

# Swordfish Software Release Notes

## 2.2.0

- New Instrument Profiles. Selected profile is now shared across all 4Deep software - select instrument in one software package and it will be used automatically in other packages. Better management of standard and custom profiles.
- Optimizations in hologram reconstruction CUDA code.
- Bug fixes and stability improvements.
- Updated to the latest libraries - Qt 5.9.6, OpenCV 3.4, CUDA 9.1.

## 2.1.0

- Image segmentation is done on GPU (when available) - increasing detection speed ~2x.
- Optimizations in hologram reconstruction CUDA code.
- Ability to set reconstruction position as fraction of  $\mu\text{m}$ .
- Added support for the latest "Volta" NVIDIA GPUs.
- Bug fixes and stability improvements.
- Updated to the latest libraries - Qt 5.9, OpenCV 3.3, CUDA 9.0.

## 2.0.0

- 64-bit software supports large RAM sizes, improves performance and stability.
- Support for the latest submersible microscope - "S6".
- During recording, metadata containing information about instrument profile and

recording parameters is stored directly into hologram image file.

- Reconstruction parameters are set automatically based on the metadata stored in the hologram image file.
- Detection of the microscope model based on information stored in the microscope EEPROM (on models that support this).
- Floating point support for laser pulse duration - better control of the exposure on microscopes that support it.
- Excel export uses the new "2007" file format, removing limitations on spreadsheet size.
- Faster hologram reconstructions.
- Bug fixes and stability improvements.
- Updated to the latest libraries - Qt 5.7, OpenCV 3.1, VTK 7.1, CUDA 8.0.

## 1.8.2

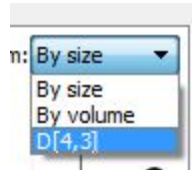
- Bug fixes and user interface improvements.
- Laser pulse duration is now double, with 100 ns step. Much better control of laser pulse duration on microscopes that support it.
- Pulsed mode is on by default.
- Improved autopulse algorithm.

## 1.8.1

- Bug fixes. Fixed crash in D[4,3] histogram export.
- Improved performance in camera code.
- Cosmetic changes.
- Updated manual.

## 1.8.0

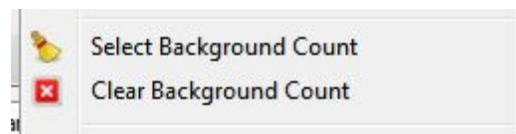
- Bug fixes. Fixed crashes in the camera control code.
- D[4,3] analysis added for histograms and statistics. In this type of analysis, relative particle volume as a fraction of total volume of all particles is calculated in each histogram bin.



- Updated manual.
- Updated the libraries to the most recent versions.

## 1.7.0

- Improved connection to microscopes - IP address of the camera is set automatically.
- Ability to subtract one histogram/statistics from another to eliminate background signal.



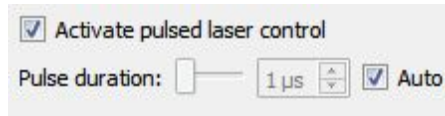
- Use 1  $\mu\text{m}$  size bins instead of fixed 32 bins to improve resolution of frequency distributions.
- Cosmetic improvements to axis and labels.
- Bug fixes.
- Updated to VTK 6.3.0

## 1.6.0

- Welcome screen shows quick tutorial on first program run.
- Show histograms of images received from camera to detect under/over exposure.



- Auto pulse control sets optimal laser pulse duration/camera gain based on camera image histogram.



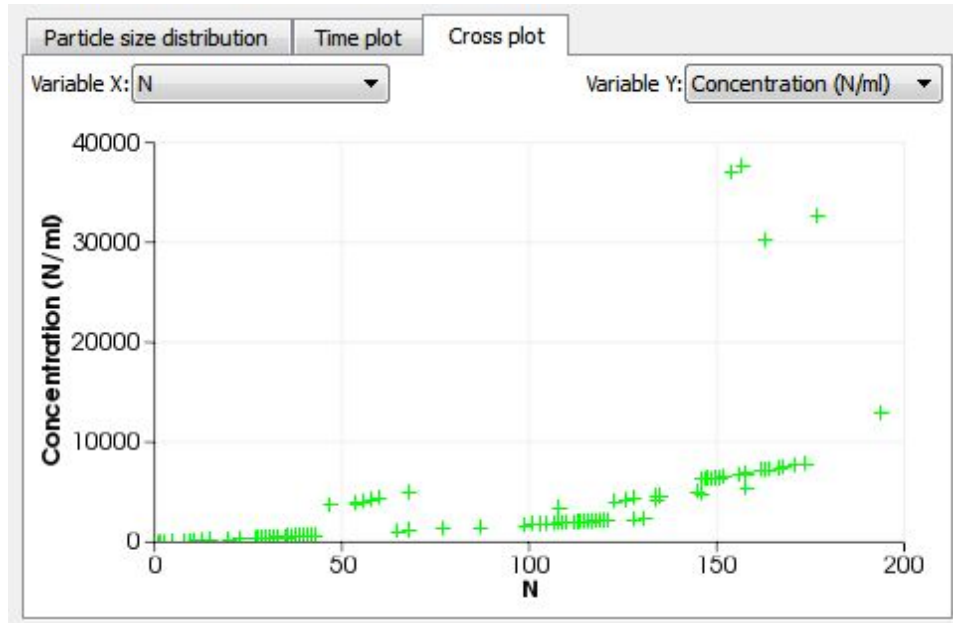
- Auto threshold uses Otsu algorithm to set optimal threshold for particle detection automatically.



- Ability to drag and drop project files from external programs such as Windows Explorer into Swordfish.
- New normalization algorithm reduces the effect of “lensing” from round transparent objects.
- New camera image queue reduces latency and improves camera performance.
- Additional remote commands for setting the sample interval, threshold/auto threshold, min and max particle sizes, detecting round vs non-round objects, analysis of offline holograms, starting and stopping counting and selecting the project file.
- Updated to NetCDF 4.3.3.1
- Updated to CUDA 6.5.

## 1.5.0

- Cross plots for displaying the correlations between the calculated values.



- Ability to downscale holograms to 1024x1024 to increase analysis frame rate.

Crop holograms to 1024x1024 px

- Notifications about new versions of software being available for download.
- Pulsed lasers support in the submersible microscopes.

Activate pulsed laser control  
 Pulse duration:  2  $\mu$ s

- Updated to Pleora 4.x SDK for the improved camera support.
- Inform the user when frames cannot be saved to the disk at the current frame rate.
- Improved frame saving code for extra stability and performance.
- Fixed crash on reconnect with the camera that lost data connection.
- Support for reconstructions on NVIDIA Maxwell GPUs.

## 1.4.0

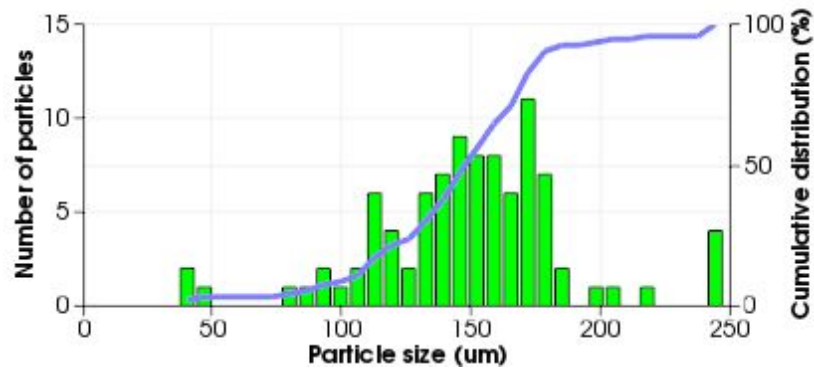
- Export data to Comma-separated values (CSV) files in addition to Excel files.

File name:   
 Save as type:

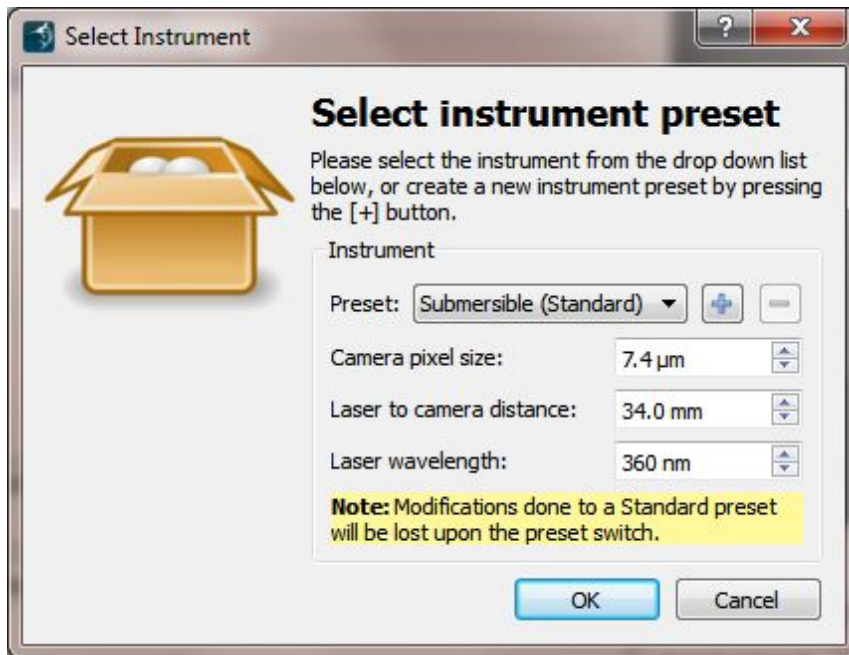
- Analyze full-size holograms, no downscaling.
- Calculate concentrations in n/ml.

Concentration (N/ml)	
6651.79	ε
6129.42	ε
5623.56	ε

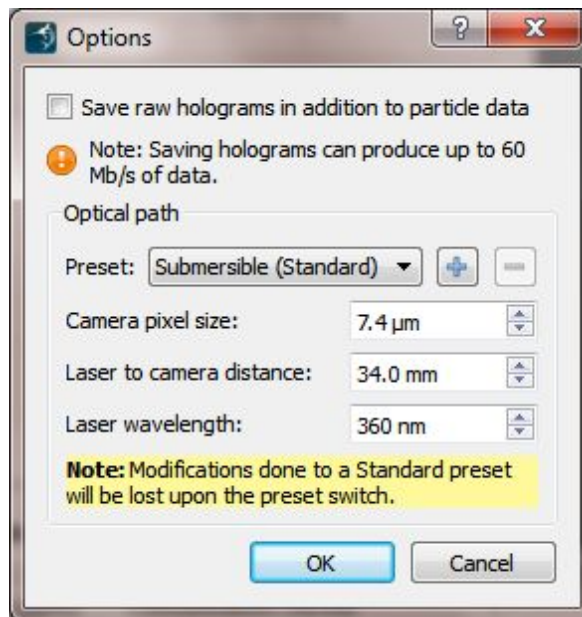
- Cumulative distribution curves.



- Hologram reconstruction performance improvements.
- Camera remote control allows to control camera parameters remotely via TCP/IP networks.
- Ability to reconstruct holograms on CPU, when CUDA reconstructions are not available.
- Camera connection improvements - no interface lockups when camera is connecting.
- Select instrument on the first run.



- Ability to select and update instrument preset in the Options dialog.



- Support for the Cuvette microscopes.
- Updated to VTK 6.1.

### 1.3.0

- Fixed the bugs in the offline analysis mode.

- Fixed the potential memory leaks.
- Chinese translation - user interface switches to Chinese if Chinese is selected in the Regions settings in the Windows Control Panel.



- Updated to CUDA 5.5.
- Updated the libraries to the most recent versions.

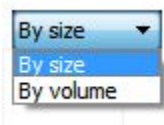
## 1.2.0

- Analysis speed has been increased to up to 16 fps.
- Min sample interval has been decreased to 1 sec.
- The background subtraction has been changed to become a pairwise subtraction, each 2 holograms recorded by the camera become background-hologram pair for subtraction.
- Ability to analyse offline holograms.
- Ability to calculate particle statistics based on particle volume in addition to particle size.
- Calculation of standard deviation (SD) of the particle population.
- Calculation of the median and mode of the particle size/volume distribution.
- Calculation of D10 and D90 values of the particle size/volume distribution.

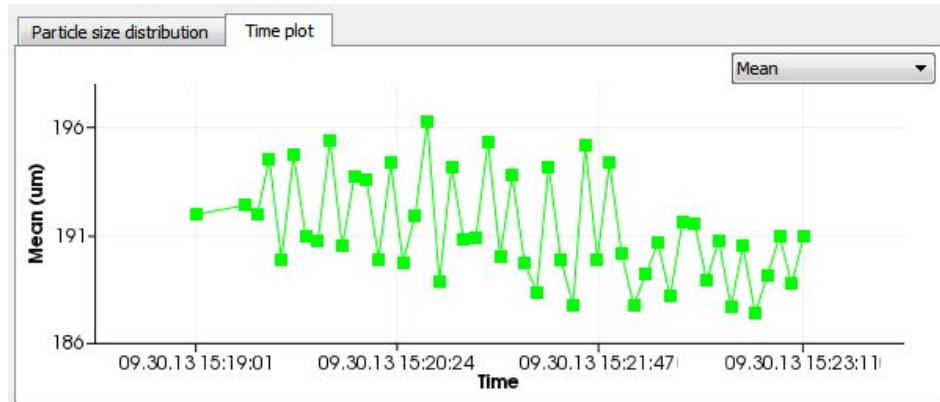
Mean (um)	SD	Median (um)	Mode (um)
193.909	40.9198	193.051	199.449
192.083	45.5507	188.763	198.479

- Ability to plot particle size or volume distribution histograms.





- Ability to plot the analyzed variable value over time (“time plot”). Variable to be plotted is user-selectable.



- Ability to export time plots to MS Excel files.
- Improved data saving code speeds up the performance.
- Improvements in detecting small round particles reduce the number of false positives.

## 1.0.1

- Improved PPM calculations
- Demo version available

## 1.0.0

- Initial release



