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The Implications and Challenges of Representing the 6D Distribution of High Charge Bunches KIERSTEN RUISARD, SARAH COUSINEAU, ALEXANDER ALEKSANDROV, Oak Ridge National Lab — As the need for higher beam intensity grows, the challenges of space charge dynamics become more pressing. Space charge both introduces nonlinear force components into the beam evolution and creates interplane coupling, complicating dynamics in the mostly linear and un-coupled accelerator system. One consequence of coupling is that the standard method of characterizing bunches, independent imaging of three phase space projections, does not fully describe the 6D phase space distribution. This presentation will describe a method for direct 6D measurement which has been implemented at the Spallation Neutron Source (SNS) Beam Test Facility. I will describe key insights from this measurement, namely the presence of hidden but significant interplane coupling after initial bunch formation and acceleration. Finally, I will touch on the implications of the 6D shape for predicting downstream beam evolution, particularly with respect to halo growth and beam loss.

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