

Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

High-speed GPU-based feedback control on the HIT-SI3 experiment¹ KYLE MORGAN, AARON HOSSACK, CHRIS HANSEN, University of Washington, DEREK SUTHERLAND, CTFusion, Inc. — The HIT-SI3 device uses Steady-Inductive Helicity Injection (SIHI) to form and sustain spheromak plasma equilibria. A real-time control system has been developed to control the amplitude, phase, and offset of bulk plasma parameters of the SIHI system. Control software running entirely on a Nvidia Tesla P40 Graphical Processing Unit (GPU) is able to receive digitizer inputs at a sample rate of 10 MS/s and send response patterns to a PWM controller with a control loop period of 12.8 μ s. A three-parameter PID controller is shown to be sufficient to inform the PWM controller to drive the desired oscillating plasma waveform, with an oscillating frequency of 15.6 kHz. This control system allows the demonstration of perturbation mode spectrum control in the formation and sustainment of spheromak plasmas on the HIT-SI3 device. Plans for feedback control of the upcoming HIT-SIU injector system will be presented.

¹The work presented was funded by the Advanced Research Projects Agency - Energy (ARPA-E), U.S. Department of Energy under award number DE-AR0001266, by CTFusion, Inc., the primary recipient of ARPA-E award number DE-AR0001098 and by the U.S. Department of Energy phase 1 SBIR program under award number SC-0018844.

Kyle Morgan
University of Washington

Date submitted: 29 Jun 2020

Electronic form version 1.4