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Analysis of vertical stability limits and vertical displacement event behavior on NSTX-U[1] MARK BOYER, DEVON BATTAGLIA, STEFAN GERHARDT, JONATHAN MENARD, DENNIS MUELLER, CLAYTON MYERS, Princeton Plasma Physics Laboratory, STEVEN SABBAGH, Columbia University, DAVID SMITH, University of Wisconsin-Madison — The National Spherical Torus Experiment Upgrade (NSTX-U) completed its first run campaign in 2016, including commissioning a larger center-stack and three new tangentially aimed neutral beam sources. NSTX-U operates at increased aspect ratio due to the larger center-stack, making vertical stabilization more challenging. Since ST performance is improved at high elongation, improvements to the vertical control system were made, including use of multiple up-down-symmetric flux loop pairs for real-time estimation, and filtering to remove noise. Similar operating limits to those on NSTX (in terms of elongation and internal inductance) were achieved, now at higher aspect ratio. To better understand the observed limits and project to future operating points, a database of vertical displacement events and vertical oscillations observed during the plasma current ramp-up on NSTX/NSTX-U has been generated. Shots were clustered based on the characteristics of the VDEs/oscillations, and the plasma parameter regimes associated with the classes of behavior were studied. Results provide guidance for scenario development during ramp-up to avoid large oscillations at the time of diverting, and provide the means to assess stability of target scenarios for the next campaign. Results will also guide plans for improvements to the vertical control system.

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