Contribution ID: **448** Type: **presentation**

# Performance optimization of the air shower simulation code for the Cherenkov Telescope Array

*Tuesday, July 10, 2018 3:30 PM (15 minutes)*

The Cherenkov Telescope Array (CTA), currently under construction, is the next- generation instrument in the field of very high energy gamma-ray astronomy. The first data are expected by the end of 2018, while the scientific operations will start in 2022 for a duration of about 30 years. In order to characterise the instrument response to the Cherenkov light emitted by atmospheric cosmic ray showers, detailed Monte Carlo simulations will be regularly performed in parallel to CTA operations. The estimated CPU time associated to these simulations is very high, of the order of 200 millions HS06 hours per year. Reducing the CPU time devoted to simulations would allow either to reduce infrastructure cost or to better cover the large phase space.
In these proceedings, we focus on the main computing step (70% of the whole CPU time) implemented in the corsika program, and specifically on the module responsible for the propagation of Cherenkov photons in the atmosphere. We present our preliminary studies about different options of code optimization, with a particular focus on vectorization facilities (SIMD instructions) together with computing precision tuning. Our proposals take care, as automatically as possible, of the hardware portability constraints introduced by the grid computing environment that hosts these simulations. Performance evaluation in terms of running-time and accuracy is provided.

**Primary authors:** ARRABITO, Luisa; BERNLOEHR, Konrad (Max-Planck-Institut fur Kernphysik, P.O. Box 103980, D-69029 Heidelberg, Germany); BREGEON, Johan (Laboratoire Univers et Particules, Université de Montpellier Place Eugène Bataillon - CC 72, CNRS/IN2P3, F-34095 Montpellier, France ); MAIER, Gernot; LANGLOIS, Philippe (DALI, Université de Perpignan Via Domitia 66860 Perpignan Cedex 9 France, LIRMM, CNRS : UMR 5506 - Université Montpellier 34095 Montpellier Cedex 5 France); PARELLO, David (DALI, Université de Perpignan Via Domitia 66860 Perpignan Cedex 9 France, LIRMM, CNRS : UMR 5506 - Université Montpellier 34095 Montpellier Cedex 5 France); REVY, Guillaume (DALI, Université de Perpignan Via Domitia 66860 Perpignan Cedex 9 France, LIRMM, CNRS : UMR 5506 - Université Montpellier 34095 Montpellier Cedex 5 France)

**Presenter:** BREGEON, Johan (Laboratoire Univers et Particules, Université de Montpellier Place Eugène Bataillon - CC 72, CNRS/IN2P3, F-34095 Montpellier, France )

**Session Classification:** T5 - Software development

**Track Classification:** Track 5 – Software development