Gamma radiation of radio pulsar polar caps with asymmetric magnetic field

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The influence of asymmetric magnetic field on intensity, spectrum and pulse profile of gamma radiation of radio pulsar polar caps is considered. The Goldreich-Julian model for the regime of free-electron emission from the neutron star surface is used. The curvature of non-dipolar magnetic field lines and the distortion of accelerating electric field caused by the magnetic field non-dipolarity are taken into account.

The influence of magnetic field non-dipolarity on radio pulsar death lines is also investigated. When calculating pulsar death lines we take into account electron-positron pair production both by curvature gamma radiation of primary electrons and the inverse Compton scattering of thermal photons from neutron star surface on primary electrons. It is shown that in the considered case the pulsar death line may be shifted to longer periods, for example, to $P = 18B_{12}$ s. This allows us to explain the existence of the long-period pulsars, with periods $P \sim (6 - 8)$ s.

It is shown that in the case of non-dipolar magnetic field the generation of electron-positron pairs outside of the pulsar tube is present. It may lead to the existence of isotropic-like low-frequency radio emission from pulsars.

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