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Instability of the ion-ion hybrid Alfvén resonator in the presence of superthermal alpha-particles[1] W.A. FARMER, Lawrence Livermore National Lab, G.J. MORALES, University of California, Los Angeles — A previous theoretical study has suggested that the ion hybrid wave (or shear Alfvén wave) will be unstable in a burning plasma environment due to fusion-born alpha particles [1]. It was concluded that instability occurs for a band of frequencies near the ion-ion hybrid frequency in a homogeneous D-T plasma. In a tokamak, the periodic variation in the strength of the magnetic field along a field–line causes the ion-ion hybrid frequency to vary between the outboard and inboard sides of the device. Because the shear Alfvén wave predominantly propagates along a field-line and experiences a parallel cut-off at the ion-ion hybrid frequency, this instability can lead to excitation of the ion-ion hybrid Alfvén resonator. Recent experiments [2] in the linear device LAPD at UCLA have demonstrated the existence of such a resonator in a magnetic mirror configuration through excitation by an antenna. In this study, instability of the shear Alfvén wave in the magnetic topology of a tokamak due to energetic alpha particles is considered [3].

[1] C. N. Lashmore-Davies and D. A. Russell. Phys. Plasmas **4**, 369 (1997).
[2] S. T. Vincena, et al., Phys. Plasmas **20**, 012111 (2013).
[3] W. A. Farmer and G. J. Morales, Phys. Plasmas **21**, 062507 (2014).

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William Farmer
Lawrence Livermore National Lab

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