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Nonlinear stabilization of tokamak microturbulence by fast ions J. CITRIN, G.M.D. HOGEWEIJ, Dutch Institute for Fundamental Energy Research DIFFER, Association EURATOM-FOM, Nieuwegein, The Netherlands, C. BOURDELLE, J. GARCIA, CEA, IRFM, F-13108 Saint Paul Lez Durance, France, J.W. HAVERKORT, Centrum Wiskunde & Informatica CWI, PO Box 94079, Amsterdam, The Netherlands, F. JENKO, D. TOLD, Max Planck Institute for Plasma Physics, EURATOM Association, 85748 Garching, Germany, T. JOHNSON, Euratom-VR Association, EES, KTH, Stockholm, Sweden, P. MANTICA, Istituto di Fisica del Plasma "P. Caldirola", Associazione Euratom-ENEA-CNR, Milano, Italy, M.J. PUESCHEL, University of Wisconsin-Madison, Madison, Wisconsin 53706, USA — Nonlinear electromagnetic stabilization by suprathermal pressure gradients found in specific regimes is shown to significantly reduce ion-temperature-gradient microturbulence in tokamaks. This effect augments the electromagnetic stabilization due to thermal pressure. The degree of nonlinear electromagnetic stabilization is considerably greater than the linear stabilization. Based on a comprehensive investigation with the nonlinear gyrokinetic code GENE, this effect can explain the ion heat flux and stiffness reduction observed in ion heat transport experiments on the JET tokamak, described by Mantica et al. [Phys. Rev. Lett. 107 135004 (2011)], which until now was not reproduced by gyrokinetic simulations. These findings are expected to improve the extrapolation of advanced tokamak scenarios to reactor relevant regimes, which are predicted to have a significant suprathermal pressure fraction.

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