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Machine learning approach to MDI optimization for 3 TeV c.o.m. Muon Collider

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The Muon Collider is a proposed future accelerator for very high energy muon collision. Since muons are heavier than electrons, the synchrotron radiation is negligible at this high energy, allowing to build a compact machine able to deliver Multi-TeV c.o.m. energy collisions, enabling precision measurements of the Standard Model quantities and search for new physics. A challenge of a muon beam is the Beam-Induced Background (BIB), a flux of particles in the detector generated by secondary interaction of muon decay products with the accelerator components.
To deliver the required physics performance, the Machine Detector Interface design needs to include a shielding for the BIB. The proposed solution consists of cone-shaped tungsten shields inside the detector area. The nozzles reduce the BIB to a manageable level at the cost of reducing the detector acceptance. A careful optimization of the geometry is necessary to further mitigate the BIB and improving the detector acceptance to maximize the physics potential. This contribution aims at discussing the optimization achieved with machine learning algorithms in combination with FLUKA simulations for a 3 TeV c.o.m. Muon Collider.

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