PARTICLE IN CELL MODELLING OF THE QUANTITATIVE EVOLUTION OF A PINCHED ELECTRON BEAM ACROSS THE A-K GAP OF A SELF MAGNETIC PINCH DIODE

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Particle in Cell (PiC) simulations using the Large Scale Plasma (LSP) code [1] of a Self Magnetic Pinch (SMP) [2] diode have been carried out to investigate the electron beam conditions present in the SMP anode-cathode (a-k) gap. The probability distributions of radial charge, macro particle energy and macro particle velocity are described as a function of emission region and position across the a-k gap. The conclusions of these investigations are that the top surface of cathode contributes around 50% of the electron flow while the lower surface accounts for only around 5% with the remaining flow coming from the tapered cathode tip. The energy of the electron beam starts as a low energy peaked distribution at the start of the a-k gap and goes through a broad distribution to one with a high energy bias, retaining a low energy tail largely independent of emission site. The angles which the electrons have across the a-k gap follow distributions which show structure for the emission sites on the top half of the cathode with the quantitative change in angle now being obtainable as a function of position. For emission sites on the lower half of the cathode, and as a position across the a-k gap, the angle distribution data has a broad shape biased to low angle with no clearly observable peaks.

1. LSP is a software product of ATK-Mission Research Corp. www.lspsuite.com
2. T. J. Goldsack *et al.,* "Multi-megavolt multi-axis high resolution flash X-ray source development for a new hydrodynamics research facility at AWE, Aldermaston," IEEE Trans. Plasma Sci., vol. 30, no. 1, pp. 239-253, Feb 2002.