

Pulsar winds: Transition to a force free regime

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The problem of reconstruction of pulsar magnetospheres near the lightcylinder surface is studied. It is shown that, on the basis of the Euler, continuity and induction equations, there is a possibility of parametrically excited rotational energy pumping process into drift modes. As a result, the toroidal component of the magnetic field increases very rapidly. The increment is analyzed for plasma parameters of a typical pulsar magnetosphere. The feedback of the excited waves on particles is considered to be insignificant. The dynamics of the reconstruction of the pulsar magnetosphere is studied analytically. It is traced from the generation of a toroidal component of the magnetic field up to the transformation of the field lines into such a configuration, when plasma particles do not experience any forces: the motion of the particles switches to the so called “force-free” regime. At this stage, the generation of the toroidal component comes to the end, and the pulsar wind reaches its stationary state.