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# Transient versus steady state solutions: a qualitative study on tokamak plasma heating

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The numerical study of steady state solutions of equations describing the particle and energy balance rightfully gets ample attention since the ultimate goal of fusion research is to produce long-lasting quasi-stationary discharges in future fusion power stations. Transient states may, however, differ significantly from the steady state ultimately reached and will - in practice - impact on the actual fate of the discharge. In current-day machines, transient behavior is rule rather than exception. Using 2 models that cut away a maximum of effects while retaining crucial ingredients in order to bring out the specific impact of transient effects more clearly, the present EFTC contribution illustrates the different signature of radio frequency (RF) wave versus beam heating allowing to transiently trigger desirable effects that help steering the discharge. A simplified Fokker-Planck equation illustrates the differening temporal evolution of RF tail formation of minorities, majorities and beams, while also highlighting important distinctions between fundamental cyclotron and harmonic heating. An equally crude transport model allows to monitor the evolution of a discharge, e.g. showing the role of spatial localization of sources and its impact on transient values reached as well as on the steady state the discharge ultimately converges to.

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