

Workshop on

***Science with High Power Lasers
and
Pulsed Power***

Santa Fe, July 28 – 30, 2009

Introduction
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Outline

- Background: SNL, UTX and IHEDS
- Workshop objectives and deliverables
- Workshop format
- Extracts from ‘Advancing the Science of High Energy Density Laboratory Plasmas’
- Some organizational details



UTX Systems and SNL have started an Institute for High Energy Density Research (IHEDS)

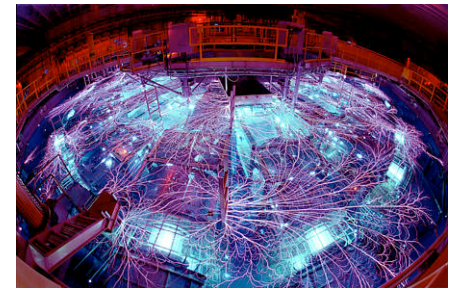
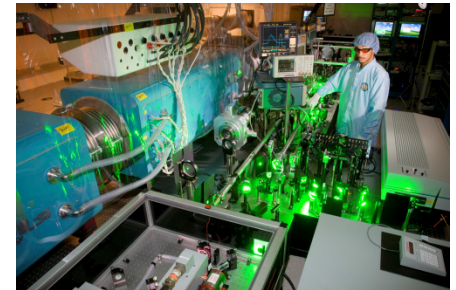
Motivation:

Common interests in:

- HED and related science
- Developing as User Facilities
- Growing the User community
- Great science in general

Existing collaborations

Complementary experimental capabilities



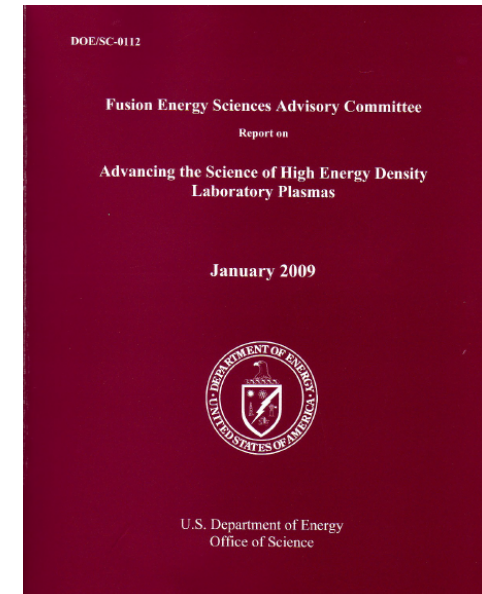
Growing SNL-UTX collaboration, growing scientific interest, and NNSA's desire for User Facilities, motivate the Institute.

A mission statement has been developed

- To provide an intellectual center and support for the exploration of fundamental and applied science and technology using the high intensity lasers and pinches at the Sandia National Laboratories and the University of Texas
- To enhance access to the unique facilities at the Sandia National Laboratories and the University of Texas, to both University and Laboratory researchers, and to the larger scientific community
- To contribute to science education, strengthen existing programs, and develop new initiatives

This workshop grew out of multiple needs

- Supporting the mission of IHEDS
- A follow-up to DOE SC/0112
- A precursor to the HED workshop in November 2009 (chaired by Rosner and Hammer)
- To expand the HED User community in general
- To discuss what is the best HED-related science that should be done at SNL and UTX



This workshop has specific objectives and deliverables

Objective: to discuss and propose projects worthy of further pursuit, which will likely satisfy the following:

- Be performed using the UTX or SNL (or both) high power lasers or pulsed power (or both)
- Involve the national or international scientific community
- Facilitate a proposal to a specific funding agency (e.g. DoE, NSF, NIH, ...)
- Produce great science in the broadest national interest
- Produce results publishable in high-impact journals
- Produce results in either a short term (~3 year) or longer term (~5 year) timeframe
- Be in either basic or applied science areas
- Cover low-hanging fruit through grand challenges

Deliverable:

- Provide enough information to down-select a few projects to develop into proposals to a funding agency, either individually or as part of a proposal for institute / center funding

Workshop format

- About a day of presentations to inspire us to think of great science to do
 - What are others doing?
 - What do others think we could or should be doing?
- About a day of parallel break-out sessions, to discuss ideas, and to down-select those for further consideration
- Half a day to report back to all of us, and discuss, what you think priorities should be
- The topical areas were chosen because they reflect areas where SNL and UTX are currently thinking about proposals. Don't be bound by them. The number of topics was chosen to give about 5 to 10 people in a break-out session, with a total around 40 to 50.

FESAC has relevant recommendations

Areas ripe for near-term discoveries in HEDL Plasma Science

- HED hydrodynamics
- Radiation dominated dynamics and material properties
- Magnetized HEDP
- Nonlinear optics of plasmas
- Relativistic HEDP
- Warm dense matter

“Priority should be given to discovery driven research efforts of high intellectual value that are expected to advance the field, explore scientific potential, stimulate interest of grad students, and attract scientists from other fields”

Priorities for energy-related HELP science

- Intense particle beam generation
- Transport and coupling of intense beams in HED
- Influence of B fields on HED fusion plasmas
- Laser-plasma instabilities and hot e generation
- Implosion hydro for high gain
- Integrated target physics for IFE

“It is recommended that the Joint program expands the development of alternate (to laser indirect drive) IFE concepts”

Presentations are in line with FESAC recommendations

- **Astro-physics:**
 - Shock waves (Wendell Horton, 'Cosmic Shocker', star formation)
 - Jets (Ampleford)
 - Stellar evolution (Greg Rochau, Winget)
 - High Energy Astrophysics (Liang, Mancini, Behar)
 - Scaled experiments: where do they break down?
- **Beams and particles:**
 - Oncology (Roth, Patel, Schollmeier)
 - X-ray sources (Brambrink)
 - Wakefield accelerators (Downer)
- **Fusion:**
 - Alternate IFE (Slutz, Patel)
 - Influence of B fields on HED plasmas (Slutz, Breizman, Bengtson)
- **HED:**
 - Flows (Ampleford)
 - Particle beam propagation (Patel)
 - Materials properties (Lemke, Cuneo, Bernstein)

Organizational details

Meeting Room Assignments (also listed on your printed materials):

- Plenary Sessions: Mesa A Ballroom

Parallel Breakouts Sessions (day two):

- Astrophysics: Mesa A
- Fusion: Mesa C (change)
- Particles and Beams: Ortiz 2
- High Energy Density Physics: Ortiz 1
- Add'l Room: Mesa B (change)

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