

Status and Prospect of Production Target at J-PARC Hadron Experimental Facility

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At the J-PARC Hadron Experimental Facility, a wide variety of nuclear and particle physics experiments have been carried out using secondary particles such as kaons and pions, which are produced in a dense metal target irradiated by a slowly extracted 30-GeV proton beam. The current target is a fixed type made of gold, which is bonded to a water-cooled copper block. The target can accept up to a 115-kW proton beam for a 4.24-s repetition cycle. The target has been in service since 2019 and has achieved 82-kW stable operation in 2024.

To increase an acceptable beam power up to 150 kW, development of a new production target is in progress. The new target is planned to be a rotating disk that distributes the heat load and radiation damage in the circumferential direction. In this plan, direct cooling using helium gas blowing onto the disk is adopted. The disk is 346 mm in diameter and 66 mm in thickness with a fin shape to increase the amount of heat transfer. The material of the disk, which should have properties of high density and high thermal conductivity, is under consideration. The candidate materials are gold, platinum, or tungsten. To study the engineering feasibility, full-size manufacturing tests are underway.

To support disk rotation, a helium-gas-lubricated bearing, which has no life limitation and is capable of rotating at a higher speed than the widely used radiation-resistant ball bearings, was examined. Rotation tests were conducted under stable operating conditions and in severe situations such as earthquakes or power shutdowns. A long-term continuous test is currently in preparation to comprehensively evaluate the rotation systems.

This report presents the operational status of the current target and prospect of the new target development.