Abstract Submitted
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Advanced feedback control of wall modes using active rotation control on HBT-EP[1] QIAN PENG, JEFF LEVESQUE, CHRIS STOAFER, DOV RHODES, PAUL HUDGES, PATRIC BYRNE, MICHEAL MAUEL, GERALD NAVRATIL, Columbia Univ — The HBT-EP tokamak can excite strong, saturated kink modes whose growth rates and rotation frequencies evolve on a millisecond timescale. To control such modes, HBT-EP uses a GPU-based feedback system in a low latency architecture.[2] When feedback is applied, the mode amplitude changes but the rotation frequency also changes quickly. The product of the latency, 20μs, and the mode frequency, around 8 kHz, is 0.16. This adds difficulty to robust feedback control even with a low latency controller.[3] To overcome this challenge, we have included active control of the bias voltage applied on an edge probe into the feedback loop. The bias voltage applied on the edge probe enables us to influence the rotation of the modes in real-time. The variation in geometry of the system, where we observe that the detected mode amplitude has a phase dependency, is also taken into consideration in the algorithm design. In addition, HBT-EP can vary the wall configuration and includes ferritic wall effects. The feedback algorithm is tested on all cases and the performance will be reported.

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[2]Rath, *et al.*, *Fusion Eng Des*, **87**, 1895 (2012).
[3]Rath, *et al.*, *Nuc Fusion* **53**, 073052 (2013).

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