LA-UR- 11-06673

Approved for public release;
distribution is unlimited.

Title:	Large-Bore Powder Gun and Confinement System
Author(s):	Don Rabern Robert Valdiviez
Intended for:	Workshop meeting with Ktech Corp. November 16, 2011

Los Alamos
NATIONAL LABORATORY
EST. 1943

Form 836 (7/06)

ABSTRACT

Large-Bore Powder Gun and Confinement System

The Large-Bore Powder Gun system has been under development at LANL for the past few years. The system will serve to conduct shock physics experiments on plutonium. This presentation discusses the current system configuration, the planned deployment at the Nevada National Security Site (NNSS), a synopsis of the requirements, and immediate project plans.

Large-Bore Powder Gun and Confinement System

November 16, 2011

Don Rabern, W-14,

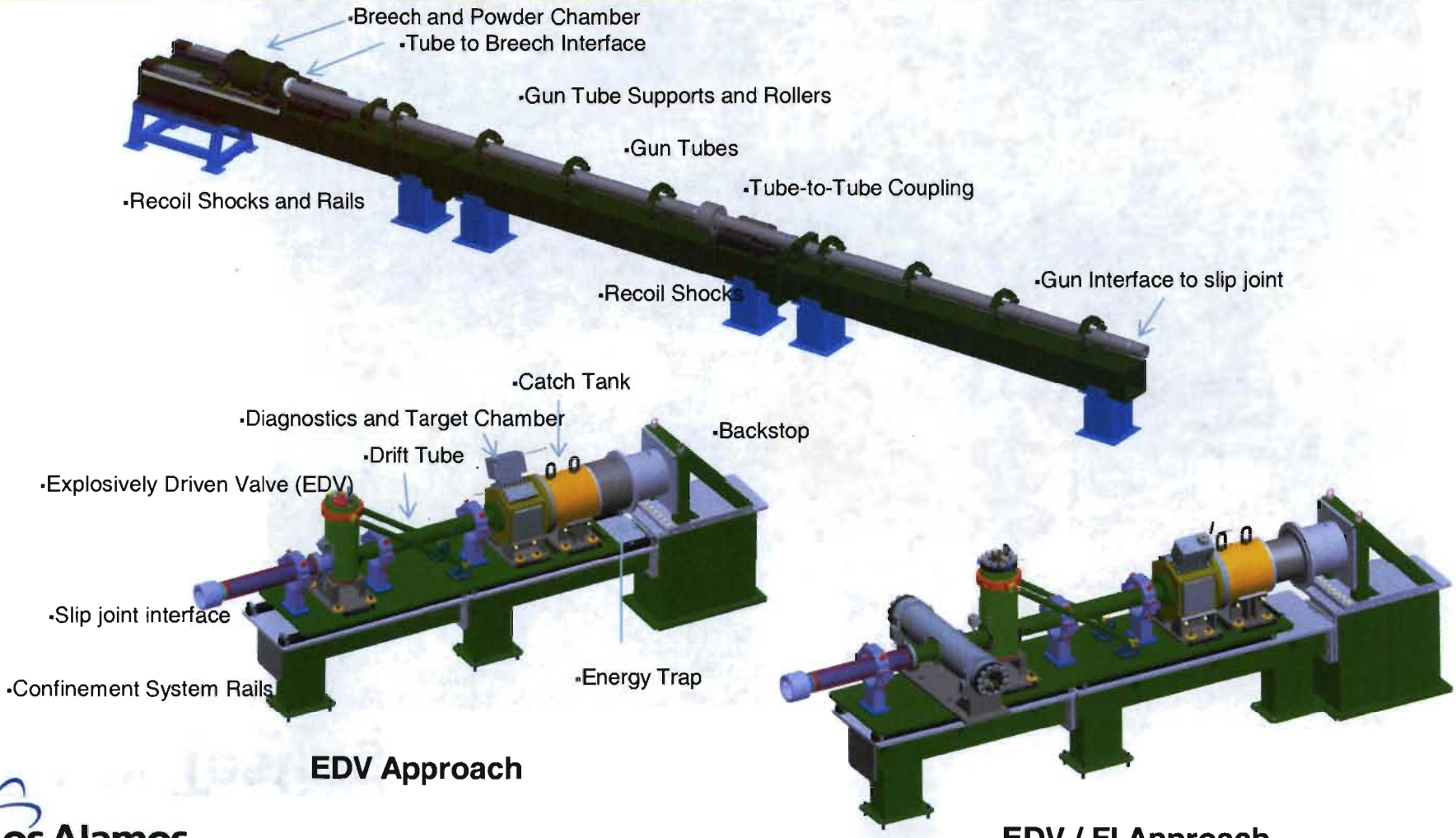
LBPG System Lead Engineer

Robert Valdiviez, W-14,

Test Engineer

Contents

Description

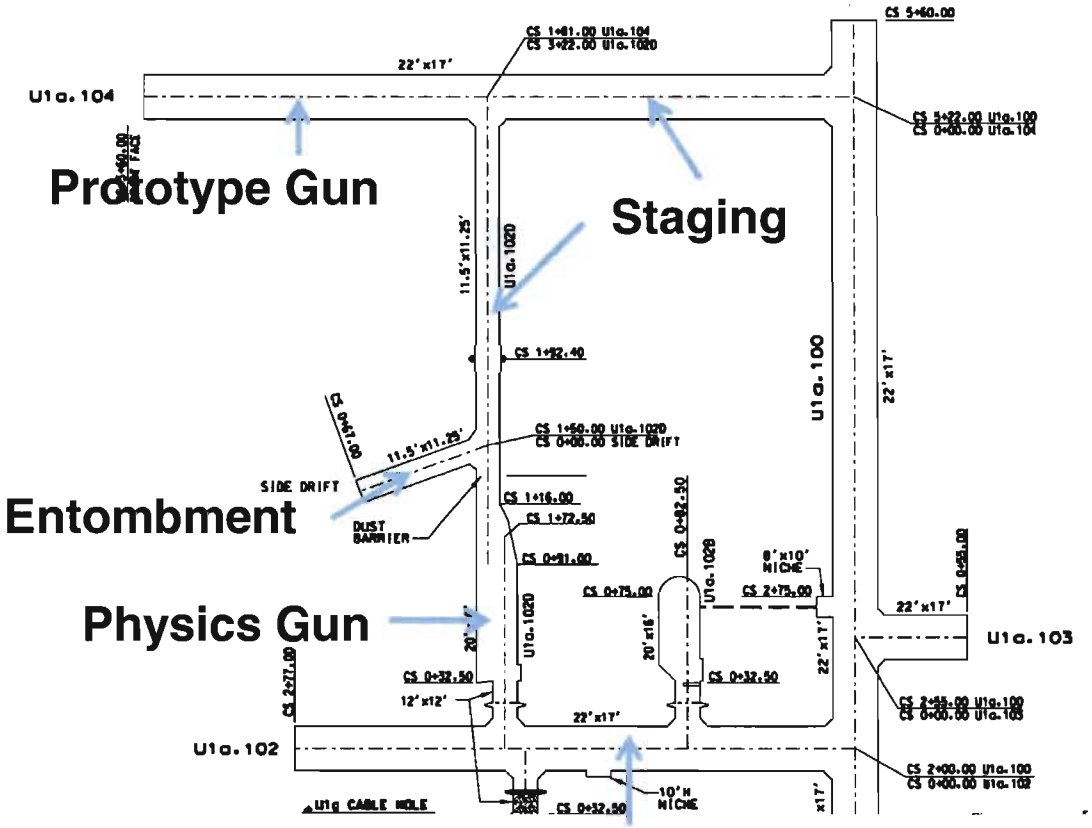


EDV Approach

EDV / FI Approach

Early Testing

Operational Environment



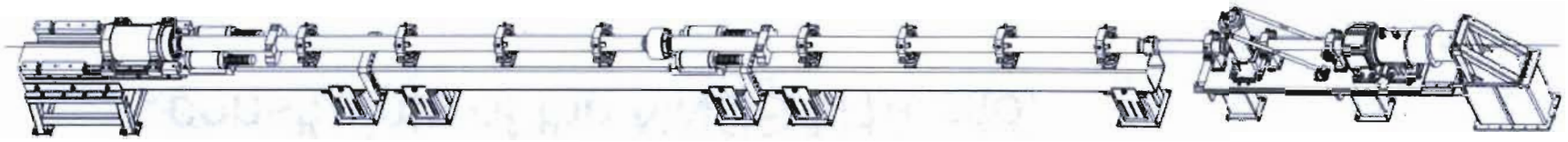
A Synopsis of Requirements

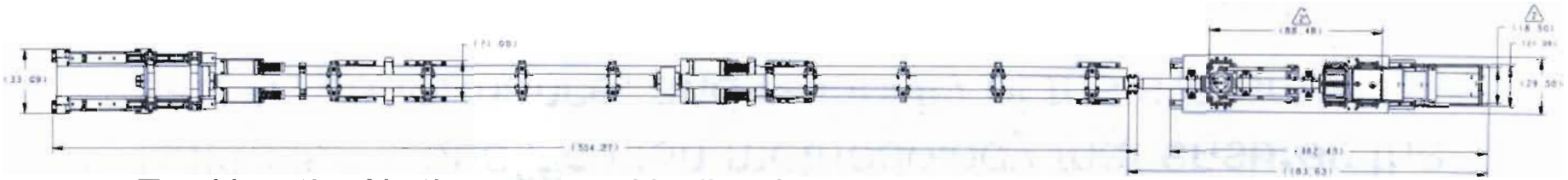
- Have a diameter of ~90mm to allow for multiple samples or large monolithic samples to enable prescribed pressure profiles and shock duration,
- Launch a range of projectiles (with a maximum mass of 2kg) to velocities up to 2 km/s,
- Stop, contain, and seal the projectile and target materials in a catch tank without structural failure or allowing the catch tank to vent significantly,
- Field reliable high fidelity instrumentation to record material behavior during impact,

Requirements continued

- Ensure structural integrity of the entire system over 60 shots as well as withstanding seismic events,
- Entomb the contaminated components of the experiment,
- Establish a qualification methodology that ensures the safety, performance, and reliability of the system,
- Be compatible with the physical and operational constraints of the NNSS U1a site.

Gun System

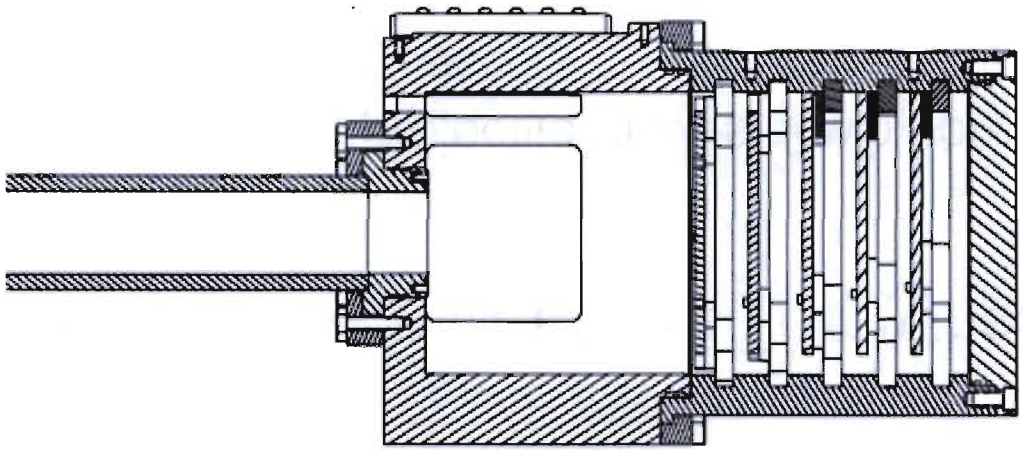




- Total length of both systems with slip tube: 733.15 in. (61.09ft)
- Total length of gun system: 551.9 in. (45.99 ft)
- Confinement system and slip tube: 183.63 in. (15.30 ft)
- Gun tube ID / OD 3.5 / 7.00 in.
- Drift tube ID / OD 3.5 / 4.625 in.
- Projectile travel to catch can cover 599 in. (49.9 ft)
- Available room in U1a 70 ft.

Confinement

- Ballistic Plates to stop projectile and target material



- Target Area

Sequence

- Evacuate the system to 1.0 e-2 Torr (Check for leaks)
- Fire Shot
  - Propellant ignited, projectile moves down bore
  - EDV or alternate closes
  - Projectile and Target Material stops
  - Site secured
- Propellant and target gases evacuated
- System charged with helium and monitored
- Contaminated system entombed

Plans for FY12

- Requirements document
- Preliminary qualification plan
- Powder Curves
- Analysis:
  - Characterize lateral loading and internal pressure at closure
  - EDV analysis and redesign
  - Flow Interrupt decision
  - Fracture simulations in breech
  - Gun structural analyses to establish structural “hot spots”