The Evaluation of the Suppressed Residual Dose caused by the Large Angle Foil Scattering Beam Loss for the High Intensity Beam Operation in the J-PARC RCS

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In the J-PARC RCS, the significant losses were observed at the H0 dump branch vacuum chamber and the Beam Position Monitor which was put at the downstream of the H0 dump branch vacuum chamber. These losses were caused by the large angle scattering of the injection and the circulating beam at the charge exchange foil. To mitigate these losses and realize high power operation, a new collimation system (H0 Collimator) was substituted for the H0 branch vacuum chamber and was installed in October 2011. The picture of the H0 Collimator is shown in Fig. 1. Two absorbers included in the downstream of the vacuum chamber are arranged at left and right side in order to remove horizontal scattered particles. The absorbers can be adjusted its position and angle along the change of the operation parameters by the expansion rods.

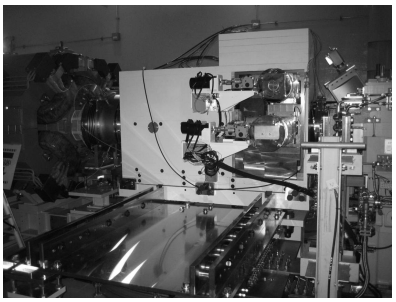

Fig. 1 The photograph of the H0 Collimator
The left side is upstream of the beam line. The vacuum chamber is covered with the radiation shield.

The beam based regulation method was developed using the simulation and the sufficient mitigation of the loss was achieved at 181 MeV injection energy [1]. Since the injection energy was upgraded to 400 MeV in this year, this system was regulated again and the suppression of the loss was confirmed at 300 kW beam power. Since the present target power of the RCS is 1 MW, the estimation of the residual dose is desired. Therefore, the evaluation of the suppressed residual dose is performed based on the realistic simulation. We will present the comparison of the residual dose between the measurements and the simulations and discuss the view of the multi-MW operation in terms of the large angle foil scattering beam loss.

References

[1] S. Kato, K. Yamamoto, M. Yoshimoto, H. Harada, and M. Kinsho, Phys. Rev. ST Accel. Beams **16**, 071003 (2013).