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TRTR/IGORR

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New Safety Basis Strategy for Concurrent Testing at TREAT

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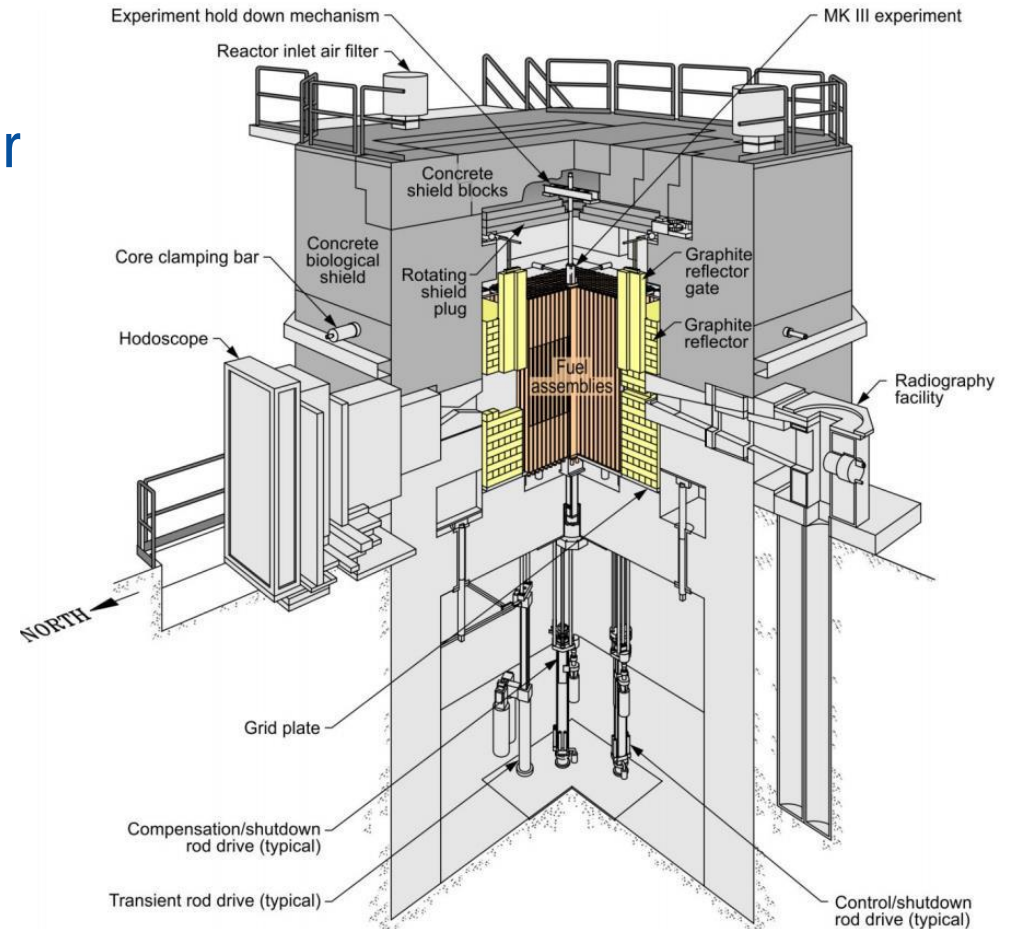
Idaho National Laboratory

Outline

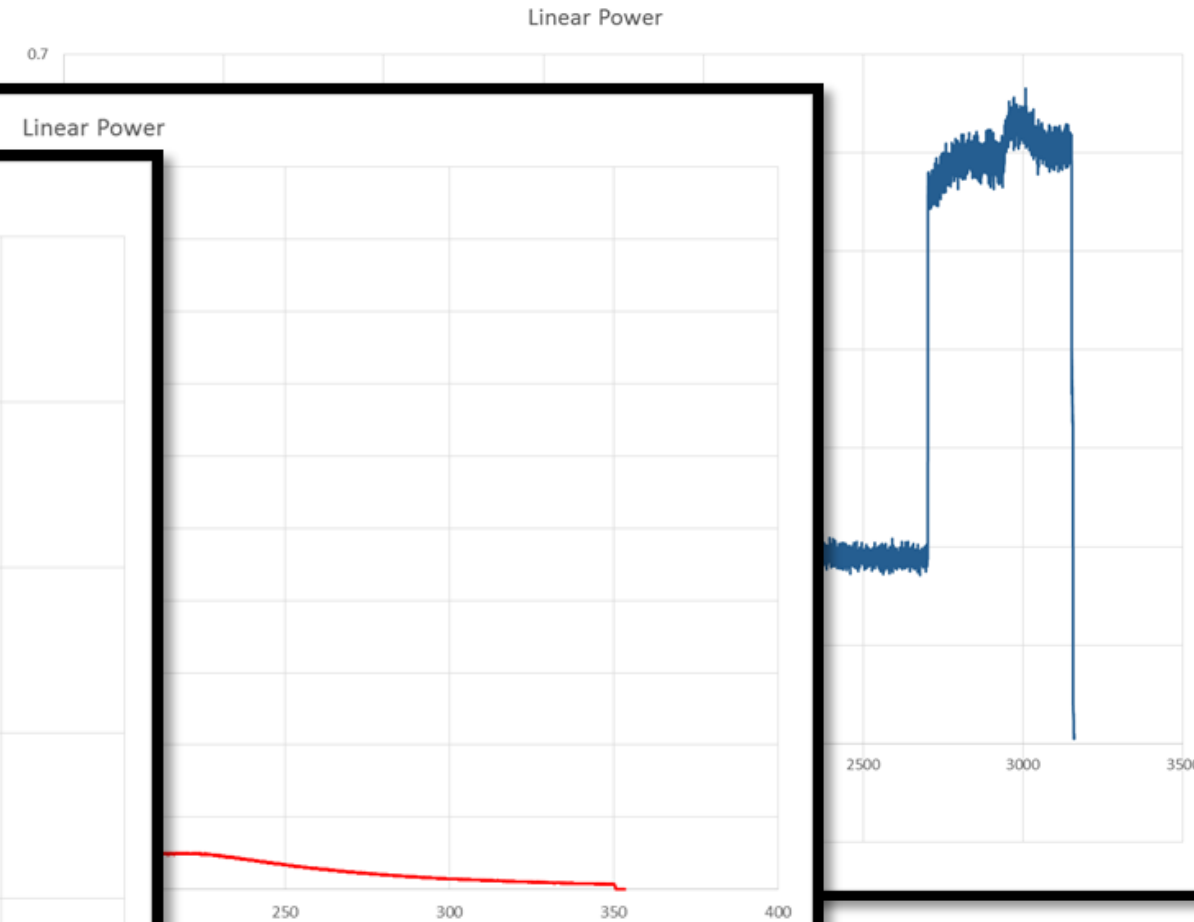
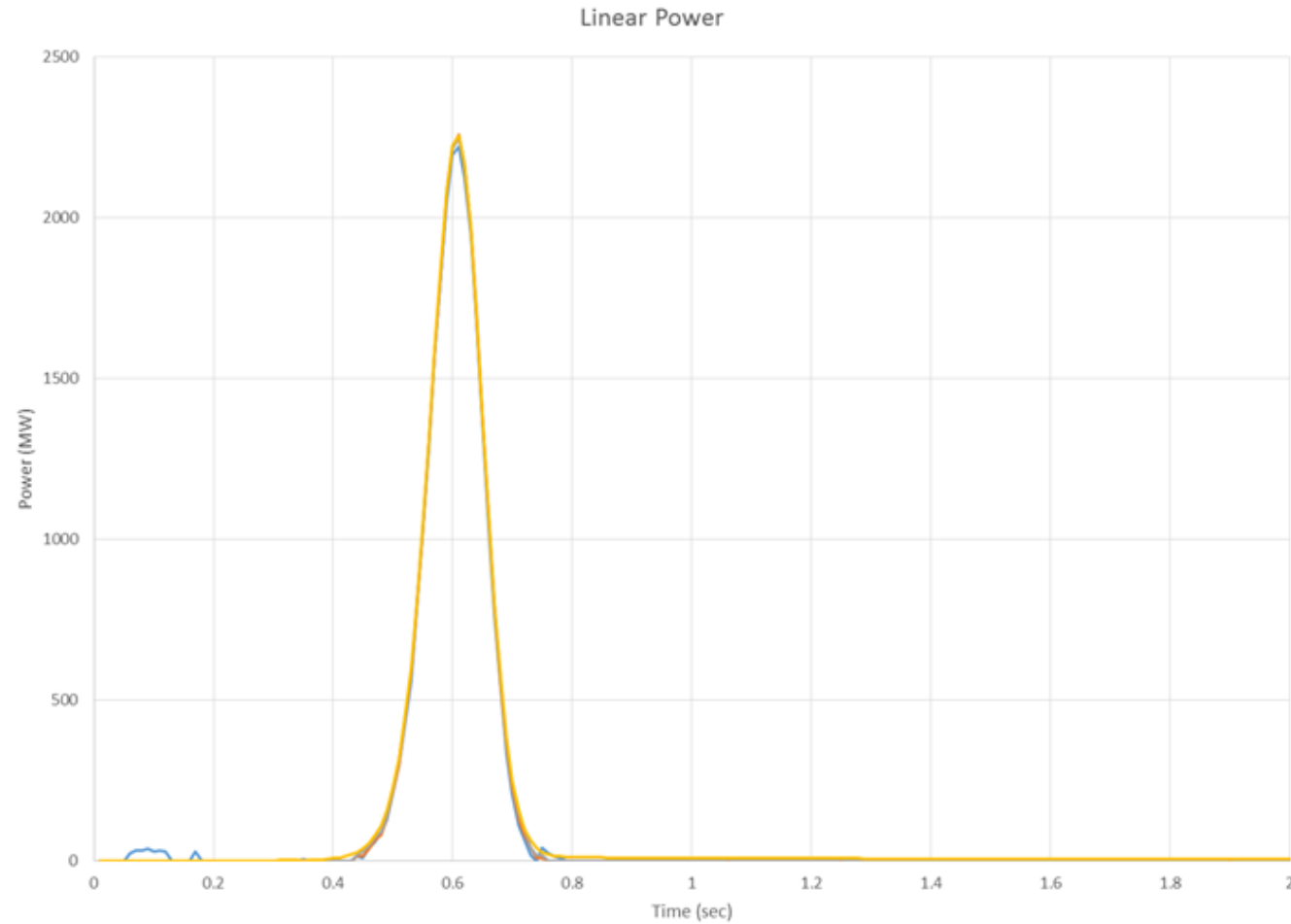
- TREAT Overview
 - Transient Capabilities
- Experiment And Concurrent Testing
 - Definition
 - Types
- Safety Basis Analysis
 - ESA Approach
 - Separate Hazards Analysis
- Safety Basis Confusion – Concurrent Testing
 - Problem
 - Interim Solutions
 - Long Term Solutions

Background of TREAT

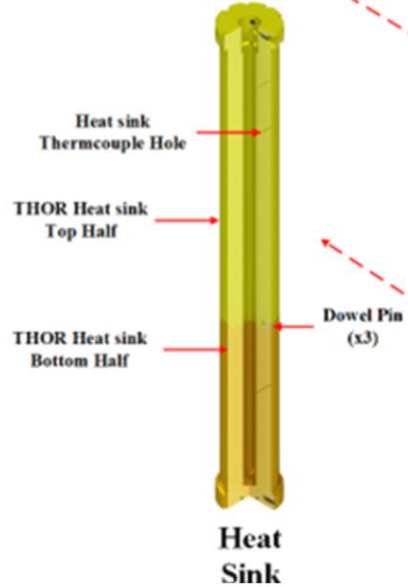
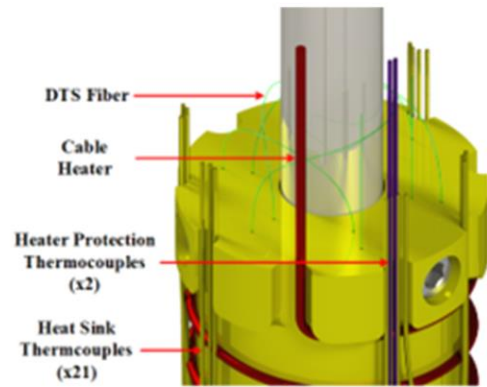
- Air-cooled, graphite moderated reactor
- 10,000:1 atoms C to atoms U
- Steady state operation 120 kW
- Minimum Period of 0.023 s
- Peak Power of 19,000 MW
- Peak Energy of 2,900 MJ



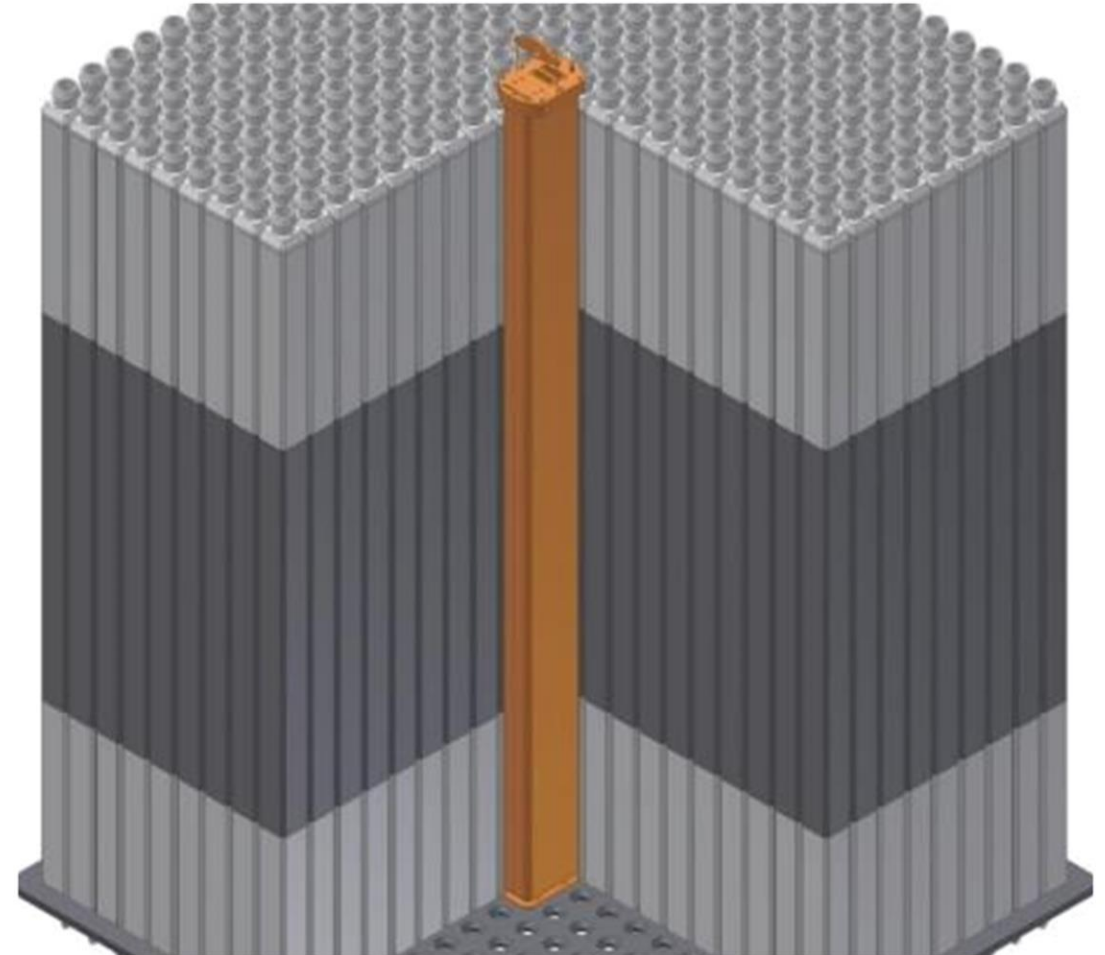
TREAT Transients



Experiments

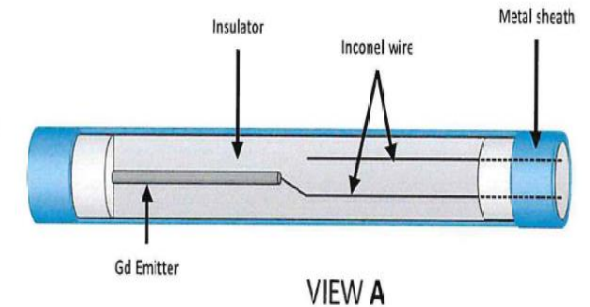
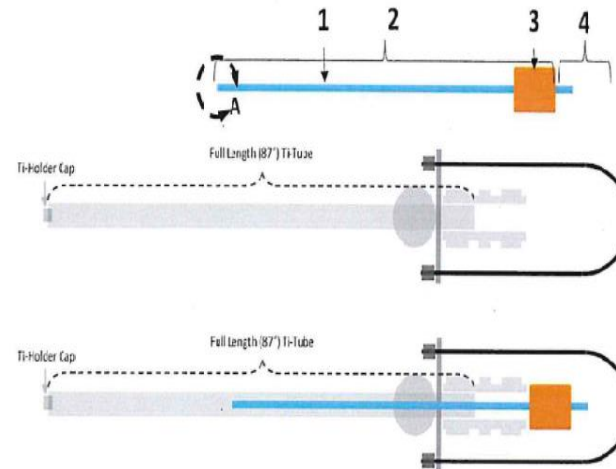


THOR
Module



Concurrent Testing

- Any item in the reactor but not dictating reactor performance (Along for the Ride)
- Current Tests:
 - Self-Powered Neutron Detectors,
 - Optical Fibers
 - Thermocouples
 - Impedance Sensors
 - Transducers
- Usually housed in $\frac{1}{4}$ " titanium tubes
- Placed in cooling channels in reactor.
 - Corner of 4 fuel elements



Safety Basis Approach

- Safety Analysis Report (SAR-420)
 - Bounding Accident Analysis
 - Requirements for Experiments
- Experiment Safety Analysis - Experiments
 - Shows Compliance to SAR
 - Written for each experiment type or group
 - TS-420 LCO 3.4.5
- Hazards Evaluation – Concurrent Testing
 - Reactivity Worth
 - Source Term (if needed)
 - Thermal

Experiment Confusion

- Discussions with DOE
 - Recall experiment definition
 - Items such as detectors, flux monitors, sensors. etc. are exempt.
 - Confusion as to what CT was categorized.
- Conclusion
 - Exempted items were only devices that were part of the reactor and needed to perform reactor functions.
 - CT and all devices should be considered Experiments

Interim Solutions

- Reactor placed in safe state
- All reactor operations halted till path forward developed
- Changes to safety basis compliance developed
 - Two Options
 - Remove concurrent testing
 - Months of core characterizations needed.
 - Develop ESAs for all test currently in use
 - Month of document creation and review needed
 - ESAs for non-fueled items hard to write
- Decision to continue to utilize CT and develop ESA for all devices.
 - 4-5 Months to develop, create, and issue new documentation.

Long Term Solutions

- Extensive SAR-420 revision
 - Define all items intended for irradiation in the reactor as Experiments.
 - Defined different levels of Experiments
 - Complex Experiment
 - An EXPERIMENT that requires trial transients to be performed before insertion into the reactor for transient operation as specified in the EXPERIMENT safety analysis (ESA).
 - Experiments
 - Experiments that do not require containment or reactor performance to be verified.
- Procedure for creation of ESAs revised
 - Gives experiment analysis requirements for each type of experiment.
 - Give a graded approach based on the hazards involved (fissile material, non-fueled).
 - ESA created for each type with different levels of rigor.

Questions



References

- [1] Idaho National Laboratory, "Transient Reactor Test (TREAT) Facility FSAR. SAR-420," Revision 6. 2022.
- [2] Idaho National Laboratory. "Experiment safety Analysis- Coolant Channel Concurrent Testing Experiment Safety Analysis" TREAT-ESA-005. 2022
- [3] Idaho National Laboratory. "Experiment safety Analysis- Experiments Operated in MARCH-BUSTER" TREAT-ESA-002. 2022
- [4] Idaho National Laboratory, "Transient Reactor Test (TREAT) Facility FSAR. SAR-420," Revision 7. 2023.



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