**Pseudo JV Standard Operating Procedure:**

**Hardware instructions:**

* Connect Keithley to computer using GPIB to USB extension located beneath the PLIV box.

A black and blue cable with a red tag attached to it

Description automatically generated A close up of a device

Description automatically generated A machine in a cabinet

Description automatically generated

* Ensure laser is turned off.
* Remove laser from PLQY integrating sphere using Allen key and place in clamp.

A close up of a device

Description automatically generated A close-up of a device

Description automatically generated

* Align sample beneath laser.
* Contact sample using alligator clips in optical box.

**Software instructions:**

**Type the following into the command prompt/terminal:**

ipython

cd /into/your/directory

from pJV import PJV

c = PJV.pJV()

c.take\_pjv(sample\_name = "sample", min\_current = 300, max\_current = 780, step = 20, direction = "fwdrev", n\_wires = 2, num\_measurements = 5, stabilize\_time = 3)

**Optional arguments:**

# User facing method to take full pseudo JV data

def take\_pjv(self, sample\_name = "sample", min\_current = 300, max\_current = 780, step = 20, n\_wires = 2, num\_measurements = 5, stabilize\_time = 3, direction = "fwdrev"):

''' Method to take a pseudo-JV curve that will save the data in a csv file

Parameters

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sample\_name : str

The name of your sample, default is "sample"

min\_current : int

Minimum current setting of laser, default is 300 mA

max\_current : int

Maximum current setting of laser, default is 780 mA

step : int

Steps between min and max current, default is 20 mA

n\_wires : int

The number of probes used with Keithly to measure Voc; options are 2 or 4, default is 2

num\_measurements : int

The number of times each condition is measured and averaged, default is 5

stabilize\_time : float

The time between laser current settings to allow laser power to stabilize, default is 4 seconds

direction : str

The direction of the scan: "fwd", "rev", or "fwdrev", default is "rev"

Returns

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Saves the data to csv file containing laser current settings, average Voc, and standard deviation

**If connection issues:**

1. check for available addresses

import pyvisa

rm = pyvisa.ResourceManager()

rm.list\_resources() #prints a list of available GPIB addresses

2. connect to address of your choice

Currently set to connect to this address:

# Connect to the Keithley

try:

self.JVcode = control3.Control(address='GPIB2::22::INSTR')

self.JVcode.wires = 2

print("Keithley connected and set to 2 probe sensing.")

except Exception as e:

print("Error while trying to connect to the Keithley: ", e)

print("Please ensure the Keithley is connected to 'GPIB1::22::INSTR' and try again.")

raise self.CustomError("Keithley Connection Error")

**Export data as needed- e.g. copy paste into Synology Drive.**

**Turn of Laser and TEC when finished measuring samples.**