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Beam loss studies for the P42 beam line at the CERN SPS north area

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The P42 beamline transports 400 GeV protons from the CERN SPS between the T4 and T10 targets. A secondary particle beam is produced at the T10 target and transported along the K12 beamline to the experimental cavern ECN3, presently housing the NA62 experiment. In the context of the Physics Beyond Colliders (PBC) study, an increase of the beam intensity in P42 has been considered to provide protons to a future high-intensity fixed-target experiment in ECN3. For both its present usage and especially for the intensity upgrade, it is important to reduce beam losses to a minimum to decrease environmental radiation levels and protect equipment. In this study, simulations of P42 with the Monte Carlo software BDSIM, are used to demonstrate that beam losses in P42 are primarily driven by particle-matter interactions in material intercepted by the beam. The distribution of the simulated losses is compared to doses measured along the beamline in radioprotection surveys and beam loss monitors. Future mitigation strategies to reduce beam losses are then discussed and evaluated.

Footnotes

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