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Microfabricated Ion Beam Drivers for Magnetized Target Fusion
ARUN PERSAUD, PETER SEIDL, QING JI, Lawrence Berkeley National Laboratory, SERHAN ARDANUC, JOSEPH MILLER, AMIT LAL, Cornell University, THOMAS SCHENKEL, Lawrence Berkeley National Laboratory — Efficient, low-cost drivers are important for Magnetized Target Fusion (MTF). Ion beams offer a high degree of control to deliver the required mega joules of driver energy for MTF and they can be matched to several types of magnetized fuel targets, including compact toroids and solid targets. We describe an ion beam driver approach based on the MEQALAC concept (Multiple Electrostatic Quadrupole Array Linear Accelerator) with many beamlets in an array of micro-fabricated channels. The channels consist of a lattice of electrostatic quadrupoles (ESQ) for focusing and of radio-frequency (RF) electrodes for ion acceleration. Simulations with particle-in-cell and beam envelope codes predict >10x higher current densities compared to state-of-the-art ion accelerators. This increase results from dividing the total ion beam current up into many beamlets to control space charge forces. Focusing elements can be biased taking advantage of high breakdown electric fields in sub-mm structures formed using MEMS techniques (Micro-Electro-Mechanical Systems). We will present results on ion beam transport and acceleration in MEMS based beamlets. Acknowledgments: This work is supported by the U.S. DOE under Contract No. DE-AC02-05CH11231.

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