

# Divertor heat flux reduction and detachment studies in NSTX

*Status Report by Vlad Soukhanovskii (LLNL)*

- Components of divertor heat flux reduction and detachment studies in NSTX:
  - Studies in low  $\delta$ ,  $\kappa$  LSN plasmas (highest heat flux to date 10 MW/m<sup>2</sup>) with D<sub>2</sub> puffing
  - Studies in high  $\delta$ ,  $\kappa$  LSN plasmas with high flux expansion, with D<sub>2</sub> puffing
  - Studies with impurity puffing (CD<sub>4</sub>, Ne) ■ Done
  - DN studies
  - Lithium
  
- This work: *steady-state* divertor heat load in H-mode plasmas with D<sub>2</sub> inj.
- IAEA presentation - an extended (detailed) version of PSI 17 paper
- Data analysis in good shape
- Modeling is in progress:
  - Two point model with losses - plan to finish by IAEA paper deadline
  - UEDGE edge transport modeling for a generic LSN case - plan to include in the NF version of IAEA paper

# IAEA FEC 2006 poster P4-28: Divertor heat flux reduction and detachment in NSTX

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- Introduction
- Inner divertor leg, MARFES
- Experiment - steady-state heat flux reduction at OSP in  $\delta=0.4$ ,  $\kappa=2$  **H-mode** plasmas with D<sub>2</sub> puffing
  - Partially detached divertor - x4 peak heat flux reduction
  - High-recycling radiative divertor - same
  - Divertor data: heat flux profiles, recycling and carbon profiles, volume recombination, estimates of e-i recombination sink, Langmuir probe data -  $I_{sat}$ ,  $T_e$ ,  $n_e$ , spectroscopic data from high- $n$  Balmer series lines -  $T_e$ ,  $n_e$ , divertor  $P_{rad}$
  - Core data during gas injection (confinement, carbon concentration, rotation)
- Discussion
  - Operational window in NSTX
  - Why is it difficult to detach OSP in NSTX? (Ion momentum and rad. power loss from 2PM as a result of NSTX open divertor and short connection length)
  - Prospects for heat flux reduction in NSTX and future ST-based devices