

In the Lab with Nuclear Scientists: Critical and Subcritical Assemblies

American Nuclear Society Webinar Series on Educator Training

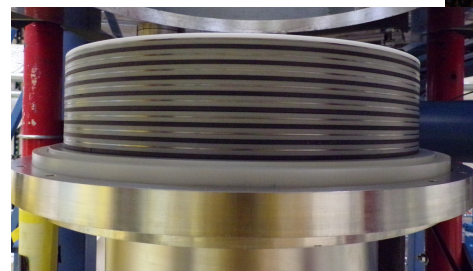
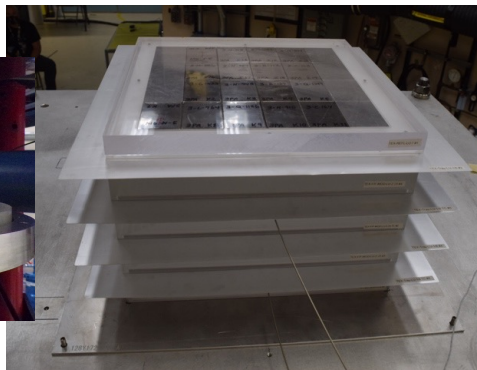
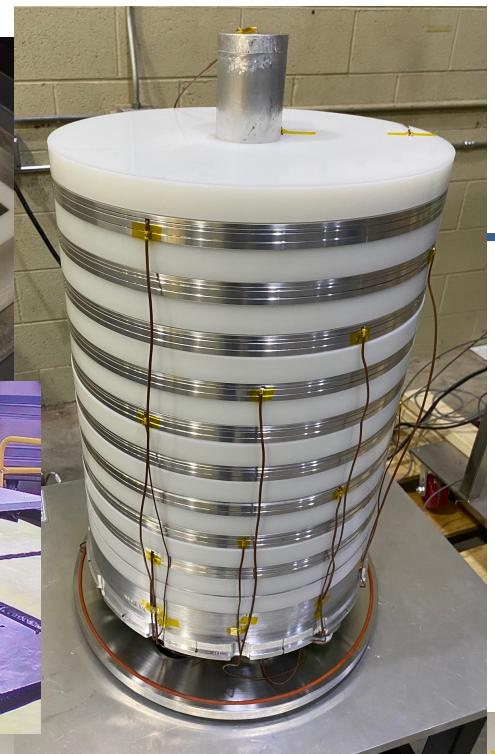
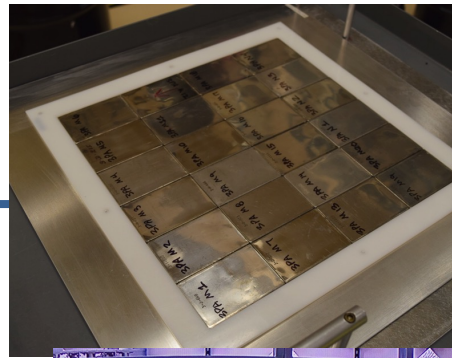
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Thermal Epithermal eXperiments (TEX)

- Critical experiments performed on the NCERC machines
 - Plutonium (^{239}Pu and ^{240}Pu)
 - Highly Enriched Uranium
 - Low-Temperature (-40°C)
- Based on a simple designs useful for modeling and validation
 - Design made to incorporate materials of interest
 - Tantalum, hafnium, lithium & more



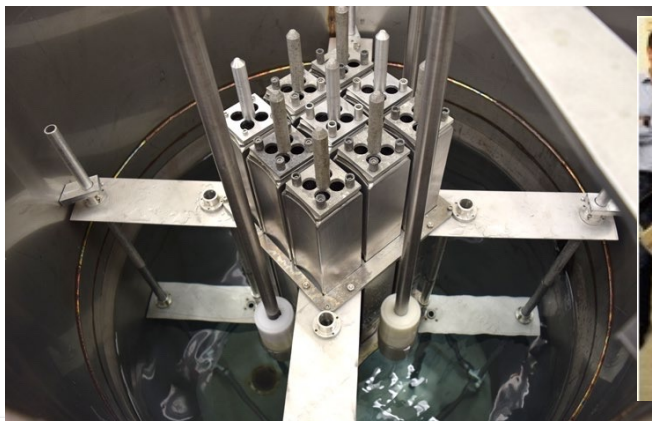
Training Assembly for Criticality Safety (TACS)

- Subcritical assembly with Highly Enriched Uranium hemishells
 - Surrogate hemishells made of depleted uranium and steel
- Experiments for hands-on training include:
 - Approach to critical by
 - Fissile mass (with surrogates)
 - Reflector/moderator
 - Separation distance
 - Effect of reflection by hands
 - Effect of neutron poisons
 - Fissile material replacement measurements
- Operated on a hand-cranked Vertical Lift Machine



Inherently Safe Subcritical Assembly (ISSA)

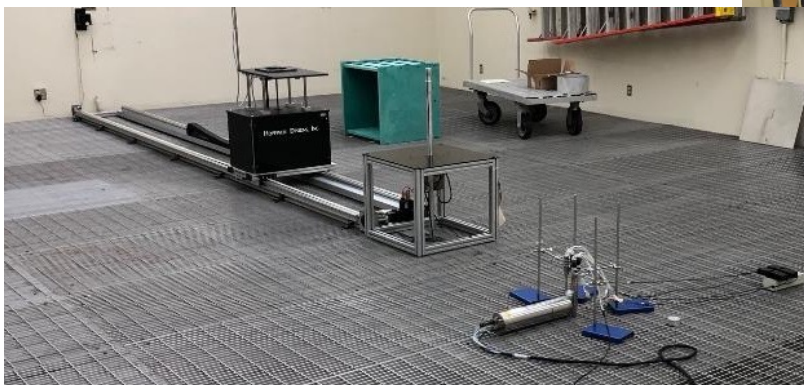
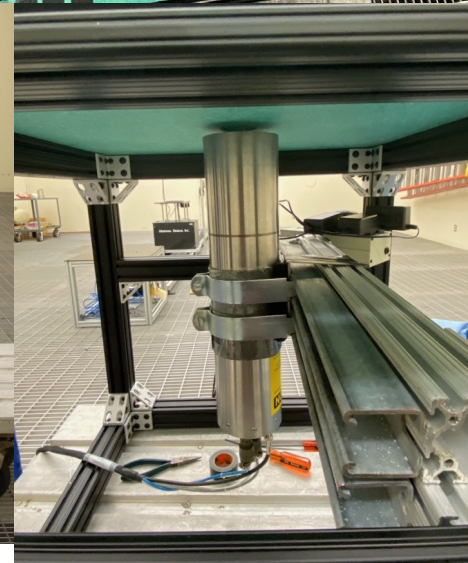
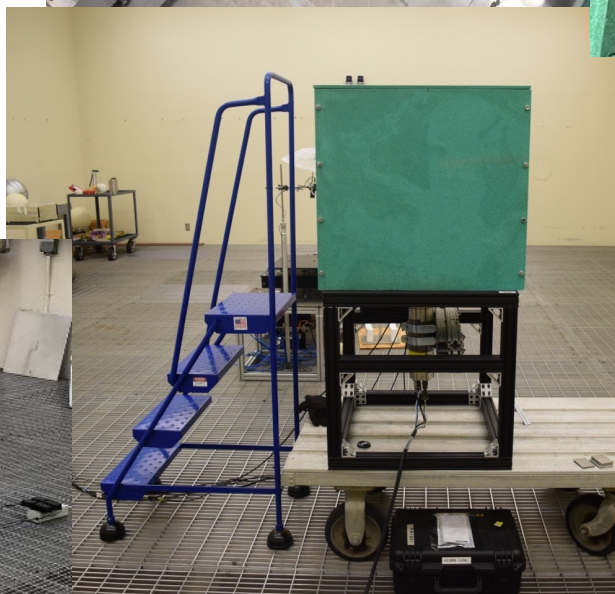
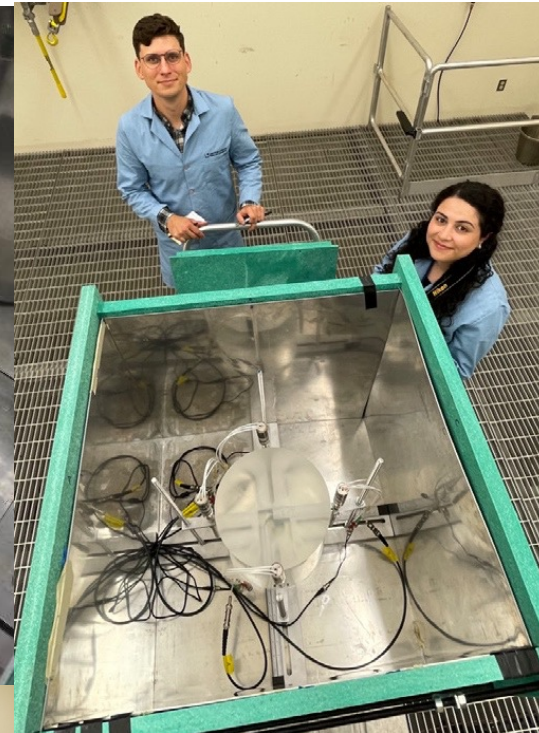
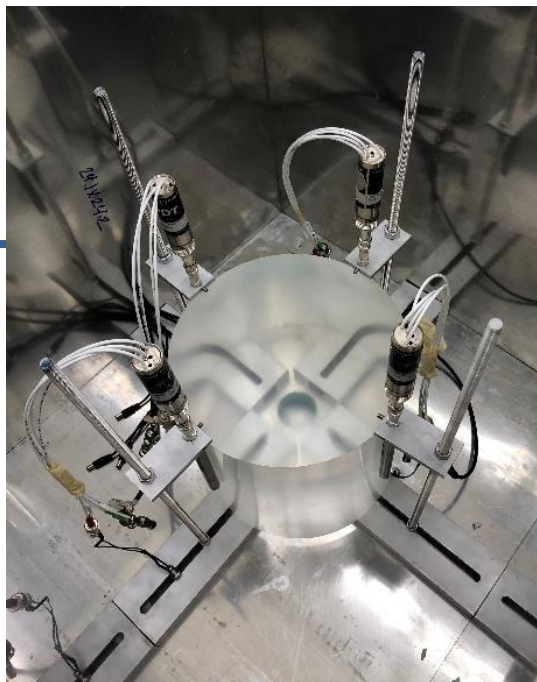
- Subcritical assembly using MTR-type fuel assemblies
 - Aluminum surrogate assemblies
- Hands-on demonstrations
 - Opportunity for visitors to engage with fissile material
- Approach to critical by fissile mass and water height
 - Fixturing allows in-core diluents





Pulsed Neutron Die-Away (PNDA)

- Nuclear experiments with or without fissile material
 - Neutron generator pulsed to measure escaping neutrons
 - Technique also applies to subcritical assemblies
- Low-Scatter Facility
 - Large room with false floor to reduce room return and background





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