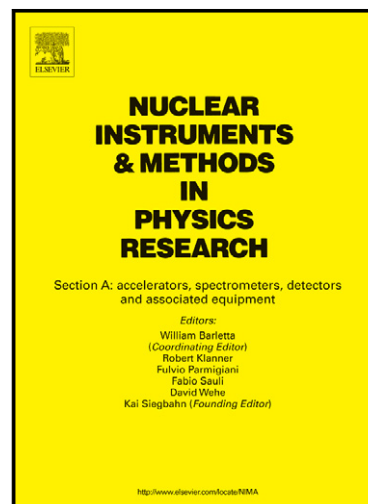


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# Point spread function due to multiple scattering of light in the atmosphere

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## Abstract

The atmospheric scattering of light has a significant influence on results of optical observations of air showers. It causes attenuation of direct light from the shower, but also contributes a delayed signal to the observed light. The scattering of light therefore should be accounted for, both in simulations of air shower detection and reconstruction of observed events. In this work a Monte Carlo simulation of multiple scattering of light has been used to determine the contribution of the scattered light in observations of a point source of light. Results of the simulations and a parameterization of the angular distribution of the scattered light contribution to the observed signal (the point spread function) are presented.

*Keywords:* Ultra-high energy cosmic rays, extensive air shower, multiple scattering, point spread function

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## 1. Introduction

The observation of light produced by an extensive air shower is one of the established methods of detection of ultra-high energy cosmic rays. As the cascade of energetic charged particles of an air shower, initiated by a highly energetic primary cosmic ray particle, moves through the air, it produces a large number of fluorescence and Cherenkov photons [1, 2, 3]. The intensity of the fluorescence light [4, 5] is proportional to the size of the air shower at any point of its trajectory, therefore observations of light along the shower

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