Review of Plasma Focus Numerical Experiments

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In this paper we review our experience in numerical experiments using the Lee Model code. The plasma focus is indeed a multi-faceted device with interesting phenomena ranging from electromagnetically driven dynamics to copious radiation including ions, electrons, x-rays, characteristic soft x-rays, fusion neutrons to fast ion beams (FIB) and fast plasma streams (FPS) to anomalous resistivity resulting from a range of plasma instabilities to plasma states of extreme high energy density (HED) achieved in the focus pinch through radiative cooling and collapse. The Lee Model code is successful in modelling most of these multi-faceted aspects of the plasma focus. The Lee Model code developed originally as a simple code to complement the AAAPT inspired UNU ICTP PFF 3 kJ plasma focus has over the past 30 years been continuously developed. It is still a relatively simple tool. Its simplicity and sound fundamental grounding enable it to have a long and wide reach to compute gross plasma dynamics and properties, to obtain data on anomalous resistivity, to pick out fundamental scaling properties and design rules-of-thumb, recognize scaling trends and formulate scaling laws and develop insights into optimum inductance, current saturation, and deterioration of neutron and radiation scaling in relation to energy and to understand some conditions for radiative collapse. Our most recent efforts lead to the development of energy throughput scaling and suggestion of a breakeven DPF which will be discussed in the next paper.

A talk to be given at the University of York on Friday 17 November 2017.