



# Long-length Scintillating Fibers for Nuclear Geological Repositories

May 2024

*Changing the World's Energy Future*

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

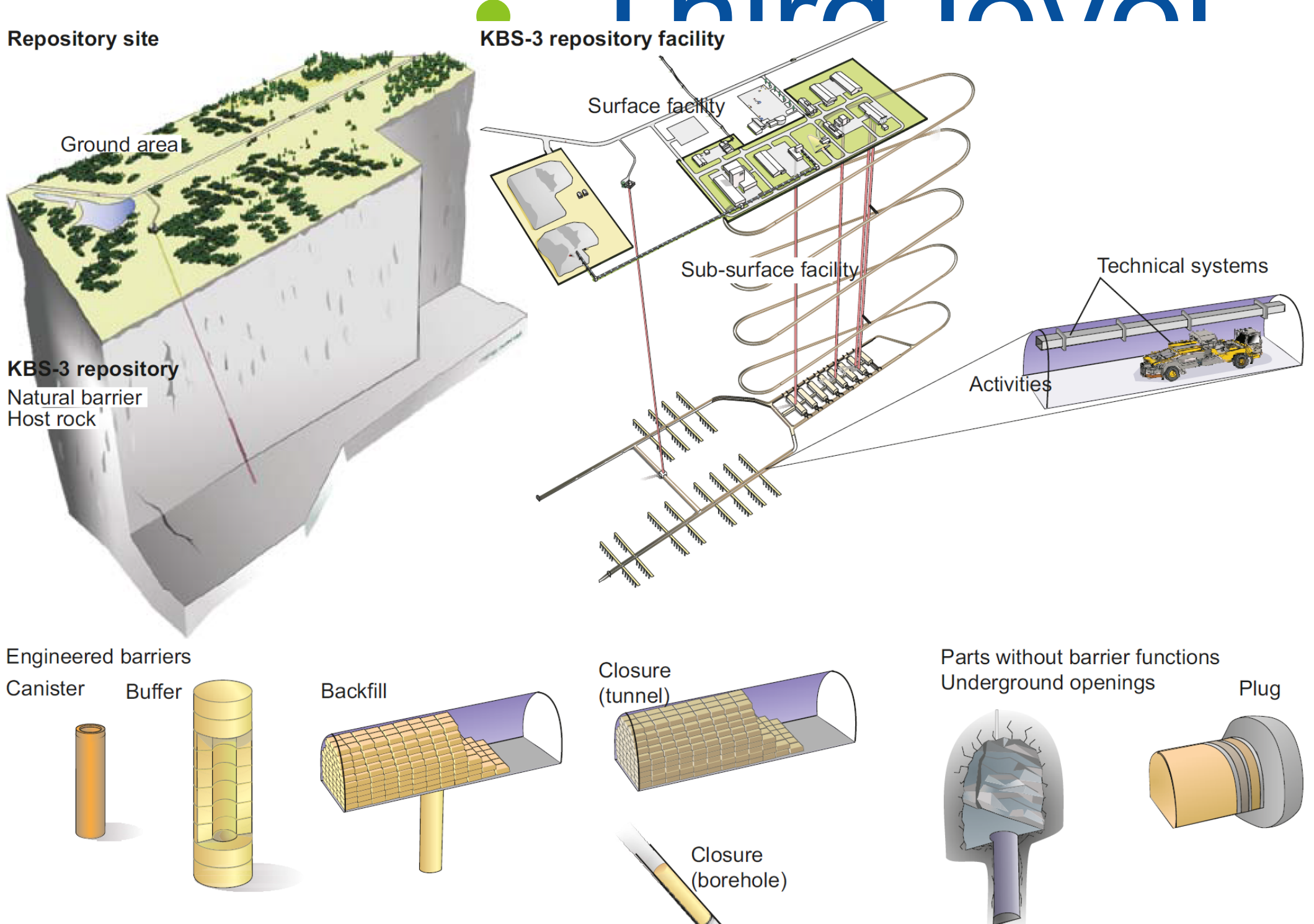
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# Long-length Scintillating Fibers for Nuclear Geological Repositories

Monitoring radiation in difficult-to-access or inaccessible areas

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## Deployment Concept



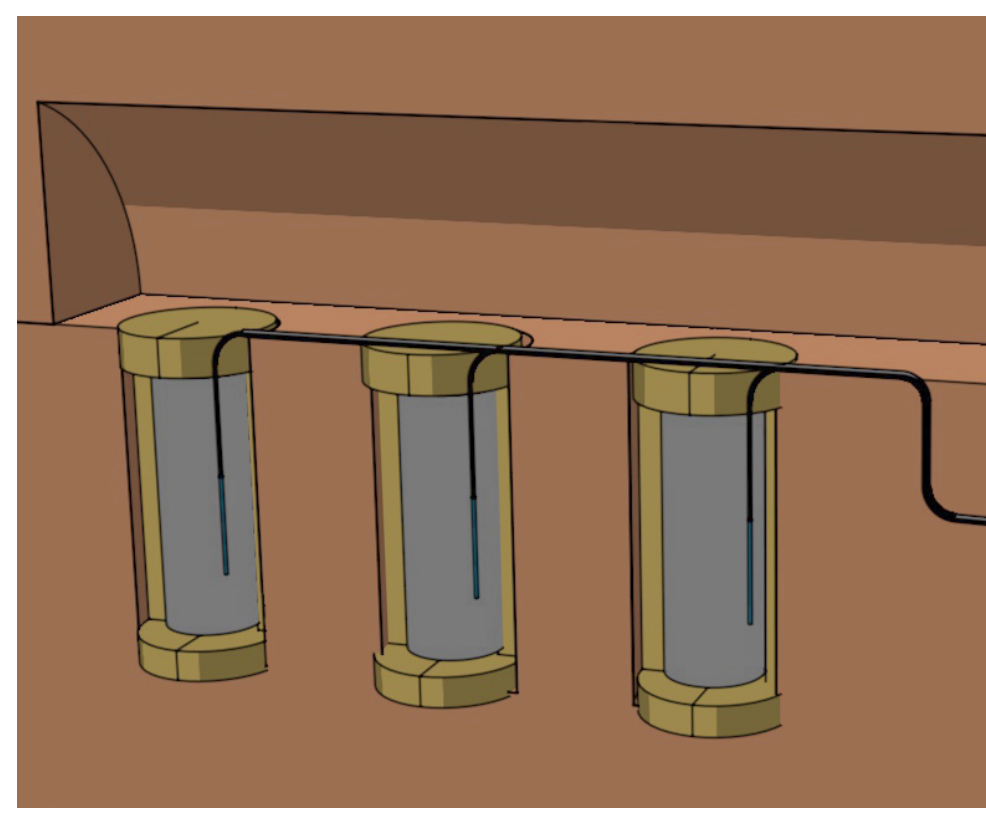
**Third level**  
Surface facility

**Second level**  
Sub-surface facility

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

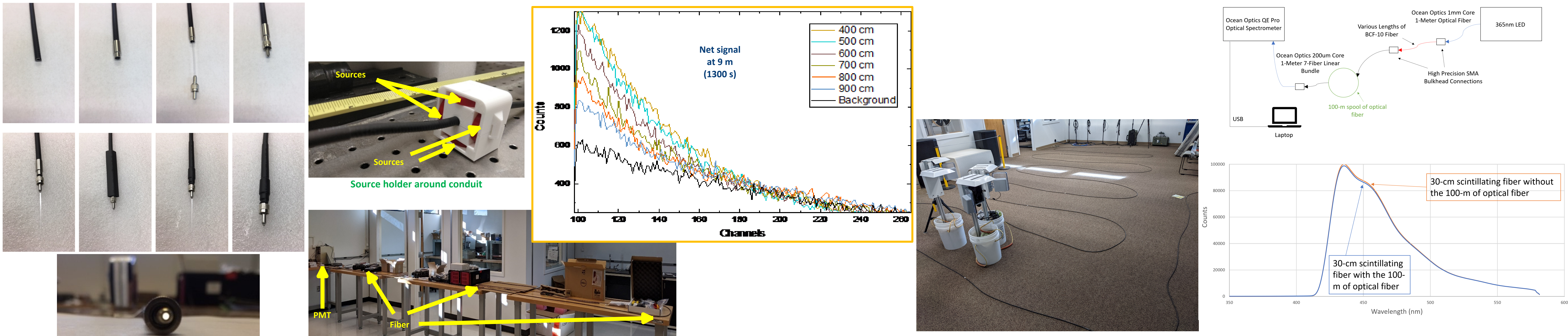
### Radiation Detection and Monitoring

- 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



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

## Scintillating Fiber Fabrication and Testing



Net signal at 9 m (1300 s)

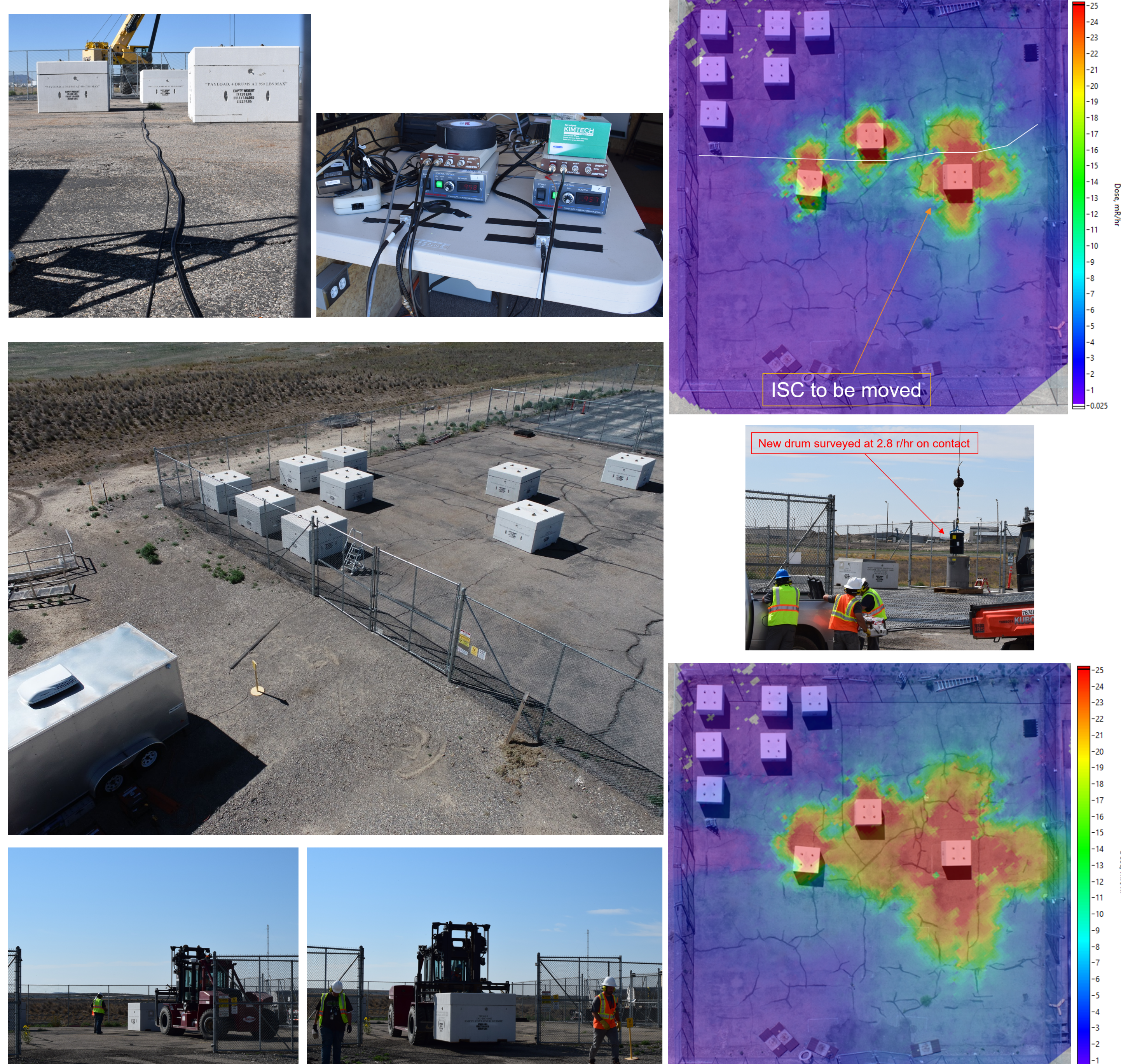
Channel	400 cm	500 cm	600 cm	700 cm	800 cm	900 cm	Background
Counts	~1200	~1000	~800	~600	~400	~200	~100

30-cm scintillating fiber without the 100-m of optical fiber

30-cm scintillating fiber with the 100-m of optical fiber

## 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



ISC to be moved.

New drum surveyed at 2.8 r/hr on contact.

Time (MDT): 08:42:29, 09:34:25, 10:26:27, 11:18:29, 12:10:23

Removal of ISC from storage area

New drum is lifted from the crane

Lid is removed from the ISC

Lid is placed on the ISC

ISC returns to original position

Total Counts vs. Date and Time (UTC)

50 meter fiber with OpFi

20 meter fiber with OpFi

Contact: Luis.OcampoGiraldo@inl.gov

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