UNIVERSITÉ
DE GENÈVE

Proton and Helium flux measurements at TeV-PeV energies at the DAMPE experiment

Young researcher day, 16 of September 2022

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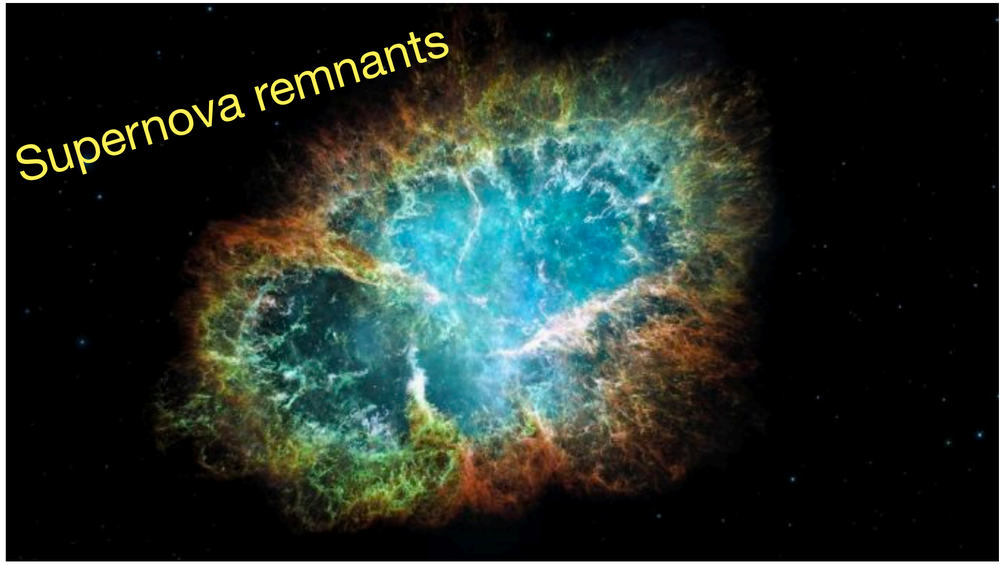
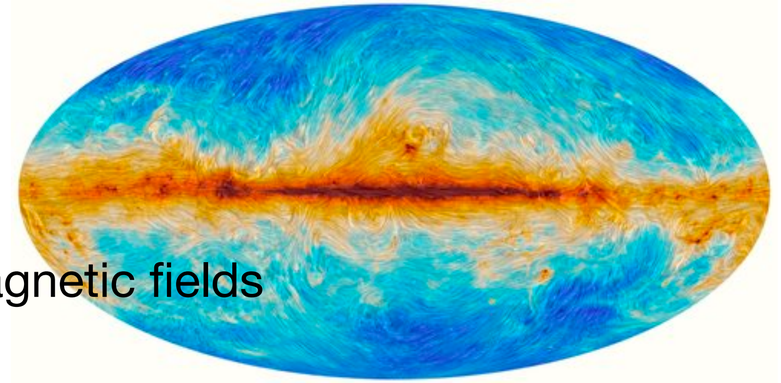
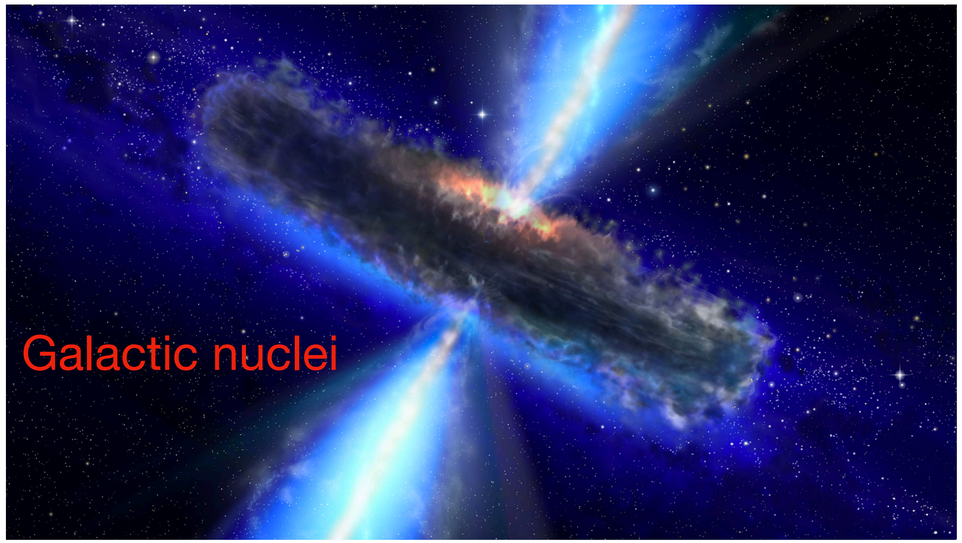
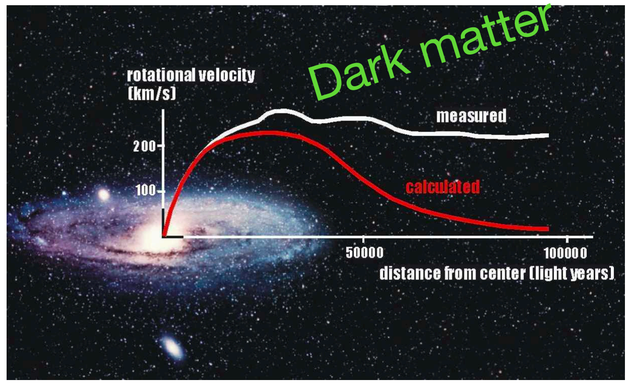
Taken from: https://vinsweb.org/investigating-the-night-sky/

Laboratory of unimaginable scale!









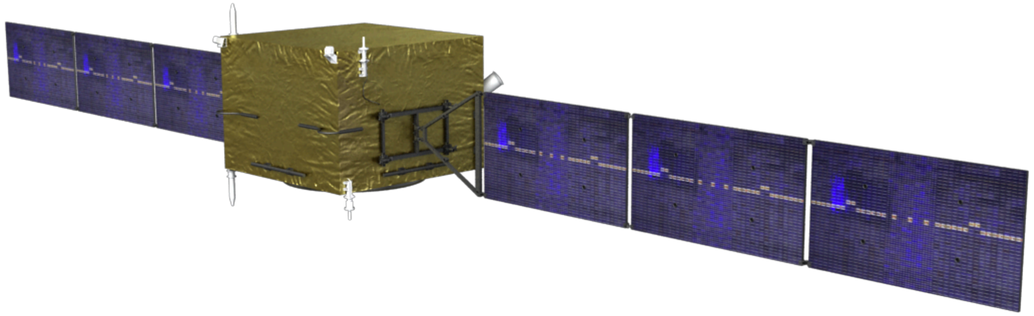
DAMPE experiment

DArk **M**atter **P**article **E**xplorer is a space experiment for direct cosmic and gamma ray detection.

Collaboration consists of Chinese, Italian and Swiss institutions.

Launched on 17th of December 2015.

Sun-synchronous orbit at the altitude of 500km.



DAMPE detector

Plastic Scintillator Detector (PSD):

- 82 plastic scintillator bars arranged in 2 double-layer planes

Silicon-Tungsten Tracker (STK):

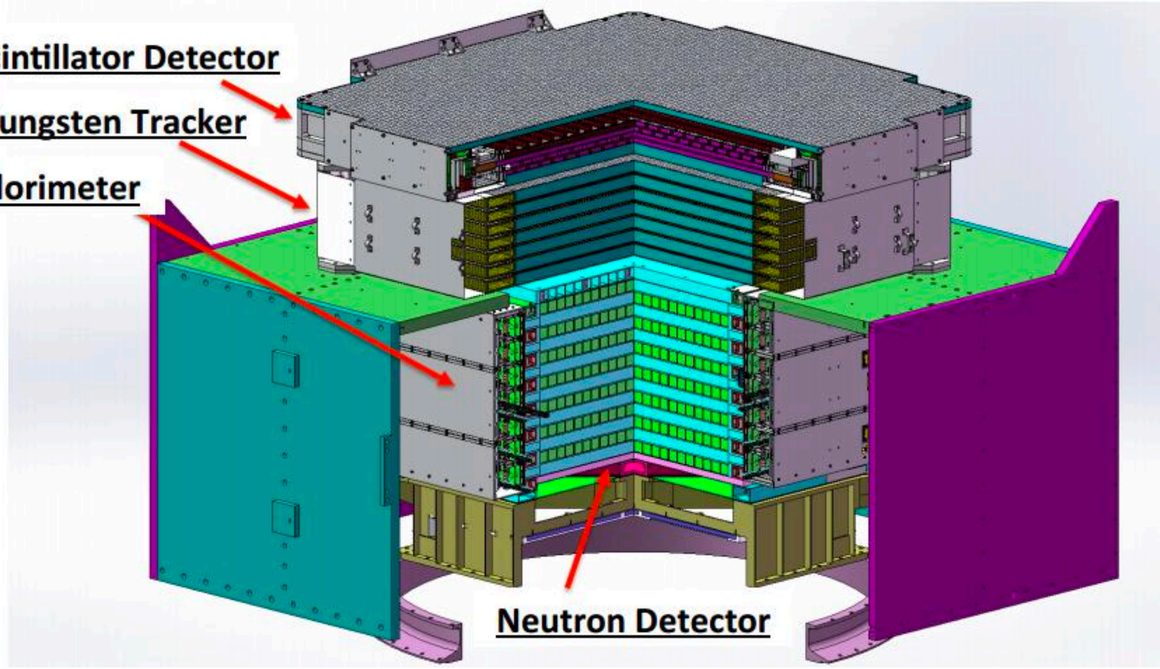
- 6 double-layers with <80 μm resolution
- 3 tungsten conversion plates

BGO calorimeter:

- 14 layers 22 bars each arranged hodoscopically
- 32 radiation lengths, 1.7 interaction lengths

Neutron Detector (NUD):

- 4 plates of boron-loaded scintillator



The biggest calorimeter currently in space!

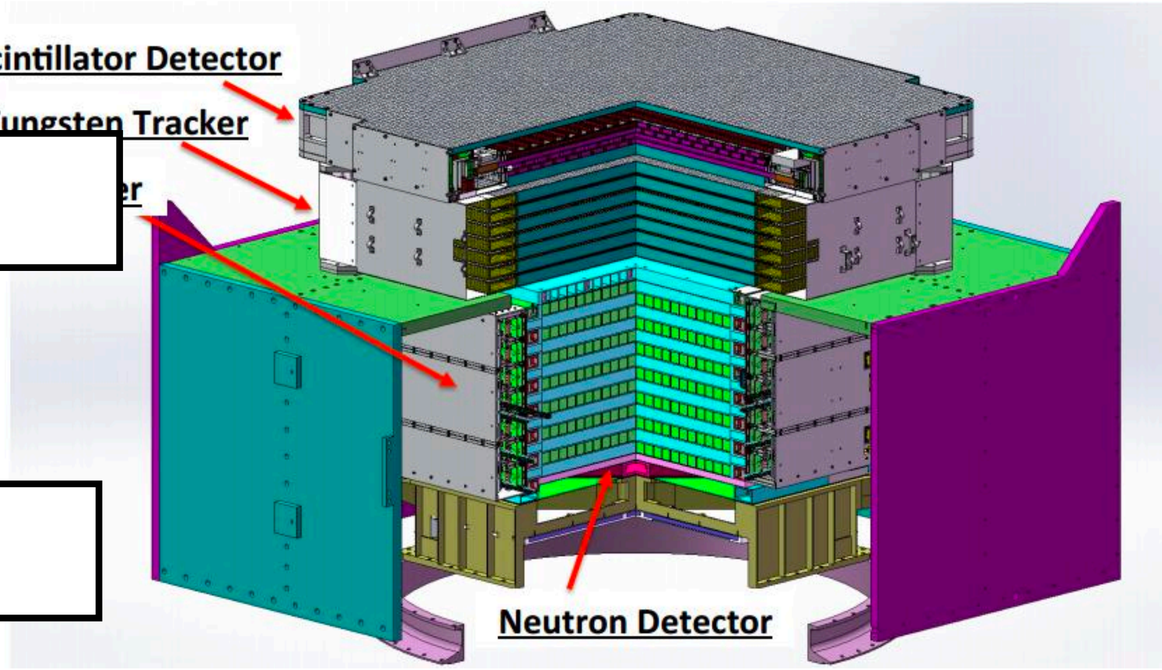
DAMPE detector

Plastic Scintillator Detector (PSD):

Charge measurement

Silicon-Tungsten Tracker (STK):

Trajectory reconstruction



BGO calorimeter:

- 14 layers 22 bars each arranged
- lengths

Released energy image

Hadron or not?

st calorimeter currently in space!

Why we (well, scientists) care about proton(hydrogen) or helium flux?

YouTube CH

university of geneva

Welcome to the University of Geneva

39,987 views **Jul 17, 2017** This movie has been shown on the occasion of the Ceremony of Dies academics 2016.

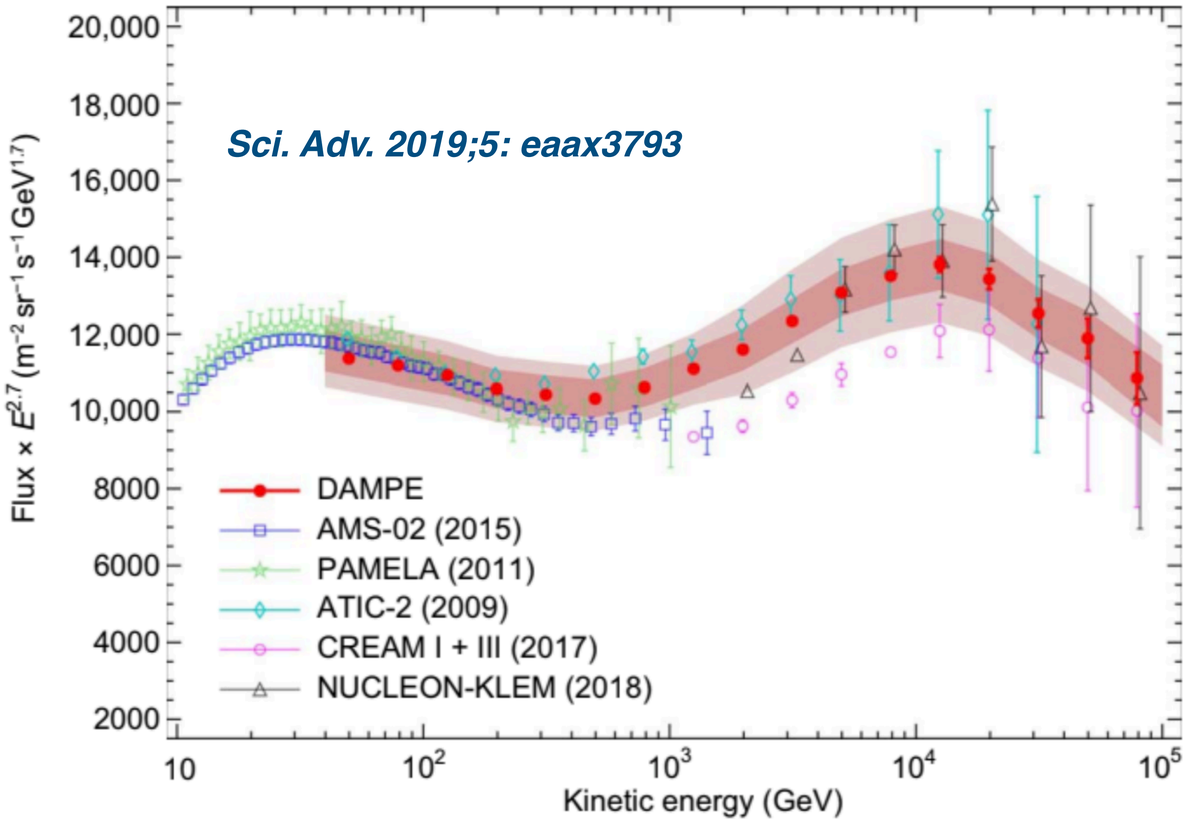
Why do we (scientists) care about p/He?

- Understanding cosmic ray acceleration (SNR, acceleration threshold charge dependent etc)
- Understanding cosmic ray propagation (distribution of matter and fields in Galaxy)

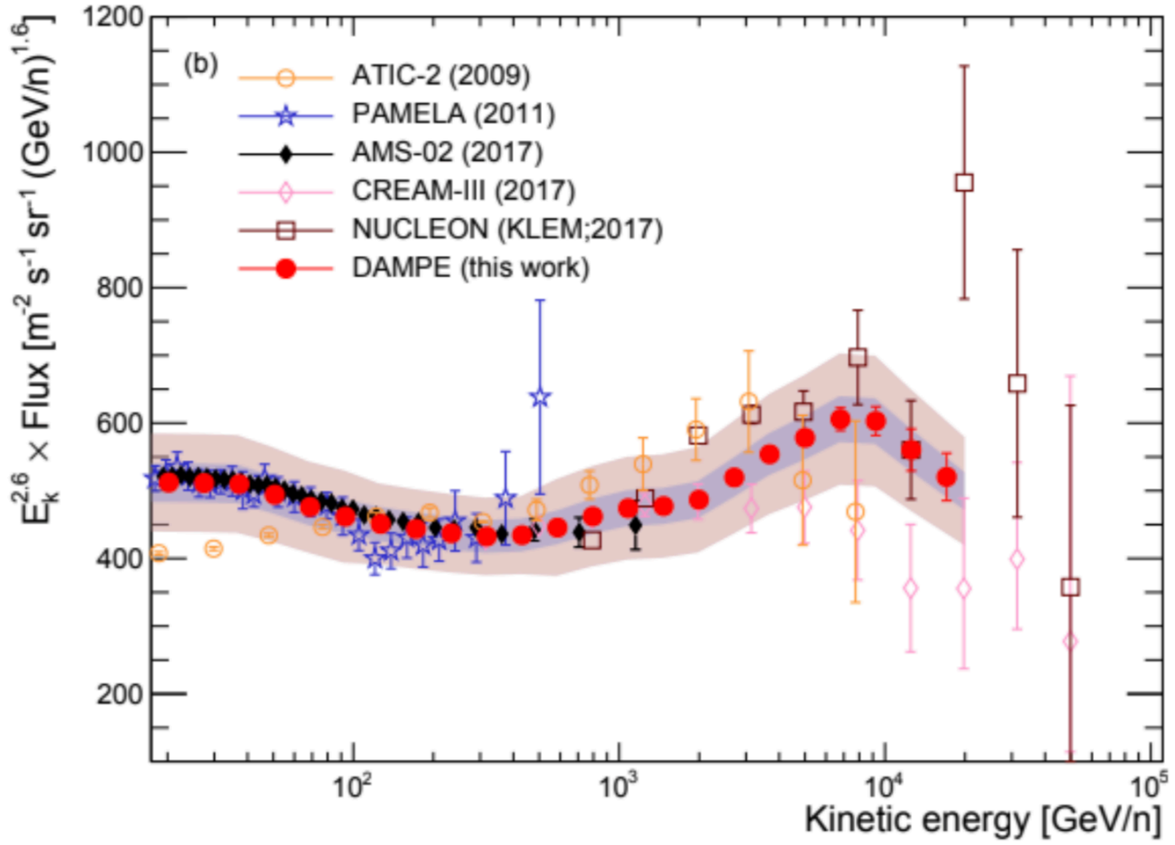
Why do we (scientists) care about p/He?

- Understanding cosmic ray acceleration (SNR, acceleration threshold charge dependent etc) TeV-PeV energy range is extremely important
- Understanding cosmic ray propagation (distribution of matter and fields in Galaxy)

Published DAMPE p/He fluxes



Phys. Rev. Lett. **126**, 201102



Published DAMPE p/He flux

- High statistics for a direct measurement experiment
- Confirms previously measured spectral features and reveals new!
- Dominated by hadronic physics simulations uncertainty

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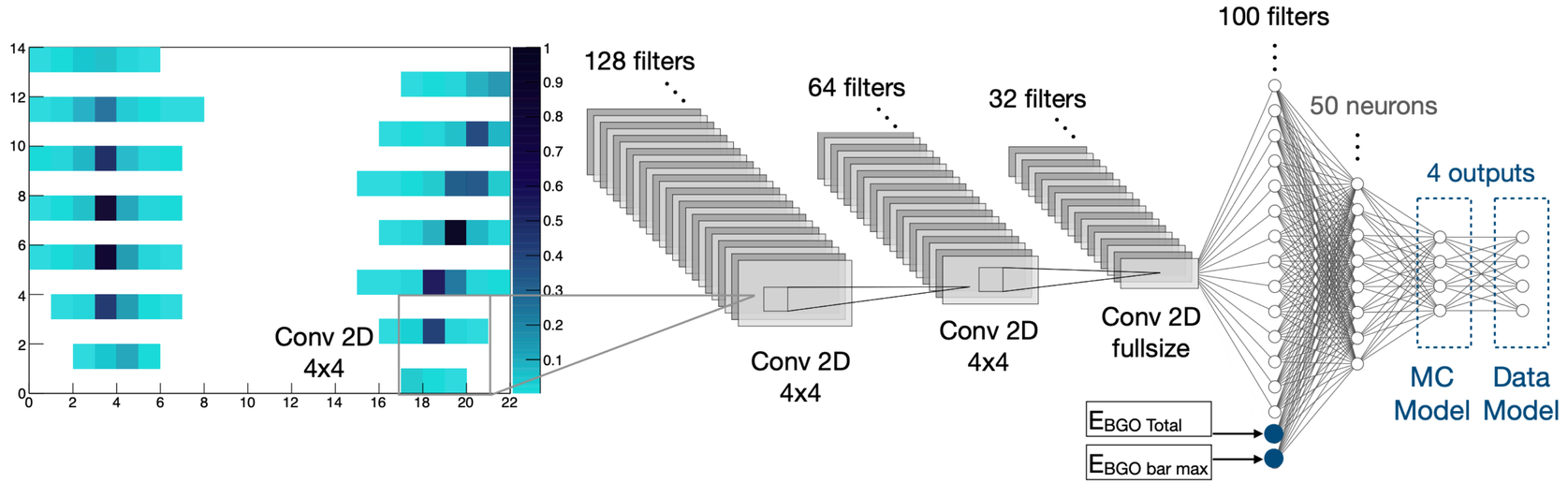
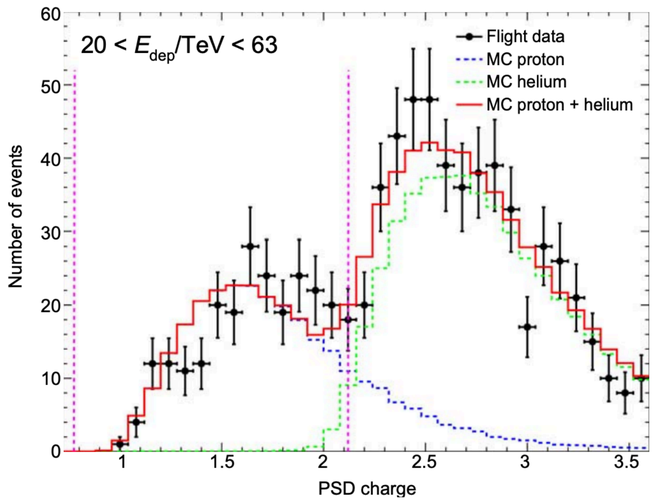
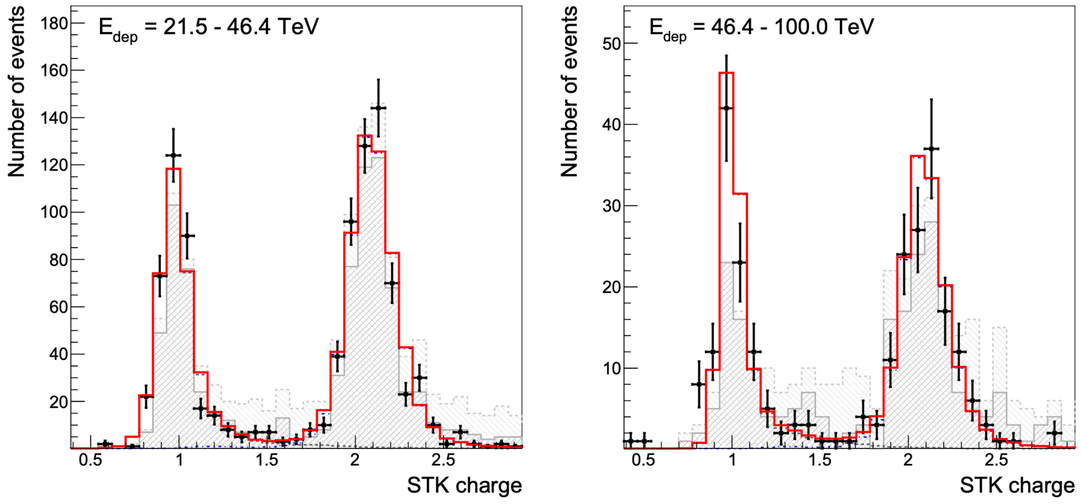
Task: to extend measurements to higher energies and reduce hadronic physics uncertainty

Improving charge identification using ML

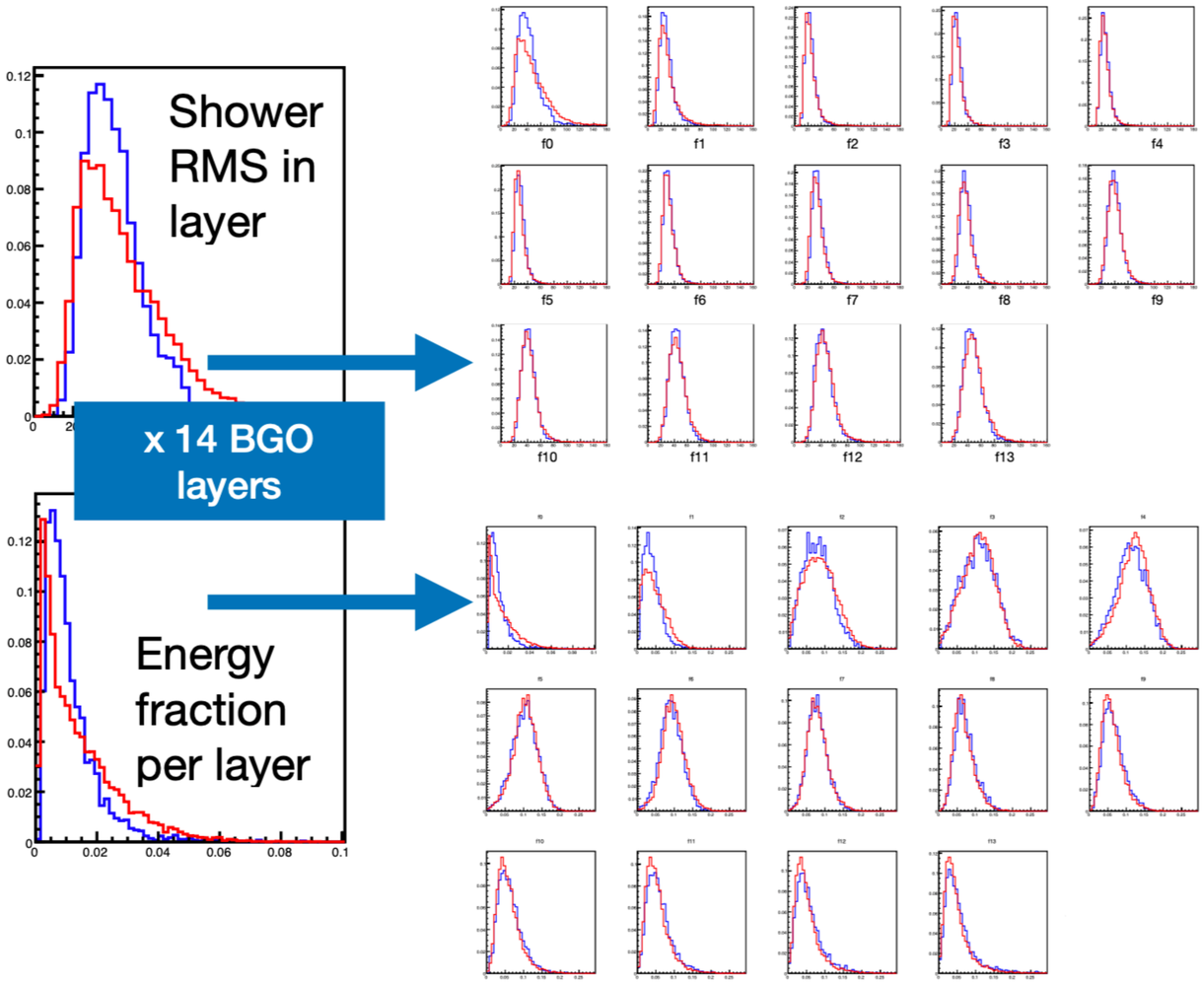


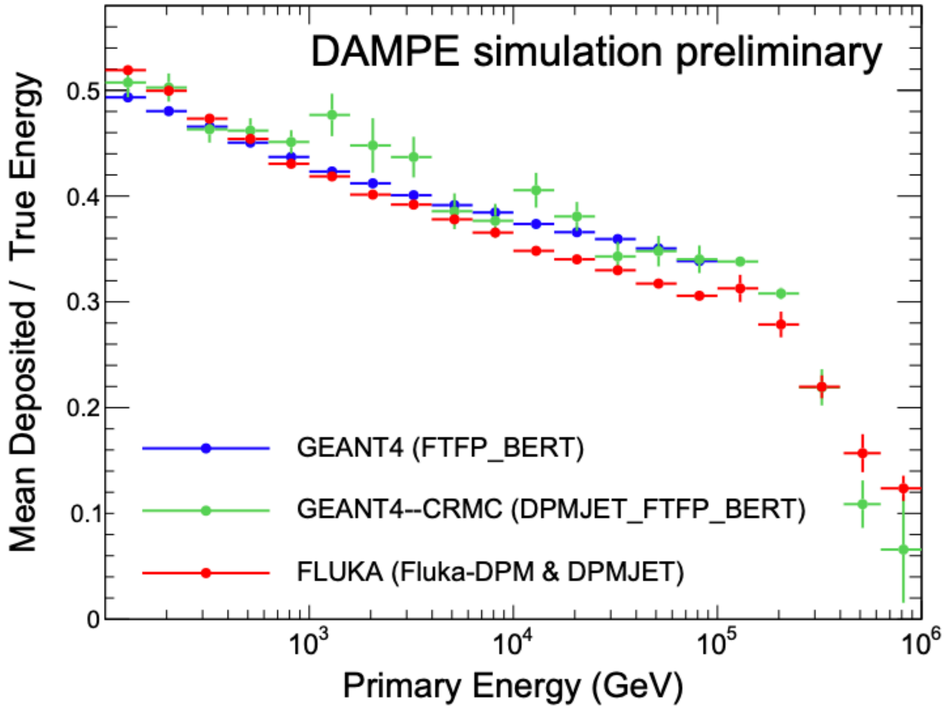
arXiv:2206.04532

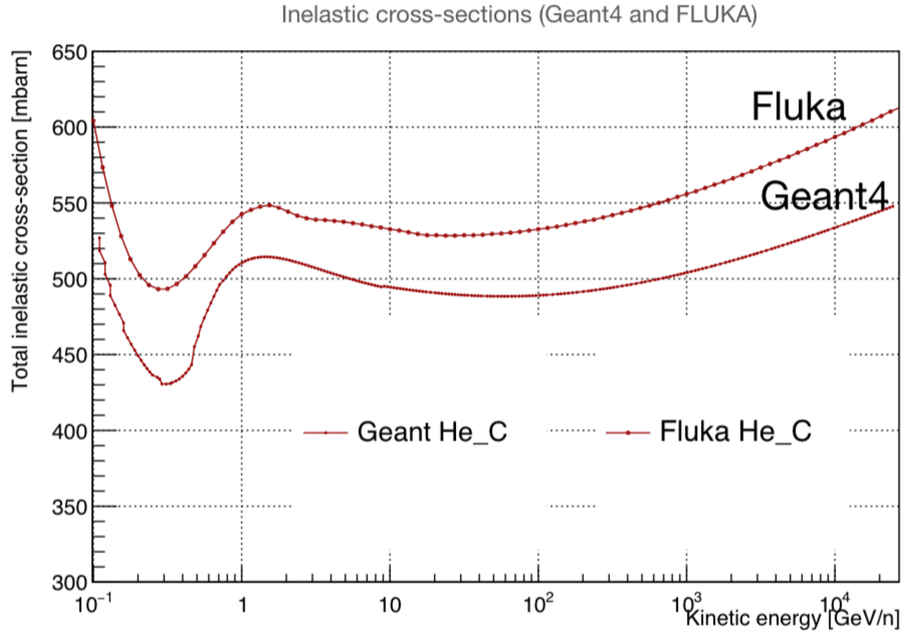




Hadronic uncertainty



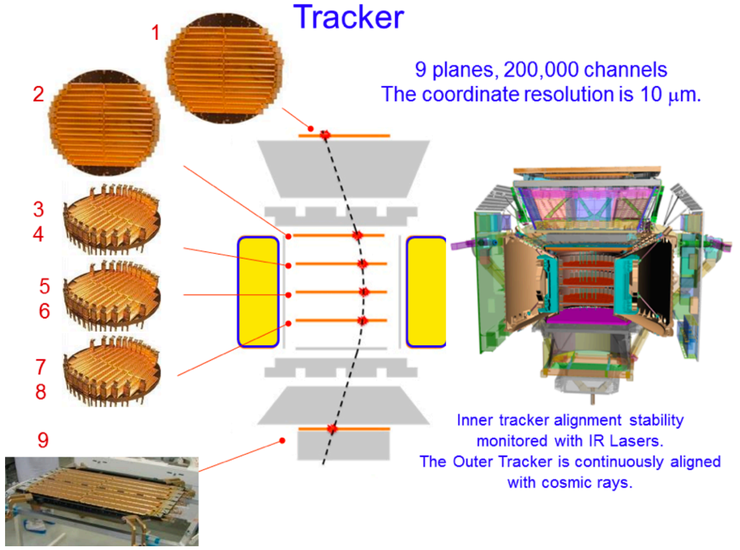




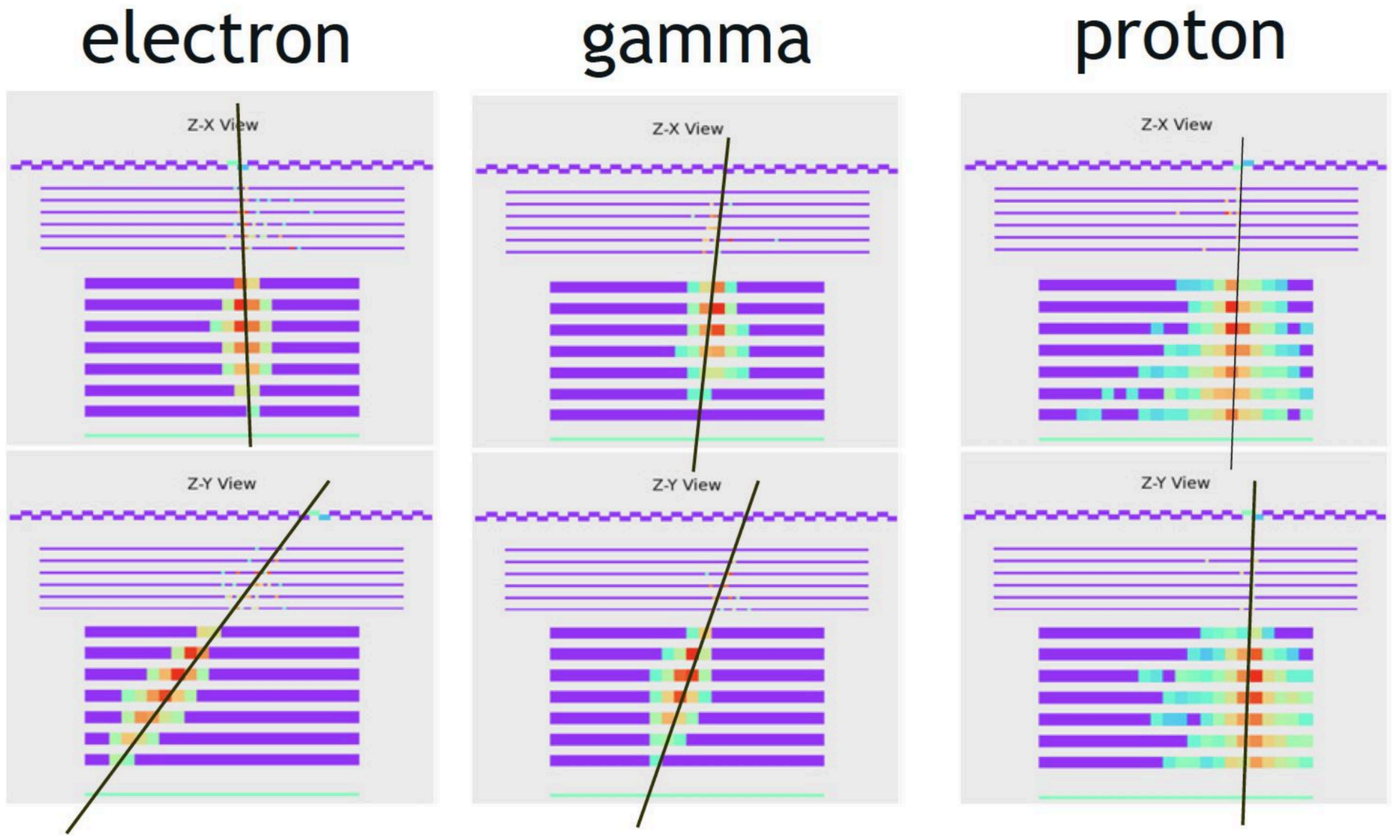
Questions!(?)

Backup

Spectrometric vs calorimetric experiment



Spectrometric vs calorimetric experiment



Particle identification

- Given persons height is 1.68m. Is it men or a woman?