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Summary slide for poster TH/P6-50

Modeling divertor concepts for spherical tokamaks NSTX-U and ST-FNSF

- The ability of UEDGE to simulate partially detached snowflake divertor (SFD) plasmas in NSTX has been demonstrated.
- In NSTX-U, the SFD can be harnessed to provide effective heat flux mitigation; attention should be given to flux surface tilting with respect to the target.
  - Analysis of a series of modeled NSTX-U SFD show that favorable flux surface tilting produces favorable neutral trapping, facilitates detachment, and enables gradual detachment onset.
- In ST-FNSF, two viable heat flux mitigation techniques are identified: a conventional divertor with vertical target (CD-VT), and a "super-snowflake" (super-SFD) configuration.
  - In the CD-VT, target tilt provides neutral trapping as expected (see, e.g, the ITER vertical target design).
  - In the super-SFD, scenarios with full detachment are found, with the detachment front position determined by the cryopump duct location.
- In future work, this modeling can be extended in many ways. For example:
  - It may be insightful to capture realistic geometry (e.g., baffling), detailed molecular and kinetic neutral effects, charge-state resolved impurity behavior, and plasma drift physics.
  - Additional snowflake effects can be considered, e.g., ELM mitigation via turbulent mixing in low B_{pol} zone, and pedestal stability modifications.