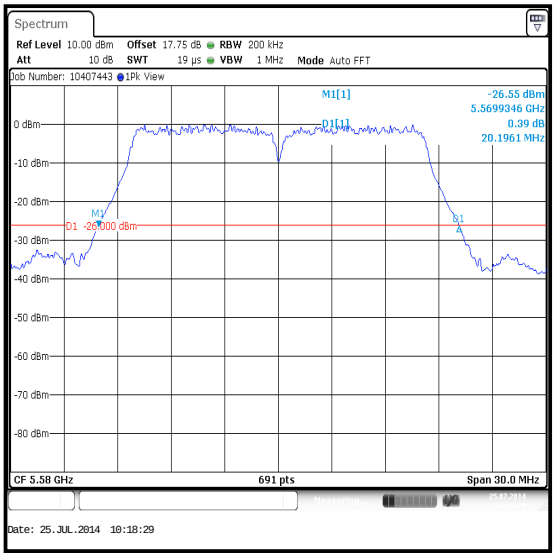
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.47-5.725 GHz band / Port 1

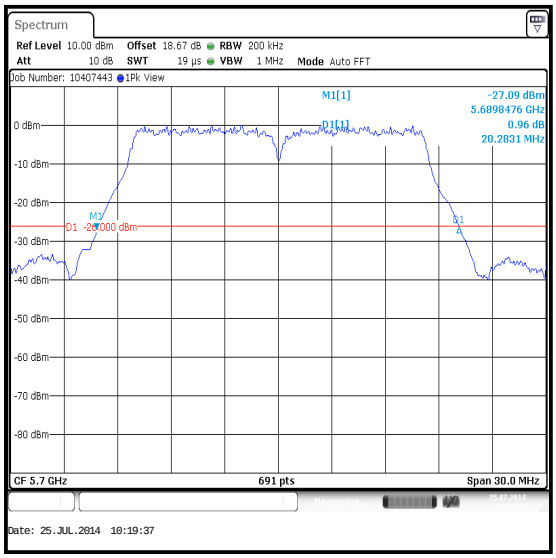
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6	20.240
Middle	5580	BPSK	6	20.196
Top	5700	BPSK	6	20.283



Bottom Channel



Middle Channel

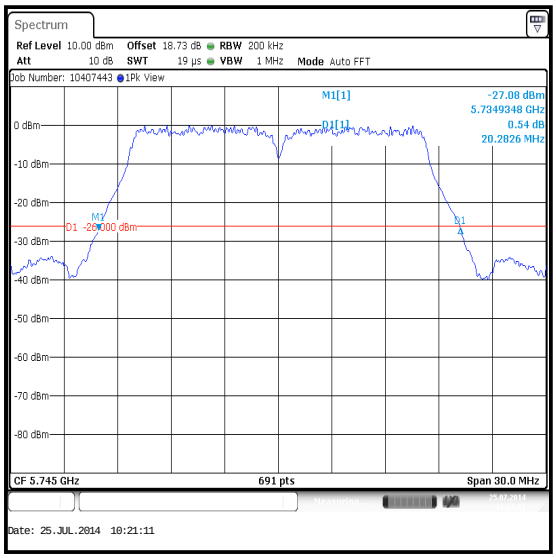


Top Channel

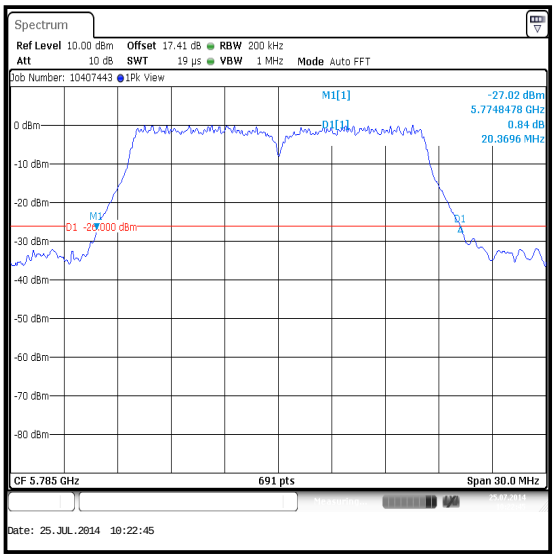
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.725-5.85 GHz band / Port 1

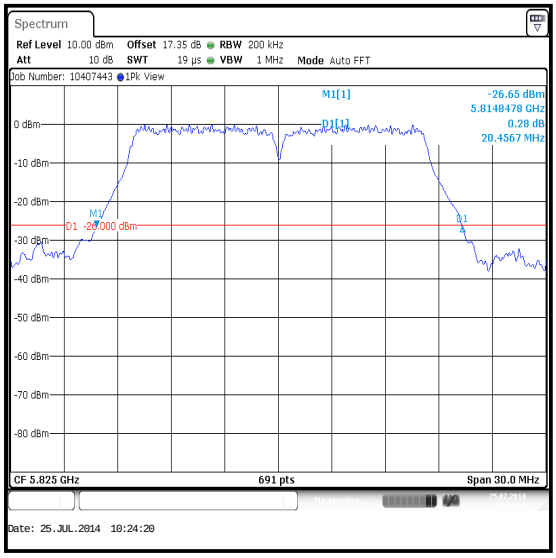
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6	20.283
Middle	5785	BPSK	6	20.370
Top	5825	BPSK	6	20.457



Bottom Channel



Middle Channel

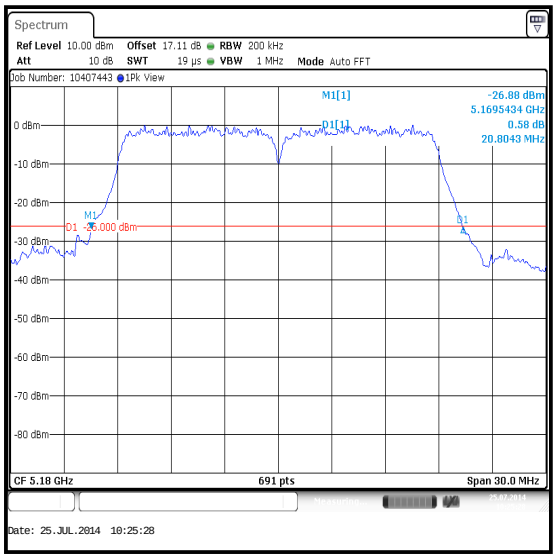


Top Channel

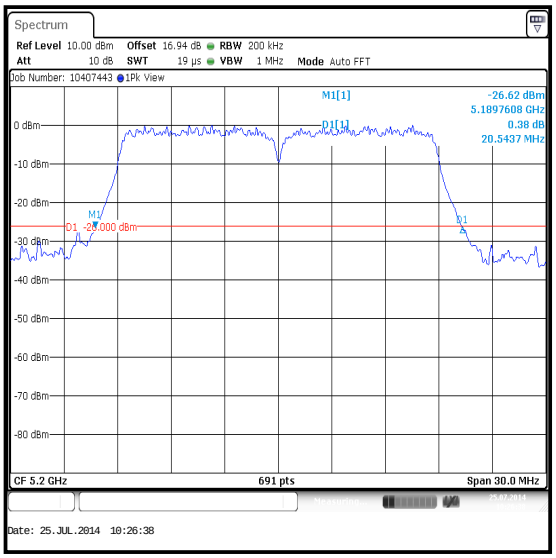
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / SISO / 5.15-5.25 GHz band / Port 1

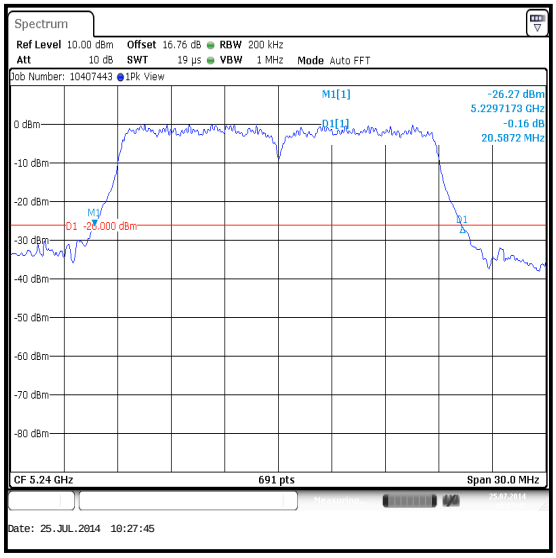
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6.5 / 0	20.804
Middle	5200	BPSK	6.5 / 0	20.544
Top	5240	BPSK	6.5 / 0	20.587



Bottom Channel



Middle Channel

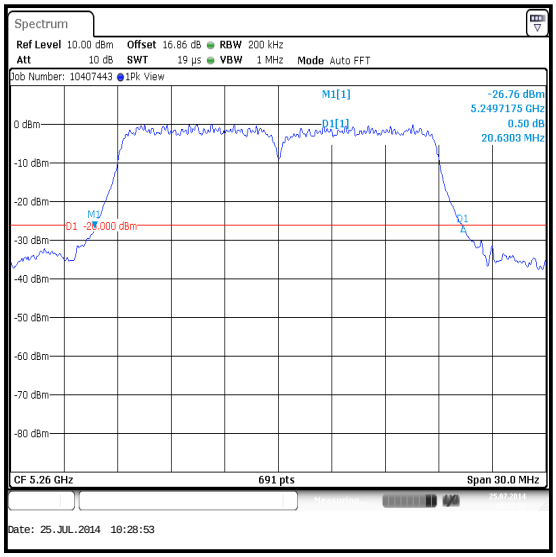


Top Channel

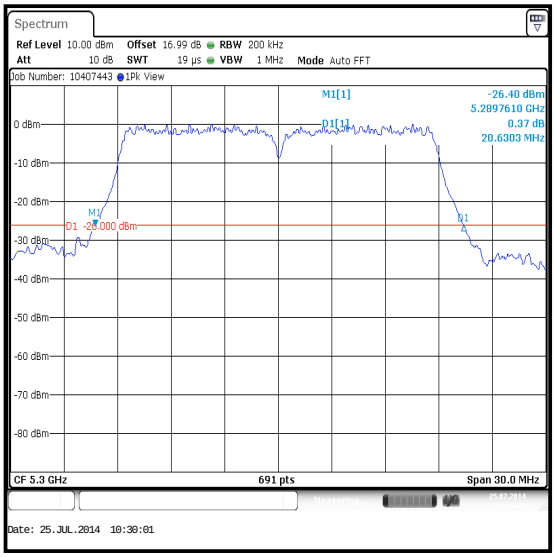
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / SISO / 5.25-5.35 GHz band / Port 1

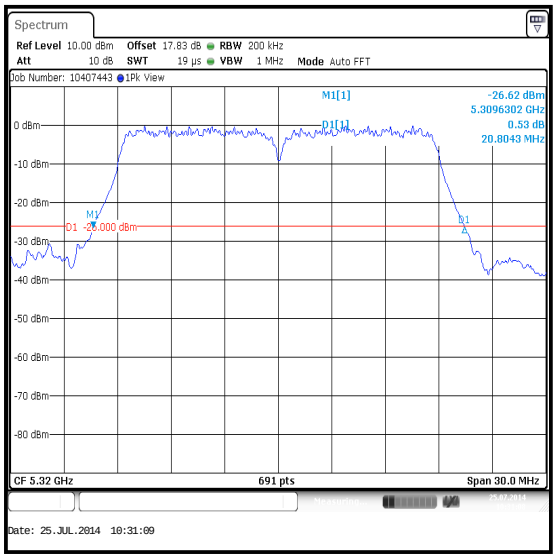
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6.5 / 0	20.630
Middle	5300	BPSK	6.5 / 0	20.630
Top	5320	BPSK	6.5 / 0	20.804



Bottom Channel



Middle Channel

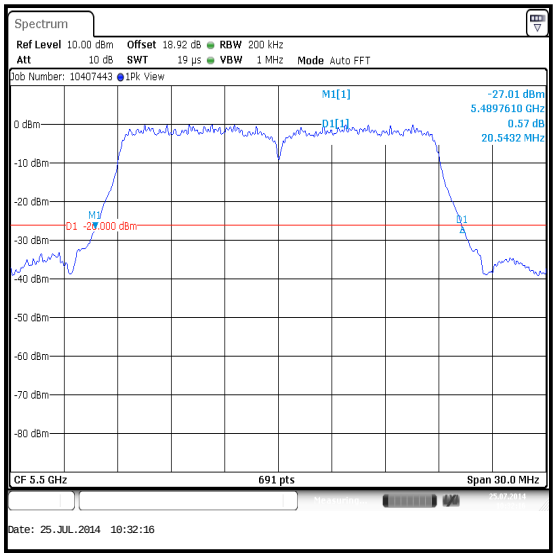


Top Channel

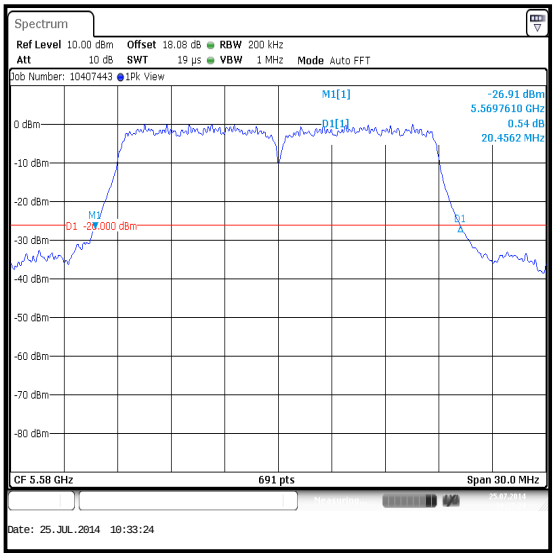
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / SISO / 5.47-5.725 GHz band / Port 1

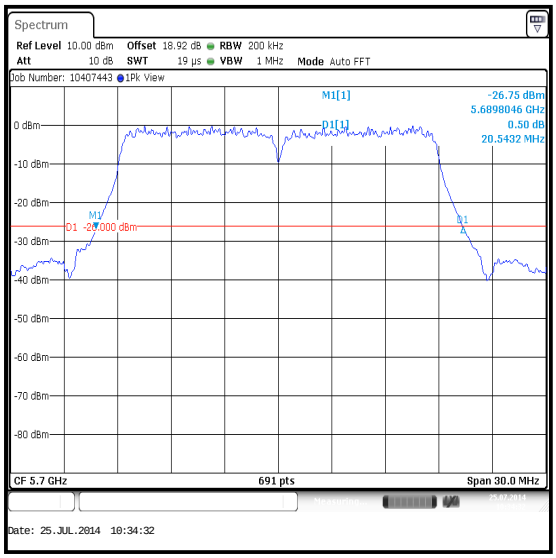
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6.5 / 0	20.543
Middle	5580	BPSK	6.5 / 0	20.456
Top	5700	BPSK	6.5 / 0	20.543



Bottom Channel



Middle Channel

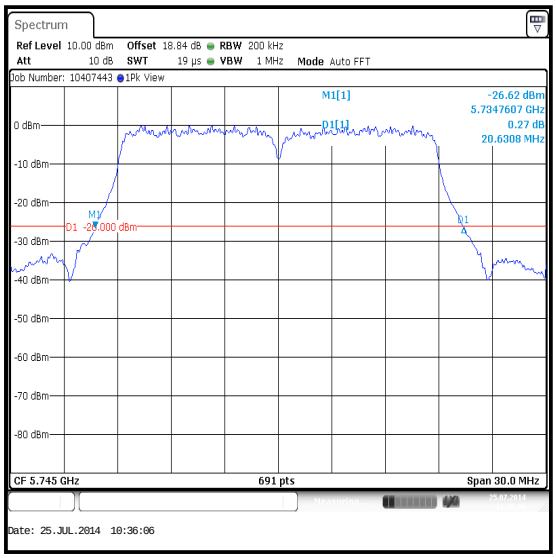


Top Channel

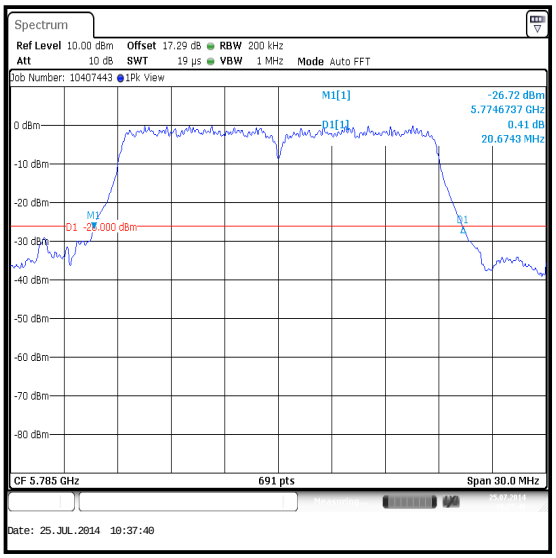
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / SISO / 5.725-5.85 GHz band / Port 1

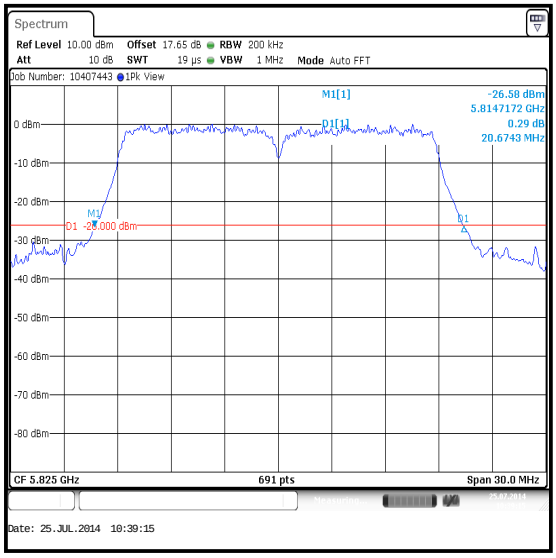
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	20.631
Middle	5785	BPSK	6.5 / 0	20.674
Top	5825	BPSK	6.5 / 0	20.674



Bottom Channel



Middle Channel

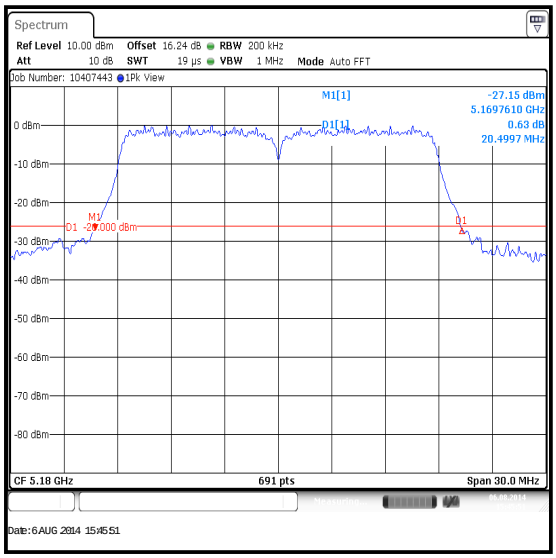


Top Channel

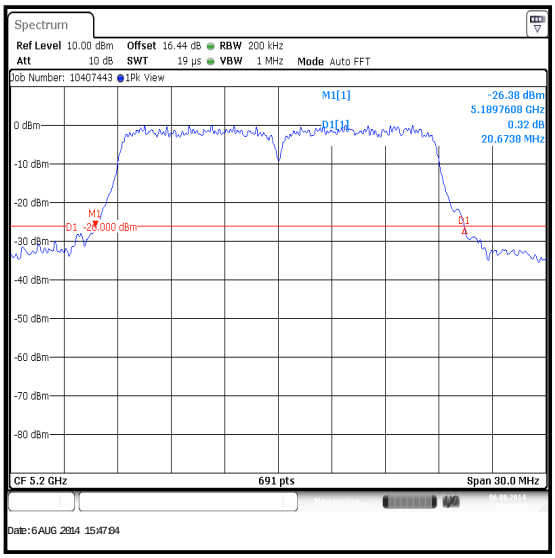
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / SISO / 5.15-5.25 GHz band / Port 2

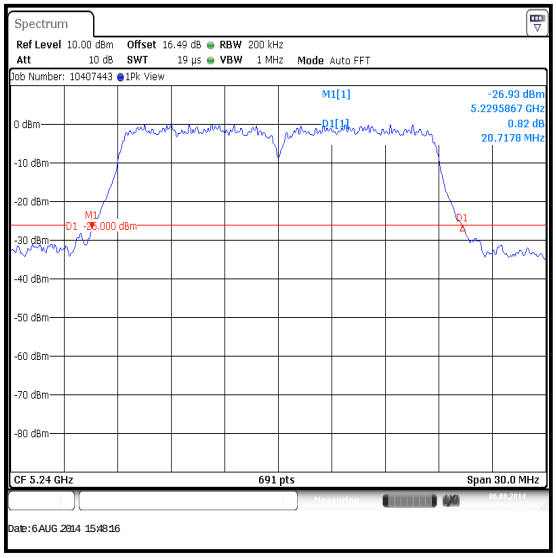
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6.5 / 0	20.500
Middle	5200	BPSK	6.5 / 0	20.674
Top	5240	BPSK	6.5 / 0	20.718



Bottom Channel



Middle Channel

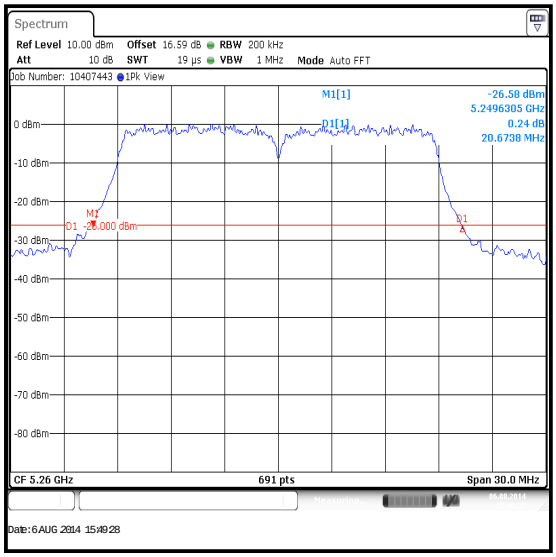


Top Channel

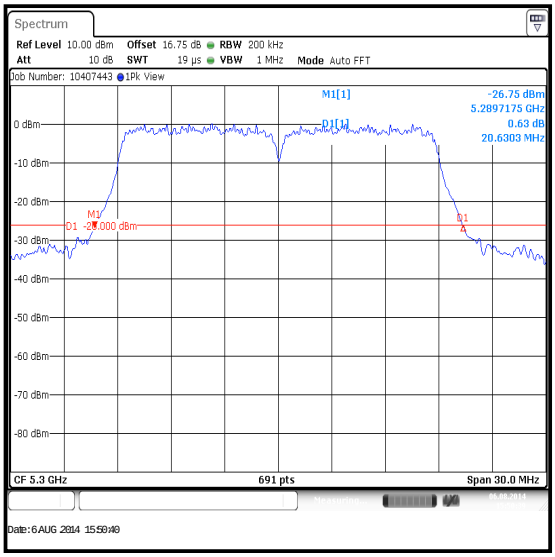
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / SISO / 5.25-5.35 GHz band / Port 2

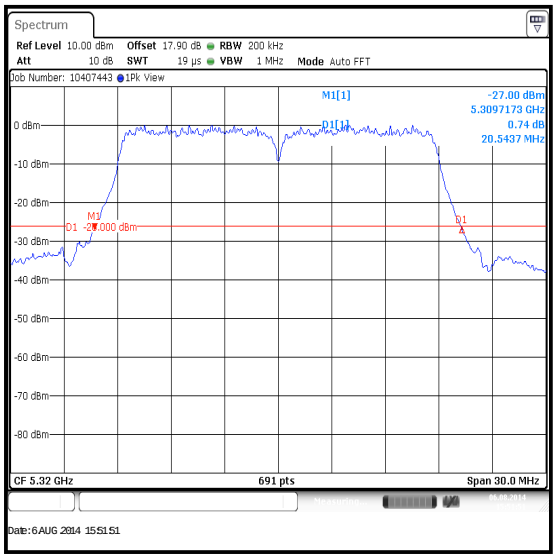
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6.5 / 0	20.674
Middle	5300	BPSK	6.5 / 0	20.630
Top	5320	BPSK	6.5 / 0	20.544



Bottom Channel



Middle Channel

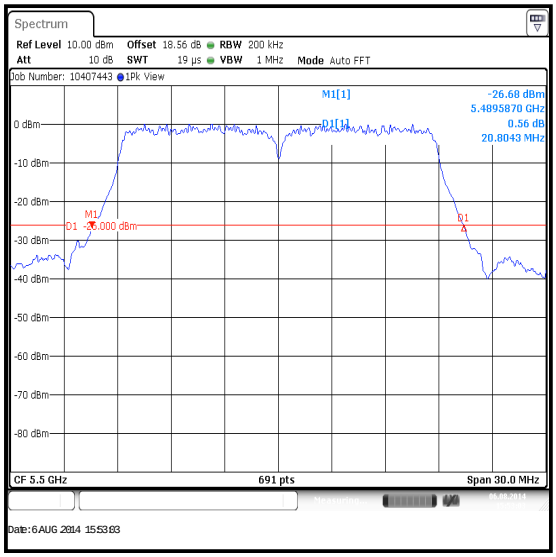


Top Channel

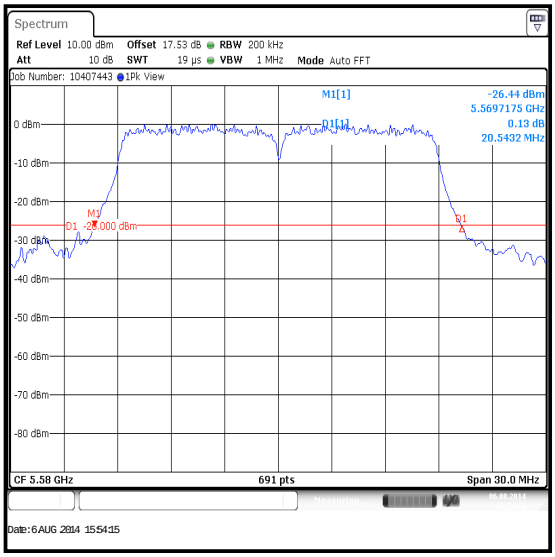
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / SISO / 5.47-5.725 GHz band / Port 2

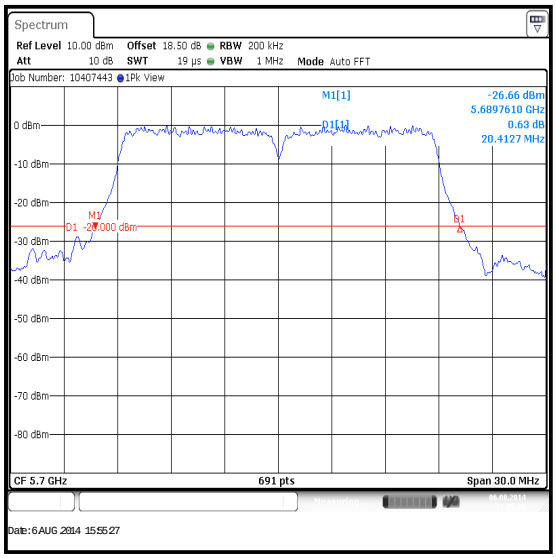
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6.5 / 0	20.804
Middle	5580	BPSK	6.5 / 0	20.543
Top	5700	BPSK	6.5 / 0	20.413



Bottom Channel



Middle Channel

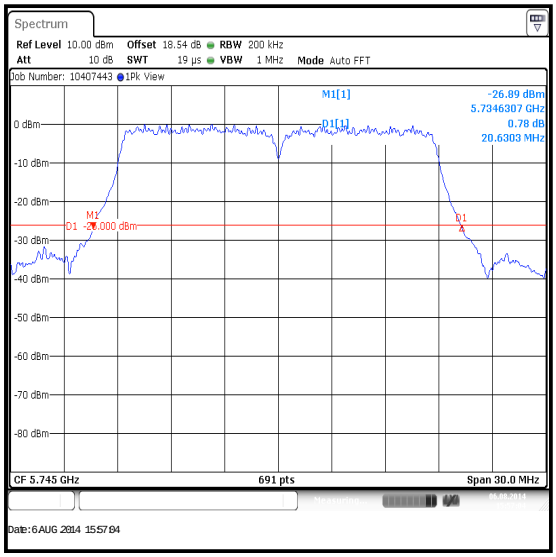


Top Channel

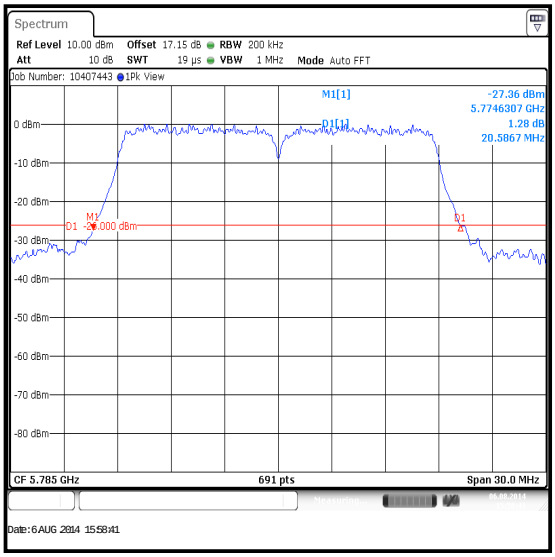
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / SISO / 5.725-5.85 GHz band / Port 2

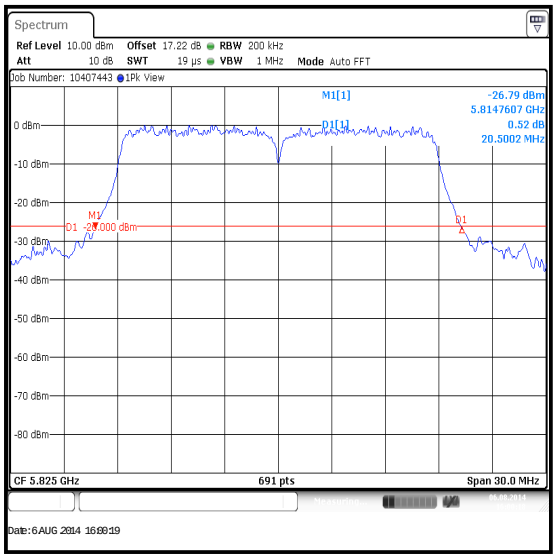
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	20.630
Middle	5785	BPSK	6.5 / 0	20.587
Top	5825	BPSK	6.5 / 0	20.500



Bottom Channel



Middle Channel

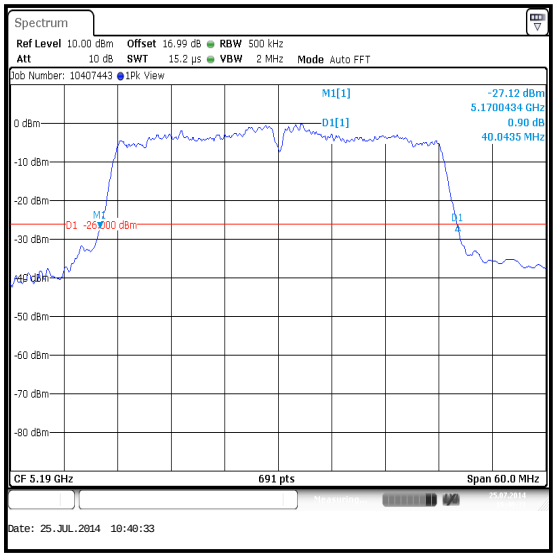


Top Channel

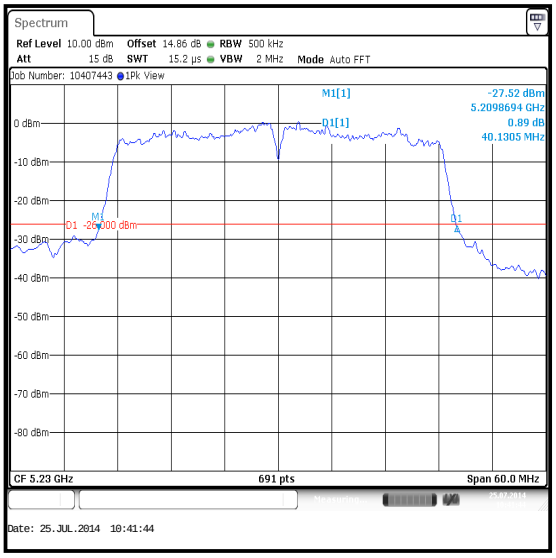
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / SISO / 5.15-5.25 GHz band / Port 1

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	BPSK	13.5 / 0	40.043
Top	5230	BPSK	13.5 / 0	40.131



Bottom Channel

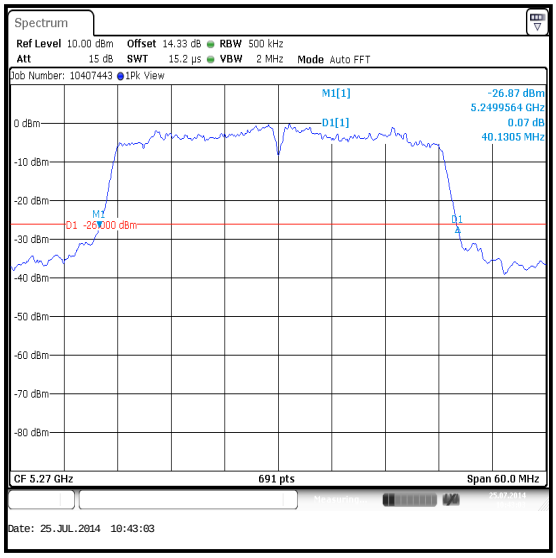


Top Channel

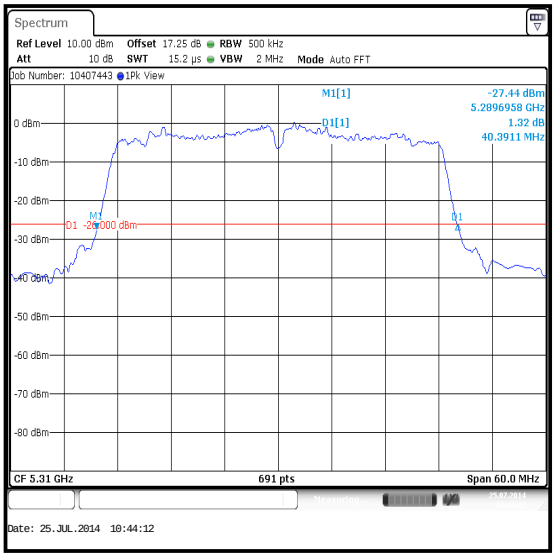
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / SISO / 5.25-5.35 GHz band / Port 1

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	BPSK	13.5 / 0	40.131
Top	5310	BPSK	13.5 / 0	40.391



Bottom Channel

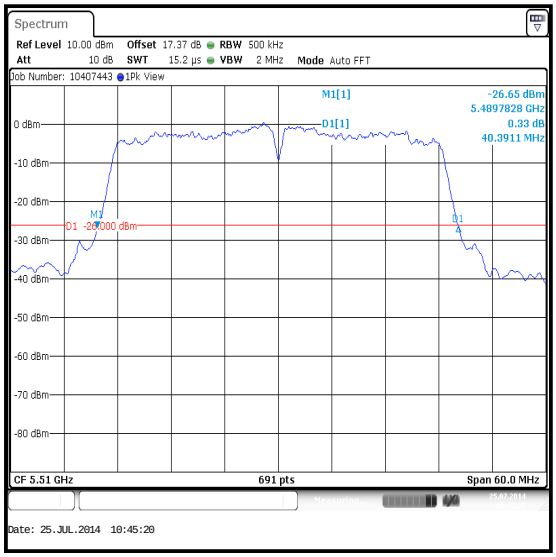


Top Channel

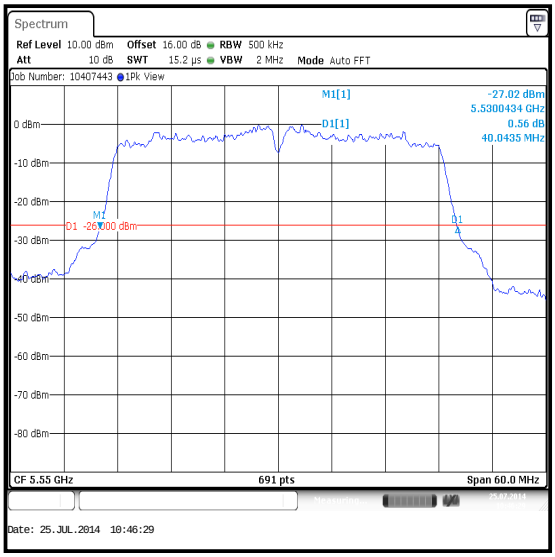
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / SISO / 5.47-5.725 GHz band / Port 1

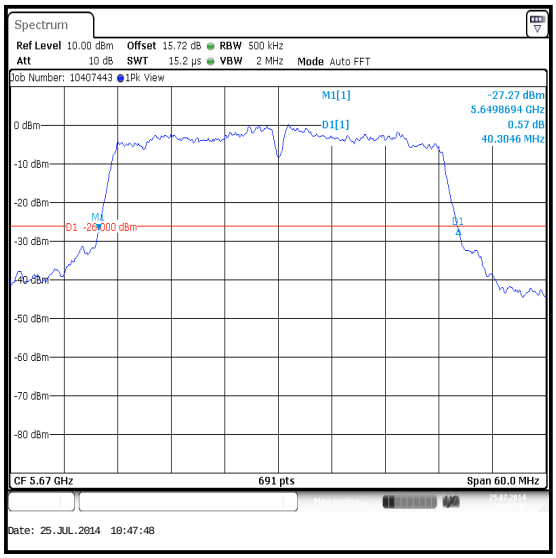
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	BPSK	13.5 / 0	40.391
Middle	5550	BPSK	13.5 / 0	40.043
Top	5670	BPSK	13.5 / 0	40.305



Bottom Channel



Middle Channel

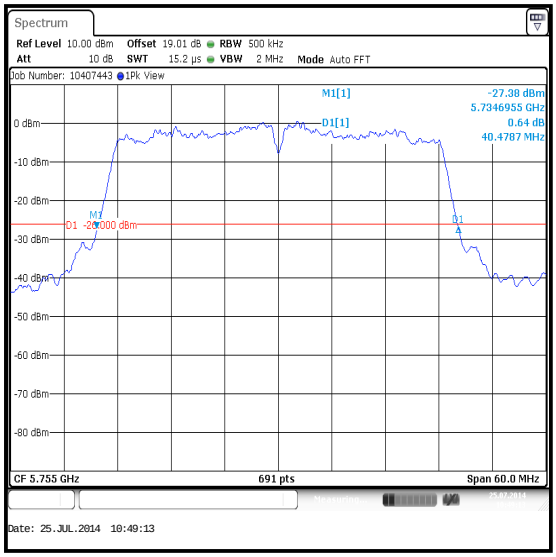


Top Channel

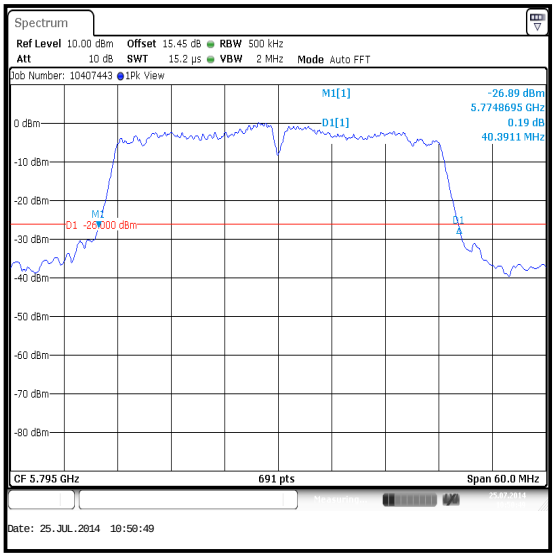
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / SISO / 5.725-5.85 GHz band / Port 1

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	BPSK	13.5 / 0	40.479
Top	5795	BPSK	13.5 / 0	40.391



Bottom Channel

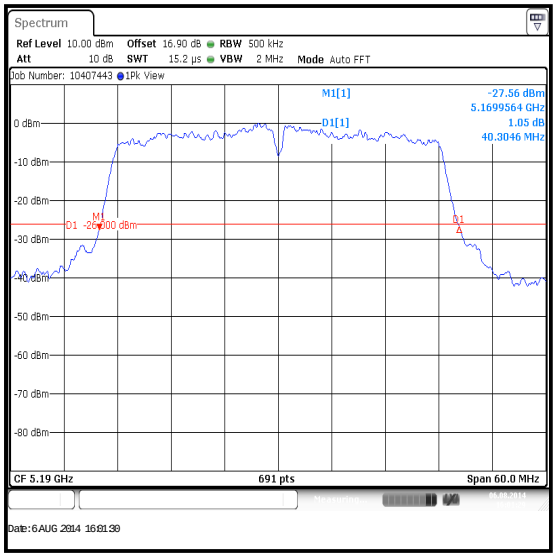


Top Channel

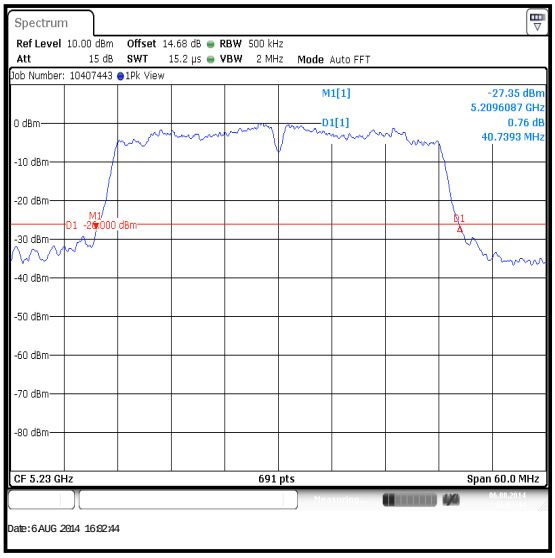
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / SISO / 5.15-5.25 GHz band / Port 2

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	BPSK	13.5 / 0	40.305
Top	5230	BPSK	13.5 / 0	40.739



Bottom Channel

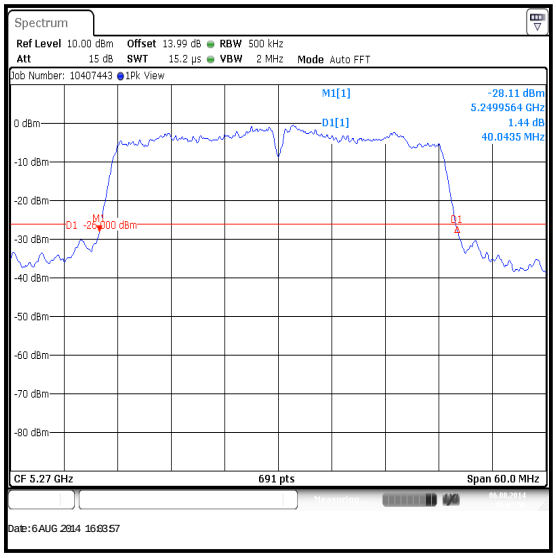


Top Channel

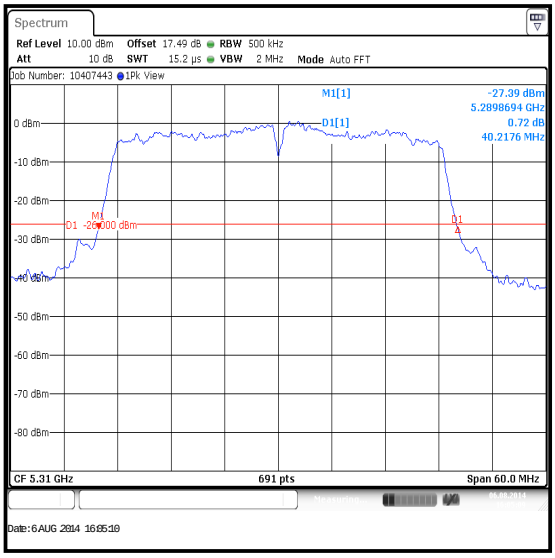
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / SISO / 5.25-5.35 GHz band / Port 2

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	BPSK	13.5 / 0	40.043
Top	5310	BPSK	13.5 / 0	40.218



Bottom Channel

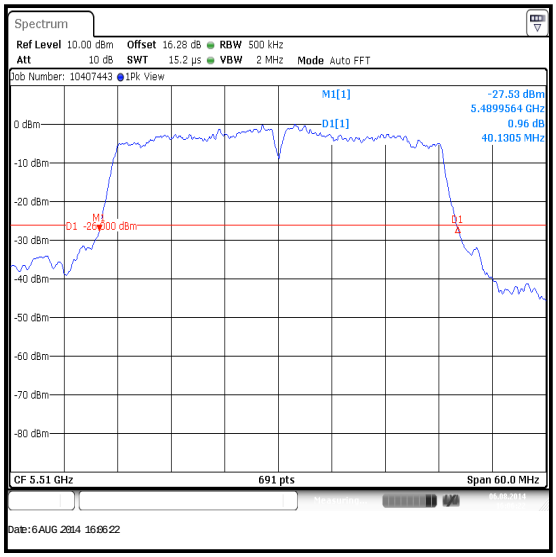


Top Channel

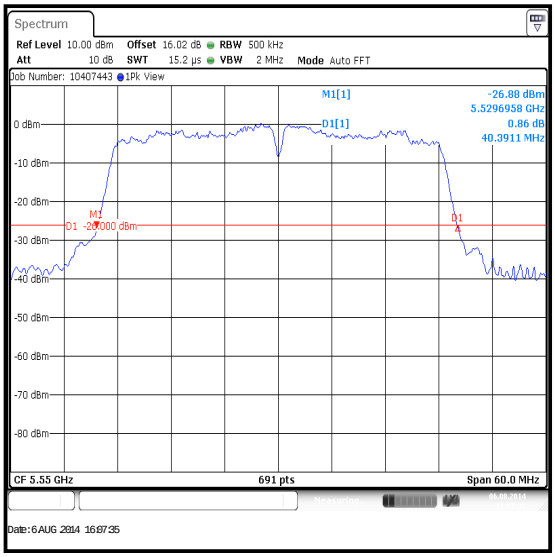
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / SISO / 5.47-5.725 GHz band / Port 2

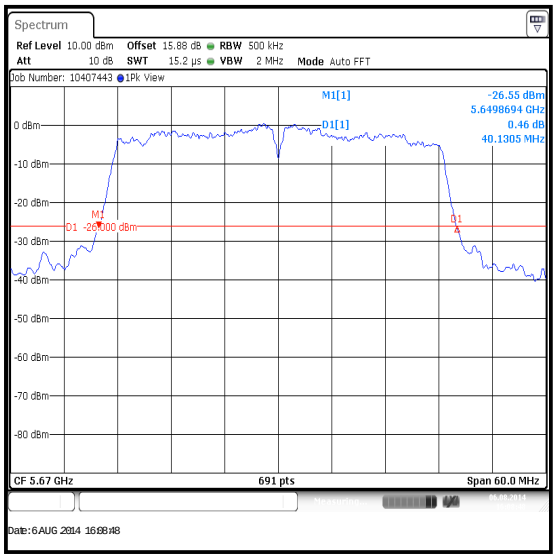
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	BPSK	13.5 / 0	40.131
Middle	5550	BPSK	13.5 / 0	40.391
Top	5670	BPSK	13.5 / 0	40.131



Bottom Channel



Middle Channel

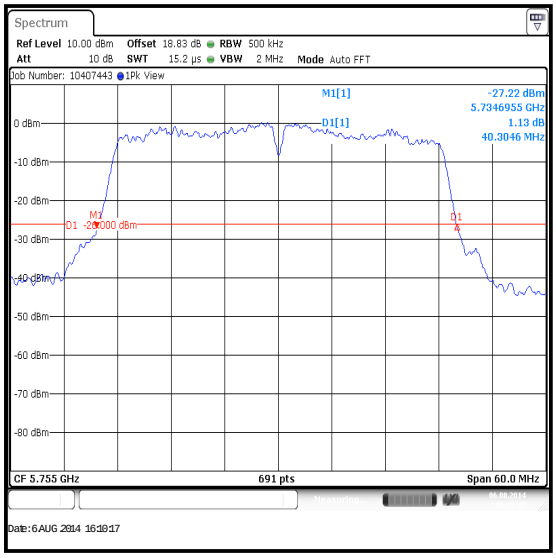


Top Channel

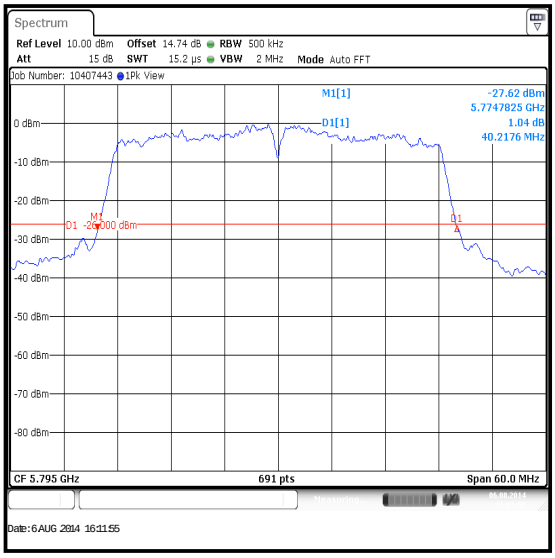
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / SISO / 5.725-5.85 GHz band / Port 2

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	BPSK	13.5 / 0	40.305
Top	5795	BPSK	13.5 / 0	40.218



Bottom Channel

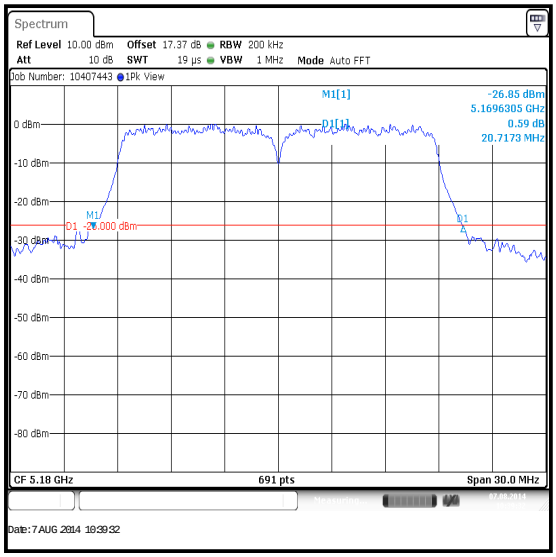


Top Channel

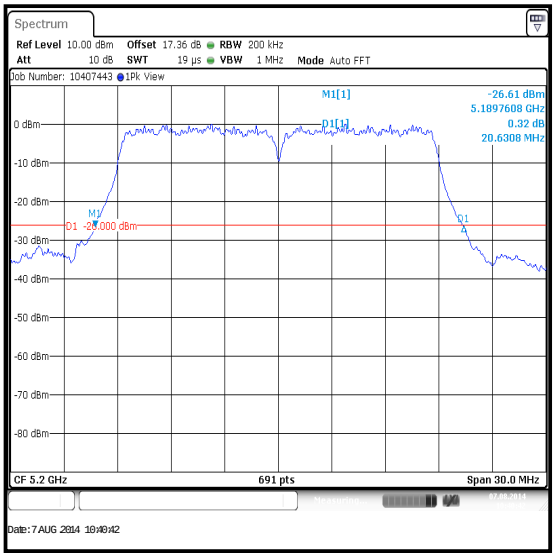
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / MIMO / 5.15-5.25 GHz band / Port 1

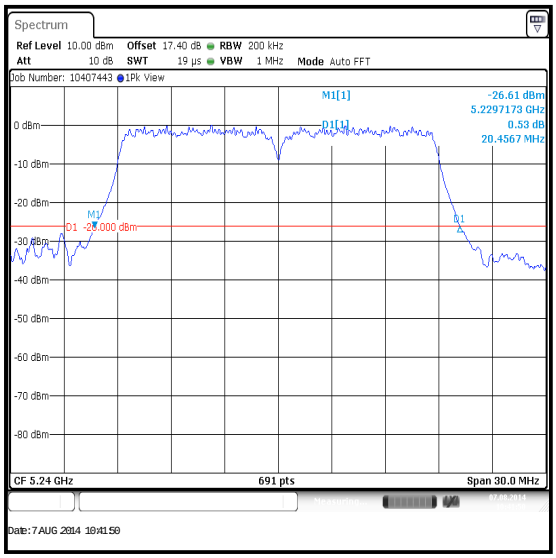
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6.5 / 0	20.717
Middle	5200	BPSK	6.5 / 0	20.631
Top	5240	BPSK	6.5 / 0	20.457



Bottom Channel



Middle Channel

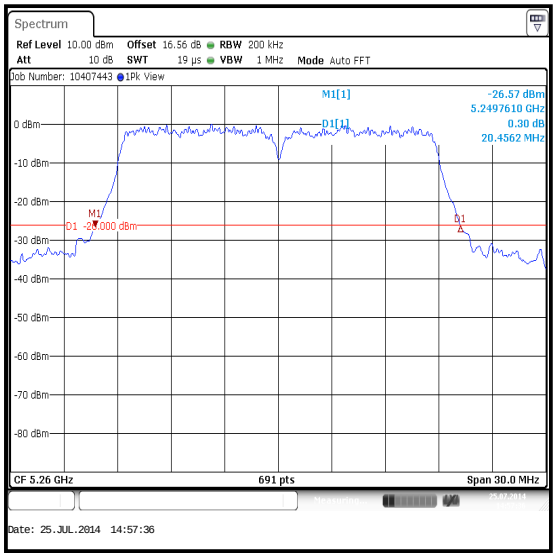


Top Channel

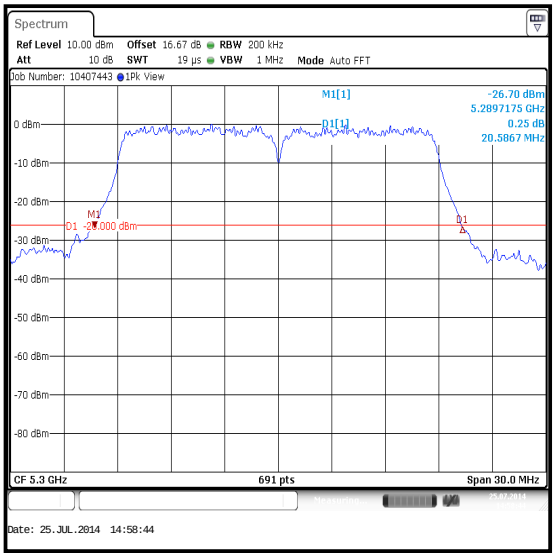
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / MIMO / 5.25-5.35 GHz band / Port 1

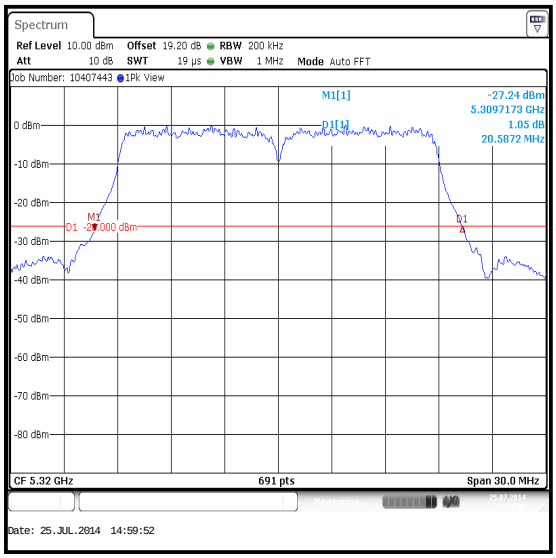
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6.5 / 0	20.456
Middle	5300	BPSK	6.5 / 0	20.587
Top	5320	BPSK	6.5 / 0	20.587



Bottom Channel



Middle Channel

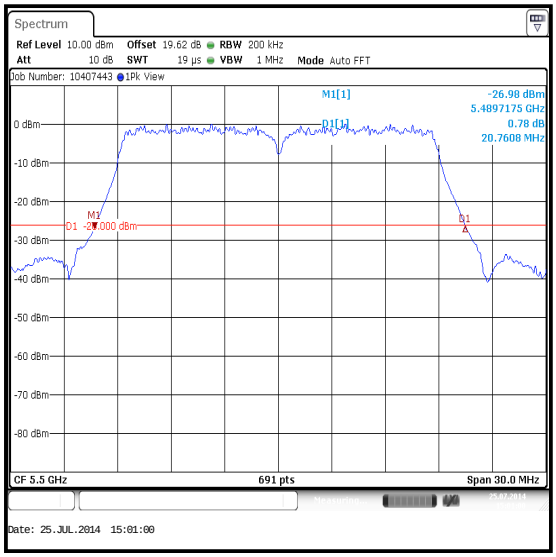


Top Channel

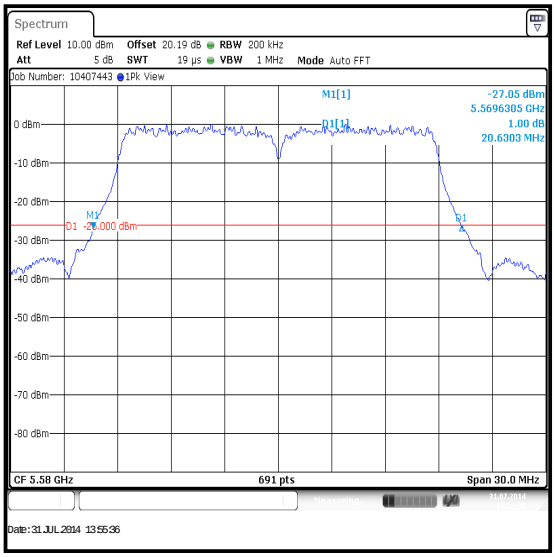
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / MIMO / 5.47-5.725 GHz band / Port 1

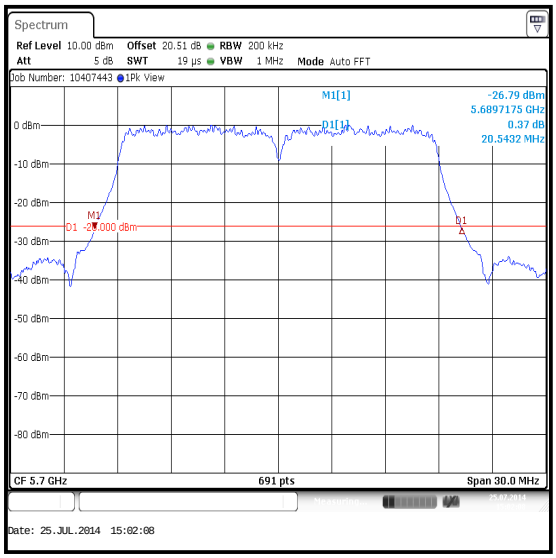
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6.5 / 0	20.761
Middle	5580	BPSK	6.5 / 0	20.630
Top	5700	BPSK	6.5 / 0	20.543



Bottom Channel



Middle Channel

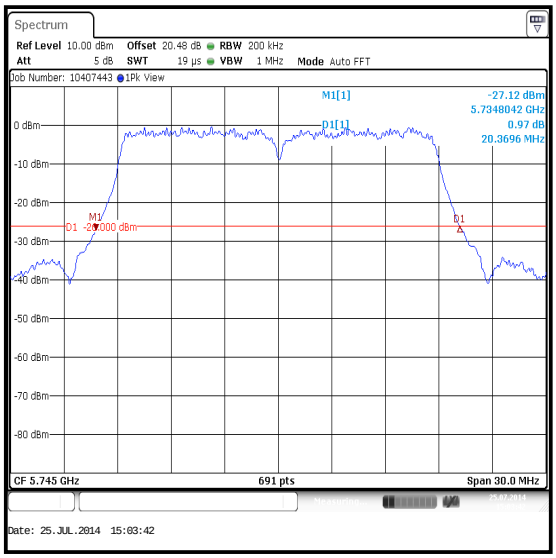


Top Channel

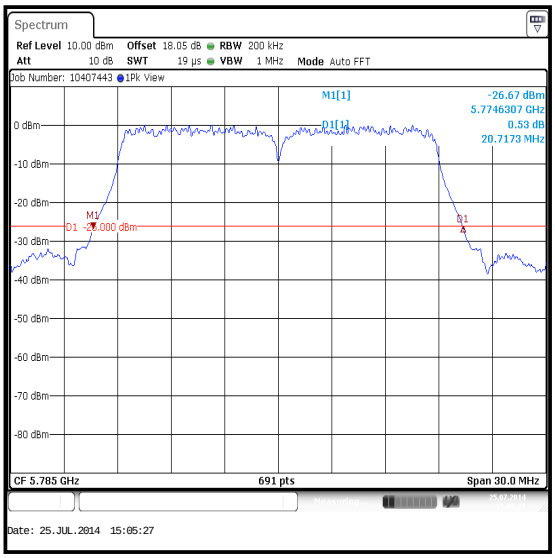
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / MIMO / 5.725-5.85 GHz band / Port 1

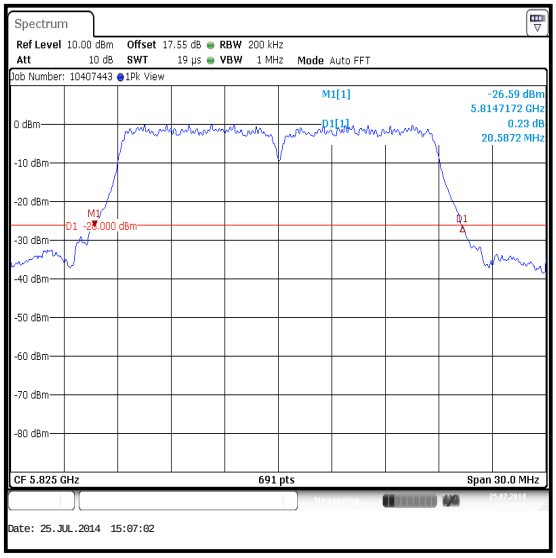
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	20.370
Middle	5785	BPSK	6.5 / 0	20.717
Top	5825	BPSK	6.5 / 0	20.587



Bottom Channel



Middle Channel

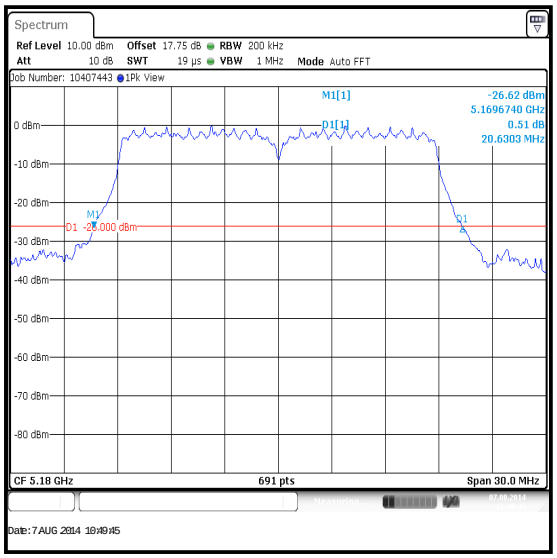


Top Channel

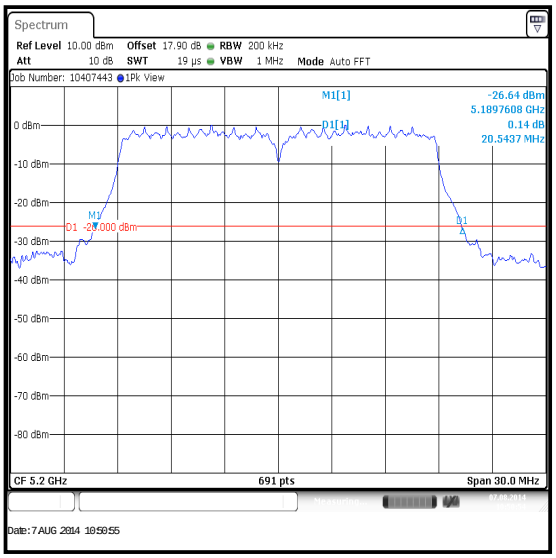
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / MIMO / 5.15-5.25 GHz band / Port 2

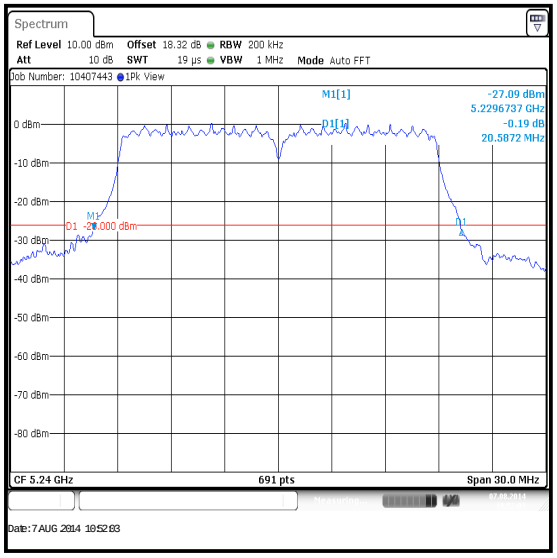
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6.5 / 0	20.630
Middle	5200	BPSK	6.5 / 0	20.544
Top	5240	BPSK	6.5 / 0	20.587



Bottom Channel



Middle Channel

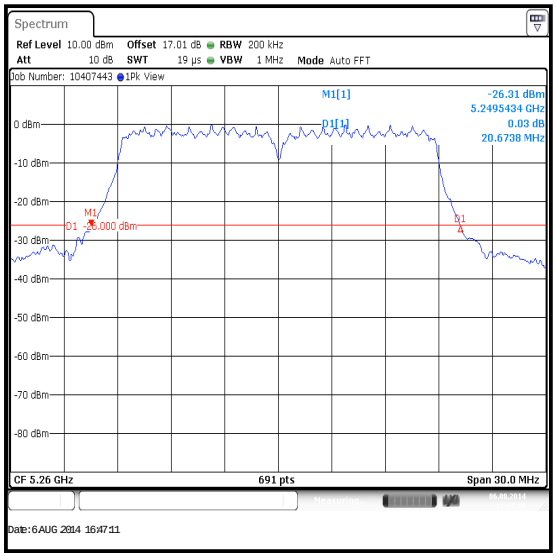


Top Channel

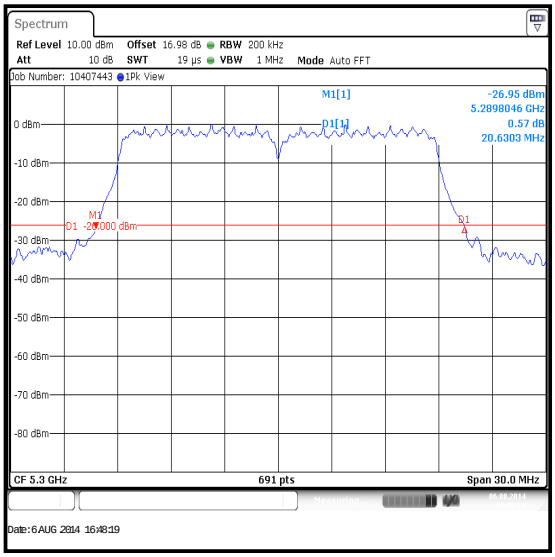
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / MIMO / 5.25-5.35 GHz band / Port 2

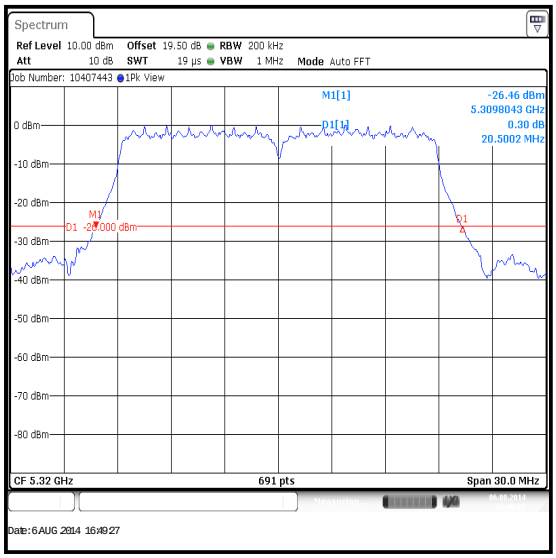
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6.5 / 0	20.674
Middle	5300	BPSK	6.5 / 0	20.630
Top	5320	BPSK	6.5 / 0	20.500



Bottom Channel



Middle Channel

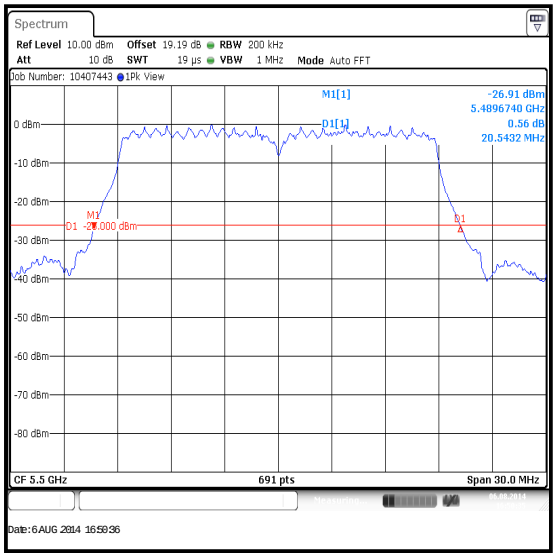


Top Channel

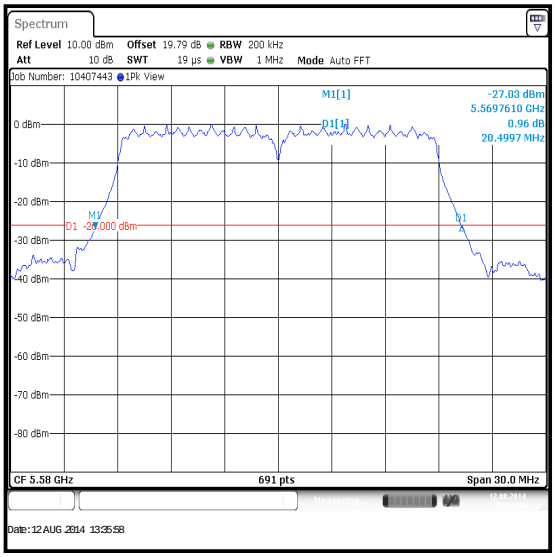
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / MIMO / 5.47-5.725 GHz band / Port 2

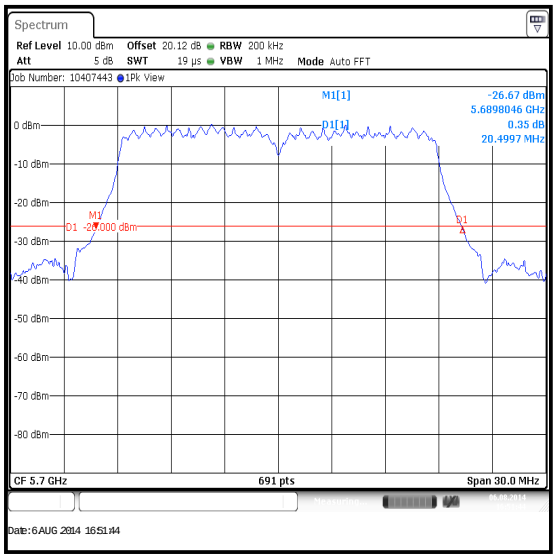
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6.5 / 0	20.543
Middle	5580	BPSK	6.5 / 0	20.500
Top	5700	BPSK	6.5 / 0	20.500



Bottom Channel



Middle Channel

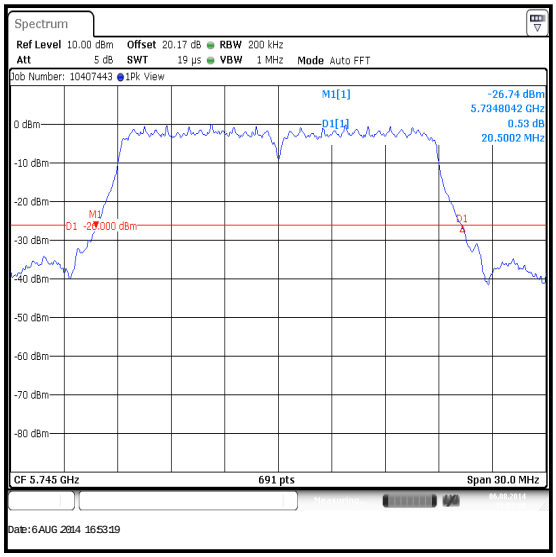


Top Channel

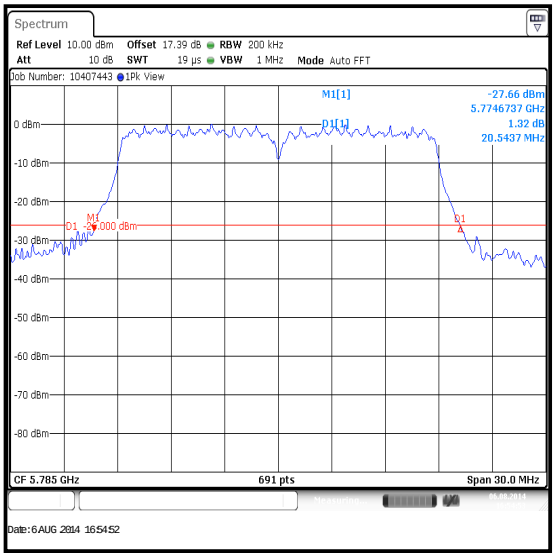
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / MIMO / 5.725-5.85 GHz band / Port 2

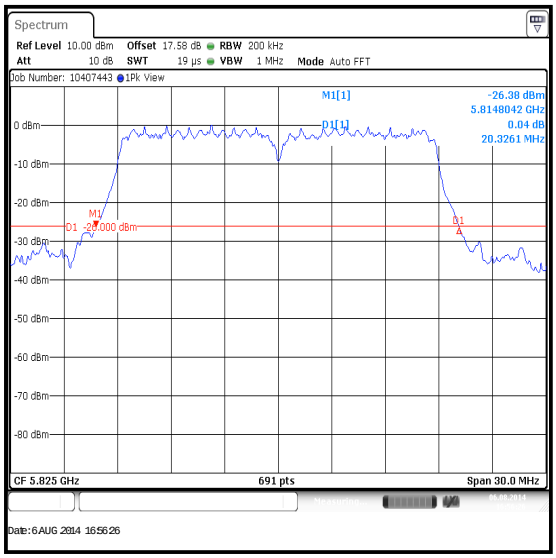
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	20.500
Middle	5785	BPSK	6.5 / 0	20.544
Top	5825	BPSK	6.5 / 0	20.326



Bottom Channel



Middle Channel

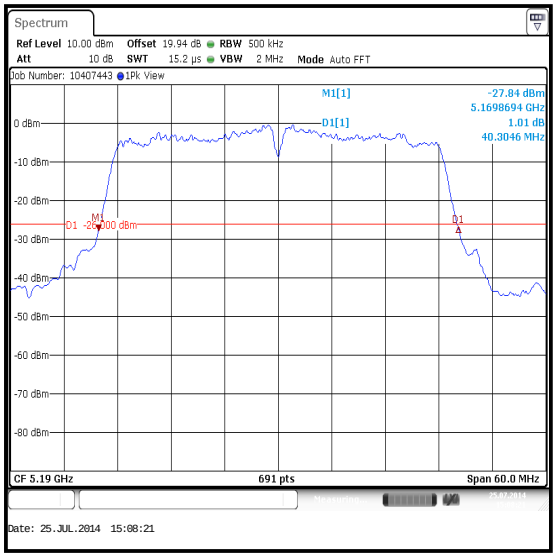


Top Channel

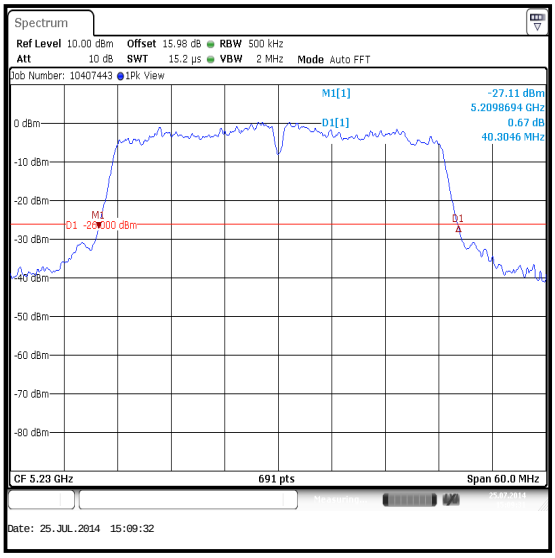
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / MIMO / 5.15-5.25 GHz band / Port 1

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	BPSK	13.5 / 0	40.305
Top	5230	BPSK	13.5 / 0	40.305



Bottom Channel

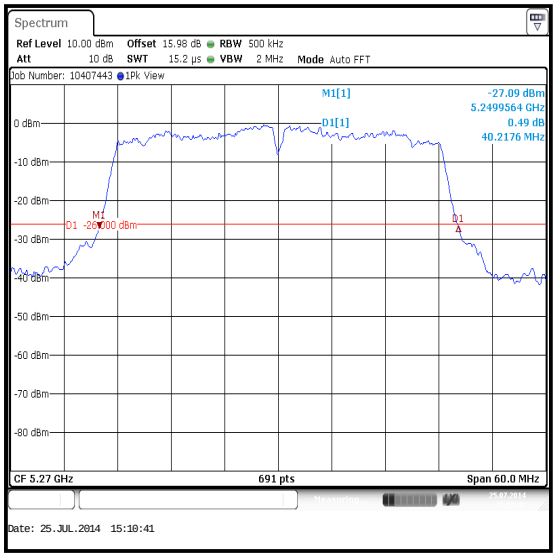


Top Channel

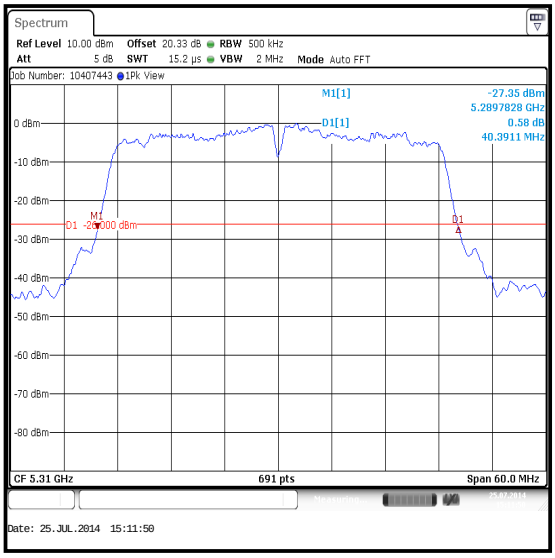
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / MIMO / 5.25-5.35 GHz band / Port 1

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	BPSK	13.5 / 0	40.218
Top	5310	BPSK	13.5 / 0	40.391



Bottom Channel

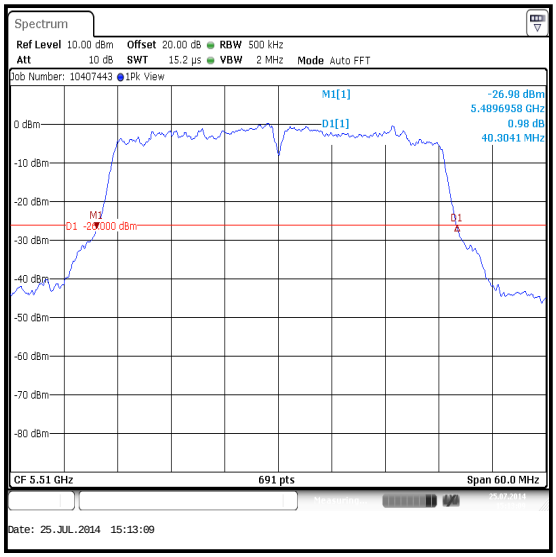


Top Channel

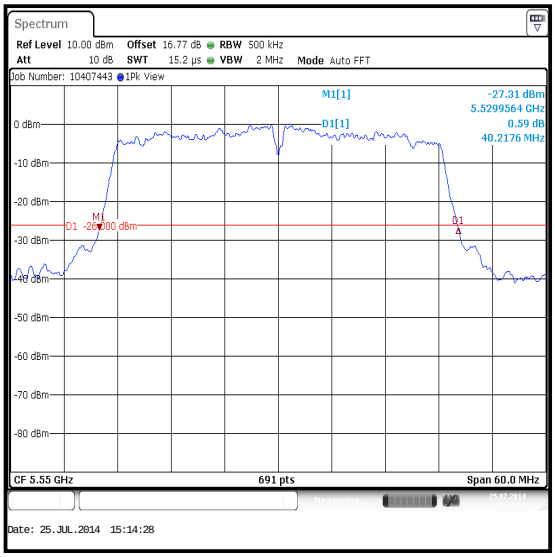
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / MIMO / 5.47-5.725 GHz band / Port 1

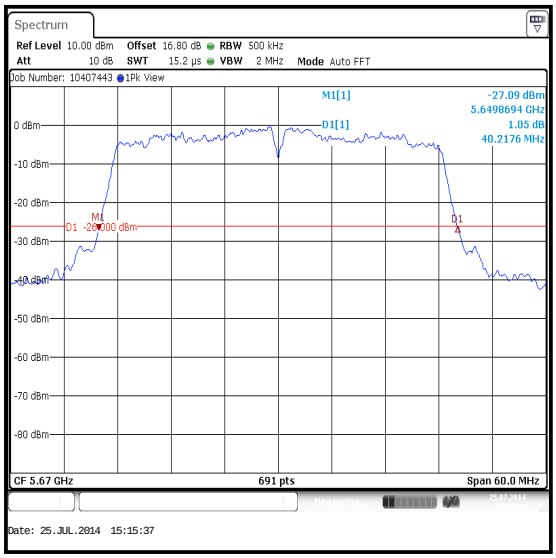
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	BPSK	13.5 / 0	40.304
Middle	5550	BPSK	13.5 / 0	40.218
Top	5670	BPSK	13.5 / 0	40.218



Bottom Channel



Middle Channel

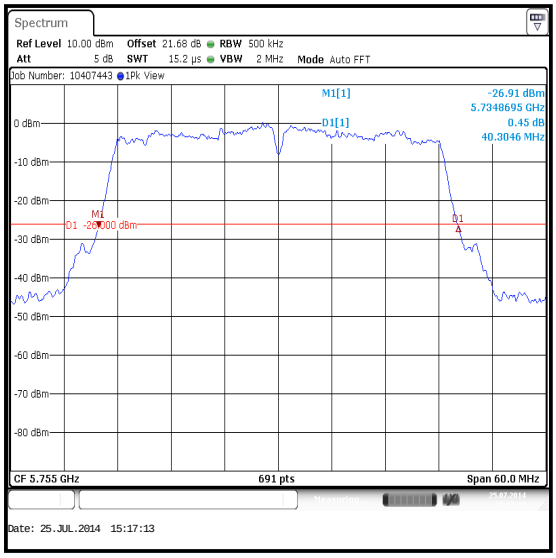


Top Channel

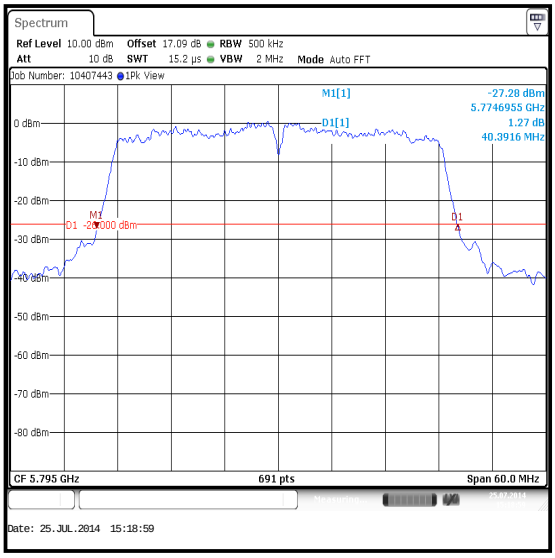
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / MIMO / 5.725-5.85 GHz band / Port 1

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	BPSK	13.5 / 0	40.305
Top	5795	BPSK	13.5 / 0	40.392



Bottom Channel

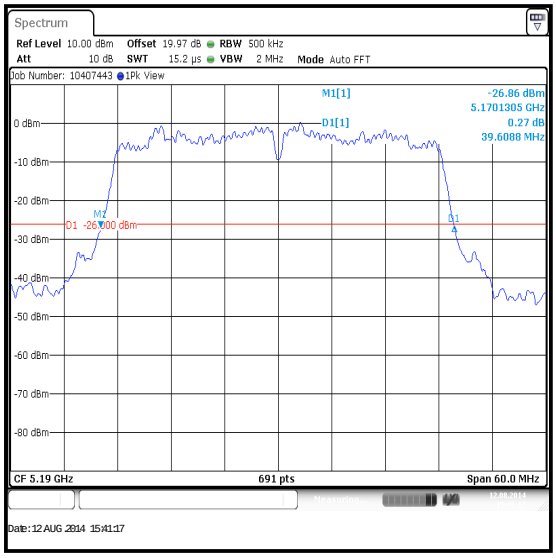


Top Channel

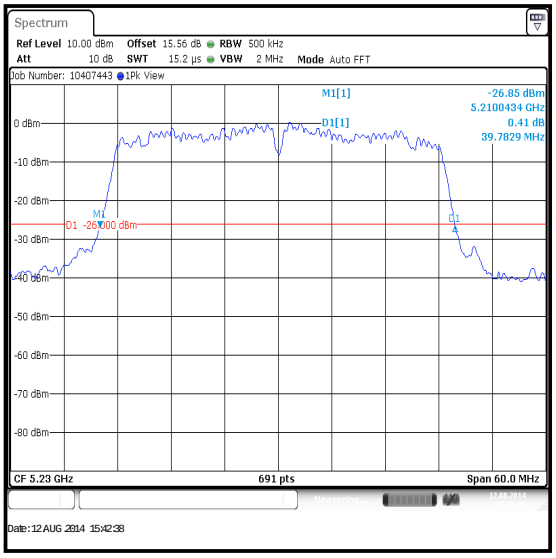
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / MIMO / 5.15-5.25 GHz band / Port 2

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	BPSK	13.5 / 0	39.609
Top	5230	BPSK	13.5 / 0	39.783



Bottom Channel

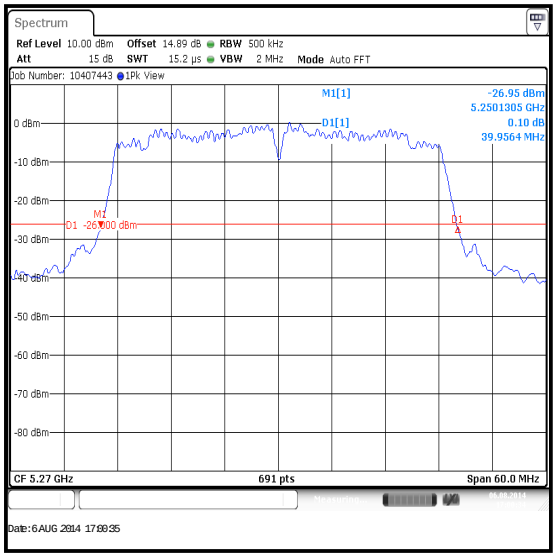


Top Channel

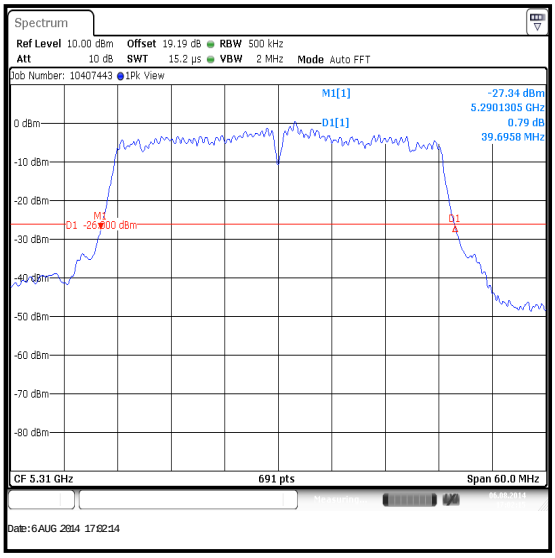
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / MIMO / 5.25-5.35 GHz band / Port 2

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	BPSK	13.5 / 0	39.956
Top	5310	BPSK	13.5 / 0	39.696



Bottom Channel

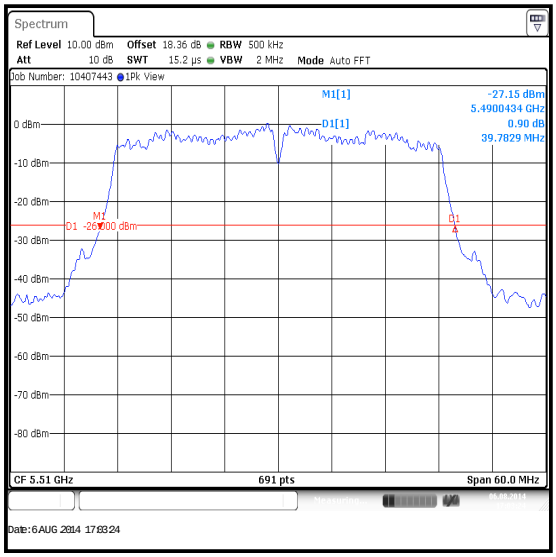


Top Channel

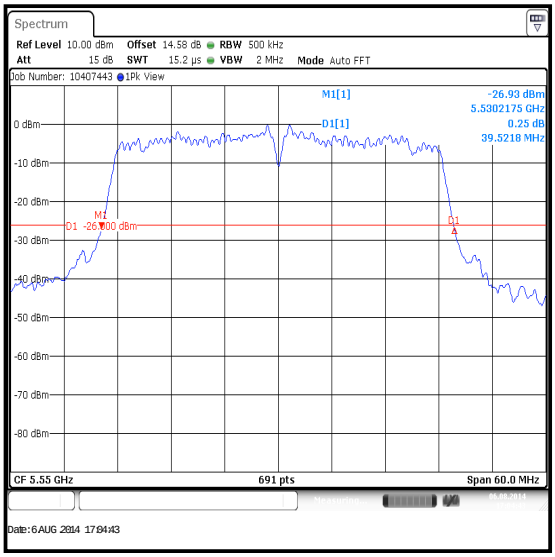
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / MIMO / 5.47-5.725 GHz band / Port 2

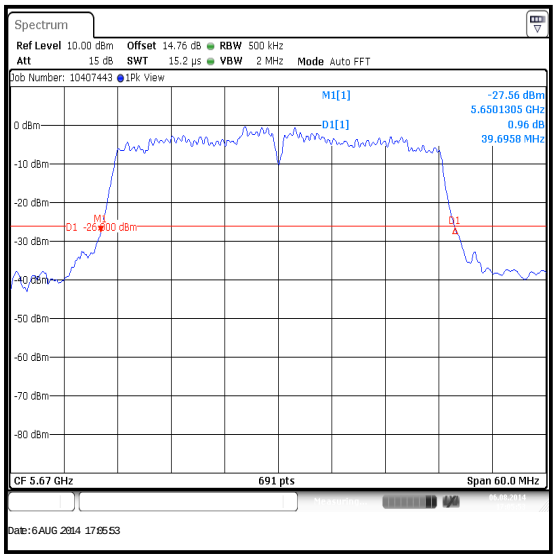
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	BPSK	13.5 / 0	39.783
Middle	5550	BPSK	13.5 / 0	39.522
Top	5670	BPSK	13.5 / 0	39.696



Bottom Channel



Middle Channel

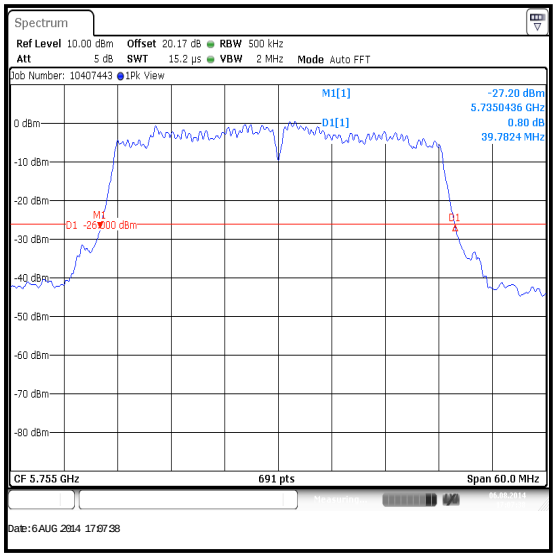


Top Channel

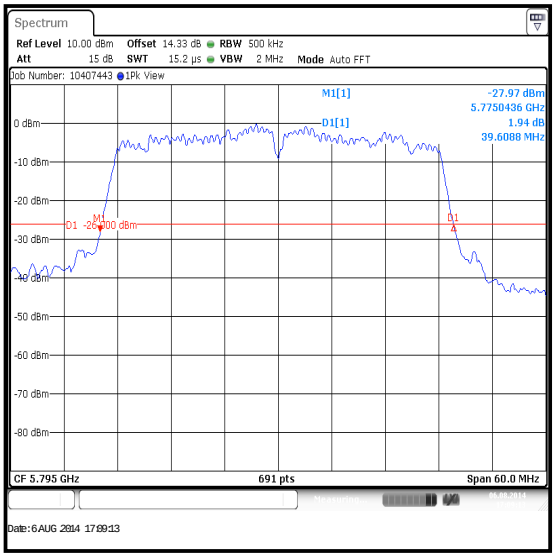
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / MIMO / 5.725-5.85 GHz band / Port 2

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	BPSK	13.5 / 0	39.782
Top	5795	BPSK	13.5 / 0	39.609



Bottom Channel



Top Channel

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1658	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
L1128	Signal Analyser	Rohde & Schwarz	FSV13	101835	25 Apr 2015	12
A1998	Attenuator	Huber & Suhner	6820.17.B	07101	Calibrated before use	-
S0558	DC Power Supply	TTI	EL 303R	395825	Calibrated before use	-
M1251	Multimeter	Fluke	175	89170179	19 May 2015	12

5.2.3. Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band)

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	25 July 2015 & 06 August 2014
Test Sample IMEI:	352025060005387		

FCC Reference:	Part 15.407(e)
Test Method Used:	As detailed in KDB 789033 D02 Section II.C.2.

Environmental Conditions:

Temperature (°C):	23 to 25
Relative Humidity (%):	39 to 44

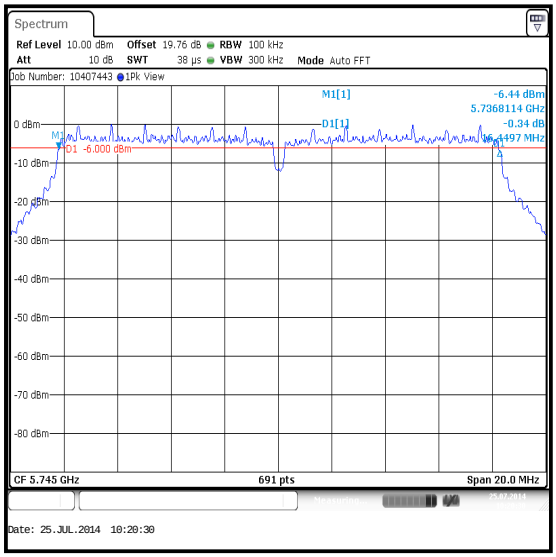
Note(s):

1. The customer declared the following data rates to be used for all measurements as:
    - 802.11a – BPSK / 6 Mbps
    - 802.11n HT20 SISO – BPSK / 6.5 Mbps / MCS0
    - 802.11n HT40 SISO – BPSK / 13.5 Mbps / MCS0
    - 802.11n HT20 MIMO – BPSK / 6.5 Mbps / MCS0
    - 802.11n HT40 MIMO – BPSK / 13.5 Mbps / MCS0
2. Final measurements were performed using the above configurations on the bottom, middle and top channels in accordance with KDB 789033 Section II.C.2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz measurement procedure.
3. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

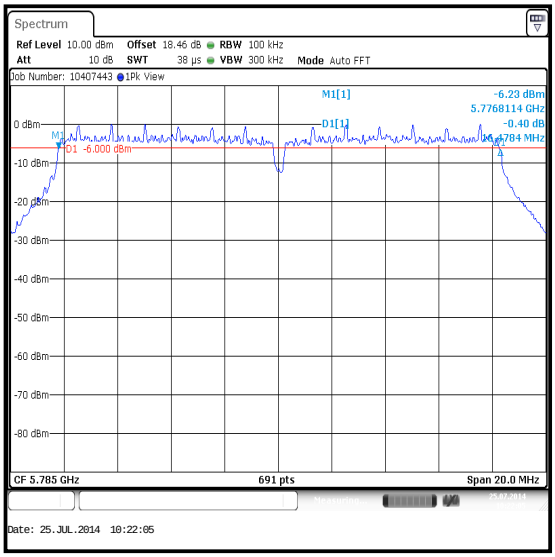
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11a / 20 MHz / BPSK / 6 Mbps / Port 1

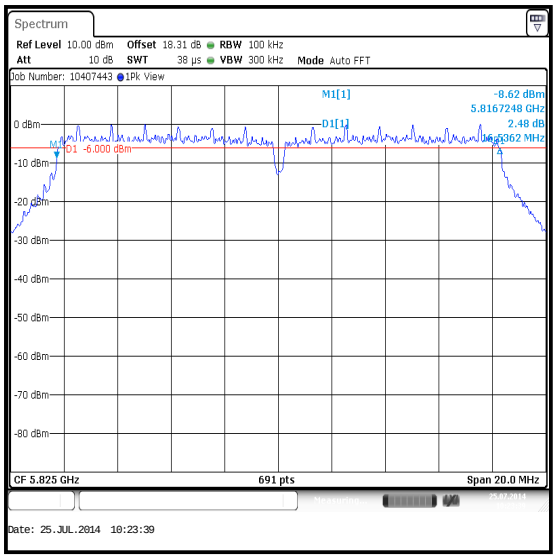
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	16450	≥500	15950	Complied
Middle	16478	≥500	15978	Complied
Top	16536	≥500	16036	Complied



Bottom Channel



Middle Channel

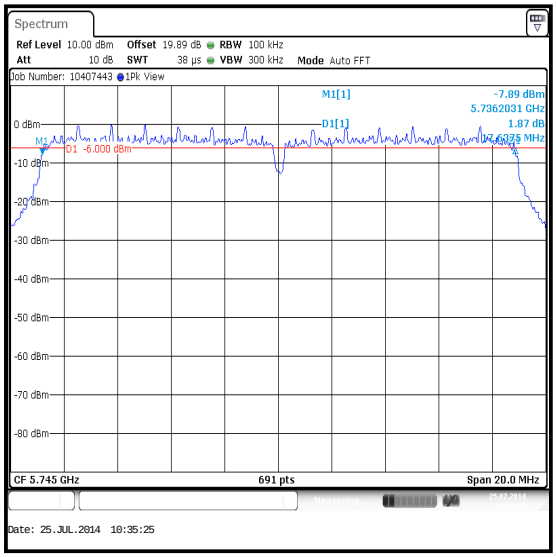


Top Channel

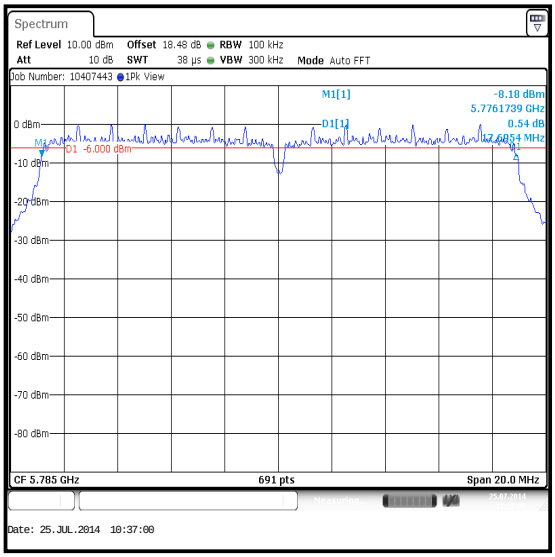
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 20 MHz / SISO / BPSK / MCS0 / Port 1

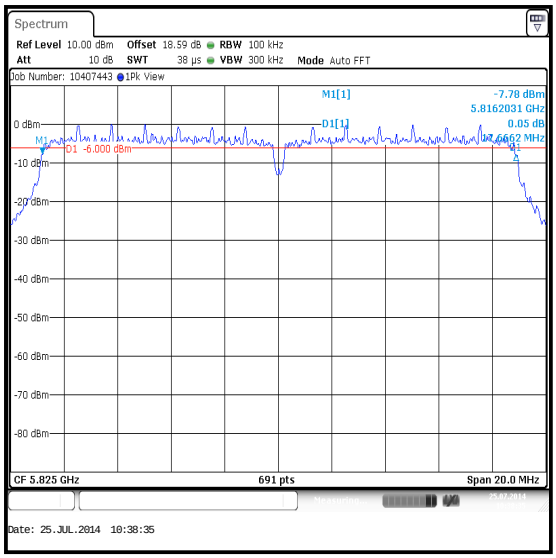
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17638	≥500	17138	Complied
Middle	17695	≥500	17195	Complied
Top	17666	≥500	17166	Complied



Bottom Channel



Middle Channel

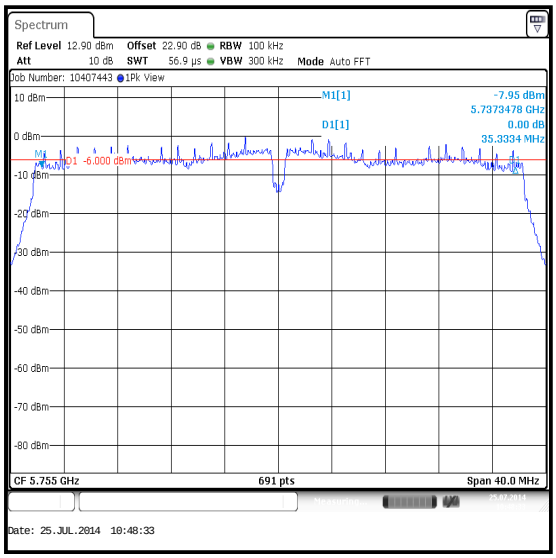


Top Channel

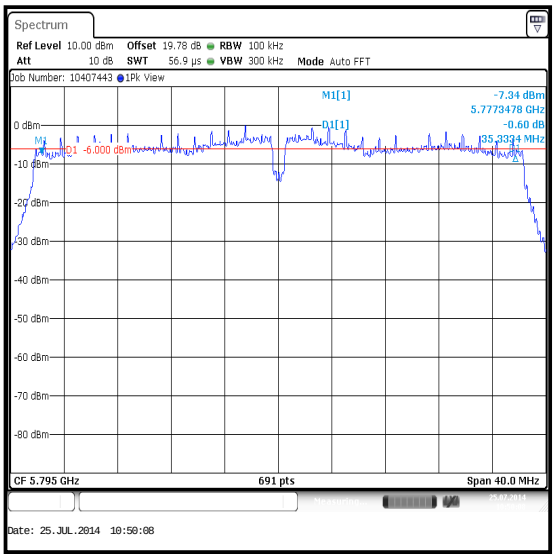
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 40 MHz / SISO / BPSK / MCS0 / Port 1

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	35333	≥500	34833	Complied
Top	35333	≥500	34833	Complied



Bottom Channel

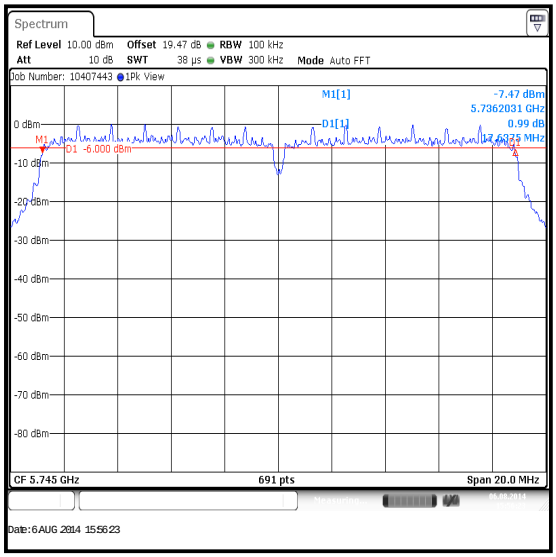


Top Channel

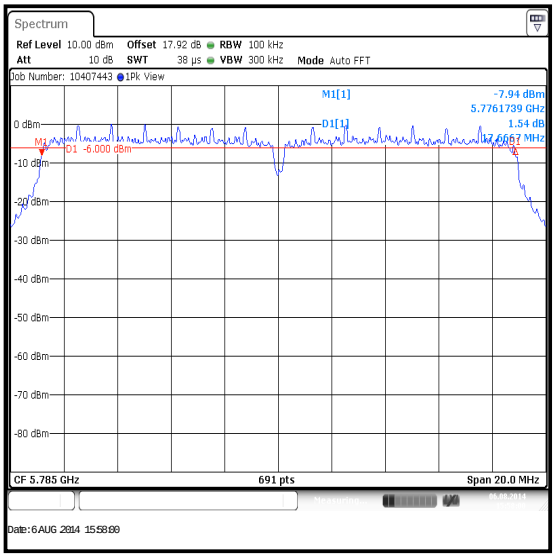
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 20 MHz / SISO / BPSK / MCS0 / Port 2

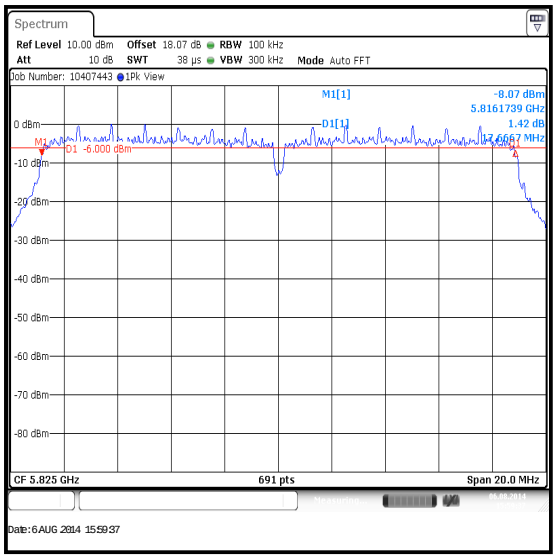
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17638	≥500	17138	Complied
Middle	17667	≥500	17167	Complied
Top	17667	≥500	17167	Complied



Bottom Channel



Middle Channel

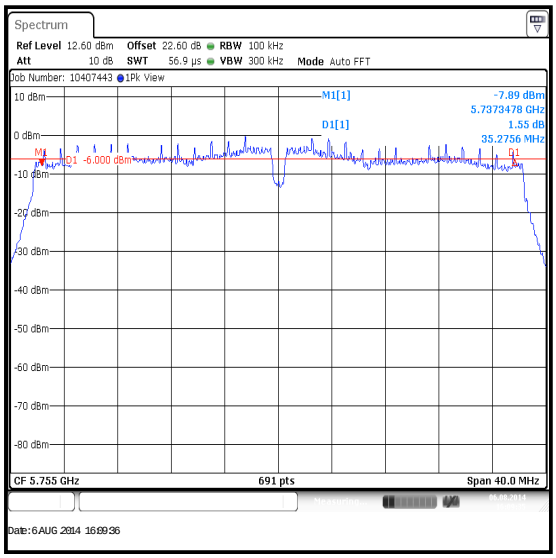


Top Channel

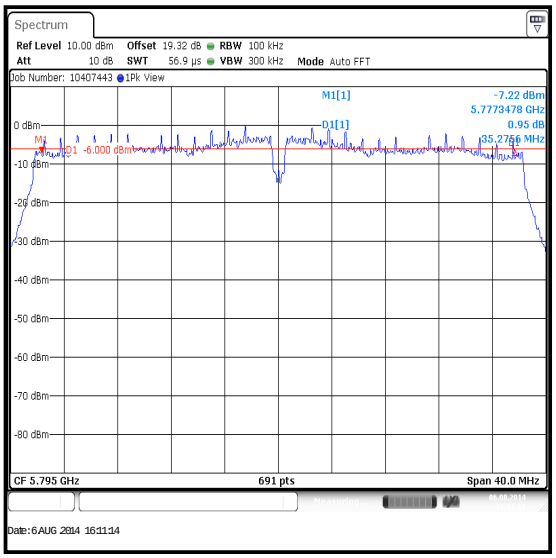
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 40 MHz / SISO / BPSK / MCS0 / Port 2

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	35276	≥500	34776	Complied
Top	35276	≥500	34776	Complied



Bottom Channel

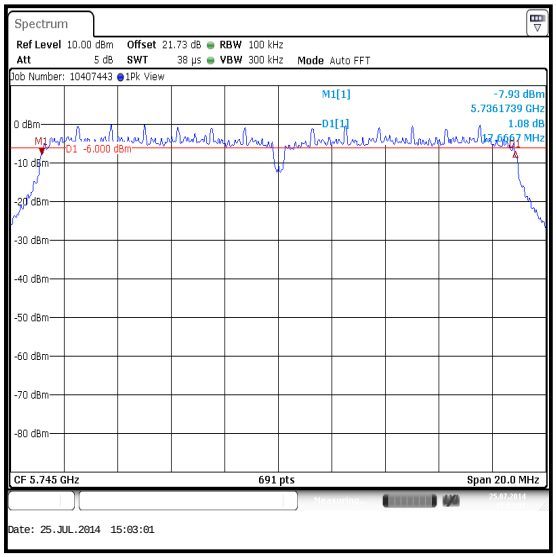


Top Channel

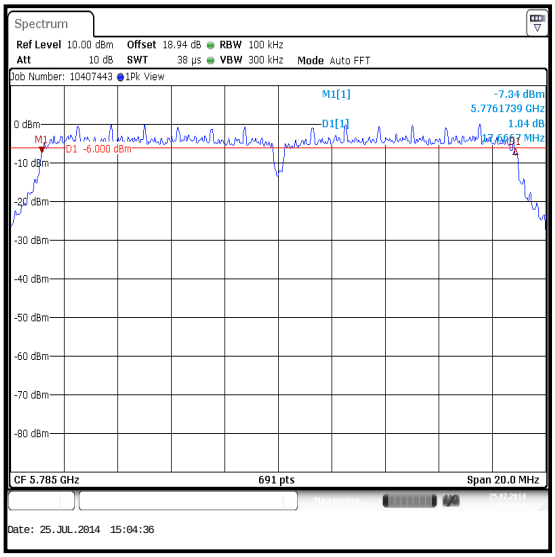
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 20 MHz / MIMO / BPSK / MCS0 / Port 1

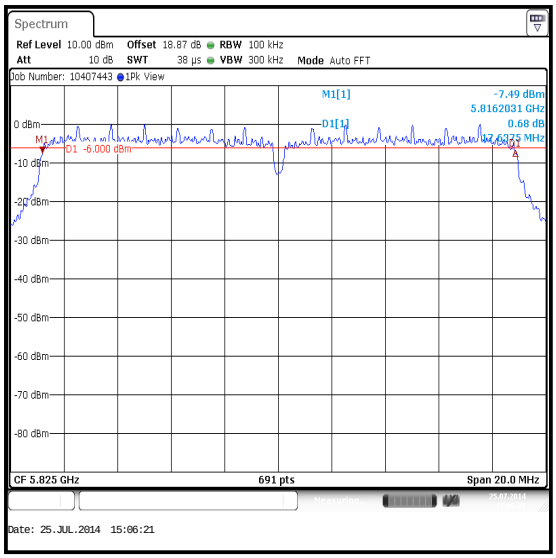
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17667	≥500	17167	Complied
Middle	17667	≥500	17167	Complied
Top	17638	≥500	17138	Complied



Bottom Channel



Middle Channel

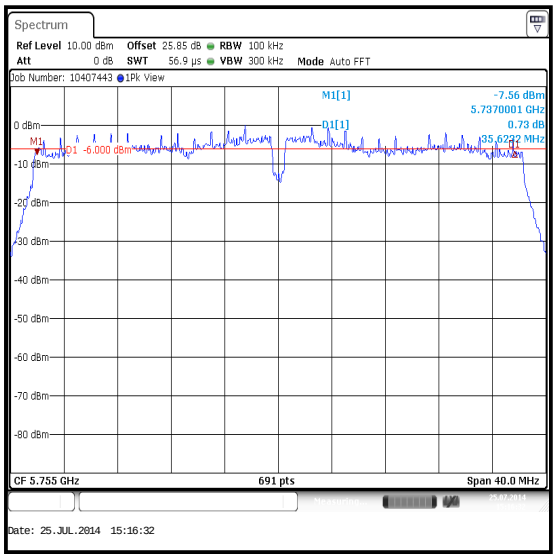


Top Channel

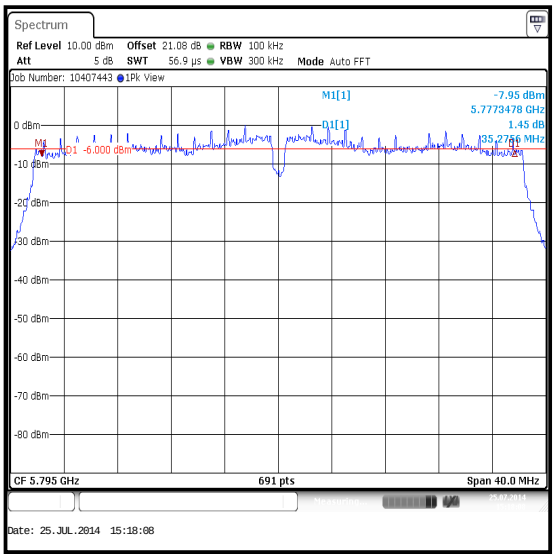
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 40 MHz / MIMO / BPSK / MCS0 / Port 1

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	35623	≥500	35123	Complied
Top	35276	≥500	34776	Complied



Bottom Channel

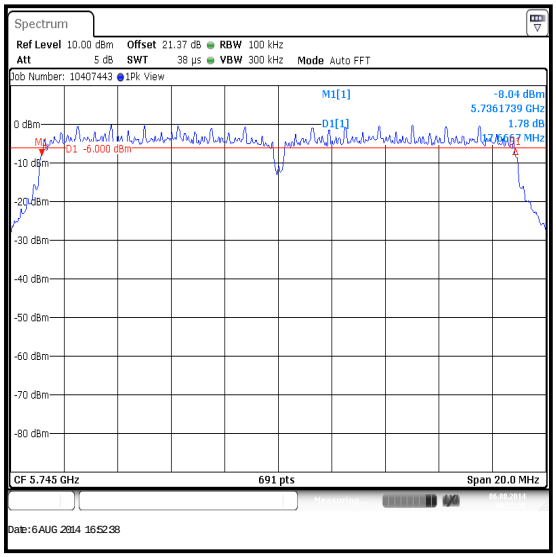


Top Channel

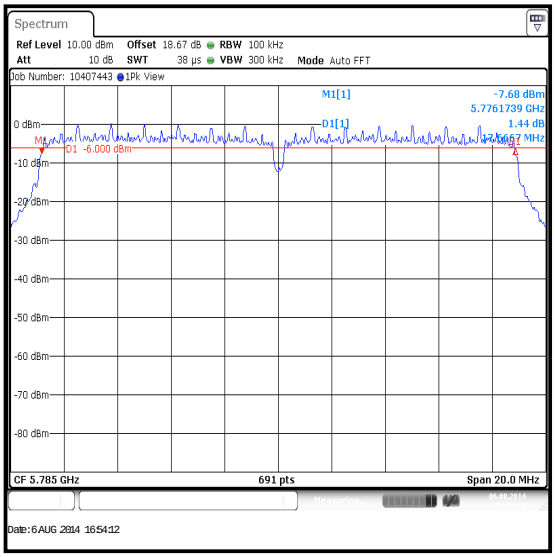
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 20 MHz / MIMO / BPSK / MCS0 / Port 2

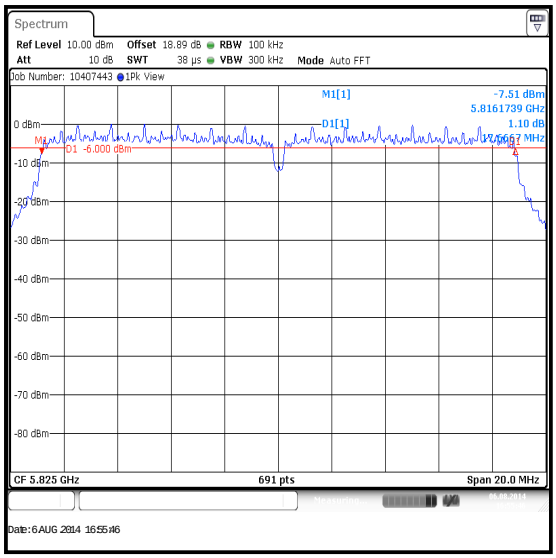
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17667	≥500	17167	Complied
Middle	17667	≥500	17167	Complied
Top	17667	≥500	17167	Complied



Bottom Channel



Middle Channel

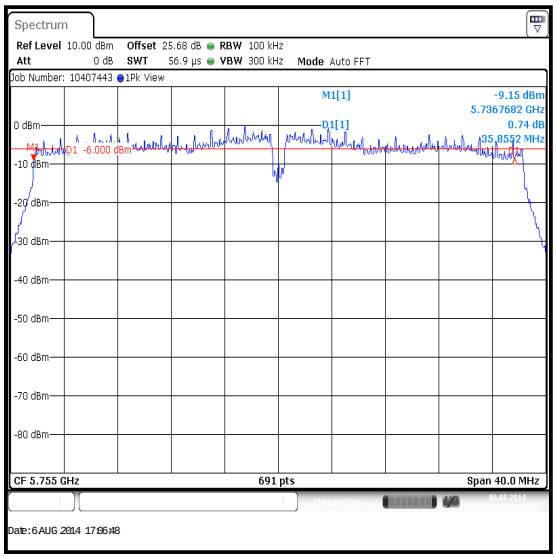


Top Channel

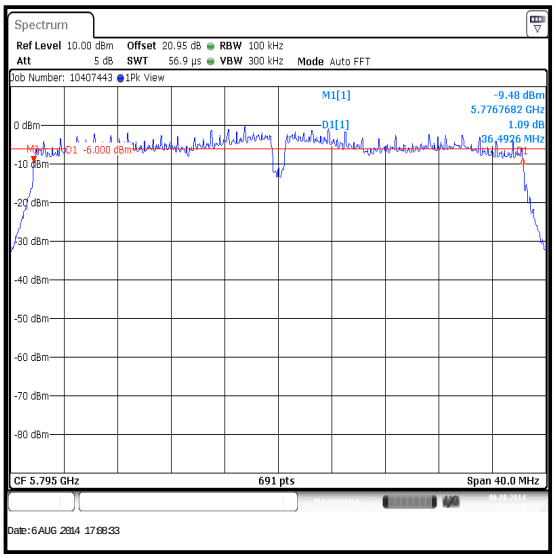
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 40 MHz / MIMO / BPSK / MCS0 / Port 2

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	35855	≥500	35355	Complied
Top	36493	≥500	35993	Complied



Bottom Channel



Top Channel

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1658	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
L1128	Signal Analyser	Rohde & Schwarz	FSV13	101835	25 Apr 2015	12
A1998	Attenuator	Huber & Suhner	6820.17.B	07101	Calibrated before use	-
S0558	DC Power Supply	TTI	EL 303R	395825	Calibrated before use	-
M1251	Multimeter	Fluke	175	89170179	19 May 2015	12

5.2.4. Transmitter Duty Cycle

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	24 July 2014
Test Sample IMEI:	352025060005387		

FCC Reference:	Part 15.35(c)
Test Method Used:	As detailed in KDB 789033 D02 Section II.B.2.b)

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	40

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 100ms whichever is the lesser]).

   802.11n / 13.5 Mbps duty cycle: 10 log (1 / (0.929/0.961)) = 0.1

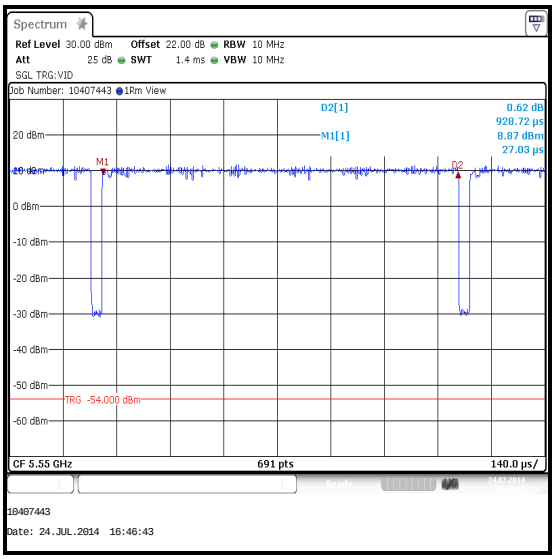
2. For all other data rates the duty cycle was measured to be greater than 98%.

Transmitter Duty Cycle (continued)

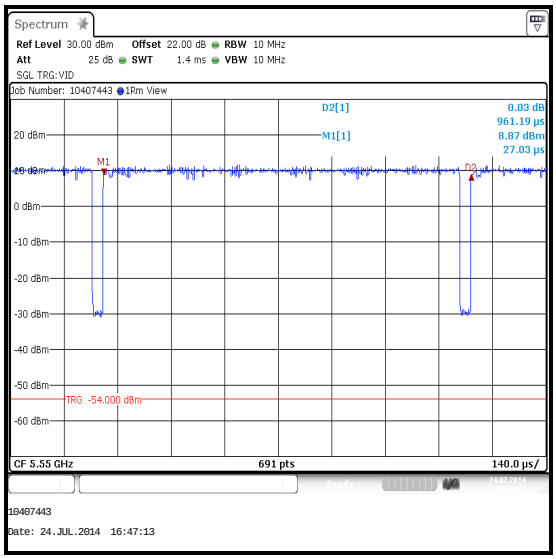
Results: 802.11n / 40 MHz / 13.5 Mbps / MCS0

Pulse Duration (µs)	Duty Cycle (dB)
928.72	0.1

Period (µs)
961.19



TX on time



TX on + off time

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1658	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
L1128	Signal Analyser	Rohde & Schwarz	FSV13	101835	25 Apr 2015	12
A1998	Attenuator	Huber & Suhner	6820.17.B	07101	Calibrated before use	-
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M1251	Multimeter	Fluke	175	89170179	19 May 2015	12