



KINECTRICS

Life Cycle Management Solutions

ADEPT™

Advanced Dose Exposure Planning Tool

Presented by Yury Verzilov

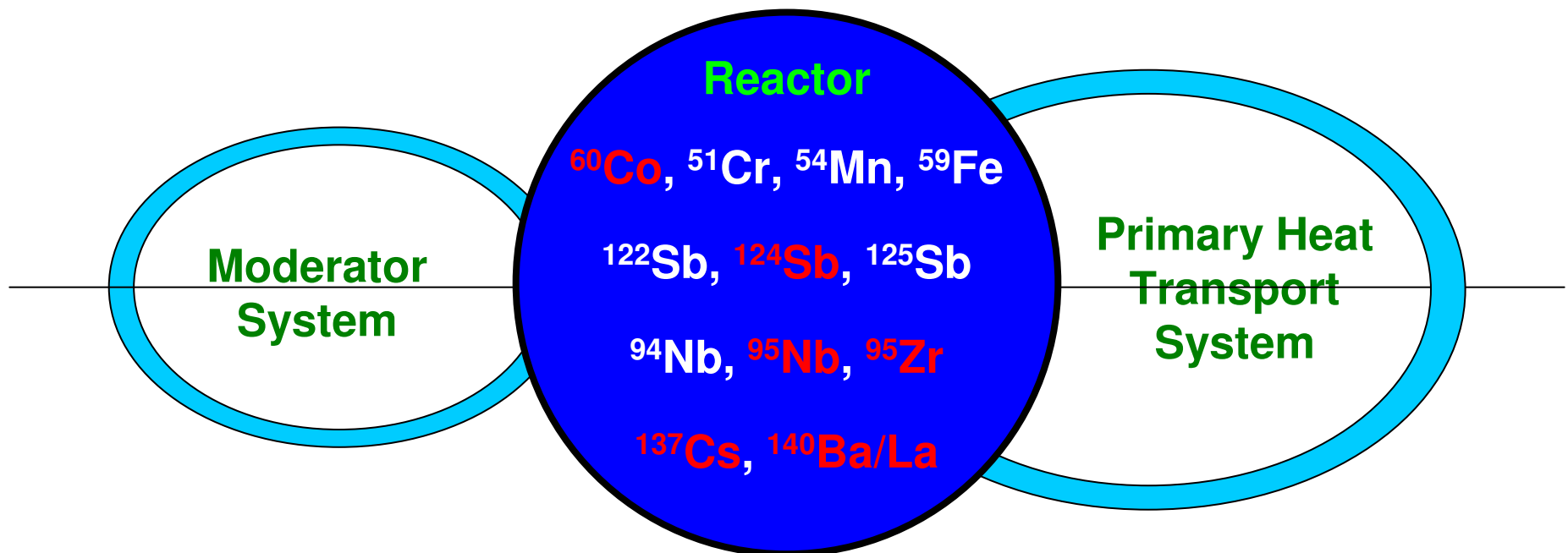
**2012 International ISOE ALARA Symposium
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Introduction



Deposition of radionuclides on out-of-core reactor surfaces leads to:

- a) growth of station gamma fields, and
- b) effect on worker dose



Background



Understanding of Radionuclide Deposits on Out-Core Surfaces is Vital for:

- Radiation Shielding Design and Optimization of Work Procedures
- Assessment and Analysis of Occupation Doses
- Source Term Monitoring

**Outage Activity Transport Monitoring (OATM)
Surveys Permit Monitoring of Radionuclide
Deposits on Reactor Components**

Outage Activity Transport Monitoring



Objective

Identification of radionuclides responsible for observed radiation field *and their specific activities*

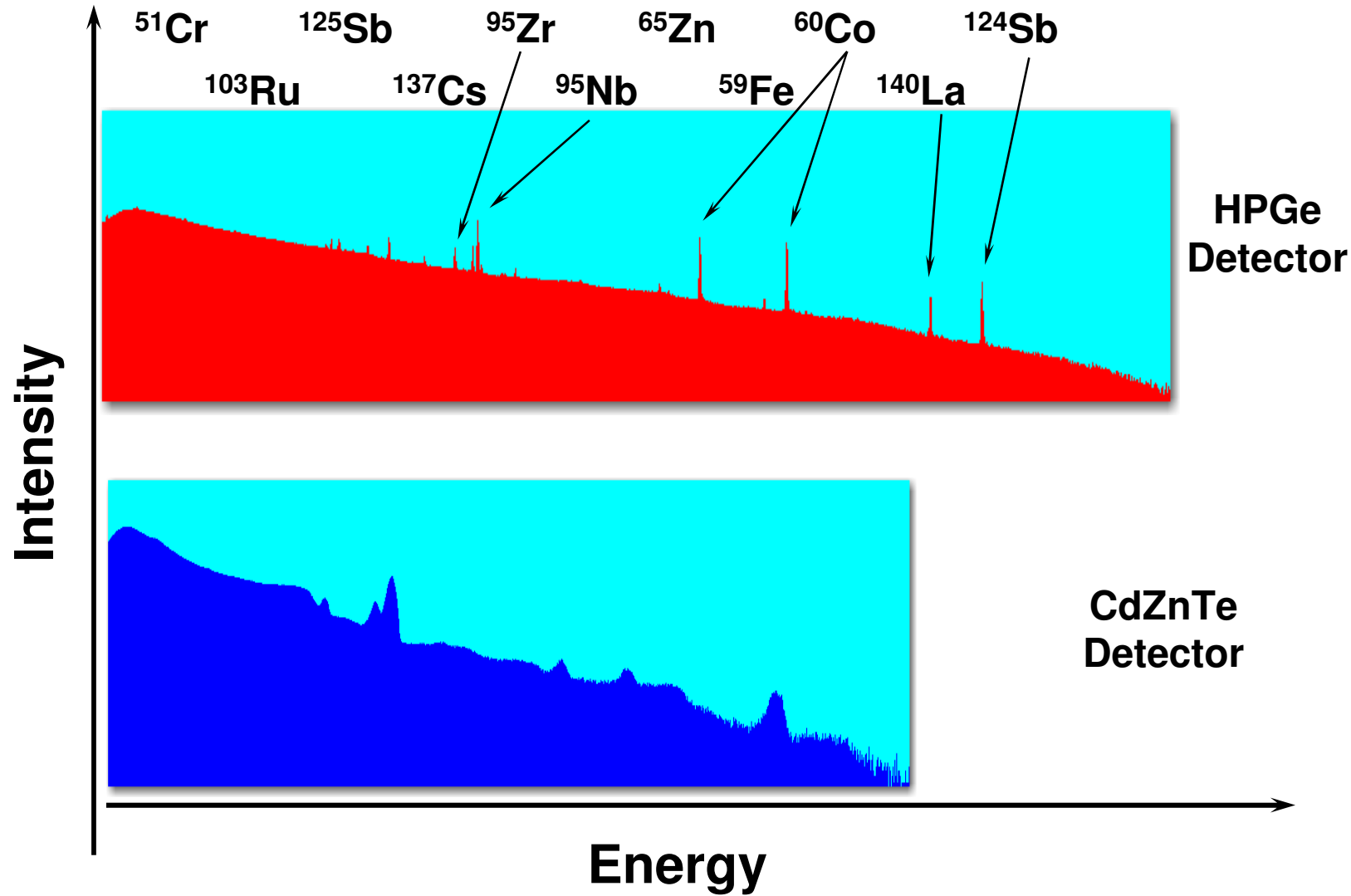
Approach

In-situ gamma spectroscopy and dose rate measurements coupled with interpretation method

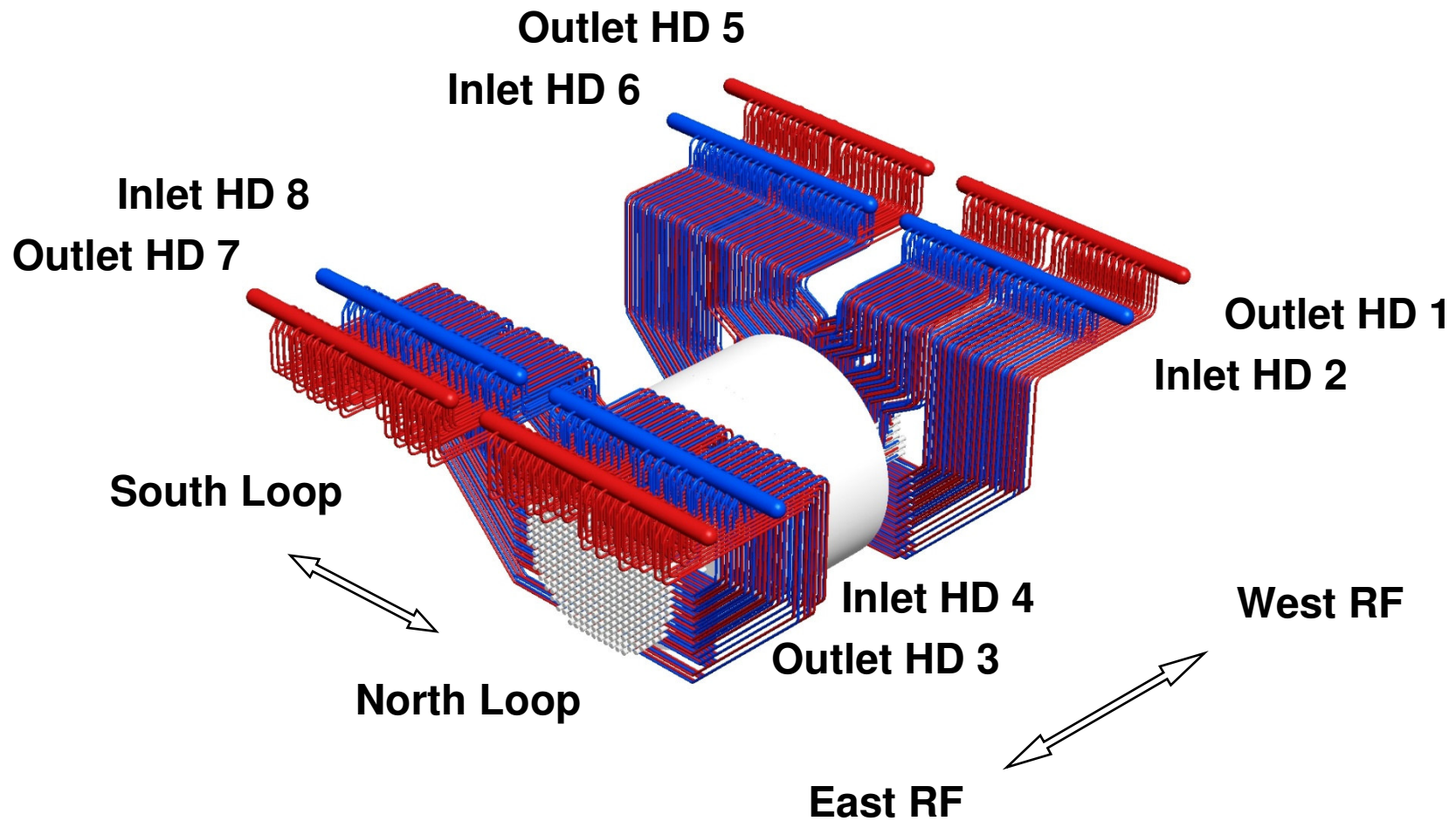
Instrumentation



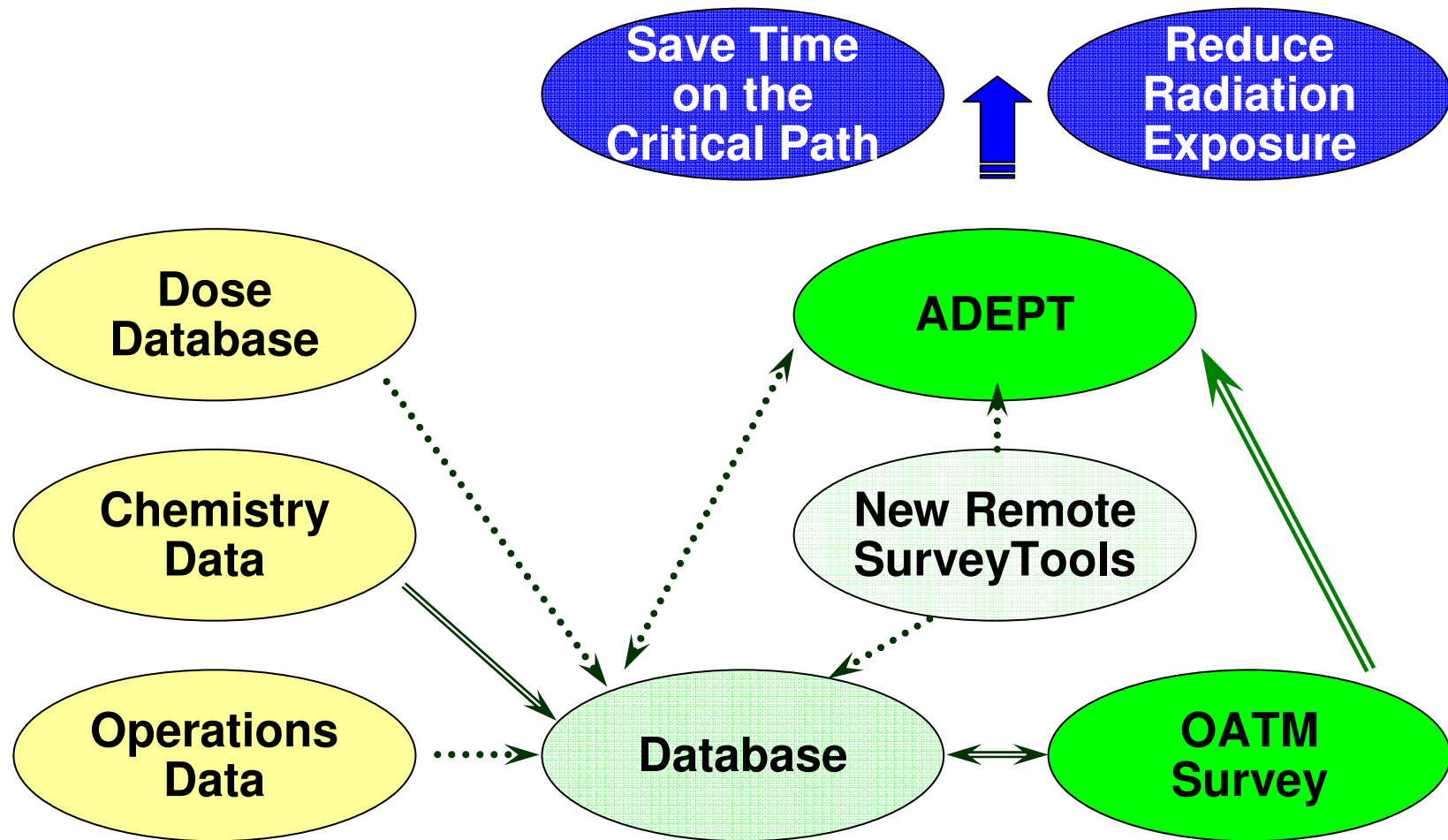
Gamma Spectra



Reactor Assembly Model

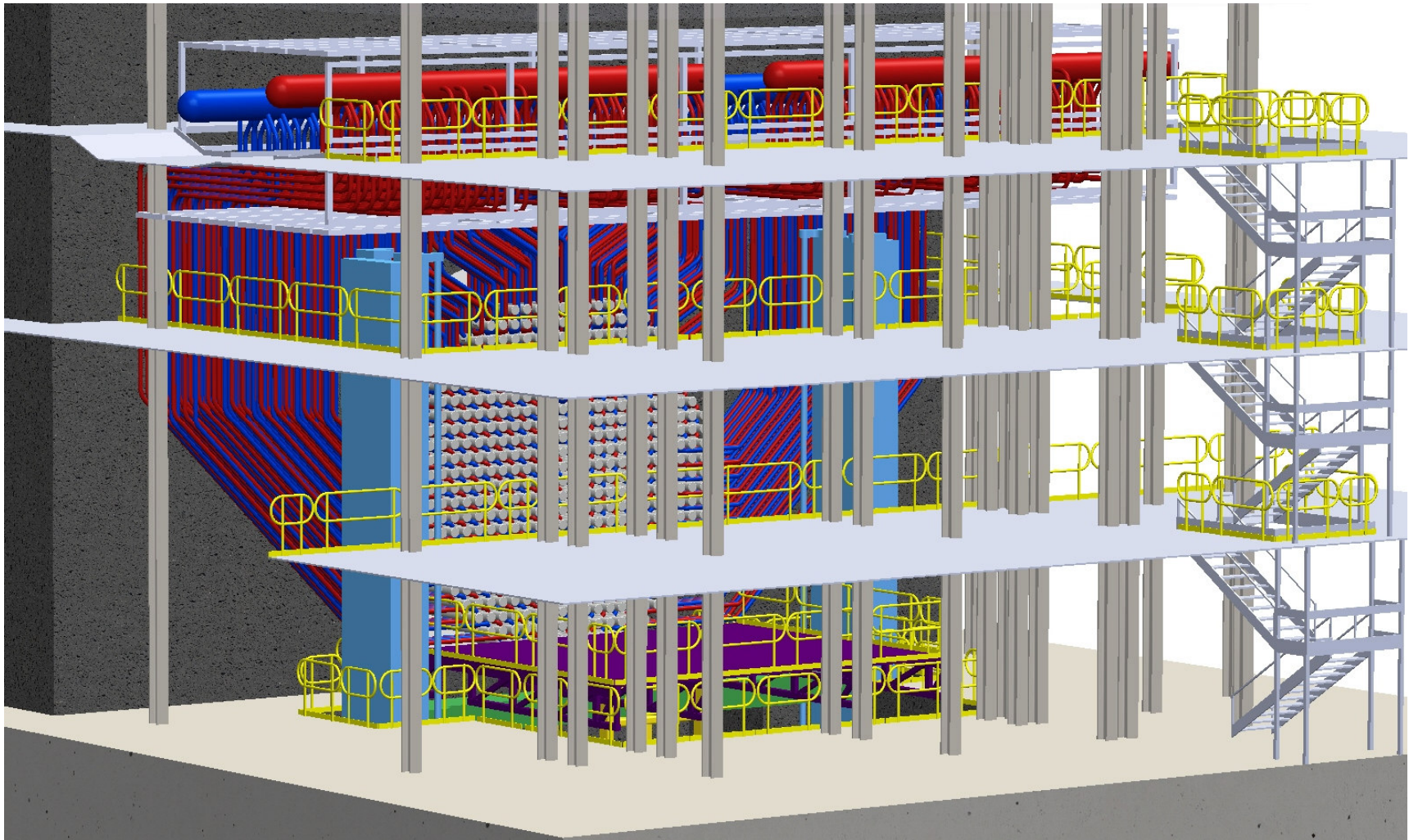


ADEPT and OATM Survey

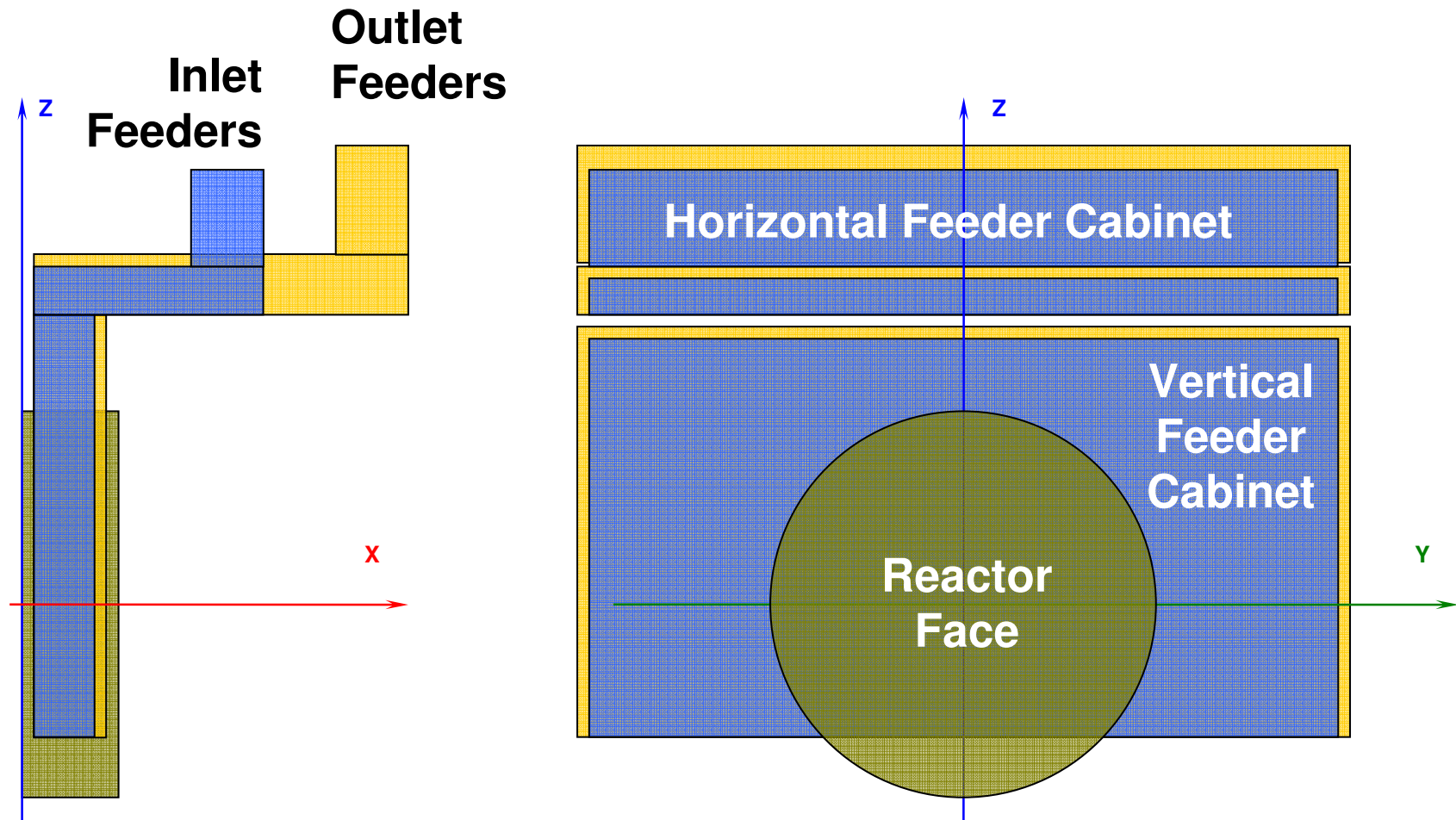


Develop Tools & Establish Data Links

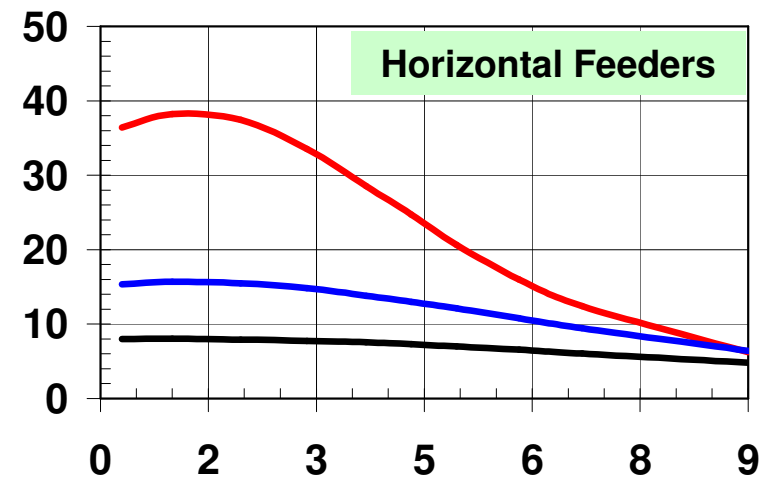
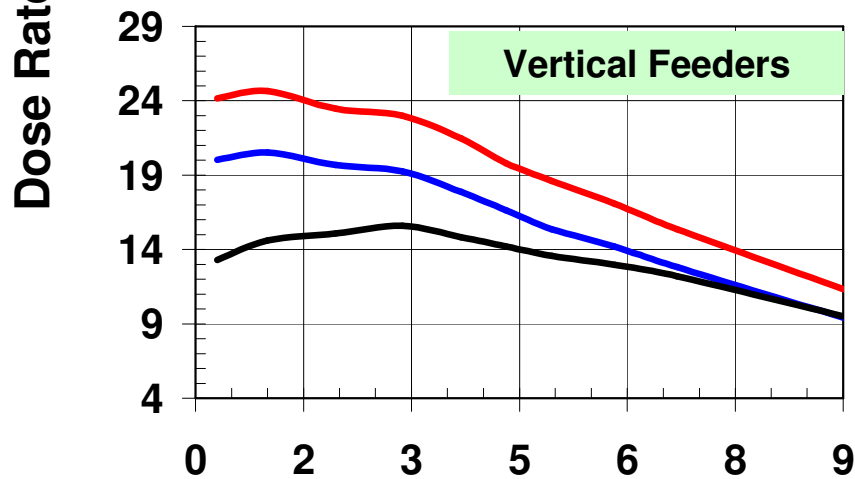
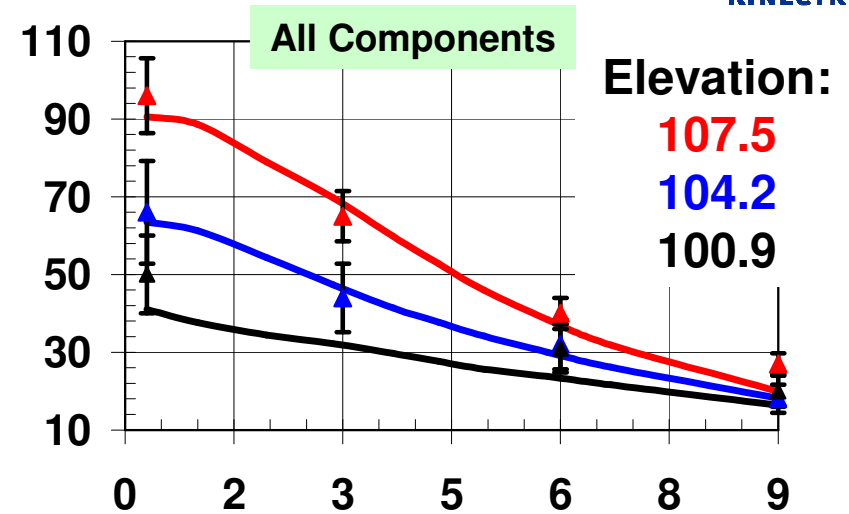
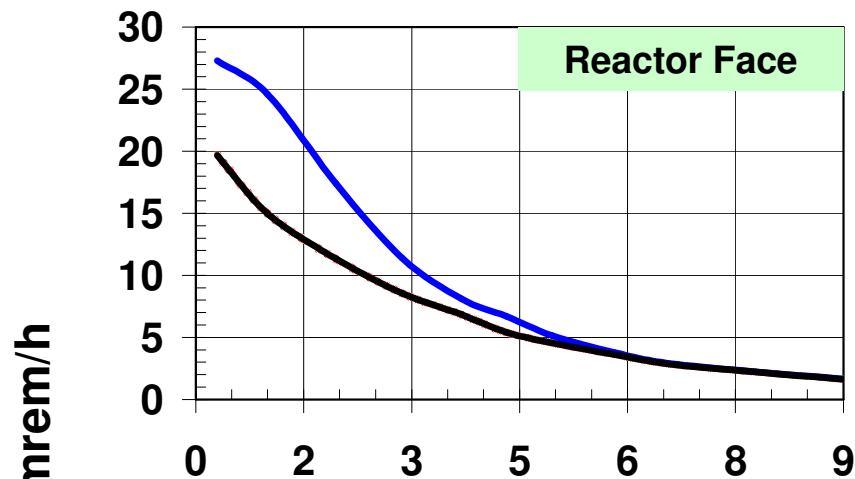
Reactor Vault Model



Schematic of Sources in the Vault



Component Radiation Fields

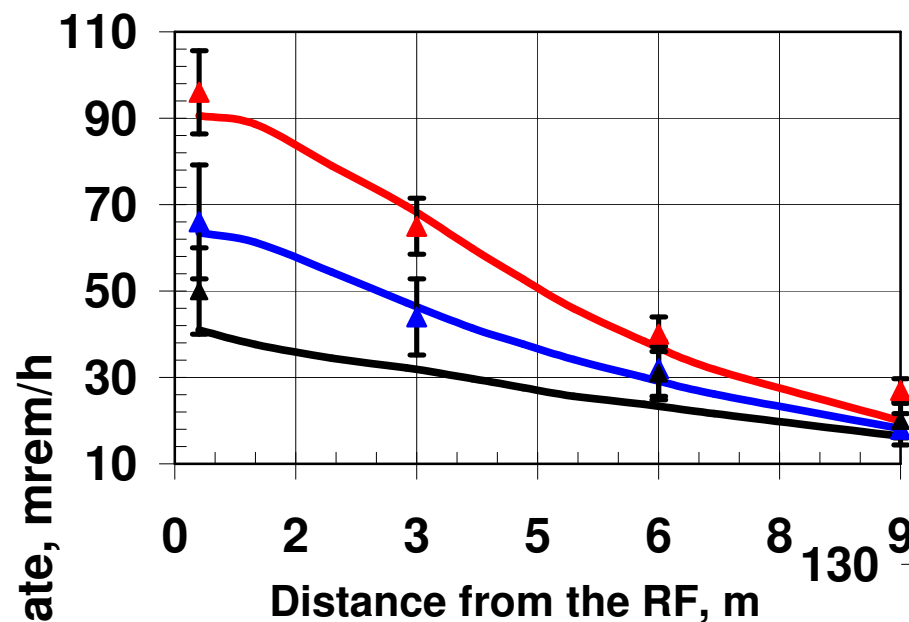


Distance from the RF, m

Reactor Vault – Dose Rate Distributions



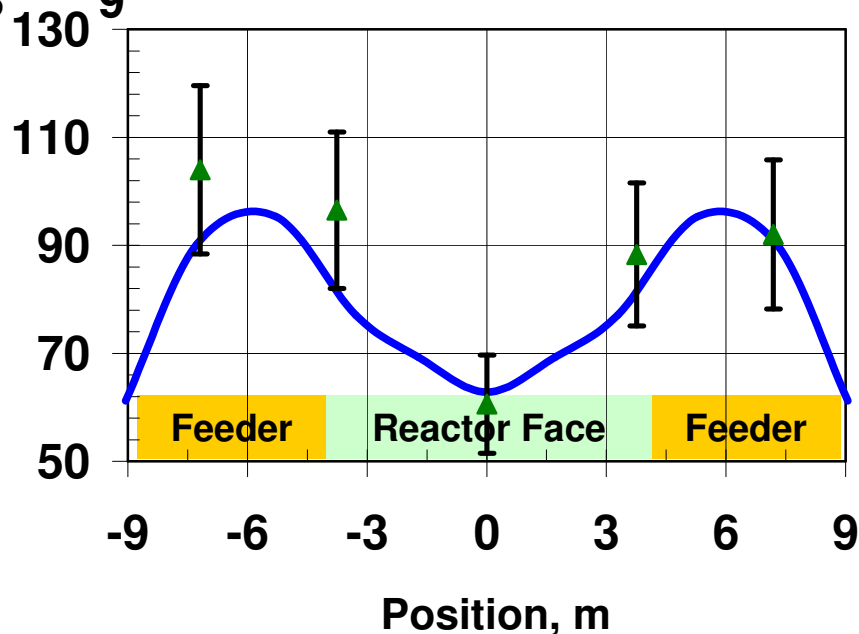
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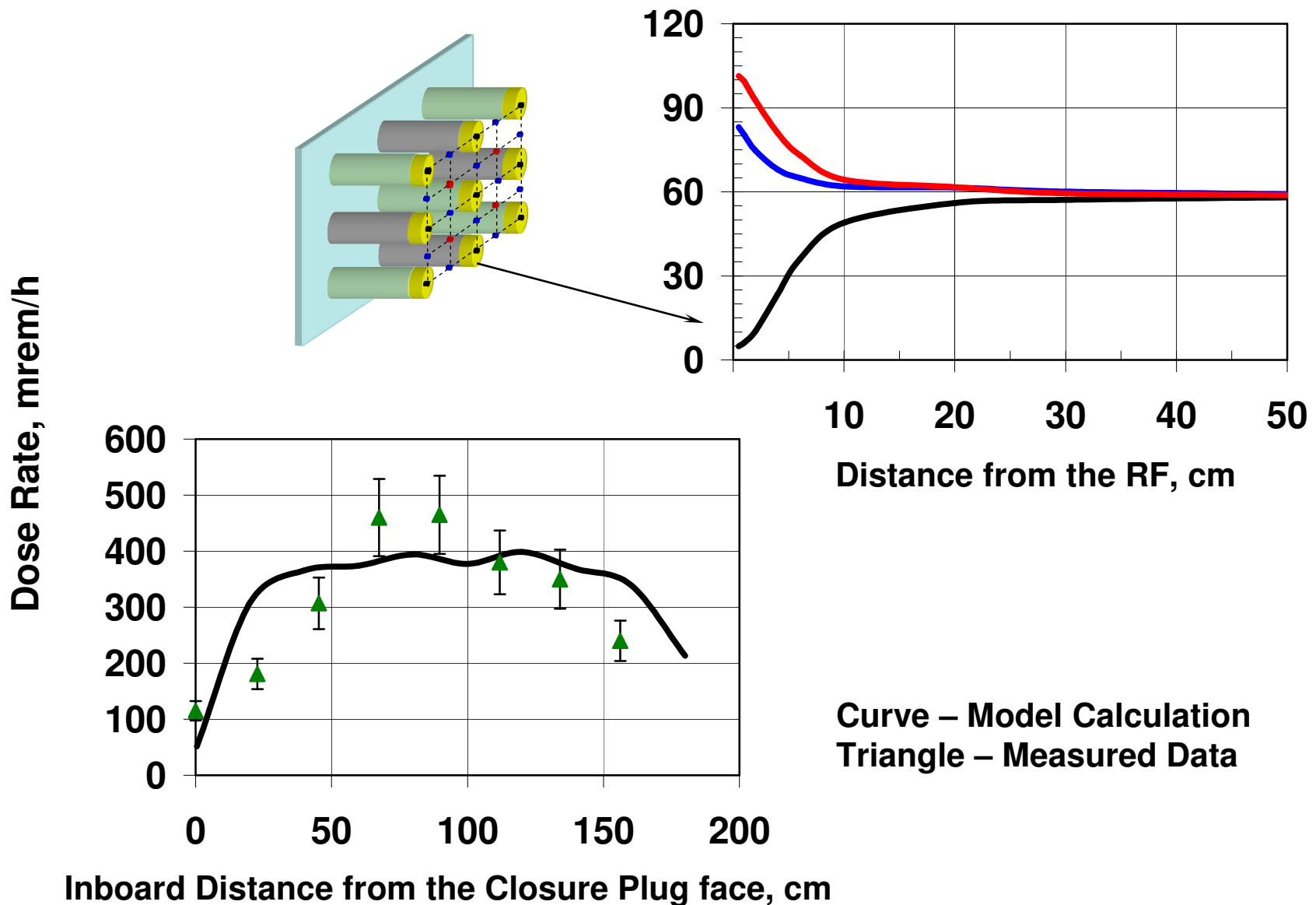
Elevation: **No HS on Reactor Face**

107.5
104.2
100.9

Curve – Model Calculation
Triangle – Measured Data



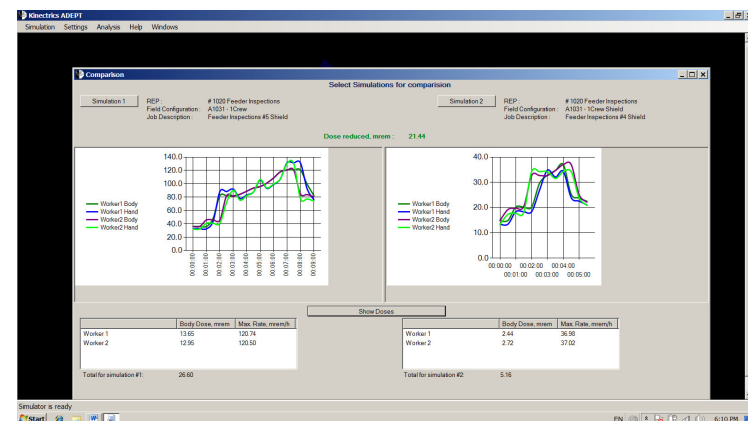
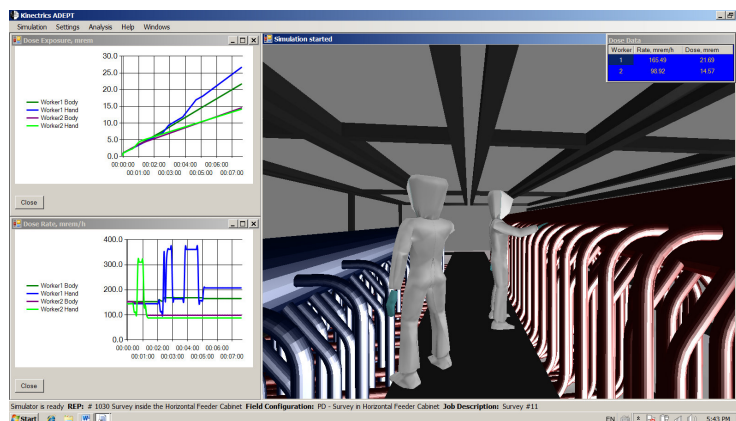
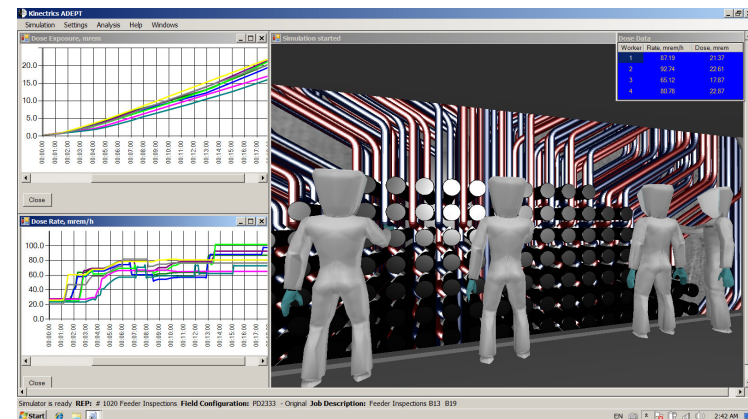
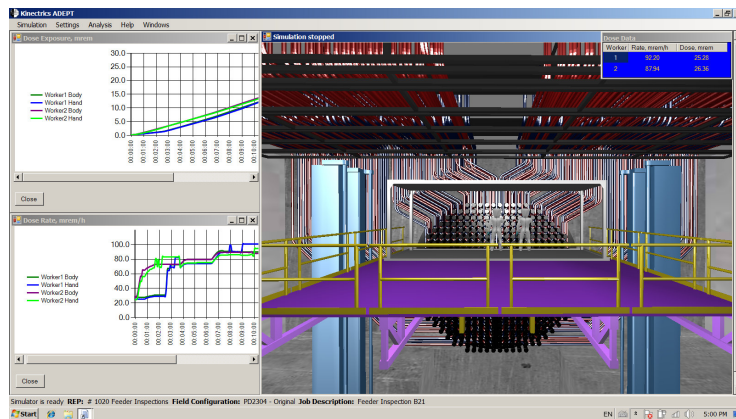
Reactor Face – Dose Rate Distributions



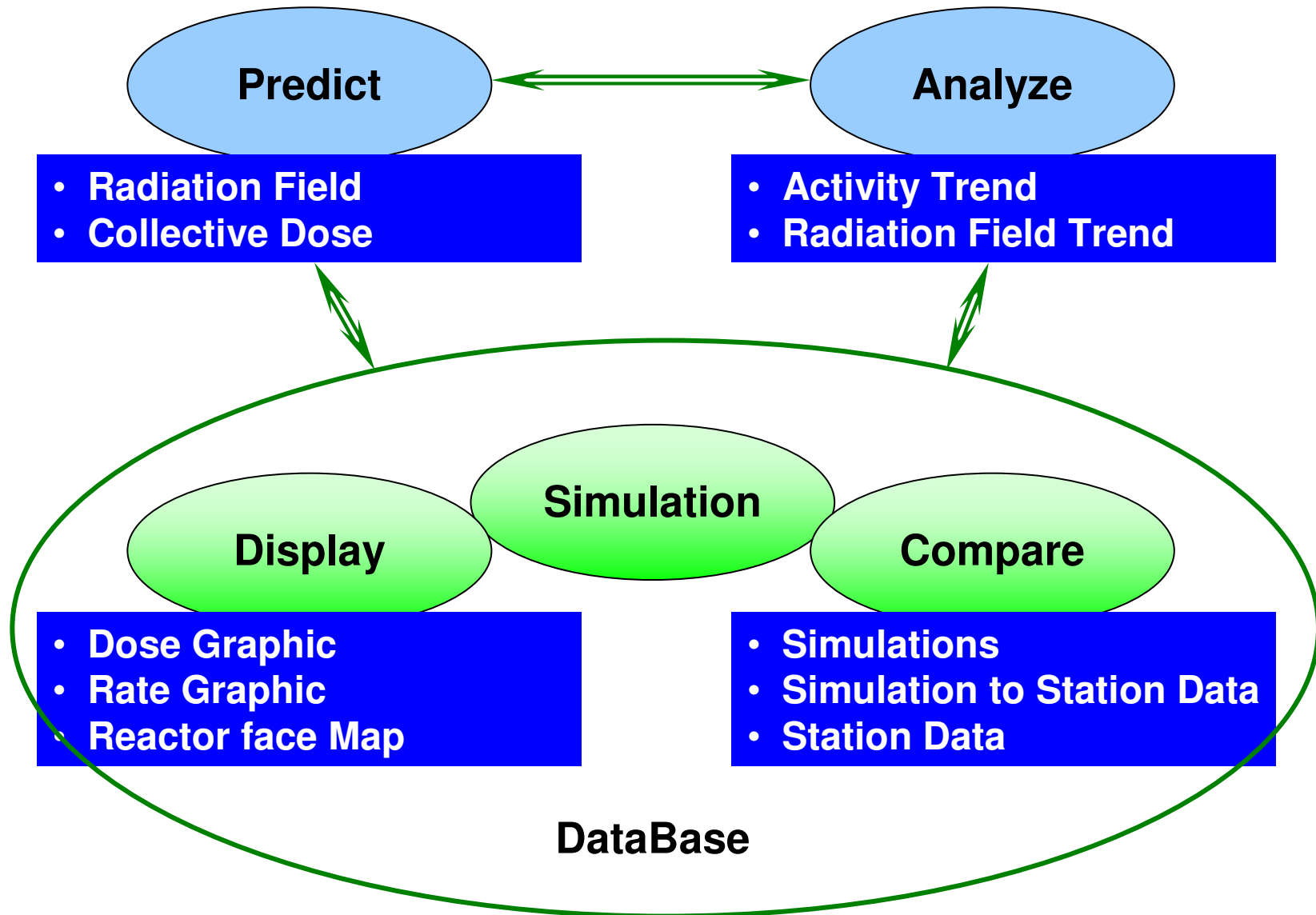
Advanced Dose Exposure Planning Tool - ADEPT



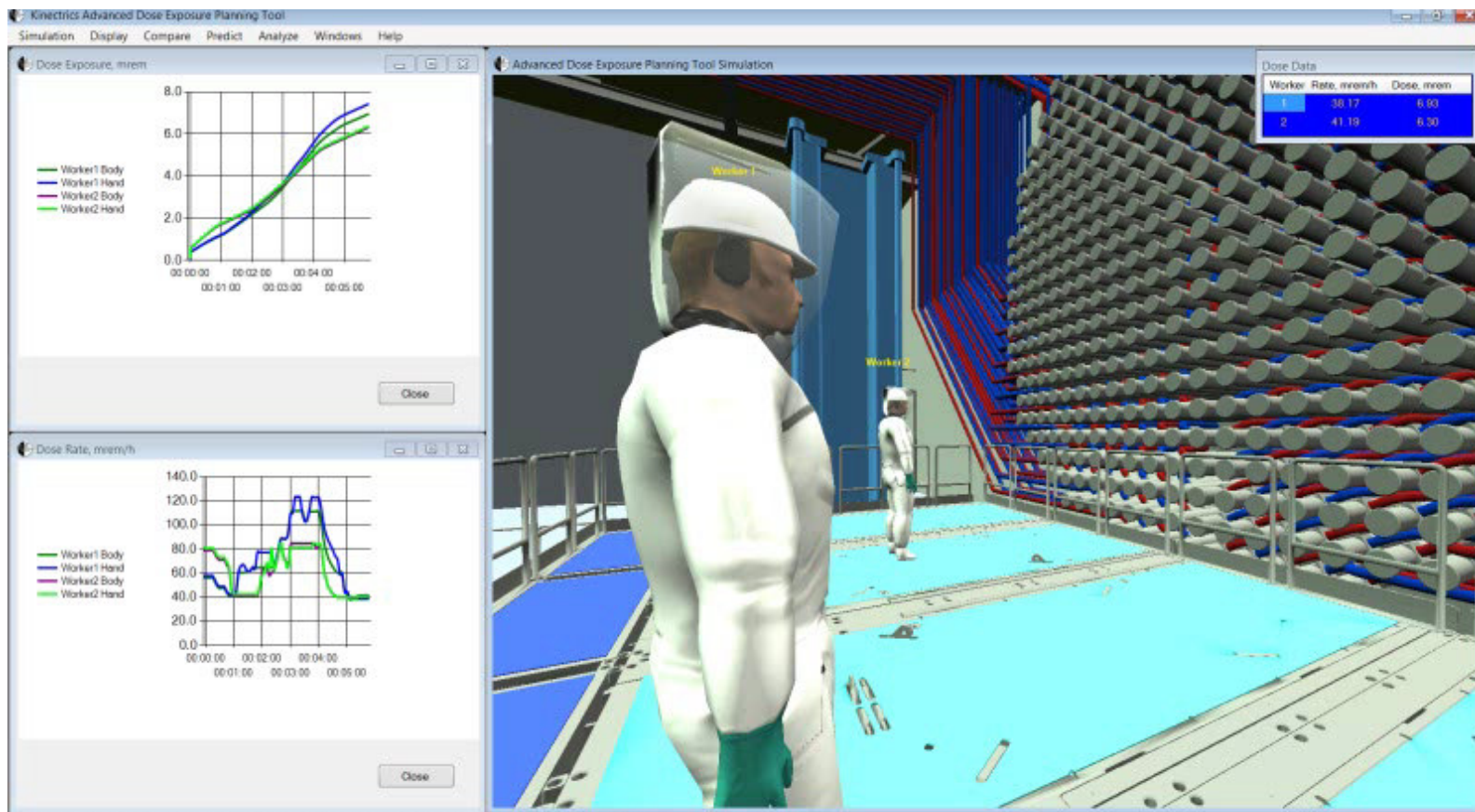
An Innovative Tool to Reduce Worker Exposure Using Virtual Job Planning



ADEPT – Main Menu

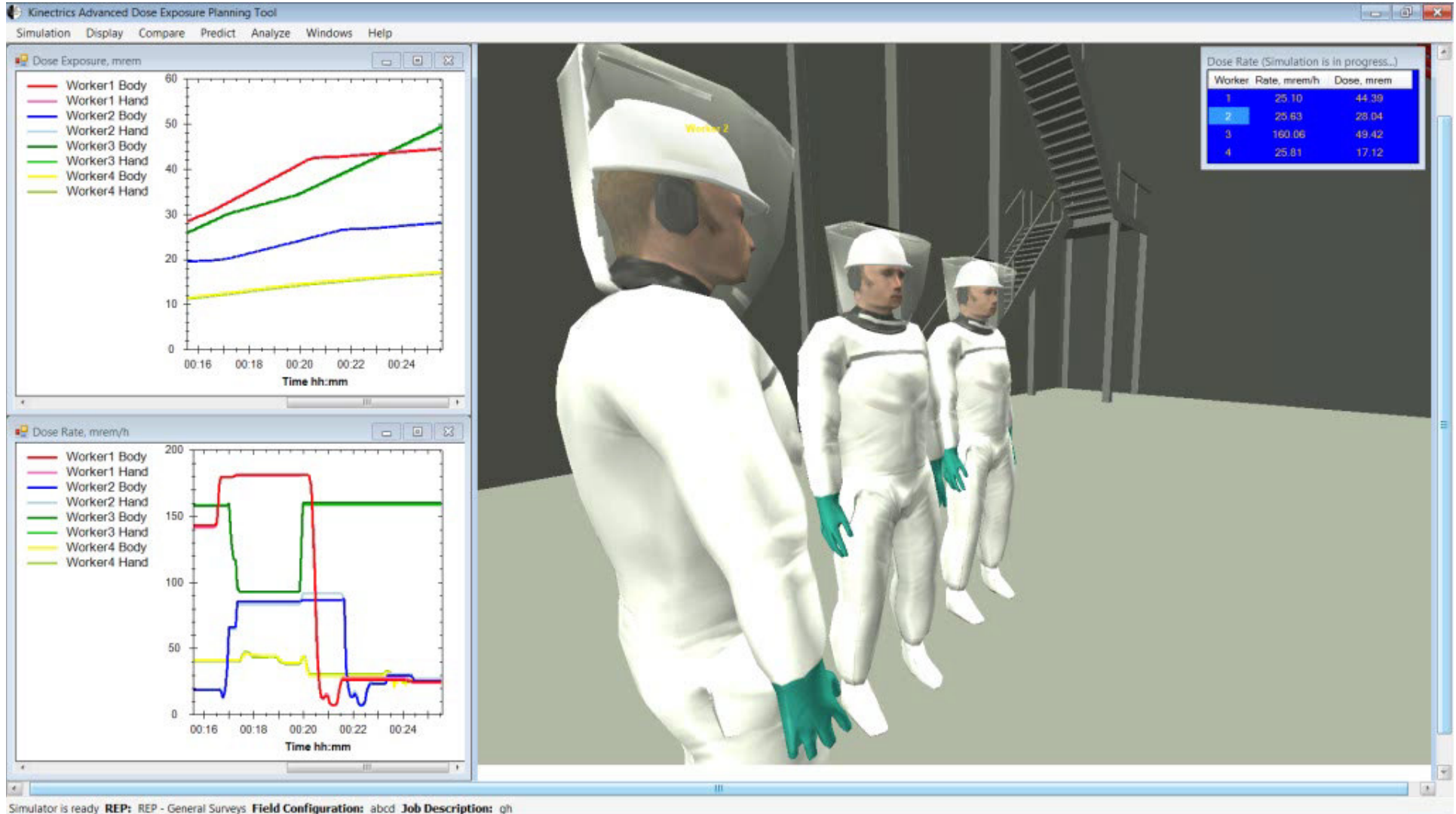


Job Simulation on F/M Platform

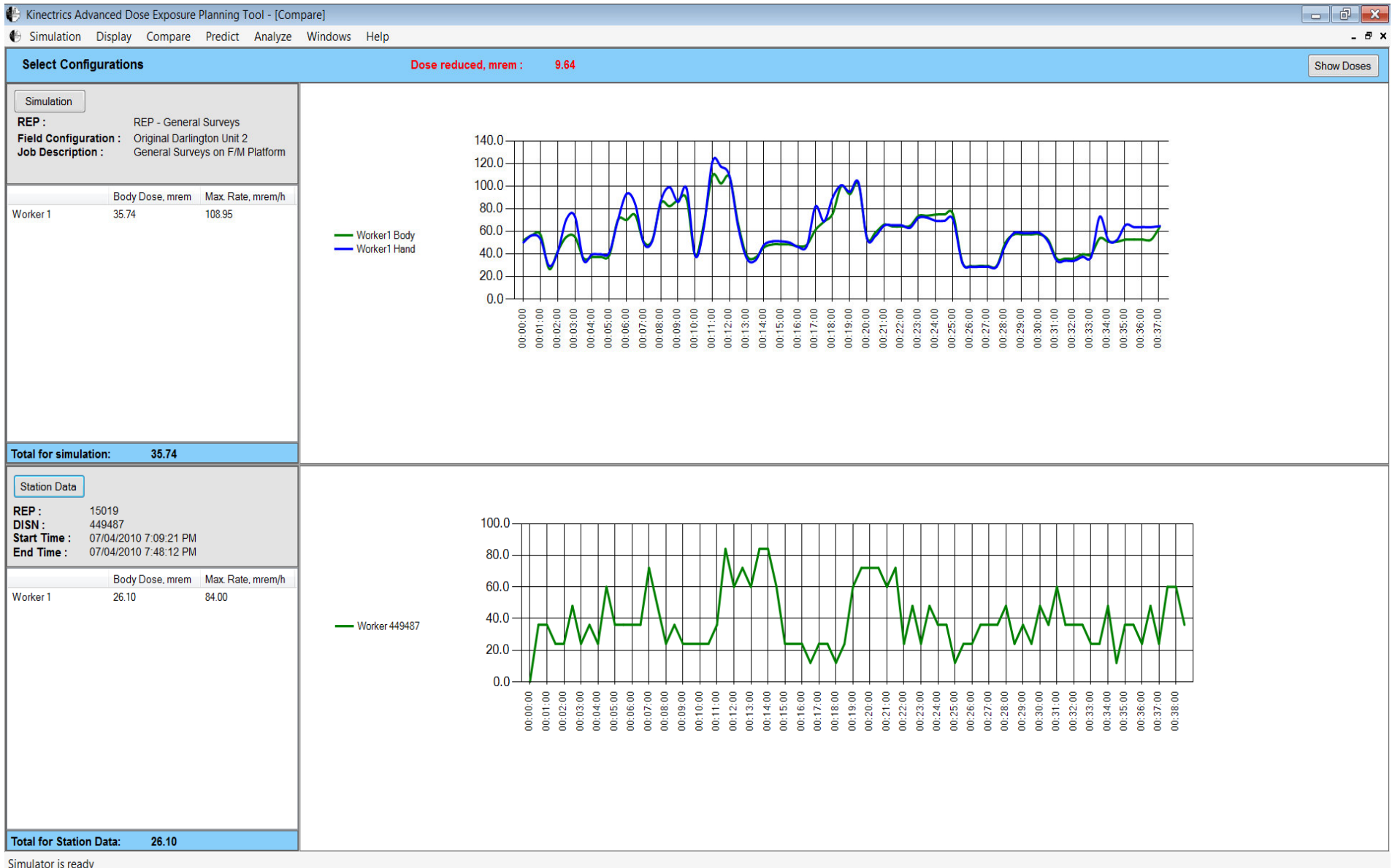


Simulator is ready. REP: REP - General Surveys. Field Configuration: Original Darlington Unit 2. Job Description: Survey and Inspection on F/M Platform.

Simulation in the Reactor Vault



Comparison: Simulation to Station Data



Simulator is ready

ADEPT – Fields of Application



- **Planning and Evaluation of Radiation Protection**
- **Procedural Training for New and Existing Staff**
- **Planning of Inspection and Maintenance Activities**
- **Pre-job Briefings and Post-job Reviews**
- **Benchmarking**
- **Support for ALARA Initiatives**

ADEPT – Key Features



- Fully customizable real-time 3D virtual reality job simulation in a CANDU reactor environment
- Radiation field simulation based on actual OATM data
- Live display of whole body and extremity dose rates, as well as doses of simulated workers
- Recording of radioactive job procedures for future analysis
- Instant estimate of shielding option effects
- Multiple dosimeters take the accuracy of effective worker dose estimations to a new level

ADEPT – Benefits



- **Visualizes Work Environments for Staff in Great Detail**
- **Provides Options for Elaborate Planning to Help Reduce Worker Dose & Save Time on the Critical Path**
- **Enables an Opportunity to Evaluate the Impact of working in different Configurations and Scenarios**
- **Demonstrates the Effects of Source Term Reduction**