

Polarization Analysis Neutron Spectrometer Project at J-PARC

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Abstract

KEK and Tohoku Univ. are advancing a project to construct a polarization analysis neutron spectrometer at J-PARC. Since there exist a few polarised neutron spectrometers in pulsed neutron facilities in the world, this spectrometer will be a key instrument to generate breakthroughs in novel material science in the high-power spallation neutron era. Since this project has many technical problems, in particular, feasibility of spin analysers with a large solid angle, we will move ahead this project in incremental phases: the first phase, a fan-type supermirror device will be used as the analyser, meaning that the energy range is focused below $\Delta E \sim 20 \text{ meV}$ in the first phase. In the second phase, by developing SEOP analysers, we will be able to observe excitations in $E_i \sim 100 \text{ meV}$ region. We also will aim at observing in $E_i \sim 300 \text{ meV}$ region in the final phase. For arriving at higher energy regions, with high stability, a SEOP type polariser will be used, which is now developing under collaborations with JAEA, KEK and Tohoku Univ. Basic performances have been estimated: the polarised neutron flux is expected to be $1.1 \text{ E}+5 \text{ (n/s/cm}^2\text{/meV)}$ at 100 meV , and energy resolution as a conventional Fermi chopper machine to be 5% of $\Delta E/E_i$ under the optimized condition. One of the characteristic points of this project is “the cross correlation method”, by which neutrons with many different E_i can be used at once; thus much enhancement of efficiency will be expected, while resolution and analytic accuracy of profile will be partly lost.