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Analysis of Alfven Eigenmodes destabilization by fast particles in Large Helical Device JACOBO VARELA, DONALD SPONG, Oak Ridge National Laboratory, LUIS GARCIA, University Carlos III Madrid — Fast particle populations in nuclear fusion experiments can destabilize Alfven Eigenmodes through inverse Landau damping and couplings with gap modes in the shear Alfven continua. We use the reduced MHD equations to describe the linear evolution of the poloidal flux and the toroidal component of the vorticity in a full 3D system, coupled with equations of density and parallel velocity moments for the energetic particles. We add the Landau damping and resonant destabilization effects by a closure relation. We apply this model to study the Alfven modes stability in Large Helical Device (LHD) equilibria for inward configurations, performing a parametric analysis along a range of realistic values of fast particle β (βfp), ratios of thermal/Alfven velocities (Vth/Vao), magnetic Lundquist numbers (S) and dominant toroidal (n) modes families. The n = 1 and n =2 toroidal families show the largest growth rates for parameters closer to a real LHD scenario (S = 5E6, βfp = 0.02 and Vth/Vao = 0.5), particularly the modes n/m = 1/2 and 2/4 located the inner and middle plasma (ρ = 0.25 – 0.5 with ρ the normalized minor radius). The n = 3 and n = 4 toroidal families are weakly perturbed by fast particles.

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