Radiation Shields of Special Environment Neutron Powder Diffractometer SPICA at BL09 of J-PARC

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A new neutron powder diffractometer, SPICA, at the ninth beamline (BL09) is being constructed for the study of materials under special environments, such as battery research at J-PARC. Its neutron flight path from the moderator to sample position is 52 m where is outside of the main hall of the Materials and Life Science Facility (MLF). Its radiation shields are composed of long neutron beam-line shields and large main shields for the neutron spectrometer. Shielding design was made with the Monte Carlo transport code system, PHITS. The initial design was made for a conventional shield configuration of iron, polyethylene and B_4C resin to satisfy the shield design criterion on radiation dose rates around both the neutron beam-line and the spectrometer, and skyshine dose rates at the site boundary as well as to lower neutron background in the neutron spectrometer room. After that, we have selected new neutron shield concrete [1], using colemanite and peridotite as an aggregate and sand as a shielding material. The alternating design was made to give the same order radiation levels as those of the initial design. As a result, major shields became a very simple configuration of only the neutron shield concrete, except for the local saddle shaped iron shields, the shields of ordinary concrete under neutron beam line and the beam-dump shields composed of iron, @Eponite and neutron shield concrete. Overall shield thickness saving was also attained such as 5cm by removing B_4C resin for main shields of the spectrometer and 10cm against 5 cm B_4C resin and 60 cm ordinary concrete of Hatch door.

On 11 March, the external building for the neutron spectrometer has been slightly sunk by the violent earthquake and the alternating design results were kept by adjusting shield's heights from the external building floor. Fabrication of the shields has been started on May by Hazama Corporation and construction of the main shields of the neutron spectrometer was started on August, aiming at the first beam within 2011.

Reference

[1] K. Okuno, M. Kawai, and H. Yamada, Nuclear Technology **168**, 545-552 (2009).