Flowing Liquid Lithium (FLILI) System

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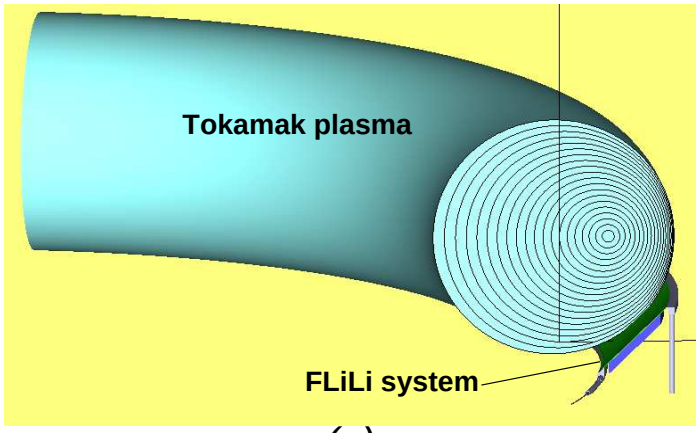
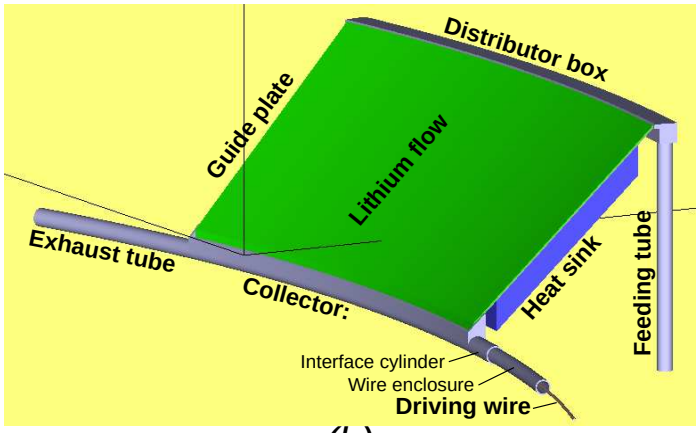
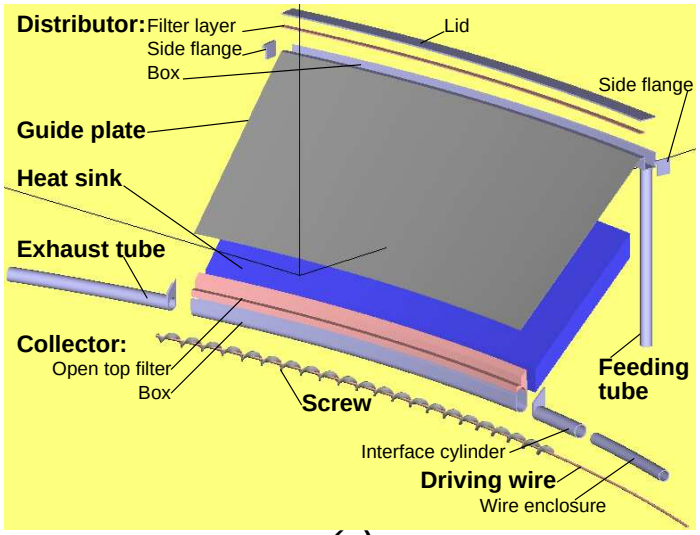


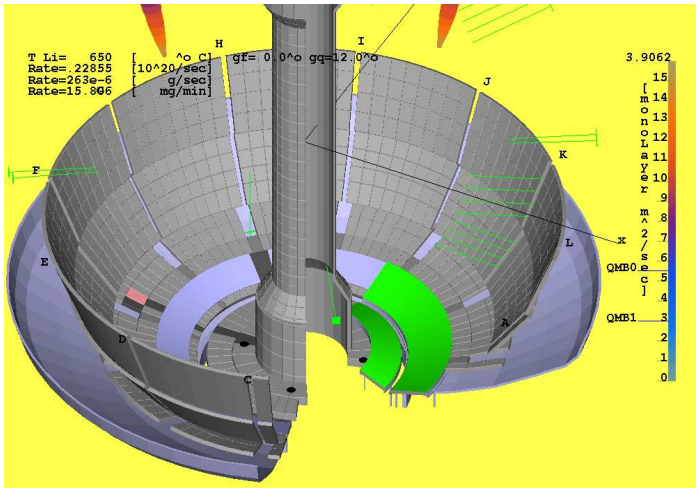
(a)



(b)



(c)



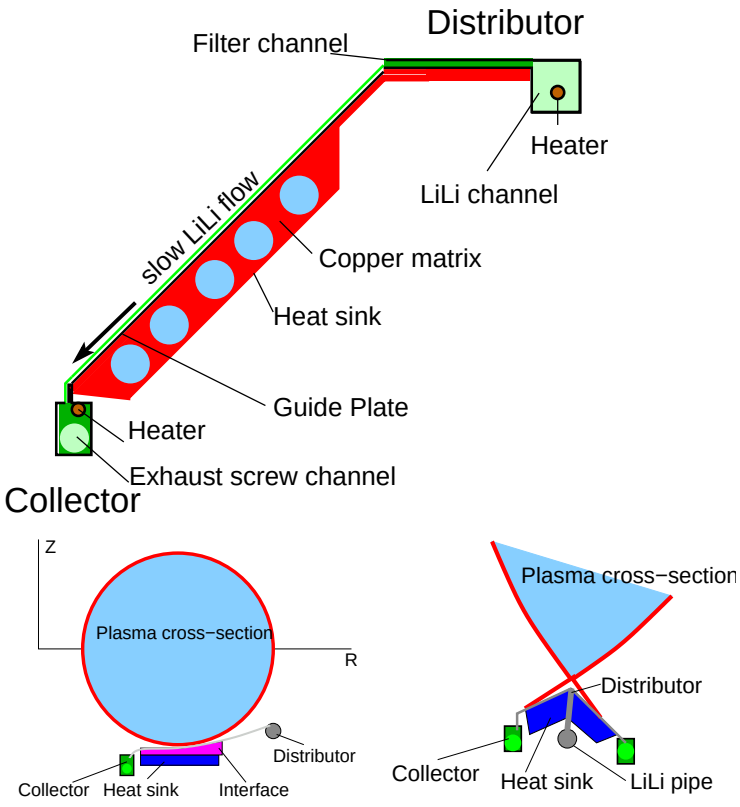
(d)

Conceptual design of the FLiLi system. (a) Example of FLiLi system as a limiter for a tokamak with a circular cross section (e.g., HT-7). (b) Assembly of distributor, feeding pipe, guide plate with LiLi flow (green), heat sink, collector and exhaust mechanism. (c) Separate parts of FLiLi system. (d) Two FLiLi systems for NSTX-U

Flow parameters and key properties

$$V_{cm/s} = 0.2 - 1, \quad Q_{cm^3/s} = 1 - 2, \quad H_{mm}^{filt} = 1, \quad L_{cm}^{filt} = 2 - 10$$

$$\Delta p_{Pa}^{filt} = 1.6 \cdot 10^2 V_{cm/s}^{filt} L_{cm} B_T^2, \quad \Delta p_{Pa}^{dist} = 1.6 \cdot 10^2 V_{cm/s}^{dist} L_{cm} \frac{d}{w} B_\perp^2$$



Design requirement $\Delta p_{Pa}^{filt} > \Delta p_{Pa}^{dist}$

Good properties are countless:

1. *FLiLi solves the problem of the Li surface contamination: open loop during machine operation, close loop overnight*
2. *Flow rate is under external control by pressure in the feeding pipes.*
3. *The system is scalable in both poloidal and toroidal direction, and from a laboratory test chamber to a real tokamak device.*
4. *Minimal in-vessel inventory of LiLi. LiLi is supplied from outside and is exhausted to outside the VV.*
5. *The bulk of LiLi is protected from plasma disruptions by the filter layer.*
6. *No side walls for LiLi flow, no leading edges.*
7. *Simple for maintenance, at the end of the campaign can be flushed out by argon and then by vinegar.*
8. *Is insensitive to yet unknown* $\mathbf{j} \times \mathbf{B}$ *forces.*
9. *Filter channel geometry and orientation is flexible.*

FLiLi is compatible with any tokamak, including NSTX-U. The plasma regime, it can provide, is beyond the dreams.

FLiLi is simply amazing.