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Astrophysical Origin of Positrons

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The recent observations of excess of high energy positrons by PAMELA and AMS-2 have raised an intriguing question of the origin of antimatter. Particle-antiparticle annihilation mechanism and astrophysical mechanism are most popular scenarios suggested so far. In this talk the astrophysical scenario, in particular QED aspect of compact stars, is critically studied and discussed. The super-critical magnetic fields and the dynamo of neutron stars and magnetars can create electron-positron pairs and then accelerate them to high energy via pulsar electrodynamics. Furthermore, the Dirac vacuum can become unstable due to the rotating super-critical magnetic fields and spontaneously emit electron-positron pairs. Finally, the astrophysical scenario is compared with particle-antiparticle annihilation mechanism and the isotropy of observed positrons is discussed.

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