

Study of the energy spectrum and mass composition of ultra-high energy cosmic rays using SimProp simulation code

On **2nd May** (Thursday) at 15:30h in Pleyades room we will have **Patrik Čechvala** (Faculty of Mathematics, Physics and Informatics, Comenius University), presenting his work:

Abstract:

It is already more than 100 years from the first measurements that proved we are permanently „bombarded“ by high energy particles from space. These are mainly protons and nuclei of different elements which can reach energies exceeding 100 Eev (1 Eev = 10^{18} eV). Events of such high energies are denoted as ultra-high energy cosmic rays (UHECRs). The sources of the particles with the highest energies remain still an open problem.

During our presentation, we would like to present the main results of our master thesis during which we studied the energy spectrum and mass composition of UHECRs. For this purpose, we used a simulation code *SimProp v2r4* which simulates the propagation of these high energy particles through the Universe to the Earth. We will briefly discuss different propagation processes which influence these particles. Considering different scenarios of energy constraints, mass of injected nuclei and distances of sources, we derived behavior of mass composition, concretely of $\langle \ln A \rangle$, with energy for different simulations. Afterwards, we compared our simulations with the currently observed data from Pierre Auger Observatory, located in Argentina, and tried to deduce constraints on characteristics (distance, spectral index, rigidity and mass composition) of possible sources.