

A C++ Cherenkov photons simulation in CORSIKA 8

Tuesday, 18 May 2021 10:50 (13 minutes)

CORSIKA is a standard software for simulations of air showers induced by cosmic rays. It has been developed in Fortran 77 continuously over the last thirty years. So it becomes very difficult to add new physics features to CORSIKA 7. CORSIKA 8 aims to be the future of the CORSIKA project. It is a framework in C++17 which uses modern concepts in object oriented programming for an efficient modularity and flexibility. The CORSIKA 8 project aims to obtain high performance by exploiting techniques such as vectorization, gpu/cpu parallelization, extended use of static polymorphism and the most precise physical models available.

In this paper we focus on the Cherenkov photon propagation module of CORSIKA, which is of particular interest for gamma-ray experiments, like the Cherenkov Telescope Array. First, we present the optimizations that we have applied to the Cherenkov module thanks to the results of detailed profiling using performance counters.

Then, we report our preliminary work to develop the Cherenkov Module in the CORSIKA 8 framework. Finally, we will demonstrate the first performance comparison with the current CORSIKA software as well as the validation of physics results.

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Session Classification: Algorithms

Track Classification: Offline Computing