

AW-XM549-EVB

**IEEE 802.11 1X1 a/b/g/n/ac/ax Wireless LAN
+ Bluetooth 5.2 + 802.15.4 Tri-radio**

12 x 12 LGA Module

User Guide

Rev. 03

(For Standard)

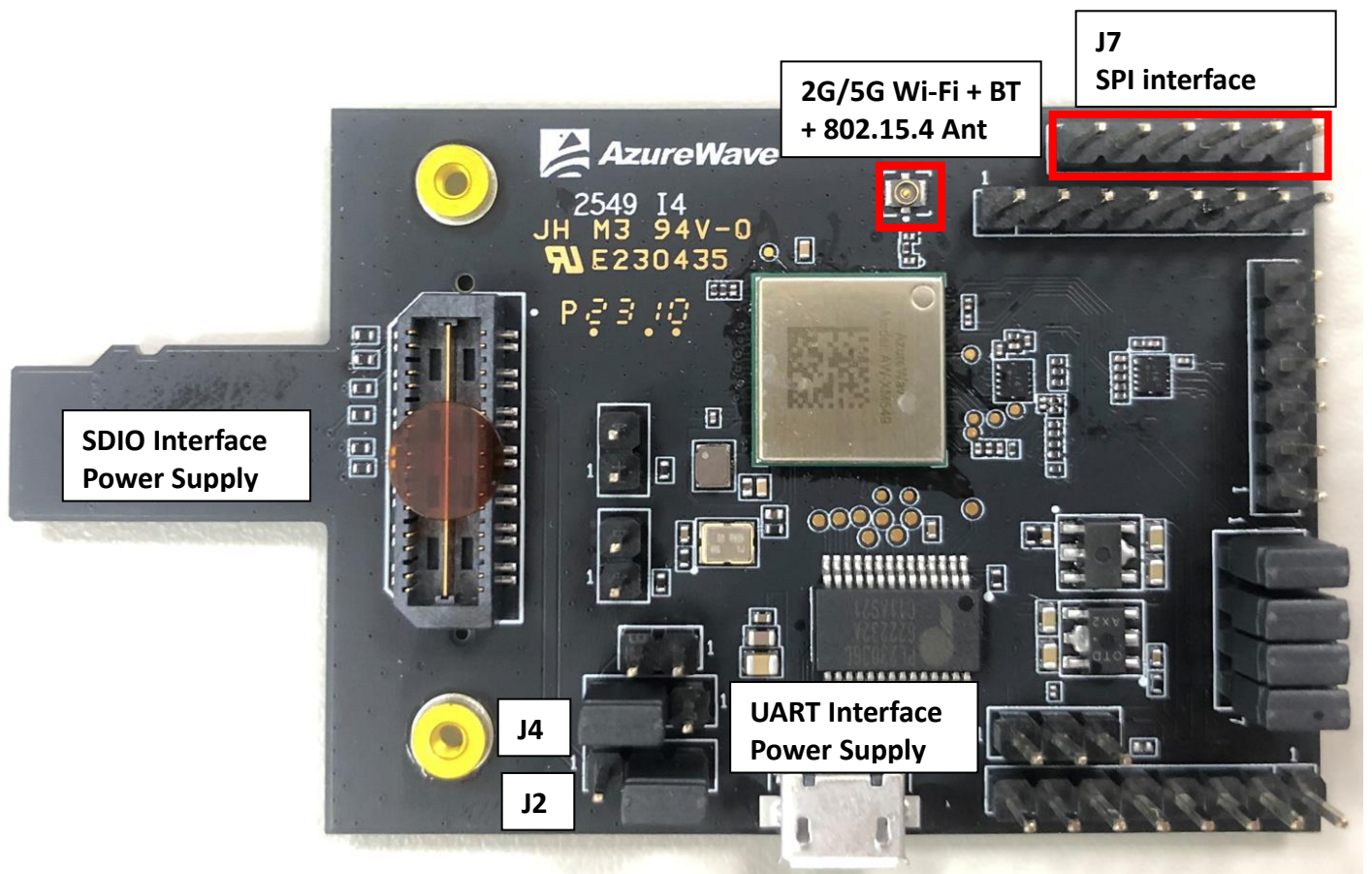
Revision History

Version	Revision Date	Description	Initials	Approved
01	2021/12/27	<ul style="list-style-type: none">● Initial Version	Roger Liu	N.C. Chen
02	2022/07/01	<ul style="list-style-type: none">● Update the setup.ini setting for Labtool● Update the RF command● Update FW version for DUT setup	Roger Liu	N.C. Chen
03	2023/08/01	<ul style="list-style-type: none">● Update SPI interface information	Roger Liu	N.C. Chen

1. System Setup

1-1. Hardware Requirements

- AW-XM549-EVB (evaluation board of AW-XM549)
- Host system need running the Linux operating system (Ubuntu16.04 or later)
- SDIO/UART interface supported (USB port needed)
- Windows system(OS later than Windows XP) 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



AW-XM549-EVB

1.1.1 For SDIO supply

For SDIO supply VBAT, please connect J2(1-2).

For **SDIO supply** VDDIO(1.8V), please connect J4(1-2).

For **SDIO supply** VDDIO(3.3V), please connect J4(2-3).

1.1.2 For USB supply

For USB supply VBAT, please connect J2(2-3).

For **USB supply** VDDIO(1.8V), please connect J4(1-2).

For **USB supply** VDDIO(3.3V), please connect J4(2-3).

1.1.3 For spi interface jumper

J7 pin 1 : SPI_CLK(SPI_CLK - SPI clock signal)

J7 pin 2 : SPI_FRM(SPI_FRM - SPI frame signal)

J7 pin 3 : SPI_RXD(SPI receive input signal)

J7 pin 4 : SPI_TXD(SPI receive output signal)

J7 pin 5 : SPI_INT(SPI interrupt signal)

J7 pin 6 : SPI_RST(Independent software reset for 802.15.4)

1-2. Software package requirement


SDIO-UART


“MFG-IW61X-MF-BRG-U16-WIN-X86-1.0.0.7-18.80.254.p23.3.zip”

1-2-1.Linux PC set up (SDIO-UART)

After download the SW package from AzureWave contact window, please build the driver first.


Open the folder and you can see below contents.


 Driver


 FwImage

Go into Driver folder and unzip the tar file you can see the files below.

 SD-UAPSTA-NW61X-U16-MMC-18.68.1.p32-MXM5X18278_V0-MGPL-src

 SD-UAPSTA-NW61X-U16-MMC-18.68.1.p32-MXM5X18278_V0-mlan-src

 UART-FW-LOADER-M322-GPL-src

 UART-U16-X86-18.35.1.p32-2.2-M3X14100-GPL-src

Unzip them all and go into the / **SD-UAPSTA-UART-BT-9177-U16-MMC-18.68.1.p32-18.35.1.p32-MXM5X18278_V0-MGPL/wlan_src** folder and use the cmds as below.

Make clean

Make build

1-2-2 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

```
root@azw-B85M-D3H: /lib/modules/3.19.0-25-generic/kernel/drivers/usb/serial# ls
aircable.ko          io_ti.ko            mxuport.ko          ssu100.ko
ark3116.ko           ipaq.ko             navman.ko           symbolserial.ko
belkin_sa.ko         ipw.ko              omninet.ko          ti_usb_3410_5052.ko
ch341.ko             ir-usb.ko           opticon.ko          usb_debug.ko
cp210x.ko            iuu_phoenix.ko     option.ko           usbserial.ko
cyberjack.ko         keyspan.ko          oti6858.ko          usb-serial-simple.ko
cypress_m8.ko        keyspan_pda.ko     pl2303.ko           usb_wwan.ko
digi_acceleport.ko  kl5kusb105.ko      qcaux.ko            visor.ko
empeg.ko             kobil_sct.ko       qcserial.ko         whiteheat.ko
f81232.ko            mct_u232.ko        quatech2.ko         wishbone-serial.ko
ftdi_sio.ko          metro-usb.ko        safe_serial.ko      xsens_mt.ko
garmin_gps.ko        mos7720.ko          sierra.ko
io_edgeport.ko       mos7840.ko          spcp8x5.ko
```

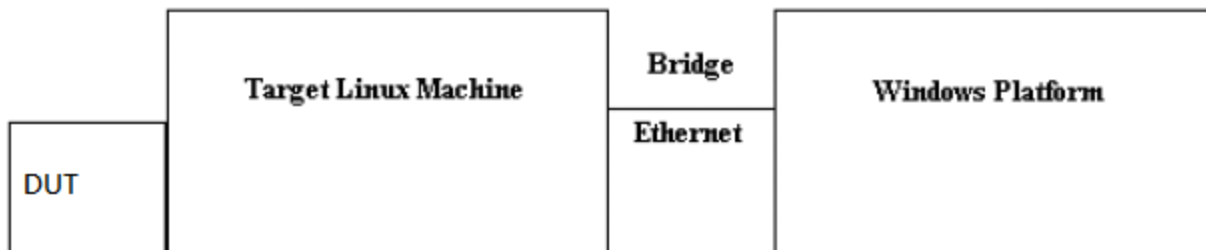
Input below cmds by terminal before connecting to AW-CM276NF-EVB's UART-to-USB port.

```
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. 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 platform. The environment enables the user to test performance of the AW-XM549



Manufacturing Bridge mode

1-4. Start driver installation and DUT testing

1-4-1. Linux PC side

After building the driver at Linux PC, you can run the following commands to install the driver and firmware and start the Manufacturing bridge application with the following commands.

Please copy firmware in the SW package

\\MFG-IW612-MF-LABTOOL-Native-1.0.0.18.0-18.80.1.p107.zip\MFG-IW612-MF-LABTOOL-Native-1.0.0.18.0-18.80.1.p107\bin\FwImage\

- uartspi_n61x_v1.bin.se
- uartspi_n61x_v1.bin
- sd_w61x_v1.bin.se
- sd_w61x_v1.bin
- sduart_nw61x_v1.bin.se
- sduart_nw61x_v1.bin

To Linux system firmware direction

/lib/firmware/mrvl/

On the working direction, use the following commands to put the IW611 in MFG mode after power on DUT.

SDIO-UART:

a. For Wi-Fi

Go into bin_sd61x folder and key in below cmds

```
modprobe cfg80211
insmod mlan.ko
insmod sd61x.ko mfg_mode=1 cal_data_cfg=none fw_name=mrvl/sduart_nw61x_v1.bin
```

b. For BT

Hciattach /dev/ttyUSB0 any 3000000 flow

*Please notice and key in the correct ttyUSB number in your Linux PC system.
Bring up the ethernet interface and specify an IP address to the Target platform. This address must match the IP for the DUT in which the Host PC is expecting.

Ex. ifconfig eth0 192.168.1.10 up










The next line will start the MFG Bridge application.

```
>./mfbridge
```

At this point, the target is ready to receive Labtool commands.

1-4-2. Windows PC side

On the Windows laptop where the Labtool release was downloaded, go to the folder shown below:

	AddCalDLL.dll	2021/9/7 上午 10:51	應用程式擴充	1,140 KB
	DutApiMimoApApp_W9177	2021/9/7 上午 10:52	應用程式	317 KB
	DutApiMimoApAppDII_SISO.dll	2021/9/7 上午 10:52	應用程式擴充	460 KB
	DutApiMimoApAppDII_SISO	2021/9/7 上午 10:52	LIB 檔案	125 KB
	DutApiMimoApAppUartDII.dll	2021/9/7 上午 10:53	應用程式擴充	461 KB
	DutApiMimoApAppUartDII	2021/9/7 上午 10:53	LIB 檔案	121 KB
	GenHeader.bin	2021/9/7 上午 10:51	BIN 檔案	2 KB
	SetUp	2021/9/7 上午 10:51	組態設定	5 KB
	Trigger_frame	2021/9/7 上午 10:51	文字文件	3 KB

Edit the “SetUp.ini” file as shown in the lines highlighted in **RED** below.

a. The setup DutIpAddress will be the IP address of your target.

HostIpAddress will be the IP address of the Windows XP Laptop.

[DutIp]

DutIpAddress = 192.168.1.10

HostIpAddress = 192.168.1.100

Protocol = TCP

b. The setup **NO_EEPROM** is the storage type to get/set function.

[DutInitSet]↵

;0 - EEPROM support↵

;1 - NO_EEPROM support↵

;2 - OTP support↵

NO_EEPROM=2↵

- 1 - NO_EEPROM support → Set storage type to .conf calibration file in labtool folder.
- 2 - OTP support → Set storage type to OTP in DUT

Then you can double click “DutApiMimoApApp_W9177.exe” to enter labtool as below picture.

```

C:\Users\Roger.Liu\Desktop\MFG-IW61X-MF-BRG-U16-WIN-X86-1.0.0.7-18.80.254.p23.3\bin\labtool\DutApiMimoApApp_W9177.exe
Name:      Dut labtool
Version:   1.0.0.07
Date:      Sep  6 2021 (19:52:27)
Note:
1. =====WiFi tool=====
2. =====BT  tool=====
3. =====15_4  tool=====
Enter CMD 99 to Exit
Enter option:
  
```

2. RF Command

As the information showed on your screen, please enter these commands below to start your test.

Command: 1 Wi-Fi testing

Command: 2 BT testing

Command: 3 802.15.4 testing

```
C:\Users\Roger.Liu\Desktop\MFG-IW61X-MF-BRG-U16-WIN-X86-1.0.0.7-18.80.254.p23.3\bin\labtool\DutApiMimoApApp_W9177.exe
Name:      Dut labtool
Version:   1.0.0.07
Date:     Sep  6 2021 (19:52:27)

Note:
1. =====WiFi tool=====
2. =====BT  tool=====
3. =====15_4  tool=====

Enter CMD 99 to Exit

Enter option:
```

2-1. Generate 802.11a/b/g/n Packet commands

a. Tx on CH 6 at 15 dBm with a CCK-11Mbps data rate in 20 MHz BW mode

```
44 2          //Set storage type to OTP
35 0 0        // Stop Tx
6 11 0        // Set 2.4G mode
112 0 0       // Set to 20 MHz BW
12 0 6        // Set to ch6
35 0 1 4 15   // Enable Output Power at 15 dBm with CCK-11M Data Rate with b mode
```

b. Tx on CH 6 at 12 dBm with an OFDM-54Mbps data rate in 20 MHz BW mode

```
44 2          //Set storage type to OTP
35 0 0        // Stop Tx
6 11 0        // Set 2.4G mode
112 0 0       // Set to 20 MHz BW
12 0 6        // Set to ch6
35 0 1 13 12  // Enable Output Power with at 12 dBm OFDM-54M Data Rate with g mode
```

c. Tx on CH 6 at 10 dBm with a MCS0 Data rate in 20 MHz BW mode

```
44 2          //Set storage type to OTP
35 0          // Stop Tx
6 11 0        // Set 2.4G mode
112 0 0       // Set to 20 MHz BW
12 0 6        // Set to ch6
35 0 1 15 10  // Enable Output Power at 10 dBm with MCS0 Data Rate with n mode
```

d. Tx on CH 36 at 16 dBm with a OFDM-54Mbps rate in 20 MHz BW Mode

```
44 2          //Set storage type to OTP
35 0 0        // Stop Tx
```



```

6 3 0 // Set 5G mode
112 0 0 // Set to 20 MHz BW
12 0 36 // Set to ch36
35 0 1 13 16 // Enable Output Power at 16 dBm with OFDM-54M Data Rate with a mode
  
```

e. Tx on CH 36-40 at 15 dBm with a MCS7 Data rate in 40 MHz BW Mode

```

44 2 //Set storage type to OTP
35 0 0 // Stop Tx
6 3 0 // Set 5G mode
112 0 1 // Set to 40 MHz BW
12 0 36 // Set to ch36-40
35 0 1 22 15 // Enable Output Power at 15 dBm with MCS7 Data Rate with n mode
  
```

f. Tx on CH 36-40 at 14 dBm with a MCS9 Data rate in 80 MHz BW Mode

```

44 2 //Set storage type to OTP
35 0 0 // Stop Tx
6 3 0 // Set 5G mode
112 0 4 // Set to 80 MHz BW
12 0 36 // Set to ch36-40
35 0 1 1109 14 // Enable Output Power at 14 dBm with MCS9 Data Rate with ac mode
  
```

g. Tx on CH 36-40 at 11 dBm with a MCS11 Data rate in 80 MHz BW Mode

```

35 0 0 // Stop Tx
44 2 //Set storage type to OTP
6 3 0 // Set 5G mode
112 0 4 // Set to 80 MHz BW
12 0 36 // Set to ch36-40
35 0 1 2111 11 // Enable Output Power at 11 dBm with MCS11 Data Rate with ax mode
  
```

Data rate set up table

B mode & G mode:

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

1100 for VHT_SS1_MCS0	1101 for VHT_SS1_MCS1	1102 for VHT_SS1_MCS2
1103 for VHT_SS1_MCS3	1104 for VHT_SS1_MCS4	1105 for VHT_SS1_MCS5
1106 for VHT_SS1_MCS6	1107 for VHT_SS1_MCS7	1108 for VHT_SS1_MCS8
1109 for VHT_SS1_MCS9		

AX mode:
HE Data Rates:

2100 for HE_SS1_MCS0	2101 for HE_SS1_MCS1	2102 for HE_SS1_MCS2
2103 for HE_SS1_MCS3	2104 for HE_SS1_MCS4	2105 for HE_SS1_MCS5
2107 for HE_SS1_MCS7	2108 for HE_SS1_MCS8	2109 for HE_SS1_MCS9
2110 for HE_SS1_MCS10	2111 for HE_SS1_MCS11	

2-2. Test RX sensitivity Commands

a. Rx on CH 6 in 20 MHz BW Mode

```

44 2           //Set storage type to OTP
35 0 0        // Stop Tx
6 11 0        // Set 2.4G
112 0 0       // Set to 20 MHz BW
12 0 6        // Set to CH 6
31 0          // Clear all the received packets
32 0          // Get Rx Packet Count and then clear the Rx packet counter
  
```

b. Rx on CH 6 in 40 MHz BW Mode

```

44 2           //Set storage type to OTP
35 0 0        // Stop Tx
6 11 0        // Set 2.4G
112 0 1       // Set to 40 MHz BW
12 0 6        // Set to CH 6
31 0          // Clear all the received packets
32 0          // Get Rx Packet Count and then clear the Rx packet counter
  
```

c. Rx on CH 36-40 in 40 MHz BW Mode

```

44 2           //Set storage type to OTP
35 0 0        // Stop Tx
6 3 0         // Set 5G
112 0 1       // Set to 40 MHz BW
12 0 36       // Set to CH 36-40
31 0          // Clear all the received packets
32 0          // Get Rx Packet Count and then clear the Rx packet counter
  
```

d. Rx on CH 36-40 in 80 MHz BW Mode

```

44 2           //Set storage type to OTP
35 0 0        // Stop Tx
6 3 0         // Set 5G
112 0 4       // Set to 80 MHz BW
12 0 36       // Set to CH 36-40
31 0          // Clear all the received packets
32 0          // Get Rx Packet Count and then clear the Rx packet counter
  
```

2-3 Others Commands

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

2-4 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.

2-5 802.15.4 Labtool Commands

a. 802.15.4 radio transmit in duty cycle mode

```

12 20          //Set channel to 20 (2450 MHz)
16 4           // Set power to 4 dBm
35 1           // Enable Tx in duty cycle mode
35 0           // Stop Tx
  
```

b. 802.15.4 radio transmit in burst packet mode

```

12 15          //Set channel to 15 (2425 MHz)
33 3 7         //Tx 500 packets at 7ms packet gap
  
```

c. 802.15.4 radio in receive mode

```

12 26          //Set channel to 20 (2480 MHz)
-Connect the DUT to 802.15.4 VSG
               // Set Generator File
               // Set 802.15.4 channel is 26 (2480 MHz)
               // Set signal level at -90 dBm
  
```

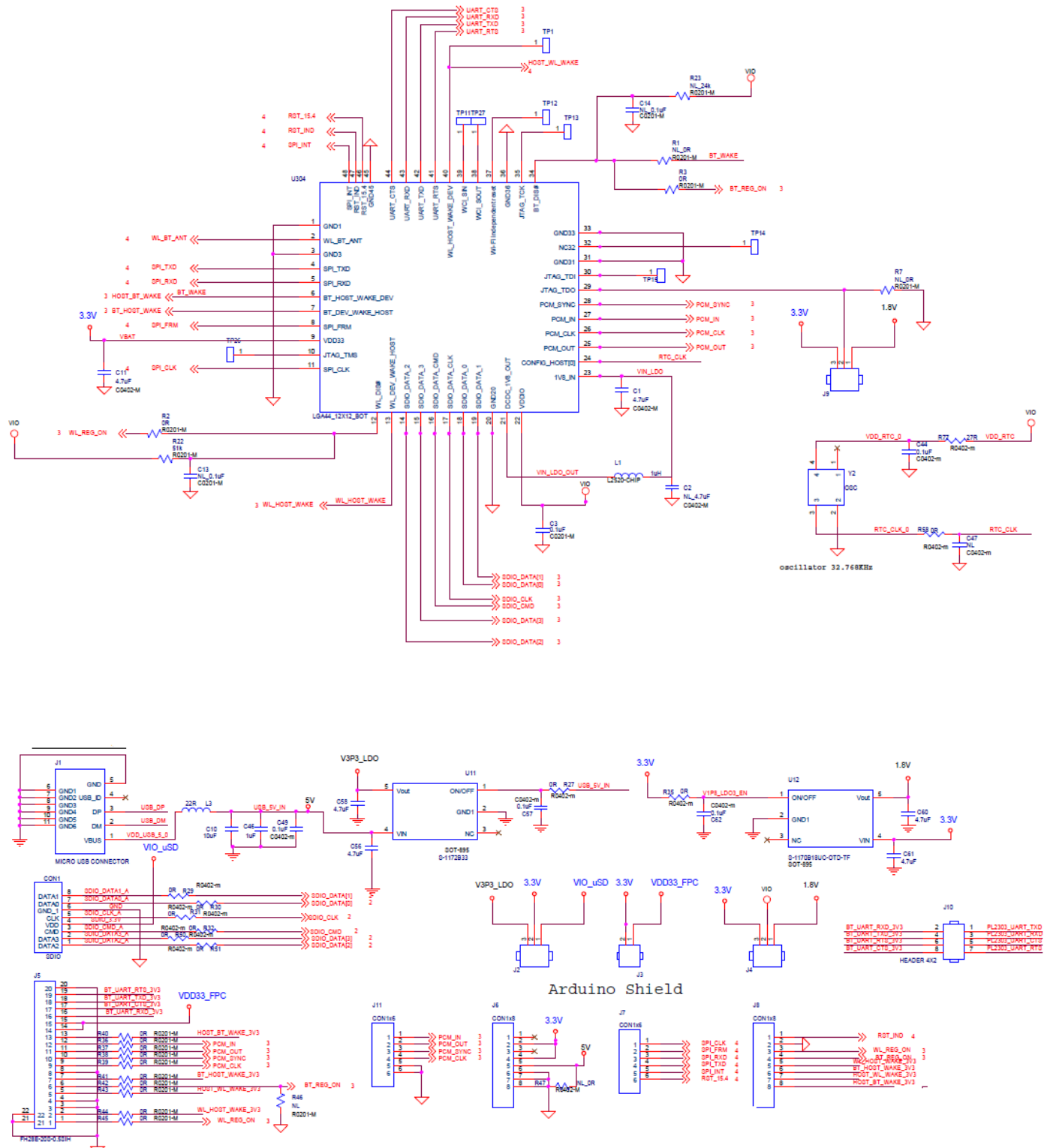
```

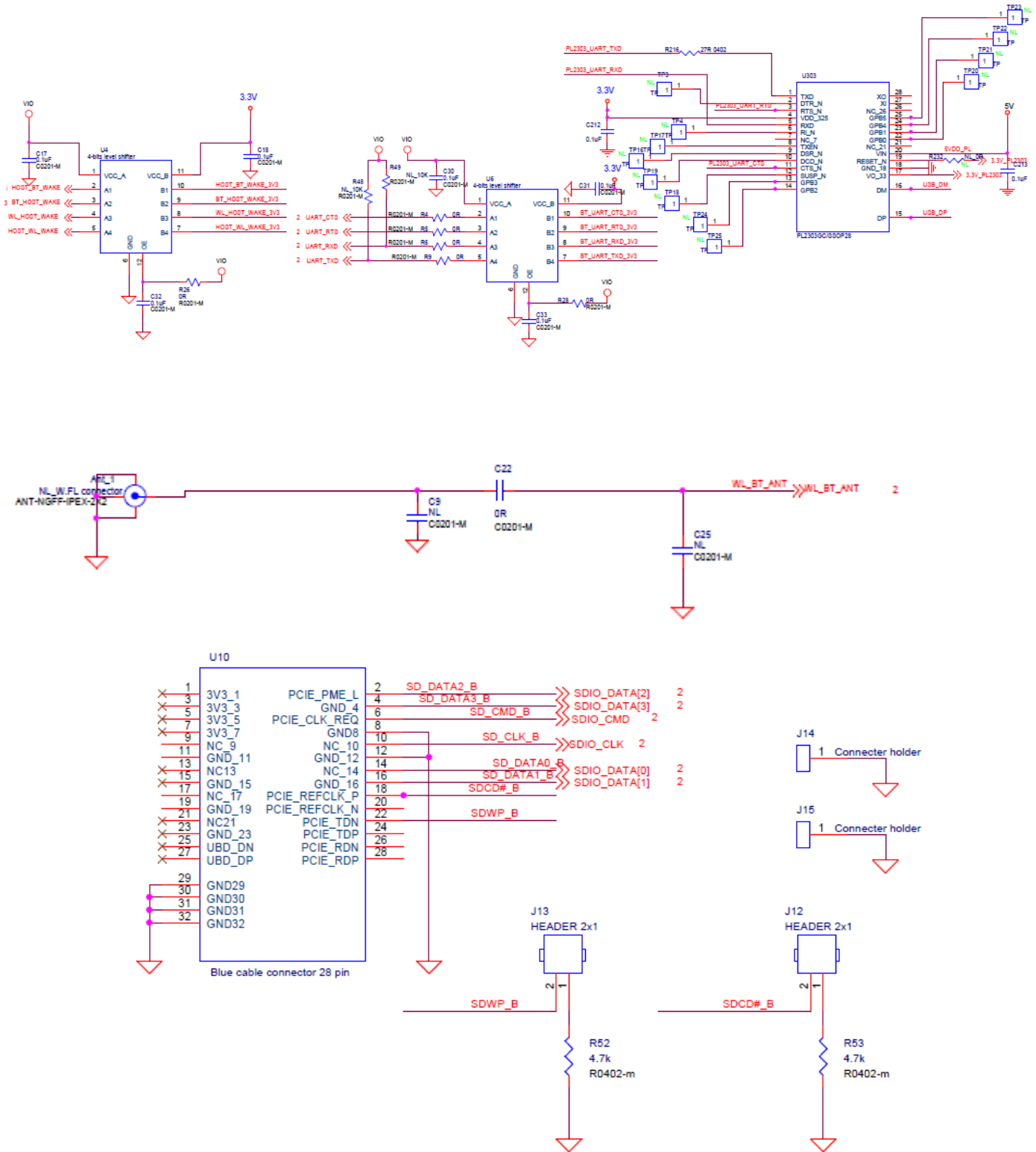
32             // Start RX
35 1           // Enable Tx in duty cycle mode
35 0           // Stop Tx
-Transmit packets from 802.15.4 VSG
  
```

31 // Return extended Rx result report
List of supported RF channels for 802.15.4 radio

Channel number	Frequency (MHz)
11	2405
12	2410
13	2415
14	2420
15	2425
16	2430
17	2435
18	2440
19	2445
20	2450
21	2455
22	2460
23	2465
24	2470
25	2475
26	2480

3. EVB schematic





4. Placement

