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Antimatter in the Universe - constraints from gamma-ray astronomy

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Antimatter in the Universe is best probed through ordinary matter, the resulting annihilation-radiation providing indirect evidence for its presence. The observations of high energy (~100 MeV) gamma-rays sets limits on the fraction of nuclear antimatter contained in our local and Galactic neighbourhood. Redshifted annihilation radiation, measured in the MeV range, constrains matter-antimatter domain boundaries in the dense early Universe. We review recent gamma-ray observations that set stringent upper limits on those emissions, confirming that our Universe contains predominately matter and very little antimatter.
Positrons, on the other hand, are the most common and easily produced form of antimatter. A characteristic gamma-line at 511 keV emitted by the annihilation of Galactic positrons has been measured for almost four decades with balloon and satellite experiments. A first all-sky map of electron-positron radiation has now been drawn, and the physical conditions in the sites where annihilation occurs are better understood. However, the very origin of the positrons and their propagation has remained as enigmatic as ever.

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