RI Retieval In Labview

User Manual

Lior Segev, Nir Bluvshtein, and Michel Flores

Weizmann Institute of Science

Rehovot, Israel

Contact person: lior.segev@weizmann.ac.il

Introduction

This software retrieves the real and imaginary part of a material’s refractive index for multiple wavelengths. It accomplishes this by best fitting theoretical (Mie theory) extinction cross sections to measured extinction cross sections for a number of size parameters. It also corrects the theoretical extinction cross sections by including contribution from multiple charge particles. The best fit procedure of minimizing chi squared enables us to predict the estimated uncertainty (one standard deviation) in both the real and imaginary best fit parameters. The users can also select which size will be included in the curve fit, decide if they want to restrict the search to positive real part or not, and to incorporate extinction or/and diameter factor to enable a sort of calibration.

Installation

Ensure that you have the build directory that include the following files:

1. RIretrievalInLabview.exe
2. Mie.dll
3. ivan

Labview 2011 is installed.

Operation

The calibration recipe proceed as follows:

1. Connect one of the fibers to HG-1 mercury lamp, while keeping the second fiber completely in the dark. It is enough to leave it connected to the cavity.
2. Setup acquisition parameters in Andor software package as shown in Figure 1, paying attention in setting the exposure time to be 0.00001 seconds and the readout mode “image” and acquisition mode is set to “single”.
3. Under “Hardware” menu, choose “Shutter Control” and set the shutter to “CLOSED for background” as shown in Figure 2. TTL level and time to close/open should be left untouched. After the calibration is done, it is recommended to return the shutter to “Fully Auto”. For orientation purposes, In Figure 3, one can see the image when the Shutter is set to Fully Auto. The lines are kept to the upper region of the CCD and the smearing effect is not there. Whereas, in Figure 4, the smearing effect is evident, where the mercury lines cross the half of the CCD screen and pass to the lower part of the CCD, where channel 2, will be located.
4. Place a cursor on the image of CCD as shown in Figure 4 and move it down to find a line index where the relevant HG peaks for calibration are not saturated.
5. We found that spectrograph comes calibrated with no need of any polynomial fit, but a applying a simple offset.
   1. Choose “x-calibration by spectrograph” from the “calibrate” menu
   2. In the center Wavelength – choose the frequency that you had like to be in the center of the CCD
   3. The micrometer setting should change automatically and should be a factor of 4 smaller than that of the chosen wavelength.
   4. Adjust the micrometer to match the value in “c”
   5. In our instrument the micrometer setting is not calibrated well, so we chose to find a mercury line and move the micrometer so that mercury line will be as close as possible to its lit value. See Figure 5 for the mercury spectral lines.
6. If you find such a line, you can save this data file in the following way: choose “save as” from the file menu and save a file with a “sif” extension, enter a filename and save.
7. Repeat from 1 with the second fiber.
8. The actual calibration is done offline by loading the file again in the Andor software and choosing “export” to an ascii file with a “.asc” extension. Locate in Andor software the line in the CCD image, where it is not saturated, and input this line to the Gaussian fit script that is written in Igor.

Spectrograph X calibration

software

Center wavelength = 365.015

Micrometer Setting = 91.2538

hardware

actual micrometer setting = 100

|  |
| --- |
| Mac HD:Users:liorsegev:Desktop:image.png |
| Figure 1 – Setup acquisition parameters window |

|  |
| --- |
| C:\Users\Weizmann\AppData\Local\Temp\VMwareDnD\1b336981\image[1].png |
| Figure 2 – Shutter control windows under the “Hardware” menu |
|  |
|  |
| C:\Users\Weizmann\AppData\Local\Temp\VMwareDnD\6d09fedc\image[2].png |
| Figure 3 – Shutter is set to “Fully Auto” – smear effect is extinguished |

|  |
| --- |
| C:\Users\Weizmann\AppData\Local\Temp\VMwareDnD\6f80f96f\image[3].png |
| Figure 4 – Shutter is set to “CLOSED for background”. The smearing is fully evident |
|  |
|  |

|  |
| --- |
| C:\Users\Weizmann\AppData\Local\Temp\VMwareDnD\713799b0\2012-07-09 15.51.47.jpg |
| Figure 5 – Hg and Ar spectral lines |
|  |
|  |