

MeV gamma from Q-ball decay

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We study the supersymmetric Q balls which decay at present and find that they create a distinctive spectrum of gamma rays at around $O(10)$ MeV. The charge of the Q ball is lepton numbers in order for the lifetime to be as long as the present age of the universe, and the main decay products are light leptons. However, as the charge of the Q ball decreases, the decay channel into pions becomes kinematically allowed towards the end of the decay, and the pions are produced at rest. Immediately, π^0 decays into two photons with the energy of $67.5\sim$ MeV, half the pion mass, which exhibits a unique emission line. In addition, π^\pm decay into μ^\pm , which further decay with emitting internal bremsstrahlung, whose spectrum has a sharp cutoff at $\sim 50\sim$ MeV. If the observations would find these peculiar features of the gamma-ray spectrum in the future, it could be a smoking gun of the supersymmetric Q-ball decay at present.

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