



PUPradar __ Smart Radar Sensor
Luswave Technology

PUP SO24P T2R2 EVALUATION KIT

USER MANUAL

PUPradar USER MANUAL

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1 Getting started

1.1 introduction

Luswave Technology develops low-power, low cost and easy using radar development kits, which offers great flexibility for applications in academic research, industry automation, public safety and DIY project .

PUP_SO24P_T2R2 is a single board K-band development kit. This model highly integrated RF module and a powerful FPGA-based processor module into a single board. The RF front end consists of two transmitters and two receiver channels, which makes it a simplest MIMO radar and support direction of arrival (DOA) measuring, is most suitable for target tracking, movement sensing, site surveillance, occupancy sensing, people counting, fall detection, gesture sensing, and many other uses. Its FPGA-based MCU and 4-channel 65MSPS pipeline LVDS ADC module offers ultimate design flexibility and accuracy with industry-leading programmable logic.

A user-friendly graphical user interface (GUI) allows great flexibility and adjustability. Users can easily select desired center frequency and bandwidth, signal waveforms, sampling rates, display parameters etc.

1.2 Key features

- Support Both FMCW and CW Modulations.
- 4 channel LVDS Pipeline AD converters.
- Complex (I & Q) Data Acquiring.
- User Friendly Graphical User Interface (GUI).
- Adjustable Parameter Setting.
- Long Recording Time for Raw Data.
- USB 2.0 High Speed(480Mb/s) Interface to Host Computer.
- Single +6V DC Supply Voltage.



Figure 1. PUP_SO24P_T2R2

1.3 Kit contents

The PUP_SO24P_T2R2 Development Kit comes with the single board radar device and a mounting base. The complete list of the SDR development kit includes:

- Single Board Development Kit
- AC/DC power adapter.

- USB 2.0 A to Mini-B cable.
- Mounting kit.
- A USB flash drive.

2 Hardware Specifications

2.1 Functional Block Diagram

Figure 2 is a block diagram of the PUP_SO24P_T2R2 single board development Kit. PLL controlled frequency sweep is configured by FPGA based MCU whenever parameter settings are changed. Through a low pass filter bank, four channel of IF signals are acquired by a 65MSPS four channel LVDS AD converter and then streamed to host computer via a high speed USB interface (up to 480Mb/s) for further processing. A graphical user interface (PUPradarGUI) is used to control the configuration of the kit.

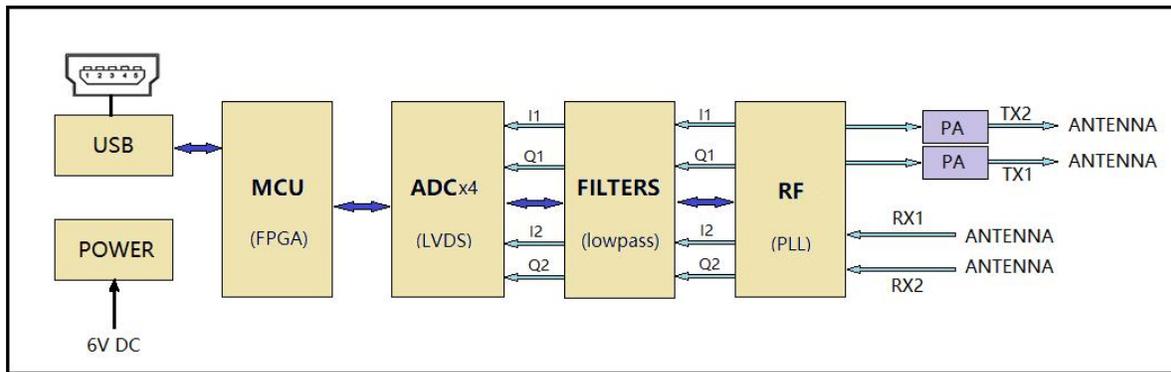


Figure 2. Block Diagram

2.2 Specifications

There are 4 on board patch antennas on PUP_SO24P_T2R2.

Table 1 Specifications of the multi-channel PUP_SO24P_T2R2

Model	PUP_SOLO24P_T2R2
Antennas	4 on board Patch
RF Channels	2 Transmitters, 2 Receivers
Modulations	FMCW, CW
Typical Frequency	24GHz-25GHz (Expandable to 23.5GHz-26GHz)
Typical Bandwidth	0.25GHz-1GHz (Expandable to 2.5GHz)
Tx output power	17dBm
Rx noise figure	10dB
Detectable Range	People: 25m, middle sized vehicle: 70m
Supply Voltage	6V
Supply Current	1.4A
Operating temperature	-40°C-85°C

3 System Setup

3.1 Mounting Base Setup

When shipped out, the device was already mounted on the mounting stand. The stability, heights and directions of the board can be adjusted by the stand base and arm extension.



Figure 3. Device on Mounting Stand

3.2 USB Driver Setup

Find the Driver folder in the include USB flash drive, and copy it to wherever you like.

<input type="checkbox"/>	DOCs	12/9/2020 8:28 PM	File folder
<input checked="" type="checkbox"/>	Driver	12/9/2020 8:29 PM	File folder
<input type="checkbox"/>	PUPradarGUI	12/9/2020 10:06 PM	File folder
<input type="checkbox"/>	PUPradarGUI_standalone	12/9/2020 10:25 PM	File folder

Figure 4. USB Driver

After plug in the 6V power to the device, connect your computer and the board with USB A to USBmini cable.



Figure 5. USB Driver Setup

Open the Device Manager window on your PC, “Unknown Device” is shown when the device is first connected.



Figure 6. Device Manager Window.

When you install the Driver for this device using the file in the driver folder and “Cypress FX2LP No EEPROM Device” is shown, the driver is installed successfully.



Figure 7. Driver Software Installed Successfully

3.3 PUPradarGUI Setup

3.3.1 GUI app install

In the USB flash drive, you can find two folders “PUPradarGUI” and “PUPradarGUI_standalone”.

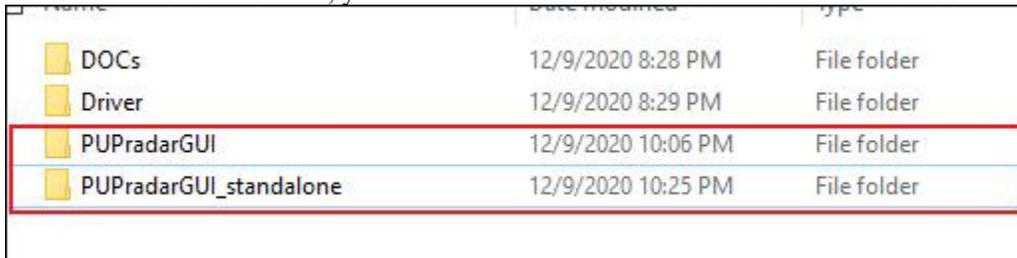


Figure 8. included documents folders

If you are already a Matlab User, copy the folder “PUPradarGUI” into your Matlab workspace, set the path to this folder and run PUPradarGUI.m.

If you want to use standalone version, open folder “PUPradarGUI_standalone” , double click “PUPradarGUI.exe” to run or “MyAppInstaller_mcr.exe” to install.

3.3.2 PUPradarGUI user’s guide

When run the PUPradarGUI, the GUI window (as shown in Figure 6) will appear. First hitting the “Fresh” button, the software will automatically detect the model of the device. Once the device has been successfully recognized, its model name will show in the message window. you may hit the “start” toggle button, the GUI gives users access to selecting of modulation and other parameters. Anytime you want to record the raw data, select recording time and push “record” button to begin. When recording is finished, a window will pop out for you to save the recorded data into a data file.

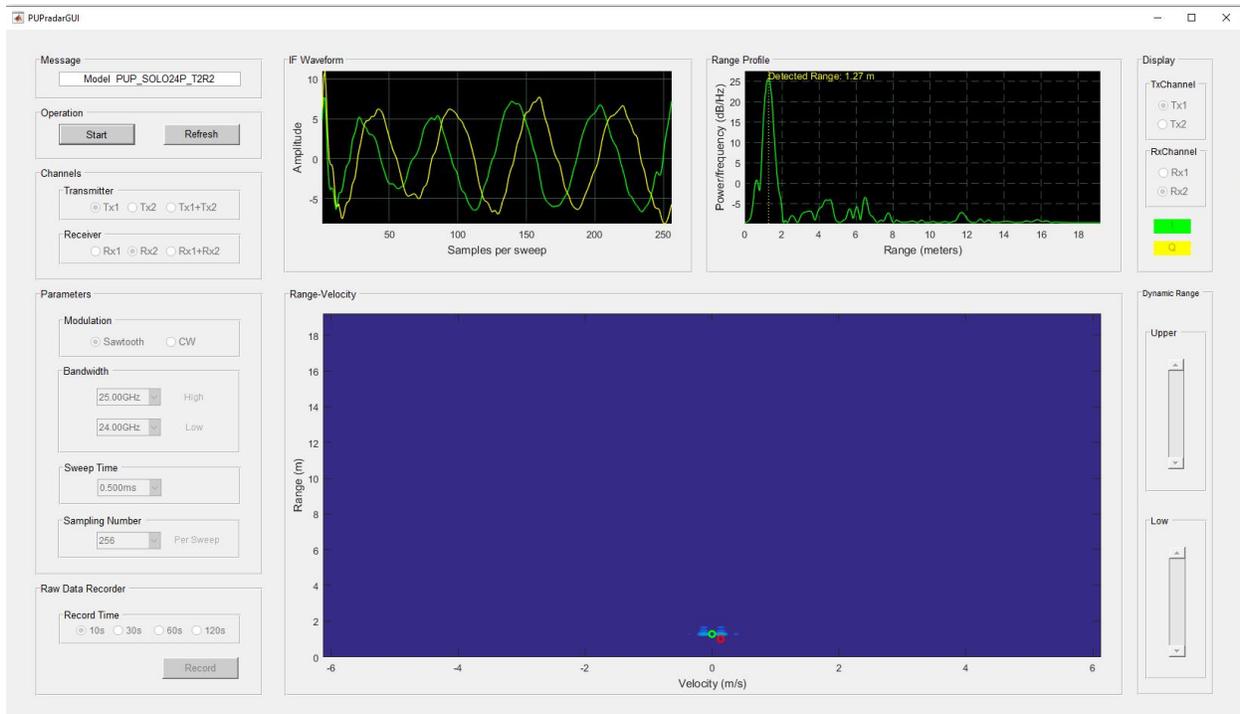


Figure 9. PUPradarGUI

- **Message Window**

When the device is OK, the Message window shows detected device model, otherwise it will show error message.

- **Operation Panel**

There are two buttons in operation panel. Start/stop button is a toggle button. Refresh button works as a software reset to default button.

- **Channel Panel**

In channel panel, you can active any Tx channel or Rx channel. When “Tx1+Tx2” is selected, the device automatically work at MIMO mode, all Tx and Rx channels are activated.

- **Parameter panel**

In Parameter Panel, modulation, centerfrequency/bandwidth, sweep time and sampling number per sweep can be select.

- **Raw Data Recorder**

When the GUI is running, the buttons in Raw Data Recorder panel are inactive. You’ll have to stop the GUI to active the setting and record function.

After the parameters are properly set, push record to start the recording and a save file window will appear after the recording time is over. The default file format is *.mat, but you can save the file as any form you like.

- **Display Panel**

When one Rx channel is activated, the three default display window is for that channel. When both the Tx channels or both Rx channels are activated, this panel switch the three display window to the selected channel combination.

- **Dynamic Range Panel**

The two sliders in Dynamic Range Panel control the signal threshold in the lower display window. lower position shows more target detail and higher position eliminate more noise for the image.