

Abstract Submitted
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Control of Compact-Toroid Characteristics by External Copper

Shell T. MATSUMOTO, J. SEKIGUCHI, T. ASAI, Nihon University, H. GOTA, T. ROCHE, I. ALLFREY, M. CORDERO, E. GARATE, J. KINLEY, T. VALENTINE, W. WAGGONER, Tri Alpha Energy, inc., AND THE TAE TEAM — A collaborative research project by Tri Alpha Energy and Nihon University has been conducted for several years, which led to the development of a new compact toroid (CT) injector [1] for efficient FRC particle refueling in the C-2U experiment [2]. The CT is formed by a magnetized coaxial plasma gun (MCPG), consisting of coaxial cylindrical electrodes. In CT formation via MCPG, the magnetic helicity content of the generated CT is one of the critical parameters. A bias coil is inserted into the inner electrode to generate a poloidal flux. The resultant bias magnetic field is spread out of MCPG with time due to its low-frequency bias current. To obtain a more effectively distributed bias magnetic field as well as to improve the voltage breakdown between electrodes, the MCPG incorporates a novel ~ 1 mm thick copper shell mounted outside of the outer electrode. This allows for reliable and controlled operation and more robust CT generation. A detailed discussion of the copper shell and experimental test results will be presented.

[1] T. Matsumoto *et al.*, Bull. Am. Phys. Soc. **59**, UP8.00008 (2014)

[2] M. Binderbauer *et al.*, Phys. Plasmas **22**, 056110 (2015)

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