

# D/P flux ratio in CR with the AMS-02 experiment

Francesco Dimiccoli\* on behalf of the AMS-02 collaboration

\*TIFPA - Trento Institute for Fundamental Physics and Applications

# Motivation

Deuterons are an unique probe for studying



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the propagation of the CR in the galaxy  $^{3}\text{He} + p \rightarrow D$ 10旨 • **Deuterium** is a secondary particle, produced both in spallation and in **p-p** fusion processes  $\sigma^{prod}$  [mb]  $p + p \rightarrow D$ • It is the most abundant secondary isotopic □ Griffiths 69 component in CR Meyer 72  $10^{-1}$ Blinov 86, Glagolev 93 • The **p-p** fusion production is dominant at low energies (<GeV/n)  $10^{-2}$  $10^{-2}$ 10-1  $E_{k/n}$  [GeV/n] D/p and D/He compared to B/C: e+Different energy ranges <sup>4</sup>He Different propagation distances F. Dimiccoli -- TIFPA р CRIS - Portopalo 2018



# D/p available measurements



### AMS and light isotope measurements (1)



- AMS-02 is a precision multi-purpose detector installed on ISS since May 2011
- It is composed by different sub-detectors for the redundant ID of the elements in CR
- The Mass is identified from the concurrent measurement of Rigidity, Velocity and Charge



### AMS and light isotope measurements (2)

0.95





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#### Raw Mass Distribution

- Deuteron peaks are visible in each range
- **Proton** tails







#### Selections on data



**Step 1:** Definition of geometry



• L1 + Inner Tracker

**Step 2:** Definition Z=1 sample



• Z = 1 at different levels

Step 3: Good measurement of  $\beta$ 



- Quality of Time of Flight
- Multivariate analysis for RICH

## Step 3: RICH multivariate classifier (1)

**Z=1:** Challenging velocity measurement by RICH



## Step 3: RICH multivariate classifier (1)

**Z=1:** Challenging velocity measurement by RICH



β NaF: 0.8 - 0.975

## Step 3: RICH multivariate classifier (2)



## Template Fit for signal extraction (1)

- **Strategy:** Fit with MC Templates
- **Elasticity:** Tuning of the **velocity response function**



## Template Fit for signal extraction (2)



## Corrections for the counts ratio (2)



D -> P Fragmentation



**From MC**: Estimation of D **lost by fragmentation at top of instrument** 



#### He -> (d,P,T) Fragmentation



#### **Control sample:**

- Z = 2 at L1
- **Z** = 1 in Inner Tracker

#### D/p Preliminary



Preliminary data, please refer to upcoming AMS PRL publication



#### Conclusions



- A preliminary measurement of D/p ratio in cosmic rays extending from 0.2 to 10 GeV/n has been presented.
- The measurement extends in an unexplored energy range
- The systematic uncertainty is dominant, further studies will reduce it
- Time dependent (monthly) study is in progress