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Investigation of the hardware functions of the URAGAN muon hodoscope using mathematical modeling

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The results of the study of the hardware function (HF) of the muon hodoscope (MH) URAGAN (MEPhI), based on mathematical modeling, are presented. A multi-parameter HF model has been formed. A hypothesis is accepted about the model function of the input distribution of the intensities of muon fluxes (MF). A functional is introduced that determines the difference between the matrix data of the URAGAN MH and the product of the AF model and the model function of the input distribution of the MF. A normalized AF and normalized muon fluxes intensities distribution functions (MFIDF) are introduced. To reduce the errors in the estimation of normalized HF and normalized variations of the MFIDF, a two-dimensional filtering algorithm based on approximating local piecewise-linear functions and a two-dimensional threshold filtering algorithm have been developed. Formulas for HF and MFIDF estimation are given. AF efficiency was estimated using mathematical modeling. Mathematical models of AF and time series of simulated input and output MFIDFs have been developed. Estimates of simulated model Forbush decreases in MF intensities are given. Modeling has shown the effectiveness of the developed approach to assessing HF. The results of testing the developed approach for assessing HF on the experimental data of the URAGAN MG are discussed, which have confirmed its effectiveness.

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