



Heading to the DAG Experiments' location.

Global Security

Source Physics Experiments (SPE)

Introduction

The U.S. Department of Energy, National Nuclear Security Administration is conducting a series of experiments aimed at improving arms control and nonproliferation treaty verification. The experiments will provide ground truth data that will enhance the United States' ability to detect and discriminate "low-yield" underground nuclear explosions from the clutter of conventional explosions and small earthquake signals. The experiments, called Source Physics Experiments (SPEs), are being conducted at the Nevada National Security Site (NNSS).

Background

The Source Physics Experiments (SPE) are a series of underground chemical high-explosive (HE) detonations of various strengths at different depths designed to accomplish the following:

- Enhance the nation's monitoring and verification capabilities.
- Determine the physical source of shear wave generation in explosions.
- Compare legacy data from regional (Nevada, California, Utah, and Arizona) networks.
- Develop an explosive source prediction capability to:
- Perform source discrimination.
- Perform source-to-receiver (sensor) waveform modeling.
- Improve yield estimation.

These experiments are conducted by the NNSS managing and operating contractor, Mission Support and Test Services, in partnership with Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratories and the University of Nevada, Reno.

Past Experiments

Phase I and II of SPE have been completed and included the following explosions conducted in granite and alluvium, summarized by the size of

the HE detonation and the depth of the explosion:

- **SPE 1:** 220 pounds TNT equivalent at 180 feet depth
- **SPE 2 and 3:** 2,220 pounds TNT equivalent at 149 feet depth
- **SPE 4:** 200 pounds TNT equivalent at 286 feet depth
- **SPE 5:** 11,077 pounds TNT equivalent at 250 feet depth
- **SPE 6:** 4,900 pounds TNT equivalent at 100 feet depth

A similar series of explosions was conducted in alluvium in 2018-2019 to provide a comparison of different source emplacement rock types. Phase II of SPE was called the Dry Alluvium Geology (DAG) Experiments and consisted of the following nitromethane explosions:

- **DAG 1:** 2,000 pounds TNT equivalent at 1263 feet depth
- **DAG 2:** 112,400 pounds TNT equivalent at 984 feet depth
- **DAG 3:** 2,000 pounds TNT equivalent at 492 feet depth
- **DAG 4:** 22,800 pounds TNT equivalent at 169 feet depth

The SPEs are an example of the expanded role the NNSS plays in our nation's nuclear security strategy, and instigated additional research through conducting surface explosions near the test beds.

Future Experiments

Phase III of SPE is now in the planning stage and will target a direct comparison with historic seismicity and an explosive test.



Prepping for the DAG Experiments.



Setting up the DAG Experiments.



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