MUSE – MULTI-AGENCY URBAN SEARCH EXPERIMENTS

Irakli Garishvili, Donald Hornback, Dan Archer, Andrew Nicholson, Douglas Peplow, Will Ray, Matthew Swinney, Jim Peltz, Lance McLean, Brian Quiter, Mark S. Bandstra

Goals of the MUSE project

- Establish a freely available comprehensive set of benchmark data relevant to the interagency radiation search community
- Develop a comprehensive operational radiation transport modeling framework that is validated and quantified against the newly collected benchmark data sets in order to systematically evaluate detector system and algorithm performance.

Measurement Campaign at Fort Indiantown Gap National Guard MOUT Facility

Aerial view of the MOUT at Fort Indiantown Gap, Pa.

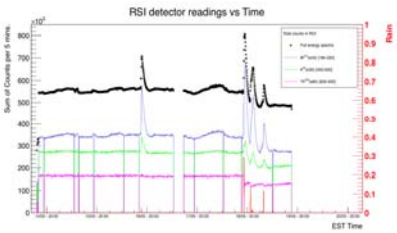
- data collection efforts designed to directly feed the development of a quantitative modeling and analysis tool that needs to be rigorously benchmarked against relevant data. Every measurement is directed at a specific analysis objective with the goals of establishing an archival quality, benchmark data set for use by the community which can then be used to construct a high-fidelity model with the quantified (1) system geometries (buildings, detector locations, etc.), (2) detector system response functions and (3) source terms for background and threat objects to serve as input to large-scale, detailed radiation transport models

Correlated radiation and meteorological data analysis

Davis Pro2 weather station

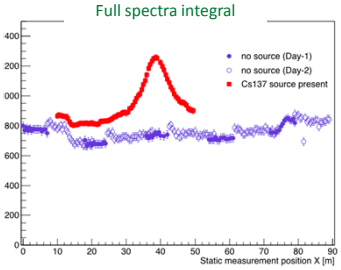
RSL's RSI-700 persistent radiation detection system

For the duration of the efforts, multiple scientific-grade weather stations were coupled with RSI-700 persistent radiation detector systems to facilitate examination of correlated variations in the measurements.



NaI detector gamma-ray spectra measurements

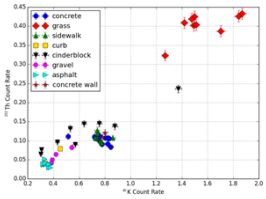
Full spectra integral



- Multiple 2x4x16 NaI based ORNL detector systems deployed for measurements at MOUT
- Custom data acquisition system
- Static Background measurements made along 90m path on Main St. every 50 cm
- More static measurements with ~ 10μCi ^{137}Cs source placed about 5 m off the path
- Both background and source data showing good sensitivity to the surrounding environment (beneficial for model validation)

HPGe Measurements

- More then 63 separate high precision HPGe measurements
- Provide necessary input to model for extracting background source terms for each material type

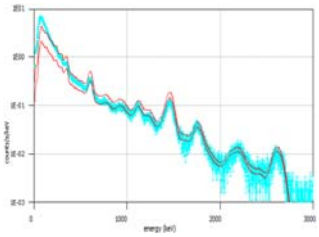


Data Storage

MUSE data is housed on LBL's MUSE server @ muse.lbl.gov and can be available to the wider community .
Contact: Brian Quiter bjquiter@lbl.gov

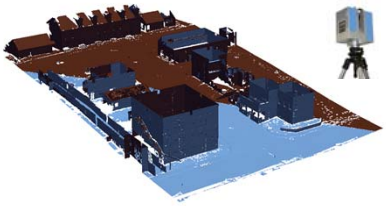
SCALE/MAVRIC Model

- Based on construction drawings Focused on main street
- Measured values on NORM concentrations
- Simulate background, threat sources



LIDAR to GEANT4 Framework

Comprehensive high-fidelity LIDAR scans
- Data taken during May and August 2015 campaigns
- Over 50 scan locations
- Composite scans contain > 50M points



Successfully developed a methodology to directly convert LIDAR point cloud data to GEANT4 native geometric 3D tesselated objects using non-proprietary CADMESH or GDML libraries

Full MOUT geometry incorporated into GEANT4 model. Successfully completed initial tests featuring surface background emissions and external radiation simulations

At the initial phases of setting up large-scale simulations on ORNL based Darter supercomputer

OAK RIDGE National Laboratory

This work has been funded by DOE DNN NNDA R&D (Enabling Capabilities), program manager Jim Peltz

U.S. DEPARTMENT OF ENERGY