



B R O O K H A V E N · I N S T R U M E N T S · L T D

Date: 17.09.99

PR #: 179-99

Article

Keywords: SQELS, research collaboration

Word count: 984

Photographs: to be confirmed

-copy starts-

Brookhaven 9000AT Correlator assists UK universities with SQELS biopolymer research

The Brookhaven Instruments 9000AT Correlator is proving very useful for many research applications and has become popular with several leading university departments in the UK. This popularity stems, not only from the instrument's performance, but also from the responsive service of the Brookhaven support team.

A leading UK university and long-standing client of Brookhaven Instruments Ltd. was recently able to help colleagues at another university to choose the right equipment for biopolymer research.

The Interdisciplinary Research Centre for Polymer Science and Technology at the University of Durham has been using Brookhaven correlators for five years and currently has three BI9000ATs and one 2023AT. In particular, the instruments have been vitally important in the development of Surface-Elastic Quasi-Light Scattering (SQELS) techniques. Based on Durham's success, the Cavendish Laboratory in Cambridge chose to equip itself with a BI9000AT when it began its own SQELS research programme early in 1999.

Registered in England Number 2562147

Vat Registration No. GB 551 5056 61

CHAPEL HOUSE · STOCK WOOD · WORCHESTER B96 6ST · UK

Tel: 01386 792727

Fax: 01386 792720

Randal W. Richards, Professor of Chemistry at the University of Durham, replaced his old systems with Brookhaven instruments in order to cope with new applications and high workloads. "We were developing SQELS from polymers at fluid interfaces and still needed to retain the capability to determine diffusion coefficients of polymers in solution. At the same time, we began working on relaxation processes in water-swollen gels. We needed a correlator that could produce accurate and precise results at both ends of the scale, with both long delay times for this application and short delay times at higher wave numbers for our work on SQELS from water surfaces."

At Durham, the Brookhaven correlators are used extensively to investigate the SQELS from liquid surfaces. "These surfaces are always perturbed by thermal fluctuations which can be described as a wave-like motion. The waves have a range of frequencies, typically from 50 kHz to in excess of 1 MHz depending on the wave number selected. The wavelengths are from tens of microns to hundreds of microns," said Professor Richards.

"When a polymer film a few angstroms thick is placed on the surface, the waves become significantly damped due to the energy dissipation processes in the polymer film. By scattering light from the liquid surface and using a heterodyne detection method, the frequency and damping of the capillary waves can be obtained from the correlation function provided by the Brookhaven correlator. The correlation function can also be analysed to give the surface tension, dilational modulus and dilational viscosity of the surface layer and the frequency (or capillary wave number dependence) of these can be used to determine if particular models of visco-elasticity are applicable. The changes in these parameters with surface concentration of polymer are also being related to structural changes in the thin polymer film that are obtained using neutron reflectometry."

"This research has led to a new theoretical appraisal of the surface modes of polymers at fluid interfaces and this has stimulated further experimentation using polymers specifically designed to explore particular aspects". Professor Richards' team is presently extending this work for polymers at liquid-liquid interfaces.

The group at the University of Durham has maintained a high level of activity in the UK SQELS research field and, as a result, has close ties with other university departments, including the Cavendish Laboratory in Cambridge. When the time came for the Laboratory to look for instruments suitable for its new SQELS research project, Professor Richards shared his experiences of the BI9000AT correlator with Dr Ian Hopkinson, a former colleague who was to lead the new project in Cambridge.

more...

Brookhaven

179.99/3...

Dr Hopkinson, Assistant Director of Research at the Cavendish Laboratory, said: "We bought the BI9000AT on the recommendation of Professor Richards specifically for our work on SQELS. Clearly the correlator was technically capable for the intended application - the macro language is rather handy for my work and the 'database' style of data storage will be very useful - and Professor Richards had been very impressed with the support and interest shown by Brookhaven representatives."

"Our work will be focussing on the behaviour of biopolymers, including globular and 'random coil' proteins, at liquid-air interfaces. Structurally, these systems bear some resemblance to synthetic polymer systems but they also present some new features. For example, many proteins undergo unfolding transitions at interfaces and this has a bearing on adsorption behaviour. Proteins are also well-defined polyelectrolytes, introducing a further range of possibilities, including the modification of interactions between proteins at the interface by changing pH and ionic concentration."

"In the future, we hope to look at liquid-liquid interfaces, where SQELS has the ability to probe exceedingly low surface tensions," Dr Hopkinson added.

Impressions & Customer Care

A key factor in the continuing application of any commercial instrumentation is the ability to gain a straightforward and rapid response from the equipment supplier. Both the University of Durham and Cavendish Laboratory have found Brookhaven's UK representatives ready to discuss requirements and solve problems that have arisen.

Certain modifications to the BI9000AT photomultiplier tube (PMT) were necessary for the SQELS applications. "The final wiring of the dynode chain prevented us from using the PMT in a particular way," pointed out Professor Richards. "Our Brookhaven representatives were happy to rewire it for us and it now behaves in the way we want it to. On the whole, they have been very keen to ensure that our data is artefact-free."

Similarly, Dr Hopkinson soon became confident with the instrument and Brookhaven's customer support: "I discussed our needs with the Brookhaven representative and he expressed great interest in further developments for this fairly specialised application."

more...

The future

Brookhaven instruments have proved that, with certain modifications, they are not only capable of meeting the specific needs of SQELS research, but also have the potential for further development so that SQELS becomes a broadly applied characterisation technique. Informal

Collaborative efforts between industry and academe, such as that between Brookhaven, Durham University and the Cavendish Laboratory, can only benefit the research community.

For more information on Brookhaven Instruments Limited please contact:

Dr Peter McFadyen

Brookhaven Instruments Limited, Chapel House, Stock Wood, Redditch, Worcestershire, B96 6ST, United Kingdom.

Telephone: + 44 (0) 1386 792727

Fax: + 44(0) 1386 792720

E-mail: peter@brookhaven.co.uk

- copy ends -

© KDM Communications 1999

Editorial contact for additional information or follow-up

Clare Butterfield at kdm Communications, Milton Keynes, UK

Telephone +44.1908.371173

Fax +44.1908.371171

e-mail ideas@kdm-communications.com

