FCC Test Report

(Class II Permissive Change)

Product Name	Long Range Wireless 5 x 2 HD Matrix Pro -Transmitter
Model No.	GWHDMS52MB-T, GWHDMS52MBB-T
FCC ID.	QLEGWHDMS52MB

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

Date of Receipt	Nov. 10, 2015
Issued Date	Sep. 12, 2016
Report No.	15B0236R-RFUSP44V00
Report Version	V1.0

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.
The test report shall not be reproduced without the written approval of QuieTek Corporation.

Test Report

Issued Date: Sep. 12, 2016
Report No.: 15B0236R-RFUSP44V00

Product Name	Long Range Wireless 5 x 2 HD Matrix Pro -Transmitter
Applicant	ATEN Technology, Inc., dba IOGEAR
Address	19641 Da Vinci Foothill Ranch, CA 92610 United States
Manufacturer	ZINWELL CORPORATION
Model No.	GWHDMS52MB-T, GWHDMS52MBB-T
FCC ID.	QLEGWHDMS52MB
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 : Genie Chang

(Senior Adm. Specialist / Genie Chang)

Tested By : Nick Chen

(Engineer / Nick Chen)

Approved By :

(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Long Range Wireless 5 x 2 HD Matrix Pro -Transmitter
Trade Name	IOGEAR / ATEN
FCC ID.	QLEGWHDMS52MB
Model No.	GWHDMS52MB-T, GWHDMS52MBB-T
Frequency Range	5755-5795MHz
Number of Channels	2CH
Data Rate	63Mbps
Type of Modulation	OFDM
Channel Control	Auto
Antenna type	PIFA Antenna
Antenna Gain	Refer to the table “Antenna List”
IR Blaster Cable	Non-Shielded, 3.0m
USB to mini Cable	Shielded, 0.2m
YPbPr Adapter Cable	Shielded, 0.3m
HDMI Cable	Shielded, 1.5m
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: Non-Shielded, 1.5m, with one ferrite core bonded.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ZINWELLL	N/A (2TX, 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 151:	5755 MHz	Channel 159:	5795 MHz

Note:

1. This device is a Long Range Wireless 5 x 2 HD Matrix Pro -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. This is requesting a Class II permissive change for FCC ID: QLEGWHDMS52MB. Originally granted on 04/24/2014

   The differences are listed as below:

   Change # 1: Frequency band 3 was previously authorized for this device under section 15.247 ofthe rules, this permissive change demonstrates compliance with new UNII rules for this same frequency band under section 15.407.

   Change # 2: The Band 1, Band 2a and Band 2c previously authorized under "Old Rules, a Class II permissive change filing to demonstrate compliance with the “New Rules”, all others hardware is identical with original granted.

   Change # 3: Addition two new adapters (MFR: Asian, M/N: WB-10E05FU) (MFR: Asian, M/N: WB-10E05R).

   Change # 4: Addition a new model name: GWHDMS52MBB-T.

   The different of each model is shown as below:

Moder Name	Trade Name	Note
GWHDMS52MB-T	IOGEAR	All models are electrically identical, different models are for marketing purpose.
GWHDMS52MBB-T	IOGEAR	

Test Mode	Mode 1: Transmit

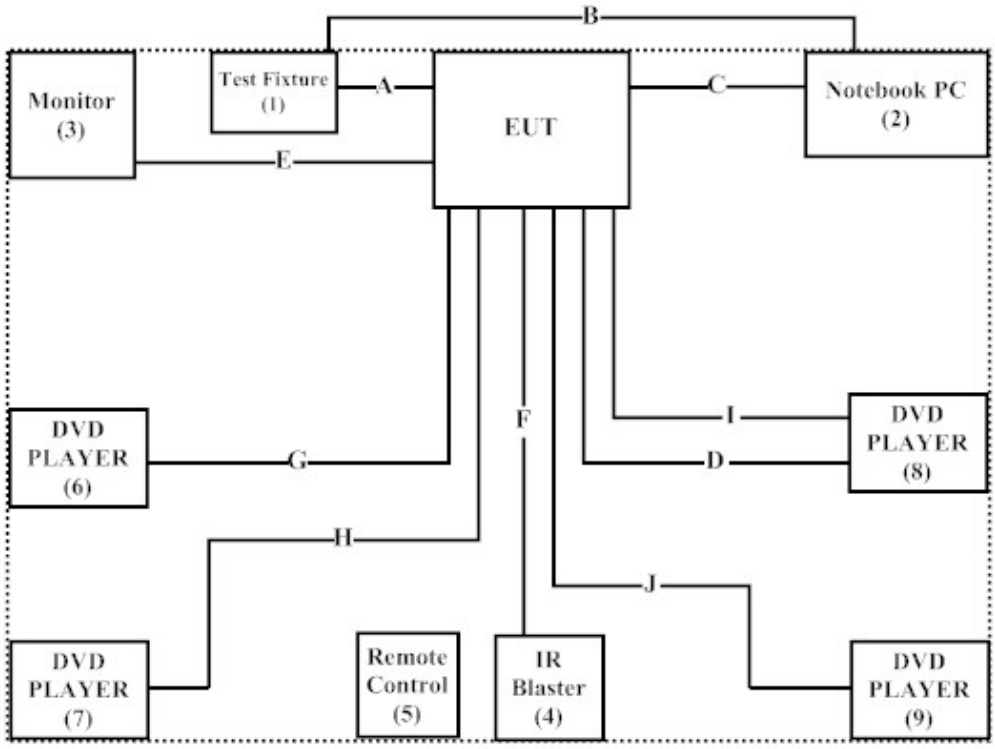
1.3. Tested System Datails

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

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

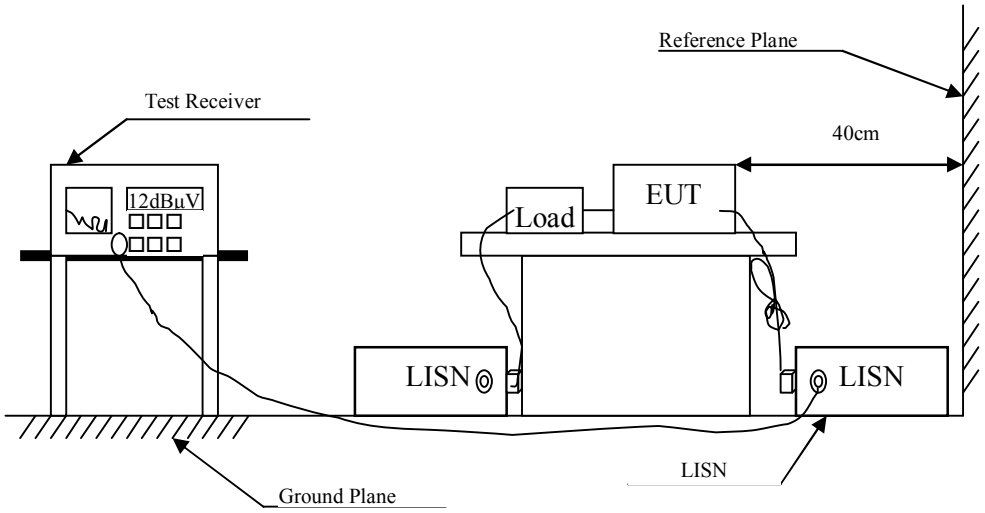
2.1. Test Equipment

	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 : Long Range Wireless 5 x 2 HD Matrix Pro -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					
0.162	9.746	41.260	51.006	-14.651	65.657
0.216	9.739	31.060	40.799	-23.315	64.114
0.255	9.741	26.190	35.931	-27.069	63.000
0.470	9.751	24.610	34.361	-22.496	56.857
0.744	9.763	22.090	31.853	-24.147	56.000
3.002	9.858	22.730	32.588	-23.412	56.000
Average					
0.162	9.746	25.870	35.616	-20.041	55.657
0.216	9.739	22.100	31.839	-22.275	54.114
0.255	9.741	15.570	25.311	-27.689	53.000
0.470	9.751	14.900	24.651	-22.206	46.857
0.744	9.763	8.560	18.323	-27.677	46.000
3.002	9.858	12.130	21.988	-24.012	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 : Long Range Wireless 5 x 2 HD Matrix Pro -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	41.100	50.847	-14.924	65.771
0.197	9.749	31.950	41.699	-22.958	64.657
0.220	9.750	28.780	38.530	-25.470	64.000
0.259	9.751	26.090	35.841	-27.045	62.886
0.658	9.759	24.590	34.349	-21.651	56.000
0.841	9.778	19.720	29.498	-26.502	56.000
Average					
0.158	9.747	33.490	43.237	-12.534	55.771
0.197	9.749	23.850	33.599	-21.058	54.657
0.220	9.750	2.580	12.330	-41.670	54.000
0.259	9.751	9.390	19.141	-33.745	52.886
0.658	9.759	10.100	19.859	-26.141	46.000
0.841	9.778	8.520	18.298	-27.702	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

3. Maximun conducted output power

3.1. Test Equipment

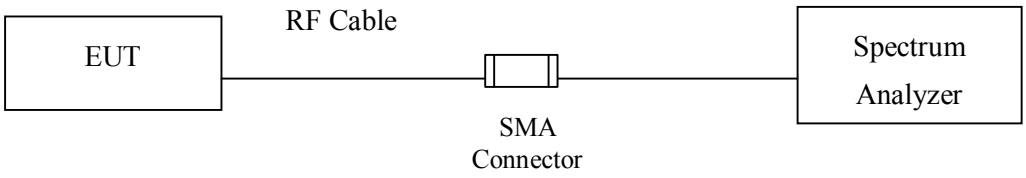
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2016
X	Power Sensor	Anritsu	MA2411B/0738448	Jun., 2016
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note:

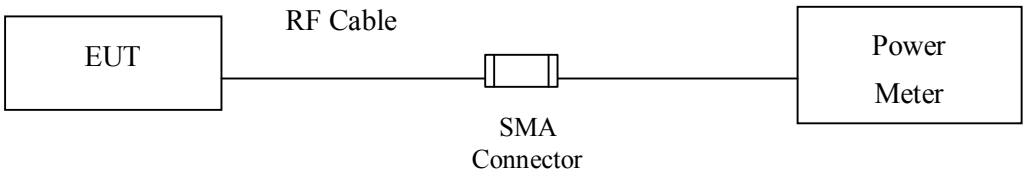
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

3.2. Test Setup

26dBc Occupied Bandwidth



Conduction Power Measurement



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.

For 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)

For 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 : Long Range Wireless 5 x 2 HD Matrix Pro -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 Measurement Level (dBm)	Required Limit
151	5755	63	15.02	<30dBm
159	5795	63	15.25	<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 Measurement Level (dBm)	Required Limit
151	5755	63	14.79	<30dBm
159	5795	63	15.39	<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	Output Power	Output Power Limit	
	(MHz)	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	dBm+10log(BW)
151	5755	--	15.02	14.79	17.92	30	--
159	5795	--	15.25	15.39	18.33	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))

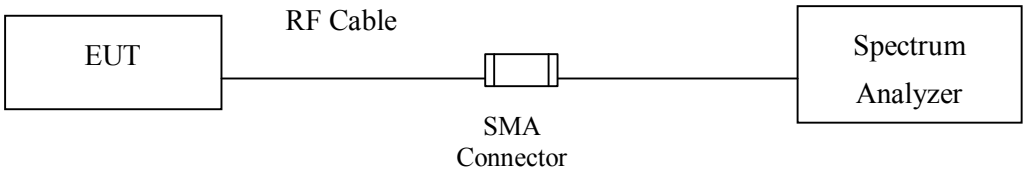
4. Peak Power Spectral Density

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

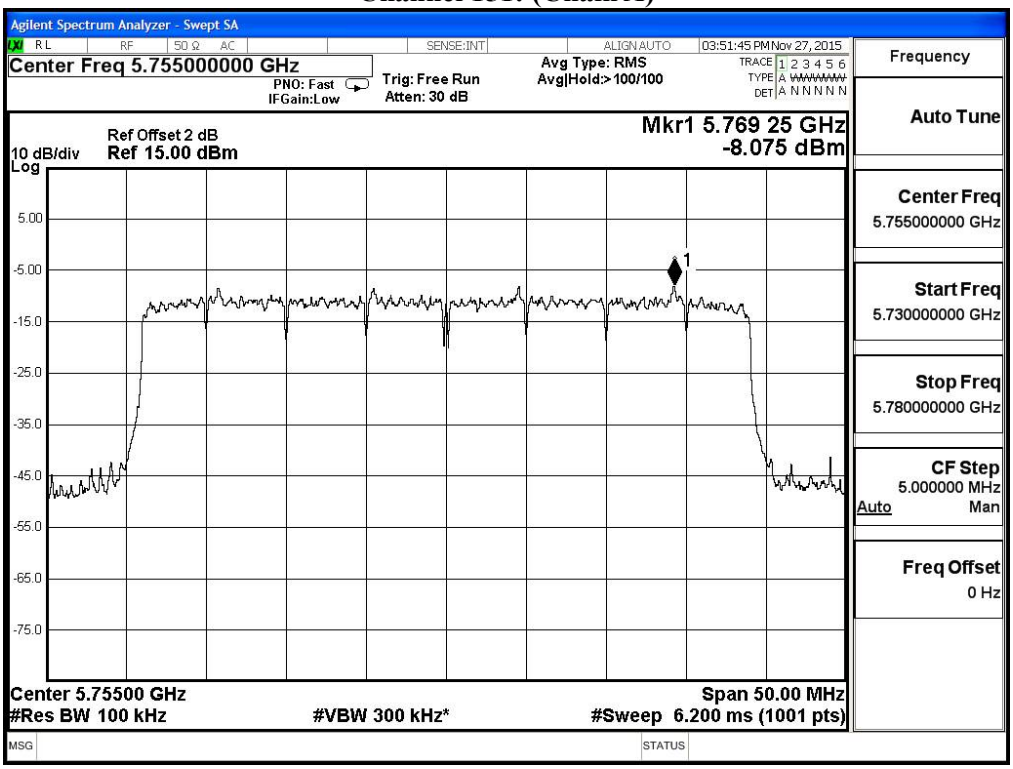
4.6. Test Result of Peak Power Spectral Density

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

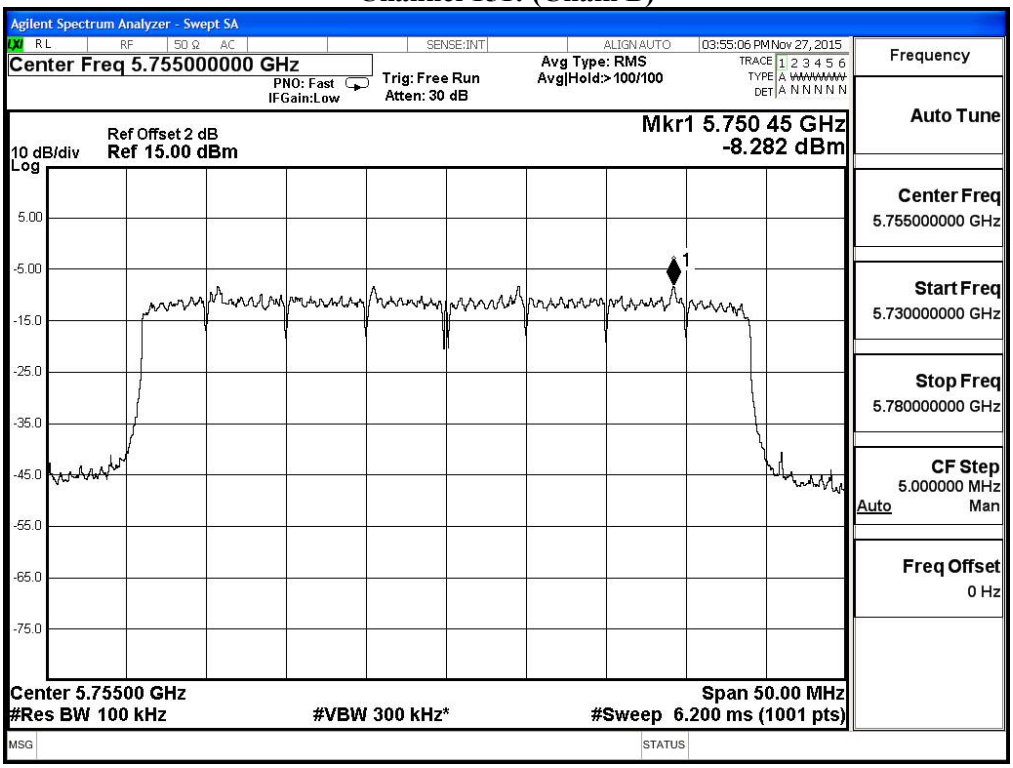
Channel Number	Frequency (MHz)	Chain	PPSD (dBm)	BWCF (dB)	Total PPSD (dBm)	Required Limit (dBm)	Result
151	5755	A	-8.075	6.98	1.915	<30	Pass
		B	-8.282	6.98	1.708	<30	Pass
159	5795	A	-8.064	6.98	1.926	<30	Pass
		B	-7.560	6.98	2.430	<30	Pass

Note 1: The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

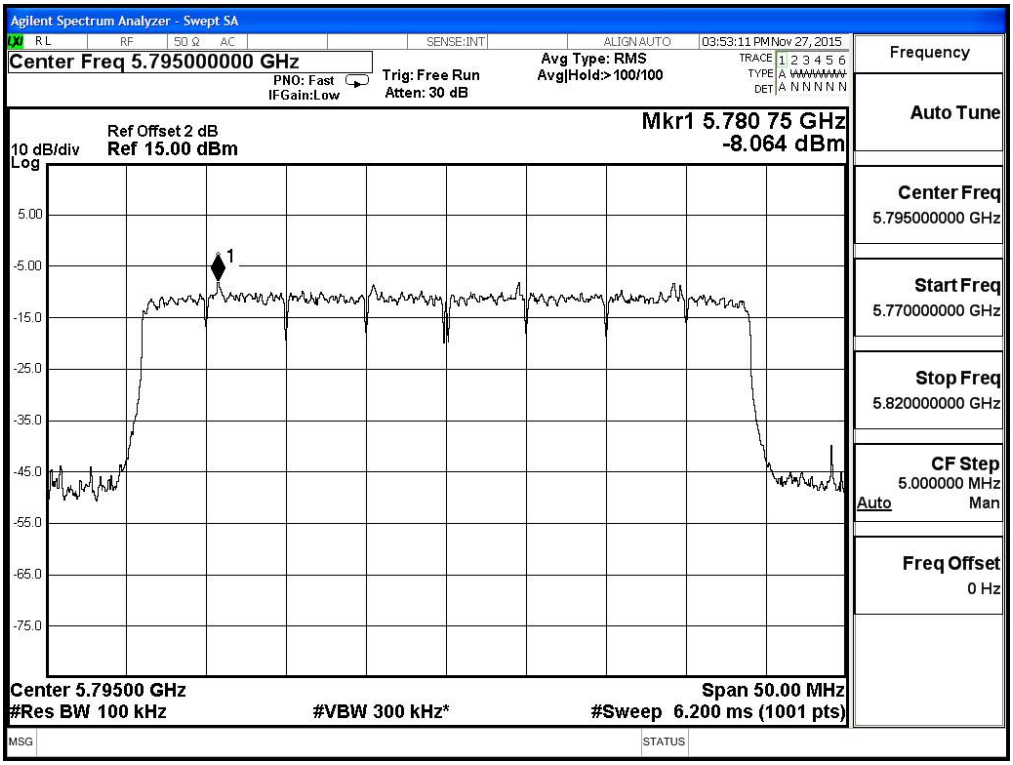
Channel 151: (Chain A)



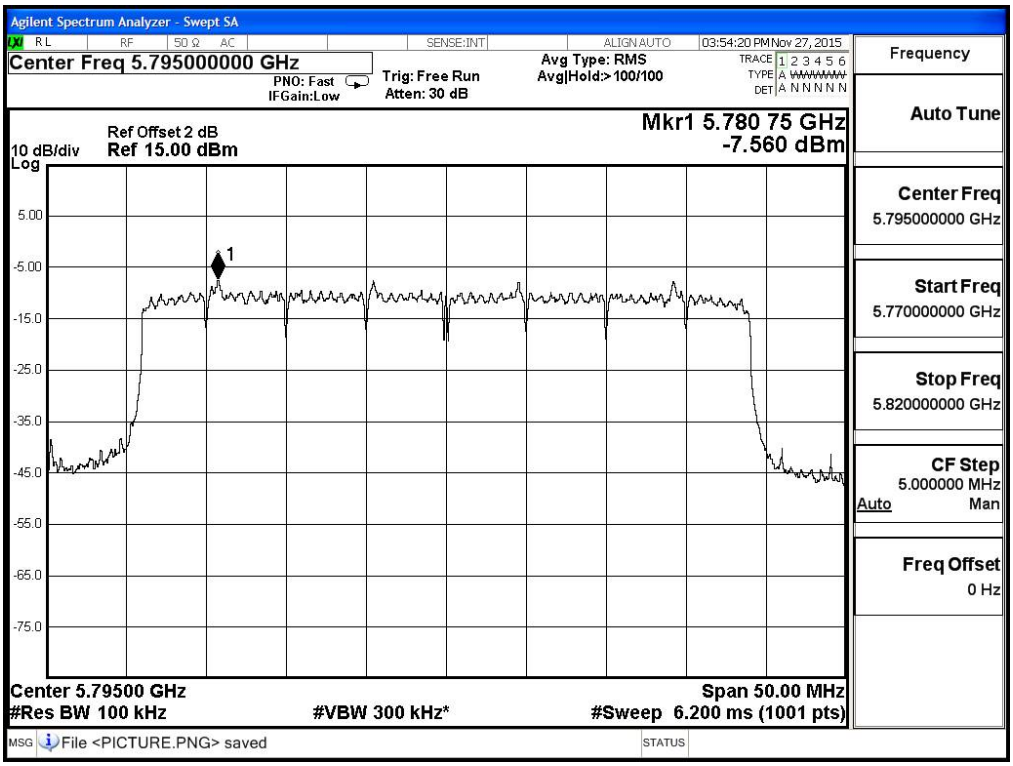
Channel 151: (Chain B)



Channel 159 – Chain A



Channel 159 – Chain B



5. Radiated Emission

5.1. Test Equipment

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

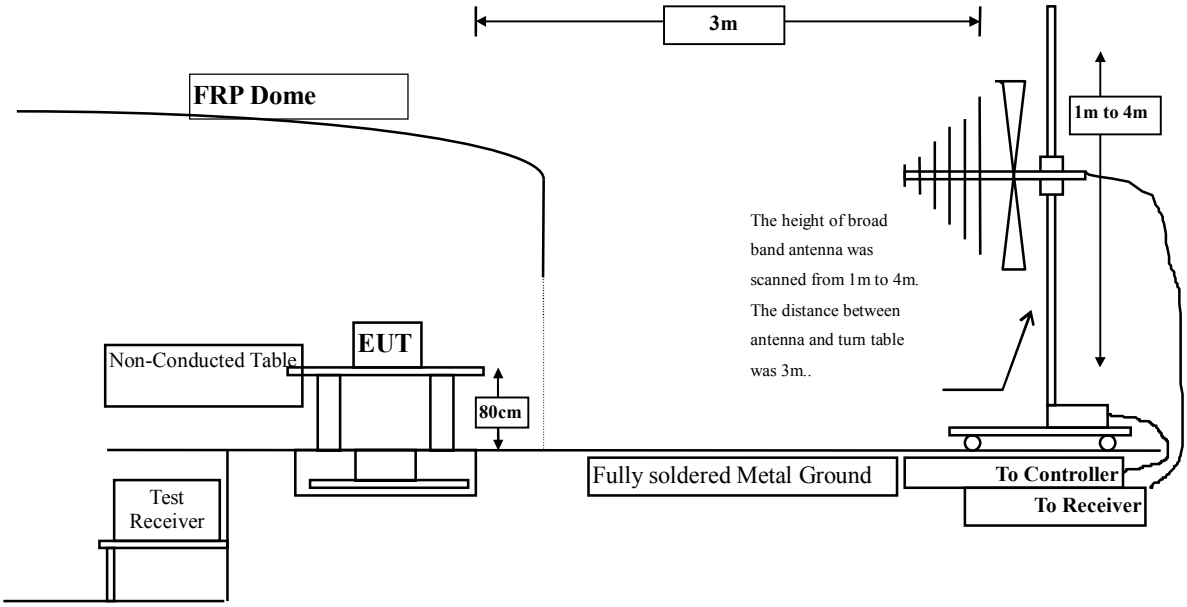
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒Site # 3	X	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep., 2016
	X	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun., 2016
	X	EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun., 2016
	X	Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun., 2016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

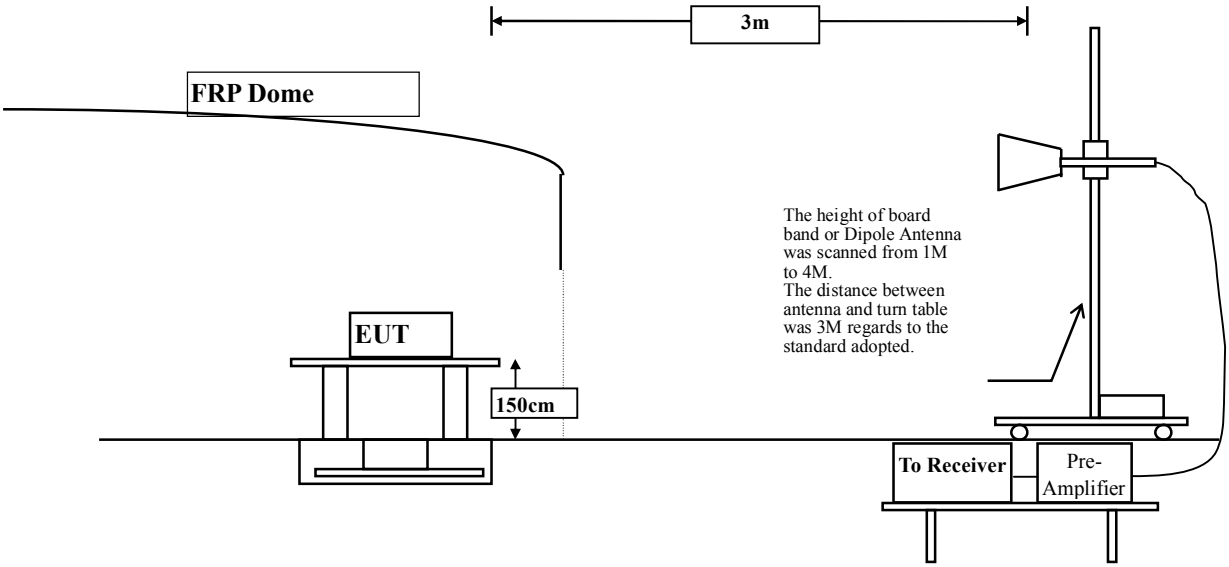
Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

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 : Long Range Wireless 5 x 2 HD Matrix Pro -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	15.044	37.450	52.493	-21.507	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
11510.000	16.536	38.180	54.716	-19.284	74.000
Average Detector:					
11510.000	16.536	26.520	43.056	-10.944	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 : Long Range Wireless 5 x 2 HD Matrix Pro -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	15.364	35.890	51.254	-22.746	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
11590.000	16.687	40.320	57.007	-16.993	74.000
Average Detector:					
11590.000	16.687	30.140	46.827	-7.173	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 : Long Range Wireless 5 x 2 HD Matrix Pro -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					
191.020	-9.679	41.341	31.662	-11.838	43.500
385.020	1.209	32.912	34.121	-11.879	46.000
499.480	1.991	33.761	35.751	-10.249	46.000
594.540	3.555	28.527	32.082	-13.918	46.000
800.180	6.417	25.903	32.320	-13.680	46.000
833.160	6.616	28.405	35.021	-10.979	46.000
Vertical					
Peak Detector					
30.000	-3.010	31.788	28.778	-11.222	40.000
74.620	-7.726	38.152	30.426	-9.574	40.000
191.020	-5.629	45.228	39.599	-3.901	43.500
499.480	-0.199	34.326	34.126	-11.874	46.000
598.420	1.114	38.527	39.641	-6.359	46.000
833.160	1.716	36.695	38.411	-7.589	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:

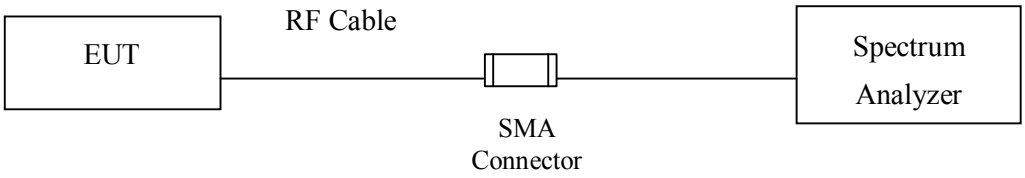
The following test equipments are used during the band edge tests:

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

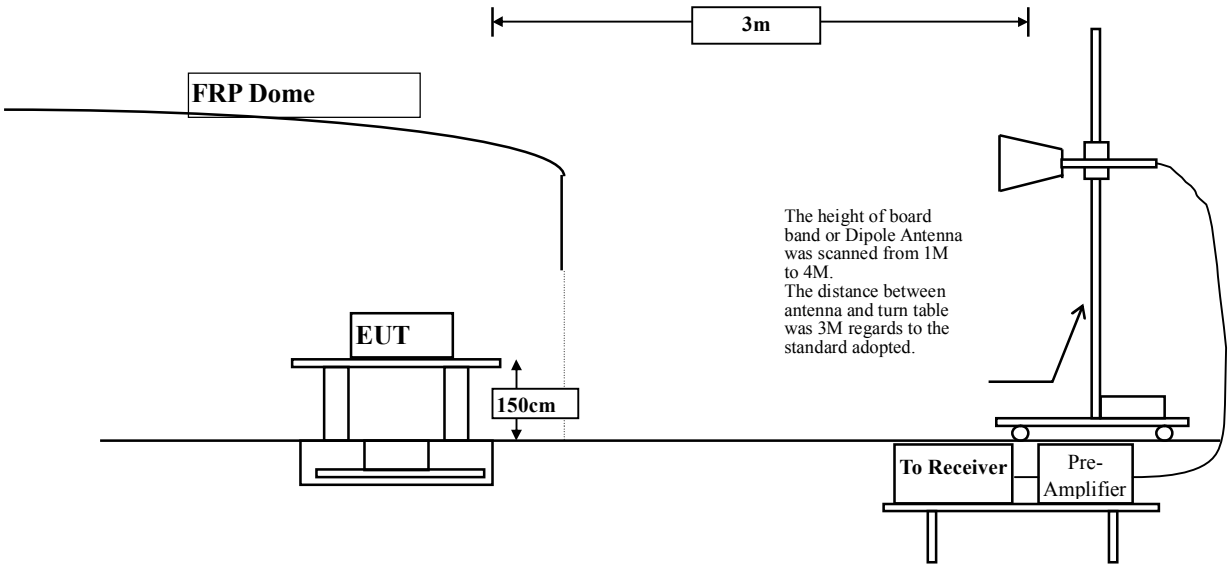
Note: 1. All instruments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

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

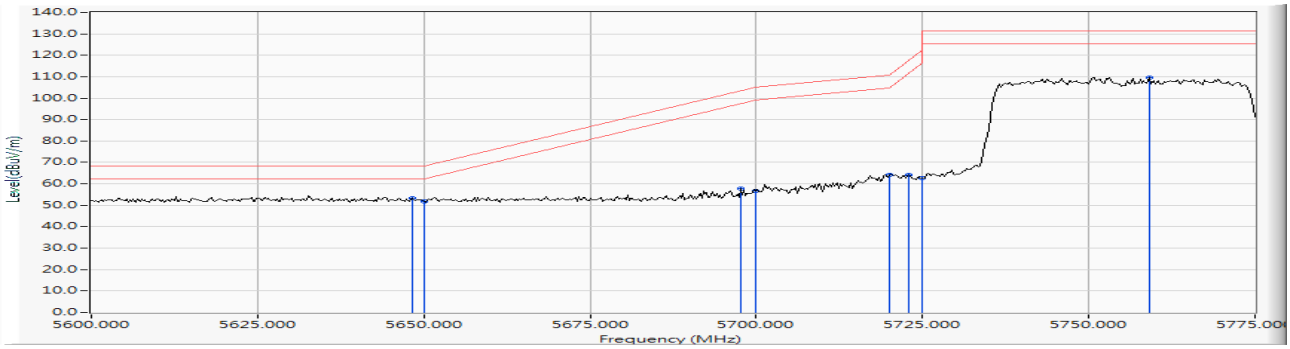
± 3.8 dB below 1GHz

± 3.9 dB above 1GHz

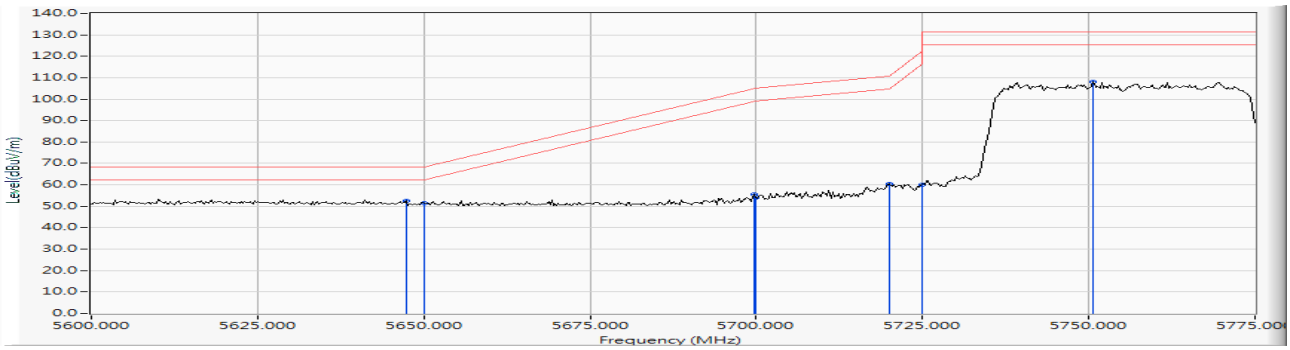
6.6. Test Result of Band Edge

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

RF Radiated Measurement:



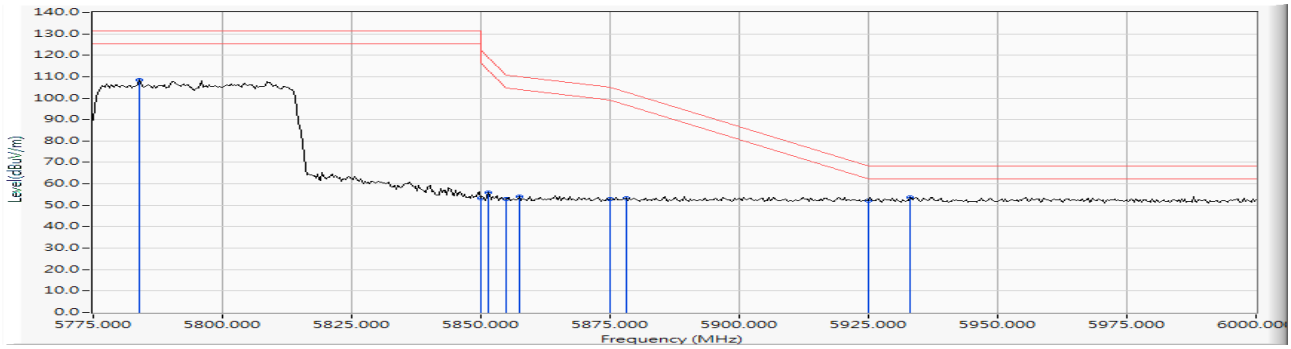
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Measure Level (dBµV /m)	Margin (dB)	Limit (dBµV /m)	Result
Horizontal	5648.188	18.761	34.645	53.406	-14.814	68.220	Pass
Horizontal	5650.000	18.766	33.045	51.812	-16.408	68.220	Pass
Horizontal	5697.645	18.910	38.937	57.847	-45.611	103.458	Pass
Horizontal	5700.000	18.917	37.854	56.771	-48.429	105.200	Pass
Horizontal	5720.000	18.977	45.187	64.164	-46.636	110.800	Pass
Horizontal	5723.007	18.986	45.293	64.280	-53.376	117.656	Pass
Horizontal	5725.000	18.993	43.835	62.828	-59.372	122.200	Pass
Horizontal	5759.022	19.104	90.624	109.728	--	--	--



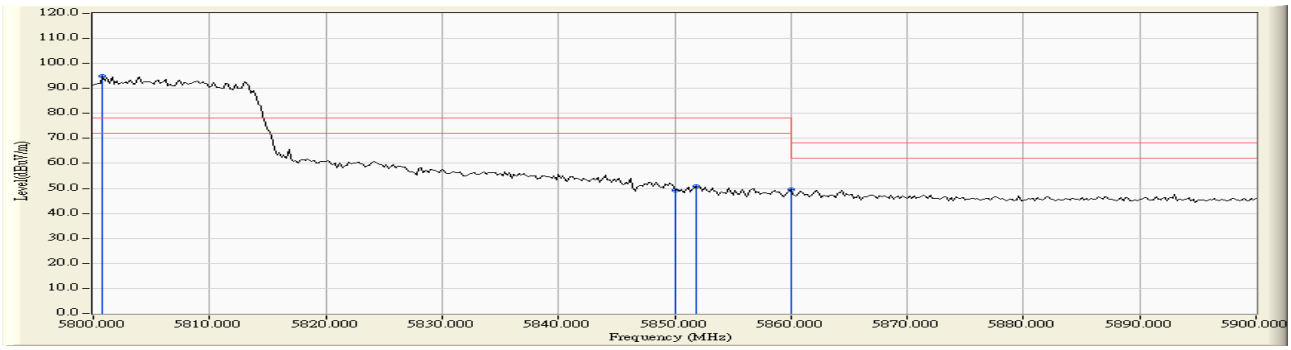
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Measure Level (dBµV /m)	Margin (dB)	Limit (dBµV /m)	Result
Vertical	5647.428	18.759	33.766	52.525	-15.695	68.220	Pass
Vertical	5650.000	18.766	32.518	51.285	-16.935	68.220	Pass
Vertical	5699.674	18.916	36.571	55.487	-49.472	104.959	Pass
Vertical	5700.000	18.917	35.032	53.949	-51.251	105.200	Pass
Vertical	5719.964	18.977	41.509	60.486	-50.304	110.790	Pass
Vertical	5720.000	18.977	41.381	60.358	-50.442	110.800	Pass
Vertical	5725.000	18.993	41.229	60.222	-61.978	122.200	Pass
Vertical	5750.652	19.081	88.921	108.001	--	--	--

Product : Long Range Wireless 5 x 2 HD Matrix Pro -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	5783.804	19.208	89.202	108.409	--	--	--
Horizontal	5850.000	19.468	33.830	53.298	-68.902	122.200	Pass
Horizontal	5851.304	19.475	36.322	55.796	-63.431	119.227	Pass
Horizontal	5855.000	19.487	33.336	52.823	-57.977	110.800	Pass
Horizontal	5857.500	19.495	34.634	54.129	-55.971	110.100	Pass
Horizontal	5875.000	19.558	33.177	52.735	-52.465	105.200	Pass
Horizontal	5878.043	19.572	33.808	53.379	-49.569	102.948	Pass
Horizontal	5925.000	19.755	32.328	52.084	-16.116	68.200	Pass
Horizontal	5933.152	19.787	33.715	53.502	-14.698	68.200	Pass



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Measure Level (dBµV /m)	Margin (dB)	Limit (dBµV /m)	Result
Vertical	5788.696	19.226	87.804	107.030	--	--	--
Vertical	5850.000	19.468	33.793	53.261	-68.939	122.200	Pass
Vertical	5854.891	19.487	35.230	54.717	-56.332	111.049	Pass
Vertical	5855.000	19.487	34.222	53.709	-57.091	110.800	Pass
Vertical	5862.065	19.510	34.524	54.035	-54.787	108.822	Pass
Vertical	5875.000	19.558	32.786	52.344	-52.856	105.200	Pass
Vertical	5877.391	19.569	34.029	53.598	-49.833	103.431	Pass
Vertical	5925.000	19.755	32.831	52.587	-15.613	68.200	Pass
Vertical	5929.891	19.775	33.639	53.414	-14.786	68.200	Pass

7. Occupied Bandwidth

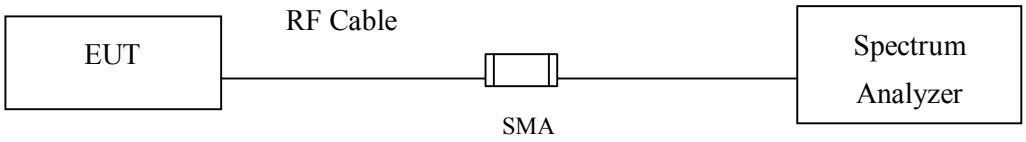
7.1. Test Equipment

	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 : Long Range Wireless 5 x 2 HD Matrix Pro -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	35900	>500	Pass
	B	5755	36500	>500	Pass
159	A	5795	37200	>500	Pass
	B	5795	37200	>500	Pass

Figure Channel 151: (Chain A)

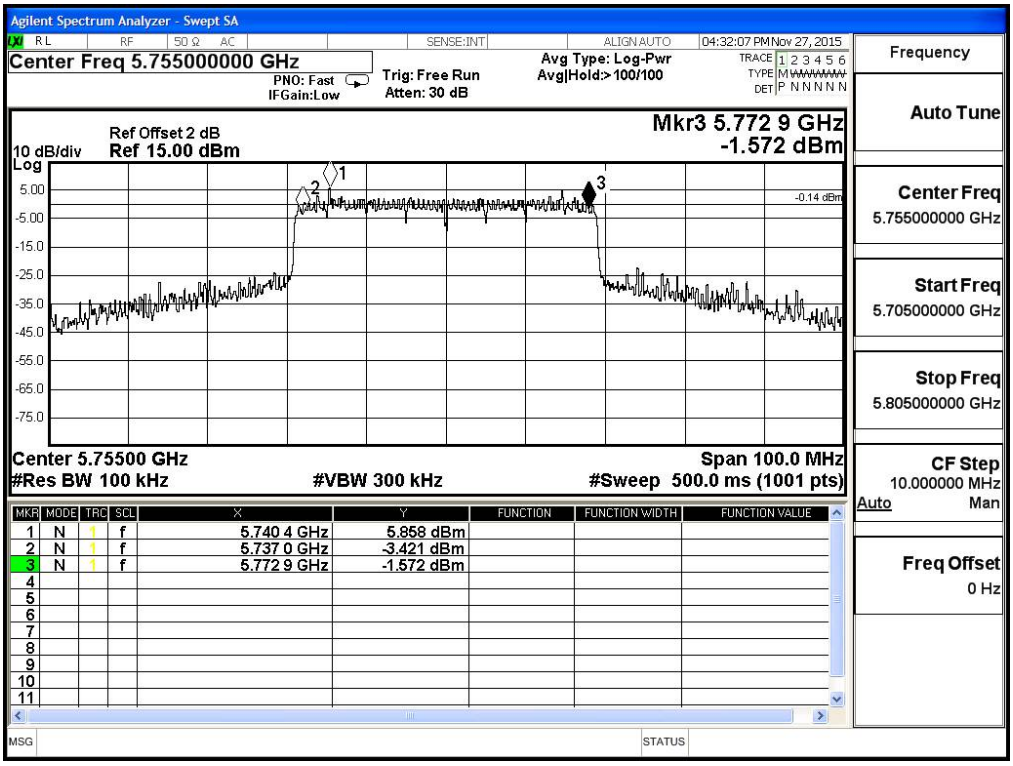


Figure Channel 151: (Chain B)

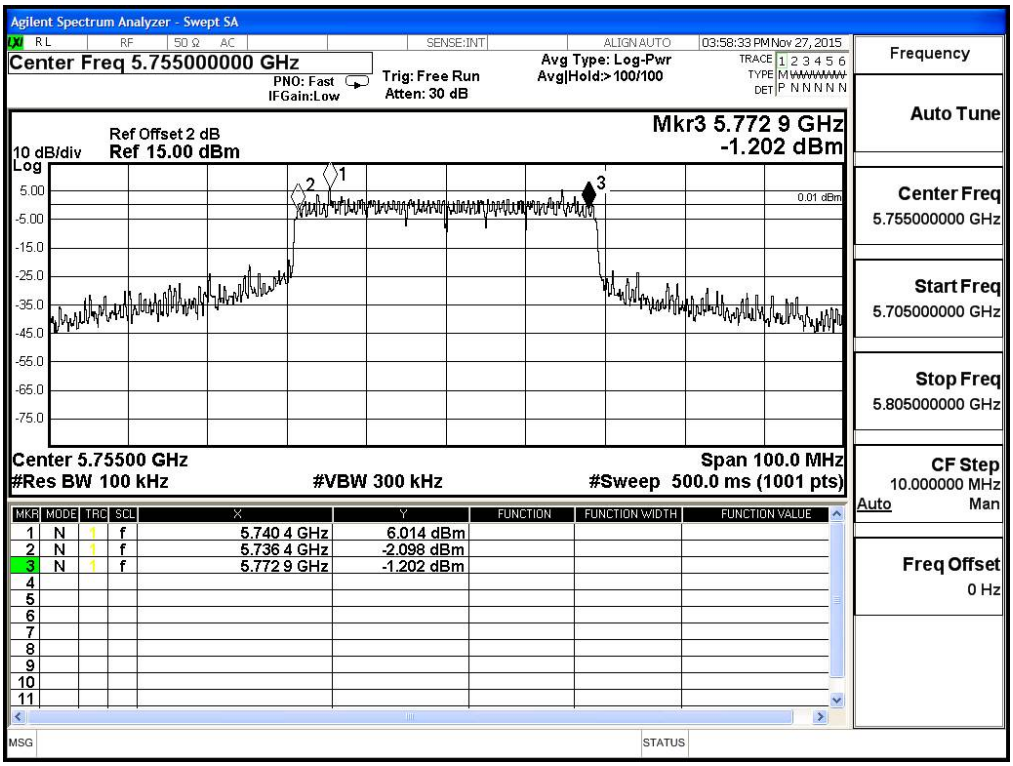


Figure Channel 159: (Chain A)

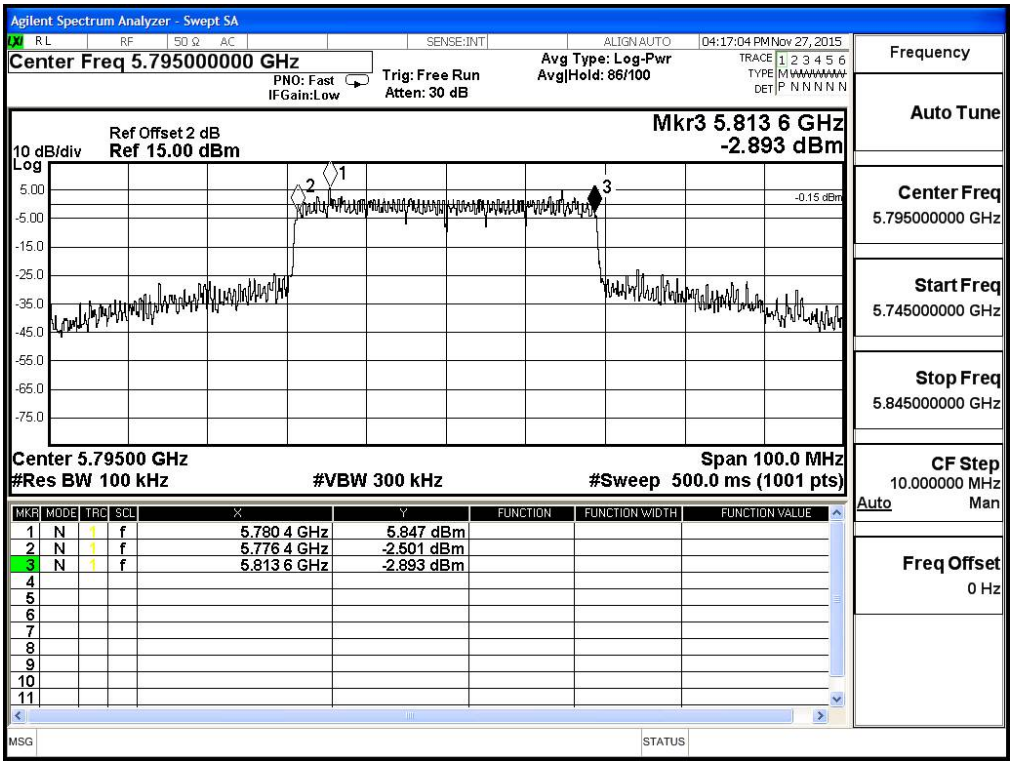
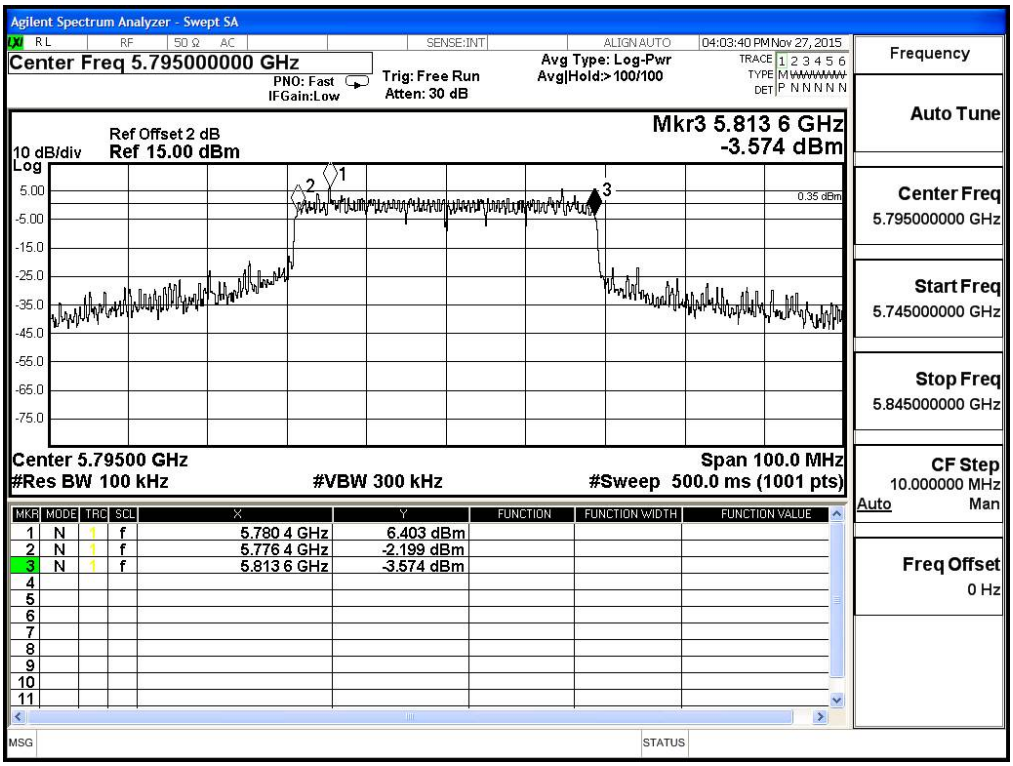


Figure Channel 159: (Chain B)



8. Frequency Stability

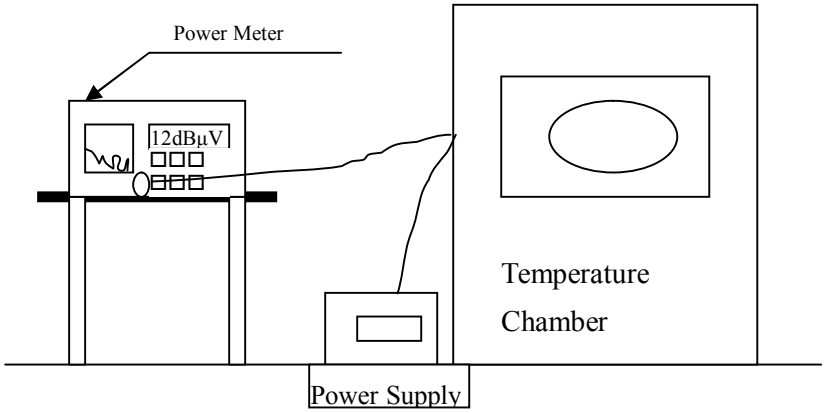
8.1. Test Equipment

	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 : Long Range Wireless 5 x 2 HD Matrix Pro -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	5755.0062	-0.0062
		159	5795.0000	5795.0011	-0.0011
Tnom (50) °C	Vnom (138)V	151	5755.0000	5755.0068	-0.0068
		159	5795.0000	5795.0018	-0.0018
Tnom (50) °C	Vnom (93.5)V	151	5755.0000	5755.0019	-0.0019
		159	5795.0000	5795.0039	-0.0039
Tnom (0) °C	Vnom (126.5)V	151	5755.0000	5755.0032	-0.0032
		159	5795.0000	5795.0058	-0.0058
Tnom (0) °C	Vnom (102)V	151	5755.0000	5755.0032	-0.0032
		159	5795.0000	5795.0058	-0.0058

Chain B

Test Conditions		Channel	Frequency (MHz)	Frequency (MHz)	ΔF (MHz)
Tnom (20) °C	Vnom (120)V	151	5755.0000	5755.0054	-0.0054
		159	5795.0000	5795.0043	-0.0043
Tnom (50) °C	Vnom (138)V	151	5755.0000	5755.0081	-0.0081
		159	5795.0000	5795.0038	-0.0038
Tnom (50) °C	Vnom (93.5)V	151	5755.0000	5755.0015	-0.0015
		159	5795.0000	5795.0064	-0.0064
Tnom (0) °C	Vnom (126.5)V	151	5755.0000	5755.0036	-0.0036
		159	5795.0000	5795.0061	-0.0061
Tnom (0) °C	Vnom (102)V	151	5755.0000	5755.0033	-0.0033
		159	5795.0000	5795.0021	-0.0021

9. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs