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Overview of the CORSIKA 8 astroparticle simulation framework

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The simulation of particle cascades is an essential foundation for the analysis chains of many astroparticle physics experiments, irrespective of whether they investigate primarily charged cosmic rays, very high-energy photons or neutrinos, or even dark matter. The most widely used software for simulating such particle showers is CORSIKA, originally developed as COsmic Ray Simulation for KASCADE. For more than 20 years, CORSIKA has been the de-facto standard for air-shower simulations.
CORSIKA 8 is the next stage in the evolution of air-shower simulations. It is designed as a modular and modern C++ framework, that, building on the strong foundation of its predecessor, provides the flexibility that is needed for the next-generation of astroparticle physics experiments.
The development of CORSIKA 8 has reached the state that the code is "physics-complete". In addition to the standard hadronic interaction models for air showers it also includes the "next generation models"EPOS-LHC-R and QGSJetIII as well as the well-known high-energy physics model Pythia 8.
Particular highlights beyond "classic"air showers are the support for multiple interaction media, including cross-media particle showers crossing from air into dense media and the calculation of radio emission including complex signal propagation effects.
In this presentation, we will discuss the design principles, give an overview of the models, assumptions and algorithms that are employed as well as show case the current capabilities of CORSIKA 8. A brief example of how to obtain the software, run an air shower simulation and inspect the outcome will also be given.

Collaboration(s)

CORSIKA 8

Author: RIEHN, Felix (Technische Universitaet Dortmund (DE))

Presenter: RIEHN, Felix (Technische Universitaet Dortmund (DE))

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