

Nuclear physics meets the sources of the ultra-high energy cosmic rays

Thursday, September 15, 2016 6:05 PM (15 minutes)

Ultra high energy cosmic rays (UHECRs) are expected to be accelerated in astrophysical sources and to travel through extragalactic space before hitting the Earth atmosphere. They interact both with the environment in the source and with the intergalactic photon fields they encounter, causing different processes at various scales depending on the photon energy in the nucleus rest frame.

Nuclear cross section data are compared with existing theoretical models, and a complete overview of the existing gamma-nuclei measurements is offered. The composition of cosmic rays emitted from candidate sources is also discussed against various assumptions for nuclear interactions and for radiation densities in the source.

The modeling of cross sections for simulating the interaction processes in astrophysical sources and in extragalactic photon fields has an impact in the predictions for observables as the energy spectrum and the composition at Earth, affecting the interpretation of UHECR measurements. The need of new inputs from nuclear physics in order to reduce the uncertainties coming from lack of measurements and from different parametrizations in existing codes is pointed out.

Summary

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Session Classification: Cosmic rays

Track Classification: Cosmic rays