Warm-fluid theory of a thermal equilibrium for a charged-particle beam in a periodic quadrupole magnetic focusing field[1] KSENIA SAMOKHVALOVA, JING ZHOU, CHIPING CHEN, MIT/PSFC — A new warm-fluid thermal equilibrium theory is developed for charged-particle beam propagation in a periodic quadrupole magnetic focusing field. Warm-fluid equilibrium equations are solved in the paraxial approximation. The equation of state for the thermal equilibrium is adiabatic. The beam density profile, the beam envelope equations and self-consistent Poisson equation are derived. The numerical algorithm for solving the self-consistent Poisson equation is discussed. Examples of thermal beam equilibrium will be presented for low intensity and high intensity beams propagating in periodic quadrupole magnetic focusing fields.

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