



# The AMS-02 experiment on the International Space Station

Manuela Vecchi<sup>1</sup>, Mercedes Paniccia<sup>2</sup>

<sup>1</sup>Kapteyn Astronomical Institute, the University of Groningen, the Netherlands

<sup>2</sup>University of Geneva, Switzerland

On behalf of the AMS-02 collaboration

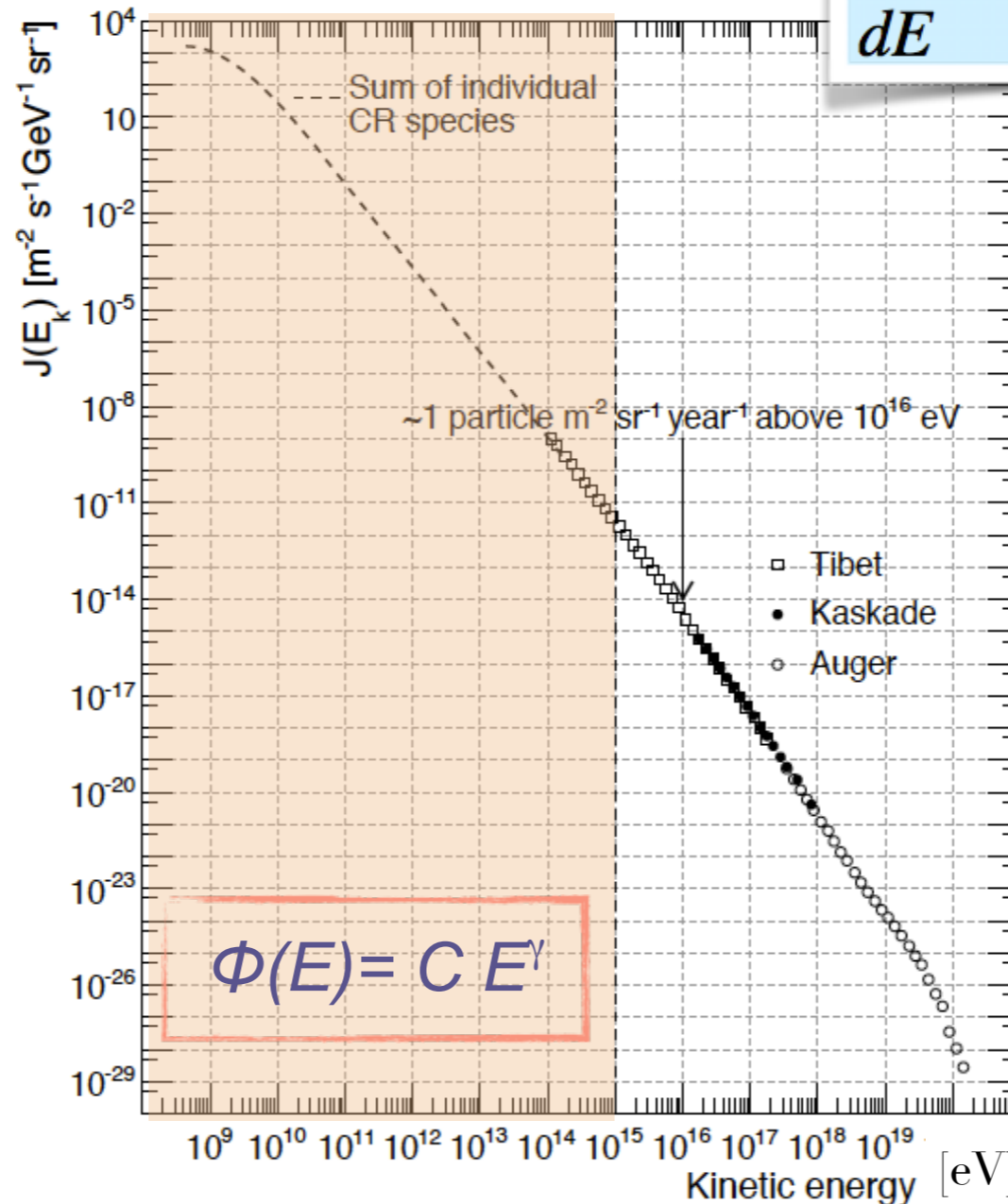
# Cosmic ray flux

*all particle flux*

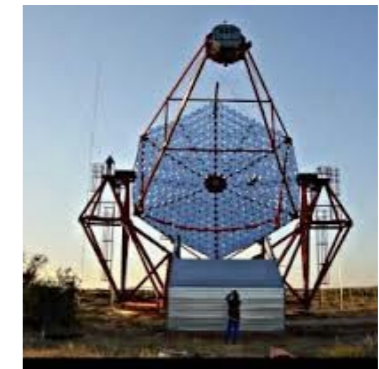
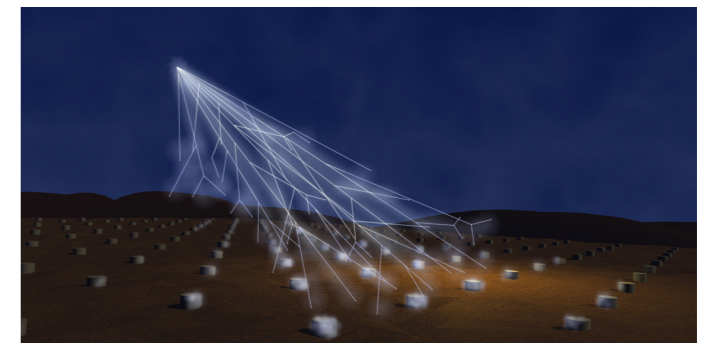
Direct measurements



$$\frac{dN}{dE} = [m^{-2}sr^{-1}s^{-1}GeV^{-1}]$$



Indirect measurements



at first sight ... a feature-less power law

L. Baldini, arXiv: 1407.7631



# The Alpha Magnetic Spectrometer



AMS-02 time on ISS since May 19th, 5:46 a.m. EDT:

**4798** DAYS **4** HOURS **27** MINUTES **18** SECONDS

AMS has collected

**237,829,494,772**

cosmic ray events

Last update: July 7, 2024, 1:32 PM



# The Alpha Magnetic Spectrometer

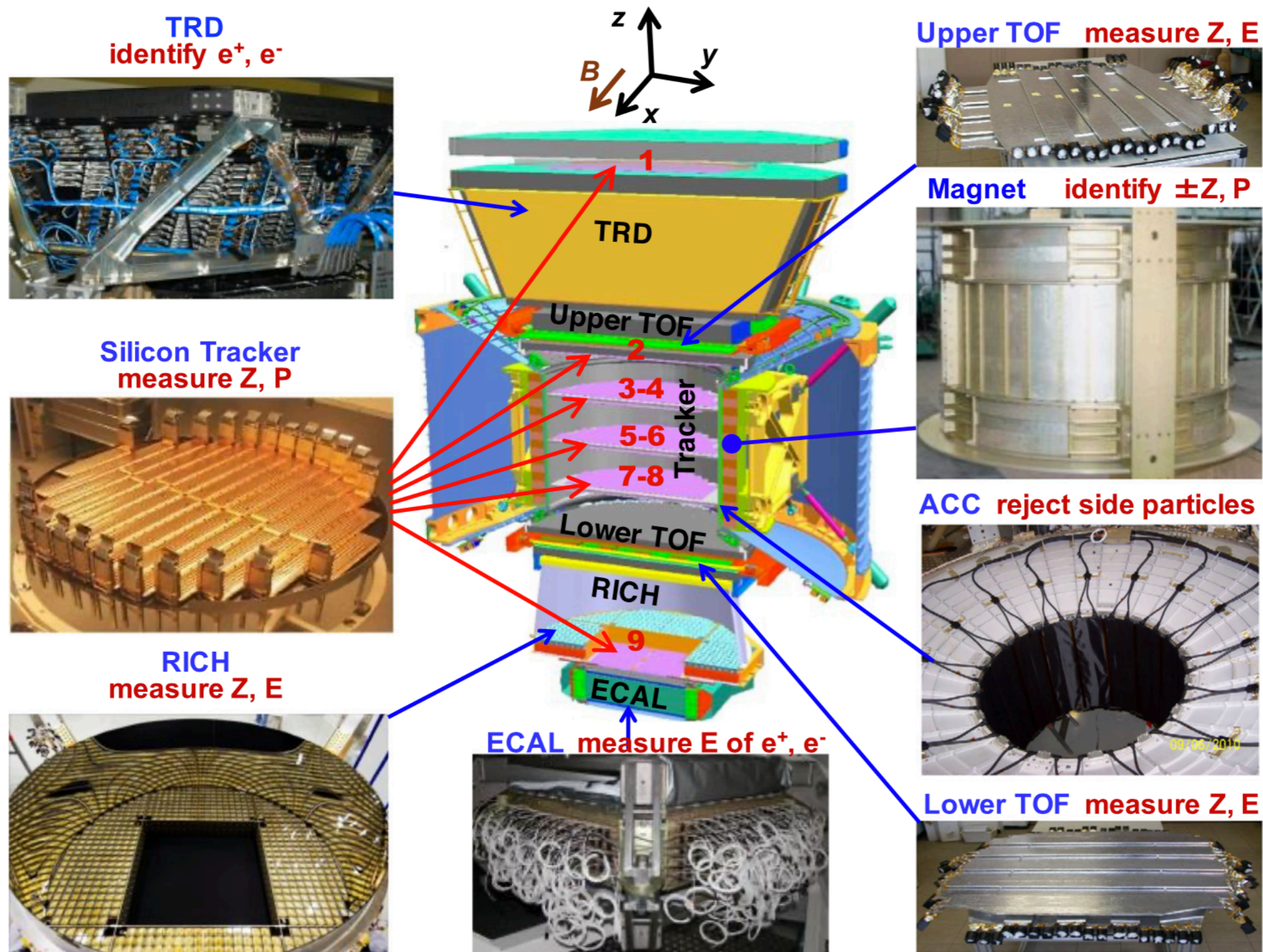
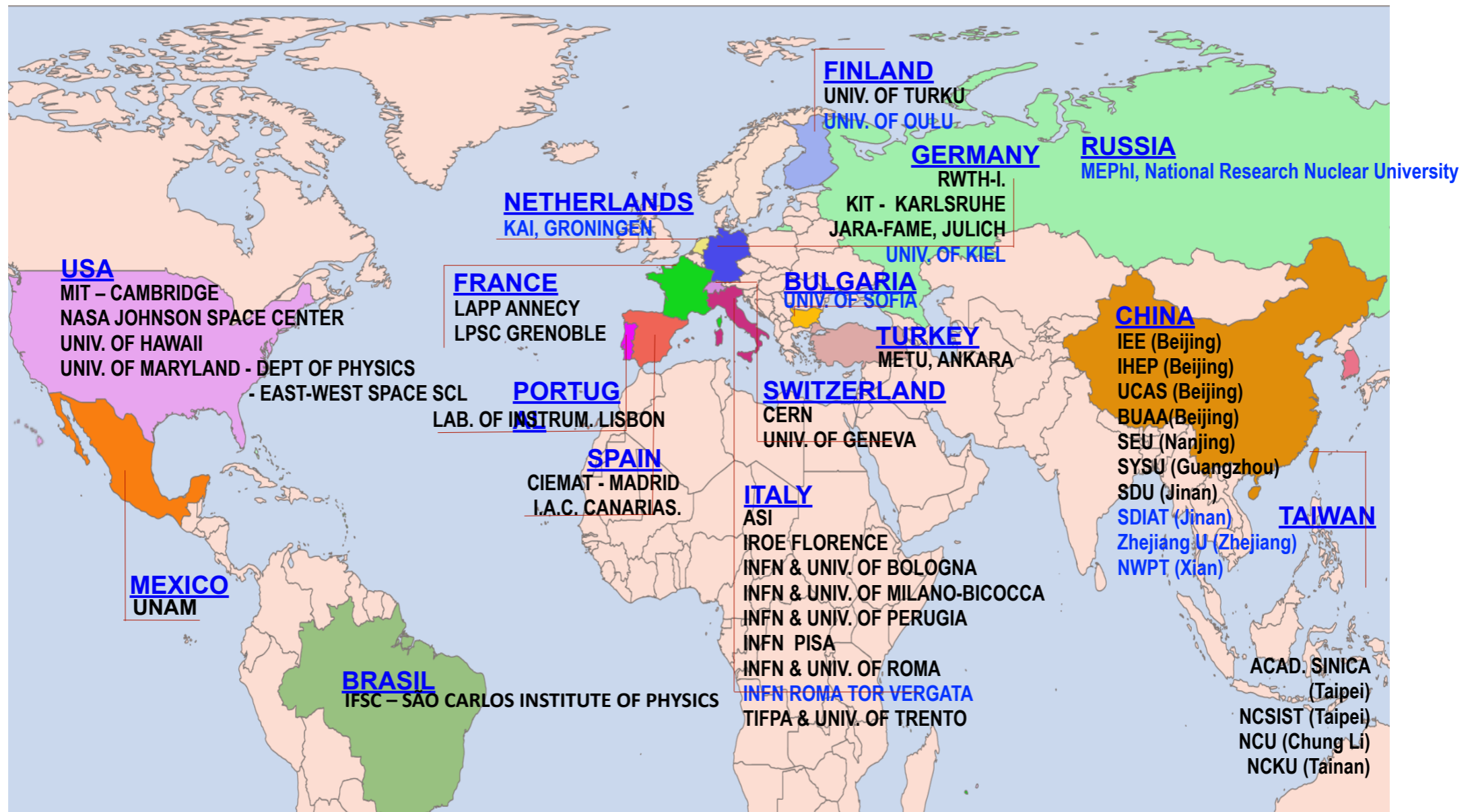


Figure from Aguilar *et al*, Physics Report 849 (2021) 1-116



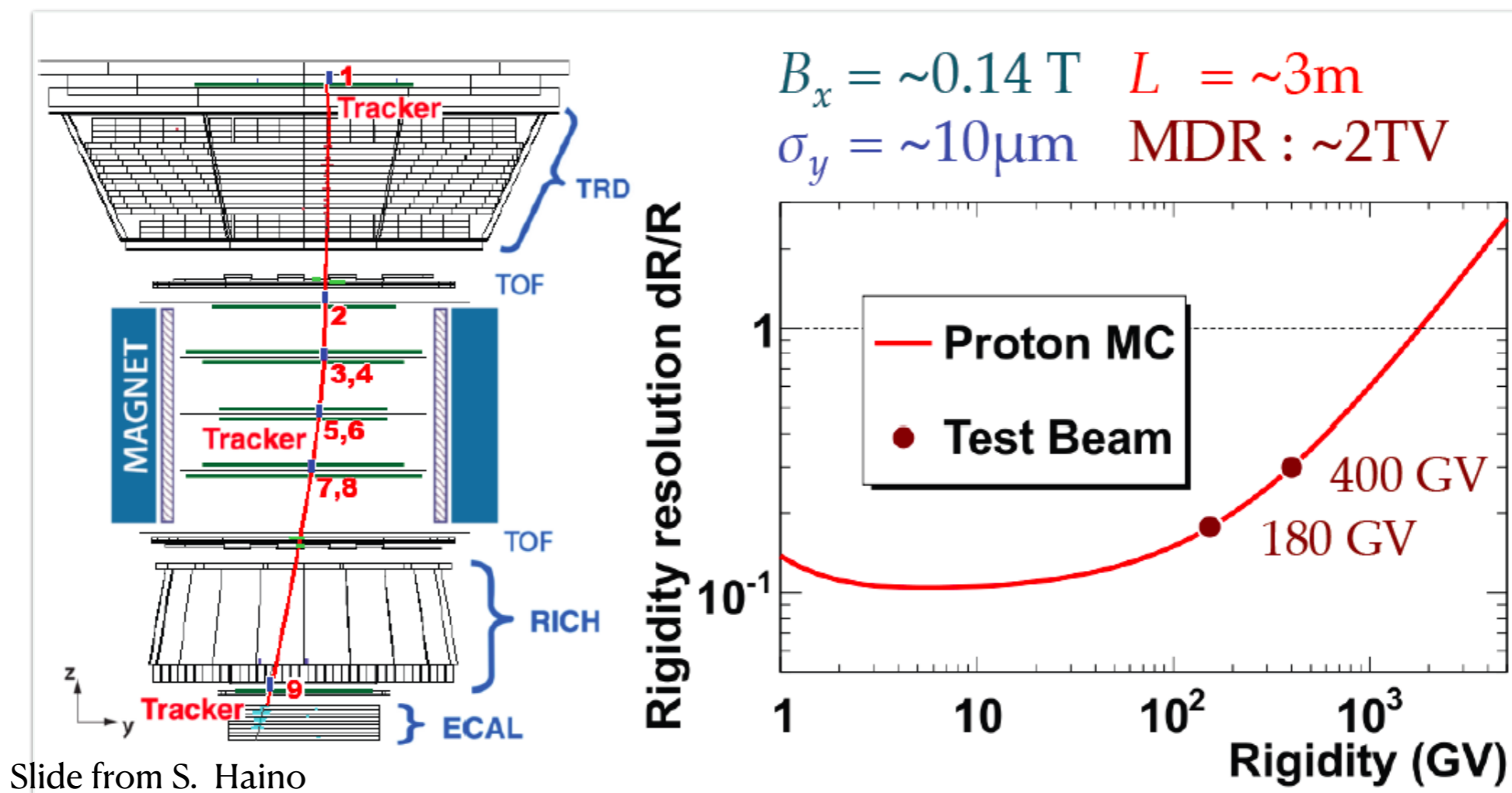
# The AMS Collaboration



# Rigidity measurement

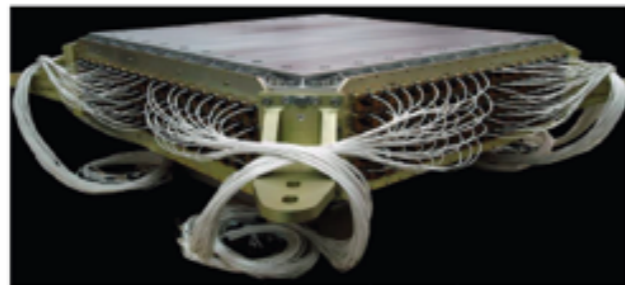
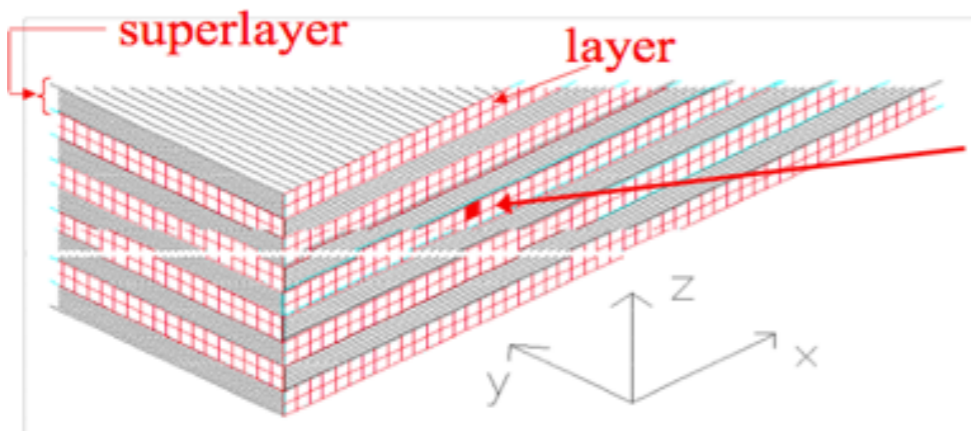
CR nuclei fluxes are measured by AMS-02 as a function of the rigidity ( $R=pc/Ze$ )

AMS-02 can measure CR nuclei in the GV to the TV energy range

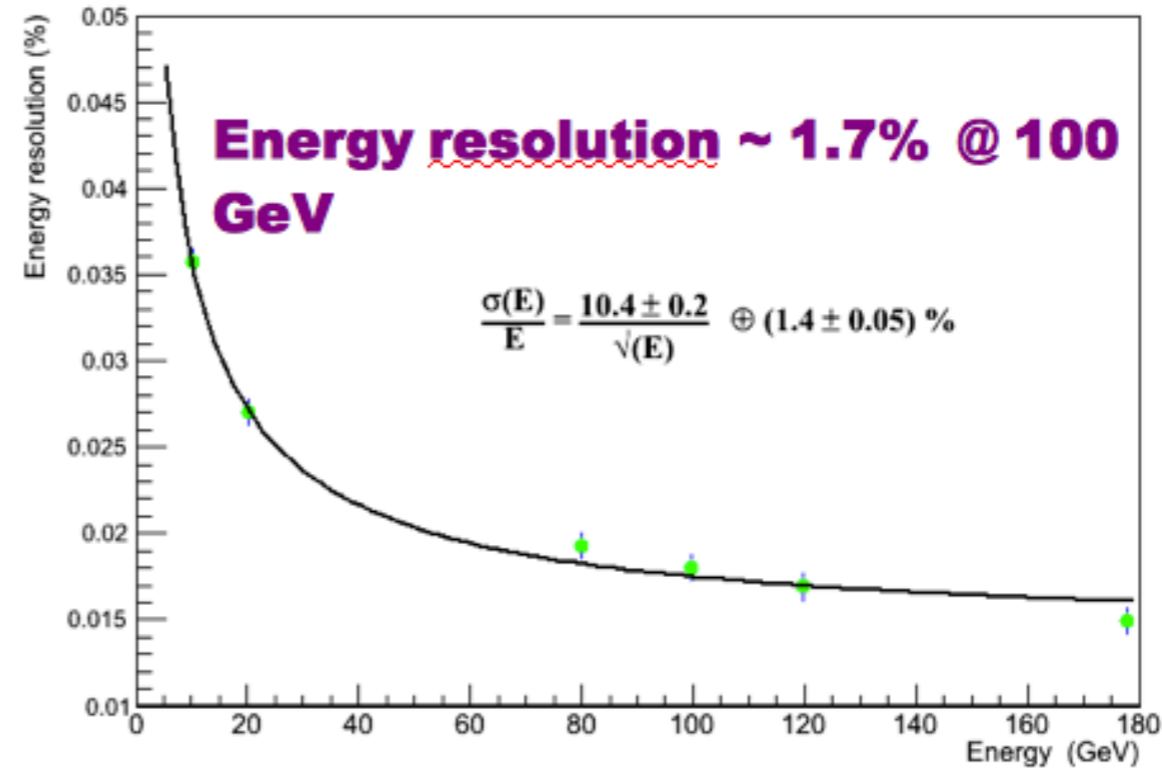


# Energy measurement

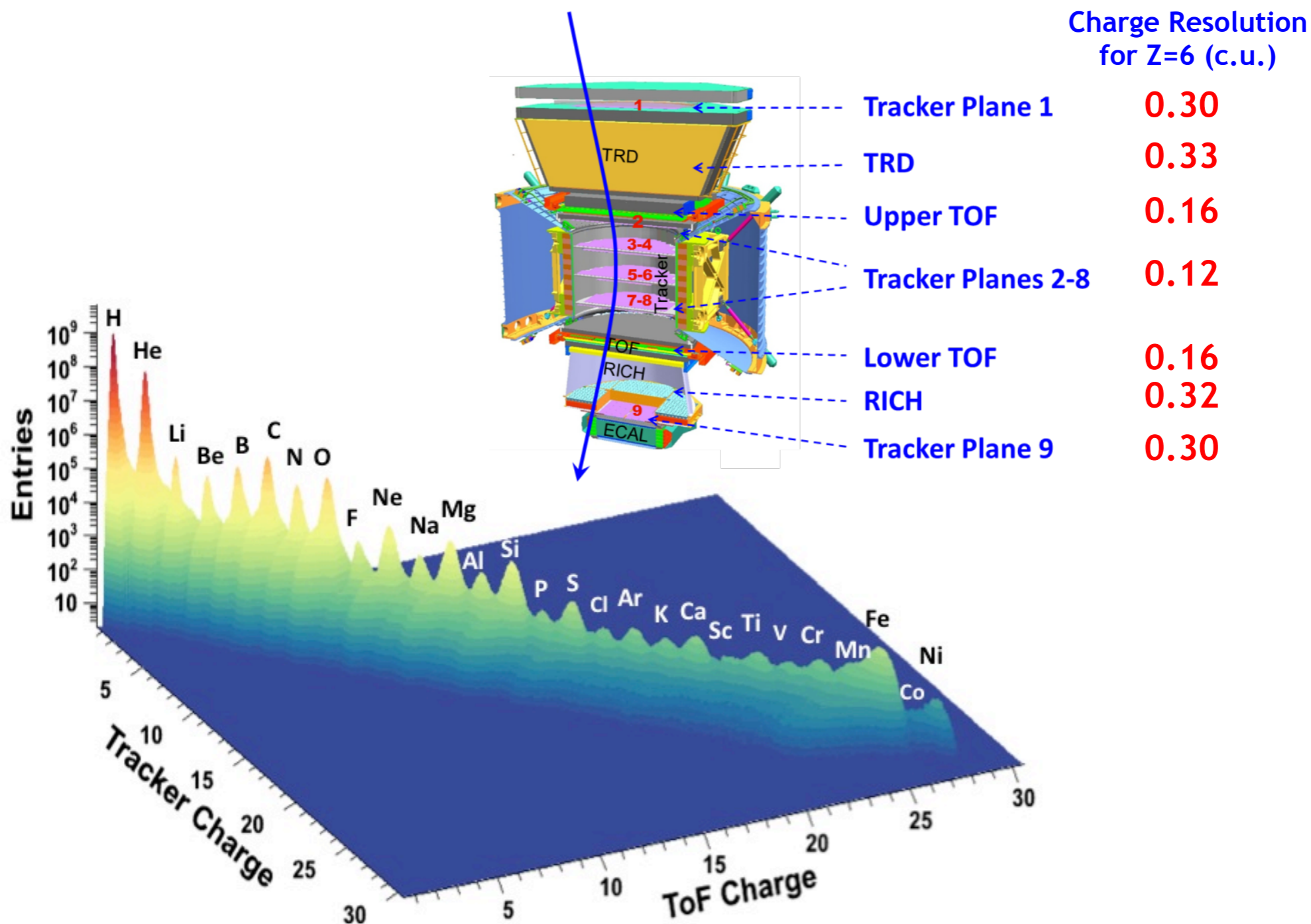
The AMS-02 electromagnetic calorimeter:  
 a 3-D sampling calorimeter made out of lead and scintillating fibers



**High granularity:**  $\sim 0.9 \times 0.9 \text{ cm}^2$   
**18 Longitudinal samplings**  
**72 Lateral samplings**  
 $17 X_0, \lambda_l / X_0 \sim 22$

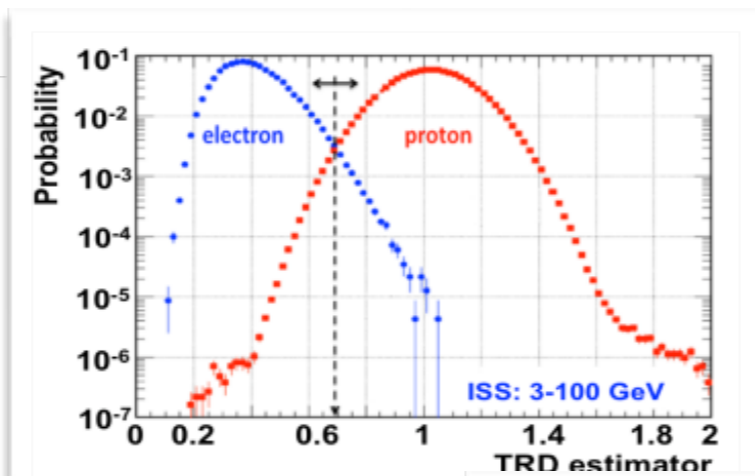
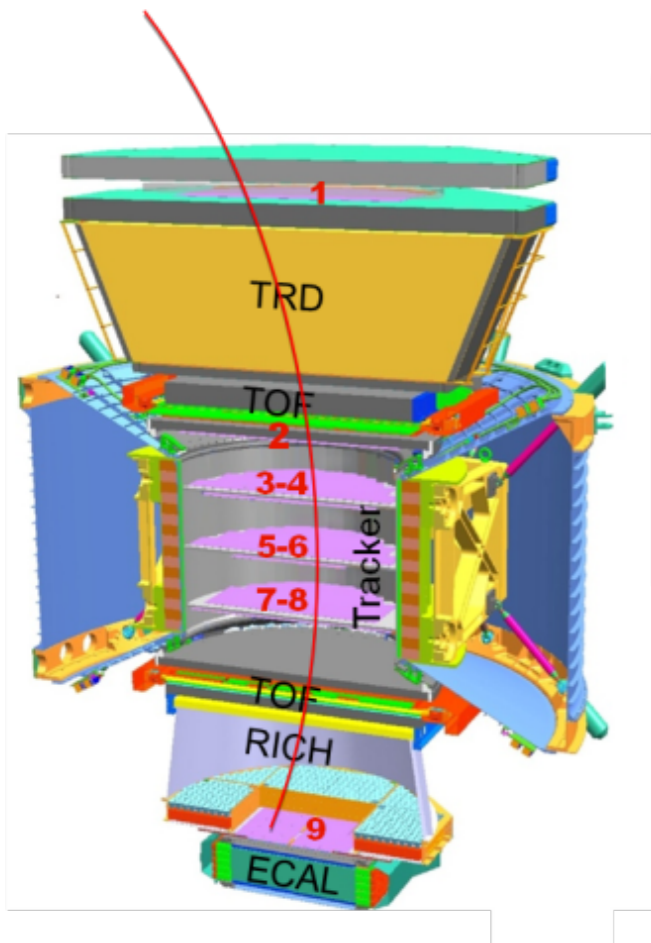


# Charge measurements

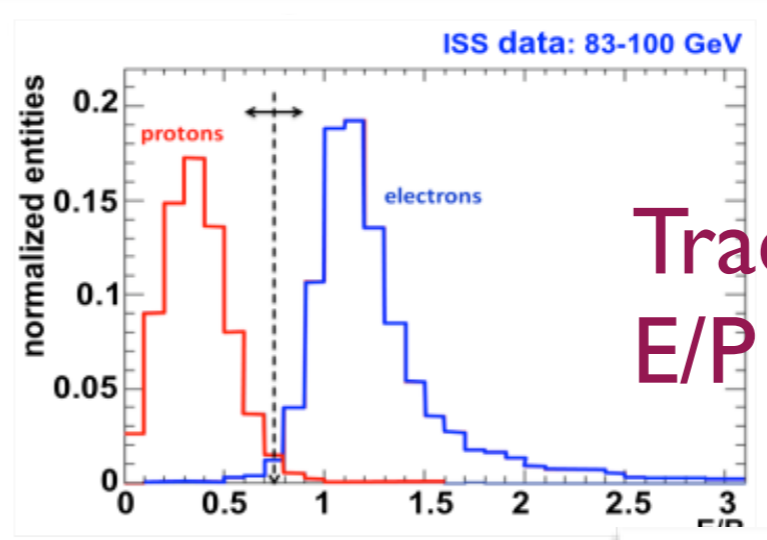




# Electrons (positrons) identification



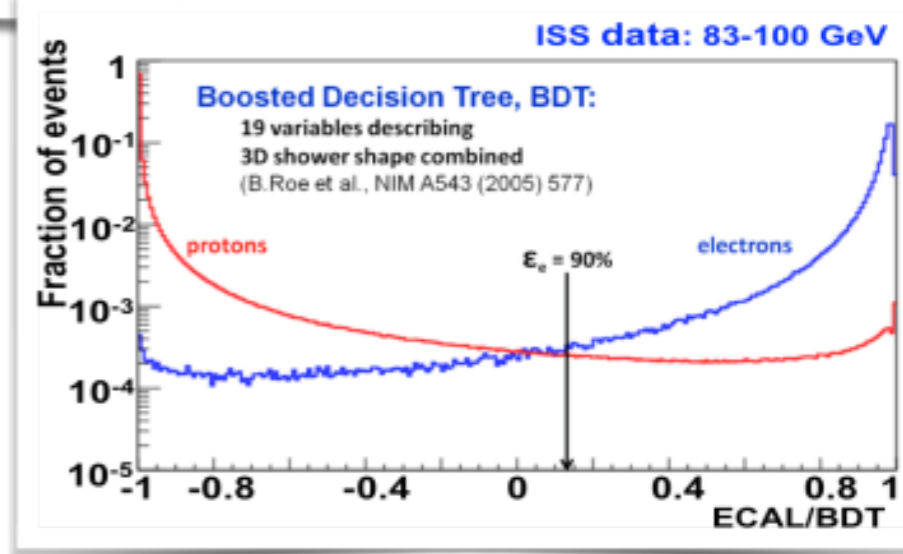
Transition Radiation Detector



Tracker:  
 $E/P \sim 1$  for  $e^+$  and  $e^-$

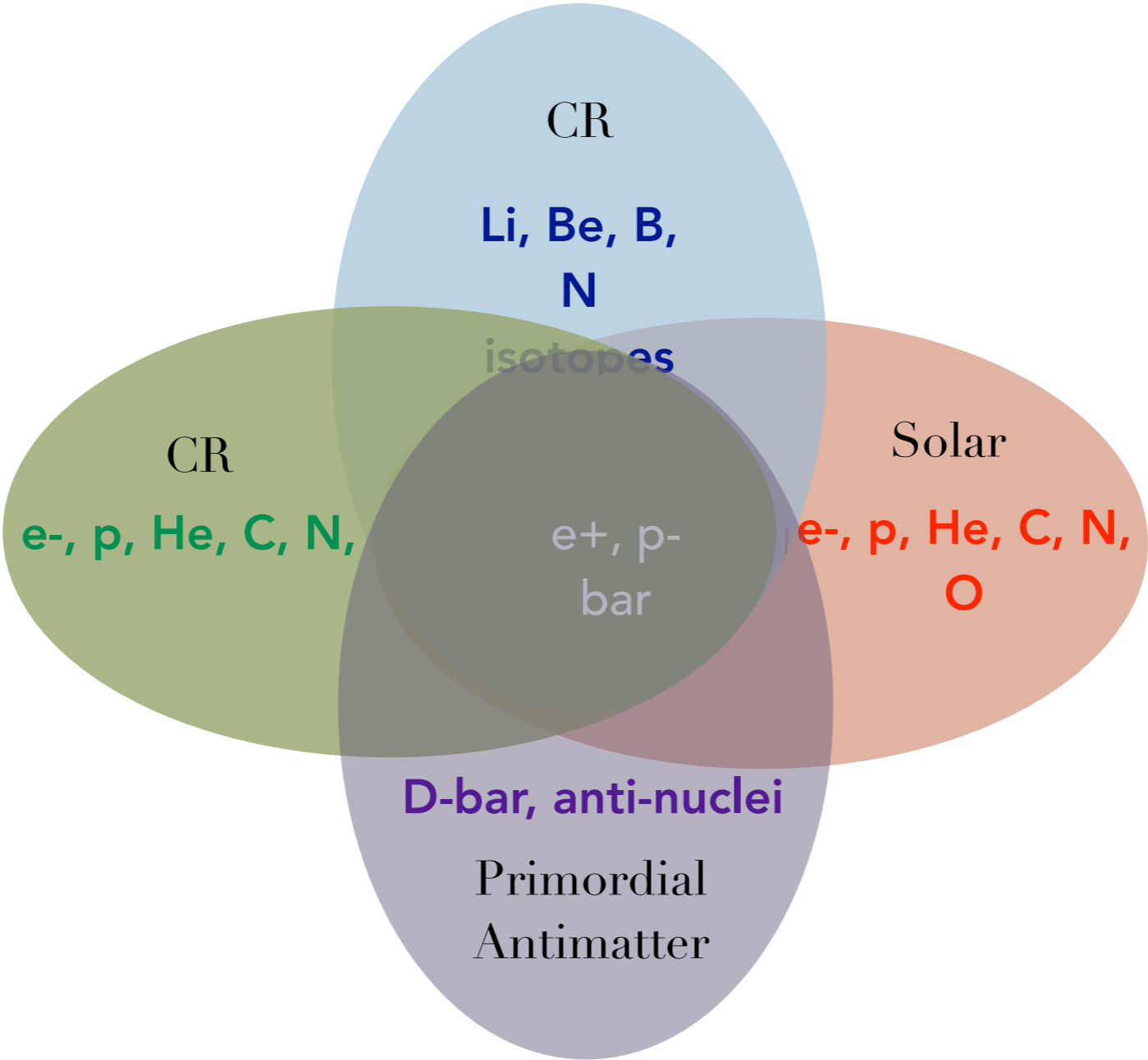
$Acc(p) \sim 0.5 \text{ m}^2\text{sr}$   
 $Acc(e) \sim 0.04 \text{ m}^2\text{sr}$

ECAL estimator: based on shower shape





# Galactic cosmic rays: what can we learn?





# Session program

< Tue 09/07 >

Print PDF Full screen Detailed view Filter

15:00	<b>The AMS-02 experiment on the International Space Station</b>	<i>Mercedes Paniccia</i>
	<i>Pazienza, Aurum</i>	15:00 - 15:10
	<b>Unique Properties of Primary Cosmic Rays measured by the Alpha Magnetic Spectrometer</b>	<i>Meeran Zuberi</i>
	<i>Pazienza, Aurum</i>	15:10 - 15:30
	<b>Unique Properties of Secondary Cosmic Rays: Results from the Alpha Magnetic Spectrometer</b>	<i>Nikita Belyaev</i>
	<i>Pazienza, Aurum</i>	15:30 - 15:50
16:00	<b>Spectra of Cosmic Rays escaping from star clusters</b>	<i>Giovanni Morlino</i>
	<i>Pazienza, Aurum</i>	15:50 - 16:10
	<b>On the origin of the spectral features observed in the cosmic ray spectrum</b>	<i>Sarah Recchia</i>
	<i>Pazienza, Aurum</i>	16:10 - 16:30
17:00	<b>The role of electron capture decay in the precision era of Galactic cosmic-ray data</b>	<i>Marta Borchiellini</i>
	<i>Pazienza, Aurum</i>	17:00 - 17:15
	<b>Properties of Cosmic Deuterons Measured by the Alpha Magnetic Spectrometer</b>	<i>Diego Gomez Coral</i>
	<i>Pazienza, Aurum</i>	17:15 - 17:35
	<b>Unique Properties of Daily Proton Fluxes up to 100 GV</b>	<i>Francesco Faldi</i>
	<i>Pazienza, Aurum</i>	17:35 - 17:55
18:00	<b>The Layer 0 upgrade of the AMS-02 experiment on the ISS: status and perspectives</b>	<i>yaozu jiang</i>
	<i>Pazienza, Aurum</i>	17:55 - 18:10
	<b>Summary of the AMS results and their interpretation</b>	<i>Manuela Vecchi</i>
	<i>Pazienza, Aurum</i>	18:10 - 18:30