THE GRAMS PROJECT

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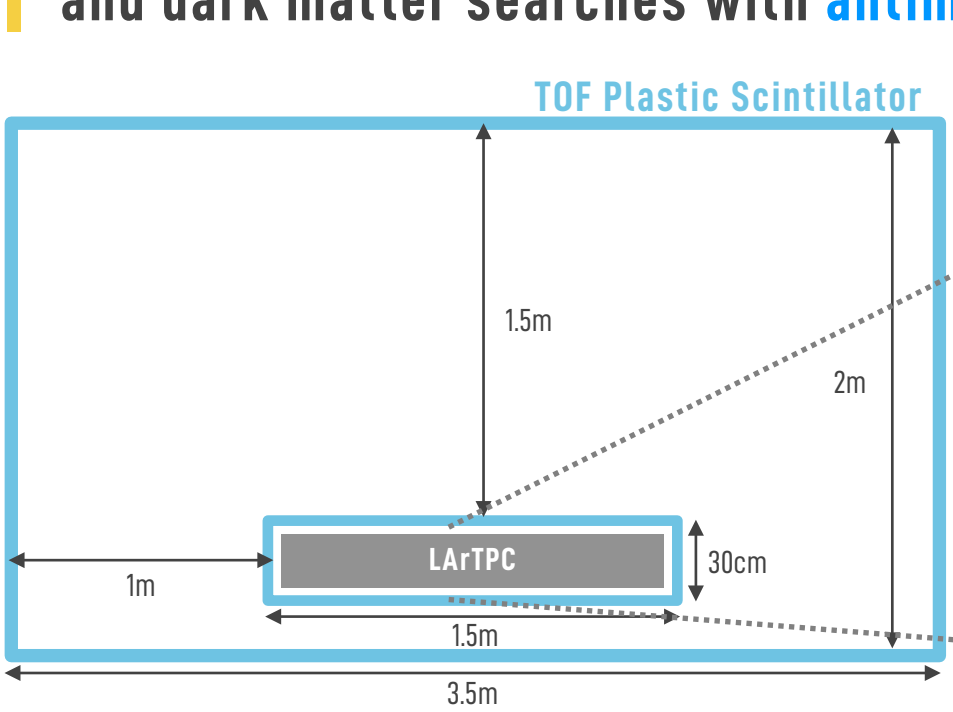
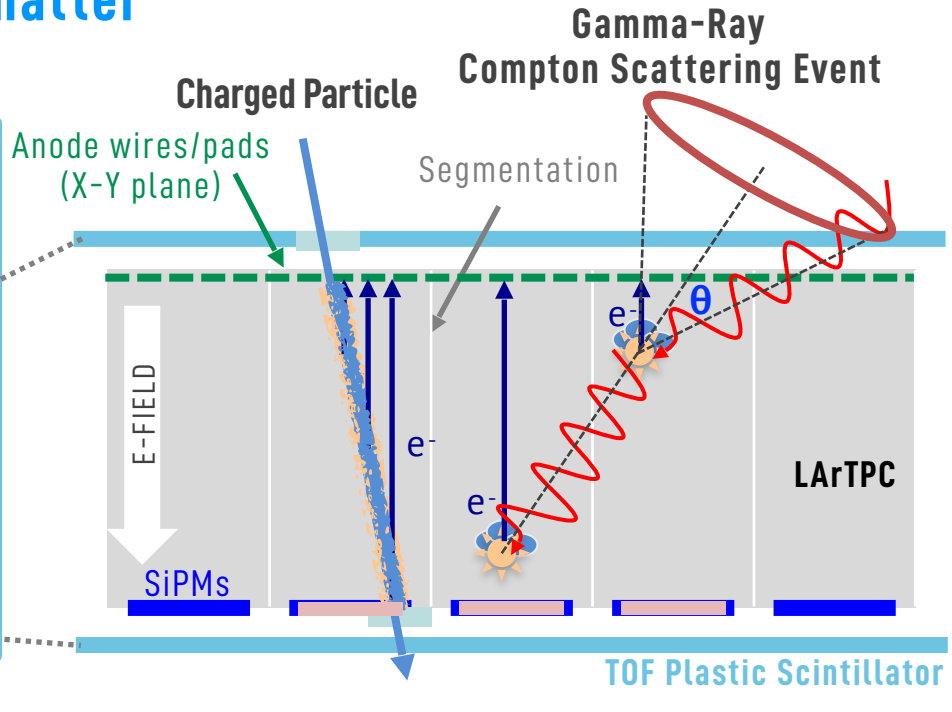
On behalf of the GRAMS Collaboration

Snowmass Instrumentation Frontier:
Noble Elements Topical Group Meeting, 7/27, 2020

GRAMS = GAMMA-RAY AND ANTIMATTER SURVEY

- A newly proposed project and an international collaboration has formed
- First balloon experiment with a low-cost, large-scale, LArTPC detector, expandable to a satellite mission
- First to target both astrophysical observations with MeV gamma-rays and dark matter searches with antimatter



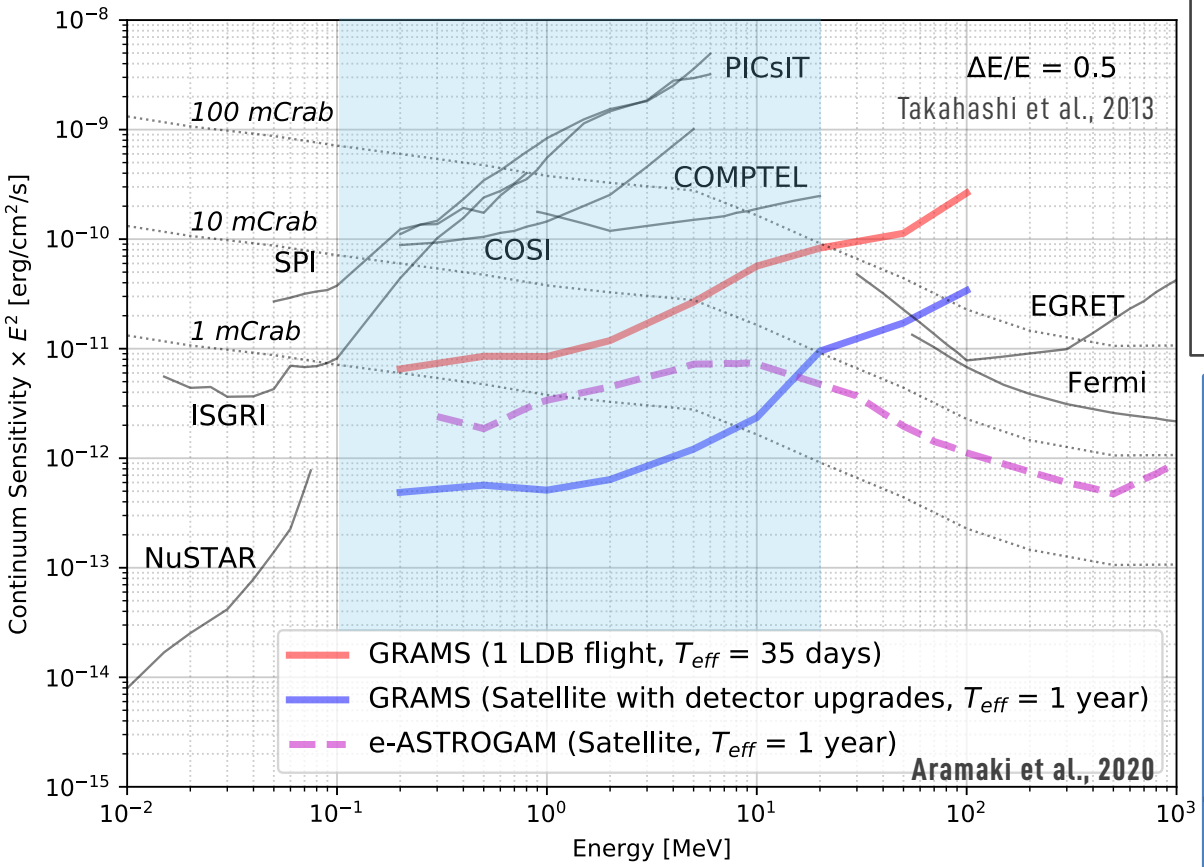


LARTPC WORKS AS A PARTICLE TRACKER, CALORIMETER FOR ANTIMATTER COMPTON CAMERA, CALORIMETER FOR GAMMA-RAYS

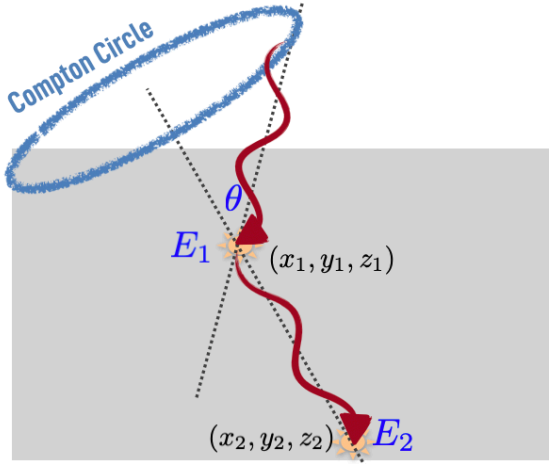
GRAMS MEV GAMMA-RAY OBSERVATIONS

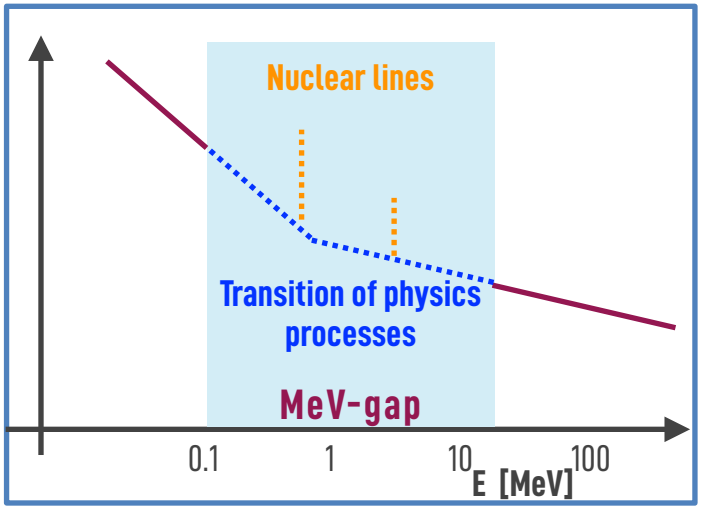
MeV gamma-ray spectrum/line studies

- Physics processes/nucleosynthesis
- Multi-messenger astronomy
- Indirect dark matter searches



Compton scattering process dominates in MeV
Good **energy** & **spacial** resolution required

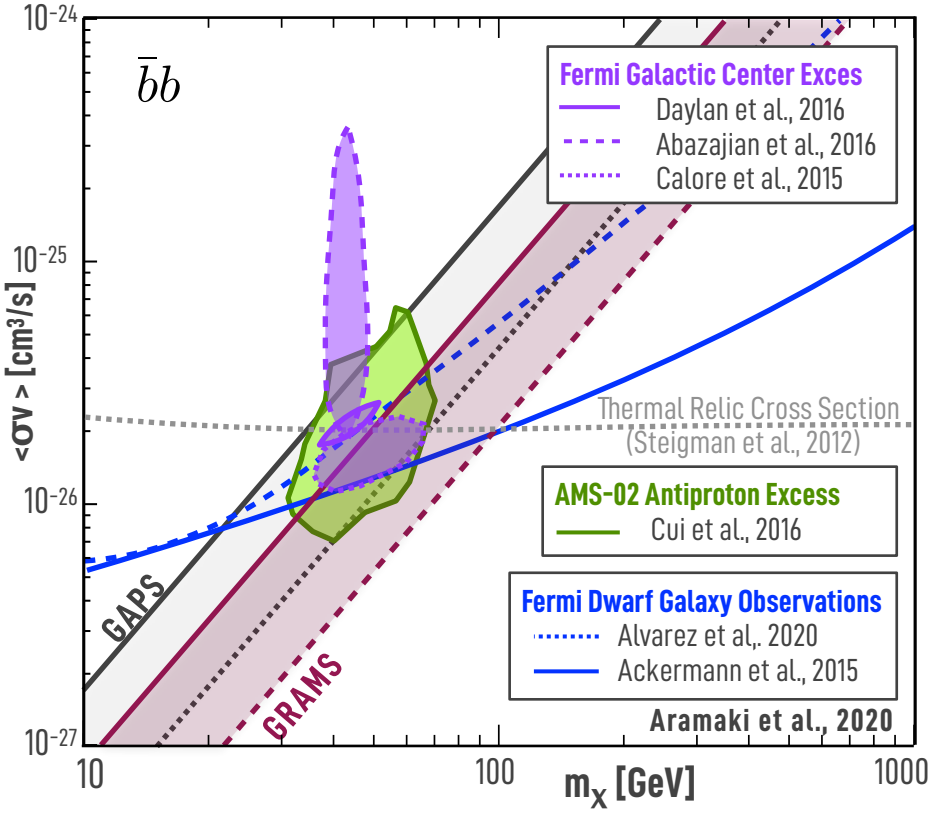




SINGLE BALLOON FLIGHT: AN ORDER OF MAGNITUDE IMPROVED SATELLITE MISSION: COMPARABLE (BETTER) TO FUTURE MISSIONS

GRAMS ANTIMATTER SURVEY

Possible DM detection reported in FERMI GCE, AMS-02 antiproton excess
Background-free DM searches with low-energy antideuterons

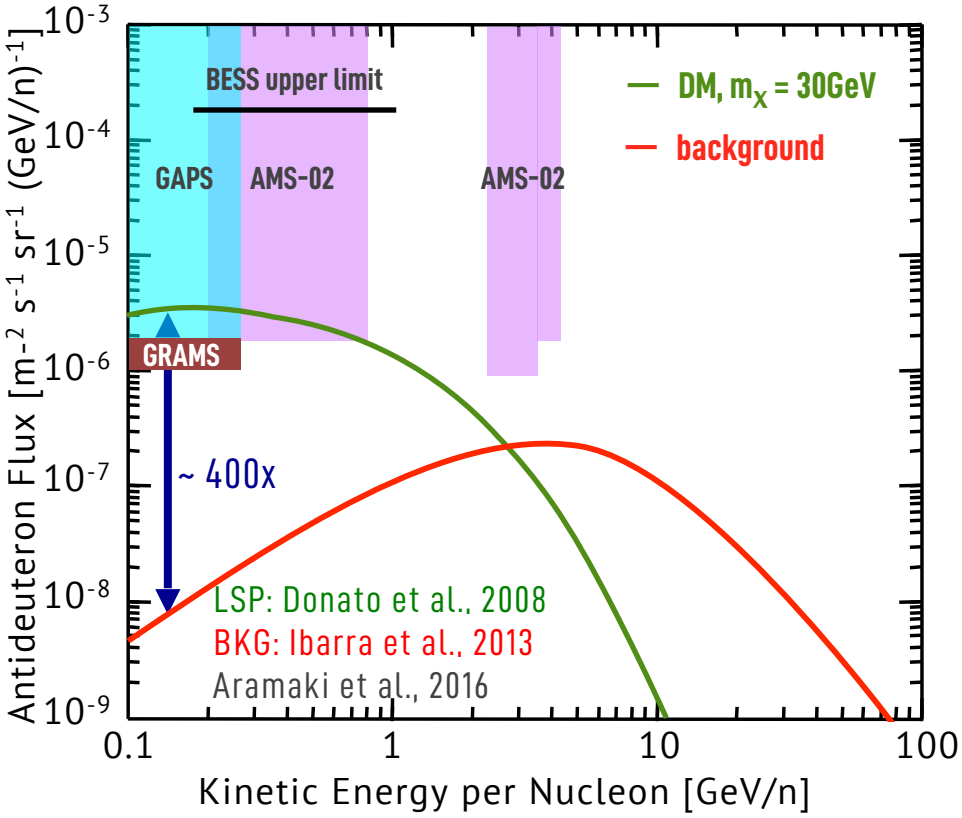


GAPS first science flight scheduled in 2022

GRAMS = next-generation experiment

Primary flux = DM annihilation/decay

Secondary flux = cosmic-ray interaction



GRAMS COULD FULLY INVESTIGATE FERMI GCE, AMS-02 ANTIPROTON EXCESS
CURRENTLY EVALUATING ANTIHELIUM SENSITIVITY

WE ARE EXPANDING OUR COLLABORATION! PLEASE JOIN US!

We are preparing for a Snowmass white paper.

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