

Executive summary

Title:

TAIGA-Observatory: First 5 years of operation of the HiSCORE Air-Cerenkov Array

Summary:

TAIGA-HiSCORE is a wide-aperture Air-Cherenkov array, and is a major component of the TAIGA Observatory (Tunka Advanced Instrument for cosmic ray physics and Gamma Astronomy), located in the Tunka valley, 50 km from Lake Baikal, Russia.

A main science target of TAIGA is gamma ray astronomy above ten's of TeV, in particular the search for sources of few 100 TeV gamma rays (candidate "PeVatrons"), the possible sites of Galactic cosmic ray acceleration.

By end 2021., TAIGA will contain 120 HiSCORE stations distributed over a 1 km² area, and 3 operating IACTs.

This report presents the performance of HiSCORE during the first 5 years of operation, in various configurations, from 28 to 89 stations.

A key for high sensitivity to gamma point sources is precision timing of the whole array down to sub-nsec level, required to be stable for the observation period.

We apply different methods to reach this goal.

The pointing resolution of the array for extended airshowers is obtained as 0.1° for highest energies, and is experimentally verified, based on independent approaches.

We present results of a 5-year-search for gamma-like point sources with HiSCORE in stand-alone operation.

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