# Paleoclassical Transport Explains Electron Transport Barriers in RTP and TEXTOR

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*Background.* The recently developed paleoclassical model [1] sets the minimum level of electron thermal transport in a tokamak. The transport level predicted by the paleoclassical model is in good agreement [2] with experimental observations in many cases when fluctuation-induced anomalous transport is small, i.e., in (near-)ohmic plasmas in small to medium size tokamaks, inside Internal Transport Barriers (ITBs) or edge Transport Barriers (H-mode pedestal). In this paper predictions of the paleoclassical transport model are compared in detail with data from such kinds of plasmas: ohmic discharges from the RTP tokamak, EC heated RTP discharges featuring both dynamic and shot-to-shot scans of the ECH power deposition radius [3], and off-axis EC heated discharges from the TEXTOR tokamak [4].

*RTP Experiments.* On RTP it was found that electron thermal transport has a layered structure: zones with high diffusion coefficient ($\chi_e$) are alternated with narrow zones of low $\chi_e$, i.e., Internal Transport Barriers (ITBs). The latter are closely tied to low order rational $q$ surfaces. The experimental results were initially successfully simulated [3] with a purely empirical transport model, in which the ITBs are prescribed as function of $q$ only.

*TEXTOR EC Heating Experiments.* In TEXTOR it has been observed that the core electron temperature $T_e$ stays constant for some time after the switch-off of off-axis ECRH, which is indicative of a local suppression of electron thermal transport [4]. This delay can be as long as 35 ms, i.e., $\simeq 1.5$ energy confinement times. The effect critically depends on the exact location of the ECR heating and on the magnetic field strength; this indicates that the effect is closely related to details of the $q$ profile.

*Paleoclassical Modeling Results.* For ohmically heated RTP discharges the $T_e$ profiles predicted by the paleoclassical model are in reasonable agreement with the experimental observations, and various parametric dependencies are captured satisfactorily. The electron thermal Internal Transport Barriers (ITBs) observed in steady state EC-heated RTP discharges and transiently after switch-off of off-axis ECH in TEXTOR are predicted very well by the paleoclassical model. Also, bifurcations in the evolution of a discharge caused by a tiny shift of the ECRH power deposition radius are reproduced remarkably well. Next steps for a predictive understanding of all paleoclassical transport effects will also be discussed.

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