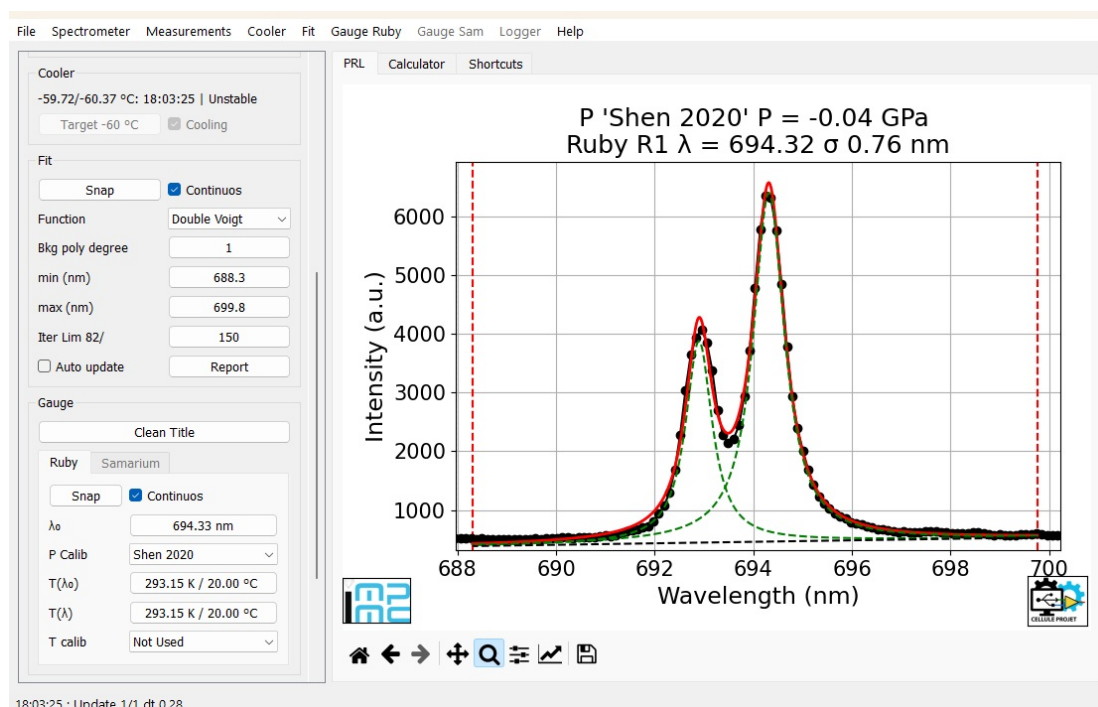


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## Rubycond

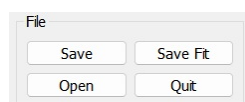
Python software to determine pressure in diamond anvil cell experiments by Ruby and Samarium luminescence



## Manual

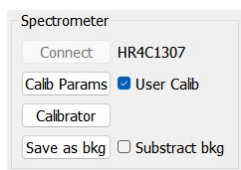
[!IMPORTANT] All controls are available both in the left sidebar and within the menus, with the exception of the items in the Help menu, which are only accessible through the menu bar. The left sidebar can be hidden to maximize the size of the figures.

### File



- **Save**
  - Save the data in txt, csv and npy format (wavelengths, intensity), plus all the accumulations if the **Measurement: Accumulation** option is selected. Save the header in rtf format, with a resume of the performed analysis. Save the main figure in png format.
- **Save Fit**
  - WIP, not yet implemented
- **Open File**
  - Read data from file using the [Rubycond Open File software](#)
- **Quit**
  - Quit the main program

### Spectrometer



Spectrometer

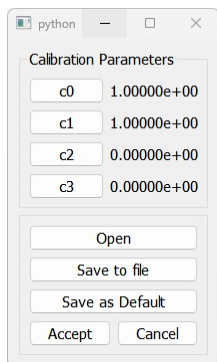
Connect: HR4C1307

Calib Params: ☒ User Calib

Calibrator

Save as bkg: ☐ Subtract bkg

- **Calib Params**
  - Opens the **Calibration Parameters** window to manually input data, manage calibration files (Open/Save), or edit the default settings. Click Accept when finished to confirm the new values.



python

Calibration Parameters

c0: 1.00000e+00

c1: 1.00000e+00

c2: 0.00000e+00

c3: 0.00000e+00

Open

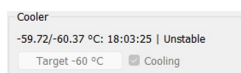
Save to file

Save as Default

Accept Cancel

- **User Calib**
  - Select to use the calibration
- **Calibrator**
  - Open the [Rubycond Calibrator software](#)
- **Save as bkg**
  - Capture the current spectrum to be used as a background reference
- **Subtract bkg**
  - Enable background subtraction to remove the stored reference from the active measurement

## Cooler :warning: Available only for Andor spectrometers.



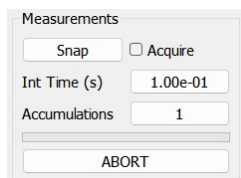
Cooler

-59.72/-60.37 °C: 18:03:25 | Unstable

Target -60 °C: ☒ Cooling

Displays the target cooling temperature and the current temperature.

## Measurements



Measurements

Snap ☐ Acquire

Int Time (s): 1.00e-01

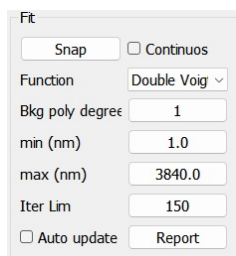
Accumulations: 1

ABORT

- **Snap**
  - perform a single acquisition
- **Acquire**
  - start a continuous acquisition
- **Int Time (s)**
  - change the acquisition integration time in seconds, default value is 0.1 seconds
- **Accumulation**
  - change the number of accumulations, default value is 1

## Fit

[!IMPORTANT] Fit are always performed to the data with Wavelengths in  $\text{cm}^{-1}$ .



Fit

Snap ☐ Continuous

Function: Double Voig ▾

Bkg poly degree: 1

min (nm): 1.0

max (nm): 3840.0

Iter Lim: 150

☐ Auto update Report

- **Snap**

- perform a single fit
- **Continuos**
  - start a continuos fitting routine
- **Function**
  - Voigt
  - Gauss
  - Lorentz
  - Double Voigt
  - Double Gauss
  - Double Lorentz
- **Bkg poly Degree**
  - change the polynomial degree up to 7
- **Min (nm)**
  - Fit range minimum value. Click on the value to change it. If you click on the graph first, the value of the selected point will be suggested automatically.
- **Max (nm)**
  - Fit range maximum value. Click on the value to change it. If you click on the graph first, the value of the selected point will be suggested automatically.
- **Iter Lim**
  - The maximum number of iterations used in the minimization routine. The default value is 150
- **Autoupdate**
  - If not selected the Fit initial condition are automatically evaluated when the Fit range is changed (**Fit:Min** and **Fit:Max**), so not taking in account eventual changement in the afterwards acquired signal.
  - If selected the Fit results are used as the Fit initial condition in the next Fit.
- **Report**
  - Opens a window with the detailed fit report

## Gauge

This menu allows to choose the gauge to be used and to change the default values for the reference wavelenghts and temperatures to be used both for Ruby and Samarium  $\text{Sm}^{2+}:\text{SrB}_4\text{O}_7$ .

- Ruby  $\text{Cr}^{3+}:\text{Al}_2\text{O}_3$ 
  - $\lambda_0$  (nm) = 694.25
  - P Calibration
    - Shen 2020
    - Mao hydro 1986
    - Mao non hydro 1986
    - Dewaele 2008
    - Dorogokupets and Oganov 2007
  - $T(\lambda_0)$  (K) = 298
  - $T(\lambda)$  (K) = 298
  - T Calibration
    - Not Used
    - Datchi 2004
- $\text{Sm}^{2+}:\text{SrB}_4\text{O}_7$ 
  - $\lambda_0$  (nm) = 685.51
  - P Calibration
    - Rashchenko 2015
    - Datchi 1997

## Logger

WIP, not yet implemented

## Tab Shortcuts

- List of available shortcuts  
Available layouts: QWERTY and AZERTY  
To switch layouts, uncomment the corresponding line (line 127 or 128). Default is QWERTY.

```
self.keyboard = 'QWERTY' #uncomment to select
#self.keyboard = 'AZERTY' #uncomment to select
```

QWERTY Shortcuts

```
ctrl + Z = Set Fit:Min as cursor
ctrl + X = Set Fit:Max as cursor
ctrl + C = Zoom to fit
ctrl + Q = Rescale to full scale
ctrl + F = Fit snap
ctrl + G = Fit continuos
```

```
ctrl + O = Open file
ctrl + S = Save file
```

#### AZERTY Shortcuts

```
ctrl + W = Set Fit:Min as cursor
ctrl + X = Set Fit:Max as cursor
ctrl + C = Zoom to fit
ctrl + Q = Rescale to full scale
ctrl + F = Fit snap
ctrl + G = Fit continuos
```

```
ctrl + O = Open file
ctrl + S = Save file
```

## Tab Calc

- Let the user to perform simulations using different gauges, wavelenght, pressure and temperatures for Ruby and gauges, wavelenght and pressure for Samarium using the [Ruby and Samarium pressure/wavelength calculator](#)

## Install

Use pip to install the program **within a virtual environment (strongly recommended)**.  
[Here's a short tutorial on installing a virtual environment](#).

```
pip install rubycond
```

To update:

```
pip install rubycond --upgrade
```

## Supported spectrometers

Ocean Optics and Andor spectrometers. To change spectrometer, uncomment the corresponding line (line 131 or 132). Default is OceanOptics.

```
self.spectrometer_model = "OceanOptics"
#self.spectrometer_model = "Andor"
```

### Ocean Optics spectrometers

Install the [python-seabreeze](#) for the Ocean Optics spectrometers:

```
conda install -c conda-forge seabreeze
seabreeze_os_setup
```

### Andor spectrometers

Using Andor spectrometers requires the purchase and installation of the official Oxford Instruments Software Development Kit (SDK).

## About

### Author

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### Contacts

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[Cellule Projet](#) @ [IMPMC](#)

## License

**Rubycond**: Python software to determine pressure in diamond anvil cell experiments by Ruby and Samarium luminescence

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## **Release notes**

Version 0.1.1 Release 240222: First release

Version 0.1.2 Release 240227: Fixed "LMFIT Error: pk\_2\_gauss" bug when "Double Gauss" fit function is selected

Version 0.2.0 Release 260301: Total program rewrite: migration from Tkinter to Qt5 libraries. Added Andor spectrometers. Version 0.1.2 is still available [here](#).