Probing the CR positron/electron ratio at few hundred GeV through Moon shadow observation with the MAGIC telescopes

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Abstract: The antimatter components measured in the Cosmic Ray (CR) flux are thought as secondary particles induced by the propagation of galactic CRs within the galaxy. Recent results from the PAMELA experiment show an unexpected increase of the positron electron ratio above 10 GeV. There could be different interpretations to explain that result, the most discussed ones being the signature of nearby compact astrophysical source(s) or of dark matter annihilation/decay. Probing the positron-fraction rise above 100 GeV would help to disentangle among different scenarios. Imaging Atmospheric Cherenkov Telescopes (IACT) can extract the cosmic lepton signal from the hadronic CR background between a few hundred GeV and a few TeV and reconstruct energy and incident direction with a very good resolution. In addition, by using the natural spectrometer formed by the Moon and the geomagnetic field, it is possible to measure the positron/electron ratio at the TeV regime through the observation of the CR Moon shadow. Despite the technique is particularly challenging because of the high background light induced by the Moon and the treatment of data, the MAGIC collaboration has performed for the first time such observations in 2010 and 2011. Here we will present the first results of this campaign.

Keywords: Cosmic ray, electron, positron, Moon shadow, MAGIC

1 Introduction

The idea of probing the Cosmic Ray (CR) positron/electron ratio by the observation of the Moon shadow with Imaging Atmospheric Cherenkov Telescopes (IACT) has been proposed at the last ICRC [1]. Since, the MAGIC collaboration has developed this technique and collected several hours of data in stereoscopic mode. The performance of MAGIC telescopes during these observations a few degrees from the Moon has also been studied thanks to Monte Carlo simulations and observations of the Crab Nebula in the same condition. The first results of the Moon shadow observation with MAGIC will be presented at the conference.

References

[1] P. Colin et al., Proc. of the 31^{st} ICRC, Łódź (2009), arXiv:0907.1026