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A hadronic origin of the high-energy gamma rays from LMC

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It has been suggested that high-energy gamma-ray emission ($>100\text{MeV}$) of nearby star-forming galaxies may be produced predominantly by cosmic rays colliding with the interstellar medium through neutral pion decay. The pion-decay mechanism predicts a unique spectral signature in the gamma-ray spectrum, characterized by a fast rising spectrum and a spectral break below a few hundreds of MeV. We here report the evidence of a spectral break around 500 MeV in the disk emission of Large Magellanic Cloud (LMC), which is found in the analysis of the gamma-ray data extending down to 60 MeV observed by the Fermi-Large Area Telescope. The break is well consistent with the pion-decay model for the gamma-ray emission, although leptonic models, such as the electron bremsstrahlung emission, cannot be ruled out completely.

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