ALFVÉN INSTABILITIES CAUSED BY CIRCULATING ENERGETIC IONS IN OPTIMIZED STELLARATORS

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The work investigates instabilities of Alfvén eigenmodes that can be driven by circulating energetic ions in optimized stellarators of Wendelstein line (Helias). It is shown for the first time that several sideband resonances rather than the only one associated with toroidicity (and known from a theory relevant to tokamaks) may essentially contribute to the instability growth rate. New resonances enhance the instabilities and, moreover, they may result in instabilities in those cases when the conventional resonance is not efficient. Destabilization of the toroidicity-induced Alfvén eigenmodes and the eigenmodes existing due to both specific plasma shaping and Fourier harmonics of the magnetic field of a Helias is considered.