

Self-consistent description of charged particle beam propagation in terrestrial magnetic field

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In the case of charged particle beam propagation in terrestrial magnetic field the beam behavior may be described in the frame of Vlasov theory. The Vlasov theory requirement of the particle collision absence is fulfilled for the cosmic rays due to the high beam energy and rather low beam intensity. In such approach 2D self-consistent time-dependent model may be applied, based on the approximation that the particle ensemble is described by the distribution function dependent on the motion equation invariants. Analytical and numerical solutions of the model equations allow to predict the beam characteristics transformation during the beam propagation in terrestrial magnetic field, in particular, the beam energy spread transfer into the particle transverse angles (velocities) and vice versa, which may be important for the estimate and the interpretation of the measurement results.

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