AW-CM276NF-EVB

IEEE 802.11 2X2 a/b/g/n/ac Wireless LAN and

Bluetooth 5.1

M.2 1216 LGA module

User Guide

Rev. 02

(For Standard)

Revision History

Version	Revision Date	Description	Initials	Approved
01	2021/04/21	● Initial Version	Renton Tao	N.C. Chen
02	2021/06/09	● Add UART bring up through bridge IC ● Change recommended Linux OS version to Ubuntu 16.04	Renton Tao	N.C. Chen

AzureWave Technologies, Inc.

Contents

1. System Setup

1.1 Hardware Requirements

- AW-CM276NF-EVB (EVB for AW-CM276NF)
- Host system need running the Linux operating system (Ubuntu16.04).
- Windows system for Labtool.
- Vector Signal Analyzer/WLAN analyzer for transmit measurements.
- WLAN signal generator for receiver measurements.
- RF isolation chamber for receive measurements.
- RF attenuators
- RF cable

1.2 Software Requirements

For Linux using SD-WLAN-SD-BT-8997…pxx.tar

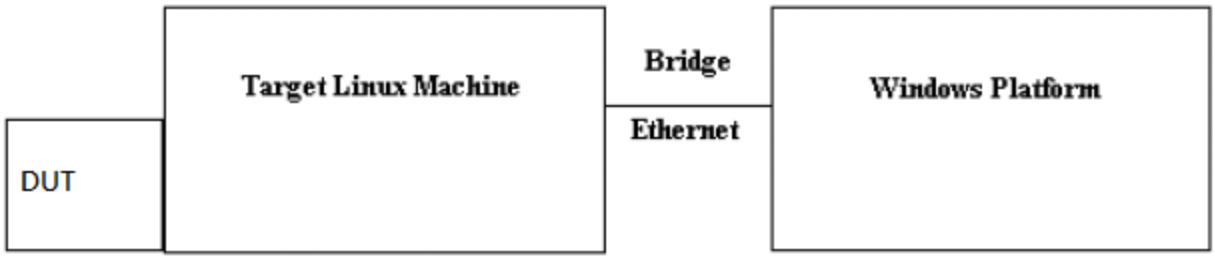
- Download and unzip the driver release package : SD-WLAN-SD-BT-8997…pxx.tar
- Download MFG SW "MFG-W8997-MF-WIFI-BT-BRG-FC-VS2013-1.1.0.168-A1-16.80.205.p168" release package from NXP Extranet website and unzip it

For Windows have to run in 64bit Windows OS

- Download MFG release package "MFG-W8997-MF-WIFI-BT-BRG-FC-VS2013-1.1.0.168-A1-16.80.205.p168"

1.3 Environment set up and Bridge Mode Tool

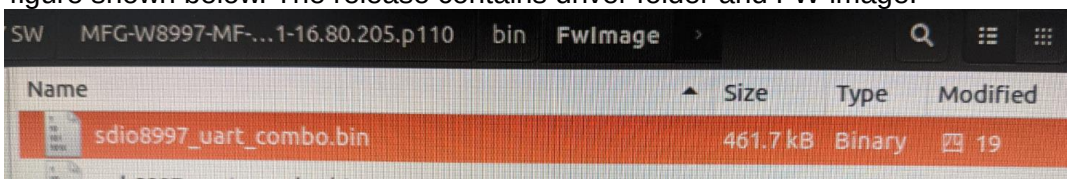
The “Manufacturing Bridge” refers to the application that allows a user to send commands between Target platform and Windows 7 platform. The environment enables the user to test performance of the AW-CM276NF-EVB.



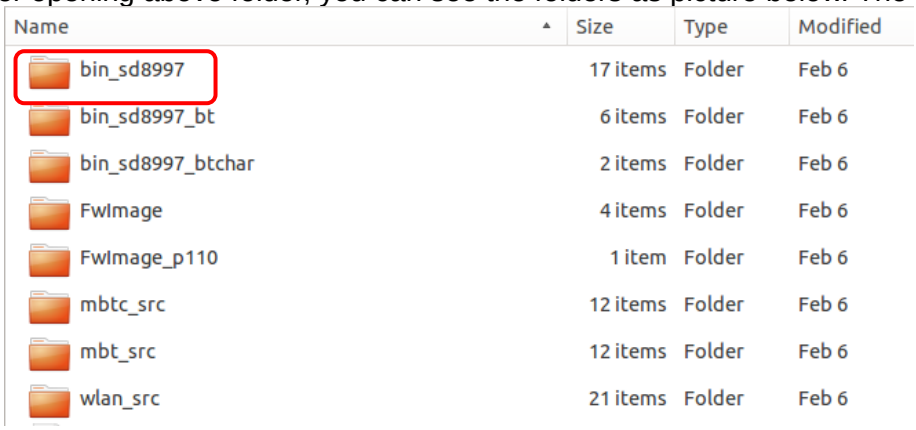
Manufacturing Bridge mode

1.3.1 Linux PC set up (Ubuntu 16.04)

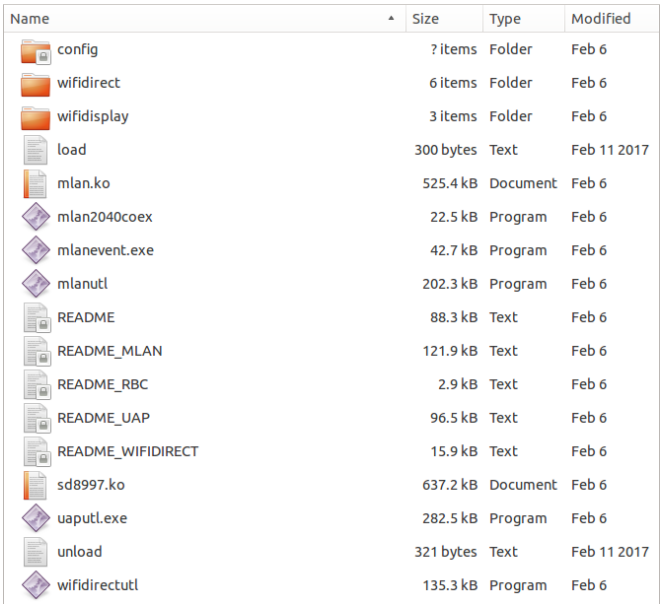
(1) Driver Folder Contents
Download the latest driver package release from NXP and unzip it. The driver folder should look similar to the figure shown below. The release contains driver folder and FW image.



After opening above folder, you can see the folders as picture below. The working direction is “bin_sd8997”.



In this folder, it includes pre-built driver file and quick start script as below picture.



Name	Size	Type	Modified
config	? items	Folder	Feb 6
wifidirect	6 items	Folder	Feb 6
wifidisplay	3 items	Folder	Feb 6
load	300 bytes	Text	Feb 11 2017
mlan.ko	525.4 kB	Document	Feb 6
mlan2040coex	22.5 kB	Program	Feb 6
mlanevent.exe	42.7 kB	Program	Feb 6
mlanutl	202.3 kB	Program	Feb 6
README	88.3 kB	Text	Feb 6
README_MLAN	121.9 kB	Text	Feb 6
README_RBC	2.9 kB	Text	Feb 6
README_UAP	96.5 kB	Text	Feb 6
README_WIFIDIRECT	15.9 kB	Text	Feb 6
sd8997.ko	637.2 kB	Document	Feb 6
uaputl.exe	282.5 kB	Program	Feb 6
unload	321 bytes	Text	Feb 11 2017
wifidirectutl	135.3 kB	Program	Feb 6

On the given Host Linux system, the following files have to be transferred & reside on the system.
(Transfer the files over via flash memory or tftp over the host.)
Place the firmware in /lib/firmware/mrvl/
Ex. sdio8997_uart_combo.bin (for SDIO/UART interface)

The user may need to compile the driver per your specific Linux OS and Kernel. This is due to that the driver is dependent on the actual OS and kernel version. This next section will describe the steps needed to be done before you can install the driver and run it.
Go to the subdirectory wlan_src
*Make sure to have kernel headers and kernel libs before executing the “make” commands below.

```
make clean
make build
```

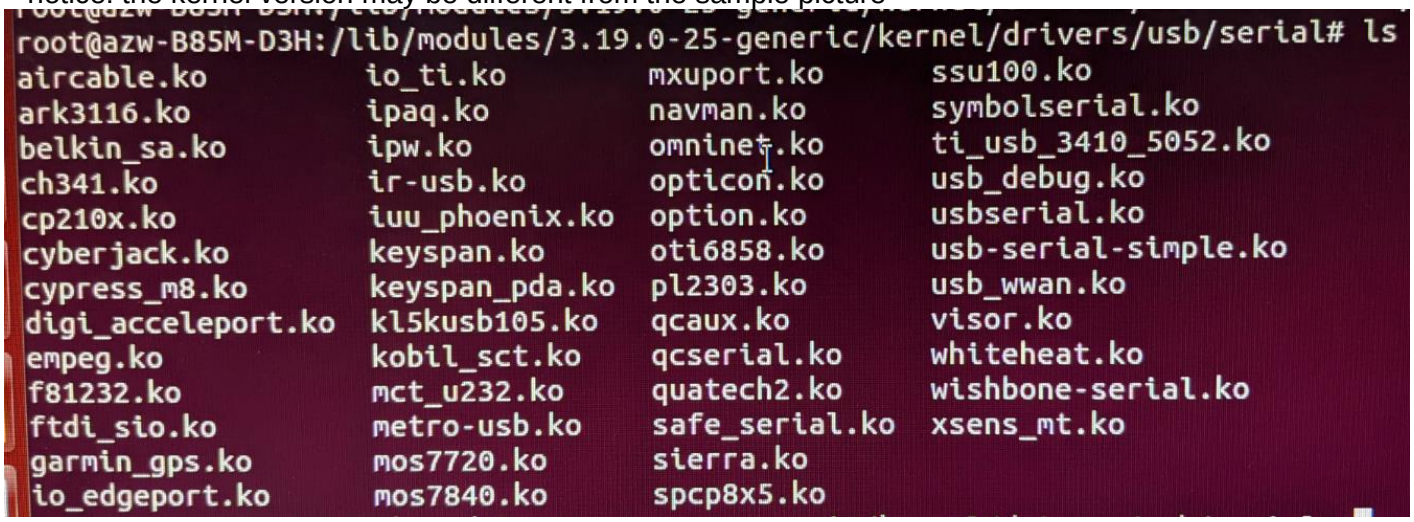
Go up one folder to copy both *.ko files to your directory in where you have the other files in where you want to run the insmod command.

Here is the sample list of files (as a minimum) at 1 location:
bridge_init.conf
mfgbridge
mlan.ko
sd8997.ko

(2) Driver for UART-to-USB bridge IC(PL2303GC)

Update pl2303.ko driver to below direction and replace the original one.

*you can contact with Azurewave FAE for pl2303.ko file.
**notice: the kernel version may be different from the sample picture



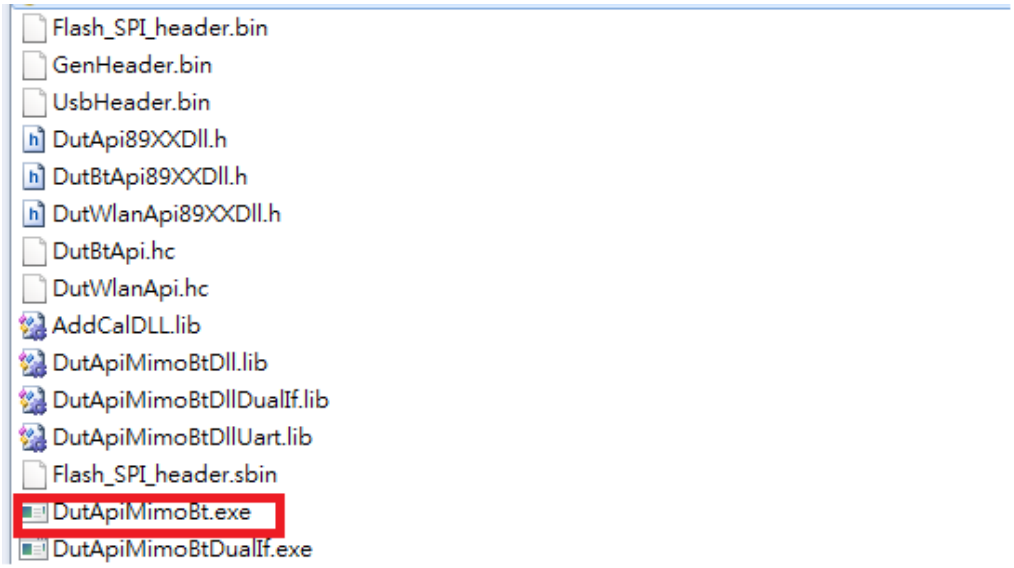
Input below cmds by terminal before connecting to AW-CM276NF-EVB's UART-to-USB port.

Insmod usbserial.ko
Insmod pl2303.ko

Connect USB-to-UART type C port to your PC and input "dmesg" to check if device ttyUSBx is generated successfully.

1.3.2 Windows PC set up

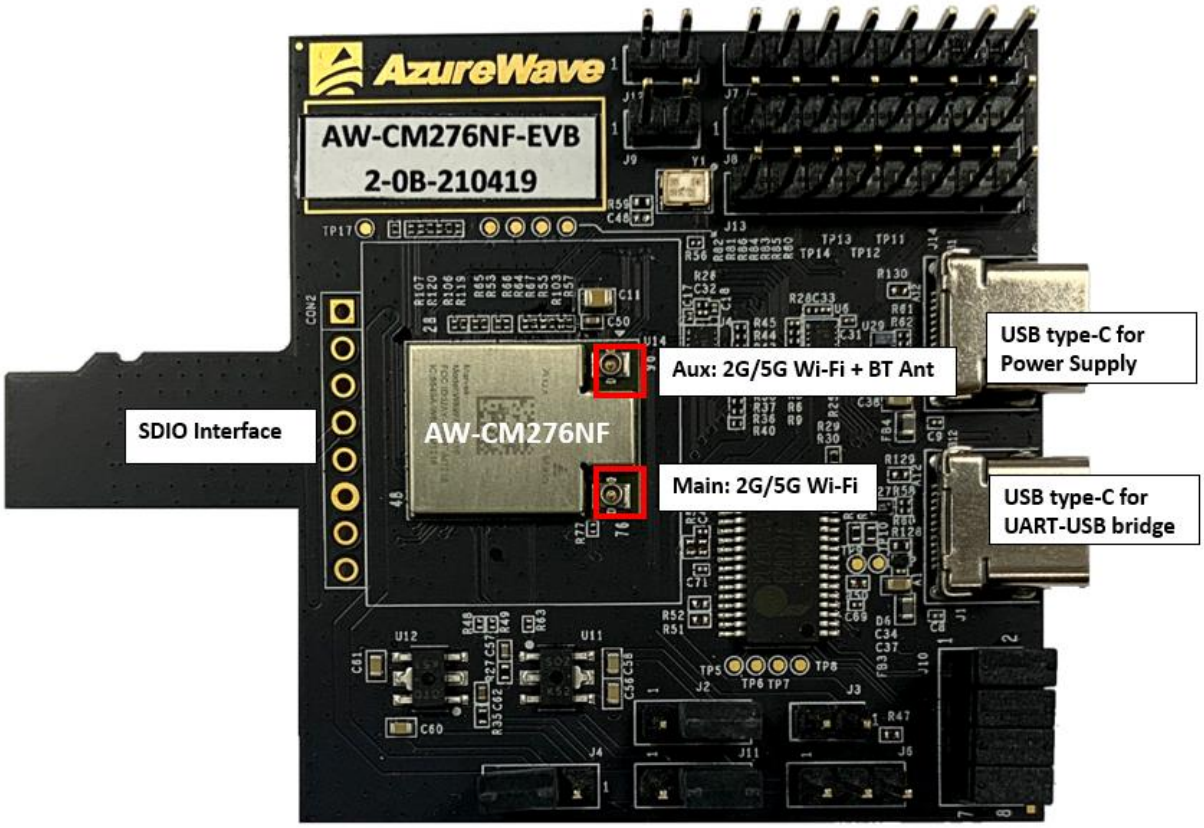
Within the internal folder is the labtool and other folders. For this document's purpose, only the details of the labtool folder will be discussed. The contents of the labtool folder are shown below.



The Labtool executable is labeled (DutApiMimoBt.exe)

2. WLAN/Bluetooth RF Test

2.1 Setup RF Test



*Please confirm that Computer's WiFi and BT had closed

1 The bridge PC have to run in Linux OS Ubuntu 16.04
2 Prepare AW-CM276NF-EVB, insert DUT.
  2.1 VBAT supply
    For SDIO supply VBAT, please connect J2(1-2).
    For USB supply VBAT, please connect J2(2-3).
  2.2 VDDIO supply
    For 3.3V supply VDDIO, please connect J4(2-3)
    For 1.8V supply VDDIO, please connect J4(1-2)
  2.3 VIO_SD supply
    For 3.3V supply VIO_SD, please connect J11(2-3)
    For 1.8V supply VIO_SD, please connect J11(1-2)
3 Open terminal, press command: $**sudo su**
4 To bring up DUT:
  # modprobe cfg80211
  # insmod mlan.ko
  # insmod sd8997.ko mfg_mode=1 cal_data_cfg=none fw_name=mrvl/sdio8997_uart_combo.bin

5 To bring up Bluetooth

```
# hciattach /dev/ttyUSB0 any 115200 flow
```

6 After success bring up, try below command to connect to other devices

```
# hcitool /dev/ttyUSB0 scan
```

7 Open bridge for labtool

```
# ./mfgbridge -B
```

8 To confirm success to bring up WiFi, please key “ifconfig mlan0”

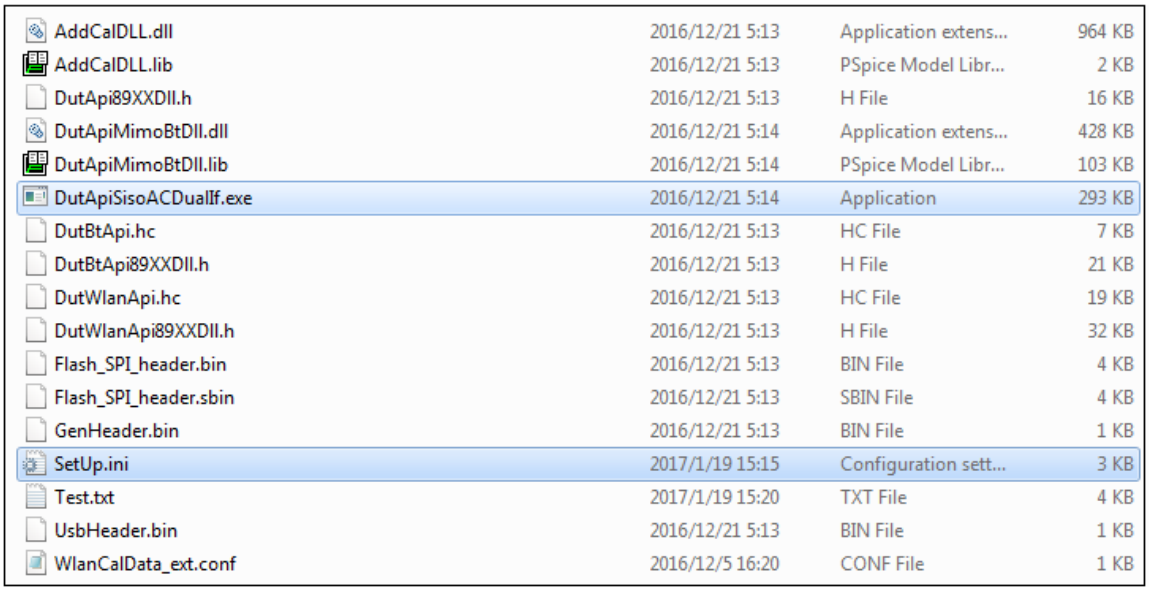
9 To confirm success to bring up Bluetooth, please key “hciconfig”

2.2 Setup for RF Tx/Rx Performance Test

The host PC have to run in Windows OS

Download MFG release package “MFG-W8997-MF-WIFI-BT-BRG-FC-VS2013-1.1.0.168-A1-16.80.205.p168” from NXP extranet website and unzip it.

Copy the “labtool” folder to the host PC .The Labtool folder content are shown in below.



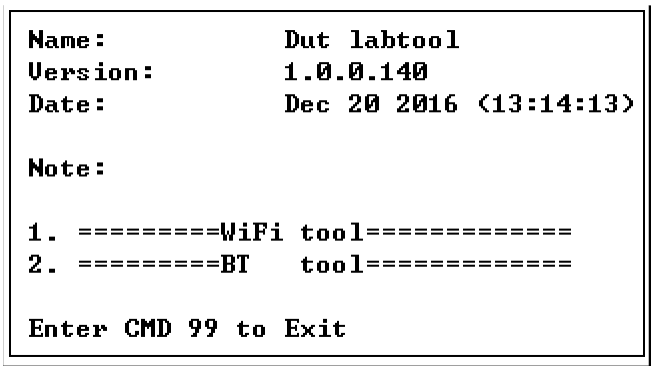
Open the “SetUp.ini” file using a text editor such as Notepad. Edit the “SetUp.ini” file as shown below. The parameter “DutIpAddress” will be the IP address of DUT. The parameter “HostIPAddress” will be the IP address of the Windows host PC.

```
[DutIp]
DutIpAddress = 192.168.0.10
HostIpAddress = 192.168.0.58
```

In the “SetUp.ini” file, the parameter “NO_EEPROM” is used for specifying the calibration data storage option. The default value is “2” (OTP support). For general RF evaluation and test, the user needs to set the parameter as “1” which is file option to use calibration data from external file. If the calibration data is already stored in on-chip OTP memory then the default value of ‘2” can be used.

[DutInitSet]
0 - EEPROM support
1 - NO_EEPROM support 2 - OTP support NO_EEPROM=1
NoEepromBtFlexFileName = WlanCalData_ext.conf
NoEepromWlanFlexFileName = WlanCalData_ext.conf

Make sure that the Bridge application is running prior to starting Labtool application. To start the Labtool application, double click on “DutApiMimoBt.exe”.
Enter “1” at the command prompt to start operating WiFi radio or “2” to start operating Bluetooth radio



Start WiFi Performance Test

3. Labtool command guide

3.1 Generate 802.11ac/a/b/g/n Packet commands

a. Tx on CH 6 at 10 dBm with a CCK-11Mbps data rate in 20 MHz BW mode on path A

```
25                  // Stop Tx
10 1 1              // Set Path A Only
30 0                // Set to 2.4 GHz Band
112 0               // Set to 20 MHz BW
22 0 6 10 0         // Set to CH 6 at 10 dBm Output Power with CCK/BPSK Data Rate on Path A

25 1 4              // Tx at 11 Mbps
```

---

b. Tx on CH 6 at 10 dBm with a CCK-11Mbps data rate in 20 MHz BW mode on path B

```
25                  // Stop Tx
10 2 2              // Set Path B Only
30 0                // Set to 2.4 GHz Band
112 0               // Set to 20 MHz BW
22 1 6 10 0         // Set to CH 6 at 10 dBm Output Power with CCK/BPSK Data Rate on Path B
25 1 4              // Tx at 11 Mbps
```

---

c. Tx on CH 6 at 10 dBm with a OFDM-54Mbps data rate in 20 MHz BW mode on path B

```
25                  // Stop Tx
10 2 2              // Set Path B Only
30 0                // Set to 2.4 GHz Band
112 0               // Set to 20 MHz BW
22 1 6 10 1         // Set to CH 6 at 10 dBm Output Power with OFDM(a mode or g mode) Data Rate on Path B
25 1 13            // Tx at 54 Mbps
```

---

d. Tx on CH 36 at 8 dBm with a MCS7 Data rate in 20 MHz BW Mode on Path A

```
25                  // Stop Tx
10 1 1              // Set Path A
30 1                // Set to 5 GHz Band
112 0               // Set to 20 MHz BW
22 0 36 8 2         // Set to CH 36 at 8 dBm Output Power with OFDM(n or ac mode) Data Rate on Path A
25 1 22             // Tx at MCS 7
```

---

e. Tx on CH 36-40 at 12 dBm with a MCS7 Data rate in 40 MHz BW Mode on Path A

```
25                  // Stop Tx
10 1 1              // Set Path A
30 1                // Set to 5 GHz Band
112 1               // Set to 40 MHz BW
22 0 36 12 2        // Set to CH 36-40 at 12 dBm Output Power with OFDM(n or ac mode) Data Rate on path A
```

25 1 22 // Tx at MCS 7

---

f. Tx on CH 42(5210MHz) at 11 dBm with a MCS9 Data rate in 80 MHz BW Mode on Path A

25 // Stop Tx
10 1 1 // Set Path A
30 1 // Set to 5 GHz Band
112 4 // Set to 80 MHz BW
22 0 36 11 2 // Set to CH 42 at 11 dBm Output Power with OFDM(n or ac mode)Data Rate on path A
25 1 110 // Tx at MCS 9

3.2 Data rate set up

B mode & G mode:

1Mbps	2Mbps	5.5Mbps	11Mbps	6Mbps	9Mbps	12Mbps	18Mbps
1	2	3	4	6	7	8	9
24Mbps	36Mbps	48Mbps	54Mbps				
10	11	12	13				

N mode:

MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
15	16	17	18	19	20	21	22

AC mode:
VHT Data Rates:

101 for VHT_SS1_MCS0
102 for VHT_SS1_MCS1
103 for VHT_SS1_MCS2
104 for VHT_SS1_MCS3
105 for VHT_SS1_MCS4
106 for VHT_SS1_MCS5
107 for VHT_SS1_MCS6
108 for VHT_SS1_MCS7
109 for VHT_SS1_MCS8
110 for VHT_SS1_MCS9
111 for VHT_SS2_MCS0
112 for VHT_SS2_MCS1
113 for VHT_SS2_MCS2
114 for VHT_SS2_MCS3
115 for VHT_SS2_MCS4
116 for VHT_SS2_MCS5
117 for VHT_SS2_MCS6
118 for VHT_SS2_MCS7
119 for VHT_SS2_MCS8
120 for VHT_SS2_MCS9

After you type above command, you can measure the 802.11a/b/g/n/ac packet by your RF test

instrument (exp: Agilent 4010, IQview…).

3.3 Generate 802.11a/b/g/n/ac continuous symbol Commands

a. Cont. Tx on CH 36 at 8 dBm with a MCS7 Data rate in 20 MHz BW Mode on Path A

```
17                  // Stop Cont. Tx
25                  // Stop Tx
10 1 1              // Set Path A
30 1                // Set to 5 GHz Band
112 0               // Set to 20 MHz BW
22 0 36 8 2         // Set to CH 36 at 8 dBm Output Power with OFDM Data Rate on Path A
25 1 22             // Tx at MCS 7
25                  // Stop Tx
17 1 22             // Cont. Tx at MCS7
17              // Stop Cont. Tx
```

3.4 Test RX sensitivity Commands

a. Rx on CH 157 in 20 MHz BW Mode on both Path A

```
25                  // Stop Tx
10 1 1              // Set to Path A
30 1                // Set to 5 GHz Band
112 0               // Set to 20 MHz BW
12 157              // Set to CH 157
31                  // Clear all the received packets
32              // Get Rx Packet Count and then clear the Rx packet counter
```

3.5 Other Commands

(1) **Command 45**→ Check the MAC
(2) **Command 99**→ Quit the test mode/ Quit the MFG tool

3.6 BT test mode Commands

This is how we test our BT: let BT enter test mode, then connect to tester for testing.
(1) Command 45→Check BT MAC.
(2) Command 78 1→BT enter test mode.

After you type above command, you can measure BT signal both TX/RX and the other BT test items by your BT instrument.

4. Setup Throughput Test

START MEASURING WLAN THROUGHPUT

The throughput measurement shows the performance of the TCP/IP layer over the wireless link. To achieve the best results, run the measurement test in a clean environment with as little interference as possible. The test can be run with the adapter connected to either an Infrastructure network (see Fig. 1) or an ad hoc network (see Fig. 2). An AP that is known to be in good working order should be used for the infrastructure mode test.

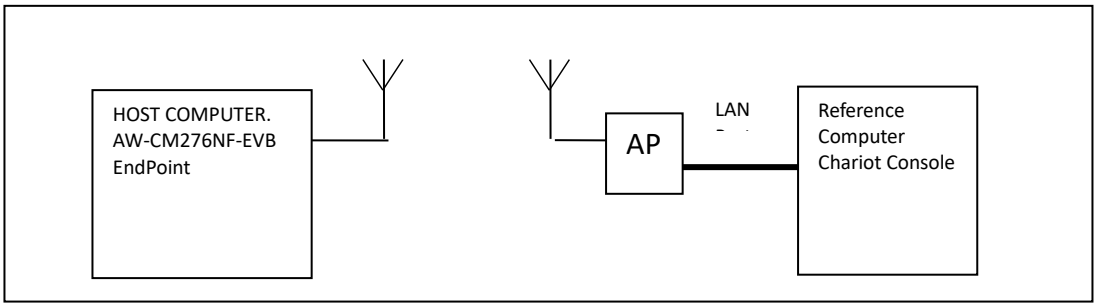


FIG. 1

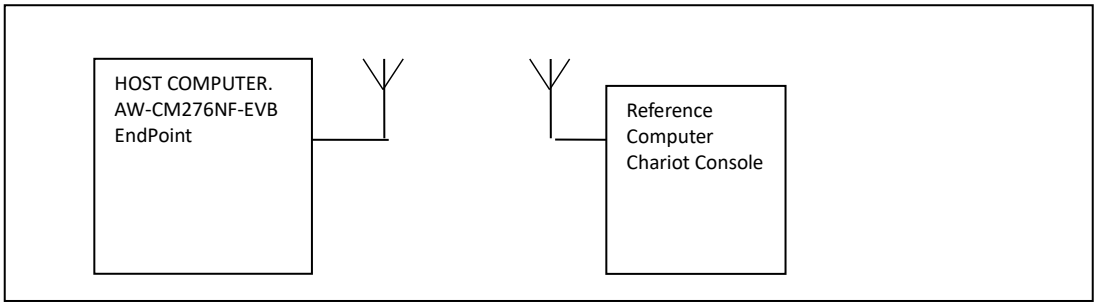


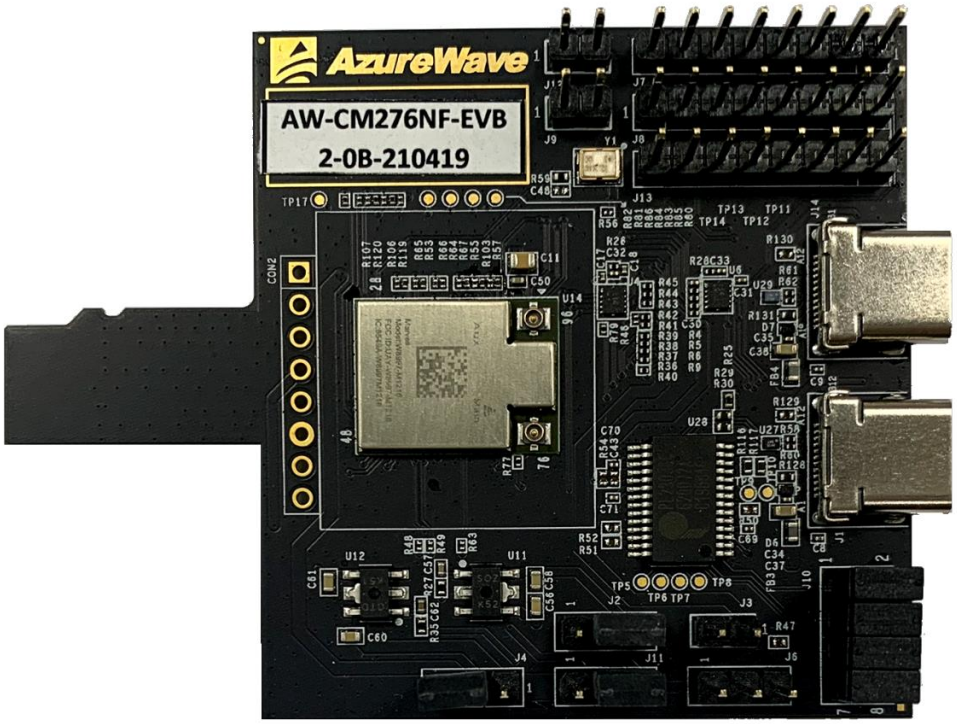
FIG. 2

MEASURING THROUGHPUT USING NETIQ CHARIOT

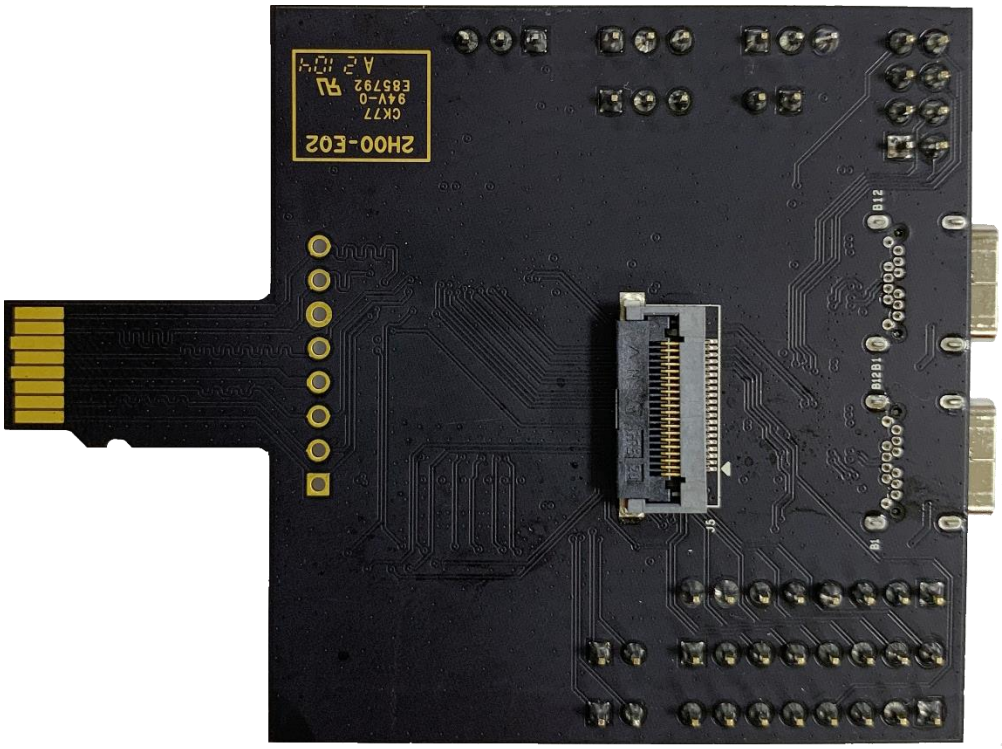
Test Procedure

1 Bring up the AW-CM276NF-EVB demo boar with the IP address set as 192.168.1.110.
2 Connect the reference computer with Chariot Console, which is assigned an IP address of 192.168.1.100, to the LAN port of the AP
3 Verify that communication exists between the reference computer and the AW-CM276NF-EVB demo board by pinging **192.168.1.100** from the AW-CM276NF-EVB host console.
4 Set up Chariot.
   a. On the host computer, activate EndPoint:
   b. Using Chariot Console on the reference computer, create two pair groups (192.168.1.100 and 192.168.1.110) using the Chariot Throughput.scr script. Run the throughput test for a specified period of time and observe the results.

5. Physical Figure of EVB



Top View



Bottom View

6. Reference Schematics of EVB