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Muon Shield optimization for SHiP experiment as HTC MC task

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SHiP (Search for Hidden Particles) is a new general-purpose experiment at the SPS ring at CERN, aimed at searching for hidden particles proposed by numerous theories beyond the Standard
Model. An important element of the experiment is muon shield. On one hand, it must provide good background suppression, and on the other hand, it should not be too heavy. The Muon shield configurations was obtained using Bayesian optimization with several types of surrogates. This allowed for effective global multi-dimensional optimization in a 42-dimensional space and reduced the muon flux by 2.5 times while maintaining the original mass of the shield. A large number of MC Geant simulation tasks were performed on the Yandex Cloud Kubernetis cluster. The paper presents our ideas and approaches that we used to reduce the amount of computation while keeping the accuracy at an acceptable level.

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