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Operational Experiences of J-PARC cryogenic hydrogen system for a spallation neutron source

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At the J-PARC, the high-energy MeV-order neutrons, which are produced via a spallation reaction between 3-GeV protons and the mercury nucleus, are moderated to cold neutrons with MeV-order energy by passing them through a supercritical hydrogen moderator (1.5 MPa and around 20 K). The cryogenic hydrogen system, which provides it to three hydrogen moderators, has been completed in April 2008. We have encountered several troubles such as unstable operation of helium refrigerator due to some impurities, a leakage through a welded bellows of an accumulator, hydrogen pump impeller damage and so on until now. Furthermore, the Great East Japan Earthquake was occurred during the cryogenic hydrogen system operation in March 2011. The proton beam power has increased to 400 kW and stable long-lasting operation has been achieved for three months. A 530-kW proton beam operation has been completed on trial for a limited time of 60 s. In this paper, we describe the operation characteristics and experiences of the J-PARC cryogenic hydrogen system.

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