Quick User's guide to the Goniometer (Angie)

Edited by Esteban Rojas based on a document by Haley Carroll

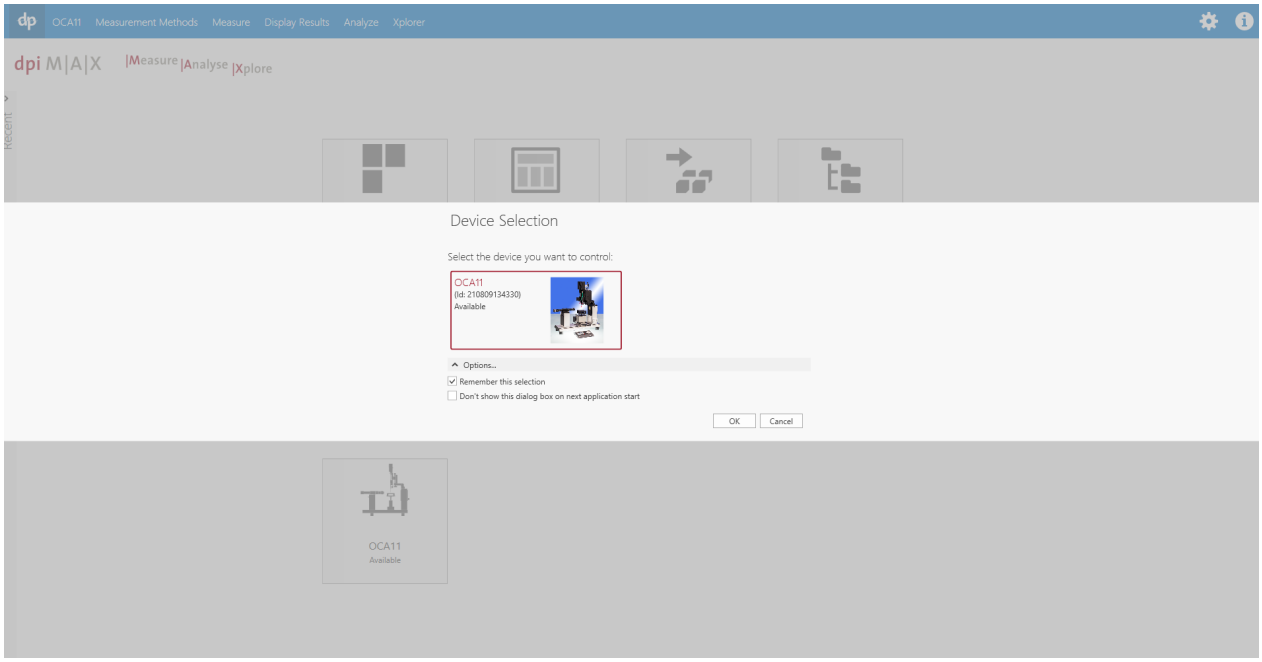
Getting started

Turning on the equipment

1. Flip the ON/OFF switch at the back of the instrument.
2. Remove the camera lens cover from the camera.
3. Turn the illumination dial until the illumination box turns on.

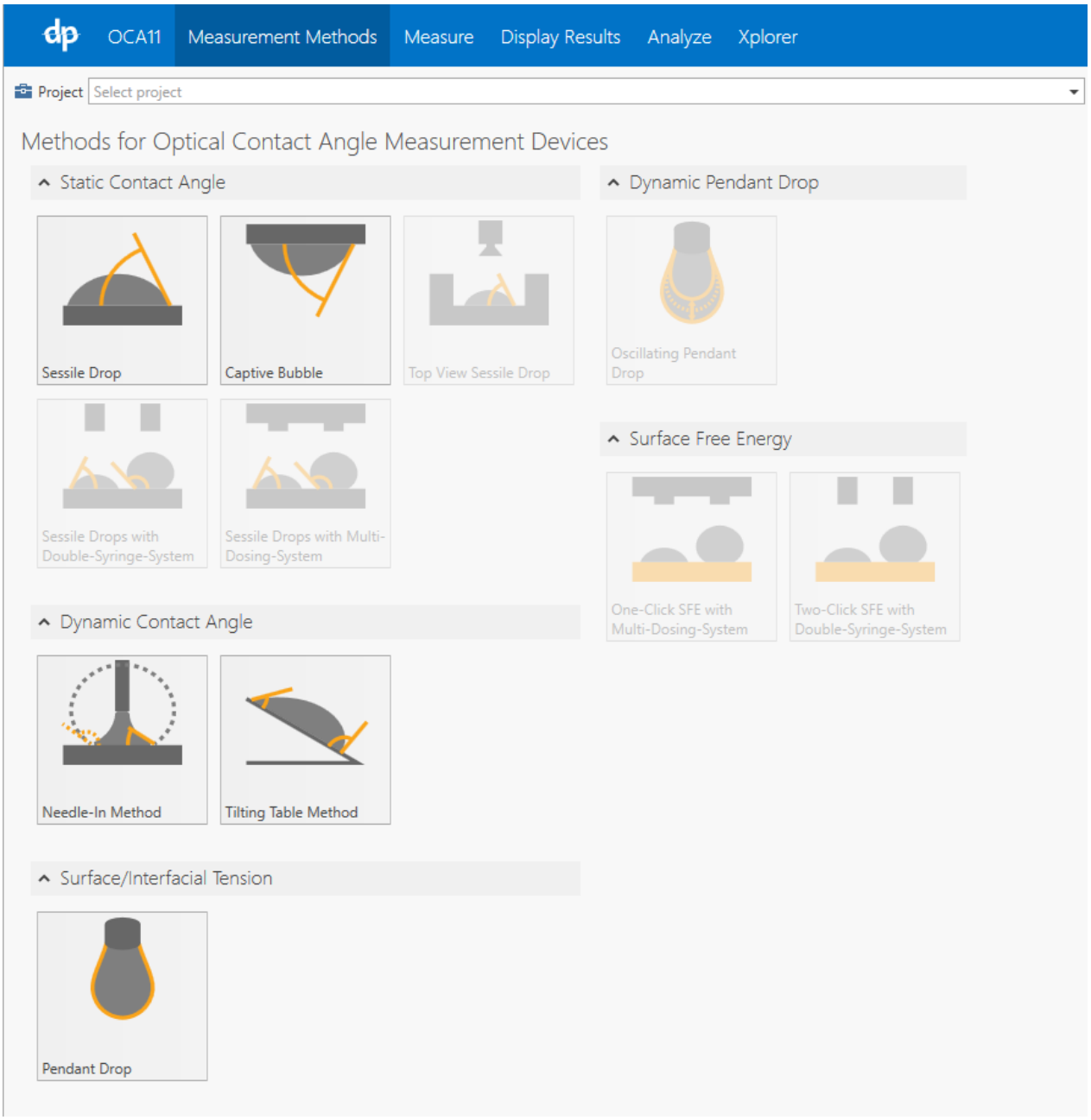
Mounting the sample

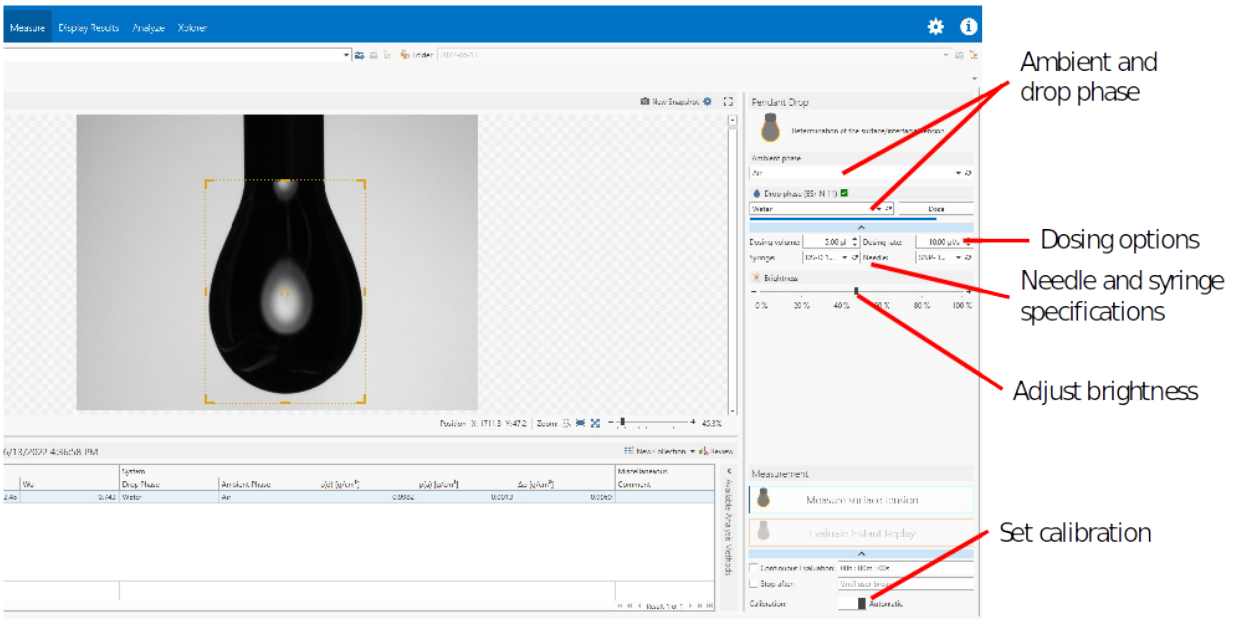
1. Prepare a 1 mL syringe and the appropriate dispensing needle. Pay attention to the needle diameter.
2. Fill most of the syringe with your sample ($0.4 - 0.9$ mL).
3. You will need to know the density of the sample, if is not in the systems database.
4. Place the syringe into the syringe holder, and use the syringe manual control as needed to allow the plunger to fit snugly. Be sure that the syringe is seated within the metal jacket.
5. Samples should be particle free. Use different syringes for different liquids, ensure there are no air bubbles.



Starting the software

1. Open de DPI Max software and select OCA11.
2. Make sure the OCA11 tab has the dosing unit (ESr-N 11), the light, and the camera connected and working (if the camera does not appear as an accessory in the software, or does not appear to be active, see the Troubleshooting sections of this SOP).
3. Remove the camera lens cover if you have not already.
4. Select the type of measurement methods you would like to use. **Pendant Drop** for surface tension or **Sessile drop** for contact angle.





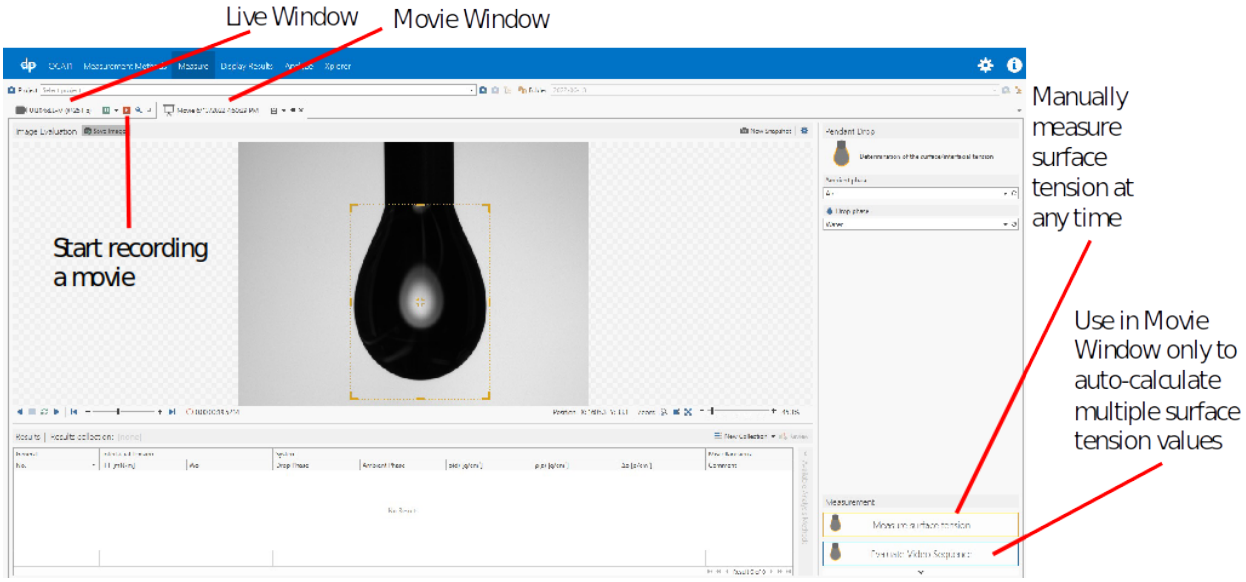
Pendant Drop: Surface tension

Measure:

1. Begin adjusting the sample to make sure it is centered and **perfectly straight** in the live viewing window.
2. Specify the ambient phase, and the drop phase of the sample.
3. Specify the syringe and needle tip being used for this experiment.
4. Adjust the background until you get a decent image.
5. Be sure to set the calibration, if you do not you may notice your surface tension measurements are not as expected.
6. Begin dosing until the droplet is as large as possible while maintaining an equilibrium. It does not have to be a specific volume.
7. Adjust the region of interest (yellow dotted region) to include only the droplet, and not any of the needle tip.
8. **Optional** Record a movie and then analyze the images in *Evaluate video sequence*.

Save results

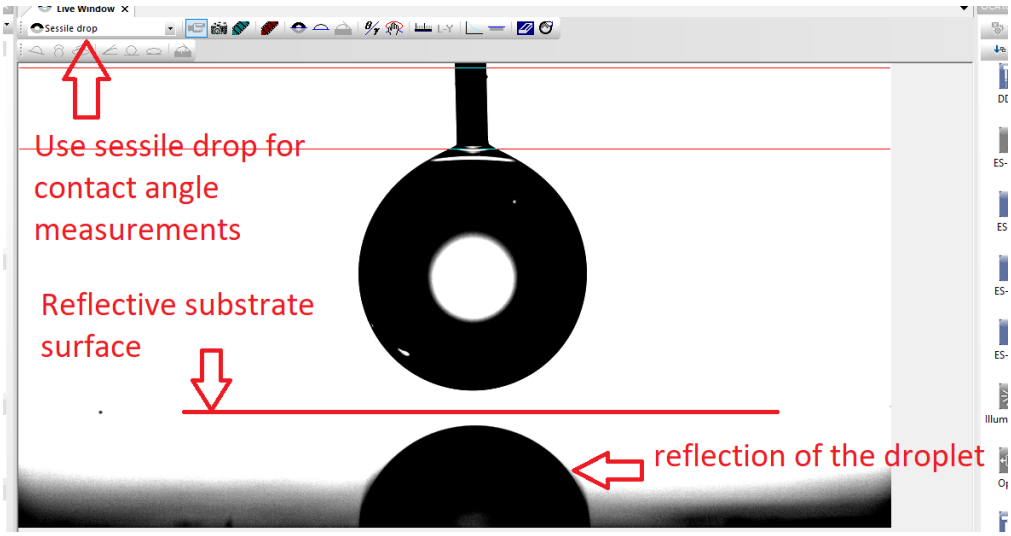
1. After you have obtained sufficient data points you can select the values in the results table and export to an excel file.
2. You can also save any movies that were recorded.
3. The *Display Results* tab at the top of the software will provide a graphic visualizer of the data you have collected.



Sessile Drop: Contact angle

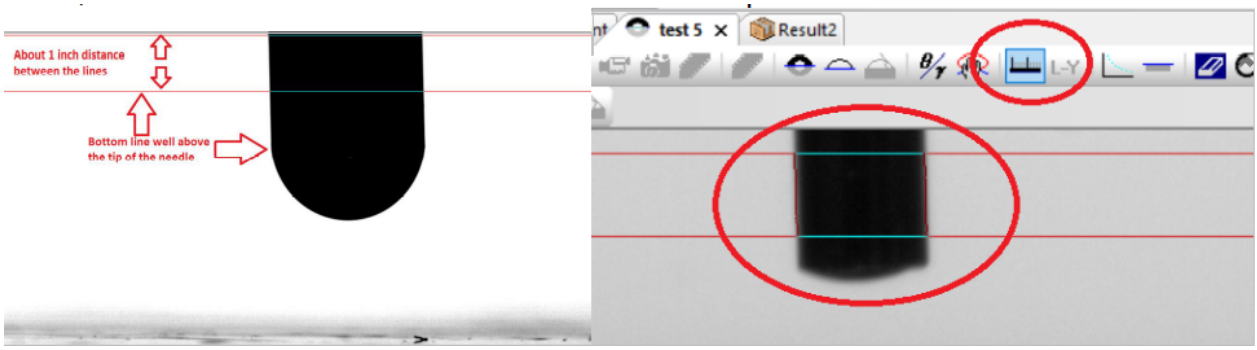
Prepare surface and camera

1. Place the substrate sample into the stage of the device.
2. Adjust the camera tilt angle so, that the bubble level touches the right mark. This angle will give about 0.5 degrees camera tilt angle for the camera to capture the surface of the substrate, it must be pointing slightly downwards.
3. Choose Sessile drop option in the upper left dialog box.
4. Dispense droplet of the test liquid from the needle. Position the sample surface below without touching the droplet. For most applications, 1 or 2 microliter volume droplets are correct size.
5. Zoom in the optics if the droplet is small on the live image. An appropriate magnification is for the droplet to take up half of the visible width of the substrate when deposited on the surface



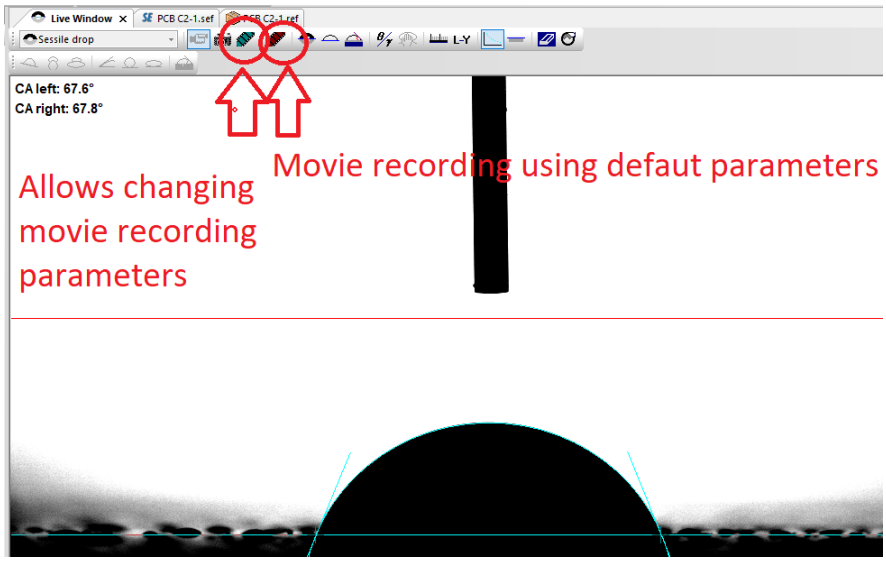
Optical calibration using the needle size

1. Open result window, insert actual needle size in the M-info¿ Ref.- Size dialog box.
2. Place both horizontal lines on the needle tip, with about 1 inch distance between them, do not locate the bottom line close to the tip of the needle.
3. Press image calibration icon (ruler) in the Menu of the live image or Movie window



Measure:

1. After the drop is deposited on the substrate- position the two red lines:
   - Bottom line through the two points of liquid- substrate contact (three phase points)
   - Upper line to be above the droplet and below the needle.
2. Press B/Y icon to get single point contact angle measurements or press Dynamic tracking icon to get contact angle results over time.
3. Movie recording is suggested to get contact angle results from drop age 0 and observe the spreading, evaporation, possible absorption effects.



To get calculation of contact angle from movie:

1. Have Result collection window opened.
2. Set Zero time for the first image when the drop is deposited on the substrate and detached from the needle.
3. Position upper and bottom lines for calculation.
4. Activate calculation with Calculator icon.
5. Press the Play button.

Troubleshooting

Camera issues: Problem: the camera does not appear as an option in the OCA11 tab, or it won't give you the option to activate.

- Reason: This is likely because the instrument was not turned off or restarted correctly.
- *Solutions:*
  - Restarting the computer and the device.
  - Be sure that the goniometer is turned on *before* you open the software.

Slanted droplet issue: Problem: The view of the needle and droplet is not not straight, and it can not be fixed with small adjustments of the syringe.

- Begin by using the bubble level and placing it on top of the silver dial at the top of the camera. Twist the silver dial until the bubble level reads that the camera is perfectly leveled.
- If the live view still seems crooked, push the sample stand up against the back of the instrument by the illumination box and adjust it to be in view of the camera. Continue positioning the camera until the edge of this sample stand appears straight.

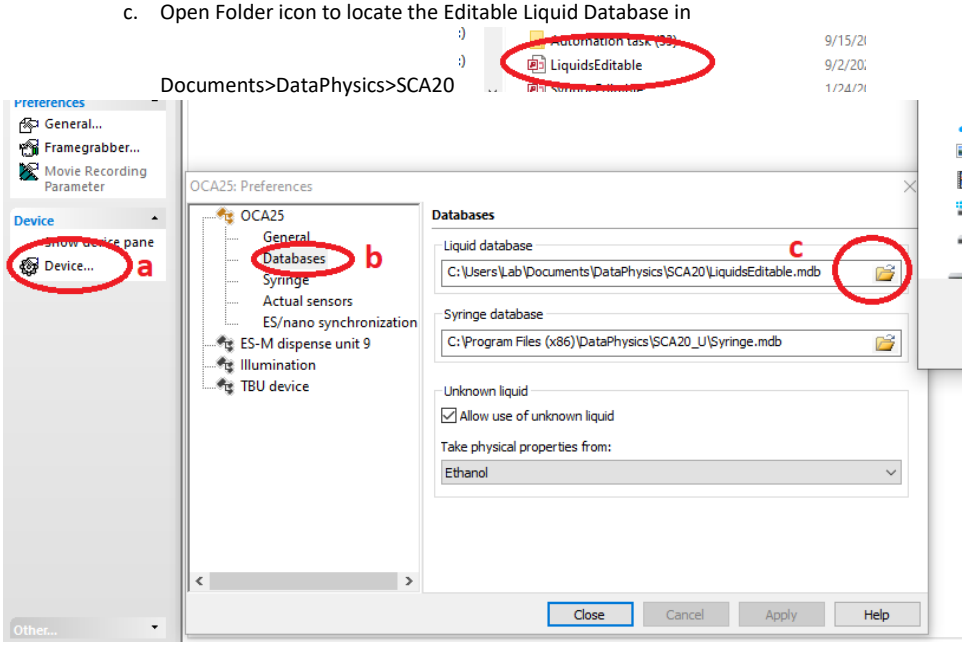
SCA software Protocol

Adding a new liquid to the SCA Database

Default Database of the SCA program is located in the Windows Program Files, location where no changes are allowed. Therefore, in order to add new liquids into the Database, editable Liquids Database located in Documents folder> DataPhysics>SCA subfolder should be used.

To add new liquid to the Editable Database:

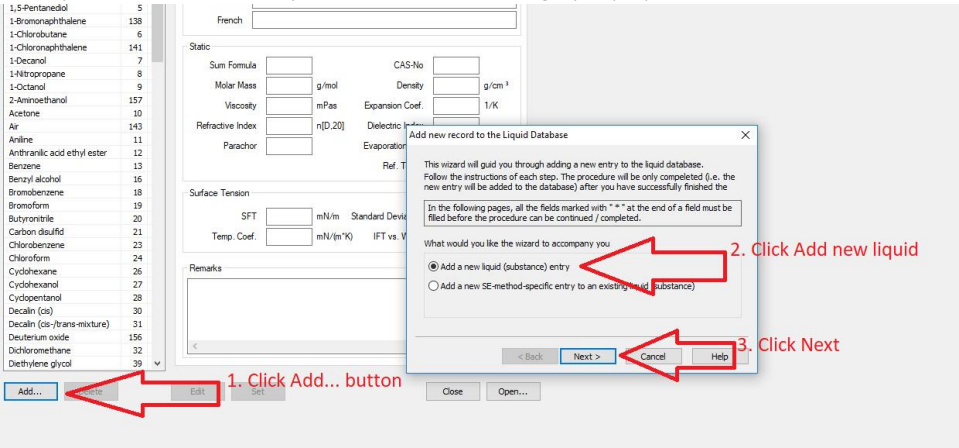
1. Change the default Database from Program Files into the Database in the Documents folder:
    a. Click Device icon in the Application Pane
    b. Select Databases in the OCA Preferences Window
    c. Open Folder icon to locate the Editable Liquid Database in Documents>DataPhysics>SCA20



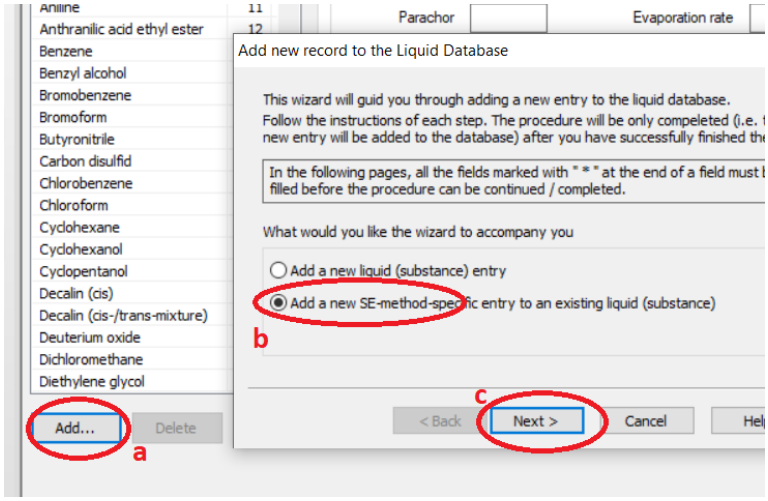
    d. Confirm the change by click on Close.
2. Open SCA Database by click on Edit>Database.

DataPhysics Instruments USA Corp, 4424 Taggart Creek Rd, Suite 102, Charlotte, NC 28208
Phone No: 704 777 1348, e-mail: p.simutis@dataphysics-instruments.com

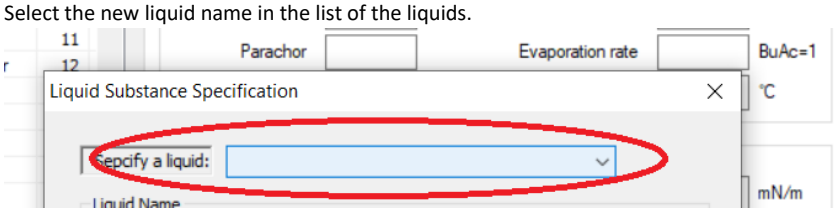
3. When the Liquids Editable Database opens, click Add button, choose Add new liquid (to create a new liquid) or Add a new SE.. if you need to edit the existing liquid properties, click Next



4. Two required fields to fill are: 1. The name of the liquid and 2. Surface tension of the liquid. You may want to add also density of the liquid. The software will confirm that a new liquid was added successfully.
5. To add polar and disperse components of the liquid, the database should be closed after adding the new liquid and opened again. Open SCA Database by click on Edit>Database.
    a. Click Add to open new window.
    b. Choose Add a new SE method specific entry.
    c. Click Next button



6. Select the new liquid name in the list of the liquids.



7. Choose the method of Surface energy calculation to apply the new liquid:
    a. OWRK method requires two components- polar and disperse.
    b. Extended Fowkes method requires three components for the liquid- polar, disperse and Hydrogen bonding