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Elaboration of a model of SPHERE-3 telescope for the studies of the primary cosmic rays in 10^15 — 10^18 eV energy range using reflected from snowed surface and direct Cherenkov light from extensive air showers

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Paper contains the first results of our attempts in the development of a model of SPHERE-3 telescope for the primary cosmic ray studies in 1-1000 PeV energy range with reflected and direct Cherenkov light generated by extensive air showers (EAS).

The aim of the work is to develop an automated method for the design of SPHERE-3 telescope, which, on one hand, will enable it to obtain the best possible estimates of EAS primary parameters and, on the other, will result in a set of rules and recommendations on how to design other detectors of the type.

Handling of samples of Cherenkov light images according to the available processing codes will give estimates of the uncertainties of the primary parameters, which integrally characterize the quality of measurements with a given version of the telescope and the procedures for their processing. As a result, the optimal version of the telescope will be selected and a general approach to the choice of its design and data processing algorithms will be developed.

A preliminary version of the SPHERE-3 optical scheme is shown as a basis for further improvement and development of optimized optical schemes that will be combined with various schemes of sensitive mosaics, electronics, trigger algorithm and off-line processing algorithms.

The description of the created database of artificial events of EAS with the generation of Cherenkov light for protons, nitrogen and iron nuclei with energies in the range of 1-100 PeV and zenith angles of 5-25 degrees according to two models of interaction and three models of the atmosphere is given.

A scheme for calculating artificial images of reflected and direct EAS Cherenkov light on the mosaic of optical sensors of the telescope is presented.

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