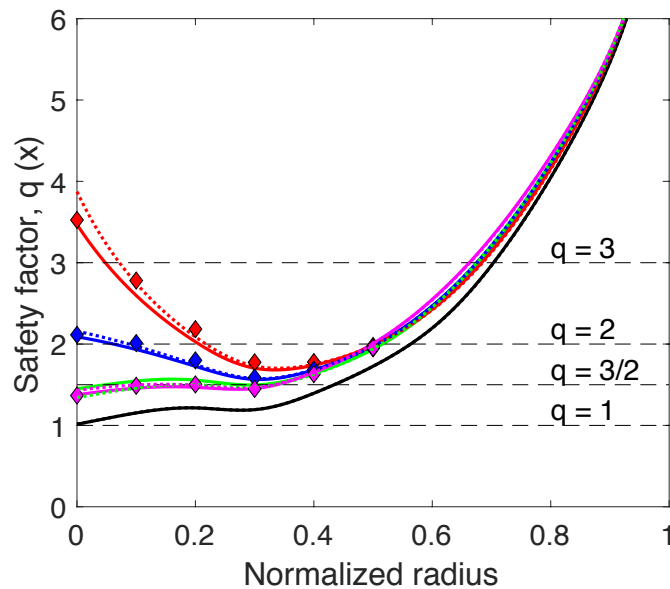
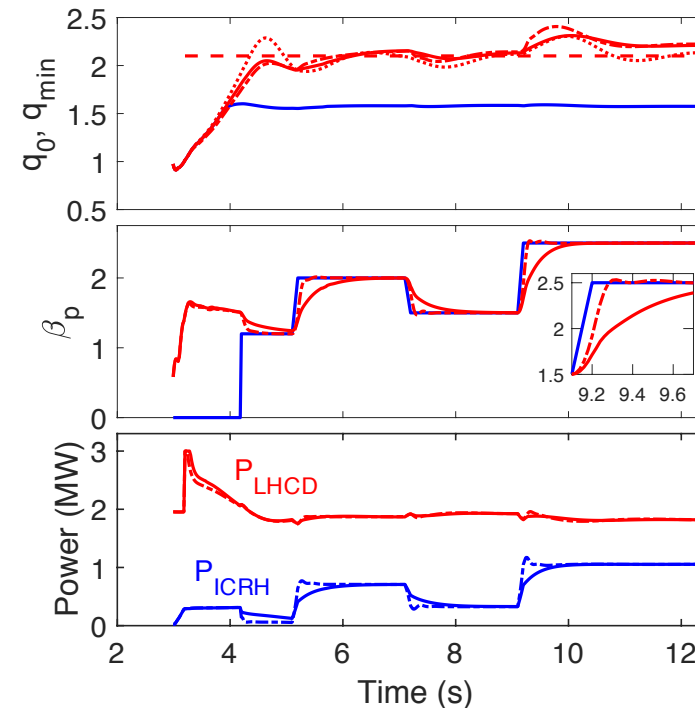


\*\*\*\*\*  
**NEW**  
\*\*\*\*\*

For the first time, model-predictive control has been combined with singular perturbation theory to synthesize fast plasma controllers based on extremely simple, data-driven, two-time-scale models.



Simulations of combined  $q$ -profile and  $\beta_p$  control using LHCD and ICRH on EAST showing either discrete  $q_0$  or distributed  $q(x)$  control and either slow (resistive time) or fast  $\beta_p$  control.



Non-linear closed loop METIS simulations show that simultaneous control of the plasma safety factor profile and of the poloidal  $\beta$  parameter can be achieved on EAST high- $\beta_p$  scenarios using LHCD and ICRH.