

Anisotropy of Positron and Electron Fluxes Measured with the Alpha Magnetic Spectrometer on the ISS Miguel Molero – IAC (Tenerife) on behalf of the AMS-02 collaboration

Motivation Positron Flux



• The **positron flux** shows an excess above 25 GeV not consistent with only secondary production

The excess is consistent with a source term with an energy cutoff ~800 GeV • There are two main proposed explanations for the source term: dark matter and astrophysical sources

AMS-02 Detector Layout



1000 10 100 AMS 10 years preliminary data Refer to the upcoming AMS publication

Electron Flux



AMS 10 years preliminary data Refer to the upcoming AMS publication

- The electron flux shows an excess above 42 GeV not consistent with low energy trends
- The flux does not have an energy cutoff below 1.9 TeV
- The electron spectrum has a contribution from a positron-like source term

In both cases, the existence of **nearby sources** of cosmic rays may induce some degree of anisotropy. Thus, the measurement of the **anisotropy** is a complementary study to characterize the observed spectral features and may help to understand their origin









Selection

400

200



Electrons



and the second s

0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2

Methodology

Coordinate System of Analysis



(EW, NS, FB)





 $\Phi_{max}-\Phi_{min}$

 $\Phi_{\max} + \Phi_{\min}$

 $=\sqrt{
ho_{\rm EW}^2+
ho_{\rm NS}^2+
ho_{\rm FB}^2}$

 $\rho_{\rm NS} = \sqrt{\frac{1}{4\pi}a_{1+0}}$

Forward-Backward $\rho_{\rm FB} = \sqrt{\frac{3}{4\pi}}a_{1+1}$



- Positron dipole components are consistent with **isotropy** for all energy ranges
- Limit to the dipole amplitude at the 95% C.I. of **1.5%** is obtained for energies 16 < E < 500 GeV





• Limit to the dipole amplitude at the 95% C.I. of **0.33%** is obtained for energies 16 < E < 500 GeV



Conclusions

- Measurement of the dipole anisotropy for the first 10 years of data taking in galactic coordinates for positrons and electrons have been performed by the Alpha Magnetic Spectrometer (AMS-02)
- No deviations with respect to isotropy have been found and limits to the dipole amplitude are established. In the lowest energy range, $E_{min} = 16 \text{ GeV}$, the 95% C.I. upper limit is $\delta < 1.50\%$ and $\delta < 0.33\%$ for positrons and electrons respectively
- AMS will continue taking data until the end of the ISS (currently 2030). By that time, AMS measurement will be sensitive to the 1% positron anisotropy level predicted by pulsar models reproducing the positron excess

