**Introduction to ASTRA**

**Objectives**:

This seminar is a general introduction to the ASTRA software, covering

1. Software installation and activation
2. Connecting to instruments
3. Collecting data and calibrating – the “first” collection

**Topics**:

1. Software installation and activation
   1. Using the installation disk
   2. Upgrading and applying patches  
      ***Note:*** You can check for available upgrades in ASTRA 5.3.4 (**Help | Check for Upgrades**)
   3. Installed software and supporting materials
   4. Activating base ASTRA functionality and optional modules in ASTRA (**System** **| Feature Activation**)
   5. Licensing:
      1. For data collection, one license required for each light scattering instrument.
      2. For the purpose of data processing (by the researcher collecting the data), ASTRA can be installed on additional computers under the same license: back in the office, your laptop, at home, whatever.
2. Connecting to instruments
   1. **Via network connection (DAWN HELEOS, miniDAWN TREOS, Viscostar, Optilab rEX)**

|  |  |
| --- | --- |
| 1. Go to **System → Instruments…**. |  |
| 1. In the **Instruments** window, choose **Add**. This will launch the **Add Instrument** dialog. |  |
| 1. In the **Add Instrument** dialog, click the **Search** button. |  |
| 1. Select your instrument(e.g. WYATT-002-H2HC),and click **Add**. |  |
| 1. In the **Instruments** window select your instrument. |  |
| 1. Choose **View** to launch the **Diagnostic Manager** to view the instrument. Click on **Start Monitoring** to view data collection. |  |

**Networking issues:**

If you are unable to connect to your instruments as described above, you may need to configure your Firewall and/or your DCOM settings. Please see the document “**Instructions for configuring Windows XP Professional Service Pack.pptx”** in Section 3 of your USB memory key for a guide.

**Please refer to the Documents:**

* ReadMe - ASTRA Firewall Configuration (6001 Rev B).pdf
* ReadMe - Windows XP SP2 & Vista Configuration (M6006 Rev B).pdf
* ReadMe - Multiple Network Adapter Configuration.pdf

If you are using ASTRA 5 with Security Pack, the following documents may be helpful to configure the SQL server:

* ReadMe - SQL Server 2002 Configuration (M6003 Rev B).pdf
* ReadMe - SQL Server 2005 Express Automating Database Maintenance (M6005 Rev B).pdf
* ReadMe - SQL Server 2005 Express Configuration (M6004 Rev B).pdf

☺ You can find these documents on your USB memory key in ***\Wyatt Hardware & Software Manuals\Software*** or on any computer with ASTRA installed in: ***C:\Program Files\WTC\Astra 5.3\ReadMe Files*** ☺

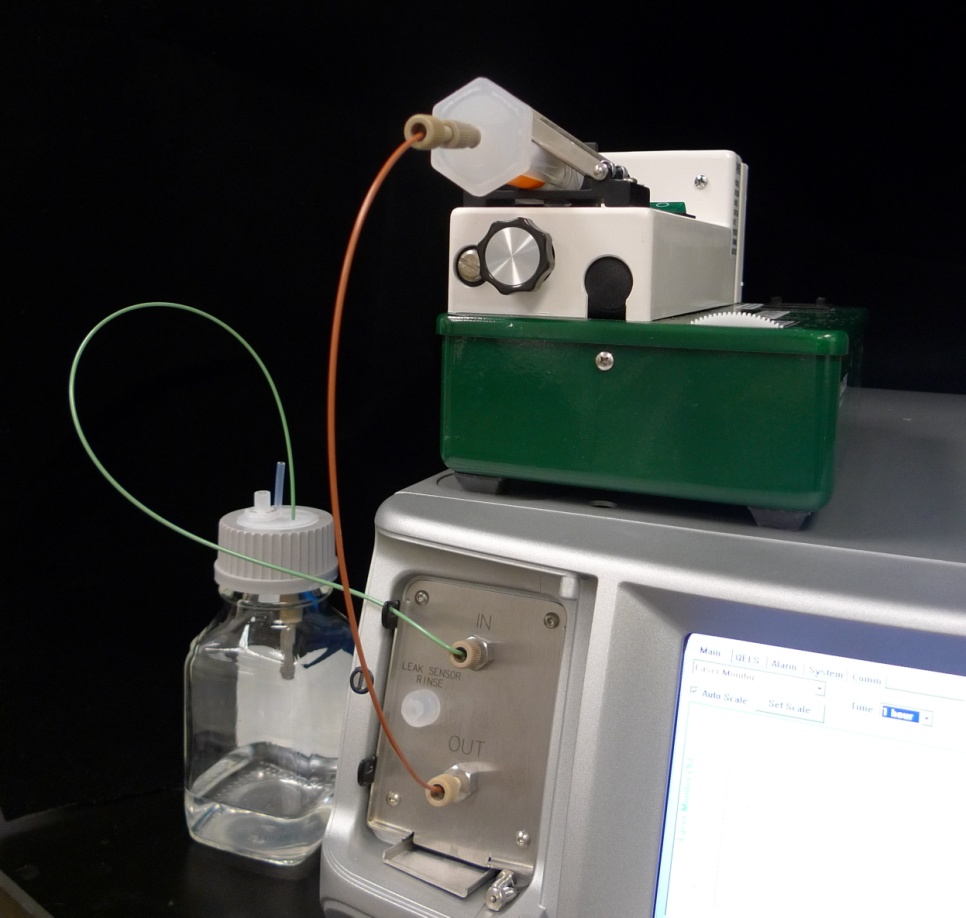
**b)** **Via serial connection (DAWN EOS, miniDAWN Tristar)**

|  |  |
| --- | --- |
| 1. Go to **System → Instruments…** (see above). 2. In the Instruments window choose **Add** (see above). |  |
| 1. In the **Add Instrument** dialog choose the **Manual** option in the lower half of the window. |  |
| 1. Copy the PC name into the **Name** field. The PC name usually can be found by right-clicking the **My Computer** icon on your desktop and choosing “**Properties**.” If the computer name is presented as a string such as PCNAME.DOMAIN.COM, copy only the first string “PCNAME.” The name of our example computer below is “LAB\_QC3”. |  |
| 1. Click the **Add** button at the bottom of the window. |  |
| 1. In the **Instruments** window, select your instrument and choose **View** to launch the Diagnostic Manager to view the instrument. Click on **Start Monitoring** to view data collection. |  |

1. Collecting data for calibration
   1. Make sure your light scattering instrument is powered on and connected to the computer.
   2. If you flow cell does not already contain toluene or contains an air bubble, use a syringe pump and syringe containing with syringe tip filter to infuse the flow cell with toluene as shown below. Make sure that the solvent in the flow cell is compatible with toluene. If you are using an aqueous salt buffer, flush first with 10-20mL of water, then 10-20 mL of alcohol and then change to toluene.

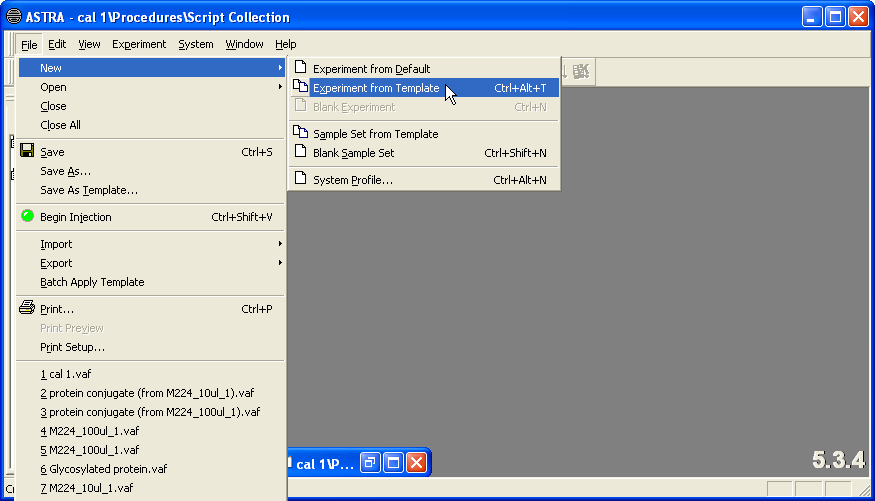
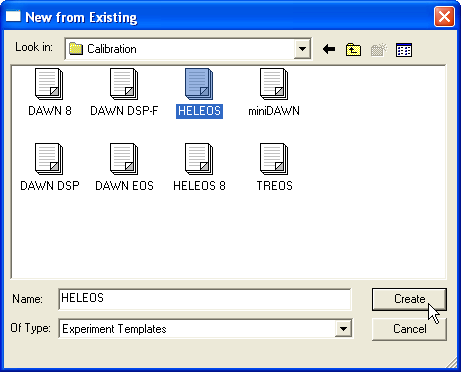
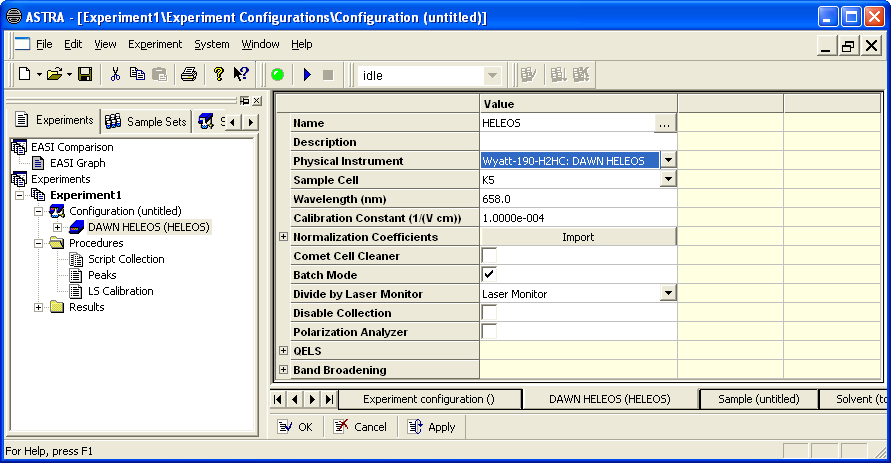
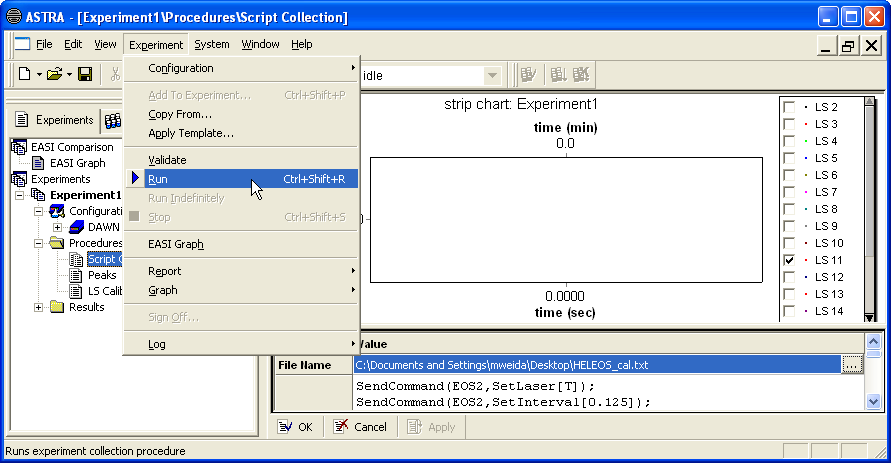
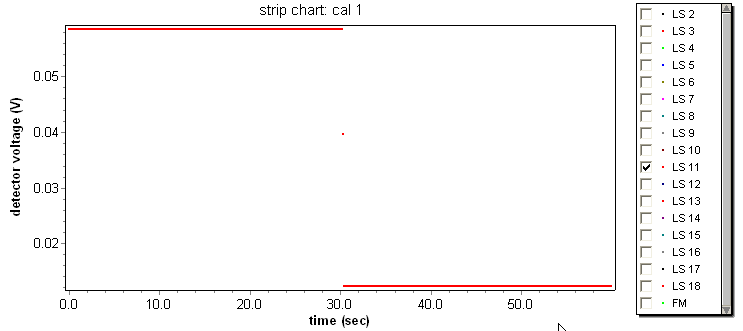
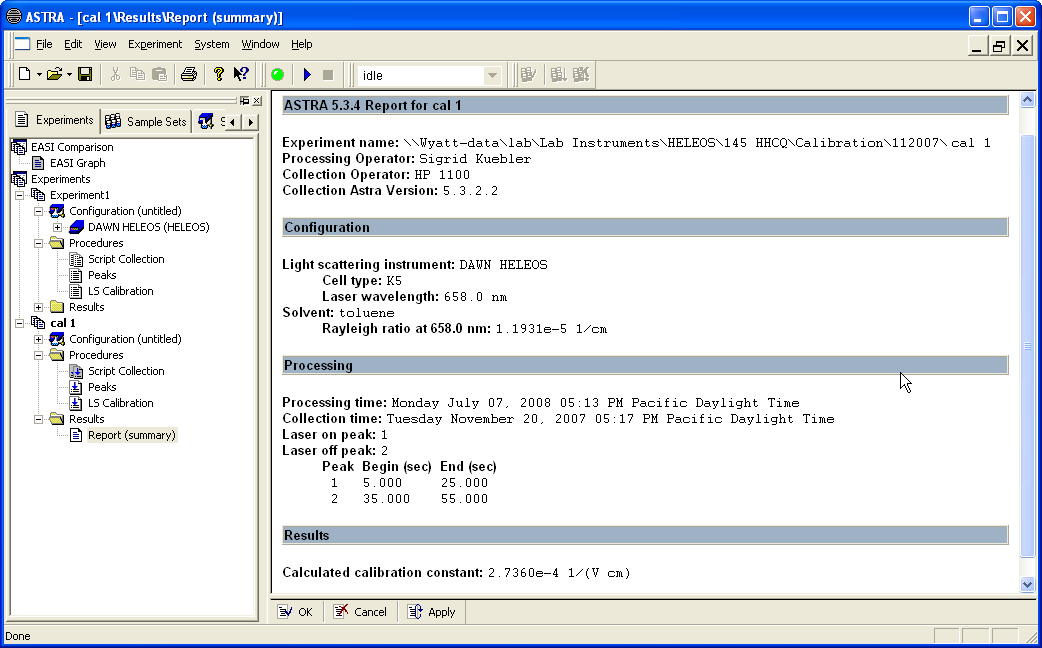
Connect a 10 mL syringe with luer connection and 0.02” tubing to the OUT port of your MALS instrument. Reverse flow will help create back pressure.

10 mL syringe with HPLC grade toluene and syringe tip filter (use smallest pore size available).



Syringe pump with flow rate ~ 0.5 mL/min.

Connect 0.03” tubing to the IN port of your MALS instrument and a waste reservoir,

* 1. In ASTRA, all experiments are created from a template. Select **File | New | Experiment from Template**.  
       
     
  2. Navigate to the **System Templates** folder, choose the **Light Scattering** folder, and open the **Calibration** folder to find the calibration template for your instrument (HELEOS, TREOS, miniDAWN, DAWN EOS, …).  
       
     
  3. In the workspace, expand the **Configuration** node and then double click on the node for the light scattering instrument. Set the following in the instrument dialog, and click **OK**:
     1. **Physical instrument** – select the button with three dots (…) and choose your instrument.
     2. **Sample cell** – make sure the appropriate flow cell is entered (**Fused Silica** in newer instruments or **K5** in older instruments are the most commonly used flow cells).
     3. **Wavelength** – make sure the appropriate wavelength is entered.  
          
        
  4. Choose **Experiment | Run**. The calibration will proceed.  
     
  5. Strip Chart after Data acquisition:  
     
  6. After the calibration is complete, view the calibration constant in the **Report**. Expand the **Results** node and select **Report**.  
       
     
     1. The **Calibration Constant** should be **within 5%** of the value reported to you by Wyatt Technology on your **Certificate of Performance**.
     2. If the calibration constant is different, it is possible that there is an air bubble in the cell. Refill the flow cell with toluene and repeat the calibration.
  7. Your instrument is now ready to go.

***Remember to flush your flow cell with 20 mL of ALCOHOL and then 20 mL of WATER before going to an aqueous buffer, since   
TOLUENE + WATER = A MESS!***

***Use only HPLC grade solvents and filter all solvents through a 0.02 μm syringe tip filter!***

**Why are the units of the toluene calibration constant (V-1cm-1)?**

The absolute calibration of the Wyatt Light Scattering detectors employs a solvent that scatters strongly, such as toluene, with the well known Rayleigh Ratio @ 658.0 nm of 1.1931x10-5 cm-1. The Rayleigh Ratio is a measure for the amount of light that will be scattered from a point source at a fixed distance and angle, can be defined as:

 *Equation (1)*

Where:

***Rθ***= the Rayleigh ratio at angle θ; units of inverse Centimeters (cm-1);

***I***= the intensity of the incident radiation; units of Volts (V);

***i*θ** = the intensity of scattered radiation observed at an angle θ; units of Volts (V);

***r*** = the distance from the point of scattering; units of Centimeters (cm);

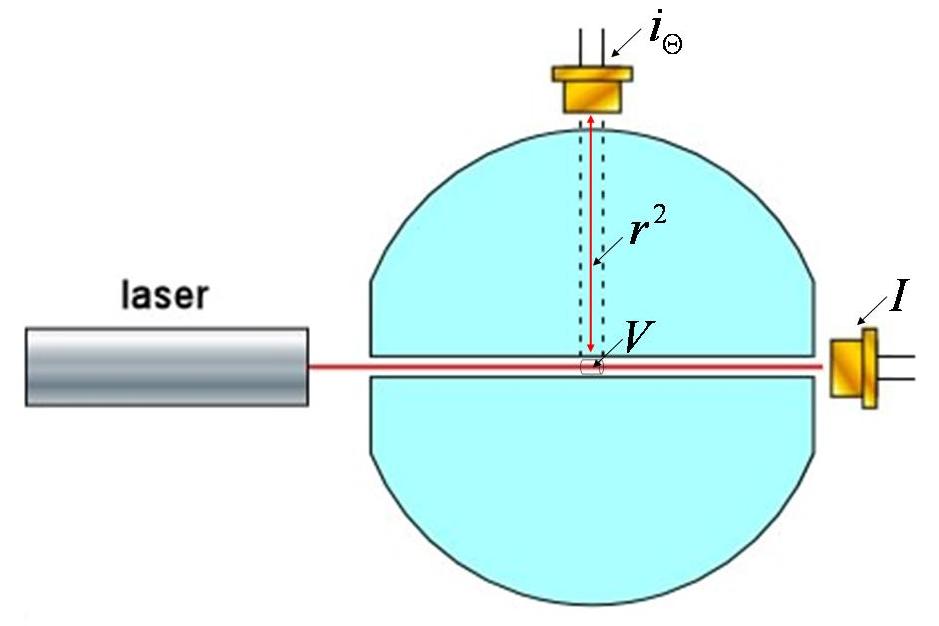
***V*** = the total scattering volume; units of Centimeters cubed (cm3);

***f*** = is a unit-less factor that takes account of polarization phenomena, for Wyatt detectors which use vertically polarized light, so the value of *f* = 1.

The units cancel out leaving inverse centimeters, which are the units for Rayleigh Ratio, refer to Equation 2. An image depicting the important variables in Equation 1 is shown in Figure 1, below.

 *Equation (2)*

In order to use Equation 1 to quantify light scattering intensity, the detectors must be calibrated because the quantities we measure directly are detector voltages and not light intensities, however because the voltages measured by the photodiodes are linearly proportional to light intensities, we can calibrate their response, this is done by deriving a calibration factor which gives the correct value for a known scattering standard and using a pure solvent as the scattering standard makes the calibration completely independent of any polymer sample.



**Figure 1:** Schematic image of the important variables used for the toluene calibration experiment.