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Quantom Magnetic Effects of P-B Fusion in Plasma Focus Devices

Authors : M. Habibi

Abstract : The feasibility of proton-boron fusion in plasmoids caused by magneto hydrodynamics instabilities in plasma focus devices is studied analytically. In plasmoids, fusion power for 76 keV < Ti < 1500 keV exceeds bremsstrahlung loss (W/Pb=5.39). In such situation gain factor and the ratio of Te to Ti for a typical 150 kJ plasma focus device will be 7.8 and 4.8 respectively. Also with considering the ion viscous heating effect, W/Pb and Ti/Te will be 2.7 and 6 respectively. Strong magnetic field will reduces ion-electron collision rate due to quantization of electron orbits. While approximately there is no change in electron-ion collision rate, the effect of quantum magnetic field makes ions much hotter than electrons which enhance the fraction of fusion power to bremsstrahlung loss. Therefore self-sustained p-11B fusion reactions would be possible and it could be said that p-11B fuelled plasma focus device is a clean and efficient source of energy.

Keywords : plasmoids, p11B fuel, ion viscous heating, quantum magnetic field, plasma focus device
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