Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Experimental progress towards a prethermal discrete time crystal[1] A. KYPRIANIDIS, P. BECKER, K. COLLINS, W. MORONG, L. FENG, W.L. TAN, A. DE, U of Maryland, Physics and JQI, G. PAGANO, RIce University, Physics, P.W. HESS, Middlebury College, Physics, F.L. MACHADO, UC Berkeley, Physics, D. ELSE, UCSB, Physics and MIT, Physics, C. NAYAK, UCSB, Physics and Microsoft, St. Q, N. YAO, UC Berkeley, C. MONROE, U of Maryland, Physics and JQI — Driven quantum systems offer opportunities for studying novel phases of non-equilibrium matter, such as time crystals [1,2,3]. To avoid continuously absorbing energy from the drive, we investigate a strategy based on Floquet prethermalization. In this case, even without disorder, one can observe a slow heating time scale with exponential dependence on the drive frequency, leading to a long-lived intermediate "prethermal" regime. We use a trapped-ion quantum simulator with chains of Yb ions confined in a rf Paul trap that realize a transverse field Ising model with tunable range interactions. By varying the initial state and drive parameters of our system, we characterize this prethermal regime. [1] F. Wilczek, Phys. Rev. Lett. 109, 160401 (2012) [2] J. Zhang et al. Observation of a discrete time crystal. Nature 543, 217-220 (2017) [3] S. Choi et al. Observation of discrete time-crystalline order in a disordered dipolar many-body system. Nature 543, 221-225 (2017)

[1]This work is supported by the DARPA DRINQS program, the NSF STAQ program, the NSF Physics Frontier Center at JQI, AFOSR and ARO MURI programs, and the DOE BES and HEP programs.

Antonios Kyprianidis
University of Maryland, College Park

Date submitted: 30 Jan 2020 Electronic form version 1.4