FCC Test Report

Product Name ： USB-AC56 dual-bank wireless adapter

Model No. ： USB-AC56

FCC ID. ： MSQ-USBAC56

Applicant ： ASUSTeK COMPUTER INC.

Address ： 4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan, R.O.C.

Date of Receipt ： 2013/05/10

Issued Date ： 2013/06/24

Report No. ： 135176R-RFUSP46V01

Report Version ： V1.0

Test Report Certification

Issued Date : 2013/06/24
Report No. : 135176R-RFUSP46V01

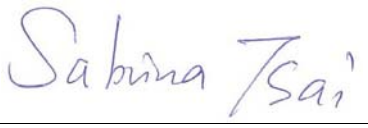
QuieTek

Product Name	:	USB-AC56 dual-bank wireless adapter
Applicant	:	ASUSTeK COMPUTER INC.
Address	:	4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan, R.O.C.
Manufacturer	:	ASUSTeK COMPUTER INC.
Model No.	:	USB-AC56
FCC ID.	:	MSQ-USBAC56
EUT Voltage	:	DC5V(Power by PC)
Trade Name	:	ASUS
Applicable Standard	:	FCC CFR Title 47 Part 15 Subpart E Section 15.407: 2012 ANSI C63.4: 2009
Test Result	:	Complied

The test results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.

Documented By : 

(Demi Chang / Engineering Adm. Specialist)

Reviewed By : 

(Sabrina Tsai / Assistant Engineer)

Approved By : 

(Roy Wang / Manager)

Laboratory Information

We, **QuieTek Corporation**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C.	**:**	**TAF, Accreditation Number: 1313**
USA	**:**	**FCC, Registration Number: 365520**
Canada	**:**	**IC, Submission No: 150981**

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site:http://www.quietek.com/tw/ctg/cts/accreditations.htm
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/
If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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TEL:+886-3-592-8858 / FAX:+886-3-592-8859 E-Mail : service@quietek.com

LinKou Testing Laboratory:
No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789 E-Mail : service@quietek.com

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1. General Information

1.1. EUT Description

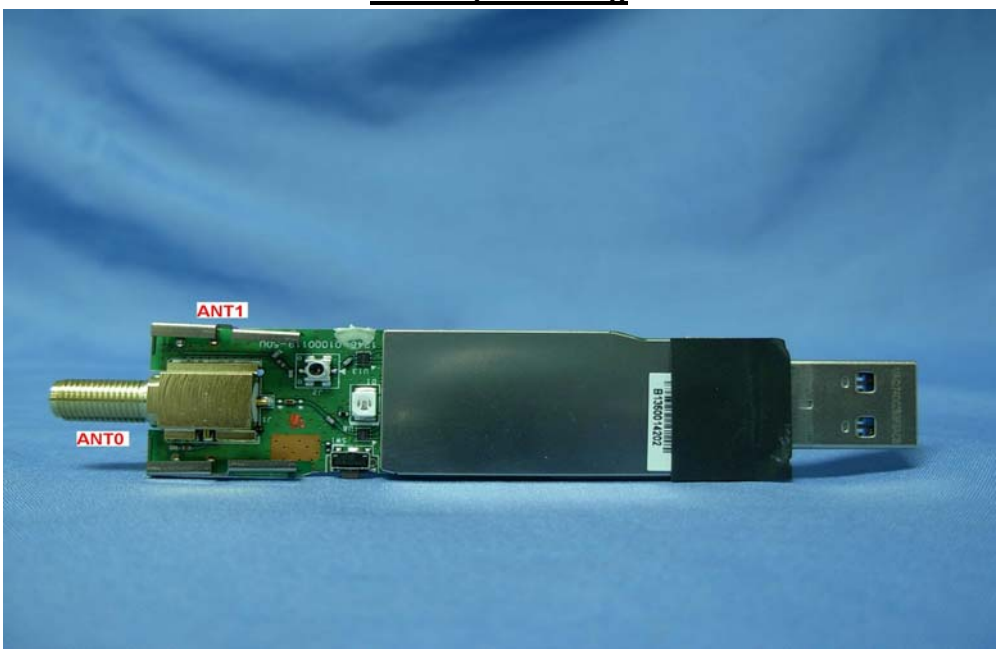
Product Name	USB-AC56 dual-bank wireless adapter
Product Type	WLAN (2TX, 2RX)
Trade Name	ASUS
Model No.	USB-AC56
Frequency Range/ Channel Number -IEEE 802.11a & IEEE 802.11n (20MHz)	5180~5240MHz / 4 Channels
Frequency Range/Channel Number -IEEE 802.11n/ac (40MHz)	5190~5230MHz / 2 Channels
Frequency Range/ Channel Number -IEEE 802.11ac (80MHz)	5210MHz / 1 Channel
Type of Modulation (IEEE 802.11a/n)	Orthogonal Frequency Division Multiplexing (OFDM)
Data Speed (IEEE 802.11a)	6Mbps,9Mbps,12Mbps,18Mbps,24Mbps,36Mbps,48Mbps,54Mbps
Data Speed (IEEE 802.11n)	Support a subset of the combination of GI, MCS 0~MCS 15 and bandwidth defined in 802.11n
Data Speed (IEEE 802.11ac)	Support a subset of the combination of GI, MCS 0~MCS 9 and bandwidth defined in 802.11ac
Antenna Gain	Dipole Antenna : Ant0 : 2.00dBi PIFA Antenna : Ant0 : 2.28dBi , Ant1 : 2.38dBi
Beamforming Gain	NA
Antenna Type	Dipole Antenna & PIFA Antenna

Component	
USB Cable	Shielded, 0.9m

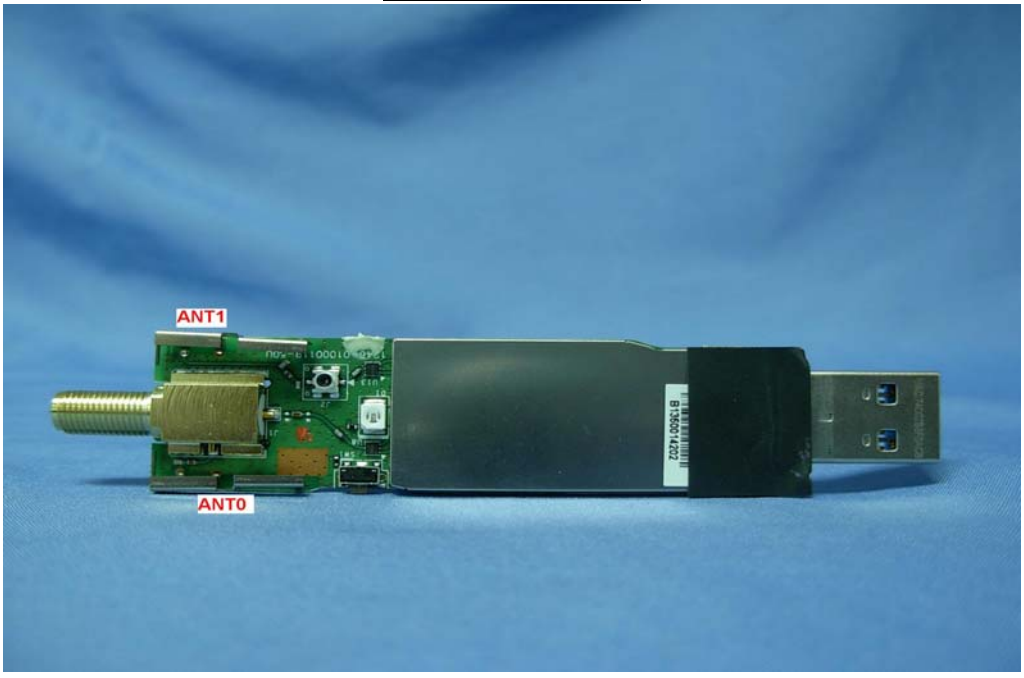
ANT-TX / Rx & Bandwidth

ANT-TX / RX	TX			RX		
Mode/ Channel Bandwidth	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz
IEEE802.11a	✓			✓		
IEEE802.11n	✓	✓		✓	✓	
IEEE802.11ac	✓	✓	✓	✓	✓	✓

Mode1 (2TX /2RX))



Mode2 (2TX /2RX))



IEEE 802.11n

MCS Index	Modulation	R	N_{BPSCS}	N_{CBPS}		N_{DBPS}		Data Rate(Mb/s)			
				20MHz	40MHz	20MHz	40MHz	800ns GI		400ns GI (Note1)	
								20MHz	40MHz	20MHz	40MHz
0	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.2	15.0
1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.4	30.0
2	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.7	45.0
3	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.9	60.0
4	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.3	90.0
5	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.8	120.0
6	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.0	135.0
7	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.2	150.0
Note 1: Support of 400ns GI is optional on transmit and receive.											

Table 1 – MCS parameters for TX Antenna number = 1

MCS Index	Modulation	R	N_{BPSCS}	N_{CBPS}		N_{DBPS}		Data Rate(Mb/s)			
				20MHz	40MHz	20MHz	40MHz	800ns GI		400ns GI (Note1)	
								20MHz	40MHz	20MHz	40MHz
8	BPSK	1/2	1	104	216	52	108	13.0	27.0	14.4	30.0
9	QPSK	1/2	2	208	432	104	216	26.0	54.0	28.9	60.0
10	QPSK	3/4	2	208	432	156	324	39.0	81.0	43.3	90.0
11	16-QAM	1/2	4	416	864	208	432	52.0	108.0	57.8	120.0
12	16-QAM	3/4	4	416	864	312	648	78.0	162.0	86.7	180.0
13	64-QAM	2/3	6	624	1296	416	864	104.0	216.0	115.6	240.0
14	64-QAM	3/4	6	624	1296	468	972	117.0	243.0	130.0	270.0
15	64-QAM	5/6	6	624	1296	520	1080	130.0	270.0	144.4	300.0
Note 1: Support of 400ns GI is optional on transmit and receive.											

Table 2 – MCS parameters for TX Antenna number = 2

Symbol	Explanation
R	Code rate
N_{BPSC}	Number of coded bits per single carrier
N_{CBPS}	Number of coded bits per symbol
N_{DBPS}	Number of data bits per symbol
GI	guard interval

Draft IEEE 802.11ac Data Rate

Spatial Streams (Note1)	MCS Index	Modulation type	Coding rate	Data Rate(Mb/s)							
				20 MHz		40 MHz		80 MHz		160 MHz	
				Guard Interval		Guard Interval		Guard Interval		Guard Interval	
				800ns	400ns	800ns	400ns	800ns	400ns	800ns	400ns
1	0	BPSK	1/2	6.5	7.2	13.5	15	29.3	32.5	58.5	65
	1	QPSK	1/2	13	14.4	27	30	58.5	65	117	130
	2	QPSK	3/4	19.5	21.7	40.5	45	87.8	97.5	175.5	195
	3	16-QAM	1/2	26	28.9	54	60	117	130	234	260
	4	16-QAM	3/4	39	43.3	81	90	175.5	195	351	390
	5	64-QAM	2/3	52	57.8	108	120	234	260	468	520
	6	64-QAM	3/4	58.5	65	121.5	135	263.3	292.5	526.5	585
	7	64-QAM	5/6	65	72.2	135	150	292.5	325	585	650
	8	256-QAM	3/4	78	86.7	162	180	351	390	702	780
	9	256-QAM	5/6	N/A	N/A	180	200	390	433.3	780	866.7
2	0	BPSK	1/2	13	14.4	27	30	58.6	65	117	130
	1	QPSK	1/2	26	28.8	54	60	117	130	234	260
	2	QPSK	3/4	39	43.4	81	90	175.6	195	351	390
	3	16-QAM	1/2	52	57.8	108	120	234	260	468	520
	4	16-QAM	3/4	78	86.6	162	180	351	390	702	780
	5	64-QAM	2/3	104	115.6	216	240	468	520	936	1040
	6	64-QAM	3/4	117	130	243	270	526.6	585	1053	1170
	7	64-QAM	5/6	130	144.4	270	300	585	650	1170	1300
	8	256-QAM	3/4	156	173.4	324	360	702	780	1404	1560
	9	256-QAM	5/6	N/A	N/A	360	400	780	866.6	1560	1733.4

IEEE 802.11a & IEEE 802.11n (20MHz) & IEEE 802.11ac (20MHz)

Working Frequency of Each Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180MHz	40	5200MHz	44	5220MHz	48	5240MHz

IEEE 802.11n (40MHz) & IEEE 802.11ac (40MHz)

Working Frequency of Each Channel			
Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz

IEEE 802.11ac (80MHz)

Working Frequency of Each Channel	
Channel	Frequency
42	5210MHz

Note:

1. This device is a USB-AC56 dual-bank wireless adapter including 2.4GHz b/g/n and 5GHz a/n/ac (2x2) transmitting and receiving function.
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with Part 15 Subpart E Paragraph 15.407.
3. Regards to the frequency band operation; the lowest、middle and highest frequency of channel were selected to perform the test, and then shown on this report.
4. The function of the 2.4GHz and 5.8GHz transmitting is measured and makes a test report of the report number: 135176R-RFUSP42V01.
5. This device has USB and Ethernet ports, which can be connected to computer. The receiving function receiving was tested and its test report number is 135176R-RFUSP37V02 under Declaration of Conformity.

1.3. Test Mode

QuieTek has verified the construction and function in typical operation. The preliminary tests were performed in different data rate, and to find the worst condition, which was shown in this test report. The following table is the final test mode.

TX	Mode 1: Transmit (Dipole Antenna) Mode 2: Transmit (PIFA Antenna)

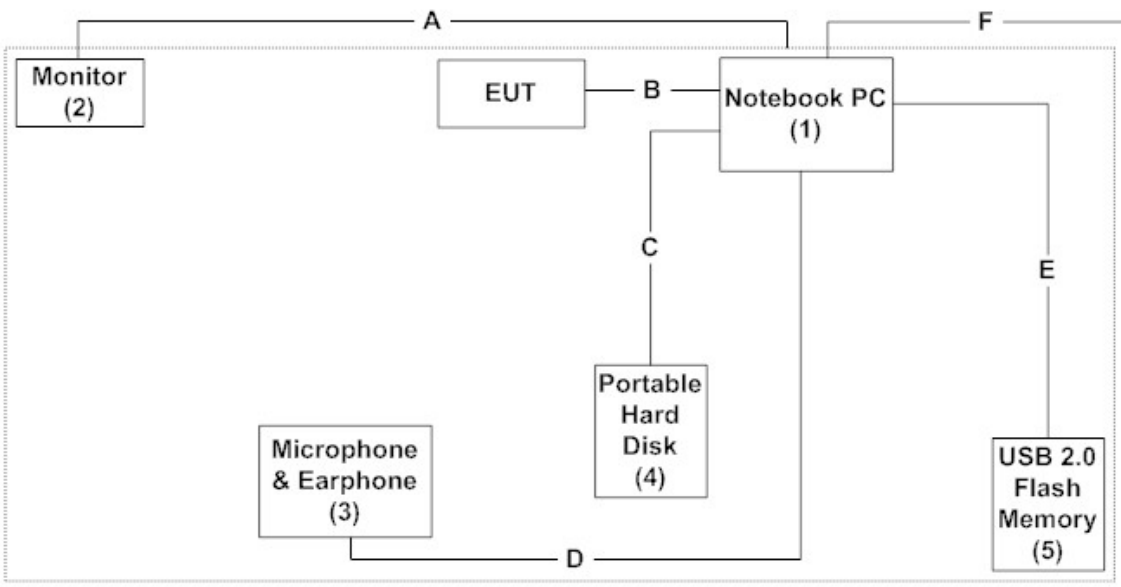
Test Items	Mode	Channel	Antenna	Result
Conducted Emission	11ac (80MHz)	42	0+1	Complies
99 % & 26dB Bandwidth	a	36/44/48	0	Complies
	11n/ac (20MHz)	36/44/48	0/1	Complies
	11n/ac (40MHz)	38/46	0/1	Complies
	11ac (80MHz)	42	0/1	Complies
Peak Transmit Output	a	36/44/48	0	Complies
	11n/ac (20MHz)	36/44/48	0+1	Complies
	11n/ac (40MHz)	38/46	0+1	Complies
	11ac (80MHz)	42	0+1	Complies
Peak Power Spectrum Density	a	36/44/48	0	Complies
	11n/ac (20MHz)	36/44/48	0+1	Complies
	11n/ac (40MHz)	38/46	0+1	Complies
	11ac (80MHz)	42	0+1	Complies
Power Excursion	a	36/44/48	0	Complies
	11n/ac (20MHz)	36/44/48	0/1	Complies
	11n/ac (40MHz)	38/46	0/1	Complies
	11ac (80MHz)	42	0/1	Complies
Radiated Emission	a	36/44/48	0	Complies
	11n/ac (20MHz)	36/44/48	0+1	Complies
	11n/ac (40MHz)	38/46	0+1	Complies
	11ac (80MHz)	42	0+1	Complies
Band Edge	a	36	0	Complies
	11n/ac (20MHz)	36	0+1	Complies
	11n/ac (40MHz)	38	0+1	Complies
	11ac (80MHz)	42	0+1	Complies
Frequency Stability	a	36/44/48	0	Complies
	11n/ac (20MHz)	36/44/48	0/1	Complies
	11n/ac (40MHz)	38/46	0/1	Complies
	11ac (80MHz)	42	0/1	Complies

1.4. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
1	Notebook PC	ASUS	K45V	K45V-0343G3110M	DoC	Non-Shielded, 1.8m
2	Monitor	DELL	2407FPW	2407FPW	DoC	Non-Shielded, 1.8m
3	Microphone & Earphone	Fujiei	SBZ-38	N/A	DoC	--
4	Portable Hard Disk	WD	My Passport	WXE1AB0M5632	DoC	--
5	USB 2.0 Flash Memory	Apacer	AH223	N/A	DoC	--

1.5. Configuration of tested System

Connection Diagram


Signal Cable Type		Signal cable Description
A	VGA Cable	Shielded, 1.8m, two ferrite cores bonded.
B	USB Cable	Shielded, 0.9m
C	USB Cable	Non-Shielded, 1m
D	Microphone & Earphone Cable	Non-Shielded, 1.8m
E	USB 2.0 Flash Memory Cable	Non-Shielded, 1.5m
F	LAN Cable	Non-Shielded, 10m

1.6. EUT Exercise Software

1	Setup the EUT as shown in Section 1.5.
2	Execute the test program “MTool” on the Notebook.
3	Configure the test mode, the test channel, and the data rate.
4	Press “Start TX” to start the continuous transmitting.
5	Verify that the EUT works properly.

1.7. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual
Temperature (°C)	FCC PART 15 C 15.407 Conducted Emission	15 - 35	20
Humidity (%RH)		25 - 75	50
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 99 % & 26dB Bandwidth	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Peal Transmit Power	15 - 35	25
Humidity (%RH)		25 - 75	65
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Peak Power Spectrum Density	15 - 35	24
Humidity (%RH)		25 - 75	49
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Power Excursion	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Radiated Emission	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Band Edge	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Frequency Stability	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000

2. Conducted Emission

2.1. Test Equipment

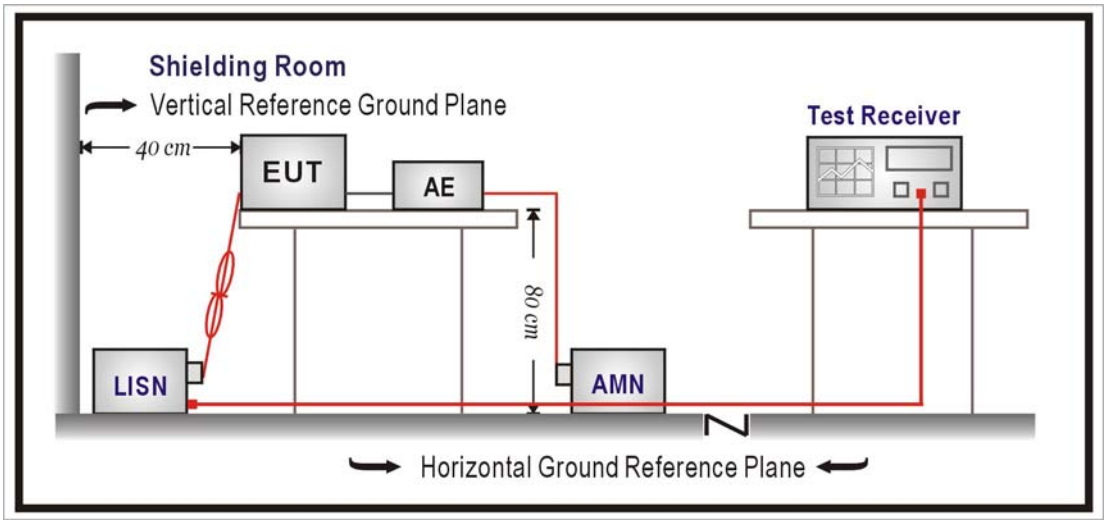
The following test equipments are used during the test:

Conducted Emission / SR3

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
LISN	R&S	ENV216	100096	2013/08/12
LISN	R&S	ESH3-Z5	836679/022	2014/01/20
Test Receiver	R&S	ESCS 30	825442/017	2014/01/01

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 Limits (dBuV)		
Frequency MHz	QP	AV
0.15 - 0.50	66-56	56-46
0.50 - 5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT was setup according to ANSI C63.4: 2009. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs.)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

2.5. Test Specification

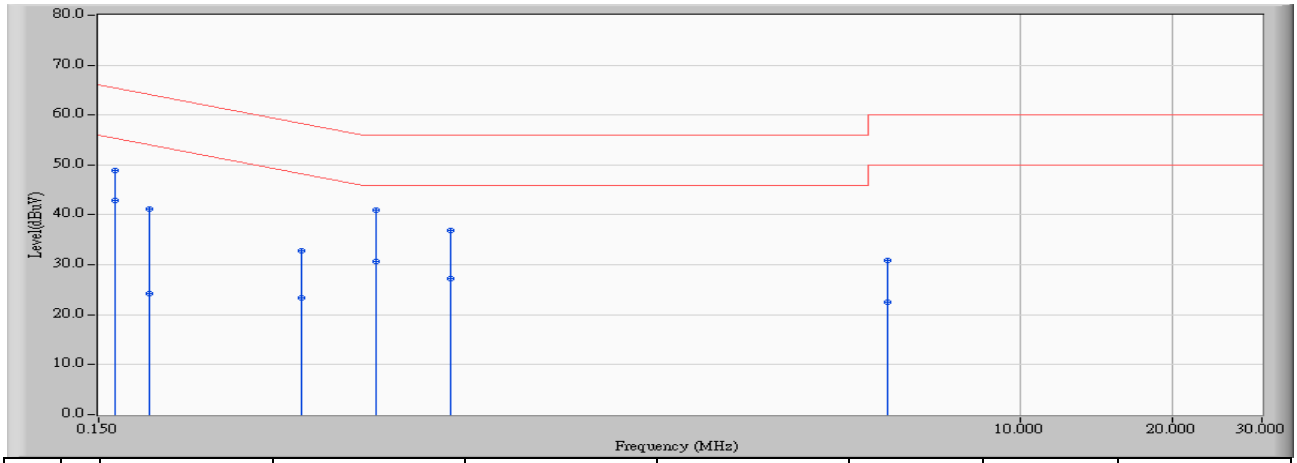
According to FCC Part 15 Subpart C Paragraph 15.207: 2012

2.6. Uncertainty

The measurement uncertainty is defined as ± 2.26 dB.

2.7. Test Result

Site : SR3	**Time : 2013/06/18 - 14:54**
Limit : CISPR_B_00M_QP	**Margin : 10**
Probe : SR3_LISN(16A)-2_0813 - Line1	**Power : DC5V(Power by PC)AC 120V/60Hz**
EUT : USB-AC56 dual-bank wireless adapter	**Note : Mode 1: Transmit (Dipole Antenna) _802.11AC80 5210MHz**

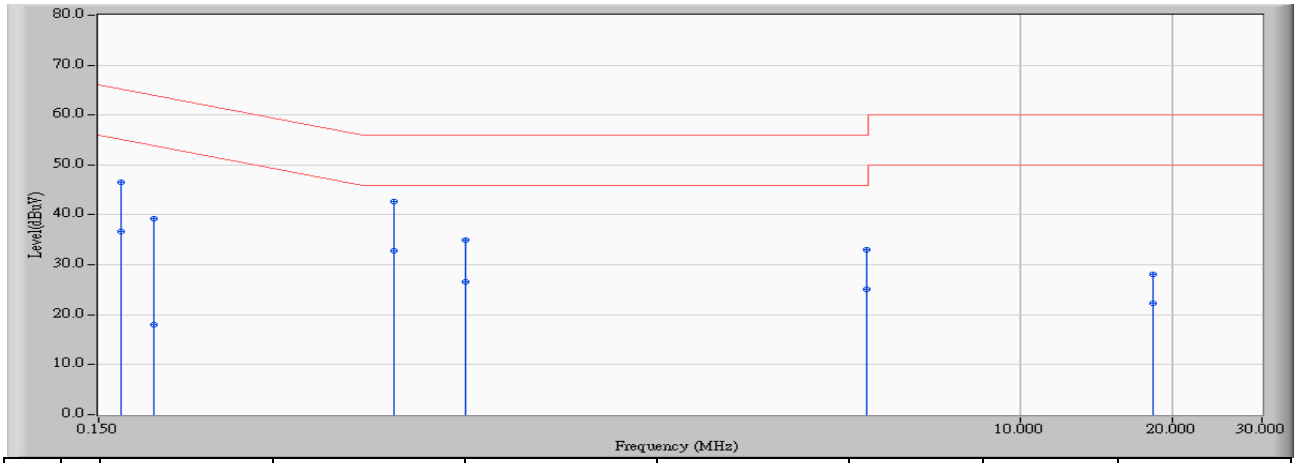


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.162	9.785	39.220	49.005	-16.370	65.375	QUASIPEAK
2	*	0.162	9.785	33.050	42.835	-12.540	55.375	AVERAGE
3		0.189	9.697	31.400	41.097	-22.981	64.078	QUASIPEAK
4		0.189	9.697	14.580	24.277	-29.801	54.078	AVERAGE
5		0.377	9.759	23.150	32.909	-25.446	58.355	QUASIPEAK
6		0.377	9.759	13.660	23.419	-24.936	48.355	AVERAGE
7		0.529	9.838	31.090	40.928	-15.072	56.000	QUASIPEAK
8		0.529	9.838	20.760	30.598	-15.402	46.000	AVERAGE
9		0.744	9.885	26.980	36.864	-19.136	56.000	QUASIPEAK
10		0.744	9.885	17.320	27.204	-18.796	46.000	AVERAGE
11		5.451	10.110	20.880	30.990	-29.010	60.000	QUASIPEAK
12		5.451	10.110	12.310	22.420	-27.580	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : SR3	**Time : 2013/06/18 - 14:56**
Limit : CISPR_B_00M_QP	**Margin : 10**
Probe : SR3_LISN(16A)-2_0813 - Line2	**Power : DC5V(Power by PC)AC 120V/60Hz**
EUT : USB-AC56 dual-bank wireless adapter	**Note : Mode 1: Transmit (Dipole Antenna) _802.11AC80 5210MHz**

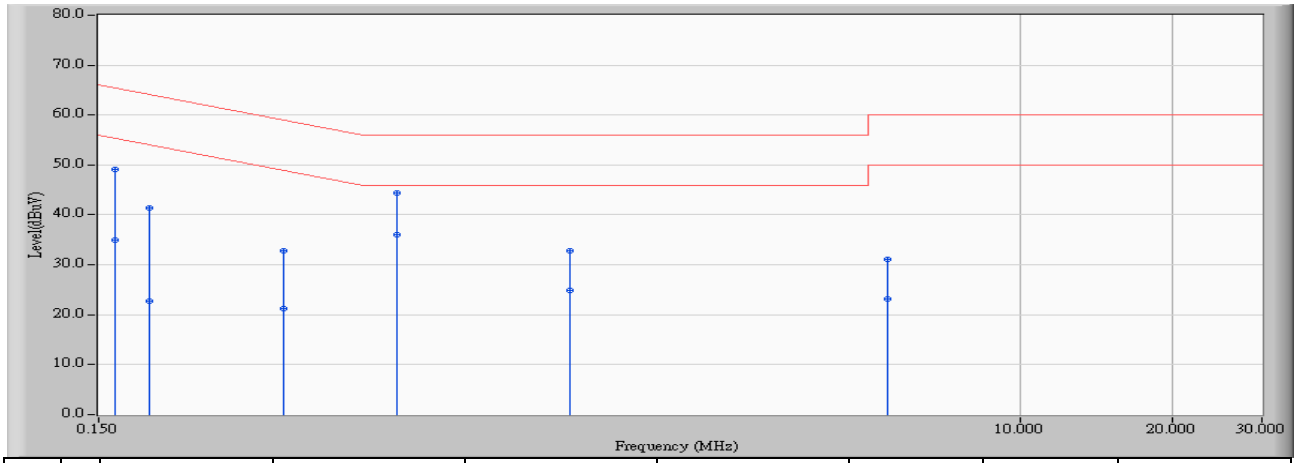


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.166	9.642	36.980	46.622	-18.555	65.177	QUASIPEAK
2		0.166	9.642	26.930	36.572	-18.605	55.177	AVERAGE
3		0.193	9.655	29.550	39.205	-24.703	63.908	QUASIPEAK
4		0.193	9.655	8.420	18.075	-35.833	53.908	AVERAGE
5		0.576	9.838	32.850	42.688	-13.312	56.000	QUASIPEAK
6	*	0.576	9.838	23.080	32.918	-13.082	46.000	AVERAGE
7		0.798	9.887	25.090	34.976	-21.024	56.000	QUASIPEAK
8		0.798	9.887	16.700	26.586	-19.414	46.000	AVERAGE
9		4.974	10.074	22.960	33.034	-22.966	56.000	QUASIPEAK
10		4.974	10.074	14.950	25.024	-20.976	46.000	AVERAGE
11		18.228	10.275	17.880	28.155	-31.845	60.000	QUASIPEAK
12		18.228	10.275	11.950	22.225	-27.775	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : SR3	**Time : 2013/06/18 - 15:09**
Limit : CISPR_B_00M_QP	**Margin : 10**
Probe : SR3_LISN(16A)-2_0813 - Line1	**Power : DC5V(Power by PC)AC 120V/60Hz**
EUT : USB-AC56 dual-bank wireless adapter	**Note : Mode 2: Transmit (PIFA Antenna) _802.11AC80 5210MHz**

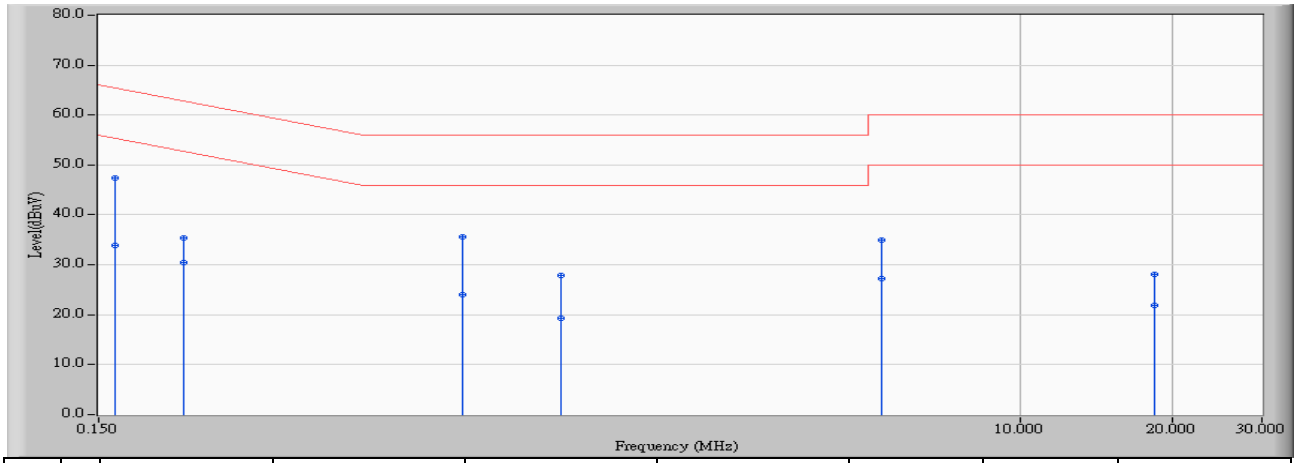


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.162	9.785	39.260	49.045	-16.330	65.375	QUASIPEAK
2		0.162	9.785	25.180	34.965	-20.410	55.375	AVERAGE
3		0.189	9.697	31.640	41.337	-22.741	64.078	QUASIPEAK
4		0.189	9.697	12.960	22.657	-31.421	54.078	AVERAGE
5		0.349	9.743	23.130	32.873	-26.108	58.981	QUASIPEAK
6		0.349	9.743	11.580	21.323	-27.658	48.981	AVERAGE
7		0.584	9.850	34.570	44.420	-11.580	56.000	QUASIPEAK
8	*	0.584	9.850	26.110	35.960	-10.040	46.000	AVERAGE
9		1.287	9.946	22.800	32.746	-23.254	56.000	QUASIPEAK
10		1.287	9.946	14.880	24.826	-21.174	46.000	AVERAGE
11		5.443	10.110	21.020	31.130	-28.870	60.000	QUASIPEAK
12		5.443	10.110	13.140	23.250	-26.750	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : SR3	**Time : 2013/06/18 - 15:11**
Limit : CISPR_B_00M_QP	**Margin : 10**
Probe : SR3_LISN(16A)-2_0813 - Line2	**Power : DC5V(Power by PC)AC 120V/60Hz**
EUT : USB-AC56 dual-bank wireless adapter	**Note : Mode 2: Transmit (PIFA Antenna) _802.11AC80 5210MHz**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.162	9.640	37.760	47.400	-17.975	65.375	QUASIPEAK
2		0.162	9.640	24.180	33.820	-21.555	55.375	AVERAGE
3		0.220	9.669	25.710	35.379	-27.428	62.807	QUASIPEAK
4		0.220	9.669	20.810	30.479	-22.328	52.807	AVERAGE
5		0.787	9.883	25.740	35.624	-20.376	56.000	QUASIPEAK
6		0.787	9.883	14.150	24.034	-21.966	46.000	AVERAGE
7		1.228	9.932	18.030	27.962	-28.038	56.000	QUASIPEAK
8		1.228	9.932	9.300	19.232	-26.768	46.000	AVERAGE
9		5.295	10.079	24.900	34.979	-25.021	60.000	QUASIPEAK
10		5.295	10.079	17.100	27.179	-22.821	50.000	AVERAGE
11		18.388	10.278	17.770	28.048	-31.952	60.000	QUASIPEAK
12		18.388	10.278	11.650	21.928	-28.072	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

3. 99% & 26dB Bandwidth

3.1. Test Equipment

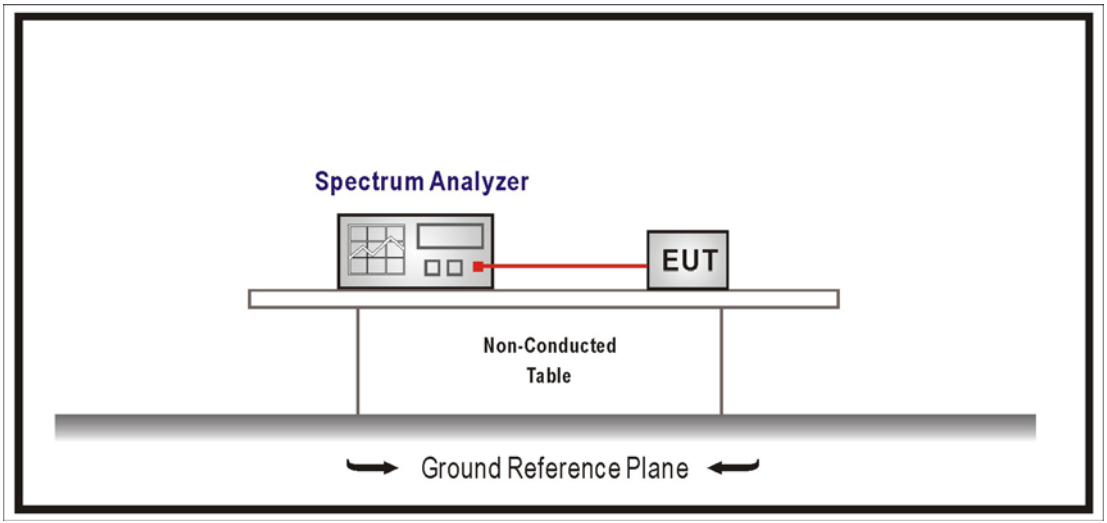
The following test equipments are used during the radiated emission tests:

99% & 26dB Bandwidth / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2013/07/31

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

3.2. Test Setup



3.3. Limits

No Required

3.4. Test Procedure

The EUT was tested according to U-NII test procedure of March 2012 KDB 789033.
Set RBW 1% of the emission bandwidth, VBW equal to 3 times the RBW.

3.5. Uncertainty

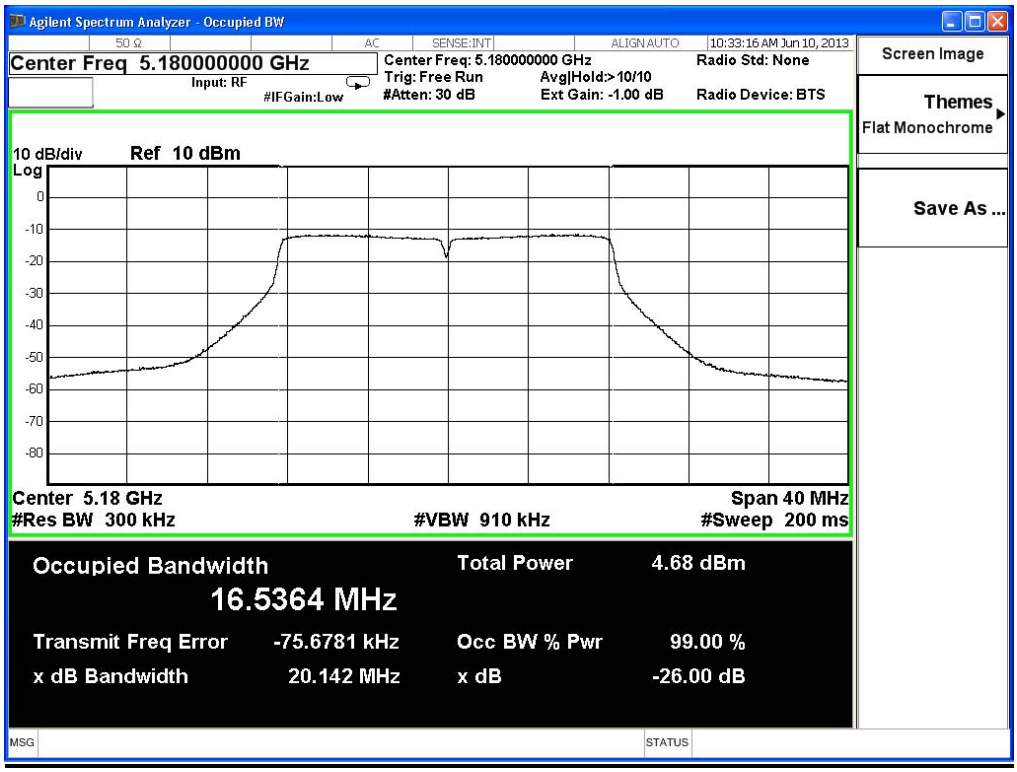
The measurement uncertainty is defined as ±150Hz

3.6. Test Result

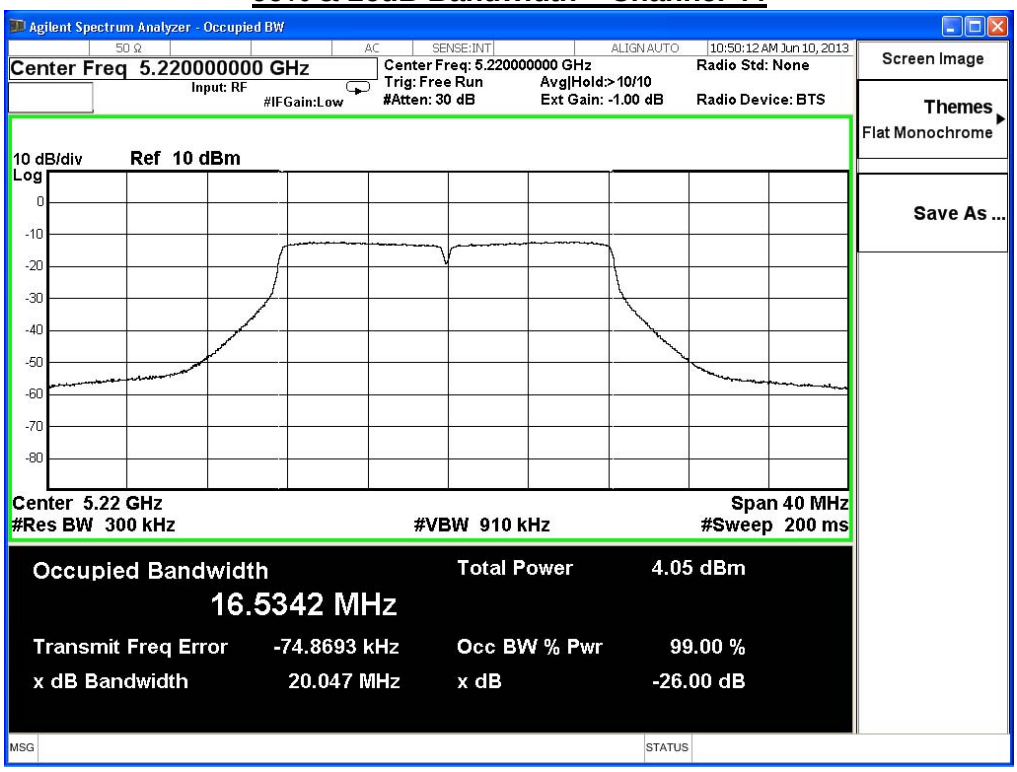
Product	USB-AC56 dual-bank wireless adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/10	Test Site	SR7

802.11a					
Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
36	5180	20.142	16.536	--	Pass
44	5220	20.047	16.534	--	Pass
48	5240	20.040	16.520	--	Pass

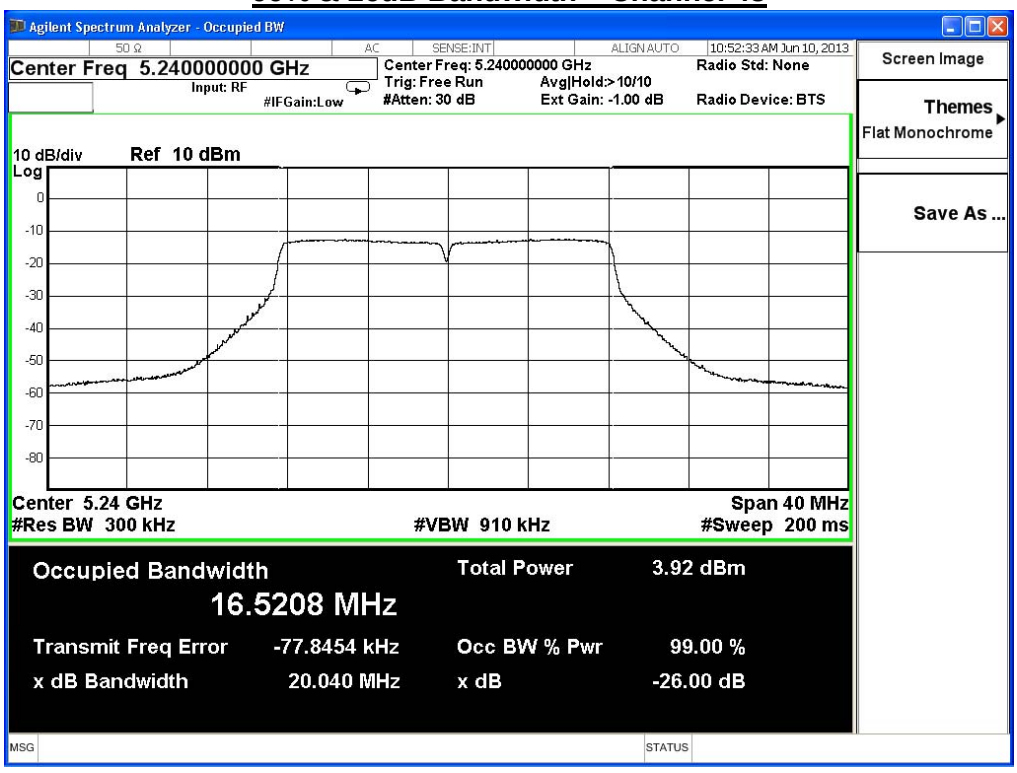
99% & 26dB Bandwidth – Channel 36



99% & 26dB Bandwidth – Channel 44



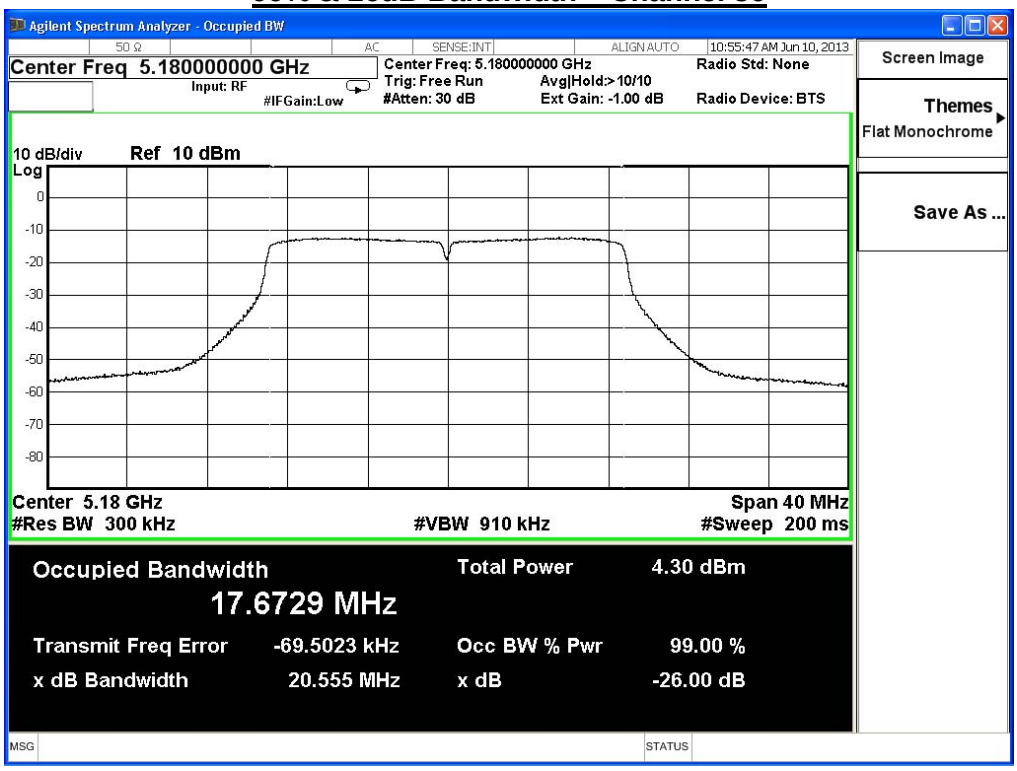
99% & 26dB Bandwidth – Channel 48



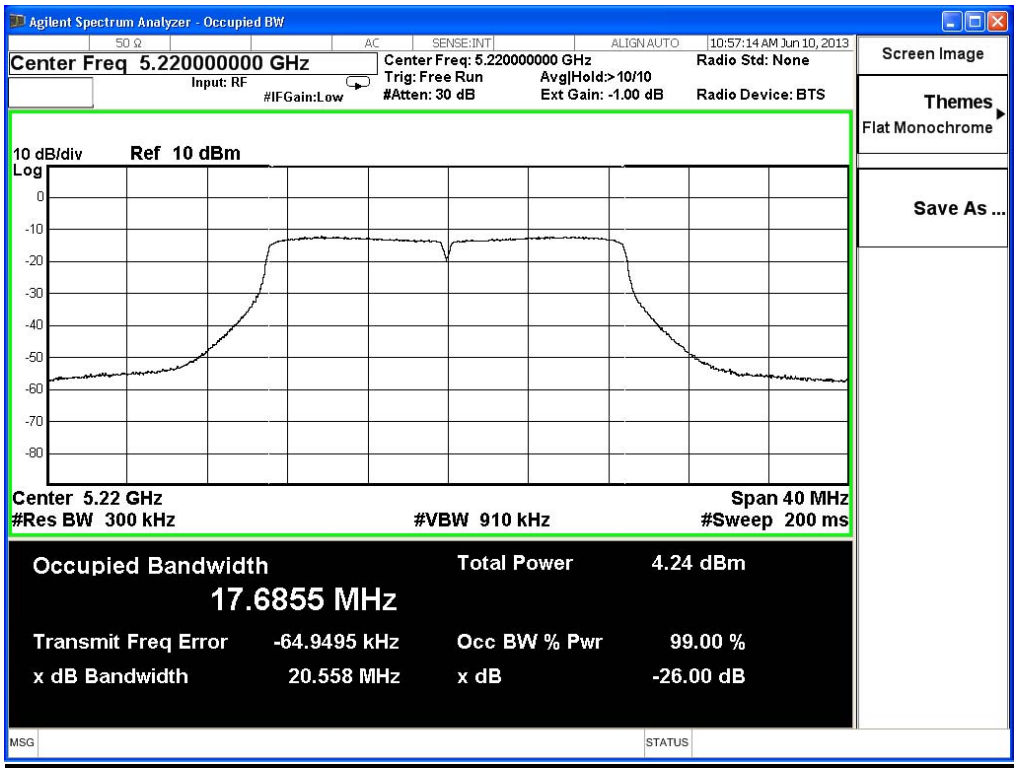
Product	USB-AC56 dual-bank wireless adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/10	Test Site	SR7

802.11n_20M(ANT 0)					
Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
36	5180	20.555	17.672	--	Pass
44	5220	20.558	17.685	--	Pass
48	5240	20.658	17.688	--	Pass

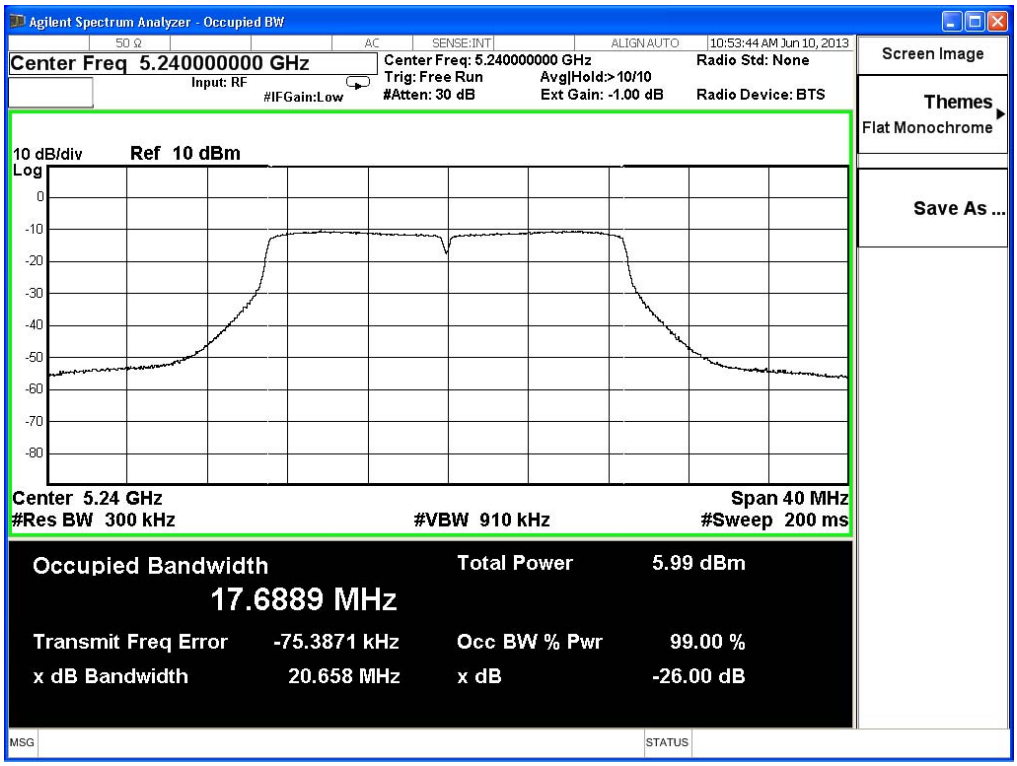
99% & 26dB Bandwidth – Channel 36



99% & 26dB Bandwidth – Channel 44



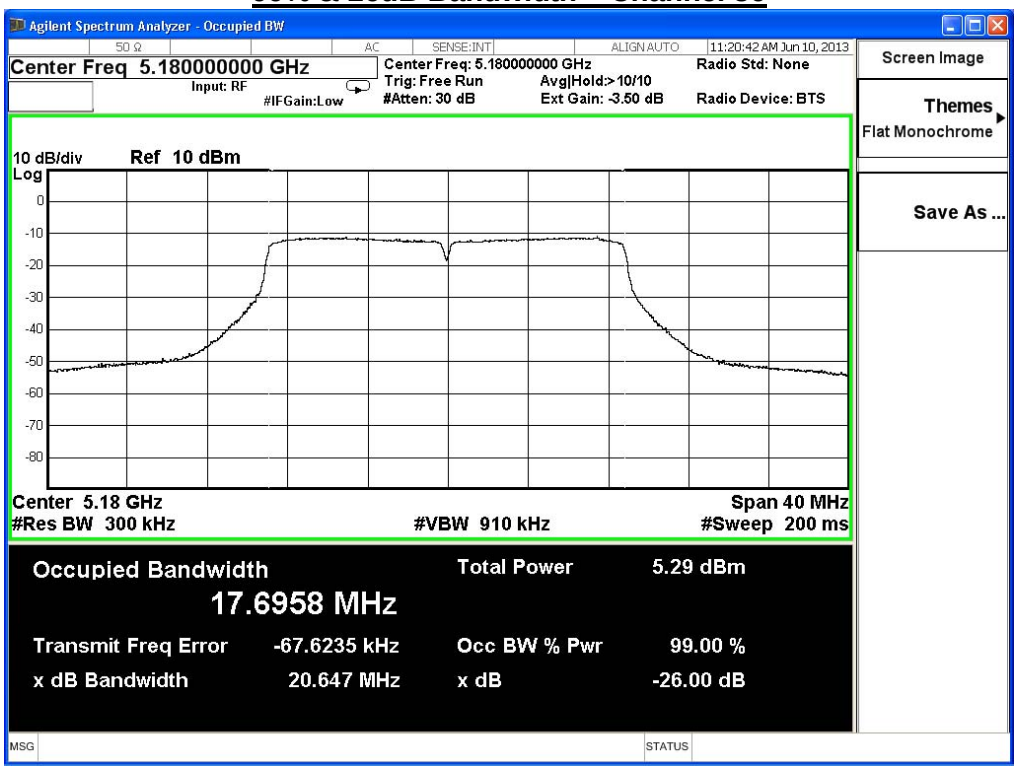
99% & 26dB Bandwidth – Channel 48



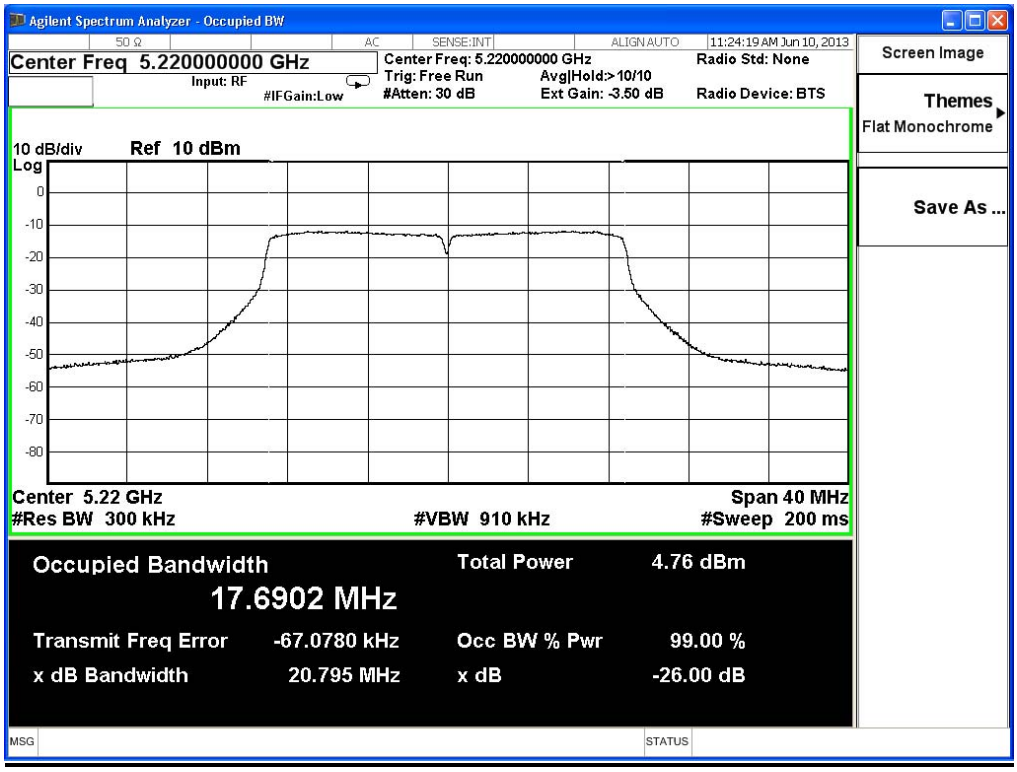
Product	USB-AC56 dual-bank wireless adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/10	Test Site	SR7

802.11n_20M(ANT 1)					
Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
36	5180	20.647	17.695	--	Pass
44	5220	20.795	17.690	--	Pass
48	5240	20.732	17.700	--	Pass

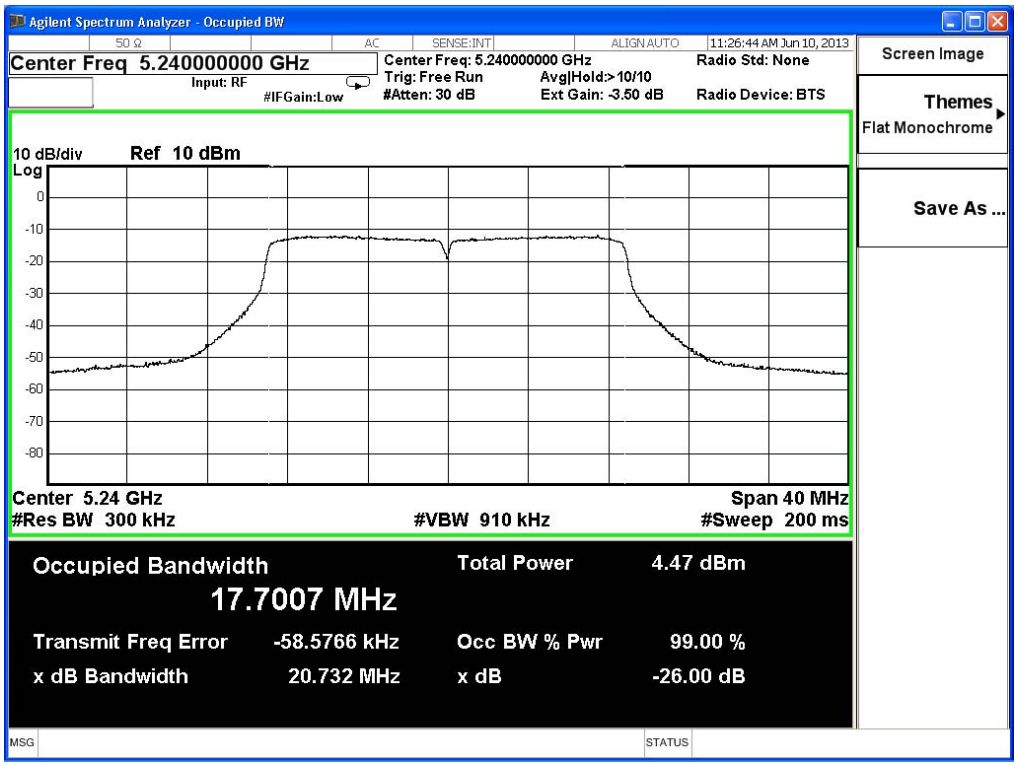
99% & 26dB Bandwidth – Channel 36



99% & 26dB Bandwidth – Channel 44



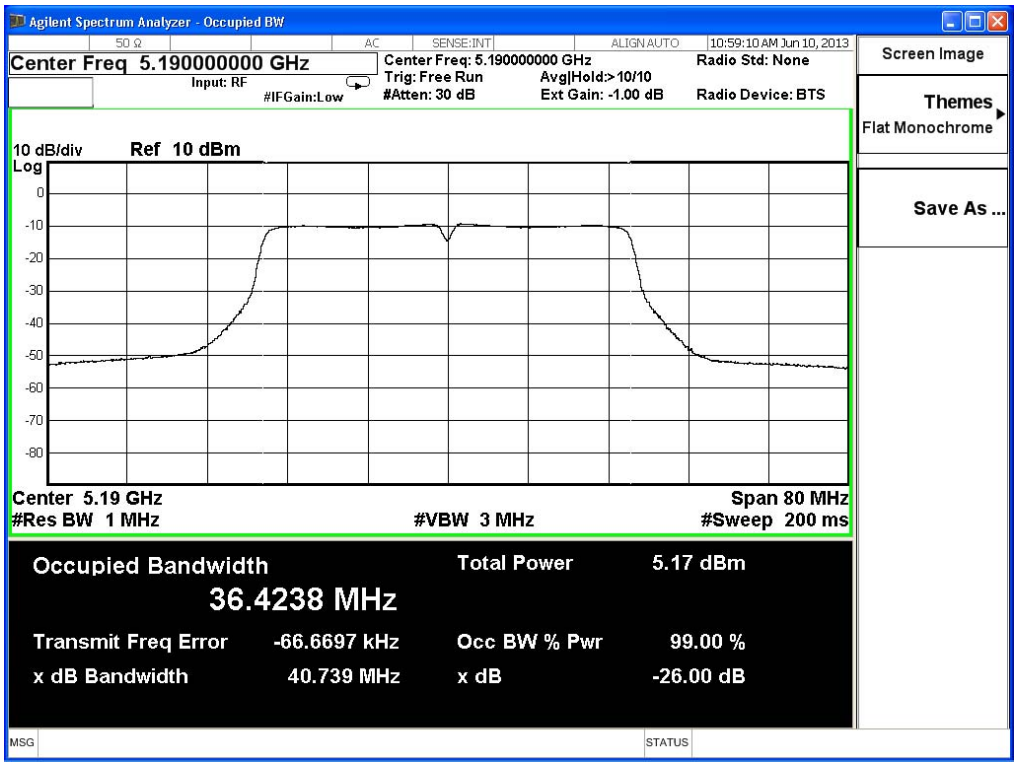
99% & 26dB Bandwidth – Channel 48



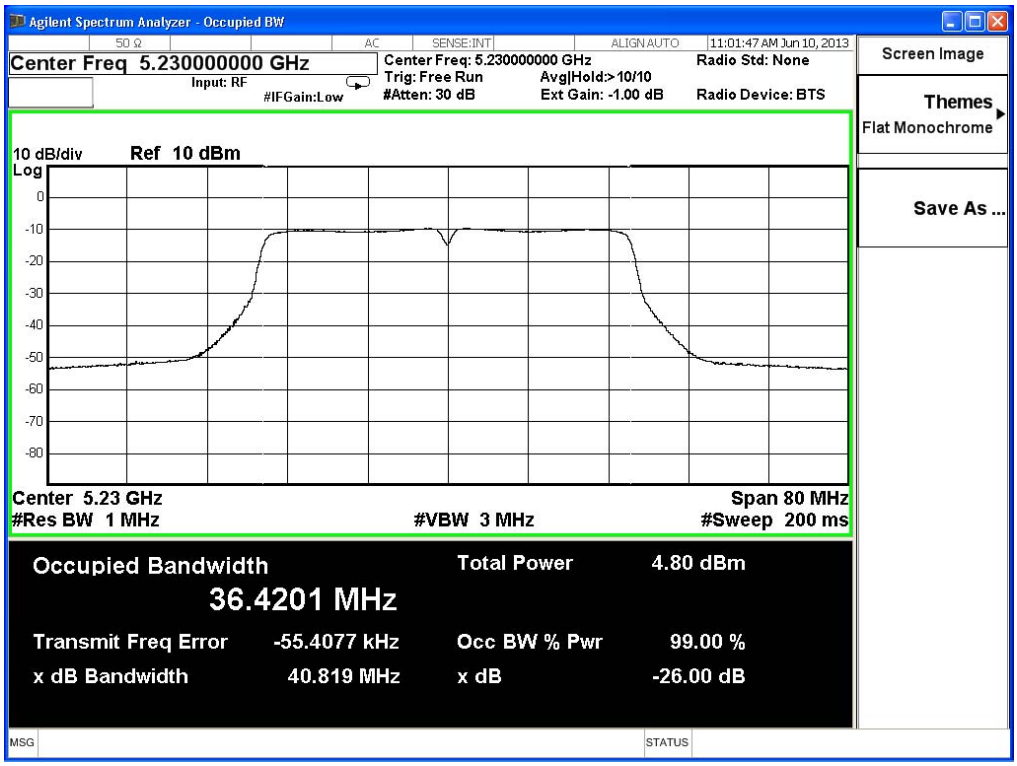
Product	USB-AC56 dual-bank wireless adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/10	Test Site	SR7

802.11n_40M(ANT 0)					
Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
38	5190	40.739	36.423	--	Pass
46	5230	40.819	36.420	--	Pass

99% & 26dB Bandwidth – Channel 38



99% & 26dB Bandwidth – Channel 46

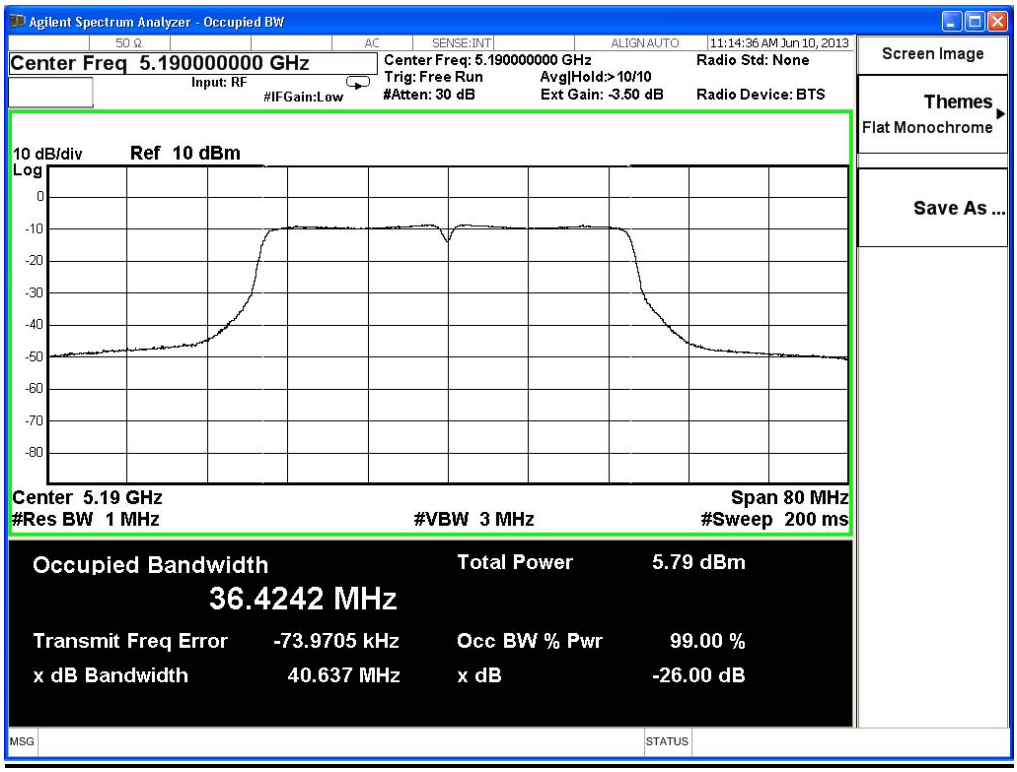


Product	USB-AC56 dual-bank wireless adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/10	Test Site	SR7

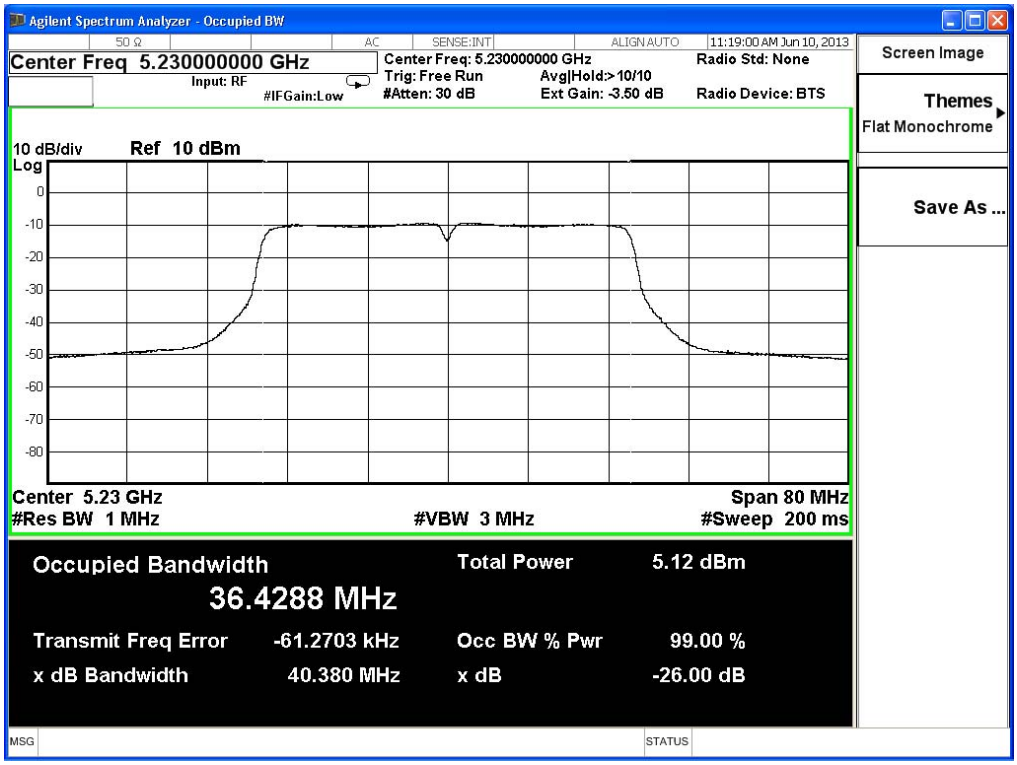
802.11n_40M(ANT 1)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
38	5190	40.637	36.424	--	Pass
46	5230	40.380	36.428	--	Pass

99% & 26dB Bandwidth – Channel 38



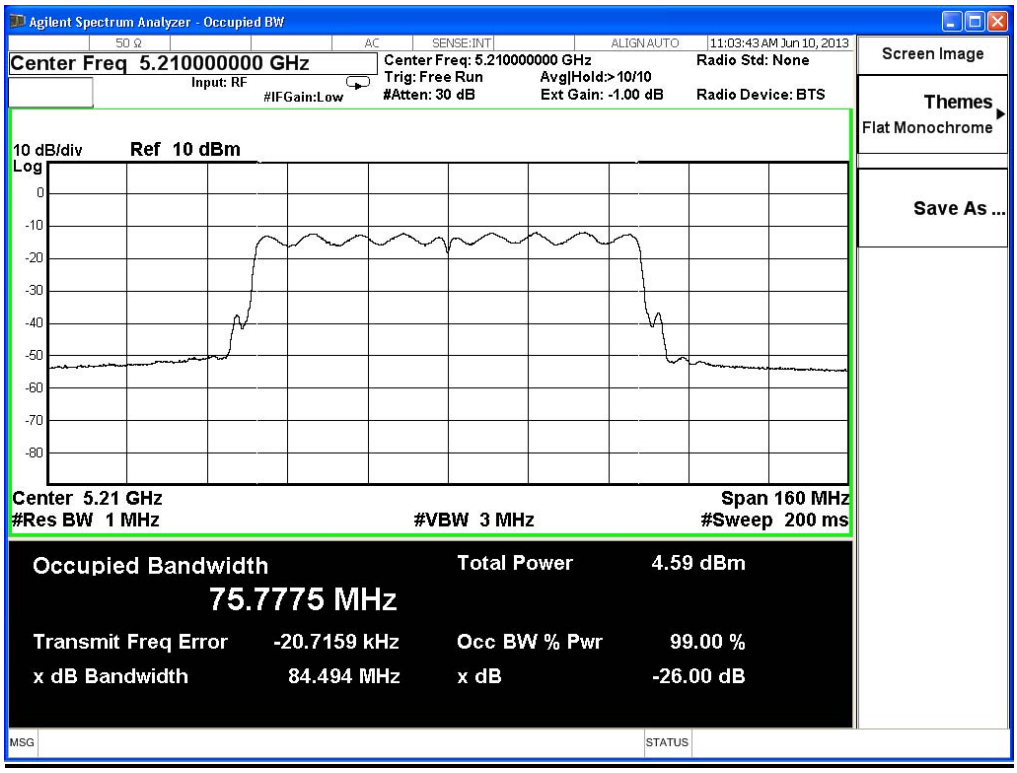
99% & 26dB Bandwidth – Channel 46



Product	USB-AC56 dual-bank wireless adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/10	Test Site	SR7

802.11ac_80M(ANT 0)					
Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
42	5210	84.494	75.777	--	Pass

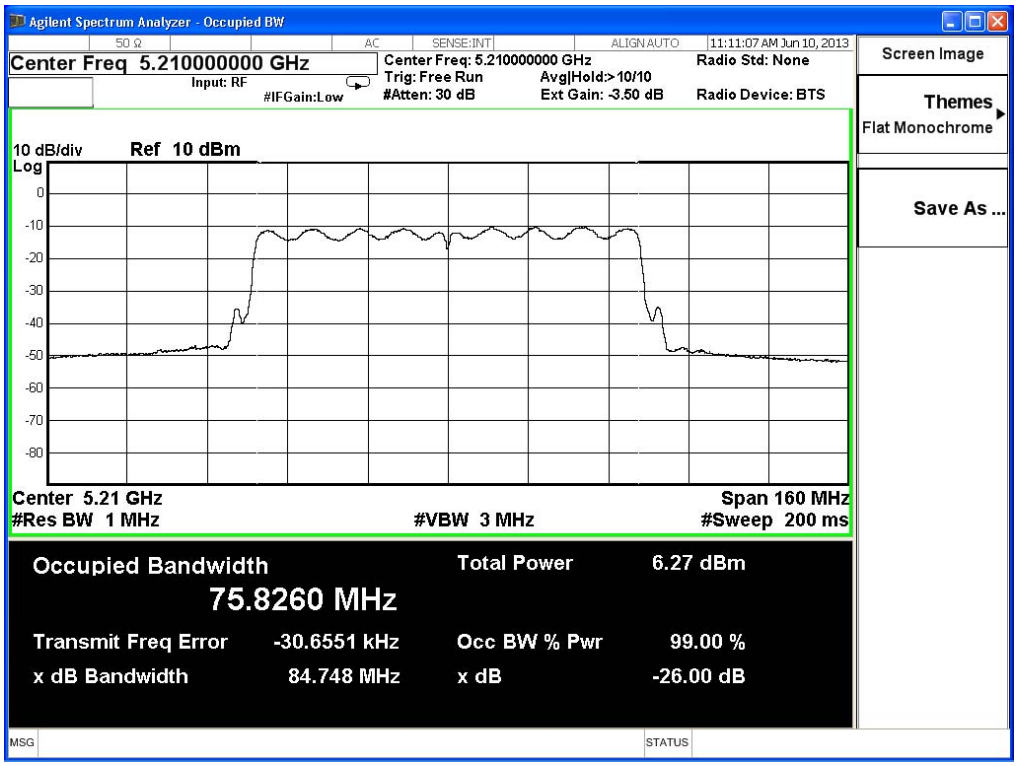
99% & 26dB Bandwidth – Channel 42



Product	USB-AC56 dual-bank wireless adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/10	Test Site	SR7

802.11ac_80M(ANT 1)					
Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
42	5210	84.748	75.826	--	Pass

99% & 26dB Bandwidth – Channel 42



4. Peak Transmit Output

4.1. Test Equipment

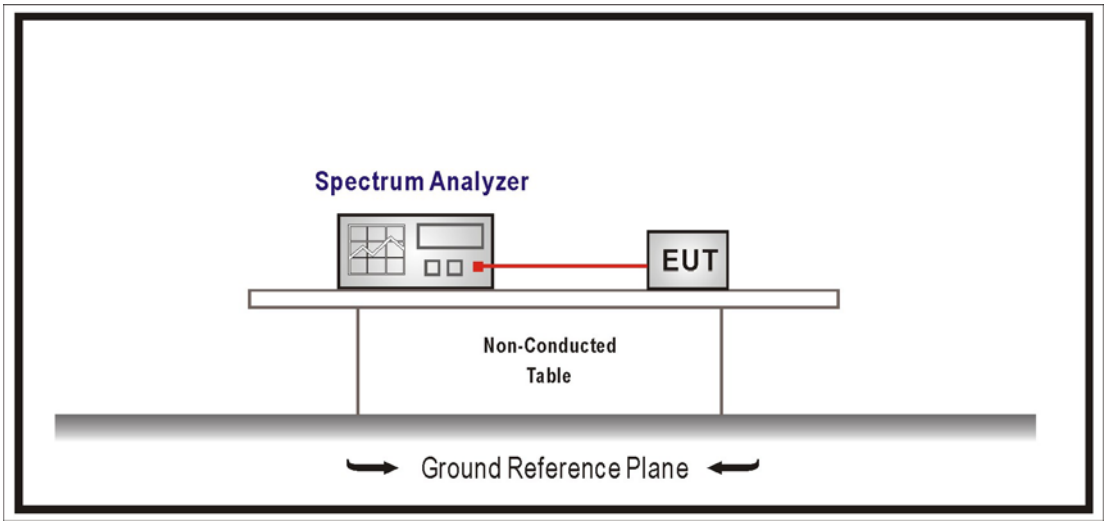
The following test equipments are used during the radiated emission tests:

Peak Transmit Output / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2013/07/31

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

4.2. Test Setup



4.3. Limits

1. For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the peak transmit power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
2. For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the peak transmit power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
3. For the band 5.725-5.825 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 1W or 17 dBm + 10log B, where B is the 26dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the peak transmit power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

4.4. Test Procedure

The EUT was setup to ANSI C63.4, 2009; tested to U-NII test procedure of March 2012 KDB 789033 for compliance to FCC 47CFR Subpart E requirements. The Method SA-1 of the Maximum conducted output power was used.

Set RBW=1MHz, VBW=3MHz with RMS detector and trace average 100 traces in power averaging mode. Set span to encompass the entire emission bandwidth (EBW) of the signal. Compute power by integrating the spectrum across the 26 dB EBW of the signal.

4.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB

4.6. Test Result

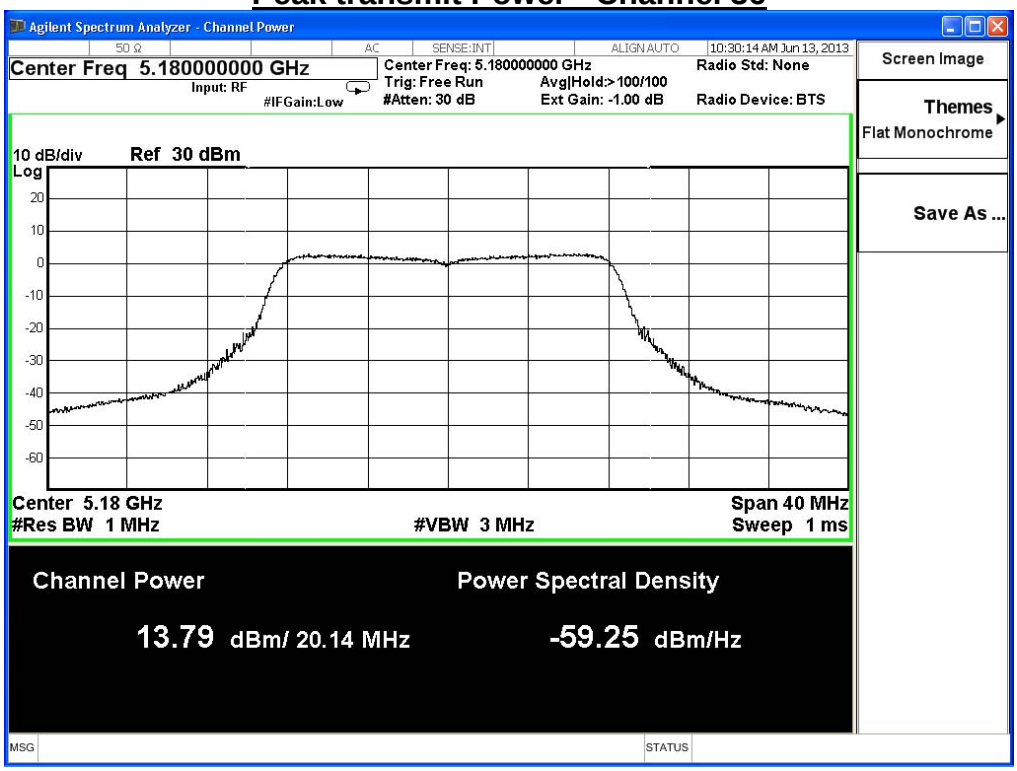
Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

802.11a						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
36	5180	20.142	13.79	≤ 17	≤17.04	Pass
44	5220	20.047	13.43	≤ 17	≤17.02	Pass
48	5240	20.040	13.85	≤ 17	≤17.01	Pass

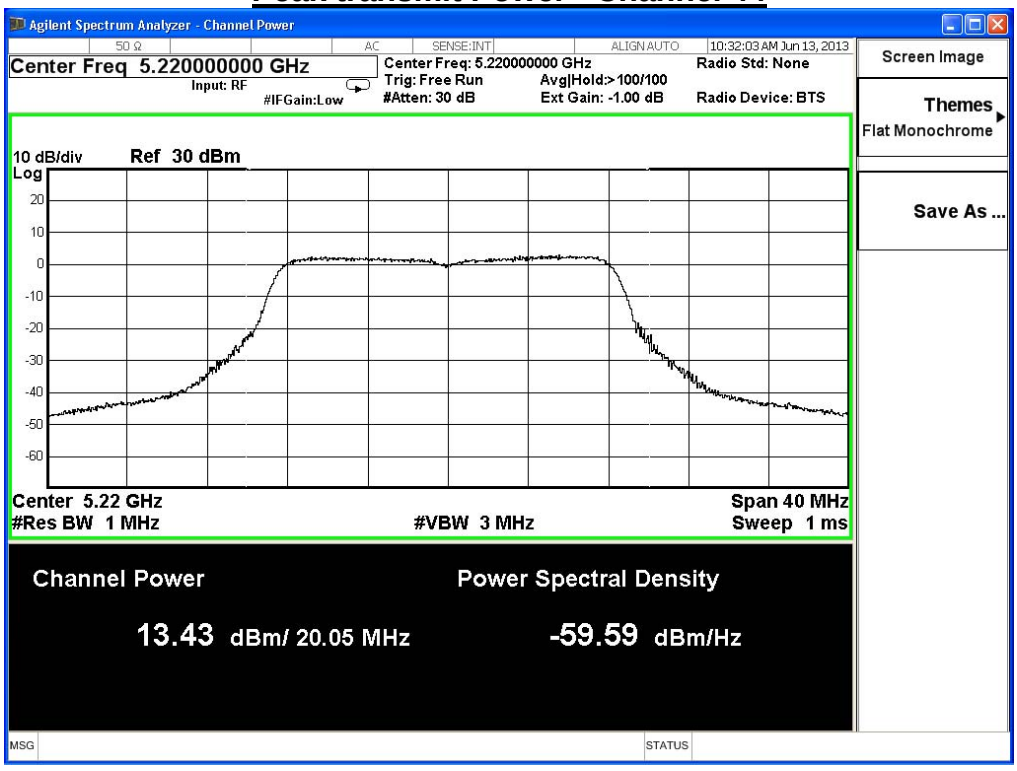
The worst emission of data rate is 6 Mbps.

Peak Power Output (dBm)									
Channel No	Frequency (MHz)	Data Rate							Required Limit
		6	12	18	24	36	48	54	
36	5180	13.79	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	13.43	13.33	13.23	13.13	12.89	12.65	12.41	
48	5240	13.85	--	--	--	--	--	--	

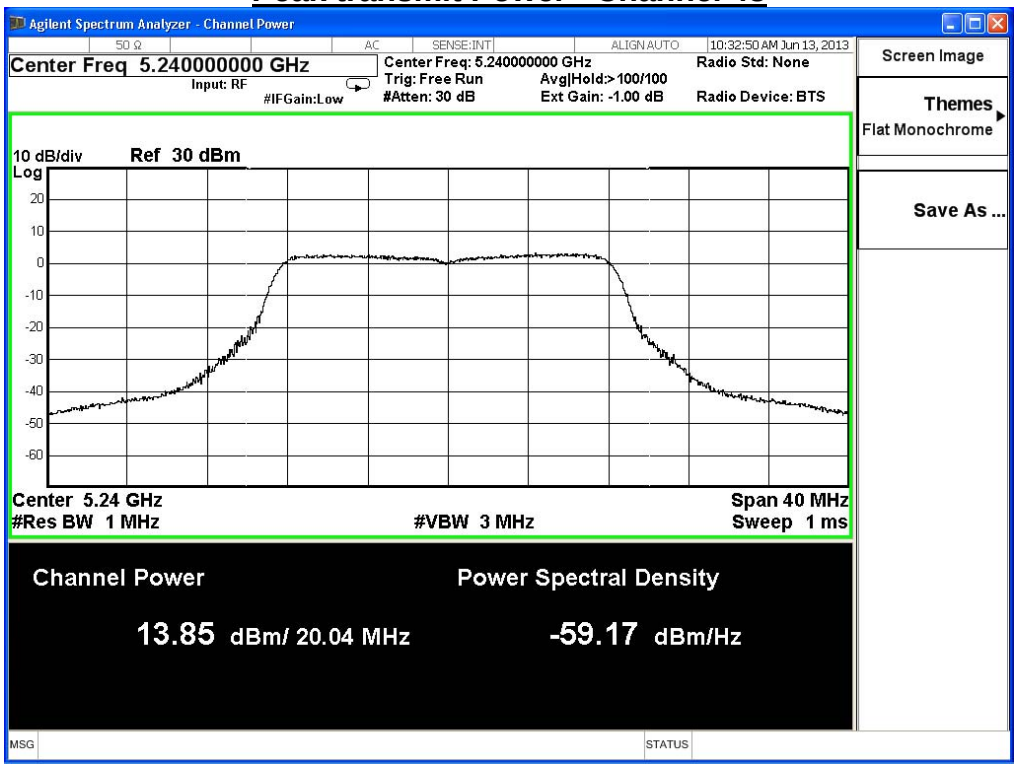
Peak transmit Power - Channel 36



Peak transmit Power - Channel 44



Peak transmit Power - Channel 48



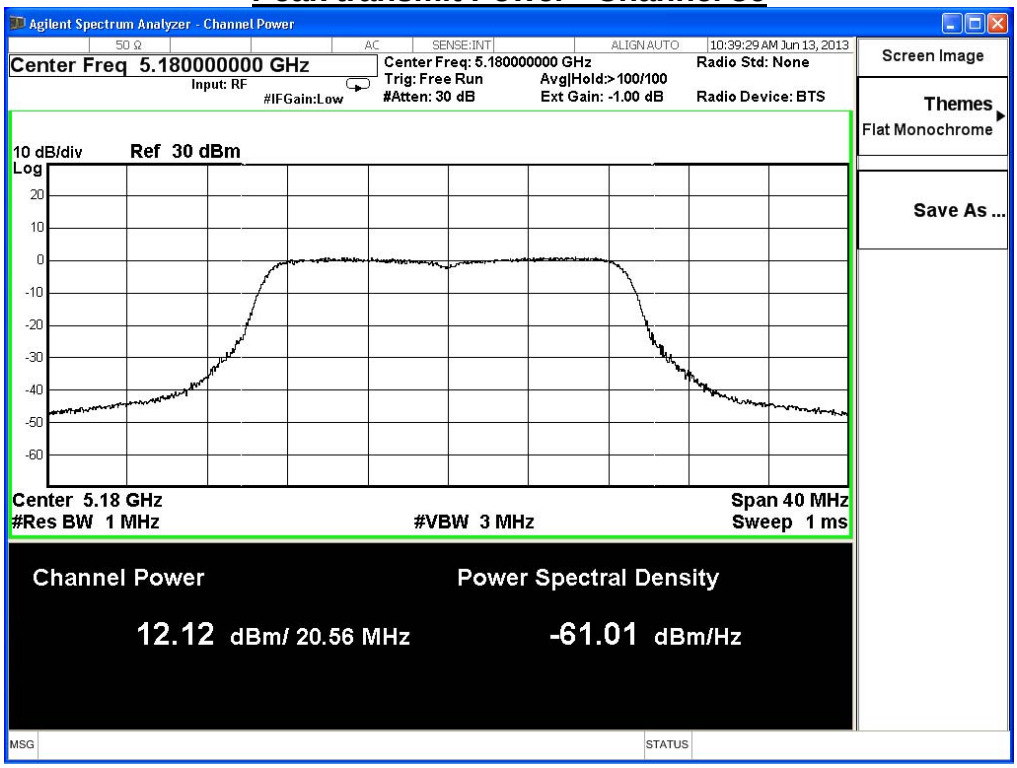
Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

IEEE 802.11n(20MHz)_ANT 0						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
36	5180	20.555	12.12	≤ 17	≤17.12	Pass
44	5220	20.558	12.32	≤ 17	≤17.12	Pass
48	5240	20.658	11.87	≤ 17	≤17.15	Pass

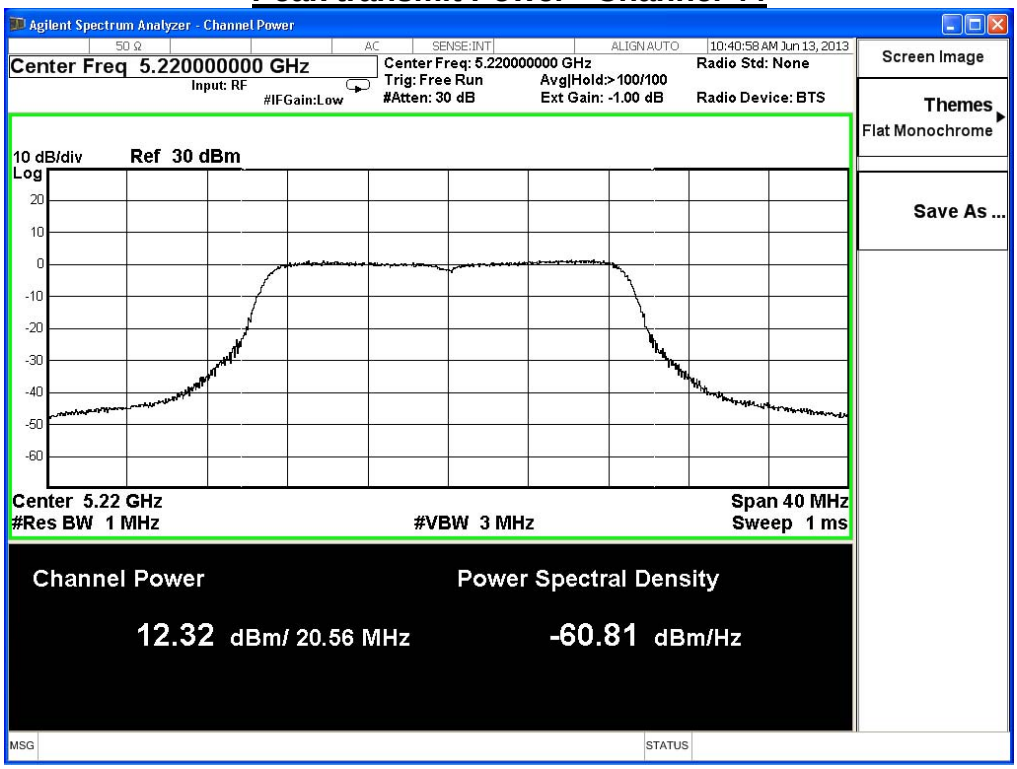
The worst emission of data rate is 19.5Mbps.

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		19.5	39	58.5	78	117	156	175.5	195	
36	5180	12.12	--	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	12.32	12.12	12.02	11.82	11.62	11.38	11.26	11.14	
48	5240	11.87	--	--	--	--	--	--	--	

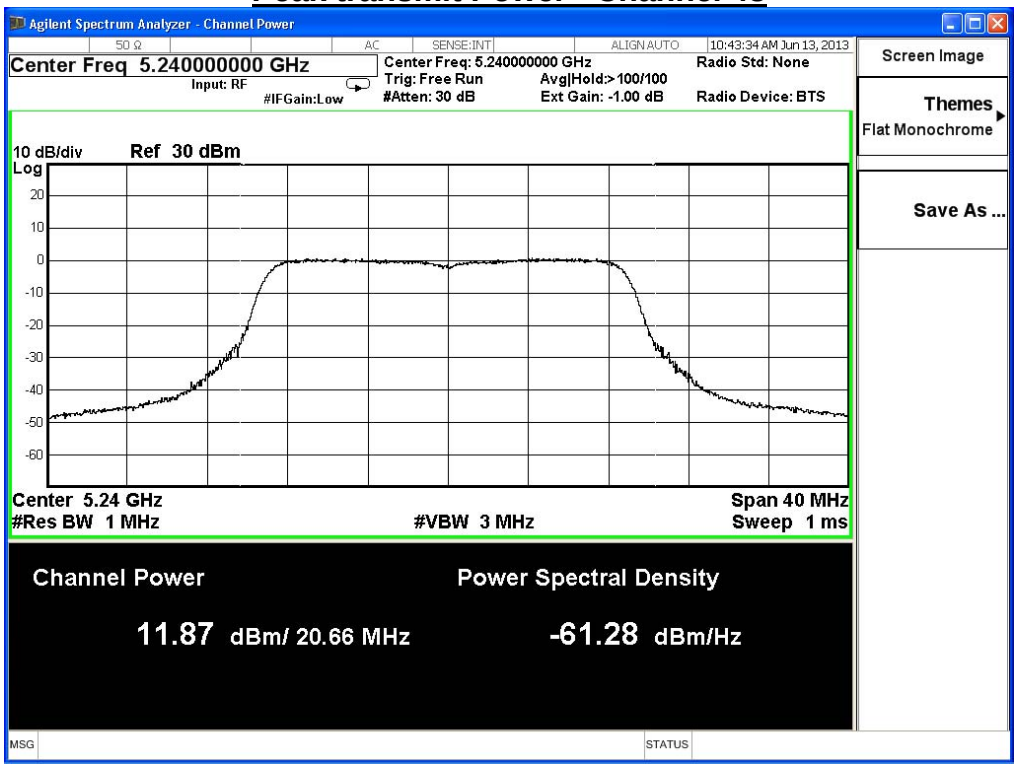
Peak transmit Power - Channel 36



Peak transmit Power - Channel 44



Peak transmit Power - Channel 48



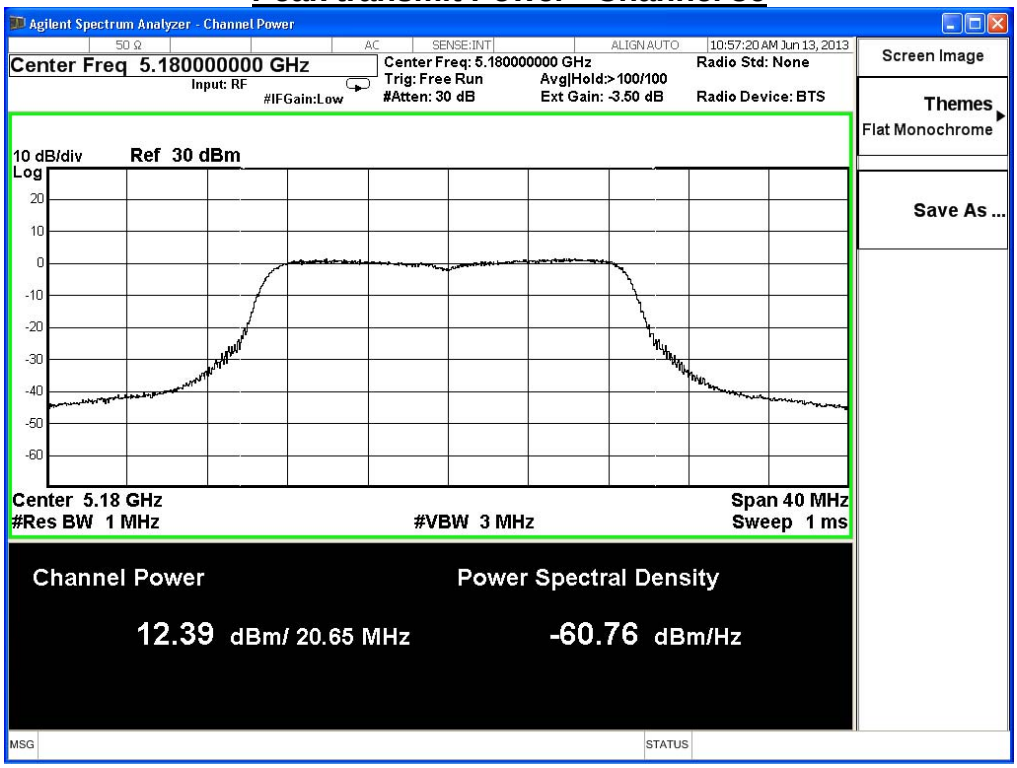
Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

IEEE 802.11n(20MHz)_ANT 1						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
36	5180	20.647	12.39	≤ 17	≤17.14	Pass
44	5220	20.795	12.56	≤ 17	≤17.17	Pass
48	5240	20.732	12.30	≤ 17	≤17.16	Pass

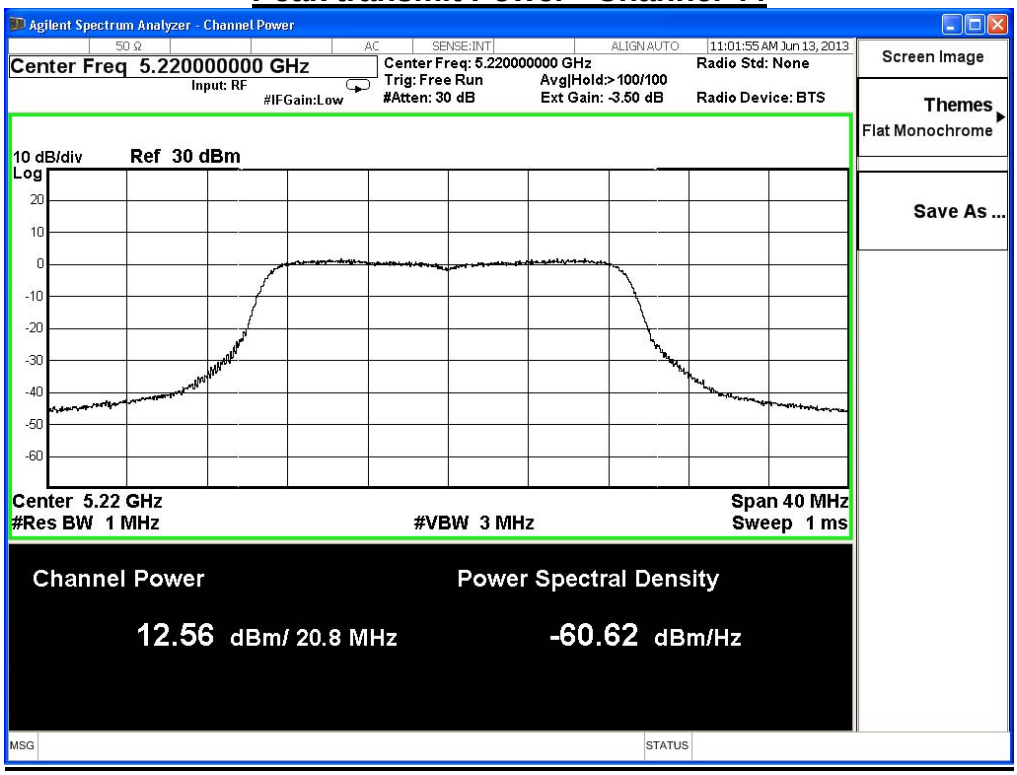
The worst emission of data rate is 19.5Mbps.

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		19.5	39	58.5	78	117	156	175.5	195	
36	5180	12.39	--	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	12.56	12.36	12.16	12.06	11.86	11.74	11.62	11.50	
48	5240	12.3	--	--	--	--	--	--	--	

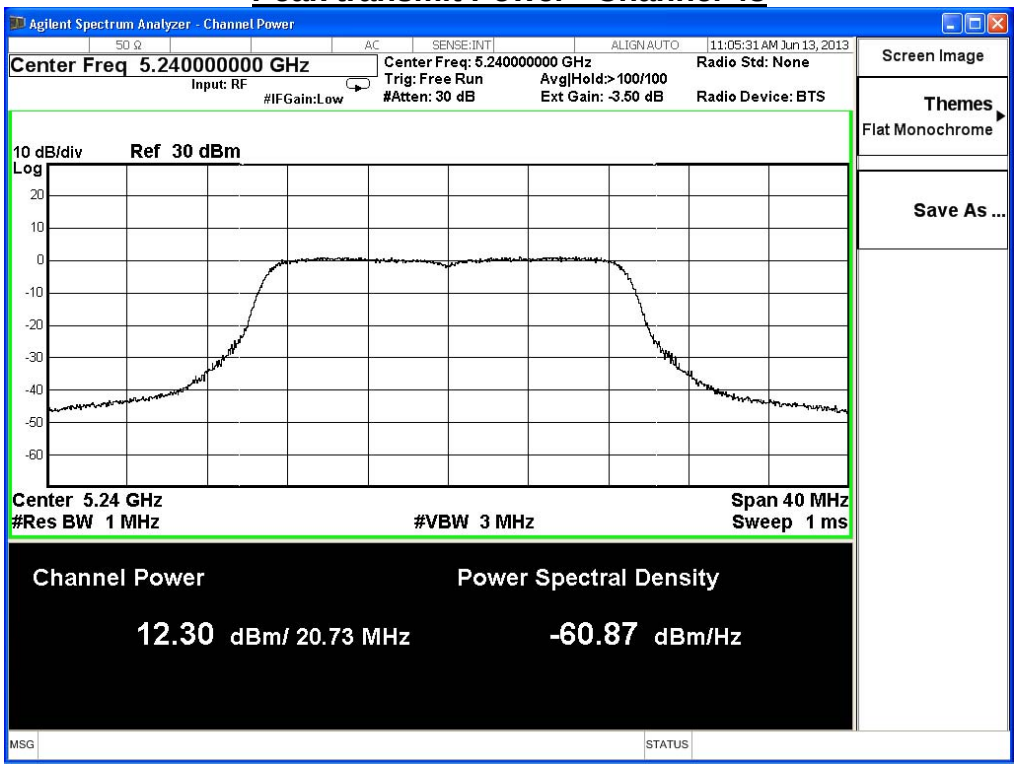
Peak transmit Power - Channel 36



Peak transmit Power - Channel 44



Peak transmit Power - Channel 48



Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

IEEE 802.11n(20MHz)_ANT 0+1					
Channel No.	Frequency (MHz)	Total Output Power		Required Limit (dBm)	Result
		(mW)	(dBm)		
36	5180	33.63	15.27	≤ 17	Pass
44	5220	35.09	15.45	≤ 17	Pass
48	5240	32.36	15.10	≤ 17	Pass

802.11 n(20M), Antenna 0+1

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		19.5	39	58.5	78	117	156	175.5	195	
36	5180	15.27	--	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	15.45	15.25	15.10	14.95	14.75	14.57	14.45	14.33	
48	5240	15.10	--	--	--	--	--	--	--	

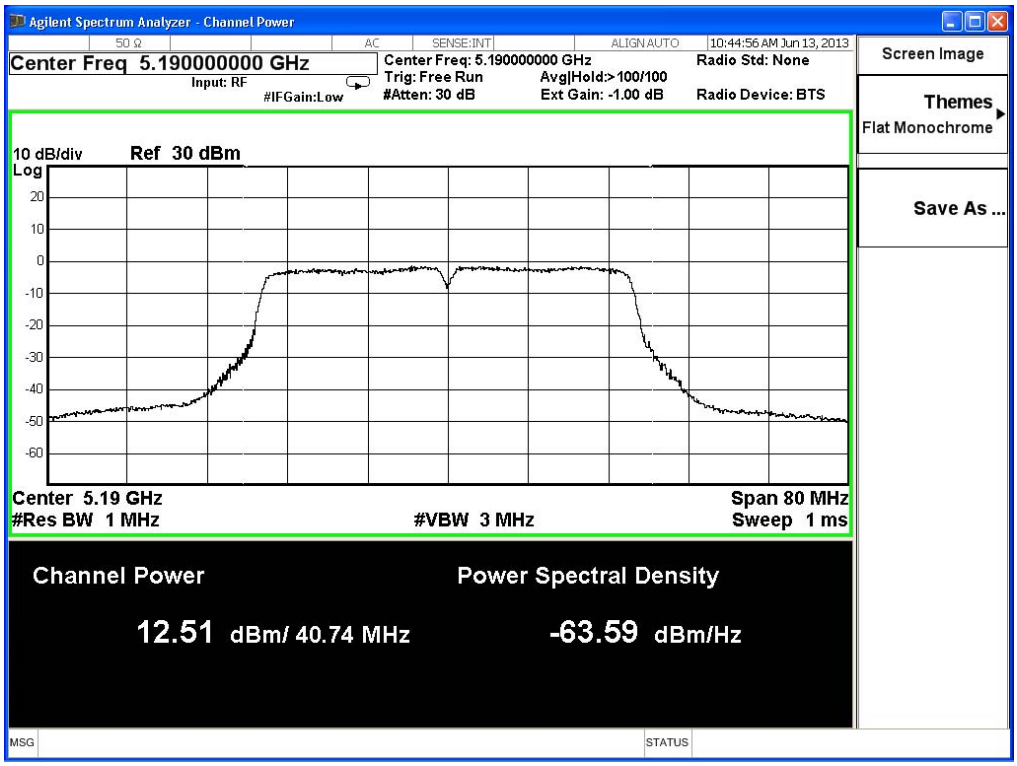
Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

IEEE 802.11n(40MHz)_ANT 0						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
38	5190	40.739	12.51	≤ 17	≤20.10	Pass
46	5230	40.819	12.86	≤ 17	≤20.10	Pass

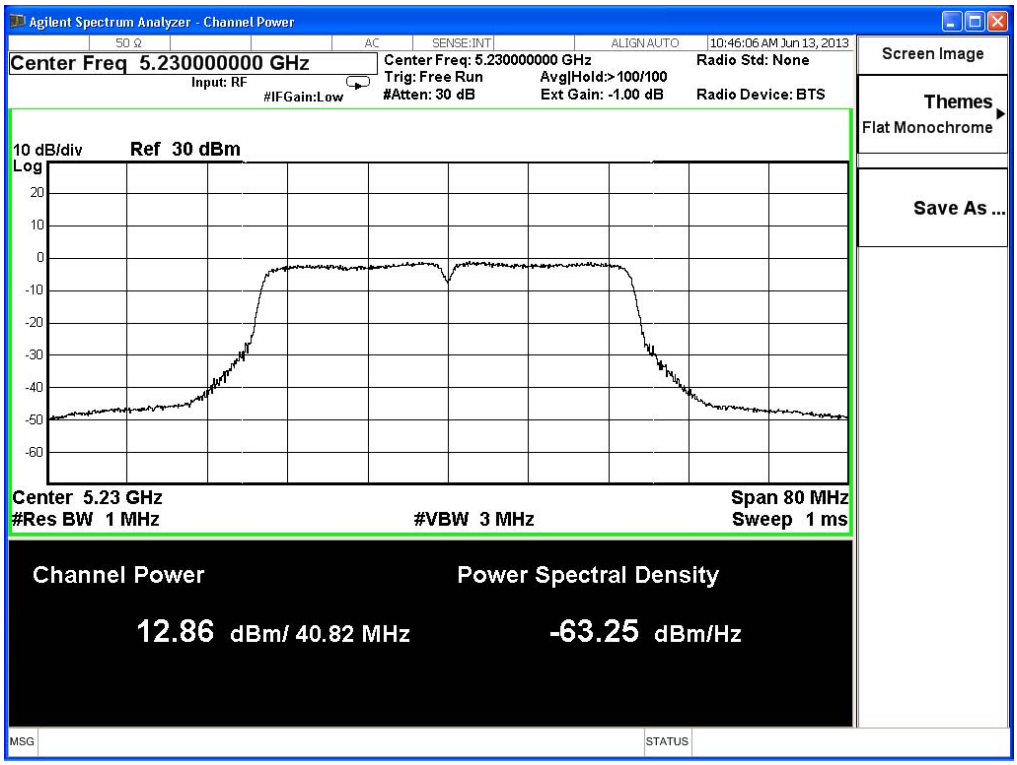
The worst emission of data rate is 40.5 Mbps

Peak Power Output (dBm)									
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		40.5	81.0	121.5	162.0	243.0	324.0	364.5	405.0	
38	5190	12.51	--	--	--	--	--	--	--	17dBm or 4dBm+10logB
46	5230	12.86	12.66	12.46	12.26	12.16	12.04	11.92	11.68	

Peak transmit Power - Channel 38



Peak transmit Power - Channel 46



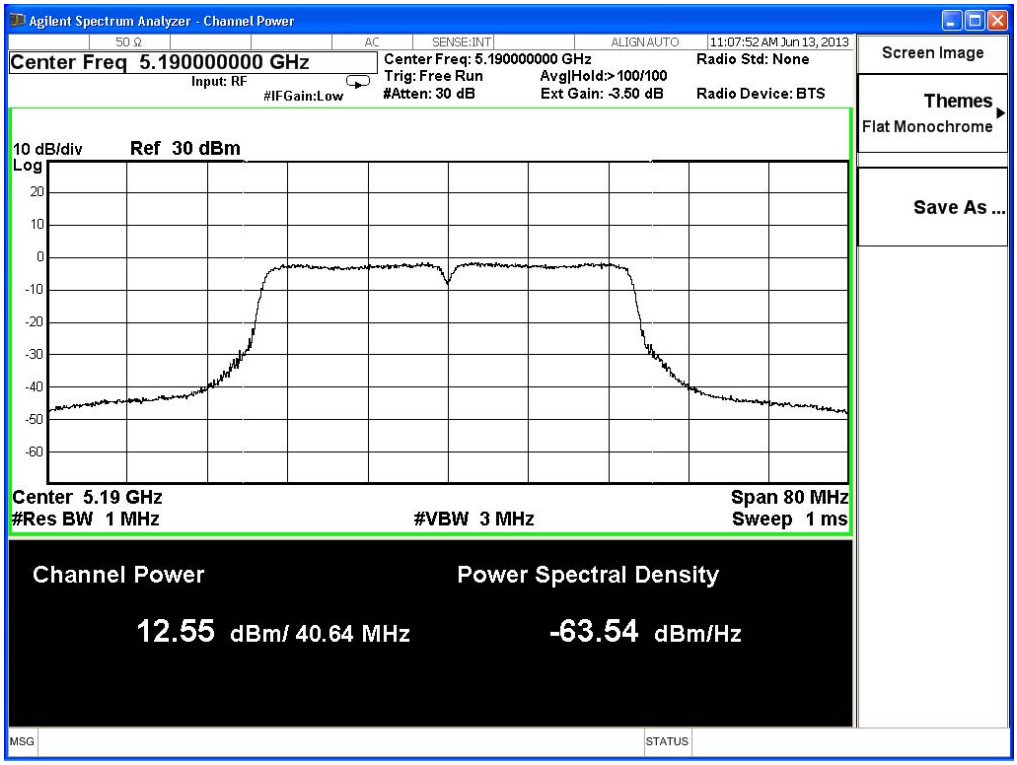
Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

IEEE 802.11n(40MHz)_ANT 1						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
38	5190	40.637	12.55	≤ 17	≤20.08	Pass
46	5230	40.380	13.33	≤ 17	≤20.06	Pass

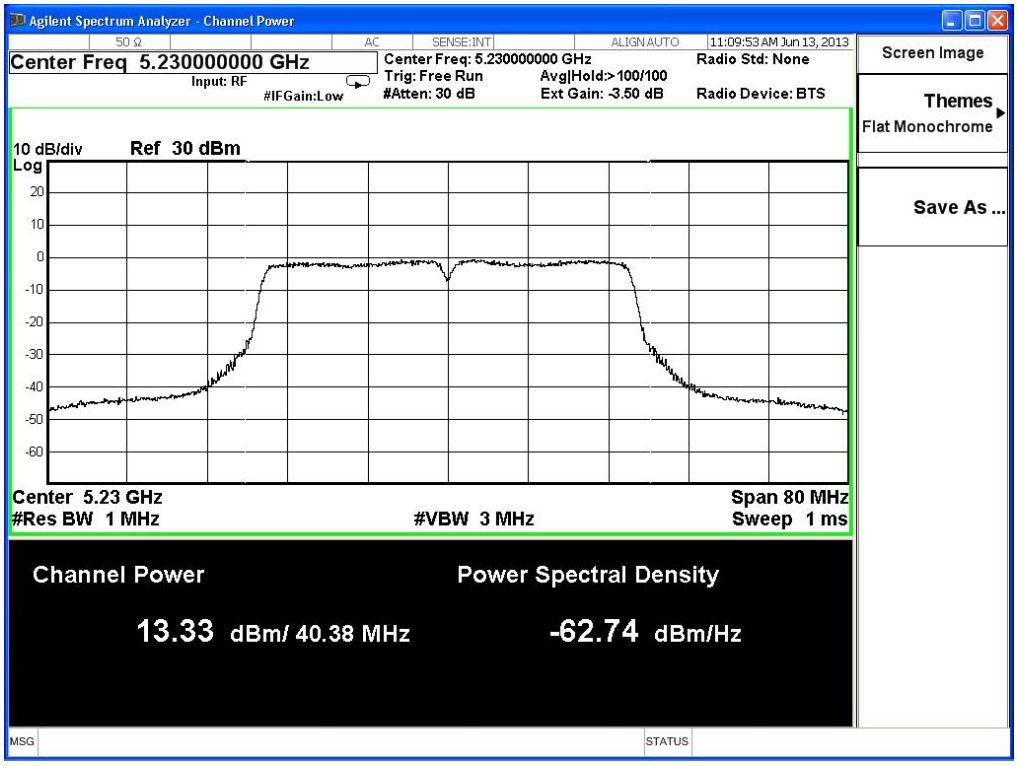
The worst emission of data rate is 40.5 Mbps

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		40.5	81.0	121.5	162.0	243.0	324.0	364.5	405.0	
38	5190	12.55	--	--	--	--	--	--	--	17dBm or 4dBm+10logB
46	5230	13.33	13.23	13.03	12.93	12.73	12.61	12.49	12.25	

Peak transmit Power - Channel 38



Peak transmit Power - Channel 46



Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

IEEE 802.11n(40MHz)_ANT 0+1					
Channel No.	Frequency (MHz)	Total Output Power		Required Limit (dBm)	Result
		(mW)	(dBm)		
38	5190	35.81	15.54	≤ 17	Pass
46	5230	40.85	16.11	≤ 17	Pass

802.11 n(40M), Antenna 0+1

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		40.5	81	121.5	162	243	324	364.5	405	
38	5190	15.54	--	--	--	--	--	--	--	17dBm or
46	5230	16.11	16.01	15.81	15.66	15.51	15.39	15.22	14.98	4dBm+10logB

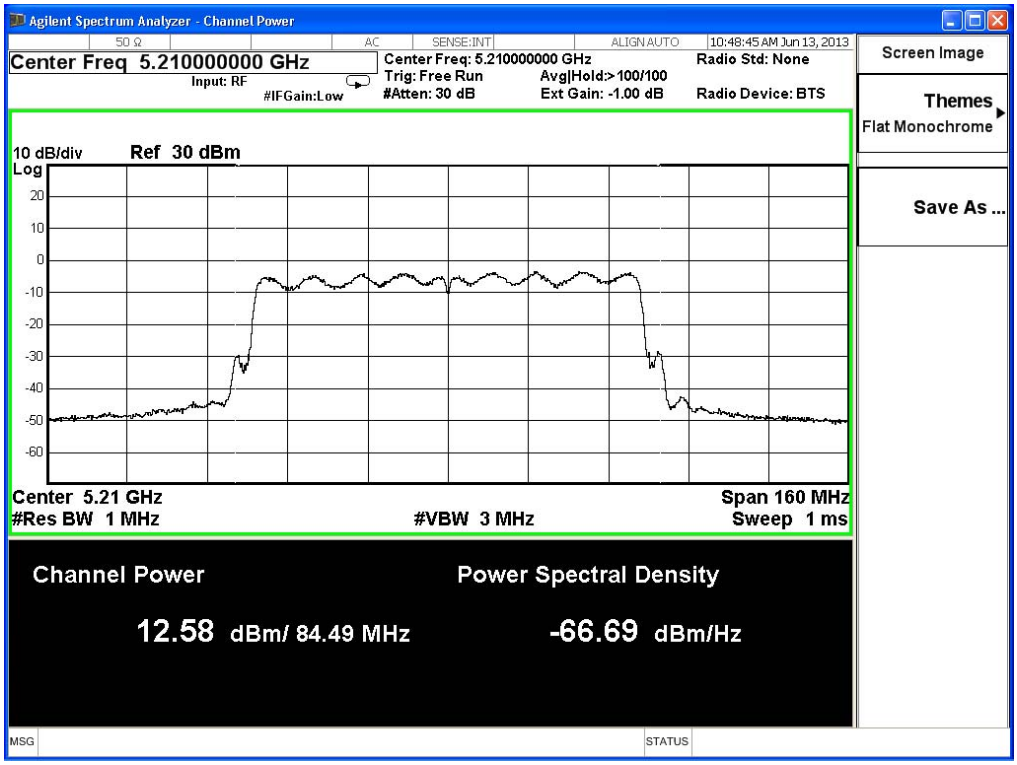
Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

IEEE 802.11ac(80MHz)_ANT 0						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
42	5210	84.494	12.58	≤17	≤23.26	Pass

The worst emission of data rate is 29.3 Mbps

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		29.3	58.5	121.5	162.0	243.0	324.0	364.5	405.0	
42	5210	12.58	12.48	12.38	12.28	12.18	11.98	11.74	11.50	17dBm or 4dBm+10logB

Peak transmit Power - Channel 42



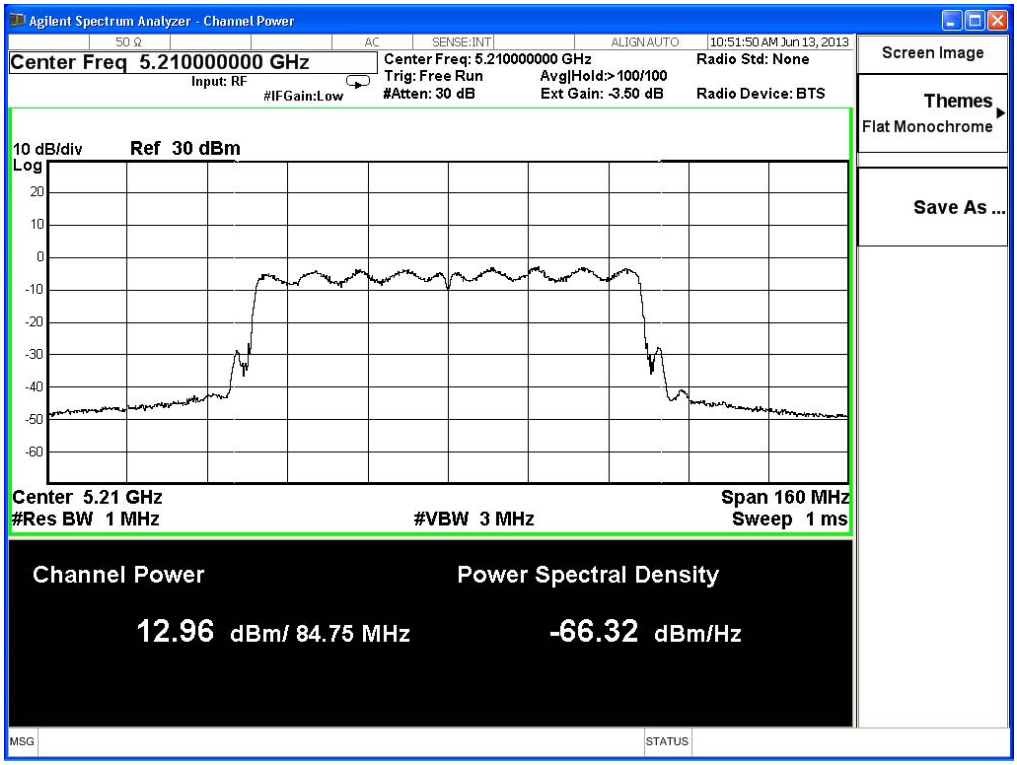
Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

IEEE 802.11ac(40MHz)_ANT 1						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
42	5210	84.748	12.96	≤ 17	≤23.28	Pass

The worst emission of data rate is 29.3 Mbps

Peak Power Output (dBm)										
MCS Index		0	1	2	3	4	5	6	7	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		29.3	58.5	121.5	162.0	243.0	324.0	364.5	405.0	
42	5210	12.96	12.76	12.66	12.56	12.46	12.26	12.02	11.78	17dBm or 4dBm+10logB

Peak transmit Power - Channel 42



Product	USB-AC56 dual-bank wireless adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (Dipole Antenna)		
Date of Test	2013/06/13	Test Site	SR7

IEEE 802.11ac(80MHz)_ANT 0+1					
Channel No.	Frequency (MHz)	Total Output Power		Required Limit (dBm)	Result
		(mW)	(dBm)		
42	5210	37.88	15.78	≤ 17	Pass

802.11 AC(80M), Antenna 0+1

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		40.5	81.0	121.5	162.0	243.0	324.0	364.5	405.0	
42	5210	15.78	15.68	16.91	16.80	16.70	16.51	16.28	16.06	17dBm or 4dBm+10logB