Tridimensional Thermonuclear Instability in Subignited Plasmas*

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Tridimensional modes involving an increase of the electron temperature can be excited as a result of α-particle heating in subignited D-T fusion burning plasmas when a nearly time-independent external source of heating is applied. The analyzed modes [1] are shown to emerge from an axisymmetric toroidal configurations and are radially localized around rational magnetic surfaces corresponding to $q\left(r=r_0\right)=m^0/n^0$ where m^0 and n^0 are the relevant poloidal and toroidal mode numbers. The radial width of the mode is of the order of the thermal scale distances $\delta_T=\left(D_{\perp e}^{th}/D_{\|e}^{th}\right)^{1/4}\left(R_0/n^0\right)^{1/2}\left(d\ln q/dr\right)_0^{-1/2}$. The mode has a severe damping rate, that has to be overcome by the relevant heating rate, and is $\left(D_{\perp e}^{th}/D_{\|e}^{th}\right)^{1/2}\left(n^0/R_0\right)\left(d\ln q/dr\right)_0$. Thus the temperature range to be considered is that where the D-T plasma reactivity undergoes a relatively large increase as a function of temperature. *Sponsored in part by the US DOE.

[1] B. Coppi, *et al. Nucl. Fus*., **55**, 053011 (2015).