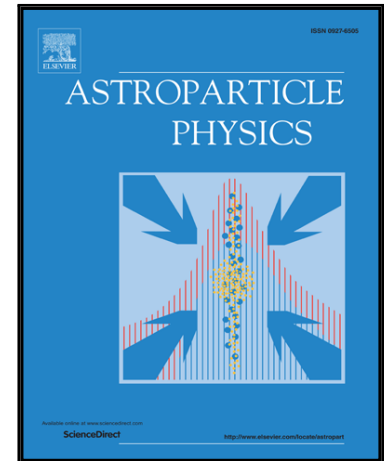


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# Improving the discrimination capability of heavy nuclei based on direct Cherenkov light

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## Abstract

The accurate measurement of individual species of cosmic rays (CRs) is very important to solve the problem of their origin. CR spectra with energies  $>100$  *TeV* can be evaluated only by detecting extensive air showers on the ground. Thus, identifying the primary components of CRs depends highly on hadronic interaction models. Direct Cherenkov light (DC-light) emitted by the primary components of CRs prior to first interaction in the atmosphere can be used to identify such primary components. The intensity of DC-light is proportional to the square of the charge of CRs primary components and independent of the hadronic interaction model. In this study, we investigate the characteristics of DC-light and its ability to discriminate heavy nuclei (iron and MgAlSi) from CR components by using the Wide Field-of-view Cherenkov Telescope Array of the Large High-Altitude Air-Shower Observatory (LHAASO-WFCTA) in the energy range between 50 *TeV* and 500 *TeV*. Results suggest that DC-light can be used in the LHAASO to improve the reconstruction accuracy of CR heavy components.

**Keywords:** cosmic rays, DC-light, EAS-light, composition discrimination, hadronic interaction model, LHAASO-WFCTA

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## 1. Introduction

The origin of cosmic rays (CRs) has been extensively explored since their discovery more than 100 years ago. However, the precise origin of CRs re-

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