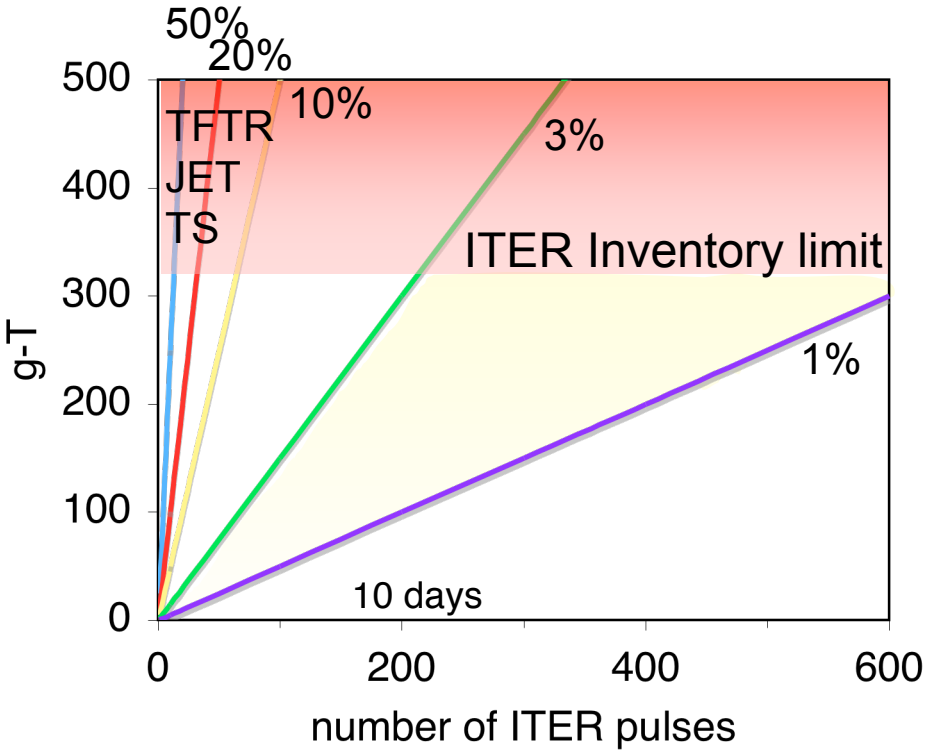
Tritium Management

- Control of tritium inventory is fundamental to public acceptance of fusion as a safe and environmentally friendly energy source.
- Present ITER design can only meet this objective by stopping DT plasma operations as there are no means to remove tritium in present design. ITER baseline is not 'done'!
- R&D gaps:
  - Tritium removal technology needed in short time remaining before ITER hardware procurement decisions are fixed.
  - Experience with W PFCs in Asdex-U and JET-ILW.
  - Investigations of tritium retention in neutron and plasma ion damaged tungsten.
  - Testing in a long-pulse, high heat flux tokamak, is a required intermediate step to qualify the durability and tritium retention properties of tungsten for NCT.

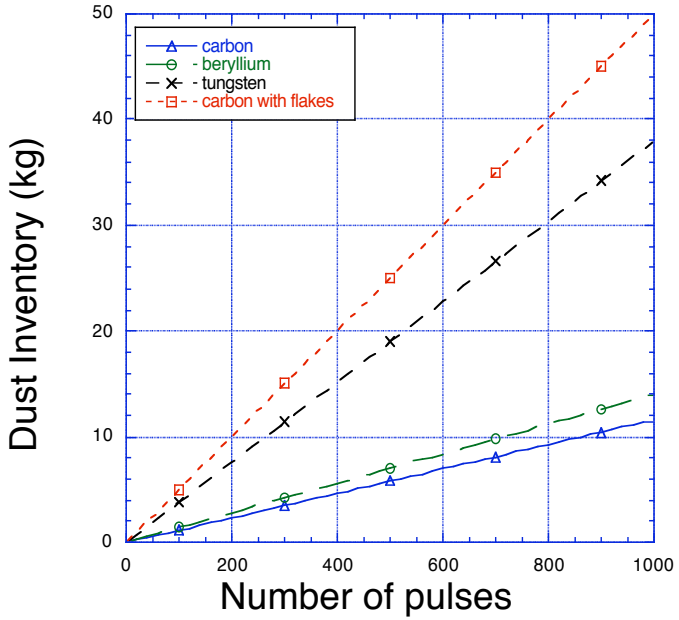


Tritium Inventory Buildup vs. retention rate

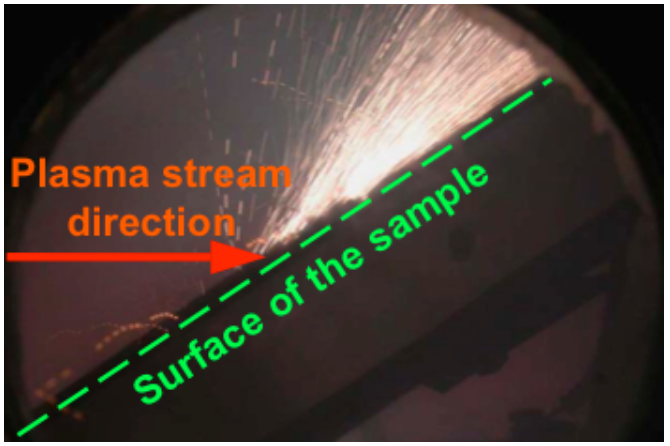
Dust Management

- Crude estimates for ITER suggest dust production at a rate of ~0.1 g/s for tungsten dust or ~3,000 kg/burn year.
- Dust safety limits are ~ 100kg, with < 6kg on hot surfaces (ITER).
- ITER baseline is not 'done' as no means to measure or remove dust are in current design !
- R&D gaps:
  - Measurements of dust production rates in a disruption simulator.
  - In-vessel dust diagnostic development
  - Dust removal technology trials in a tokamak mockup.

- Other serious deficiencies in ITER design exist. The US needs to feel 'ownership' of these issues and work with the IO to assess the design changes required. Without a successful ITER the chances of a Demo are slim.



ITER dust production crudely estimated at 10% of sputtered, 50% of evaporated material + flakes for CFC [G Federici]



Tungsten droplet tracks in QSPA ELM simulator at Troitsk, 1.6 MJ/m^2 first pulse 3ms after 1st pulse. Mass loss 67 mg/pulse
[Zhitlukhin J. Nucl. Mater., 363-365 (2007) 301.]