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Collision effects on the filamentation instability MASSIMILIANO FIORE, MICHAEL MARTI, RICARDO FONSECA, LUIS SILVA, GoLP/CFP, Instituto Superior Técnico, Lisbon, Portugal, CHUANG REN, University of Rochester, MICHAIL TZOUFRAS, WARREN MORI, UCLA — In the fast ignitor scenario the MA current carried by the forward laser driven beam MeV electrons, beyond the Alfvén limit, can be transported only by the presence of a plasma return current. This system is subject to collisionless filamentation (Weibel) instability in the coronal region. The effects of collisions in inner regions of the fusion pellet change the features of the filamentation instability and have to be considered. Simulations performed with PIC code osiris 2.0, including binary collisions, are presented, analyzing the filament behavior due to the collisional filamentation instability. As the collision frequency increases, the instability occurs at larger typical wavelengths compared to the collisionless case. Hence, only larger filaments can form, eventually becoming comparable to the typical beam size, and whole beam instabilities can be driven. These features are theoretically recovered using relativistic kinetic theory, including space charge effects, warm species and collisions through the BGK model. Furthermore, it is shown that collisions lead to small but not negligible growth rates even at temperatures for which the collisionless instability is completely stabilized by thermal effects.

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