



ALICE

Antihelium-3 fluxes near Earth using data-driven estimates for annihilation cross section

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Antihelium-3 cosmic rays and interactions

Propagation

- ▶ Using GALPROP [1].
- ▶ Parameters from [2] were used here.

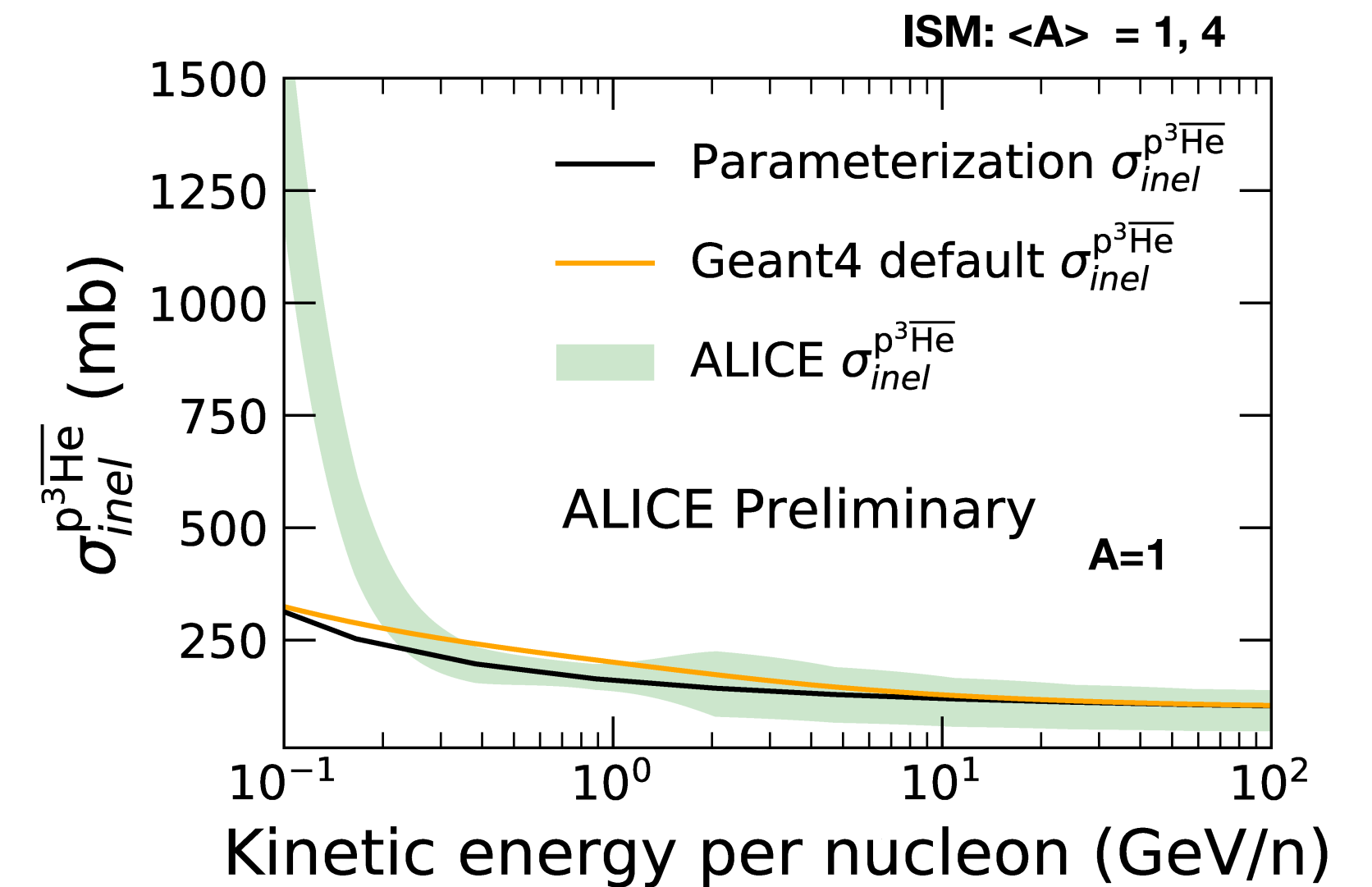
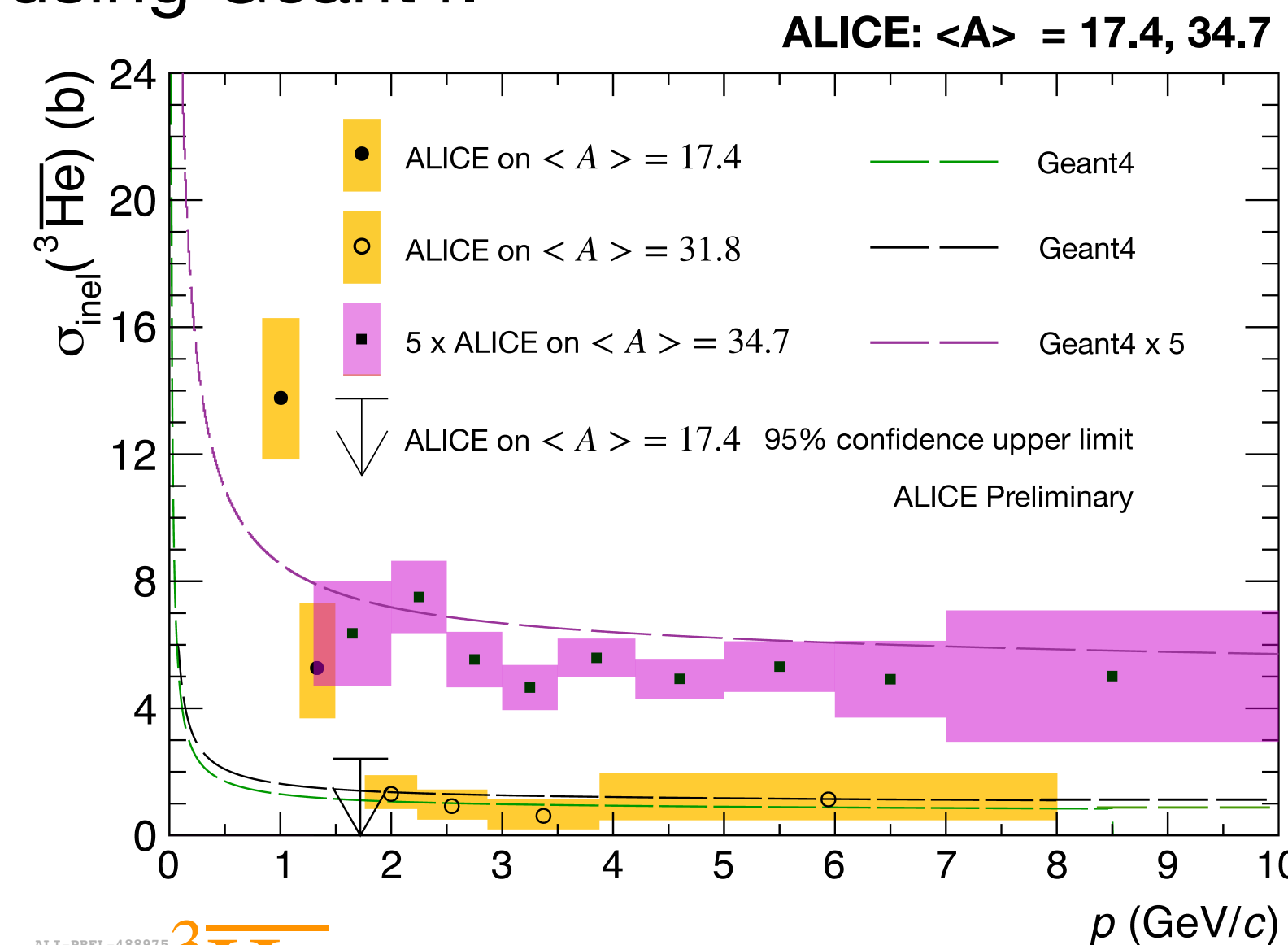
$$q(\vec{r}, p) + \vec{\nabla} \cdot (D_{xx} \vec{\nabla} \psi - \vec{V} \psi) + \frac{\partial}{\partial p} p^2 D_{pp} \frac{\partial}{\partial p} \frac{\psi}{p^2} - \frac{\partial}{\partial p} \left[\psi \frac{dp}{dt} - \frac{p}{3} (\vec{\nabla} \cdot \vec{V}) \psi \right] - \frac{\psi}{\tau_f} = \frac{\partial \psi}{\partial t}$$

$^3\overline{\text{He}}$ Source Functions

- ▶ $^3\overline{\text{He}}$ spectra produced in DM annihilation taken from [3].
- ▶ $^3\overline{\text{He}}$ production cross section in cosmic ray collisions with interstellar medium taken from [4].

$^3\overline{\text{He}}$ Annihilation Cross Section

- ▶ $^3\overline{\text{He}}$ inelastic cross section measured using ALICE detector as a target material.
- ▶ The annihilation cross sections on proton and helium-4 targets were estimated using Geant4.

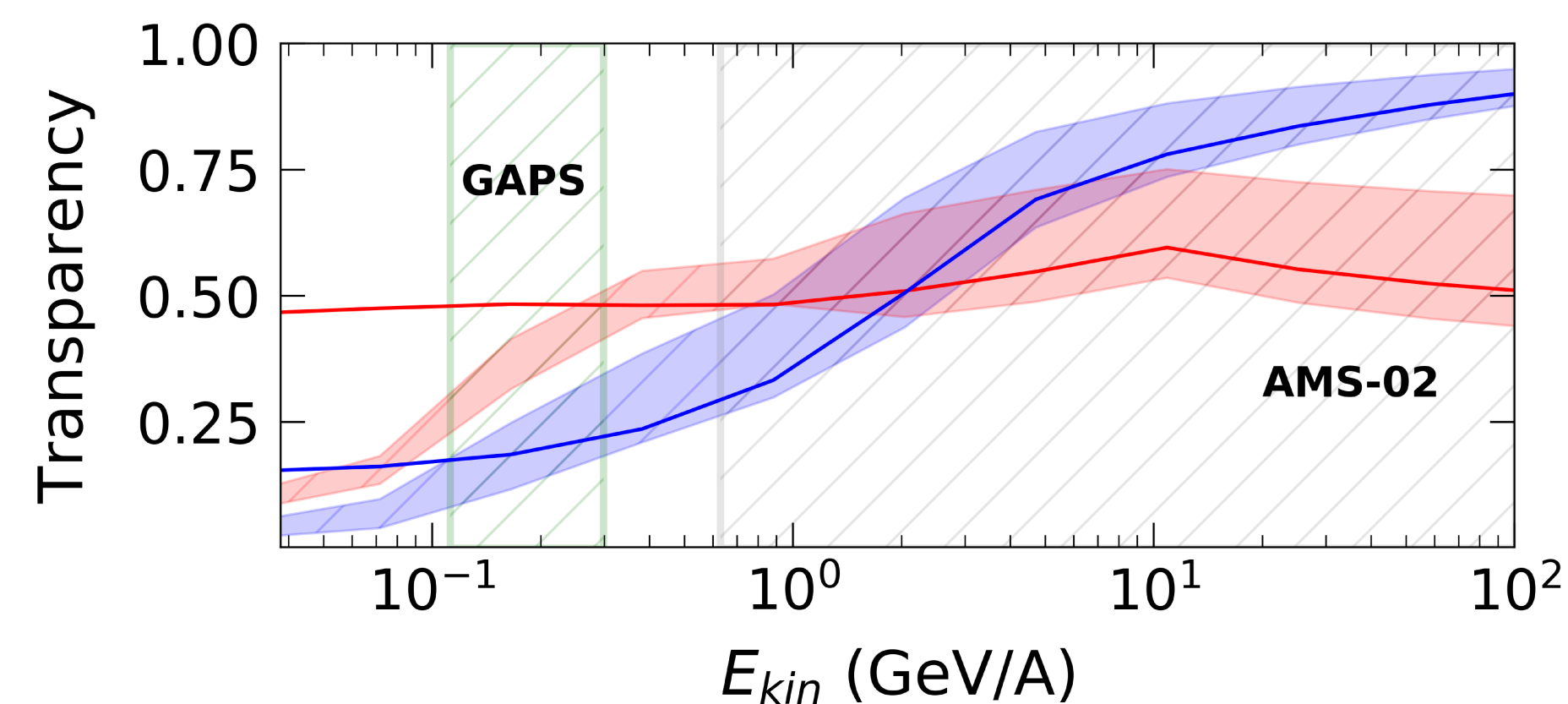
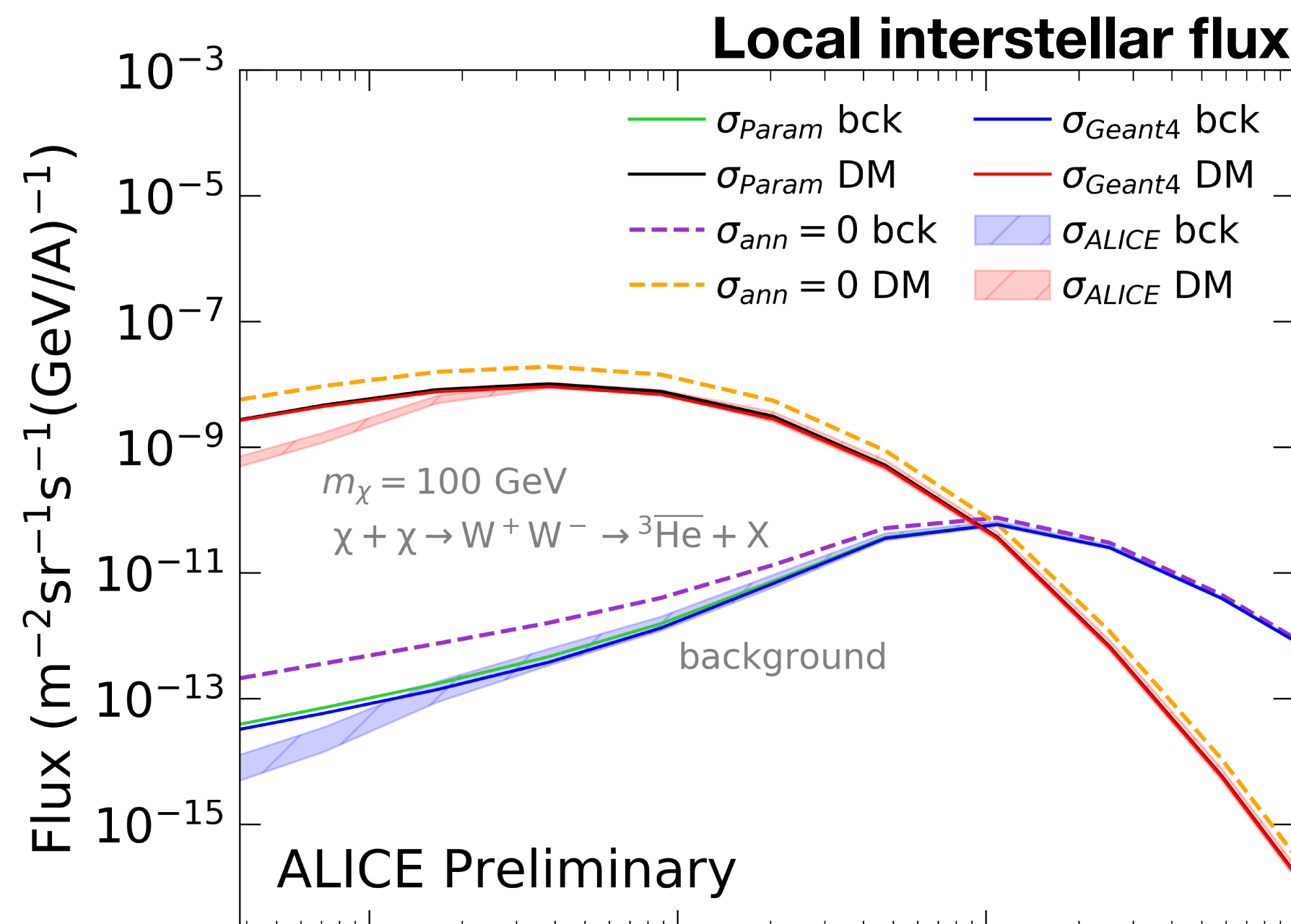


First $^3\overline{\text{He}}$ inelastic cross section measurement ever!

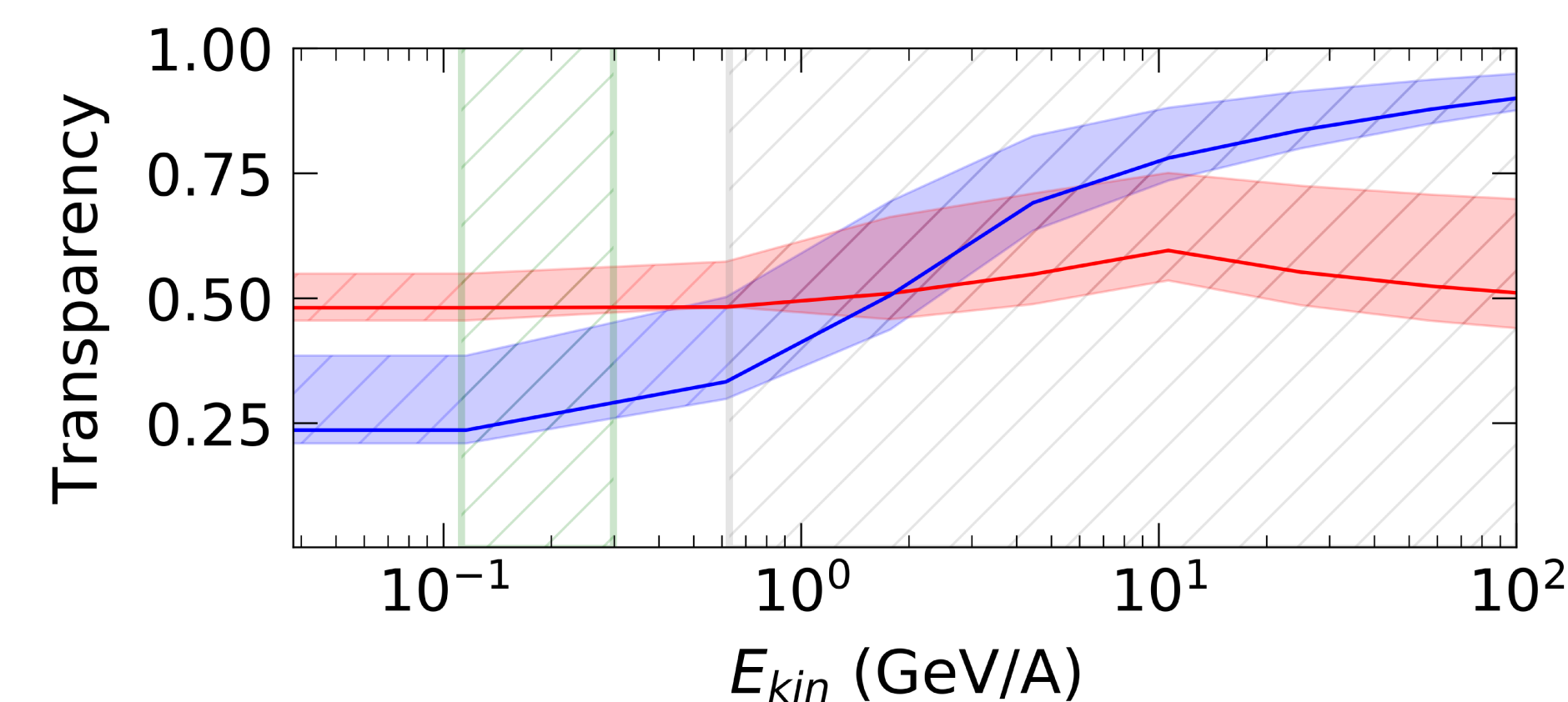
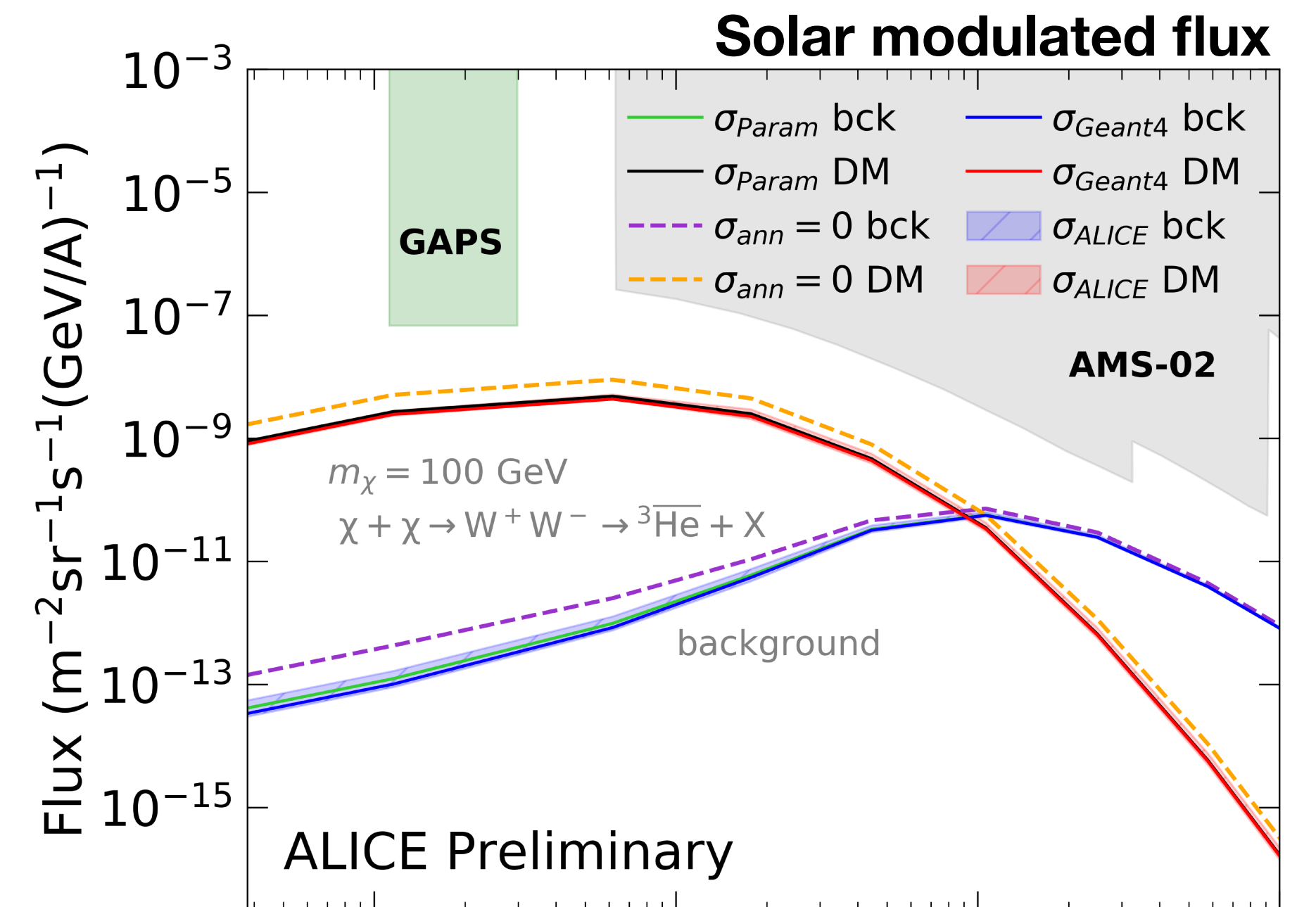
Results

- ▶ ALICE measurement allows estimate of the ${}^3\overline{\text{He}}$ CR annihilation in the Galaxy.
- ▶ The transparency of the Galaxy shows survival probability of ${}^3\overline{\text{He}}$ in the interstellar medium.
- ▶ Uncertainty is shown only for annihilation CS.
- ▶ Solar modulation - Force Field with Fisk potential 0.4 GV.
- ▶ Rather constant transparency of 50% for DM scenario (similar results obtained for $b\bar{b}$) and 25-90% for background (TOA).

First data-driven estimation of ${}^3\overline{\text{He}}$ annihilation in the Galaxy!



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ALI-PREL-486179