

The LTX-beta Research Program and First Results

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The research program for LTX-beta, the upgrade to the Lithium Tokamak Experiment, combines lithium walls to produce gradient-free temperature profiles and stabilize ion and electron temperature gradient-driven modes, with approaches to stabilization of density gradient-driven modes, such as the trapped electron mode (TEM). Candidate stabilization mechanisms for the TEM include sheared flow stabilization, which will be tested on LTX-beta using neutral beam induced rotation. The goal is to reduce anomalous transport in a low aspect ratio tokamak. The upgrade will approximately double the toroidal field of LTX-beta (to 3.4 kG) and plasma current (to 150–175 kA), compared to LTX. Upgrades to the diagnostic set are in the areas of equilibrium, core transport, scrape-off layer (SOL) physics, and plasma-material interactions. Neutral beam injection at 20 kV, 30 A will be added in spring 2018, using a neutral beam system provided by Tri-Alpha Energy. A 9.3 GHz, 50 kW, short-pulse (5–10 msec) magnetron will be available later in 2018 for electron heat pulse propagation experiments. New lithium evaporation sources allow between-shots recoating of the walls. LTX-beta is a collaborative effort, with major participation from Oak Ridge and Lawrence Livermore National Laboratories (ORNL and LLNL), as well as the University of California at Los Angeles (UCLA). ORNL and the University of Tennessee will focus on spectroscopic improvements, and edge plasma/plasma-material interaction (PMI) analysis. LLNL plans research in the areas of SOL transport and plasma-surface interactions with lithium and tin. UCLA is upgrading the LTX profile reflectometer for high radial wavenumber backscattering. The 1 mm UCLA interferometer system will also be upgraded to probe low perpendicular wavenumber density fluctuations. The LTX-beta research program will be discussed, and initial operation of the upgraded device will be described. This work supported by USDoE contracts DE-AC02-09CH11466, DE-AC05-00OR22725, and DE-AC52-07NA27344.

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Primary author: MAJESKI, Richard (Princeton Plasma Physics Lab)

Co-authors: MAAN, A. (University of Tennessee); NELSON, A. (Princeton Plasma Physics Lab); KOEL, B. E. (Princeton University); HANSEN, C. (University of Washington); ELLIOTT, D. B. (Oak Ridge National Lab); DONOVAN, D. (University of Tennessee); BOYLE, D. P. (Princeton Plasma Physics Lab); MERINO, E. (Princeton Plasma Physics Lab); SCOTTI, F. (Lawrence Livermore National Lab); BIALEK, J. (Columbia University); CANIK, J. M. (Oak Ridge National Lab); BUZI, L. (Princeton University); ZAKHAROV, L. (LiWFusion); DORF, M. A. (Lawrence Livermore National Lab); REINKE, M. (Oak Ridge National Lab); HUGHES, P. E. (Princeton Plasma Physics Lab); BELL, R. E. (Princeton Plasma Physics Lab); KAITA, R. (Princeton Plasma Physics Lab); LUNSFORD, R. (Princeton Plasma Physics Lab); KUBOTA, S. (University of California at Los Angeles); JARBOE, T. (University of Washington); KOZUB, T. (Princeton Plasma Physics Lab); BIEWER, T. M. (Oak Ridge National Lab); RHODES, T. (University of California at Los Angeles); ROGNLIEN, T. (Lawrence Livermore National Lab); SOUKHANOVSKII, Vsevolod (Lawrence Livermore National Lab); ZHANG, X. (Princeton Plasma Physics Lab)

Presenter: MAJESKI, Richard (Princeton Plasma Physics Lab)

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