Large-scale simulations of antihelium production in cosmic-ray interactions

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Antinuclei background fluxes from multiparticle coalescence

- **30 trillion proton-proton collisions simulated.**
- **6000 years of single-CPU processing time.**

- Antinuclei are a potential breakthrough approach for dark matter searches.
- The possibility of antihelium production in interaction of cosmic rays with the interstellar gas is studied using large-scale Monte Carlo simulations.
- An two-particle coalescence mechanism developed by Gomez et al. is extended to estimate the production of larger antinuclei (antihelium-3 and antihelium-4).
- Galactic propagation software developed by Poulin et al. was used to predict the top-of-atmosphere (TOA) secondary fluxes.
- The background antihelium fluxes predicted by this study are lower than the fluxes predicted by models using numerical scaling, by almost an order of magnitude.
- In light of the AMS-02 antihelium candidate events, this study reinforces the prediction of extremely low antiparticle background for low-energy cosmic rays.

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