Title

Scientific objectives and key features of a sequence of heavy-ion-beam-driven facilities for high energy density physics and fusion

Author

Logan, B.G.

Publication Date

2009-11-01

HIFAN 1664a

Scientific objectives and key features of a sequence of heavy-ion-beam-driven facilities for high energy density physics and fusion

by
B.G. Logan LBNL

Accelerator Fusion Research Division
Ernest Orlando Lawrence Berkeley National Laboratory
University of California
Berkeley, California 94720

November 2009

This work was supported by the Director, Office of Science, Office of Fusion Energy Sciences, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

Scientific objectives and key features of a sequence of heavy-ion-beam-driven facilities for high energy density physics and fusion*

B. Grant Logan (On behalf of Heavy Ion Fusion Virtual National Laboratory-LBNL, LLNL, PPPL). Successful longitudinal and radial compression of intense neutralized heavy ion beams in the Neutralized Drift Compression Experiment (NDCX-I), together with novel acceleration and compression waveforms using existing induction accelerator modules will lead to an upgraded facility (NDCX-II) capable of driving warm dense matter targets to 1 Mbar, and planar direct drive targets to study hydro-coupling efficiency with beams ramping up in velocity and range. Two further significant enhancements in the heavy ion program, construction of IB-HEDPX with more existing accelerator modules, and commencement of design and R&D for a Heavy Ion Driven Target Implosion Experiment (HIDDIX), could occur after successful experiments in NDCX-II, and after successful ignition in NIF, respectively. Fruition of these research opportunities for heavy-ion-driven high energy density physics (HEDP) and fusion over the next twenty years could establish the HEDP target physics knowledge base needed for a heavy ion fusion test facility, as well as for fundamental HEDP in warm dense matter important to many scientific applications as well as to fusion.

*Research supported by the US Department of Energy under Contracts DE-AC02-05CH1123, DE-AC52-07NA27344 , and DE-AC02-76CH03073.