Data extraction and analysis

Written by: ALJ June 2022, adjusted by ABL February 2023

This document contains guides for exporting data from our aerosol instruments, as well as for selecting the proper export settings, enabling the use of our Python library for plotting and further analysis.

Indhold

General information

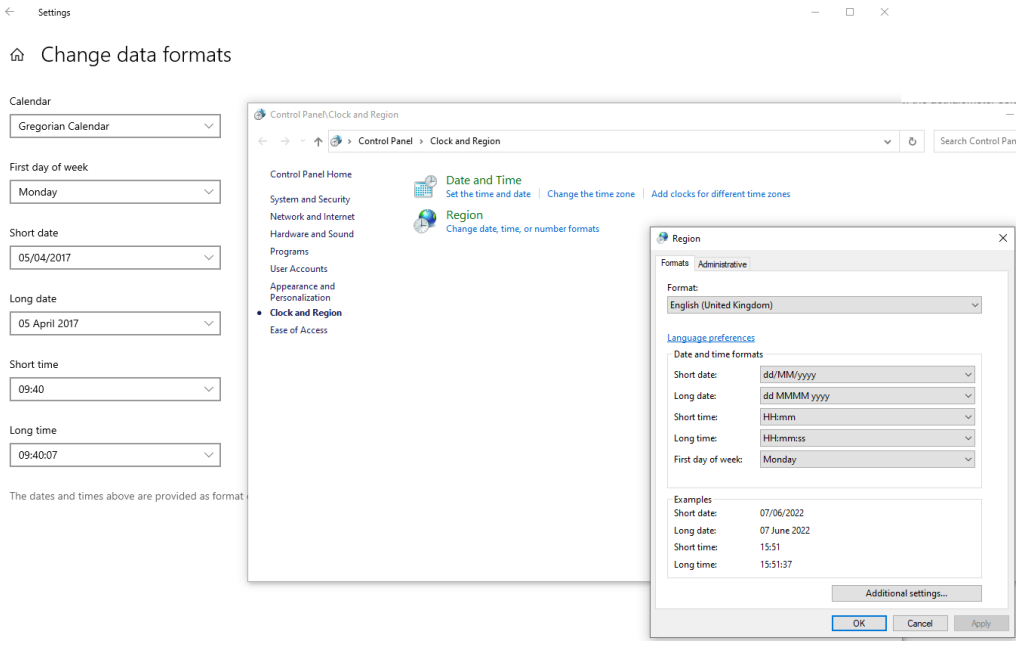
Software for instruments and python codes for data conversion is located on the L-drive

Good practice is that data files should be indicated with instrument type, measurement location/position and date in YYYYMMDD format for example: NS_NF_20220602

There are Python codes for converting all the exported data file types into a format for data treatment. See also the documentation and help functions in the Python codes.

Python codes can be executed e.g. in Spyder, which is a Python interpreter available with the anaconda package that can be downloaded from the Software library. Please see the install Python guide, to ensure installation in the correct folder, allowing you to update without having to go via SIT.

For some instrument software (especially with TSI instruments), the exported timestamp is depending on the computer settings. See the regional formatting in the control panel. Differences in time format can cause problems with the conversion software. Either correct the time format and export the data again or use a different PC for exporting.



Copy “Control Panel\Clock and Region” to the explorer for quick access

Many of our instruments are using RS-232 serial connection. While this is a very stable connection type, more stable than the USB converters alternative. However, it is increasingly difficult to find replacement computers.

Example of possible replacement laptop with rs-232: https://www.danbit.dk/da/embedded-pc-industri-pc-panel-pc-pos/20703-14--industriel-notebook-ip53--robust--rs232--mil-std-810g-i7-i5-8--gen--option--1000nits--option--capacitiv-touch.html accessed 14-06-2022

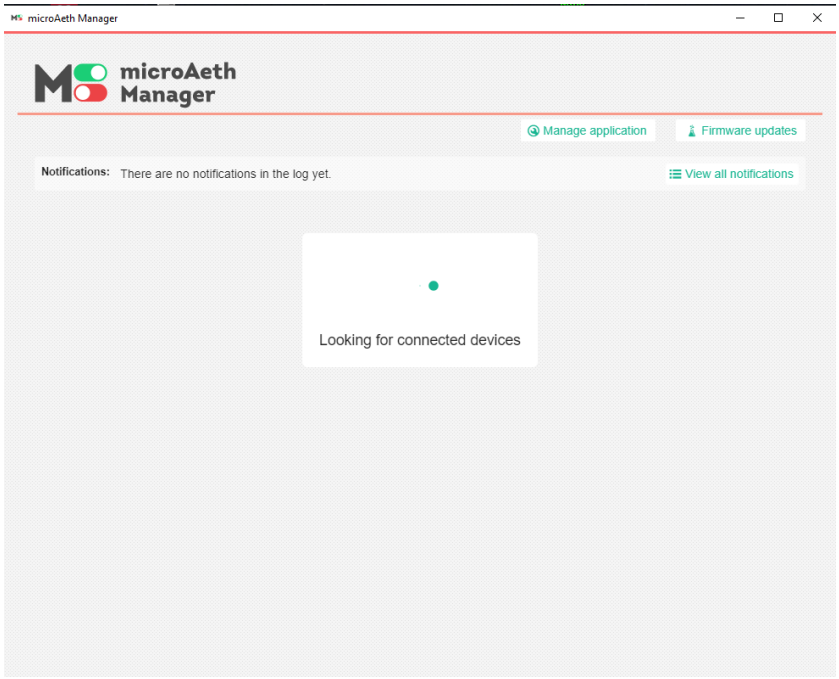
Exporting data from instruments

Below you will find guides for exporting data from all our aerosol instruments, and how to set the formatting correctly, making it possible to further process them with our Python Library.

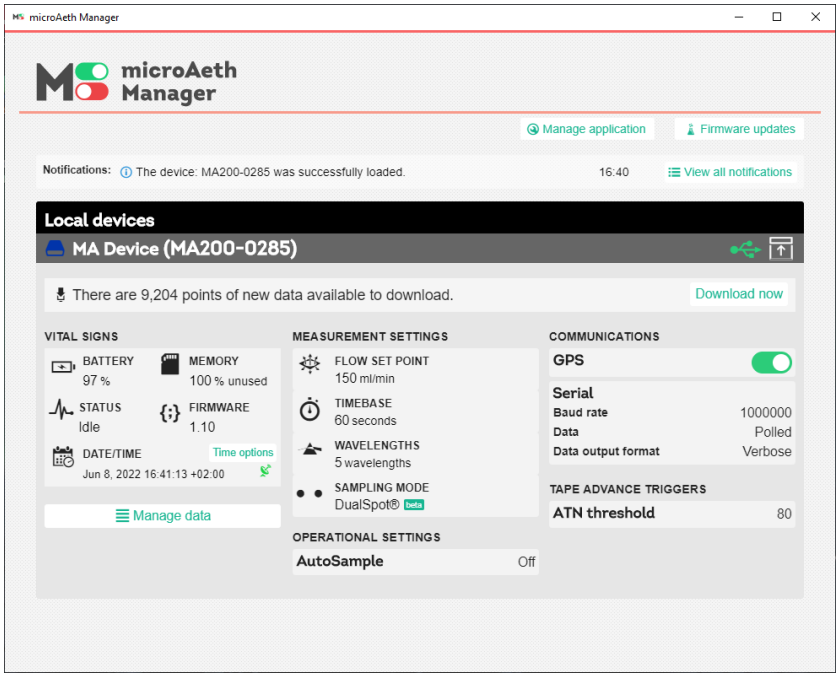
Aethalometer

To extract the data from the Aethalometer open the Aethalometer software microAeth Manager

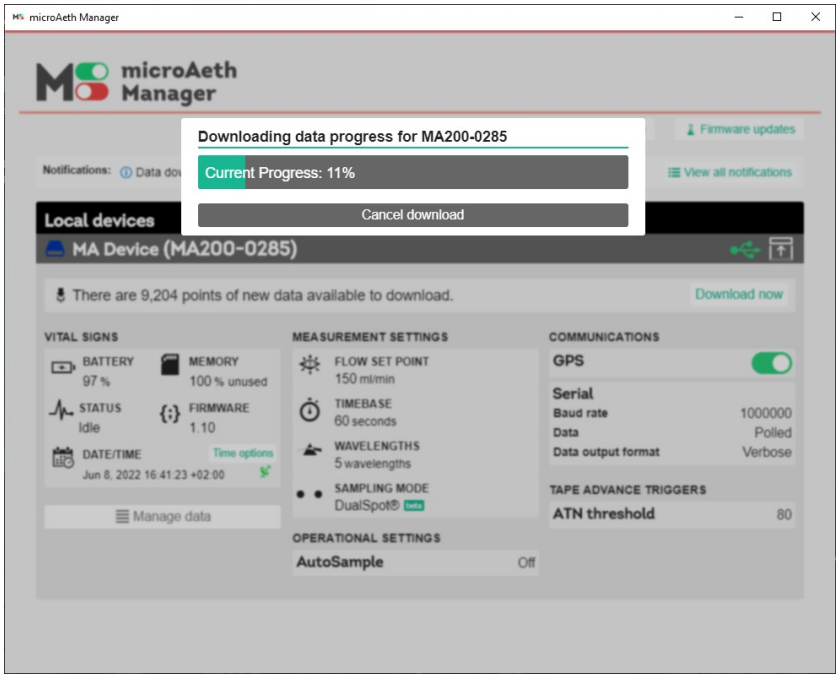
Make sure that a device is connected with a USB cable.



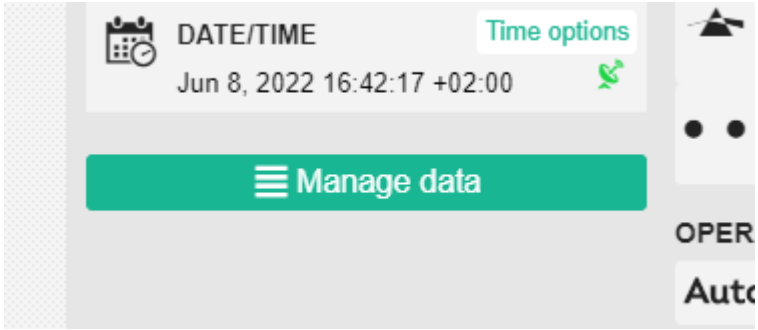
When the instrument has connected press **Download now**



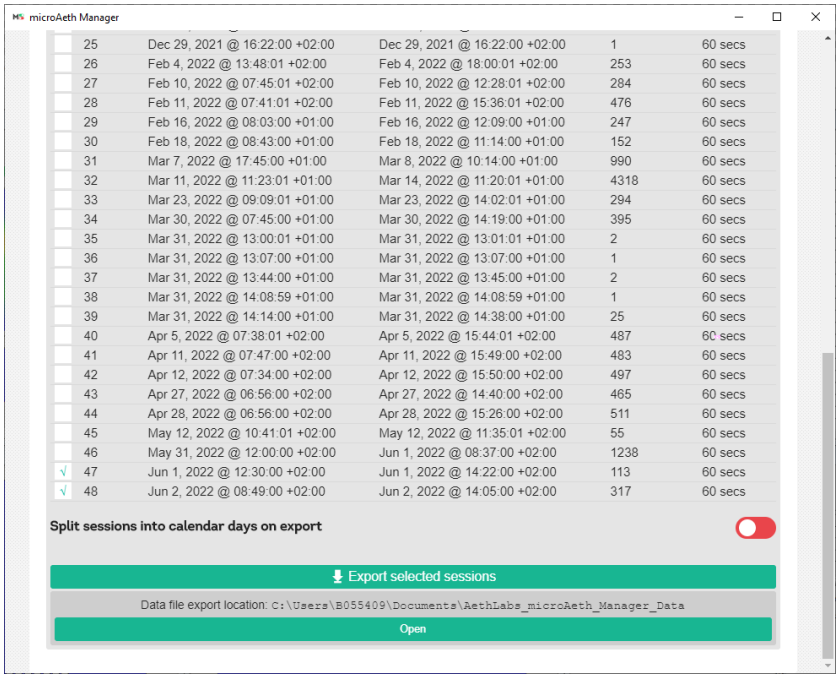
This will open a dialog.



Next click **Manage data**.



In the next window, select the data that you want.



Press **Export selected data**. The data is places in the location found below the export button. There is an option to open the file location by pressing **open**.

If a data file with the same name already exists in the folder. The software will create a new file with the same name and added _1, _2 … etc.

Alphasense Optical particle counter (OPC)

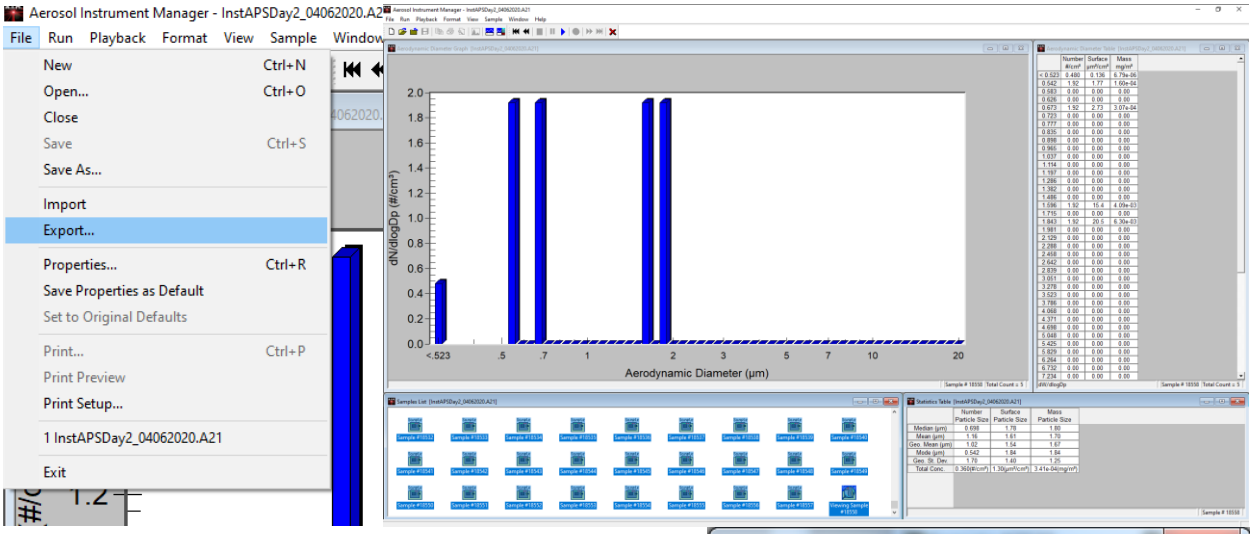
Data from the OPC is in a simple .CSV file format. If the OPC was run using the connected software the data is located in the specified file location. Otherwise, the data from the OPC is located on an internal SD card inside the instrument and can be retrieved with the micro-USB cable.

APS

The APS data-files are saved in a format using the TSI AIM (aerosol instrument manager) software. The data available for export depends on the initial instrument setup for data acquisition. Ideally, you should have both aerodynamic channel and side scatter channel data. The raw data is useless as it is meant for an internal calibration curve.

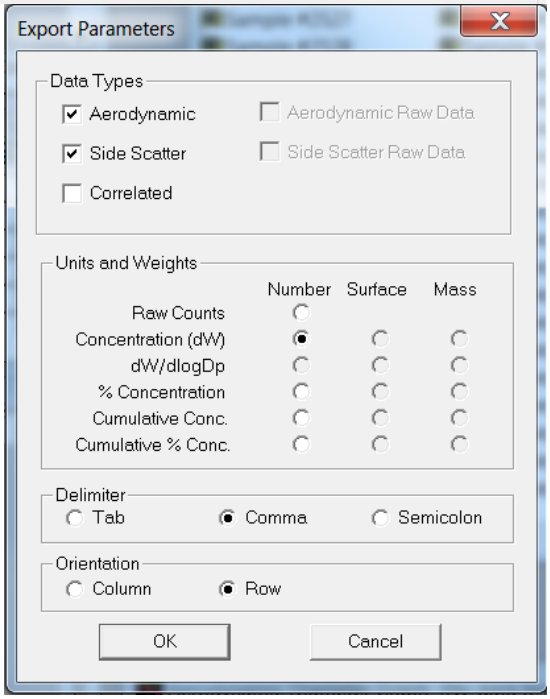
Select all the samples in the window.

Go to File and select Export…



In the **Export parameters** choose:

Data Types	: **Aerodynamic + Side Scatter**
Units and Weights	: **Concentration (dW)**
Delimeter	: **Comma**
Orientation	**: Row**

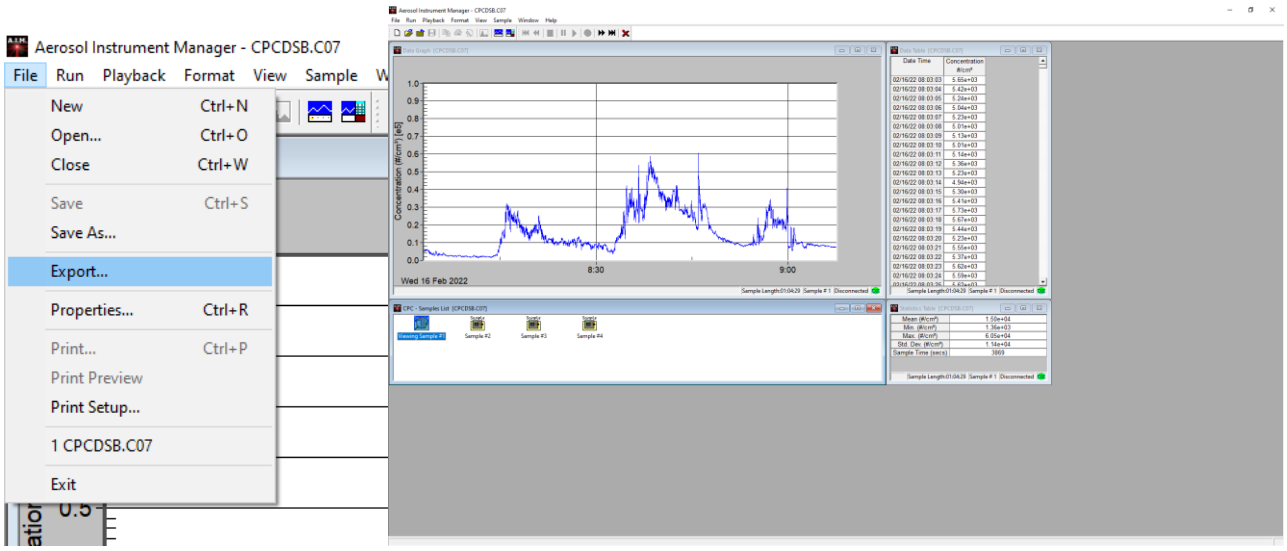


CPC

To export the data from the CPC using the TSI AIM software.

In the interface, select the time series to export or crtl+a to select all.

Then go to File and select Export…



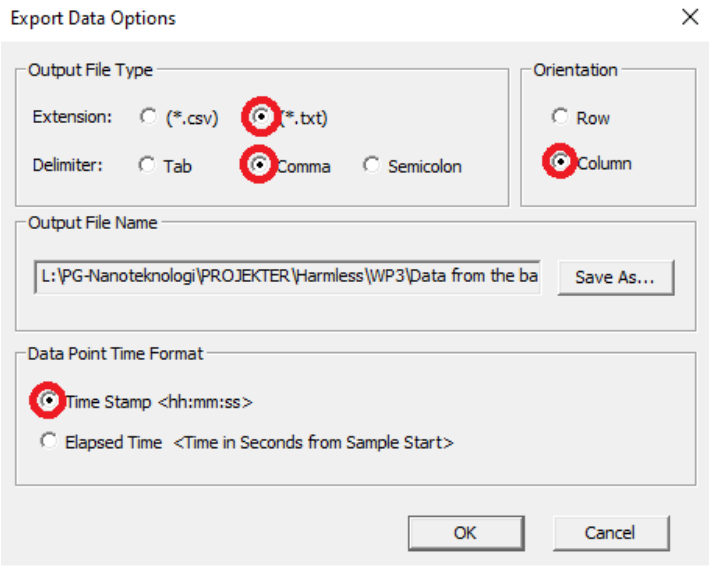
In the **Export data options,** the data should be exported as:

Extension : **(*.txt)**

Delimiter : **Comma**

Orientation : **Row**

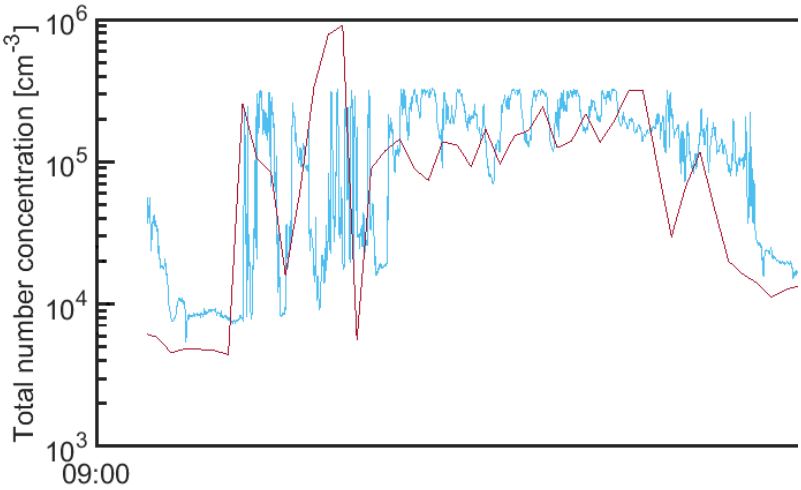
Time Format : **Time Stamp <hh:mm:ss>**



Use the scripts to convert to elapsed time if needed.

The data can be analysed using Python, by visualising the time series.

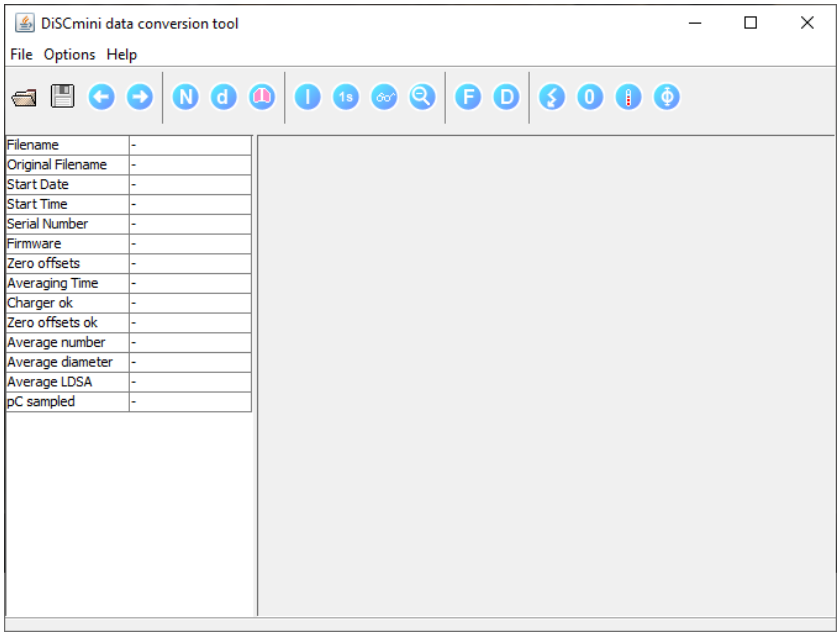
Particle number concentrations >150.000 # cm^{-3} should be of concern as the concentration range goes only to 100.000 # cm^{-3}. Usually measurements including high concentrations will look like there is a ceiling on the peaks, see example below.


Total number concentration [cm-3]
10^6
10^5
10^4
10^3
09:00

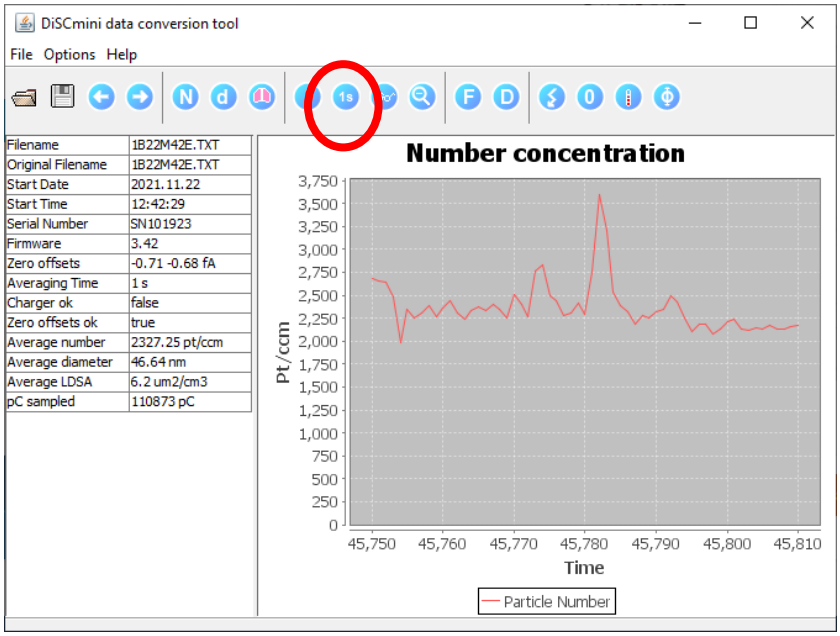
DiscMini

Data from the DiscMini is handled by the DiscMini data conversion tool, which is a java-based program.

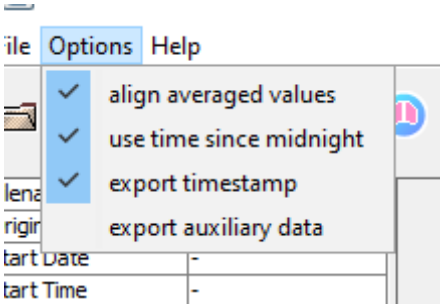
Open the data by pressing open under the file pane and select the data file



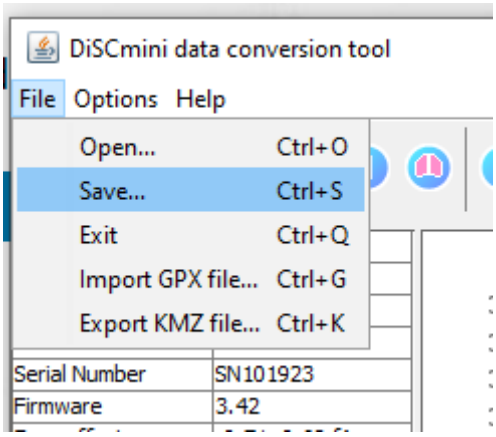
Ensure that the time resolution is set to 1 s before exporting. The data can be rebinned to a lower time resolution afterwards if needed.



Under the options pane ensure that the top three options are selected with check marks.



To export the data simply press save this will open the save dialogue, the default output filename will be the original file name with "_output" added, e.g. "xyz_output.txt".



Dust monitor

We currently have two versions of the Grimm software namely the new version Grimm-Spectrometer V6.0 and an older version named Grimm-Spectrometer V1.177. The new software has to be run as administrator in order for it to store the recorded data.

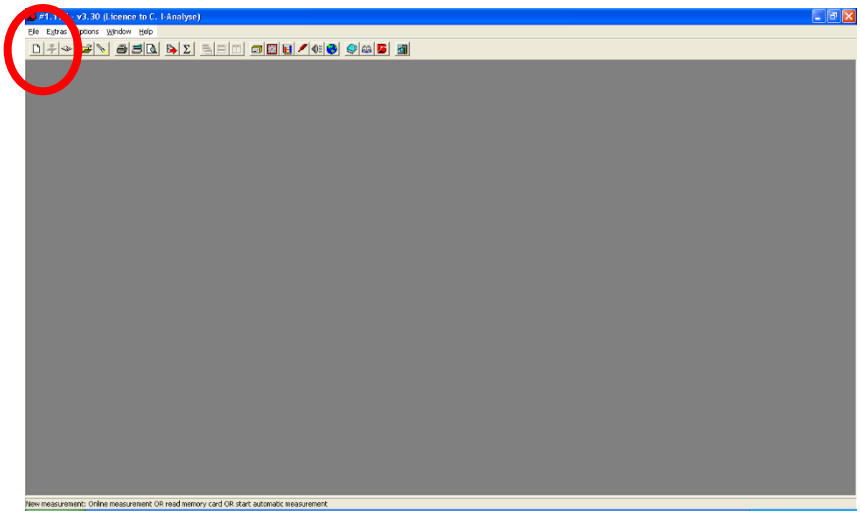
NEW software:

The new software stores data as ".dat" files, which are ASCII encoded, meaning that they can be read directly via the python software, notepad, excel, and other similar programs. It is therefore not necessary to export the data.

OLD software:

The old dust monitor software requires a 32-bit computer therefore the software does not work with newer computers from e.g. Statens-IT. It is possible to install Windows as a 32-bit version on a new computer, but it needs to be coordinated with SIT/Jesper.

If the old software v. 1.177 is used, you have to export the stored data using the export function under the file pane, and select the data file to be exported. NOTE! The old data file format cannot be read by the new Grimm software, so if you started with the old software, you have to stick with it!



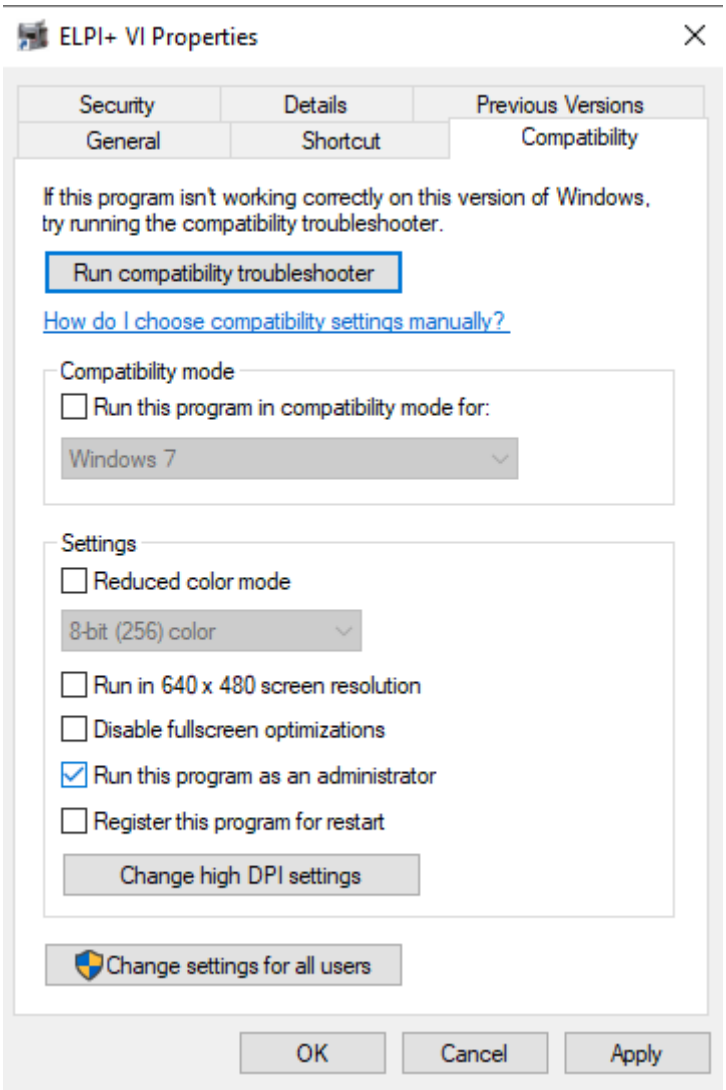
ELPI+VI 2.0

Do not use the HR-ELPI+VI software as the data inversion is unreliable!

Data recorded by the ELPI is in a "*.dat*" format. This is an ASCII coded format that can be opened in notebook, by excel or converted with Python as is. There is thus no need to export the ELPI data.

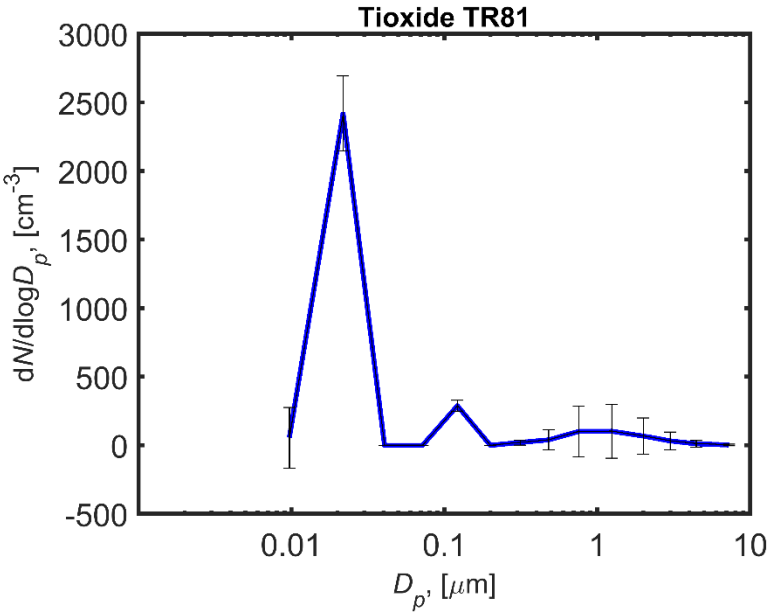
To view or record the data using the ELPI software, remember that the ELPI software needs administrator rights to run. Therefore, it is not possible to run on the NFA computers provided by Statens-IT only on the lab-PCs where we have full administrator rights.

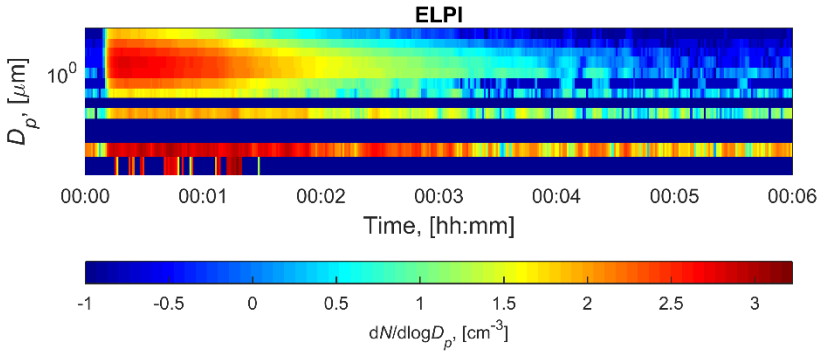
When installing the software on new computers, remember to check the run as administrator in the compatibility pane of the program properties.

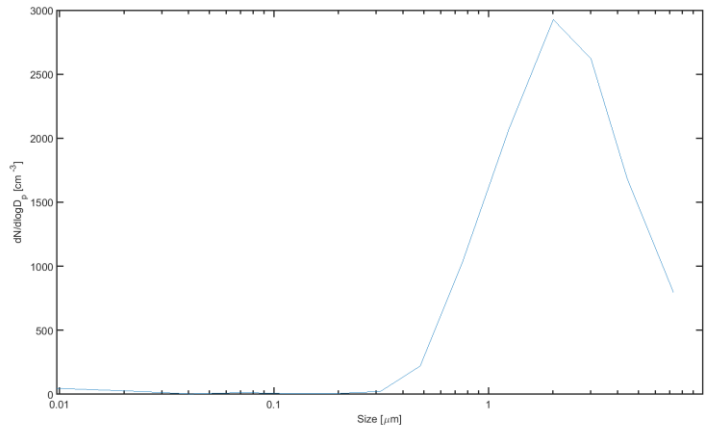


High concentrations of particles >1 um can cause accumulation of material in the ELPI top stages. This may cause the larger particles to bounce down through the stages, which gives rise to artefacts. See example below from a dustiness test of a TiO2 powder. The top figure shows the erroneous signal where the particles around 1-2 um are not visible but a phantom peak at 20 nm is present. Additionally, the channels

around the strong peak are showing close to zero particles (Blue lines in the middle figure). This is contrasting the lower panel with a freshly cleaned ELPI impactor showing a strong signal of 2 um particles (bottom figure). The material has a crystal primary particle size of 250 nm further indicating that the 20 nm peak is not “real”.

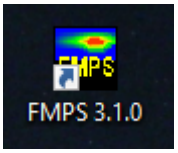




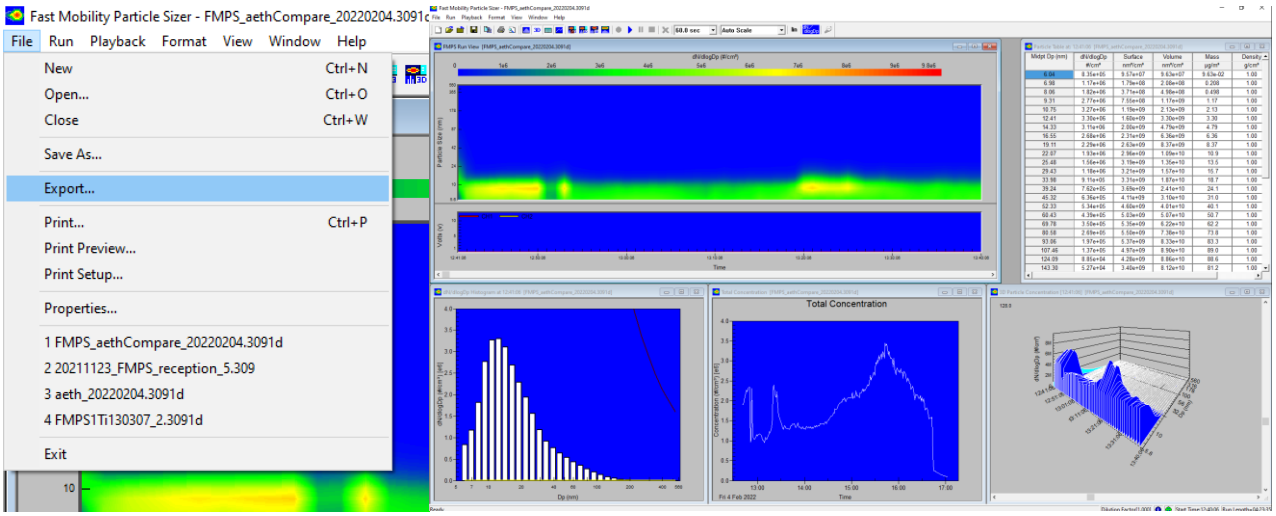


FMPS

In order to export data from the FMPS, use the FMPS software



Go to “File” and choose “Export”



In the **Export data options,** the data should be exported as:

Data Types : **Concentration, Total Concentration**

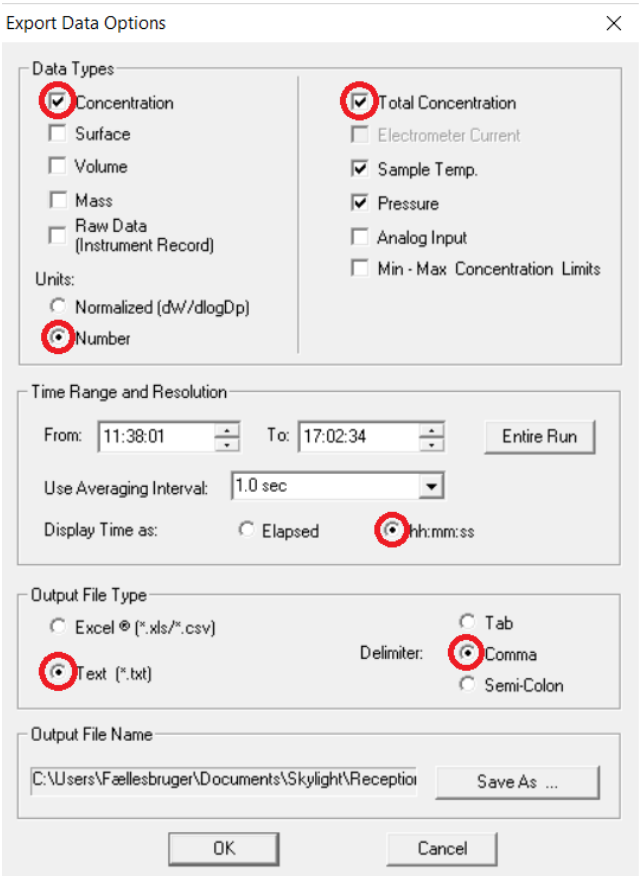
Units : **Number**

Use Average : **1.0 sec**

Display Time : **hh:mm:ss**

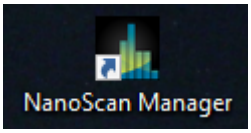
Output File : **Text (*.txt)**

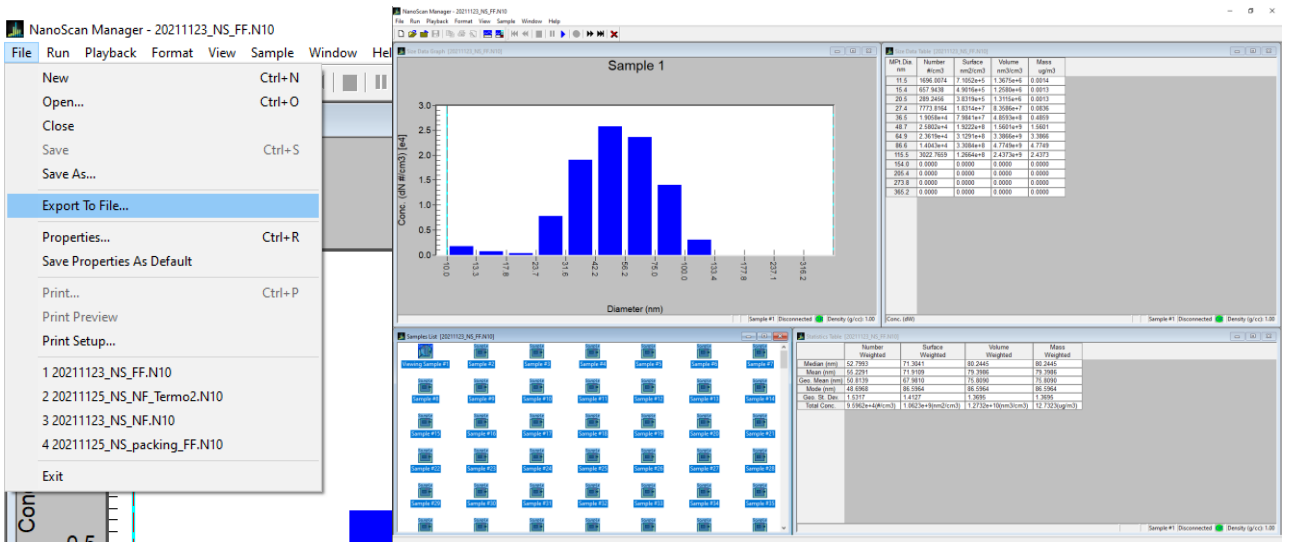
Delimiter : **Comma**



NanoScan

To export data, select all samples (ctrl+a), go to file and select Export To File



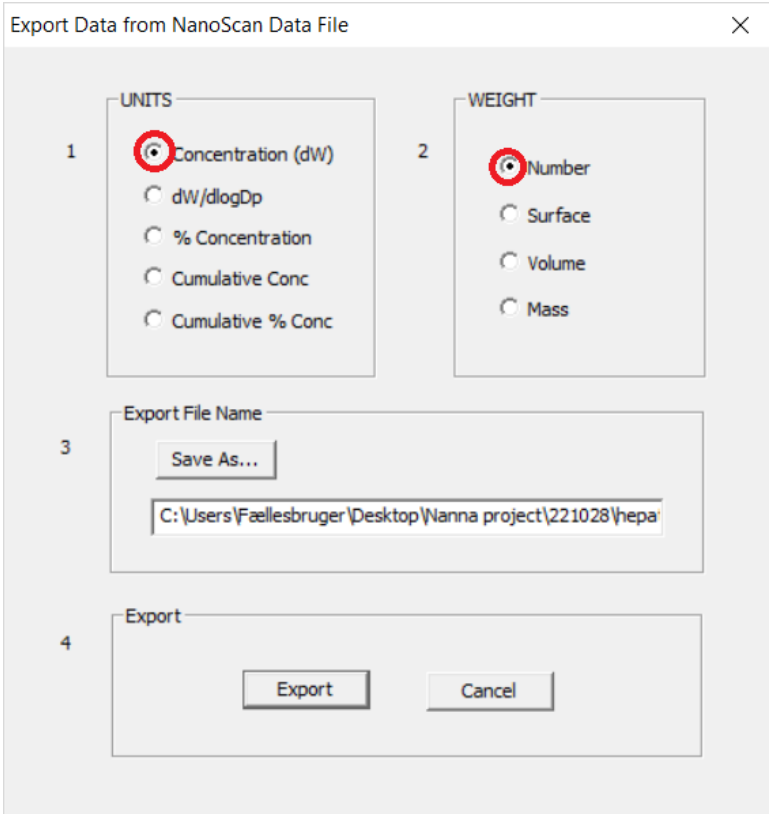


In the export window choose:

UNITS : **Concentration (dW)**

WEIGHT : **Number**

Use the scripts to convert to Volume, Mass, elapsed time, and dN/dlogDp if needed.



See also Fonseca et al (2016) Intercomparison of a portable and two stationary mobility particle sizers for nanoscale aerosol measurements, Aerosol Science and Technology, 50:7, 653-668, DOI: 10.1080/02786826.2016.1174329 for more information on the nanoscan.

Nanoscan export is sensitive to comma and decimal separators, so it is crucial to set it up correctly before exporting to a .txt file!

If the PC is not setup to US formatting the software will export number concentrations that are a factor of 10.000 higher than the actual concentration reported in the Nanoscan software.

Remember to set it up correctly!

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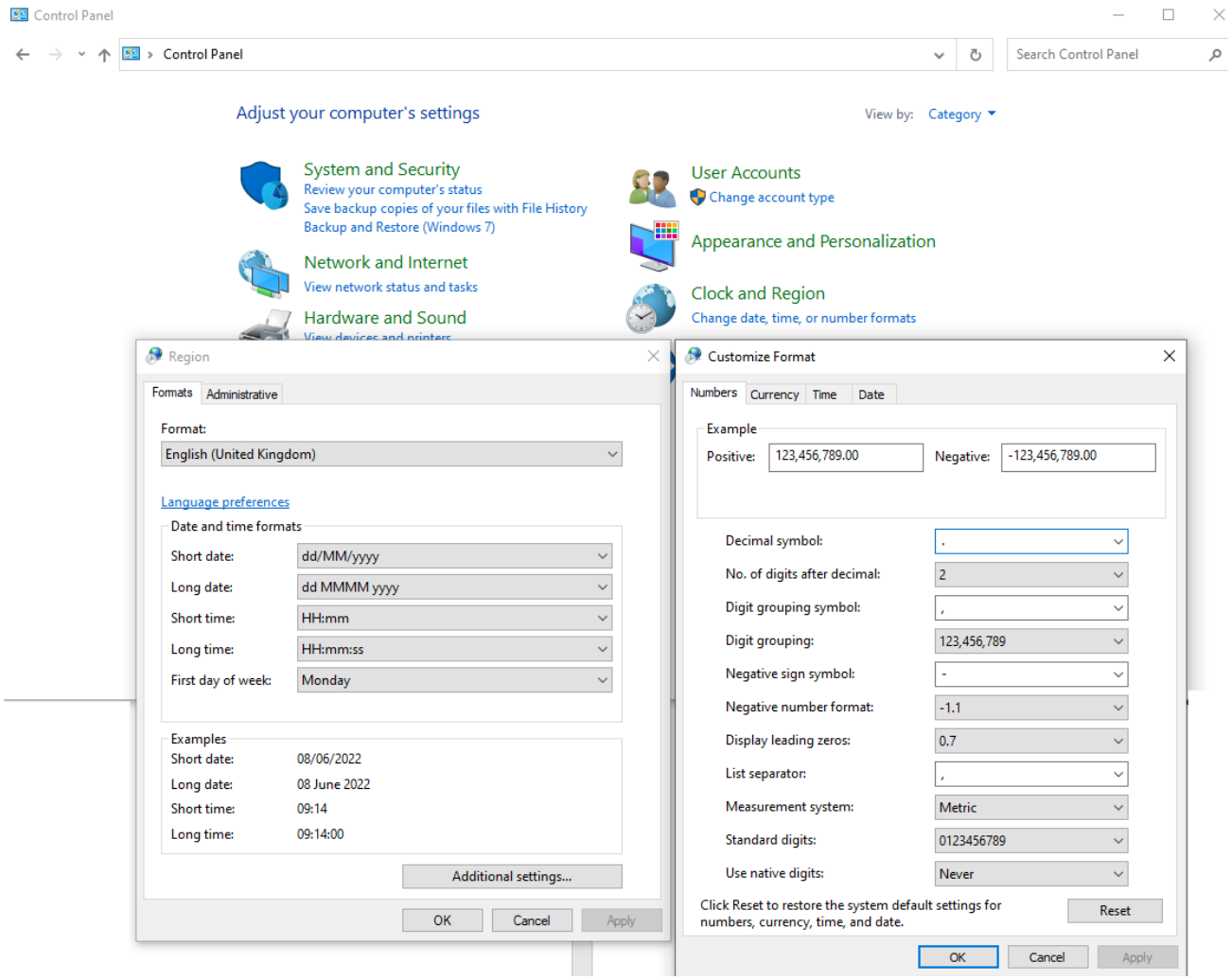
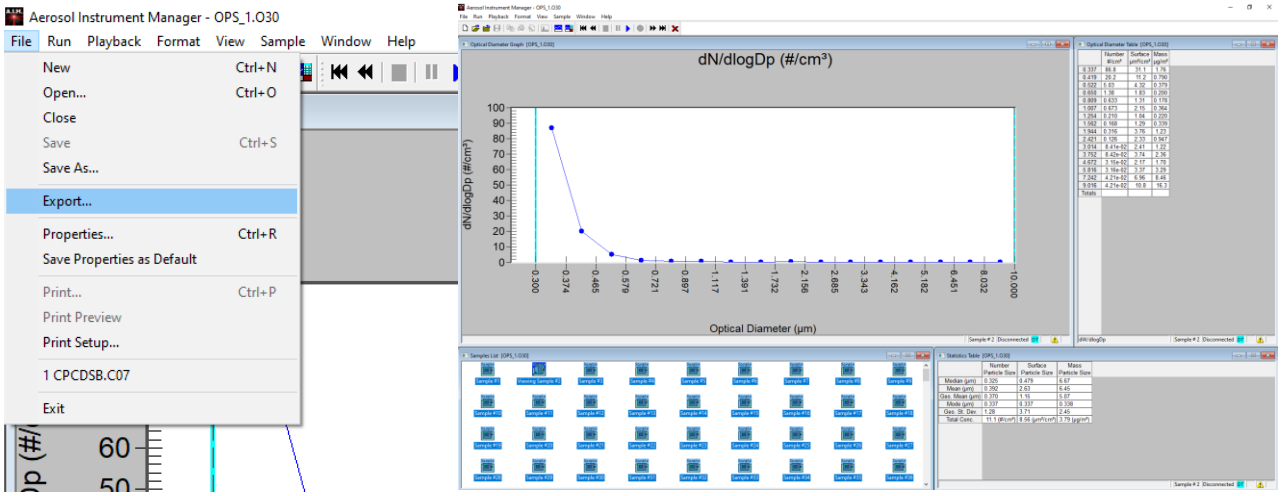


NSAM

This instrument is rarely used and a guide has therefore not been made.

OPS

To export OPS data, select all samples (ctrl+a), go to file and select export



Under the file pane, select Export and use the following settings:

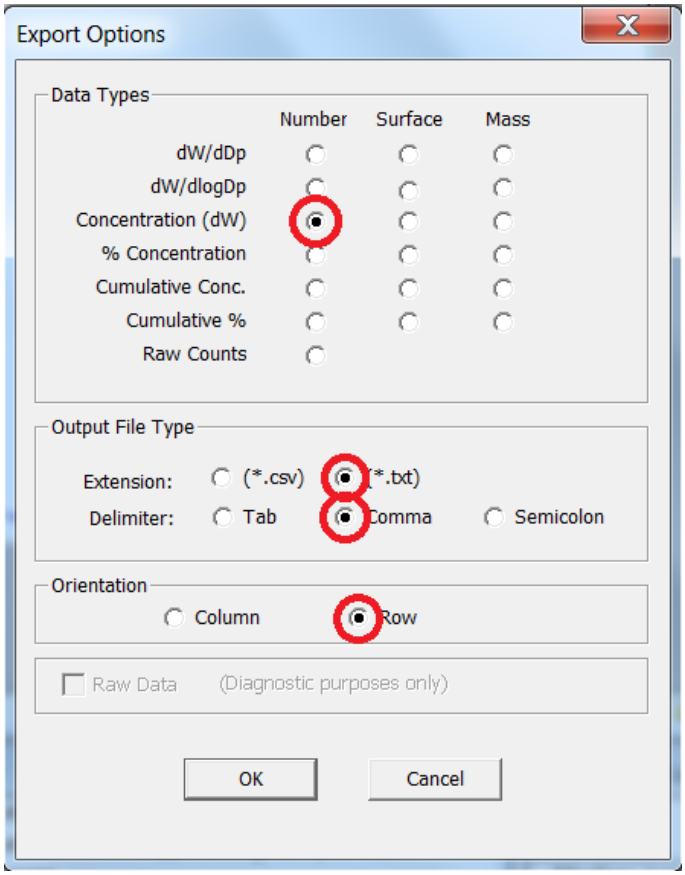
Data Type : **Concentration (dW)**

Extension : **(*.txt)**

Delimiter : **Comma**

Orientation : **Row**

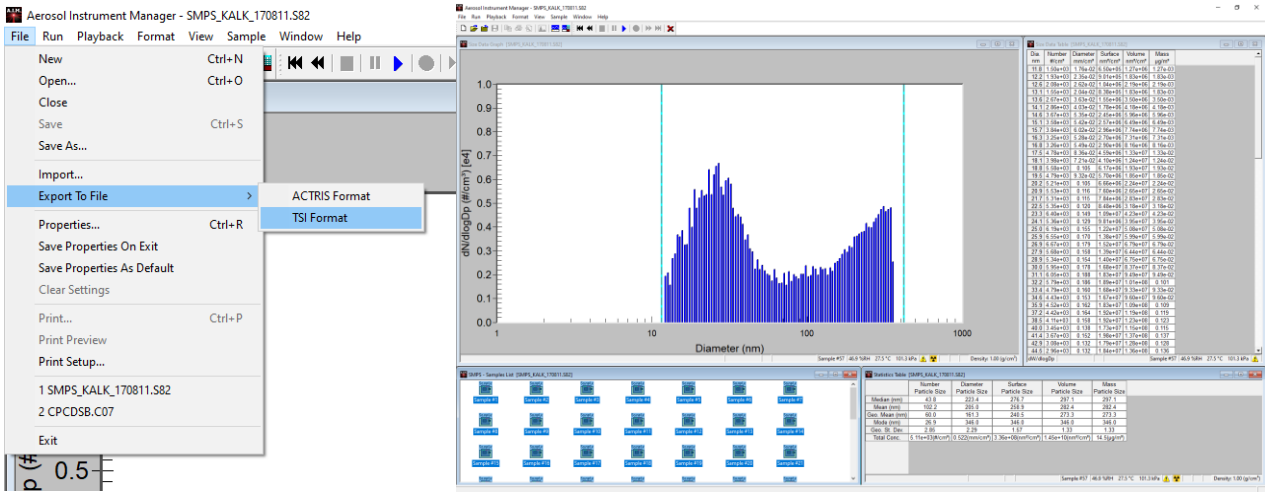
Use the scripts to convert to dN/dlogDp and/or elapsed time if needed.



SMPS

Select all samples (ctrl+a).

Under the file pane select Export to file



In the Export Parameters window, use the following settings:

Data Type : **Concetration (dW)**

Delimiter : **Comma**

Orientation : **Rows**

Date Format : **DD/MM/YYYY**

Number Form: **124.1234 – Decimal Point**

Use the scripts to convert to dW/dlogDp and/or elapsed time if needed.