



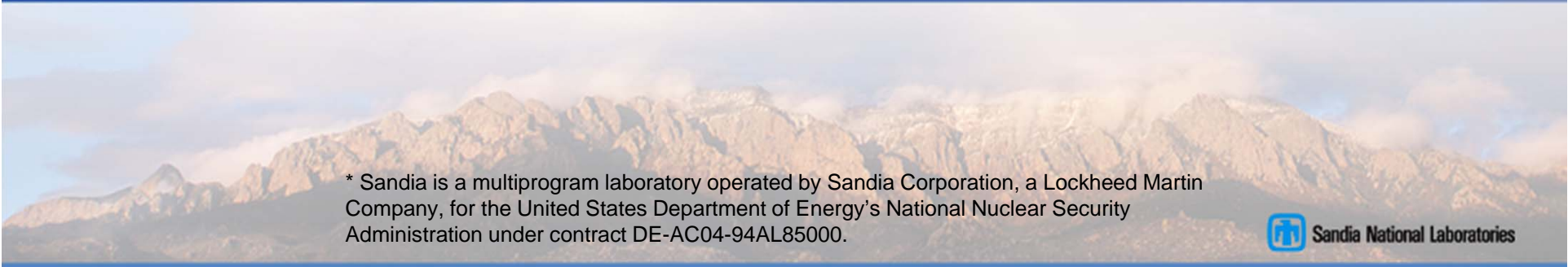
Sandia National Laboratories

May 22, 2012

Electromagnetics, Pulsed Power and Work for Others Programs

L. X Schneider, Senior Manager 1650

Presentation to Tri Alpha Energy



* Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

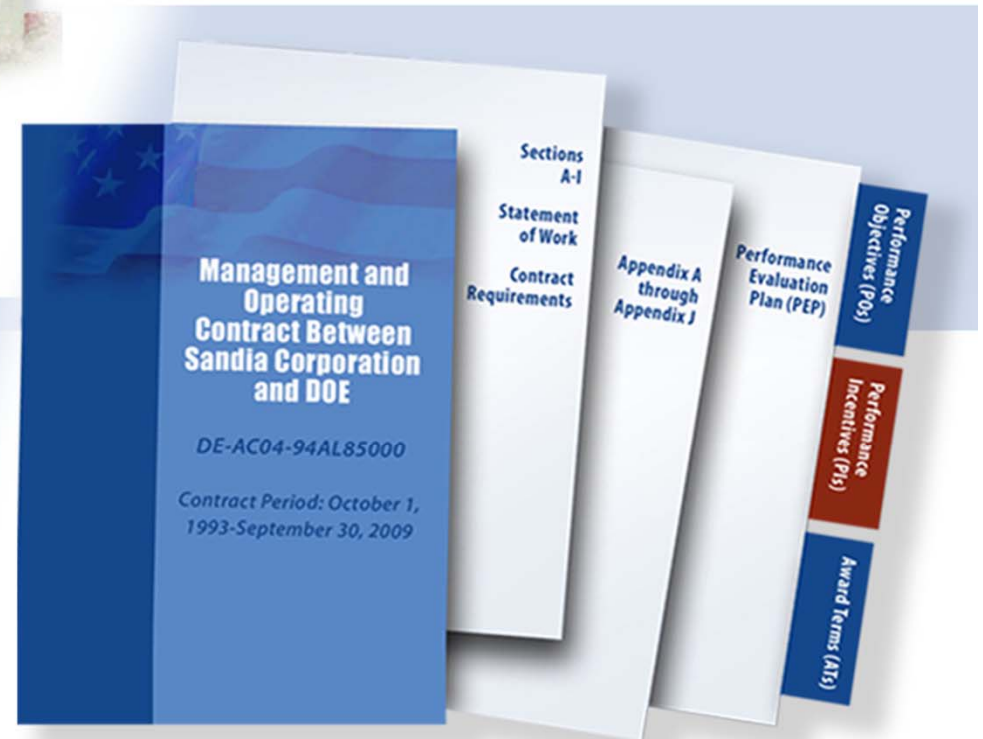
Sandia National Laboratories



Sandia Corporation

- AT&T: 1949–1993
- Martin Marietta: 1993–1995
- Lockheed Martin: 1995–present

Government-Owned, Contractor-Operated

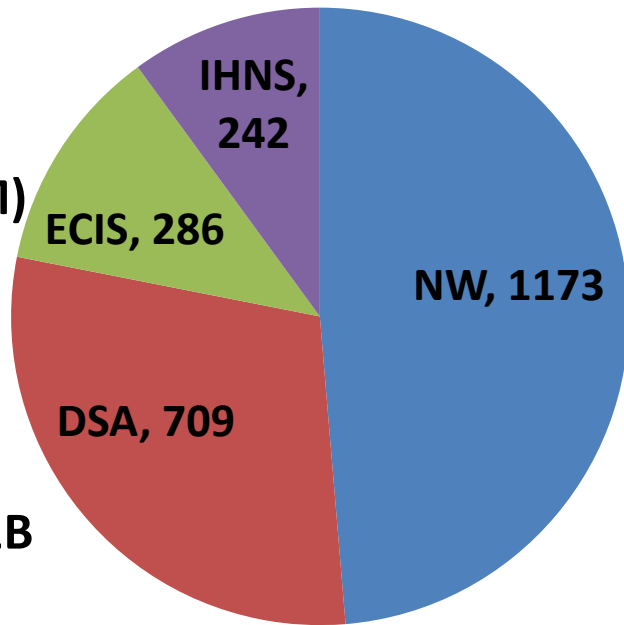


Federally Funded Research & Development Center

Sandia's Four Strategic Mission Areas

- Nuclear Weapons
- Defense Systems & Assessments (DoD and Intelligence)
- Energy, Climate, & Infrastructure Security
- International, Homeland, and Nuclear Security

FY11 SMU
revenue
breakout (\$M)



Total - \$2.41B

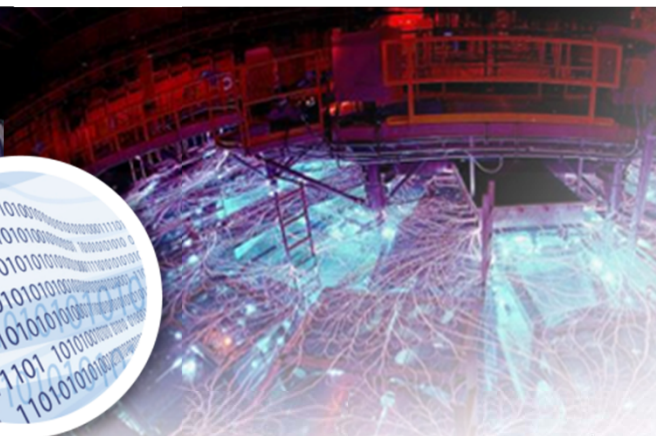


Strong science and engineering foundations enable mission performance

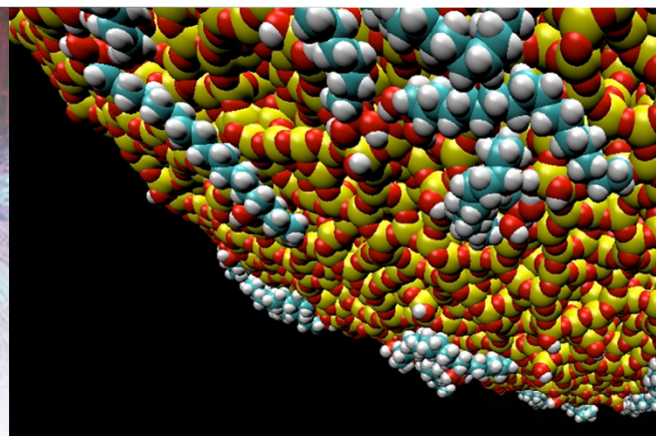
Computer Science & Math



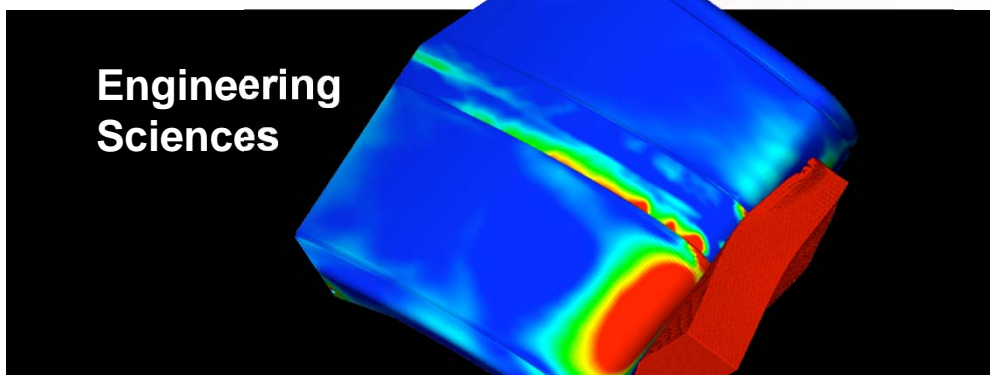
Pulsed Power & Radiation Effects Science



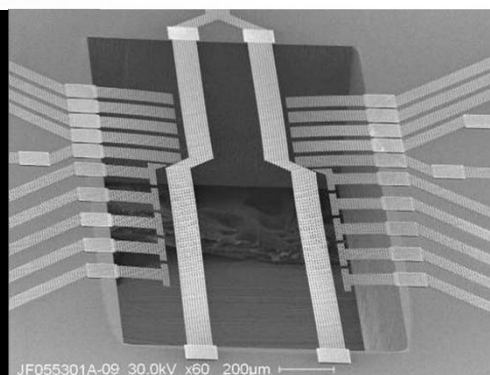
Materials Science & Technology



Microsystems Science & Technology



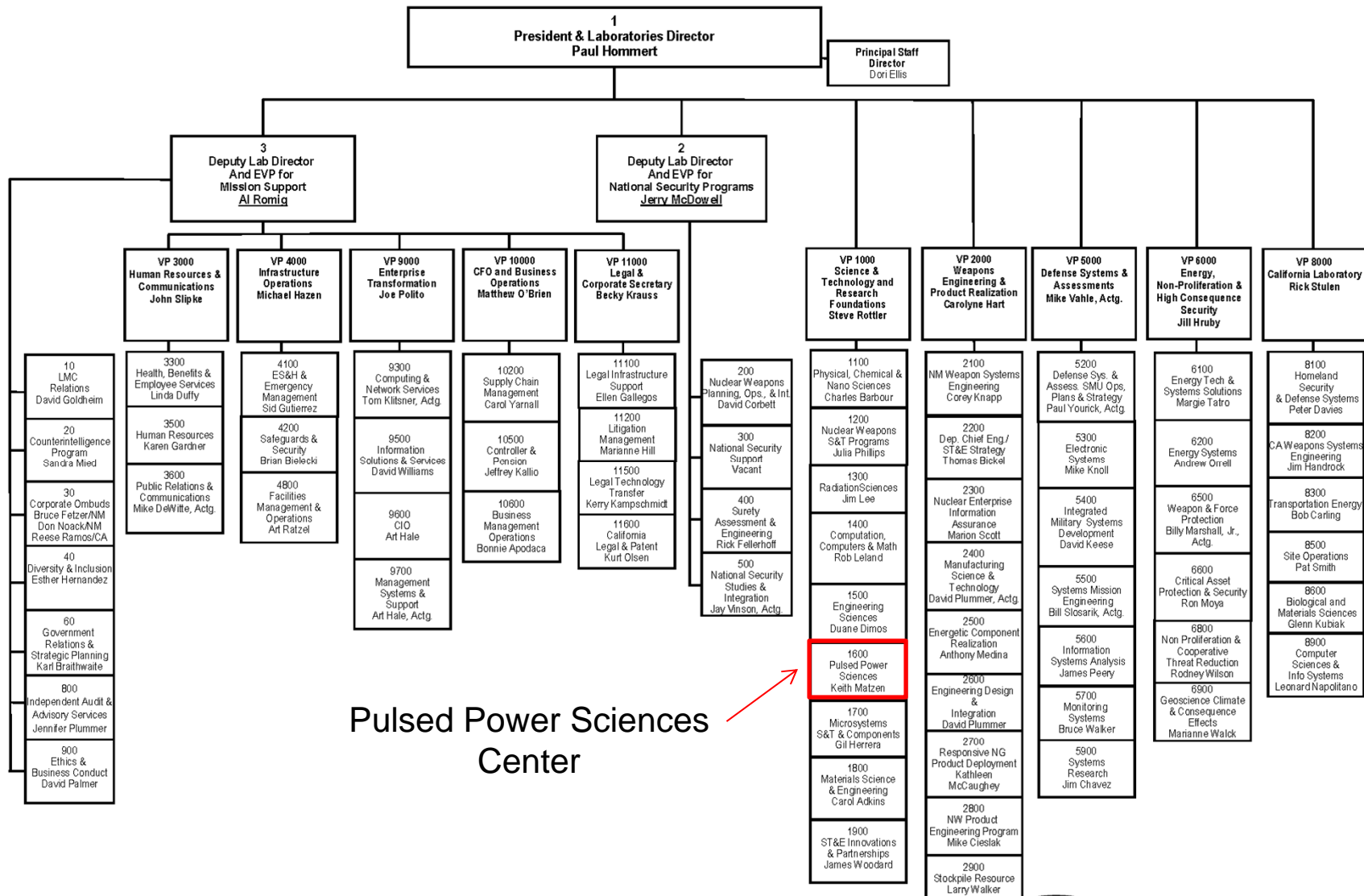
Engineering Sciences



Bio Science & Technology



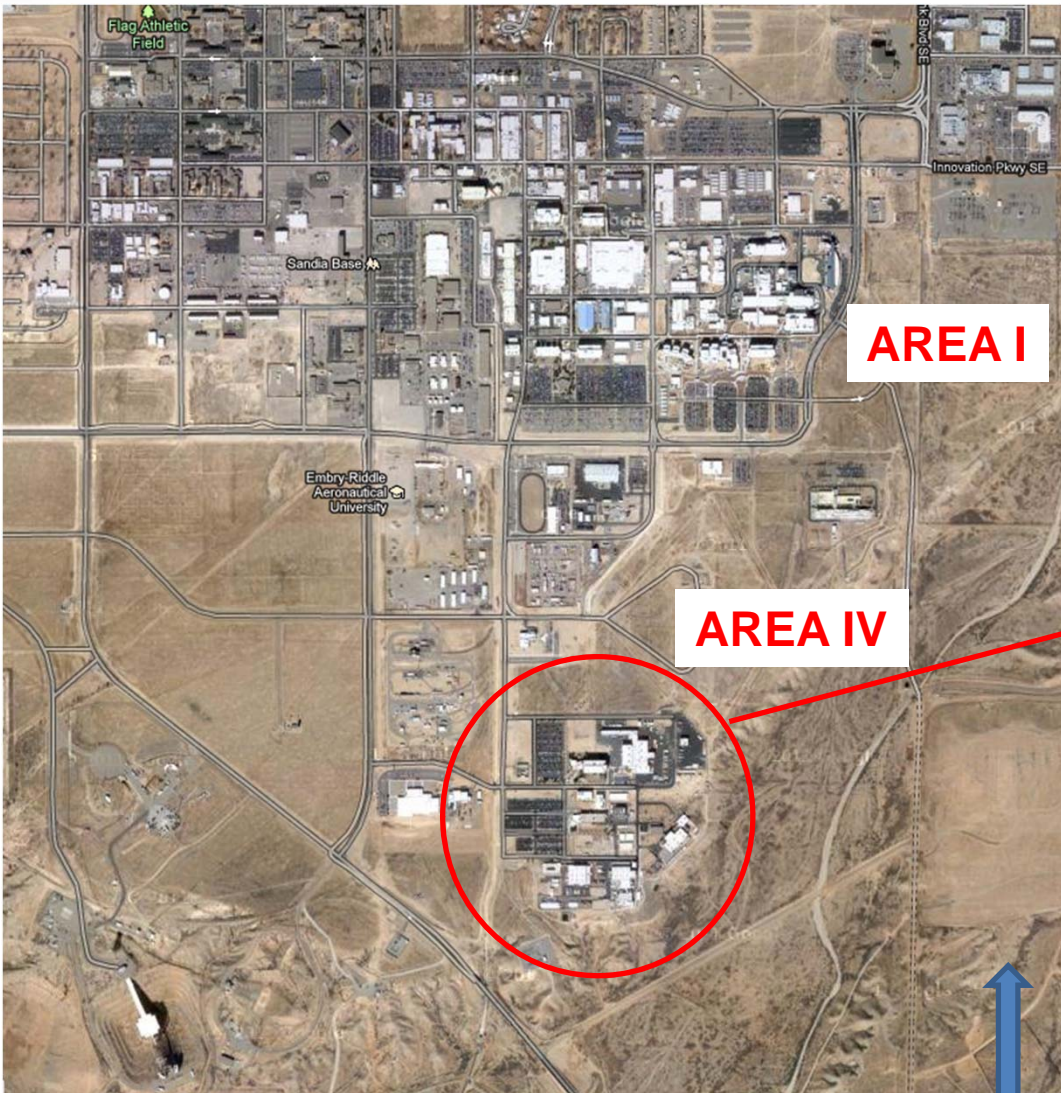
Geo Sciences



Pulsed Power Sciences Center

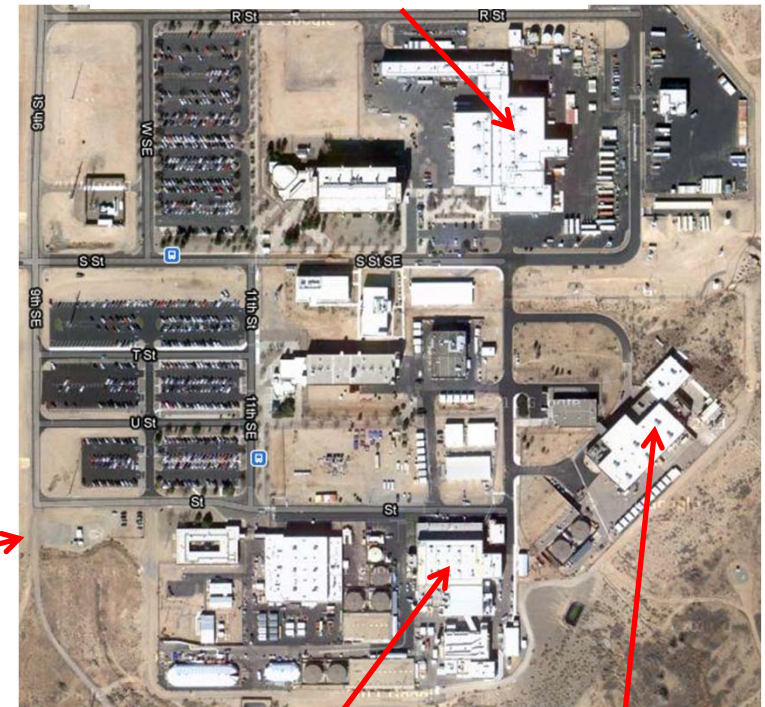
Changes effective 10/15/2010

Pulsed Power and Radiation Sciences Sandia Laboratories Area IV



HAWK

World's largest DC-like electron beam accelerator



Z Machine (350 TW, 26 MA)

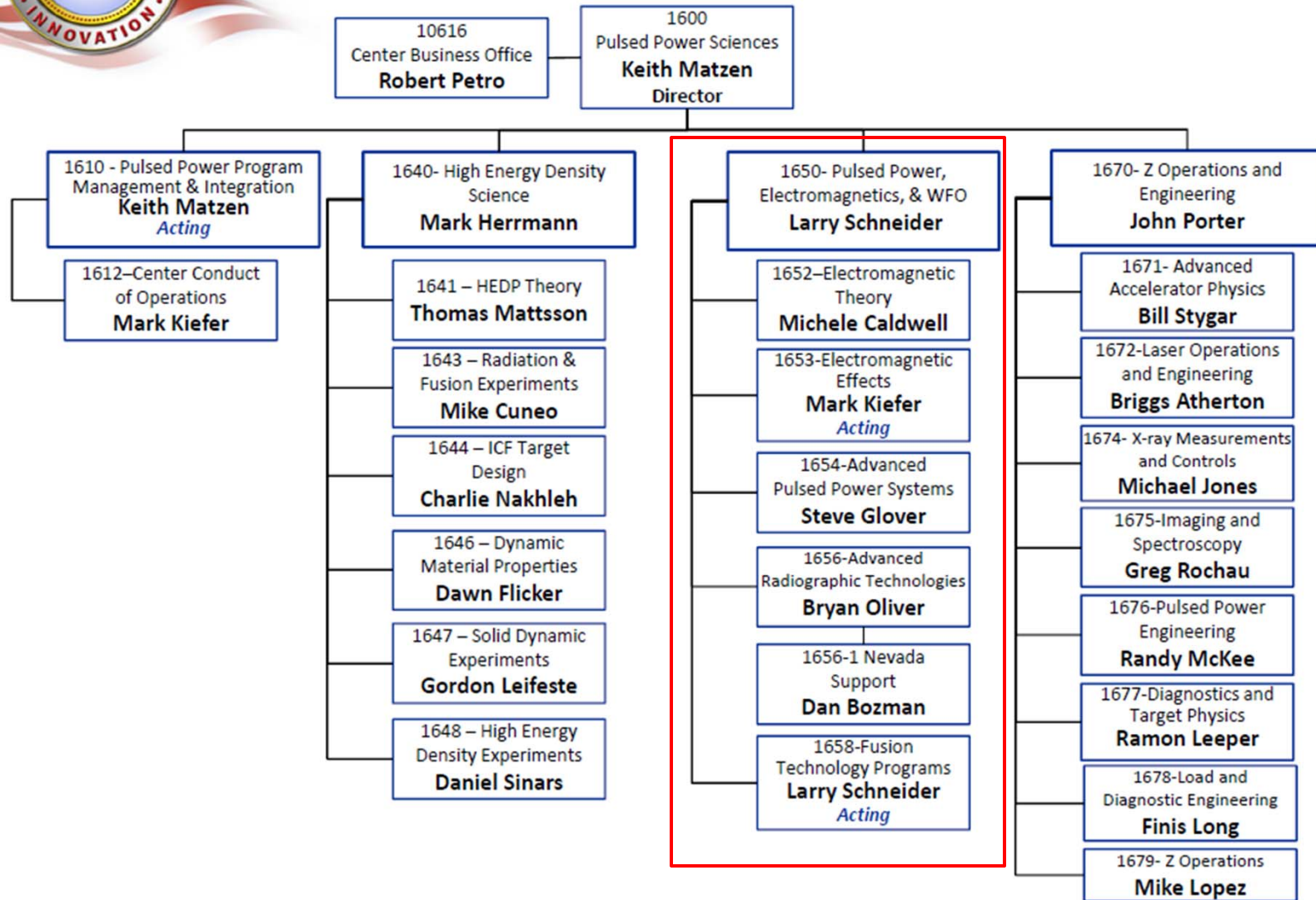
World's most powerful radiation source for fusion, dynamic materials and radiation effects sciences

Hermes III

Flash x-ray source for nuclear weapons effects testing

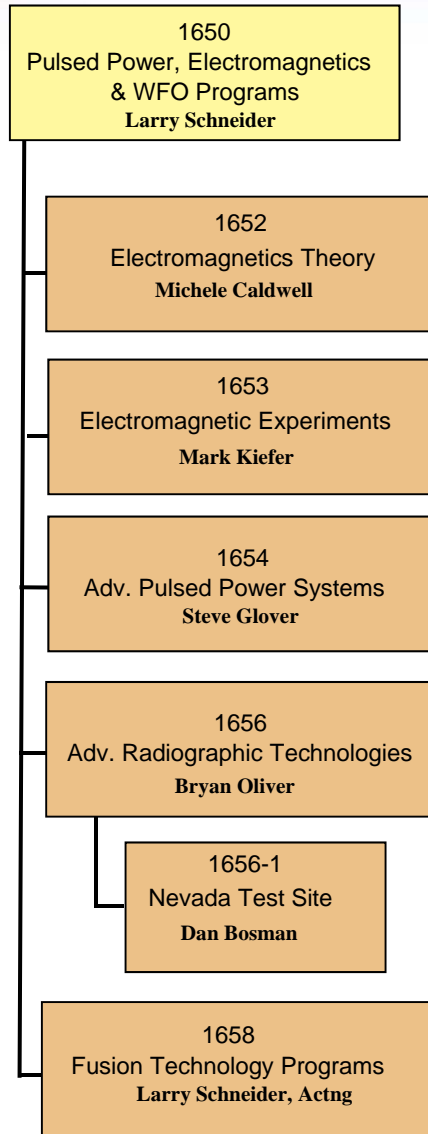


Center 01600 Organization Chart



Pulsed Power Sciences Center

Group 1650



Advanced Pulsed Power Systems

- HV-high current pulsed power components/systems
- Advanced AC/DC power systems
- Advanced accelerator systems

Advanced Electromagnetics

- EM and plasma physics code development
- EM experiments

Advanced Radiographic Technologies

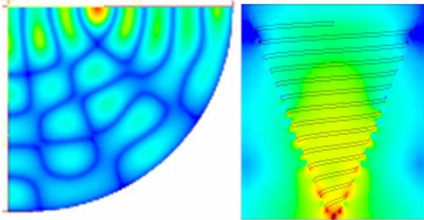
- Large scale flash x-ray sources

Plasma Facing Component Technology

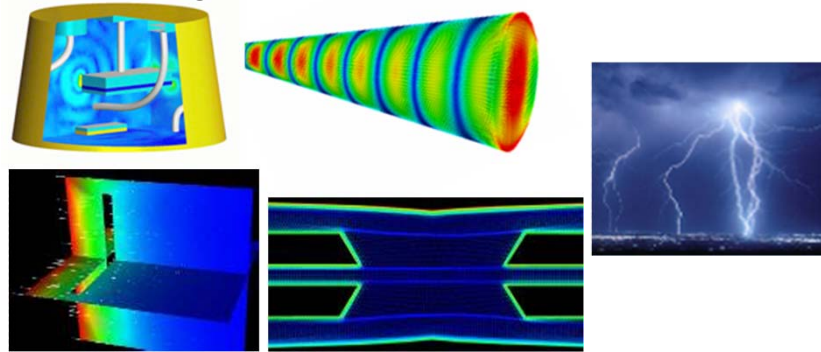


Advanced Code and analysis capabilities are essential to our ability to maintain the NW stockpile

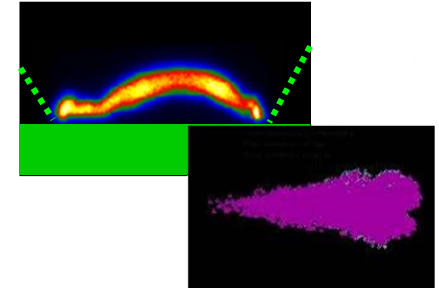
New EM environments & devices



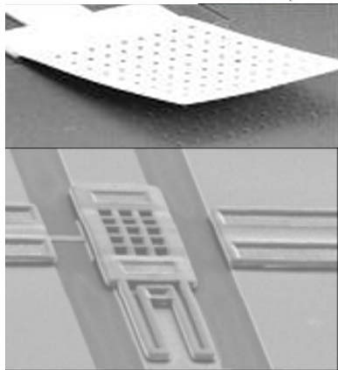
System Response to EM, lightning, high voltage & SGEMP Environments



High Voltage Science

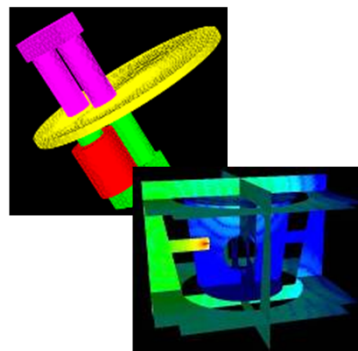


HV Standoff, Arcing, Leakage Currents, Electrostatic Discharge



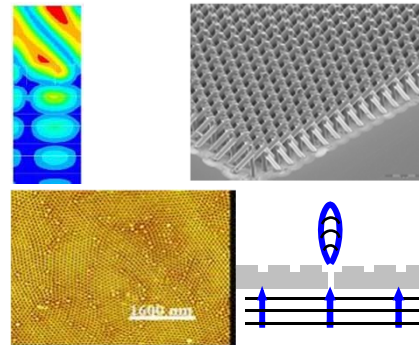
High-Frequency Cavity/Aperture Response, Advanced Antennas, RF-MEMS devices

Components



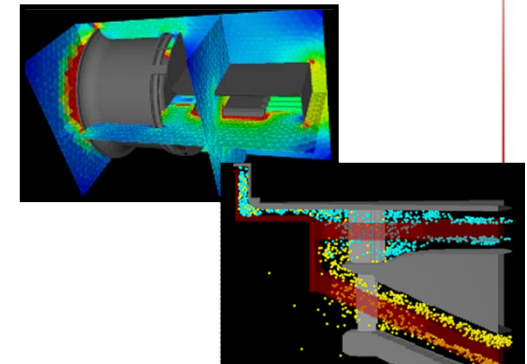
Stronglinks, Radar, Firesets, Neutron Tubes

EM Materials



Photonic Band-gap Devices; Plasmon Structures; Metamaterials

Fast Pulsed Power



Z-pinch apps for NW, Mat'l Dynamics, Fusion Energy



Our pulsed power science base enables support to our core NW mission and other agencies and industry

Integrated theoretical, experimental and engineering capabilities often operating at the interface between science and engineering

- Electromagnetics
- Pulsed power & high voltage sciences
- Generation and control of Intense particle beams
- Plasma physics and intense power flow
- Plasma interactions with materials
- Mechanical engineering in extreme environments
- Advanced materials
- *Systems engineering and integration*
- *Concept to product*



Example partnerships:

DOE - Nuclear National Security Administration

DOE - Office of Science

DOD-Army/USADTRA

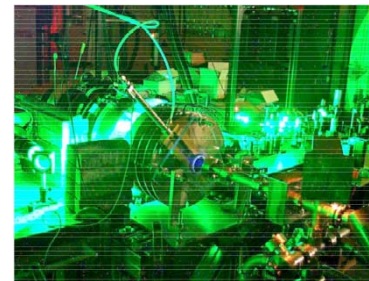
Lockheed Martin Technology Research

Federal Aviation Administration, Boeing

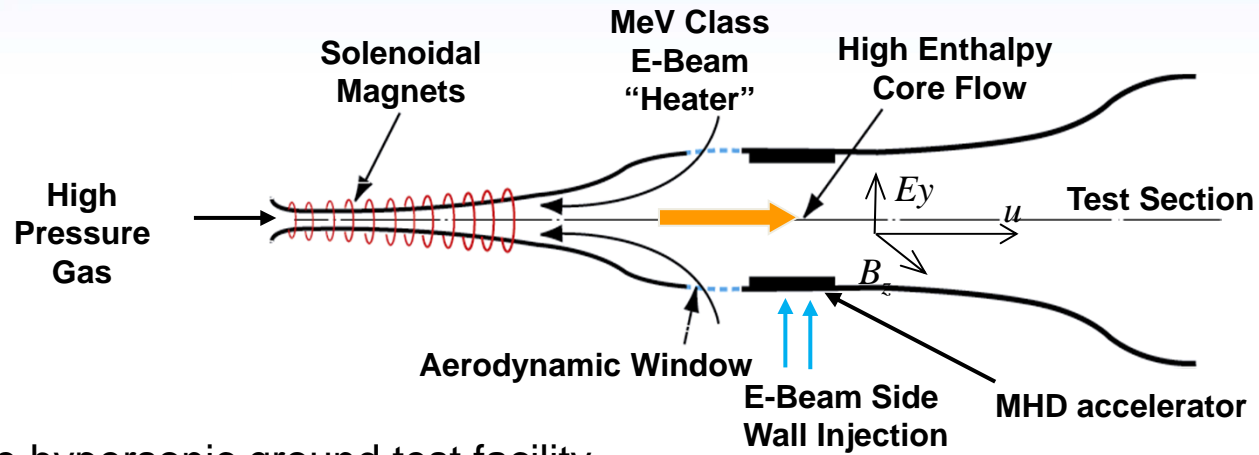
Electric Power Res. Institute

Naval Research lab, FMC, Inc.

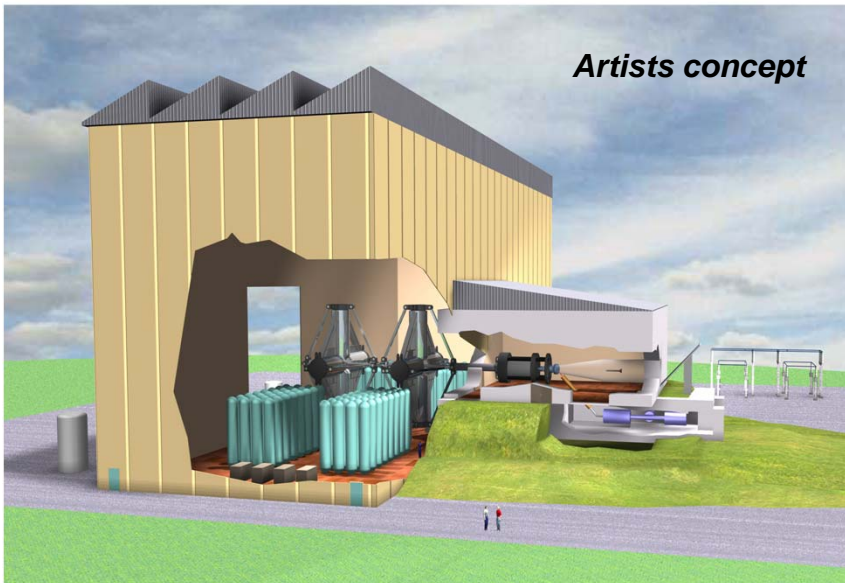
Goodyear



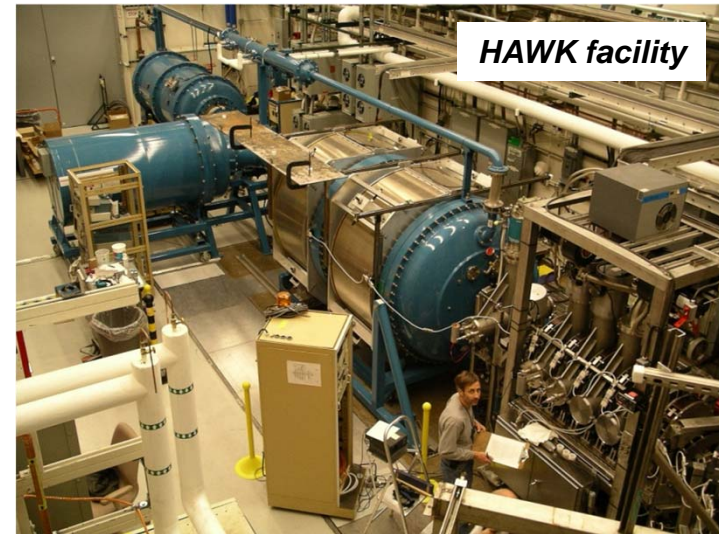
Long term relationships have advanced the state-of-the-art in electron beam accelerator technology



Long runtime hypersonic ground test facility

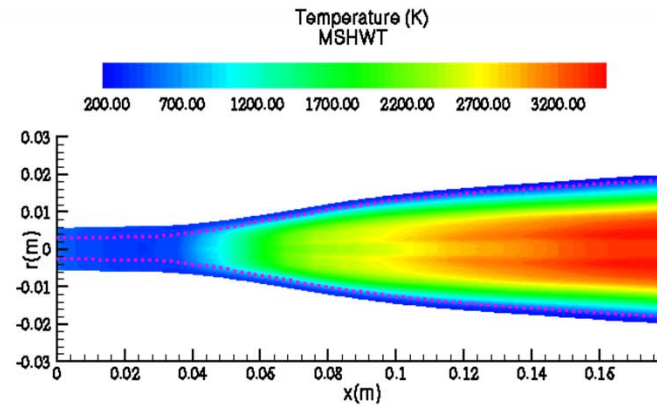
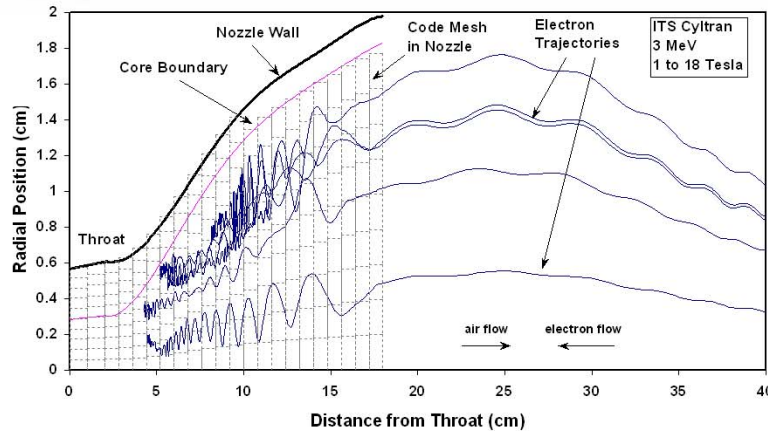


1 MW, 5ms demonstration experiment



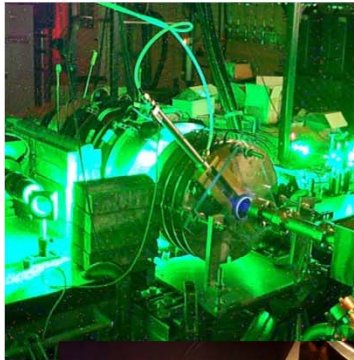
Modeling, analysis, validation experiments, Complex system design & integration

Coupled electron/photon Monte Carlo transport codes for energy addition and CFD



Conduct of complex experiments

World class accelerator
technology development

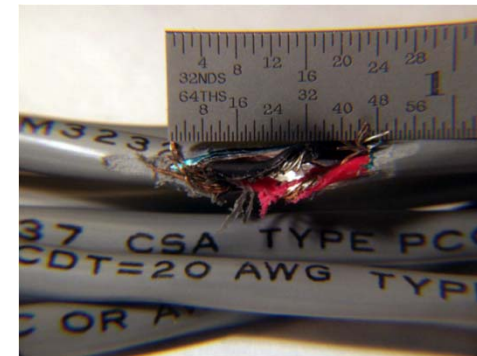
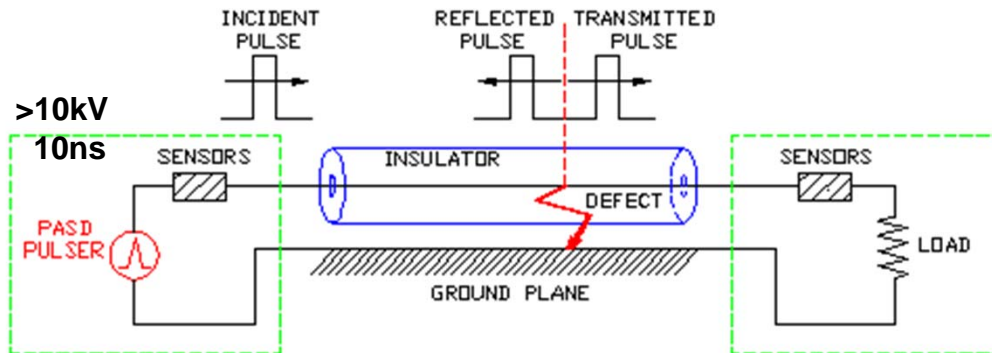


World's first large
aperture vacuum window



Pulsed Arrested Spark Discharge (PASD) capability detects defects in aging wiring

- PASD can find wiring defects waiting for a disaster to occur: from pin-holes in the dielectric to crushed, but fully functional cables.
- True non-destructive test of dielectric strength of wiring insulation



Astronics Advanced
Electronics
licensed PASD for
application in aircraft wiring
systems



ArcSafe® product

ASTRONICS
CORPORATION



R&D 100 Award



Federal Laboratory
Partnering Award



Technology Partnerships Agreements with Non Federal Entities

- ❑ **WFO/NFE Funds In Agreements** make Sandia's unique resources available to private industry. The partner/sponsor provides 100% of the funding for WFO/NFE Funds In agreements.
 - Must be consistent with and complementary to the missions of DOE/NNSA.
 - Must not adversely impact DOE/NNSA programs or create a potentially detrimental future burden on DOE/NNSA resources.
 - Must not place Sandia in direct competition with the domestic private sector.

Intellectual Property (IP):

- The government retains rights to IP for government use only.

The preparation time to send agreement to sponsor for execution is usually two weeks. Sandia cannot start work until NFE sponsor executes agreement and provides advanced funding. This can take an additional one to two months. If the total exceeds \$25K and the duration of the project is longer than three months, payment terms can be arranged.



Technology Partnerships Agreements with Non Federal Entities

- ❑ **CRADAs** allow Sandia to partner with industry to conduct R&D that benefits the goals of each participant. The primary purpose of CRADAs is the effective transfer of Sandia technologies, processes, research and development capabilities, and technical know-how to the private sector. CRADAs may be cost shared by Sandia and the CRADA partner(s), or 100% funded by the CRADA partner(s).

Intellectual Property (IP):

- Information developed under a CRADA can be protected for five years.
- Negotiable intellectual property rights.
- The government retains rights to IP for government use only.

Because of the potential complexity in negotiation, the CRADA averages two to three months in preparation; however, Sandia has executed a CRADA in less than a month.

