

## Summary of contribution to the ICANS-X panel discussion

*F. Mezei*

Hahn-Meitner Institute Berlin GmbH  
Glienicke Str. 100, D-1000 Berlin 39  
FEDERAL REPUBLIC OF GERMANY

The field of high-resolution inelastic spectroscopy at pulsed neutron sources is still at its beginnings. However, a closer analysis of the opportunities reveals that in this particular field of applications, the pulsed nature of these sources offers distinct advantages compared to continuous sources. Assuming that the resolution improvement is achieved by using longer flight paths (which is well feasible without undue intensity losses, even for relatively short wavelengths, by the application of ordinary or supermirror coated neutron guides), the intensity penalty turns out to be just proportional to the resolution increase, because either the pulse length or the wavelength band can be kept constant. This is in contrast to losses increasing with higher powers of the resolution gain on continuous sources.

In any case, the main limiting factor in inelastic spectroscopy, in general, and in high-resolution spectroscopy, in particular, is the neutron intensity. Therefore, flexibility of resolution is crucial to obtain the optimal resolution-intensity compromise for the particular feature studied. The asymmetric resolution functions often encountered on pulsed sources offer a fortunate (and rather surprising) possibility, which is fully understood and tested by now. In a wide variety of cases, we can simultaneously derive advantage from both the better resolution offered by the sharper edge and the higher intensity corresponding to the full width of the resolution function by extracting all information from the measured spectra using proper mathematical approaches.

The main implications of these considerations concerning the characteristics of an optimally adapted neutron source are: (a) low pulse repetition rate is to be preferred (some 10 Hz or less) to allow the use of long flightpaths; and (b) best flexibility for optimizing resolution and intensity is provided by maximum intensity, unpoisoned, and coupled ("big fat") moderators and pulse-shaping choppers.

By now it is perfectly clear that the best performance in the next generation of neutron sources can be expected from advanced pulsed sources as opposed to reactors, not only at short wavelengths where pulsed sources have already proved to be superior, but over the whole spectrum of wavelengths and applications. A pulsed source offering some hundred times the effective useful flux of ILL might be within the realm of the possible by the turn of the century.

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