

50th IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) –  
The Next Steps (A4)  
SETI 1: SETI Science and Technology (1)

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SEARCH FOR NANOSECOND OPTICAL TRANSIENTS WITH TAIGA-HISCORE ARRAY FOR THE  
SETI PROBLEM.

**Abstract**

The open air, wide-angle integrating Cerenkov array TAIGA-HiSCORE (FOV  $\sim 0.6$  ster) is part of the TAIGA installation for high-energy gamma-ray astronomy and cosmic ray physics. Today this array includes nearly 100 optical detector stations distributed over an area of  $\sim 1$  km<sup>2</sup> in Tunka Valley near lake Baikal, Siberia, Russia. Due to high accuracy and stability of time synchronization of the optical stations ( $\sim 1$  ns), the arrival direction of EAS from the primary particle can be reconstructed to a precision of 0.1. This array is used to search for nanosecond astrophysical transients in the optical range. The sensitivity of the HiSCORE telescope is shown to allow to register signals of distant (up to 1000 light-years and even more) nanosecond lasers having rather moderate energies and sizes, therefore, such observations are of interest for the SETI problem. This report discusses the method of searching for astrophysical transients using the HiSCORE array and demonstrates its performance on the example of detecting laser pulses from an Earth-bound satellite mission. Search for optical transients in the HiSCORE data of 2018-2019 winter season has been carried out. One candidate for recurrent transient has been detected, but the estimated probability of random chance by fluctuation of background EAS is at least 10%. An upper bound on the event frequency of optical transients with a spectral energy density of more than  $1.5 \times 10^{-3}$  erg/sec/cm<sup>2</sup> and a duration of  $\geq 1$  ns has been found to be 0.05 events/ster/day.