Report on the Data Acquisition and Detector Session

by J.M. Newsam and N. Niimura

Three themes are common to the contributed papers on data acquisition systems and detectors and to the discussions which followed their presentation.

1) the desirability of standardising both hardware equipment and software on different instruments which might have widely differing intermediate data storage and control requirements.

2) the increasing reliance on the use of Li^6 glass scintillators.

3) the problems associated with the sheer number of arithmetic operations that are required to correct and display the data recorded by large area position-sensitive detectors (PSD).

The speed with which corrections may be applied to the measured data and intermediate results obtained depends on the available on-line computational capacity which, in turn, depends on the philosophy behind the computer configuration. The star or hub approach planned for SNS and IPNS-I and installed at the new Harwell Linac allows each instrument a dedicated mini-computer with intermediate storage capacity. This minimizes the reliance of a given

instrument on the central hub computer although perhaps at the expense of a reduction in the amount of on-line processing that is possible.

The problem is particularly acute for small angle scattering instruments that are equipped with large-area PSD's and, during operation, a two-dimensional display obtained by summing the data for difficult time channels or positions may be all that is possible. As Stewart pointed out, however, this arrangement is unsatisfactory when the scattering is anisotropic. It is possible that parallel array processors will prove useful in reducing the total time required for correcting the raw data.

In TOF scans there are advantages to allowing flexibility in the number and width of the time channel gates. For some situations it may be desirable to match the width of these gates to the widths of the corresponding resolution elements. If electronic time focussing is employed, short-channel widths may be necessary for accuracy in combining the data from different detectors. Further, in particular experiments where only certain portions of the time scan are of interest, it may be advantageous to group the channels in a bunched or 'concertina' fashion.

At the Institut Laue-Langevin all measured data is archived and is therefore readily available to users even several years after their measurements were made. Howells outlined how a similar scheme for data storage and management was envisaged for the SNS facility. This scheme would be consistent with the requirements of the other centres supported by the Science Research Council so that a single data management system would control access to all data

measured at these facilities.

On the question of standardisation, Windsor suggested that ICANS might provide a medium for the exchange of software. As Fortran is the most commonly used programming language, such an exchange would help to standardise the systems at different centres and facilitate new development. Stewart explained that such standardisation at different centres had already ocurred in the case of many European small angle scattering machines. Following the proposal of Price, a member from each ICANS laboratory was then selected to act as the software and computing representative. Questions or information should therefore be addressed to the following

KENS:	N. Niimura/M. Kohgi
Harwell Linac:	D. Johnson
IPNS:	T. Worlton
SNS:	M. Johnson
LASL:	J. Eckert

The question of beam monitors was raised by Crawford who described the flat-plate BF_3 detectors which were successfully used for this purpose at Zing-P'. These detectors have efficiencies which are variable within the range 10^{-5}-10^{-3} for thermal neutrons. They have better pulse height distributions than fission counters which have

the added disadvantage that their signal depends on atmospheric conditions and on the level of discriminators. Howells mentioned the possibility of using low-efficiency edge-coupled scintillation detectors as monitors. In TOF measurements it is usually necessary to monitor the energy dependance of both the incident intensity and sample absorption. Two or more beam monitors may therefore be required.

Stewart pointed out the problems of calibrating area detectors, particularly for small angle scattering and he further elaborated on this issue in a subsequent additional meeting. Vanadium powder is acceptable at high Q ($\gtrsim$0.1 $\mathring{A}^{-1}$) but for lower Q values down to 0.05 $\mathring{A}^{-1}$ a single crystal is preferable (suitable single crystals of vanadium are obtainable from Metals Research, Cambridge, UK) or, for wavelengths greater than 8 $\mathring{A}$, a thin sample of distilled water may be used. It would be desirable to have a standard sample, such as irradiated Ni in the case of small angle X-ray scattering, which would both allow the intercalibration of intensities and provide an internationally accepted standard.

In conclusion, there has been much recent progress, particulary in position sensitive detector research, although there remain some difficulties in very fast arithmetic processing for data correction and display and in the calibration and cross-calibration of large area detectors.