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The Effect of Magnetic Topology of Polywell Fusion Devices on The Electron Confinement Time

The polywell fusion reactor is smaller than other types of fusion reactor. Its concept arises from a combination between cusped magnetic confinement and inertial electrostatic confinement. This work uses numerical simulations to investigate the effects of magnetic field topology resulted from various configurations of the polywell fusion device, i.e. cube configuration (6 coils), dodec configuration (12 coils), double-layer configuration (6,8 coils) and disco configuration (26 coils). It is shown that by increasing the number of magnetic coils and the magnitude of magnetic flux density via increasing current in the coils, the electron confinement time increases. Electron injections are applied numerically into each magnetic field topology in order to determine the decay behavior of electron numbers. The electron confinement time is defined by using the curve fitting to the simulation data. The simulation results show the comparison of effective confinement of various polywell fusion configurations device and demonstrate that the double-layer configuration yields the best confinement time. The longest electron confinement time is about 69 ns.
Keyword: polywell device, magnetic field topology, confinement time

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