Idaho National Laboratory Real Time Fuel Monitoring Capabilities

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Purpose

To measure the performance of new fuel types under normal irradiation and accident conditions. This is accomplished by the implementation of measurement systems capable of continuously monitoring the release of gaseous fission products.

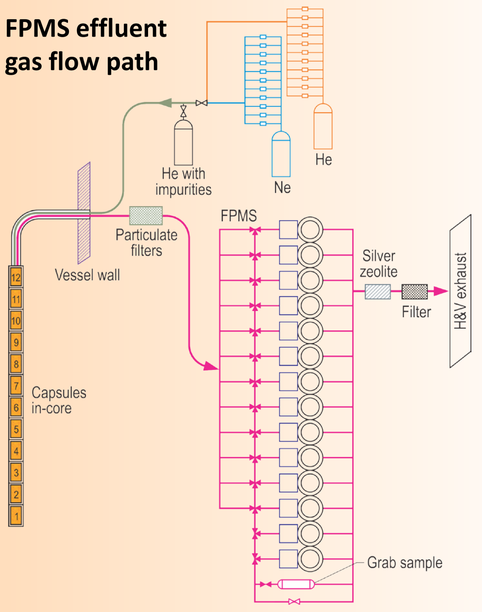
Motivation

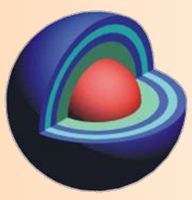
Advanced Reactor Technologies application:

Provide the traceable, qualified measurement data needed for NRC certification of new fuel types.

Unique Capability

- ✓ Continuous round the clock monitoring with minimal operator invention.
- ✓ Automated spectral analysis protocols.
- ✓ The program components used for the monitoring systems are applicable to a number of different measurement scenarios.
- ✓ Measurements systems are configured to meet the specific measurement requirements. Examples:
  - The **Fission Product Monitoring System (FPMS)** monitors the fission products released during irradiation from multi-capsule test trains installed in the ATR reactor.
  - The **Fission Gas Monitoring System (FGMS)** monitors the fission products released from fuel capsules under different heating profiles, up to and including high temperature accident conditions.

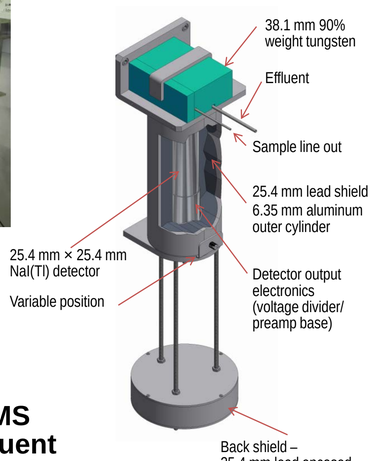




Tristructural isotropic (TRISO) coated fuel particle

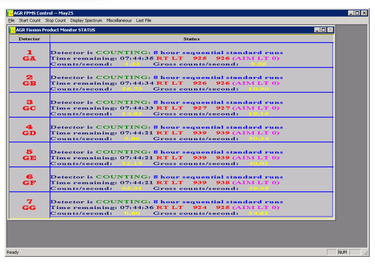
FPMS detectors: NaI gross monitors and HPGe detectors

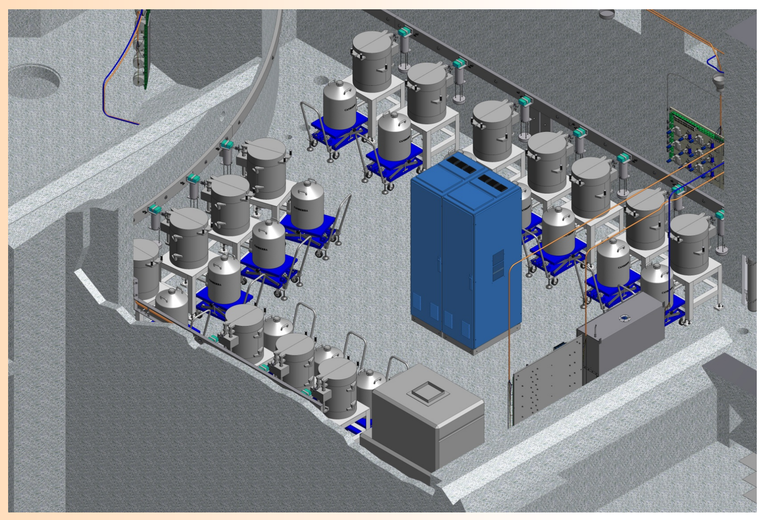
Cutaway of the NaI Gross Monitor



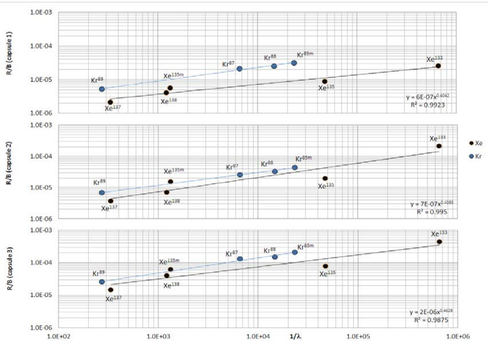
FPMS Effluent Sample Chamber and Collimator

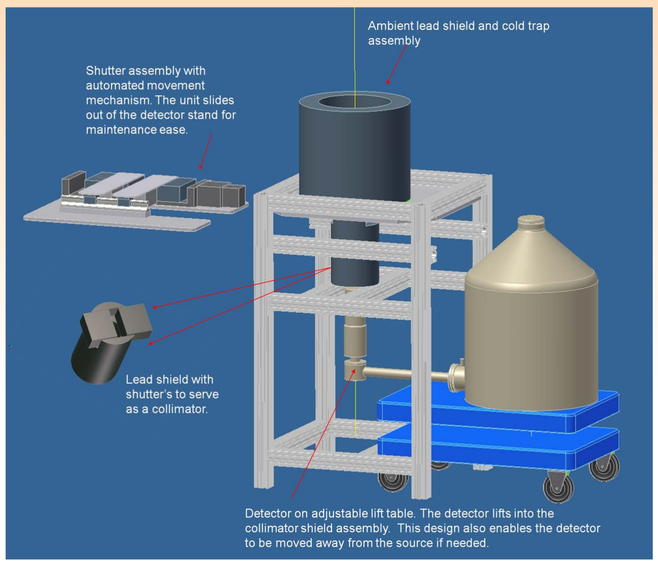
FPMS Automated Data Acquisition System



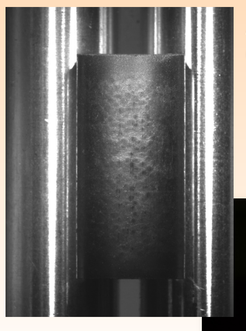


FPMS installed at the ATR 1A Primary Cubicle.





Fission Gas Monitoring System



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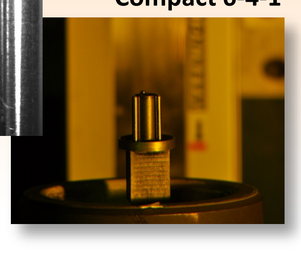

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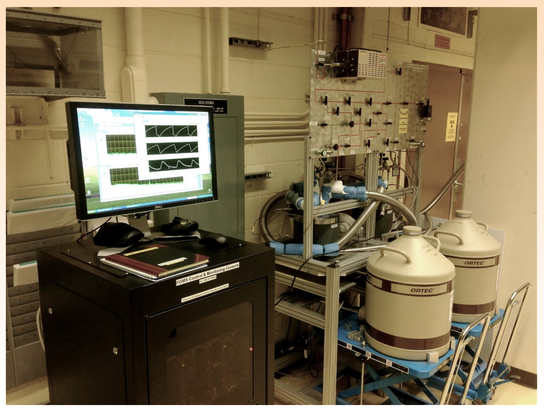
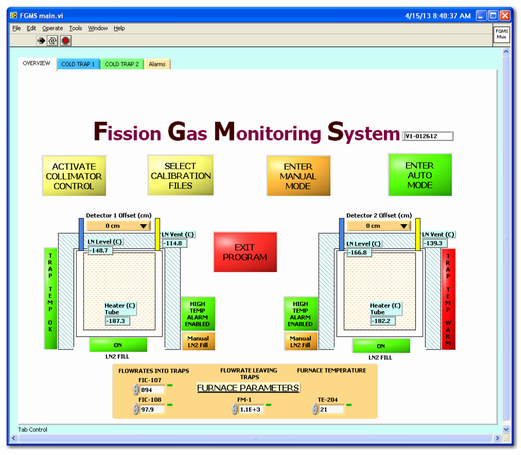
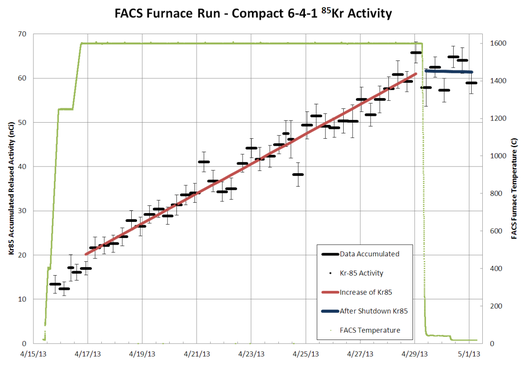
FGMS Automated Data Acquisition System

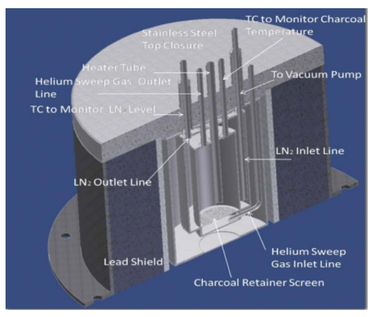


FGMS detectors and cold trap system at HFEF





Cutaway view of the FGMS cold trap assembly



Future Capabilities

The basic design elements of the measurement systems described can be applied to any number of different monitoring systems or sensor types.

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