

Optics Tuning in the 3-50 Beam Transport Line for Beam Collimation

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The J-PARC 3-50BT line is the beam transport line from 3-GeV rapid-cycling synchrotron (RCS) to 50-GeV main ring (MR). The RCS is the high-intensity proton accelerator, where designed beam power is 1 MW, and has the complex source of space charge effect, etc. Therefore, the uncontrolled emittance growth and beam halo increase nonlinearly with the increasing the beam power. Additionally, the physical aperture of MR with 81π mm mrad is smaller than that of RCS with 486π mm mrad. Therefore, the 3-50BT line has the collimators in order to remove the tail or halo of the extracted beam from the RCS. The designed collimator aperture is 54π mm mrad.

The designed optics parameters in the 3-50BT is shown Fig. 1. It is required to measure and optimize the optics parameters in the collimator area for taking full advantage of the beam collimation. Especially, it is very important to make the dispersion functions free in the collimator area and optimize the beta function. This paper will introduce the method of optics measurement and report the result of the measurement and optimization based on the simulation.

