

V. Formato - INFN Sezione di Tor Vergata - 10/02/2025

AMS-02: ALPHA MAGNETIC SPECTROMETER

AMS-02

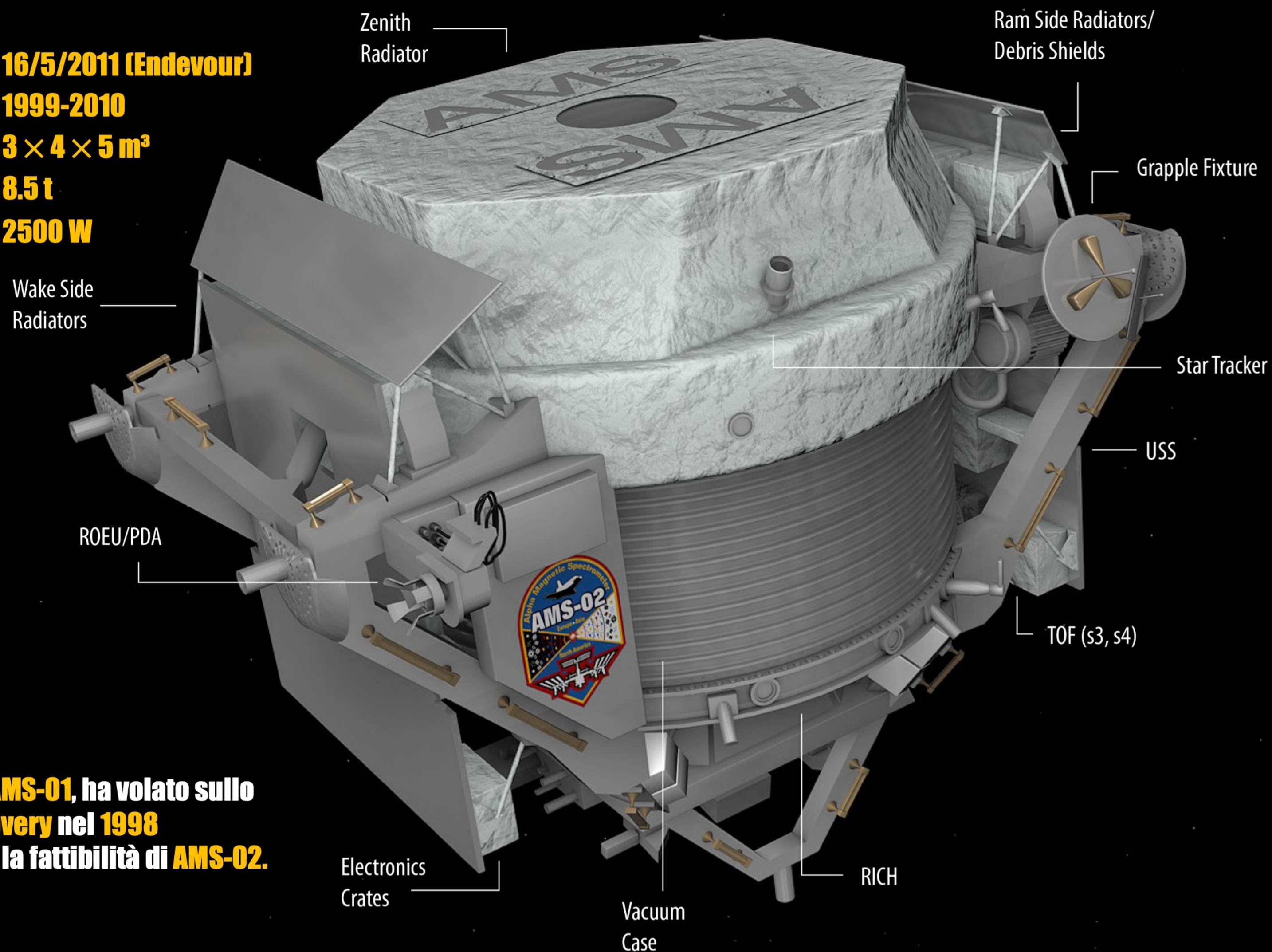
AMS-02 è uno **spettrometro magnetico** a larga accettazione in grado di misurare accuratamente il passaggio di particelle nel range di energia **GeV-TeV**. Dal 19 Maggio **2011** AMS-02 è in operazione a bordo della Stazione Spaziale Internazionale (ISS), raccogliendo **>230 miliardi di raggi cosmici**.



AMS dovrebbe prendere dati per l'intera durata della ISS (estesa al 2030)

AMS-02: ALPHA MAGNETIC SPECTROMETER

Lancio 16/5/2011 (Endeavour)
Costruzione 1999-2010
Dimensioni 3 × 4 × 5 m³
Peso 8.5 t
Potenza 2500 W



300'000 canali di lettura

650 processori

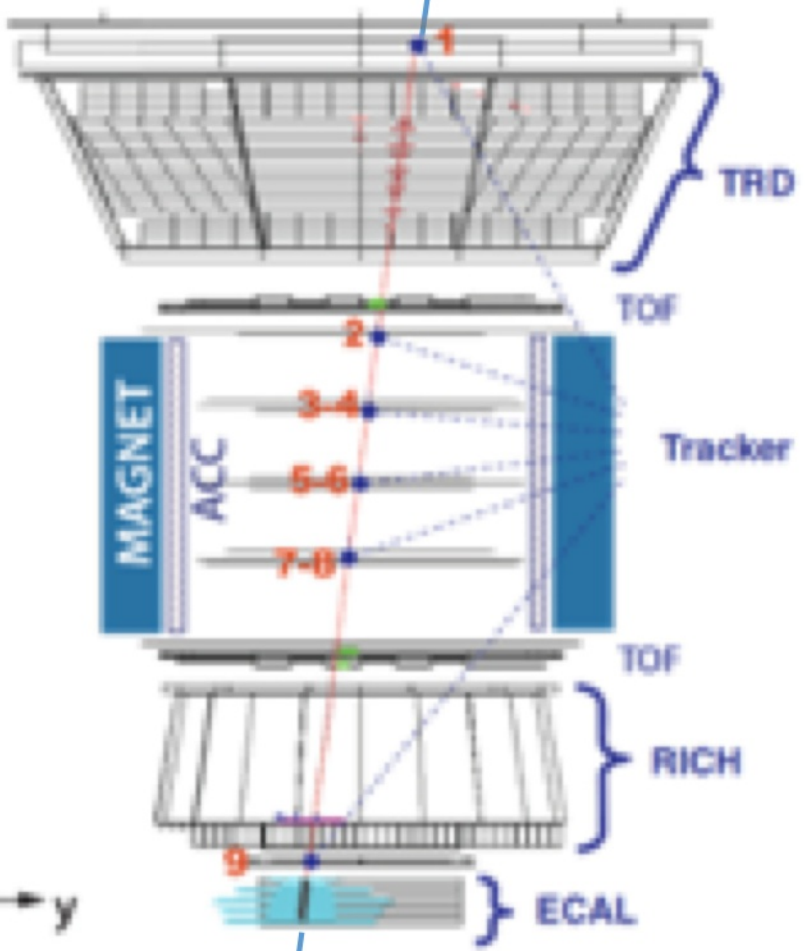
Dimensioni: 3m x 4m x 5m

Peso: 8.5 tonnellate

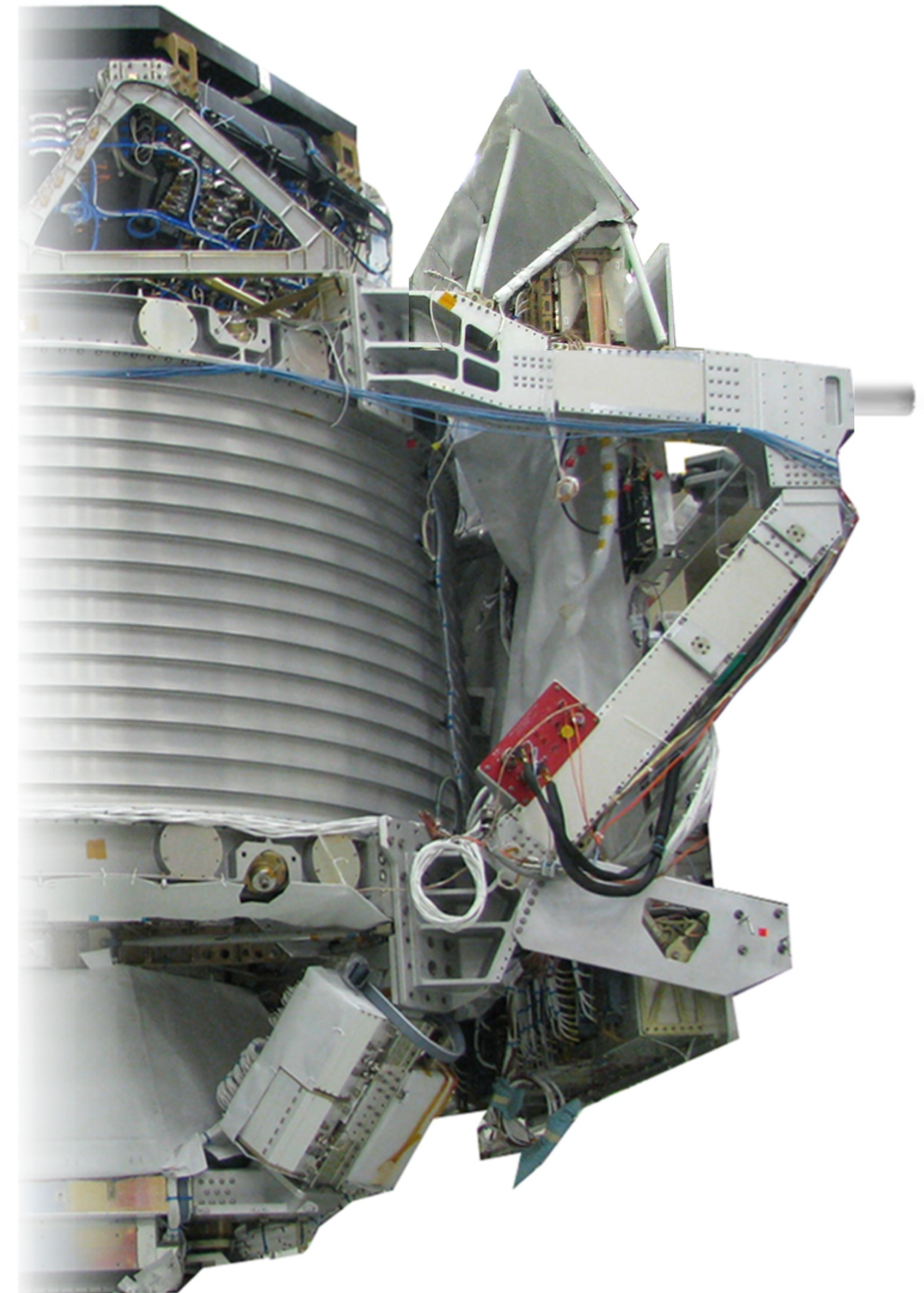
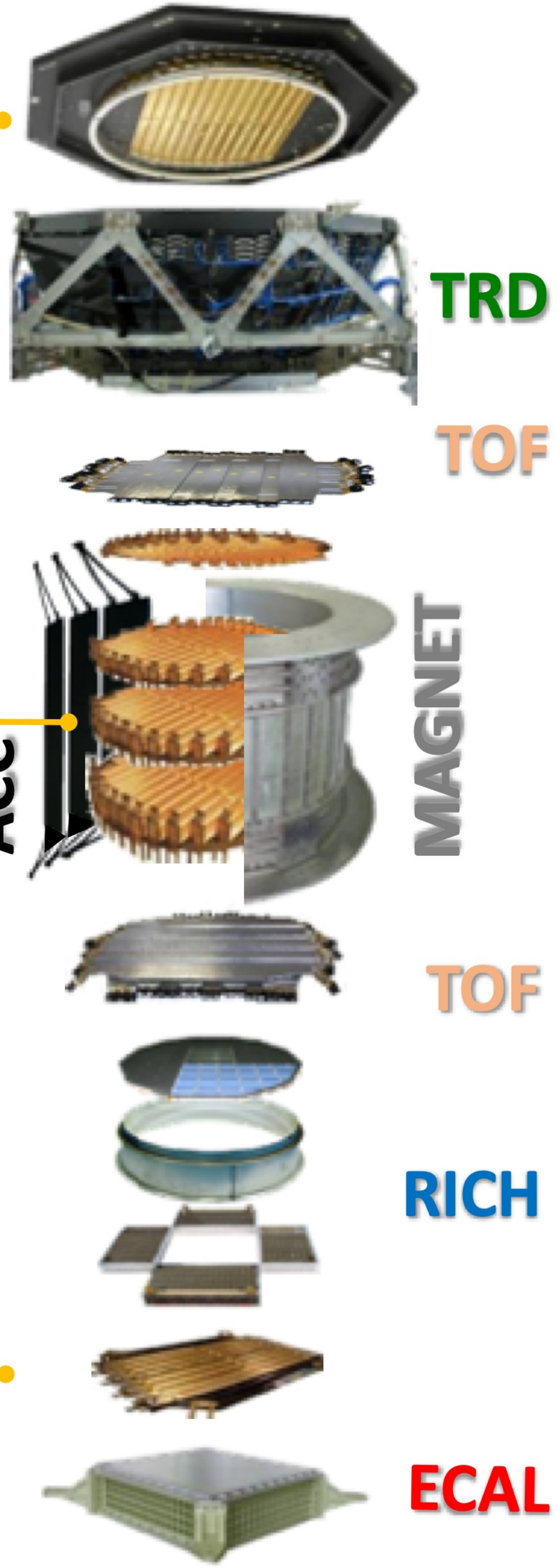
In operazione 24h su 24, 7 giorni su 7, 365 giorni all'anno

Il prototipo, **AMS-01**, ha volato sullo shuttle **Discovery** nel **1998** dimostrando la fattibilità di **AMS-02**.

Tracker
planes

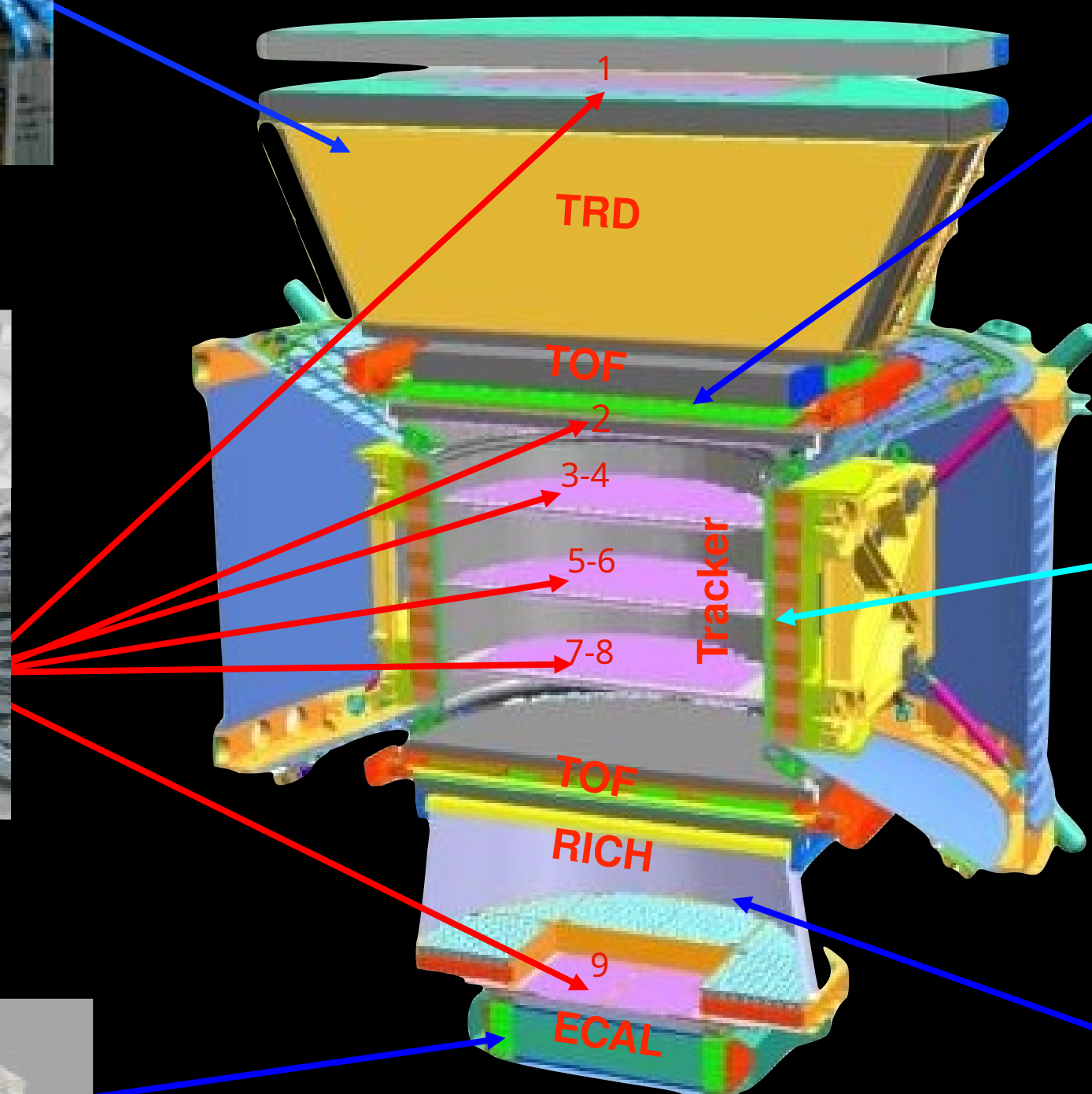
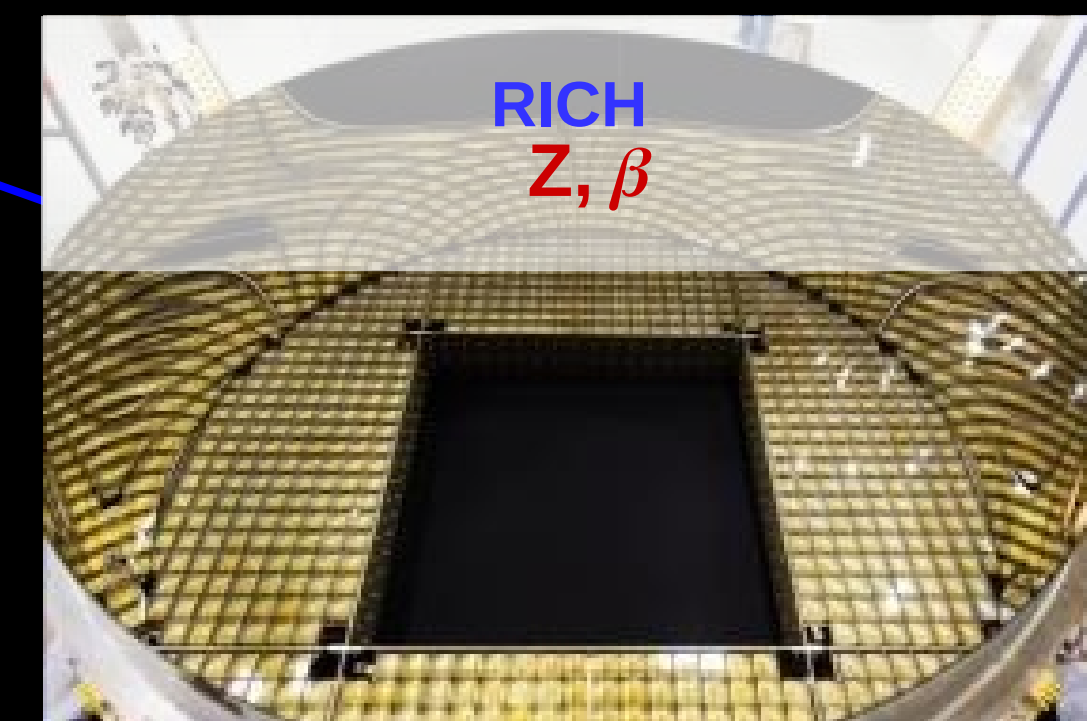
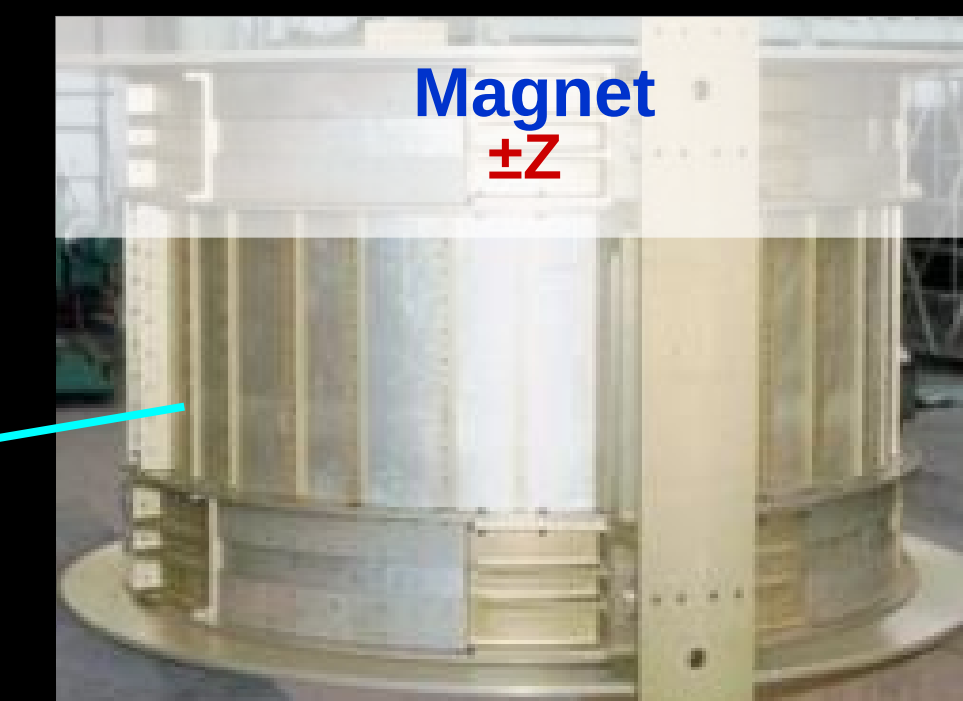


- 1
- 2
- 3-4
- 5-6
- 7-8
- 9

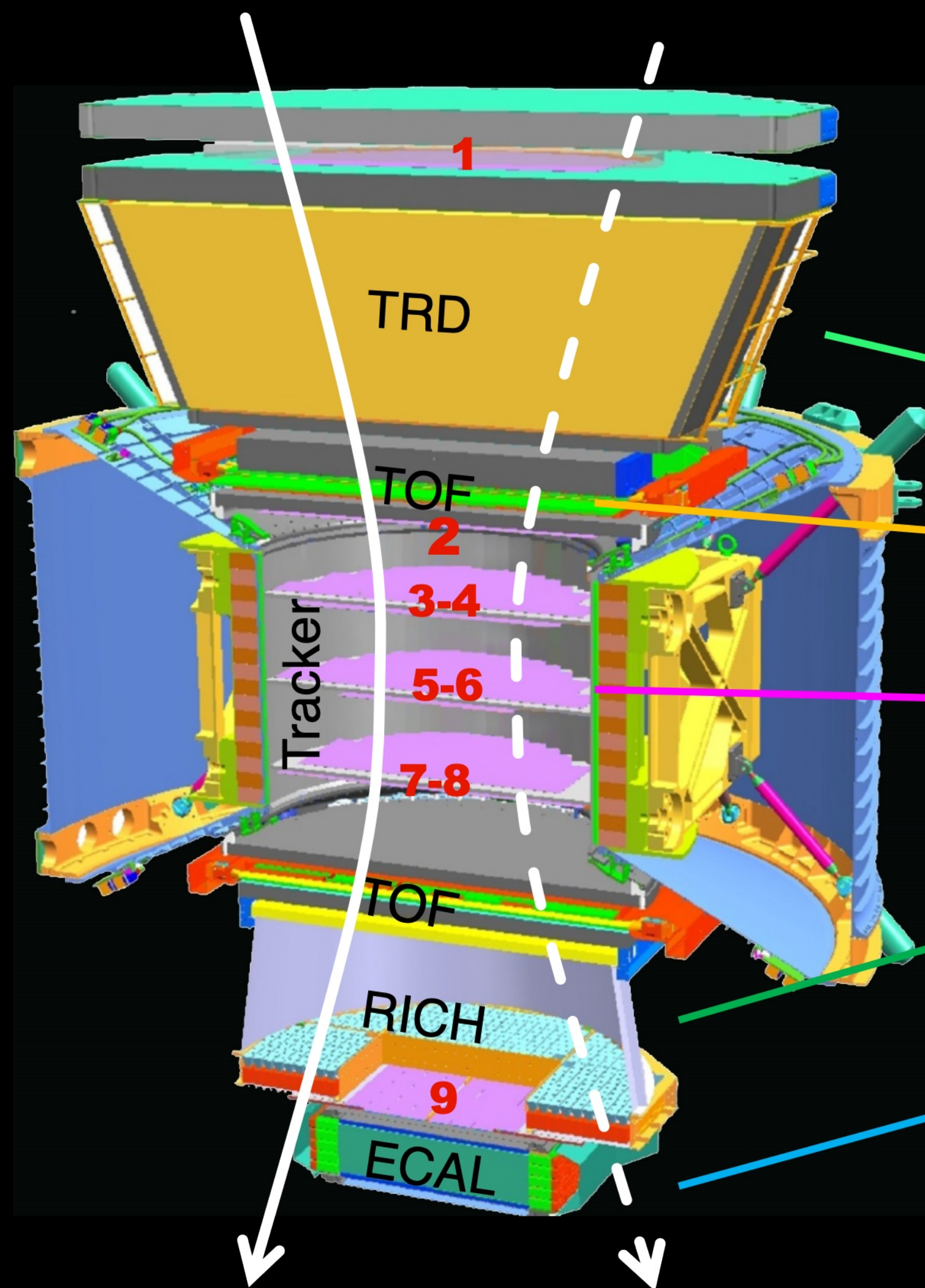


AMS-02

Per raggiungere una elevata precisione nella misura di raggi cosmici una caratteristica chiave è la ridondanza nella misura di caratteristiche come **carica elettrica, momento, velocità e, in generale, particle ID.**



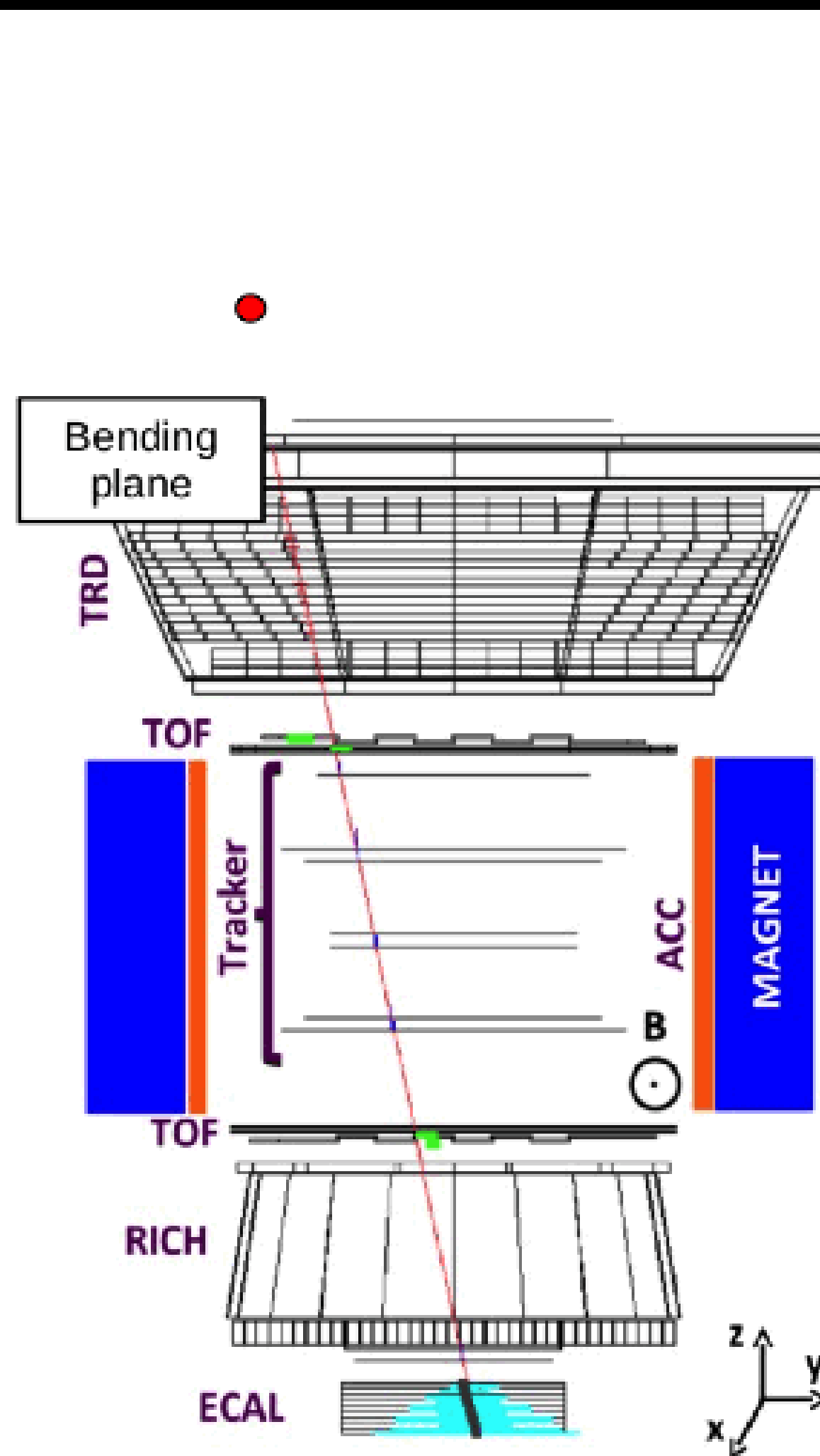
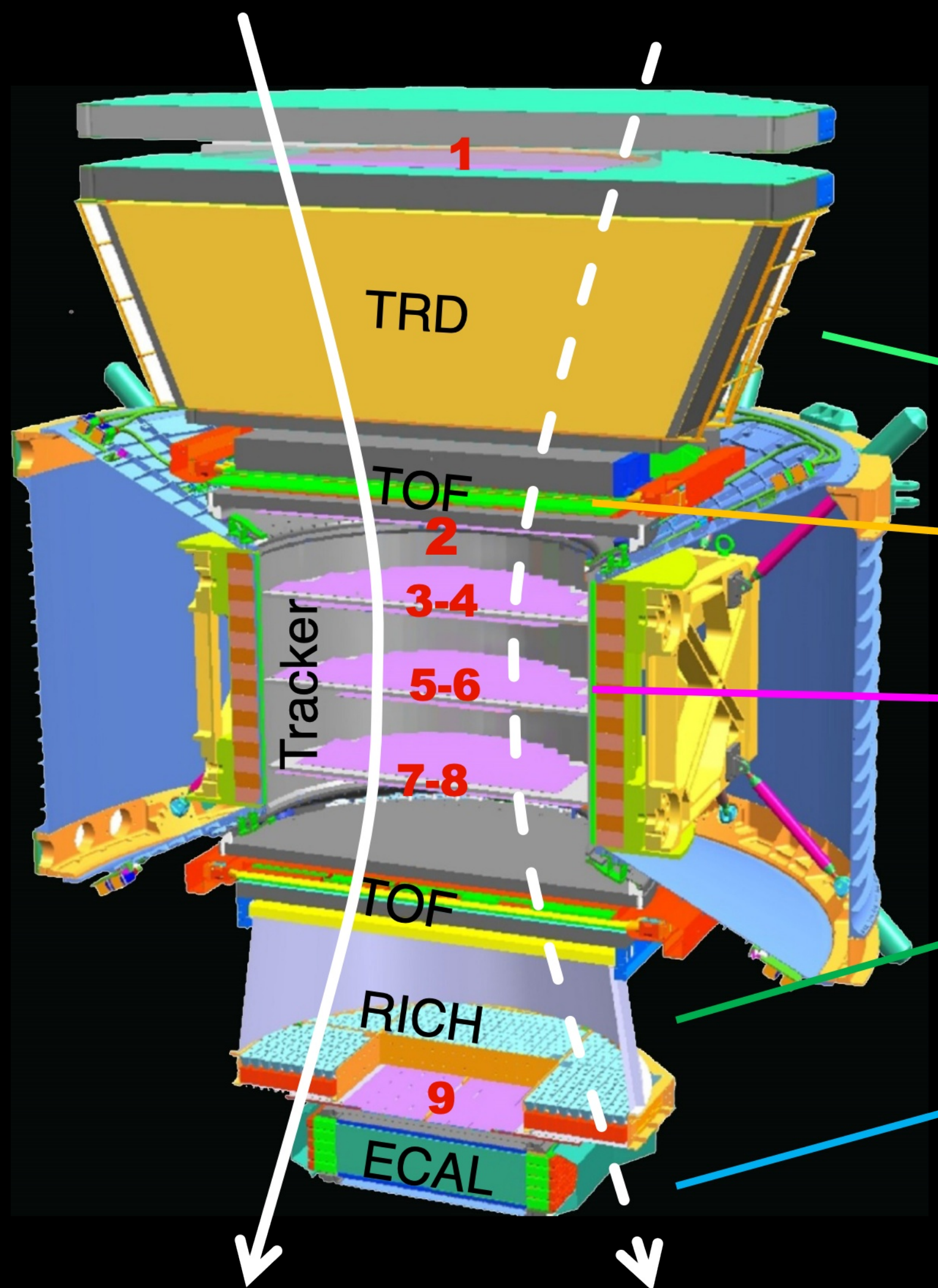
AMS-02: UNO SPETTROMETRO POLIVALENTE



Materia **Anti-materia**

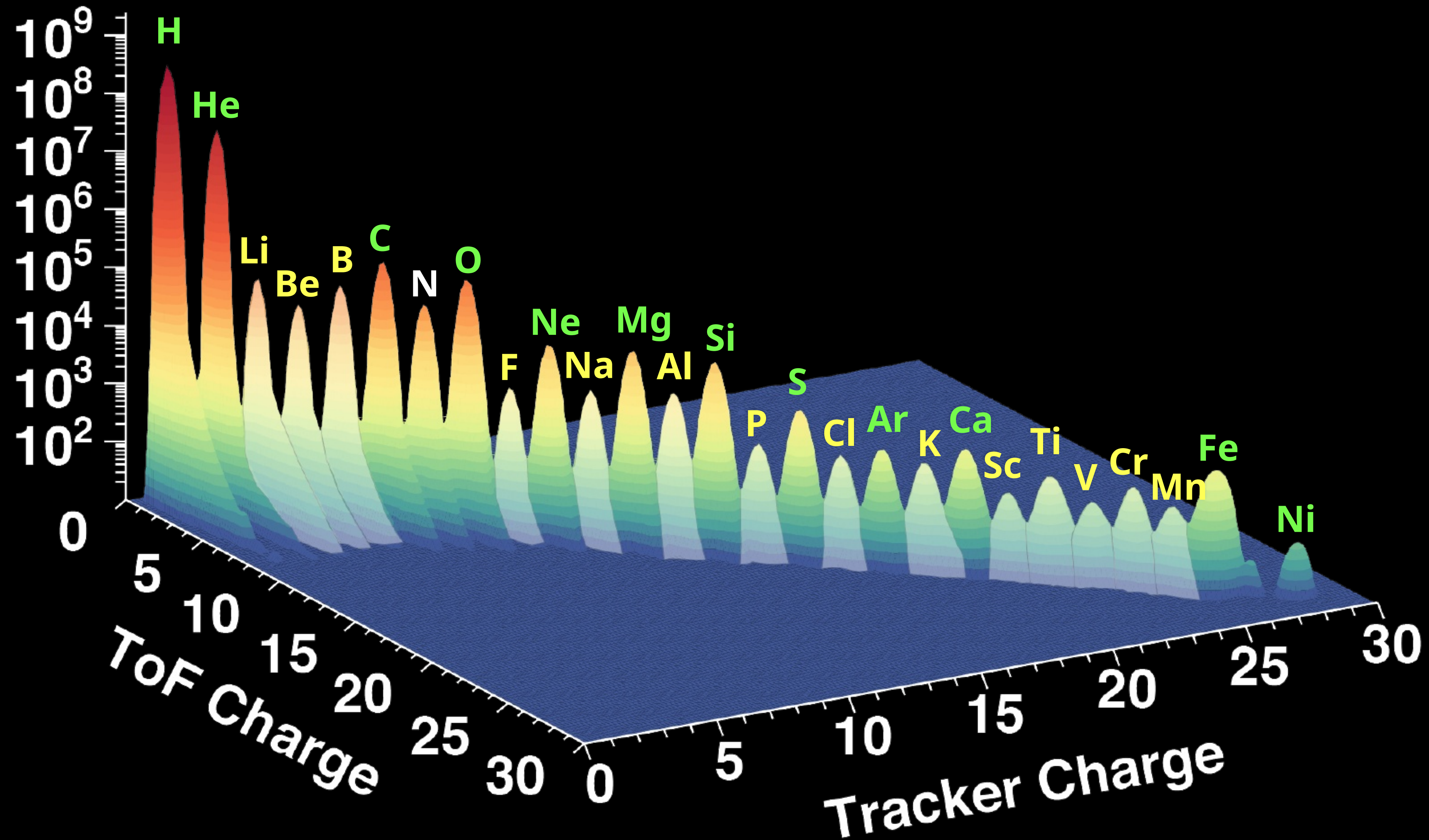
	e^-	P	Fe	e^+	\bar{P}	\bar{He}
TRD						
TOF						
Tracker + Magnet						
RICH						
ECAL						

AMS-02: UNO SPETTROMETRO POLIVALENTE

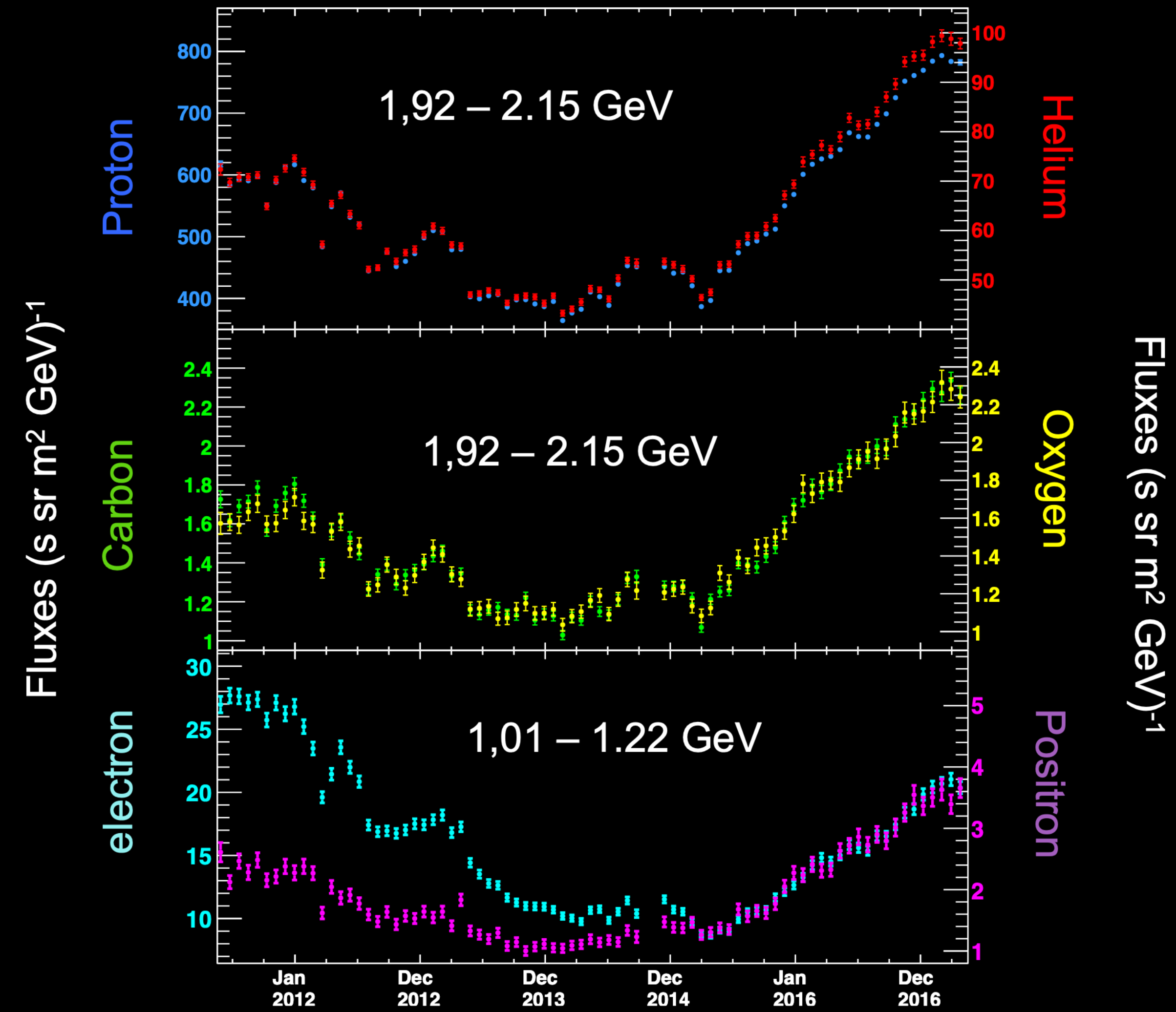
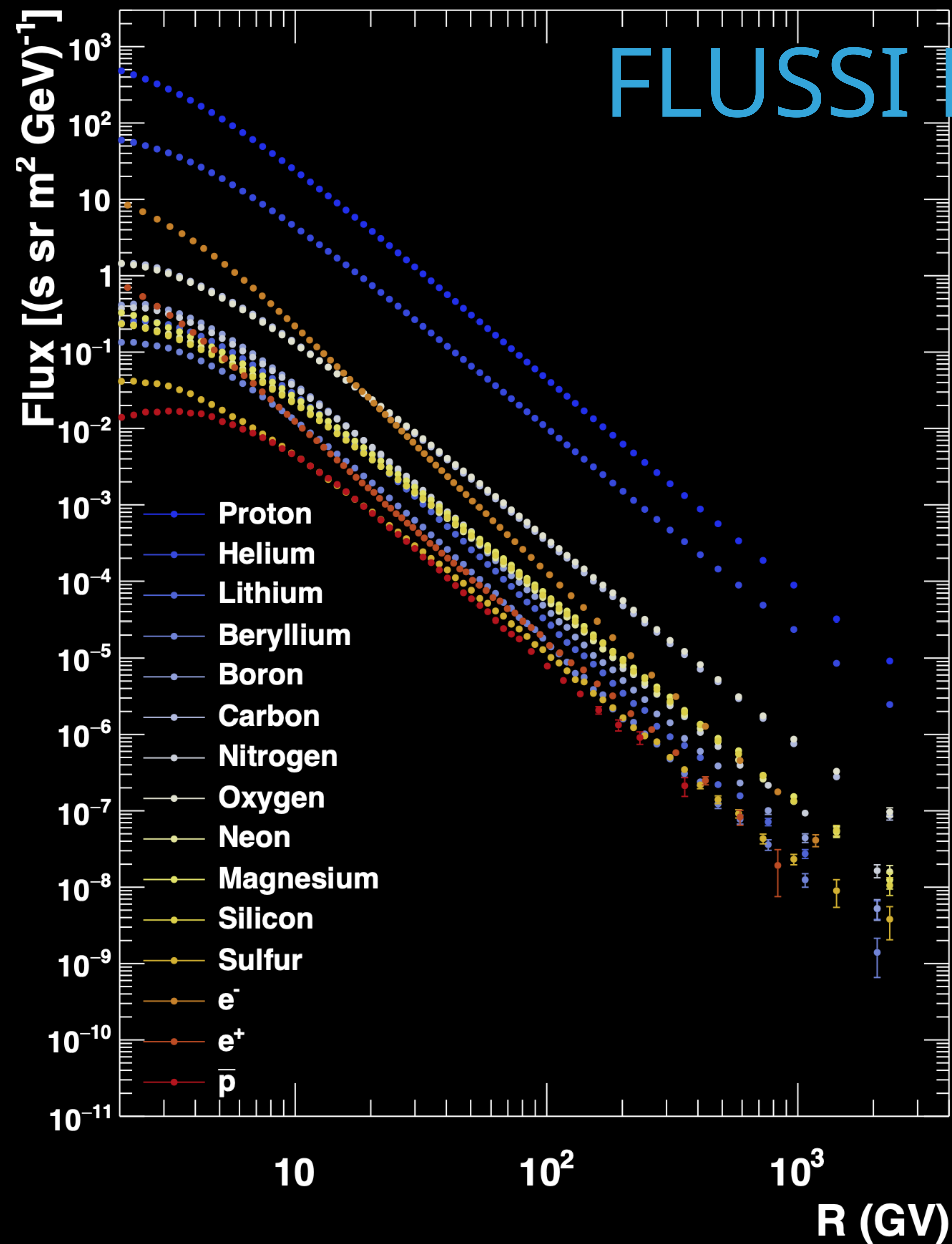


	e^-	p	He
TRD 20 layers	=====	=====	=====
TOF 4 layers	=====	=====	=====
TRK 9 layers	=====	=====	=====
RICH	=====	=====	=====
ECAL 20 layers	=====	=====	=====

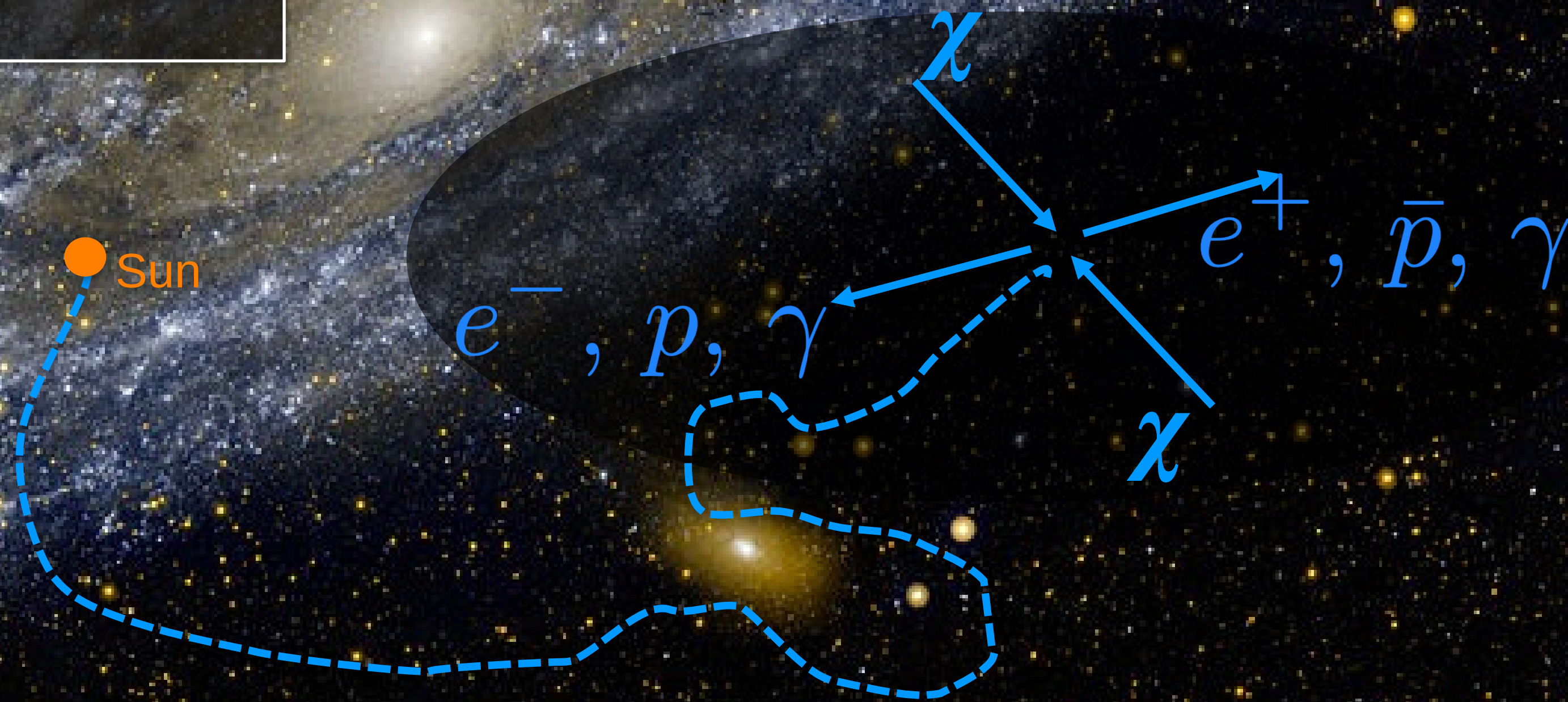
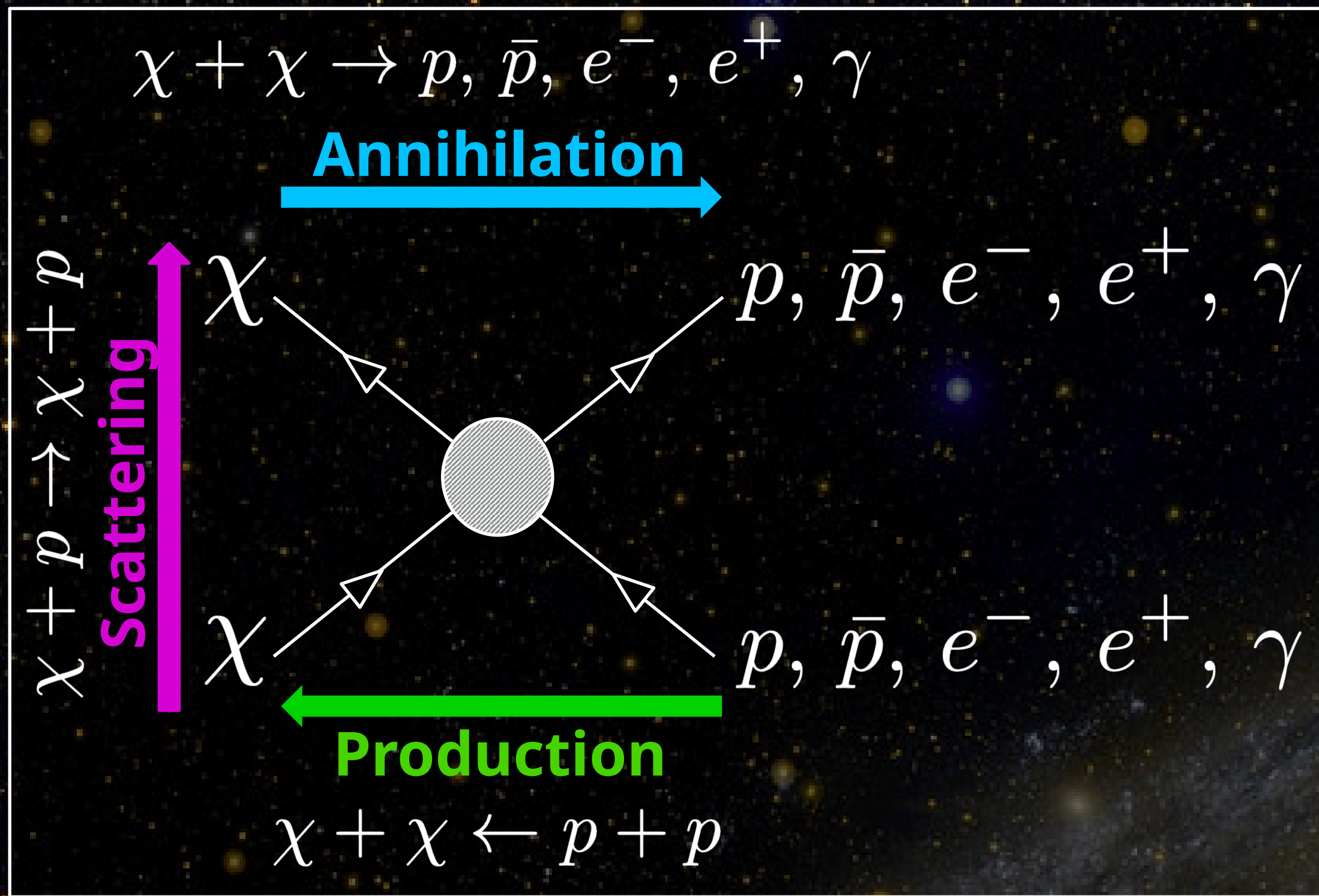
LA TAVOLA PERIODICA DI AMS



FLUSSI DI RAGGI COSMICI: IN PRATICA

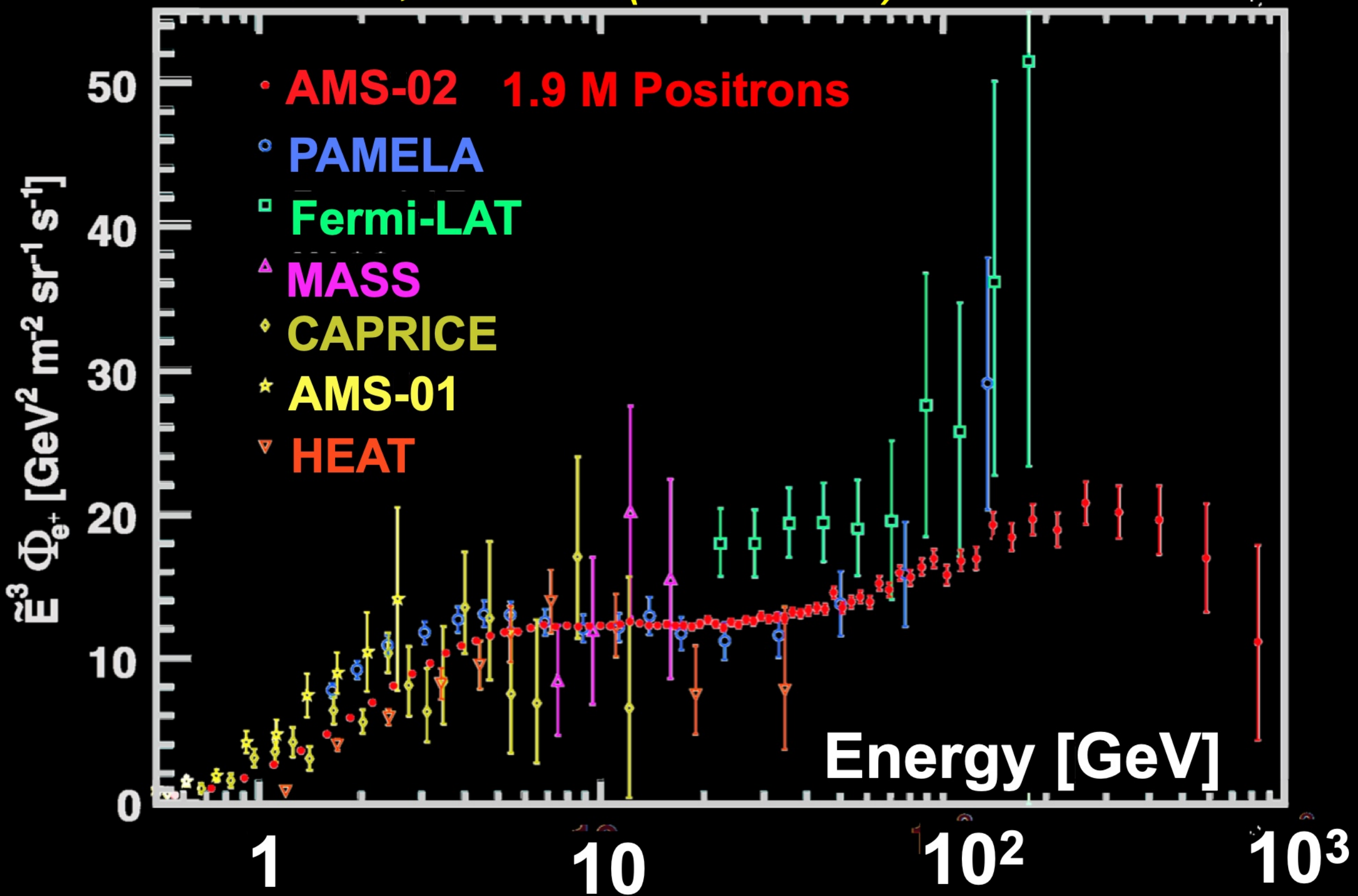


RICERCA DI NUOVA FISICA

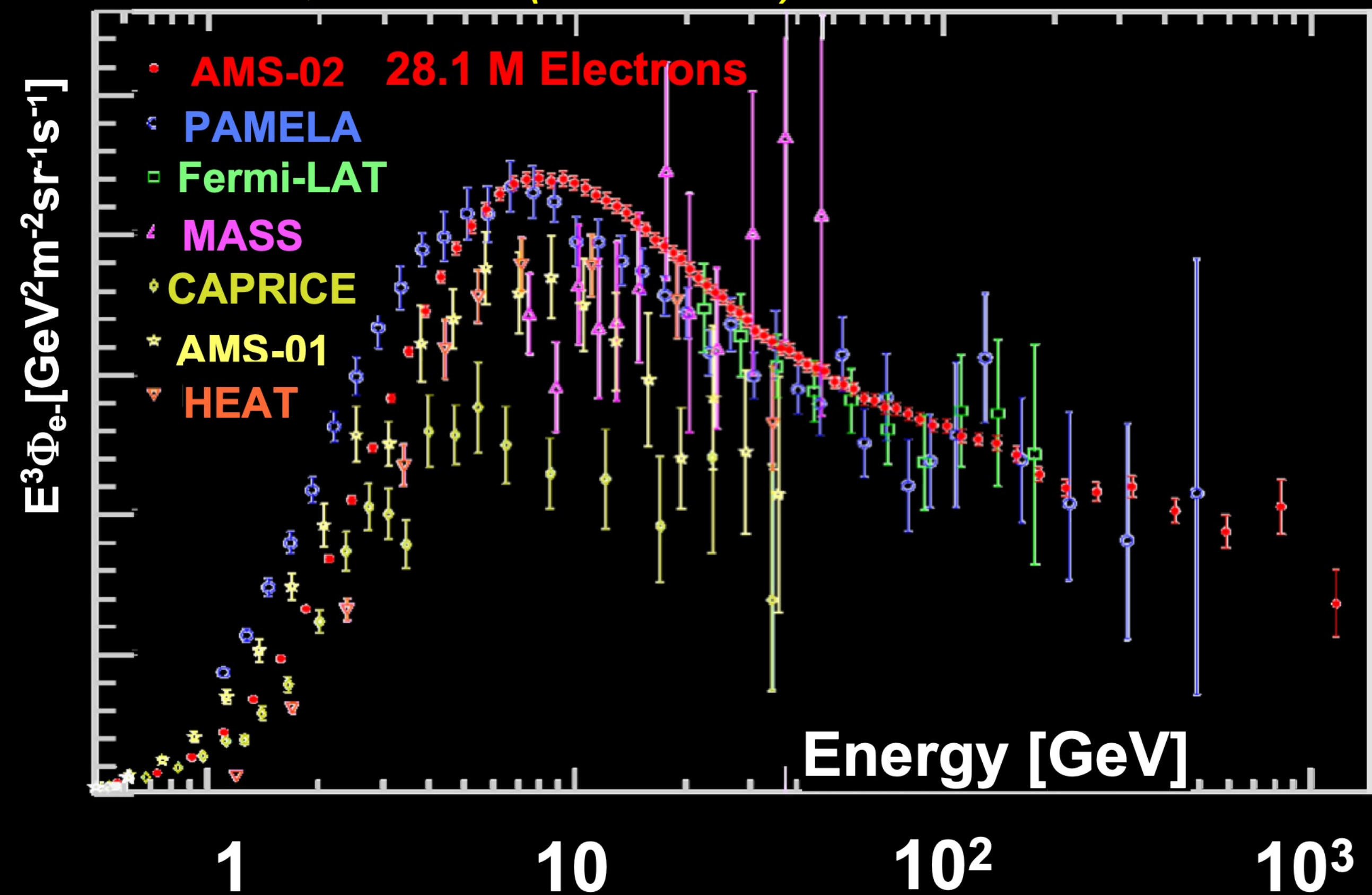


ELETTRONI E POSITRONI

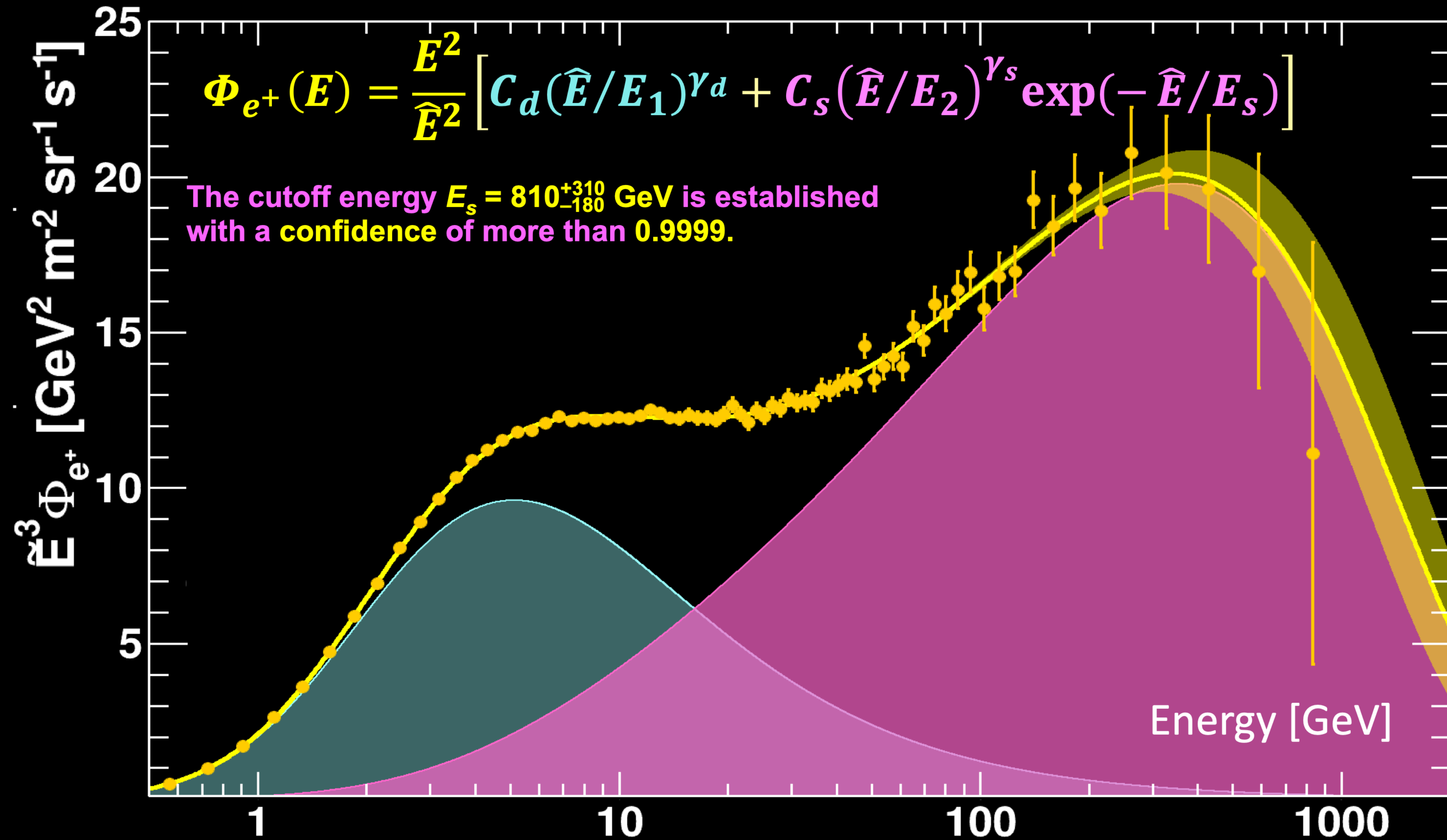
PRL 122, 041102 (Jan. 2019)

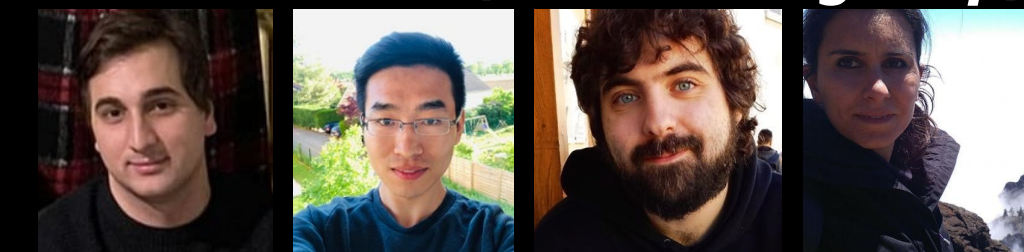


PRL 122, 101101 (Mar. 2019)



FLUSSO DI POSITRONI

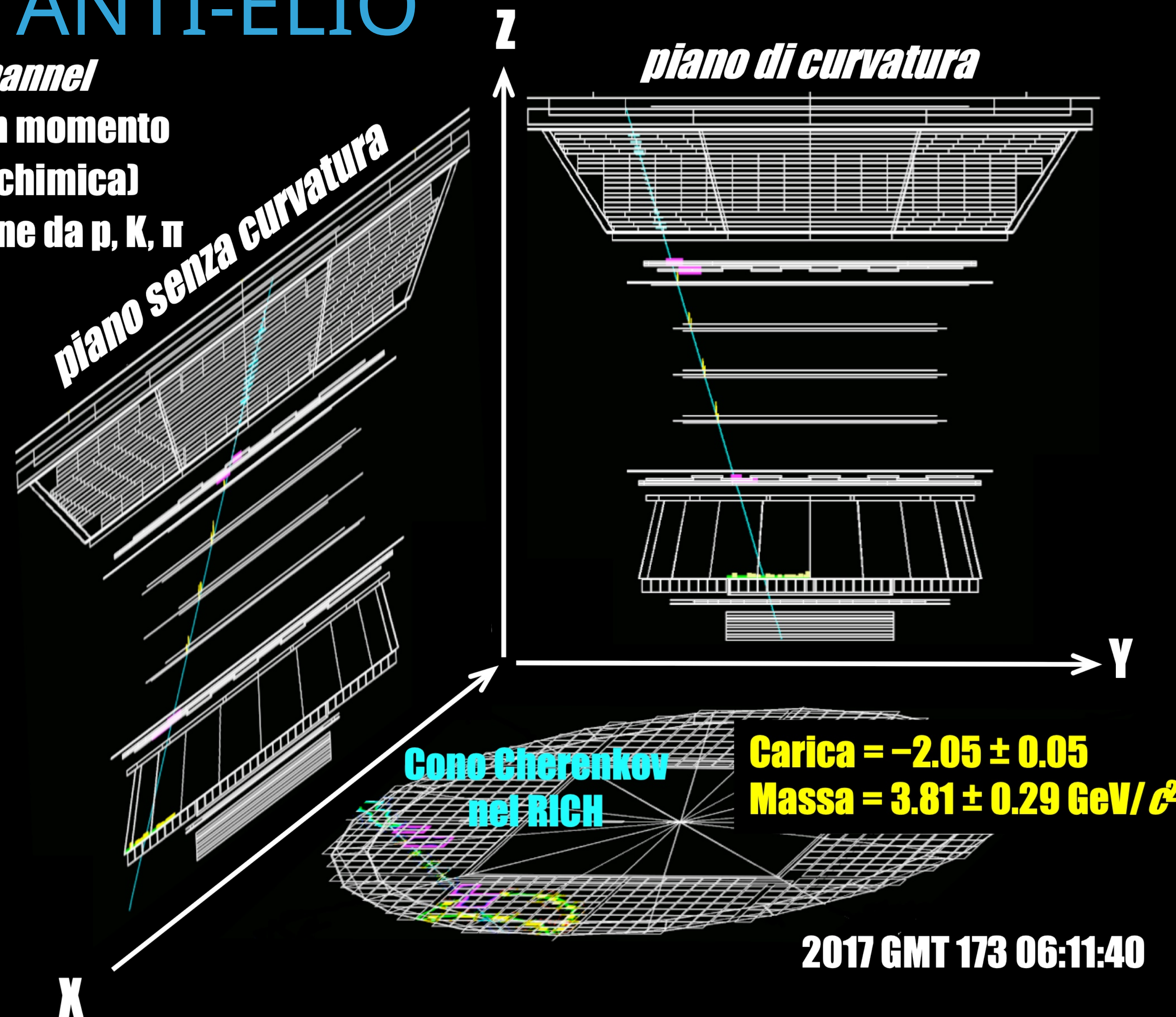




RICERCA DI ANTI-ELIO

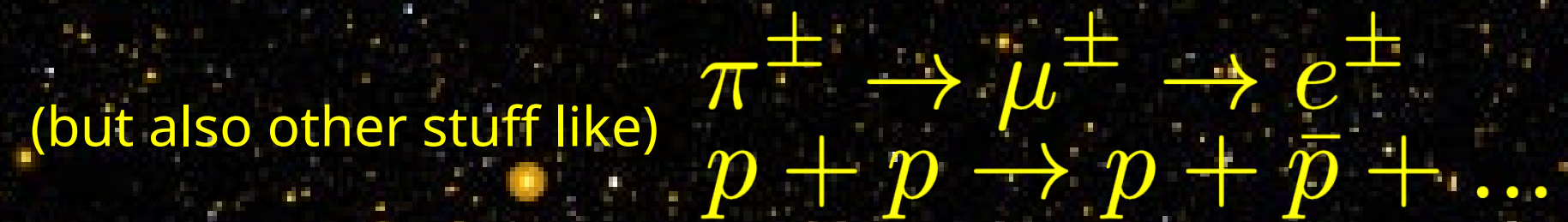
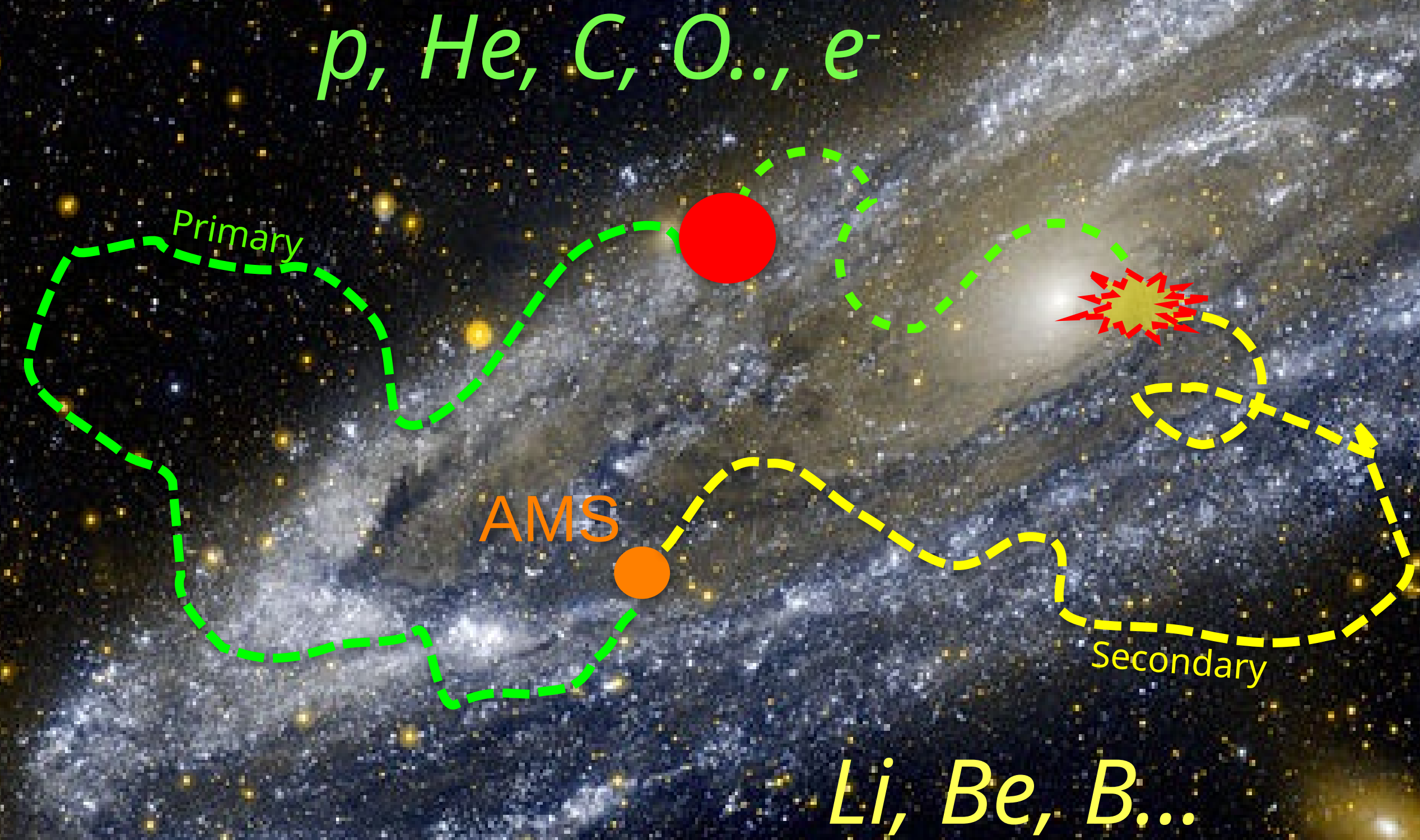
L'anti-elio è un *golden-channel*

- Migliore risoluzione in momento
- Migliore separazione chimica)
- Non c'è contaminazione da p, K, π

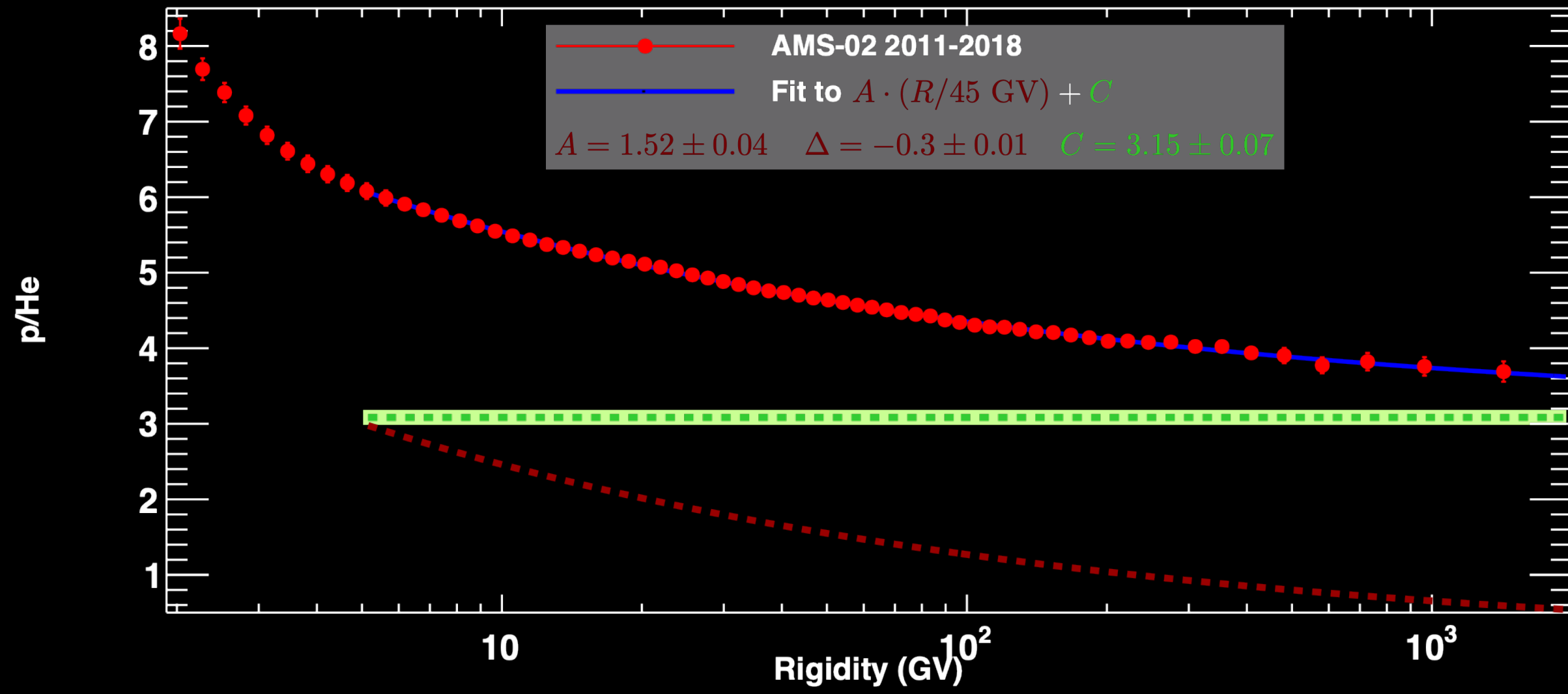
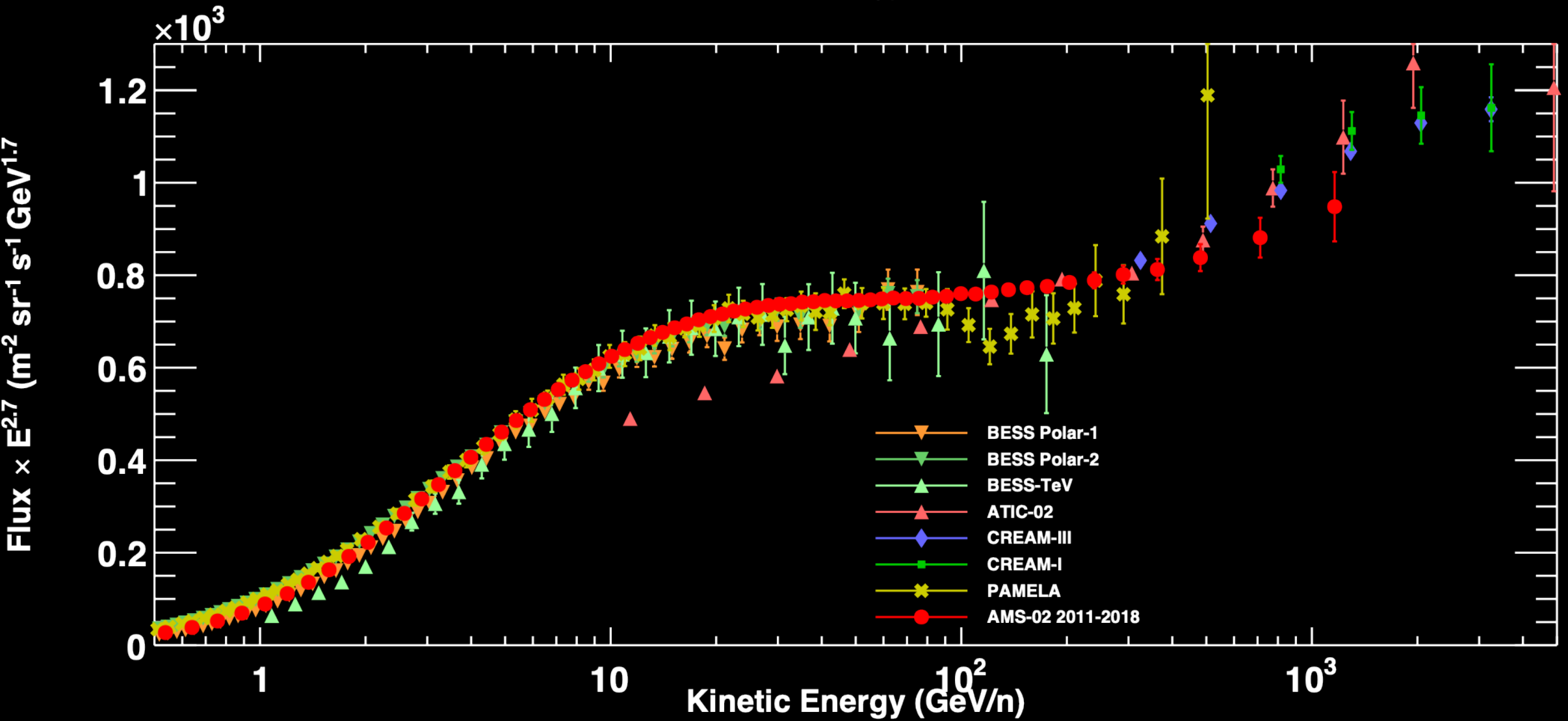
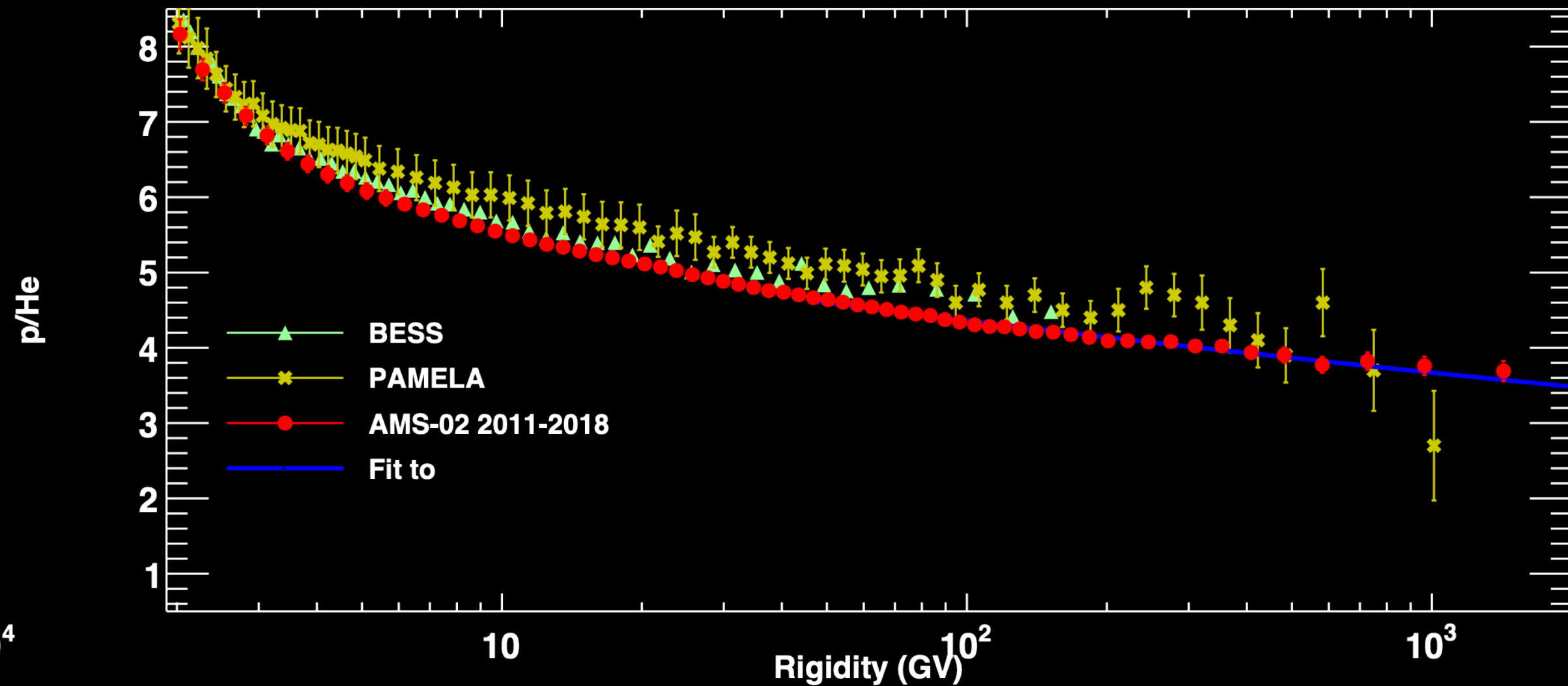
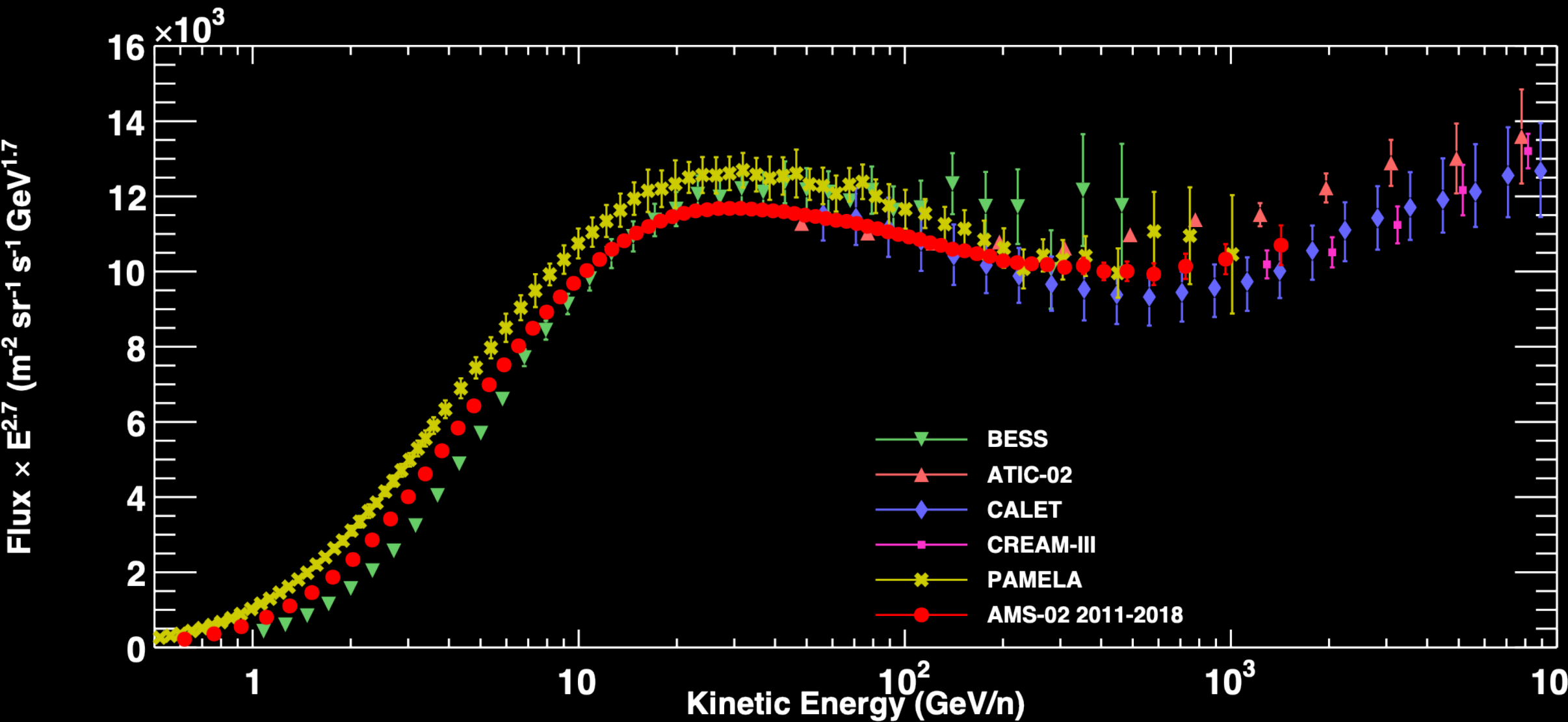


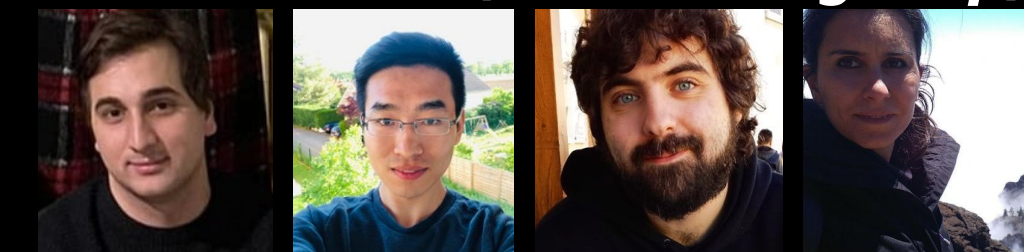
Carica = -2.05 ± 0.05
Massa = $3.81 \pm 0.29 \text{ GeV}/c^2$

I RAGGI COSMICI NELLA GALASSIA

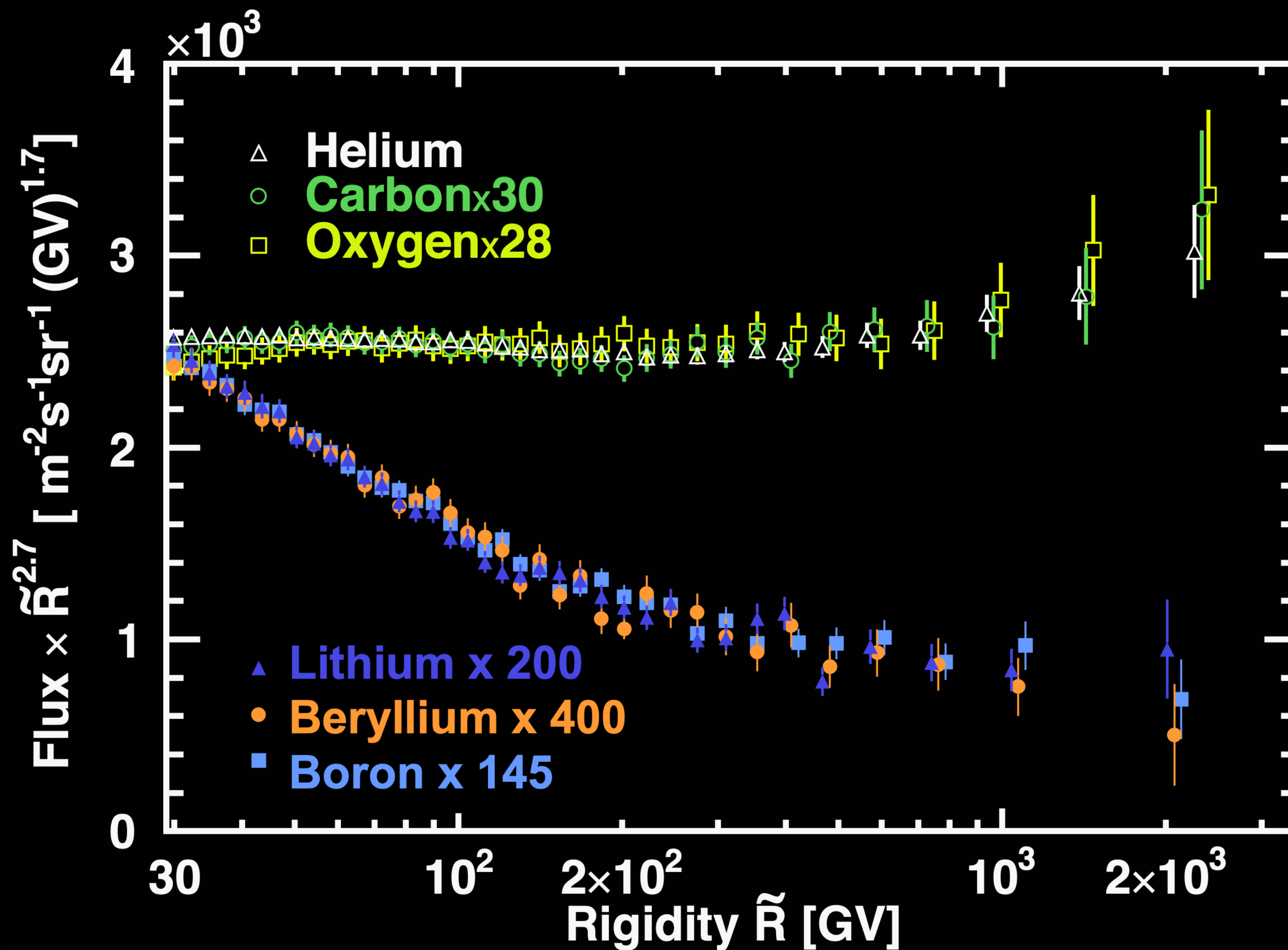
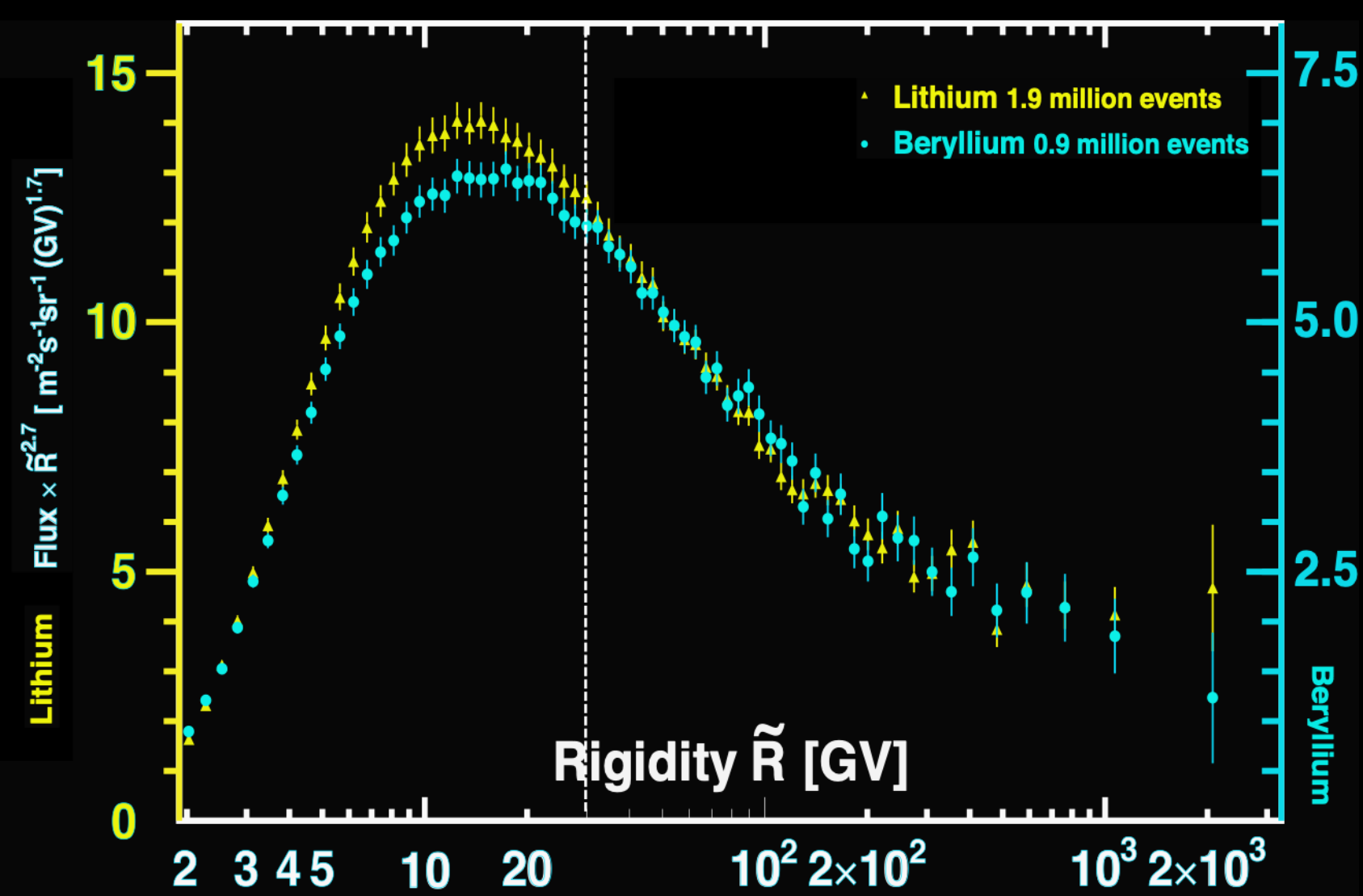
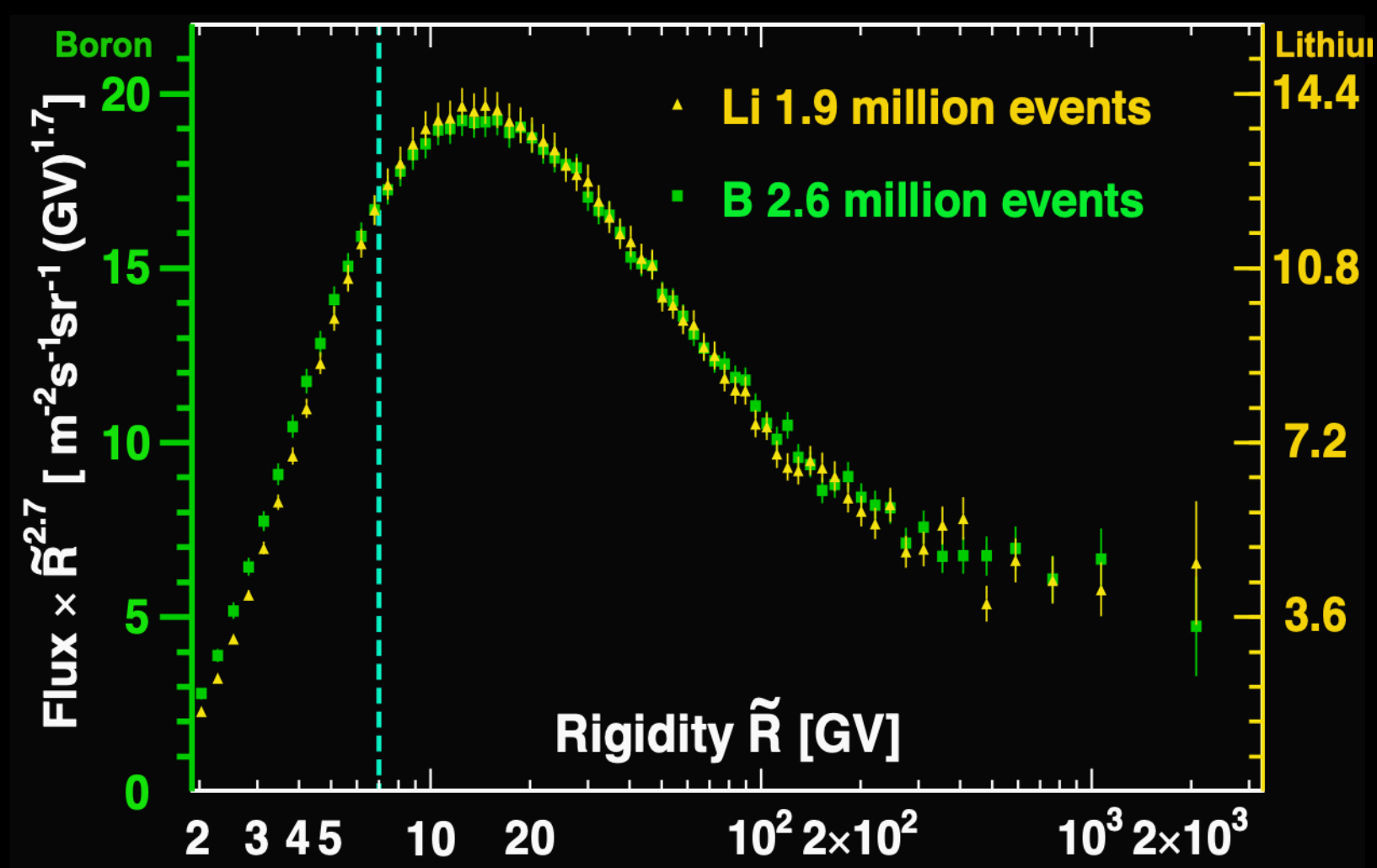


FLUSSI DI PROTONI E ELIO

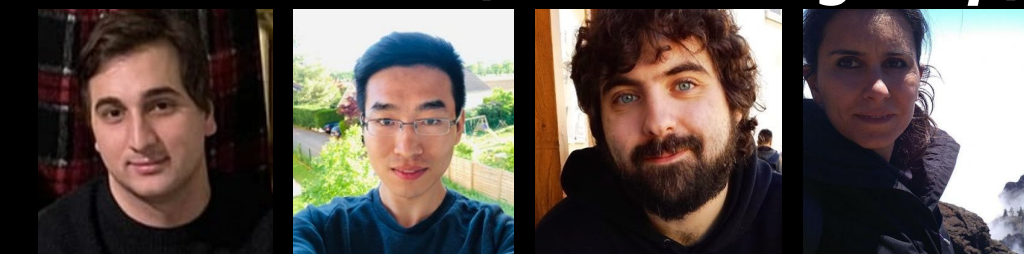




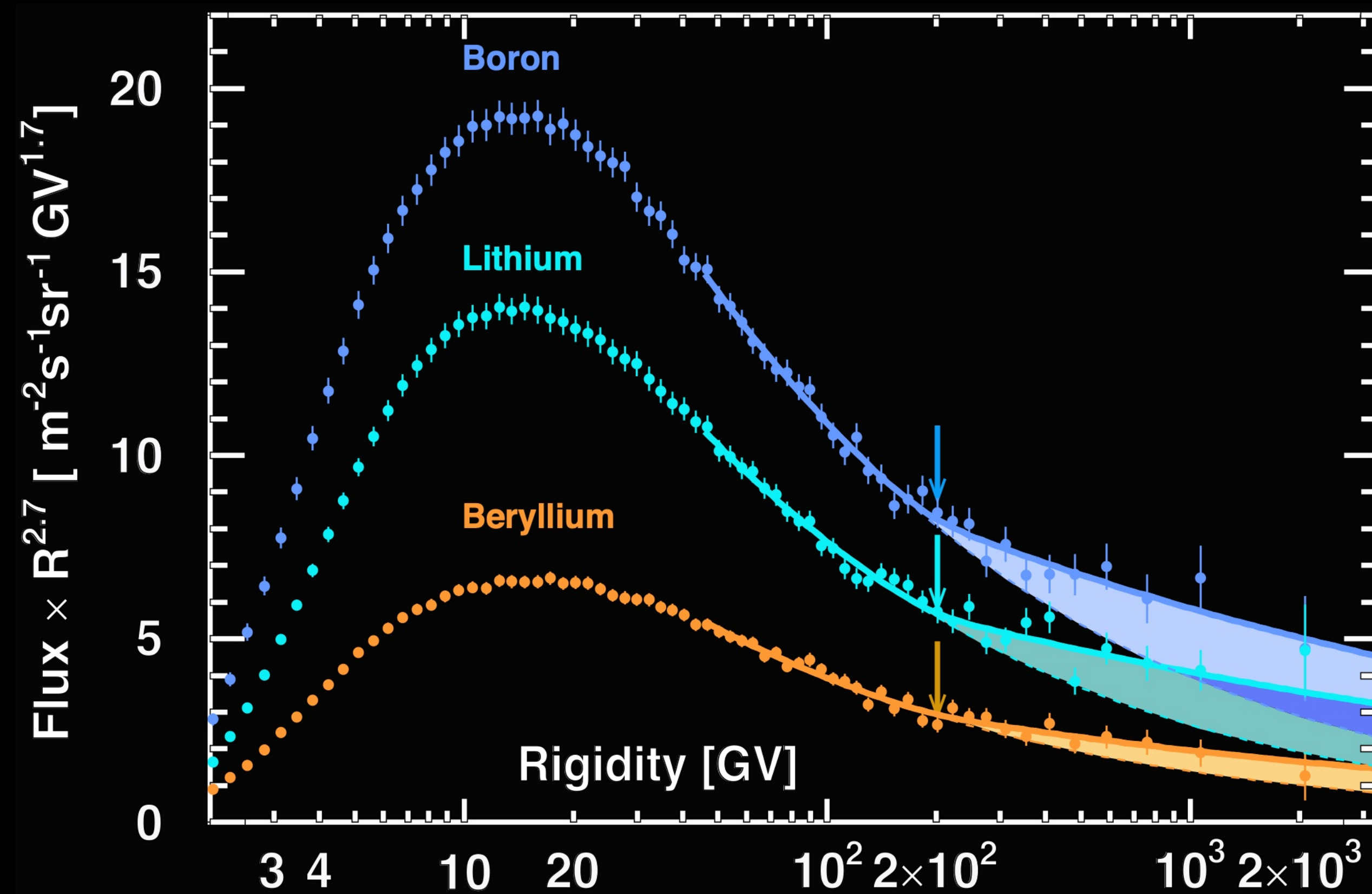
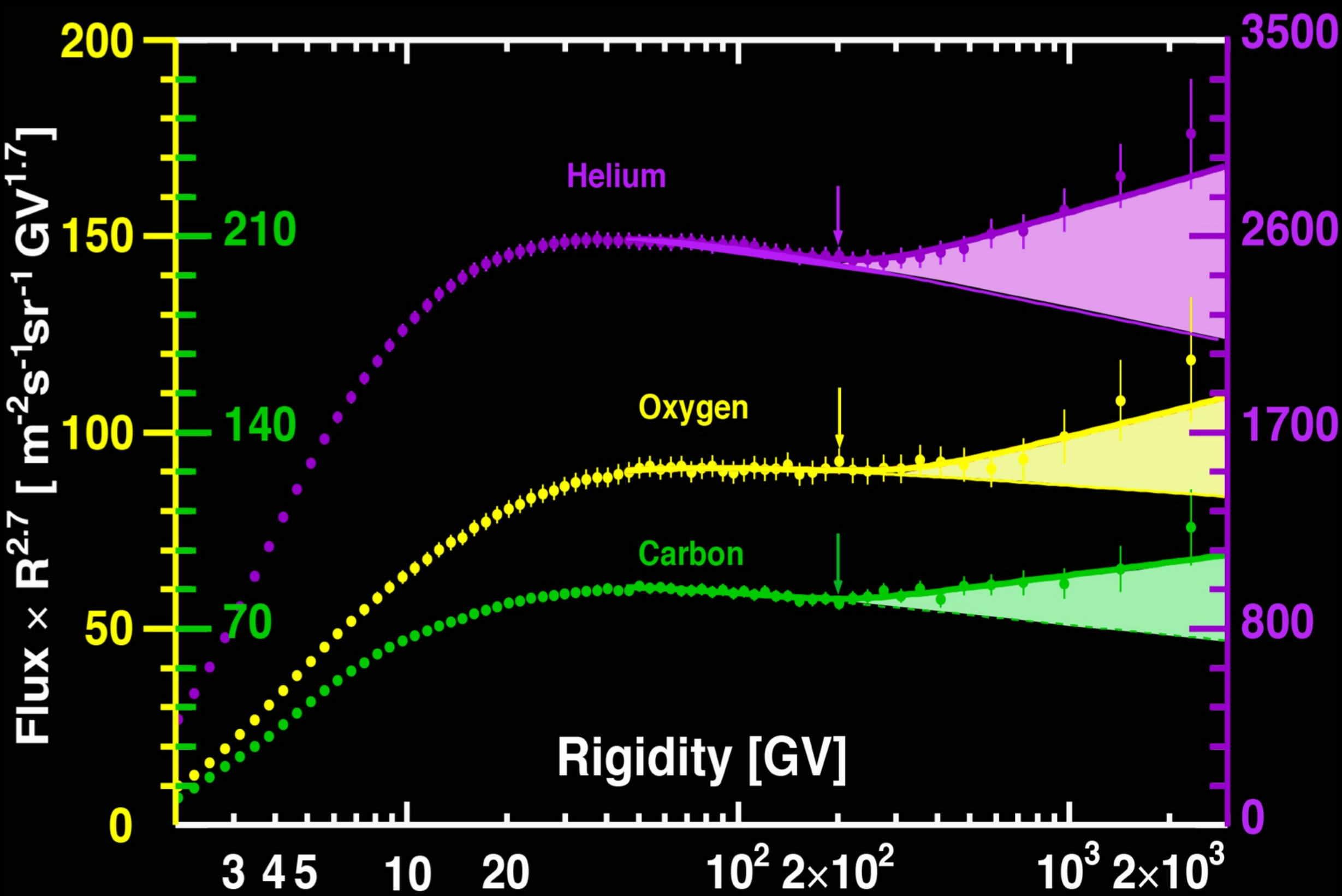
FLUSSI DI NUCLEI LEGGERI



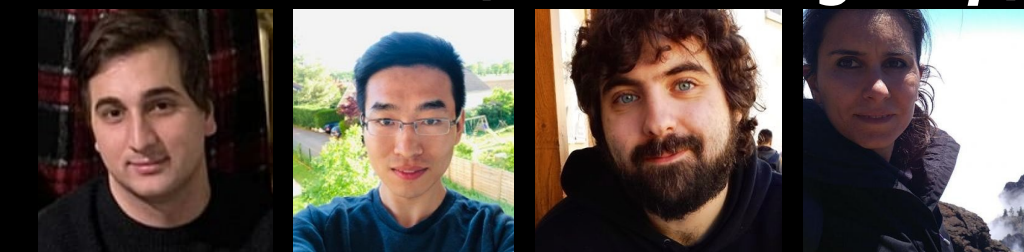
(AMS RM2 group)



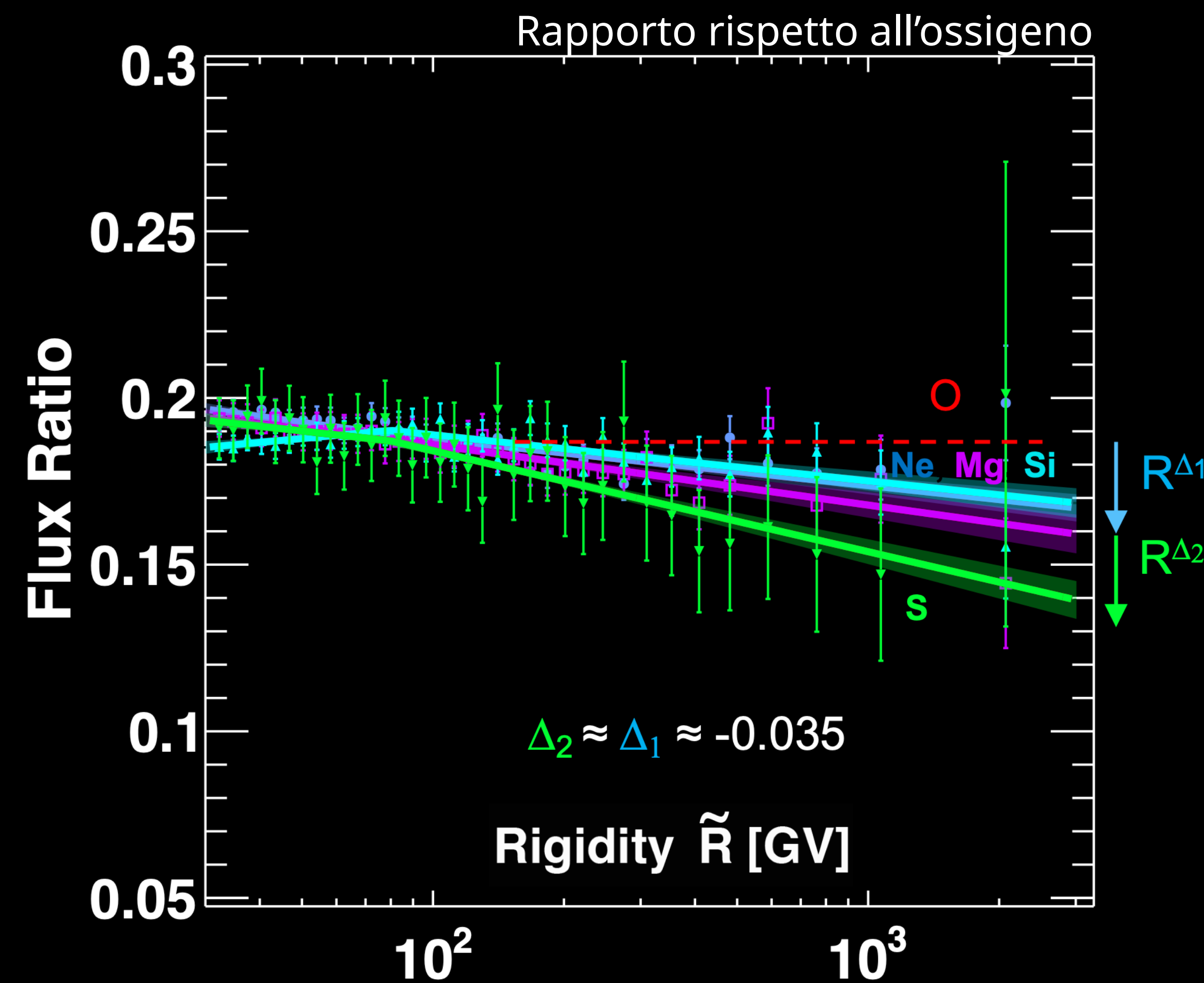
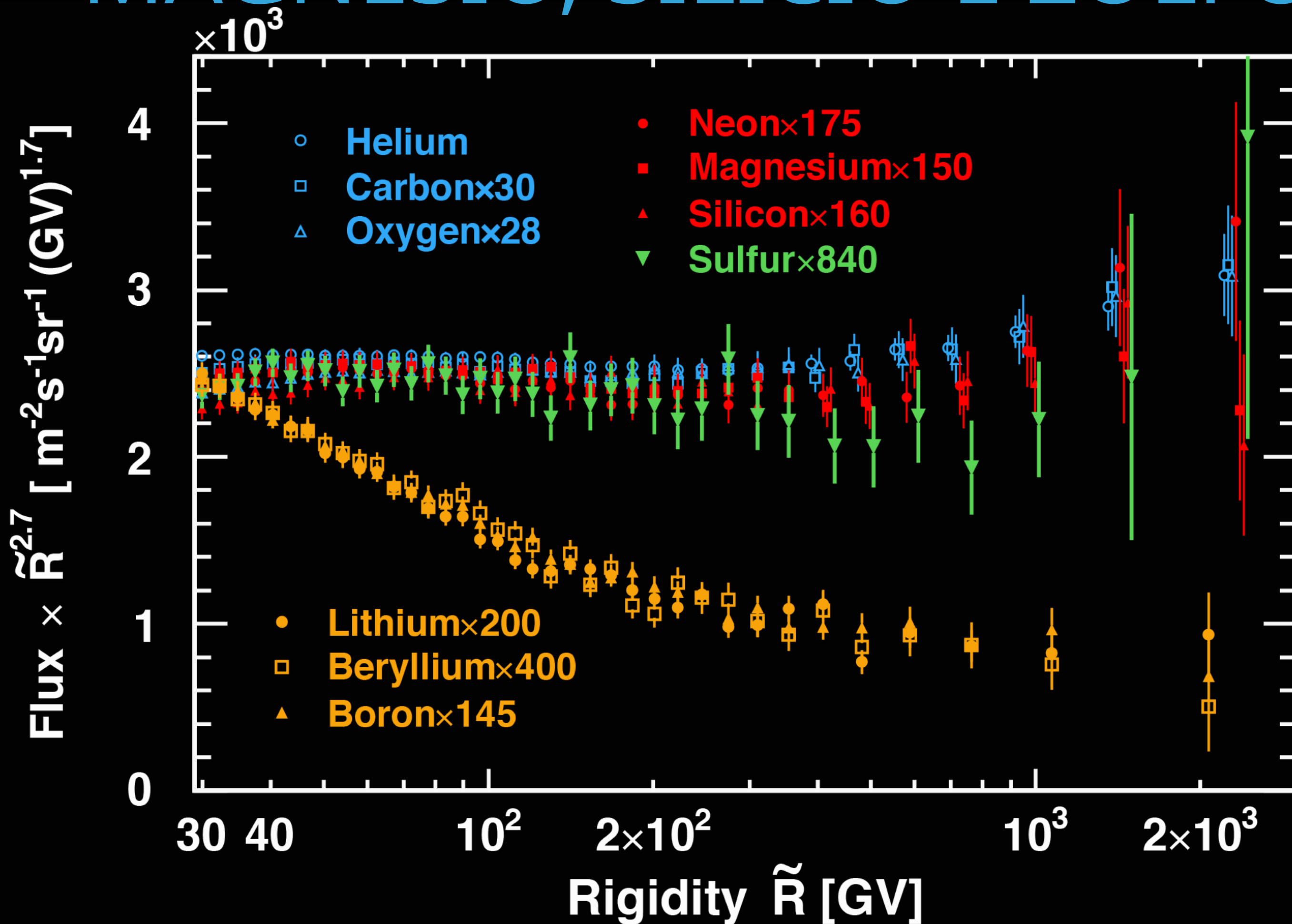
FLUSSI DI NUCLEI LEGGERI: CARATTERISTICHE SPETTRALI



(AMS RM2 group)



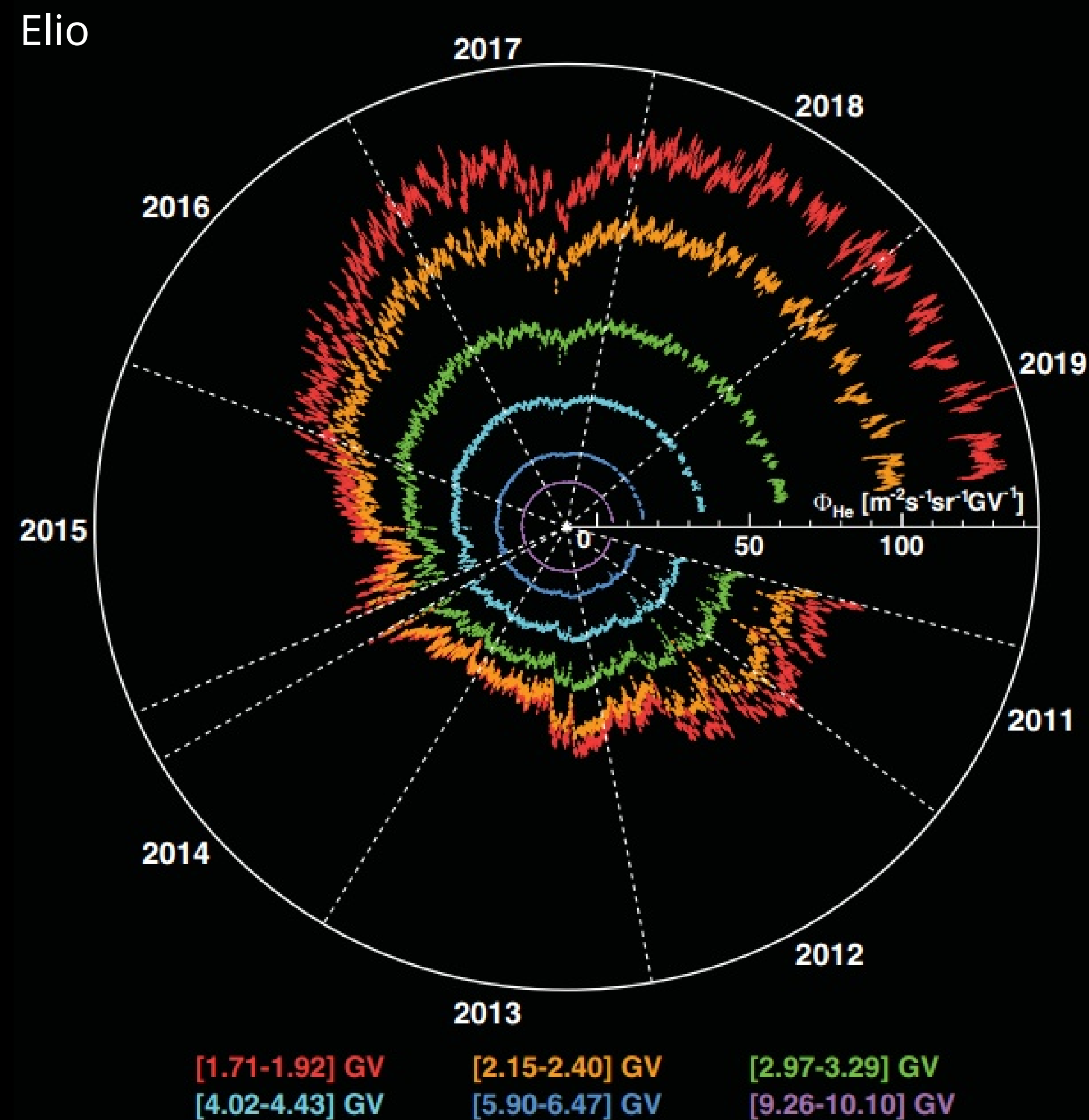
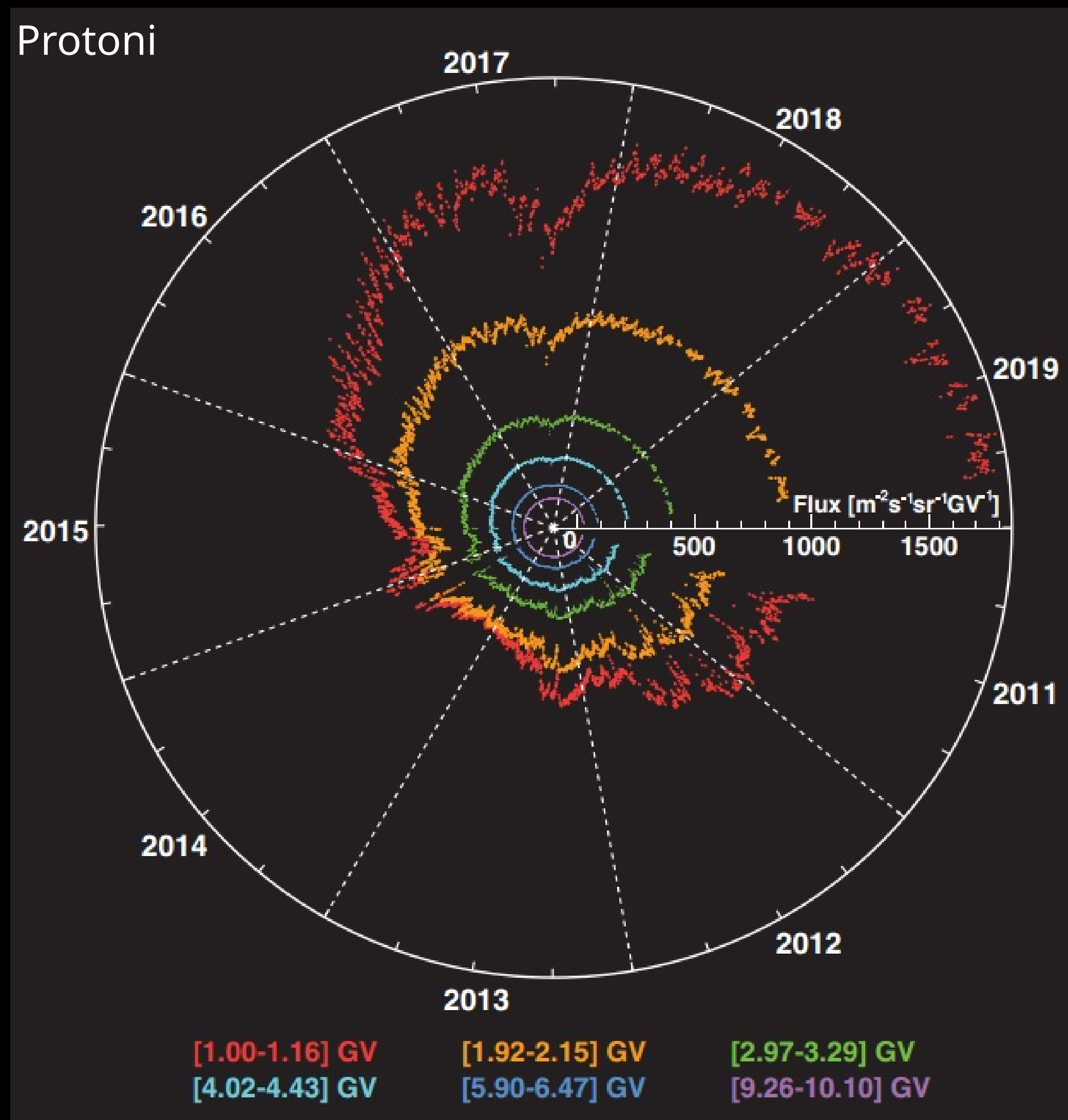
VERSO NUCLEI PIÙ PESANTI: NEON, MAGNESIO, SILICIO E ZOLFO



RAGGI COSMICI NELL'ELIOSFERA

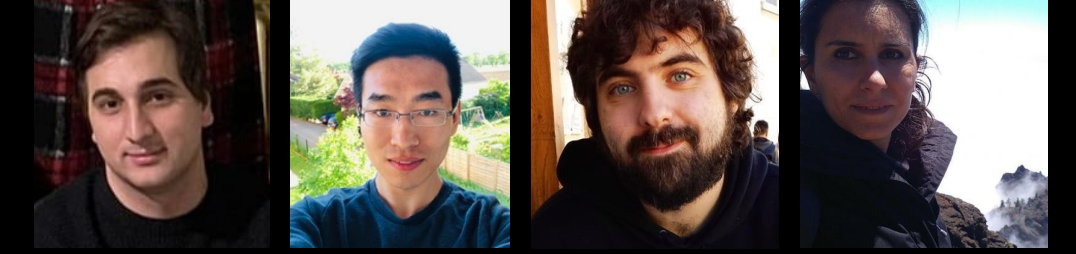


RAGGI COSMICI NELL'ELIOSFERA

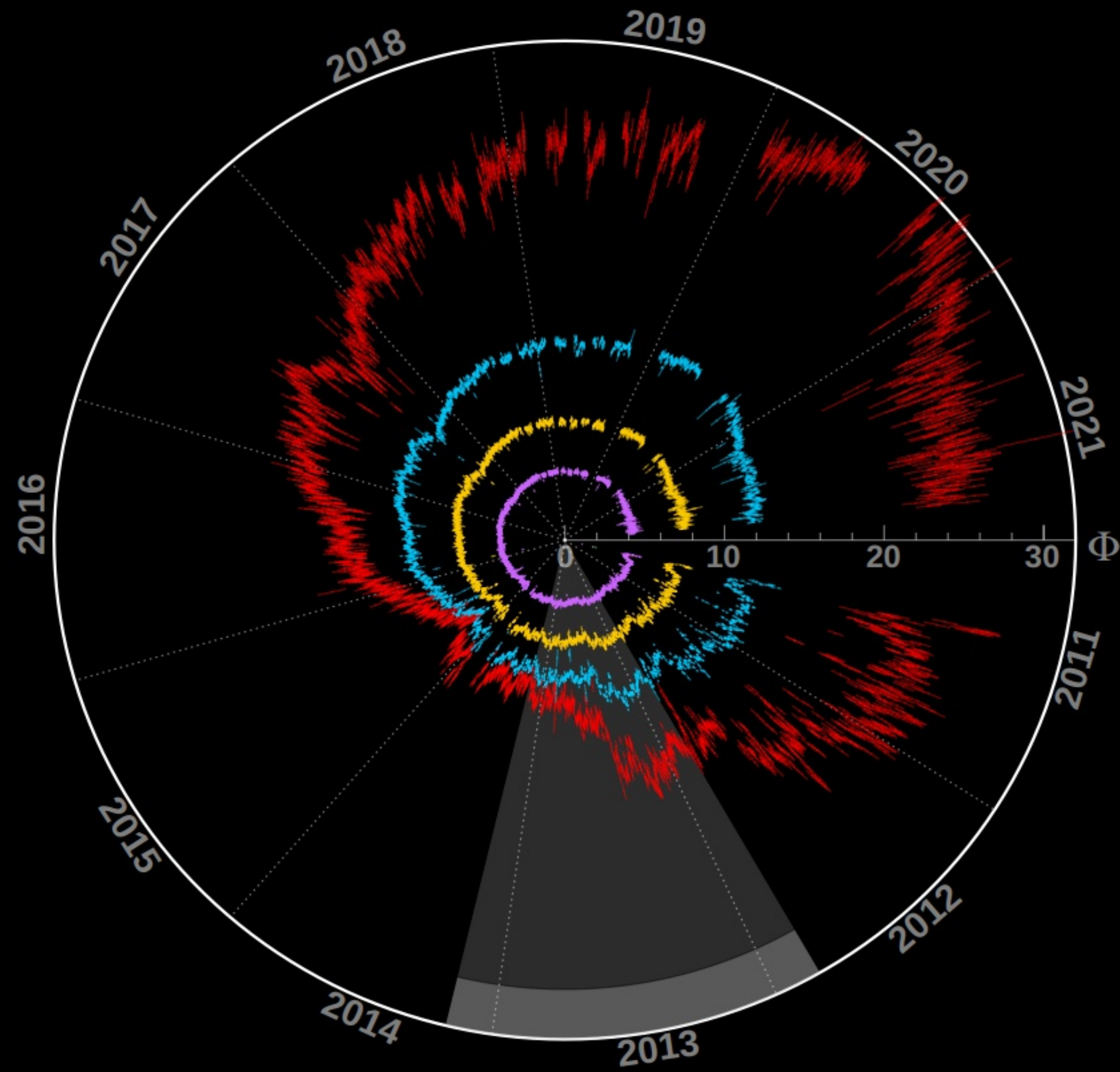


RAGGI COSMICI NELL'ELIOSFERA

(AMS RM2 group)



Elettroni



[1.00 - 1.71] GV Φ_{e^-}

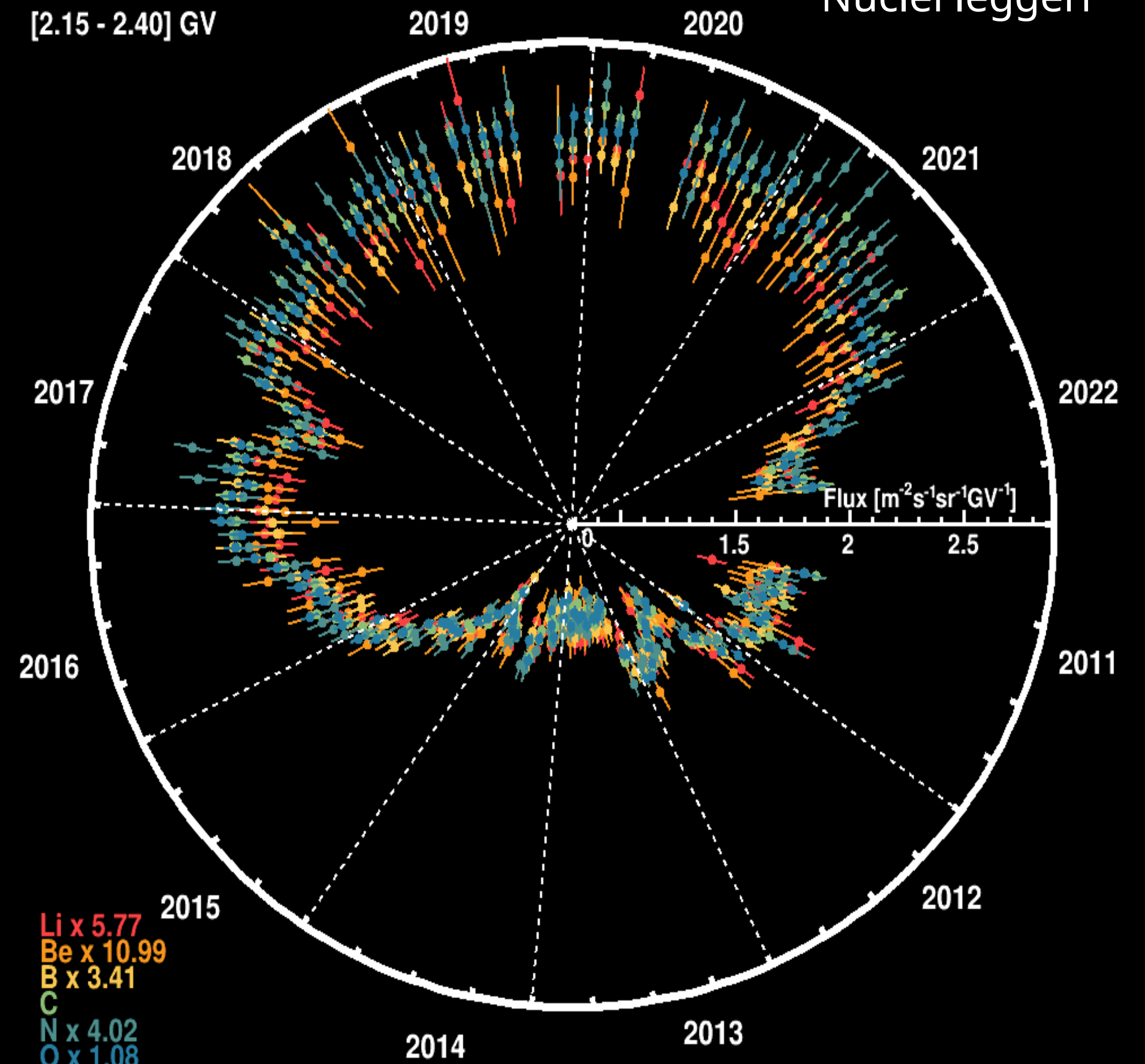
[5.90 - 7.1] GV $\Phi_{e^-} \times 8$

[2.97 - 4.02] GV $\Phi_{e^-} \times 2.5$

[8.48-11.0] GV $\Phi_{e^-} \times 16$

Nuclei leggeri

[2.15 - 2.40] GV



Li x 5.77
Be x 10.99
B x 3.41
C
N x 4.02
O x 1.08

PAYLOAD OPERATION CONTROL CENTER (POCC)



DATA/LEAD

(PM)
TOF/ECAL/RICH

(TEE)
TRACKER/TRD

THERMAL