

# FCC REPORT (WIFI)

**Applicant:** LigoWave LLC

**Address of Applicant:** 138 Mountain Brook Dr Canton, GA 30115 United States

**Equipment Under Test (EUT)**

Product Name: Broadband Digital Transmission System

Model No.: FWBD-1401

**FCC ID:** V2V-FWBD1401

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.247

**Date of sample receipt:** 18 Nov., 2013

**Date of Test:** 19 Nov., 2013 to 23 Jan., 2014

**Date of report issued:** 24 Jan., 2014

**Test Result:** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang  
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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## 2 Version

Version No.	Date	Description
00	24 Jan., 2014	This report was basis on report No.: RSZ121128004-00

Prepared by:

*Shirley Li*

Date:

24 Jan., 2014

**Report Clerk**

Reviewed by:

*Wim Zhang*

Date:

24 Jan., 2014

**Project Engineer**

## 3 Contents

	Page
<b>1 COVER PAGE .....</b>	<b>1</b>
<b>2 VERSION .....</b>	<b>2</b>
<b>3 CONTENTS .....</b>	<b>3</b>
<b>4 TEST SUMMARY .....</b>	<b>4</b>
<b>5 GENERAL INFORMATION .....</b>	<b>5</b>
5.1 CLIENT INFORMATION.....	5
5.2 GENERAL DESCRIPTION OF E.U.T.....	5
5.3 TEST ENVIRONMENT AND MODE .....	7
5.4 LABORATORY FACILITY.....	8
5.5 LABORATORY LOCATION .....	8
5.6 TEST INSTRUMENTS LIST.....	9
<b>6 TEST RESULTS AND MEASUREMENT DATA .....</b>	<b>10</b>
6.1 JUSTIFICATION .....	10
6.2 ANTENNA REQUIREMENT .....	10
6.3 CONDUCTED EMISSION .....	11
6.4 SPURIOUS EMISSION .....	18
6.4.1 Radiated Emission Method.....	18

## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Spurious Emission	15.205/15.209	Pass

*Pass: The EUT complies with the essential requirements in the standard.*

### Remark:

This report was basis on report No.: RSZ121128004-00 which issued by Bay Area Compliance laboratories Corp. (Shenzhen), the product has below changes:

Original model No.: FWBD-1401 (version 0005);

New model No.: FWBD-1401 (version 0008)

- 1) Power supply: FWBD-1401 (version 0008) has isolated DC power supply electrical circuitry by using a different internal power supply IC compared to FWBD-1401 (version 0005).  
FWBD-1401 (version 0005), has non-isolated DC power supply electrical circuitry.
- 2) PCB version marking.
- 3) New POE adapter

*So this report only retested the Conducted Emission and Spurious Emission of Radiated Emission Method (below 1GHz).*

## 5 General Information

### 5.1 Client Information

Applicant:	LigoWave LLC
Address of Applicant:	138 Mountain Brook Dr Canton, GA 30115 United States

### 5.2 General Description of E.U.T.

Product Name:	Broadband Digital Transmission System
Model No.:	FWBD-1401
Operation Frequency:	5725MHz-5850MHz
Channel numbers:	802.11a/ 802.11n20:5, 802.11n40:2
Channel separation:	802.11a/802.11n20 :20MHz, 802.11n40 :40MHz
Modulation technology: (IEEE 802.11a)	BPSK,QPSK,16-QAM,64-QAM
Modulation technology: (IEEE 802.11n/802.11n)	BPSK,QPSK,16-QAM,64-QAM
Data speed(IEEE 802.11a)	6MHz,9MHz,12MHz,18MHz,24MHz,36MHz,48MHz,54MHz
Data speed(IEEE 802.11n20):	MCS0: 6.5MHz,MCS1:13MHz,MCS2:19.5MHz,MCS3:26MHz, MCS4:39MHz,MCS5:52MHz,MCS6:58.5MHz,MCS7:65MHz
Data speed (IEEE 802.11n40):	MCS0:15MHz,MCS1:30MHz,MCS2:45MHz,MCS3:60MHz, MCS4:90MHz,MCS5:120MHz,MCS6:135MHz,MCS7:150MHz
Antenna Type:	ANT1:Omni-directional, ANT2:Panel,ANT3:Dish
Antenna gain:	ANT1: 3 dBi, ANT2: 23 dBi, ANT3: 30 dBi
AC adapter:	POE 1: Model: AY032E-ZF563 Input: AC100-240V,50/60Hz, 0.5A Output:DC56V, 0.5A  POE 2: Model: FAS4800070-C55 Input: AC100-240V,50/60Hz, 0.7A Output: DC48V, 0.7A  POE 3: Model: VX-PI1000GB Input: AC100-240V,50/60Hz, 0.6A Output: DC48V, 0.5A

## Operation Frequency each of channel

802.11a/802.11n20	
Channel	Frequency
149	5745MHz
153	5765MHz
157	5785MHz
161	5805MHz
165	5825MHz

802.11n40	
Channel	Frequency
151	5755MHz
159	5795MHz

### Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

#### 802.11a/802.11n20

Channel	Frequency
The lowest channel	5745MHz
The middle channel	5785MHz
The Highest channel	5825MHz

#### 802.11n40

Channel	Frequency
The lowest channel	5755MHz
The Highest channel	5795MHz

## 5.3 Test environment and mode

<b>Operating Environment:</b>	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
<b>Test mode:</b>	
Continuously transmitting mode	Keep the EUT in 100% duty cycle transmitting with modulation.

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

**Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.**

Mode	Data rate
802.11a	6 Mbps
802.11n20	6.5 Mbps
802.11n40	13 Mbps

### Final Test Mode:

According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup” 6 Mbps for 802.11a, 6.5 Mbps for 802.11n20 and 13 Mbps for 802.11n40. All test items for 802.11a and 802.11n were performed in MIMO mode and duty cycle all above 98%, meet the requirements of KDB 558074.

## 5.4 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC - Registration No.: 817957**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 817957, February 27, 2012.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

## 5.5 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.  
Address: No.B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,  
Bao'an District, Shenzhen, Guangdong, China  
Tel: +86-755-23118282  
Fax: +86-755-23116366



## 5.6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	SAEMC	9(L)*6(W)* 6(H)	CCIS0001	June 09 2013	June 08 2014
2	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	CCIS0005	May 25 2013	May 24 2014
3	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	CCIS0006	May 25 2013	May 24 2014
4	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
5	Coaxial Cable	CCIS	N/A	CCIS0016	Apr. 01 2013	Mar. 31 2014
6	Coaxial Cable	CCIS	N/A	CCIS0017	Apr. 01 2013	Mar. 31 2014
7	Coaxial cable	CCIS	N/A	CCIS0018	Apr. 01 2013	Mar. 31 2014
8	Coaxial Cable	CCIS	N/A	CCIS0019	Apr. 01 2013	Mar. 31 2014
9	Coaxial Cable	CCIS	N/A	CCIS0087	Apr. 01 2013	Mar. 31 2014
10	Amplifier(10kHz-1.3GHz)	HP	8447D	CCIS0003	Apr. 01 2013	Mar. 31 2014
11	Amplifier(1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	June 09 2013	June 08 2014
12	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	Apr. 01 2013	Mar. 31 2014
13	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 30 2013	Mar. 29 2014
14	Printer	HP	HP LaserJet P1007	N/A	N/A	N/A
15	Positioning Controller	UC	UC3000	CCIS0015	N/A	N/A
16	Spectrum analyzer 9k-30GHz	Rohde & Schwarz	FSP	CCIS0023	May. 25 2013	May. 24 2014
17	EMI Test Receiver	Rohde & Schwarz	ESPI	CCIS0022	Apr 01 2013	Mar. 31 2014
18	Loop antenna	Laplace instrument	RF300	EMC0701	Aug. 12 2013	Aug. 11 2014
19	Universal radio communication tester	Rhode & Schwarz	CMU200	CCIS0069	May. 25 2013	May. 24 2014
20	Signal Analyzer	Rohde & Schwarz	FSIQ3	CCIS0088	May. 25 2013	May. 24 2014

Conducted Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	Shielding Room	ZhongShuo Electron	11.0(L)x4.0(W)x3.0(H)	CCIS0061	June 09 2013	June 08 2014
2	EMI Test Receiver	Rohde & Schwarz	ESCI	CCIS0002	May 25 2013	May 24 2014
3	LISN	CHASE	MN2050D	CCIS0074	Apr 01 2013	Mar. 31 2014
4	Coaxial Cable	CCIS	N/A	CCIS0086	Apr. 01 2013	Mar. 31 2014
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

## 6 Test results and Measurement Data

### 6.1 Justification

According to differences with the original report which described in section 4 of this report, we selected the **Conducted emissions** and **Radiated emissions below 1 GHz** to perform the additional tests. For these test items, all three kinds of POEs were tested, and the 3 dBi Omni-directional antenna was selected to perform the conducted emission as the worst case mode, 30 dBi Dish antenna was selected to perform the conducted emission as the worst case mode.

### 6.2 Antenna requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203 /247(c)																		
<i>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.</i>																			
<b>E.U.T Antenna:</b>																			
<i>The product is a professionally installed device which has three types of antenna for the application. The antenna information as below table:</i>																			
<table><tr><td>Antenna No.</td><td>Antenna Type</td><td>Antenna Gain (dBi)</td><td>Antenna Connector Type</td></tr><tr><td>Antenna 1</td><td>Omni-directional</td><td>3</td><td>RP-SMA-J</td></tr><tr><td>Antenna 2</td><td>Panel</td><td>23</td><td>MCX</td></tr><tr><td>Antenna 3</td><td>Dish</td><td>30</td><td>N-type</td></tr></table>				Antenna No.	Antenna Type	Antenna Gain (dBi)	Antenna Connector Type	Antenna 1	Omni-directional	3	RP-SMA-J	Antenna 2	Panel	23	MCX	Antenna 3	Dish	30	N-type
Antenna No.	Antenna Type	Antenna Gain (dBi)	Antenna Connector Type																
Antenna 1	Omni-directional	3	RP-SMA-J																
Antenna 2	Panel	23	MCX																
Antenna 3	Dish	30	N-type																
<i>According to above information, the antennas meet the requirements of this section. The details of antenna plots please refer to section 8 of this report.</i>																			

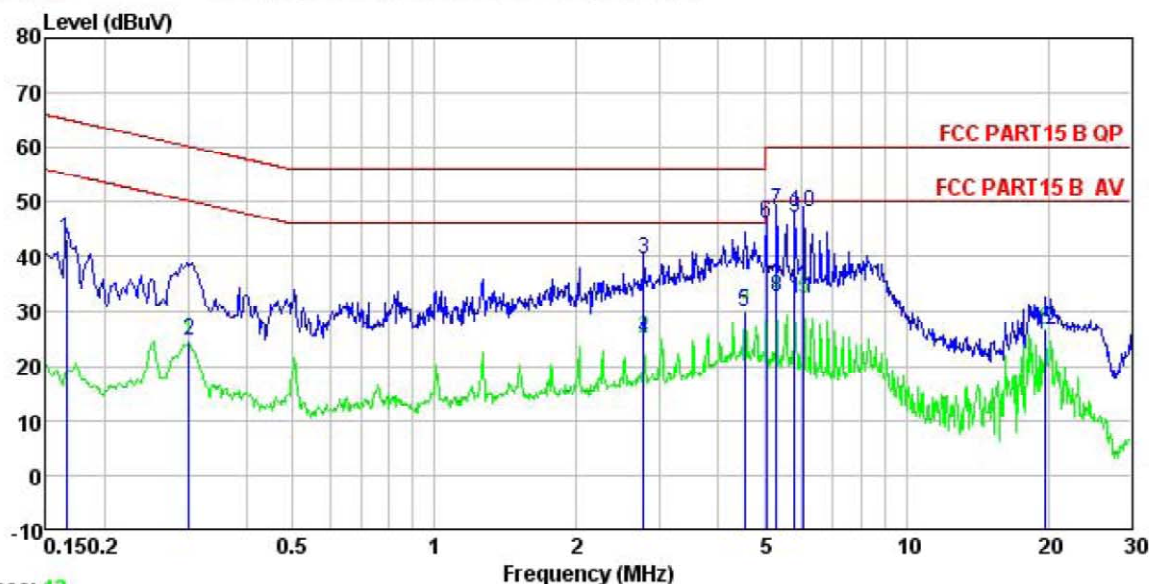
## 6.3 Conducted Emission

Test Requirement:	FCC Part15 C Section 15.207		
Test Method:	ANSI C63.4: 2003		
Test Frequency Range:	150 kHz to 30 MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9 kHz, VBW=30 kHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test procedure	<div>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.), which provides a 50ohm/50uH coupling impedance for the measuring equipment.</div> <div>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</div> <div>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.</div>		
Test setup:	<div><div><div>Reference Plane</div><div><div><div>LISN</div><div>AUX Equipment</div><div>E.U.T</div></div><div>40cm</div><div>80cm</div><div><div>LISN</div><div>Filter</div><div>AC power</div></div><div>EMI Receiver</div></div><div>Test table/Insulation plane</div></div><div><div>Remark:</div><div>E.U.T: Equipment Under Test</div><div>LISN: Line Impedance Stabilization Network</div><div>Test table height=0.8m</div></div></div>		
Test Instruments:	Refer to section 5.6 for details		
Test mode:	Refer to section 5.3 for details Pre-scan all three kinds of antenna, and found the 3 dBi Antenna is the worst Case among the three Antennas.		
Test results:	Passed		

### Measurement Data

POE 1: Model: AY032E-ZF563

Neutral:

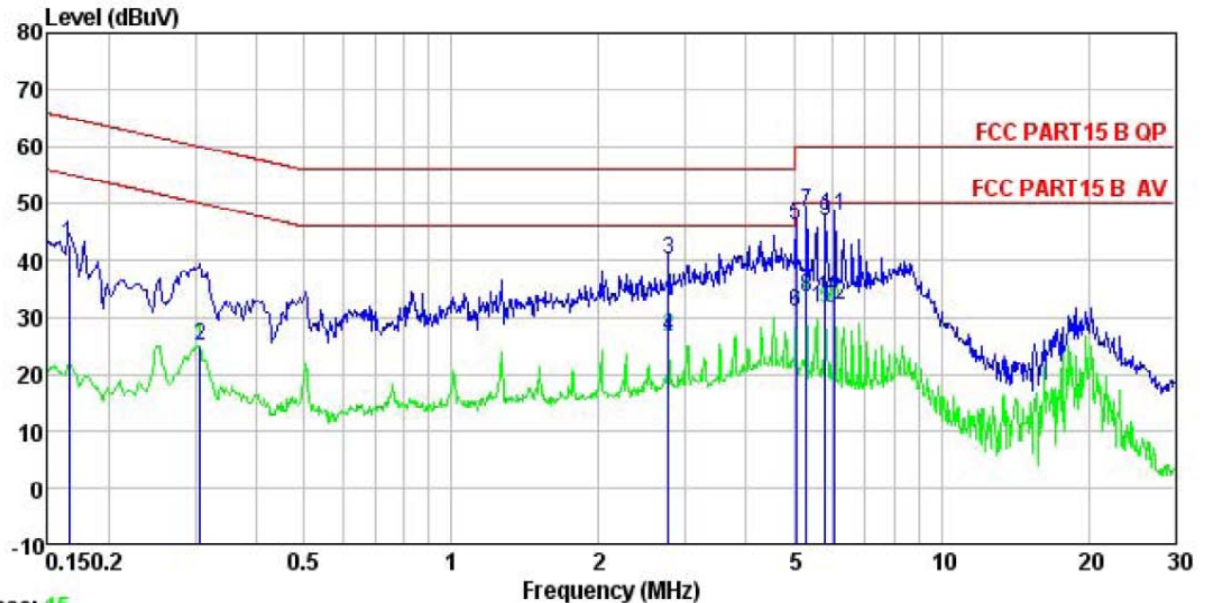


Trace: 13

Site : CCIS Conducted test Site  
 Condition : FCC PART15 B QP LISN NEUTRAL  
 Job. no : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWED-1401  
 Test Mode : Wifi mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa  
 Test Engineer: Winner  
 Remark : POE:AY032E-ZF563

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.166	32.21	0.25	10.77	43.23	65.16	-21.93	QP
2	0.302	13.43	0.26	10.74	24.43	50.19	-25.76	Average
3	2.779	28.34	0.29	10.93	39.56	56.00	-16.44	QP
4	2.779	13.72	0.29	10.93	24.94	46.00	-21.06	Average
5	4.549	18.63	0.28	10.87	29.78	46.00	-16.22	Average
6	5.058	35.03	0.28	10.85	46.16	60.00	-13.84	QP
7	5.305	37.48	0.28	10.84	48.60	60.00	-11.40	QP
8	5.305	21.52	0.28	10.84	32.64	50.00	-17.36	Average
9	5.805	36.13	0.27	10.83	47.23	60.00	-12.77	QP
10	6.056	37.05	0.27	10.82	48.14	60.00	-11.86	QP
11	6.056	20.99	0.27	10.82	32.08	50.00	-17.92	Average
12	19.740	15.49	0.26	10.93	26.68	50.00	-23.32	Average

Line:



Trace: 15

Site : CCIS Conducted test Site  
 Condition : FCC PART15 B QP LISN LINE  
 Job. no : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test Mode : Wifi mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa  
 Test Engineer: Winner  
 Remark : POE:AY032E-ZF563

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.166	31.70	0.27	10.77	42.74	65.16	-22.42	QP
2	0.307	13.95	0.26	10.74	24.95	50.06	-25.11	Average
3	2.779	28.94	0.27	10.93	40.14	56.00	-15.86	QP
4	2.779	15.21	0.27	10.93	26.41	46.00	-19.59	Average
5	5.058	34.99	0.30	10.85	46.14	60.00	-13.86	QP
6	5.058	19.74	0.30	10.85	30.89	50.00	-19.11	Average
7	5.305	37.16	0.30	10.84	48.30	60.00	-11.70	QP
8	5.305	22.24	0.30	10.84	33.38	50.00	-16.62	Average
9	5.805	35.79	0.31	10.83	46.93	60.00	-13.07	QP
10	5.805	20.25	0.31	10.83	31.39	50.00	-18.61	Average
11	6.056	36.66	0.31	10.82	47.79	60.00	-12.21	QP
12	6.056	21.19	0.31	10.82	32.32	50.00	-17.68	Average

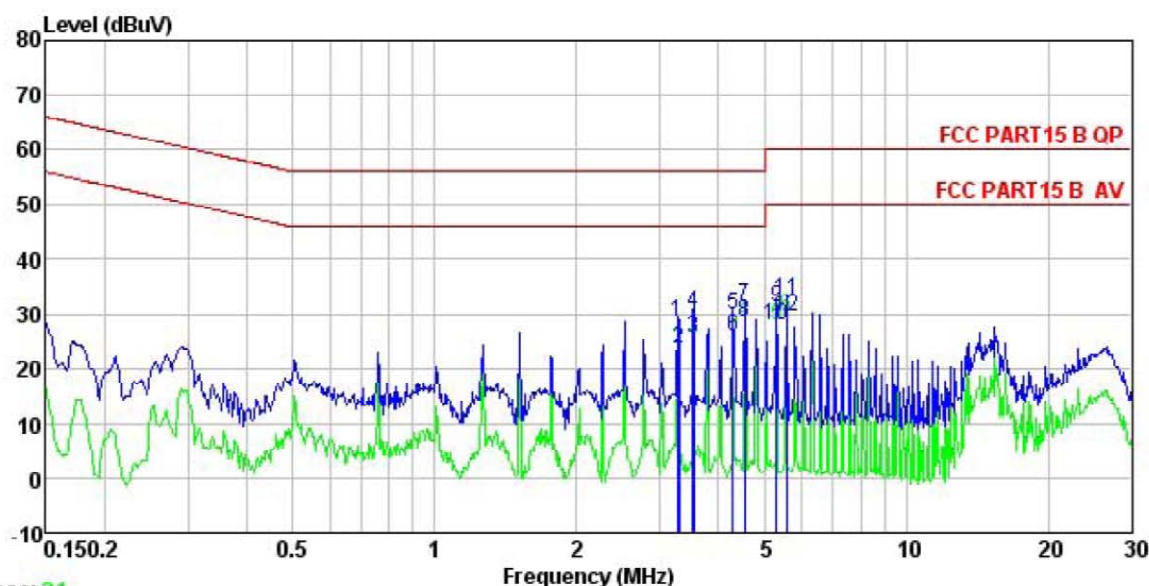
Notes:

1. An initial pre-scan was performed on the live and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss



POE 2: Model: FAS4800070-C55

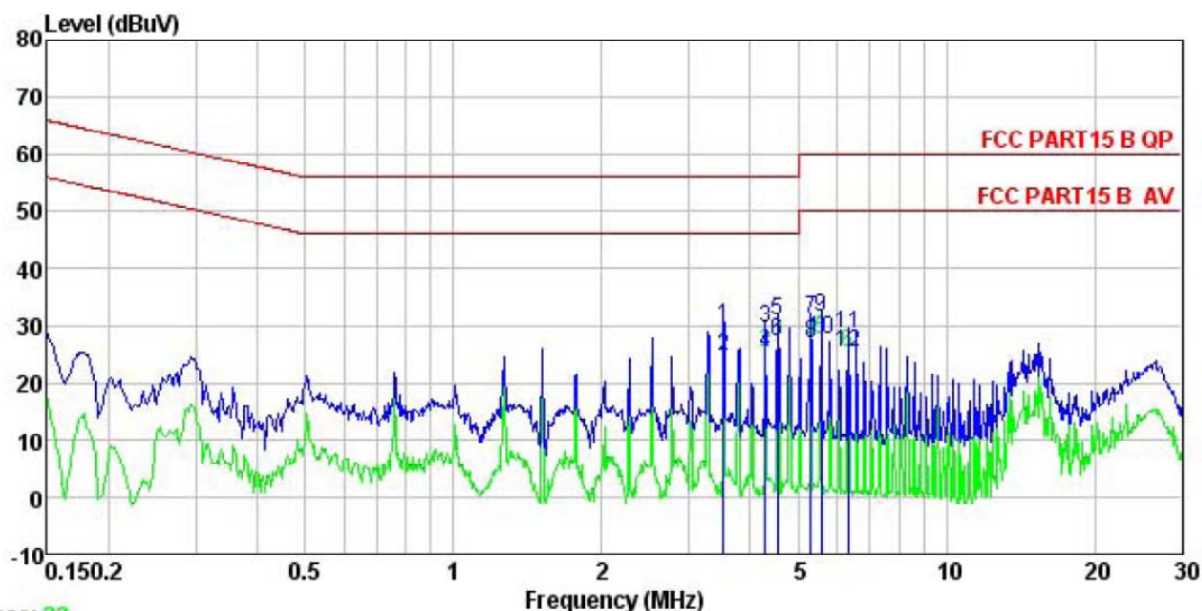
Neutral:



Trace: 21  
 Site : CCIS Conducted test Site  
 Condition : FCC PART15 B QP LISN NEUTRAL  
 Job. no : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test Mode : Wifi mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa  
 Test Engineer: Winner  
 Remark : POE:FAS4800070-C55

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit	Over	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	3.276	17.38	0.29	10.91	28.58	56.00	-27.42	QP
2	3.293	12.29	0.29	10.91	23.49	46.00	-22.51	Average
3	3.528	14.32	0.29	10.90	25.51	46.00	-20.49	Average
4	3.547	18.88	0.29	10.90	30.07	56.00	-25.93	QP
5	4.292	18.72	0.29	10.88	29.89	56.00	-26.11	QP
6	4.292	14.68	0.29	10.88	25.85	46.00	-20.15	Average
7	4.549	20.43	0.28	10.87	31.58	56.00	-24.42	QP
8	4.549	17.40	0.28	10.87	28.55	46.00	-17.45	Average
9	5.305	20.21	0.28	10.84	31.33	60.00	-28.67	QP
10	5.305	16.80	0.28	10.84	27.92	50.00	-22.08	Average
11	5.564	21.24	0.27	10.83	32.34	60.00	-27.66	QP
12	5.564	18.48	0.27	10.83	29.58	50.00	-20.42	Average

Line:



Trace: 23

Site : CCIS Conducted test Site  
 Condition : FCC PART15 B QP LISN LINE  
 Job. no : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test Mode : Wifi mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa  
 Test Engineer: Winner  
 Remark : POE:FAS4800070-C55

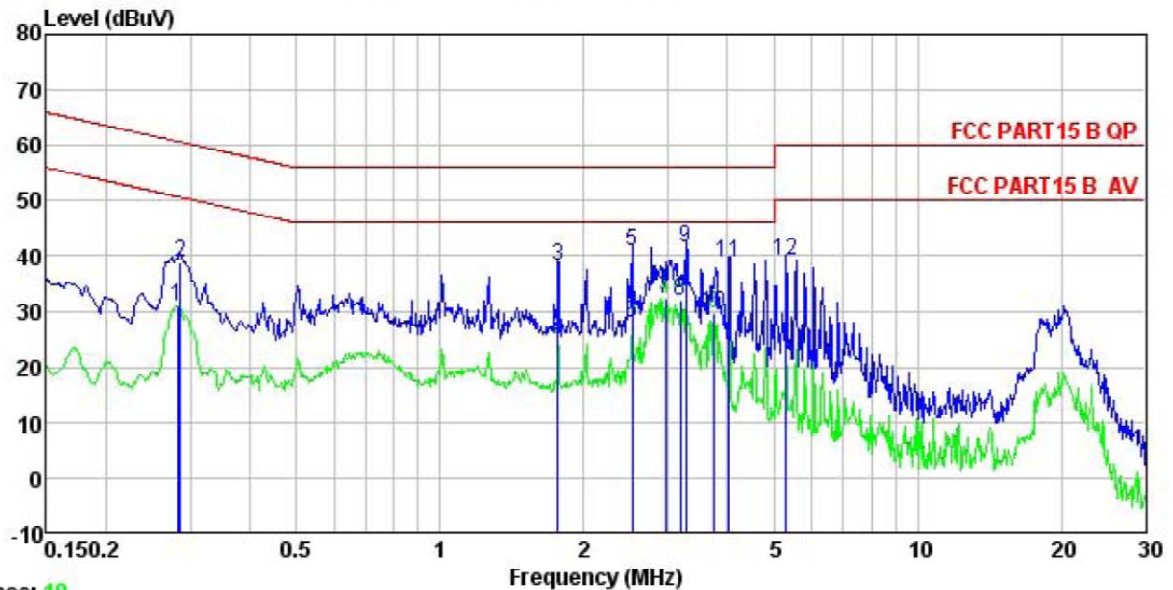
	Read	LISN	Cable	Limit	Over	
Freq	Level	Factor	Loss	Line	Limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB
1	3.528	18.53	0.28	10.90	29.71	56.00 -26.29 QP
2	3.528	13.25	0.28	10.90	24.43	46.00 -21.57 Average
3	4.292	18.35	0.28	10.88	29.51	56.00 -26.49 QP
4	4.292	13.97	0.28	10.88	25.13	46.00 -20.87 Average
5	4.549	19.79	0.29	10.87	30.95	56.00 -25.05 QP
6	4.549	16.10	0.29	10.87	27.26	46.00 -18.74 Average
7	5.305	19.95	0.30	10.84	31.09	60.00 -28.91 QP
8	5.305	15.67	0.30	10.84	26.81	50.00 -23.19 Average
9	5.564	20.28	0.30	10.83	31.41	60.00 -28.59 QP
10	5.564	16.46	0.30	10.83	27.59	50.00 -22.41 Average
11	6.319	17.49	0.31	10.81	28.61	60.00 -31.39 QP
12	6.319	14.17	0.31	10.81	25.29	50.00 -24.71 Average

Notes:

1. An initial pre-scan was performed on the live and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

POE 3: Model: VX-PI1000GB

Neutral:



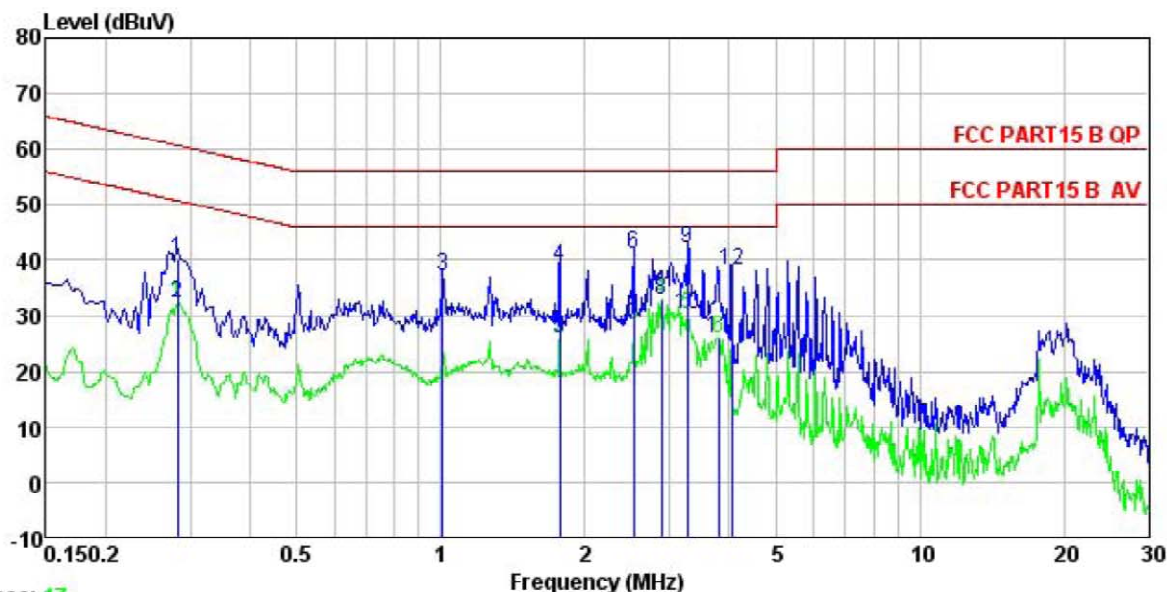
Trace: 19

Site : CCIS Conducted test Site  
 Condition : FCC PART15 B QP LISN NEUTRAL  
 Job. no : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test Mode : Wifi mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa  
 Test Engineer: Winner  
 Remark : POE:VX-PL1000GB

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.282	19.98	0.26	10.74	30.98	50.76	-19.78	Average
2	0.286	27.69	0.26	10.74	38.69	60.63	-21.94	QP
3	1.762	27.09	0.28	10.94	38.31	56.00	-17.69	QP
4	1.762	13.73	0.28	10.94	24.95	46.00	-21.05	Average
5	2.527	29.65	0.29	10.94	40.88	56.00	-15.12	QP
6	2.527	16.64	0.29	10.94	27.87	46.00	-18.13	Average
7	2.962	21.03	0.29	10.92	32.24	46.00	-13.76	Average
8	3.190	20.63	0.29	10.91	31.83	46.00	-14.17	Average
9	3.276	30.35	0.29	10.91	41.55	56.00	-14.45	QP
10	3.759	18.39	0.29	10.90	29.58	46.00	-16.42	Average
11	4.027	27.73	0.29	10.89	38.91	56.00	-17.09	QP
12	5.305	28.02	0.28	10.84	39.14	60.00	-20.86	QP



Line:



Trace: 17

Site : CCIS Conducted test Site  
 Condition : FCC PART15 B QP LISN LINE  
 Job. no : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test Mode : Wifi mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa  
 Test Engineer: Winner  
 Remark : POE:VX-PL1000GB

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.282	29.09	0.26	10.74	40.09	60.76	-20.67	QP
2	0.282	21.22	0.26	10.74	32.22	50.76	-18.54	Average
3	1.010	25.94	0.25	10.87	37.06	56.00	-18.94	QP
4	1.772	27.70	0.26	10.94	38.90	56.00	-17.10	QP
5	1.772	14.55	0.26	10.94	25.75	46.00	-20.25	Average
6	2.527	29.92	0.27	10.94	41.13	56.00	-14.87	QP
7	2.527	16.82	0.27	10.94	28.03	46.00	-17.97	Average
8	2.884	21.70	0.27	10.92	32.89	46.00	-13.11	Average
9	3.276	31.02	0.27	10.91	42.20	56.00	-13.80	QP
10	3.276	18.97	0.27	10.91	30.15	46.00	-15.85	Average
11	3.799	14.74	0.28	10.90	25.92	46.00	-20.08	Average
12	4.049	27.06	0.28	10.89	38.23	56.00	-17.77	QP

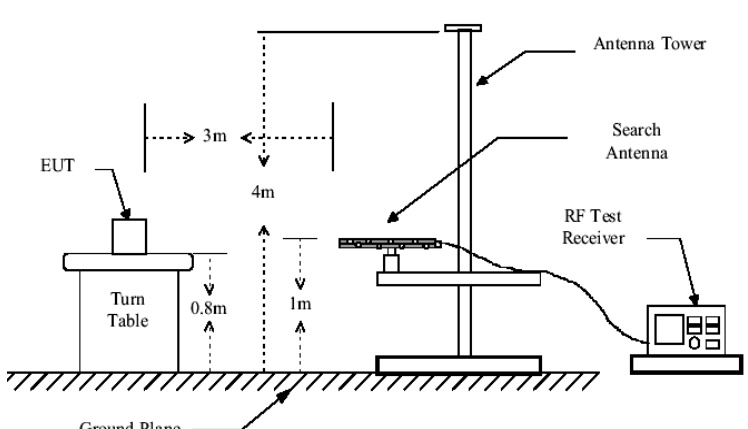
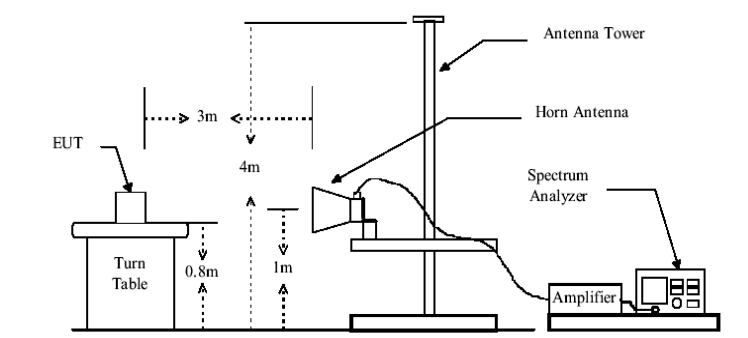
Notes:

1. An initial pre-scan was performed on the live and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

## 6.4 Spurious Emission

### 6.4.1 Radiated Emission Method

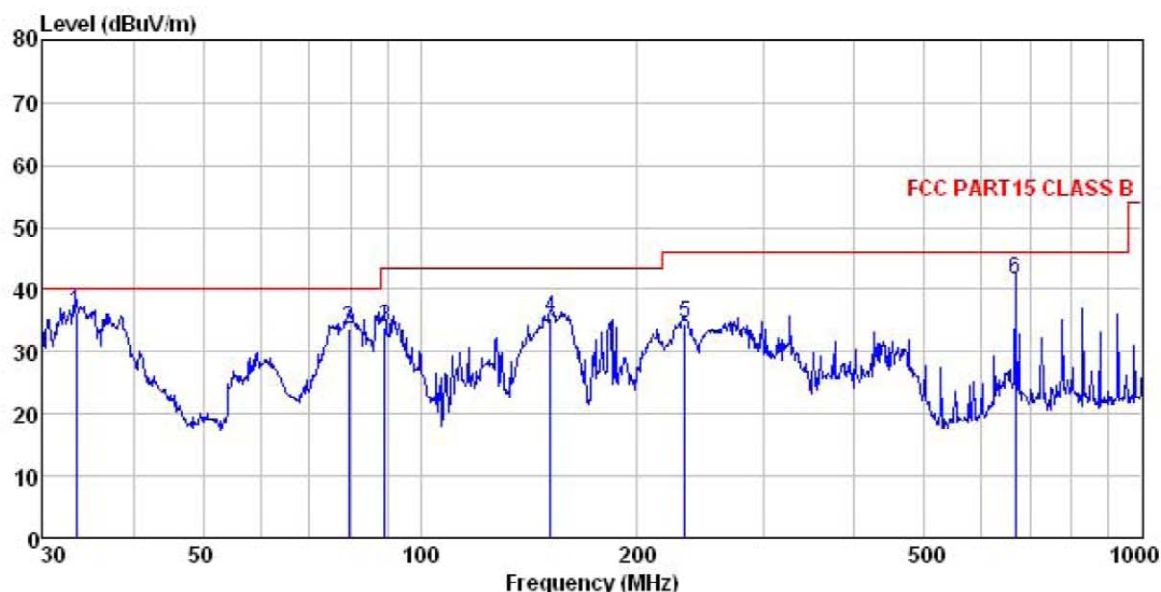
Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.4:2003				
Test Frequency Range:	9KHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-88MHz		40.0		Quasi-peak Value
	88MHz-216MHz		43.5		Quasi-peak Value
	216MHz-960MHz		46.0		Quasi-peak Value
	960MHz-1GHz		54.0		Quasi-peak Value
	Above 1GHz		54.0		Average Value
			74.0		Peak Value
Test Procedure:	<div>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div> <div>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</div> <div>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</div>				

Test setup:	<p>Below 1GHz</p>  <p>Above 1GHz</p> 
Test Instruments:	Refer to section 5.6 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	<ol style="list-style-type: none"> <li>1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.</li> <li>2. 9 kHz to 30MHz is too low, so only shows the data of above 30MHz in this report.</li> <li>3. The 30 dBi Antenna is the Worst Case among the three Antennas.</li> </ol>

## Below 1GHz

POE 1: Model: AY032E-ZF563

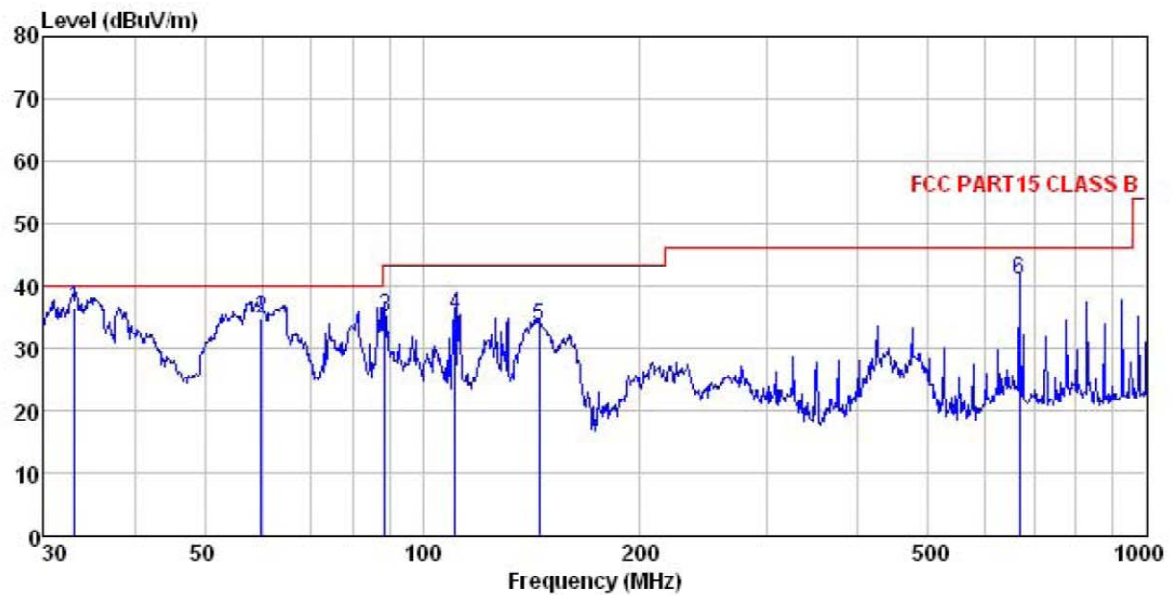
Horizontal:



Site : 3m chamber  
 Condition : FCC PART15 CLASS B 3m VULB9163(30M1G) HORIZONTAL  
 Job No. : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test mode : Wifi TX mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp:25.5°C Humi:55%  
 Test Engineer: Winner  
 Remark : POE:AY032E-ZF563

	Read	Antenna	Cable	Preamp	Level	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
-----	-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	33.328	49.65	12.31	0.98	26.63	36.31	40.00	-3.69 QP
2	79.521	53.54	8.48	1.65	30.13	33.54	40.00	-6.46 QP
3	89.276	50.32	11.76	2.04	30.07	34.05	43.50	-9.45 QP
4	151.597	54.03	8.32	2.53	29.36	35.52	43.50	-7.98 QP
5	232.532	49.60	11.72	2.83	29.67	34.48	46.00	-11.52 QP
6	668.142	49.49	18.69	3.97	30.59	41.56	46.00	-4.44 QP

Vertical:

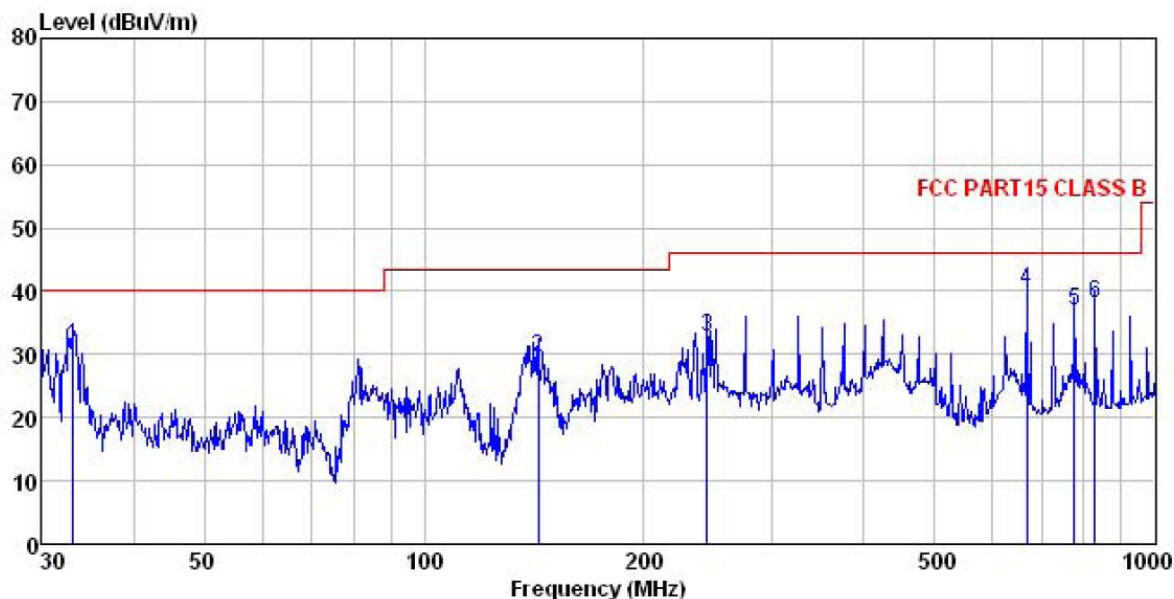


Site : 3m chamber  
 Condition : FCC PART15 CLASS B 3m VULB9163(30M1G) VERTICAL  
 Job No. : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test mode : Wifi TX mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp:25.5°C Humi:55%  
 Test Engineer: Winner  
 Remark : POE:AY032E-ZF563

		ReadAntenna	Cable Preamp		Limit	Over	
Freq	Level	Factor	Loss Factor	Level	Line	Limit	Remark
-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	33.095	49.99	12.31	0.91	26.61	36.60	40.00 -3.40 QP
2	59.859	50.03	12.71	1.38	29.19	34.93	40.00 -5.07 QP
3	88.652	51.77	11.47	2.00	30.08	35.16	43.50 -8.34 QP
4	110.957	51.30	12.04	2.07	29.87	35.54	43.50 -7.96 QP
5	144.842	52.34	8.23	2.45	29.30	33.72	43.50 -9.78 QP
6	668.142	49.00	18.69	3.97	30.59	41.07	46.00 -4.93 QP

POE 2: Model: FAS4800070-C55

Horizontal:

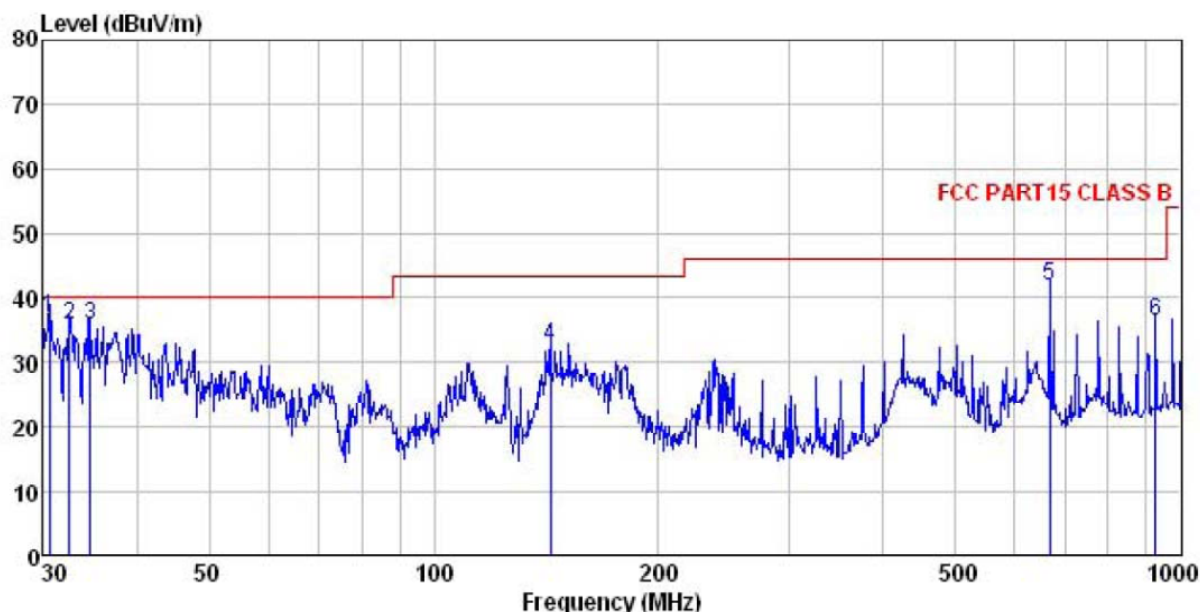


Site : 3m chamber  
 Condition : FCC PART15 CLASS B 3m VULB9163(30M1G) HORIZONTAL  
 Job No. : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test mode : Wifi TX mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp:25.5°C Humi:55%  
 Test Engineer: Winner  
 Remark : POE:FAS4800070-C55

	Freq	Read	Antenna	Cable	Preamplifier	Level	Limit	Over	
	MHz	Level	Factor	Loss	Factor	dBuV/m	dBuV/m	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	33.095	44.80	12.31	0.91	26.61	31.41	40.00	-8.59	QP
2	143.326	48.12	8.22	2.44	29.33	29.45	43.50	-14.05	QP
3	244.232	47.59	12.08	2.82	29.62	32.87	46.00	-13.13	QP
4	668.142	48.17	18.69	3.97	30.59	40.24	46.00	-5.76	QP
5	776.878	43.30	19.77	4.35	30.45	36.97	46.00	-9.03	QP
6	827.493	43.75	20.37	4.26	30.33	38.05	46.00	-7.95	QP



Vertical:

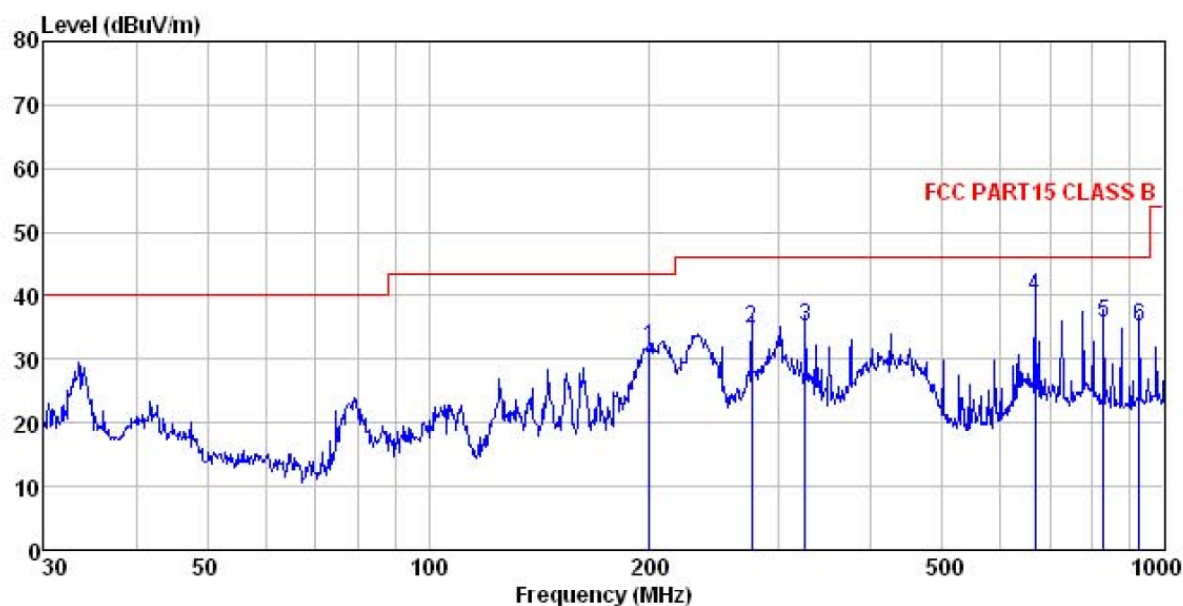


Site : 3m chamber  
 Condition : FCC PART15 CLASS B 3m VULB9163(30M1G) VERTICAL  
 Job No. : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWED-1401  
 Test mode : Wifi TX mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp:25.5°C Humi:55%  
 Test Engineer: Winner  
 Remark : POE:FAS4800070-C55

	Freq	ReadAntenna	Cable	Preamp	Limit	Over	
		Level	Factor	Loss	Factor	Level	Line
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
							dB
1	30.531	50.15	12.33	0.78	26.32	36.94	40.00
2	32.520	48.95	12.31	0.91	26.54	35.63	40.00
3	34.639	49.10	12.30	1.04	26.75	35.69	40.00
4	143.326	51.19	8.22	2.44	29.33	32.52	43.50
5	668.142	49.85	18.69	3.97	30.59	41.92	46.00
6	925.756	41.13	21.28	3.96	30.04	36.33	46.00

## POE 3: Model: VX-PI1000GB

Horizontal:

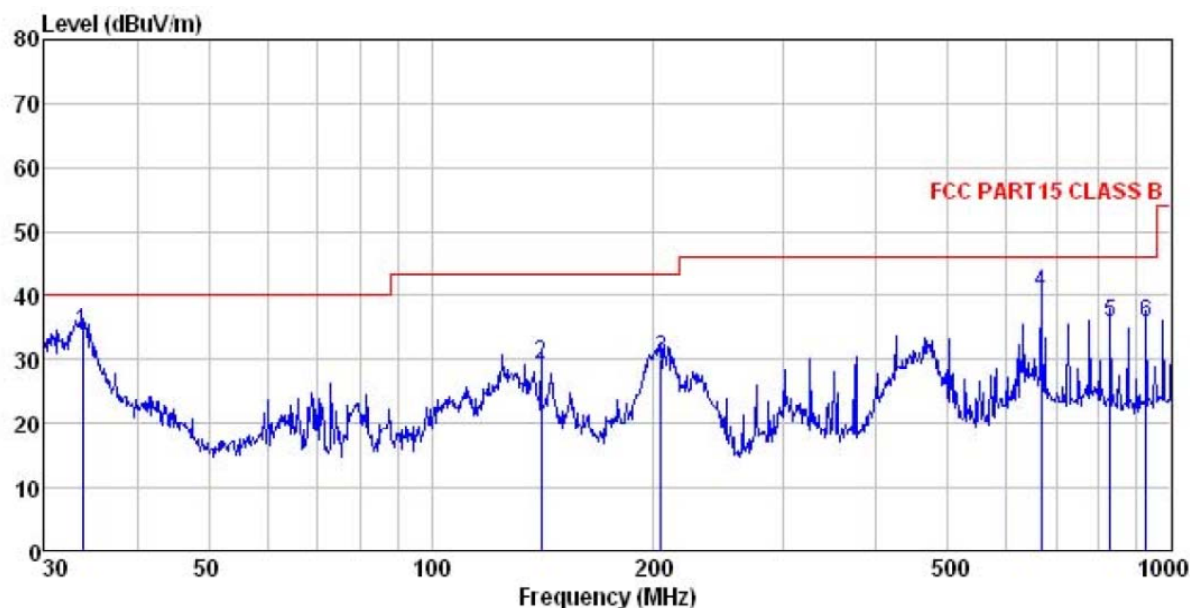


Site : 3m chamber  
 Condition : FCC PART15 CLASS B 3m VULB9163(30M1G) HORIZONTAL  
 Job No. : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test mode : Wifi TX mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp:25.5°C Humi:55%  
 Test Engineer: Winner  
 Remark : POE:VX-PI1000GB

	Freq	Read	Antenna	Cable	Preamp	Level	Limit	Over	
		Level	Factor	Loss	Factor		Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	199.986	48.37	10.57	2.87	29.81	32.00	43.50	-11.50	QP
2	275.157	48.95	12.55	2.87	29.51	34.86	46.00	-11.14	QP
3	325.596	47.94	13.59	3.02	29.56	34.99	46.00	-11.01	QP
4	668.142	47.81	18.69	3.97	30.59	39.88	46.00	-6.12	QP
5	827.493	41.52	20.37	4.26	30.33	35.82	46.00	-10.18	QP
6	925.756	39.81	21.28	3.96	30.04	35.01	46.00	-10.99	QP



Vertical:



Site : 3m chamber  
 Condition : FCC PART15 CLASS B 3m VULB9163(30M1G) VERTICAL  
 Job No. : 502RF  
 EUT : Broadband Digital Transmission System  
 Model : FWBD-1401  
 Test mode : Wifi TX mode  
 Power Rating : AC 120V/60Hz  
 Environment : Temp:25.5°C Humi:55%  
 Test Engineer: Winner  
 Remark : POE:VX-PI1000GB

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	33.799	47.64	12.31	0.98	26.67	34.26	40.00	-5.74 QP
2	140.835	47.83	8.20	2.41	29.36	29.08	43.50	-14.42 QP
3	204.238	46.39	10.70	2.87	29.79	30.17	43.50	-13.33 QP
4	668.142	48.34	18.69	3.97	30.59	40.41	46.00	-5.59 QP
5	827.493	41.36	20.37	4.26	30.33	35.66	46.00	-10.34 QP
6	925.756	40.39	21.28	3.96	30.04	35.59	46.00	-10.41 QP

-----End of report-----