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Neutron guide at PLANET in MLF of J-PARC

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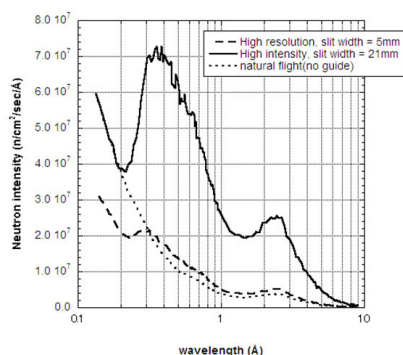
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The powder diffractometer dedicated to high-pressure experiments (PLANET) is now being constructed on BL11 at the spallation neutron source of J-PARC. PLANET aims to study structures of hydrogen-bearing materials including dense hydrous minerals of the Earth's deep interior, magmas and light element liquids.

The performance for the instrument required by users vary according to their research fields such as earth and space science, material science, and high-pressure physics and chemistry. Therefore, the instrumental design should incorporate wide Q range and have the flexibility for intensity-resolution optimization to improve versatility and efficiency in structure analysis of crystal and liquid at high pressure.

Key requirements for the guide at the beamline are as follows: (i) focus neutrons of wavelength between 0.45 to 10 Å, especially below 1 Å, to achieve accurate crystal structure analysis; (ii) generate a small focal spot size to reduce background noise from a complicated sample environment; and (iii) provide a homogeneous phase space distribution at the sample position to maintain relatively high beam flux without sacrificing resolution of the diffraction profile. To fulfill these requirements, we designed an elliptical-shaped guide, which has rectangular cross-section and consists of four walls coated with supermirror.

The instrument commissioning has been started from March 2011 parallel with the final stage of the construction. Here we present design of neutron delivery system of PLANET and first results of beam characterization.



The simulation results of incident neutron fluxes on the sample position.

Keywords: neutron diffraction, supermirror, high pressure and high temperature