FCC Test Report

(Class II Permissive Change)

Product Name	Wireless 5 x 2 HD Matrix Transmitter
Model No	GWHDMS52-T, GWHDMS52B-T, GWHDMS52W6-T, GWHDMS52BW6-T, VE829T
FCC ID	QLEGWHDMS52

Applicant	ATEN Technology, Inc. dba IOGEAR
Address	19641 Da Vinci Foothill Ranch, CA 92610 United States

Date of Receipt	Nov. 10, 2015
Issued Date	Dec. 08, 2015
Report No.	15B0235R-RFUSP05V00
Report Version	V1.0

ilac-MRA TAF Testing Laboratory 3023

The test results relate only to the samples tested.
The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.
This report must not be used to claim product endorsement by TAF or any agency of the government.

Test Report

Issued Date: Dec. 08, 2015
Report No.: 15B0235R-RFUSP05V00

Product Name	Wireless 5 x 2 HD Matrix Transmitter
Applicant	ATEN Technology, Inc. dba IOGEAR
Address	19641 Da Vinci Foothill Ranch, CA 92610 United States
Manufacturer	ZINWELL CORPORATION
Model No.	GWHDMS52-T, GWHDMS52B-T, GWHDMS52W6-T, GWHDMS52BW6-T, VE829T
FCC ID.	QLEGWHDMS52
EUT Rated Voltage	AC 100-240V, 50-60Hz
EUT Test Voltage	AC 120 V / 60 Hz
Trade Name	IOGEAR / ATEN
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2015 ANSI C63.4: 2014, C63.10: 2013 789033 D02 General UNII Test Procedures New Rules v01r03
Test Result	Complied

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

Tested By : Nick Chen
(Engineer / Nick Chen)

Approved By :
(Director / Vincent Lin)

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Description Page

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless 5 x 2 HD Matrix Transmitter
Trade Name	IOGEAR / ATEN
FCC ID.	QLEGWHDMS52
Model No.	GWHDMS52-T, GWHDMS52B-T, GWHDMS52W6-T, GWHDMS52BW6-T, VE829T
Frequency Range	802.11n-40MHz: 5190-5310, 5510-5670MHz, 5755-5795MHz
Number of Channels	802.11n-40MHz: 9CH
Data Rate	63Mbps
Type of Modulation	OFDM
Channel Control	Auto
Antenna type	PIFA Antenna
Antenna Gain	Refer to the table "Antenna List"
Power Adapter (1)	MFR: SINO-AMERICAN, M/N: SA110C-05S-A Input: AC 100-240V, 50-60Hz, 0.3A Output: DC 5V, 2A, 10W Cable Out: Non-Shielded, 1.5m, with one ferrite core bonded.
Power Adapter (2)	MFR: Asian, M/N: WB-10E05FU Input: AC 100-240V, 50-60Hz, 0.4A Output: DC 5V, 2A Cable Out: Non-Shielded, 1.8m, with one ferrite core bonded.
Power Adapter (3)	MFR: Asian, M/N: WB-10E05R Input: AC 100-240V, 50-60Hz, 0.4A Max. Output: DC 5V, 2A Cable Out: Shielded, 1.8m, with one ferrite core bonded.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ZINWELLL	N/A (4TX, 1RX)	PIFA	2.5dBi for 5.725~5.850GHz

Note: The antenna of EUT is conform to FCC 15.203

Center Working Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 038:	5190 MHz	Channel 046:	5230 MHz	Channel 054:	5270 MHz	Channel 062:	5310 MHz
Channel 102:	5510 MHz	Channel 110:	5550 MHz	Channel 134:	5670 MHz	Channel 151:	5755 MHz
Channel 159:	5795 MHz						

Note:

1. This device is a Wireless 5 x 2 HD Matrix Transmitter 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 EUT is including 5 models for different trademark requirement, product layout、technical specifications and the radio frequency performance are identical.

Model name	Trade Name	Note
GWHDMS52-T	IOGEAR	All models are electrically identical, different models are for marketing purpose.
GWHDMS52B-T	IOGEAR	
GWHDMS52W6-T	IOGEAR	
GWHDMS52BW6-T	IOGEAR	
VE829T	ATEN	

5. The Band 1, Band 2a and Band 2c didn't change with the new rule, the test data is not presented in the test report.
6. This is requesting a Class II permissive change for FCC ID: QLEGWHDMS52 Originally granted on 05/02/2013.

   The differences are listed as below:

   Change # 1: Add Model No.: GWHDMS52-T, GWHDMS52B-T, GWHDMS52W6-T, GWHDMS52BW6-T, VE829T.

   Change # 2: Original grant compliance are following old rule of UNII requirements, changed to meet the requirements of the new rules.

   Change # 3: Addition two new adapters (MFR: Asian, M/N: WB-10E05FU), (MFR: Asian, M/N: WB-10E05R), all other hardware is identical with original granted.

Test Mode	Mode 1: Transmit

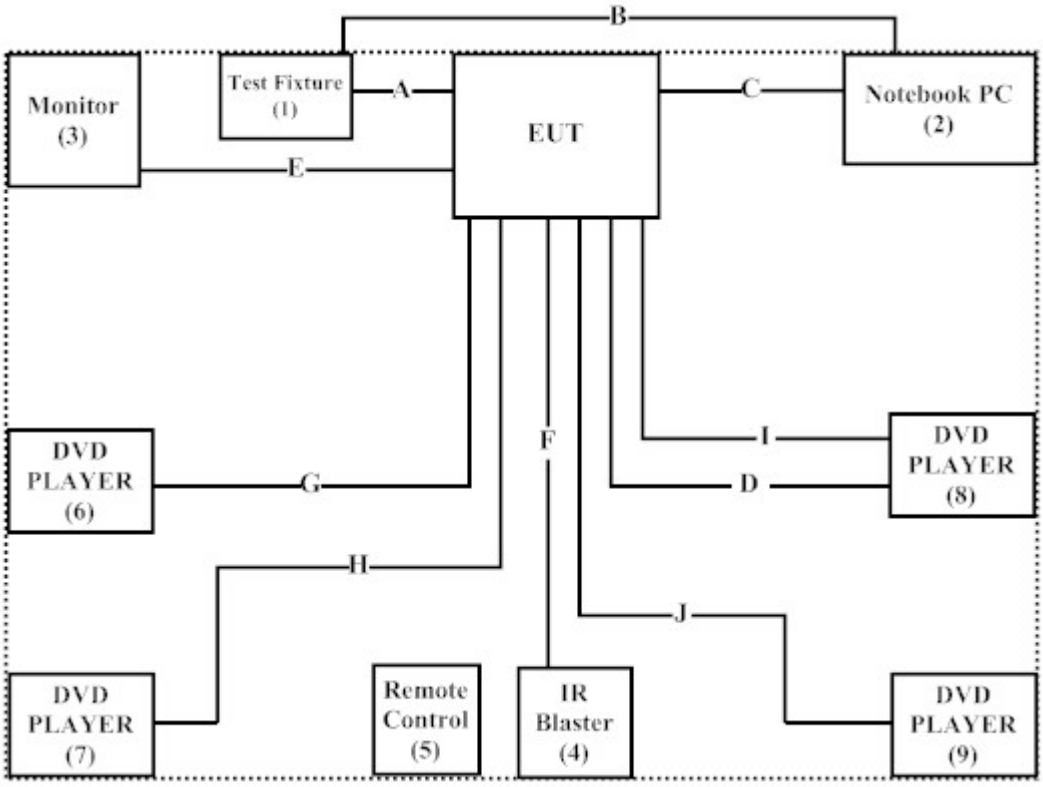
1.3. Tested System Datails

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	Test Fixture	ZINWELL	N/A	N/A	N/A
2	Notebook PC	DELL	Latitude E5440	74BTK32	Non-Shielded, 0.8m
3	Monitor	ASUS	VS229HA	CN-0FC255-46633-638-1MDS	Non-Shielded, 1.8m
4	IR Blaster	ZINWELL	N/A	N/A	N/A
5	Remote Control	ZINWELL	N/A	N/A	N/A
6	DVD PLAYER	Pioneer	DV-S969Avi	EAMP004399LW	Non-Shielded, 1.8m
7	DVD PLAYER	Pioneer	DV-S969Avi	EAMP004349LW	Non-Shielded, 1.8m
8	DVD PLAYER	Pioneer	DV-S969Avi	EAMP004305LW	Non-Shielded, 1.8m
9	DVD PLAYER	Pioneer	DV-989Avi-G	FEMP000538TA	Non-Shielded, 1.8m

Signal Cable Type		Signal cable Description
A	Test Fixture Cable	Non-Shielded, 0.15m
B	USB to RS-232 Cable	Shielded, 2.0m
C	USB to mini USB Cable	Shielded, 0.2m
D	YPbPr Cable	Non-Shielded, 0.3m
E	HDMI Cable	Shielded, 1.5m
F	IR Blaster Cable	Non-Shielded, 3.0m
G	HDMI Cable	Shielded, 1.5m
H	HDMI Cable	Shielded, 1.5m
I	HDMI Cable	Shielded, 1.5m
J	HDMI Cable	Shielded, 1.5m
K	YPbPr Cable	Non-Shielded, 0.3m

1.4. Configuration of tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4
2. Execute program ”AppCom v3.0.3.5” on the Notebook PC.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous transmission.
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/chinese/about/certificates.aspx?bval=5
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

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

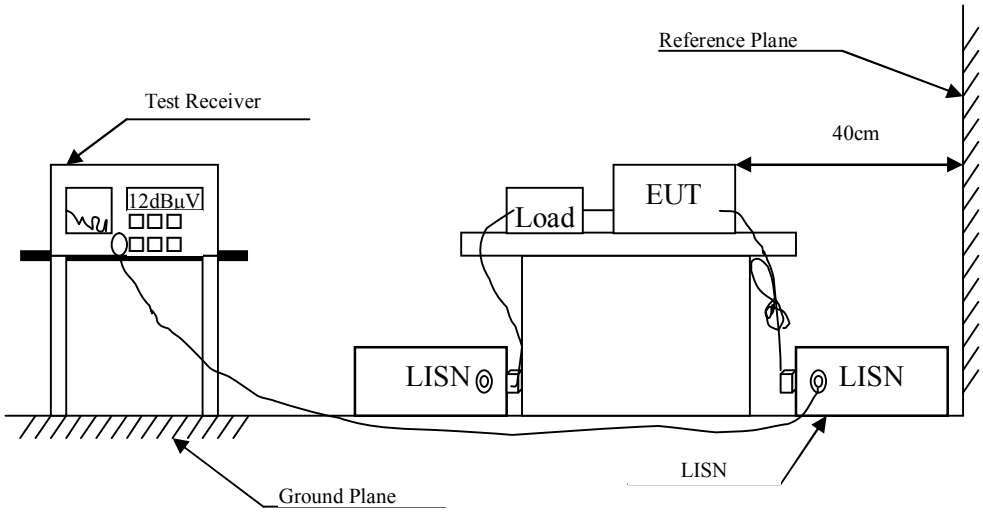
2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2016	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2016	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2016	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar., 2016	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2016	
	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 (dBμV) 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 C63.10:2013 on conducted measurement.
Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.
The EUT was setup to ANSI C63.4, 2014; tested to UNII 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 : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 1: Transmit (5755MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 1					
Quasi-Peak					
0.158	9.747	41.120	50.867	-14.904	65.771
0.177	9.742	34.300	44.042	-21.187	65.229
0.205	9.739	32.760	42.499	-21.930	64.429
0.474	9.751	25.240	34.991	-21.752	56.743
0.689	9.761	24.890	34.651	-21.349	56.000
3.002	9.858	23.040	32.898	-23.102	56.000
Average					
0.158	9.747	18.270	28.017	-27.754	55.771
0.177	9.742	25.660	35.402	-19.827	55.229
0.205	9.739	26.230	35.969	-18.460	54.429
0.474	9.751	21.130	30.881	-15.862	46.743
0.689	9.761	12.890	22.651	-23.349	46.000
3.002	9.858	10.780	20.638	-25.362	46.000

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 : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 1: Transmit (5755MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 2					
Quasi-Peak					
0.158	9.747	41.140	50.887	-14.884	65.771
0.205	9.749	32.880	42.629	-21.800	64.429
0.255	9.751	26.270	36.021	-26.979	63.000
0.720	9.769	23.170	32.940	-23.060	56.000
2.873	9.850	22.640	32.490	-23.510	56.000
16.400	10.030	23.190	33.220	-26.780	60.000
Average					
0.158	9.747	34.410	44.157	-11.614	55.771
0.205	9.749	12.890	22.639	-31.790	54.429
0.255	9.751	17.810	27.561	-25.439	53.000
0.720	9.769	8.560	18.330	-27.670	46.000
2.873	9.850	9.060	18.910	-27.090	46.000
16.400	10.030	18.660	28.690	-21.310	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. Maximun conducted output power

3.1. Test Equipment

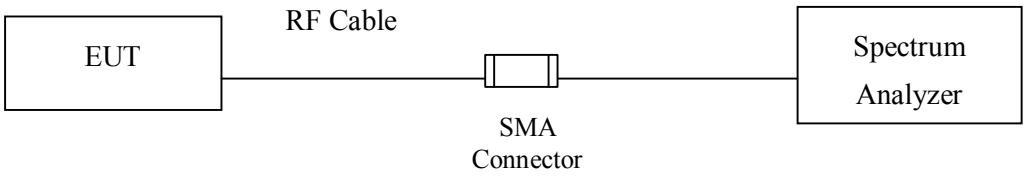
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2016
X	Power Sensor	Anritsu	MA2411B/0738448	Jun., 2016
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note:

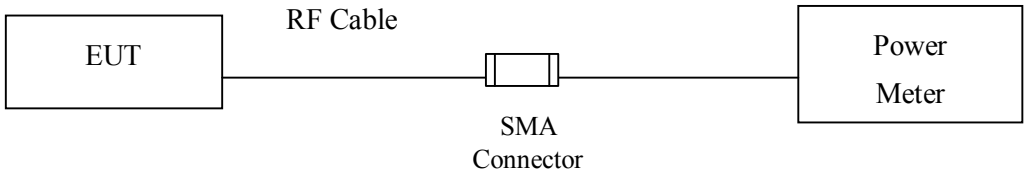
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

3.2. Test Setup

26dBc Occupied Bandwidth



Conduction Power Measurement (for 802.11an)



3.3. Limits

3.3.1. For the band 5.15-5.25 GHz,

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-topoint U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.3. For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point UNII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

3.4. Test Procedure

As an alternative to FCC KDB-789033, the EUT maximum conducted output power was measured with an average power meter employing a video bandwidth greater the 6dB BW of the emission under test. Maximum conducted 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.

802.11an (BW≦40MHz) Maximum conducted output power using KDB 789033 section E)3)b) Method PM-G (Measurement using a gated RF average power meter)
Note: the power meter have a video bandwidth that is greater than or equal to the measurement bandwidth, (Anritsu/ MA2411B video bandwidth: 65MHz)

802.11ac (BW=80MHz) Maximum conducted output power using KDB 789033 section E)2)b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep).

When transmitted signals consist of two or more non-contiguous spectrum segments (e.g., 80+80 MHz mode) or when a single spectrum segment of a transmission crosses the boundary between two adjacent U-NII bands, KDB 644545 D01 section F) procedure is used for measurements.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Maximum conducted output power

Product : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Maximum conducted output power
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit

CHAIN A

Channel No	Frequency (MHz)	Data Rata (Mbps)	Average Power	Required Limit
			Measurement Level (dBm)	
151	5755	63	10.38	<30dBm
159	5795	63	10.61	<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

CHAIN B

Channel No	Frequency (MHz)	Data Rata (Mbps)	Average Power	Required Limit
			Measurement Level (dBm)	
151	5755	63	10.61	<30dBm
159	5795	63	10.62	<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

CHAIN C

Channel No	Frequency (MHz)	Data Rata (Mbps)	Average Power	Required Limit
			Measurement Level (dBm)	
151	5755	63	10.88	<30dBm
159	5795	63	11.09	<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

CHAIN D

Channel No	Frequency (MHz)	Data Rata (Mbps)	Average Power	Required Limit
			Measurement Level (dBm)	
151	5755	63	10.92	<30dBm
159	5795	63	10.71	<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

Maximum conducted output power Measurement:

Channel Number	Frequency	26dB Bandwidth	Chain A Power	Chain B Power	Chain C Power	Chain D Power	Output Power	Output Power Limit	
	(MHz)	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	dBm+10log(BW)
151	5755	--	10.38	10.61	10.88	10.92	16.72	30	--
159	5795	--	10.61	10.62	11.09	10.71	16.78	30	--

Note:
1. Power Output Value =Reading value on average power meter + cable loss
2. Output Power (dBm) = 10LOG (Chain A Power (mW)+ Chain B Power (mW) + Chain C Power (mW) + Chain D Power (mW))

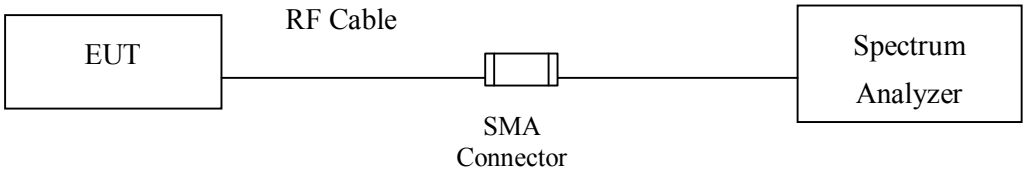
4. Peak Power Spectral Density

4.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2016
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2016
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr, 2016

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,

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-topoint U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.+

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point UNII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

4.4. Test Procedure

The EUT was setup to ANSI C63.10, 2013; tested to UNII test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.
The Peak Power Spectral Density using KDB 789033 section F) procedure, Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer.
SA-1 method is selected to run the test.
For the band 5.725-5.85 GHz, Scale the observed power level to an equivalent value in 500 kHz by adjusting (increase) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (500 kHz/100 kHz) = 6.98 dB.

4.5. Uncertainty

± 1.27 dB

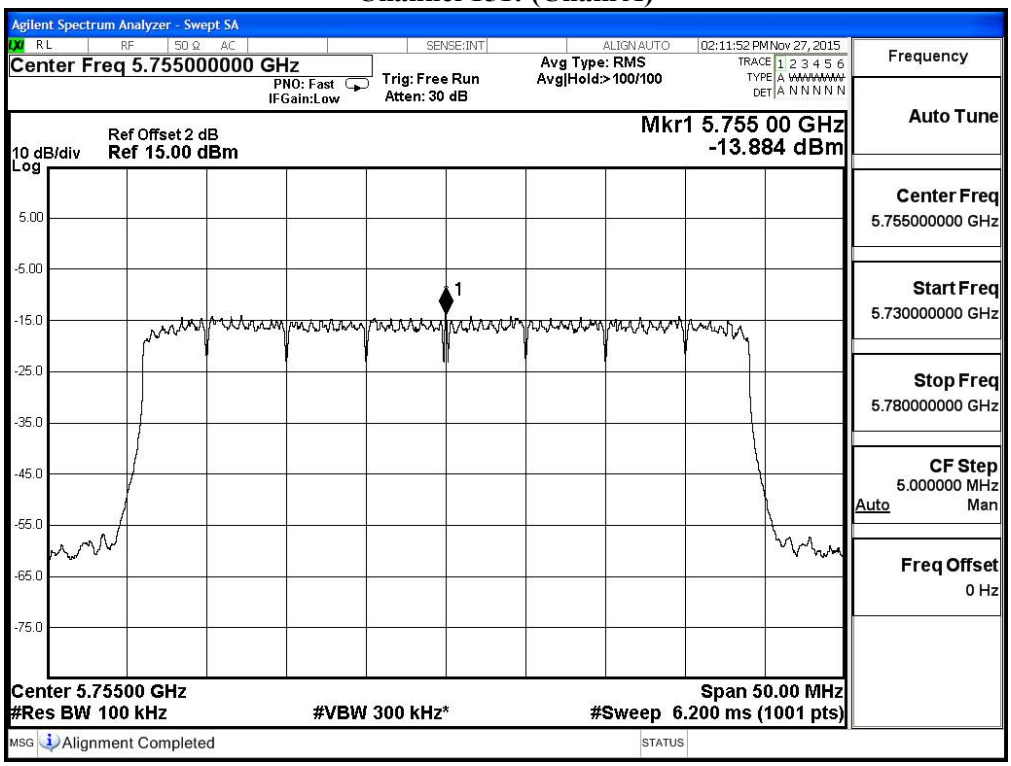
4.6. Test Result of Peak Power Spectral Density

Product : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Peak Power Spectral Density
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit

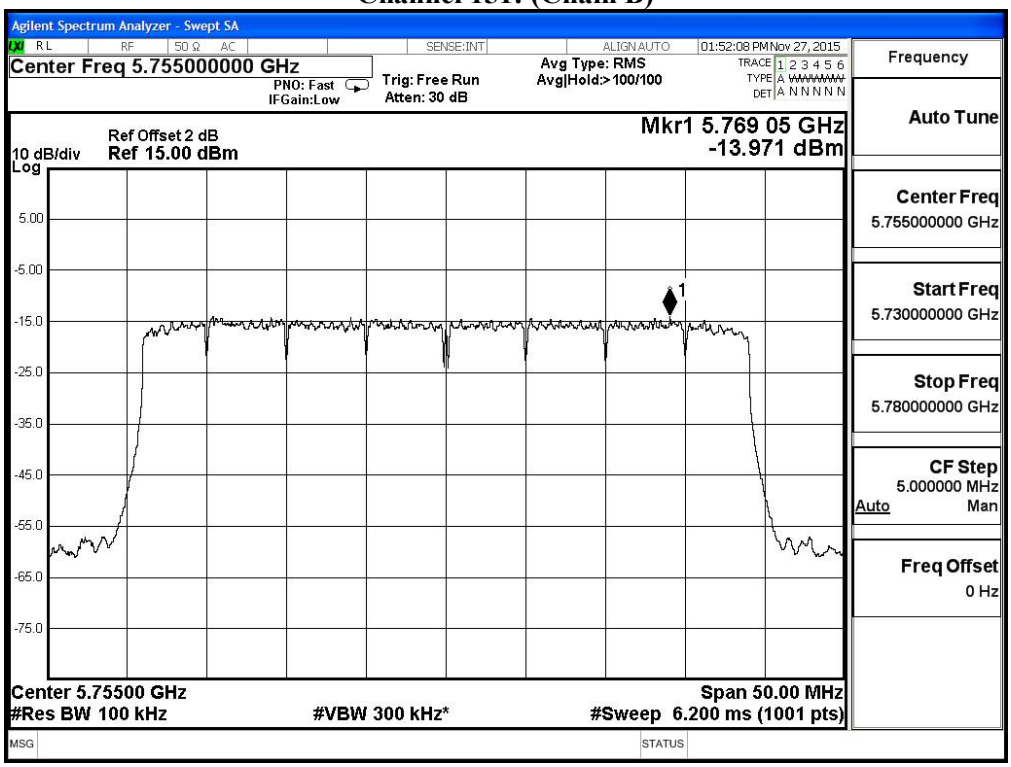
Channel Number	Frequency (MHz)	Chain	PPSD (dBm)	BWCF (dB)	Total PPSD (dBm)	Required Limit (dBm)	Result
151	5755	A	-13.884	6.98	-0.884	<30	Pass
		B	-13.971	6.98	-0.971	<30	Pass
		C	-12.708	6.98	0.292	<30	Pass
		D	-13.461	6.98	-0.461	<30	Pass
159	5795	A	-13.791	6.98	-0.791	<30	Pass
		B	-14.444	6.98	-1.444	<30	Pass
		C	-13.496	6.98	-0.496	<30	Pass
		D	-13.805	6.98	-0.805	<30	Pass

Note 1: The quantity 10*log 4 (four antennas) is added to the spectrum peak value according to document 662911 D01.

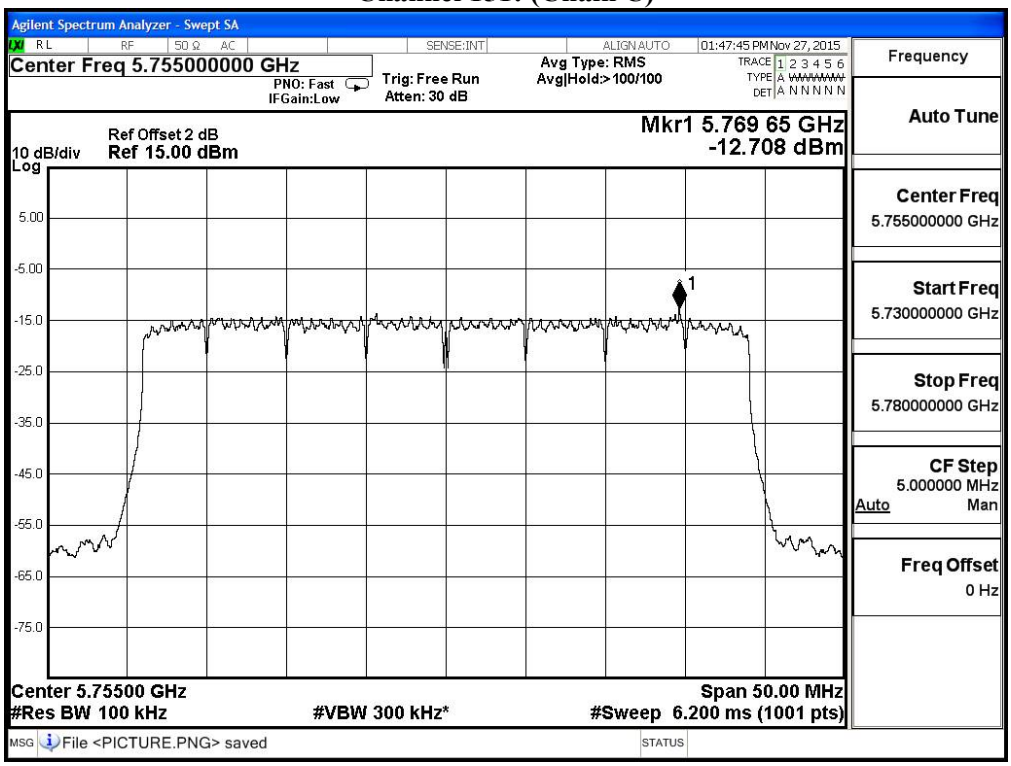
Channel 151: (Chain A)



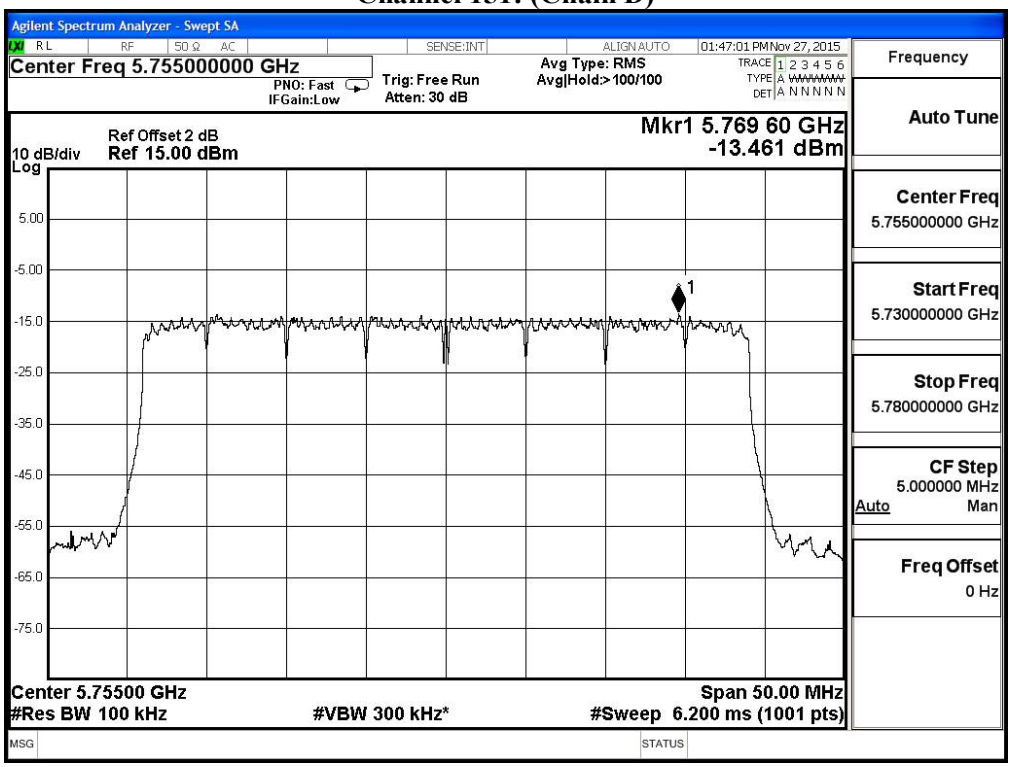
Channel 151: (Chain B)



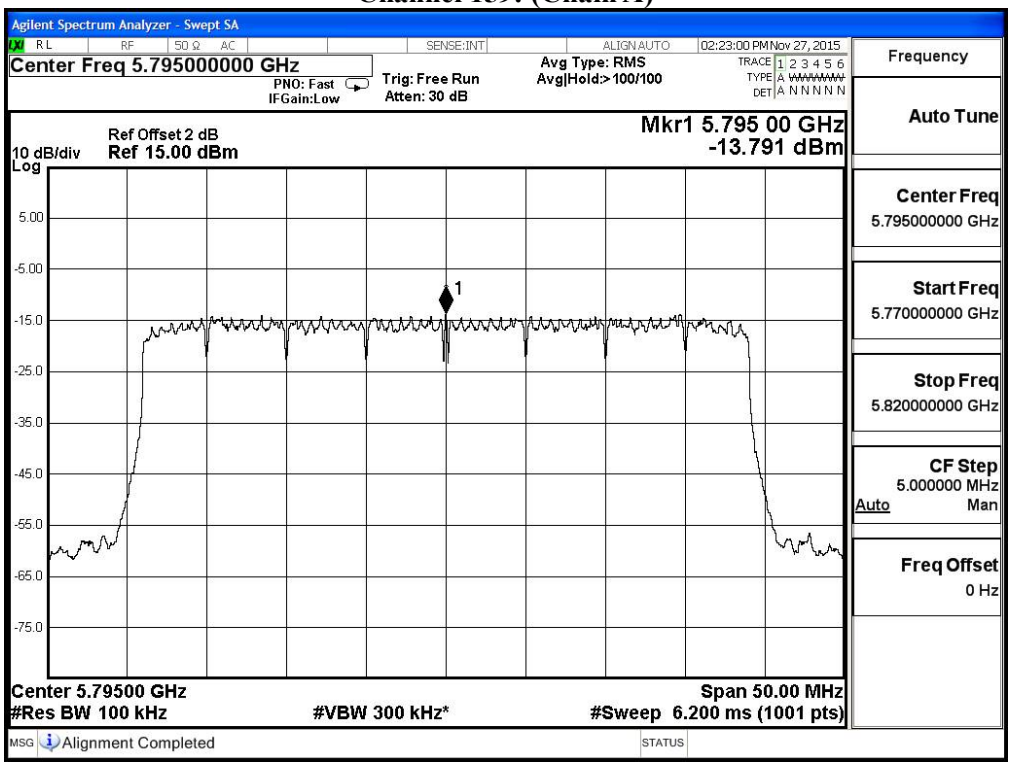
Channel 151: (Chain C)



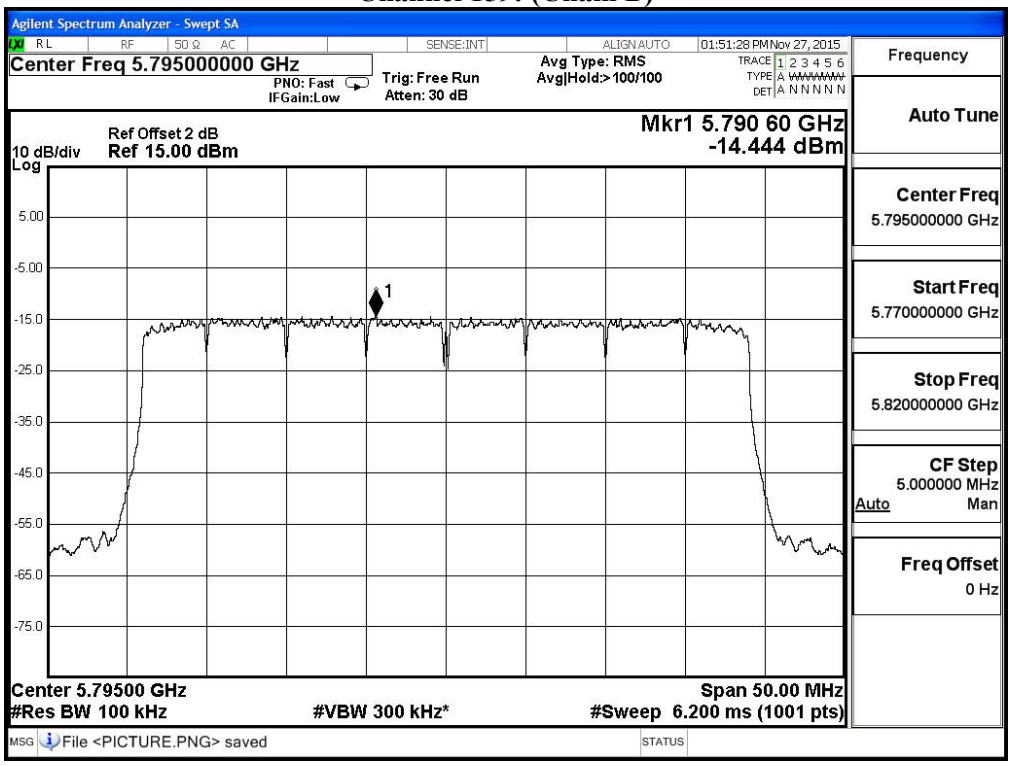
Channel 151: (Chain D)



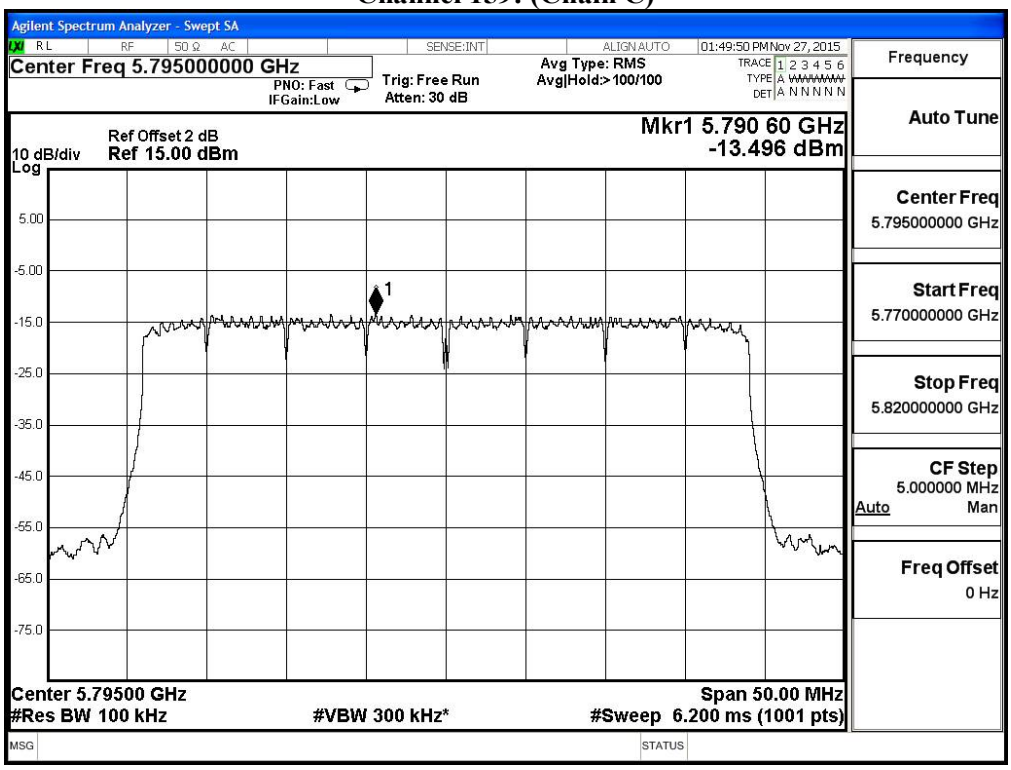
Channel 159: (Chain A)



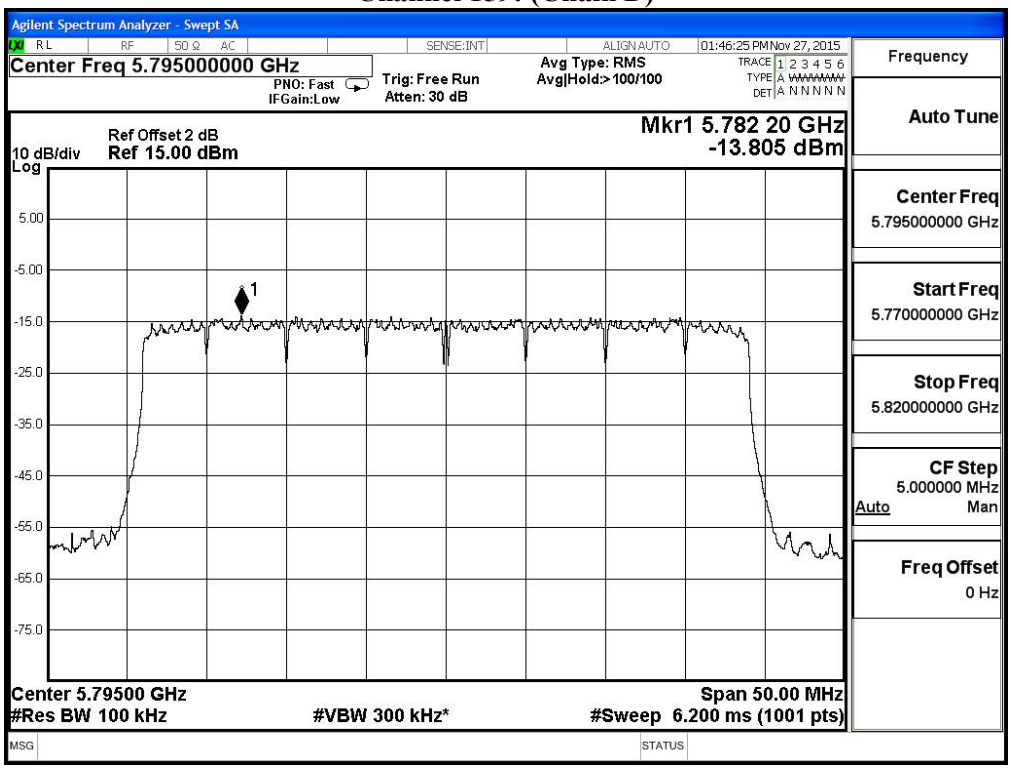
Channel 159: (Chain B)



Channel 159: (Chain C)



Channel 159: (Chain D)



5. Radiated Emission

5.1. Test Equipment

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

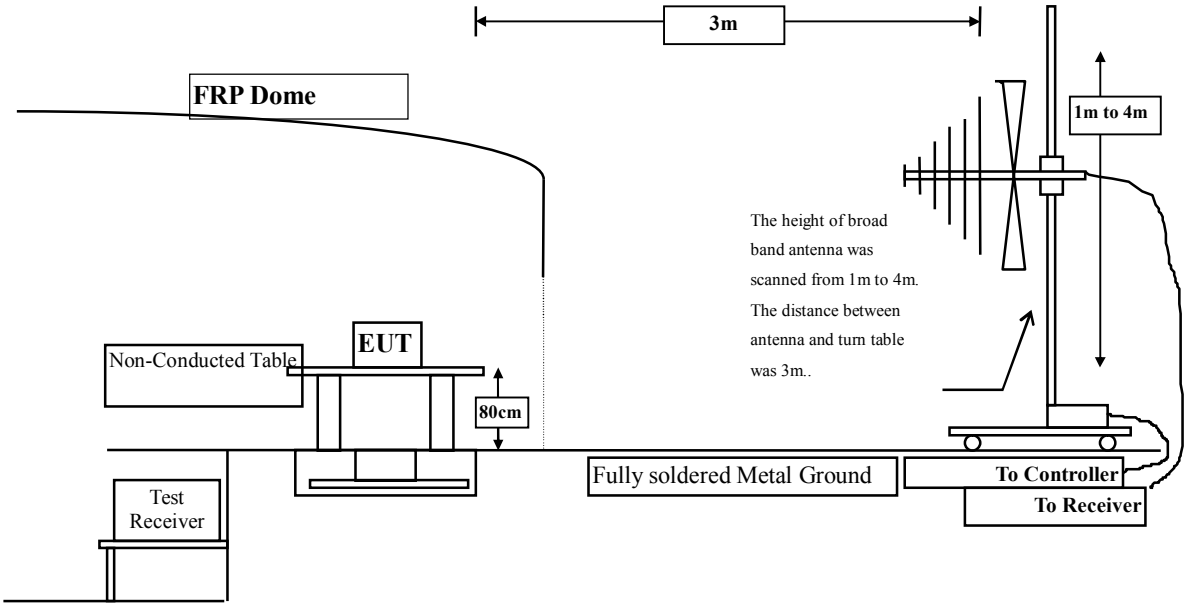
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒Site # 3	X	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep., 2016
	X	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun., 2016
	X	EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun., 2016
	X	Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun., 2016
	X	Coaxial signal switch	Arnist	MP59B/ 6200798682	Jun., 2016

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2015
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2016
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan, 2016
	X	Horn Antenna	TRC	AH-0801/95051	Aug., 2016
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2016
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul., 2016
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2016

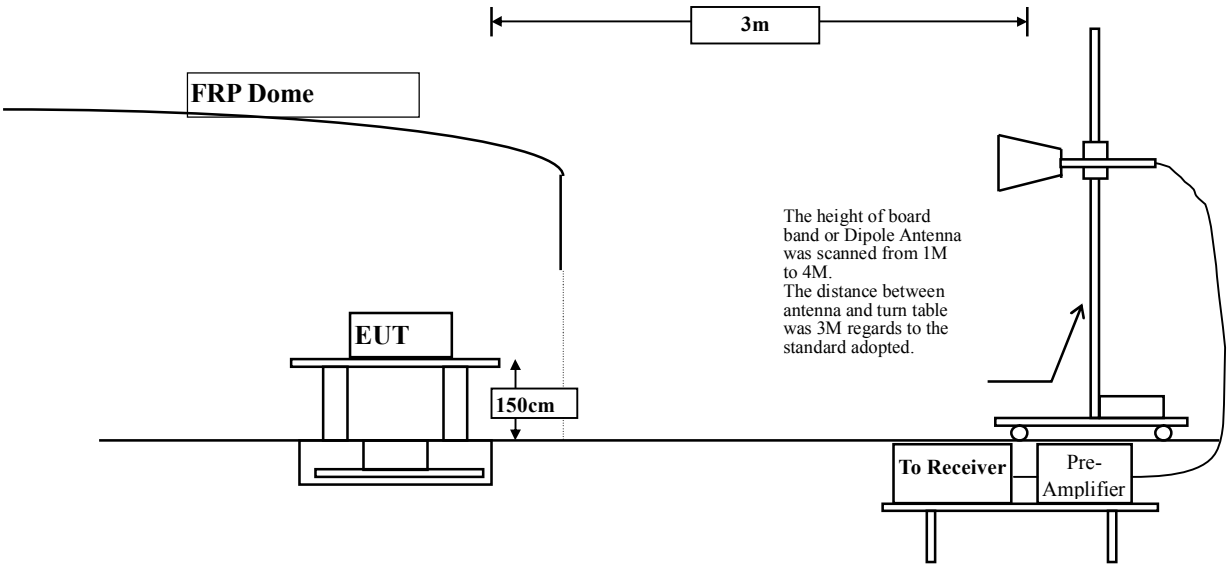
Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

5.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



5.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: E field strength (dBμV/m) = 20 log E field strength (uV/m)

5.4. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to FCC KDB-789033 test procedure for compliance to FCC 47CFR 15. 407 requirements.
Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.
The turn table is rotated 360 degrees to determine the position of the maximum emission level.
The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.
The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.
Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.
The measurement is divided into the Preliminary Measurement and the Final Measurement.
The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.
The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.
The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

5.5. Uncertainty

± 3.8 dB below 1GHz
± 3.9 dB above 1GHz

5.6. Test Result of Radiated Emission

Product : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (5755MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
11510.000	14.402	38.310	52.712	-21.288	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
11510.000	15.894	38.890	54.784	-19.216	74.000
Average Detector:					
11510.000	15.894	25.480	41.374	-12.626	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (5795MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
11590.000	15.138	37.580	52.718	-21.282	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
11590.000	16.461	37.820	54.281	-19.719	74.000
Average Detector:					
11590.000	16.461	24.830	41.291	-12.709	54.000

Note:
1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless 5 x 2 HD Matrix Transmitter
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (5795MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector					
216.240	-10.271	45.418	35.147	-10.853	46.000
375.320	0.918	36.979	37.897	-8.103	46.000
577.080	3.221	36.206	39.427	-6.573	46.000
720.640	3.826	29.332	33.158	-12.842	46.000
833.160	6.616	31.142	37.758	-8.242	46.000
998.060	8.838	31.209	40.047	-13.953	54.000
Vertical					
Peak Detector					
191.020	-5.629	44.994	39.365	-4.135	43.500
359.800	-1.316	35.783	34.467	-11.533	46.000
499.480	-0.199	36.538	36.338	-9.662	46.000
598.420	1.114	38.706	39.820	-6.180	46.000
817.640	2.966	35.742	38.708	-7.292	46.000
928.220	3.640	27.278	30.918	-15.082	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

6. Band Edge

6.1. Test Equipment

RF Conducted Measurement

The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2016
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2016
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

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.

RF Radiated Measurement:

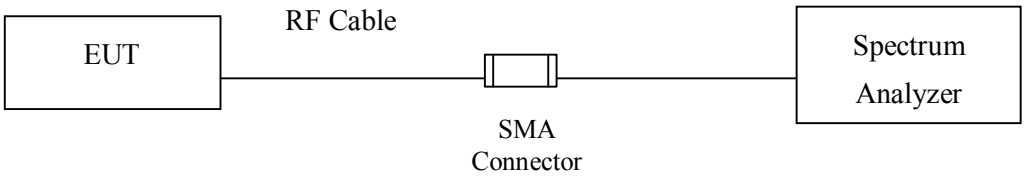
The following test equipments are used during the band edge tests:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2015
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2016
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan., 2016
	X	Horn Antenna	TRC	AH-0801/95051	Aug., 2016
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2016
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul., 2016
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2016

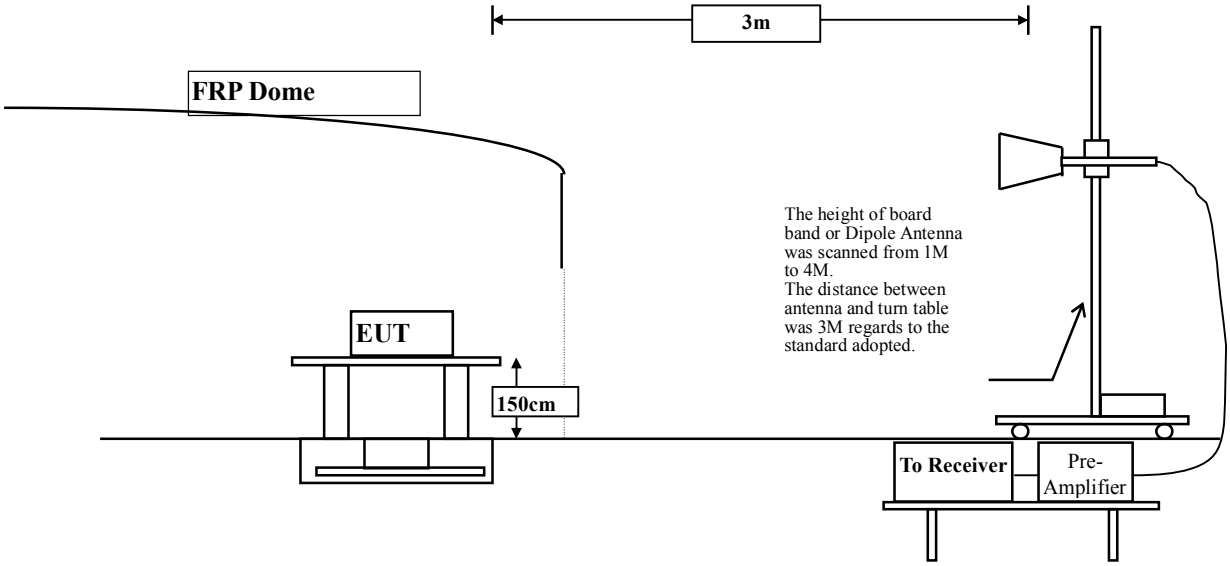
Note: 1. All instruments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

6.2. Test Setup

RF Conducted Measurement:



RF Radiated Measurement:



6.3. Limits

The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

Radiated emissions which fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209:

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m @3m	dBμV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks : 1. RF Voltage (dBμV) = 20 log RF Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

6.4. Test Procedure

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10:2013 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz.

The EUT was setup to ANSI C63.10, 2013; tested to UNII test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

6.5. Uncertainty

± 3.8 dB below 1GHz

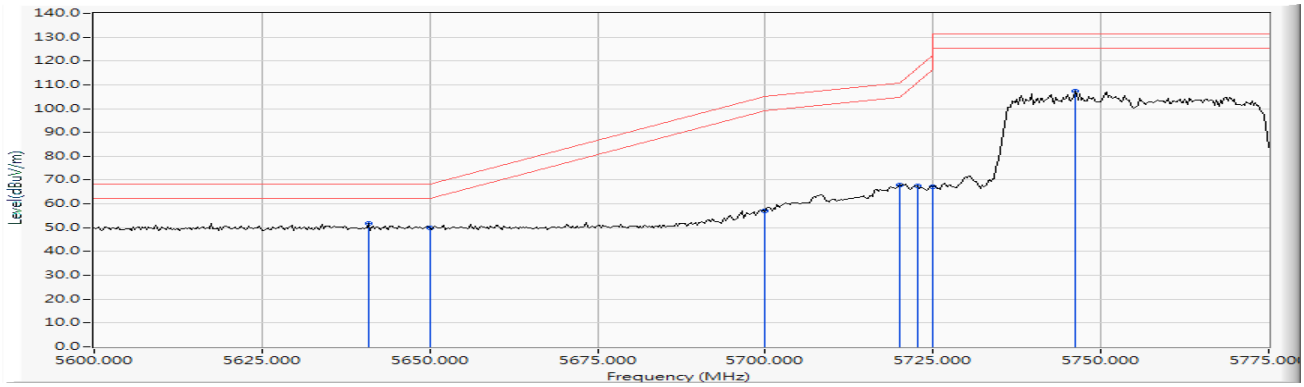
± 3.9 dB above 1GHz

6.6. Test Result of Band Edge

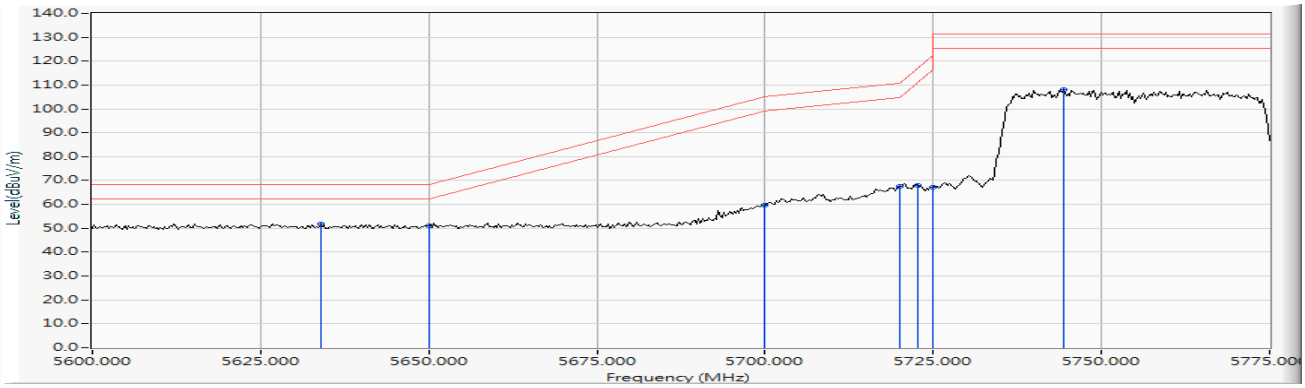
Product : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit -Channel 151

RF Radiated Measurement:

	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Measure Level (dBμV /m)	Margin (dB)	Limit (dBμV /m)	Result
Horizontal	5640.833	18.738	32.899	51.638	-16.582	68.220	Pass
Horizontal	5650.000	18.766	30.994	49.761	-18.459	68.220	Pass
Horizontal	5700.000	18.917	38.228	57.145	-48.055	105.200	Pass
Horizontal	5719.964	18.977	49.004	67.981	-42.809	110.790	Pass
Horizontal	5720.000	18.977	48.950	67.927	-42.873	110.800	Pass
Horizontal	5722.754	18.986	48.448	67.434	-49.645	117.079	Pass
Horizontal	5725.000	18.993	48.159	67.152	-55.048	122.200	Pass
Horizontal	5746.087	19.067	88.359	107.426	--	--	--



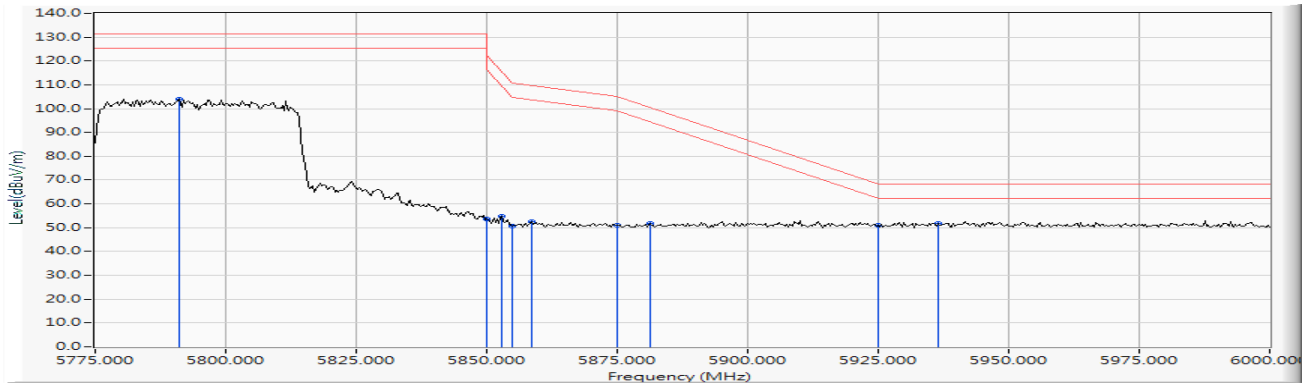
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Measure Level (dBμV /m)	Margin (dB)	Limit (dBμV /m)	Result
Vertical	5633.986	18.720	32.978	51.698	-16.522	68.220	Pass
Vertical	5650.000	18.766	32.312	51.079	-17.141	68.220	Pass
Vertical	5700.000	18.917	40.616	59.533	-45.667	105.200	Pass
Vertical	5720.000	18.977	48.578	67.555	-43.245	110.800	Pass
Vertical	5722.754	18.986	49.038	68.024	-49.055	117.079	Pass
Vertical	5725.000	18.993	48.266	67.259	-54.941	122.200	Pass
Vertical	5744.312	19.062	88.889	107.951	--	--	--



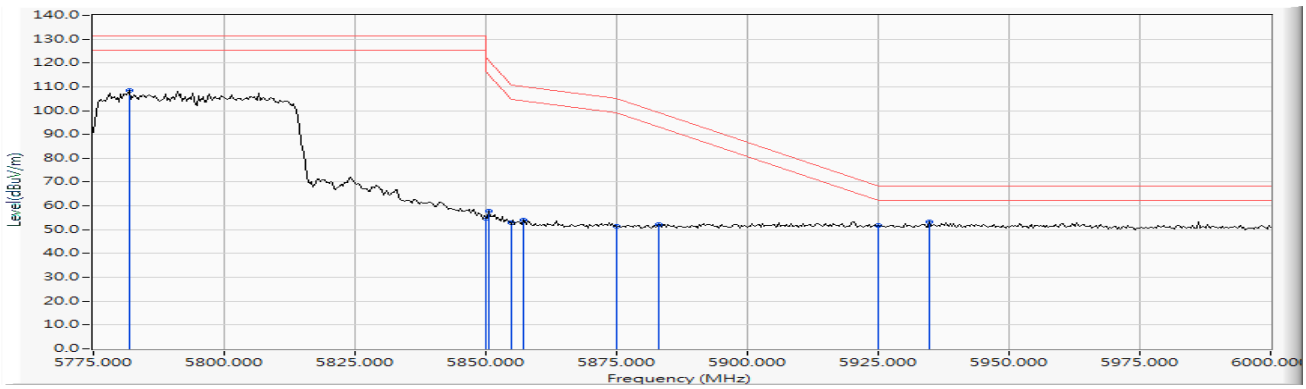
Product : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit -Channel 159

RF Radiated Measurement:

	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Measure Level (dBμV /m)	Margin (dB)	Limit (dBμV /m)	Result
Horizontal	5790.978	19.235	84.877	104.111	--	--	--
Horizontal	5850.000	19.468	34.129	53.597	-68.603	122.200	Pass
Horizontal	5852.935	19.481	35.391	54.871	-60.637	115.508	Pass
Horizontal	5855.000	19.487	31.356	50.843	-59.957	110.800	Pass
Horizontal	5858.478	19.499	33.044	52.543	-57.283	109.826	Pass
Horizontal	5875.000	19.558	31.449	51.007	-54.193	105.200	Pass
Horizontal	5881.304	19.586	32.137	51.722	-48.813	100.535	Pass
Horizontal	5925.000	19.755	31.298	51.054	-17.146	68.200	Pass
Horizontal	5936.413	19.800	31.928	51.727	-16.473	68.200	Pass



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Measure Level (dBμV /m)	Margin (dB)	Limit (dBμV /m)	Result
Vertical	5781.848	19.200	89.304	108.504	--	--	--
Vertical	5850.000	19.468	35.290	54.758	-67.442	122.200	Pass
Vertical	5850.652	19.471	38.161	57.632	-63.081	120.713	Pass
Vertical	5855.000	19.487	33.267	52.754	-58.046	110.800	Pass
Vertical	5857.174	19.494	34.536	54.030	-56.161	110.191	Pass
Vertical	5875.000	19.558	31.735	51.293	-53.907	105.200	Pass
Vertical	5882.935	19.593	32.730	52.323	-47.005	99.328	Pass
Vertical	5925.000	19.755	32.172	51.928	-16.272	68.200	Pass
Vertical	5934.783	19.794	33.425	53.218	-14.982	68.200	Pass



7. Occupied Bandwidth

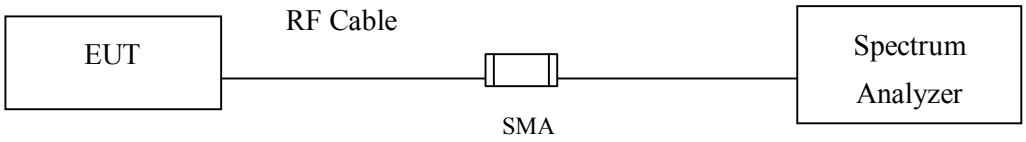
7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2016
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2016
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

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.

7.2. Test Setup



7.3. Limits

For the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz

7.4. Test Procedure

The EUT was setup to ANSI C63.10, 2013; tested to UNII test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

7.5. Uncertainty

± 150Hz

7.6. Test Result of Occupied Bandwidth

Product : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit

Channel No.	Chain	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
151	A	5755	37200	>500	Pass
	B	5755	37200	>500	Pass
	C	5755	37100	>500	Pass
	D	5755	37200	>500	Pass
159	A	5795	37200	>500	Pass
	B	5795	37200	>500	Pass
	C	5795	37200	>500	Pass
	D	5795	37200	>500	Pass

Figure Channel 151: (Chain A)

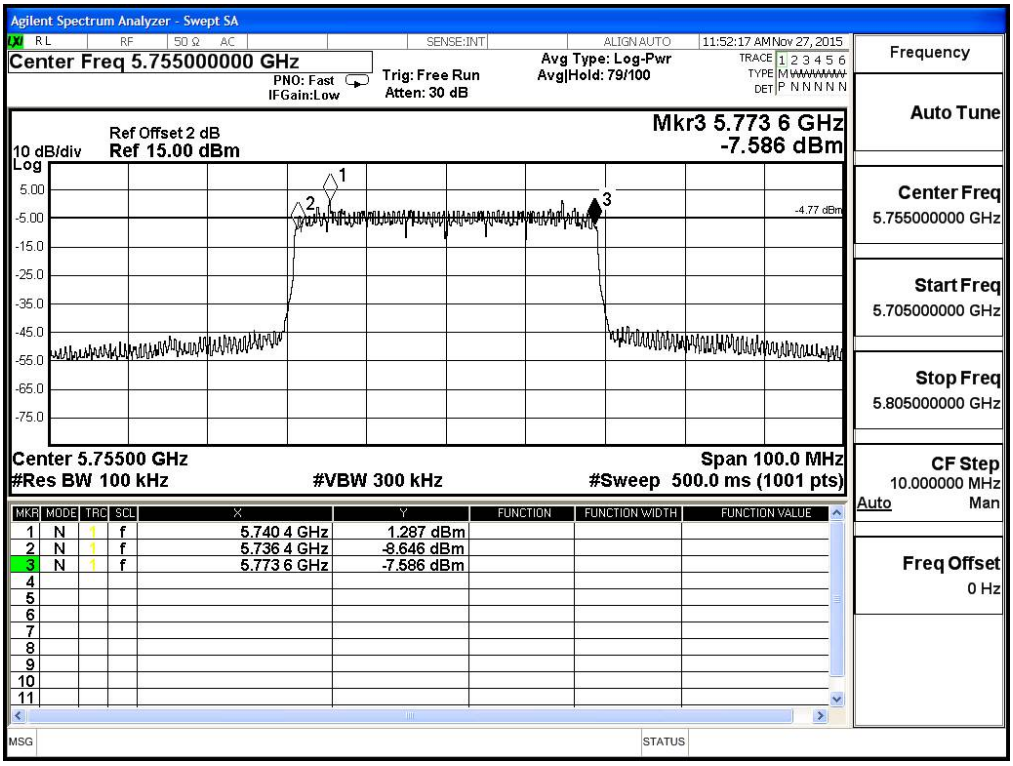


Figure Channel 151: (Chain B)

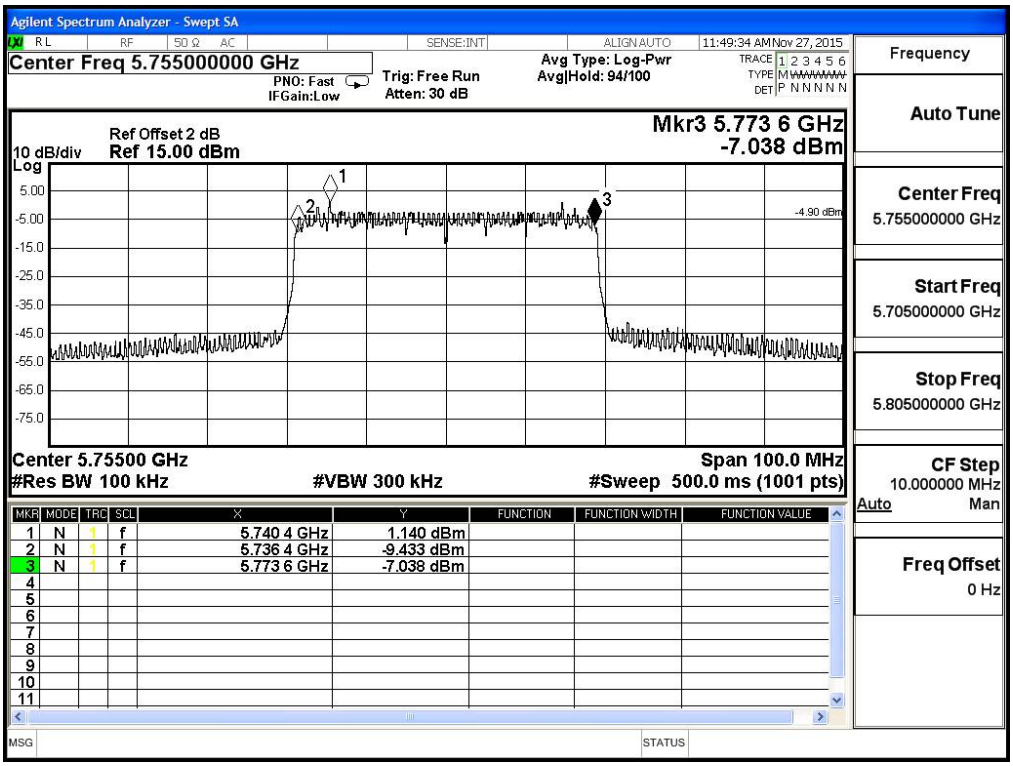


Figure Channel 151: (Chain C)

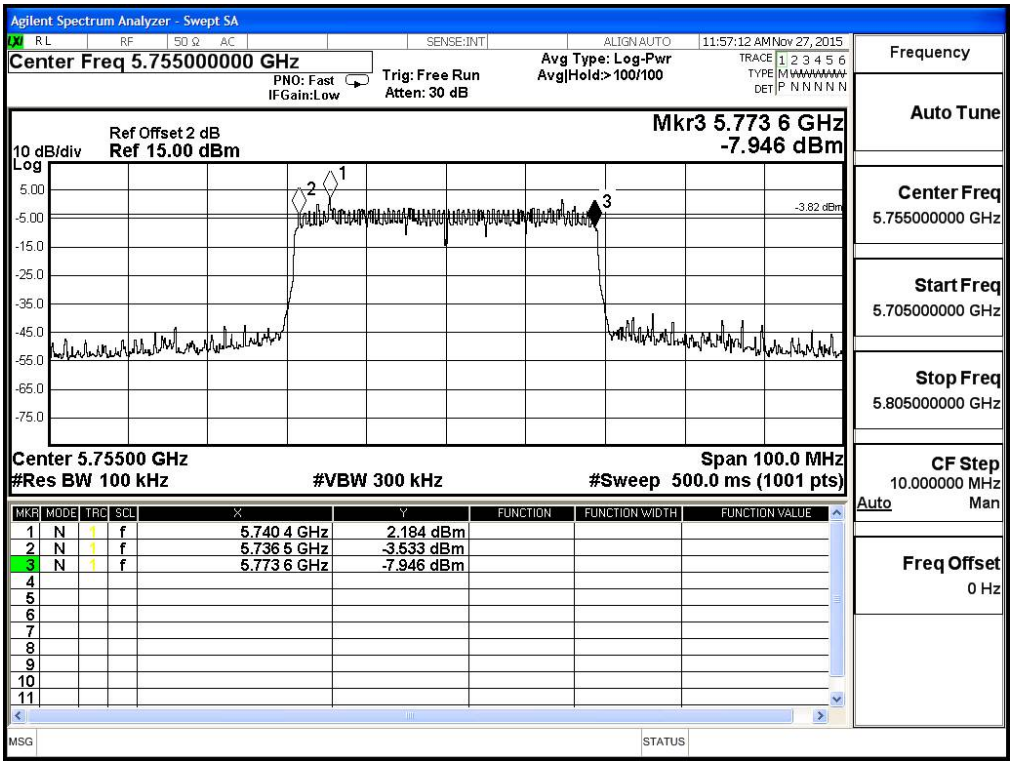


Figure Channel 151: (Chain D)

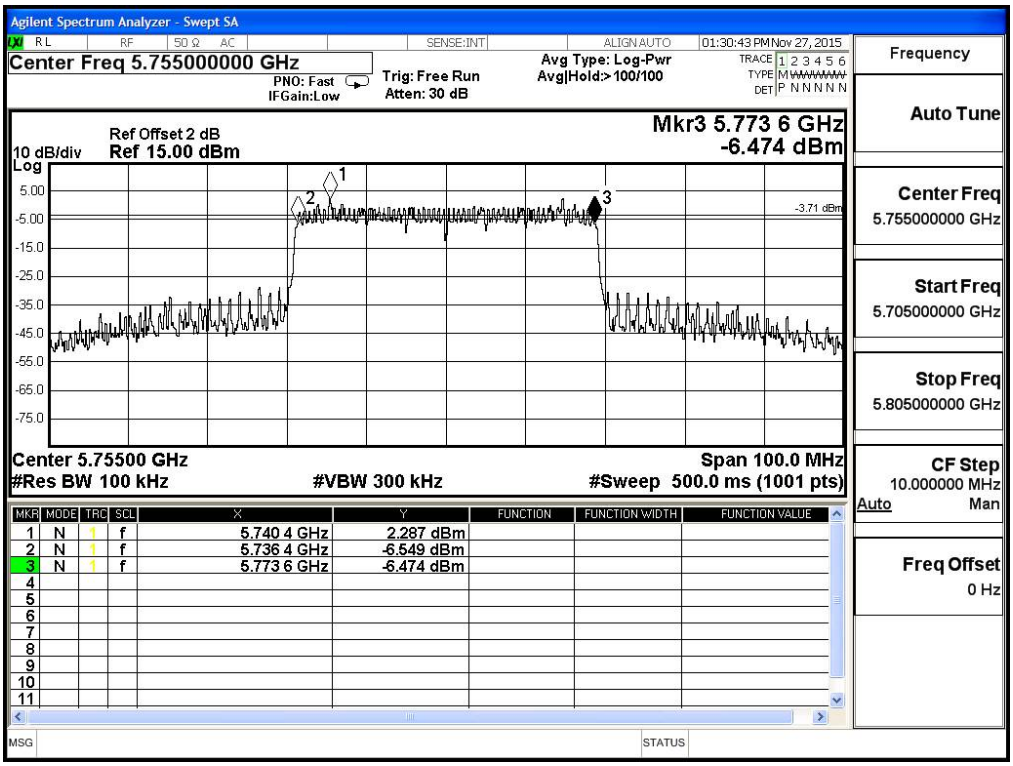


Figure Channel 159: (Chain A)

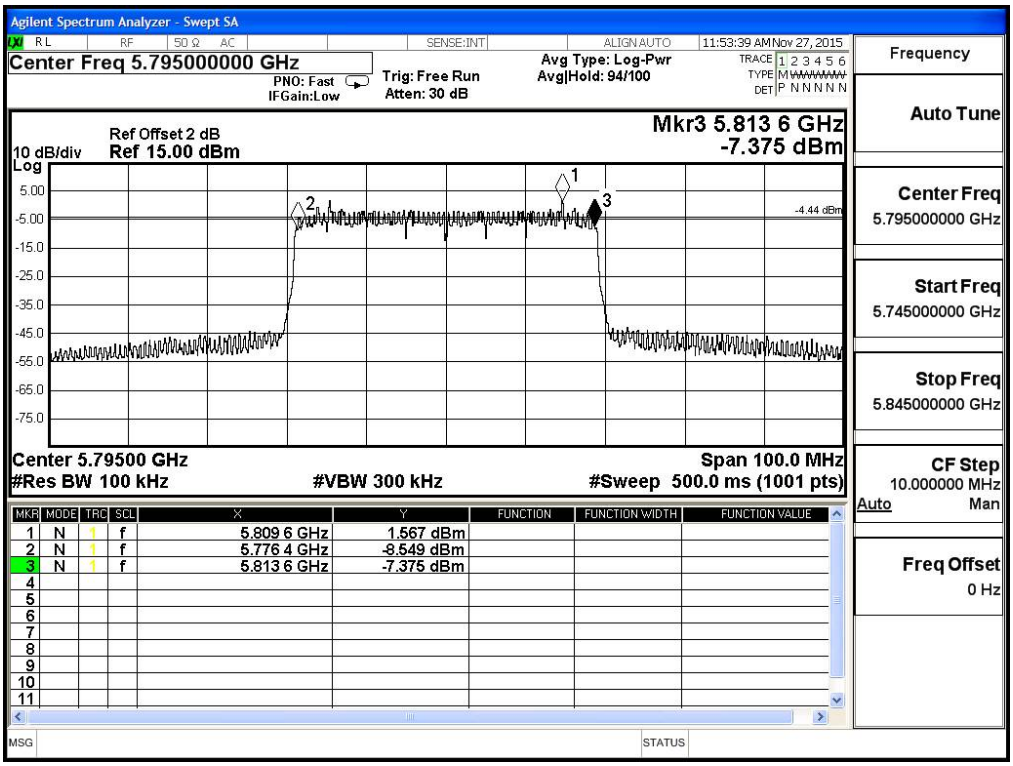


Figure Channel 159: (Chain B)

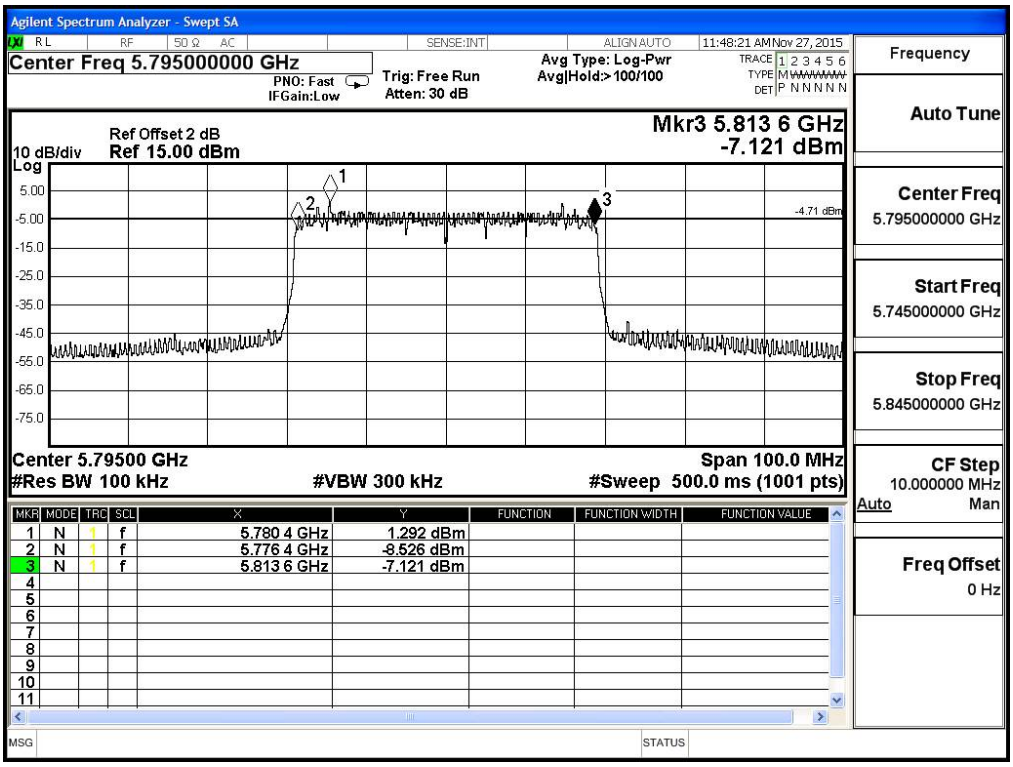


Figure Channel 159: (Chain C)

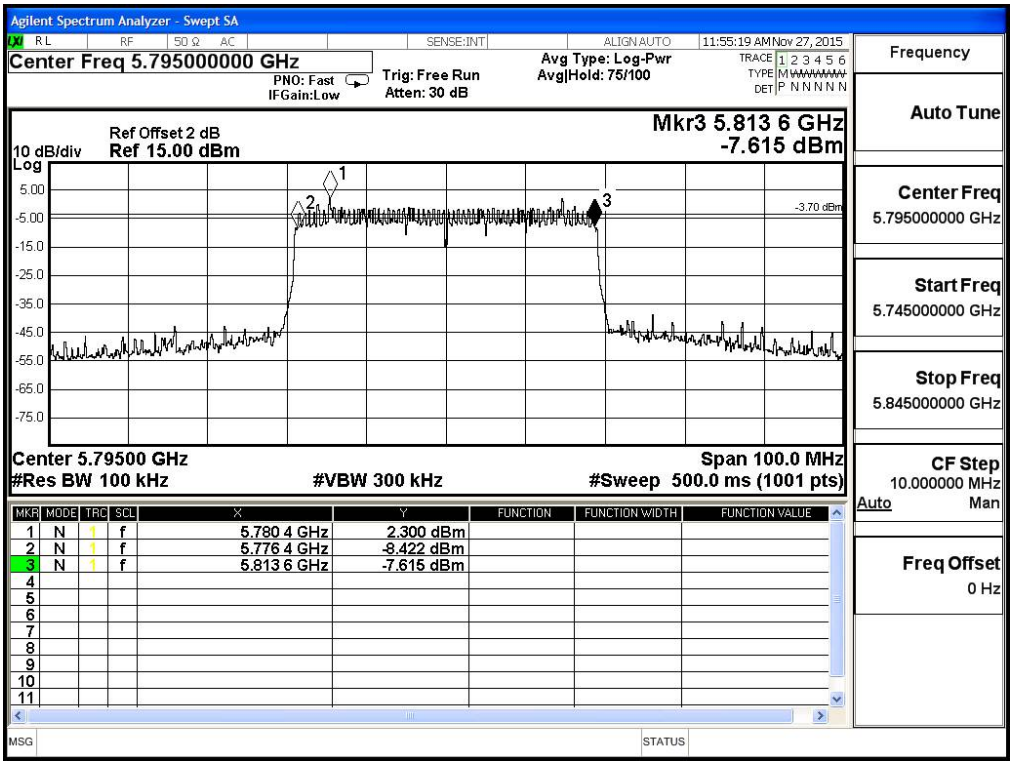
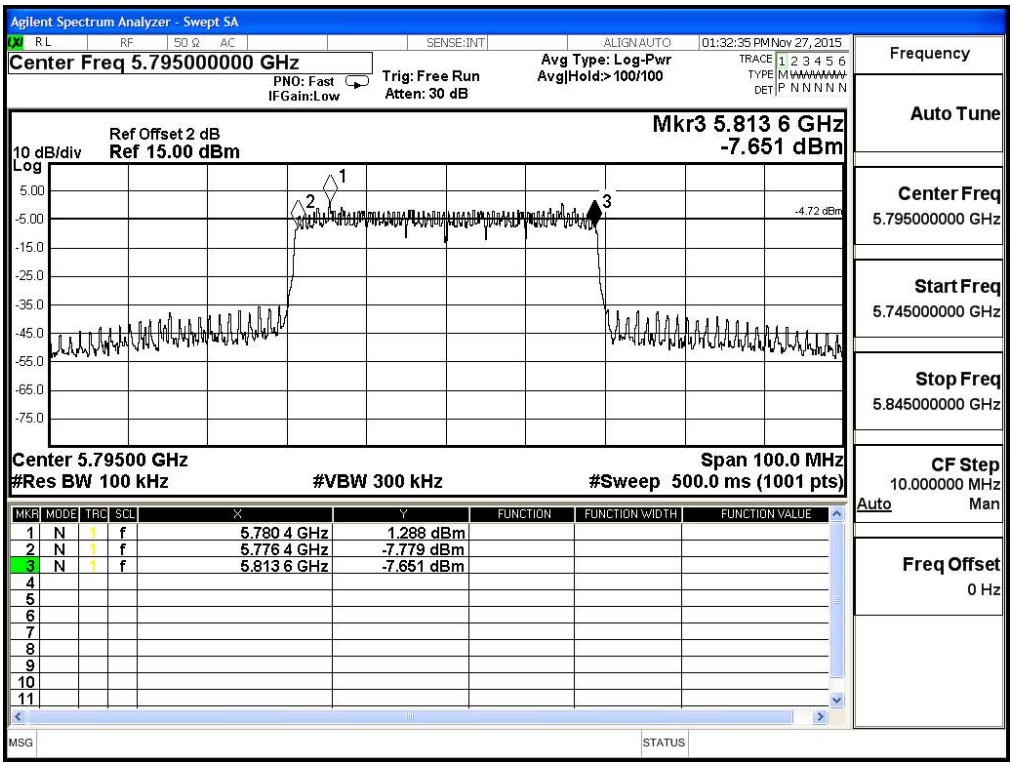


Figure Channel 159: (Chain D)



8. Frequency Stability

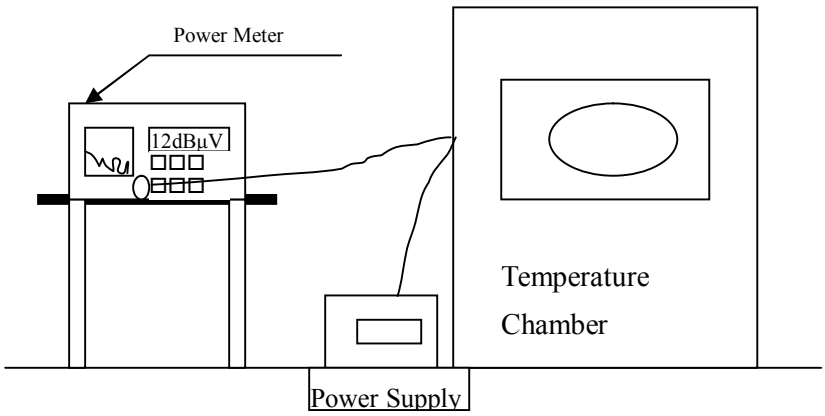
8.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2016
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2016
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

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.

8.2. Test Setup



8.3. Limits

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified

8.4. Test Procedure

The EUT was setup to ANSI C63.10, 2013; tested to UNII test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

8.5. Uncertainty

± 150 Hz

8.6. Test Result of Frequency Stability

Product : Wireless 5 x 2 HD Matrix Transmitter
Test Item : Frequency Stability
Test Site : Temperature Chamber
Test Mode : Carrier Wave

Chain A

Test Conditions		Channel	Frequency (MHz)	Frequency (MHz)	ΔF (MHz)
Tnom (20) °C	Vnom (120)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010
Tnom (50) °C	Vnom (138)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010
Tnom (50) °C	Vnom (93.5)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010
Tnom (0) °C	Vnom (126.5)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010
Tnom (0) °C	Vnom (102)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045

Chain B

Test Conditions		Channel	Frequency (MHz)	Frequency (MHz)	ΔF (MHz)
Tnom (20) °C	Vnom (120)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045
Tnom (50) °C	Vnom (138)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045
Tnom (50) °C	Vnom (93.5)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045
Tnom (0) °C	Vnom (126.5)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045
Tnom (0) °C	Vnom (102)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045

Chain C

Test Conditions		Channel	Frequency (MHz)	Frequency (MHz)	ΔF (MHz)
Tnom (20) °C	Vnom (120)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010
Tnom (50) °C	Vnom (138)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010
Tnom (50) °C	Vnom (93.5)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010
Tnom (0) °C	Vnom (126.5)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010
Tnom (0) °C	Vnom (102)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010

Chain D

Test Conditions		Channel	Frequency (MHz)	Frequency (MHz)	ΔF (MHz)
Tnom (20) °C	Vnom (120)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045
Tnom (50) °C	Vnom (138)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045
Tnom (50) °C	Vnom (93.5)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045
Tnom (0) °C	Vnom (126.5)V	151	5755.0000	5755.0058	-0.0058
		159	5795.0000	5795.0010	-0.0010
Tnom (0) °C	Vnom (102)V	151	5755.0000	5755.0056	-0.0056
		159	5795.0000	5795.0045	-0.0045

9. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs