Research Capabilities in PALLAS

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PALLAS Program - Work Package Owner Research Capabilities

NRG PALLAS

Nuclear. For Life.

Continuation of irradiation capabilities

High Flux Reactor

- Designed for research
- Construction 1957-1960
- Operational since 1961
- 45 MW thermal power
- 260-265 full power days per year

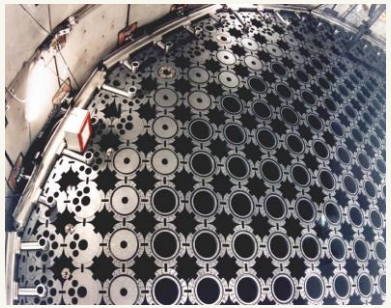
PALLAS reactor

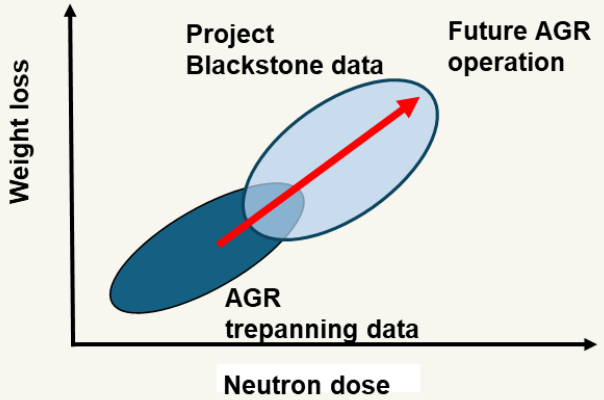
- Designed for medical isotopes and research
- Project started in 2013
- Start operation in 2030 — PALLAS will take over HFR role
- 25 MW thermal power
- 300 full power days per year

Splijtstof en Materiaal Onderzoek

Levensduurverlenging

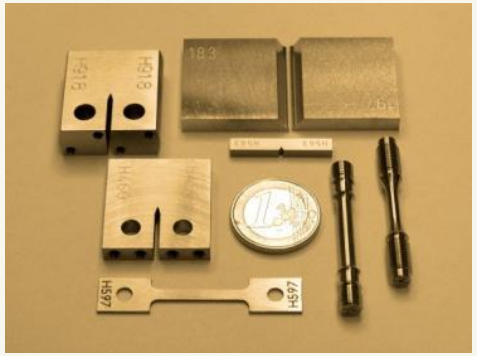
- Het leveren van data om langer veilig reactorbedrijf aan te tonen





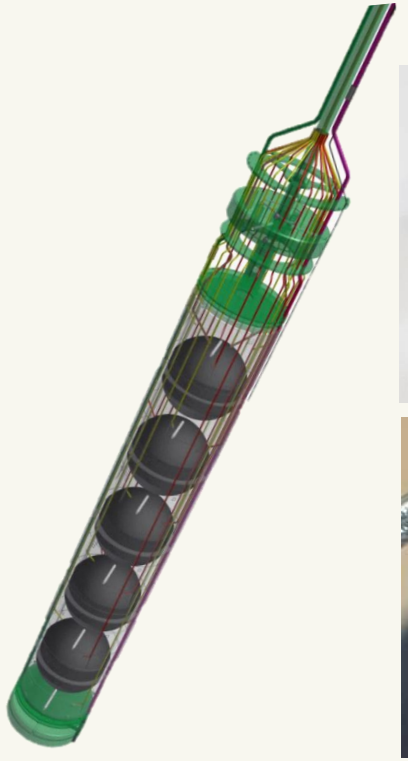
Materiaal en Splijtstofkwalificatie

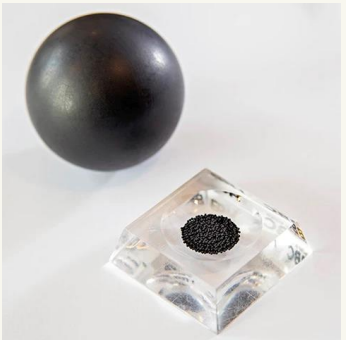
- Het testen van bestaande of nieuwe materialen onder representatieve omstandigheden



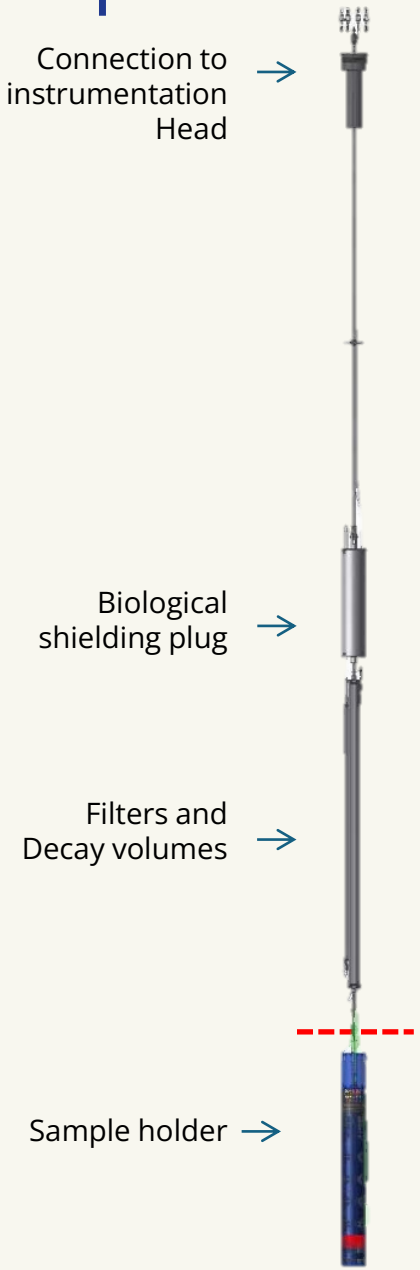
Innovatie

- Het testen van materialen voor nieuwe innovatieve reactoren
- SMR / MSR / HTR





Experiment Ontwerp (HFR)

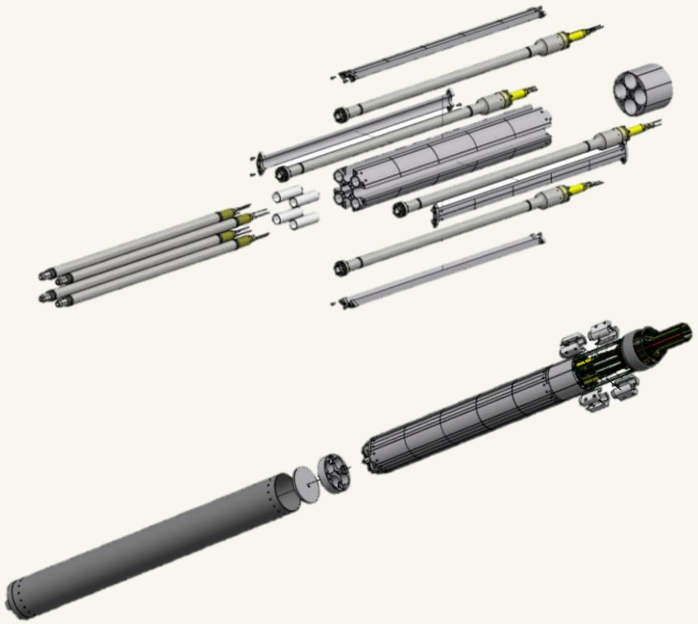


Voor alle experimenten geldt:

- Robust ontwerp
- Betrouwbaar meten
- Hoge nauwkeurigheid

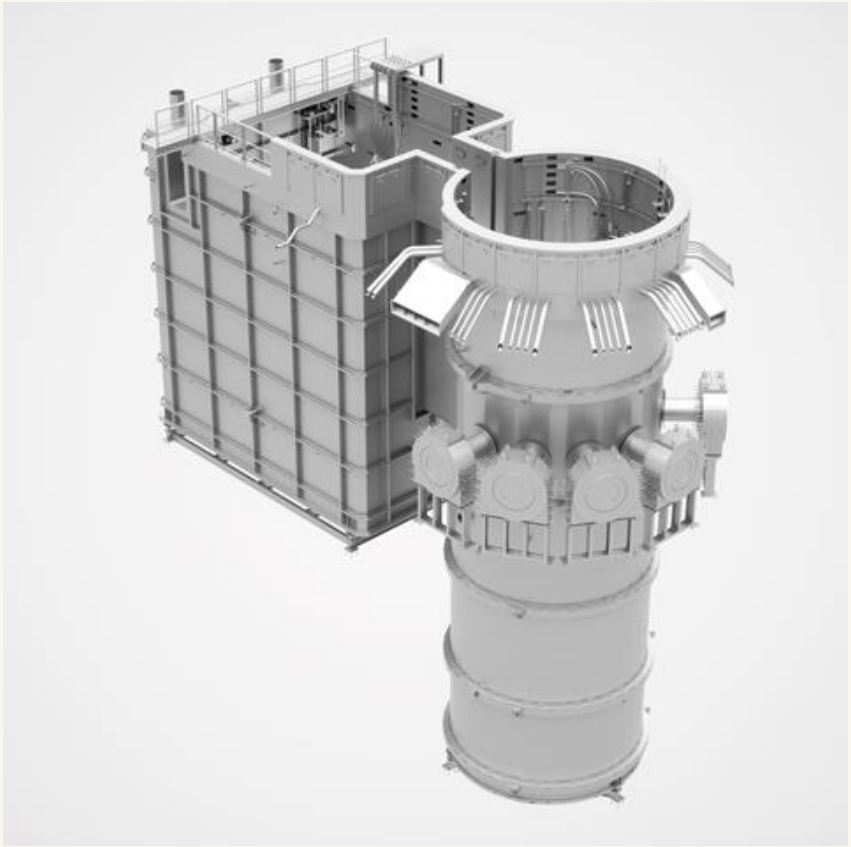
} *Gasvoorziening & Instrumentatie*

- *Elk experiment is uniek!*

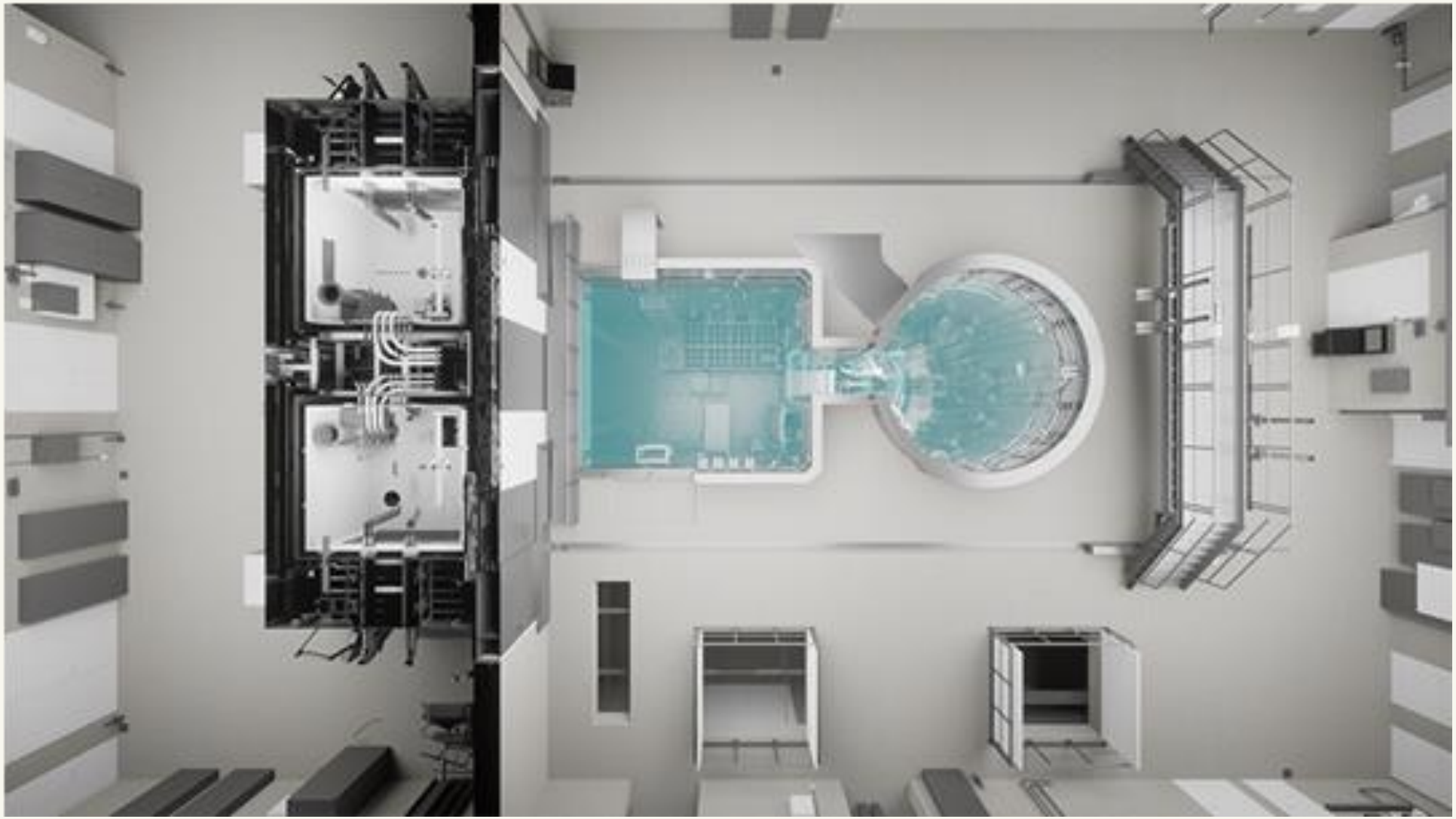


Reactor design

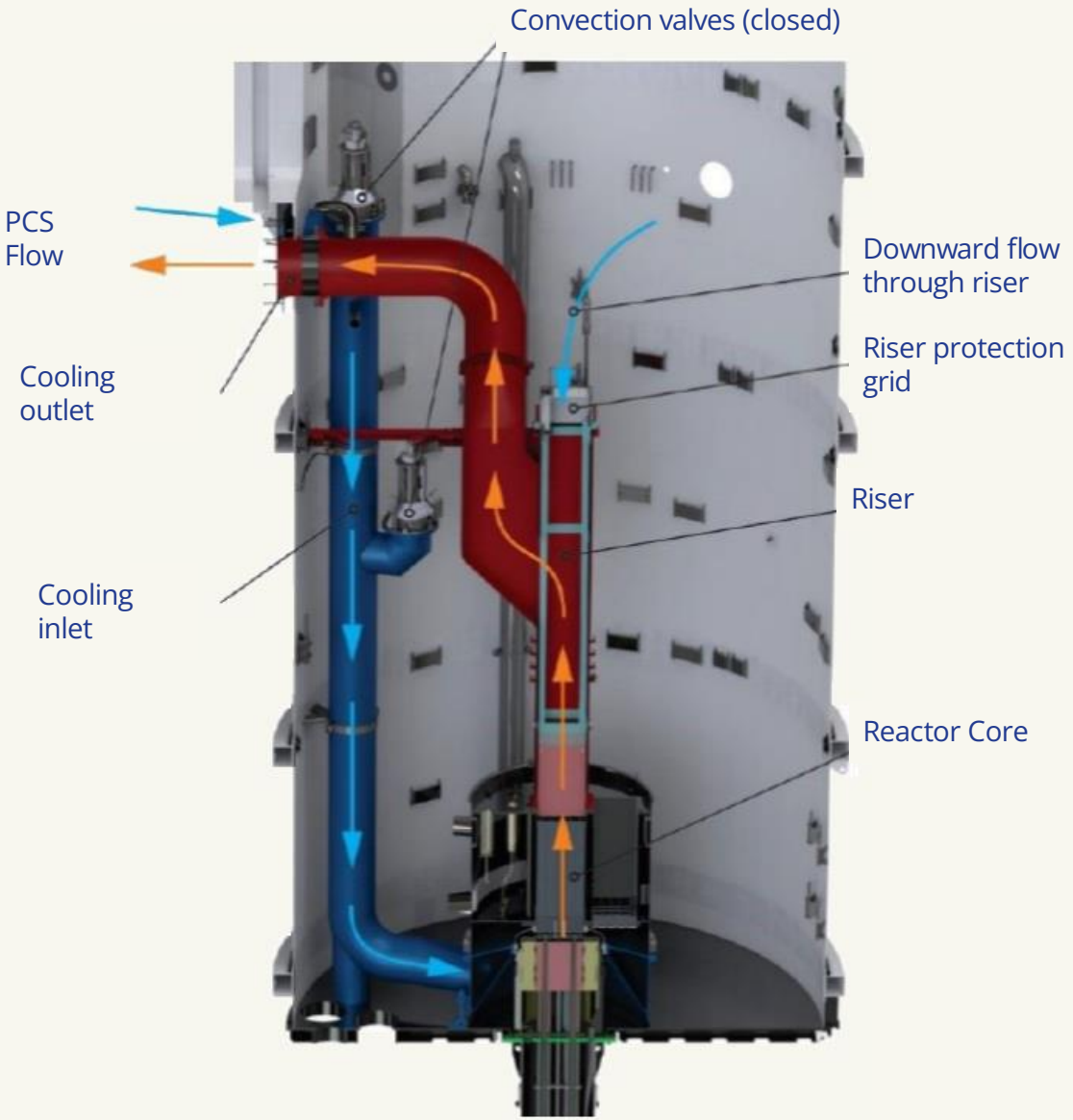
PALLAS is an open core-in-pool design with heavy water reflector
Designed by ICHOS as General Contractor, construction by FCC

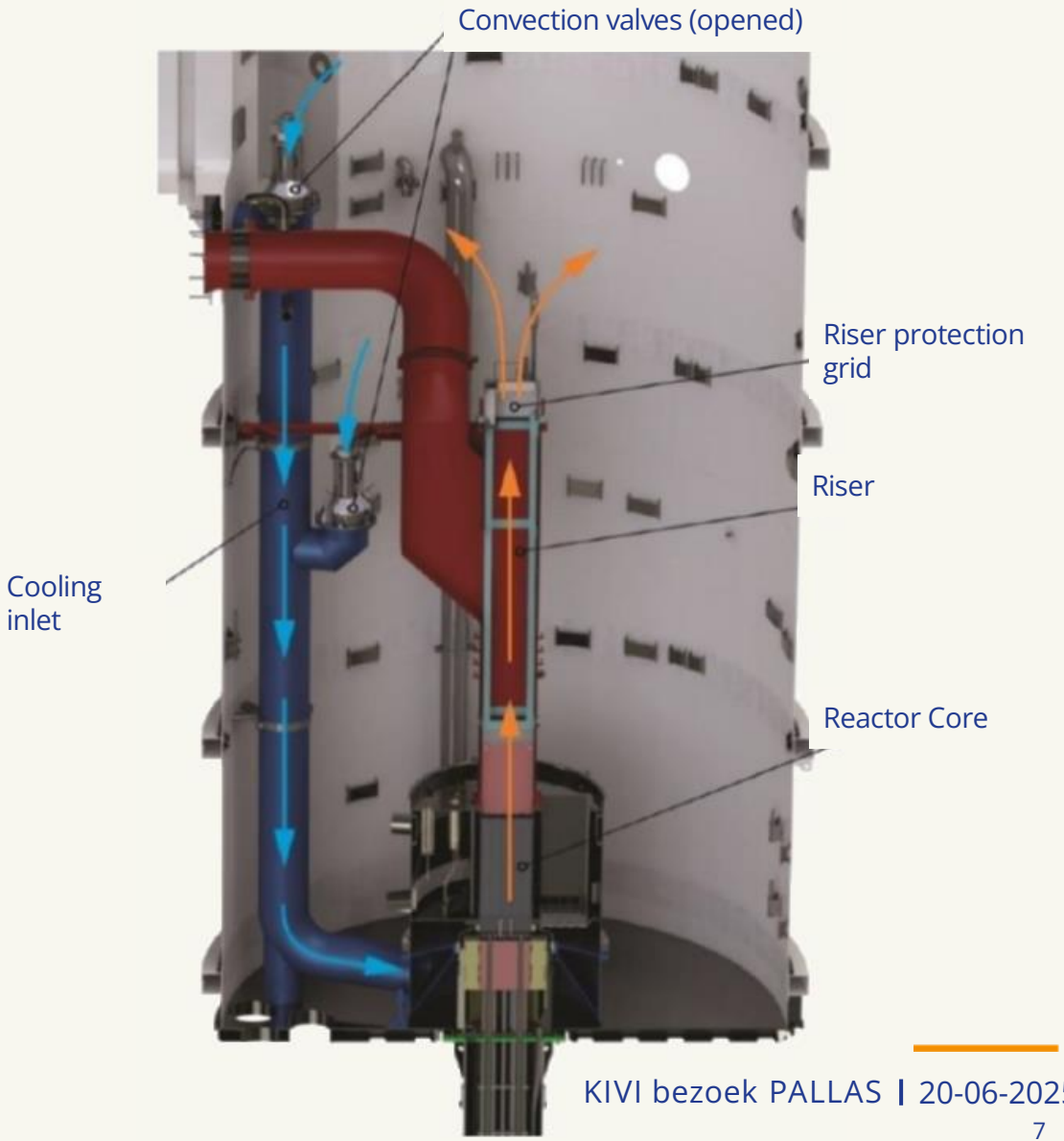


Irradiated material extracted via Hot Cells



PALLAS – Primary Cooling system

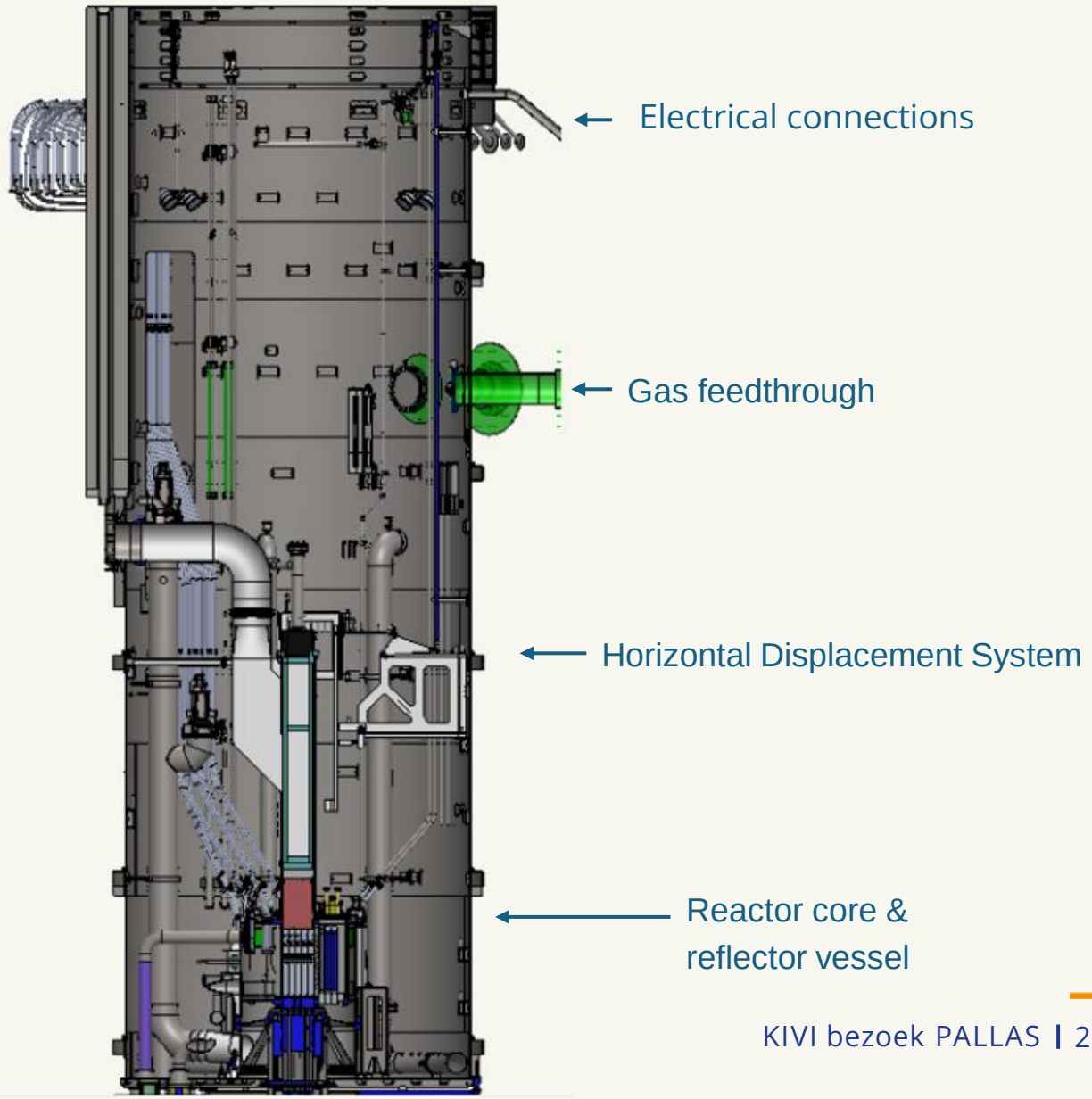




PALLAS – Experiment provisions

Included provisions

- Instrumentation of experiments via penetrations in reactor pool wall
- Experiments can be placed in Horizontal Displacement System
- Core cooling system goes via ‘chimney’
- Storage and handling positions



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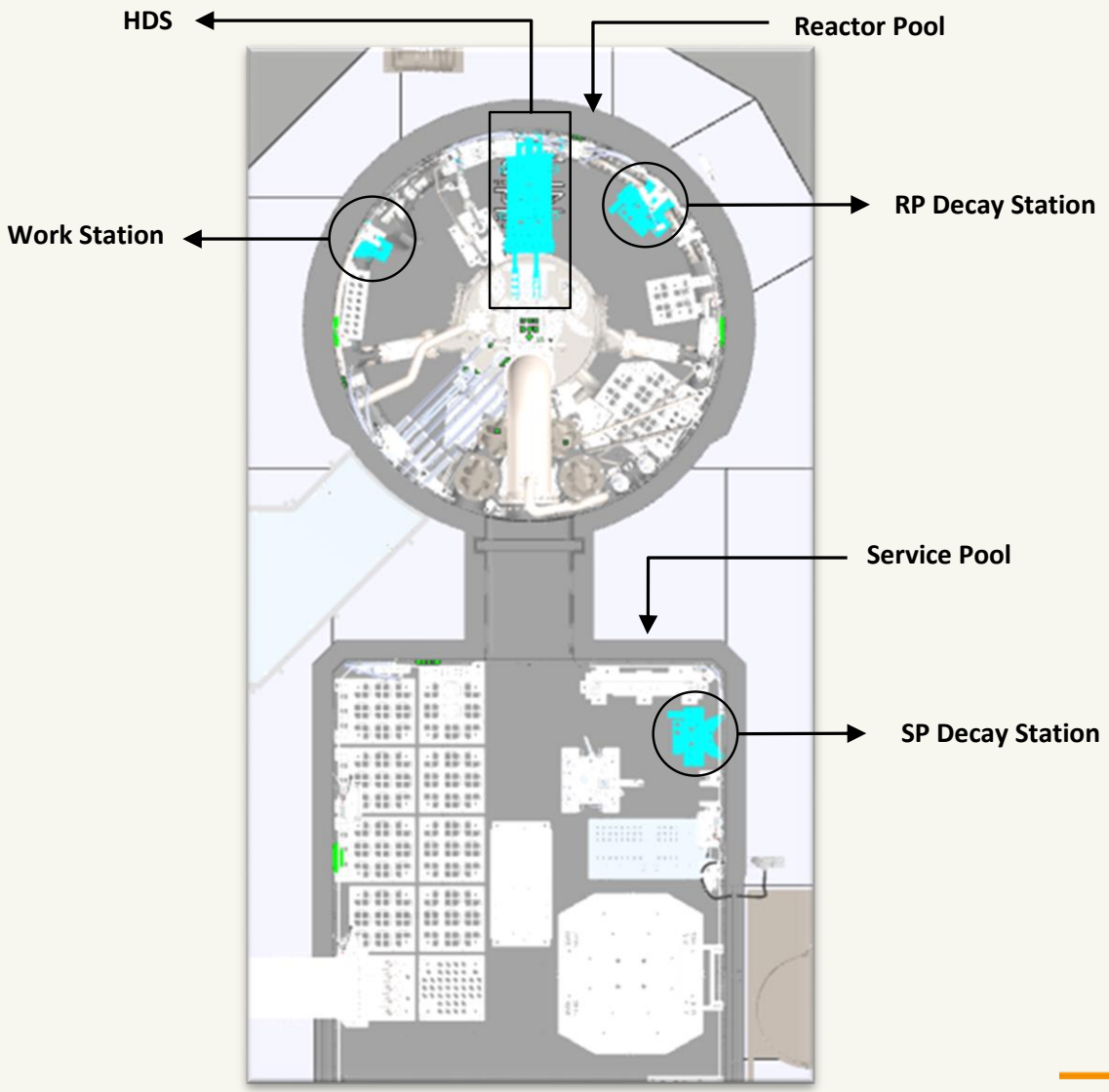
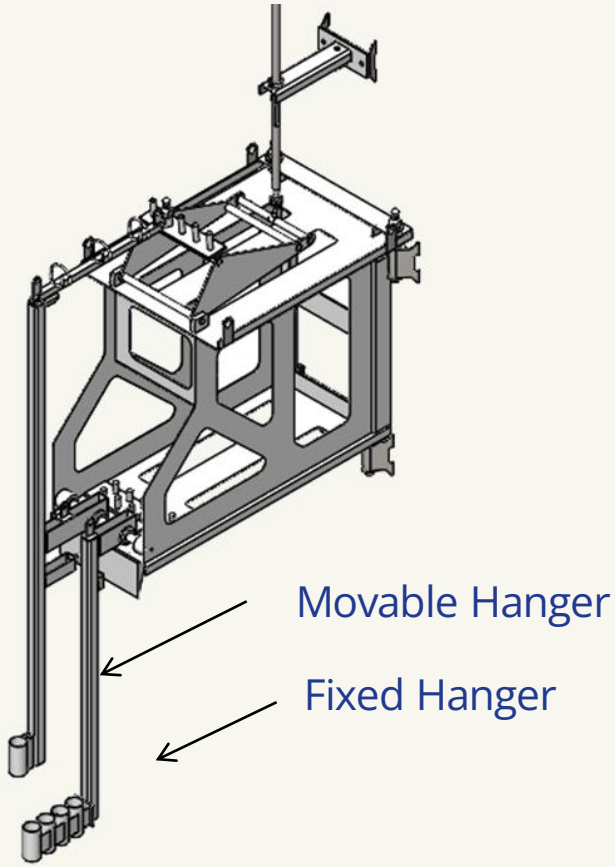
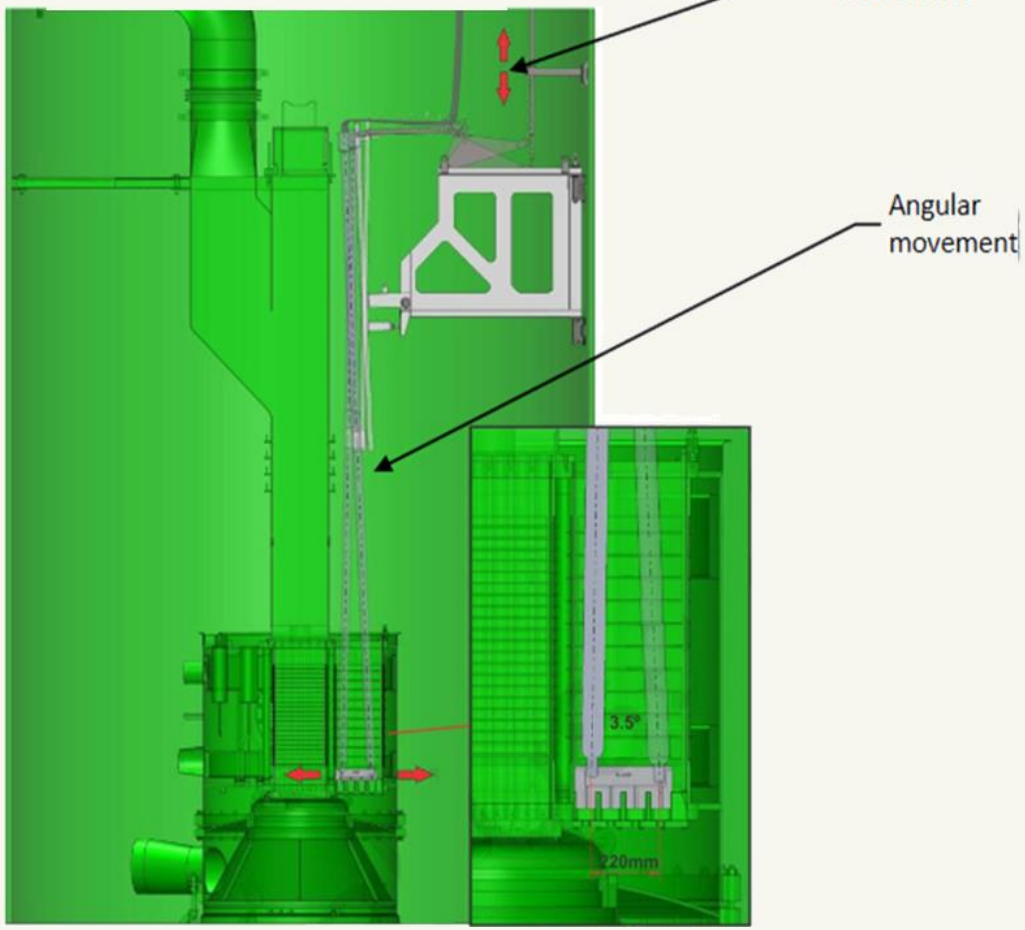


PALLAS Layout – Horizontal Displacement System

- HDS designed to accomodate experiment rigs
- Optional movement to and from the core for flux tuning or power transients

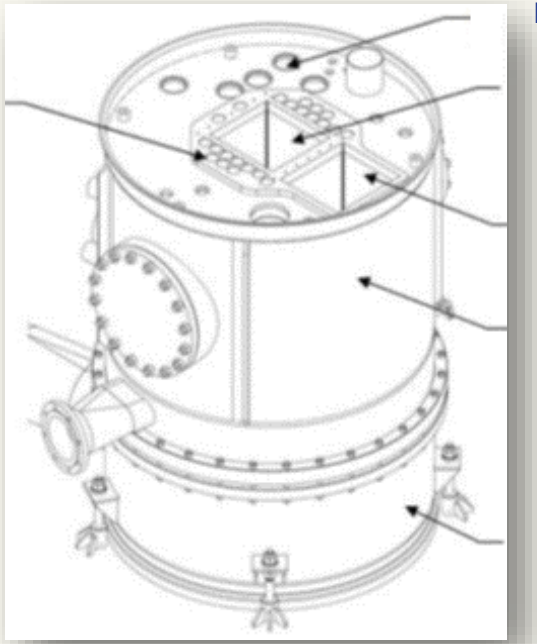


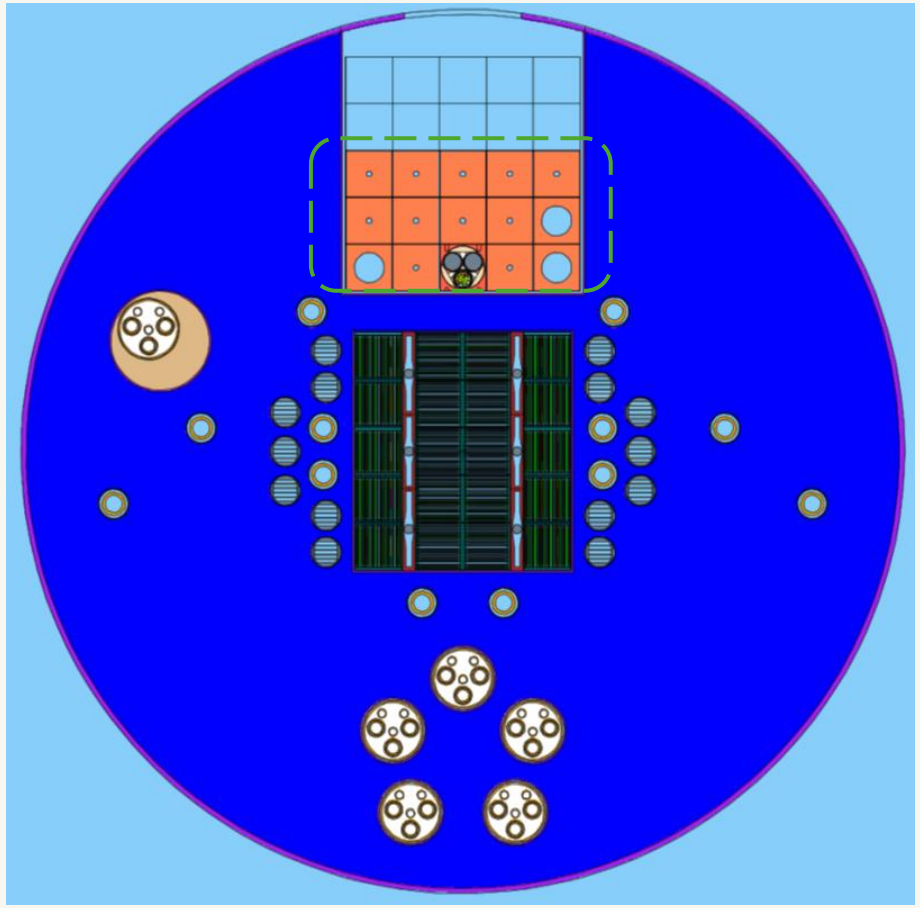


PALLAS Layout – Reactor Vessel

- The (open) core is surrounded by a heavy water reflector vessel
- Irradiation positions are located in
  - Channels in the Reflector Vessel
  - **The Beryllium grid**
  - **In-core**
  - Pneumatic positions

} Positions for experiments

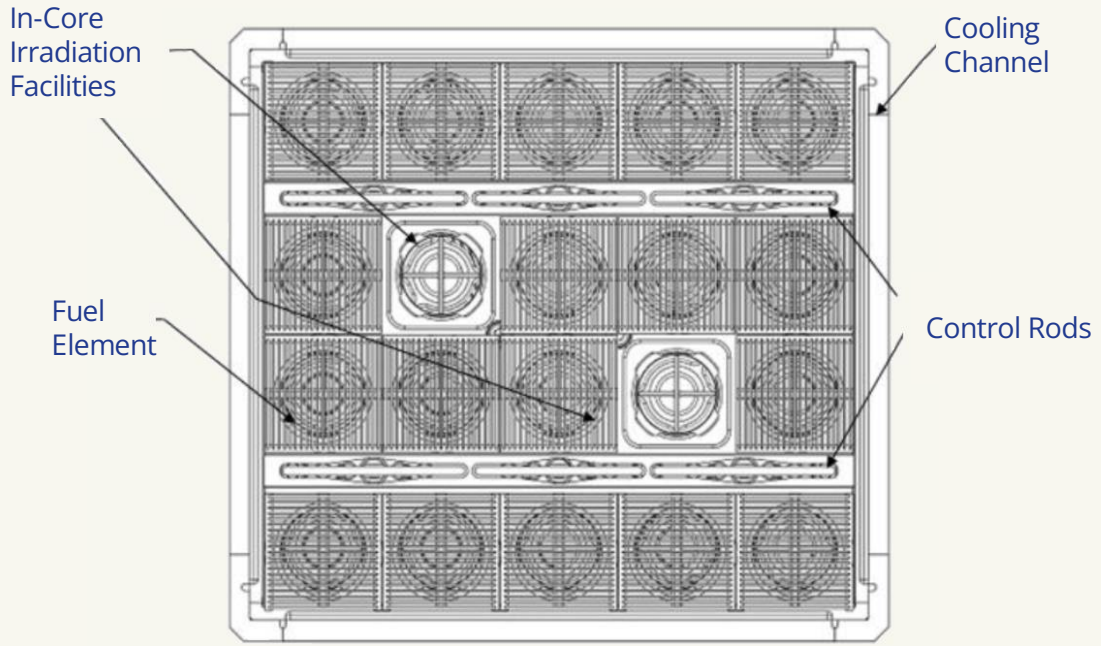




*Exact irradiation channels may differ in latest design

PALLAS Core design

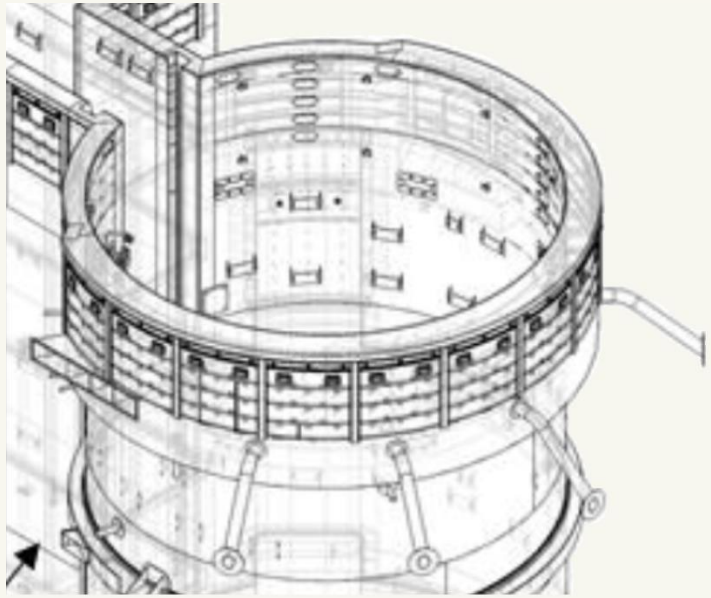
- PALLAS is designed to operate with 20, 19 or 18 fuel elements
- U_3Si_2-Al fuel
- 6 Hafnium control rods
- Average neutron flux $1{,}1.10^{14}$ $n/cm^2/s$
- Reference cycle length is 43 days

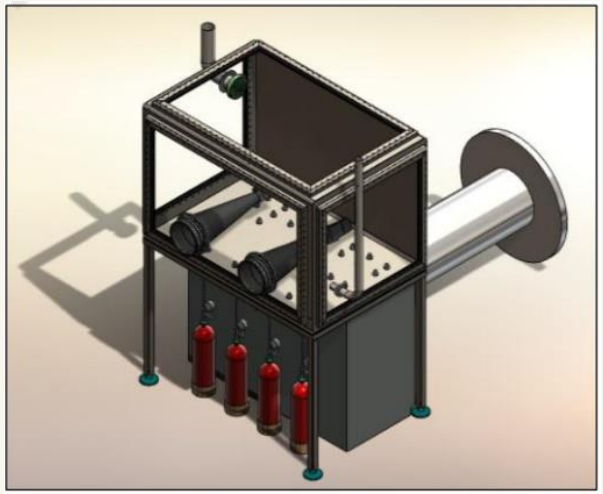


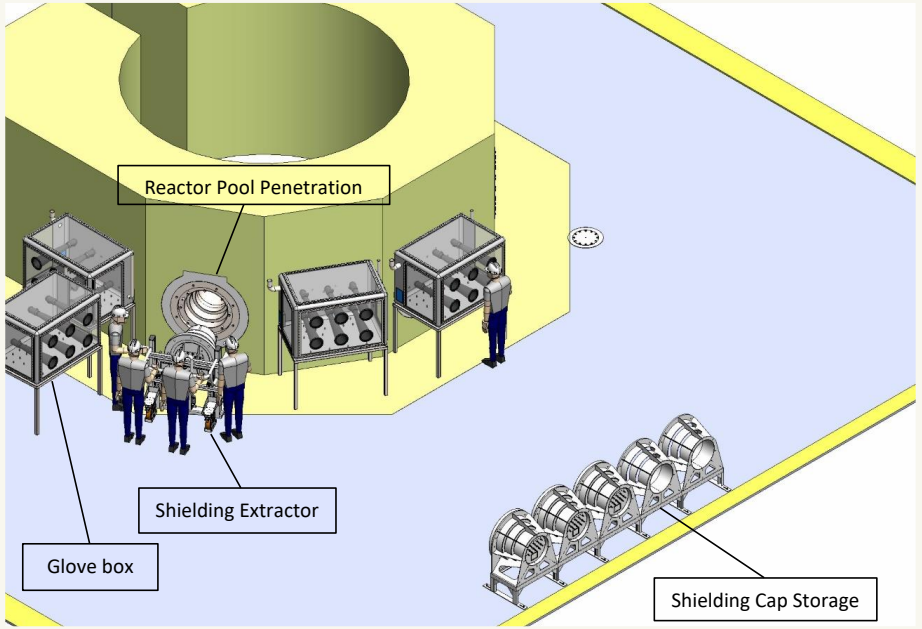
Parameter	Value
Dimensions	80,5 x 80,5 x 1045 mm
Width cooling channels	2,45 mm
Number of plates	21
Fuel matrix	U_3Si_2-Al
Nominal enrichment	19,75% (<20%)
Nominal uranium density in the matrix	4,8 g/cm^3

Instrumentation & Gas supply

- Control of experiments from dedicated “Experiment Room”
- Instrumentation through separate feedthroughs
- Gas supply for temperature control
- Continuous gas supply of He, Ne and N_2 is available





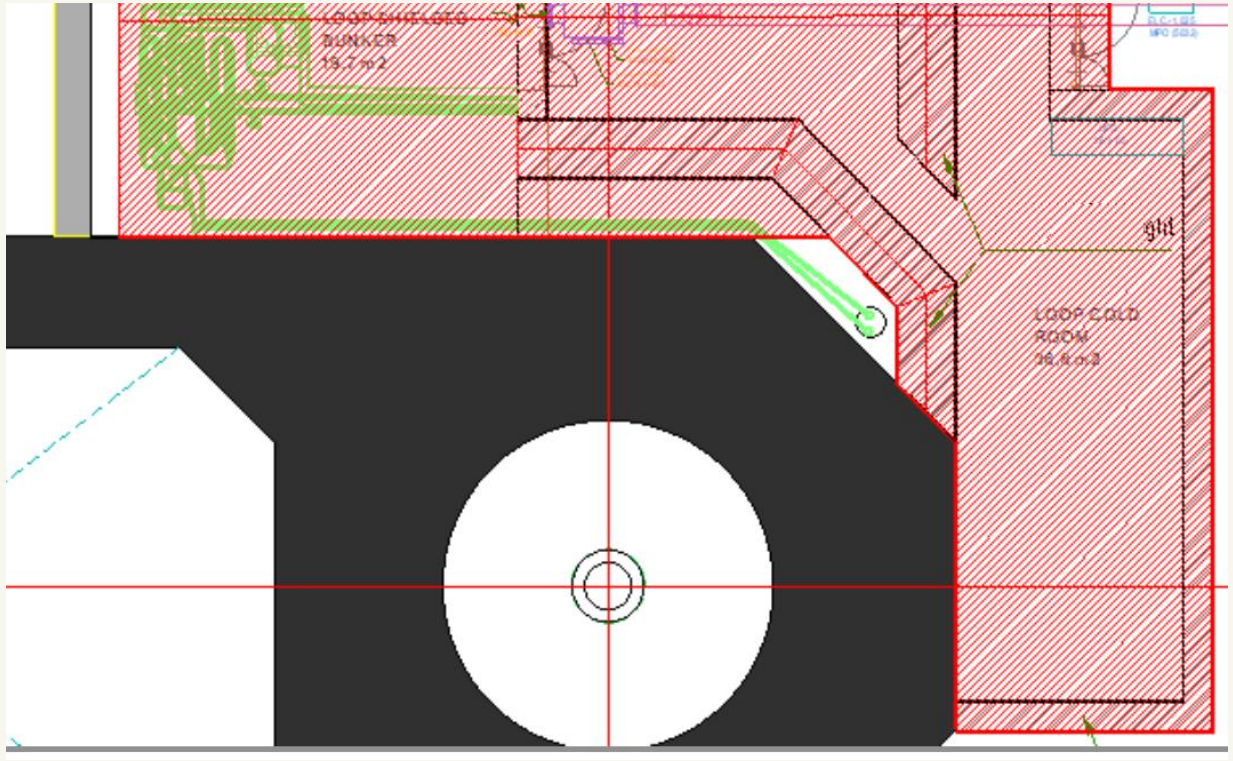


Loop Experiment Bunker

Provision for a loop

Loop shielded bunker of 20 m^2 to install all the equipment which handle activated material as well as the necessary walls and doors to provide adequate shielding

The Loop Cold Room is an area that contains the remaining Experimental Loop equipment that does not need shielding.



PALLAS Reactor zal de voortzetting van hoogwaardig materiaal- en splijtstofonderzoek garanderen

In het PALLAS ontwerp van ICHOS zijn alle voorzieningen aanwezig voor materiaal en splijtstof onderzoek. NRG PALLAS heeft het Own Scope programma geïnitieerd om de bestalingsfaciliteiten te ontwikkelen.

- In-core bestralingsfaciliteit
  - Hoge snelle flux (>5 dpa/jaar) voor materiaal bestralingen
- Reflector experiment ontwerp
  - Thermische flux geschikt voor splijtstof bestralingen
  - Grote bestralingspositie voor experimenten (<80 mm diameter) / Kleine bestralingsexperiment voor gedeelde positie
- Geavanceerde gassystemen
  - Gas systeem voor continue gereguleerde gasmengsels en meetsysteem voor actieve gassen
- Druk Water Loop ontwikkeling
  - Potentieel voor een druk-water loop

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Bedankt voor uw aandacht!