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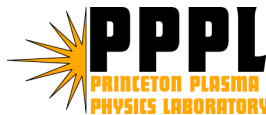
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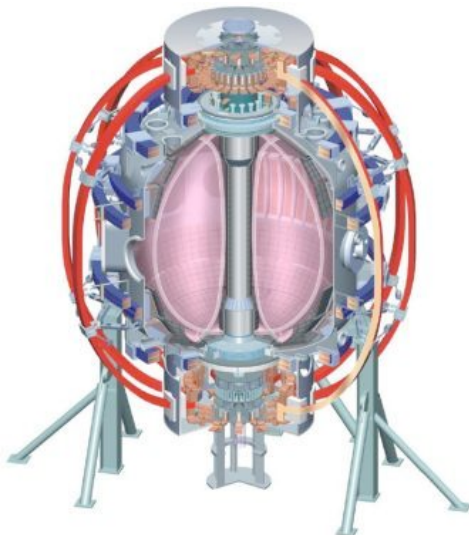
XP1029: Dependence of P_{LH} on the X-point radius

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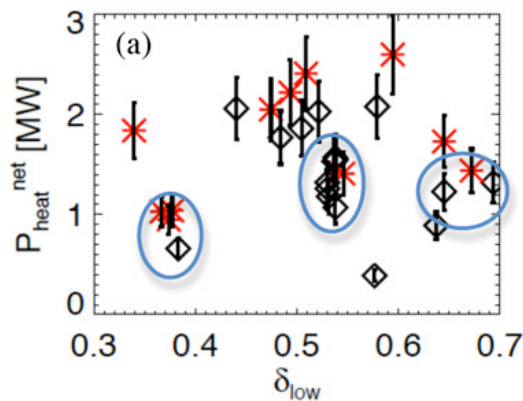
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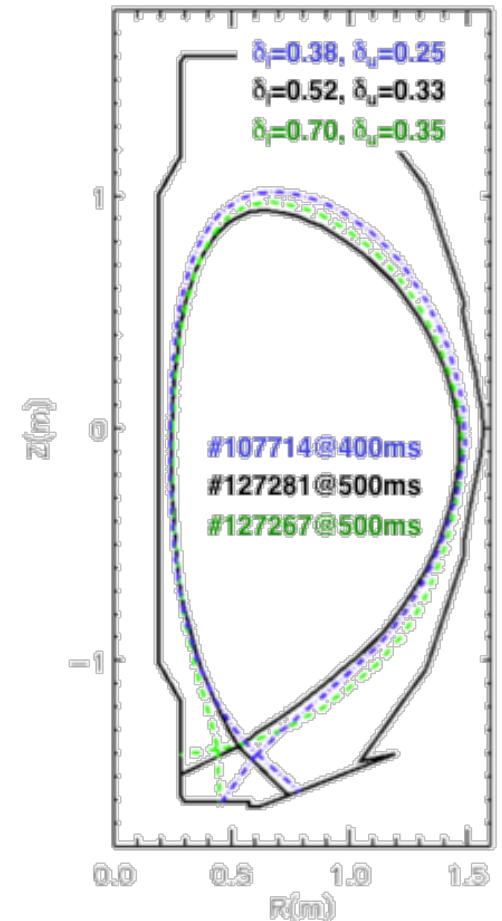
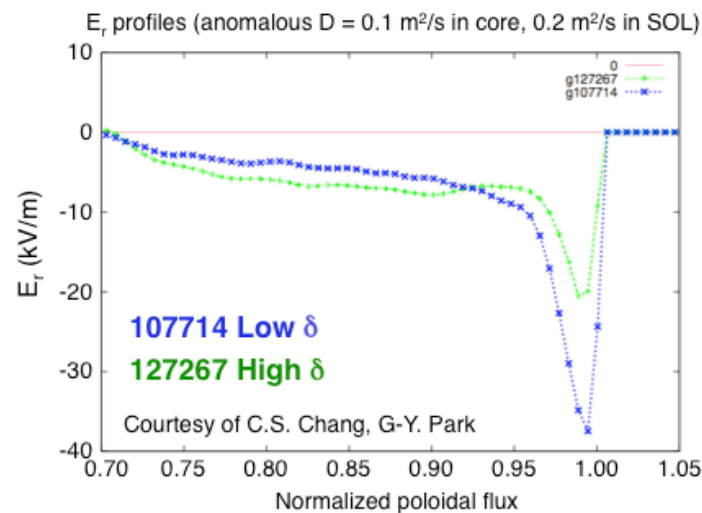
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Simulations and observations suggest dependence of P_{LH} on R_X

- XGC-0: thermal ion loss at the X-point increases with R_X
 - Increases E_r and E_r shear
 - May result in lower power threshold
- Goal: Measure P_{LH} vs R_X
 - Aim for transition during a period with small dW/dt and constant P_{OH} and n_e to reduce uncertainty

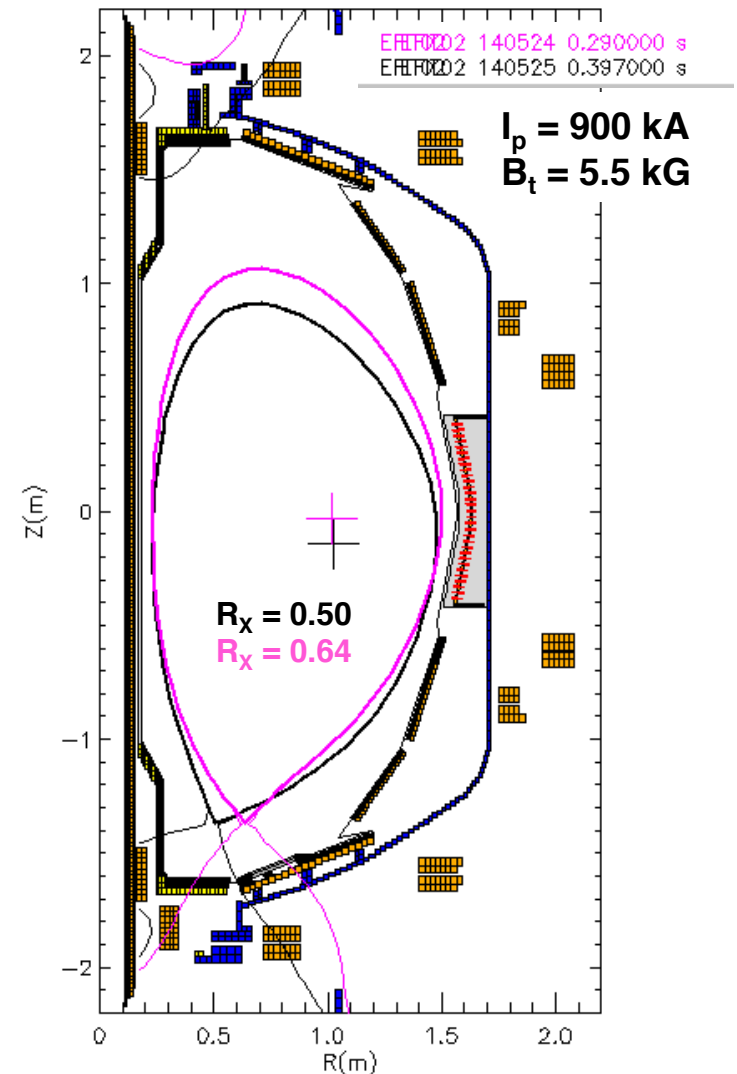
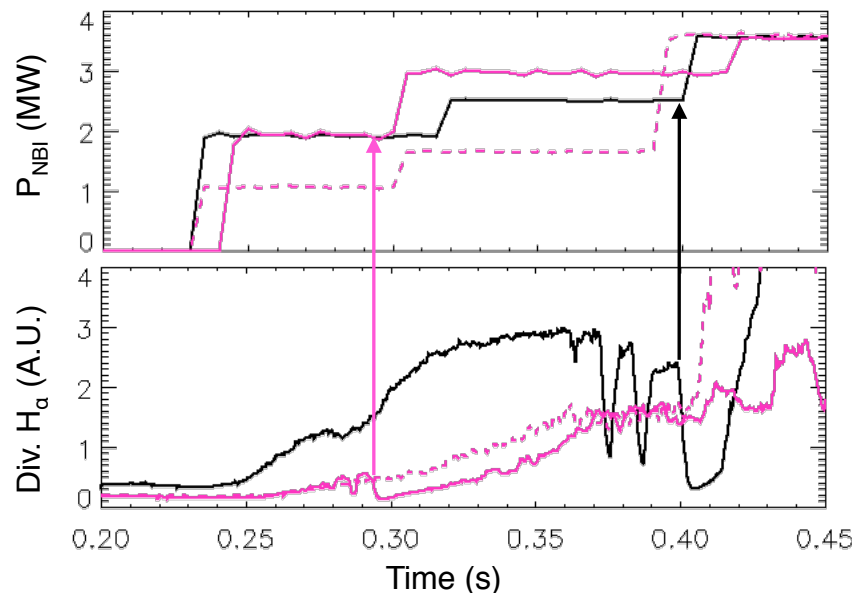


R. Maingi, et. al., *Nucl. Fusion*, **50** (2010) 064010



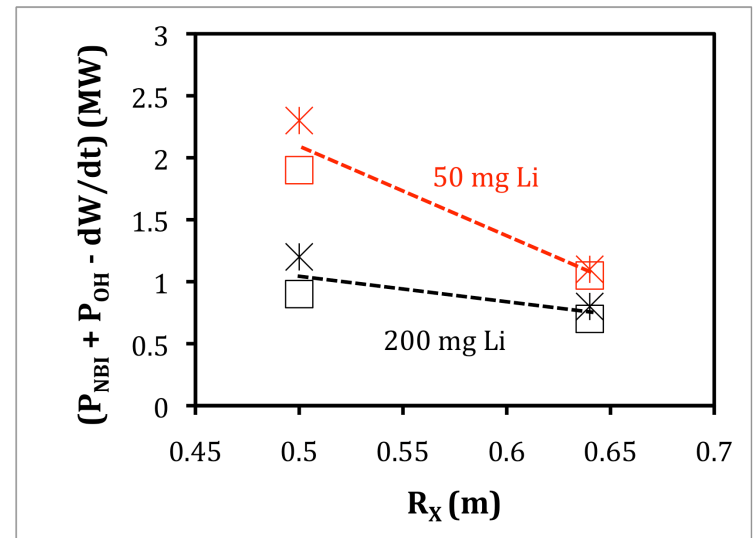
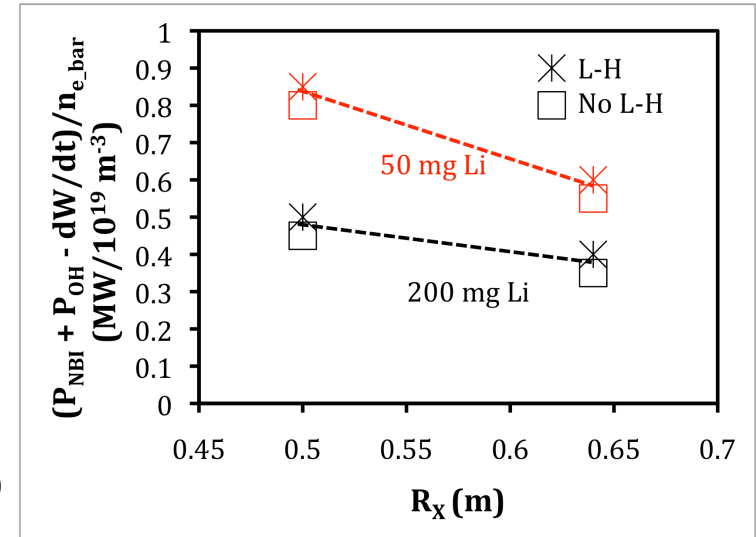
Two shapes reproduced with low and high lithium depositions

- First day: 300 mg of lithium
 - Early I_i evolution altered desired high triangularity shape with $R_x = 0.42$
 - 5.5 kG to avoid transition before flattop
- Second day: 50 mg of lithium
 - Good reproduction of both shapes
 - Lower CS gas programming



Initial results suggest dependence of P_{LH} on R_X

- P_{loss} computed from EFIT02
 - $P_{OH} \sim 0.3$ MW, $dW/dt \sim 0.5$ MW
 - P_{loss}/\bar{n}_e approximate correction for P_{LH} density dependence
 - P_{NBI} is total beam power
- $R_X = 0.5 \rightarrow 0.64$ (22% reduction in B_t at X)
 - P_{loss}/\bar{n}_e reduction of 29% w/ low lithium
 - P_{loss}/\bar{n}_e reduction of 20% w/ high lithium
- Lithium = 50 mg \rightarrow 200 mg
 - P_{loss}/\bar{n}_e reduction of 41% for high- δ
 - Maximum lithium at outer strike point
 - P_{loss}/\bar{n}_e reduction of 33% for low- δ
 - Maximum lithium in private flux region



Future plans and goals

- Higher time resolution equilibrium calculations underway
 - LRDFIT and/or EFIT02 at 1 ms resolution
 - Input into TRANSP to get beam loss
 - Aim to get consistent values of P_{OH} and dW/dt from different models
 - Complete error analysis
- XGC calculations for high- and low- δ shapes at time of L-H
- XP would benefit from additional run time before APS
 - Repeat low- δ shape with low lithium for reference
 - Get $R_X = 0.42$ shape using pre-heat during I_p ramp
 - Decrease B_t so it matches the value at X-point in the low- δ shape

Backup

Values from EFIT02 used for initial analysis

- Value of $(P_{OH} - dW/dt)$ used is maximum in range:
 - 50 ms after beam turn-on
 - Beam slowing down time
 - 15 ms before next beam turn-on or L-H
 - EFIT02 smoothing
- Using P_{NBI}
 - Will use TRANSP to compute absorbed beam power

