

Sandia National Labs Facility for Acceptance Calibration and Testing (FACT) Site



PRESENTED BY

Randy K Rembold

B John Merchant



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Google Earth

FACT Site (45 Acres)

Fenced Compound

FACT Site Array Elements

8
7

6

3

4

5

2

1



FACT Component Evaluation



4

Independent evaluations of the primary hardware components used for monitoring for nuclear explosions.

- Components include waveform recorders (digitizers), amplifiers, seismometers, and infrasound sensors
- Provide evaluation reports to sponsors
- Perform research in new methods and capabilities of testing hardware components.

Measurements traceable to International System of Units (SI) through reference meters calibrated at Sandia Primary Standards Lab

Sponsors include:

- U.S. Department of Energy / NNSA
- U.S. National Data Center
- U.S. Defense Threat Reduction Agency / Nuclear Arms Control Technology
- CTBTO





- 3.4m below surface
- Interior room 3m x 4.6m with .6m overburden
- Concrete pier runs length of room for testing
- Provides thermal stability and Isolation from surface noise



Seismometer Testing and Calibration



Spektra CS-18 and SE-13 Seismic Calibration Table

- Air-bearing suspension
- 0.1 Hz – 160 Hz
- Up to 50 kg
- Vertical & horizontal
- Laser measurement
- Provides primary metrology calibration, traceable to $< 1\%$



Vault testing

- Sensor self-noise
- Response testing relative to a reference sensor
 - Geotech GS13 (short-period) and STS-2 (broadband)

Shallow bore-holes



Infrasound Testing and Calibration



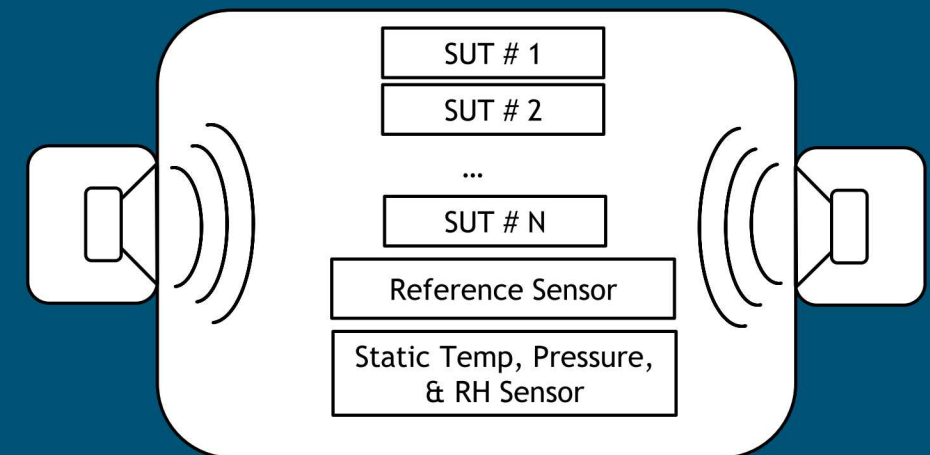
8

Infrasound chamber

- Designed & built by NCPA
- 1 m x 2 m, 1411.5 L, +/- 14 L
- 4000 lb. (1814 kg), 1" (25 mm) thick steel
- High ambient isolation
- Allows testing more sensors simultaneously

Sandia Upgrades

- Active Temperature (ambient to +60 C)
- Developed a new piston-driver
 - 10" professional speaker
 - 1 kw high-end amplifier
 - Custom feedback control to linearize
 - Goal is 0.01 – 10 Hz, 50 Pa amplitude
- Capable of being pressurized:
 - From sea level(+20 kPa / +3 PSI) to
 - 10 km elevation (-75 kPa / -11 PSI)



Temperature Testing



ESPEC EPL-2HE Environmental Chamber

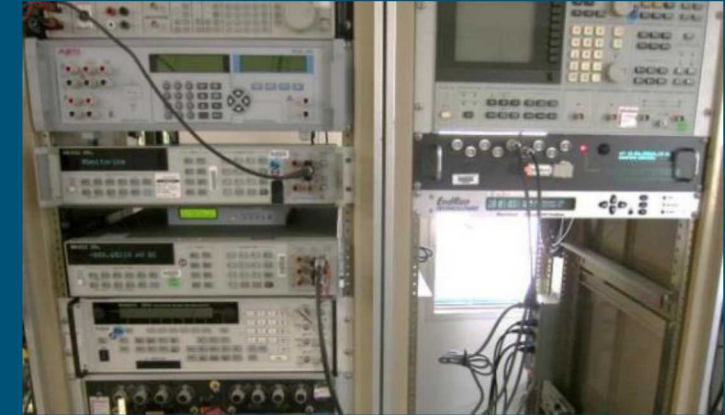
- Interior 8 cu. ft.
- Temperature range of (-35 to 180 C)
 - Digitizers
 - Infrasond



Digitizer Testing



- Capable of testing high resolution digitizers across entire frequency / amplitude range
- High quality signal generators
- Ultra-low distortion oscillators
- Timing sources, capable of measuring $< 50 \mu\text{s}$ of error



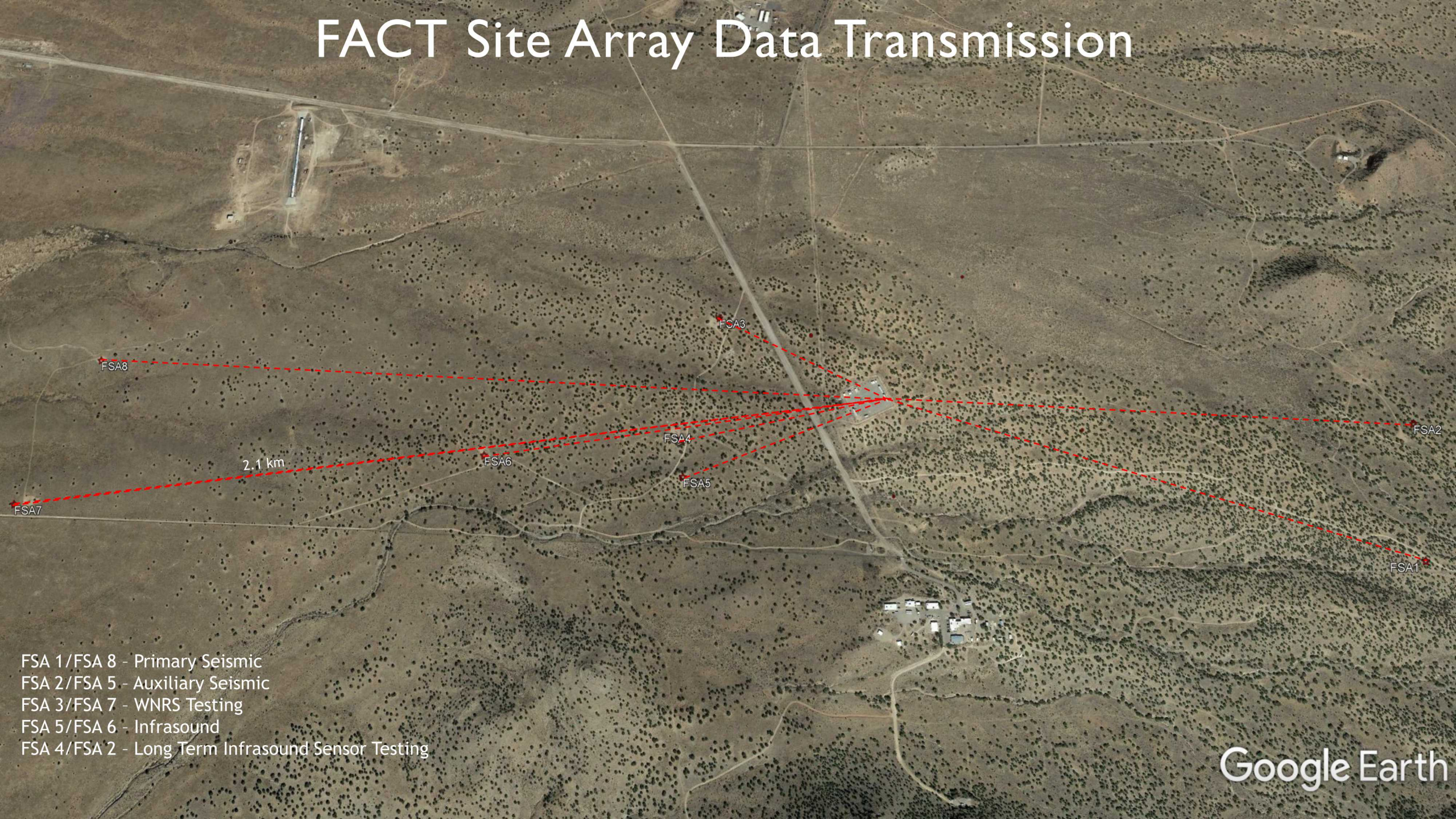
Sandia FACT Site Array



- 8 sites covering 400 acres
- 3.2 km widest aperture
- Surface vault & pad
- 260 Watts PV Power with 184 AH of battery storage
- Radio telemetered
- Capable of supporting several tests at each site



FACT Site Array Data Transmission



FSA8

FCA3

FSA2

2.1 km

FSA6

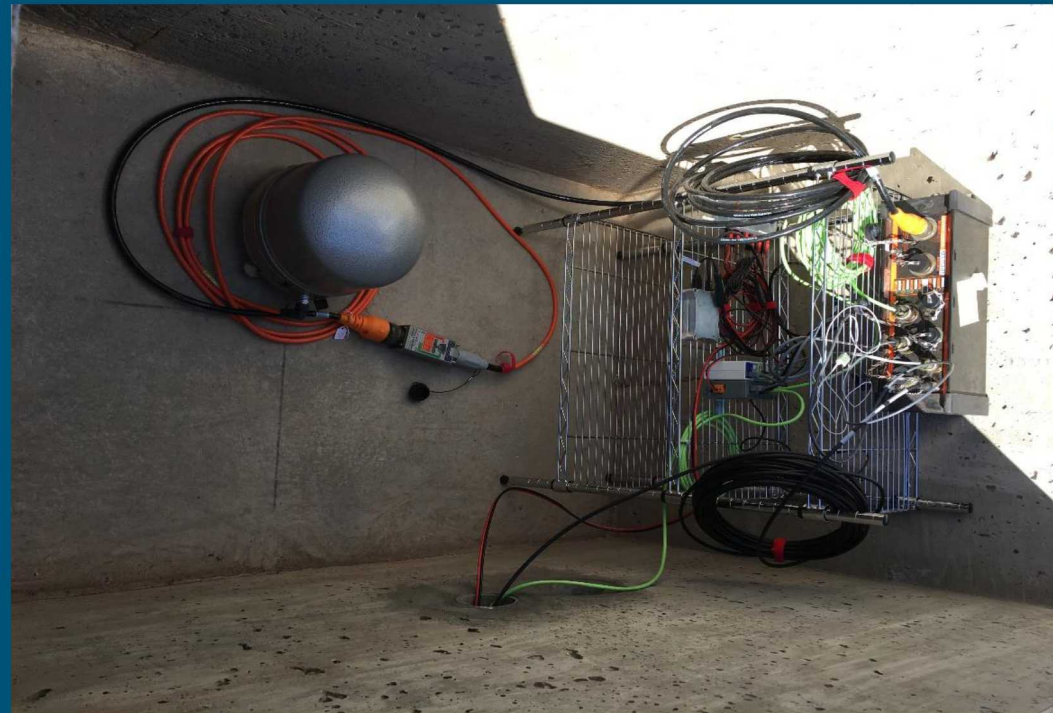
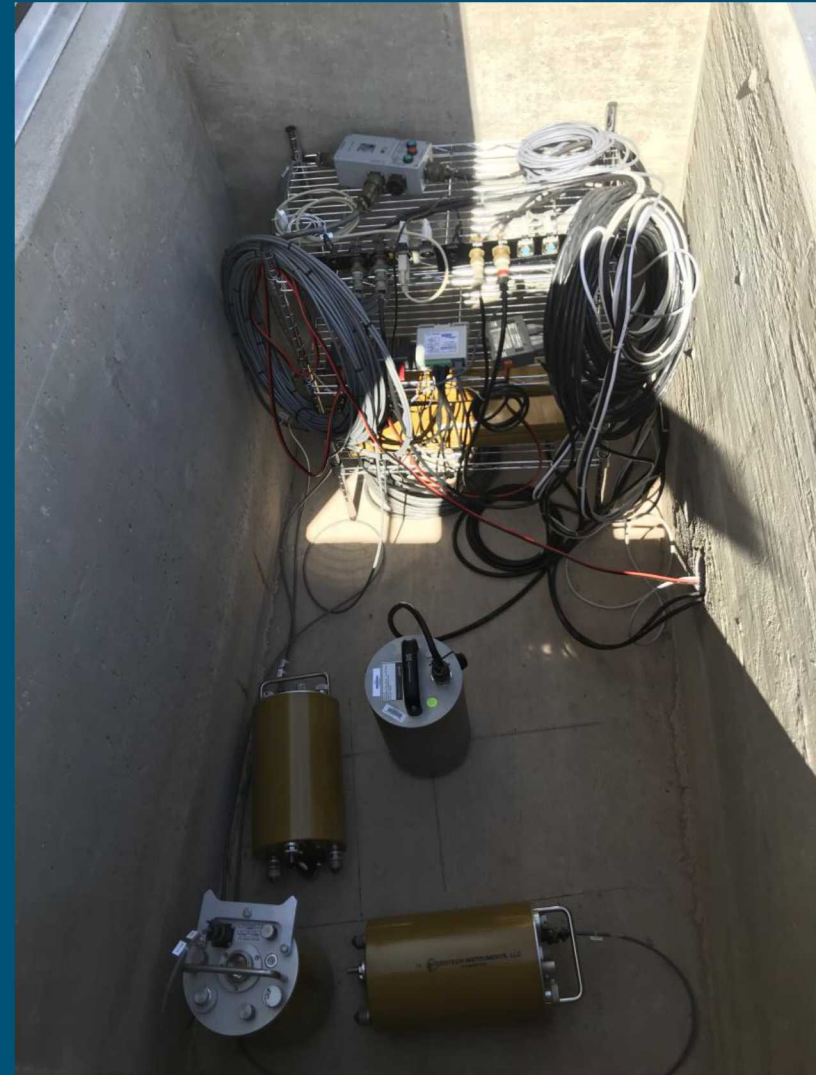
FSA4

FSA5

FSA1

FSA7

- FSA 1/FSA 8 - Primary Seismic
- FSA 2/FSA 5 - Auxiliary Seismic
- FSA 3/FSA 7 - WNRS Testing
- FSA 5/FSA 6 - Infrasound
- FSA 4/FSA 2 - Long Term Infrasound Sensor Testing



Six of the sites have mockups of the three types of NACT waveform stations

- 2 each infrasound
- 2 each Primary seismic
- 2 each auxiliary seismic



