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High Performance Field-Reversed Configuration Plasmas in the C-2 Device H. GOTA, M. TUSZEWSKI, A. SMIRNOV, H. GUO, M. BINDERBAUER, D. BARNES, Tri Alpha Energy, Inc., T. AKHMETOV, A. IVANOV, Budker Institute of Nuclear Physics, AND THE TAE TEAM — A high temperature, stable, long-lived field-reversed configuration (FRC) plasma state has been produced in the C-2 device by dynamically colliding and merging two oppositely directed compact toroids, by biasing edge plasma near the FRC separatrix from a plasma-gun (PG) located at one end of the C-2 device, and by neutral-beam (NB) injection. The PG creates an inward radial electric field (E_r <0) which counters the usual FRC spin-up in the ion diamagnetic direction and mitigates the $n = 2$ rotational instability without applying quadrupole magnetic fields. Better plasma centering is also obtained, presumably from line-tying to the gun electrodes. The PG produces $E \times B$ velocity shear in the FRC edge layer which may explain observations of improved transport properties The FRCs are nearly axisymmetric, which enables fast ion confinement. The combined effects of the PG and of NB injection yield a new High Performance FRC (HPF) regime with confinement times improved by factors 2 to 4 and FRC lifetimes extended from 1 to 3 ms. A second PG was newly installed at the other end of the C-2 device, and new experimental campaigns with 2 PGs have been explored. Characteristics of the HPF regime will be presented at the meeting as well as newly obtained results with 2 PGs and NBs.

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