Contribution ID: **742** Type: **Talk**

The TAIGA - an advanced hybrid detector complex for astroparticle physics, cosmic ray physics and gamma-ray astronomy

Tuesday 20 July 2021 12:36 (12 minutes)

The physical motivations and performance of the TAIGA (Tunka Advanced Instrument for cosmic ray physics and Gamma Astronomy) project are presented. The TAIGA observatory addresses ground-based gamma-ray astronomy at energies from a few TeV to several PeV, as well as cosmic ray physics from 100 TeV to several EeV and astroparticle physics. The pilot TAIGA complex locates in the Tunka valley, ~50 km West from the southern tip of the lake Baikal. It includes integrating air Cherenkov TAIGA-HiSCORE array with 120 wide-angle optical stations distributed over on area 1 square kilometer about and three the 4-m class Imaging Atmospheric Cherenkov Telescopes of the TAIGA-IACT array. The latter array has a shape of triangle with side lengths of about 300m, 400m and 500m. The expected integral sensitivity of the 1 km^2 TAIGA detector will be about 2,5 × 10^{-13} TeV cm^{-2} sec^{-1} for detection of E ≥ 100 TeV gamma-rays in 300 hours of source observations. The combination of the wide angle Cherenkov array and IACTs could offer a cost effective-way to build a really large (up to 10 km^2) array for very high energy gamma-ray astronomy. The reconstruction of a given EAS energy, incoming direction and the core position, based on the TAIGA-HiSCORE data, allows one to increase the distance between the relatively expensive IACTs up to 600-800 m. These, together with the surface and underground electron/Muon detectors will be used for selection of gamma-ray induced EAS. Present status of the project, together with the current array description and the first experimental results and plans for the future will be reported.

Keywords

TAIGA, hybrid Cherenkov array, high energy gamma-ray astronomy, cosmic rays physics, EAS parameter reconstruction, gamma/hadron EAS separation

Collaboration

TAIGA

other Collaboration

Subcategory

Experimental Methods & Instrumentation

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Session Classification: Discussion

Track Classification: Scientific Field: GAI | Gamma Ray Indirect