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LLD Related Ideas For The 2010 Run

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U Illinois
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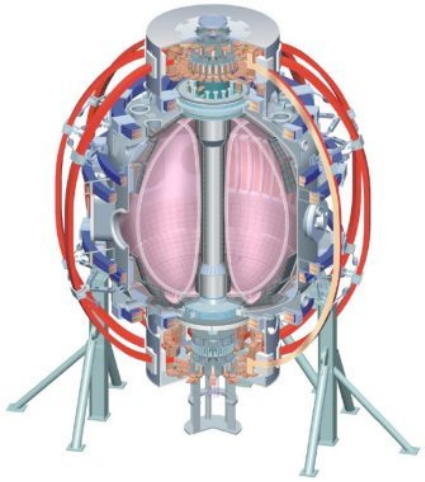
Each Idea has 2 parts:

- **"Cold-LLD" portion, with independent programmatic merit, to be proposed in another TSG (MS & ASC).**
- **"Hot-LLD" portion to be considered for Li TSG.**

LLD operational experience will modify these proposals

- **Early EFC, Fuelling Schemes, Rep. Rate,…?**
- **Hot and Cold LLD on the same day?**



Culham Sci Ctr
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I_P Quench and Halo Current Studies With a Liquid Lithium Surface

- Many new halo current measurements in 2010, including sensors on the LLD grounding posts.
- Questions:
  - How do VDE dynamics change with a recycling/pumping surface.
    - Pump-out during the wall contact phase of VDE changing the dynamics? D_2 vs He?
  - How do halo current dynamics change?
    - Halo T_e changing the halo current magnitude?
  - How do current quench dynamics change (faster or slower) with Li?
- Diagnostics:
  - Triple probe array, USXR, Halo current detectors, fast IR and TCs.
- "Cold LLD" Step (MS TSG)
  - Reproduce low-current VDE scenario from 2008 in D_2 and maybe He.
  - Brief scan over I_P, B_T?
- "Hot LLD" Step (Lithium TSG?)
  - Repeat one or two reference scenarios in He & D_2 with a hot LLD.
  - 1/2 day.
- Other things to look for:
  - Thermal quench dynamics, timescales.
  - Protective evaporative barrier?

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Improved NBCD and Stability at High-Normalized Current and Low-Collisionality

Develop and understand high-performance operating scenarios utilizing a liquid lithium divertor (LLD) for particle control

- ST-CTF designs typically operate at high-l_N, κ, and β_N, at low f_{GW} in order to increase the NBCD.
- Last years XP-948 took a small step toward meeting needs of the scenario.
  - Close on κ and β_N, but…
  - …too rapid q_{min} evolution, bottom-gap tended to zero late in the shot, stability sensitive to input power, ***density too high, reducing the NBCD***.
- "Cold LLD" step (ASC TSG):
  - Integrate improved control tools (β-control, X-point height control, improved RWM control) in high-β_T discharges from 2009.
  - Prepare if possible two targets: I_P=1.1 MA / B_T=0.4 T & I_P=0.7 MA / B_T=0.4 T
- "Hot LLD" step (Lithium TSG):
  - Reproduce the target.
  - Adjust fuelling to achieve minimal density consistent with stability.
  - Early EFC, SGI…work these in as necessary.
- 1 day in hot LLD step.
- Points of comparison.
  - Non-inductive current fractions.
  - Confinement.
  - Current profile evolution and core n=1 mode onset.
  - Rotation evolution and ideal stability.

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