



Test Report

Product Name	WHDI Tx board
Model No	WV300A
FCC ID	PPQ-WV300A

Applicant	LITE-ON Technology Corp.
Address	4F, No.90, Chien 1 Rd., Chung-Ho, Taipei Hsien 235, Taiwan

Date of Receipt	Sep. 16, 2011
Issued Date	Oct. 12, 2011
Report No.	119315R-RFUSP32V01
Report Version	V1.0

The test results relate only to the samples tested.


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This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Test Report Certification

Issued Date: Oct. 12, 2011

Report No.: 119315R-RFUSP32V01



Product Name	WHDI Tx board	
Applicant	LITE-ON Technology Corp.	
Address	4F, No.90, Chien 1 Rd., Chung-Ho, Taipei Hsien 235, Taiwan	
Manufacturer	DONG GUAN G-COM COMPUTER CO., LTD.	
Model No.	WV300A	
FCC ID.	PPQ-WV300A	
EUT Rated Voltage	DC 5V (Power by AC Adapter)	
EUT Test Voltage	AC 120V/60Hz	
Trade Name	LITE-ON	
Applicable Standard	FCC CFR Title 47 Part 15 Subpart E: 2010 ANSI C63.4: 2009; FCC KDB-789033	 NVLAP Lab Code: 200533-0
Test Result	Complied	

The Test Results relate only to the samples tested.

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Documented By : Joanne Lin
(Adm. Specialist / Joanne Lin)



Tested By : Jack Hsu
(Assistant Engineer / Jack Hsu)

Approved By : Vincent Lin
(Manager / Vincent Lin)



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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	WHDI Tx board
Trade Name	LITE-ON
FCC ID.	PPQ-WV300A
Model No.	WV300A
Frequency Range	20MHz-BW: 5180-5240MHz 40MHz-BW: 5190-5230MHz
Number of Channels	20MHz-BW: 4; 40MHz-BW: 2
Maximum Data Rate	20MHz-BW: 31.5Mbps; 40MHz-BW: 63MHz
Channel Separation	20MHz-BW: 20MHz, 40MHz-BW: 40MHz
Antenna Gain	Refer to the table "Antenna List"
Antenna type	Printer on PCB
Type of Modulation	OFDM
Channel Control	Auto
Power Adapter	MFR: APD, M/N: WA-15C05FU Input: AC 100-240V, 50-60Hz, 0.5A Max Output: DC 5V, 3A Cable Out: Non-Shielded, 1.5m

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	Liteon	N/A	2dBi for 5.15~5.25GHz

Note: The antenna of EUT is conform to FCC 15.203

20MHz Center Working Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 36:	5180 MHz	Channel 40:	5200 MHz	Channel 44:	5220 MHz	Channel 48:	5240 MHz

40MHz Center Working Frequency of Each Channel:

Channel	Frequency	Channel	Frequency
Channel 38:	5190 MHz	Channel 46:	5230 MHz

Note:

1. This device is a WHDI Tx board with a built-in 5GHz transceiver.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart E for Unlicensed National Information Infrastructure devices.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

1.2. Operational Description

The EUT is a Full HD Video Wireless Transmitter Module with a built-in 5GHz transceiver, together with Full HD Video Wireless Receiver Module. It has a SIMO design of five channel and one slow rate output wireless channel, which generates an upstream channel for data content transmissions.

The data modulation is OFDM, using five antennas to support 4(Transmit) * 1(Receive) technology. The device only provided one transmitting speed 31.5Mbps in 20MHz bandwidth mode and 63Mbps in 40MHz bandwidth mode. Presents the ultimate solution for converting any High Definition (HD) system, including Full HD, into a wireless one. These add-on modules enable wireless A/V applications that fit easily into the living room and eliminate traditional A/V wiring. The perfect HD video and audio quality and the high robustness are unmatched by any other wireless technology and present a true alternative to cable. The WHDI system transmits uncompressed video and audio streams wirelessly and thus simplifies and eliminates system issues, such as: lip-sync, large buffers and other burdens like retransmissions or error propagation.

The device can transmit audio and video signal to associate equipment, device will receive signal form associate equipment when associate equipment request change operation frequency. The AMN2120 WHDITM baseband transmitter chip is the heart of the WV300A WHDI transmitter module. The AMN2120 interfaces the A/V source through the WHDI connector. The AMN2120 includes an internal microcontroller for controlling the physical level. The AMN2120 is based on MIMO technology transmitting through up to four output channels. Four digital-to-analog converters and one analog-to-digital converter are embedded within the chip. The AMN2120 internal PLL accepts an input clock frequency of 40MHz. The input frequency is multiplied and then used as an internal system clock. The AMN2120 also generates a 10 MHz reference clock, derived from 40 MHz for general use.

The AMN3110 is a fully-integrated direct conversion MIMO transmitter specifically designed for WHDI applications using OFDM modulation in 5.15-5.25GHz and 5.725~5.850GHz. The device consists of:

- Four Complete Downlink Direct Conversion Transmitters.
- One Uplink Receiver.
- Integrated Synthesizer.
- Internal DC Servo Loops.
- RSSI.
- IQ Detector.
- RF and Baseband Control Interface.
- Power Management Unit.
- 3-Wire SPI Interface.

To complete the RF front-end solution, the AMN3110 uses external PA, RF switches, RF Band Pass Filters (BPF), RF BALUNs and a few passive components.

The device antenna are use five FIFA(4TX, 1RX) and printed on PCB, for receiver function there are support one external antenna which can instead of printed antenna.

Test Mode	Mode 1: Transmit (31.5Mbps 20MBW) Mode 2: Transmit (63Mbps 40MBW)
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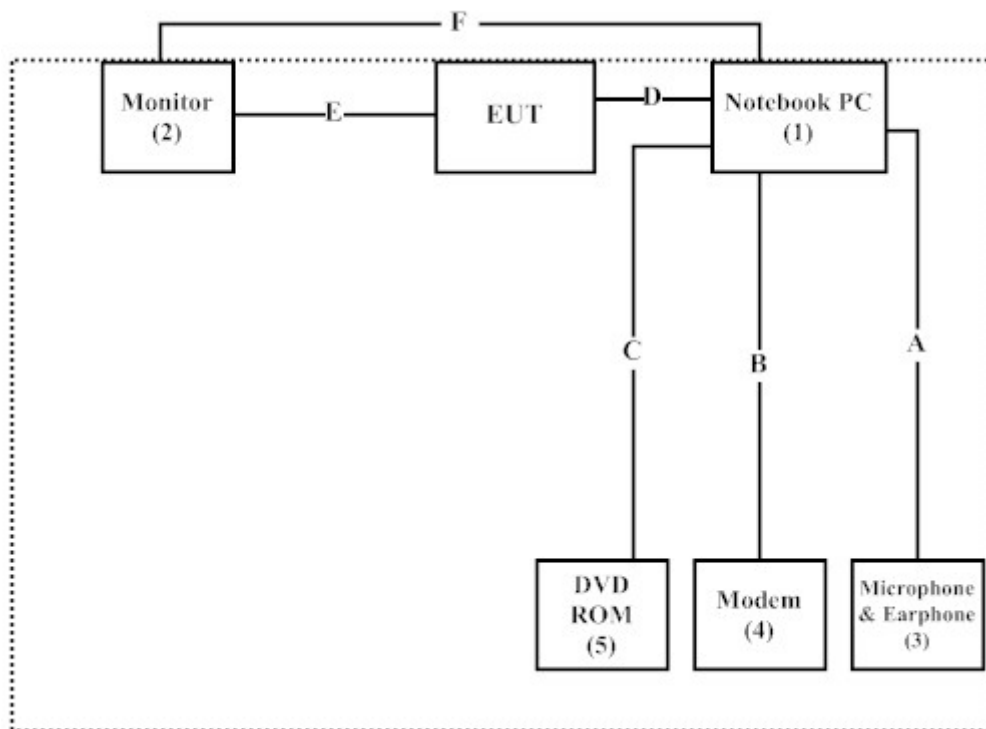
1.3. Tested System Details

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

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Notebook PC	DELL	PPT	N/A	Non-Shielded, 0.8m
2 Monitor	LG	W2261VT	907YHPB07296	Non-Shielded, 1.8m
3 Microphone & Earphone	Ergotech	ET-E201	N/A	N/A
4 Modem	ACEEX	DM-1414	0102027558	Non-Shielded, 1.8m
5 DVD ROM	DELL	PD01S	N/A	N/A

Signal Cable Type	Signal cable Description
A Microphone & Earphone Cable	Non-Shielded, 1.2m
B Modem Cable	Shielded, 1.5m
C USB Cable	Shielded, 0.55m
D USB Cable	Shielded, 0.45m
E HDMI Cable	Shielded, 1.5m
F D-SUB Cable	Non-Shielded, 1.8m, with two ferrite cores bonded.

1.4. Configuration of tested System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4
- (2) Execute “APPcom” program on the Notebook.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Press “OK” to start the continuous Transmit.
- (5) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

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/>

Site Description: File on
 Federal Communications Commission
 FCC Engineering Laboratory
 7435 Oakland Mills Road
 Columbia, MD 21046
 Registration Number: 92195



Accreditation on NVLAP
 NVLAP Lab Code: 200533-0



Site Name: Quietek Corporation
 Site Address: 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

FCC Accreditation Number: TW1014



2. Conducted Emission

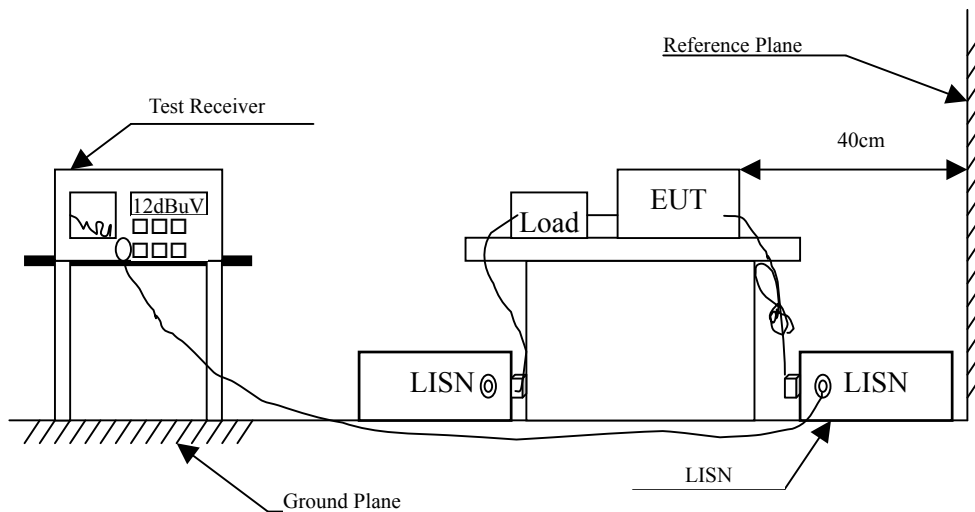
2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2011	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2011	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2011	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar, 2011	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2011	
	No.1 Shielded Room				

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	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 and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2009 on conducted measurement.

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

The EUT was setup to ANSI C63.4, 2009; tested to DTS test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : WHDI Tx board
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 2: Transmit (63Mbps 40MBW) (5190MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 1					
Quasi-Peak					
0.209	9.701	47.320	57.021	-7.293	64.314
0.326	9.650	38.560	48.210	-12.761	60.971
0.451	9.640	32.700	42.340	-15.060	57.400
0.748	9.640	40.080	49.720	-6.280	56.000
3.638	9.700	24.900	34.600	-21.400	56.000
14.896	9.990	33.380	43.370	-16.630	60.000
Average					
0.209	9.701	33.170	42.871	-11.443	54.314
0.326	9.650	27.390	37.040	-13.931	50.971
0.451	9.640	22.240	31.880	-15.520	47.400
0.748	9.640	29.840	39.480	-6.520	46.000
3.638	9.700	13.720	23.420	-22.580	46.000
14.896	9.990	24.450	34.440	-15.560	50.000

Note:

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

Product : WHDI Tx board
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 2: Transmit (63Mbps 40MBW) (5190MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 2					
Quasi-Peak					
0.189	9.724	50.540	60.264	-4.622	64.886
0.252	9.685	38.720	48.405	-14.681	63.086
0.341	9.659	42.640	52.299	-8.244	60.543
0.713	9.650	38.660	48.310	-7.690	56.000
1.267	9.670	27.480	37.150	-18.850	56.000
15.017	10.000	31.260	41.260	-18.740	60.000
Average					
0.189	9.724	33.600	43.324	-11.562	54.886
0.252	9.685	20.520	30.205	-22.881	53.086
0.341	9.659	30.930	40.589	-9.954	50.543
0.713	9.650	27.440	37.090	-8.910	46.000
1.267	9.670	15.450	25.120	-20.880	46.000
15.017	10.000	21.980	31.980	-18.020	50.000

Note:

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

3. Peak Transmit Power

3.1. Test Equipment

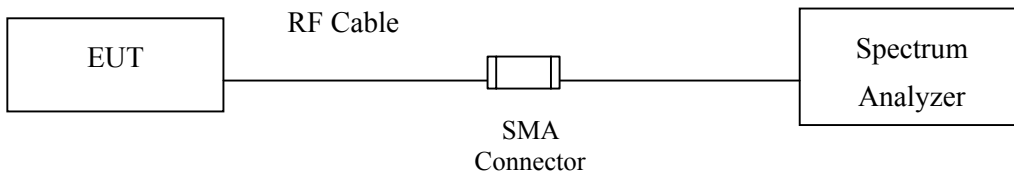
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2011
X	Power Sensor	Anritsu	MA2411B/0738448	Jun, 2011
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2011

Note:

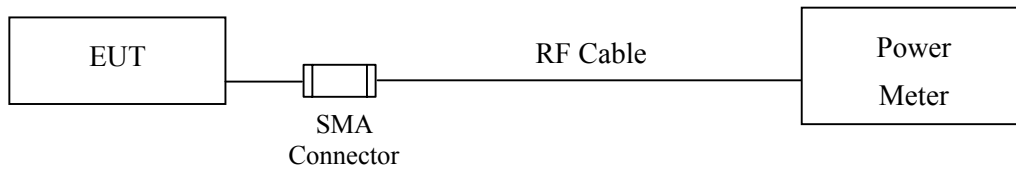
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

3.2. Test Setup

26dBc Occupied Bandwidth



Conduction Power Measurement



3.3. 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 $4 \text{ dBm} + 10\log B$, where B is the 26-dB 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 $11 \text{ dBm} + 10\log B$, where B is the 26-dB 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 $17 \text{ dBm} + 10\log B$, where B is the 26-dB 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.

3.4. Test Procedur

As an alternative to FCC KDB-789033, the EUT peak power was measured with a peak power meter employing a video bandwidth greater than 6dB BW of the emission under test. Peak output power was read directly from the meter across all data rates, and across three channels within each sub-band. Special care was used to make sure that the EUT was transmitting in continuous mode. This method exceeds the limitations of FCC KDB-789033, and provides more accurate measurements.

3.5. Uncertainty

$\pm 1.27 \text{ dB}$

3.6. Test Result of Peak Transmit Power

Product : WHDI Tx board
 Test Item : Peak Transmit Power
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (31.5Mbps 20MBW)

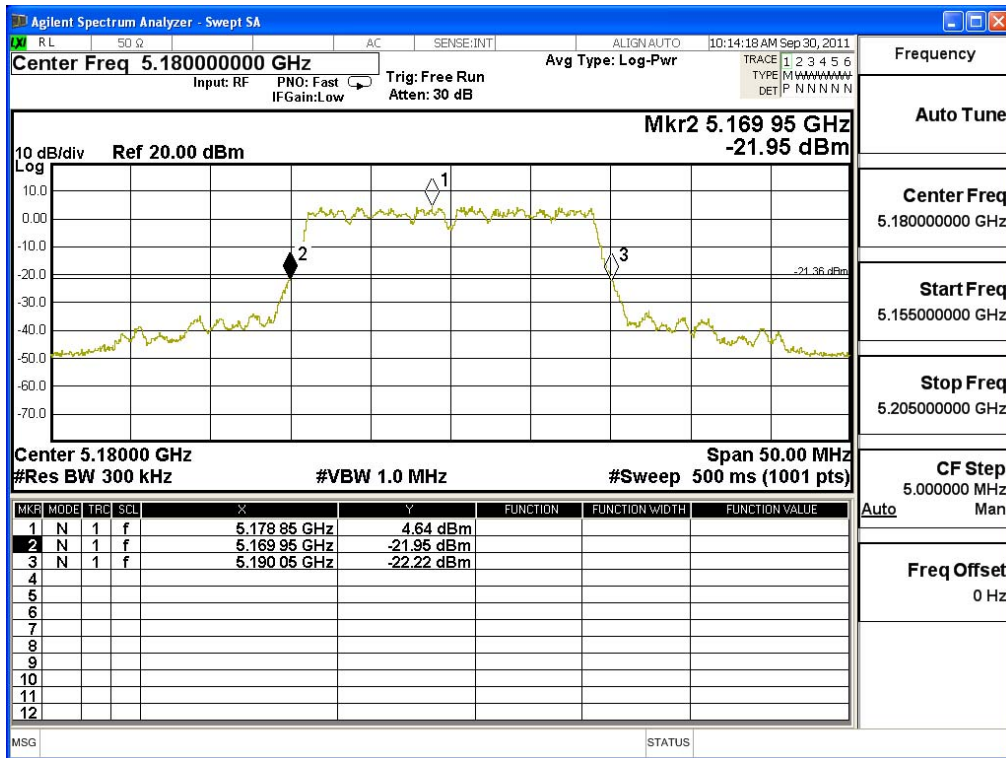
Peak Transmit Power Measurement: (CHAIN A+B+C+D)

Channel Number	Frequency (MHz)	26dB Bandwidth (MHz)	Chain A	Chain B	Chain C	Chain D	Output Power (dBm)	Output Power Limit	
			Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)		(dBm)	dBm+10log(BW)
36	5180	20.100	8.84	9.85	8.87	8.72	15.12	17	17.03
44	5220	20.100	9.95	10.42	9.30	9.86	15.92	17	17.03
48	5240	19.850	9.40	10.16	10.29	8.32	15.63	17	16.98

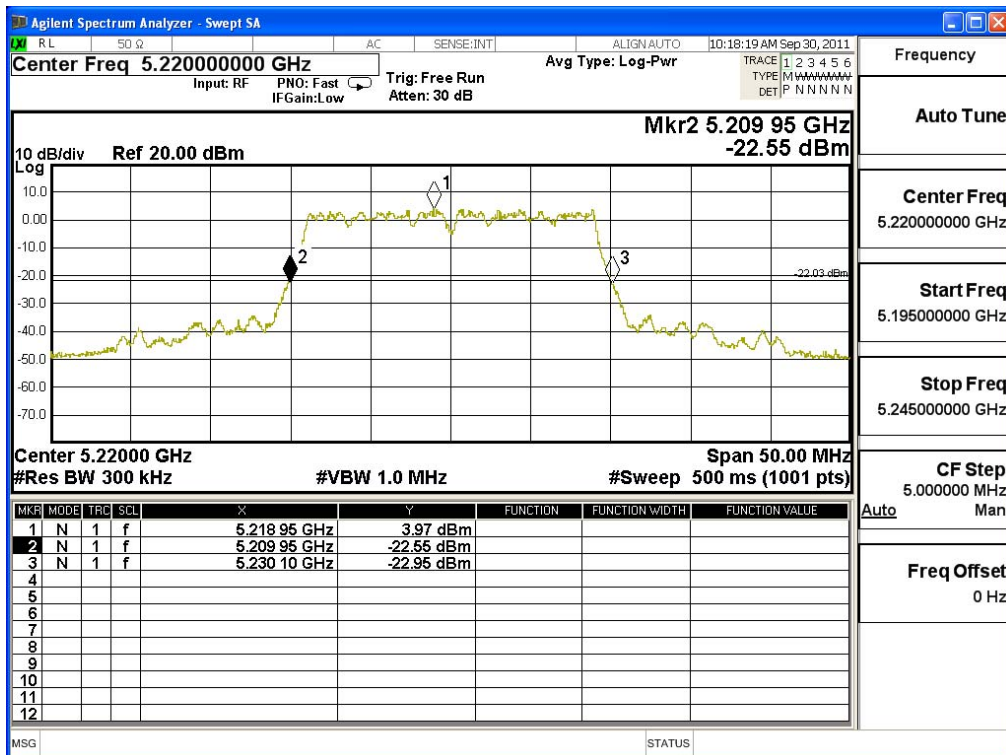
Note:

1. Power Output Value = Reading value on peak power meter + cable loss
2. Output Power (dBm) = 10*LOG (Chain A Power (mW)+ Chain B Power (mW)+ Chain C Power (mW)+ Chain D Power (mW))
3. 26 dB Bandwidth is the bandwidth of chain A 、 chain B 、 chain C or chain D whichever is less bandwidth, output power limitation is more stringent.

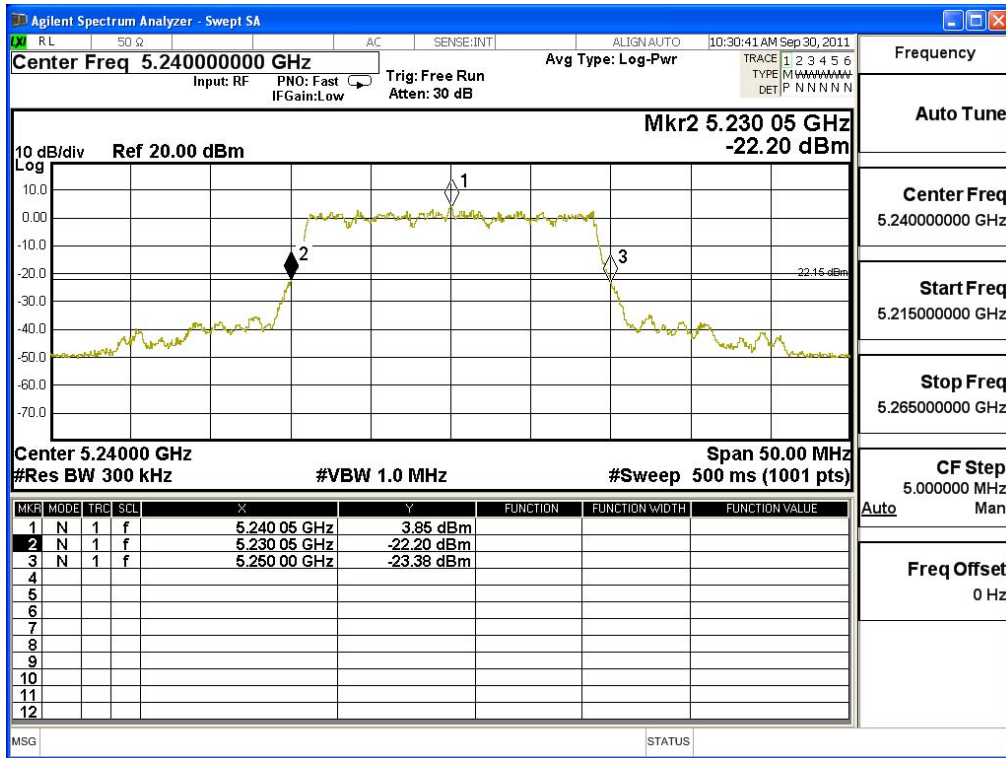
26dBc Occupied Bandwidth: Channel 36 -Chain A



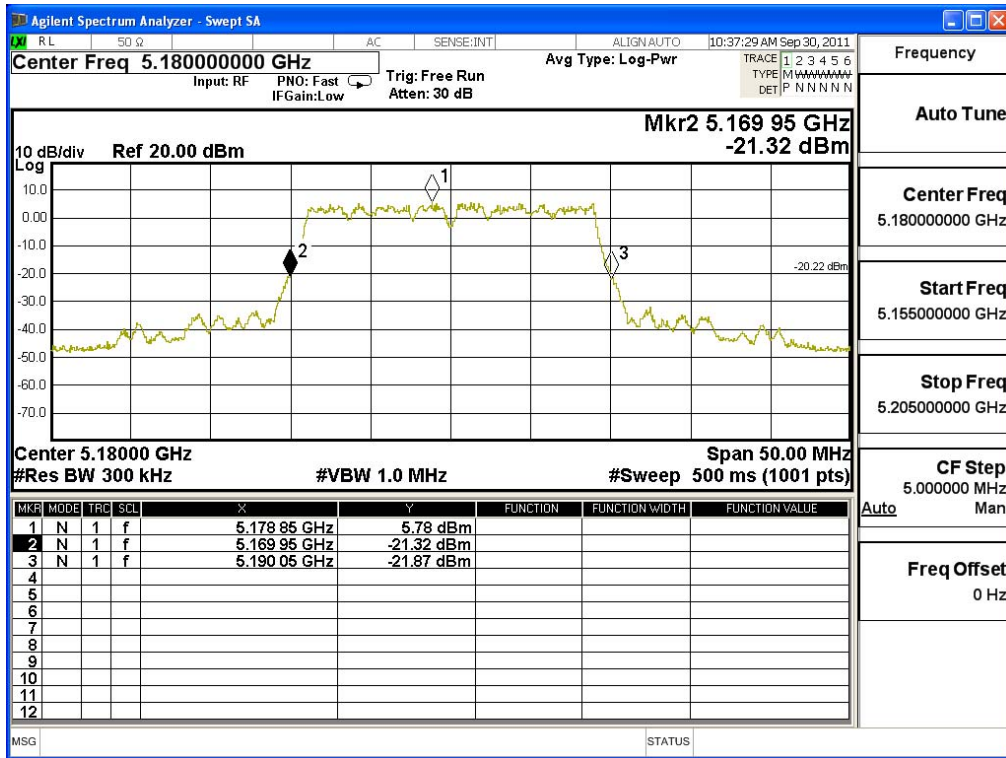
Channel 44 -Chain A



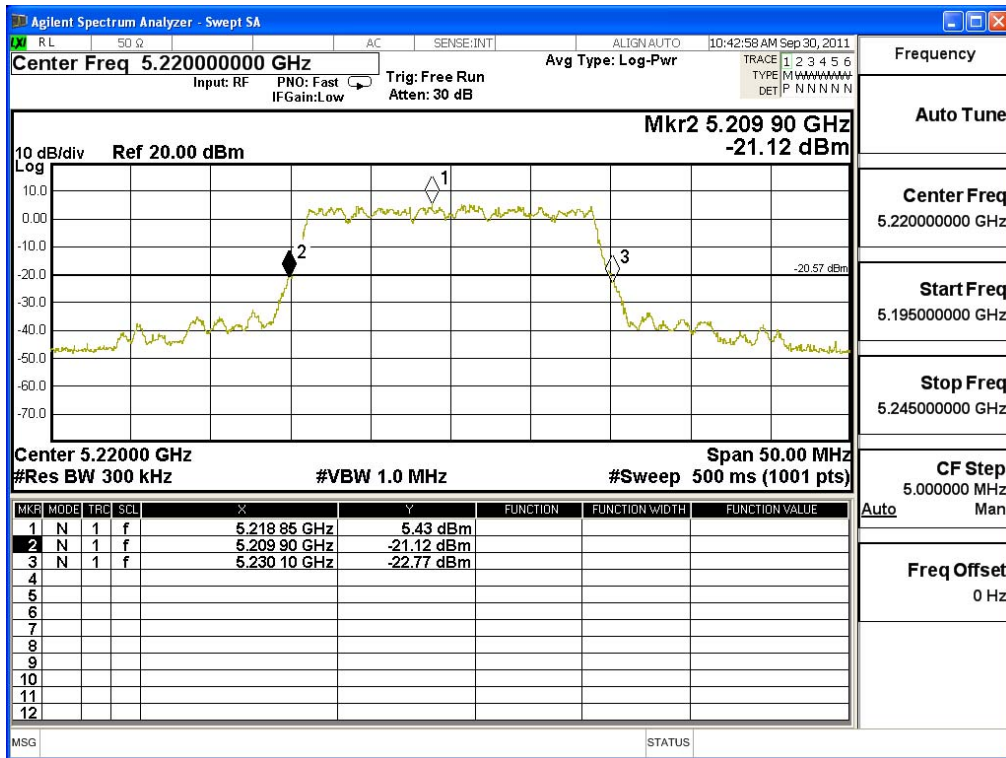
Channel 48 -Chain A



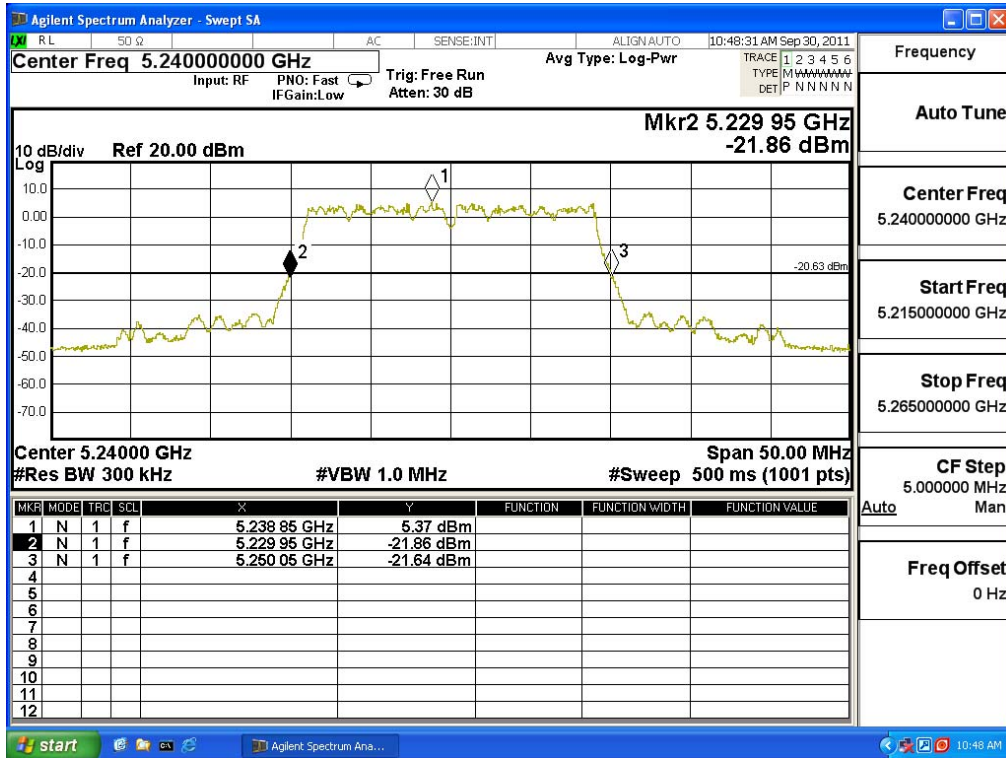
Channel 36 -Chain B



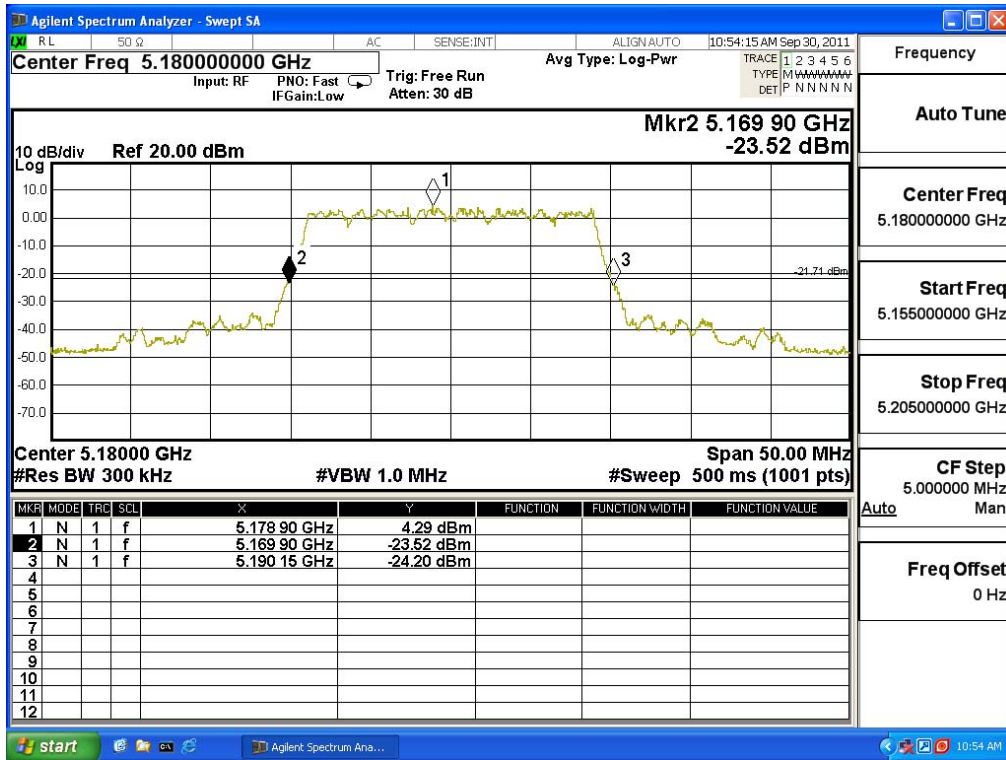
Channel 44 -Chain B



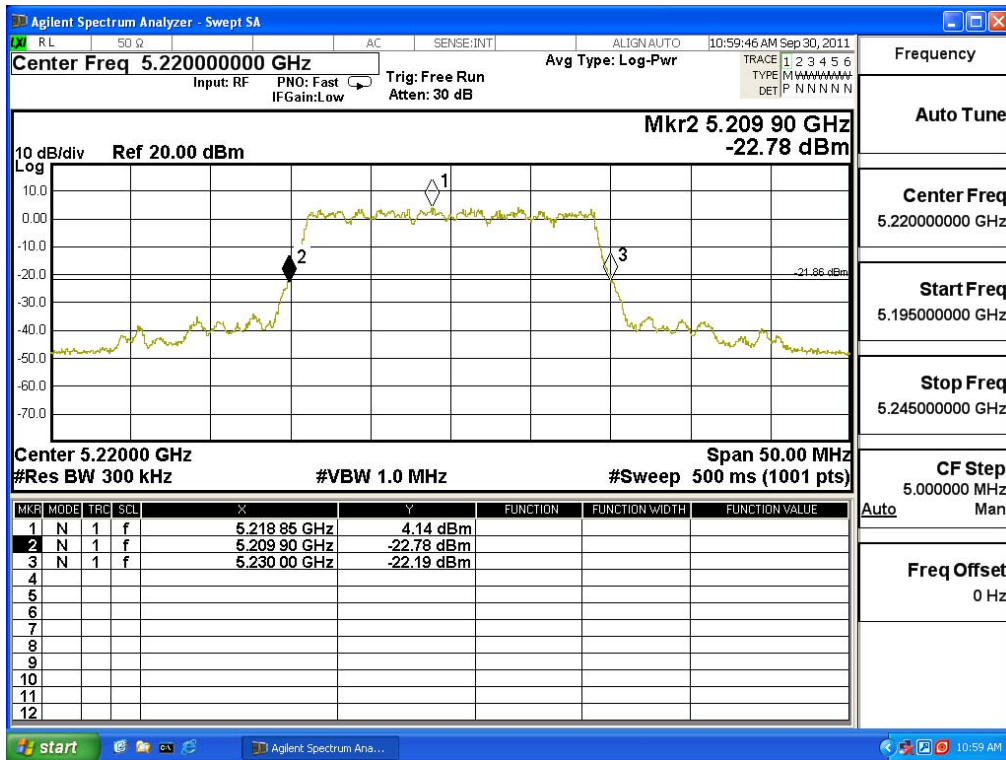
Channel 48 -Chain B



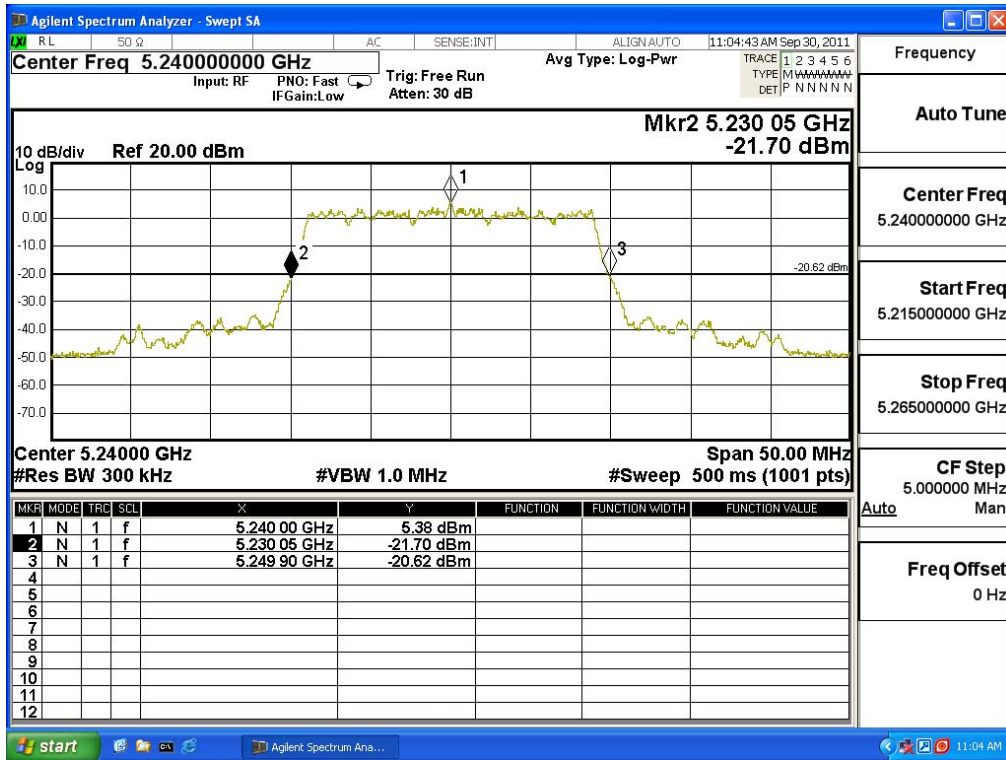
Channel 36 -Chain C



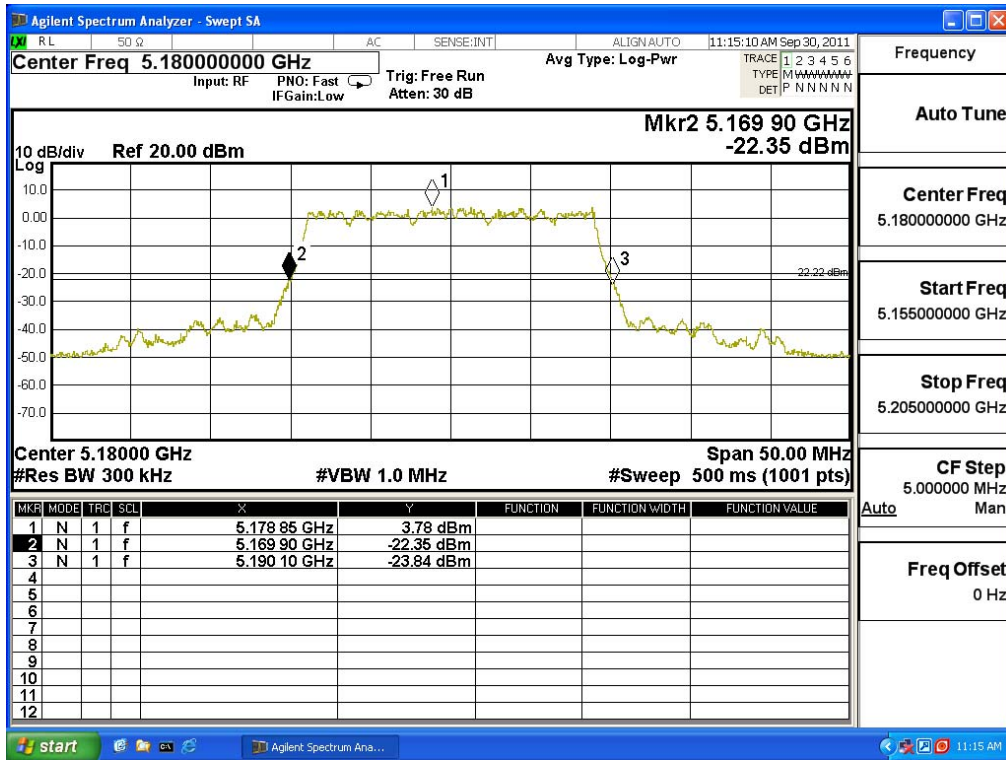
Channel 44 -Chain C



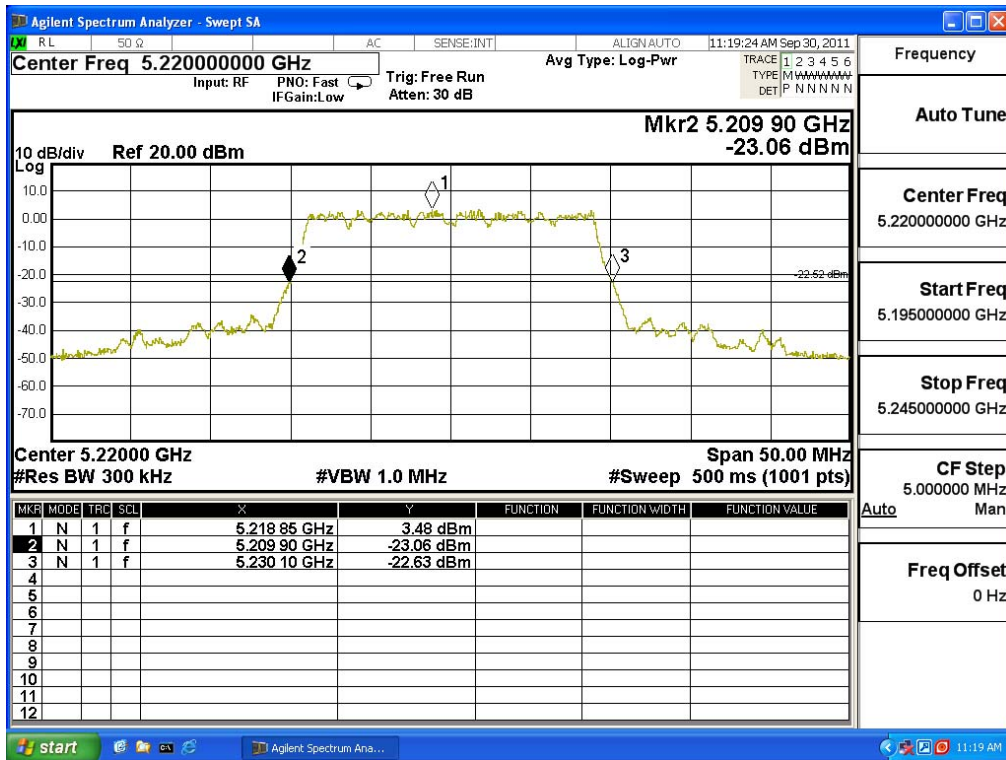
Channel 48 -Chain C



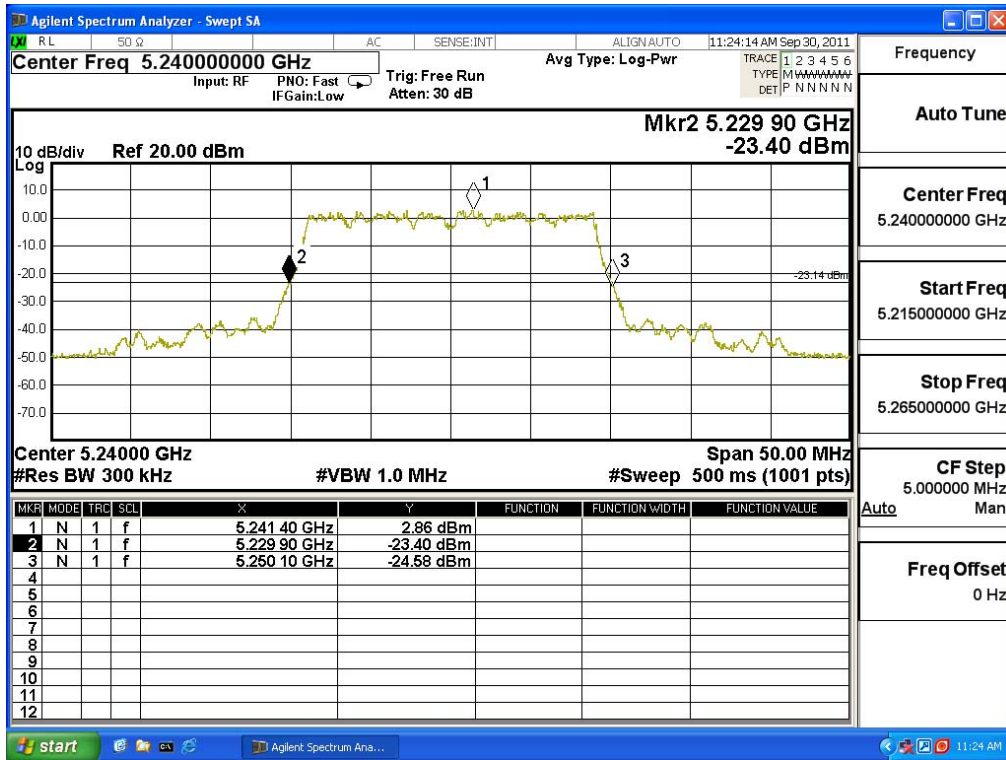
Channel 36 -Chain D



Channel 44 -Chain D



Channel 48 -Chain D



Product : WHDI Tx board
 Test Item : Peak Transmit Power
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (63Mbps 40MBW)

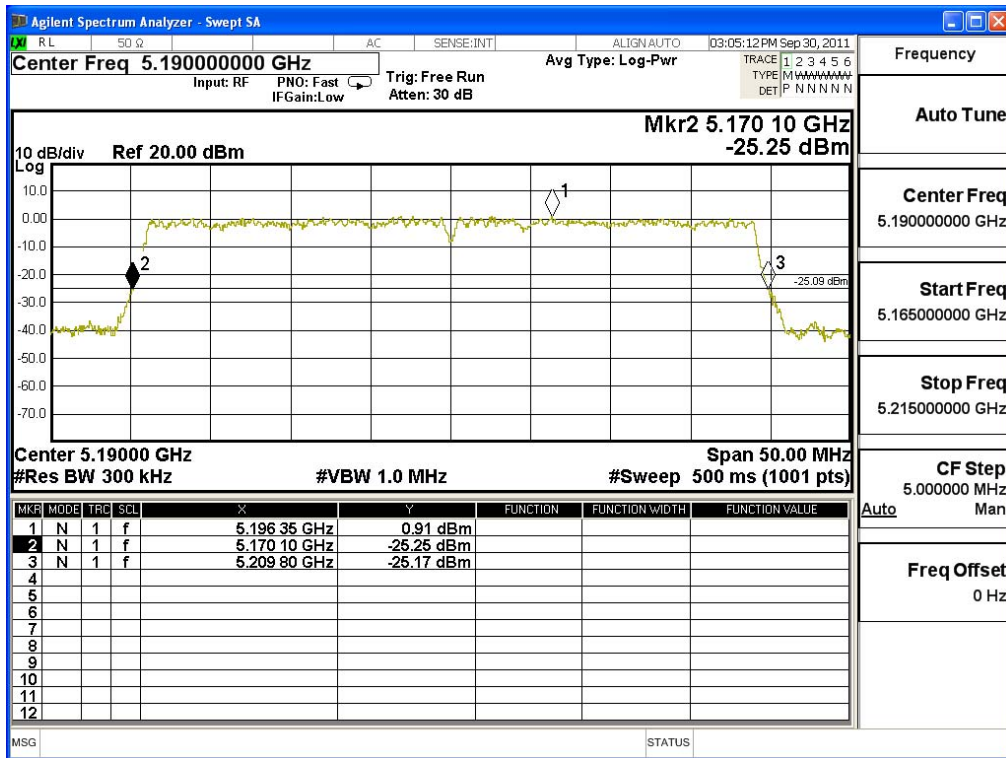
Peak Transmit Power Measurement: (CHAIN A+B+C+D)

Channel Number	Frequency (MHz)	26dB Bandwidth (MHz)	Chain A Power (dBm)	Chain B Power (dBm)	Chain C Power (dBm)	Chain D Power (dBm)	Output Power (dBm)	Output Power Limit	
		(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	dBm+10log(BW)
38	5190	39.700	10.35	10.36	9.36	9.77	16.00	17	19.99
46	5230	39.800	10.76	12.03	10.58	9.60	16.85	17	20.00

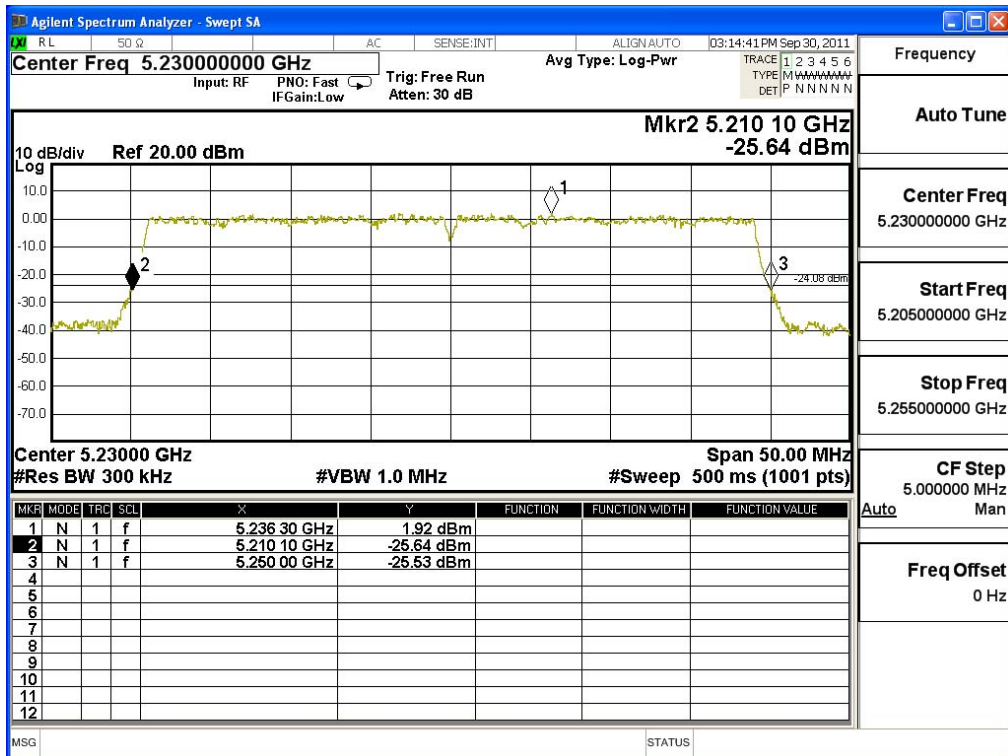
Note:

1. Power Output Value = Reading value on peak power meter + cable loss
2. Output Power (dBm) = 10*LOG (Chain A Power (mW)+ Chain B Power (mW)+ Chain C Power (mW)+ Chain D Power (mW))
3. 26 dB Bandwidth is the bandwidth of chain A 、 chain B 、 chain C or chain D whichever is less bandwidth, output power limitation is more stringent.

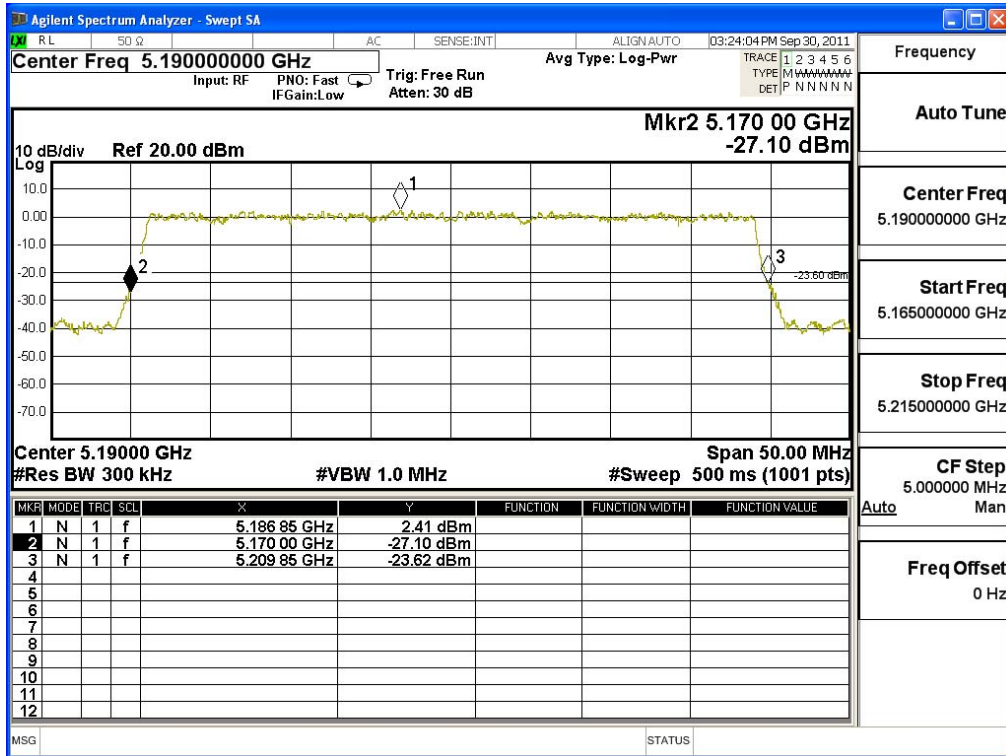
26dBc Occupied Bandwidth: Channel 38 – Chain A



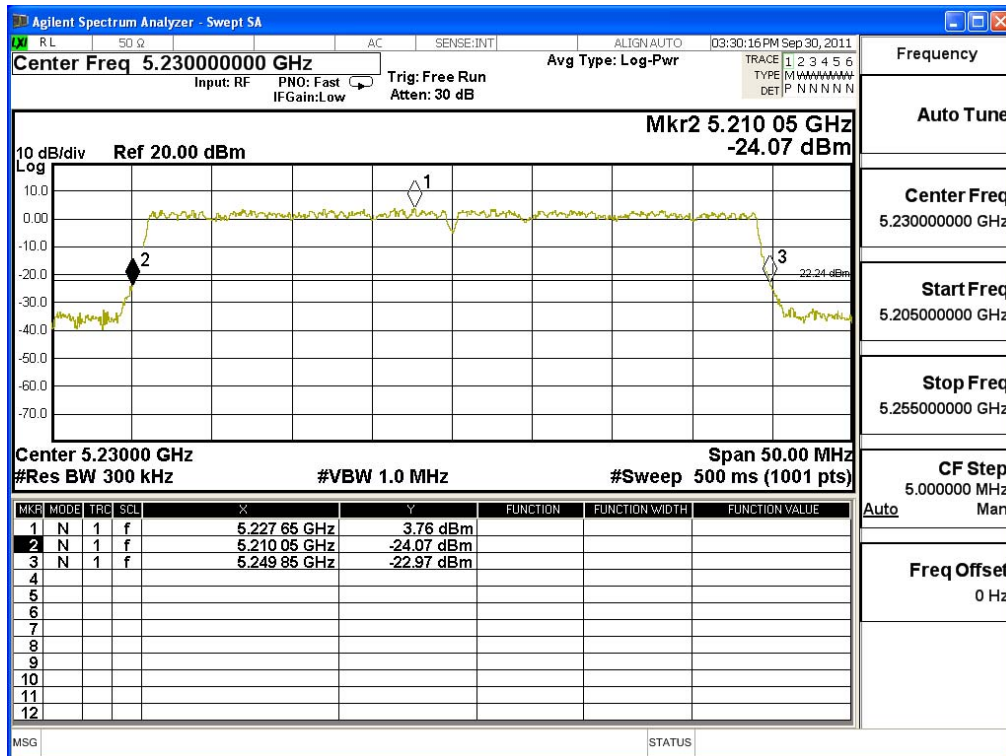
Channel 46 – Chain A



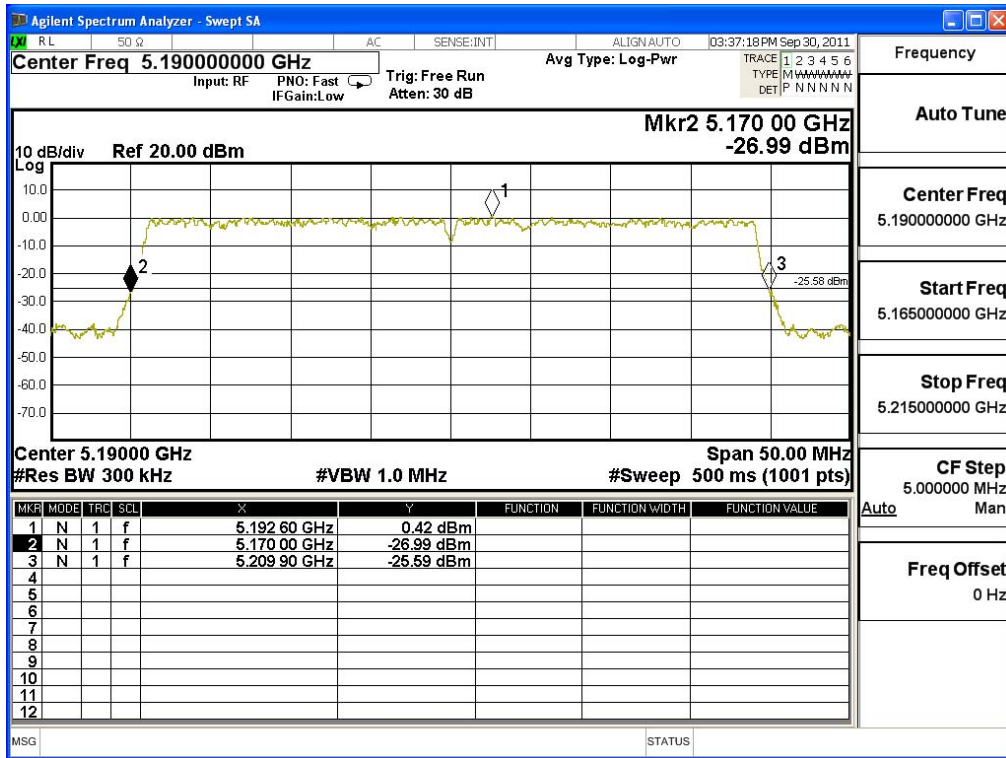
Channel 38 – Chain B



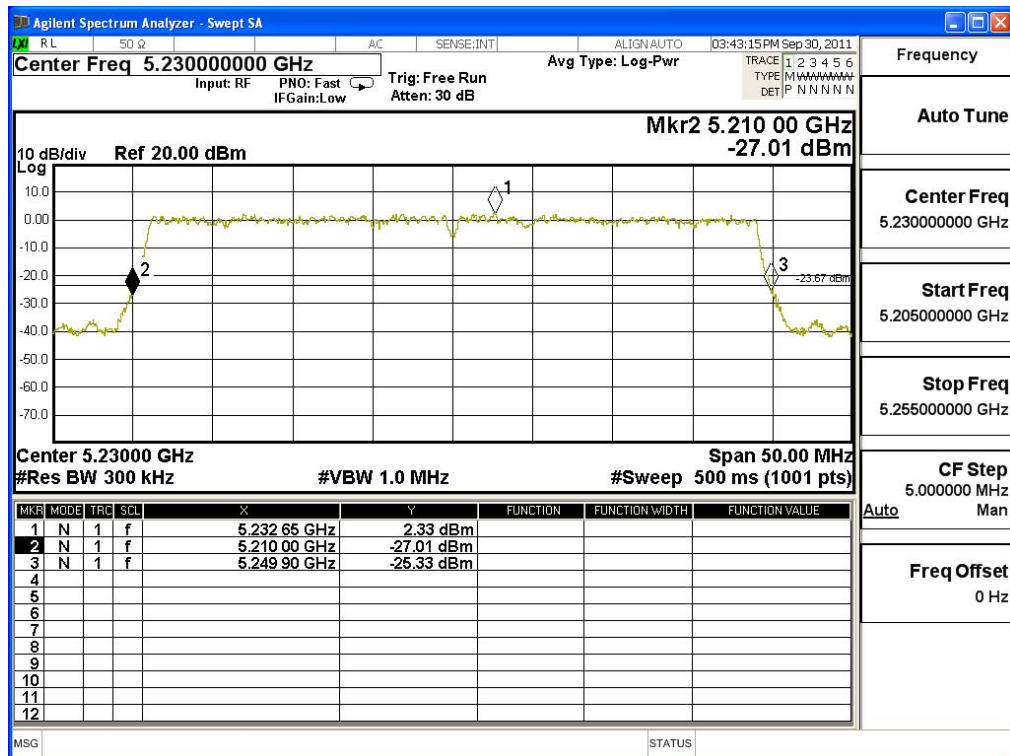
Channel 46 – Chain B



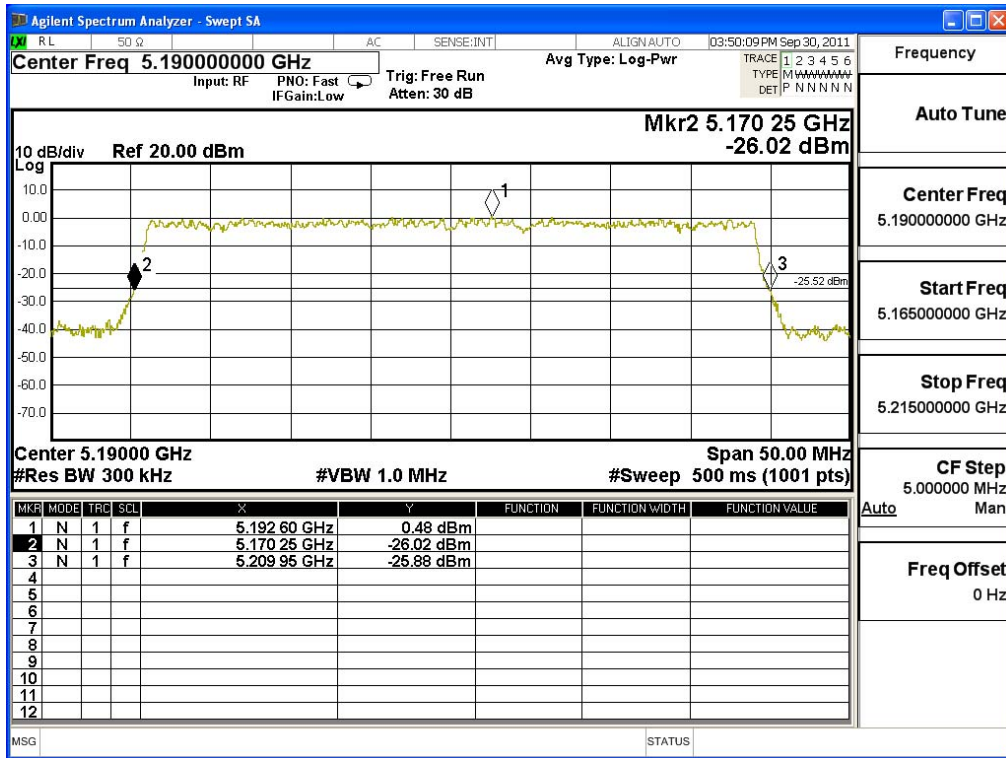
Channel 38 – Chain C



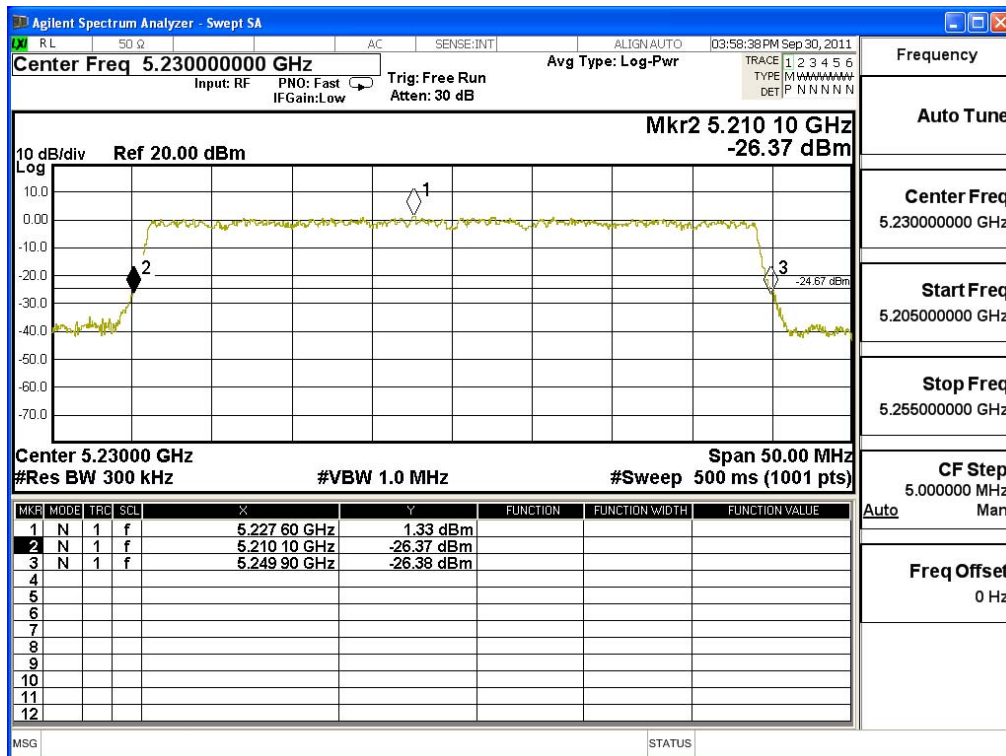
Channel 46 – Chain C



Channel 38 – Chain D



Channel 46 – Chain D



4. Peak Power Spectral Density

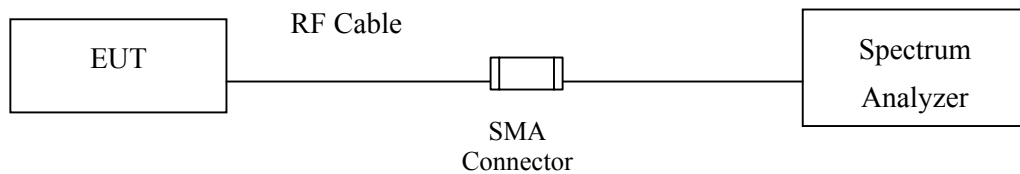
4.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2011
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2011
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr, 2011

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

4.2. Test Setup



4.3. Limits

- (1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antenna of directional gain greater than 6 dBi are used, the peak power spectral density 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 power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antenna of directional gain greater than 6 dBi are used, the peak power spectral density 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 power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antenna of directional gain greater than 6 dBi are used, the peak power spectral density 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 DTS test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

4.5. Uncertainty

± 1.27 dB

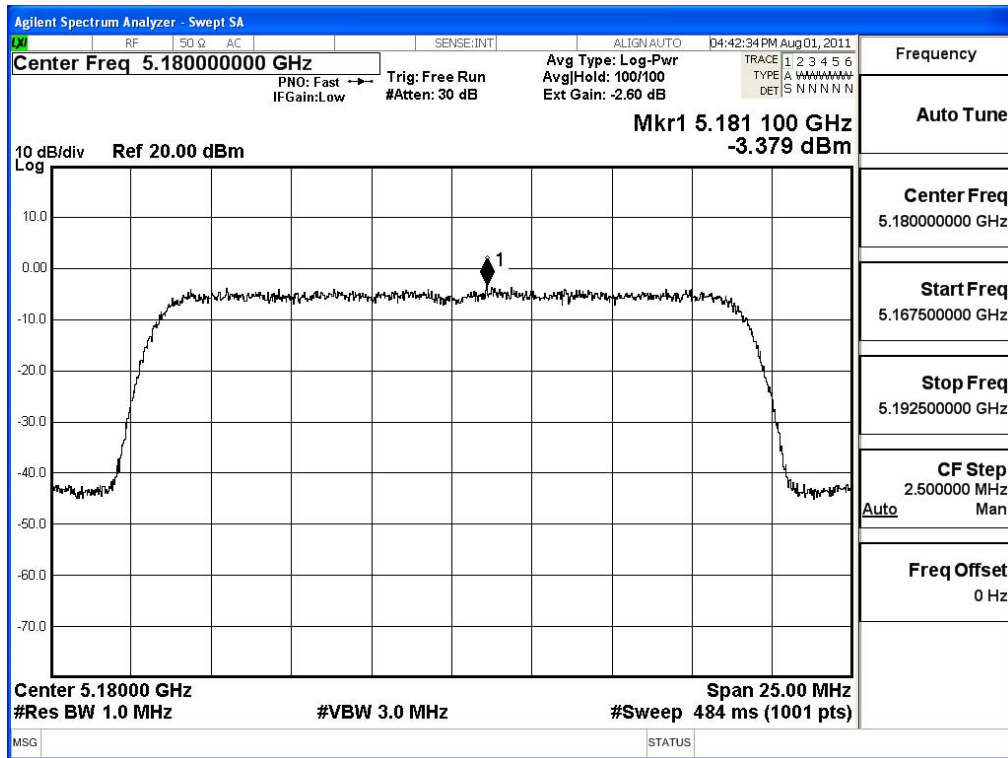
4.6. Test Result of Peak Power Spectral Density

Product : WHDI Tx board
 Test Item : Peak Power Spectral Density
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (31.5Mbps 20MBW)

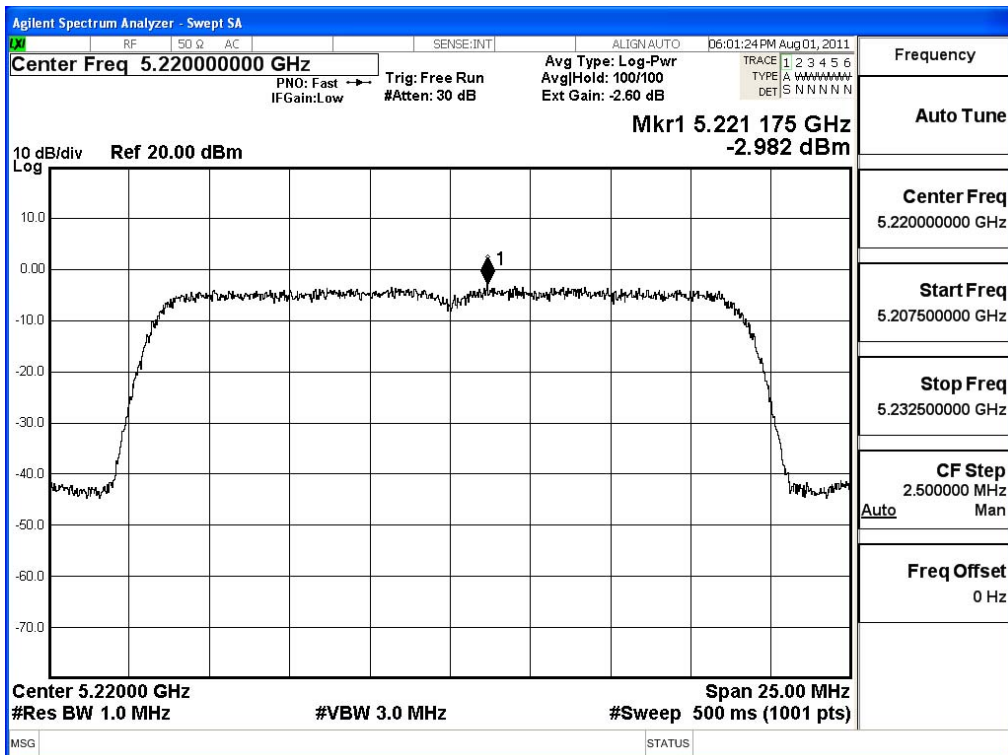
Channel Number	Frequency (MHz)	Chain A Power (dBm)	Chain B Power (dBm)	Chain C Power (dBm)	Chain D Power (dBm)	Measurement Level (dBm)	Required Limit (dBm)	Result
36	5180	-3.379	-3.252	-2.507	-2.653	3.089	<4	Pass
44	5220	-2.982	-2.350	-3.992	-3.230	2.922	<4	Pass
48	5240	-2.704	-2.464	-2.878	-4.660	2.925	<4	Pass

Note: Measurement Level (dBm) = 10LOG (Chain A Power (mW)+ Chain B Power (mW)+ Chain C Power (mW)+ Chain D Power (mW))

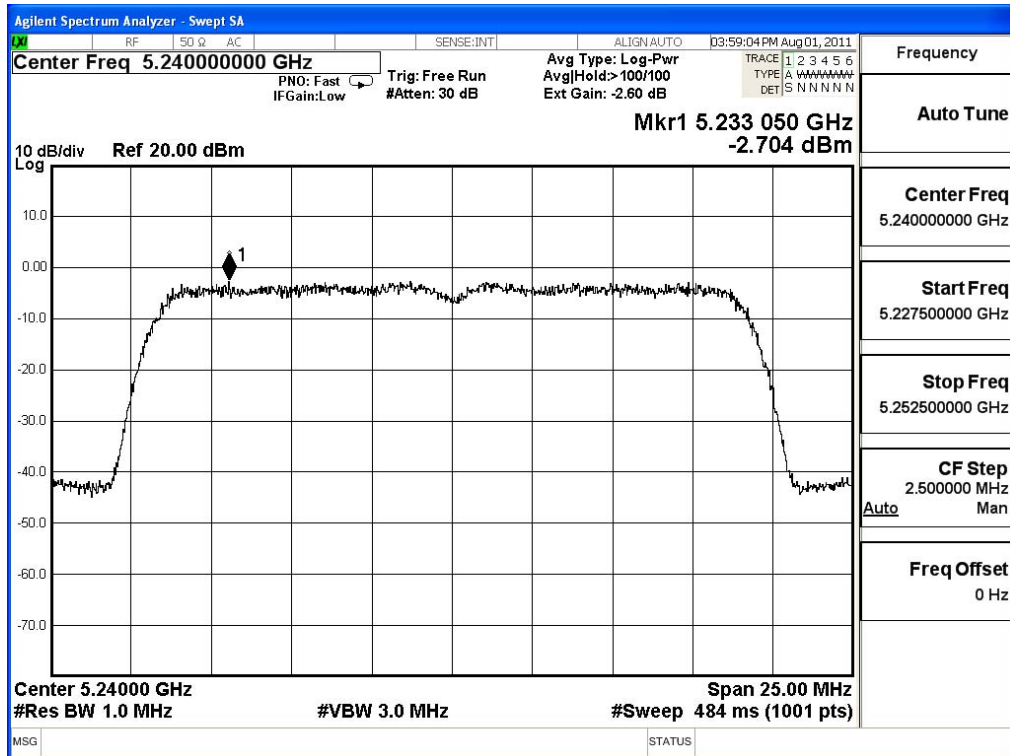
Channel 36 – Chain A



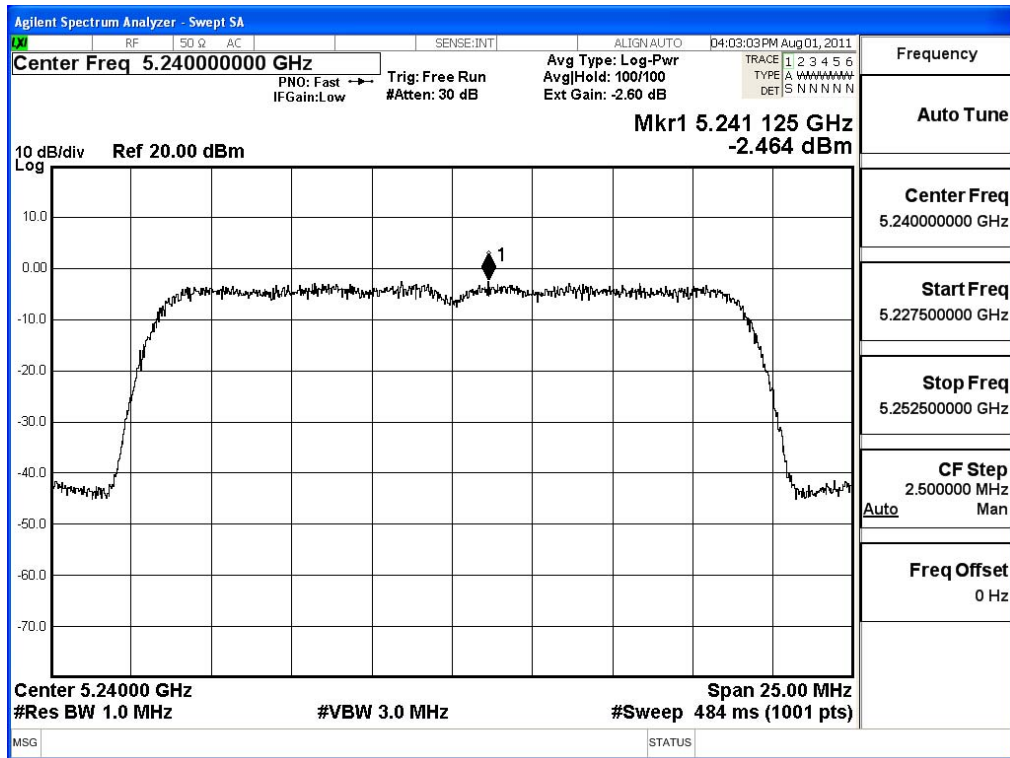
Channel 44 – Chain A



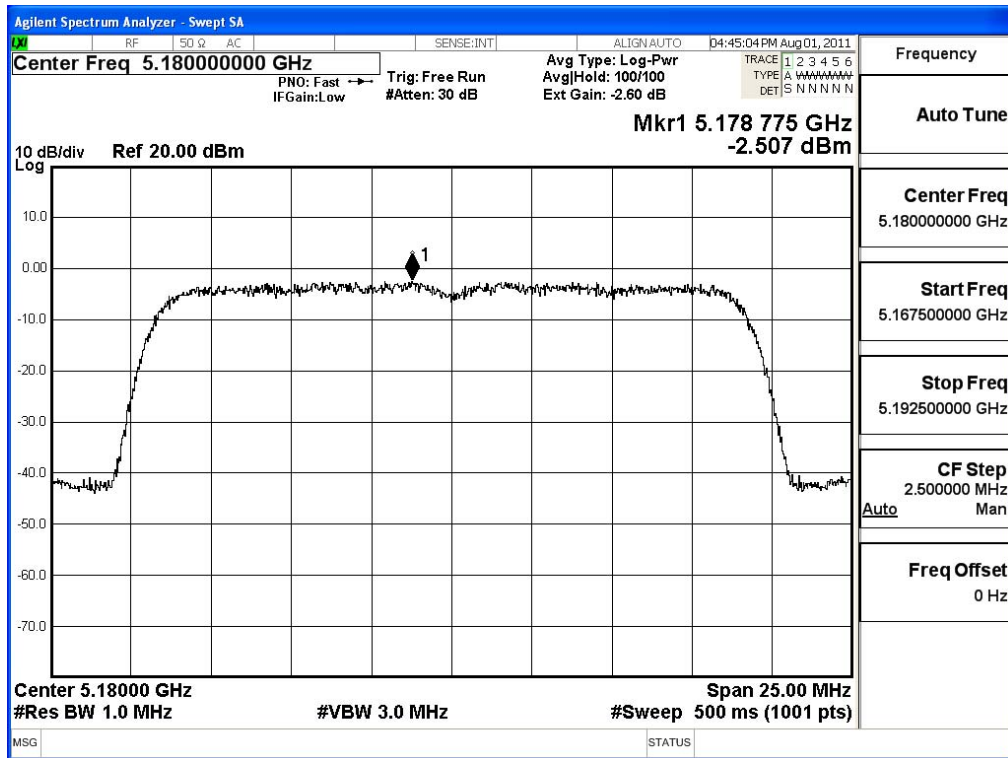
Channel 48 – Chain A



Channel 48 – Chain B



Channel 36 – Chain C



Channel 44 – Chain C

