INL/CON-23-75856-Revision-1

Long-length Scintillating Fibers for Nuclear Geological Repositories

May 2024

Luis A Ocampo Giraldo, Scott J Thompson, Jay D Hix, James T Johnson, David L Chichester

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Monitoring radiation in difficult-to-access or inaccessible areas

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  - Second level
    - Third level

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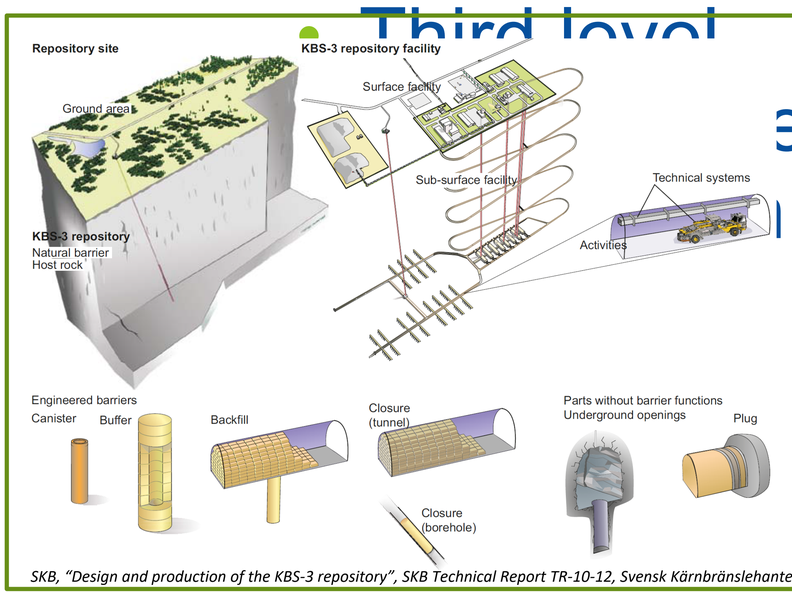
Deployment Concept

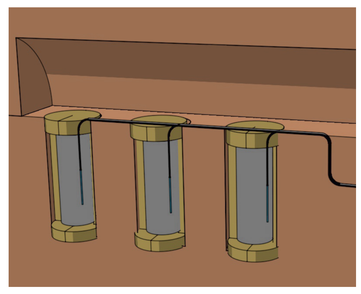


SKB, "Design and production of the KBS-3 repository", SKB Technical Report TR-10-12, Svensk Kärnbränslehantering AB (2010)

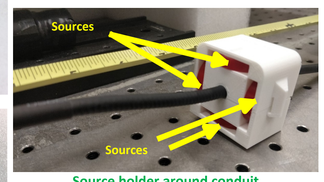
KBS-3 repository by the Swedish Nuclear Fuel and Waste Management Company

Radiation Detection and Monitoring

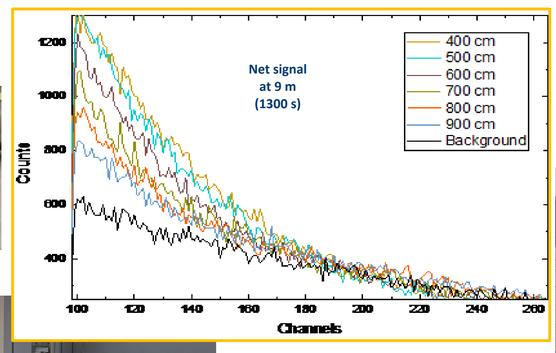
- Using radiation-sensitive plastic scintillating fibers coupled to long-length standard optical fibers
- The fiber can be placed along the tunnels of a geological repository to monitor the radiation field along its length
- Detect an increase of radiation due to movement, leakage, or unexpected opening of the containers, and decrease in the radiation due to removal
- Principal electronics and data acquisition systems will be placed at surface level for easier maintenance

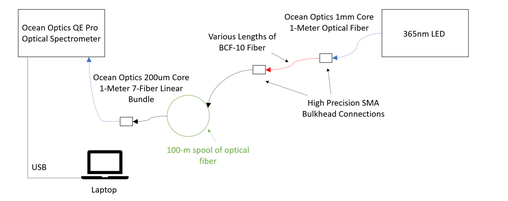


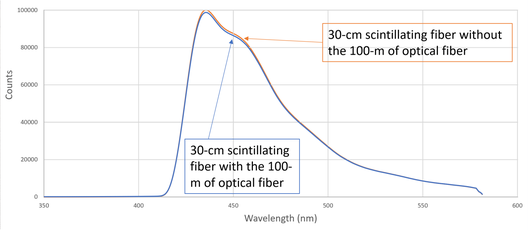
Scintillating Fiber Fabrication and Testing



Source holder around conduit

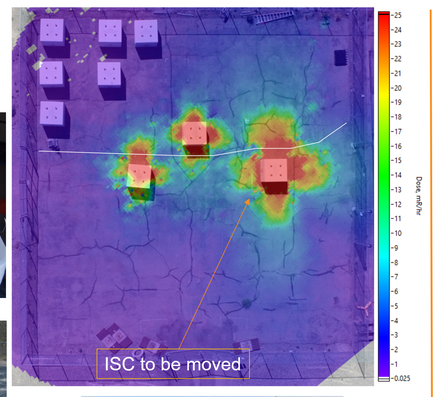


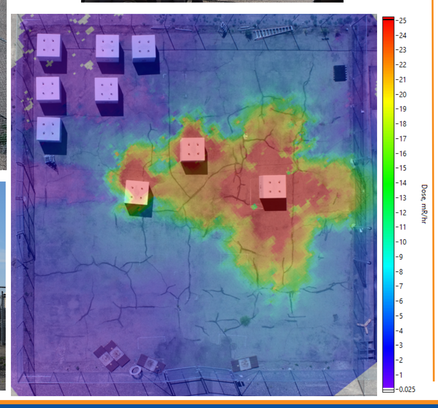


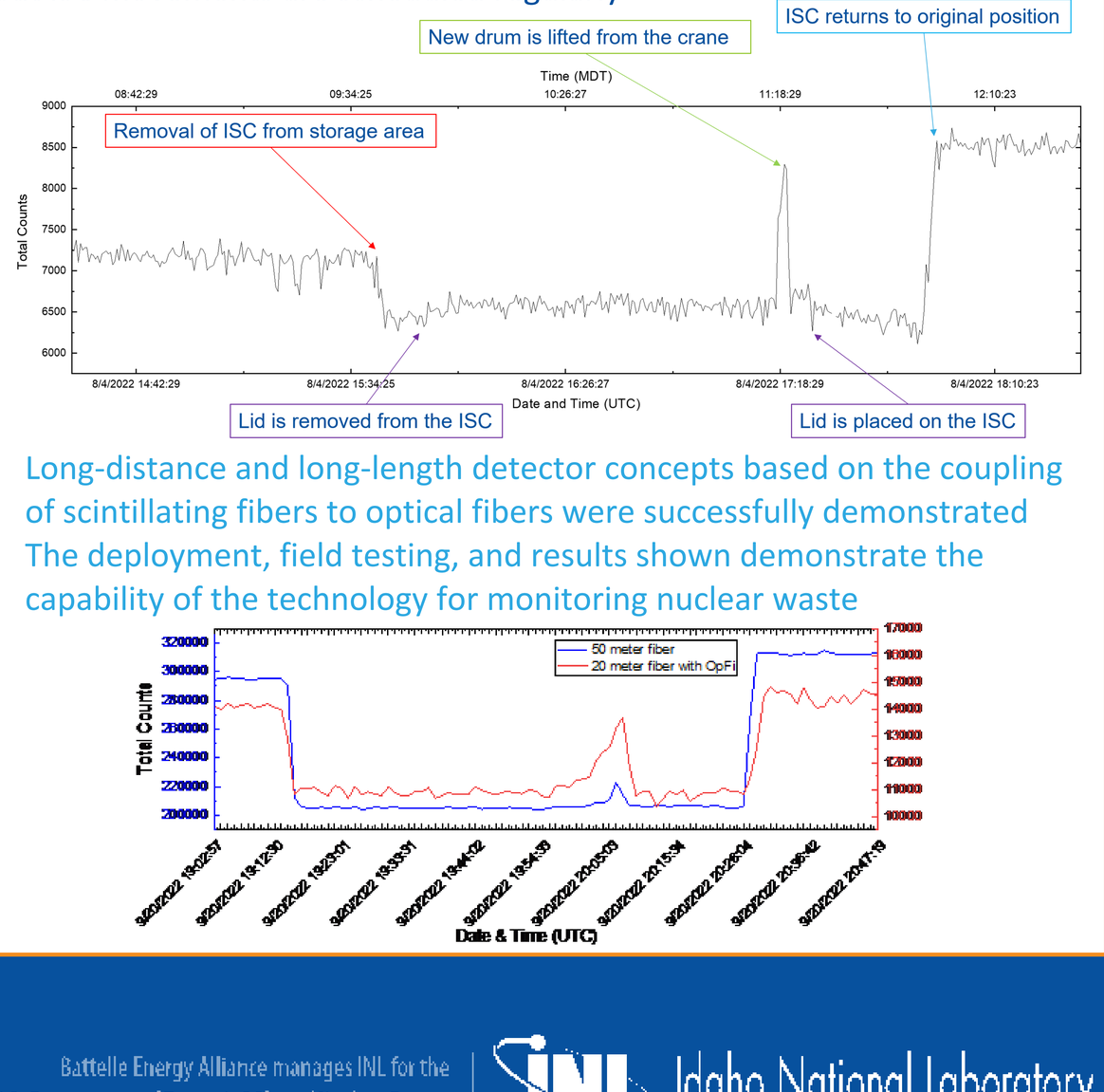


Field Testing at a Static Storage Facility

- The Radioactive Scrap Waste Facility contains several interim storage containers (ISC)
- ISCs measure 2 x 2 x 1.5 meters and have several 50-gallon drums filled with radioactive waste ranging from spent fuel to laboratory waste
  The configuration of the facility remains intact for several weeks, but ISC movements are scheduled regularly







- Long-distance and long-length detector concepts based on the coupling of scintillating fibers to optical fibers were successfully demonstrated
- The deployment, field testing, and results shown demonstrate the capability of the technology for monitoring nuclear waste

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