

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

**Artisan Technology Group**
(217) 352-9330 | sales@artisantg.com | artisantg.com

**Full-service, independent repair center**
with experienced engineers and technicians on staff.

**We buy your excess, underutilized, and idle equipment**
along with credit for buybacks and trade-ins.

**Custom engineering**
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

**Expert team | Trust guarantee | 100% satisfaction**

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Wyatt Technology DAWN EOS WEOS-02* at our website: ***Click HERE***

WYATT TECHNOLOGY CORPORATION

# WyattQELS™

## The most versatile Quasi-Elastic Light Scattering Device for Multi-Angle Light Scattering Instruments




Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# The WyattQELS™

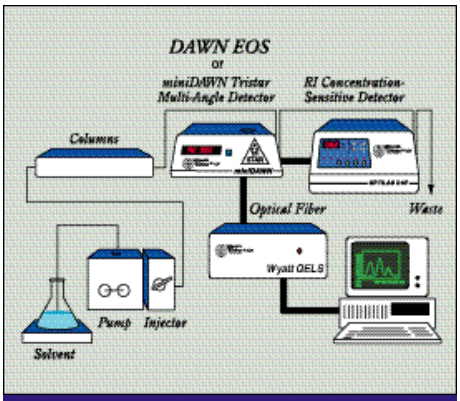
## The Ultimate Add-on Instrument for Quasi-Elastic Light Scattering

The WyattQELS™ (Quasi-Elastic Light Scattering) is a compact, add-on instrument that can be connected to a DAWN® EOS or a miniDAWN Tristar in order to determine particle sizes and their distributions. The combined system gives you the ability to size very small particles (under 10nm), as well as very large particles *on-line* after they have been separated by some kind of fractionation technique. Naturally, the DAWN instruments always measure molar mass for any size. In addition, the WyattQELS system enables you to move the optical detection to any of the DAWN's 18 angular positions. The instrument can also be used in a batch or "micro-batch" mode when sample separation is not required.

The WyattQELS instrument contains a single photon-counting avalanche photodiode, an optical fiber that is connected to the read head of the DAWN or miniDAWN, and a real time digital correlator that measures the autocorrelation function (see *How it Works* inset at far right) of the intensity signal carried by the optical fiber.

Collecting the autocorrelation function, the ASTRA® software calculates the hydrodynamic radius ($r_h$) at each elution time over the chromatographic peak selected. In addition to the presentation of these derived values, the software package permits the display of the actual correlation functions on which basis the $r_h$ values are generated. The ability to review these data sets cannot be overemphasized. Systematic errors caused by artifacts, stray light, set-up errors, or other effects are often easily revealed by examining the source data collected.

Unlike other dynamic light scattering instruments, the WyattQELS system comes with the ability to measure the correlation function at different angles. For on-line measurements, this feature adds enormous flexibility to the types of molecules which may be studied. The WyattQELS allows aggregation phenomena and conformational changes (as a function of temperature and solution properties) to be studied with greater precision than ever before.




**Just by adding a WyattQELS to your existing DAWN EOS or miniDAWN system, you'll be able to determine hydrodynamic radii to less than 1nm.**

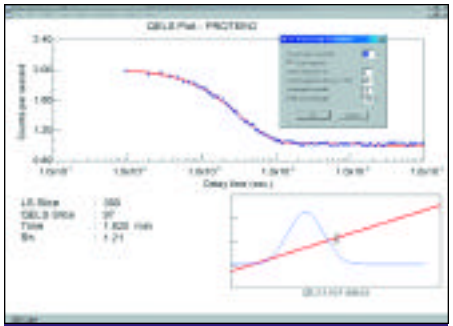
The WyattQELS may be used also in a batch mode with special 10µL cuvettes. On the basis of user-selected parameters, various size distributions may be generated from the collected correlation functions. And even using such small volumes, simultaneous measurements of molar mass are always available.

## Software

The WyattQELS system is driven by the ASTRA program, a state-of-the art on-line chromatography software package. By means of recently developed proprietary algorithms, ASTRA can process the autocorrelation function collected at each slice to yield the associated diffusion constant and, from that, the hydrodynamic radius. In addition, the software detects the presence of artifacts, if any, and *corrects for their presence*. Such artifacts may arise from dust contributions and peak passage events.

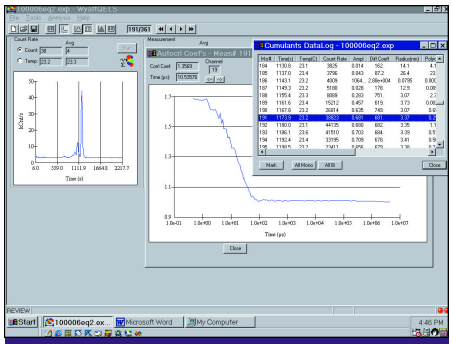
In the microliter batch mode, the system will collect data from small samples that have been injected into special, blackened cuvettes. Unfractionated samples will produce complex correlation functions whose departure from pure exponential decay arises from the presence of heterodisperse components. The user can then select among a set of distribution *assumptions* on which basis the software will attempt to obtain a distribution. Unlike other software packages, the fundamental basis for the distributions presented are readily observed.

In the flow mode, the instruments may be used to collect, simultaneously, the dynamic and classical light scattering data from which the molar mass and rms radii (where possible) are calculated for each slice. For the miniDAWN Tristar, dynamic light scattering signals are only collected from the 90° location, whereas for the DAWN EOS, dynamic light scattering signals can be collected at any one of its 18 detector locations.



**For any given slice of a chromatogram, the ASTRA software will provide the WyattQELS slice number and hydrodynamic radius. In addition, the QELS processing parameters dialog can be invoked for more sophisticated processing.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



**The WyattQELS software package enables you to see the underlying detail for every slice of the chromatogram. In this example, a particular slice of the monomeric peak is highlighted in which the software has calculated a hydrodynamic radius of 3.37nm.**

The ASTRA software controls the operation of the WyattQELS module. A typical data acquisition time is three seconds per entire correlation function. The program also includes an export facility for sending results to ASCII files which can be processed in spreadsheet format or imported into statistical mathematics packages. Among the many features of ASTRA is an easy-to-use "Start/Stop" button operation, a one-click "Results Summary" button, and an integrated "Calculator" for the estimation of solution viscosities, maximum sizes accessible, etc.

Other software features include:

- **Fraction of two components of known $M_W$ and $r_h$**
- **Data fitting routines: Monomodal + regularization**
- **Integrated Help File**

## Special Features and Benefits

The DAWN EOS and miniDAWN Tristar instruments are available with static microliter-volume cuvette holders that are easily installed or removed. The DAWN EOS can be ordered with precise temperature control capabilities with its on-board Peltier heating/cooling accessory. This feature is particularly useful for QELS measurements, since studies can be performed to examine particle sizes as a function of temperature.

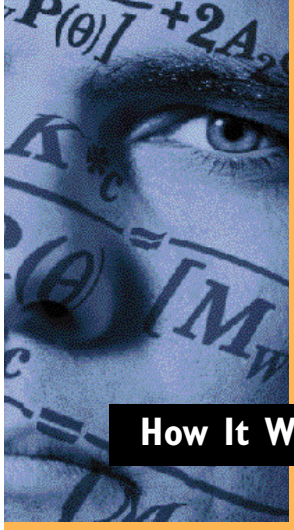
With the DAWN EOS it is possible to measure the autocorrelation function at different values of the scattering fluctuation wave vector, $q$, by moving the detecting fiber to any of one of the 18 angular positions accessible. As the angle selected is *increased*, the collection time is effectively *decreased*. Thus, the maximum size of particles accessible for measurement within a fixed time period (the time allowed for QELS data collection) may be *decreased* by selecting a larger scattering angle for measurement. Conversely, by selecting a smaller angle, the time scale of the correlation measurement is increased, which allows better resolution for small molecules.



**The micro-cuvette accessory kit fits DAWN EOS and miniDAWN Tristar instruments and allows static and dynamic light scattering measurements to be made simultaneously on samples as small as 10µL.**

Several features common for both the DAWN EOS and miniDAWN include:

- **Multiple Tau correlation design with a fixed range of channels from 480 nsec to ~1 hour (real-time).**
- **No sample time optimization required.**
- **A total of 264 channels with input data format of 5 bits for first 16 channels, then the sample time doubles every 8 channels and the data width is incremented 1 bit for every set of channels. No pre-scaling required!**
- **The fastest channel of the correlator is 480 nsec.**



## How It Works...

**The light scattered in the DAWN flow cell is collected by a special optical fiber. The fiber detects wavelets of light which scatter destructively or constructively, depending on the positions of the illuminated molecules. As the molecules undergo Brownian motion, their relative positions change with time. Small molecules—which diffuse quickly—generate signals that fluctuate rapidly. Conversely, large molecules generate signals that fluctuate slowly. The time dependence of these fluctuations is characterized by the intensity autocorrelation function that is defined as**

$$G(\tau) = \int_{-\infty}^{\infty} I(t)\, I(t-\tau)\, dt\,,$$

**where $I(t)$ is the intensity as a function of time, and $\tau$ is a delay time. The autocorrelation function of a monodisperse sample is related to its diffusion constant by**

$$G(\tau) = \langle I(t)\rangle^2 \,(1+\alpha e^{-2D_T q^2 \tau})$$

**where $\langle I(t)\rangle^2$ is the average intensity squared, $\alpha$ is an instrument constant, $D_T$ is the translational diffusion constant, $q = (4\pi n/\lambda_0)\sin(\theta/2)$, $n$ is the index of refraction of the solvent, $\lambda_0$ is the wavelength of light in vacuum, and $\theta$ is the angle of detection with respect to the incident beam direction.**

**By analyzing the correlation function, one can measure directly the diffusion constant of the molecule. Furthermore, if the molecule is assumed to be a uniform sphere, the Stokes-Einstein relation enables the molecule's hydrodynamic radius to be determined:**

$$r_h = \frac{k_B T}{6\pi\eta D_T}\,,$$

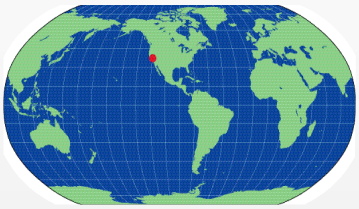
**where $k_B$ is Boltzman's constant, $T$ is the absolute temperature (in degrees Kelvin), and $\eta$ is the solvent viscosity.**

# Specifications

| | |
|---|---|
| **Size Range:** | 1 nm to 30 nm in flow mode. Up to 1 µm in batch mode |
| **Measured Volume:** | 0.2 nl |
| **Temperature Control:** | Ambient, optional Peltier heater/cooler |
| **Data Acquisition:** | 1-3600 seconds |
| **Correlator Minimum Delay Time:** | 480 nsec. |
| **Hardware interface:** | 248 channel digital autocorrelator with multi-tau |
| **Maximum Light Intensity:** | 8,000,000 photons per second for 2 seconds |
| **Interface:** | 2 Universal Serial Bus (USB) ports |
| **Operating System:** | Windows 98® or Windows 2000® |
| **Power:** | Switchable, automatic 85-265 V, 50-60 Hz input |
| **Dimensions (cm):** | 32 cm (L) x 26 cm (W) x 15 cm (H); 13" x 10" x 6" |
| **Weight:** | 8.2 kg (18 lbs.) |




**Like the DAWN EOS, the miniDAWN Tristar may be interfaced to the WyattQELS so that static and dynamic light scattering measurements may be made simultaneously, even on flowing samples.**



With installations in *more* than 35 countries, Wyatt Technology is the **world's leading manufacturer of light scattering instruments** for absolute macromolecular characterization. It is the only company in the world focused exclusively on such systems, their design, and their application.

DAWN, ASTRA, AURORA, EOS and the Wyatt Technology logo are registered trademarks of Wyatt Technology Corporation. DAWN instruments and their components are patented, and are covered by one or more of the following: U.S. Patent Nos.: 4,541,719; 4,616,927; 4,710,025; 4,907,884; 5,404,217; 5,475,235; 5,528,366; European Patent No.: 0102726. Other patents pending. No part of this brochure may be reproduced in any way without written permission from Wyatt Technology Corporation.

© 2001 Wyatt Technology Corporation.

Wyatt Technology CORPORATION

**30 South La Patera Lane, B-7**
**Santa Barbara, CA 93117 USA**
**Tel: 805/681-9009 • Fax: 805/681-0123**
**e-mail: info@wyatt.com**

**Light Scattering for the Masses™**

**www.wyatt.com**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

WQELS0201-20K

**Artisan Technology Group** is an independent supplier of quality pre-owned equipment

## Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

## We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

## Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP