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Title:	NDFOM Description for DNDO Summer Internship Program
Author(s):	Budden, Brent Scott
Intended for:	Description of the NDFOM project that will be submitted to DNDO. Presumably they will post it on their website, and distribute to universities through emails.
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Brent Budden, PhD

NDFOM
NUCLEAR DETECTION FIGURE OF MERIT

Los Alamos
NATIONAL LABORATORY
EST. 1943

Nuclear Detection Figure of Merit (NDFOM) is a DNDO-funded project at LANL to develop a software framework that allows a user to evaluate a radiation detection scenario of interest, quickly obtaining results on detector performance. It is intended as a "first step" in detector performance assessment, and meant to be easily employed by subject matter experts (SMEs) and non-SMEs alike. The generic scenario consists of a potential source moving past a detector at a relative velocity and with a distance of closest approach. Such a scenario is capable of describing, e.g., vehicles driving through portal monitors, border patrol scanning suspected illicit materials with a handheld instrument, and first responders with backpack- or pager-based detectors (see Fig. 1). The backend library is prepopulated by the NDFOM developers to include sources and detectors of interest to DNDO and its community.

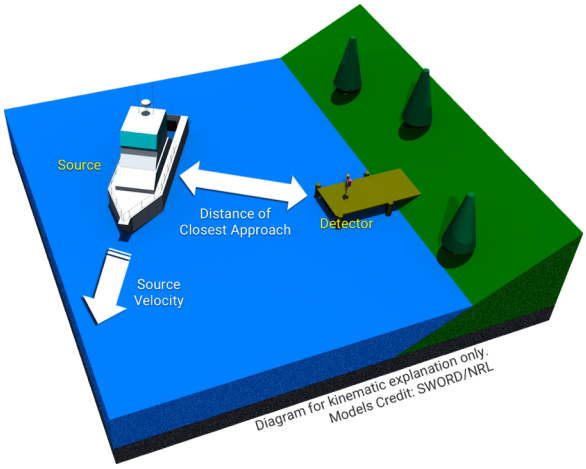

Figure 1: Example Scenario of Interest.

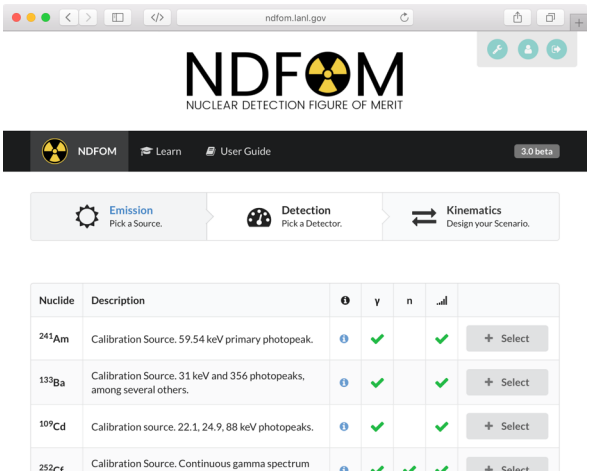

Figure 2: NDFOM Web Interface.

NDFOM leverages the Monte Carlo physics transport packages MCNP and Geant4, and the NRL-developed frontend tool SWORD (Software for the Optimization of Radiation Detectors) to build detector response functions (DRFs)—a model of the detector that describes its response to impinging radiation—and source attenuation functions (SAFs)—a model of a source that describes its apparent energy spectrum from increasing distances through the atmosphere. Generation of such models allows for a tool that can be run by its users *without* re-running Monte Carlo transport codes. Rather, the models are interpolated and fed into custom-developed algorithms to describe a number of figures of merit—e.g., probability to detect and signal-to-noise ratio—along with user-specified kinematic parameters. Resulting values and figures are automatically generated by a Python backend and presented to the user, all through a web-based interface (see Fig 2). This interface is currently being deployed on PNNL servers where it will be accessible to the laboratories, universities, and other contractors working with DNDO.

While NDFOM is a working tool, there are a number of ongoing tasks including: improving the python backend to allow for faster computation, validating its results through comparison with DNDO experimental data, generating new source and detector models, and devising new utilities and features. We seek either a computer scientist or software engineering student with familiarity in python, html, and databases, or a physics or nuclear engineering student looking to hone their skills with MCNP, Geant, and SWORD.