



# Poster for 12th World Conference for Neutron Radiography (WCNR-12)

May 2024

*Changing the World's Energy Future*

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# **Poster for 12th World Conference for Neutron Radiography (WCNR-12)**

**Shawn R Jensen, Aaron E Craft, David L Chichester**

**May 2024**

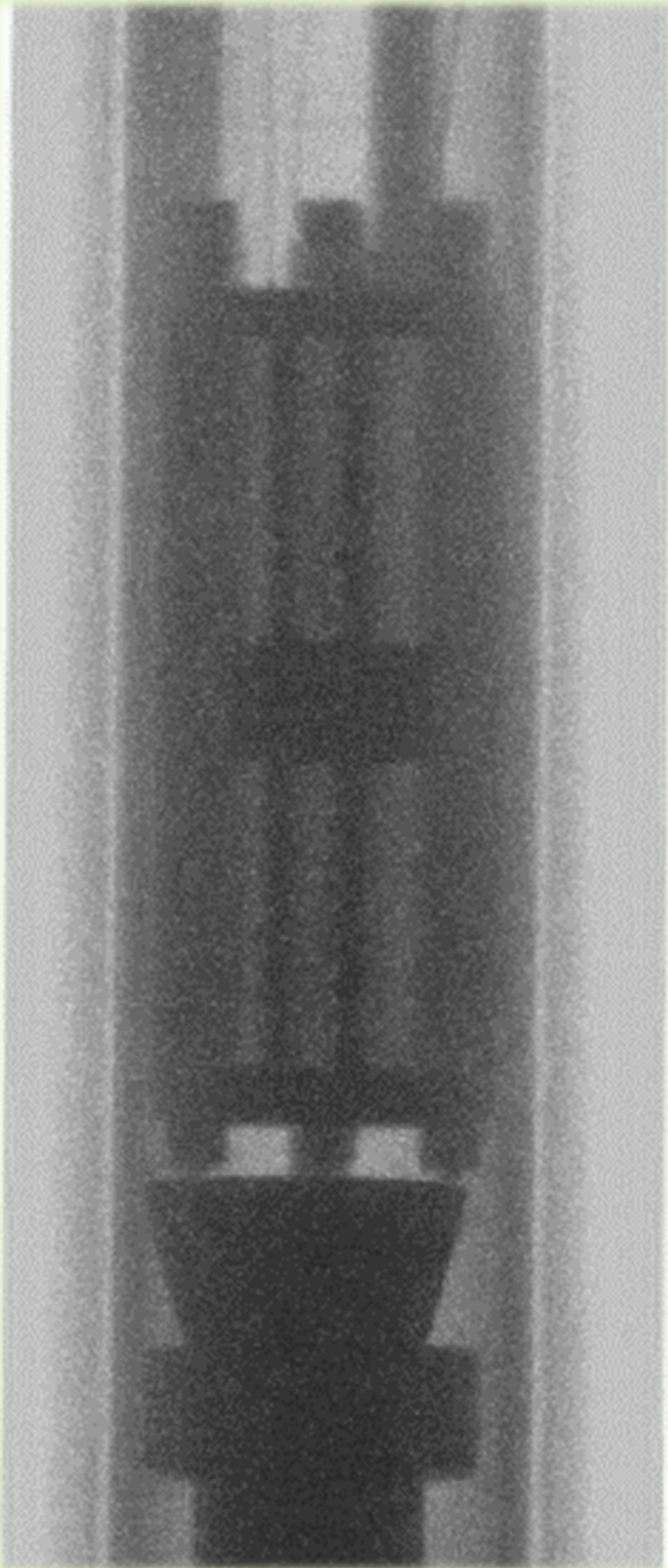
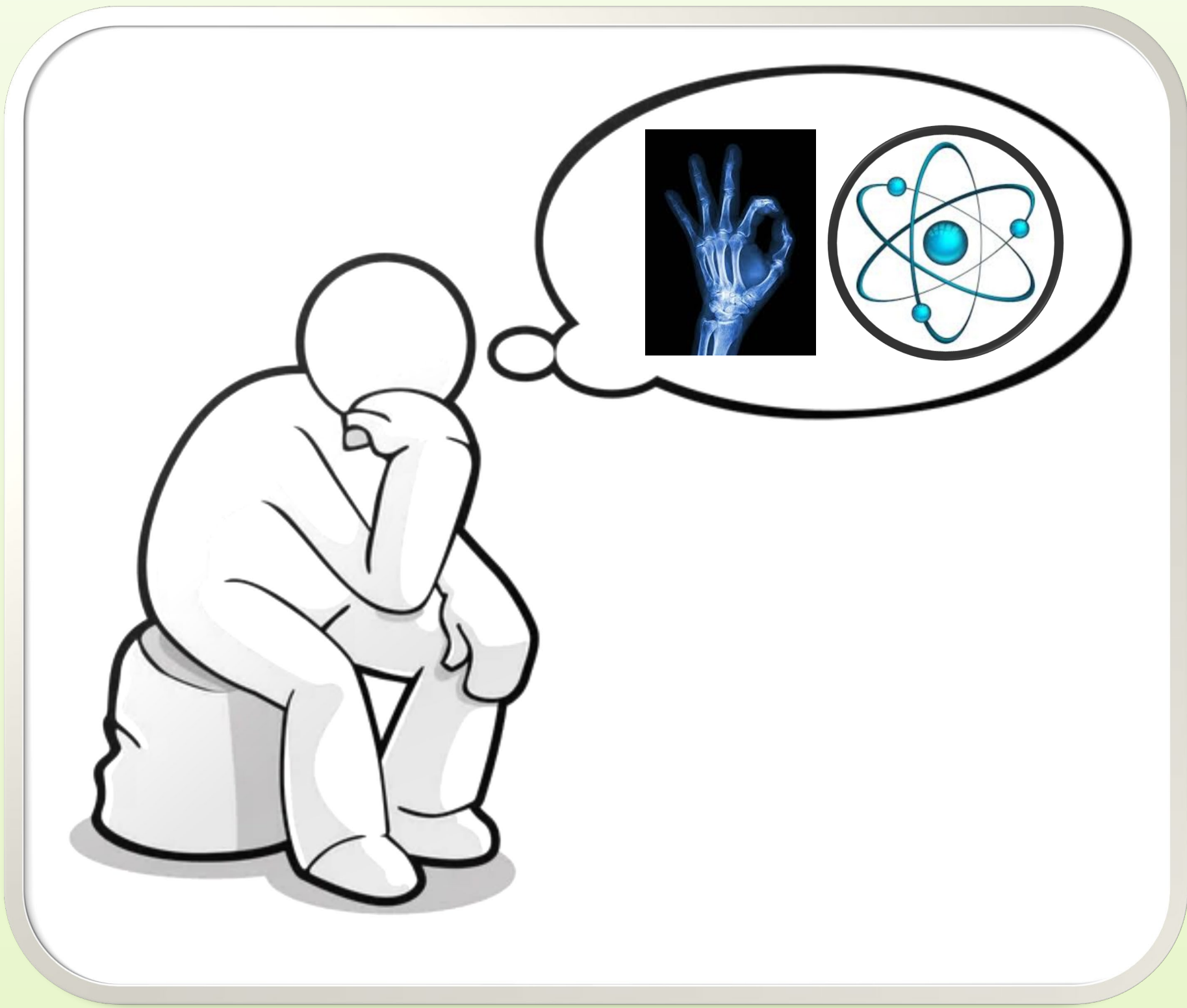
**Idaho National Laboratory  
Idaho Falls, Idaho 83415**

**<http://www.inl.gov>**

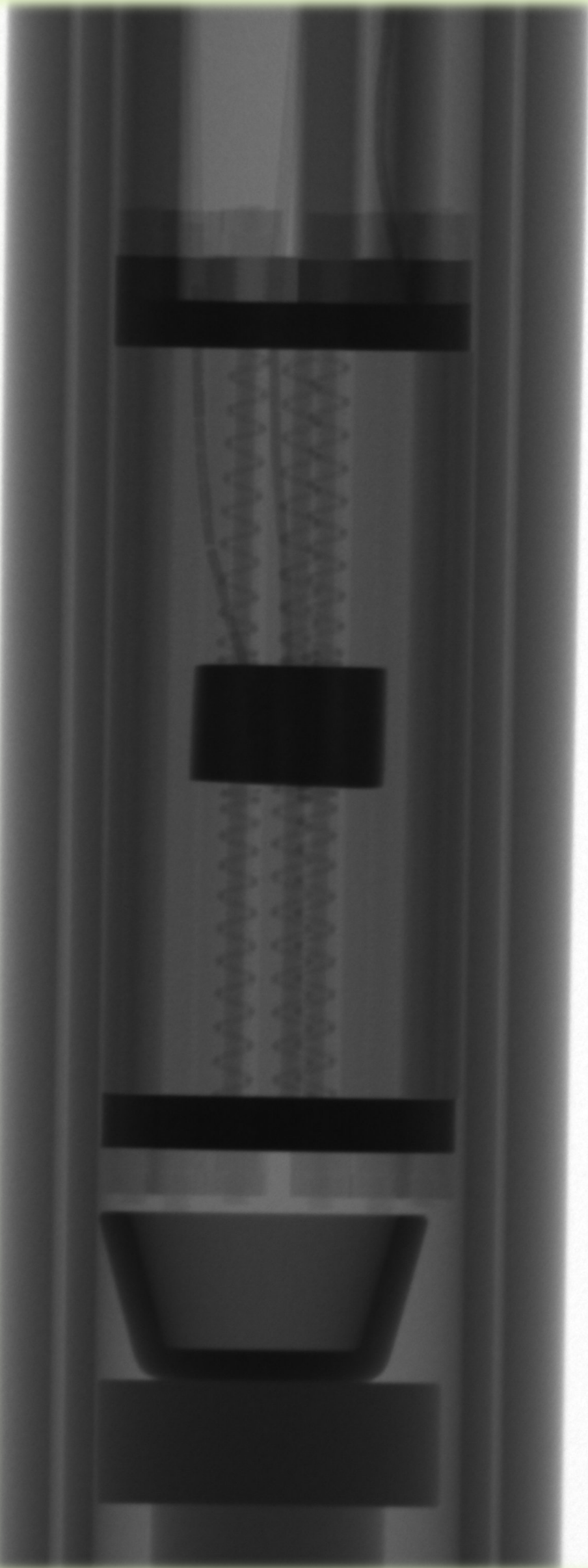
**Prepared for the  
U.S. Department of Energy  
Under DOE Idaho Operations Office  
Contract DE-AC07-05ID14517**



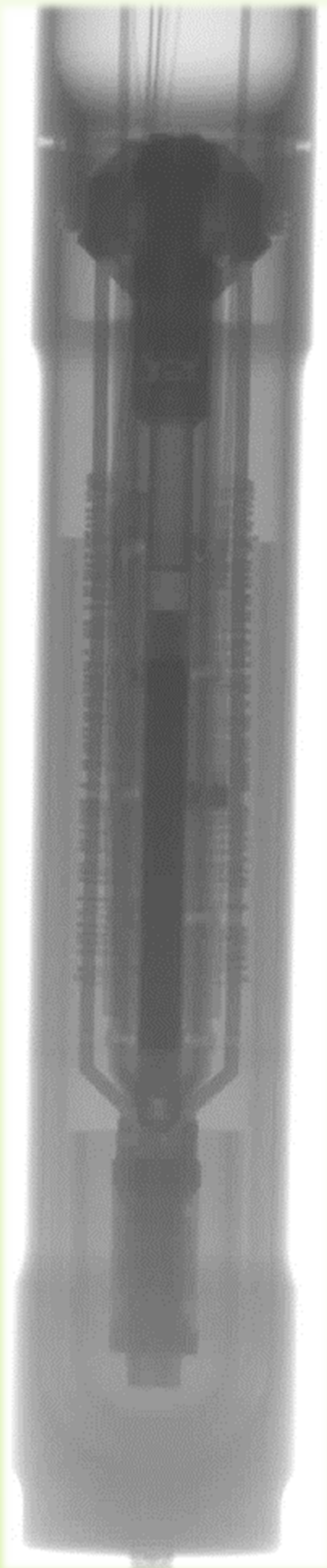
# Neutrons or X-rays?



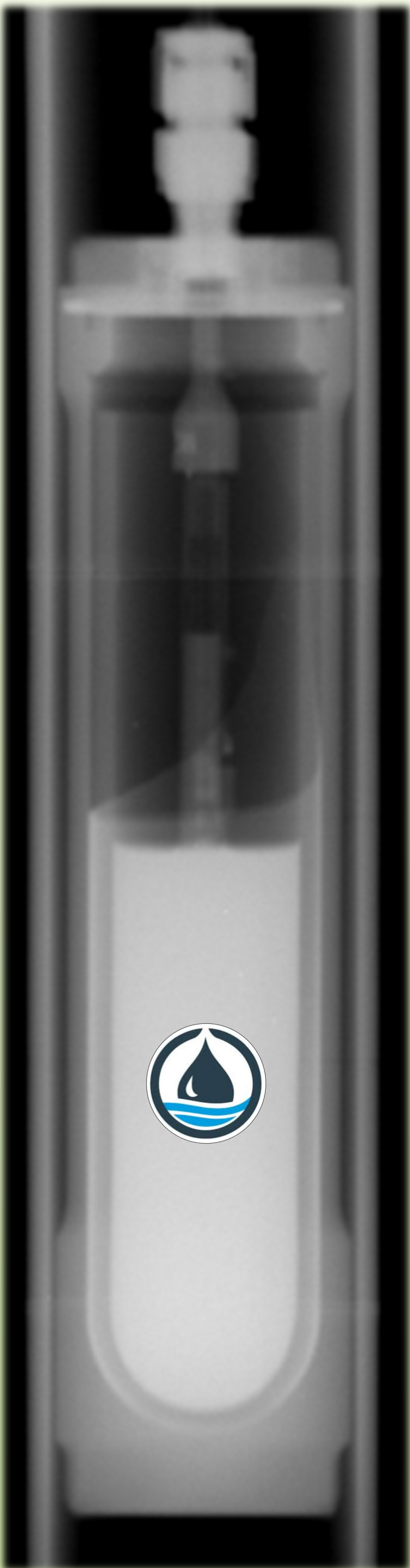
X-ray



N-ray



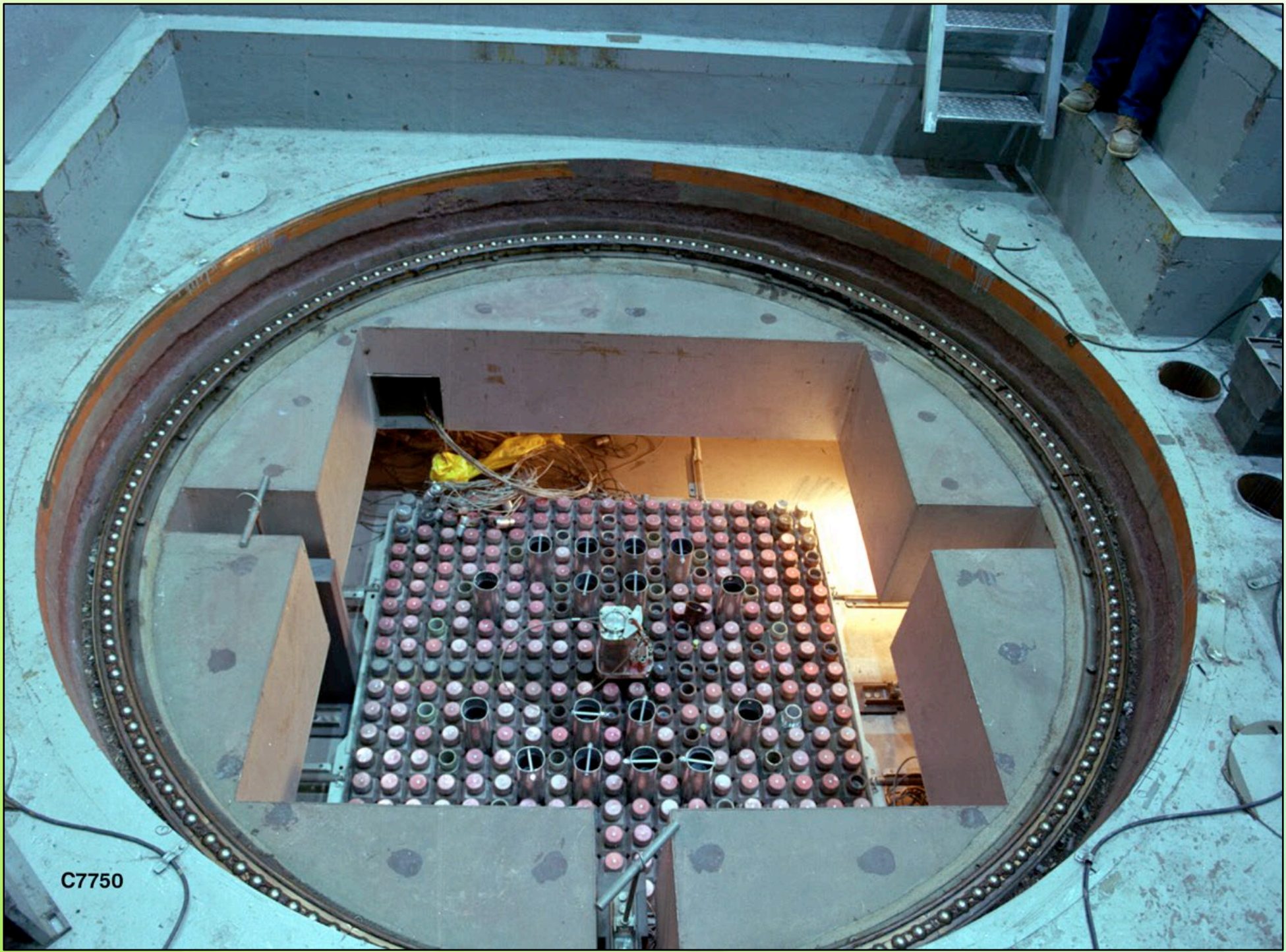
X-ray



N-ray

- Higher Radiation Specimen**
- Both the N-ray image and the X-ray image were obtained a few days following a transient and were assembled in an irradiation vehicle.
  - The dose rates for both the specimen for both the N-ray image and X-ray image were an average of 20 mSv/hr on contact.
  - This specimen was pushing the capabilities of the X-ray generator.
  - Neutron images typically have greater image quality (resolution and contrast) than X-ray images when there are additional materials (irradiation vehicle and insulation) and when dose rates are high such as immediately following a transient.
  - Very acceptable X-ray images are achievable when post processing is applied.

- Water Filled Specimens**
- Both images obtained with the specimen assembled in an irradiation vehicle prior to irradiation.
  - Internal items and the water level can be identified.
  - Due to the high attenuating nature of water to neutrons, n-ray images cannot show internal items in water.
  - N-ray does have the ability to clearly show water in an undesired location.

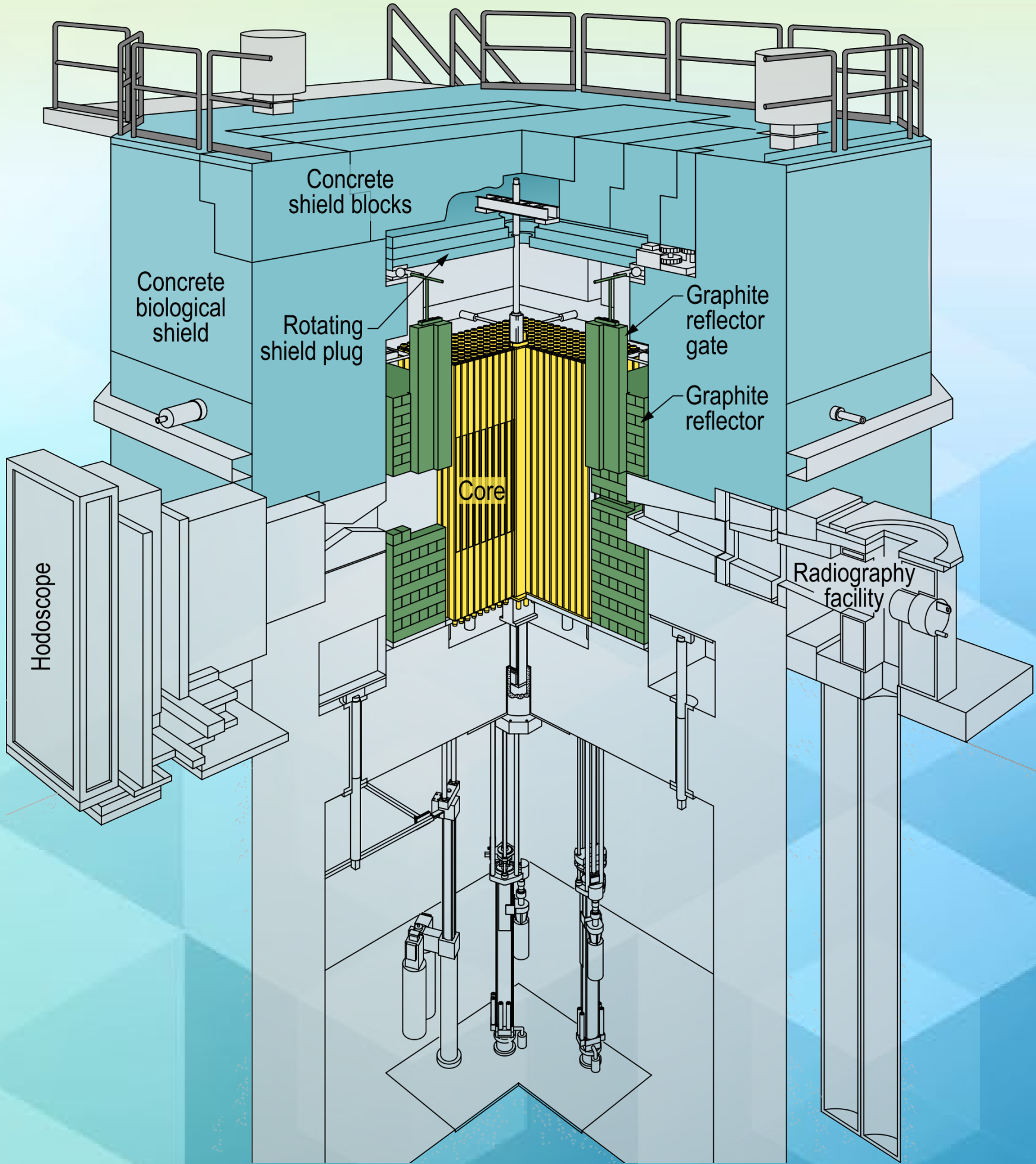


## Transient Reactor Test (TREAT) Facility

- Construction began: February 1958
- Initial criticality: February 1959

### TREAT Features:

- Air cooled
- Graphite moderated
- Power:
  - 120 kW steady-state
  - Up to 19,000 MW peak transient
- Neutron Radiography (low resolution)
  - Samples up to 20 cm wide, 400 cm tall
  - FOV: 11.4 cm wide × 43.2 cm tall
- X-ray Radiography
  - Samples up to 28 cm wide, 5,000 cm tall
  - FOV: 28 cm wide × 43.2 cm tall



Authors and Acknowledgements  
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