

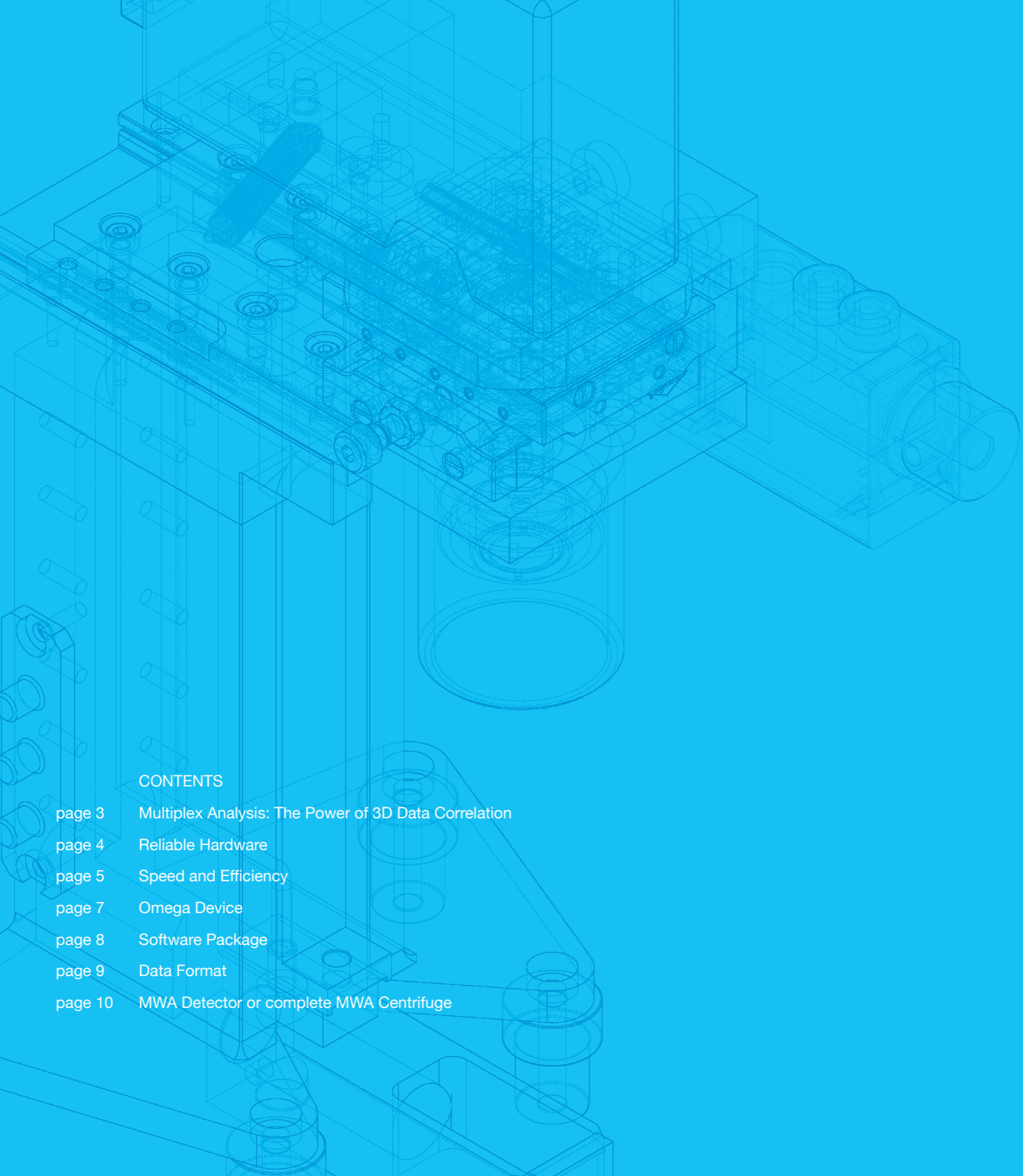
Advancing from monochrome  
to Multiwavelength  
Absorbance Detection

## The Nanolytics Instruments MWA Detector

It's fast.  
It's precise.  
It's in color.



NANOLYTICS **INSTRUMENTS**



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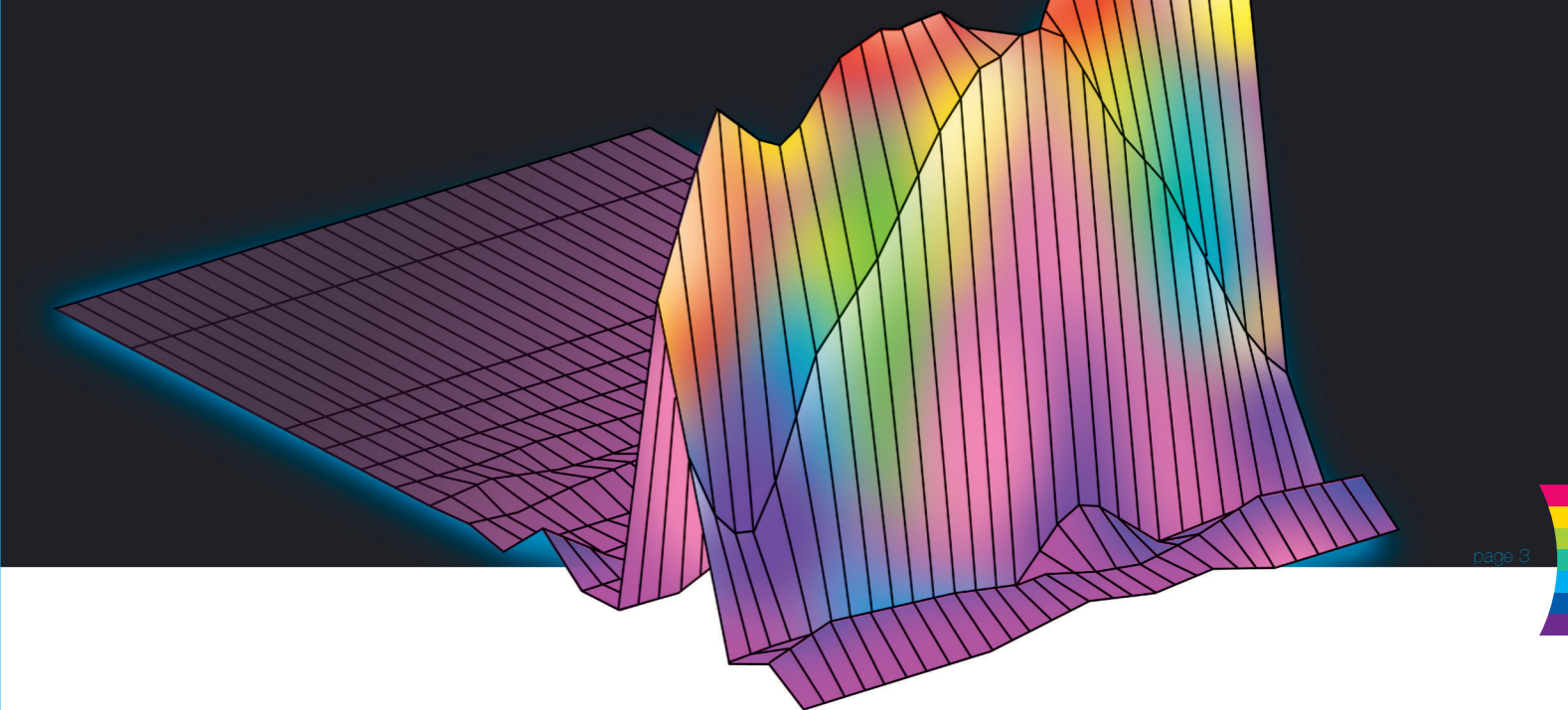
On a classical monochromator/photomultiplier setup, only one wavelength can be recorded at a time. For multiple wavelengths, scans need to be repeated and experimental time is multiplied.

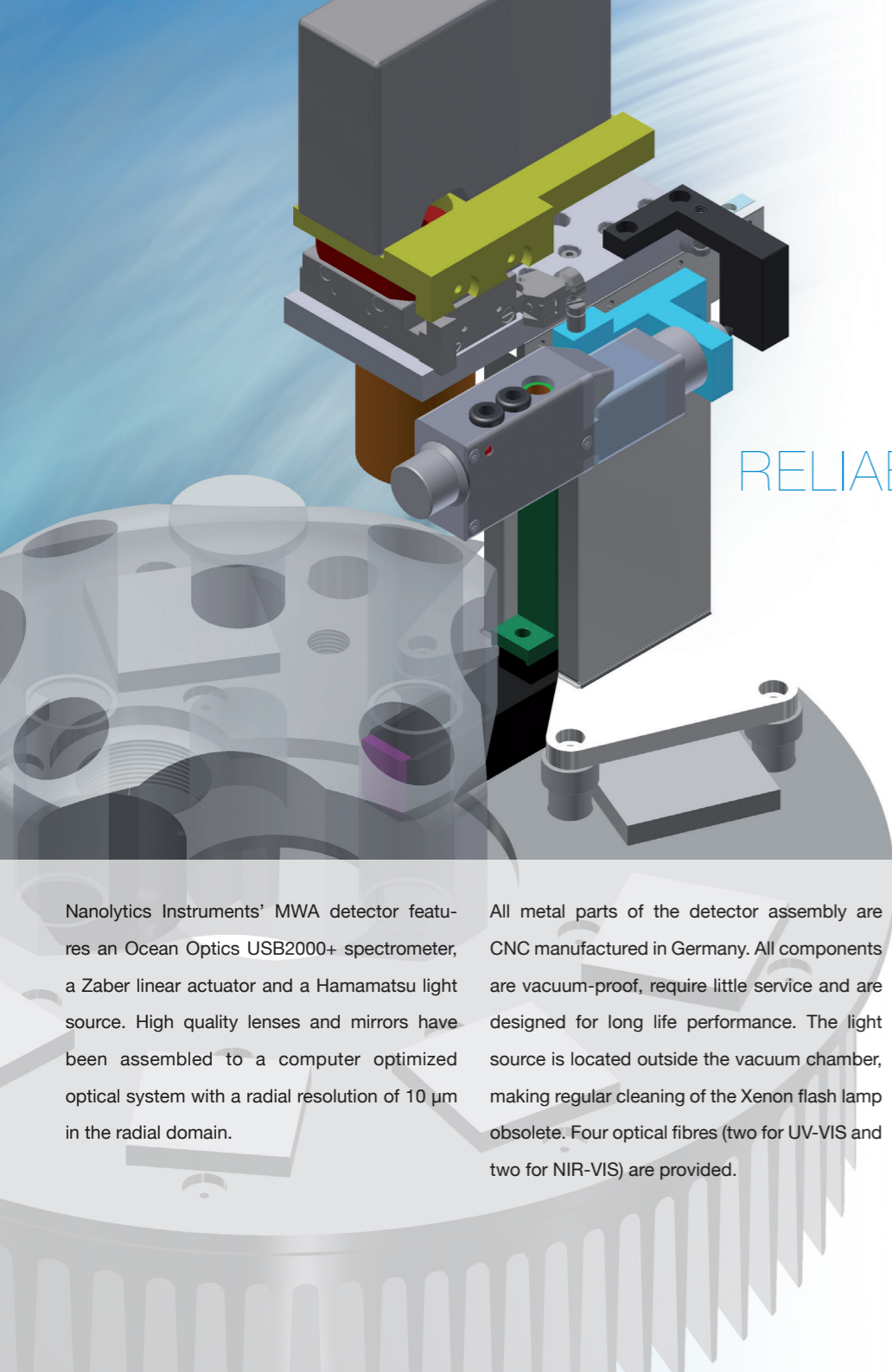
The MWA detector records complete spectra and makes radial data for 2048 wavelengths available with **one single scan**. It is available for UV-VIS and NIR-VIS ranges.

In the past 20 years, interference optics was often preferred to absorbance optics for the merit of being much faster in scanning. However, interference detection is unspecific. Specific absorbance detection is now available within a comparable timeframe.

## MULTIPLEX ANALYSIS

Using absorbance optics adds the individual spectral properties of different species to their individual – or common – sedimentation properties. Thus, MWA data allow for multiplex analysis, deconvoluting complex mixtures by the combination of sedimentation and spectral properties.





## RELIABLE HARDWARE

Nanalytics Instruments' MWA detector features an Ocean Optics USB2000+ spectrometer, a Zaber linear actuator and a Hamamatsu light source. High quality lenses and mirrors have been assembled to a computer optimized optical system with a radial resolution of 10  $\mu\text{m}$  in the radial domain.

All metal parts of the detector assembly are CNC manufactured in Germany. All components are vacuum-proof, require little service and are designed for long life performance. The light source is located outside the vacuum chamber, making regular cleaning of the Xenon flash lamp obsolete. Four optical fibres (two for UV-VIS and two for NIR-VIS) are provided.

Detection can be switched between UV-VIS and NIR-VIS by exchanging the spectrometer and the fibre – a procedure that experienced users can accomplish in less than an hour.

**Robust. Durable. Flexible.**

## SPEED AND EFFICIENCY

Nanalytics Instruments' detector control operates the light source and detector at a maximum frequency of 250 Hz – safely below the specified limits. The step motor is capable of moving along the radial coordinate at a maximum of 8 mm/s. Thus, collecting 1300 datapoints at the maximum resolution of 10  $\mu\text{m}$  takes only several seconds, depending on rotor speed. Even at

low angular velocities, where classical analytical ultracentrifuges require 10 minutes for one scan, this device takes less than one minute to scan both sectors of a cell. This enables collection of a large number of scans even for rapidly sedimenting materials with no need to limit the number of cells scanned. More samples can be scanned in a single run.



[Sophisticated calibration routines take full advantage of the high operation frequency. Delay calibration is performed in approximately 30 seconds, likewise radial calibration. Automatic optimization allows for the highest possible scanning speed at any run conditions.](#)

**Unmatched Performance by advanced Software Design**







# NANOLYTICS INSTRUMENTS OMEGA DEVICE

## $\omega$ device

The Omega Device is essentially an autonomous microcomputer for counting rotor revolutions, calculating angular velocity ( $\omega$ , omega, giving the device its name), and multiplexing light sources. It receives commands from the controlling computer and carries them out until further notice, making the critical and time-sensitive process control independent from a windows-based operating system.

The runtime integral, critical parameter for all evaluations, is measured with unmatched precision, due to a highly developed algorithm, optimized for maximum performance at any rotor speed. The device is designed to simultaneously multiplex two detector systems, though only one is needed for the MWA system.

The device will accommodate all electrical connections, coming from the computer on the right and leading to detector components on the left. The display allows to monitor proper hall input signal; additional controls allow to throttle

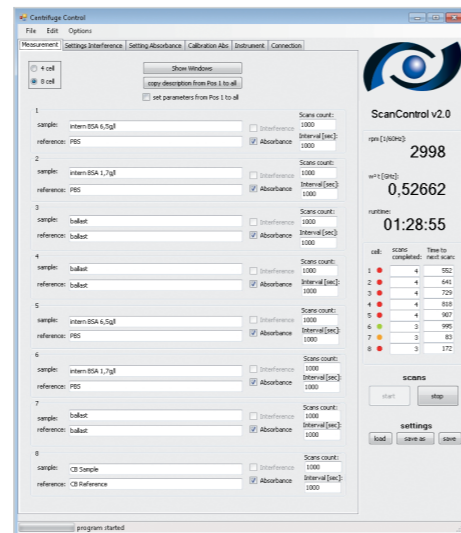
or mute the light source. The device contains diagnostic components for remote troubleshooting and maintenance. For convenience, it also contains all power supplies for detector components, making the MWA a simple plug-and-play setup.



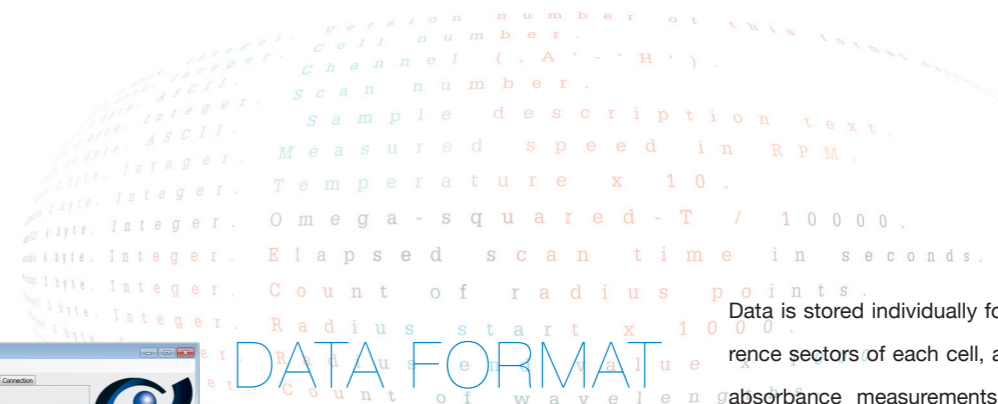
- Scanning configuration for four- and eight-hole-rotors, allowing for individual scan numbers and intervals
- Immediate effect of changes in configuration with no need to stop and restart scanning
- automatic radial and delay calibration routines with diagnostic plots for user review
- color map display for 3D data of current cell
- spectral and radial data for review on a single click
- tablet display for all cells with selected wavelengths, allowing the user to monitor the progress of the experiment

# SOFTWARE PACKAGE

Nanolytics ScanControl software is made to work with the Omega Device. It controls the external multiplexing computer and manages scan configuration and acquisition. A standalone program module provides access to previously recorded data, allowing for review and export to evaluation programs.



Optimal Experiment Control with best monitoring Capabilities



# DATA FORMAT

3D MWA data is stored in an uncompressed binary format, containing arrays of radial and spectral data, preceded by a header containing all relevant experimental information. Data format is open source, published on our website. Any user can design individual software for loading, examining, and exporting data according to his own needs. Nanolytics Instruments ScanControl exports data in Ultrascan 3 MWA import format and as single-wavelength files in classical Beckman format.

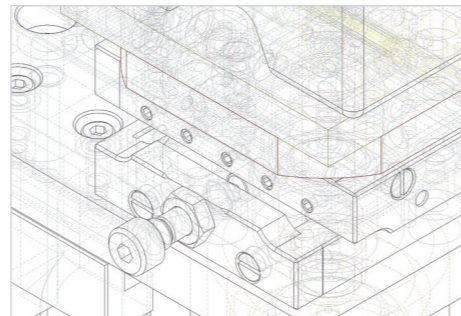
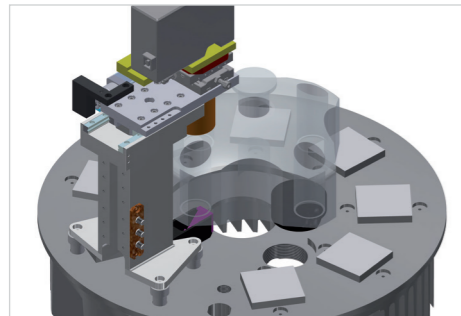
Data is stored individually for sample and reference sectors of each cell, allowing for pseudo absorbance measurements. ScanControl will automatically calculate classical absorbance if the reference sector is used for buffer solution, according to classical spectrometry. MWA data can be exported for sample, reference, and resulting absorbance signal.

Huge scan files for 2048 wavelengths at 10 μm resolution (11 MB) can be reduced by limiting storage to a relevant wavelength range. For UV data only (non chromophore proteins) the data scope can be reduced by 90%.

High Flexibility with Open Source Data Storage Format



# MWA DETECTOR OR COMPLETE MWA CENTRIFUGE



Nanalytics Instruments MWA detector system is available in three configurations:

- MWA detector toolkit for individual software solutions
- in combination with Nanolytics Instruments' Omega Device for multiplex control, experimental setup and monitoring
- complete MWA AUC instrument based on BeckmanCoulter's L/XL preparative centrifuge series.

**Do-it-yourself or complete Instrument Packages**

**NANOLYTICS INSTRUMENTS** is located in the Golm Science Park in Potsdam, one of the largest technological and scientific clusters in Germany. Nanolytics Instruments GmbH has emerged from Nanolytics GmbH, a contract research company that has been providing analytical services on the Analytical Ultracentrifuge and other devices since 1999. Besides performing service measurements, Nanolytics has been significantly improving AUC hardware in order to provide its clients the highest data quality possible. With the new company, Nanolytics' developments are becoming available to other AUC users, with the mission of getting the most out of a 100 year old method - by applying modern detector hardware in combination with advanced operating software.

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