

The TS2 moderator process: Design by Computer

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Requirements

- Neutronics
- Engineering
- The Design

Basics of Moderator Design

- Decoupled Moderator
- Coupled Moderator



Primary Requirement Specification

- ▶ Long wavelength moderator system
- ▶ Four moderator faces based on a high intensity, high flux, medium pulse width, short pulse width
- ▶ Get the performance at the sample position
 - ▶ **Reality:** at the guide entrance
- ▶ Facilitate the innovative



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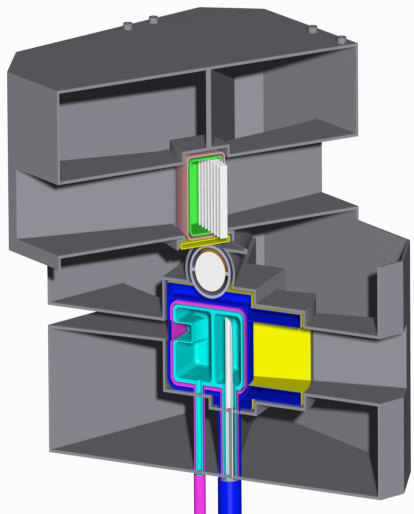
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 - ▶ Pulse FWHM must be less than existing H₂ moderator
- ▶ Force Bayesian probability

The Realization of the Specification: Simulators

- ▶ Involve the engineers early
- ▶ Simulate real shapes, real materials and real engineering
- ▶ Comparison testing if possible
- ▶ Parameterise everything and use AI to find design

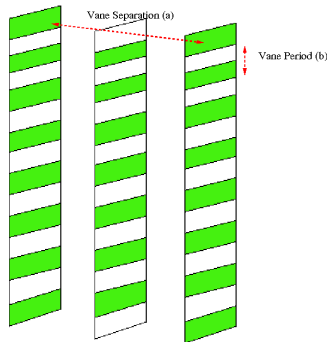
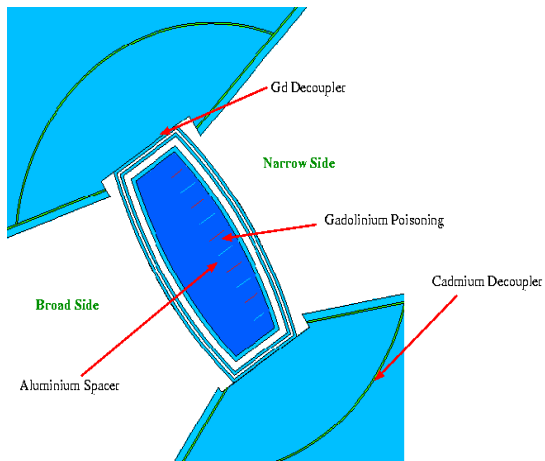


Layout of TS2's moderators



- ▶ Two cold moderator:
Coupled + Decoupled
- ▶ Low powered solid
W-target (48KW)
- ▶ This is the baseline
picture

Layout of the Vaned moderator



Vaned moderator Equations

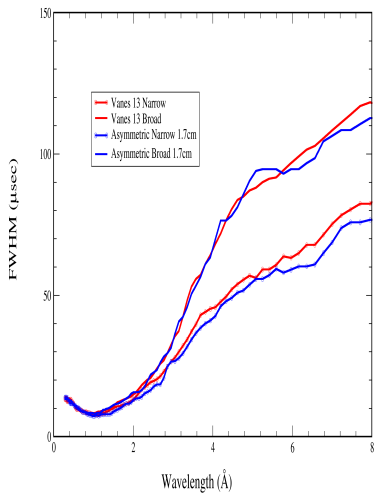
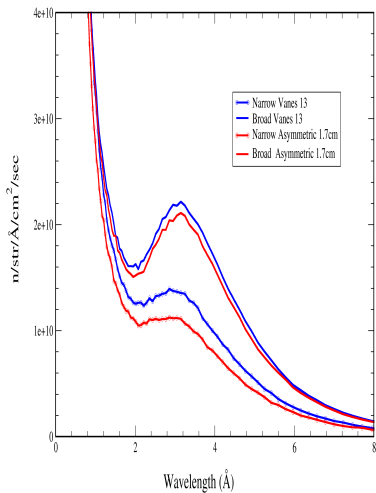
$$\phi(t) = \text{const} \exp\left(-\frac{1 + (2B^2)L_T^2}{t_d}\right) \quad (2)$$

$$B_{lmn}^2 = \left(\frac{l\pi}{a}\right)^2 + \left(\frac{m\pi}{b}\right)^2 + \left(\frac{n\pi}{c}\right)^2 \quad (3)$$

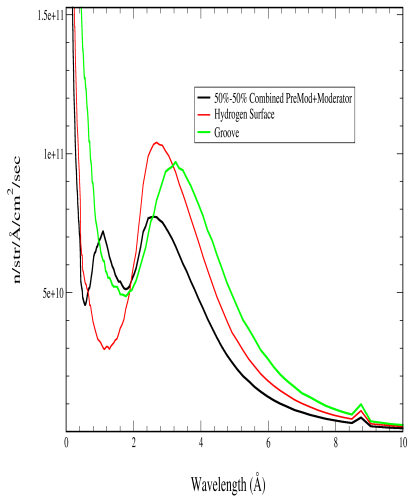
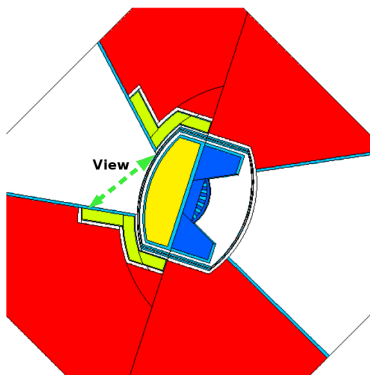
a , b are the vane diagonal separations :: theoretical gain of 44%



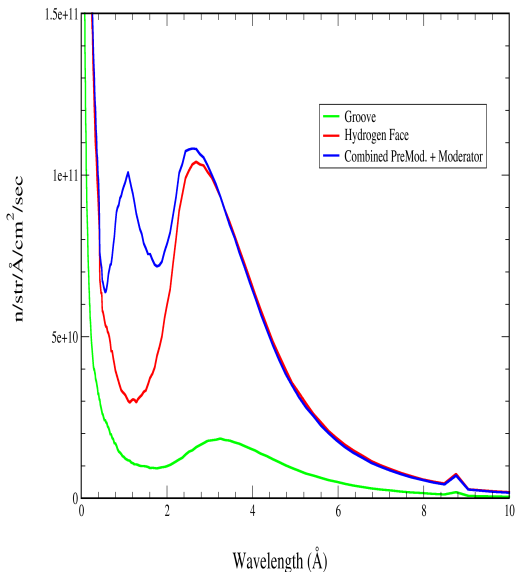
Advantage of a vaned model



Different Views of the Hydrogen Face

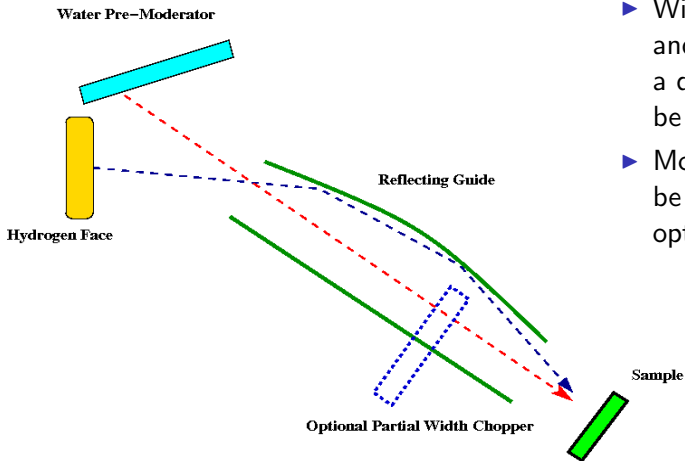


Different Views of the Hydrogen Face



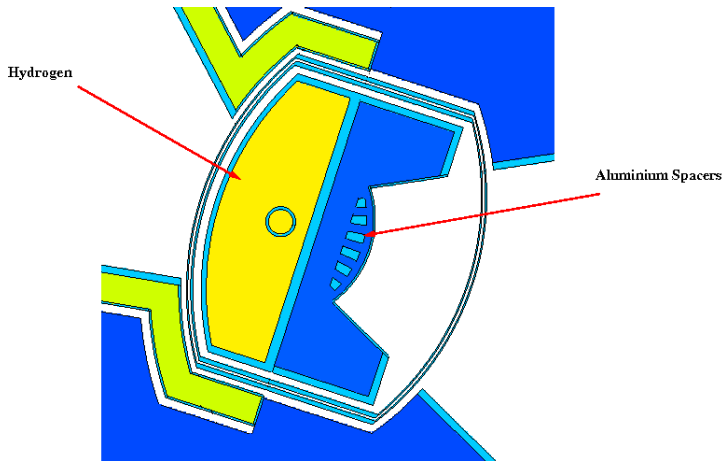
- ▶ Massive gain if the whole range can be used
- ▶ Clever timing tricks can be done to help re-resolve

Realization as a beamline

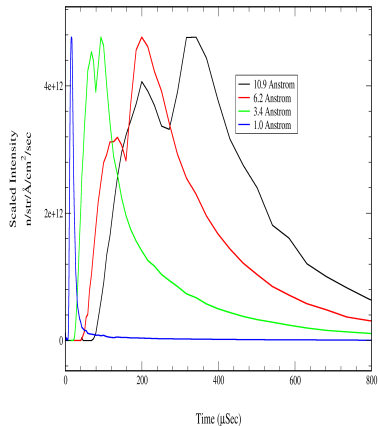
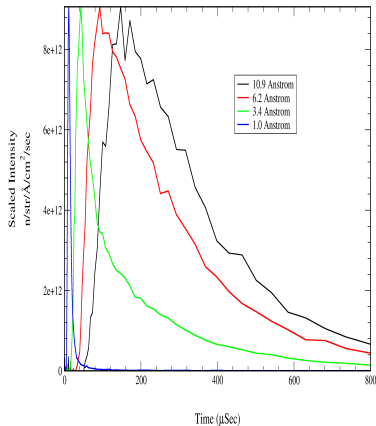


- ▶ With time-separation and re-angle correction a doubling of flux can be achieved.
- ▶ Moderator overlap can be avoided with an optional chopper

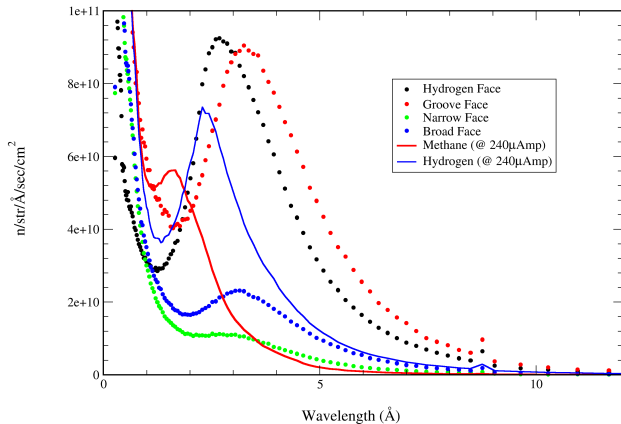
Castle Structure for the Groove



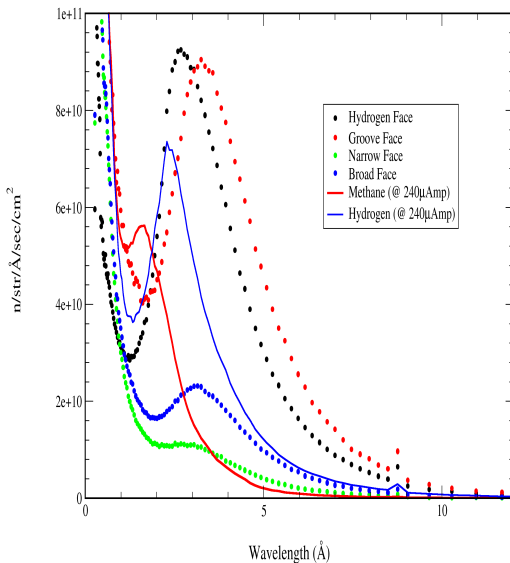
Time Structure Problems



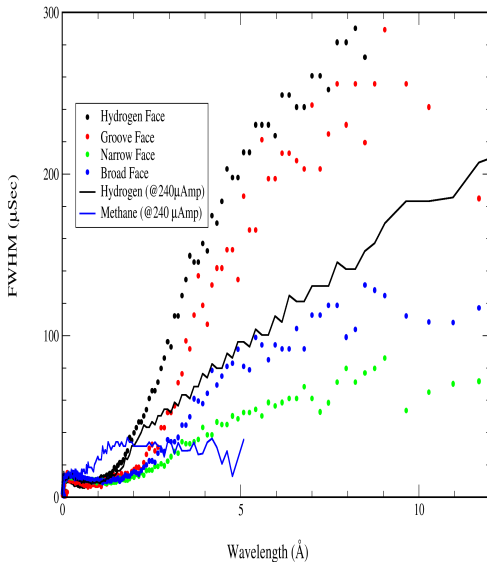
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- ▶ The AI systems are lagging the MC