

## Behavior of CTs injected into C-2U FRC

T. Matsumoto<sup>1,2</sup>, T. Roche<sup>1</sup>, I. Allfrey<sup>1</sup>, H. Gota<sup>1</sup>, T. Asai<sup>3</sup>, T. Edo<sup>3</sup>, J. Sekiguchi<sup>3</sup>, E. Granstedt<sup>1</sup>, J. Kinley<sup>1</sup>, M. Binderbauer<sup>1</sup>, T. Tajima<sup>1,2</sup>, and the TAE Team

<sup>1</sup>*TAE Technologies, Inc., 19631 Pauling, Foothill Ranch, CA 92610, USA*

<sup>2</sup>*Department of Physics and Astronomy, University of California, Irvine, CA 92697, USA*

<sup>3</sup>*College of Science and Technology, Nihon University, Chiyoda-ku, Tokyo 101-8308, Japan*

*e-mail: TMatsumoto@tae.com*

A compact toroid (CT) injection experiment on the C-2U field-reversed configuration (FRC) device [1] has been conducted and has demonstrated an increase of the FRC's particle inventory [2][3]. Reducing the amount of initial neutral gas used to generate the CTs eliminated disruptive effects on the FRC target plasma. Potentially, the CT injection is capable of transferring a high particle density plasmoid into the core of the target plasma, across its surrounding magnetic field. It was also confirmed that the injected plasmoid dispersed inside the FRC's core; however, the behavior of the injected CT inside the confinement vessel cannot be clearly defined due to the CT's motion, which is quite complicated.

Therefore, we employed a high-speed camera to observe the CT's behavior. With this camera we captured the global motions of the injected/penetrated CT; its trajectory with external magnetic field outside of the FRC separatrix, and the collisional process between CT and FRC. While penetrating the external field the CT moved straight before colliding with the FRC. We confirmed that the collision started with the CT surrounding the FRC and rotating along its surface. C-2U also has arrays of bolometers and magnetic probes, which measured some perturbations due to the CT injection. The trajectory and behavior of the penetrated CTs inside the confinement vessel along with results of CT injection into C-2U FRCs will be presented.

[1] M. Binderbauer *et al.*, AIP Conf. Proc. **1721**, (2016) 030003.

[2] T. Matsumoto *et al.*, Rev. Sci. Instrum. **87**, (2016) 053512.

[3] T. Asai *et al.*, Nucl Fusion **57**, (2017) 076018.