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The Interpretation of the Tokamak Self-Consistent Pressure Profiles

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The phenomenon of a pressure profiles self-consistency in tokamak plasmas is interpreted in the framework of a “thermodynamic” approach, used successfully in complex non-equilibrium systems studies. Plasma is considered as the self-organized system and self-consistent solutions correspond to the minimum of the free energy. The solutions for the self-consistent pressure profiles are in accordance with experiments. The deduced energy confinement scaling law is in a good agreement with the empirical so called IPB98(y,2) scaling. Basing on the Smoluchowski linear relaxation equation, the dynamic of the system in the vicinity of the free energy minimum is analyzed. The important features of the dynamics, such as inward energy pinch and density pump-out effect, are deduced in the analysis.

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