

Instrumentation at a compact accelerator-based neutron source

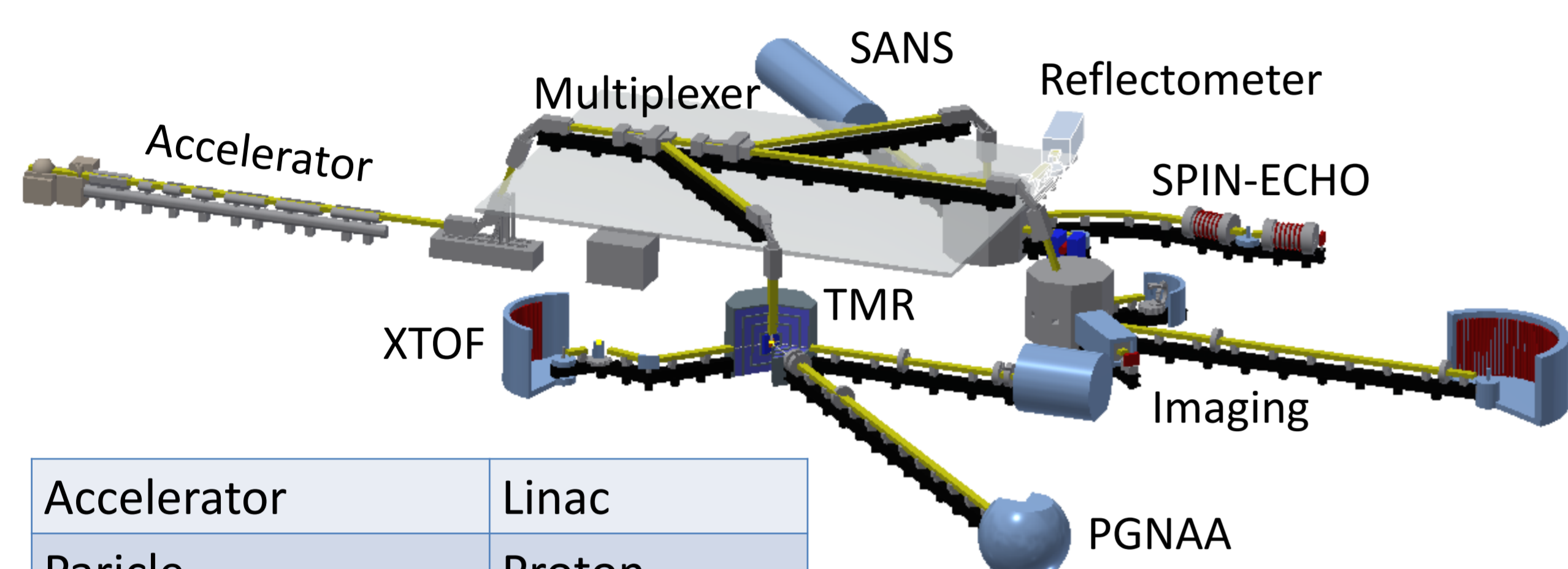
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High Brilliance neutron Source (HBS)



Accelerator	Linac
Particle	Proton
Energy	70 MeV
Current	100 mA
Duty cycle	1 – 5 %
Beam frequency	24 – 384 Hz
Power at target	100 kW
Instruments	10 - 20

Compact accelerator-driven neutron source will supply neutrons for science and industry

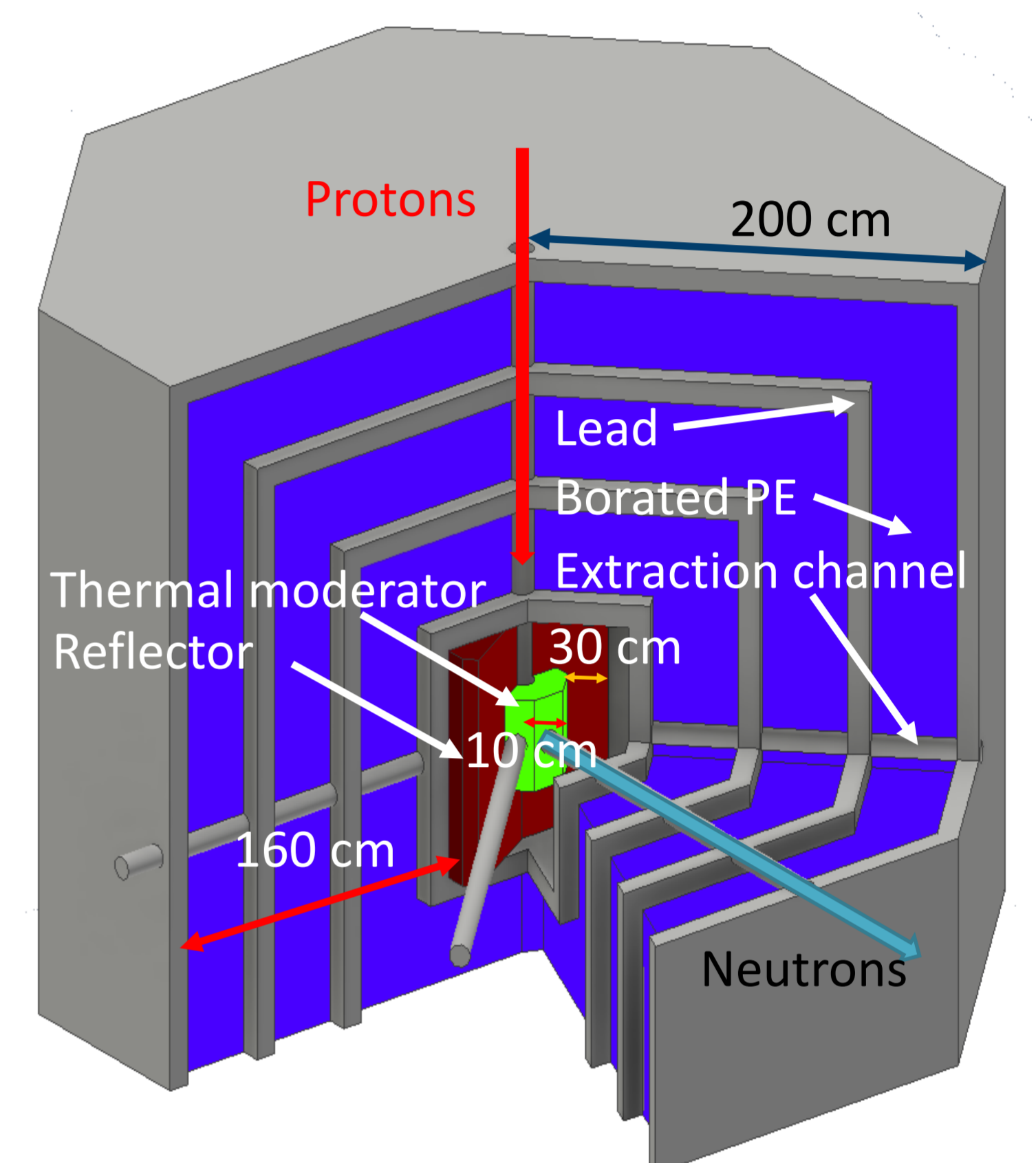
TMR Unit

TMR Unit

- Compact design due to low proton energy and therefore efficient neutron extraction
- Effective coupling of neutron production and neutron moderation

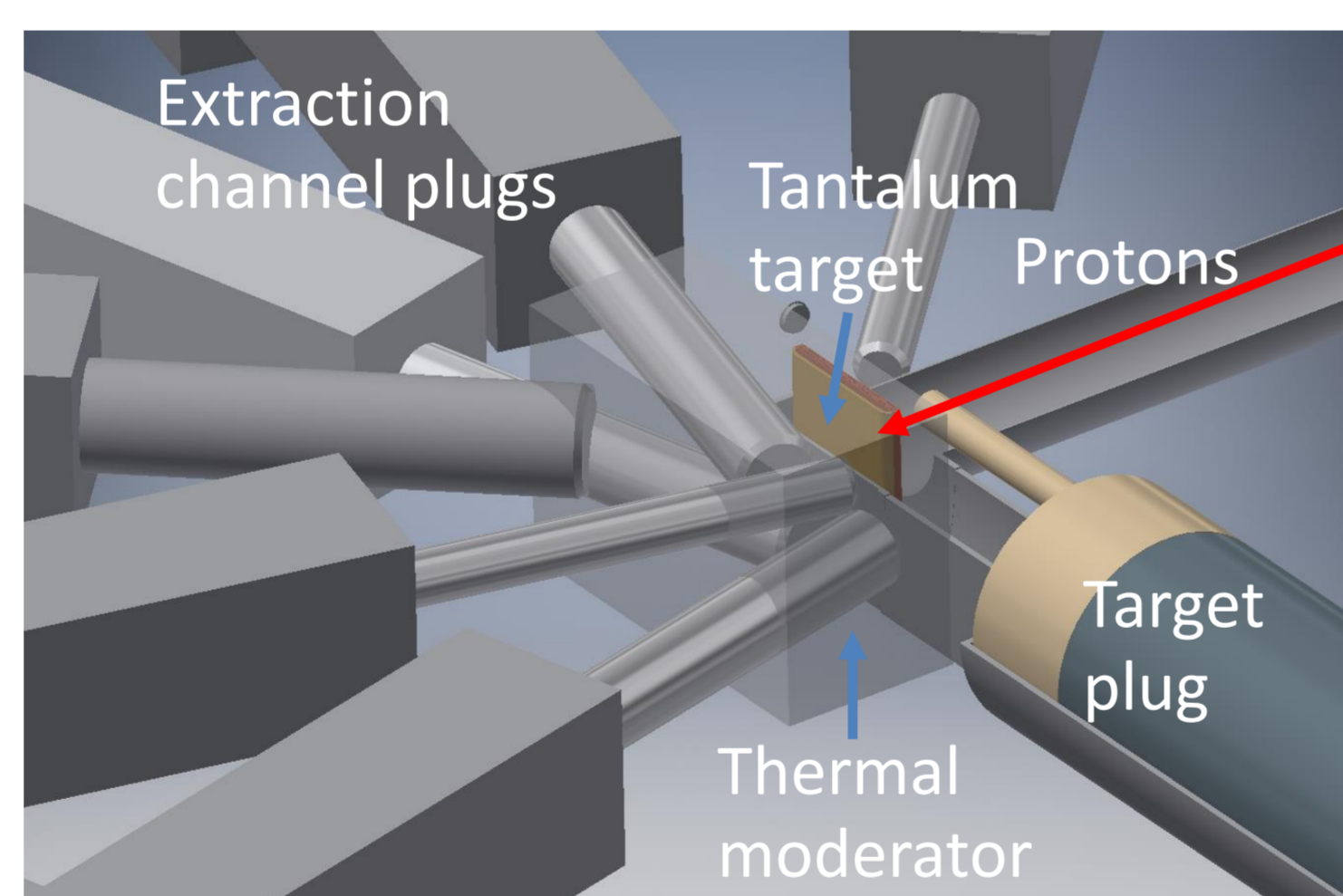
Instrument considerations

- TMR operated at pulse frequency of 24 Hz, 96 Hz or 384 Hz
- Chopper placement at 2 m distance to moderator surface possible
- Neutron guide can be placed inside TMR at 40 cm distance to moderator

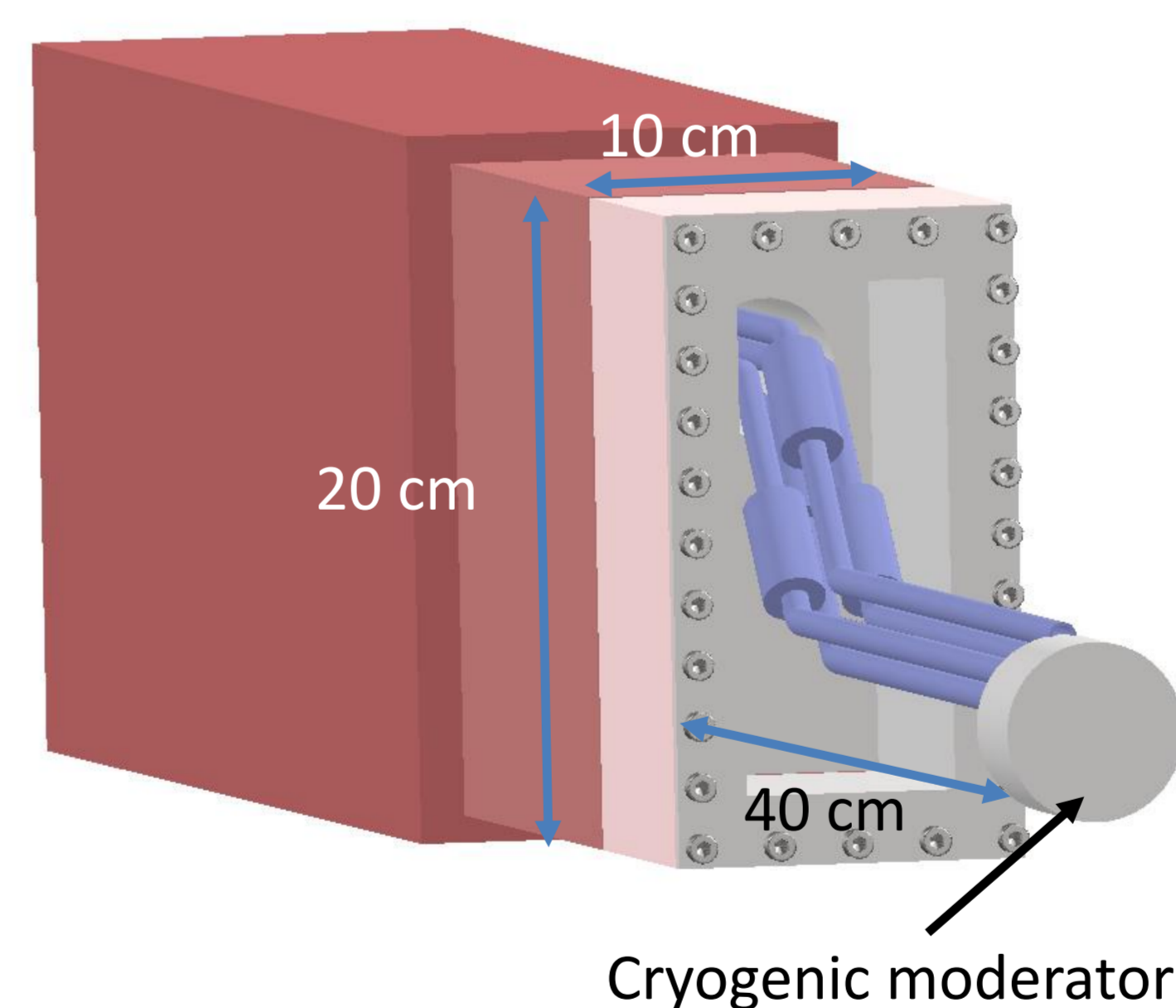


Target / Moderator assembly

- Thermal moderator just few cm away from target
- Channel extracts neutrons from thermal maximum
- Cryogenic moderator can be placed into extraction channel



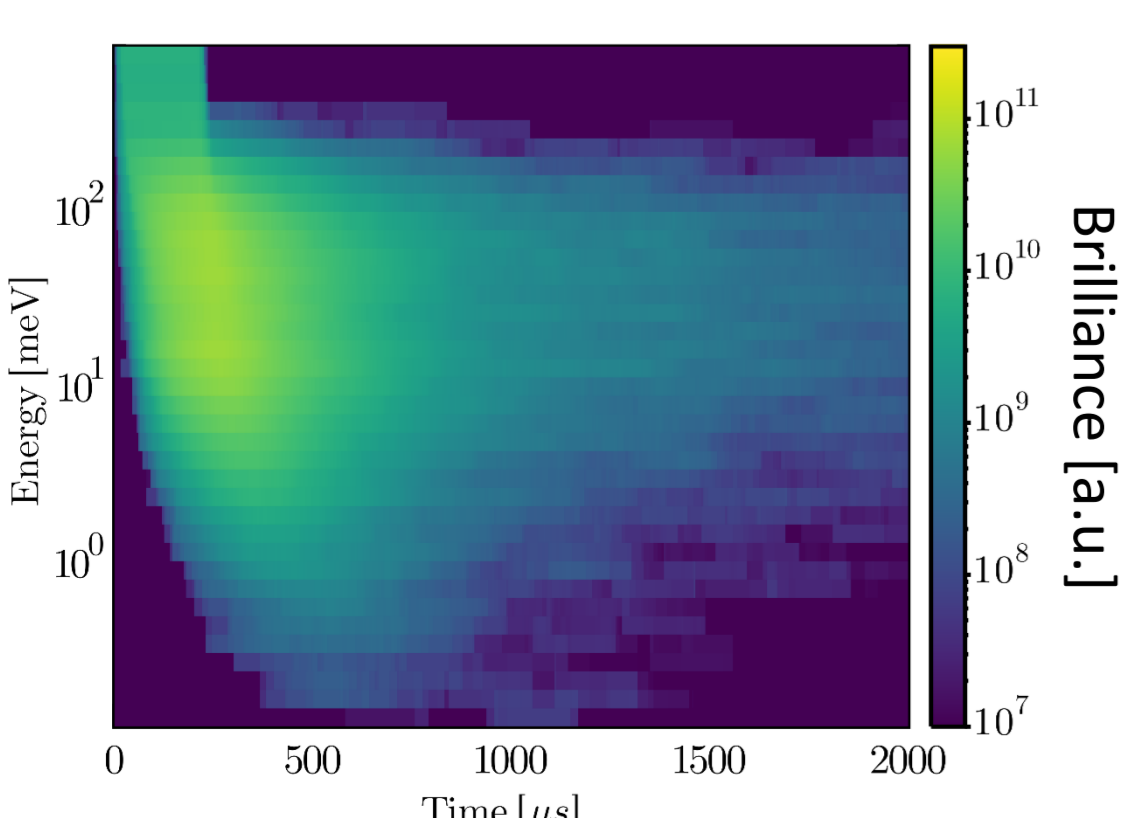
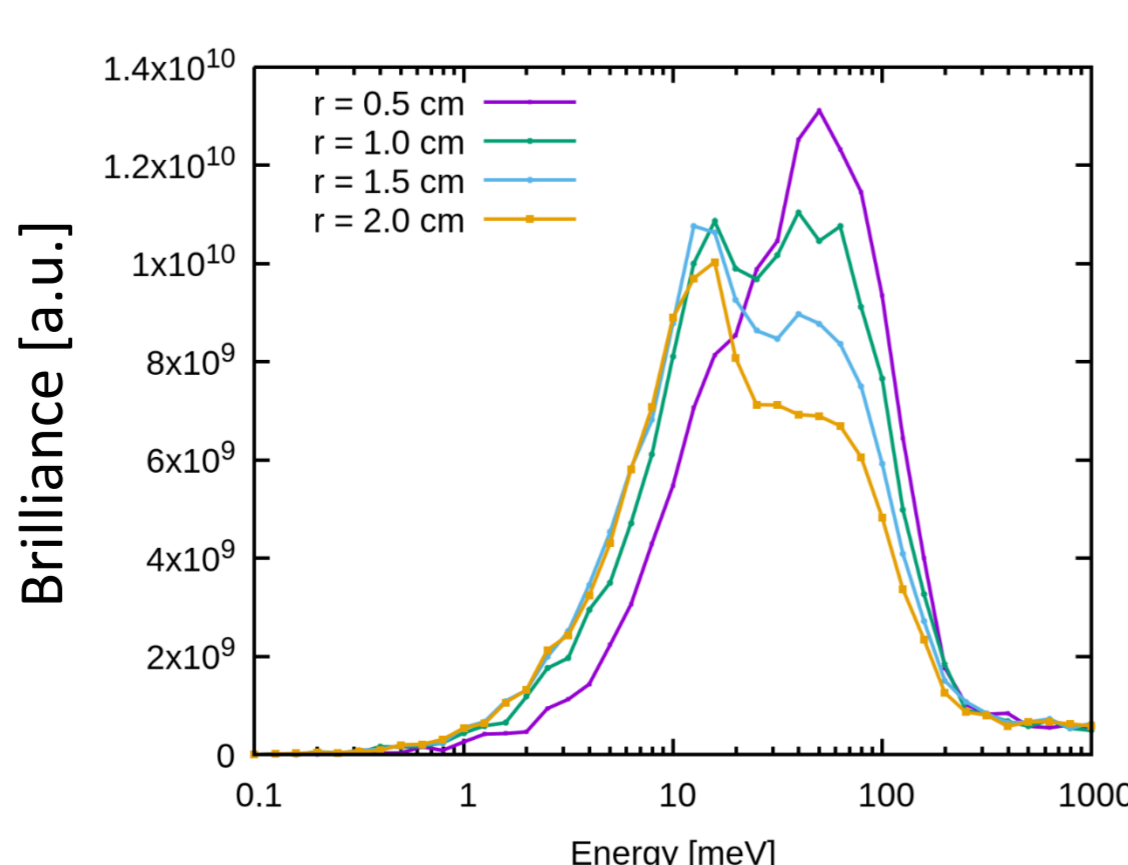
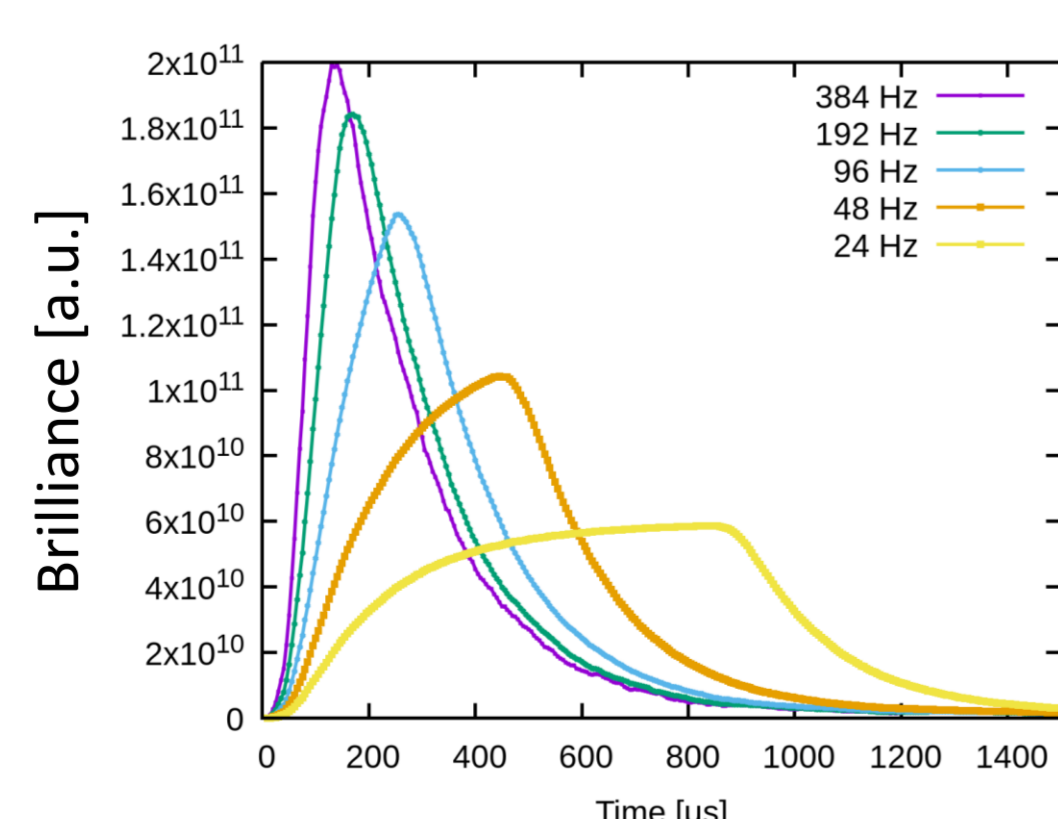
Extraction channel plug



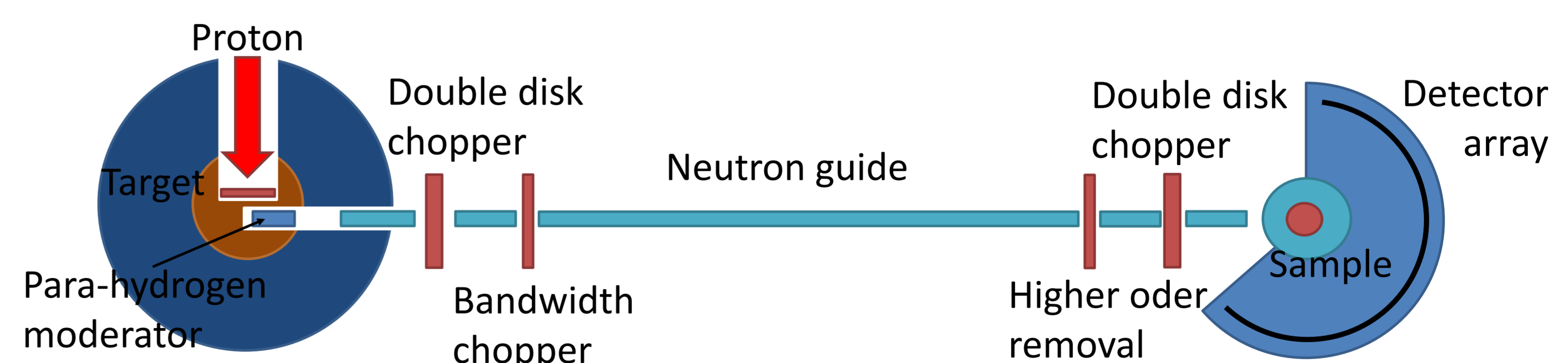
- Extraction channel belongs to instrument and can be optimized to instrument needs
- Moderator dimensions and material (H₂, Methane, Mesitylene..) are free parameters
- Compact design of plug necessary
- Media supply to moderator goes through extraction plug as well as neutron guide

Cryogenic moderator

- Pulse frequency, moderator material and dimensions allow for a neutron spectrum tuning
- Spectrum can be optimized to instrument requirements



Instrument Performance



- CANS allows for a compact instrument design
- rethinking of instrument length, neutron guide and chopper placement, moderator usage
- Huge optimization potential

Beam frequency	96 Hz
Moderator	Liquid para-hydrogen
Moderator to sample distance	15.5 m
Detector to sample distance	3 m
Initial wavelength range	1.6 Å < λ < 10 Å
Scattered wavelength range	0 Å < λ < 13 Å
Detector range	3° < 2θ < 150°
Flux @ λ = 5 Å, δhν = 100 μeV	3.5 × 10 ⁵ n cm ⁻² s ⁻¹