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REPORT OF SESSION ON "TOTAL PERFORMANCE"

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The phrase "total performance" has become a key one at this meeting, although in this session we were concerned only with its interpretation for neutron scattering instruments. Our program says "The performance of an instrument should be characterized as a whole system including accelerators, neutron source, instrument itself, sample environment, data acquisition and analysis system, etc." If we use this idea to characterize an instrument, then weaker sources have a chance to be competitive with the stronger sources because the instrument is assessed from the point of view of the experimentalist and the use he or she wishes to make of the data.

The six speakers discussed different instruments from this point of view. Drs. Watanabe and Izumi discussed LAM-80ET and how it had been improved and optimized to give a total performance similar to IRIS on a much stronger source. Very large mica crystal analysers were developed and used on LAM-80ET. Dr. Taylor discussed the present status of MARI and showed how its design had been optimized. Examples of early data were shown, and he felt that MARI could cover the work done by HET and LRMECS in one package. Later he spoke of the advantages of using two target assemblies on one source. Dr. Carpenter discussed how the resolution of pulsed source choppers could be improved and hence improve total performance. He used HRMECS as an example and described the improvement possible with the new design. Dr. Pynn discussed how small angle scattering instruments on reactors and pulsed sources should be compared, and emphasized the advantages of the wider Q range and wavelength scanning available at a pulsed source. From the point of view of total performance LQD was comparable to D11. Dr. Furusaka also discussed small angle scattering work at a pulsed source, and he reviewed the effects of varying path length, moderator temperatures, and other parameters on performance. Intensity at low Q should be optimized to improve total performance.

The six speakers discussed numerous different parameters, and while a full report of their

ideas cannot be given it is useful to list the items they considered in two categories. These are list A of hardware items and list B of data quality matters.

A Hardware Items to be Considered

Accelerator Parameters

Target and moderator parameters

Local Shielding and Voids

Geometrical Parameters, e.g. collimation, beam size, paths, etc.

Devices e.g. choppers, guides, crystals, filters, etc.

Detectors, etc.

Backgrounds, including crosstalk, spurious effects, etc.

Other spectrometer parameters

Costs and labour

B Data Quality Concerns

Intensity per variables of interest (e.g. time)

Signal/Background ratio, and absolute background

Background from expt. components (e.g. Al windows)

Resolution per variables of interest

Experimentally adjustable parameters (compared to fixed parameters)

Quality of instrumental checks

Ancillary Equipment - installation and operation

Convenience of operation; data taking and analysis

Costs and labour

With the help of such lists the concept of 'total performance' may be discussed in greater detail. First the experimentalist should define an ideal matrix [B] for each experimental case under

consideration. Let one of these matrices be called [B^1]. A "good total performance" would then consist of adjusting the matrix [A] in order to cause a given [B] to move significantly towards [B^1]. There maybe several roughly equivalent ways of doing this, and if so the one selected should minimize the costs and labour. The best example of this approach given in this session was the description of the development of LAM80ET. However in the other instrument sessions other examples were given, such as the design of SANDALS.

At the end of the Total Performance session the speakers formed a panel to discuss this topic. A wide ranging discussion was held, and some of the points made follow. It is easier to succeed when a few parameters stand out as being more important than the others (so that matrices [A] and [B] are small). Also new technical improvements which permit a bigger range of some parameters can alter an established picture, for example new guides, very large monochromators, better reflectors, etc. One speaker called for improved chopper designs for pulsed sources which would allow the more intense (but wider) pulses from large hydrogenous moderators to be exploited more effectively. Some radical questions were proposed, such as "when is it better to spend money on instruments, moderators etc. to improve total performance rather than on the purchase of higher power accelerators?" It was agreed that the concept of total performance should be explored further and ways of applying it to various experiments clarified. Finally it was suggested that a follow up session be included in the next ICANS meeting.