

SCIENTIFIC ISSUES IN FUTURE ACCELERATORS FOR HEAVY ION FUSION*

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The U.S. and worldwide heavy ion fusion programs have made a large amount of progress over almost three decades of research on the intense beam physics and driver concepts needed for our concept. In the 1970's, '80's, and '90's, most experiments used driver parameters scaled to low energy and low line charge in order to study, most often with a single beam, the physics of high-perveance beams. More recently, the U.S. program has introduced higher line-charge experiments, where the beam space charge potential is significant. This allows investigation of the production, and effect on the beam, of stray electrons. Increasingly, the possibilities for neutralizing plasmas are also being investigated, both just upstream, and in, the target chamber. This talk will outline the scientific issues which remain to be examined. These include issues of longitudinal compression, dynamic aperture, electron/ion instabilities, effect of electrons and gas on the beam, longitudinal emittance evolution, halo production, inductive effects at high energy, multiple beams, innovative final focus approaches, and driver issues for solenoid transport. A outline of future experiments to address these issues will be presented and discussed.

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