



National Spherical Torus eXperiment Upgrade

International Collaborations Update, I&T Dept.

NSTX-U Physics Meeting

R. Maingi, F. Poli on behalf of the I&T Dept

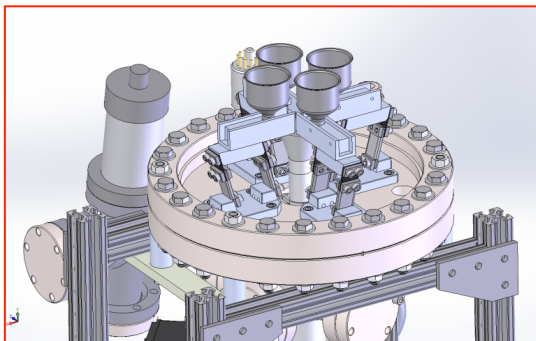
July 23, 2018

PPPL, Princeton, NJ

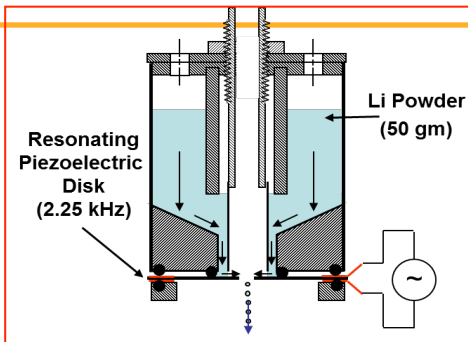
I&T Collaborations Activities on EAST

- Site visit by Maingi, Gilson, Sun, Tritz, Canik: 7/9-7/21
 - Installed new impurity powder dropper (Li, B, BN powder, Li granules)
 - Ran experiments on 7/16 & 7/20
 - Additional experiment for ELM elimination with powder and flowing liquid Li generation 3 limiter- made entirely of Mo – planned in next 2 weeks (IAEA 2018 oral)
- Modeling of synergy of EC/LH for optimization of long pulse operation (Poli)
- EAST schedule: run Nov. 2018 – Jan. 2019, and then shut down for ~ 10-12 months to install new pump plenum and replace lower divertor C tiles with W tiles
- Beginning to discuss Li Vapor Box partial divertor test (Goldston)

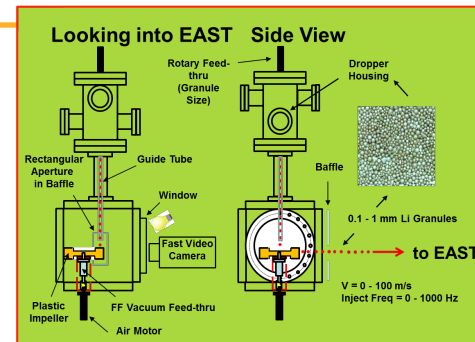
Many **NEW** and upgraded ELM control systems utilized!



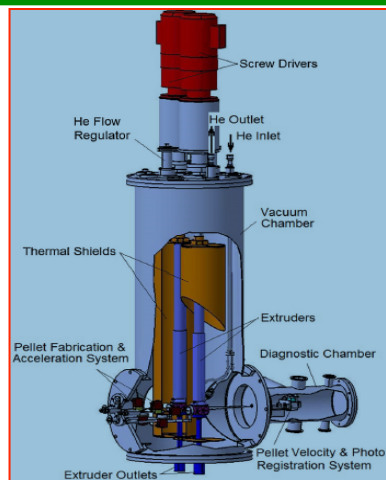
NEW Impurity Powder Injection
(Li, B, BN powder, 0.7mm Li granule, near upper X Point)



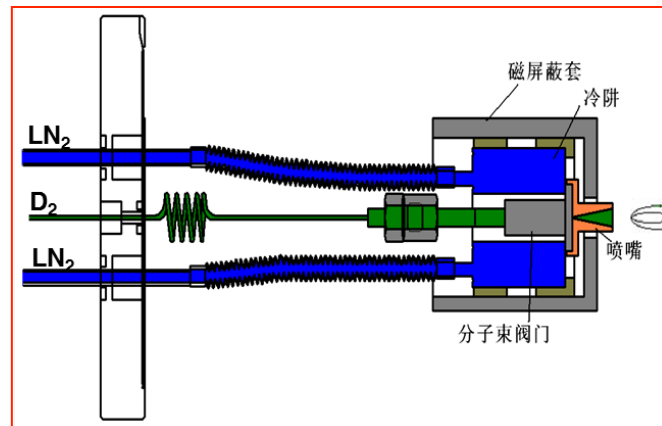
Li Powder Injection
@Top port, Low field side
(R=1750)



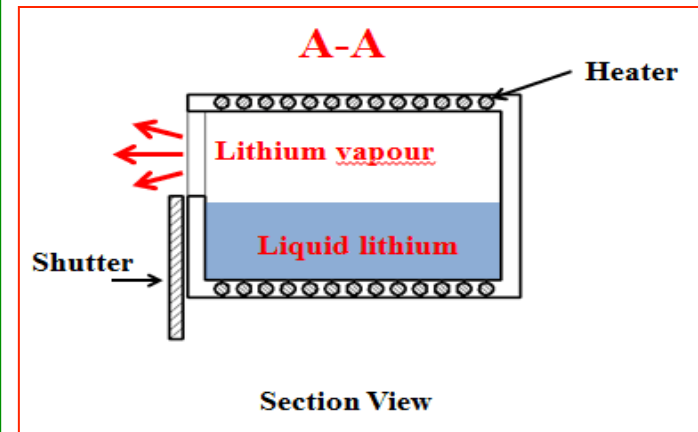
Li Granule Injection
(0.3, 0.5, 0.7, 0.9mm)



NEW 50 Hz D₂ PI

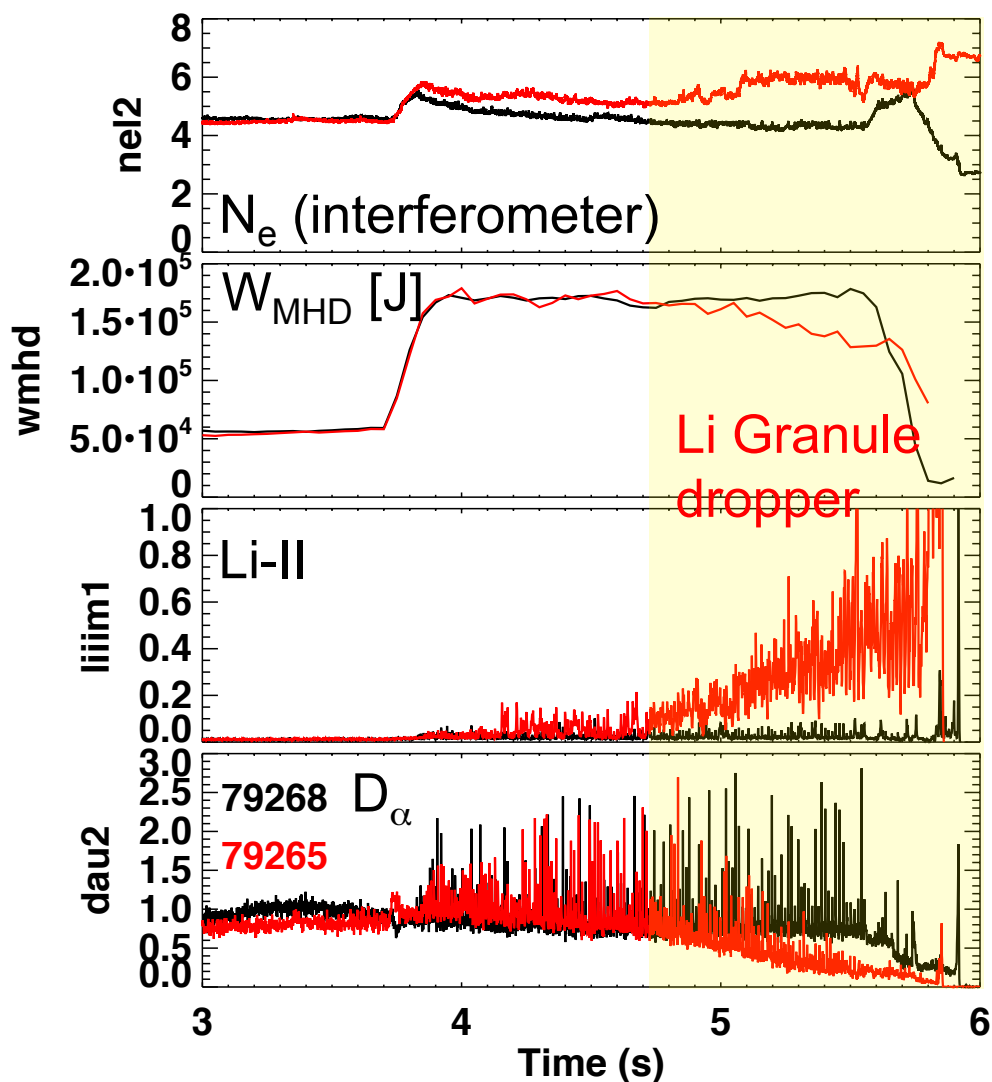


SMBI (D₂, Ne, Ar)



NEW Li evaporator

ELM Mitigation -> Suppression? Achieved with Lithium Granules dropped into plasma



- Comparable density
- Stored energy drops slowly with Lithium granule dropper (need lower drop rate)
- Li-II light shows when granules go in
- ELMs eliminated 5.2-5.7s
 - Recycling strongly reduced
- 0.45 MA, 1.5 T, 1.2 MW PLH2, 0.4 MW PLH1, 4.8 MW NBI

I&T Collaboration Activities on KSTAR

- Started a new project to develop a fusion flight simulation based on TRANSP, in collaboration with NFRI (Poli)
- New collaboration on fast ion physics (Poli)
- Ongoing RMP collaboration (Park, Nazikian)
- Installed and commissioned in early July a new impurity powder dropper for long pulse conditioning
 - Experiments scheduled Sept. 17-21, 2018: 2 shifts

I&T Collaboration Activities on JET, AUG, COMPASS

JET:

- Support to TRANSP-JET users: better streamline of processing data (Poli)
- Support to modeling of baseline and hybrid discharges: RF-NBI synergy, EP stability, optimized ramp-up (Poli)

AUG:

- Follow-up experiments with powder dropper for wall conditioning with B, BN, and new experiments with Sn, W (IAEA 2018 oral)

COMPASS: Potential new collaborations

- Existing 3D fields collaboration (Park, Logan)
- TRANSP support for design of COMPASS-U (Poli)
- Participation in liquid Li metal divertor experiments in COMPASS (**Li CPS 2/19, SN or Sn/Li CPS 10/19**); design for COMPASS-U