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Theory of Intermediate Nonlinear Ballooning Mode in a Tokamak[1] P. ZHU, C.C. HEGNA, University of Wisconsin-Madison — In this work we extend the ideal MHD theory of intermediate nonlinear ballooning instabilities [2] to the case of tokamak plasmas. Evolution equations for plasma displacements induced by the ballooning instability are analytically derived that account for the dominant nonlinear effects in an ideal MHD description. The intermediate nonlinear regime of ballooning modes is defined by the ordering that the plasma displacement (ξ_Ψ) across field line in the direction of pressure gradient is comparable to the mode width (l_Ψ) in the same direction. In the tokamak case, this regime becomes particularly relevant for a transport barrier as the width of that barrier (or pedestal) region approaches the width (l_Ψ) of the dominant ballooning mode.

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[2]P. Zhu and C. C. Hegna, Sherwood 2007.

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