Beamline and Target Design of the Future TATTOOS Radionuclides Facility at PSI

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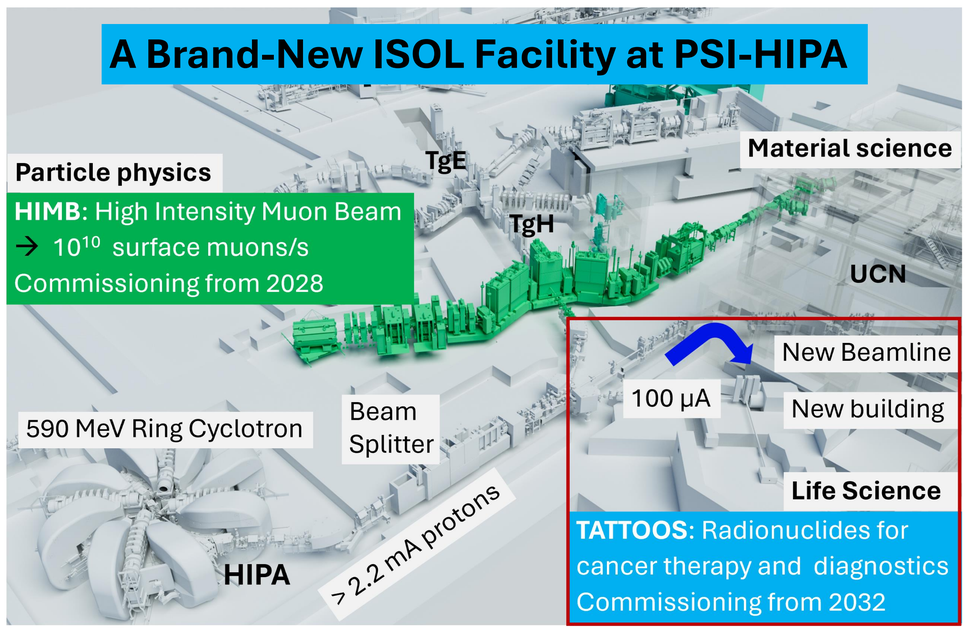
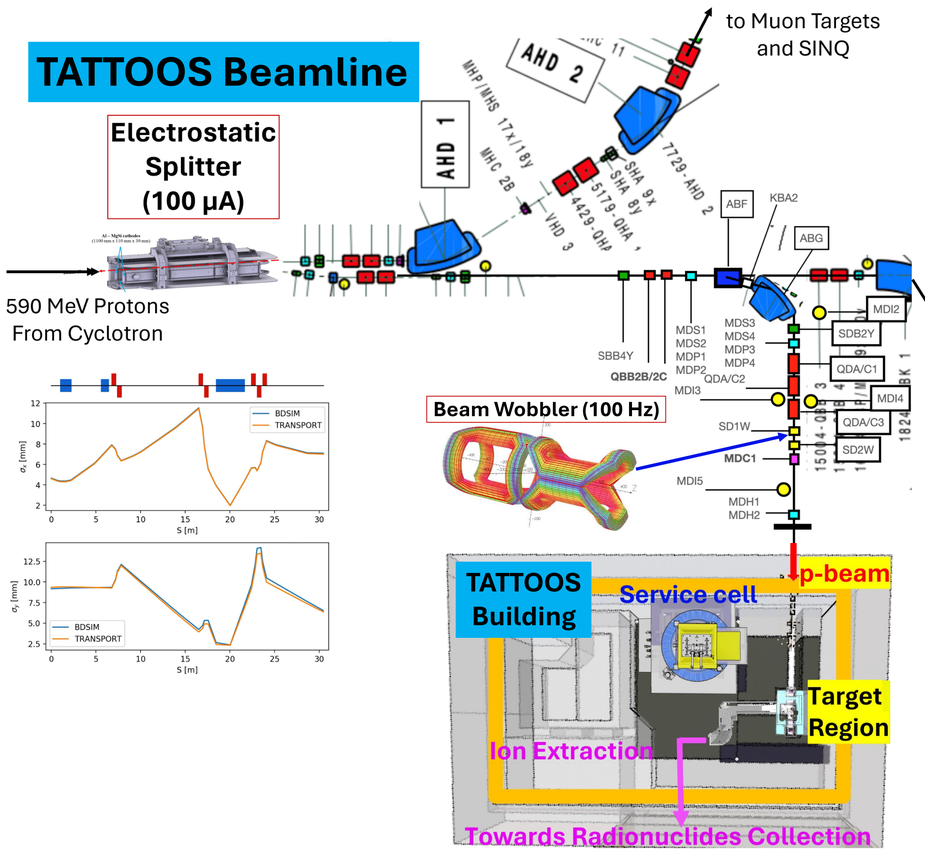
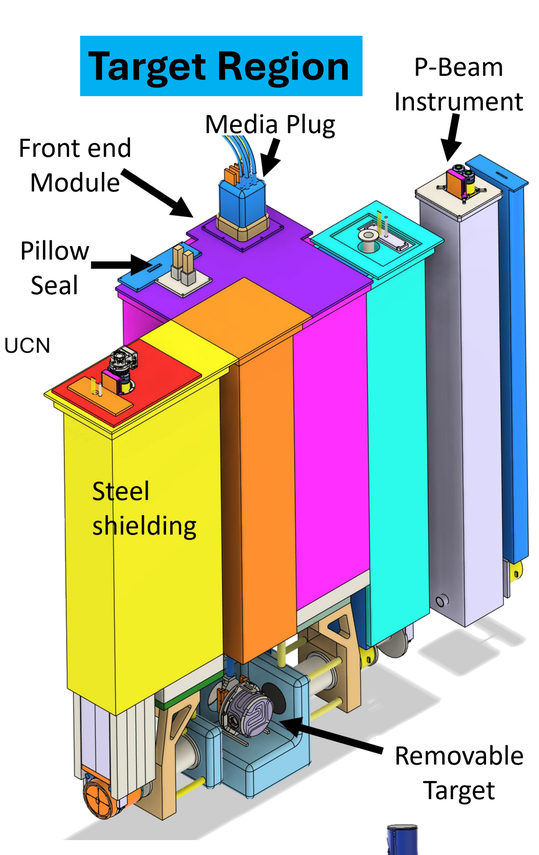
A Brand-New ISOL Facility at PSI-HIPA



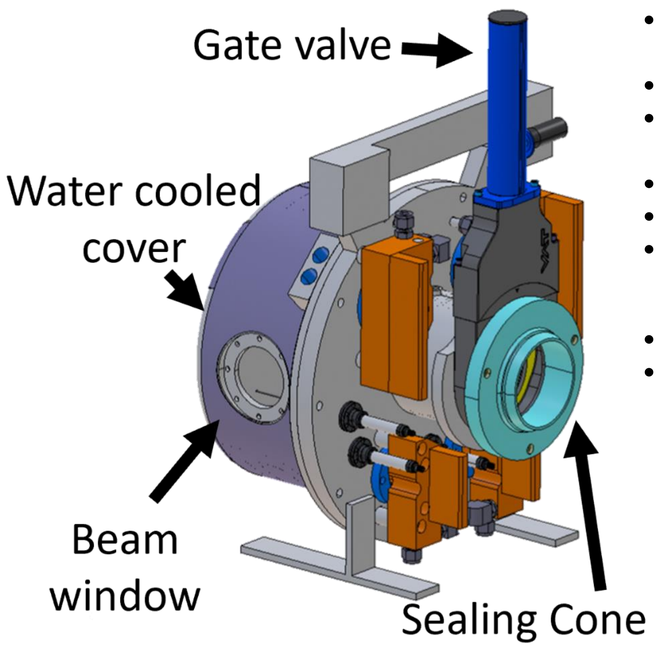
TATTOOS Beamline



Target Region

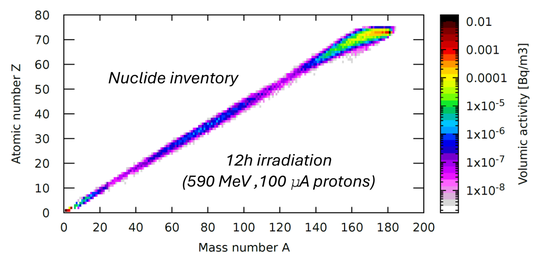


Target Module

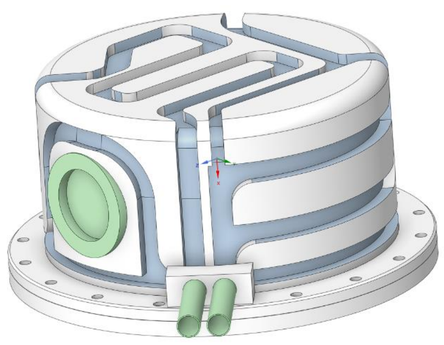


Tantalum Target

- Target structure: thin **Ta-discs** encapsulated in outer tube
- Optional cooling fins to increase emissivity
- Dimension: **35 mm Ø**, **100 mm equivalent length**
- Thermal load up to 50 kW (**26 kW** nominal)
- Nominal temperature: **2200 °C**
- Joule heating:
  - **4000 A** target
  - 1000 A ioniser and transfer line
- Expected lifetime: ~1 month
- Only Ta-Target and holders to be replaced

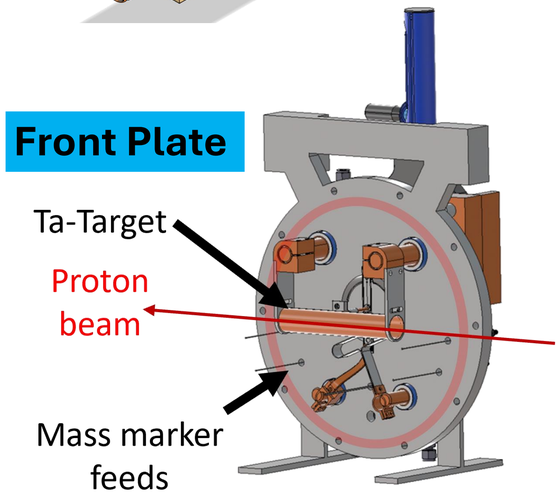


Target Cover



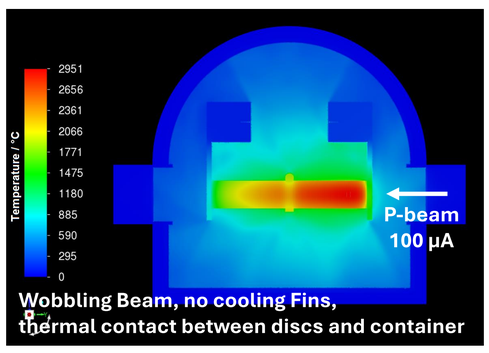
- **Stainless steel**
- **Water cooling loop**

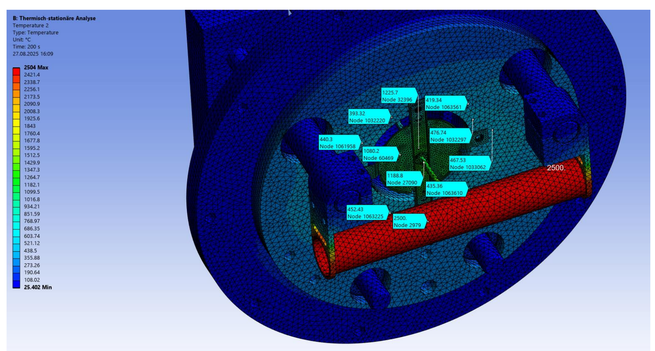
Front Plate

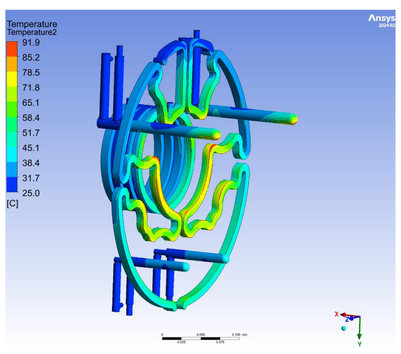


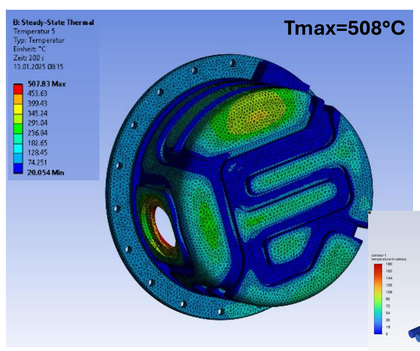
- **Stainless steel**
- 2 x water loops @ 1kg/sec
- Hermetically sealed target module
- 5 general purpose lines (mass markers)
- 1 multipin feed (thermocouples)
- Reusable Plate and Cover

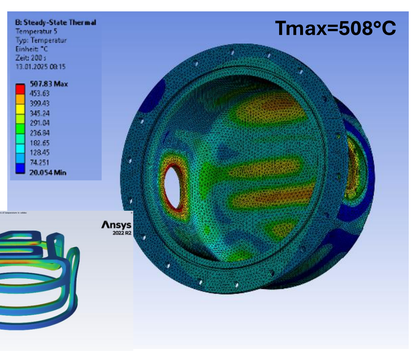
Thermal Simulations of Ta-Target, Front Plate and Target Cover



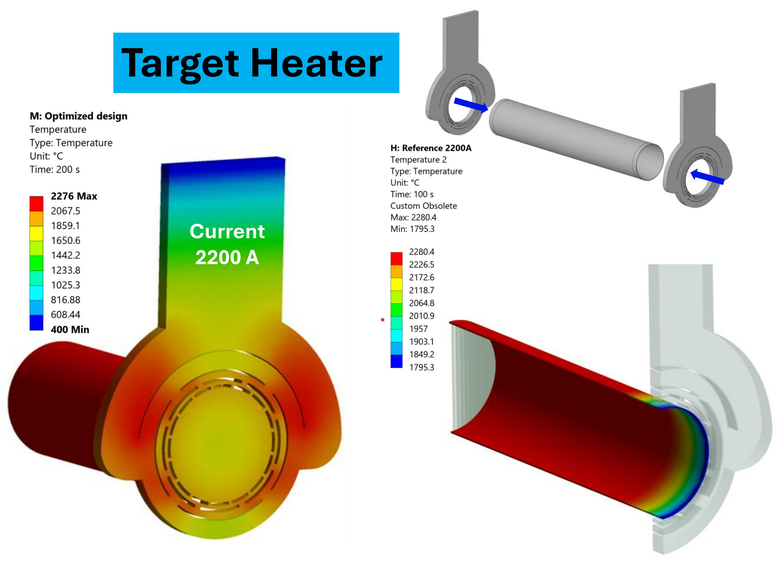






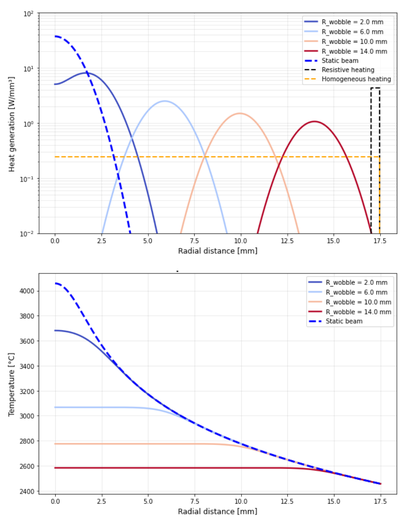


Target Heater

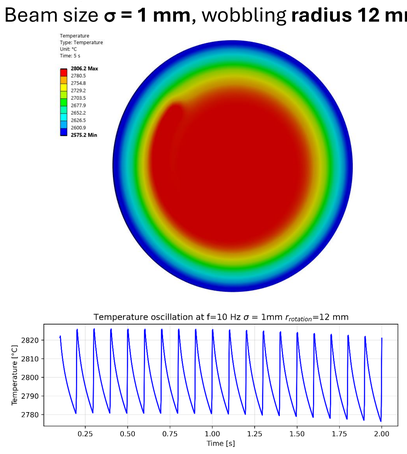


Optimized geometry to avoid cold spots

Beam Wobbling Model



58 W deposited on a **250 µm thick Ta-disc**
Beam size **σ = 1 mm**, wobbling **radius 12 mm**



Temperature oscillation at 10 Hz rotation

Tantalum Tests

Goals:
- **Reproduce the proton beam power deposition** using an electron beam
- Study the **influence of beam focusing/defocusing** and **beam rotation**
- Explore **different foil designs** and **contacts with the target container**

Equipment:
- **60 kV, 100 mA electron beam welding machine**
- 2 bichromatic pyrometers