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Spectral Intensities of Antiprotons and the Lifetime of Cosmic Rays in the Galaxy

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In this paper we note that the spectral intensities of antiprotons observed in Galactic cosmic rays in the energy range ~ 1 -100 GeV by BESS and PAMELA instruments display nearly the same spectral shape as that generated by primary cosmic rays through their interaction with matter in the interstellar medium, without any significant modifications. More importantly, a constant residence time of $\sim 2.5 \pm 0.7$ million years in the Galactic volume, independent of the energy of cosmic rays, matches the observed intensities. A small additional component of secondary antiprotons in the energy below 10 GeV, generated in cocoon-like regions surrounding the cosmic-ray sources, seems to be present. We discuss this result in the context of observations of other secondary components like positrons, beryllium and boron, and conclude with general remarks about the origins and propagation of cosmic rays.

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