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The upgrade plan and progress of China Spallation Neutron Source Target Station

The target station converts high energy (1.6GeV,62.5μA) protons into lower-energy (< 1 eV), short-pulsed neutron beams optimized for the neutron scattering instruments. The interaction between the pulsed high-energy proton beam with the light water-cooling tungsten target produces the fast neutrons through the spallation reaction. Then the fast neutron will be moderated into short the cold, thermal and epithermal neutrons by the decoupled and poisoned hydrogen moderator, the coupled hydrogen moderator and the ambient decoupled water moderator. These moderators provide neutron pulses with different energy spectra to satisfy the requirements from various neutron instruments. The CSNS target station uses the flat tungsten target plates and the single layer container to reduce the distance between the tungsten target and the moderators. This compact mode makes the CSNS target station has very high neutron efficiency. When CSNS upgrades to 500KW during its Phase II, the target station also use the fixed solid target and keep the target-moderator compact mode in order to keep the high neutron efficiency of the target station. We will replace the light water to heavy water to cool the target and the beryllium reflector to increase the neutron intensity for the moderators. The key import thing is to ensure of the safety of the center components of our target station. We consider the different handling methods to cope with the different risk levels based on the thermal hydraulic simulation results. We also have develop the Post Irradiation Examination(PIE) since PIE is very important to minimize the risk.

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