

Advanced Inertial Test Laboratory (AITL) Facts

Description

The Advanced Inertial Test Laboratory (AITL), building 1256, is a one-of-a-kind, seismically quiet test facility for testing ultra-sensitive inertial navigation instruments and is one of the most seismically quiet test facilities in the world. Each test cell inside the building contains a seismic isolation pier and a temperature controlled environment for testing inertial guidance components and optical systems. The facility contains four of these isolated test cells each with an azimuth reference device to align test table primary axes to within 1.0 arcsec ($<5 \mu\text{rad}$). One test cell has an absolute gravity survey mark for calibrating gravimeters.

The facility was designed to enhance the natural seismic advantages of the Tularosa Basin, i.e. isolation from coastal ocean activity, large water bodies, industrial and metropolitan activity; lack of forestation and low transmissible caliche soil. Three test cells are located approximately 10 feet below ground level and each test cell contains a 10' x 20' x 2' (w x l x d) seismic pier supporting the test bed. The mechanical building housing the environmental support equipment is located separately to minimize seismic self-contamination; minimal office space and no maintenance area limits human activity.

History

AITL has played a crucial part in legacy space and missile strategic test programs. From 1979 to 2009 AITL was the primary test facility for space qualification of the Hubble Space Telescope gyroscopes. Fundamental Peacekeeper and Minuteman III accelerometer and gyroscope characterization was conducted non-stop from the early 1970s through the mid-1990s. The ultra-quiet environment enabled essential targeting evaluation of Strategic Defense Initiative gyroscopes during the early to mid-1990s.

Requirements

After a relative hiatus in inertial system interest from the late 90s through the first decade of the 21st century, recent interest has mushroomed in both strategic missile and space applications. The Ground Based Strategic Deterrent (Minuteman III replacement) and DARPA micro-PNT initiatives have invested multi-millions of dollars in upgrading AITL test facilities in anticipation of strategic accelerometer (SRBA, MERA, CSCAN) and gyroscope (SFOG, CSCAN) qualification for missile and space applications starting in FY 2016. The anticipated test facility seismic requirements and current AITL noise capabilities are identified in Table 1.

Table 1. Anticipated AITL Seismic Requirements (1σ)

Sensor	Requirement	AITL
Strategic Resonating Beam Accelerometer (SRBA)	50 ng	100 ng
Minuteman Enhanced Replacement Accelerometer (MERA)	70 ng	
Chip-Scale Combinatorial Atomic Navigator (CSCAN) Accelerometer	100 ng	
Strategic Fiber Optic Gyroscope (SFOG)	50 $\mu\text{deg/hr}$	50 $\mu\text{deg/hr}$
Chip-Scale Combinatorial Atomic Navigator (CSCAN) Gyroscope	0.1 mdeg/hr	
Honeywell Reference Gyroscope	5 $\mu\text{deg/hr}$	

Impact

The impact on the seismic environment in our AITL facility from mining activities such as blasting and ore processing is unknown. The created seismic disturbances generated at the mine will be naturally attenuated by the 83 miles of soil and rock between the mine and AITL.

Request

The 746th Test Squadron suggests establishing a line of communication with the mine management. Prior notice of scheduled blasting would enable correlation of seismic data recording with the blasting effects. Advanced scheduling of disturbance producing activities would provide opportunities to schedule low noise characterization testing around the mining activities. The 746th Test Squadron POC is Mr. John Cao, Technical Director, (575) 679-2125, john.cao@us.af.mil.