

AW-XM643-SUR

IEEE 802.11 a/b/g/n/ac/ax Wi-Fi 6E

+ Bluetooth 6.0 Combo Module

User Guide

Rev. 0.2

(For Standard)

Revision History

Version	Revision Date	Description	Initials	Approved
A	2024/10/30	● Initial Version	YuFu Chen	NC Chen
B	2026/06/30	● integration instructions	Tom Hsieh	NC Chen

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1. Overview

1.1. Device supported

This document supports AW-XM643-SUR.

2. System Setup

2.1. Hardware Requirements

- AW-XM643-SUR Module
- Host system need running the Linux operating system
- Vector Signal Analyzer/WLAN analyzer for transmit measurements
- WLAN signal generator for receiver measurements.
- RF isolation chamber for receive measurements.
- RF attenuators
- RF cable

2.2. Software Requirements

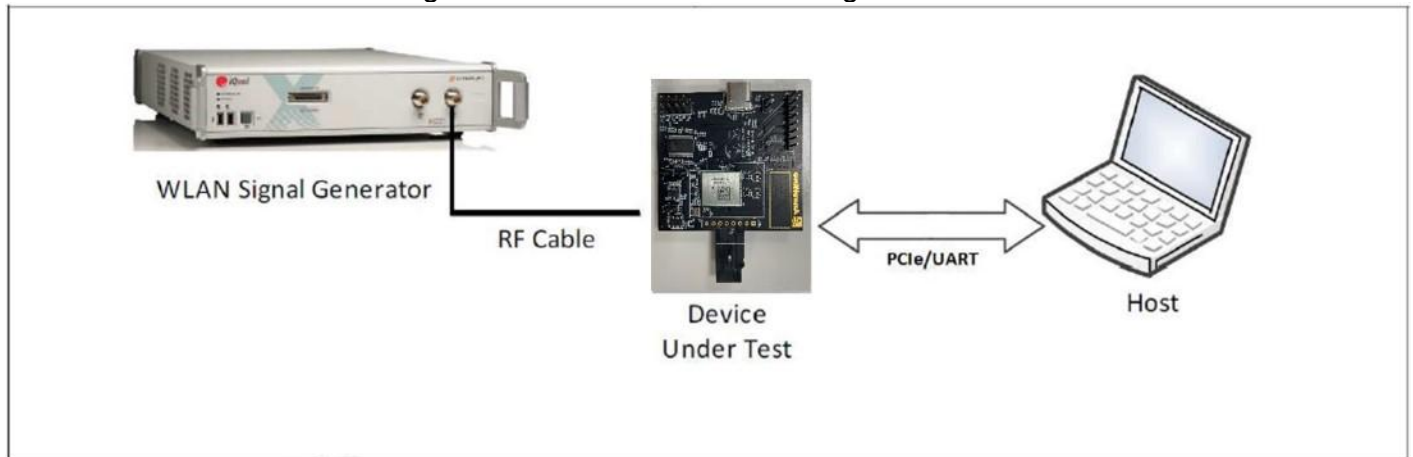
Linux device driver package for WLAN

(AW-XM643-SUR DUT driver must be installed in the host system to run WL commands.)

Windows Bluetool with AW-XM643-SUR hcd files.

2.3. RF Transmit Test Setup

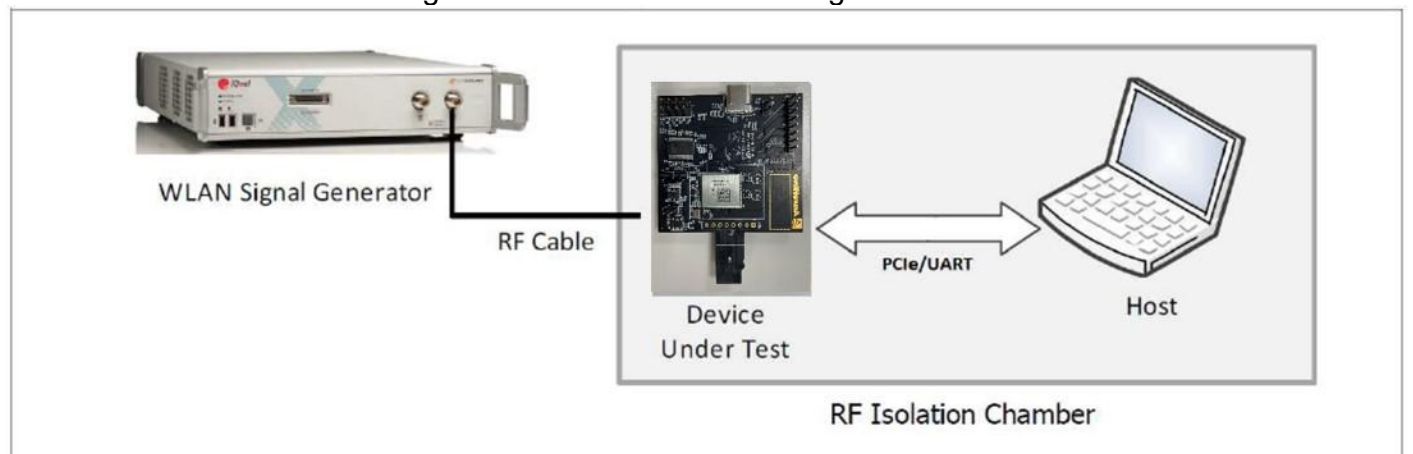
Show the basic hardware configuration for RF transmits testing.



*The PCB will have trace loss around 2G/5G/6G : 0.4 dBm / 0.7dB / 0.8dB.

2.4. RF Receive Test Setup

Show the basic hardware configuration for RF Receive testing.



*The PCB will have trace loss around 2G/5G/6G : 0.4 dBm / 0.7dB / 0.8dB.

3. WLAN Basic Test

3.1. Setup Throughput Test

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

1. OS: Ubuntu 18.04.1, kernel 5.4.0-42-generic
2. Prepare AW-XM643-SUR DUT, insert DUT.

CONNECTING TO WIRELESS NETWORKS

The examples in the following sections illustrate how to connect to both infrastructure and ad hoc networks, including infrastructure networks that use no security, WEP security, and WPA/PSK and WPS2/PSK security.

SCANNING FOR WIRELESS NETWORKS

To force the dongle to scan

- Run `./wl up`
- Run `./wl scan`.

To force the dongle to return the results of the scan

- Run `./wl scanresults`.

Example results returned when an AP is found:

- SSID: "Eval4325"
- Mode: Managed: RSSI: -48 dBm noise: -105 dBm Channel: 1
- BSSID: 00:10:18:90:2E:C1 Capability: ESS ShortSlot
- Supported Rates: [1(b) 2(b) 5.5(b) 11(b) 18 24 36 54 6 9 12 48]

Example results returned when an ad hoc network is found:

- SSID: "ADHOC#1"
- Mode: Ad Hoc RSSI: -41 dBm noise: -105 dBm Channel: 1
- BSSID: B2:51:28:6B:3C:A1 Capability: IBSS
- Supported Rates: [1(b) 2(b) 5.5(b) 11(b)]

CONNECTING TO AN INFRASTRUCTURE NETWORK WITH NO SECURITY (AP CONNECTION)

To connect to the network through an AP with SSID = Eval4325

Run `./wl join Eval4325`.

CONNECTING TO AN INFRASTRUCTURE NETWORK WITH WEP SECURITY

To connect to the network that uses 12345 as the network key

- Run `./wl join Eval4325 key 12345`.

CONNECTING TO AN INFRASTRUCTURE NETWORK WITH WPA-PSK/WPA2-PSK SECURITY

To specify TKIP or AES as the data encryption method

- Run `./wl wsec 3/7`.

To enable the supplicant

- Run `./wl sup_wpa 1`.

To specify the PSK passphrase (network key) to use

- Run `./wl set_psk $passphrase`.

To connect to a network that uses WPA-PSK security

- Run `./wl join Eval4325 imode bss amode wpa`.

To connect to a network that uses WPA2-PSK security

- Run `./wl join Eval4325 imode bss amode wpa2`.

CONNECTING TO AN AD HOC NETWORK USING CHANNEL 1

To set the channel to channel 1

- Run `./wl channel 1`.

To connect to the ad hoc network with SSID = 4325-ADHOC

- Run `./wl join 4325-ADHOC imode ibss`.

MANAGING POWER CONSUMPTION

To disable Power Save (PS) mode (default)

- Run `./wl PM 0`.

To enable legacy IEEE 802.11 Power Save (PS) mode

- Run `./wl PM 1`.

To enable Fast IEEE 802.11 Power Save mode

- Run `./wl PM 2`.

Note:

- The STA automatically transitions to Legacy PS mode when no data is being sent or received.
- The STA automatically disables PS mode when data is being sent or received.

MEASURING WLAN THROUGHPUT

The throughput measurement shows the performance of the TCP/IP layer over the 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.

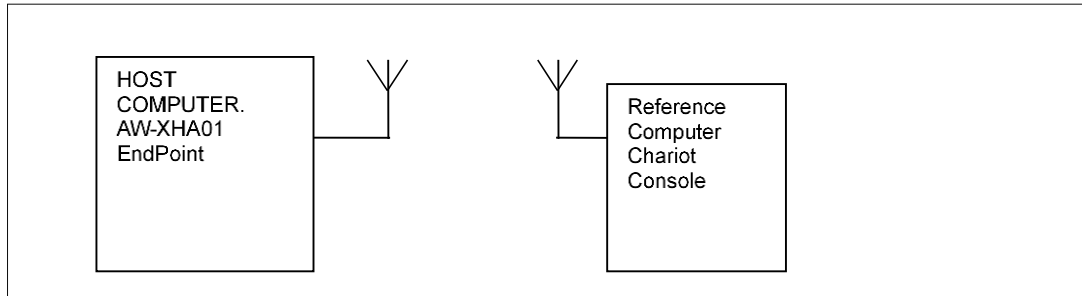


FIG. 1

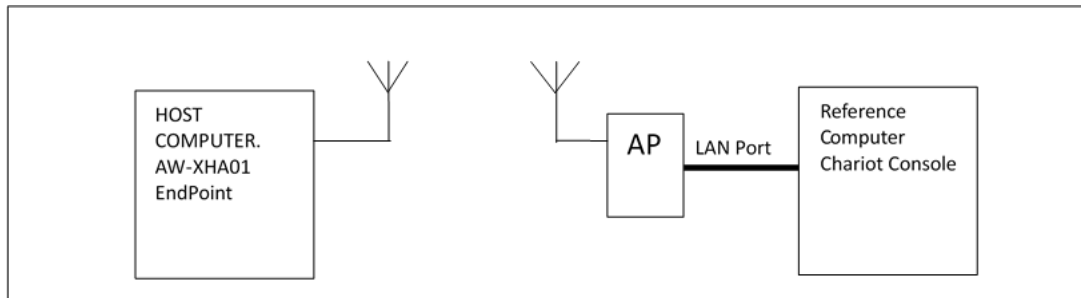


FIG. 2

MEASURING THROUGHPUT USING NETIQ CHARIOT

Test Procedure

1. Bring up the AW-XM643-SUR demo board 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-XM643-SUR demo board by pinging **192.168.1.100** from the AW-XM643-SUR 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 script. Run the throughput test for a specified period of time and observe the results.

3.2. RF Tx/Rx WL Command Test

3.2.1 802.11b/g Tx in 2.4G 20MHz

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band b
./wl channel 7
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 2g_rate -r 11 -b 20
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 18
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel :

wl channel <channel> or
wl chanspec <channel>/<BW>

How to set chains :

wl txchain <bitmask> (1=core0, 2=core1)

How to set rate:

wl 2g_rate -r <legacy rate (CCK, DSSS, OFDM)> -b <BW>

How to set Tx power :

wl txpwr1 -o -d <integer only> or
wl txpwr1 -o -q <quarter dbm units>

How to transmit continuous packet with pkteng:

wl pkteng_start <addr> tx <ipg> <len> <nframes>

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.2 802.11n HT20 Tx in 2.4G 20MHz

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band b
./wl chanspec 7/20
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 2g_rate -h 7 -b 20
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 16
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

wl channel **<channel>** or
wl chanspec **<channel>/<BW>**

How to set chains :

wl txchain **<bitmask>** (1=core0, 2=core1)

How to set rate

wl 2g_rate -h **<HT MCS index [0~7]>** -b **<BW>**

How to set Tx power :

wl txpwr1 -o -d **<integer only>** or
wl txpwr1 -o -q **<quarter dbm units>**

How to transmit continuous packet with pkteng:

wl pkteng_start **<addr>** tx **<ipg>** **<len>** **<nframes>**

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.3 802.11ax HE20 Tx in 2G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band b
./wl chanspec 7/20
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 2g_rate -e 11 -b 20
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 14
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

wl channel **<channel>** or
wl chanspec **<channel>/<BW>**

How to set chains :

wl txchain **<bitmask>** (1=core0, 2=core1)

How to set rate

wl 2g_rate -e **<HE rate M [0-11]>** -b **<BW>**

How to set Tx power :

wl txpwr1 -o -d **<integer only>** or
wl txpwr1 -o -q **<quarter dbm units>**

How to transmit continuous packet with pkteng:

wl pkteng_start **<addr>** tx **<ipg>** **<len>** **<nframes>**

<addr> : will be the destination address :

<jpg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.4 802.11a Tx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl chanspec 36/20
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 5g_rate -r 54 -b 20
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 16
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

wl channel **<channel>** or
wl chanspec **<channel>/<BW>**

How to set chains :

wl txchain **<bitmask>** (1=core0, 2=core1)

How to set rate

wl 5g_rate -r **< legacy rate (CCK, DSSS, OFDM)>** -b **<BW>**

How to set Tx power :

wl txpwr1 -o -d **<integer only>** or
wl txpwr1 -o -q **<quarter dbm units>**

How to transmit continuous packet with pkteng:

wl pkteng_start **<addr>** tx **<ipg>** **<len>** **<nframes>**

<addr> : will be the destination address :

<jpg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.5 802.11n HT20 Tx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl chanspec 36/20
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 5g_rate -h 7 -b 20
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 16
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

wl channel **<channel>** or
wl chanspec **<channel>/<BW>**

How to set chains :

wl txchain **<bitmask>** (1=core0, 2=core1)

How to set rate

wl 5g_rate -h **<HT MCS index [0~7]>** -b **<BW>**

How to set Tx power :

wl txpwr1 -o -d **<integer only>** or
wl txpwr1 -o -q **<quarter dbm units>**

How to transmit continuous packet with pkteng:

wl pkteng_start **<addr>** tx **<ipg>** **<len>** **<nframes>**

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.6 802.11n HT40 Tx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl chanspec 36/40
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 5g_rate -h 7 -b 40
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 16
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

wl channel <channel> or
wl chanspec <channel>/<BW>

How to set chains :

wl txchain <bitmask> (1=core0, 2=core1)

How to set rate

wl 5g_rate -h <HT MCS index [0~7]> -b <BW>

How to set Tx power :

wl txpwr1 -o -d <integer only> or
wl txpwr1 -o -q <quarter dbm units>

How to transmit continuous packet with pkteng:

wl pkteng_start <addr> tx <ipg> <len> <nframes>

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.7 802.11ac VHT20 Tx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl chanspec 36/20
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 5g_rate -v 8 -b 20
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 15
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

wl channel <channel> or
wl chanspec <channel>/<BW>

How to set chains :

wl txchain <bitmask> (1=core0, 2=core1)

How to set rate

wl 5g_rate -v <VHT MCS index [0~8]> -b <BW>

How to set Tx power :

wl txpwr1 -o -d <integer only> or
wl txpwr1 -o -q <quarter dbm units>

How to transmit continuous packet with pkteng:

wl pkteng_start <addr> tx <ipg> <len> <nframes>

<addr> : will be the destination address :

<jpg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.8 802.11ac VHT40 Tx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl chanspec 36/40
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 5g_rate -v 9 -b 40
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 14
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

wl channel <channel> or
wl chanspec <channel>/<BW>

How to set chains :

wl txchain <bitmask> (1=core0, 2=core1)

How to set rate

wl 5g_rate -v <VHT MCS index [0~9]> -b <BW>

How to set Tx power :

wl txpwr1 -o -d <integer only> or
wl txpwr1 -o -q <quarter dbm units>

How to transmit continuous packet with pkteng:

wl pkteng_start <addr> tx <ipg> <len> <nframes>

<addr> : will be the destination address :

<jpg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.9 802.11ac VHT80 Tx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl chanspec 36/80
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 5g_rate -v 9 -b 80
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 14
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

wl channel **<channel>** or
wl chanspec **<channel>/<BW>**

How to set chains :

wl txchain **<bitmask>** (1=core0, 2=core1)

How to set rate

wl 5g_rate -v **<VHT MCS index [0~9]>** -b **<BW>**

How to set Tx power :

wl txpwr1 -o -d **<integer only>** or
wl txpwr1 -o -q **<quarter dbm units>**

How to transmit continuous packet with pkteng:

wl pkteng_start **<addr>** tx **<ipg>** **<len>** **<nframes>**

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.10 802.11ax HE20 Tx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl chanspec 36/20
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 5g_rate -e 11 -b 20
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 14
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

```
wl channel <channel> or
wl chanspec <channel>/<BW>
```

How to set chains :

```
wl txchain <bitmask> (1=core0, 2=core1)
```

How to set rate

```
wl 5g_rate -e <HE rate [0~11]> -b <BW>
```

How to set Tx power :

```
wl txpwr1 -o -d <integer only> or
wl txpwr1 -o -q <quarter dbm units>
```

How to transmit continuous packet with pkteng:

```
wl pkteng_start <addr> tx <ipg> <len> <nframes>
```

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.11 802.11ax HE40 Tx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl chanspec 36/40
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 5g_rate -e 11 -b 40
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 14
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

```
wl channel <channel> or
wl chanspec <channel>/<BW>
```

How to set chains :

```
wl txchain <bitmask> (1=core0, 2=core1)
```

How to set rate

```
wl 5g_rate -e <HE rate [0~11]> -b <BW>
```

How to set Tx power :

```
wl txpwr1 -o -d <integer only> or
wl txpwr1 -o -q <quarter dbm units>
```

How to transmit continuous packet with pkteng:

```
wl pkteng_start <addr> tx <ipg> <len> <nframes>
```

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.12 802.11ax HE80 Tx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl chanspec 36/80
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 5g_rate -e 11 -b 80
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 13
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

```
wl channel <channel> or
wl chanspec <channel>/<BW>
```

How to set chains :

```
wl txchain <bitmask> (1=core0, 2=core1)
```

How to set rate

```
wl 5g_rate -e <HE rate [0~11]> -b <BW>
```

How to set Tx power :

```
wl txpwr1 -o -d <integer only> or
wl txpwr1 -o -q <quarter dbm units>
```

How to transmit continuous packet with pkteng:

```
wl pkteng_start <addr> tx <ipg> <len> <nframes>
```

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.13 802.11ax HE20 Tx in 6G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band s
./wl chanspec 1/20
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 6g_rate -e 11 -b 20
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 12
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

```
wl channel <channel> or
wl chanspec <channel>/<BW>
```

How to set chains :

```
wl txchain <bitmask> (1=core0, 2=core1)
```

How to set rate

```
wl 6g_rate -e <HE rate [0~11]> -b <BW>
```

How to set Tx power :

```
wl txpwr1 -o -d <integer only> or
wl txpwr1 -o -q <quarter dbm units>
```

How to transmit continuous packet with pkteng:

```
wl pkteng_start <addr> tx <ipg> <len> <nframes>
```

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.14 802.11ax HE40 Tx in 6G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band s
./wl chanspec 17/40
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 6g_rate -e 11 -b 40
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 11
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

wl channel **<channel>** or
wl chanspec **<channel>/<BW>**

How to set chains :

wl txchain **<bitmask>** (1=core0, 2=core1)

How to set rate

wl 6g_rate -e **<HE rate [0~11]>** -b **<BW>**

How to set Tx power :

wl txpwr1 -o -d **<integer only>** or
wl txpwr1 -o -q **<quarter dbm units>**

How to transmit continuous packet with pkteng:

wl pkteng_start **<addr>** tx **<ipg>** **<len>** **<nframes>**

<addr> : will be the destination address :

<jpg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.15 802.11ax HE80 Tx in 6G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band s
./wl chanspec 21/80
./wl txchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl 6g_rate -e 11 -b 80
./wl phy_txpwrctrl 1
./wl txpwr1 -o -d 10
./wl pkteng_start 00:11:22:33:44:55 tx 100 1024 0
```

How to set channel:

```
wl channel <channel> or
wl chanspec <channel>/<BW>
```

How to set chains :

```
wl txchain <bitmask> (1=core0, 2=core1)
```

How to set rate

```
wl 6g_rate -e <HE rate [0~11]> -b <BW>
```

How to set Tx power :

```
wl txpwr1 -o -d <integer only> or
wl txpwr1 -o -q <quarter dbm units>
```

How to transmit continuous packet with pkteng:

```
wl pkteng_start <addr> tx <ipg> <len> <nframes>
```

<addr> : will be the destination address :

<ipg> : inter packet gap

<len> : packet length

<nframes> : number of frames; 0 indicates continuous tx test

How to generate a single carrier tone :

After wl pkteng_start, use: wl phy_tx_tone -1

3.2.16 802.11b/g/n/ax Rx in 2.4G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band b
./wl channel 7
./wl rxchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl pkteng_start 00:11:22:33:44:55 rx
./wl reset_cnts
#send 1000 packets from signal generator
./wl counters
#check the counters register increment : pktengrxdmcast
./wl counters | grep pktengrxdmcast
```

How to set channel:

wl channel **<channel>** or
wl chanspec <channel>/<BW>

How to set chains :

wl rxchain **<bitmask>** (1=core0, 2=core1)

How to calculate PER:

- Use the counters command to read pktengrxdmcast. Record this value as **<Counter #1>**.
- Use LitePoint to generate a waveform that transmits **X** packets.
- Use the counters command again to read pktengrxdmcast. Record this as **<Counter #2>**.

$$\text{PER\%} = \{ [X - (\text{Counter\#2} - \text{Counter\#1})] / X \} * 100\%$$

3.2.17 802.11a/n/ac/ax Rx in 5G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band a
./wl channel 36
./wl rxchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl pkteng_start 00:11:22:33:44:55 rx
./wl reset_cnts
#send 1000 packets from signal generator
./wl counters
#check the counters register increment : pktengrxdmcast
./wl counters | grep pktengrxdmcast
```

How to set channel:

wl channel **<channel>** or
wl chanspec **<channel>/<BW>**

How to set chains :

wl rxchain **<bitmask>** (1=core0, 2=core1)

How to calculate PER:

- Use the counters command to read pktengrxdmcast. Record this value as **<Counter #1>**.
- Use LitePoint to generate a waveform that transmits **X** packets.
- Use the counters command again to read pktengrxdmcast. Record this as **<Counter #2>**.

$$\text{PER\%} = \{ [X - (\text{Counter\#2} - \text{Counter\#1})] / X \} * 100\%$$

3.2.18 802.11ax Rx in 6G

```
./wl pkteng_stop tx
./wl pkteng_stop rx
./wl up
./wl down
./wl mpc 0
./wl phy_watchdog 0
./wl country ALL
./wl band s
./wl channel 1
./wl rxchain 1
./wl up
./wl phy_forcecal 1
./wl scansuppress 1
./wl pkteng_start 00:11:22:33:44:55 rx
./wl reset_cnts
#send 1000 packets from signal generator
./wl counters
#check the counters register increment : pktengrxdmcast
./wl counters | grep pktengrxdmcast
```

How to set channel:
wl channel **<channel>** or
wl chanspec **<channel>/<BW>**

How to set chains :
wl rxchain **<bitmask>** (1=core0, 2=core1)

How to calculate PER:

- Use the counters command to read pktengrxdmcast. Record this value as **<Counter #1>**.
- Use LitePoint to generate a waveform that transmits **X** packets.
- Use the counters command again to read pktengrxdmcast. Record this as **<Counter #2>**.

$$\text{PER\%} = \{ [X - (\text{Counter\#2} - \text{Counter\#1})] / X \} * 100\%$$

4. BT Basic Test

4.1 Driver Installation and enter test mode

A. HCD File Download

- Modify the “**MBT_TRANSPORT**” in mbt_setup.ini
- Open command under mbt.exe file
- On the CMD terminal, reset mbt file by entering “mbt.exe reset”

```
C:\Users\Test\Desktop\2653_V3.4.4.30_18.53.366.20_SDIO-I3+I6_20241015>mbt.exe reset
MBT_TRANSPORT: COM19
DOWNLOAD_BAUDRATE: 115200
APPLICATION_BAUDRATE: 115200
Sending HCI Command:
0000 < 03 0C 00 >
Received HCI Event:
0000 < 0E 04 01 03 0C 00 >
0x0e 0x04
dwRead = 6
Send HCI Success
Success
Success
** mbt command finish **
```

- Unzip DM_A0_A1.zip
- Modify the “**hcd file name**” in DM_Programming.pl

```
#=====
# INPUT PARAMS
# Transport port to be used for programming
my $transport = 'com19@921600';
my $stranum = 'com'. $stranum . '@921600';
# 1 - Device reset controlled using relay, 0 - Reset not connected to relay
my $relayForReset = 0;
# Relay COM port number
my $relayComPort = 'COM6';
# Relay Port number connected to BT Reset
my $bt_reset_relay_port = 4;
# Relay Port number connected to WLAN Reset. Set to same as BT_RESET if WLAN_RESET is not connected to Relay.
my $wlan_reset_relay_port = 5;
# Input files
my $working_dir = ".";
my $minidriver_hex = "dm_full A1.hex";
my $patch_hex = "CYW55560A1_001.002.087.0258.0082.hcd";
my $btp_file = "patch_test.btp";
#=====
```

- On the CMD terminal, execute “**DM_Programming.pl 19**” (10=BT comport)
- Set “**BT_REG_ON**” Low and High to start BT programming (Hardware GPIO reset)

```
C:\Users\Test\Desktop\2653_V3.4.4.30_18.53.366.20_SDIO-I3+I6_20241015\Driver\DM_A0_A1>DM_Programming.pl 19
MD hex - ./dm_full A1.hex
Patch hex - ./CYW55560A1_001.002.087.0258.0082.hcd
BTP file - ./patch_test.btp
Opening Transport...
Please wait 5 seconds for resetting the device...
Sending HCI_Reset...
Closing Transport...
Programming Minidriver...
```

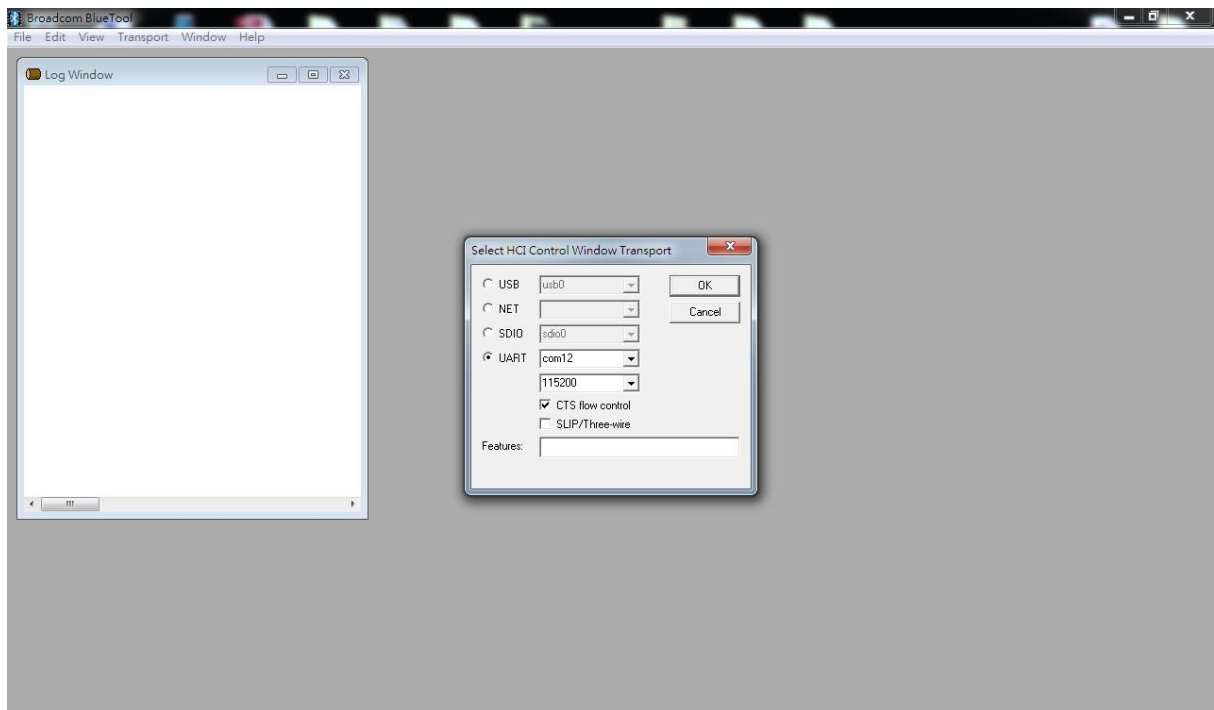
- Download successful

```
Download config successfully had written 132 bytes to address 0x80438E60: 40 6E A0 7A 8E C5 7E E6 5A D1 16 B5 19 B2 7A
01 01 AC AE 26 ED C4 12 8F 5D 99 DD 3E FE 1E 86 CA E1 46 6A 47 E4 8F 0E 7B 68 66 75 41 44 B5 5C AE 05 75 5B 08 5B 41 74
BD 29 AB 55 38 33 62 7C BD E3 81 1E 47 C8 35 CC 79 CE DA CD 7F 92 AD 1C 69 BE 90 B7 8E 91 C7 7D A3 42 D8 65 22 63 44 8A
B9 8E 2B 3F D7 00 B2 52 E2 F2 4E 2F B5 FE 1F 4D 91 91 1A 63 FB 04 00 00 00 FF FF FF FF 03 00 00 00 00 00 00 00
Chip reset to address 0x00000000 succeeded
Downloaded 0 code bytes ( 0.0%) and 122578 data bytes (100.0%). Verified 0 code bytes ( 0.0%) and 0 data bytes ( 0.0%).
Current state: Completed successfully

A total of 8 contiguous memory areas were filled:
[804086C0..8040943B] DATA (3452 bytes)
[8046D200..8046D293] DATA (148 bytes)
[003018E0..0030DB3B] DATA (49756 bytes)
[0030DB44..0030DBFF] DATA (188 bytes)
[804086C0..8040A253] DATA (7060 bytes)
[80423500..80423BEF] DATA (1776 bytes)
[80425C00..80425C41] DATA (66 bytes)
[8042A400..80438EE3] DATA (60132 bytes)
Total execution time: 8.90 seconds    Net downloading time: 8.88 seconds
```

B. BT Driver Installation

- Start Broadcom BlueTool.
- On the View menu, click Log Windows Details.
- On the Transport menu, click HCI Control.



- In Select HCI Control Window Transport
 - A. Select UART as the type of transport.
 - B. Select com12 , and baud rate 115200
 - C. Click OK
- On the Transport menu, click HCI Control.

4.2 Setup RF Performance Test

RESETTING THE DEVICE

To reset the device

In HCI Control, in the HCI Control commands list, select **7.3: Host Controller & Baseband Commands (3 key)**, and then double-click **Reset**.

READING THE BLUETOOTH DEVICE ADDRESS

To read the Bluetooth Device Address

In HCI Control, in the HCI Control commands list, select **7.4: Informational Parameters (4 key)**, and then double-click

Read_BD_ADDR.

The Bluetooth Device Address (BD_ADDR) is displayed in the log window. The Bluetooth Device Address might be needed by the Bluetooth tester

SETTING THE EVENT FILTER TO AUTOMATICALLY ALLOW CONNECTION

To set the event filter to automatically allow connection

1. In HCI Control, in the HCI Control commands list, select **7.3: Host Controller & Baseband Commands (3 key)**, and then double-click **Set_Event_Filter**.
2. In HCI Command: Set_Event_Filter:
 - a. In the **Filter_Type** list, select **Connection Setup**.
 - b. In the **Connection_Setup_Filter_Condition_Type** list, select **Allow Connections from all devices**.
 - c. In the **Auto_Accept_Flag** list, select **Do Auto accept the connection with role switch disabled**.

ENABLING WRITE SCAN

To enable Write Scan

1. In HCI Control, in the HCI Control commands list, select **7.3: Host Controller & Baseband Commands (3 key)**, and then double-click **Write_Scan_Enable**.
2. In HCI Command: Write_Scan_Enable, in the **Scan_Enable** list, select **Inquiry and Page Scan enabled**.

ENABLING TEST MODE

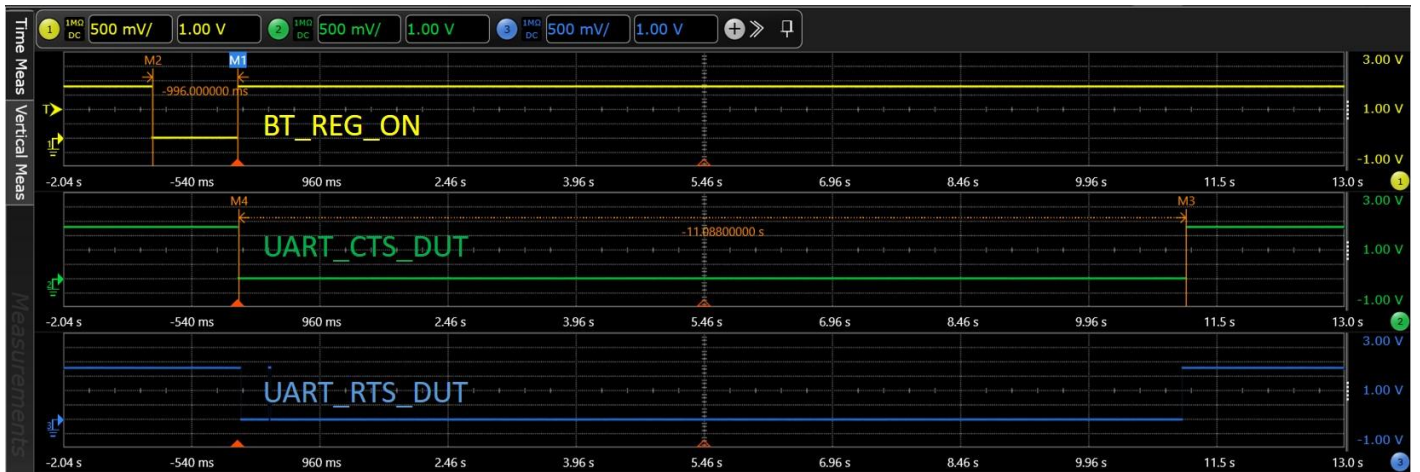
To enable Test Mode

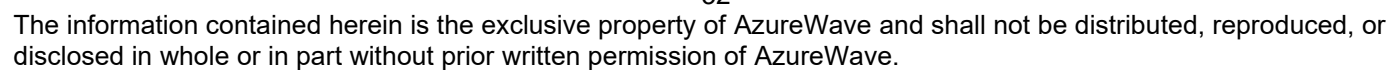
In HCI Control, in the HCI Control commands list, select **7.6: Testing Commands (6 key)**, and then double-click

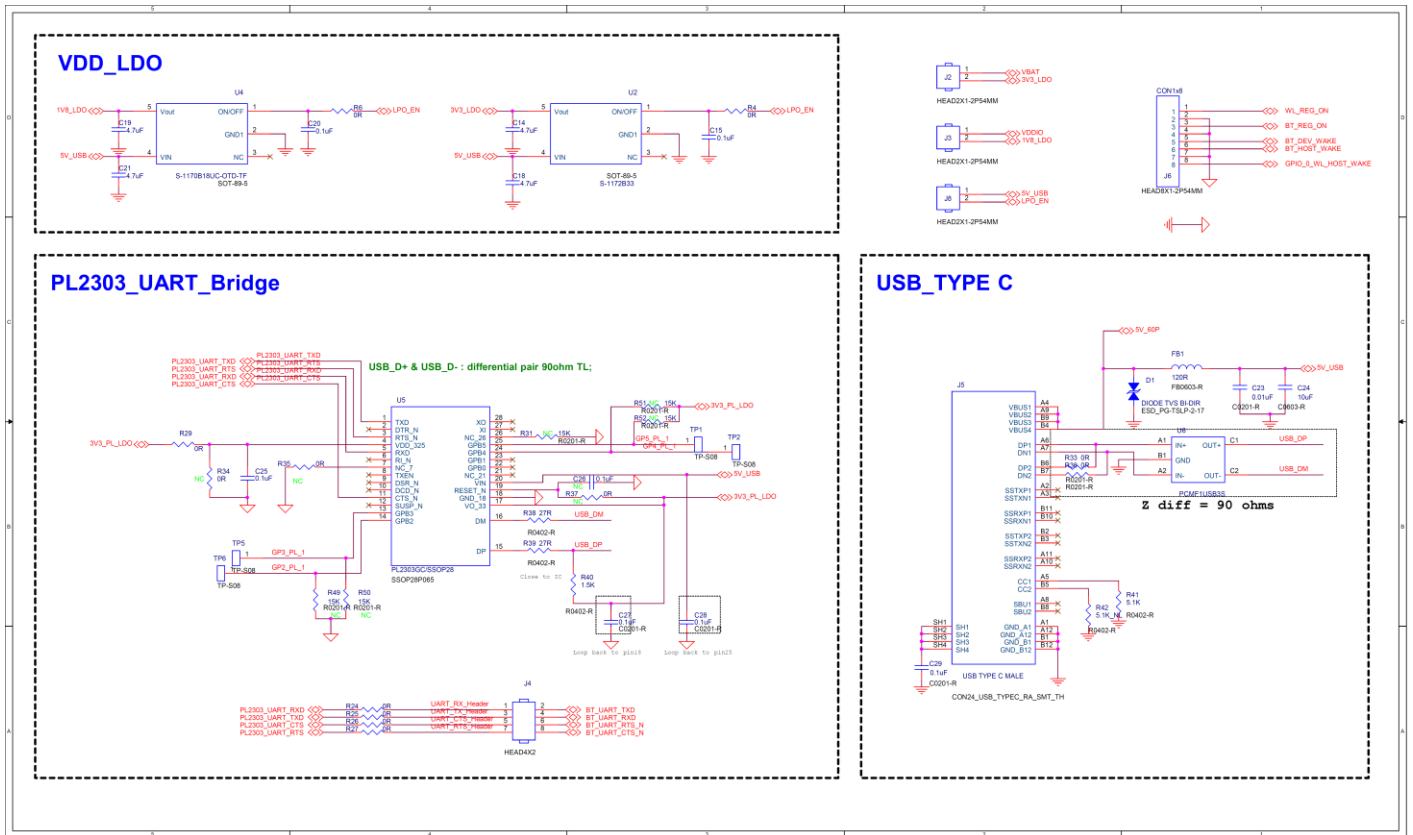
Enable_Device_Under_Test_Mode.

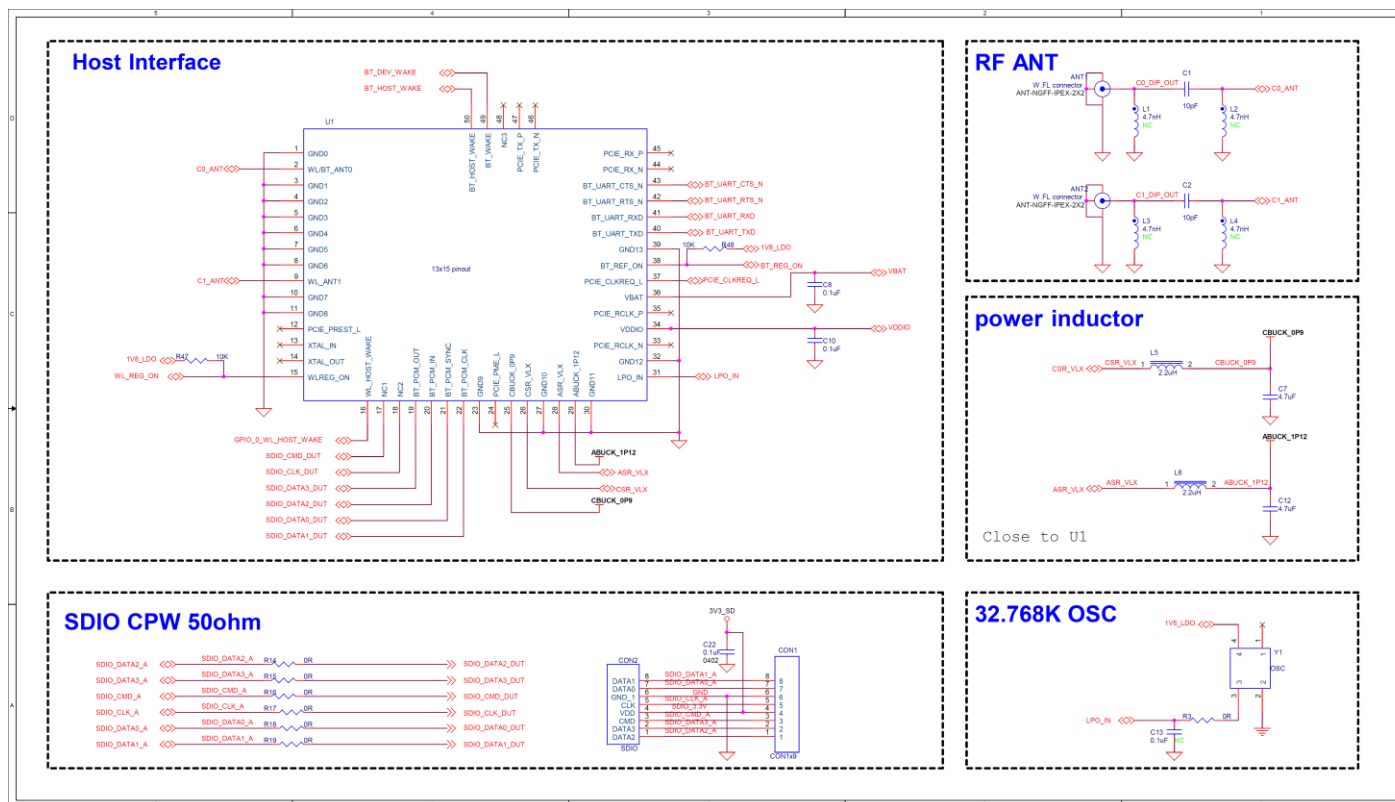
The AW-XM643-SUR is now ready to receive a connection request from the Bluetooth tester and begin testing specified RF parameters.

4.3 BT Download Timing









6. integration instructions

6.1. FCC

6.1.1 RF exposure

Transmitters in the 5.925-7.125 GHz band are prohibited from operating to control or communicate with unmanned aircraft systems.

6.1.2 Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

6.1.3 Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

6.1.4 FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,
3. Transmitters in the 5.925-7.125 GHz band are prohibited from operating to control or communicate with unmanned aircraft systems.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

6.1.5 End Product Labelling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users.

The final end product must be labelled in a visible area with the following:

“Contains FCC ID: TLZ-XM643SUR”.

6.1.6 Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

6.2. IC

6.2.1 RF exposure

The device for operation in the band 5150–5350 MHz is only for indoor use.

- Devices shall not be used for control of or communications with unmanned aircraft systems.
- Devices shall not be used on oil platforms.
- Devices shall not be used on aircraft, except for the low-power indoor access points, indoor subordinate devices, low-power client devices, and very low-power devices operating in the 5925-6425 MHz band, that may be used on large aircraft as defined in the Canadian Aviation Regulations, while flying above 3,048 metres (10,000 feet).
- Devices shall not be used on automobiles.
- Devices shall not be used on trains.
- Devices shall not be used on maritime vessels..

6.2.2 Canada Statement

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

6.2.2 Caution Exposure

This device meets the exemption from the routine evaluation limits in section 2.5 of RSS102 and users can obtain Canadian information on RF exposure and compliance.

Le dispositif répond à l'exemption des limites d'évaluation de routine dans la section 2.5 de RSS102 et les utilisateurs peuvent obtenir des renseignements canadiens sur l'exposition aux RF et le respect.

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Cet équipement doit être installé et utilisé avec une distance minimale de 20 centimètres entre le radiateur et votre corps.

6.2.3 The final end product must be labelled in a visible area with the following:

The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the Industry

Canada certification number of the module, preceded by the words “Contains transmitter module”, or the word “Contains”, or similar wording expressing the same meaning, as follows:
Contains transmitter module IC: 6100A-XM643SUR

This End equipment should be installed and operated with a minimum distance of 20cm centimeters between the radiator and your body.

Cet équipement devrait être installé et actionné avec une distance minimum de 20cm centimètres entre le radiateur et votre corps.

The end user manual shall include all required regulatory information/warning as show in this manual.

The device for operation in the band 5150 – 5350 MHz is only for indoor use.

- Devices shall not be used for control of or communications with unmanned aircraft systems.
- Devices shall not be used on oil platforms.
- Devices shall not be used on aircraft, except for the low-power indoor access points, indoor subordinate devices, low-power client devices, and very low-power devices operating in the 5925-6425 MHz band, that may be used on large aircraft as defined in the Canadian Aviation Regulations, while flying above 3,048 metres (10,000 feet).
- Devices shall not be used on automobiles.
- Devices shall not be used on trains.
- Devices shall not be used on maritime vessels.

L'appareil conçu pour fonctionner dans la bande 5150–5350 MHz est uniquement destiné à un usage intérieur.

- Les dispositifs ne doivent pas être utilisés pour le contrôle ou la communication avec les systèmes d'aéronefs sans pilote.
- Les dispositifs ne doivent pas être utilisés sur les plates-formes pétrolières.
- Les équipements ne doivent pas être utilisés à bord des aéronefs, à l'exception des points d'accès intérieurs à faible puissance, des dispositifs intérieurs subordonnés, des appareils clients à faible puissance et des dispositifs à très faible puissance fonctionnant dans la bande de 5925-6425 MHz, qui peuvent être utilisés sur les grands aéronefs selon les Règlements aéronautiques canadiens, lorsque le vol se déroule à une altitude supérieure à 3 048 mètres (10 000 pieds).
- Les dispositifs ne doivent pas être utilisés sur les véhicules automobiles.
- Les appareils ne doivent pas être utilisés sur les trains.
- Les dispositifs ne doivent pas être utilisés sur les navires maritimes.