Summary of contribution to the ICANS-X panel discussion

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In general, users don't care about the source characteristics or even the type of source—what they care about is the performance of specific instruments for specific experiments. It is the instrument designers who dictate what source characteristics are necessary or desirable to achieve specific levels of instrument performance. From an instrument designer's point of view, the time-structure (pulse shape and repetition frequency) of the source and the time-averaged intensity as a function of wavelength are the two most important source parameters. Clearly, the source time-structure is of fundamental importance to those instruments based on traditional time-of-flight techniques. However, source time-structure can also be of considerable importance to some instruments that traditionally have been operated in a steady-state mode. If new sources are being designed, some of these traditional techniques should be reexamined from this point of view.

Many instruments are now operated with a less-than-optimum source time-structure and could achieve significant performance improvements if the source time-structure were optimized. Consider, for example, the small-angle scattering instruments currently operating at pulsed spallation neutron sources. For these instruments, the pulses are typically much narrower than required, so lengthening the pulses could lead to significant gains in data rates with no appreciable loss in resolution. Another example is the triple-axis spectrometers, which have been so important at steady-state sources. Introduction of a non-steady-state source time-structure could permit the use of time-gating techniques to eliminate higher-order monochromator and analyzer reflections, and so eliminate many spurious effects from the data. All instruments involve tradeoffs between intensity and resolution. Source time-structure optimization in many cases allows some of these tradeoffs to be made at the source rather than in the instruments, so that fewer unwanted neutrons escape to contribute to the background.

One of the great advantages of pulsed sources is the flexibility they provide in optimizing source time-structure and intensity-vs-wavelength characteristics. Moderators can be cold, hot, small and decoupled, or large and coupled. Several of these can coexist around a single target. If more than one target station were driven by the accelerator, preferably at different repetition rates, still greater flexibility could be achieved and a greater number of instruments could be physically accommodated. Such a dual- or multi-target facility should be seriously considered when a new pulsed neutron source is planned.