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On the optimisation of the construction of a ground-based neutron monitor for galactic cosmic ray monitoring and space weather applications

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The neutron monitor (NM) remains the best available instrument for monitoring the secondary nucleonic component of the galactic cosmic rays for more than 80 years. Today, NMs have been given another role related to satellite-based technologies for monitoring and forecasting of space weather events. At many sites around the world, the old neutron monitors were refurbished and synchronised into a network known as the neutron monitor data base (NMDB). During the years, little has been changed in the construction of the actual neutron monitor. In this work we carried out a detailed study of the role of the various components (reflector, producer and moderator) on the output signal of a NM64 neutron monitor. The study was performed using the fully integrated particle physics Monte Carlo simulation package FLUKA utilising several different types of incident particles - from monoenergetic neutrons and protons to a complex galactic cosmic rays source tailored for the location of the neutron monitor in Dourbes (50.1°N, 4.6°E). The influence of the size and shape of the different parts on the energy spectrum of the neutrons in the detector tube was analysed in order to optimise the construction and to investigate if it would be possible to extract more information about the incident radiation. The results obtained here have been applied to the design of the second neutron monitor which is under construction in Dourbes.

Collaboration

– not specified –

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