

Braneworld effects in plasma magnetosphere of a slowly rotating magnetized neutron star

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Results of our previous paper [B. V. Turimov, B. J. Ahmedov and A. A. Hakimov, *Phys. Rev. D* **96** (2017) 104001] show that the effects of brane charges are not negligible in the magnetic field of the magnetized neutron star, in particular at the surface of the star, and increasing the value of brane tidal charges causes an increase in the value of surface magnetic field of magnetized neutron star, that is why it is important to consider the effects of braneworlds on energetic processes in the plasma magnetosphere of the neutron star. In this paper, we have obtained the analytical expression for Goldreich–Julian (GJ) charge density in braneworlds for inclined neutron star by solving Maxwell's equations and found that the value of GJ charge density decreases in braneworlds. The analytical expression for scalar potential in the polar cap region of the neutron star has also been obtained. It is shown that the values of the parallel accelerating electrical fields increase with the increase of the value of the tidal charge near the surface of the neutron star. The influence of braneworlds on pair production condition on the surface of the neutron star and magnetospheric energy losses due to electromagnetic radiations have also been studied. We have shown how radiation beam becomes narrow due to the effects of braneworlds by studying the particle's trajectory in the polar cap region in the x - y ($z = \text{const.}$) plane. Numerical calculations for particle motion in the polar cap region show that accelerating distance of charged particle increases up to its maximum value