

On Emittance Growth in Space-Charge Dominated Beams, YU. ZUEV, NII EFA - A tendency to consider halo formation in Liouvillian beams as a randomization process or chaotic behaviour of single particles is observed, although emittance is statistical parameter. Halo formation appears as escaping particles from beam core so is transfer of mass and driven by mass flow velocity. If beam collisionless is true, phase space projection area may grow only because of coupling between degrees of freedom. An effective area may rise due to filamentation in nonlinear fields. To unify all these facts is required. In the paper two equations for continuous round beam in arbitrary electrostatic channel are presented. The first one is linearized equation of single-fluid model for plasma transport and closes to envelope equation. The second equation defines correction in a manner like aberration. Simple combination of their solutions gives so-called fluid part of rms emittance responsible for beam phase-ellipse crooking. If the solutions are within some limits the beam distortion will stay reversible. Otherwise beam appears as a multi-stream or turbulence flow, entropy of which grows due to multivaluedness of stream velocity. There is conversion of field energy to mass flow energy and then to heat or spread of stream velocities. The energy transfer between degrees of freedom occurs as internal friction.