A dynamic beam window for ADS

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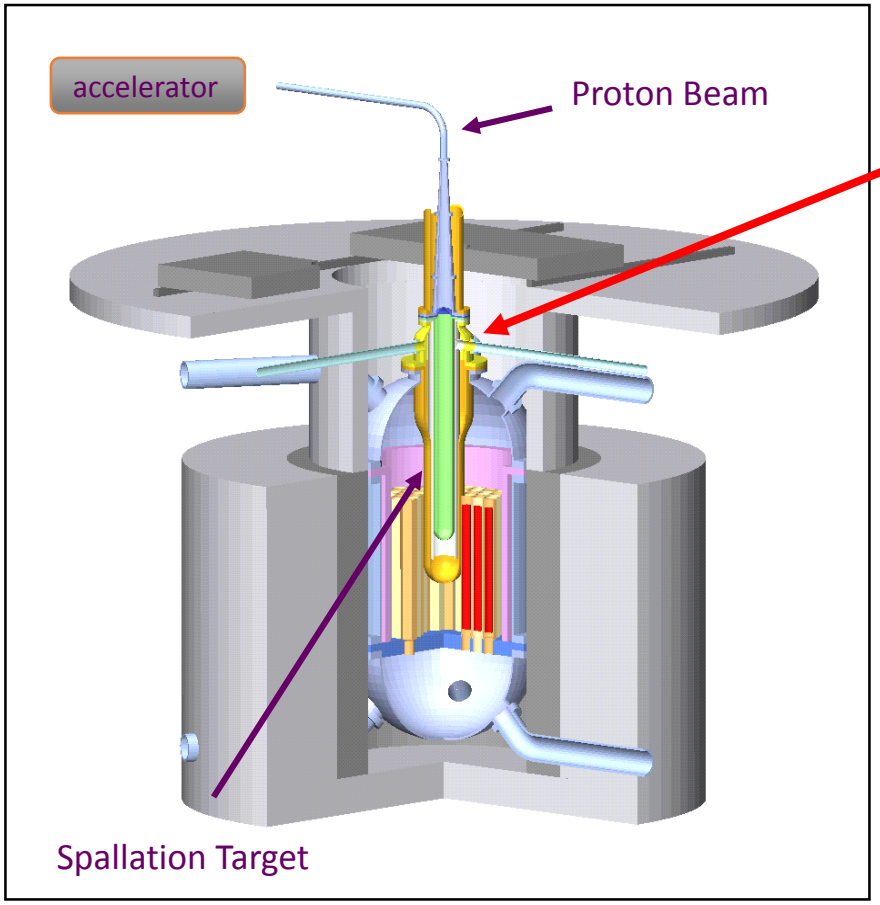
The case



Transition Region
Accelerator Spallation Target

- ADS designers have so far come up with 2 types of solutions for the transition: "window" and "window-less"
- A window is very fragile, as necessarily thin, and exposed to the intense proton beam
- In a window-less solution the accelerator is rather unprotected from residual out-gassing, possible backsplashing from the hot-molten target into the accelerator, further the supression of a containment barier presents licensing issues

Ingredients for an unconventional solution:

- Since the vacuum pressure in this region is not that high, e.g. 3×10^{-6} hPa for Pb at 450°C, the main function is the protection against splashes of molten metal and hopefully some mild differential pumping.
- Nobody really likes metallic vacuum windows where the high power beam has to pass through, but often there is no way around.

The idea (hopefully a solution):

- Shoot through the propeller…like the machine gun in the WW1 airplanes..BUT with proper and reliable synchronization
- Of course this concept needs some numbers..
  - Can we get the required pumping speed?
  - How many propeller blades are possible?
  - How many propeller can be stacked on the axis?
  - Is the operation, control and reliability reasonable for such a hot and highly radioactive environment?
- Assuming, after first proper estimates in discussion with vacuum experts, the numbers being realistic, we have to check realistic options for the beam (certainly a fast chopper is required then)

First tests…

In case it turns out that this concept can work on paper and in simulations and that one can produce this kind of special vacuum pump, some testing will be required.

- Having such a setup on a bench the beam could be simulated with a pulsed laser to check for timing and synchronization issues.
- High temperature tests for the motor and bearings (probably magnetic bearings) are needed which implies the use of magnetic material with very high Curie temperature.(>450 deg C)
- Same of sensors (position, sync.) with SiO2 insulated cables to connect to electronics in safe distance.