HIGH-FLUX PLASMA STATE FORMED BY DYNAMIC MERGING OF TWO COLLIDING COMPACT TOROIDS

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A high temperature field reversed configuration (FRC) has been produced in the newly built and world's largest compact toroid device, C-2, by dynamically merging two oppositely directed, highly supersonic compact toroids. Dramatic amplification of the poloidal flux occurs during the collisional merging process with a flux amplification factor well over 10, which is by far the highest obtained in a magnetic confinement system. Most of the kinetic energy is converted into thermal energy with total temperature ($T_i + T_e$) exceeding 0.5 keV upon merging. The final FRC state exhibits a record plasma lifetime with transport rates (based on robust flux diffusion) within about a factor of 10 from classical scaling. Moreover, the dynamics of the merging/reconnection process are reproduced, for the first time, by a newly developed 2-D resistive magnetohydrodynamic (MHD) code, LamyRidge. As such, the combined effort sheds new light on high-β reconnection and relaxation.